

Welcome to Eclipse

Lab User

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Welcome to Eclipse

Welcome to the Eclipse platform!

The following sections discuss the issues and problems with building integrated tool suites, and how the Eclipse tooling platform can help solve these problems.

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20th June, 2002

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Who needs a platform?

On any given day, you can probably find an announcement about a strategic alliance, an open architecture, or a commercial API that promises to integrate all your tools, seamlessly move your data among applications, and simplify your programming life.

Down in the trenches, you're trying to apply enough import/export duct tape to let marketing say "suite" with

Welcome to Eclipse

a straight face.

Where is all this integration pressure coming from? Why is everyone trying to integrate their products into suites or build platforms to support open integration? Who needs these platforms?

End users

Let's face it. End users do not call the support line to say, "What I really need is an open tools platform."

But they do ask why your product doesn't integrate with their other tools. They ask for features outside of the scope of your application because they can't get their data to a tool that would do the job better. They run into problems importing and exporting between different programs. They wonder why their programs have completely different user interfaces for doing similar tasks. Doesn't it seem obvious that their web site design tool should be integrated with their scripting program?

Your users want the freedom to pick the best tool for the task. They don't want to be constrained because your software only integrates with a few other programs. They have a job to do, and it's not managing the flow of files and data between their tools. They're busy solving their own problems. It's your job to make the tools work, and even better if you can make them work together.

Software developers

Meanwhile, you are slaving on your tool implementing the next round of critical features, fixing bugs, and shipping releases. The last thing you need is another emergency import feature added to your list.

Wouldn't it be nice if you could just publish enough hooks to make integrating with your tool everyone else's problem? Unfortunately, unless you work for one of the giants, you just don't have enough clout to get away with that.

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The holy grail

What we all want is a level of integration that magically blends separately developed tools into a well designed suite. And it should be simple enough that existing tools can be moved to the platform without using a shoehorn or a crowbar.

The platform should be open, so that users can select tools from the best source and know that their supplier has a voice in the development of the underlying platform.

It should be simple to understand, yet robust enough to support integration without a lot of extra glue.

It should provide tools that help automate mundane tasks. It should be stable enough so that industrial strength tools can build on top of it. And it should be useful enough that the platform developers can use it to build itself.

These are all goals of Eclipse. The remainder of this programming guide will help you determine how close Eclipse has come to delivering on these ideals.

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What is Eclipse?

Eclipse is a platform that has been designed from the ground up for building integrated web and application development tooling. By design, the platform does not provide a great deal of end user functionality by itself. The value of the platform is what it encourages: rapid development of integrated features based on a **plug-in** model.

Eclipse provides a common user interface (UI) model for working with tools. It is designed to run on multiple operating systems while providing robust integration with each underlying OS. Plug-ins can program to the Eclipse portable APIs and run unchanged on any of the supported operating systems.

At the core of Eclipse is an architecture for dynamic discovery, loading, and running of plug-ins. The platform handles the logistics of finding and running the right code. The platform UI provides a standard user navigation model. Each plug-in can then focus on doing a small number of tasks well. What kinds of tasks? Defining, testing, animating, publishing, compiling, debugging, diagramming...the only limit is your imagination.

Open architecture

The Eclipse platform defines an open architecture so that each plug-in development team can focus on their area of expertise. Let the repository experts build the back ends and the usability experts build the end user tools. If the platform is designed well, significant new features and levels of integration can be added without impact to other tools.

The Eclipse platform uses the model of a common workbench to integrate the tools from the end user's point of view. Tools that you develop can plug into the workbench using well defined hooks called **extension points**.

The platform itself is built in layers of plug-ins, each one defining extensions to the extension points of lower-level plug-ins, and in turn defining their own extension points for further customization. This extension model allows plug-in developers to add a variety of function to the basic tooling platform. The artifacts for each tool, such as files and other data, are coordinated by a common platform resource model.

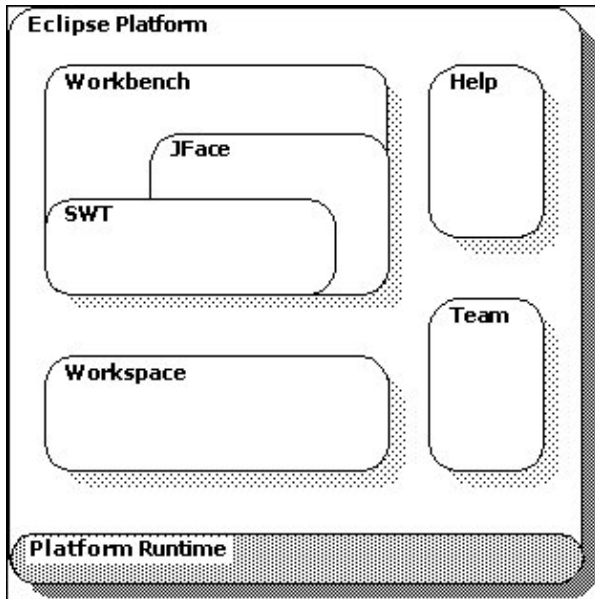
The platform gives the users a common way to work with the tools, and provides integrated management of the resources they create with plug-ins.

Plug-in developers also gain from this architecture. The platform manages the complexity of different runtime environments, such as different operating systems or workgroup server environments. Plug-in developers can focus on their specific task instead of worrying about these integration issues.

Platform structure

The Eclipse platform itself is structured as subsystems which are implemented in one or more plug-ins. The subsystems are built on top of a small runtime engine. The figure below depicts a simplified view.

Welcome to Eclipse

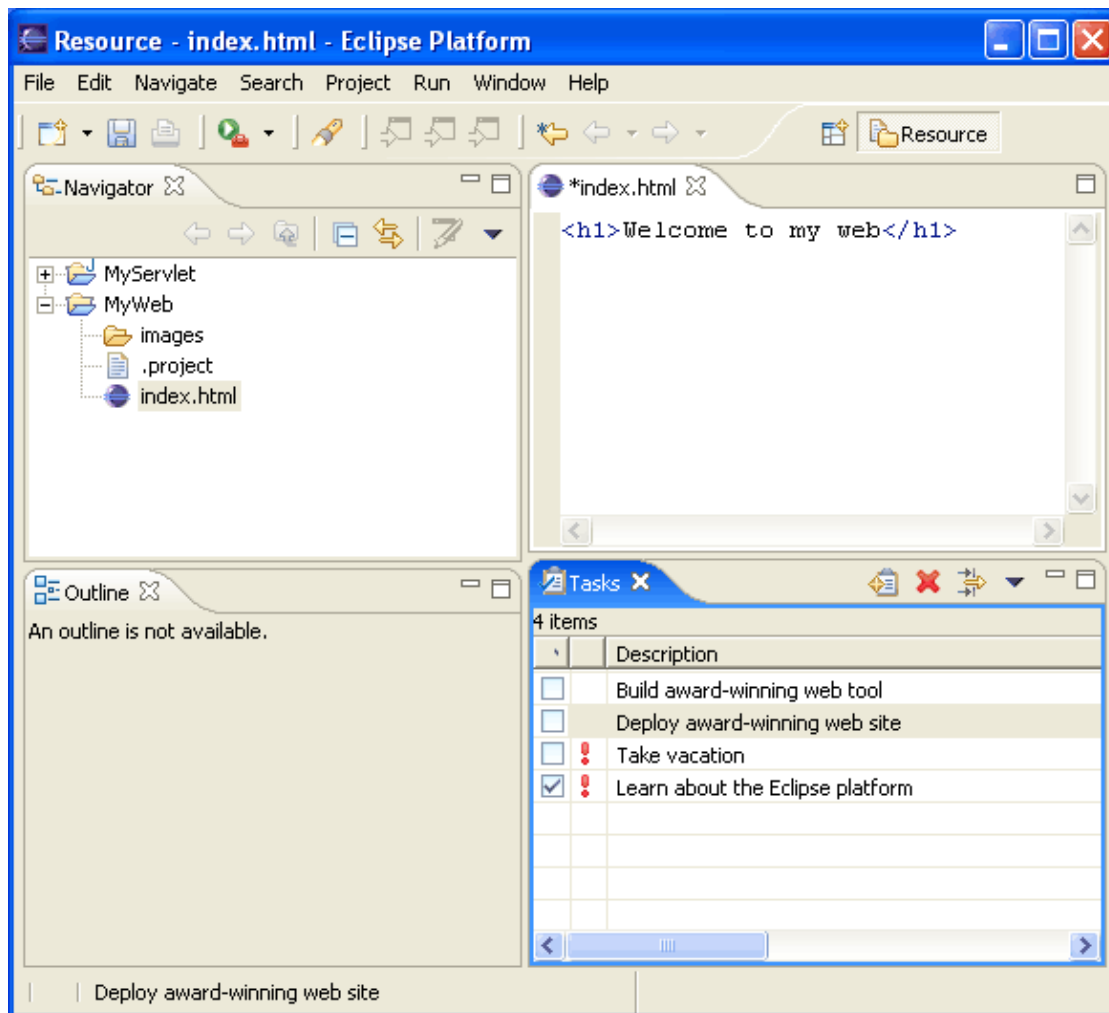


The plug-ins that make up a subsystem define extension points for adding behavior to the platform. The following table describes the major runtime components of the platform that are implemented as one or more plug-ins.

Platform runtime	Defines the extension point and plug-in model. It dynamically discovers plug-ins and maintains information about the plug-ins and their extension points in a platform registry. Plug-ins are started up when required according to user operation of the platform. The runtime is implemented using the OSGi framework.
Resource management (workspace)	Defines API for creating and managing resources (projects, files, and folders) that are produced by tools and kept in the file system.
Workbench UI	Implements the user cockpit for navigating the platform. It defines extension points for adding UI components such as views or menu actions. It supplies additional toolkits (JFace and SWT) for building user interfaces. The UI services are structured so that a subset of the UI plug-ins can be used to build rich client applications that are independent of the resource management and workspace model. IDE-centric plug-ins define additional function for navigating and manipulating resources.
Help system	Defines extension points for plug-ins to provide help or other documentation as browsable books.
Team support	Defines a team programming model for managing and versioning resources.
Debug support	Defines a language independent debug model and UI classes for building debuggers and launchers.
Other utilities	Other utility plug-ins supply function such as searching and comparing resources, performing builds using XML configuration files, and dynamically updating the platform from a server.

Out of the box

Out of the box – or off the web – the basic platform is an integrated development environment (IDE) for anything (and nothing in particular).



It's the plug-ins that determine the ultimate functionality of the platform. That's why the Eclipse SDK ships with additional plug-ins to enhance the functionality of the SDK.

Your plug-ins can provide support for editing and manipulating additional types of resources such as Java files, C programs, Word documents, HTML pages, and JSP files.

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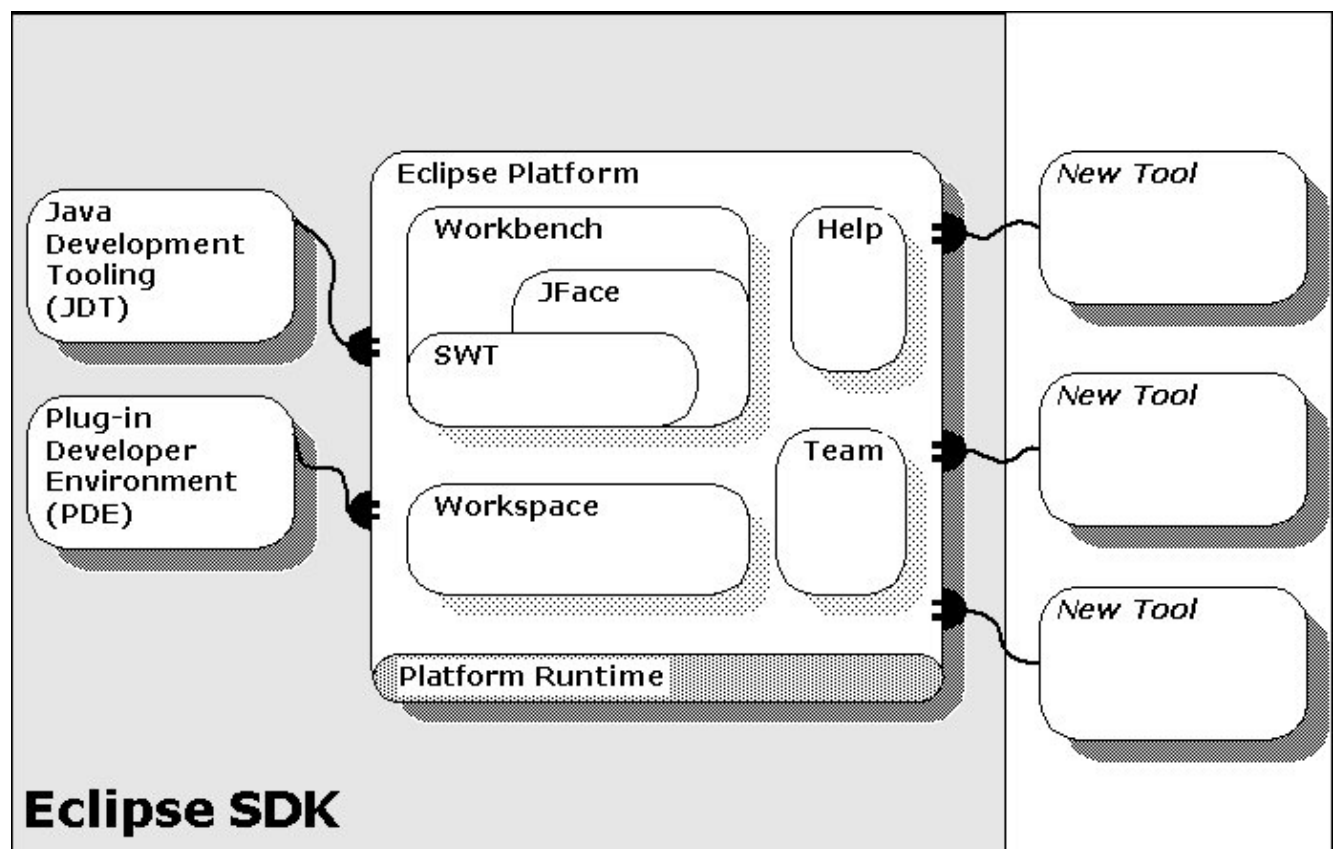
Platform architecture

The Eclipse platform is structured around the concept of **plug-ins**. Plug-ins are structured bundles of code and/or data that contribute function to the system. Function can be contributed in the form of code libraries (Java classes with public API), platform **extensions**, or even documentation. Plug-ins can define **extension points**, well-defined places where other plug-ins can add functionality.

Each subsystem in the platform is itself structured as a set of plug-ins that implement some key function. Some plug-ins add visible features to the platform using the extension model. Others supply class libraries that can be used to implement system extensions.

The Eclipse SDK includes the basic platform plus two major tools that are useful for plug-in development. The Java development tools (JDT) implement a full featured Java development environment. The Plug-in Developer Environment (PDE) adds specialized tools that streamline the development of plug-ins and extensions.

These tools not only serve a useful purpose, but also provide a great example of how new tools can be added to the platform by building plug-ins that extend the system.



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Platform SDK roadmap

Runtime core

The platform runtime core implements the runtime engine that starts the platform base and dynamically discovers and runs plug-ins. A **plug-in** is a structured component that describes itself to the system using a manifest (**plugin.xml**) file. The platform maintains a registry of installed plug-ins and the function they provide.

A general goal of the runtime is that the end user should not pay a memory or performance penalty for plug-ins that are installed, but not used. A plug-in can be installed and added to the registry, but the plug-in will not be activated unless a function provided by the plug-in has been requested according to the user's activity.

The platform runtime is implemented using the OSGi services model. While implementation details of the runtime may not be important to many application developers, those already familiar with OSGi will recognize that an Eclipse plug-in is, in effect, an OSGi bundle.

The best way to get a feel for the runtime system is to build a plug-in. See [Plug it in: Hello World meets the workbench](#) to get started building a plug-in. To understand the nuts and bolts of the runtime system, see [Runtime overview](#).

Resource management

The resource management plug-in defines a common resource model for managing the artifacts of tool plug-ins. Plug-ins can create and modify **projects**, **folders**, and **files**. Resource extension points allow plug-ins to define other their own resource types.

[Resources overview](#) provides an overview of the resource management system.

Workbench UI

The workbench UI plug-in implements the workbench UI and defines a number of extension points that allow other plug-ins to contribute menu and toolbar actions, drag and drop operations, dialogs, wizards, and custom views and editors.

[Plugging into the workbench](#) introduces the workbench UI extension points and API.

Additional UI plug-ins define frameworks that are generally useful for user interface development. These frameworks were used to develop the workbench itself. Using the frameworks not only eases the development of a plug-in's user interface, but ensures that plug-ins have a common look and feel and a consistent level of workbench integration.

The Standard Widget Toolkit (SWT) is a low-level, operating system independent toolkit that supports platform integration and portable API. It is described in [Standard Widget Toolkit](#).

The JFace UI framework provides higher-level application constructs for supporting dialogs, wizards, actions, user preferences, and widget management. The functionality in JFace is described in [Dialogs and wizards](#) and [JFace: UI framework for plug-ins](#).

Team support

The Team plug-ins allow other plug-ins to define and register implementations for team programming, repository access, and versioning. The Eclipse SDK includes a CVS plug-in that uses the team support to provide CVS client support in the SDK.

Team support is described in [Team support](#).

Debug support

The Debug plug-ins allow other plug-ins to implement language specific program launchers and debuggers.

Debug support is described in [Program debug and launching support](#).

Help System

The Help plug-in implements a platform optimized help web server and document integration facility. It defines extension points that plug-ins can use to contribute help or other plug-in documentation as browsable books. The documentation web server includes special facilities to allow plug-ins to reference files by using logical, plug-in based URLs instead of file system URLs.

Additional features are provided for integrating help topics in product level documentation configurations.

The help facility is described in [Plugging in help](#).

Java Development Tools (JDT)

The Java development tools (JDT) plug-ins extend the platform workbench by providing specialized features for editing, viewing, compiling, debugging, and running Java code.

The JDT is installed as a set of plug-ins that are included in the SDK. The Java Development User Guide describes how to use the Java tools. The JDT Plug-in Developer Guide describes the structure and API of the JDT.

Plug-in Development Environment (PDE)

The Plug-in Development Environment (PDE) supplies tools that automate the creation, manipulation, debugging, and deploying of plug-ins.

The PDE is installed as a set of plug-ins that are included in the SDK. The PDE Guide describes how to use the environment.

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Team support

The Eclipse Team support defines API that allow plug-ins to integrate the function of a versioning and configuration management repository. The function provided by a repository fundamentally affects the user workflow, since there are additional steps for retrieving files, comparing their content with local content, versioning them, and returning updated files to the repository. The goal of the team plug-in API is to be passive enough to allow repository plug-in providers to define their own workflow so that users familiar with their product can use the platform in a similar fashion and provide support for workflows that we have found are useful for team plug-ins.

This goal is accomplished by supplying several building blocks:

- Repository Providers

A repository provider allows synchronization of workspace resources with a remote location. At a minimum it allows pushing resources in the workspace to a remote location and pulling resources from a remote location into the workspace. A repository provider is associated with a project and controls the resources in the project by optionally providing a IFileModificationValidator and IMoveDeleteHook. There is only one repository provider associated with each project. A user associates a repository provider with a project by providing a IConfigurationWizard. Repository providers can also participate in exporting and importing of projects into the workspace via the team project set feature. To support this a repository provider should implement a ProjectSetCapability.

- Resource Management

Allows other plug-ins to indicate special handling of resources with respect to team operations. The repository provider can mark resources as team-private which essentially hides the resource from other plug-ins. This is done via the IResource#setTeamPrivateMember method and is commonly done to hide repository provider specific metafiles from the user. Also, builders will often mark build output as derived which is a hint to a repository provider that the resource is transient and could be ignored by the repository provider. A provider can check this flag on a resource via the IResource#isDerived method.

In addition, other plug-ins can add provide hints to the repository provider about file type information via the org.eclipse.team.core.fileTypes extension and about common files that should be ignored by the repository via the org.eclipse.team.core.ignore extension.

- Synchronization Support [new in 3.0]

Synchronization support provides classes and interfaces for managing dynamic collections of synchronization information (SyncInfo, SyncInfoSet). This support helps you manage information about variants of the resources in the workspace. For example, with FTP you could store timestamps for the latest remote file and the base for the currently loaded resource. Synchronization support provides APIs to help manage and persist resource variants and display synchronization state to the user.

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The UI support is also structured passively. Placeholders for team provider actions, preferences, and properties are defined by the team UI plug-in, but it's up to the team plug-in provider to define these UI elements. The team UI plug-in also includes a simple, extendable configuration wizard that lets users associate projects with repositories. Plug-ins can supply content for this wizard that let the user specify repository specific information.

Multiple repository providers can coexist peacefully within the platform. In fact, it's even possible to have different client implementations for the same repository installed. For example, one could install a CVS client designed for experts and a different one for novice users.

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Repository providers

A repository provider (**RepositoryProvider**) is the central class in the implementation of your repository. This class is responsible for configuring a project for repository management and providing the necessary hooks for resource modification. Providers are mapped to a project using project persistent properties. The mechanism for mapping providers to a project is not central to the team API, but you'll need to be aware of it when filtering out resources in your UI. For the most part, you'll be using team API to work with projects and associate them to your provider.

To implement a provider, you must define a repository using org.eclipse.team.core.repository and supply a class derived from **RepositoryProvider**. We'll use the CVS client as an example to see how this works.

Extension point

The org.eclipse.team.core.repository extension point is used to add a repository definition. Here is the markup for the CVS client.

```
<extension
  point="org.eclipse.team.core.repository">
  <repository
    class="org.eclipse.team.internal.cvs.core.CVSTeamProvider"
    id="org.eclipse.team.cvs.core.cvsprovider">
  </repository>
</extension>
```

This registers your team provider with the team support plug-in and assigns an id that should be used when your provider is associated with a project. The specified **class** for the repository must extend **RepositoryProvider**.

Implementing a RepositoryProvider

The class identified in the extension must be a subclass of **RepositoryProvider**. Its primary responsibilities are to configure and deconfigure a project for repository support, and supply any necessary resource modification hooks. The CVS client serves as a good example. Its repository provider is **CVSTeamProvider**.

```
public class CVSTeamProvider extends RepositoryProvider {
  ...
}
```


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RepositoryProvider defines two abstract methods, **configureProject** and **deconfigure**. All providers must implement these methods.

A project is configured when it is first associated with a particular repository provider. This typically happens when the user selects a project and uses the team wizards to associate a project with your repository. Regardless of how the operation is triggered, this is the appropriate time to compute or cache any data about the project that you'll need to provide your repository function. (Assume that mapping the project to your provider has already happened. You'll be taking care of this in your configuration wizard.)

The CVS provider simply broadcasts the fact that a project has been configured:

```
public void configureProject() throws CoreException {
    CVSProviderPlugin.broadcastProjectConfigured(getProject());
}
```

We won't follow the implementation of the plug-in broadcast mechanism. Suffice to say that any parties that need to compute or initialize project specific data can do so at this time.

A project is deconfigured when the user no longer wants to associate a team provider with a project. It is up to your plug-in to implement the user action that causes this to happen (and unmapping the project from your team provider will happen there). The **deconfigure** method is the appropriate time to delete any project related caches or remove any references to the project in the UI. The CVS provider flushes project related caches kept in its views and broadcasts the fact that the project is deconfigured.

```
public void deconfigure() throws CoreException {
    ...
    try {
        EclipseSynchronizer.getInstance().flush(getProject(), true, true /*flush deep*/,
    } catch(CVSException e) {
        throw new CoreException(e.getStatus());
    } finally {
        CVSProviderPlugin.broadcastProjectDeconfigured(getProject());
    }
}
```

Configuring a project

Typically, the first step in building a team UI is implementing a wizard page that allows users to configure a project for your plug-in's team support. This is where your team provider's id will be added to the project's properties. You participate in project configuration by contributing to the **org.eclipse.team.ui.configurationWizards** extension point. This wizard is shown when the user chooses **Team->Share Project...**

We'll look at this in the context of the CVS client implementation. Here is the CVS UI markup for its configuration wizard:

```
<extension
  point="org.eclipse.team.ui.configurationWizards">
  <wizard
    name="%SharingWizard.name"
    icon="icons/full/wizards/newconnect_wiz.gif"
    class="org.eclipse.team.internal.ccvs.ui.wizards.SharingWizard"
    id="org.eclipse.team.ccvs.ui.SharingWizard">
  </wizard>
</extension>
```

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As usual, plug-ins supply a **class** that implements the extension and a unique **id** to identify their extension. The **name** and **icon** are shown in the first page of the project configuration wizard if there are multiple providers to choose from.

Once the user has selected a provider, the next page shows the specific configuration information for your provider. (If your provider is the only team provider plug-in installed, then the wizard skips directly to your page.) Your wizard must implement **IConfigurationWizard**, which initializes the wizard for a specified workbench and project. The rest of the implementation depends on the design of your wizard. You must gather up any information needed to associate the project with your team support.

When the wizard is completed, you must map your team provider to the project using **RepositoryProvider.map(IProject, String)**. Mapping handles the assignment of the correct project persistent property to your project.

The CVS client does this work in its provider's **setSharing** method, which is called when its wizard is finished:

```
public void setSharing(IProject project, FolderSyncInfo info, IProgressMonitor monitor) throws Te

    // Ensure provided info matches that of the project
    ...
    // Ensure that the provided location is managed
    ...
    // Register the project with Team
    RepositoryProvider.map(project, CVSProviderPlugin.getTypeId());
}
```

Finding a provider

Static methods in **RepositoryProvider** make it easy for clients to map projects to providers and to find the providers associated with a given project.

- **map(IProject, String)** – instantiates a provider of the specified provider id and maps the specified project to it. This call sets the proper project persistent property on the project.
- **unmap(IProject, String)** – removes the association of the specified provider id from the specified project. Leaves the project unassociated with any team provider.
- **getProvider(IProject)** – answers the provider for a given project. Can be used to find any team provider for a project.
- **getProvider(IProject, String)** – answers the provider for a given project with the specified provider id. Can be used to check whether a particular team provider type is associated with a given project. It is commonly used by providers to quickly check whether a given project is under their care. This call is safer for clients since it does not return a provider that does not match the client's id.

Repository Providers and Capabilities

If a product chooses to add a Repository plug-in to a capability, it should bind the capability to the repository id. Here are the two steps to take to enable a RepositoryProvider as a capability:

1. Bind the capability to the repository provider id. This allows the Team plug-in to activate/disable based on repository provider ids.

```
<activityPatternBinding
```

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```
activityId="org.eclipse.team.cvs"  
pattern="org\.eclipse\.team\.cvs\.core\/.*cvsnature">  
</activityPatternBinding>
```

2. Next bind the capability to all UI packages for the provider:

```
<activityPatternBinding  
activityId="org.eclipse.team.cvs"  
pattern="org\.eclipse\.team\.cvs\.ui\/.*">  
</activityPatternBinding>
```

There are two capability triggers points defined by the Team plug-ins. The first is the Team > Share Project... wizard which allows filtering of repository providers based on the enabled/disabled state of workbench capabilities, and the other is the Team plug-in auto-enablement trigger.

Resource modification hooks

Most of the interesting function associated with a repository provider occurs as the user works with resources in the project that is configured for the provider. In order to be aware of changes the user makes to a resource, the provider can implement resource modification hooks. The resources plug-in provides these hooks as extension points. The documentation for **IMoveDeleteHook**, **IFileModificationValidator** and **ResourceRuleFactory** describe the details for implementing these hooks.

The team plug-in optimizes and simplifies the association of the hook with appropriate resources by registering generic hooks with the resources plug-in. These generic hooks simply look up the repository provider for a given resource and obtain its hook. This has the advantage of calling only one provider hook rather than having each provider implementation register a hook that must first check whether the resource is managed by the provider.

What this means to your plug-in is that you provide any necessary hooks by overriding methods in **RepositoryProvider**. The default implementation of these methods answers null, indicating that no hook is necessary (except for the resource rule factory, as described below):

- **getMoveDeleteHook** – answers an **IMoveDeleteHook** appropriate for the provider. This hook allows providers to control how moves and deletes occur and includes the ability to prevent them from happening. Implementors can provide alternate implementations for moving or deleting files, folders, and projects. The CVS client uses this hook to monitor folder deletions and ensure that any files contained in deleted folders are remembered so that they can later be deleted from the repository if desired.
- **getFileModificationValidator** – answers an **IFileModificationValidator** appropriate for the provider. This hook allows providers to pre-check any modifications or saves to files. This hook is typically needed when a repository provider wants to implement **pessimistic versioning**. In pessimistic versioning, a file must be checked out before modifying it, and only one client can check out a file at any given time. Pessimistic versioning could be implemented by checking out a file (if not already checked out) whenever a file is edited, and checking the file back in when it is saved. Since CVS uses an optimistic versioning scheme, it does not implement this hook.
- **getRuleFactory** – answers a resource rule factory appropriate for the provider. Providers should always override this method as the default factory locks the workspace for all operations for backwards compatibility reasons. Providers should subclass **ResourceRuleFactory** and override those rules required to ensure that the proper rules are obtained for operations that invoke the move/delete hook and file modification validator. The rule methods of particular interest to repository providers are:

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- ◆ *deleteRule* – move/delete hook
- ◆ *moveRule* –move/delete hook
- ◆ *validateEditRule* – file modification validator validateEdit
- ◆ *modifyRule* – file modification validator validateSave

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Resource properties

Resources have properties that can be used to store meta-information about the resource. Your plug-in can use these properties to hold information about a resource that is specific to your purpose. Resource properties are declared, accessed, and maintained by various plug-ins, and are not interpreted by the platform. When a resource is deleted from the workspace, its properties are also deleted.

There are two kinds of resource properties:

- **Session properties** allow your plug-ins to easily cache information about a resource in key-value pairs. The values are arbitrary objects. These properties are maintained in memory and lost when a resource is deleted from the workspace, or when the project or workspace is closed.
- **Persistent properties** are used to store resource-specific information on disk. The value of a persistent property is an arbitrary string. Your plug-in decides how to interpret the string. The strings are intended to be short (under 2KB). Persistent properties are stored on disk with the platform metadata and maintained across platform shutdown and restart.

If you follow the convention of qualifying property key names with the unique id of your plug-in, you won't have to worry about your property names colliding with those of other plug-ins.

If your plug-in needs to store persistent information about a project that is much larger than 2 KB, then these properties should be exposed as resources in their own right, rather than using the persistent properties API.

See [**IResource**](#) for a description of the API for getting and setting the different kinds of resource properties.

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Team Repository Provider

Identifier:

org.eclipse.team.core.repository

Since:

2.0

Description:

The Team plugin contains the notion of Repositories. The job of a repository is to provide support for sharing resources between Team members. Repositories are configured on a per-project basis. Only one repository can be mapped to a project at a time.

Repositories that extend this extension point can provide implementations for common repository specific rules for resource modifications, moving and deleting. See the following interfaces for more details `IFileModificationValidator` and `MoveDeleteHook`.

A Repository type can also be specified in order to provide non-project specific functionality such as a `org.eclipse.team.core.ProjectSetCapability`.

Optionally, a repository provider type can designate that it can import projects from second provider, in the case where the second provider's plugin is not available in the current install. This is provided as a means to support the migration from one provider implementation to another where the reuse of the same id for the two providers was not possible.

Configuration Markup:

```
<!ELEMENT extension (repository)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED>
```

```
<!ELEMENT repository EMPTY>
```

```
<!ATTLIST repository
```

```
id CDATA #IMPLIED
```

```
class CDATA #REQUIRED
```

```
typeClass CDATA #IMPLIED
```

```
canImportId CDATA #IMPLIED>
```

- **id** – an optional identifier of the extension instance

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- **class** – the fully-qualified name of a subclass of `org.eclipse.team.core.RepositoryProvider`.
- **typeClass** – the fully-qualified name of a subclass of `org.eclipse.team.core.RepositoryProviderType`.
- **canImportId** – The id of an older version of this provider. Including this means that this provider can import the project sets that were created by using the older version of the provider. Since 3.0.1

Examples:

```
<extension point=
"org.eclipse.team.core.repository"
>
<repository class=
"org.eclipse.myprovider.MyRepositoryProvider"
typeClass=
"org.eclipse.myprovider.MyRepositoryProvider"
id=
"org.eclipse.myprovider.myProviderID"
canImportId=
"org.eclipse.myprovider.myOldProviderID"
>
</repository>
</extension>
```

API Information:

The value of the class attribute must represent a subclass of `org.eclipse.team.core.RepositoryProvider` and the value of the typeClass attribute must represent a subclass of `org.eclipse.team.core.RepositoryProviderType`

Supplied Implementation:

The provided implementation of `RepositoryProvider` provides helper methods and common code for mapping and unmapping providers to projects. The optional `RepositoryProviderType` provides project set import and export through a `ProjectSetCapability`.

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Configuration Wizards

Identifier:

org.eclipse.team.ui.configurationWizards

Description:

This extension point is used to register a method for configuration of a project. Configuration involves the association of a project with a team provider, including all information necessary to initialize that team provider, including such things as username, password, and any relevant information necessary to locate the provider.

Providers may provide an extension for this extension point, and an implementation of `org.eclipse.team.ui.IConfigurationWizard` which gathers the necessary information and configures the projects.

Configuration Markup:

```
<!ELEMENT extension (wizard?)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT wizard EMPTY>
```

```
<!ATTLIST wizard
```

```
name CDATA #REQUIRED
```

```
icon CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
id CDATA #REQUIRED>
```

- **name** – The name of the configuration type as it should appear in the configuration wizard. Examples are "CVS", "WebDAV".
- **icon** – the icon to present in the configuration wizard next to the name.
- **class** – a fully qualified name of the Java class implementing `org.eclipse.team.ui.IConfigurationWizard`.
- **id** – a unique identifier for this extension.

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Examples:

Following is an example of a configuration wizard extension:

```
<extension point=
"org.eclipse.team.ui.configurationWizards"
>
<wizard name=
"WebDAV"
icon=
"webdav.gif"
class=
"com.xyz.DAVDecorator"
id=
"com.xyz.dav"
>
</wizard>
</extension>
```

API Information:

The value of the `class` attribute must represent a class that implements `org.eclipse.team.ui.IConfigurationWizard`. This interface supports configuration of a wizard given a workbench and a project.

Supplied Implementation:

The plug-in `org.eclipse.team.provider.examples.ui` contains sample implementations of `IConfigurationWizard` for the WebDAV and filesystem provider types.

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Resource modification hooks

So far, we've assumed that resource API is being used to modify resources that are located in the user's file system. This is indeed the fundamental structure of the workspace, but it's also possible that a plug-in adds capabilities for manipulation of resources that are managed somewhere else. For example, the platform [Team support](#) plug-ins add the ability to work with resources that are under the management of a versioning repository.

The resource API includes capabilities that have been added specifically to enable the team support plug-ins and plug-ins that implement repository providers using the team support. The following discussion covers the generic mechanism for registering resource hooks. See [Implementing a repository provider](#) for a discussion of how team uses these hooks.

Resource move/delete hooks

This hook allows the team plug-in and its providers to control how resource moves and deletes are implemented. The hook includes the ability to prevent these operations from happening. Implementors can provide alternate implementations for moving or deleting files, folders, and projects.

The team plug-in uses the [org.eclipse.core.resources.moveDeleteHook](#) extension point to register its hook:

```
<extension point="org.eclipse.core.resources.moveDeleteHook" id="MoveDeleteHook">
    <moveDeleteHook class="org.eclipse.team.internal.core.MoveDeleteManager" />
</extension>
```

The supplied class must implement [IMoveDeleteHook](#), which is called by the platform whenever a resource is moved or deleted. The team plug-in installs a move delete hook manager that can determine which team provider is managing a resource and invoke its specific hook.

Note: The move delete hook was designed specifically for use by the team core plug-in and other team repository provider clients. It is not intended for general use. Team providers should not install the hook using the extension point, but instead implement their hook in their RepositoryProvider class. See [Team resource modification hooks](#) for more information about using these hooks.

File modification validators

It's also possible that team repository providers will need to prevent or intervene in the editing or saving of a file. The team plug-in accomplishes this by using the extension point [org.eclipse.core.resources.fileModificationValidator](#) to register a validator that is called whenever a resource is to be modified.

```
<extension point="org.eclipse.core.resources.fileModificationValidator" id="FileValidator">
    <fileModificationValidator class="org.eclipse.team.internal.core.FileModificationValidato
</extension>
```

The supplied class must implement [IFileModificationValidator](#), which is called by the platform whenever a resource is saved or opened. The team plug-in installs a file modification manager that can determine which team provider is managing a resource and invoke its specific validator.

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Note: The file modification validator hook was designed specifically for use by the team core plug-in. It is not intended for general use. Team providers should not install the hook using the extension point, but instead implement their hook in their Repository Provider class. See [Team resource modification hooks](#) for more information about using these hooks.

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Move/Delete Hook

Identifier:

org.eclipse.core.resources.moveDeleteHook

Since:

2.0

Description:

For providing an implementation of an `IMoveDeleteHook` to be used in the `IResource.move` and `IResource.delete` mechanism. This extension point tolerates at most one extension.

Configuration Markup:

```
<!ELEMENT extension (moveDeleteHook?)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT moveDeleteHook EMPTY>
```

```
<!ATTLIST moveDeleteHook
```

```
class CDATA #REQUIRED>
```

- **class** – the fully-qualified name of a class which implements `org.eclipse.core.resources.team.IMoveDeleteHook`

Examples:

The following is an example of using the `moveDeleteHook` extension point. (in file `plugin.xml`)

```
<extension point=
```

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```
"org.eclipse.core.resources.moveDeleteHook"
```

```
>
```

```
<moveDeleteHook class=
```

```
"org.eclipse.team.internal.MoveDeleteHook"
```

```
/>
```

```
</extension>
```

API Information:

The value of the class attribute must represent an implementation of `org.eclipse.core.resources.team.IMoveDeleteHook`.

Supplied Implementation:

The Team component will generally provide the implementation of the move/delete hook. The extension point should not be used by any other clients.

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Repository resource management

Once you have created a **RepositoryProvider**, there are other resource management mechanism that should be understood:

- In order to allow other plug-ins to indicate special handling for their projects and files the team plug-in defines extension points that other providers and other plug-ins can use to register file types and to declare files that should be ignored by a repository provider.
- Team providers can also register a class that can be used to persist a set a projects so that references to the project can be shared across a team, with the actual contents coming from the repository.
- Repository providers should consider how they will handle linked resources.
- Finally, team providers can mark resources that should be hidden from the user as team private.

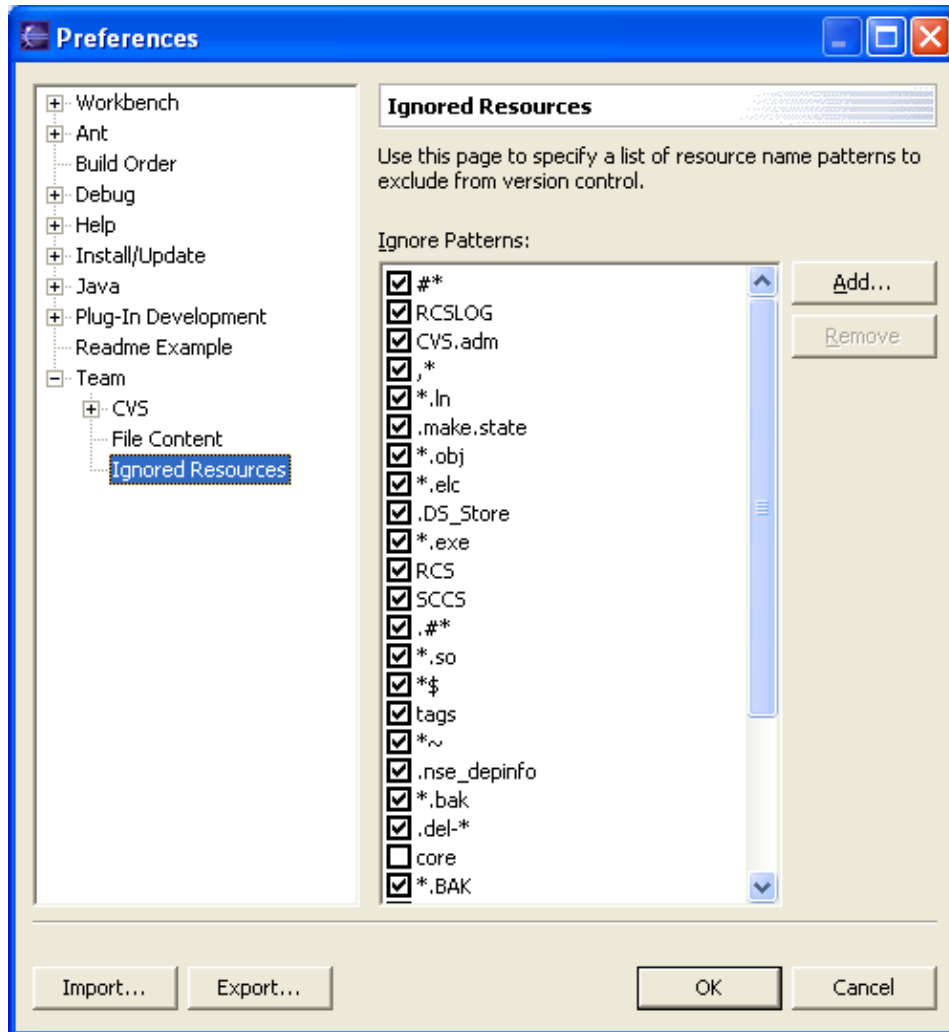
Ignored files

In several cases, it may be unnecessary to keep certain files under repository control. For example, resources that are derived from existing resources can often be omitted from the repository. For example, compiled source files, (such as Java ".class" files), can be omitted since their corresponding source (".java") file is in the repository. It also may be inappropriate to version control metadata files that are generated by repository providers. The **org.eclipse.team.core.ignore** extension point allows providers to declare file types that should be ignored for repository provider operations. For example, the CVS client declares the following:

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```
<extension point="org.eclipse.team.core.ignore">
  <ignore pattern = ".#*" selected = "true"/>
</extension>
```

The markup simply declares a file name **pattern** that should be ignored and a **selected** attribute which declares the default selection value of the file type in the preferences dialog. It is ultimately up to the user to decide which files should be ignored. The user may select, deselect, add or delete file types from the default list of ignored files.



File Types

Some repositories implement different handling for text vs. binary files. The [org.eclipse.team.core.fileTypes](#) extension allows plug-ins to declare file types as text or binary files. For example, the Java tooling declares the following:

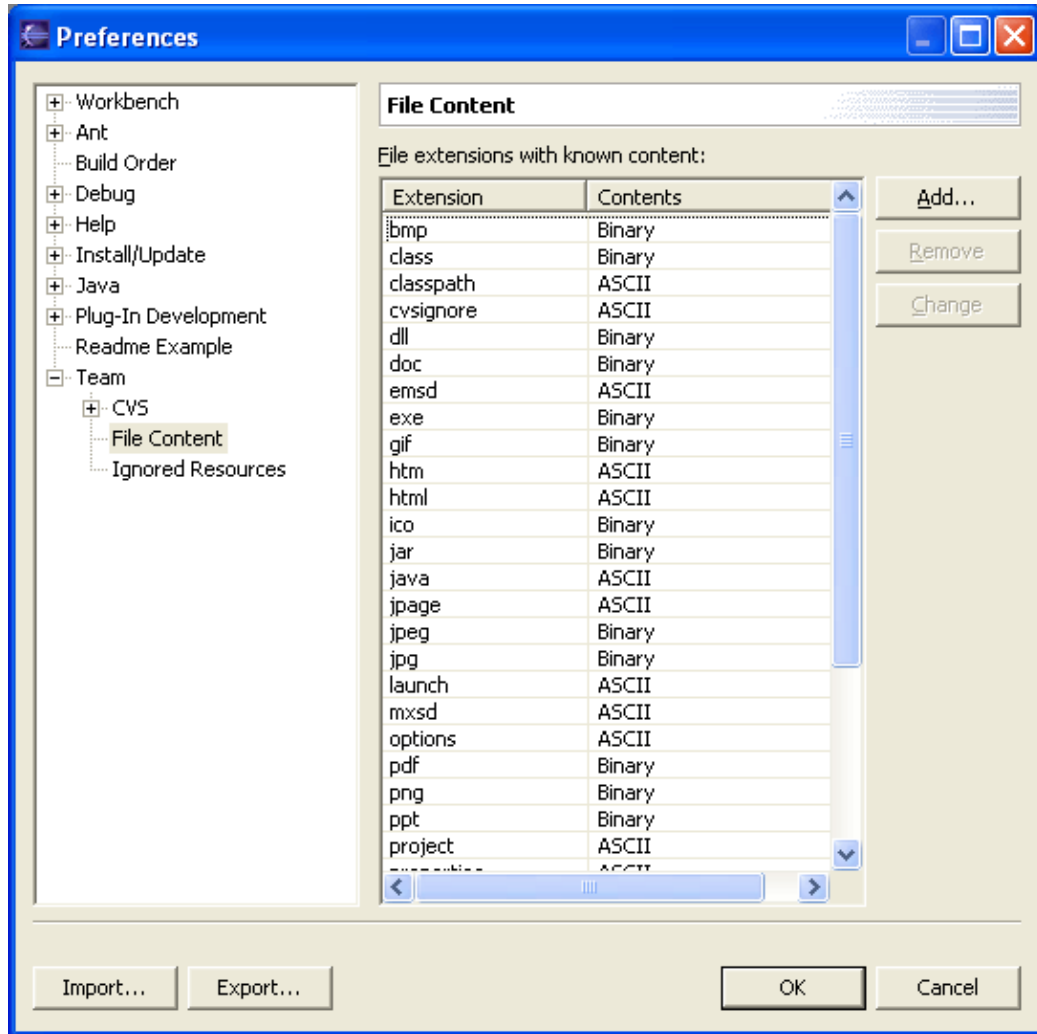
```
<extension point="org.eclipse.team.core.fileTypes">
  <fileTypes extension="java" type="text"/>

  <fileTypes extension="classpath" type="text"/>
  <fileTypes extension="properties" type="text"/>
  <fileTypes extension="class" type="binary"/>
```

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```
<fileTypes extension="jar" type="binary"/>
<fileTypes extension="zip" type="binary"/>
</extension>
```

The markup lets plug-ins define a file type by **extension** and assign a **type** of text or binary. As with ignored files, it is ultimately up to the user to manage the list of text and binary file types.



Team and linked resources

A project may contain resources that are not located within the project's directory in the local file system. These resources are referred to as linked resources.

Consequences for Repository Providers

Linked resources can pose particular challenges for repository providers which operate directly against the file system. This is a consequence of the fact that linked resources by design do not exist in the immediate project directory tree in the file system.

Providers which exhibit the following characteristics may be affected by linked resources:

1. Those which call out to an external program that then operates directly against the file system.

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2. Those which are implemented in terms of `IResource` but assume that all the files/folders in a project exist as direct descendents of that single rooted directory tree.

In the first case, let's assume the user picks a linked resource and tries to perform a provider operation on it. Since the provider calls a command line client, we can assume that the provider does something equivalent to first calling `IResource.getLocation().toOSString()`, feeding the resulting file system location as an argument to the command line program. If the resource in question is a linked resource, this will yield a file/folder outside of the project directory tree. Not all command line clients may expect and be able to handle this case. In short, if your provider ever gets the file system location of a resource, it will likely require extra work to handle linked resources.

The second case is quite similar in that there is an implicit assumption that the structure of the project resources is 1:1 with that of the file system files/folders. In general, a provider could be in trouble if they mix `IResource` and `java.io.File` operations. For example, for links, the parent of `IFile` is not the same as the `java.io.File`'s parent and code which assumes these to be the same will fail.

Backwards Compatibility

It was important that the introduction of linked resources did not inadvertently break existing providers. Specifically, the concern was for providers that reasonably assumed that the local file system structure mirrored the project structure. Consequently, by default linked resources can not be added to projects that are mapped to such a provider. Additionally, projects that contain linked resources can not by default be shared with that provider.

Strategies for Handling Linked Resources

In order to be "link friendly", a provider should allow projects with linked resources to be version controlled, but can disallow the version controlling of linked resources themselves.

A considerably more complex solution would be to allow the versioning of the actual linked resources, but this should be discouraged since it brings with it complex scenarios (e.g. the file may already be version controlled under a different project tree by another provider). Our recommendation therefore is to support version controlled projects which contain non-version controlled linked resources.

Technical Details for Being "Link Friendly"

Repository provider implementations can be upgraded to support linked resources by overriding the `RepositoryProvider.canHandleLinkedResources()` method to return `true`. Once this is done, linked resources will be allowed to exist in projects shared with that repository provider. However, the repository provider must take steps to ensure that linked resources are handled properly. As mentioned above, it is strongly suggested that repository providers ignore all linked resources. This means that linked resources (and their children) should be excluded from the actions supported by the repository provider. Furthermore, the repository provider should use the default move and delete behavior for linked resources if the repository provider implementation overrides the default `IMoveDeleteHook`.

Team providers can use `IResource.isLinked()` to determine if a resource is a link. However, this method only returns true for the root of a link. The following code segment can be used to determine if a resource is the child of a link.

```
String linkedParentName = resource.getProjectRelativePath().segment(0);
IFolder linkedParent = resource.getProject().getFolder(linkedParentName);
```


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```
boolean isLinked = linkedParent.isLinked();
```

Repository providers should ignore any resource for which the above code evaluates to *true*.

Team private resources

It is common for repository implementations to use extra files and folders to store information specific about the repository implementation. Although these files may be needed in the workspace, they are of no interest to other plug-ins or to the end user.

Team providers may use **`IResource.setTeamPrivateMember(boolean)`** to indicate that a resource is private to the implementation of a team provider. Newly created resources are not private members by default, so this method must be used to explicitly mark the resource as team private. A common use is to mark a subfolder of the project as team private when the project is configured for team and the subfolder is created.

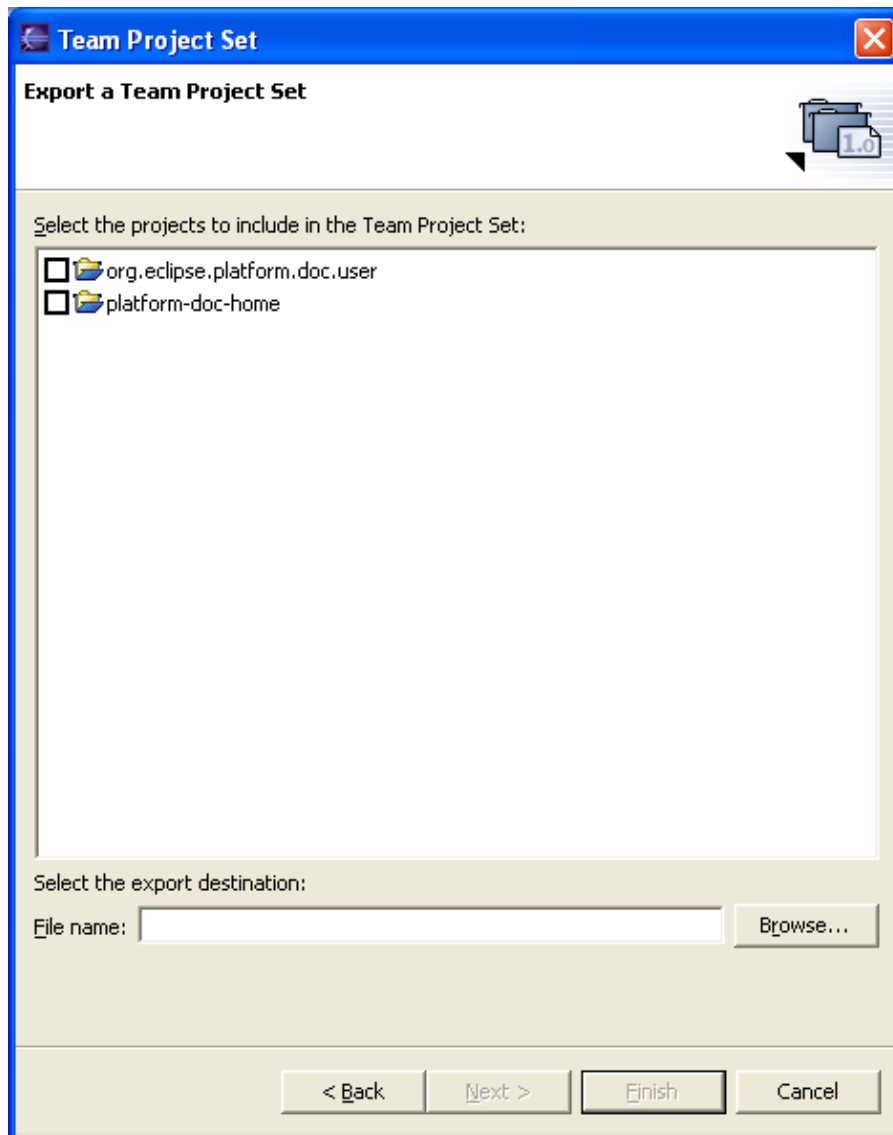
Other resource API that enumerates resources (such as resource delta trees) will exclude team private members unless explicitly requested to include them. This means that most clients will not "see" the team private resources and they will not be shown to the user. The resource navigator does not show team private members by default, but users can indicate via Preferences that they would like to see team private resources.

Attempts to mark projects or the workspace root as team private will be ignored.

Project sets

Since the resources inside a project under version control are kept in the repository, it is possible to share projects with team members by sharing a reference to the repository specific information needed to reconstruct a project in the workspace. This is done using a special type of file export for **team project sets**.

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In 3.0, API was added to ProjectSetCapability to allow repository providers to declare a class that implements project saving for projects under their control. When the user chooses to export project sets, only the projects configured with repositories that define project sets are shown as candidates for export. This API replaces the old project set serialization API (see below).

The project set capability class for a repository provider is obtained from the RepositoryProviderType class which is registered in the same extension as the repository provider. For example:

```
<extension point="org.eclipse.team.core.repository">
  <repository
    typeClass="org.eclipse.team.internal.cvs.core.CVSTeamProviderType"

    class="org.eclipse.team.internal.cvs.core.CVSTeamProvider"
    id="org.eclipse.team.cvs.core.cvsnature">
  </repository>
</extension>
```

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Prior to 3.0, The [org.eclipse.team.core.projectSets](#) extension point allowed repository providers to declare a class that implements project saving for projects under their control. When the user chooses to export project sets, only the projects configured with repositories that define project sets are shown as candidates for export.

For example, the CVS client declares the following:

```
<extension point="org.eclipse.team.core.projectSets">  
    <projectSets id="org.eclipse.team.cvs.core.cvsnature" class="org.eclipse.team.internal.cvs.CvsProjectSet">  
</extension>
```

The specified class must implement [IProjectSetSerializer](#). Use of this interface is still supported in 3.0 but has been deprecated.

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Ignore

Identifier:

org.eclipse.team.core.ignore

Since:

2.0

Description:

This extension point is used to register information about whether particular resources should be ignored; that is, excluded from version configuration management operations. Providers may provide an extension for this extension point. No code beyond the XML extension declaration is required.

Configuration Markup:

```
<!ELEMENT extension (ignore*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT ignore EMPTY>
```

```
<!ATTLIST ignore
```

```
pattern CDATA #REQUIRED
```

```
enabled (true | false) >
```

- **pattern** – the pattern against which resources will be compared.
- **enabled** – one of "true" or "false", determines whether this ignore pattern is enabled.

Examples:

Following is an example of an ignore extension:

```
<extension point=
```

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```
"org.eclipse.team.core.ignore"
```

```
>
```

```
<ignore pattern=
```

```
"*.class"
```

```
enabled=
```

```
"true"
```

```
/>
```

```
</extension>
```

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File Types

Identifier:

org.eclipse.team.core.fileTypes

Since:

2.0

Description:

This extension point is used to register information about whether particular file types should be considered to contain text or binary data. This information is important to some repository providers as it affects how the data is stored, compared and transmitted.

Providers may provide an extension for this extension point. No code beyond the XML extension declaration is required.

Configuration Markup:

```
<!ELEMENT extension (fileTypes*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT fileTypes EMPTY>
```

```
<!ATTLIST fileTypes
```

```
extension CDATA #REQUIRED
```

```
type CDATA #REQUIRED>
```

- **extension** – the file extension being identified by this contribution.
- **type** – one of either "text" or "binary", identifying the contents of files matching the value of extension.

Examples:

Following is an example of a fileTypes extension:

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```
<extension point=  
"org.eclipse.team.core.fileTypes"  
>  
<fileTypes extension=  
"txt"  
type=  
"text"  
>  
</extension>
```

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Linked resources

Earlier discussions of resources and the file system ([Mapping resources to disk locations](#)) assumed that all resources in a project are located in the same place in the file system. This is generally true. However, the concept of **linked resources** in the workbench is provided so that files and folders inside a project can be stored in the file system outside of the project's location.

Linked resources must have a project as their parent resource. They can be located virtually anywhere in the file system. They can reside outside the project location, or even within another project. There are only a few restrictions on linked resource locations. The method **`IWorkspace.validateLinkLocation`** can be used to ensure that a given location is valid for creating a linked resource.

Linked resources are created using the method **`IFolder.createLink`** or **`IFile.createLink`**. To determine programmatically whether a given resource is a linked resource, you can use the method **`IResource.isLinked`**. Note that this method will only return `true` for linked resources, not for children of linked resources.

Apart from these special methods for creating linked resources and finding out if a resource is linked, you can use normal workspace API when manipulating linked resources. In most respects, linked resources act exactly like any other resource in the workspace. However, some restrictions apply when moving, copying, or deleting linked resources. See **`IResource`** and its sub-classes for information on individual operations and their limitations.

Path variables

Path variables can be used when specifying the location of linked resources. A path variable is a simple (String → **`IPath`**) mapping that defines a shortcut for a location in the file system. Variables can ease the

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management of linked resources by reducing the number of places where hard-coded, absolute file system paths are used.

Path variables streamline the management of linked resources for users in several ways:

- Allows a single reference to the absolute path when defining several linked resources under a common root
- Allows the location of several resources to be redefined by changing a single variable
- Allows users to share projects containing linked resources without updating the paths of each resource (since the absolute path can vary from one machine to another.)

The last item in this list deserves a bit of explanation. When a user creates a linked resource in a project, a description of the linked resource is added to the project description file (".project") in the project's location. By using a path variable, users can share a project (by copying the project's content or by using a repository), and redefine the variable to suit each individual workstation. For example, one user might store external resources under `c:\temp` on one system, while another user using Unix might store the same resources in `/home/username/tmp`. Defining a path variable on each workspace (`TEMP=c:\temp` and `TEMP=/home/userb/tmp`) allows users to work around this difference and share the projects with linked resources as is.

IPathVariableManager defines the API for creating, manipulating, and resolving path variables. It also provides methods for validating variable names and values before creating them, and for installing a listener to be notified when path variable definitions change. You can obtain an instance of this class using **IWorkspace.getPathVariableManager**. See the code examples at the end of this section for more detail.

The method **IResource.getRawLocation** can be used to find out the unresolved location of a linked resource. That is, to get the actual path variable name instead of resolving it to its value. If a resource location is not defined with a path variable, the **getRawLocation** method acts exactly like the **getLocation** method.

Broken links

Clients that manipulate resources programmatically need to be aware of the possibility of broken links. Broken links occur when a linked resource's location does not exist, or is specified relative to an undefined path variable. The following special cases apply when using **IResource** protocol:

- The **copy** and **move** methods will fail when called on broken links.
- Calling **refreshLocal** on a broken link will not cause the resource to be removed from the workspace, as it does for normal resources that are missing from the file system.
- The method **getLocation** will return `null` for linked resources whose locations are relative to undefined path variables.
- You can still use **delete** to remove broken links from the workspace.

Compatibility with installed plug-ins

Some plug-ins may not be able to handle linked resources, so there are a number of mechanisms available for disabling them. If you are writing a plug-in that absolutely needs all of a project's contents to be located in the project's default location, you can use these mechanisms to prevent users from creating linked resources where you don't want them to appear.

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The first mechanism is called the *project nature veto*. If you define your own project nature, you can specify in the nature definition that the nature is not compatible with linked resources. Here is an example of a nature definition that employs the nature veto:

```
<extension
    id="myNature"
    name="My Nature"
    point="org.eclipse.core.resources.natures">
    <runtime>
        <run class="com.xyz.MyNature"/>
    </runtime>
    <allowLinking="false"/>
</extension>
```

The second mechanism for preventing linked resource creation is the *team hook*. If you define your own repository implementation, you can make use of the org.eclipse.core.resources.teamHook extension point to prevent the creation of linked resources in projects that are shared with your repository type. By default, repository providers do *not* allow linked resources in projects connected to the repository.

If the repository support is provided by an older plug-in that is not aware of linked resources, you will not be able to create linked resources in those projects.

Finally, there is a preference setting that can be used to disable linked resources for the entire workspace. While the previous two veto mechanisms work on a per-project basis, this preference affects all projects in the workspace. To set this preference programatically, use the preference `ResourcesPlugin.PREF_DISABLE_LINKING`. Note that even when set, users or plug-ins can override this by turning the preference off.

Linked resources in code

Let's go into some examples of using linked resources in code. We'll start by defining a path variable:

```
IWorkspace workspace = ResourcesPlugin.getWorkspace();
IPathVariableManager pathMan = workspace.getPathVariableManager();
String name = "TEMP";
IPath value = new Path("c:\\temp");
if (pathMan.validateName(name).isOK() && pathMan.validateValue(value).isOK()) {
    pathMan.setValue(name, value);
} else {
    //invalid name or value, throw an exception or warn user
}
```

Now we can create a linked resource relative to the defined path variable:

```
IProject project = workspace.getProject("Project");//assume this exists
IFolder link = project.getFolder("Link");
IPath location = new Path("TEMP/folder");
if (workspace.validateLinkLocation(location).isOK()) {
    link.createLink(location, IResource.NONE, null);
} else {
    //invalid location, throw an exception or warn user
}
```

That's it! You now have a linked folder in your workspace called "Link" that is located at "c:\temp\folder".

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Let's end with some code snippets on this linked resource to illustrate the behavior other methods related to linked resources:

```
link.getFullPath() ==> "/Project/Link"
link.getLocation() ==> "c:\temp\folder"
link.getRawLocation() ==> "TEMP/folder"
link.isLinked() ==> "true"

IFile child = link.getFile("abc.txt");
child.create(...);
child.getFullPath() ==> "/Project/Link/abc.txt"
child.getLocation() ==> "c:\temp\folder\abc.txt"
child.getRawLocation() ==> "c:\temp\folder\abc.txt"
child.isLinked() ==> "false"
```

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Project natures

Project natures allow a plug-in to tag a project as a specific kind of project. For example, the Java development tools (JDT) use a "Java nature" to add Java-specific behavior to projects. Project natures are defined by plug-ins, and are typically added or removed per-project when the user performs some action defined by the plug-in.

A project can have more than one nature. However, when you define a project nature, you can define special constraints for the nature:

- **one-of-nature** – specifies that the nature is one of a named set. Natures in a set are mutually exclusive; that is, only one nature belonging to the set can exist for a project.
- **requires-nature** – specifies that the nature depends on another nature and can only be added to a project that already has the required nature.

To implement your own nature, you need to define an extension and supply a class which implements **IProjectNature**.

Defining a nature

The **org.eclipse.core.resources.natures** extension point is used to add a project nature definition. The following markup adds a nature for the hypothetical **com.example.natures** plug-in.

```
<extension
  point="org.eclipse.core.resources.natures"
  id="myNature"
  name="My Nature">
  <runtime>
    <run class="com.example.natures.MyNature">
    </run>
  </runtime>
</extension>
```

The class identified in the extension must implement the platform interface **IProjectNature**. This class implements plug-in specific behavior for associating nature-specific information with a project when the nature is configured.

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```
public class MyNature implements IProjectNature {  
  
    private IProject project;  
  
    public void configure() throws CoreException {  
        // Add nature-specific information  
        // for the project, such as adding a builder  
        // to a project's build spec.  
    }  
    public void deconfigure() throws CoreException {  
        // Remove the nature-specific information here.  
    }  
    public IProject getProject() {  
        return project;  
    }  
    public void setProject(IProject value) {  
        project = value;  
    }  
}
```

The **configure()** and **deconfigure()** methods are sent by the platform when natures are added and removed from a project. You can implement the **configure()** method to add a builder to a project as discussed in [Builders](#).

Associating the nature with a project

Defining the nature is not enough to associate it with a project. You must assign a nature to a project by updating the project's description to include your nature. This usually happens when the user creates a new project with a specialized new project wizard that assigns the nature. The following snippet shows how to assign our new nature to a given project.

```
try {  
    IProjectDescription description = project.getDescription();  
    String[] natures = description.getNatureIds();  
    String[] newNatures = new String[natures.length + 1];  
    System.arraycopy(natures, 0, newNatures, 0, natures.length);  
    newNatures[natures.length] = "com.example.natures.myNature";  
    description.setNatureIds(newNatures);  
    project.setDescription(description, null);  
} catch (CoreException e) {  
    // Something went wrong  
}
```

The natures are not actually assigned to (and configured) for the project until you set the project description into the project. Also note that the identifier used for the nature is the fully qualified name (plug-in id + extension id) of the nature extension.

If the nature has been defined with constraints, then workspace API can be used to validate the new nature. For example, suppose a nature is defined with a prerequisite:

```
<extension  
    point="org.eclipse.core.resources.natures"  
    id="myOtherNature"  
    name="My Other Nature">  
    <runtime>  
        <run class="com.example.natures.MyOtherNature">  
        </run>
```

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```
</runtime>
<requires-nature id="com.example.natures.myNature"/>
</extension>
```

The new nature is not valid unless the first nature exists for the project. Depending on the design of your plug-in, you may want to check whether the prerequisite nature has been installed, or you may want to add the prerequisite nature yourself. Either way, you can check on the validity of proposed combinations of project natures using workspace API.

```
try {
    IProjectDescription description = project.getDescription();
    String[] natures = description.getNatureIds();
    String[] newNatures = new String[natures.length + 1];
    System.arraycopy(natures, 0, newNatures, 0, natures.length);
    newNatures[natures.length] = "com.example.natures.myOtherNature";
    IStatus status = workspace.validateNatureSet(natures);

    // check the status and decide what to do
    if (status.getStatusCode() == IStatus.OK) {
        description.setNatureIds(newNatures);
        project.setDescription(description, null);
    } else {
        // raise a user error
        ...
    }
} catch (CoreException e) {
    // Something went wrong
}
```

Nature descriptors

In addition to working with natures by their id, you can obtain the descriptor (**IProjectNatureDescriptor**) which describes a nature, its constraints, and its label. You can query a particular nature for its descriptor, or get descriptors from the workspace. The following snippet gets the project nature descriptor for our new nature:

```
IProjectNatureDescriptor descriptor = workspace.getNatureDescriptor("com.example.natures.my
```

You can also get an array of descriptors for all installed natures:

```
IProjectNatureDescriptor[] descriptors = workspace.getNatureDescriptors();
```

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Project Natures

Identifier:

org.eclipse.core.resources.natures

Description:

The workspace supports the notion of project natures (or "natures" for short"). A nature associates lifecycle behaviour with a project. Natures are installed on a per-project basis using the setDescription method defined on org.eclipse.core.resources.IProject. They are configured automatically when a project is opened and deconfigured when a project is closed. For example, the Java nature might install a Java builder and do other project configuration when added to a project

The natures extension-point allows nature writers to register their nature implementation under a symbolic name that is then used from within the workspace to find and configure natures. The symbolic name is id of the nature extension. When defining a nature extension, users are encouraged to include a human-readable value for the "name" attribute which identifies their meaning and potentially may be presented to users.

Natures can specify relationship constraints with other natures. The "one-of-nature" constraint specifies that at most one nature belong to a given set can exist on a project at any given time. This enforces mutual exclusion between natures that are not compatible with each other. The "requires-nature" constraint specifies a dependency on another nature. When a nature is added to a project, all required natures must also be added. The natures are guaranteed to be configured and deconfigured in such a way that their required natures will always be configured before them and deconfigured after them. For this reason, cyclic dependencies between natures are not permitted.

Natures cannot be added to or removed from a project if that change would violate any constraints that were previously satisfied. If a nature is configured on a project, but later finds that its constraints are not satisfied, that nature and all natures that require it are marked as *disabled*, but remain on the project. This can happen, for example, when a required nature goes missing from the install. Natures that are missing from the install, and natures involved in dependency cycles are also marked as disabled.

Natures can also specify which incremental project builders, if any, are configured by them. With this information, the workspace will ensure that builders will only run when their corresponding nature is present and enabled on the project being built. If a nature is removed from a project, but the nature's deconfigure method fails to remove its corresponding builders, the workspace will remove those builders from the spec automatically. It is not permitted for two natures to specify the same incremental project builder in their markup.

Natures also have the ability to disallow the creation of linked resources on projects they are associated with. By setting the allowLinking attribute to "false", a nature can declare that linked resources should never be created. This feature is new in release 2.1.

Configuration Markup:

```
<!ELEMENT extension (runtime , (one-of-nature | requires-nature | builder)* , options?)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

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id CDATA #IMPLIED

name CDATA #IMPLIED>

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

<!ELEMENT runtime (run)>

<!ELEMENT run (parameter*)>

<!ATTLIST run

class CDATA #REQUIRED>

- **class** – the fully-qualified name of a class which implements `org.eclipse.core.resources.IProjectNature`

<!ELEMENT parameter EMPTY>

<!ATTLIST parameter

name CDATA #REQUIRED

value CDATA #REQUIRED>

- **name** – the name of this parameter made available to instances of the specified nature class
- **value** – an arbitrary value associated with the given name and made available to instances of the specified nature class

<!ELEMENT one-of-nature EMPTY>

<!ATTLIST one-of-nature

id CDATA #REQUIRED>

- **id** – the name of an exclusive project nature category.

<!ELEMENT requires-nature EMPTY>

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<!ATTLIST requires-nature

id CDATA #REQUIRED>

- **id** – the fully-qualified id of another nature extension that this nature extension requires.

<!ELEMENT builder EMPTY>

<!ATTLIST builder

id CDATA #REQUIRED>

- **id** – the fully-qualified id of an incremental project builder extension that this nature controls.

<!ELEMENT options EMPTY>

<!ATTLIST options

allowLinking (true | false) >

- **allowLinking** – an option to specify whether this nature allows the creation of linked resources. By default, linking is allowed.

Examples:

Following is an example of three nature configurations. The waterNature and fireNature belong to the same exclusive set, so they cannot co-exist on the same project. The snowNature requires waterNature, so snowNature will be disabled on a project that is missing waterNature. It naturally follows that snowNature cannot be enabled on a project with fireNature. The fireNature also doesn't allow the creation of linked resources.

<extension id=

"fireNature"

name=

"Fire Nature"

point=

"org.eclipse.core.resources.natures"

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```
>  
<runtime>  
<run class=  
"com.xyz.natures.Fire"  
>  
</runtime>  
<one-of-nature id=  
"com.xyz.stateSet"  
>  
<options allowLinking=  
"false"  
>  
</extension>  
<extension id=  
"waterNature"  
name=  
"Water Nature"  
point=  
"org.eclipse.core.resources.natures"  
>  
<runtime>  
<run class=  
"com.xyz.natures.Water"  
>  
</runtime>  
<one-of-nature id=
```


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```
"com.xyz.stateSet"  
  
</>  
  
</extension>  
  
<extension id=  
  
"snowNature"  
  
name=  
  
"Snow Nature"  
  
point=  
  
"org.eclipse.core.resources.natures"  
  
>  
  
<runtime>  
  
<run class=  
  
"com.xyz.natures.Snow"  
  
>  
  
<parameter name=  
  
"installBuilder"  
  
value=  
  
"true"  
  
</>  
  
</run>  
  
</runtime>  
  
<requires-nature id=  
  
"com.xyz.coolplugin.waterNature"  
  
</>  
  
<builder id=  
  
"com.xyz.snowMaker"
```

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/>

</extension>

If these extensions were defined in a plug-in with id "com.xyz.coolplugin", the fully qualified name of these natures would be "com.xyz.coolplugin.fireNature", "com.xyz.coolplugin.waterNature" and "com.xyz.coolplugin.snowNature".

API Information:

The value of the class attribute must represent an implementor of `org.eclipse.core.resources.IProjectNature`. Nature definitions can be examined using the `org.eclipse.core.resources.IProjectNatureDescriptor` interface. The descriptor objects can be obtained using the methods `getNatureDescriptor(String)` and `getNatureDescriptors()` on `org.eclipse.core.resources.IWorkspace`.

Supplied Implementation:

The platform itself does not have any predefined natures. Particular product installs may include natures as required.

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Team Hook

Identifier:

org.eclipse.core.resources.teamHook

Since:

2.1

Description:

For providing an implementation of a TeamHook that is used for mechanisms available only to team providers. This extension point tolerates at most one extension.

Configuration Markup:

```
<!ELEMENT extension (teamHook)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT teamHook EMPTY>
```

```
<!ATTLIST teamHook
```

```
class CDATA #REQUIRED>
```

- **class** – the fully-qualified name of a class which subclasses `org.eclipse.core.resources.team.TeamHook`

Examples:

The following is an example of using the teamHook extension point. (in file plugin.xml)

```
<extension point=
```

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```
"org.eclipse.core.resources.teamHook"
```

```
>
```

```
<teamHook class=
```

```
"org.eclipse.team.internal.TeamHook"
```

```
/>
```

```
</extension>
```

API Information:

The value of the class attribute must represent a subclass of `org.eclipse.core.resources.team.TeamHook`.

Supplied Implementation:

The Team component will generally provide the implementation of the team hook. The extension point should not be used by any other clients.

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Project Sets

Identifier:

org.eclipse.team.core.projectSets

Since:

2.0

Description:

This extension point is used to register a handler for creating and reading project sets. Project sets are lightweight, portable method of sharing a particular lineup of team–shared projects in a workspace. A project set file may be used to provide team members with a simple way of creating a workspace with a particular lineup of projects from one or more team providers. Providers may provide an extension for this extension point.

deprecated: see RepositoryProvider#getProjectSetCapability.

Configuration Markup:

```
<!ELEMENT extension (projectSets*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT projectSets EMPTY>
```

```
<!ATTLIST projectSets
```

```
id CDATA #REQUIRED
```

```
class CDATA #REQUIRED>
```

- **id** – the nature id of the provider for which this handler creates and reads project sets.
- **class** – the fully qualified name of a class implementing `org.eclipse.team.core.IProjectSerializer`.

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Examples:

Following is an example of a projectSets extension:

```
<extension point=
"org.eclipse.team.core.projectSets"
>
<projectSets id=
"org.eclipse.team.cvs.core.cvsnature"
class=
"org.eclipse.team.cvs.core.CVSPProjectSetSerializer"
>
</projectSets>
</extension>
```

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Synchronization Support

New in Eclipse 3.0 are APIs for managing and displaying synchronization state between workspace resources and resources in another location. We refer to a resource outside of the workspace as a variant. Synchronizing is the act of displaying the changes between resources in different locations and optionally allowing the user to affect the synchronization state by performing an action. The synchronize APIs are orthogonal to the RepositoryProvider APIs and can be used without a repository provider. The purpose of the synchronization API is to ease the task of implementing different ways of presenting the synchronization state of resources. As such, the API requires a means to query the synchronization state of resources but does not require a means to affect the state. The means of affecting the state is left to the implementer (although the UI does provide hooks for adding provider specific menu items to menus).

Terminology

Before the synchronization API is described, it is helpful to present some of the terminology and concepts that apply when discussing workspace synchronization.

Resource Variant: A local resource that is mapped to a resource that exists at another location

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can be referred to as a variant of that resource. That is, the resources are usually very similar but may differ slightly (either due to modifications to the local resource or changes made the remote copy by other users). We take a local workspace centric view of this, referring to the local copy as the resource and any remote copy as resource variants.

Synchronize: We refer to synchronize as the action of displaying to the user the differences between resource variants. Synchronizing doesn't affect the state of the variants, but instead provides a view to help the user understand the differences between different sets of variants. It is common however to allow users to affect the states of the variants (e.g. allowing to check-in, or revert) while synchronizing.

Two-way vs. Three-way Synchronization: There are two basic types of synchronization state determination: two-way and three-way. A two-way comparison only considers the local resource and a single resource variant, referred to as the remote resource variant. This type of comparison can only show the differences between the two resources but cannot offer hints as to how the changes interrelate. Most code repository systems support a three-way comparison for synchronization state determination. This type of comparison involves the local resource, a remote resource variant and a base resource variant. The base resource variant represents a common ancestor for the local and remote resources. This allows for more sophisticated synchronization states that indicate the direction of the change.

Table 1: The synchronization states

Two-Way	Three-Way
Changed	Outgoing Change
Deleted	Incoming Change
Added	Outgoing Deletion
	Incoming Deletion
	Outgoing Addition
	Incoming Addition
	Conflicting Change
	Conflicting Deletion
	Conflicting Addition

The Basics – SyncInfo

The classes in the [org.eclipse.team.core.synchronize](#) are used to describe the synchronization state. The most important class is [SyncInfo](#) because it is the class that actually defines the synchronization state. It can be used as follows:

```
SyncInfo info = getSyncInfo(resource); // this is a simulated method of obtaining the sync info f
int changekind = info.getKind();
if(info.getResourceComparator().isThreeWay()) {
    if((changeKind & SyncInfo.DIRECTION_MASK) == SyncInfo.INCOMING) {
        // do something
    }
} else if(changeKind == SyncInfo.CHANGE) {
    // do something else
}
```

The SyncInfo class provides both the two-way and three-way comparison algorithms, a client must provide

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the resources and a class that can compare the resources ([IResourceVariantComparator](#)). Here is an example variant comparator:

```
public class TimestampVariantComparator implements IResourceVariantComparator {
    protected boolean compare(IResourceVariant e1, IResourceVariant e2) {
        if(e1.isContainer()) {
            if(e2.isContainer()) {
                return true;
            }
            return false;
        }
        if(e1 instanceof MyResourceVariant && e2 instanceof MyResourceVariant) {
            MyResourceVariant myE1 = (MyResourceVariant)e1;
            MyResourceVariant myE2 = (MyResourceVariant)e2;
            return myE1.getTimestamp().equals(myE2.getTimestamp());
        }
        return false;
    }
    protected boolean compare(IResource e1, IResourceVariant e2) {
    }
    public boolean isThreeWay() {
        return true;
    }
}
```

```
SyncInfo info = new SyncInfo(resource, variant1, variant2, new TimestampComparator());
info.init(); // calculate the sync info
```

This package also contains collections specifically designed to contain SyncInfo and filters that can be applied to SyncInfo instances.

Managing the synchronization state

As we have seen in the examples above, [SyncInfo](#) and [IResourceVariantComparator](#) classes provide access to the synchronization state of resources. But what we haven't seen yet is how the state is managed. A [Subscriber](#) provides access to the synchronization state between the resources in the local workspace and a set of resource variants for these resources using either a two-way or three-way comparison, depending on the nature of the subscriber. A subscriber provides the following capabilities:

- local workspace traversal: a subscriber supports the traversal of the local workspace resources that are *supervised* by the subscriber. As such, the subscriber has a set of *root* resources that define the workspace subtrees under the subscriber's control, as well as a *members* method that returns the supervised members of a workspace resource. This traversal differs from the usual workspace resource traversal in that the resources being traversed may include resources that do not exist locally, either because they have been deleted by the user locally or created by a 3rd party.
- resource synchronization state determination: For supervised resources, the subscriber provides access to the synchronization state of the resource, including access to the variants of the resource. For each supervised resource, the subscriber provides a *SyncInfo* object that contains the synchronization state and the *variants* used to determine the state. The subscriber also provides an *IResourceVariantComparator* which determines whether two-way or three-way comparison is to be used and provides the logic used by the SyncInfo to comparing resource variants when determining the synchronization state.
- refresh of synchronization state and change notification: Clients can react to changes that happen to local resources by listening to the Core resource deltas. When a local resource is changed, the

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synchronization state of the resource can then be re-obtained from the subscriber. However, clients must explicitly query the server to know if there are changes to the resource variants. For subscribers, this process is broken up into two parts. A client can explicitly *refresh* a subscriber. In response the subscriber will obtain the latest state of the resource variants from the remote location and fire *synchronization state change* events for any resource variants that have changed. The change notification is separate from the refresh since there may be other operations that contact the remote location and obtain the latest remote state.

The APIs do not define how a Subscriber is created, this is left to the specific implementations. For example the CVS plugin creates a Subscriber when a merge is performed, another for a comparison, and another when synchronizing the local workspace with the current branch.

So let's revisit our first example of using SyncInfo and see how a Subscriber could be used to access SyncInfo.

```
// Create a file system subscriber and specify that the
// subscriber will synchronize with the provided file system location
Subscriber subscriber = new FileSystemSubscriber("c:\temp\repo");

// Allow the subscriber to refresh its state
subscriber.refresh(subscriber.roots(), IResource.DEPTH_INFINITE, monitor);

// Collect all the synchronization states and print
IResource[] children = subscriber.roots();
for(int i=0; i < children.length; i++) {
    printSyncState(children[i]);
}

...

void printSyncState(Subscriber subscriber, IResource resource) {
    System.out.println(subscriber.getSyncInfo(resource).toString());
    IResource[] children = subscriber.members(resource);
    for(int i=0; i < children.length; i++) {
        IResource child = children[i];
        if(! child.exists()) {
            System.out.println(resource.getFullPath() + " doesn't exist in the workspace");
        }
        printSyncState(subscriber, children[i]);
    }
}
```

The important point to remember is that the Subscriber knows about resources that do not exist in the workspace and non-existing resources can be returned from the [Subscriber#members\(\)](#) and [SyncInfo#getLocal\(\)](#).

Displaying the synchronizations state in the UI

We could spend more time explaining how to manage synchronization state but instead let's see how to actually get the state shown to the user. A [ISynchronizeParticipant](#) is the user interface component that displays synchronization state and allows the user to affect its state. The Synchronize View displays synchronize participants, but it is also possible to show these in dialogs and wizards. In order to provide support for users to show any type of synchronization state to the user, even those not based on SyncInfo and Subscribers, a participant is a very generic component.

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There is also an extension point called [org.eclipse.team.ui.synchronizeWizards](#) to add a synchronization creation wizard. This will put your wizard in the global synchronize action and in the Synchronize View, so that users can easily create a synchronization of your type.

However, if you have implemented a Subscriber you can benefit from a concrete participant called [SubscriberParticipant](#) which will provide the following functionality:

- Collects SyncInfo from a Subscriber in the background.
- Listens to changes in the workspace and those found when a Subscriber is refreshed and keeps the synchronization state updated dynamically.
- Provides the user interface that support modes for filtering the changes, and layouts.
- Support scheduling a refresh with the Subscriber so that the synchronization states are kept up-to-date.
- Supports refreshing a Subscriber in the background.
- Supports navigation of the changes and showing the differences between the files.
- Supports configuration of the actions, toolbars, and decorators by subclasses.

The best way to explain these concepts are to see them used in the context of a simple example. Go to the [local history synchronization](#) example to see how all of these pieces can be used together. Or if you want pointers on how to use the more advanced APIs, go to [Beyond The Basics](#).

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Synchronize Participant Creation Wizards

Identifier:

org.eclipse.team.ui.synchronizeWizards

Since:

3.0

Description:

This extension point is used to register a synchronize participant creation wizard. These wizards are used to create synchronize participants that will appear in the Synchronize View. A provider will typically create a creation wizard to allow the user to perform and manage a particular type of synchronize participant. Providers may provide an extension for this extension point, and an implementation of `org.eclipse.jface.wizard.IWizard`.

Configuration Markup:

```
<!ELEMENT extension (wizard?)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT wizard EMPTY>
```

```
<!ATTLIST wizard
```

```
name CDATA #REQUIRED
```

```
description CDATA #REQUIRED
```

```
icon CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
id CDATA #REQUIRED>
```

- **name** – The name of the synchronize participant creation type. Examples are "CVS", "CVS Merge", "WebDAV".
- **description** – The description for the creation wizard.
- **icon** – The icon to be shown when this wizard type is shown to the user.

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- **class** – A fully qualified name of the Java class implementing `org.eclipse.jface.wizard.IWizard`.
- **id** – A unique identifier for this extension.

Examples:

Following is an example of a synchronize participant creation wizard extension:

```
<extension point=
"org.eclipse.team.ui.synchronizeWizards"
>
<wizard name=
"WebDAV"
description=
"Create a WebDAV participant to view changes between workspace resources and their remote WebDAV
location"
icon=
"webdav.gif"
class=
"com.xyz.DAVWizard"
id=
"com.xyz.dav.synchronizeWizard"
>
</wizard>
</extension>
```

API Information:

The value of the `class` attribute must represent a class that implements `org.eclipse.jface.wizard.IWizard`.

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Supplied Implementation:

The plug-in `org.eclipse.team.cvs.ui` contains example definitions of `synchronizeWizards` extension point.

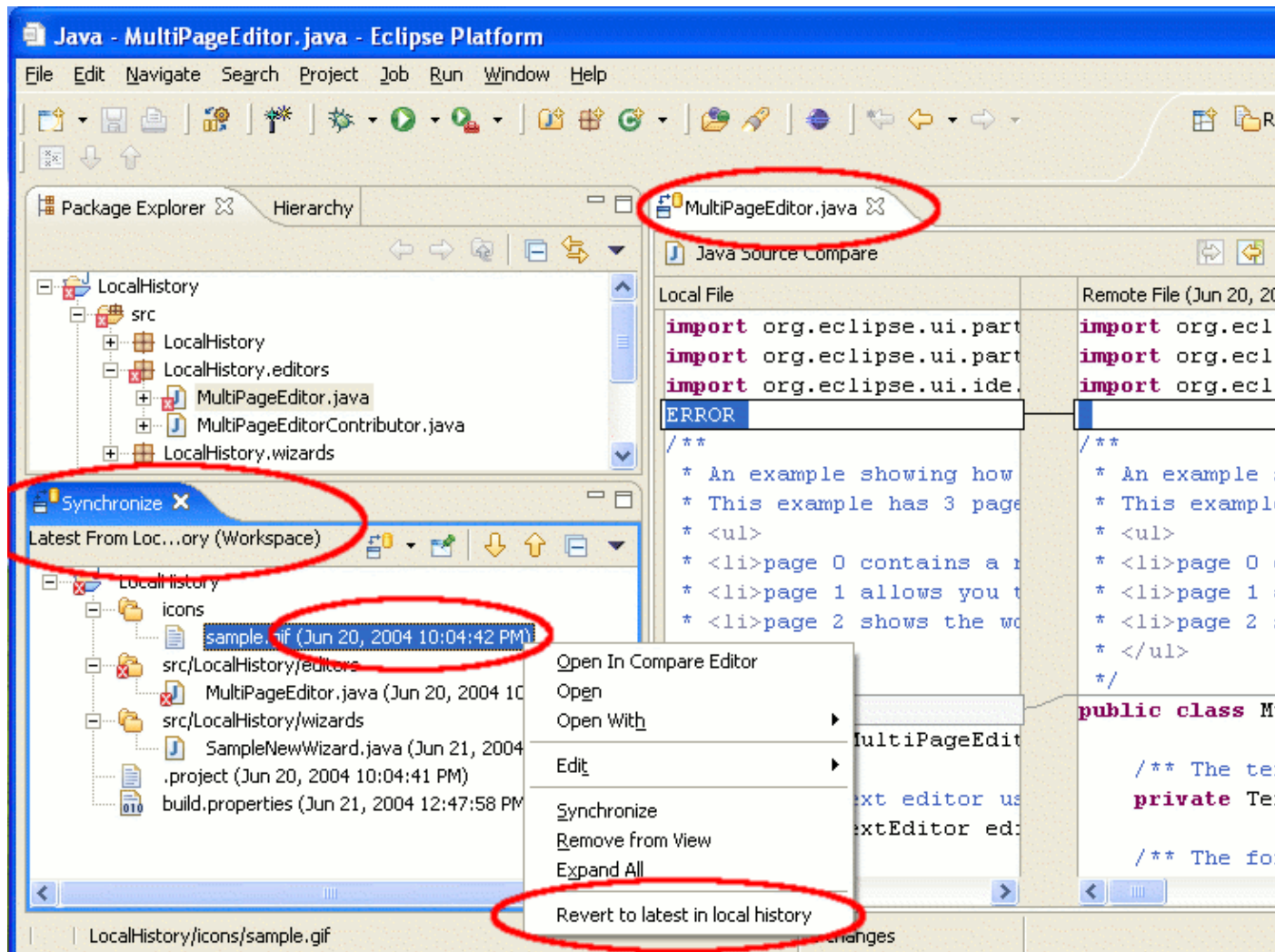
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Local History Example

The best way to understand the Synchronize APIs is to create a simple example that actually works. In this example we will be creating a page in the Synchronize View that will display the latest local history state for all files in the workspace. The local history synchronization will update automatically when changes are made to the workspace, and a compare editor can open to browse, merge, then changes. We will also add a custom decorator to show the last timestamp of the local history element and an action to revert the workspace files to their latest saved local history state. This is an excellent example because we already have a store of resource variants available and we don't have to manage it.

For the remainder of this example we will make use of a running example. Much, but not all, of the source code will be included on this page. The full source code can be found in the local history package of the [org.eclipse.team.examples.filesystem](#) plug-in. You can check the project out from the CVS repository and use it as a reference while you are reading this tutorial. *Disclaimer:* The source code in the example plugin may change over time. To get a copy that matches what is used in this example, you can check out the project using the 3.0 version tag (most likely R3_0) or a date tag of June 28, 2004.

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This screen shot shows the local history synchronization in the Synchronize View. With it you can browse the changes between the local resource and the latest state in history. It has a custom decorator for displaying the timestamp associated with the local history entry and a custom action to revert your file to the contents in the local history. Notice also that the standard Synchronize View presentation is used which provide problem annotations, compressed folder layout, and navigation buttons.

Defining the variants for local history

The first step is to define a variant to represent the elements from local history. This will allow the synchronize APIs to access the contents from the local history so it can be compared with the current contents and displayed to the user.

```
public class LocalHistoryVariant implements IResourceVariant {
    private final IFileState state;

    public LocalHistoryVariant(IFileState state) {
        this.state = state;
    }

    public String getName() {
        return state.getName();
    }
}
```

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```
public boolean isContainer() {
    return false;
}

public IStorage getStorage(IProgressMonitor monitor) throws TeamException {
    return state;
}

public String getContentIdentifier() {
    return Long.toString(state.getModificationTime());
}

public byte[] asBytes() {
    return null;
}
}
```

Since the `IFileState` interface already provides access to the contents of the file from local history (i.e. implements the `IStorage` interface), this was easy. Generally, when creating a variant you have to provide a way of accessing the content, a content identifier that will be displayed to the user to identify this variant, and a name. The `asBytes()` method is only required if persisting the variant between sessions.

Next, let's create a variant comparator that allows the `SyncInfo` calculation to compare local resources with their variants. Again, this is easy because the existence of a local history state implies that the content of the local history state differs from the current contents of the file. This is because the specification for local history says that it won't create a local history state if the file hasn't changed.

```
public class LocalHistoryVariantComparator implements IResourceVariantComparator {
    public boolean compare(IResource local, IResourceVariant remote) {
        return false;
    }

    public boolean compare(IResourceVariant base, IResourceVariant remote) {
        return false;
    }

    public boolean isThreeWay() {
        return false;
    }
}
```

Because we know that the existence of the local history state implies that it is different from the local, we can simply return *false* when comparing the file to its local history state. Also, synchronization with the local history is only two-way because we don't have access to a base resource so the method for comparing two resource variants is not used.

Note that the `synchronize` calculation won't call the `compare` method of the comparator if the variant doesn't exist (i.e. is null). It is only called if both elements exist. In our example, this would occur both for files that don't have a local history and for all folders (which never have a local history). To deal with this, we need to define our own subclass of `SyncInfo` in order to modify the calculated synchronization state for these cases.

```
public class LocalHistorySyncInfo extends SyncInfo {
    public LocalHistorySyncInfo(IResource local, IResourceVariant remote, IResourceVariantComparator comparator) {
        super(local, null, remote, comparator);
    }
}
```

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```
protected int calculateKind() throws TeamException {
    if (getRemote() == null)
        return IN_SYNC;
    else
        return super.calculateKind();
}
}
```

We have overridden the constructor to always provide a base that is *null* (since we are only using two-way comparison) and we have modified the synchronization kind calculation to return *IN_SYNC* if there is no remote (since we only care about the cases where there is a local file and a file state in the local history).

Creating the Subscriber

Now we will create a Subscriber that will provide access to the resource variants in the local history. Since local history can be saved for any file in the workspace, the local history Subscriber will supervise every resource and the set of roots will be all projects in the workspace. Also, there is no need to provide the ability to refresh the subscriber since the local history changes only when the contents of a local file changes. Therefore, we can update our state whenever a resource delta occurs. That leaves only two interesting method on our local history subscriber: obtaining a SyncInfo and traversing the workspace.

```
public SyncInfo getSyncInfo(IResource resource) throws TeamException {
    try {
        IResourceVariant variant = null;
        if (resource.getType() == IResource.FILE) {
            IFile file = (IFile)resource;
            IFileState[] states = file.getHistory(null);
            if (states.length > 0) {
                // last state only
                variant = new LocalHistoryVariant(states[0]);
            }
        }
        SyncInfo info = new LocalHistorySyncInfo(resource, variant, comparator);
        info.init();
        return info;
    } catch (CoreException e) {
        throw TeamException.asTeamException(e);
    }
}
```

The Subscriber will return a new SyncInfo instance that will contain the latest state of the file in local history. The SyncInfo is created with a local history variant for the remote element. For projects, folders and files with no local history, no remote resource variant is provided, which will result in the resource being considered in-sync due to the *calculateKind* method in our LocalHistorySyncInfo.

The remaining code in the local history subscriber is the implementation of the *members* method:

```
public IResource[] members(IResource resource) throws TeamException {
    try {
        if (resource.getType() == IResource.FILE)
            return new IResource[0];
        IContainer container = (IContainer)resource;
        List existingChildren = new ArrayList(Arrays.asList(container.members()));
        existingChildren.addAll(
            Arrays.asList(container.findDeletedMembersWithHistory(IResource.DEPTH_INFINITE, null)));
        return (IResource[]) existingChildren.toArray(new IResource[existingChildren.size()]);
    } catch (CoreException e) {
```


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```
        throw TeamException.asTeamException(e);
    }
}
```

The interesting detail of this method is that it will return non-existing children if a deleted resource has local history. This will allow our Subscriber to return SyncInfo for elements that only exist in local history and are no longer in the workspace.

Adding a Local History Synchronize Participant

So far we have created the classes which provide access to SyncInfo for elements in local history. Next, we will create the UI elements that will allow us to have a page in the Synchronize View to display the last history state for every element in local history. Since we have a Subscriber, adding this to the Synchronize View is easy. Let's start by adding an synchronize participant extension point:

```
<extension
    point="org.eclipse.team.ui.synchronizeParticipants">
    <participant
        persistent="false"
        icon="synced.gif"
        class="org.eclipse.team.synchronize.example.LocalHistoryParticipant"
        name="Latest From Local History"
        id="org.eclipse.team.synchronize.example"/>
    </extension>
```

Next we have to implement the LocalHistoryParticipant. It will subclass SubscriberParticipant which will provide all the default behavior for collecting SyncInfo from the subscriber and updating sync states when workspace changes occur. In addition, we will add an action to revert the workspace resources to the latest in local history.

First, we will look at how a custom action is added to the participant.

```
public static final String CONTEXT_MENU_CONTRIBUTION_GROUP = "context_group_1"; //$NON-NLS-1$

private class LocalHistoryActionContribution extends SynchronizePageActionGroup {
    public void initialize(ISynchronizePageConfiguration configuration) {
        super.initialize(configuration);
        appendToGroup(
            ISynchronizePageConfiguration.P_CONTEXT_MENU, CONTEXT_MENU_CONTRIBUTION_GROUP,
            new SynchronizeModelAction("Revert to latest in local history", configuration) { //$NON-NLS-1$
                protected SynchronizeModelOperation getSubscriberOperation(ISynchronizePageConfiguration
                    configuration) {
                    return new RevertAllOperation(configuration, elements);
                }
            });
    }
}
```

Here we are adding a specific SynchronizeModelAction and operation. The behavior we get for free here is the ability to run in the background and show busy status for the nodes that are being worked on. The action reverts all resources in the workspace to their latest state in local history. The action is added by adding an action contribution to the participants configuration. The configuration is used to describe the properties used to build the participant page that will display the actual synchronize UI.

The participant will initialize the configuration as follows in order to add the local history action group to the context menu:

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```
protected void initializeConfiguration(ISynchronizePageConfiguration configuration) {
    super.initializeConfiguration(configuration);
    configuration.addMenuGroup(
        ISynchronizePageConfiguration.P_CONTEXT_MENU,
        CONTEXT_MENU_CONTRIBUTION_GROUP);
    configuration.addActionContribution(new LocalHistoryActionContribution());
    configuration.addLabelDecorator(new LocalHistoryDecorator());
}
```

Now lets look at how we can provide a custom decoration. The last line of the above method registers the following decorator with the page's configuration.

```
public class LocalHistoryDecorator extends LabelProvider implements ILabelDecorator {
    public String decorateText(String text, Object element) {
        if(element instanceof ISynchronizeModelElement) {
            ISynchronizeModelElement node = (ISynchronizeModelElement)element;
            if(node instanceof IAdaptable) {
                SyncInfo info = (SyncInfo)((IAdaptable)node).getAdapter(SyncInfo.class);
                if(info != null) {
                    LocalHistoryVariant state = (LocalHistoryVariant)info.getRemote();
                    return text+ " (" + state.getContentIdentifier() + ")";
                }
            }
        }
        return text;
    }

    public Image decorateImage(Image image, Object element) {
        return null;
    }
}
```

The decorator extracts the resource from the model element that appears in the synchronize view and appends the content identifier of the local history resource variant to the text label that appears in the view.

The last and final piece is to provide a wizard that will create the local history participant. The Team Synchronizing perspective defines a global synchronize action that allows users to quickly create a synchronization. In addition, the ability to create synchronizations is available from the Synchronize view toolbar. To start, create a synchronizeWizards extension point:

```
<extension
    point="org.eclipse.team.ui.synchronizeWizards">
    <wizard
        class="org.eclipse.team.synchronize.example.LocalHistorySynchronizeWizard"
        icon="synced.gif"
        description="Creates a synchronization against the latest local history state of all reso
        name="Latest From Local History Synchronize"
        id="ExampleSynchronizeSupport.wizard1"/>
</extension>
```

This will add our wizard to the list and in the wizards finish() method we will simply create our participant and add it to the synchronize manager.

```
LocalHistoryPartipant participant = new LocalHistoryPartipant();
ISynchronizeManager manager = TeamUI.getSynchronizeManager();
manager.addSynchronizeParticipants(new ISynchronizeParticipant[] {participant});
ISynchronizeView view = manager.showSynchronizeViewInActivePage();
view.display(participant);
```

Conclusion

This is a simple example of using the synchronize APIs and we have glossed over some of the details in order to make the example easier to understand. Writing responsive and accurate synchronization support is non-trivial, the hardest part being the management of synchronization information and the notification of synchronization state changes. The user interface, if the one associated with SubscriberParticipants is adequate, is the easy part once the Subscriber implementation is complete. For more examples please refer to the [org.eclipse.team.example.filesystem](#) plugin and browse the subclasses in the workspace of Subscriber and ISynchronizeParticipant.

The next section describes some class and interfaces that can help you write a Subscriber from scratch including how to cache synchronization states between workbench sessions.

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Beyond the Basics

If you plan on providing synchronization support and don't have an existing mechanism for managing synchronization state, this section explains how to implementing a Subscriber from scratch. This means that there is no existing synchronization infrastructure and illustrates how to use some API that is provided to maintain the synchronization state.

For the remainder of this example we will make use of a running example. The source code can be found in the file system provider package of the [org.eclipse.team.examples.filesystem](#) plug-in. You should check the project out from the CVS repository and use as a reference while you are reading this tutorial.

Implementing a Subscriber From Scratch

This first example assumes that there is no existing infrastructure for maintaining the synchronization state of the local workspace. When implementing a subscriber from scratch, you can make use of some additional API provided in the [org.eclipse.team.core](#) plugin. The [org.eclipse.team.core.variants](#) package contains two subclasses of [Subscriber](#) which can be used to simplify implementation. The first is [ResourceVariantTreeSubscriber](#) which will be discussed in the second example below. The second is a subclass of the first: [ThreeWaySubscriber](#). This subscriber implementation provides several helpful classes for managing the synchronization state of a local workspace. If you do not have any existing infrastructure, this is a good place to start.

Implementing a subscriber from scratch will be illustrated using the file system example available in the [org.eclipse.team.examples.filesystem](#) plugin. The code in the following description is kept to a minimum since it is available from the Eclipse CVS repository. Although not technically a three-way subscriber, the file system example can still make good use of this infrastructure. The FTP and WebDav plugins also are built using this infrastructure.

ThreeWaySubscriber

For the file system example, we already had an implementation of a [RepositoryProvider](#) that associated a local project with a file system location where the local contents were mirrored. [FileSystemSubscriber](#) was created as a subclass of [ThreeWaySubscriber](#) in order to make use of a [ThreeWaySynchronizer](#) to manage workspace synchronization state. Subclasses of this class must do the following:

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- create a ThreeWaySynchronizer instance to manage the local workspace synchronization state.
- create an instance of a ThreeWayRemoteTree subclass to provide remote tree refresh.
 - ◆ The class `FileSystemRemoteTree` was defined for this purpose
- implement a method to create the resource variant handles used to calculate the synchronization state.
 - ◆ The class `FileSystemResourceVariant` (a subclass of CachedResourceVariant) was defined for this
- implement the roots method.
 - ◆ The roots for the subscriber are all the projects mapped to the `FileSystemProvider`. Callbacks were added to `FileSystemProvider` in order to allow the `FileSystemSubscriber` to generate change events when projects are mapped and unmapped.

In addition to the subscriber implementation, the get and put operations for the file system provider were modified to update the synchronization state in the `ThreeWaySynchronizer`. The operations are implemented in the class `org.eclipse.team.examples.filesystem.FileSystemOperations`.

ThreeWaySynchronizer

ThreeWaySynchronizer manages the synchronization state between the local workspace and a remote location. It caches and persists the local, base and remote timestamps in order to support the efficient calculation of the synchronization state of a resource. It also fires change notifications to any registered listeners. The ThreeWaySubscriber translates these change events into the proper format to be sent to listeners registered with the subscriber.

The ThreeWaySynchronizer makes use of Core scheduling rules and locks to ensure thread safety and provide change notification batching.

ThreeWayRemoteTree

A ThreeWayRemoteTree is a subclass of ResourceVariantTree that is tailored to the ThreeWaySubscriber. It must be overridden by clients to provide the mechanism for fetching the remote state from the server. ResourceVariantTree is discussed in more detail in the next example.

CachedResourceVariant

A CachedResourceVariant is a partial implementation of `IResourceVariant` that caches any fetched contents for a period of time (currently 1 hour). This is helpful since the contents may be accessed several times in a short period of time (for example, to determine the synchronization state and display the contents in a compare editor). Subclasses must still provide the unique content identifier along with the byte array that can be persisted in order to recreate the resource variant handle.

Building on Top of Existing Workspace Synchronization

Many repository providers may already have a mechanism for managing their synchronization state (e.g. if they have existing plugins). The ResourceVariantTreeSubscriber and its related classes provide the ability to build on top of an existing synchronization infrastructure. For example, this is the superclass of all of the CVS subscribers.

ResourceVariantTreeSubscriber

As was mentioned in the previous example, the ThreeWaySubscriber is a subclass of ResourceVariantTreeSubscriber that provides local workspace synchronization using a ThreeWaySynchronizer. Subclasses of ResourceVariantTreeSubscriber must provide:

- Subclasses of ResourceVariantTree (or AbstractResourceVariantTree) that provide the behavior for traversing and refreshing the remote resource variants and, for subscribers that support three-way comparisons, the base resource variants.
- An implementation of IResourceVariantComparator that performs the two-way or three-way comparison for a local resource and its base and remote resource variants. It is common to also provide a subclass of SyncInfo in order to customize the synchronization state determination algorithm.
- An implementation of the roots method for providing the roots of the subscriber and an implementation of the isSupervised method for determining what resources are supervised by the subscriber.

The other capabilities of the subscriber are implemented using these facilities.

ResourceVariantTree

ResourceVariantTree is a concrete implementation of IResourceVariantTree that provides the following:

- traversal of the resource variant tree
- logic to merge the previous resource variant tree state with the current fetched state.
- caching of the resource variant tree using a ResourceVariantByteStore.

The following must be implemented by subclasses:

- creation of resource variant handles from the cached bytes that represent a resource variant
- fetching of the current remote state from the server
- creation of the byte store instance used to cache the bytes that uniquely identify a resource variant

Concrete implementations of ResourceVariantByteStore are provided that persist bytes across workbench invocations (PersistentResourceVariantByteStore) or cache the bytes only for the current session (SessionResourceVariantByteStore). However, building a subscriber on top of an existing workspace synchronization infrastructure will typically require the implementation of ResourceVariantByteStore subclasses that interface with the underlying synchronizer. For example the ThreeWayRemoteTree makes use of a byte store implementation that stores the remote bytes in the ThreeWaySynchronizer.

The creation of resource variant handles for this example does not differ from the previous example except that the handles are requested from a resource variant tree instance instead of the subscriber.

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Program debug and launch support

The resource plug-ins in the Eclipse platform allow you to manage a set of source files for a program and compile them using an incremental project builder. Plug-ins can define new builders that handle special resource types, such as source files for a particular programming language. Once an executable program is built with your plug-in's builder, how can you make sure that it gets invoked correctly?

The **[org.eclipse.debug.core](#)** plug-in provides the API that allows a program to define a configuration for launching a program. The program can be launched for regular execution or in debug mode, depending on the capabilities of your plug-in. The Eclipse Java development tooling (JDT) uses the platform debug support to launch Java VM's and the Java debugger.

The **[org.eclipse.debug.ui](#)** plug-in includes support for user configuration of launch parameters and utility classes that ease the implementation of powerful debuggers.

There are some shared concepts in launching and debugging programs that are implemented in the platform debug support. However, the best way to understand how to use the platform debug support is to study a robust concrete implementation of launching and debugging, such as the JDT launching and debug tools. We'll review the major concepts of the platform debug support in order to provide a roadmap for studying a concrete implementation.

For a detailed explanation of how to define and develop custom launch configurations, see [We Have Lift-off: The Launching Framework in Eclipse](#).

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Plugging in help

The Eclipse platform's help facilities provide you with the raw building blocks to structure and contribute documentation to the platform. It does not dictate structure or granularity of documentation. You can choose the tools and structure for your documentation that suits your needs. The help plug-in allows you to describe your documentation structure to the platform using a table of contents (toc) file.

Your plug-in's online help is contributed using the [org.eclipse.help.toc](#) extension point. You can either contribute the online help as part of your code plug-in or provide it separately in its own documentation plug-in.

Separating the documentation into a separate plug-in is beneficial in those situations where the code and documentation teams are different groups or where you want to reduce the coupling between the documentation and code.

Advanced features of the help system include context-sensitive help with reference links (known as **infopops**) and the ability to invoke platform code from the documentation. A help browser lets you view, print, and search your documentation.

The best way to demonstrate the contribution of help is to create a documentation plug-in.

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Table of Contents (TOC)

Identifier:

org.eclipse.help.toc

Description:

For registering an online help contribution for an individual plug-in.

Each plug-in that contributes help files should in general do the following:

- ◆ author the html files, zip html files into doc.zip, and store the zip file in the plug-in directory.
- ◆ create TOC files that describe Table of Contents for the help and the necessary topic interleaving. See the syntax below.
- ◆ the plugin.xml file should extend the `org.eclipse.help.toc` extension point and specify TOC file(s).

Configuration Markup:

```
<!ELEMENT extension (toc*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT toc EMPTY>
```

```
<!ATTLIST toc
```

```
file CDATA #REQUIRED
```

```
primary (true | false) "false"
```

```
extradir CDATA #IMPLIED>
```

- **file** – the name of the TOC file which contains the table of contents or section for this plug-in's online help.

Configuration Markup for toc file:

```
<!ELEMENT toc (topic | anchor | link)* >  
<!ATTLIST toc link_to CDATA #IMPLIED >  
<!ATTLIST toc label CDATA #REQUIRED >  
<!ATTLIST toc topic CDATA #IMPLIED >
```


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```
<!ELEMENT topic (topic | anchor | link )* >
<!ATTLIST topic label CDATA #REQUIRED >
<!ATTLIST topic href CDATA #IMPLIED >

<!ELEMENT anchor EMPTY >
<!ATTLIST anchor id ID #REQUIRED >

<!ELEMENT link EMPTY >
<!ATTLIST link toc CDATA #REQUIRED >
```

In general, a plug-in that needs to provide online help will define its own TOC files. In the end, the help system is configured to be launched as some actions, and the path of the TOC file can be used to do so.

The topic element

All help topic element are contributed as part of the toc container element. They can have a hierarchical structure, or can be listed as a flat list.

The topic element is the workhorse of structure of Table of Contents. There are two typical uses for the topic element:

1. To provide a link to a documentation file – usually an HTML file.
2. To act as a container for other toc, either in the same manifest or another.

1. Topics as links

The simplest use of a topic is as a link to a documentation file.

```
<topic label="Some concept file" href="concepts/some_file.html" />
```

The href attribute is relative to the plug-in that the manifest file belongs to. If you need to access a file in another plug-in, you can use the syntax

```
<topic label="topic in another plug-in"
href="../other.plugin.id/concepts/some_other_file.html" />
```

2. Topics as containers

The next most common use of a topic is to use it as a container for other toc. The container topic itself can always refer to a particular file as well.

```
<topic label="Integrated Development Environment"
href="concepts/ciover.htm" >
  <topic label="Starting the IDE" href="concepts/blah.htm" />
  ...
</topic>
```

The link element

The link element allows to link Table of Contents defined in another toc file. All the topics from the toc file specified in the toc attribute will appear in the table of contents as if they were defined directly in place of the link element. To include toc from api.xml file you could write

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```
<topic label="References" >
  ...
  <link toc="api.xml" />
  ...
</topic>
```

The anchor element

The anchor element defines a point that will allow linking other toc files to this navigation, and extending it, without using the link element and referencing other toc files from here. To allow inserting Table of Contents with more topics after the "ZZZ" document you would define an anchor as follows:

```
...
<topic label="zzz" href="zzz.html" />
<anchor id="moreapi" />
...
```

The toc element

The toc element is a Table of Contents that groups topics and other elements defined in this file. The label identifies the table of contents to the user, when it is displayed to the user. The optional topic attribute is the path to a topic file describing the TOC. The optional link_to attribute allows for linking toc from this file into another toc file being higher in the navigation hierarchy. The value of the link_to attribute must specify an anchor in another toc file. To link toc from myapi.xml to api.xml file, specified in another plugin you would use the syntax

```
<toc link_to="../../anotherPlugin/api.xml#moreapi" label="My Tool
API" />
...
<toc />
```

where # character separates toc file name from the anchor identifier.

- **primary** – specifies whether the TOC file is a primary table of contents and is meant to be the master table of contents, or not primary and intended to be integrated into another table of contents.
- **extradir** – specifies relative directory name of containing additional documents that are associated with the table of contents. All help documents in this directory, and all subdirectories, will be indexed, and accessible through the documentation search, even if `topic` elements in the TOC file do not refer to these documents.

Examples:

The following is an example of using the `toc` extension point.

(in file `plugin.xml`)

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```
<extension point=
"org.eclipse.help.toc"
>
<toc file=
"maindocs.html"
primary=
"true"
/>
<toc file=
"task.xml"
/>
<toc file=
"sample.xml"
extradir=
"samples"
/>
</extension>
```

(in file maindocs.xml)

```
<toc label="Help System Example">
  <topic label="Introduction" href="intro.html"/>
  <topic label="Tasks">
    <topic label="Creating a Project" href="tasks/task1.html">
      <topic label="Creating a Web Project"
href="tasks/task11.html"/>
      <topic label="Creating a Java Project"
href="tasks/task12.html"/>
    </topic>
    <link toc="task.xml" />
    <topic label="Testing a Project" href="tasks/taskn.html"/>
  </topic>
  <topic label="Samples">
    <topic label="Creating Java Project"
href="samples/sample1.html">
```

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```
<topic label="Launch a Wizard"
href="samples/sample11.html"/>
  <topic label="Set Options" href="samples/sample12.html"/>
  <topic label="Finish Creating Project"
href="samples/sample13.html"/>
</topic>
<anchor id="samples" />
</topic>
</toc>
```

(in file `tasks.xml`)

```
<toc label="Building a Project">
  <topic label="Building a Project" href="build/building.html">
  <topic label="Building a Web Project"
href="build/web.html"/>
  <topic label="Building a Java Project"
href="build/java.html"/>
</topic>
</toc>
```

(in file `samples.xml`)

```
<toc link_to="maindocs.xml#samples" label="Using The Compile
Tool">
  <topic label="The Compile Tool Sample"
href="compilesample/example.html">
  <topic label="Step 1" href="compilesample/step1.html"/>
  <topic label="Step 2" href="compilesample/step2.html"/>
  <topic label="Step 3" href="compilesample/step3.html"/>
  <topic label="Step 4" href="compilesample/step4.html"/>
</topic>
</toc>
```

Assuming more documents exists with the path starting with "samples", they will not be displayed in the navigation tree, but be accessible using search. It is due to the presence of "extradir" attribute in the element `<toc file="sample.xml" extradir="samples" />` inside `plugin.xml` file. For example searching for "Creating Java Project" could return a document "Other Ways of Creating Java Project", which path is `samples/sample2.html`.

Internationalization The TOC XML files can be translated and the resulting copy (with translated labels) should be placed in `nl/<language>/<country>` or `nl/<language>` directory. The `<language>` and `<country>` stand for two letter language and country codes as used in locale codes. For example, Traditional Chinese translations should be placed in the `nl/zh/TW` directory. The `nl/<language>/<country>` directory has a higher priority than `nl/<language>`. Only if no file is found in the `nl/<language>/<country>`, the file residing in `nl/<language>` will be used. The the root directory of a plugin will be searched last.

The documentation contained in `doc.zip` can be localized by creating a `doc.zip` file with translated version of documents, and placing `doc.zip` in

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nl/<language>/<country> or nl/<language> directory. The help system will look for the files under this directories before defaulting to plugin directory.

API Information:

No code is required to use this extension point. All that is needed is to supply the appropriate manifest files mentioned in the plugin.xml file.

Supplied Implementation:

The default implementation of the help system UI supplied with the Eclipse platform fully supports the `toc` extension point.

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<http://www.eclipse.org/legal/cpl-v10.html>

Plug it in: Hello World meets the workbench

The Eclipse platform is structured as a core runtime engine and a set of additional features that are installed as platform **plug-ins**. Plug-ins contribute functionality to the platform by contributing to pre-defined **extension points**. The workbench UI is contributed by one such plug-in. When you start up the workbench, you are not starting up a single Java program. You are activating a platform runtime which can dynamically discover registered plug-ins and start them as needed.

When you want to provide code that extends the platform, you do this by defining system extensions in your plug-in. The platform has a well-defined set of extension points – places where you can hook into the platform and contribute system behavior. From the platform's perspective, your plug-in is no different than basic plug-ins like the resource management system or the workbench itself.

So how does your code become a plug-in?

- Decide how your plug-in will be integrated with the platform.
- Identify the extension points that you need to contribute in order to integrate your plug-in.
- Implement these extensions according to the specification for the extension points.
- Provide a manifest file (plugin.xml) that describes the extensions you are providing and the packaging of your code.

The process for creating a plug-in is best demonstrated by implementing an old classic, "Hello World," as a plug-in. The intention of this example is to give you a flavor of how plug-in development is different from Java application development. We'll gloss over a lot of details in order to get the plug-in built and running. Then we'll look at extension points in more detail, see where they are defined, and learn how plug-ins describe their implementation of an extension.

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A minimal plug-in

We all know what "Hello World" looks like in plain old Java without using any user interface frameworks or other specialized libraries.

```
public class HelloWorld {
    public static void main(String[] args) {
        System.out.println("Hello World");
    }
}
```

What happens to this old standard in the context of the Eclipse platform? Instead of thinking of Hello World as a self-contained program, we recast it as an extension of the platform. Since we want to say hello to the world, we need to figure out how to extend the workbench to include our greeting.

When we get deeper into the platform user interface components, we'll do an exhaustive review of the ways that you can extend and customize the workbench UI. For now, let's start with one of the simplest workbench extensions – a view.

You can think of the workbench window as a frame that presents various visual parts. These parts fall into two major categories: views and editors. We will look at editors later. **Views** provide information about some

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object that the user is working with in the workbench. Views often change their content as the user selects different objects in the workbench.

Hello world view

For our hello world plug-in, we will implement our own view to greet the user with "Hello World."

The plug-in **org.eclipse.ui.workbench** defines most of the public interfaces that make up the workbench API. These interfaces can be found in the package **org.eclipse.ui** and its sub packages. Many of these interfaces have default implementation classes that you can extend to provide simple modifications to the system. In our hello world example, we will extend a workbench view to provide a label that says hello.

The interface of interest is **IViewPart**, which defines the methods that must be implemented to contribute a view to the workbench. The class **ViewPart** provides a default implementation of this interface. In a nutshell, a view part is responsible for creating the widgets needed to show the view.

The standard views in the workbench often display some information about an object that the user has selected or is navigating. Views update their contents based on actions that occur in the workbench. In our case, we are just saying hello, so our view implementation will be quite simple.

Before jumping into the code, we need to make sure our environment is set up for plug-in development...

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Creating the plug-in project

You can use any Java IDE you wish to build Eclipse plug-ins, but we'll walk through the steps for building our plug-in with the Eclipse Java IDE, since this is the typical case. If you are not already familiar with the Eclipse workbench and the Java IDE, consult the Java Development User Guide for further explanations of the steps we are taking. For now we are focusing on the code, not the tool. However, there are some IDE logistics for getting started.

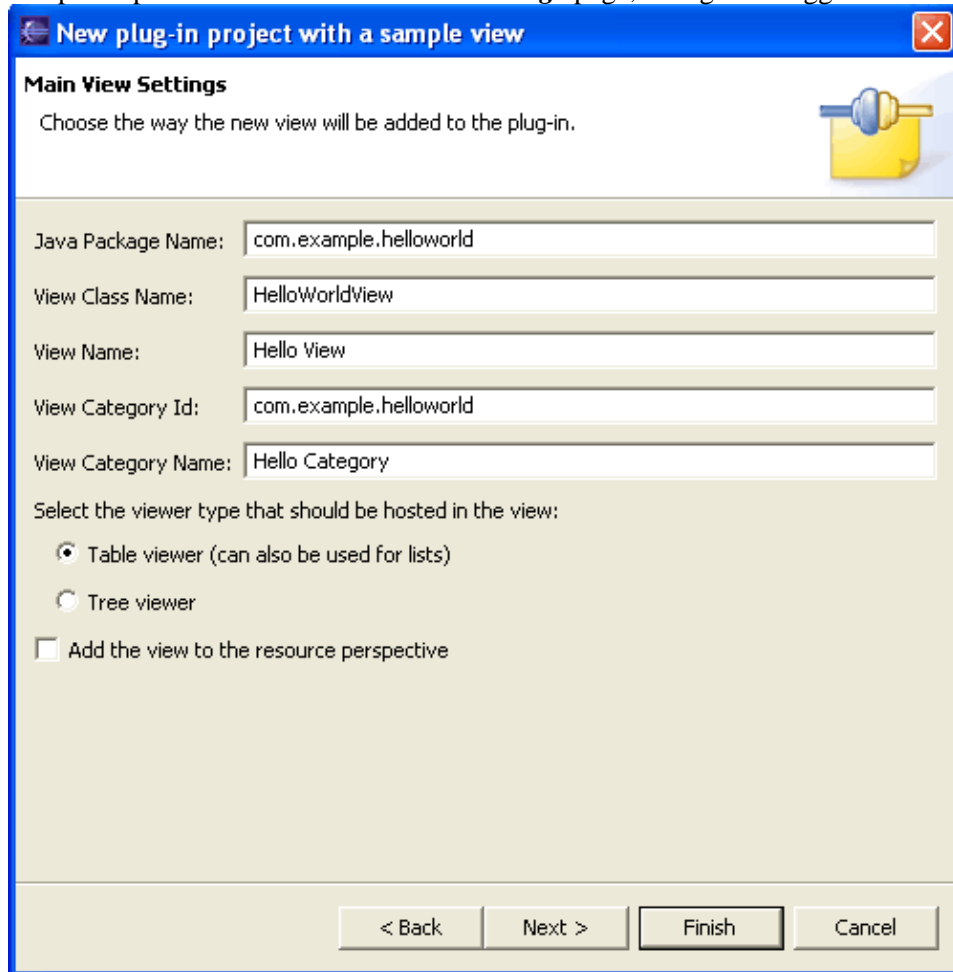
Creating your plug-in project

You will need to create a project that contains your work. We'll take advantage of some of the code-generation facilities of the Plug-in Development Environment (PDE) to give us a template to start from. This will set up the project for writing Java code and generate a default plug-in manifest file (explained in a moment) and class to hold our view.

1. Open the **New Project...** wizard (*File > New > Project...*) and choose **Plug-in Project** from the **Plug-in Development** category and click *Next*.
2. On the **Plug-in Project** page, use **com.example.helloworld** as the name for your project and check the box for **Create a Java project** (this should be the default). Click *Next* to accept the default Java project structure.
3. On the **Plug-in Content** page, look at the default settings. The wizard sets **com.example.helloworld** as the id of the plug-in. The wizard will also generate a plug-in class for your plug-in and allow you supply additional information about contributing to the UI. These defaults are acceptable, so click *Next*.
4. On the **Templates** page, check the box for **Create a plug-in using one of the templates**. Then select the **Plug-in with a view** template. Click *Next*.

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5. We want to create a minimal plug-in, so at this point we need to change the default settings to keep things as simple as possible. On the *Main View Settings* page, change the suggested defaults as follows:



The screenshot shows the 'Main View Settings' dialog box in Eclipse. The title bar reads 'New plug-in project with a sample view'. The main heading is 'Main View Settings' with a sub-instruction: 'Choose the way the new view will be added to the plug-in.' Below this are several text input fields: 'Java Package Name' (com.example.helloworld), 'View Class Name' (HelloWorldView), 'View Name' (Hello View), 'View Category Id' (com.example.helloworld), and 'View Category Name' (Hello Category). There are three radio button options for 'Select the viewer type that should be hosted in the view:': 'Table viewer (can also be used for lists)' (selected), 'Tree viewer', and 'Add the view to the resource perspective' (unchecked). At the bottom are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

- ◆ Change the *Java Package Name* from *com.example.helloworld.views* to *com.example.helloworld* (we don't need a separate package for our view).
 - ◆ Change the *View Class Name* to *HelloWorldView*.
 - ◆ Change the *View Name* to *Hello View*.
 - ◆ Leave the default *View Category Id* as *com.example.helloworld*.
 - ◆ Change the *View Category Name* to *Hello Category*.
 - ◆ Leave the default viewer type as *Table viewer* (we will change this in the code to make it even simpler).
 - ◆ Uncheck the box for *Add the view to the resource perspective*.
 - ◆ Click *Next* to proceed to the next page.
6. On the *View Features* page, uncheck all of the boxes so that no extra features are generated for the plug-in. Click *Finish* to create the project and the plug-in skeleton.
7. When asked if you would like to switch to the Plug-in Development perspective, answer *Yes*.
8. Navigate to your new project and examine its contents.

The skeleton project structure includes several files and a Java package. The important files at this stage are the *plugin.xml* (manifest) file and the Java source code for your plug-in. We'll start by looking at the implementation for a view and then examine the manifest file.

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The Hello World view

Now that we've created a project, package, and view class for our plug-in, we're ready to study some code. Here is everything you need in your **HelloWorldView**. Copy the contents below into the class you created, replacing the auto-generated content.

```
package com.example.helloworld;

import org.eclipse.swt.widgets.Composite;
import org.eclipse.swt.widgets.Label;
import org.eclipse.swt.SWT;
import org.eclipse.ui.part.ViewPart;

public class HelloWorldView extends ViewPart {
    Label label;
    public HelloWorldView() {
    }
    public void createPartControl(Composite parent) {
        label = new Label(parent, SWT.WRAP);
        label.setText("Hello World");
    }
    public void setFocus() {
        // set focus to my widget. For a label, this doesn't
        // make much sense, but for more complex sets of widgets
        // you would decide which one gets the focus.
    }
}
```

The view part creates the widgets that will represent it in the **createPartControl** method. In this example, we create an SWT label and set the "Hello World" text into it. This is about the simplest view that can be created.

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The Hello World manifest

Before we run the new view, let's take a look at the manifest file that was generated for us:

```
<?xml version="1.0" encoding="UTF-8"?>
<?eclipse version="3.0"?>
<plugin
  id="com.example.helloworld"
  name="Helloworld Plug-in"
  version="1.0.0"
  provider-name="EXAMPLE"
  class="com.example.helloworld.HelloworldPlugin">

  <runtime>
    <library name="helloworld.jar">
      <export name="*" />
    </library>
  </runtime>

  <requires>
    <import plugin="org.eclipse.ui" />
    <import plugin="org.eclipse.core.runtime" />
    <import plugin="org.eclipse.core.runtime.compatibility" />
  </requires>
```

Welcome to Eclipse

```
<extension
  point="org.eclipse.ui.views">
  <category
    name="Hello Category"
    id="com.example.helloworld">
  </category>
  <view
    name="Hello View"
    icon="icons/sample.gif"
    category="com.example.helloworld"
    class="com.example.helloworld.HelloWorldView"
    id="com.example.helloworld.HelloWorldView">
  </view>
</extension>

</plugin>
```

The information about the view that we provided when we created the plug-in project was used to generate a manifest file with the appropriate mark-up for defining our view extension. In the extension definition, we define a **category** for the view, including its **name** and **id**. We then define the view itself, including its **name** and **id**, and we associate it with the **category** using the **id** we defined for our category. We also specify the **class** that implements our view, **HelloWorldView**.

As you can see, the manifest file wraps up all the information about our extension and how to run it into a nice, neat package.

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Running the plug-in

We have all the pieces needed to run our new plug-in. Now we need to build the plug-in. If your Eclipse workbench is set up to build automatically, then your new view class should have compiled as soon as you saved the new content. If not, then select your new project and choose **Project>Build Project**. The class should compile without error.

There are two ways to run a plug-in once it has been built.

1. The plug-in's manifest file and jar file can be installed in the *eclipse/plugins* directory. When the workbench is restarted, it will find the new plug-in.
2. The PDE tool can be used to run another workbench from within your current workbench. This *runtime workbench* is handy for testing new plug-ins immediately as you develop them from your workbench. (For more information about how a runtime workbench works, check the PDE guide.)

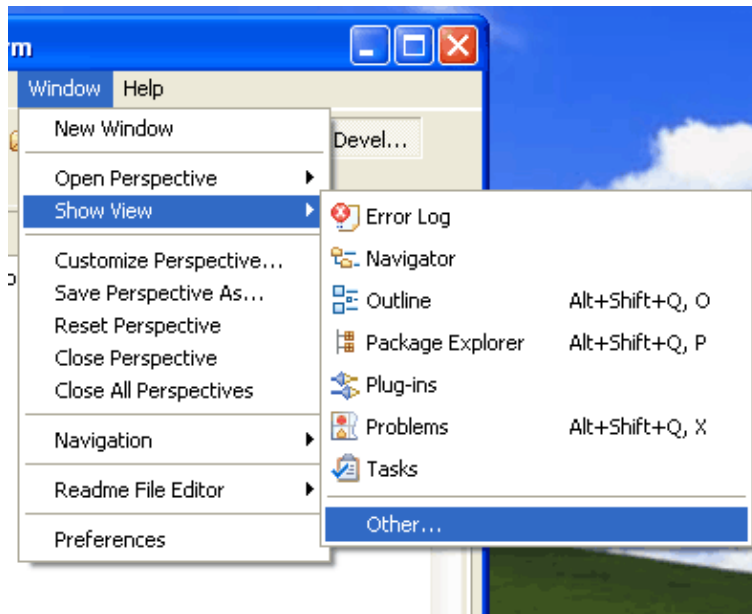
For simplicity, we'll run the new plug-in from within the Eclipse workbench.

Launching the workbench

To launch a runtime workbench, choose **Run>Run....** This dialog will show you all the different kinds of ways you can launch a program. Choose *Runtime workbench* and accept all of the default settings. This will cause another instance of the Eclipse workbench, the runtime workbench, to start.

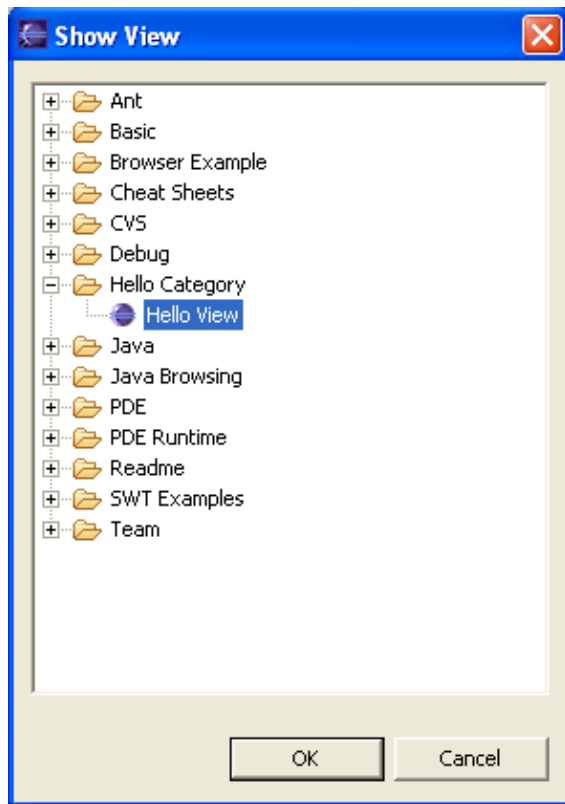
Running Hello World

So where is our new view? We can see all of the views that have been contributed by plug-ins using the **Window >Show View** menu.



This menu shows us what views are available for the current perspective. You can see all of the views that are contributed to the platform (regardless of perspective) by selecting **Other...**. This will display a list of view categories and the views available under each category.

The workbench creates the full list of views by using the extension registry to find all the plug-ins that have provided extensions for the [org.eclipse.ui.views](#) extension point.

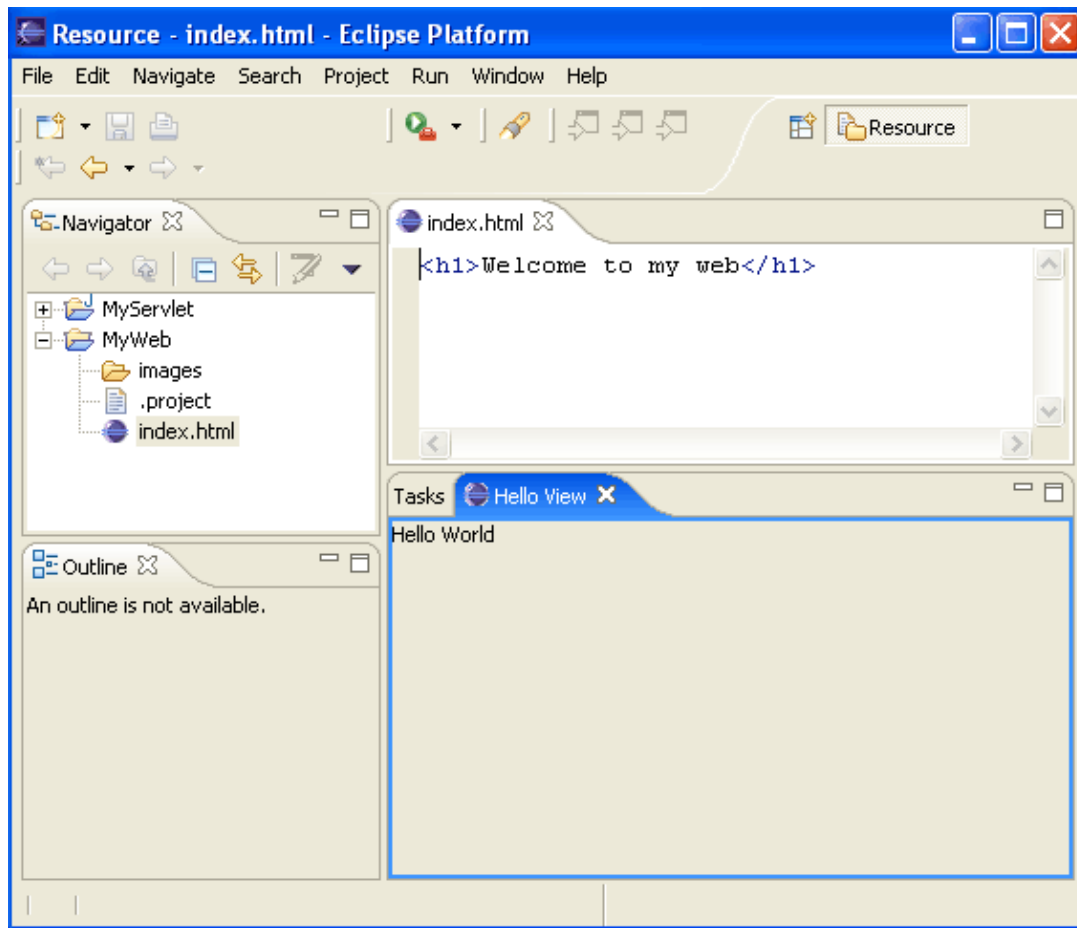


There we are! The view called "Hello View" has been added to the **Show View** window underneath our category "Hello Category." The labels for our category and view were obtained from the extension point configuration markup in the **plugin.xml**.

Up to this point, we still have not run our plug-in code! The declarations we made in the **plugin.xml** (which can be seen by other plug-ins using the extension registry) are enough for the workbench to find out that there is a view called "Hello View" available in the "Hello" category. It even knows what class implements the view. But none of our code will be run until we decide to show the view.

If we choose the "Hello View" view from the **Show View** list, the workbench will activate our plug-in, instantiate and initialize our view class, and show the new view in the workbench along with all of the other views. Now our code is running.

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There it is, our first plug-in! We'll cover more specifics about UI classes and extension points later on.

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Views

Identifier:

org.eclipse.ui.views

Description:

This extension point is used to define additional views for the workbench. A view is a visual component within a workbench page. It is typically used to navigate a hierarchy of information (like the workspace), open an editor, or display properties for the active editor. The user can make a view visible from the View menu or close it from the view local title bar.

In order to reduce the visual clutter in the Show View Dialog, views should be grouped using categories.

Configuration Markup:

```
<!ELEMENT extension (category | view | stickyView)*>
```

```
<!ATTLIST extension
```

```
  point CDATA #REQUIRED
```

```
  id CDATA #IMPLIED
```

```
  name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT category EMPTY>
```

```
<!ATTLIST category
```

```
  id CDATA #REQUIRED
```

```
  name CDATA #REQUIRED
```

```
  parentCategory CDATA #IMPLIED>
```

- **id** – a unique name that will be used to identify this category
- **name** – a translatable name that will be used in the UI for this category
- **parentCategory** – an optional path composed of category IDs separated by '/'. This attribute provides for creating category hierarchy.

```
<!ELEMENT view (description?)>
```

<!ATTLIST view

id CDATA #REQUIRED

name CDATA #REQUIRED

category CDATA #IMPLIED

class CDATA #REQUIRED

icon CDATA #IMPLIED

fastViewWidthRatio CDATA #IMPLIED

allowMultiple (true | false) >

- **id** – a unique name that will be used to identify this view
- **name** – a translatable name that will be used in the UI for this view
- **category** – an optional attribute that is composed of the category IDs separated by '/'. Each referenced category must exist prior to being referenced in this attribute.
- **class** – a fully qualified name of the class that implements `org.eclipse.ui.IViewPart`. A common practice is to subclass `org.eclipse.ui.part.ViewPart` in order to inherit the default functionality.
- **icon** – a relative name of the icon that will be associated with the view.
- **fastViewWidthRatio** – the percentage of the width of the workbench that the view will take up as an active fast view. This must be defined as a floating point value and lie between 0.05 and 0.95. If no value is supplied, a default ratio will be used.
- **allowMultiple** – flag indicating whether this view allows multiple instances to be created using `IWorkbenchPage.showView(String id, String secondaryId)`. The default is false.

<!ELEMENT description (#CDATA)>

an optional subelement whose body should contain text providing a short description of the view.

<!ELEMENT stickyView EMPTY>

<!ATTLIST stickyView

id CDATA #REQUIRED

location (RIGHT|LEFT|TOP|BOTTOM)

closeable (true | false)

moveable (true | false) >

Welcome to Eclipse

A sticky view is a view that will appear by default across all perspectives in a window once it is opened. Its initial placement is governed by the location attribute, but nothing prevents it from being moved or closed by the user. Use of this element will only cause a placeholder for the view to be created, it will not show the view. Please note that usage of this element should be done with great care and should only be applied to views that truly have a need to live across perspectives. Since 3.0

- **id** – the id of the view to be made sticky.
- **location** – optional attribute that specifies the location of the sticky view relative to the editor area. If absent, the view will be docked to the right of the editor area.
- **closeable** – optional attribute that specifies whether the view should be closeable. If absent it will be closeable.
- **moveable** – optional attribute that specifies whether the view should be moveable. If absent it will be moveable.

Examples:

The following is an example of the extension point:

```
<extension point=
"org.eclipse.ui.views"
>
<category id=
"com.xyz.views.XYZviews"
name=
"XYZ"
>
</category>
<view id=
"com.xyz.views.XYZView"
name=
"XYZ View"
category=
```


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```
"com.xyz.views.XYZviews"  
  
class=  
  
"com.xyz.views.XYZView"  
  
icon=  
  
"icons/XYZ.gif"  
  
>  
  
</view>  
  
</extension>
```

The following is an example of a sticky view declaration:

```
<extension point=  
  
"org.eclipse.ui.views"  
  
>  
  
<stickyView id=  
  
"com.xyz.views.XYZView"  
  
</>  
  
</extension>
```

API Information:

The value of the `class` attribute must be a fully qualified name of the class that implements `org.eclipse.ui.IViewPart`. It is common practice to subclass `org.eclipse.ui.part.ViewPart` when developing a new view.

Supplied Implementation:

The workbench provides a number of standard views including Navigator, Properties, Outline and Tasks. From the user point of view, these views are no different from any other view provided by the plug-ins. All the views can be shown from the "Show View" submenu of the "Window" menu. The position of a view is persistent: it is saved when the view is closed and restored when the view is reopened in a single session. The position is also persisted between workbench sessions.

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Welcome to Eclipse

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Beyond the basics

Hopefully you've gotten a flavor of how you can contribute code in the form of an extension, and package that functionality into a plug-in. From here, you can start diving into more detail:

- [Basic workbench extension points](#)
- [Workbench menu contributions](#)
- [Advanced workbench concepts](#)
- [Workbench wizard extension points](#)

A complete list of extension points can be found in the [Platform Extension Point Reference](#).

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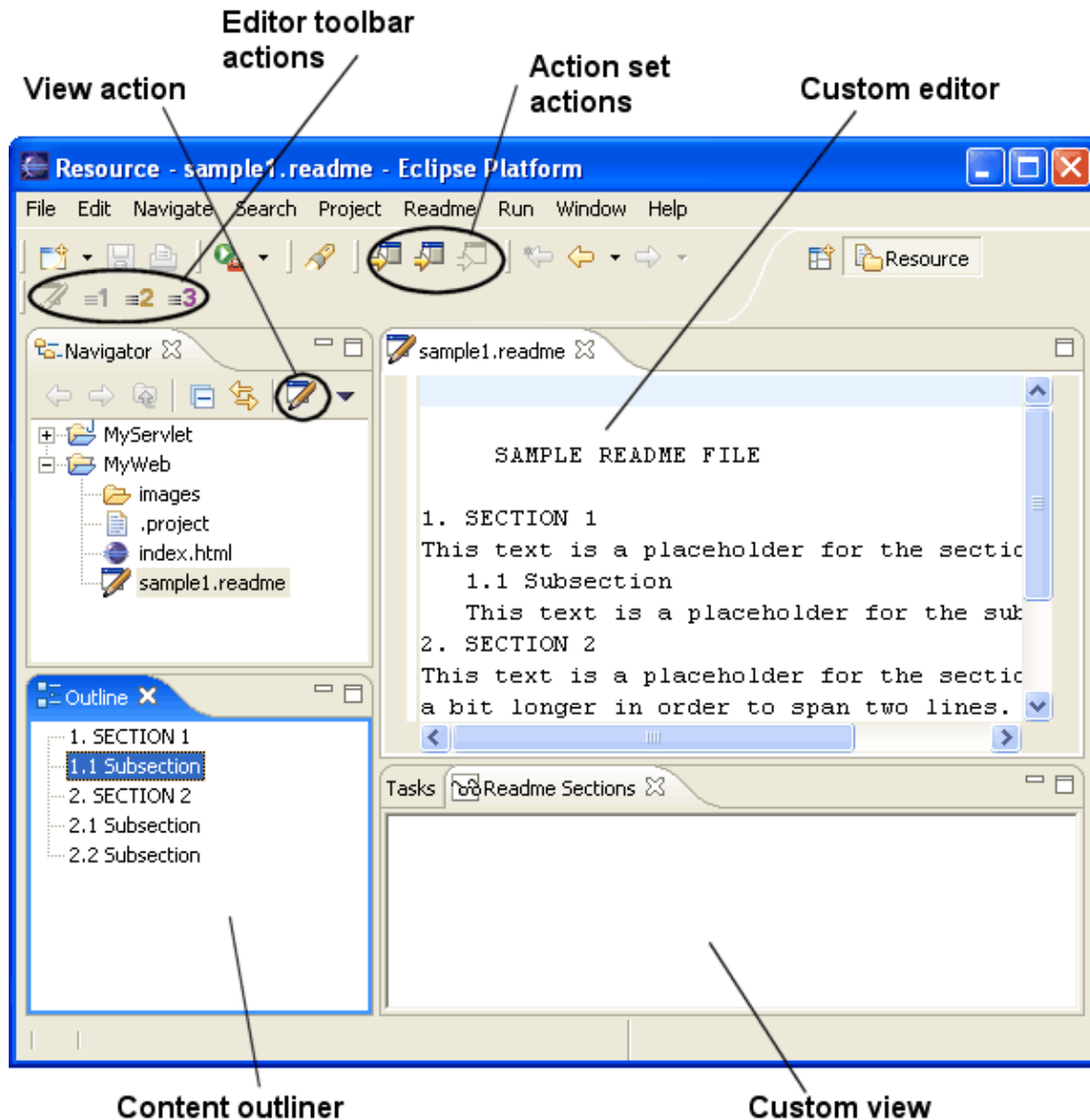
Basic workbench extension points

The workbench defines extension points that allow plug-ins to contribute behaviors to existing views and editors or to provide implementations for new views and editors. We are going to take a look at the contributions to these extension points from one of the workbench sample applications, the readme tool.

The readme tool is a plug-in that provides custom editing and navigation for a specific resource, a **.readme** file. The example shows many typical (but simplified) ways that extensions can be used to provide specialized tools.

The readme tool contributes to the menus of the navigator view, adds editor related actions to the workbench menus and tool bar, defines a custom view and content outliner, and defines markers and marker resolutions. The figure below shows some of the customized features added to the workbench by the readme tool.

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The readme tool also contributes preference and properties pages to the workbench. Later we'll also look at some wizard contributions in [Dialogs and wizards](#).

The readme tool is located in the `org.eclipse.ui.examples.readmetool` package. The `readmetool.jar` and `plugin.xml` can be found in the `org.eclipse.ui.examples.readmetool` directory underneath the `plugins` directory. To follow along, you will need to make sure that you have installed the platform examples. (See the [Examples Guide](#) for more information.)

The [readme tool](#) implements many different workbench extensions. We will start with one of the simplest workbench extension points, a view. We'll continue by looking at additional readme tool extensions.

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Installing the examples

Installing examples via the Update Manager

The Eclipse SDK examples are found on the Eclipse project update site at <http://update.eclipse.org/updates>. To locate and install them into a product:

1. Open the main update manager by clicking **Help > Software Updates > Find and Install**. This opens the Install Wizard.
2. Select "Search for new features" and click **Next**.
3. In the sites to search page, add an update site by clicking on **Add Update Site** button: In the Add Update Site dialog that opens, give the site the name "Eclipse.org" and URL "<http://update.eclipse.org/updates>". Note: this step is not needed if the site is already there.
4. Click **Next** and wait for the search results to return all the features found on that site.
5. Select the SDK Examples feature and click **Next**.
6. Accept the license and click **Next**.
7. Select the directory into which the example feature is to be installed and hit **Next**.
8. Click **Install** to allow the downloading and installing to proceed.
9. Click **Yes** when asked to exit and restart the workbench for the changes to take effect. The examples are now installed in the workbench. Note: you can also click on **Apply Now** to dynamically install the examples into the current configuration.

Installing examples manually

To install the examples without the Update Manager, download the appropriate Eclipse SDK Example zip file from the Eclipse project web site at <http://www.eclipse.org/downloads>.

The workbench should not be running while the examples are being installed. Extract the contents of the zip file to the root directory of your Eclipse installation.

For example, if you installed the Eclipse Project SDK on **d:\eclipse-sdk** then extract the contents of the examples zip file to **d:\eclipse-sdk** (the subdirectories named **eclipse** should line up).

Start the workbench. The workbench will report that updates have been detected; accept them. The examples are now installed in the workbench.

You can verify that examples have been installed by looking for **File > New > Example...** in the workbench menu bar.

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Example – Readme Tool

Introduction

The Readme editor shows how to define your own extension points for use by other plugins. It also shows how to create extensions for resource popup menu entries, new resource wizards, file editors on an extension

Welcome to Eclipse

(.readme), a custom view and property pages.

Running the example

To start using this example create a file with the .readme extension using the file creation wizard or create one using the example creation wizard. The additional view provided by this example can be seen by selecting Window > Show View > Other and expanding the Readme section. The view action can be seen by clicking on the readme icon on the Navigator View.

Creating a new readme file

Create a new file with file extension .readme. From the File menu, select New and then select Other... from the sub menu. Click on Simple in the wizard, then select File in the list on the left. Click on Next to supply the file name (make sure the extension is .readme) and the folder in which the file should be contained.

Example creation wizards

From the File menu, select New and from the sub menu select Example... Now select Example Creation Wizards. Select Readme File. Click Next. Select the folder in which you want the file to be created. Type the name of the file with a .readme extension. Click Finish.

Readme view extension action

In the Navigator View, select a file with extension .readme. If there isn't one create a file with that extension. On the local toolbar of the Navigator View, you will see a button whose hover help says Run Readme View Extension. Click on this button. A dialog will popup saying View Action executed.

Popup menus

In the Navigator View, select a file with extension .readme. If there isn't one create a file with that extension. Select the file to bring up the popup menu. Notice there is a menu item that says Show Readme Action in the popup menu. Choose this menu item to open a dialog that says Popup Menu Action Executed.

Preference page

From the Window menu, select Preferences. Click on the page called Readme Example. This shows an example of a preference page.

Property page

In the Navigator View, select a file with extension .readme. If there isn't one create a file with that extension. Select the file to bring up the popup menu, then select the Properties menu item. Click on the page called Readme Tool to see an example of a property page.

Readme file editor

The Readme File Editor is the default editor for files of type *.readme. Create a file with extension .readme and open the file by double clicking on it, or by bringing up the popup menu, selecting Open With, then selecting Readme File Editor from the sub menu. Notice the editor has an icon with a pencil. This is the editor that the readme tool uses by default for files of type *.readme.

Readme Editor Actions

This demonstrates an example of actions that are applicable only to a particular editor. When a readme file editor has focus, notice 4 additional tool bar buttons – Run Readme Editor Extension, Readme Editor Action 1, Readme Editor Action 2, Readme Editor Action 3.

A pull down menu named Readme appears when a readme file editor has focus. It contains the actions previously described: Readme Editor Action 1, Readme Editor Action 2, Readme Editor Action 3.

Readme sections view

To see this Readme Sections view, from the Window menu select Show View, then select Other... from the sub menu. Expand the Readme item and then select Readme Sections. This will show a list of the sections in the current *.readme file when a .readme file is selected in the Navigator View. You can also see the structure of a *.readme file in the Outline view.

A file with extension .readme can be broken down into sections when each section begins with a number. For example, if the following text were entered into the readme file editor, the readme tool would detect 2 sections. To see how sections are detected in the readme tool, type some text in the readme file editor, save the file by either typing CTRL-S or selecting File->Save. Open the Readme Sections view and select the .readme file in the Navigator View.

Example text:

99.1 This is my first section
This is some text in my first section.

99.1.1 This is a sub section
This is some text in my sub-section.

Drag and Drop

The Drag and Drop functionality can be seen by selecting a section in the Outline View and dragging the selection over top of a text file. The contents of the selection will be appended to the file.

Help contribution

The readme tool example also demonstrates how to use and implement context help on all of the extensions it supplies – a view, various actions and a wizard page. To get context help on an action, hover over the menu item, but do not select it, then hit the F1 key. You can also get context sensitive (F1) help on the Readme Sections view and the Example Creation Wizards page (in the New wizard).

Details

The Readme Tool example declares one extension point and supplies a number of extensions. The extensions supplied are quite comprehensive in understanding how the Workbench functions, as it utilizes a number of the more interesting extension points declared by the workbench. Supplied extensions included in this example are views and view actions, preference pages, property pages, wizards, editors and editor actions, popup menus, action sets, help contributions, help contexts, and drop actions.

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This example also supplies an extension point declared in the plug-in.. The class `IReadmeFileParser` is required for any plug-in that uses the `org.eclipse.ui.examples.readmetool.sectionParser` extension that this example defines. The class `DefaultSectionParser` is an example implementation of `IReadmeFileParser`.

The class `ReadmeEditor` implements `IEditorPart` and is defined as an editor on files with the extension `.readme` in the `plugin.xml` using the `org.eclipse.ui.editors` extension point. The class `ReadmeSectionsView` implements `IViewPart` and is defined as a view using the `org.eclipse.ui.views` extension point. This extension point also defines a category for the view for use in view selection.

Two types of preference settings are defined in this example, workbench preferences and resource properties. The workbench preference is defined in class `ReadmePreferencePage` which implements `IWorkbenchPreferencePage` so that it will be added to the Window->Preferences dialog. The class is defined in the extension point `org.eclipse.ui.preferencePages` in the `plugin.xml`. The two resource properties pages are `ReadmeFilePropertyPage` and `ReadmeFilePropertyPage2` both of which implement `IWorkbenchPropertyPage`. They are both defined to be invoked on the `IFile` type by the `objectClass` tag in the `plugin.xml` in the `org.eclipse.ui.propertyPages` extension point.

The class `ReadmeCreationWizard` implements `INewWizard` and is defined in the `org.eclipse.ui.newWizards` extension point in the `plugin.xml`. This extension point also defines the category that the wizard that is shown when the user selects File->New->Example....

Several action stubs are added to this example. The action set declares a menu labeled `Readme File Editor` to be included in the workbench window menu bar using the extension point `org.eclipse.ui.actionSets`. It also defines an action for the workbench toolbar and menu bar using the tags `toolbarPath` and `menubarPath`. It uses the class `WindowActionDelegate` which implements `IWorkbenchWindowActionDelegate` to implement the action. The action for the popup menu is defined as an `objectContribution` by the class `PopupMenuActionDelegate` in the extension point `org.eclipse.ui.popupMenus`. `PopupMenuActionDelegate` implements `IObjectActionDelegate` and uses the `IWorkbenchPart` provided to open a message dialog. The view action `ViewActionDelegate` is defined in the extension point `org.eclipse.ui.viewActions` and implements `IViewActionDelegate`. The View it appears in is defined by the tag `targetID` which in this example is `org.eclipse.ui.views.ResourceNavigator`. The editor action is defined by the class `EditorActionDelegate` which implements `IEditorActionDelegate` and is added using the `org.eclipse.ui.editorActions` extension point. The editor that it is applied to is defined by the tag `targetID` which in this example is defined on `org.eclipse.ui.examples.readmetool.ReadmeEditor`.

The class `ReadmeDropActionDelegate` implements `IDropDelegate`. `IDropDelegates` are informed every time there is a drop action performed in the workbench . The extension point for this action is `org.eclipse.ui.dropActions`.

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Workbench menu contributions

We've seen several different extension points that contribute to various menus and toolbars in the workbench. How do you know which one to use? The following table summarizes the various menu contributions and their use.

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Extension point name	Location of Actions	Details
viewActions	Actions appear in a specific view's local toolbar and local pulldown menu.	Contribute an action class that implements <u>IViewActionDelegate</u> . Specify the id of the contribution and the id of the target view that should show the action. The label and image dictate the appearance of the action in the UI. The path specifies the location relative to the view's menu and toolbar items.
editorActions	Actions are associated with an editor and appear in the workbench menu and/or tool bar.	Contribute an action class that implements <u>IEditorActionDelegate</u> . Specify the id of the contribution and the id of the target editor that causes the action to be shown. The label and image specify the appearance of the action in the UI. Separate menu and toolbar paths specify the existence and location of the contribution in the workbench menu and toolbar.
popupMenus	Actions appear in the popup menu of an editor or view. Actions associated with an object type show up in all popups of views and editors that show the object type. Actions associated with a specific popup menu appear only in that popup menu.	Object contributions specify the type of object for which the action should appear in a popup menu. The action will be shown in all view and editor popups that contain the object type. Provide an action class that implements <u>IObjectActionDelegate</u> . Viewer contributions specify the id of the target popup menu in which the menu item should appear. Provide an action class that implements <u>IEditorActionDelegate</u> or <u>IViewActionDelegate</u> .
actionSets	Actions appear in the workbench main menus and toolbar. Actions are grouped into action sets. All actions in an action set will show up in the workbench menus and toolbars according to the user's selection of action sets and the current perspective shown in the workbench. May be influenced by <code>actionSetPartAssociations</code> (below).	Contribute an action class that implements <u>IWorkbenchWindowActionDelegate</u> or <u>IWorkbenchWindowPulldownDelegate</u> . Specify the name and id of the action set. Enumerate all of the actions that are defined for that action set. For each action, separate menu and toolbar paths specify the existence and location of the contribution in the workbench menu and toolbar.
actionSetPartAssociations	Actions sets are shown only when the specified views or editors are active. This is ignored if the user has customized the current perspective.	Specify an action set by id and followed by one or more parts (by id) that must be active in the current perspective in order to show the action set.

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Advanced workbench concepts

[Plugging into the workbench](#) looks at the basic workbench extension points in the context of the readme tool example. However, there are many more extension points available for contributing to the workbench.

The next topics cover additional workbench extensions and concepts that you will likely encounter once you've implemented your plug-in and have begun to refine its function. In order to understand the next few topics, you should already be familiar with

- [Plugging into the Workbench](#)
- [JFace UI framework](#)
- [SWT](#)
- [Resources overview](#)

Since the readme tool does not contribute to all of these extension points, we will look at example extensions that are implemented by the platform workbench, the platform help system, and Java tooling (JDT).

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Plugging into the workbench

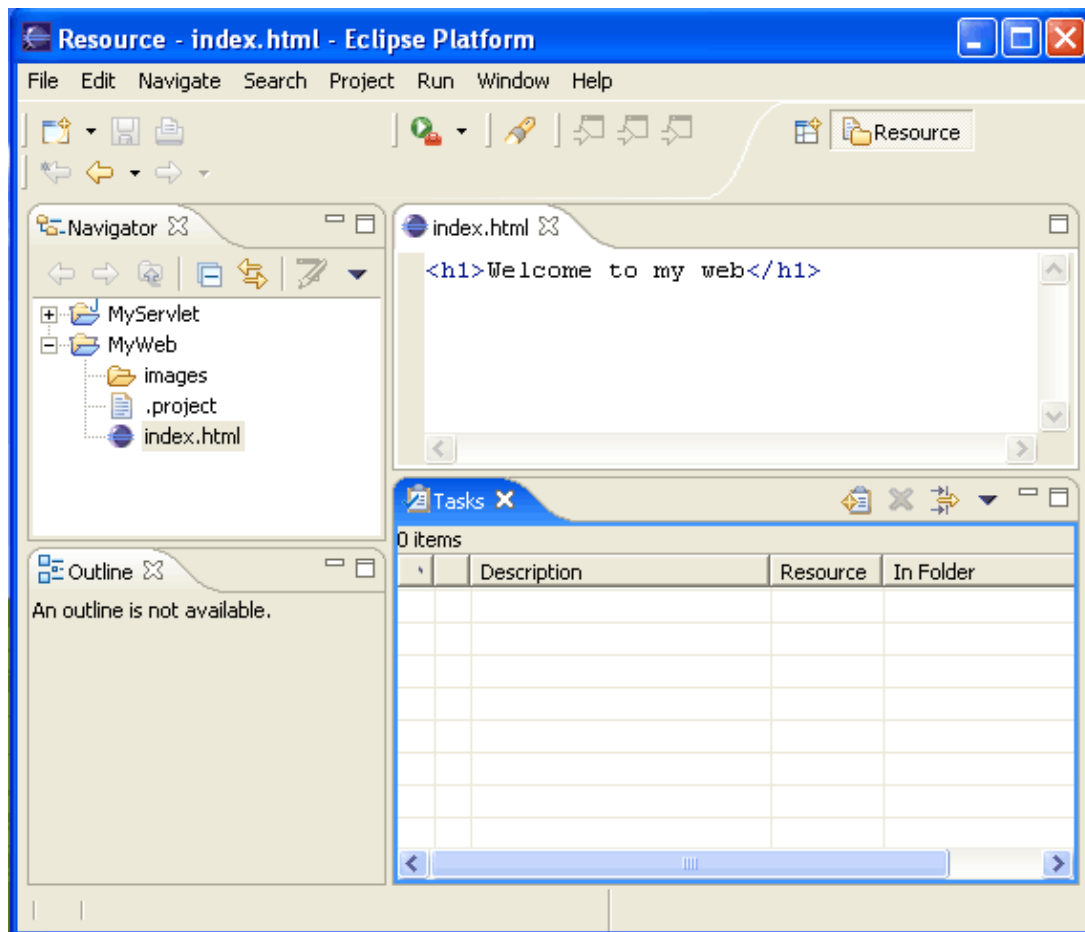
By now, you should be quite familiar with the operation of the workbench and how it uses views and editors to display information. If not, read the quick tour of the workbench below.

The sections following the quick tour will look at the workbench user interface from an API perspective. We will show how a plug-in can contribute to the workbench UI.

Quick tour of the workbench

The workbench is the cockpit for navigating all of the function provided by plug-ins. By using the workbench, we can navigate resources and we can view and edit the content and properties of these resources.

When you open your workbench on a set of projects, it looks something like this.



The workbench is just a frame that can present various visual parts. These parts fall into two major categories: **views** and **editors**.

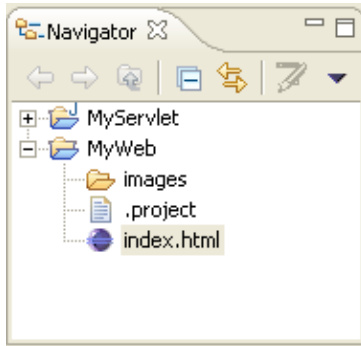
- **Editors** allow the user to edit something in the workbench. Editors are "document-centric," much like a file system editor. Like file system editors, they follow an open-save-close lifecycle. Unlike file system editors, they are tightly integrated into the workbench.

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- **Views** provide information about some object that the user is working with in the workbench. Views often change their content as the user selects different objects in the workbench. Views often support editors by providing information about the content in the active editor.

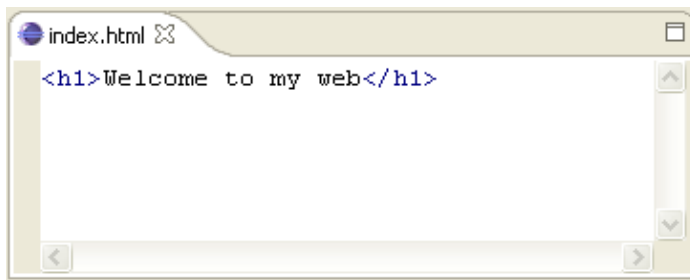
Views

The workbench provides several standard views that allow the user to navigate or view something of interest. For example, the resource navigator lets the user navigate the workspace and select resources.



Editors

Editors allow the user to open, edit, and save objects. The workbench provides a standard editor for text resources.



Additional editors, such as Java code editors or HTML editors, can be supplied by plug-ins

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JFace: UI framework for plug-ins

We've seen that the workbench defines extension points for plug-ins to contribute UI function to the platform. Many of these extension points, particularly wizard extensions, are implemented using classes in the **org.eclipse.jface.*** packages. What's the distinction?

JFace is a UI toolkit that provides helper classes for developing UI features that can be tedious to implement. JFace operates above the level of a raw widget system. It provides classes for handling common UI programming tasks:

- **Viewers** handle the drudgery of populating, sorting, filtering, and updating widgets.
- **Actions** and **contributions** introduce semantics for defining user actions and specifying where to make them available.
- **Image** and **font registries** provide common patterns for handling UI resources.
- **Dialogs** and **wizards** define a framework for building complex interactions with the user.

JFace frees you up to focus on the implementation of your specific plug-in's function, rather than focusing on the underlying widget system or solving problems that are common in almost any UI application.

JFace and the workbench

Where does JFace end and the workbench begin? Sometimes the lines aren't so obvious. In general, the JFace APIs (from the packages **org.eclipse.jface.***) are independent of the workbench extension points and APIs. Conceivably, a JFace program could be written without using any workbench code at all.

The workbench makes use of JFace but attempts to reduce dependencies where possible. For example, the workbench part model (**IWorkbenchPart**) is designed to be independent of JFace. We saw earlier that views and editors can be implemented using SWT widgets directly without using any JFace classes. The workbench attempts to remain "JFace neutral" wherever possible, allowing programmers to use the parts of JFace they find useful. In practice, the workbench uses JFace for much of its implementation and there are references to JFace types in API definitions. (For example, the JFace interfaces for **IMenuBar**, **IToolBarManager**, and **IStatusLineManager** show up as types in the workbench **IActionBar** methods.)

JFace and SWT

The lines between SWT and JFace are much cleaner. SWT does not depend on any JFace or platform code at all. Many of the SWT examples show how you can build a standalone application.

JFace is designed to provide common application UI function on top of the SWT library. JFace does not try to "hide" SWT or replace its function. It provides classes and interfaces that handle many of the common tasks associated with programming a dynamic UI using SWT.

The relationship between JFace and SWT is most clearly demonstrated by looking at viewers and their relationship to SWT widgets.

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Standard Widget Toolkit

The Standard Widget Toolkit (SWT) is a widget toolkit for Java developers that provides a portable API and tight integration with the underlying native OS GUI platform.

Many low level UI programming tasks are handled in higher layers of the Eclipse platform. For example, the *plugin.xml* markup for UI contributions specifies menu and toolbar content without requiring any SWT programming. Additionally, JFace viewers and actions provide implementations for the common interactions between applications and widgets. However, knowledge of the underlying SWT architecture and design philosophy is important for understanding how the rest of the platform works.

Portability and platform integration

A common issue in widget toolkit design is the tension between portable toolkits and platform integration. The Java AWT (Abstract Window Toolkit) provides platform integrated widgets for lower level widgets such as lists, texts, and buttons, but does not provide access to higher level platform components such as trees or rich text. This forces application developers into a "least common denominator" situation in which they can only use widgets that are available on all platforms.

The Swing toolkit attempts to address this problem by providing non-native implementations of high level widgets like trees, tables, and text. This provides a great deal of functionality, but makes applications developed in Swing stand out as being different. Platform look and feel emulation layers help the applications look more like the platform, but the user interaction is different enough to be noticed. This makes it difficult to use emulated toolkits to build applications that compete with shrink-wrapped applications developed specifically for a particular OS platform.

SWT addresses this problem by defining a common portable API that is provided on all supported platforms, and implementing the API on each platform using native widgets wherever possible. This allows the toolkit to immediately reflect any changes in the underlying OS GUI look and feel while maintaining a consistent programming model on all platforms.


The "least common denominator" problem is solved by SWT in several ways:

- Features that are not available on all platforms but are generally useful for the workbench and tooling plug-ins can be emulated on platforms that provide no native support. For example, the OSF/Motif 2.1 widget toolkit does not contain a tree widget, so SWT provides an emulated tree widget on Motif 2.1 that is API compatible with the Windows native implementation.
- Features that are not available on all platforms but are not widely used can be omitted from SWT. For example, Windows provides a widget that implements a calendar, but this is not provided in SWT.
- Features that are specific to a platform, such as ActiveX integration, are only provided on the relevant platform. Platform specific features are separated into separate packages that clearly denote the platform name in the package.

Consistency with the platform

Platform integration is not strictly a matter of look and feel. Tight integration includes the ability to interact with native desktop features such as drag and drop, to integrate with OS desktop applications, and to use components developed with OS component models like Win32 ActiveX.

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 SWT ActiveX support is discussed in the article [ActiveX Support in SWT](#).

Consistency is also achieved in the code itself by providing an implementation that looks familiar to the native OS developer. Rather than hide OS differences in native C code or attempt to build portable and non-portable layers in the Java implementation, SWT provides separate and distinct implementations in Java for each platform.

One important implementation rule is that natives in C map one-to-one with calls to the OS. A Windows programmer will immediately recognize the implementation of the SWT toolkit on Windows, because it uses natives that directly map to the system calls used in C. None of the "platform magic" is hidden in C code. A platform developer can eyeball the code and know exactly which platform calls are executed by the toolkit. This greatly simplifies debugging. If a failure occurs when calling a native method, calling the platform API with the same parameters from C code will exhibit the same failure. (A complete discussion of this issue can be found in [SWT Implementation Strategy for Java Natives](#).)

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Resources overview

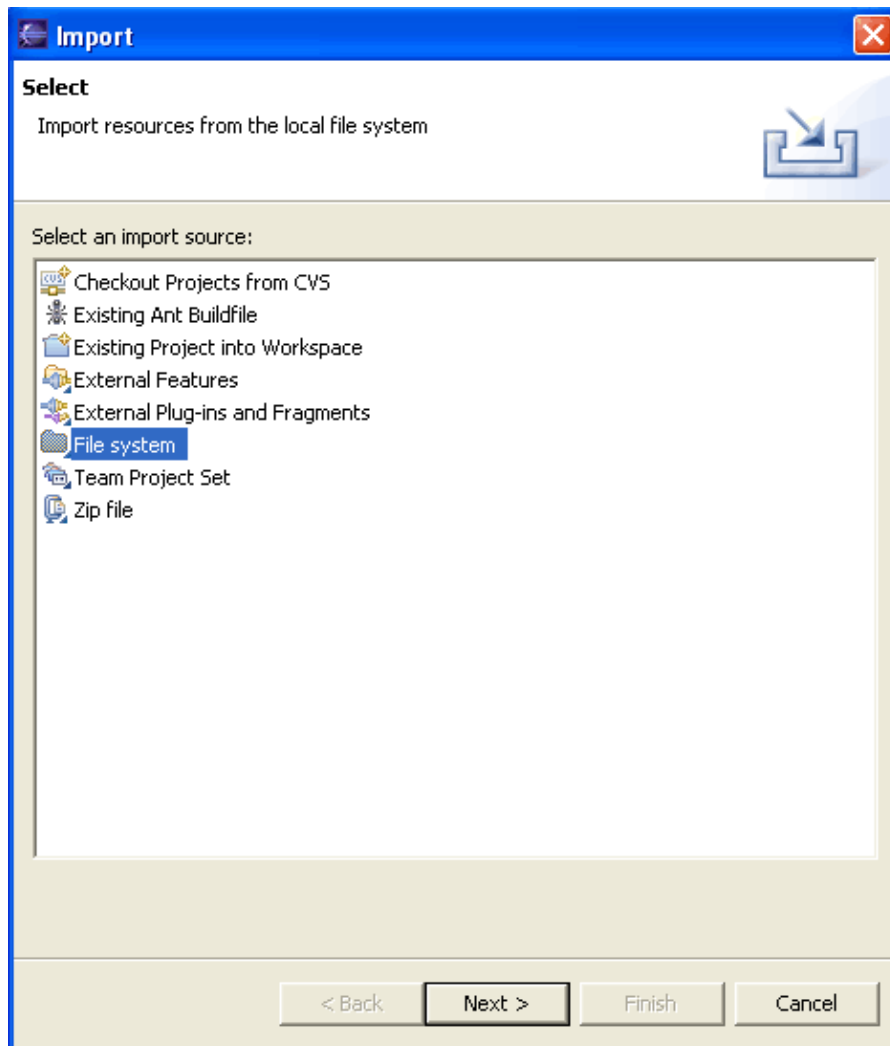
An essential plug-in for Eclipse IDE applications is the resources plug-in (named **org.eclipse.core.resources**). The resources plug-in provides services for accessing the projects, folders, and files that a user is working with.

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Workbench wizard extension points

The workbench defines extension points for wizards that create new resources, import resources, or export resources.

When you make selections in the new, import, or export menu, the workbench uses various wizard selection dialogs to display all the wizards that have been contributed for that particular extension point. The import wizard dialog is shown below.



Your wizard takes control once it is selected in the list and the **Next** button is pressed. This is when your first page becomes visible.

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Platform Extension Points

The following extension points can be used to extend the capabilities of the platform infrastructure:

Platform runtime

- [org.eclipse.core.runtime.adapters](#)
- [org.eclipse.core.runtime.applications](#)
- [org.eclipse.core.runtime.contentTypes](#)
- [org.eclipse.core.runtime.preferences](#)
- [org.eclipse.core.runtime.products](#)

Workspace

- [org.eclipse.core.resources.builders](#)
- [org.eclipse.core.resources.fileModificationValidator](#)
- [org.eclipse.core.resources.markers](#)
- [org.eclipse.core.resources.moveDeleteHook](#)
- [org.eclipse.core.resources.natures](#)
- [org.eclipse.core.resources.refreshProviders](#)
- [org.eclipse.core.resources.teamHook](#)

Platform text

- [org.eclipse.core.filebuffers.annotationModelCreation](#)
- [org.eclipse.core.filebuffers.documentCreation](#)
- [org.eclipse.core.filebuffers.documentSetup](#)
- [org.eclipse.ui.editors.annotationTypes](#)
- [org.eclipse.ui.editors.documentProviders](#)
- [org.eclipse.ui.editors.markerAnnotationSpecification](#)
- [org.eclipse.ui.editors.markerUpdaters](#)
- [org.eclipse.ui.editors.templates](#)
- [org.eclipse.ui.workbench.texteditor.quickDiffReferenceProvider](#)

Workbench

- [org.eclipse.ui.acceleratorConfigurations](#)
- [org.eclipse.ui.acceleratorScopes](#)
- [org.eclipse.ui.acceleratorSets](#)
- [org.eclipse.ui.actionDefinitions](#)
- [org.eclipse.ui.actionSetPartAssociations](#)
- [org.eclipse.ui.actionSets](#)
- [org.eclipse.ui.activities](#)
- [org.eclipse.ui.cheatsheets.cheatSheetContent](#)
- [org.eclipse.ui.cheatsheets.cheatSheetItemExtension](#)
- [org.eclipse.ui.commands](#)
- [org.eclipse.ui.contexts](#)
- [org.eclipse.ui.decorators](#)
- [org.eclipse.ui.dropActions](#)

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- [org.eclipse.ui.editorActions](#)
- [org.eclipse.ui.editors](#)
- [org.eclipse.ui.elementFactories](#)
- [org.eclipse.ui.exportWizards](#)
- [org.eclipse.ui.fontDefinitions](#)
- [org.eclipse.ui.helpSupport](#)
- [org.eclipse.ui.ide.markerHelp](#)
- [org.eclipse.ui.ide.markerImageProviders](#)
- [org.eclipse.ui.ide.markerResolution](#)
- [org.eclipse.ui.ide.projectNatureImages](#)
- [org.eclipse.ui.ide.resourceFilters](#)
- [org.eclipse.ui.importWizards](#)
- [org.eclipse.ui.intro](#)
- [org.eclipse.ui.intro.config](#)
- [org.eclipse.ui.intro.configExtension](#)
- [org.eclipse.ui.newWizards](#)
- [org.eclipse.ui.perspectiveExtensions](#)
- [org.eclipse.ui.perspectives](#)
- [org.eclipse.ui.popupMenus](#)
- [org.eclipse.ui.preferencePages](#)
- [org.eclipse.ui.presentationFactories](#)
- [org.eclipse.ui.propertyPages](#)
- [org.eclipse.ui.startup](#)
- [org.eclipse.ui.systemSummarySections](#)
- [org.eclipse.ui.themes](#)
- [org.eclipse.ui.viewActions](#)
- [org.eclipse.ui.views](#)
- [org.eclipse.ui.workingSets](#)

Team

- [org.eclipse.team.core.fileTypes](#)
- [org.eclipse.team.core.ignore](#)
- [org.eclipse.team.core.projectSets](#)
- [org.eclipse.team.core.repository](#)
- [org.eclipse.team.ui.configurationWizards](#)
- [org.eclipse.team.ui.synchronizeParticipants](#)
- [org.eclipse.team.ui.synchronizeWizards](#)

Debug

- [org.eclipse.debug.core.breakpoints](#)
- [org.eclipse.debug.core.launchConfigurationComparators](#)
- [org.eclipse.debug.core.launchConfigurationTypes](#)
- [org.eclipse.debug.core.launchDelegates](#)
- [org.eclipse.debug.core.launchers](#)
- [org.eclipse.debug.core.launchModes](#)
- [org.eclipse.debug.core.logicalStructureTypes](#)
- [org.eclipse.debug.core.processFactories](#)
- [org.eclipse.debug.core.sourceContainerTypes](#)

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- [org.eclipse.debug.core.sourceLocators](#)
- [org.eclipse.debug.core.sourcePathComputers](#)
- [org.eclipse.debug.core.statusHandlers](#)
- [org.eclipse.debug.core.watchExpressionDelegates](#)
- [org.eclipse.debug.ui.consoleColorProviders](#)
- [org.eclipse.debug.ui.consoleLineTrackers](#)
- [org.eclipse.debug.ui.contextViewBindings](#)
- [org.eclipse.debug.ui.debugModelContextBindings](#)
- [org.eclipse.debug.ui.debugModelPresentations](#)
- [org.eclipse.debug.ui.launchConfigurationTabGroups](#)
- [org.eclipse.debug.ui.launchConfigurationTypeImages](#)
- [org.eclipse.debug.ui.launchGroups](#)
- [org.eclipse.debug.ui.launchShortcuts](#)
- [org.eclipse.debug.ui.sourceContainerPresentations](#)
- [org.eclipse.debug.ui.stringVariablePresentations](#)

Help

- [org.eclipse.help.contentProducer](#)
- [org.eclipse.help.contexts](#)
- [org.eclipse.help.toc](#)
- [org.eclipse.help.base.browser](#)
- [org.eclipse.help.base.luceneAnalyzer](#)

Other

- [org.eclipse.ant.core.antProperties](#)
- [org.eclipse.ant.core.antTasks](#)
- [org.eclipse.ant.core.antTypes](#)
- [org.eclipse.ant.core.extraClasspathEntries](#)
- [org.eclipse.compare.contentMergeViewers](#)
- [org.eclipse.compare.contentViewers](#)
- [org.eclipse.compare.streamMergers](#)
- [org.eclipse.compare.structureCreators](#)
- [org.eclipse.compare.structureMergeViewers](#)
- [org.eclipse.core.expressions.propertyTesters](#)
- [org.eclipse.core.variables.dynamicVariables](#)
- [org.eclipse.core.variables.valueVariables](#)
- [org.eclipse.search.searchPages](#)
- [org.eclipse.search.searchResultSorters](#)
- [org.eclipse.search.searchResultViewPages](#)
- [org.eclipse.ui.externaltools.configurationDuplicationMaps](#)
- [org.eclipse.update.core.featureTypes](#)
- [org.eclipse.update.core.installHandlers](#)
- [org.eclipse.update.core.siteTypes](#)

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Adapters

Identifier:

org.eclipse.core.runtime.adapters

Since:

3.0

Description:

The adapters extension point allows plug-ins to declaratively register adapter factories. This information is used to by the runtime XML expression language to determine existence of adapters without causing plug-ins to be loaded. Registration of adapter factories via extension point eliminates the need to manually register adapter factories when a plug-in starts up.

Configuration Markup:

```
<!ELEMENT extension (factory+)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT factory (adapter+)>
```

```
<!ATTLIST factory
```

```
adaptableType CDATA #REQUIRED
```

```
class CDATA #REQUIRED>
```

- **adaptableType** – The fully qualified name of a class (typically implementing IAdaptable) that this factory provides adapters for.
- **class** – The fully qualified name of the adapter factory class. Must implement `org.eclipse.core.runtime.IAdapterFactory`.

```
<!ELEMENT adapter EMPTY>
```

```
<!ATTLIST adapter
```

```
type CDATA #REQUIRED>
```

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- **type** – The fully qualified name of a Java class or interface that this factory can adapt to.

Examples:

Following is an example of an adapter declaration. This example declares that this plug-in will provide an adapter factory that will adapt objects of type `IFile` to objects of type `MyFile`.

```
<extension point=
"org.eclipse.core.runtime.adapters"
>
<factory class=
"com.xyz.MyFileAdapterFactory"
adaptableType=
"org.eclipse.core.resources.IFile"
>
<adapter type=
"com.xyz.MyFile"
/>
</factory>
</extension>
```

API Information:

Adapter factories registered using this extension point can be queried using the method `IAdapterManager.hasAdapter`, or retrieved using one of the `getAdapter` methods on `IAdapterFactory`. An adapter factory registered with this extension point does not need to be registered at runtime using `IAdapterFactory.registerAdapters`.

Supplied Implementation:

Several plug-ins in the platform provide adapters for a number of different `IAdaptable` objects.

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Applications

Identifier:

org.eclipse.core.runtime.applications

Description:

Platform runtime supports plug-ins which would like to declare main entry points. That is, programs which would like to run using the platform runtime but yet control all aspects of execution can declare themselves as an application. Declared applications can be run directly from the main platform launcher by specifying the *-application* argument where the parameter is the id of an extension supplied to the applications extension point described here. This application is instantiated and run by the platform. Platform clients can also use the platform to lookup and run multiple applications.

Configuration Markup:

```
<!ELEMENT extension (application)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #REQUIRED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT application (run?)>
```

```
<!ELEMENT run (parameter*)>
```

```
<!ATTLIST run
```

```
class CDATA #REQUIRED>
```

- **class** – the fully-qualified name of a class which implements `org.eclipse.core.runtime.IPlatformRunnable`.

```
<!ELEMENT parameter EMPTY>
```

```
<!ATTLIST parameter
```

```
name CDATA #REQUIRED
```

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value CDATA #REQUIRED>

- **name** – the name of this parameter made available to instances of the specified application class
- **value** – the value of this parameter made available to instances of the specified application class

Examples:

Following is an example of an application declaration:

```
<extension id=
"coolApplication"
point=
"org.eclipse.core.runtime.applications"
>
<application>
<run class=
"com.xyz.applications.Cool"
>
<parameter name=
"optimize"
value=
"true"
/>
</run>
</application>
</extension>
```

API Information:

The value of the class attribute must represent an implementor of `org.eclipse.core.runtime.IPlatformRunnable`.

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Supplied Implementation:

The platform supplies a number of applications including the platform workbench itself.

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Content Types

Identifier:

org.eclipse.core.runtime.contentTypes

Since:

3.0

Description:

The content types extension point allows plug-ins to contribute to the platform content type catalog. There are two forms of contributions: *content types* and *file associations*.

- a content type represents a file format and its naming conventions. Content types can be defined from scratch, or can inherit from existing ones, specializing them
- a file association extends an existing content type by associating new file names and/or extensions to it

Configuration Markup:

```
<!ELEMENT extension (content-type* , file-association*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT content-type (describer?)>
```

```
<!ATTLIST content-type
```

```
id CDATA #REQUIRED
```

```
base-type CDATA #IMPLIED
```

```
name CDATA #REQUIRED
```

```
file-extensions CDATA #IMPLIED
```

```
file-names CDATA #IMPLIED
```

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priority (low|normal|high) "normal"

default-charset CDATA #IMPLIED>

- **id** – the identifier for this content type (simple id token, unique for content types within the extension namespace). The token cannot contain dot (.) or whitespace
- **base-type** – the fully qualified identifier of this content type's base type. This content type will inherit its base type's file associations, content describer and default charset, unless they are redefined
- **name** – the human-readable name of this content type
- **file-extensions** – a comma-separated list of file extensions to be associated with this content type
- **file-names** – a comma-separated list of file names to be associated with this content type
- **priority** – the priority for this content type. Priorities are used to solve conflicts (when two content types are associated to the same file name/extension)
- **default-charset** – the default charset for this content type, or an empty string, if this content type should not have a default charset even if the parent has one

<!ELEMENT describer (parameter*)>

<!ATTLIST describer

class CDATA #REQUIRED>

- **class** – the fully qualified name of a class that implements `org.eclipse.core.runtime.content.IContentDescriber` or `org.eclipse.core.runtime.content.ITextContentDescriber`, or an empty string, if this content type should not have a describer even if the parent has one

<!ELEMENT file-association EMPTY>

<!ATTLIST file-association

content-type CDATA #REQUIRED

file-names CDATA #IMPLIED

file-extensions CDATA #IMPLIED>

- **content-type** – the fully qualified identifier for the content type this file association contributes to
- **file-names** – a comma-separated list of file names to be associated with the target content type
- **file-extensions** – a comma-separated list of file extensions to be associated with the target content type

<!ELEMENT parameter EMPTY>

<!ATTLIST parameter

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name CDATA #REQUIRED

value CDATA #REQUIRED>

- **name** – the name of this parameter made available to instances of the specified application class
- **value** – the value of this parameter made available to instances of the specified application class

Examples:

Following is an example of a XML-based content type declaration using the `XMLRootElementContentDescriber` (a built-in describer):

```
<extension point=
"org.eclipse.core.runtime.contentTypes"
>
<content-type id=
"ABC"
base-type=
"org.eclipse.core.runtime.xml"
file-extensions=
"a,b,c"
>
<describer class=
"org.eclipse.core.runtime.content.XMLRootElementContentDescriber"
>
<param name=
"element"
value=
"abc"
/>
```

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```
</describer>
```

```
</content-type>
```

```
</extension>
```

Here is an example of a simple text-based content type that has a specific file extension:

```
<extension point=
"org.eclipse.core.runtime.contentTypes"
>
<content-type id=
"MyText"
base-type=
"org.eclipse.core.runtime.text"
file-extensions=
"mytxt"
/>
</extension>
```

In a case like the example above, when we are just trying to associate new file names/extensions to an existing content type, to contribute a file association is usually the best thing to do:

```
<extension point=
"org.eclipse.core.runtime.contentTypes"
>
<file-association content-type=
"org.eclipse.core.runtime.text"
file-extensions=
"mytxt"
```

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/>

</extension>

API Information:

The value of the class attribute in the describer element must represent an implementor of `org.eclipse.core.runtime.content.IContentDescriber` or `org.eclipse.core.runtime.content.ITextContentDescriber`.

Supplied Implementation:

The `org.eclipse.core.runtime` plug-in provides the following content types:

- `org.eclipse.core.runtime.text`
- `org.eclipse.core.runtime.xml`

Other plug-ins in the platform contribute other content types.

Also, the `org.eclipse.core.runtime` plug-in provides ready-to-use implementations of content describers:

- `org.eclipse.core.runtime.content.XMLRootElementContentDescriber`
- `org.eclipse.core.runtime.content.BinarySignatureDescriber`

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Preferences

Identifier:

org.eclipse.core.runtime.preferences

Since:

3.0

Description:

The preferences extension point allows plug-ins to add new preference scopes to the Eclipse preference mechanism as well as specify the class to run to initialize default preference values at runtime.

Configuration Markup:

```
<!ELEMENT extension (scope* , initializer*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT scope EMPTY>
```

```
<!ATTLIST scope
```

```
name CDATA #REQUIRED
```

```
class CDATA #REQUIRED>
```

Element describing a client's definition of a new preference scope.

- **name** – The name of the scope.
- **class** – The name of the class.

```
<!ELEMENT initializer EMPTY>
```

```
<!ATTLIST initializer
```

```
class CDATA #REQUIRED>
```

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Element which defines the class to use for runtime preference initialization.

- **class** – The name of the class.

Examples:

Following is an example of a preference scope declaration. This example declares that this plug-in will provide a preference implementation for the scope "foo". It also declares that when the default values are loaded for this plug-in, the class "MyPreferenceInitializer" contains code to be run to initialize preference default values at runtime.

```
<extension point=
"org.eclipse.core.runtime.preferences"
>
<scope name=
"foo"
class=
"com.example.FooPrefs"
/>
<initializer class=
"com.example.MyPreferenceInitializer"
/>
</extension>
```

API Information:

The preference service (obtained by calling `org.eclipse.core.runtime.Platform.getPreferencesService()`) is the hook into the Eclipse preference mechanism.

Supplied Implementation:

The `org.eclipse.core.runtime` plug-in provides preference implementations for the "configuration", "instance", and "default" scopes. The `org.eclipse.core.resources` plug-in provides an implementation for "project" preferences.

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Products

Identifier:

org.eclipse.core.runtime.products

Since:

3.0

Description:

Products are the Eclipse unit of branding. Product extensions are supplied by plug-ins wishing to define one or more products. There must be one product per extension as the extension id is used in processing and identifying the product.

There are two possible forms of product extension, static and dynamic. Static product extensions directly contain all relevant information about the product. Dynamic product extensions identify a class (an `IProductProvider`) which is capable of defining one or more products when queried.

Configuration Markup:

```
<!ELEMENT extension ((product | provider))>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT product (property*)>
```

```
<!ATTLIST product
```

```
application CDATA #REQUIRED
```

```
name CDATA #REQUIRED
```

```
description CDATA #IMPLIED>
```

- **application** – the default application to run when running this product
- **name** – the human-readable name of this product
- **description** – the human-readable description of this product

```
<!ELEMENT property EMPTY>
```

<!ATTLIST property

name CDATA #REQUIRED

value CDATA #REQUIRED>

- **name** – the key under which this property is stored
- **value** – the value of this property

<!ELEMENT provider (run)>

details of a product provider

<!ELEMENT run EMPTY>

<!ATTLIST run

class CDATA #REQUIRED>

- **class** – the fully-qualified name of a class which implements `org.eclipse.core.runtime.IProductProvider`.

Examples:

Following is an example of static product declaration:

<extension id=

"coolProduct"

point=

"org.eclipse.core.runtime.products"

>

<product name=

"%coolName"

application=

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```
"coolApplication"  
description=  
"%coolDescription"  
>  
<property name=  
"windowImage"  
value=  
"window.gif"  
</>  
<property name=  
"aboutImage"  
value=  
"image.gif"  
</>  
<property name=  
"aboutText"  
value=  
"%aboutText"  
</>  
<property name=  
"appName"  
value=  
"CoolApp"  
</>  
<property name=  
"welcomePage"
```

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```
value=  
"$nl$/welcome.xml"  
/>  
  
<property name=  
"preferenceCustomization"  
value=  
"plugin_customization.ini"  
/>  
  
</product>  
  
</extension>
```

The following is an example of a dynamic product (product provider) declaration: Following is an example of an application declaration:

```
<extension id=  
"coolProvider"  
point=  
"org.eclipse.core.runtime.products"  
>  
  
<provider>  
  
<run class=  
"com.example.productProvider"  
/>  
  
</provider>  
  
</extension>
```

API Information:

Static product extensions provided here are represented at runtime by instances of `IProduct`. Dynamic product extensions must identify an implementor of `IProductProvider`. See

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`org.eclipse.ui.branding.IProductConstants` for details of the branding related product properties defined by the Eclipse UI.

Supplied Implementation:

No implementations of `IProductProvider` are supplied.

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Incremental Project Builders

Identifier:

org.eclipse.core.resources.builders

Description:

The workspace supports the notion of an incremental project builder (or "builder" for short). The job of a builder is to process a set of resource changes (supplied as a resource delta). For example, a Java builder would recompile changed Java files and produce new class files.

Builders are configured on a per-project basis and run automatically when resources within their project are changed. As such, builders should be fast and scale with respect to the amount of change rather than the number of resources in the project. This typically implies that builders are able to incrementally update their "built state".

The builders extension-point allows builder writers to register their builder implementation under a symbolic name that is then used from within the workspace to find and run builders. The symbolic name is the id of the builder extension. When defining a builder extension, users are encouraged to include a human-readable value for the "name" attribute which identifies their builder and potentially may be presented to users.

Configuration Markup:

```
<!ELEMENT extension (builder)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT builder (run?)>
```

```
<!ATTLIST builder
```

```
hasNature (true | false) >
```

- **hasNature** – "true" or "false" indicating whether the builder is owned by a project nature. If "true" and no corresponding nature is found, this builder will not run but will remain in the project's build spec. If the attribute is not specified, it is assumed to be "false".

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<!ELEMENT run (parameter*)>

<!ATTLIST run

class CDATA #REQUIRED>

- **class** – the fully-qualified name of a subclass of `org.eclipse.core.resources.IncrementalProjectBuilder`.

<!ELEMENT parameter EMPTY>

<!ATTLIST parameter

name CDATA #REQUIRED

value CDATA #REQUIRED>

- **name** – the name of this parameter made available to instances of the specified builder class
- **value** – an arbitrary value associated with the given name and made available to instances of the specified builder class

Examples:

Following is an example of a builder configuration:

```
<extension id=
"coolbuilder"
name=
"Cool Builder"
point=
"org.eclipse.core.resources.builders"
>
<builder hasNature=
"false"
>
```


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```
<run class=  
"com.xyz.builders.Cool"  
>  
<parameter name=  
"optimize"  
value=  
"true"  
>  
<parameter name=  
"comment"  
value=  
"Produced by the Cool Builder"  
>  
</run>  
</builder>  
</extension>
```

If this extension was defined in a plug-in with id "com.xyz.coolplugin", the fully qualified name of this builder would be "com.xyz.coolplugin.coolbuilder".

API Information:

The value of the class attribute must represent a subclass of `org.eclipse.core.resources.IncrementalProjectBuilder`.

Supplied Implementation:

The platform itself does not have any predefined builders. Particular product installs may include builders as required.

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File Modification Validator

Identifier:

org.eclipse.core.resources.fileModificationValidator

Description:

For providing an implementation of an IFileModificationValidator to be used in the validate–edit and validate–save mechanism. This extension point tolerates at most one extension.

Configuration Markup:

```
<!ELEMENT extension (fileModificationValidator?)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT fileModificationValidator EMPTY>
```

```
<!ATTLIST fileModificationValidator
```

```
class CDATA #REQUIRED>
```

- **class** – a fully qualified name of a class which implements `org.eclipse.core.resources.IFileModificationValidator`.

Examples:

The following is an example of using the `fileModificationValidator` extension point:

```
<extension point=
```

```
"org.eclipse.core.resources.fileModificationValidator"
```

```
>
```

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```
<fileModificationValidator class=  
"org.eclipse.vcm.internal.VCMFileModificationValidator"  
/>  
  
</extension>
```

API Information:

The value of the `class` attribute must represent an implementation of `org.eclipse.core.resources.IFileModificationValidator`.

Supplied Implementation:

The Team component will generally provide the implementation of the file modification validator. The extension point should be used by any other clients.

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Resource Markers

Identifier:

org.eclipse.core.resources.markers

Description:

The workspace supports the notion of markers on arbitrary resources. A marker is a kind of metadata (similar to properties) which can be used to tag resources with user information. Markers are optionally persisted by the workspace whenever a workspace save or snapshot is done.

Users can define and query for markers of a given type. Marker types are defined in a hierarchy which support multiple-inheritance. Marker type definitions also specify a number attributes which must or may be present on a marker of that type as well as whether or not markers of that type should be persisted.

The markers extension-point allows marker writers to register their marker types under a symbolic name that is then used from within the workspace to create and query markers. The symbolic name is the id of the marker extension. When defining a marker extension, users are encouraged to include a human-readable value for the "name" attribute which identifies their marker and potentially may be presented to users.

Configuration Markup:

```
<!ELEMENT extension (super* , persistent? , attribute*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT super EMPTY>
```

```
<!ATTLIST super
```

```
type CDATA #REQUIRED>
```

- **type** – the fully-qualified id of a marker super type (i.e., a marker type defined by another marker extension)

```
<!ELEMENT persistent EMPTY>
```

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<!ATTLIST persistent

value (true | false) >

- **value** – "true" or "false" indicating whether or not markers of this type should be persisted by the workspace. If the persistent characteristic is not specified, the marker type is **not** persisted.

<!ELEMENT attribute EMPTY>

<!ATTLIST attribute

name CDATA #REQUIRED>

- **name** – the name of an attribute which may be present on markers of this type

Examples:

Following is an example of a marker configuration:

```
<extension id=
```

```
"com.xyz.coolMarker"
```

```
point=
```

```
"org.eclipse.core.resources.markers"
```

```
name=
```

```
"Cool Marker"
```

```
>
```

```
<persistent value=
```

```
"true"
```

```
/>
```

```
<super type=
```

```
"org.eclipse.core.resources.problemmarker"
```

```
/>
```

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```
<super type=  
"org.eclipse.core.resources.textmarker"  
/>  
  
<attribute name=  
"owner"  
/>  
  
</extension>
```

API Information:

All markers, regardless of their type, are instances of `org.eclipse.core.resources.IMarker`.

Supplied Implementation:

The platform itself has a number of pre-defined marker types. Particular product installs may include additional markers as required.

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Auto-refresh providers

Identifier:

org.eclipse.core.resources.refreshProviders

Since:

3.0

Description:

The workspace supports a mode where changes that occur in the file system are automatically detected and reconciled with the workspace in memory. By default, this is accomplished by creating a monitor that polls the file system and periodically searching for changes. The monitor factories extension point allows clients to create more efficient monitors, typically by hooking into some native file system facility for change callbacks.

Configuration Markup:

```
<!ELEMENT extension (refreshProviders)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT refreshProvider EMPTY>
```

```
<!ATTLIST refreshProvider
```

```
name CDATA #REQUIRED
```

```
class CDATA #REQUIRED>
```

- **name** – A human-readable name for the monitor factory
- **class** – The fully qualified name of a class implementing `org.eclipse.core.resources.refresh.RefreshProvider`.

Examples:

Following is an example of an adapter declaration. This example declares that this plug-in will provide an adapter factory that will adapt objects of type `IFile` to objects of type `MyFile`.

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```
<extension id=
"coolProvider"
point=
"org.eclipse.core.resources.refreshProviders"
>
<refreshProvider name=
"Cool Refresh Provider"
class=
"com.xyz.CoolRefreshProvider"
>
</refreshProvider>
</extension>
```

API Information:

Refresh provider implementations must subclass the abstract type `RefreshProvider` in the `org.eclipse.core.resources.refresh` package. Refresh requests and failures should be forward to the provide `IReshfreshResult`. Clients must also provide an implementation of `IReshfreshMonitor` through which the workspace can request that refresh monitors be uninstalled.

Supplied Implementation:

The `org.eclipse.core.resources.win32` fragment provides a native refresh monitor that uses win32 file system notification callbacks. The workspace also supplies a default naive polling-based monitor that can be used for file systems that do not have native refresh callbacks available.

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Annotation Model Creation

Identifier:

org.eclipse.core.filebuffers.annotationModelCreation

Since:

3.0

Description:

This extension point is used to customize the annotation model creation behavior of this plug-in's default text file buffer manager. It allows to specify which annotation model factory should be used in order to create the annotation model instance of a text file buffer created for a certain file content type, file extension, or file name.

Configuration Markup:

```
<!ELEMENT extension (factory)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT factory EMPTY>
```

```
<!ATTLIST factory
```

```
class CDATA #REQUIRED
```

```
extensions CDATA #IMPLIED
```

```
fileNames CDATA #IMPLIED
```

```
contentTypeId CDATA #IMPLIED>
```

The specification of a annotation model factory. In order to find a factory for a given file the attributes of each factory specification are consulted in the following sequence: contentTypeId, fileNames, extensions. If multiple, equally specific factory specifications are found for a given file it is not specified which factory is used.

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- **class** – The fully qualified name of the factory implementation class. This class must implement the `org.eclipse.core.filebuffers.IAnnotationModelFactory` interface.
- **extensions** – A comma separated list of file extensions for which this factory should be used.
- **fileNames** – A comma separated list of file names for which this factory should be used.
- **contentTypeId** – The id of a content type as defined by the `org.eclipse.core.runtime.contentTypes` extension point for which this factory should be used.

Examples:

```
<extension point=
"org.eclipse.core.filebuffers.annotationModelCreation"
>
<factory extensions=
"xzy"
class=
"org.eclipse.ui.texteditor.ResourceMarkerAnnotationModelFactory"
>
</factory>
</extension>
```

API Information:

Annotation model factories have to implement `org.eclipse.core.filebuffers.IAnnotationModelFactory`.

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Document Creation

Identifier:

org.eclipse.core.filebuffers.documentCreation

Since:

3.0

Description:

This extension point is used to customize the document creation behavior of this plug-in's default text file buffer manager. It allows to specify which document factory should be used in order to create the document instance of a text file buffer created for a certain file content type, file extension, or file name.

Configuration Markup:

```
<!ELEMENT extension (factory)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT factory EMPTY>
```

```
<!ATTLIST factory
```

```
class CDATA #REQUIRED
```

```
extensions CDATA #IMPLIED
```

```
fileNames CDATA #IMPLIED
```

```
contentTypeId CDATA #IMPLIED>
```

The specification of a document factory. In order to find a factory for a given file the attributes of each factory specification are consulted in the following sequence: contentTypeId, fileNames, extensions. If multiple, equally specific factory specifications are found for a given file it is not specified which factory is used.

- **class** – The fully qualified name of the factory implementation class. This class must implement the org.eclipse.core.filebuffers.IDocumentFactory interface.
- **extensions** – A comma separated list of file extensions for which this factory should be used.

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- **fileNames** – A comma separated list of file names for which this factory should be used.
- **contentType** – The id of a content type as defined by the `org.eclipse.core.runtime.contentTypes` extension point for which this factory should be used.

Examples:

```
<extension id=
"org.eclipse.jdt.debug.ui.SnippetDocumentFactory"
name=
"%snippetDocumentFactory.name"
point=
"org.eclipse.core.filebuffers.documentCreation"
>
<factory extensions=
"jpage"
class=
"org.eclipse.jdt.internal.debug.ui.snippeteditor.SnippetDocumentFactory"
>
</factory>
</extension>
```

API Information:

Document factories have to implement `org.eclipse.core.filebuffers.IDocumentFactory`.

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Document Setup

Identifier:

org.eclipse.core.filebuffers.documentSetup

Since:

3.0

Description:

This extension point is used to customize the initialization process of a document for a text file buffer manager by this plug-in's default text file buffer manager. It allows to specify which document setup participant should be involved in the initialization process for a text file buffer created for a certain file content type, file extension, or file name.

Configuration Markup:

```
<!ELEMENT extension (participant)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT participant EMPTY>
```

```
<!ATTLIST participant
```

```
class CDATA #REQUIRED
```

```
extensions CDATA #IMPLIED
```

```
fileNames CDATA #IMPLIED
```

```
contentTypeId CDATA #IMPLIED>
```

The specification of a document setup participant. In order find all participants for a given file the attributes of each participant specification are consulted in the following sequence: contentTypeId, fileNames, extensions. If multiple participants are found, the sequence in which they are called is not specified.

- **class** – The fully qualified name of the participant implementation class. This class must implement the org.eclipse.core.filebuffers.IDocumentSetupParticipant interface.

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- **extensions** – A comma separated list of file extensions for which this participant should be used.
- **fileNames** – A comma separated list of file names for which this participant should be used.
- **contentTypeId** – The id of a content type as defined by the `org.eclipse.core.runtime.contentTypes` extension point for which this participant should be used.

Examples:

```
<extension id=
"JavaDocumentSetupParticipant"
name=
"%javaDocumentSetupParticipant"
point=
"org.eclipse.core.filebuffers.documentSetup"
>
<participant extensions=
"java"
class=
"org.eclipse.jdt.internal.ui.javaeditor.JavaDocumentSetupParticipant"
>
</participant>
</extension>
```

API Information:

Document setup participants have to implement `org.eclipse.core.filebuffers.IDocumentSetupParticipant`.

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Annotation Types

Identifier:

org.eclipse.ui.editors.annotationTypes

Since:

3.0

Description:

An Annotation is a piece of information attached to a certain region of a text document. New kinds of annotations may be defined using this extension point. Annotations are attached to documents via their annotation model and may be displayed in text editors and views. Annotation types form a hierarchy: an annotation type may refine another type by specifying it in its `super` attribute. Some annotations serve as the UI counterpart of markers (see `org.eclipse.core.resources.IMarker`), while others exist on their own without having a persistable form. The mapping between markers and annotation types is defined by the optional `markerType` attribute.

Configuration Markup:

```
<!ELEMENT extension (type)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT type EMPTY>
```

```
<!ATTLIST type
```

```
name CDATA #REQUIRED
```

```
markerType CDATA #IMPLIED
```

```
super CDATA #IMPLIED
```

```
markerSeverity (0|1|2) >
```

A marker type definition.

- **name** – The unique name of this annotation type.

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- **markerType** – The marker type that this annotation type corresponds to, if any.
- **super** – The name of the parent type, if this type is a descendant of another annotation type.
- **markerSeverity** – The severity of this annotation type, used for ordering. Any out of 1, 2, 3.

Examples:

This is an excerpt from the plugin.xml for JDT UI, which adds the java compiler error and warning annotations:

```
<extension point=
"org.eclipse.ui.editors.annotationTypes"
>
<type name=
"org.eclipse.jdt.ui.error"
super=
"org.eclipse.ui.workbench.texteditor.error"
markerType=
"org.eclipse.jdt.core.problem"
markerSeverity=
"2"
>
</type>
<type name=
"org.eclipse.jdt.ui.warning"
super=
"org.eclipse.ui.workbench.texteditor.warning"
markerType=
"org.eclipse.jdt.core.problem"
```


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```
markerSeverity=  
"1"  
>  
</type>  
<type name=  
"org.eclipse.jdt.ui.info"  
super=  
"org.eclipse.ui.workbench.texteditor.info"  
markerType=  
"org.eclipse.jdt.core.problem"  
markerSeverity=  
"0"  
>  
</type>  
</extension>
```

API Information:

See the `org.eclipse.jface.text.source.Annotation` class and the `org.eclipse.ui.editors.markerAnnotationSpecification` extension point.

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Document Providers

Identifier:

org.eclipse.ui.editors.documentProviders

Since:

3.0 (originally named org.eclipse.ui.documentProviders)

Description:

This extension point is used to define mappings between file types and document providers or between types of editor inputs and document providers that can be used by editors. Document providers must implement the interface `org.eclipse.ui.texteditor.IDocumentProvider`. Editor inputs must be instance of `org.eclipse.ui.IEditorInput`.

Configuration Markup:

```
<!ELEMENT extension (provider*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT provider EMPTY>
```

```
<!ATTLIST provider
```

```
extensions CDATA #IMPLIED
```

```
inputTypes CDATA #IMPLIED
```

```
class CDATA #REQUIRED
```

```
id CDATA #REQUIRED>
```

- **extensions** – a comma separated list of file extensions
- **inputTypes** – a comma separated list of qualified editor input class names
- **class** – the qualified name of the document provider class
- **id** – the unique id of this provider

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Examples:

```
<extension point=
"org.eclipse.ui.editors.documentProviders"
>
<provider extensions=
".jav"
class=
"org.eclipse.ui.examples.javaeditor.JavaDocumentProvider"
id=
"org.eclipse.ui.examples.javaeditor.JavaDocumentProvider"
>
</provider>
</extension>
```

This example registers `org.eclipse.ui.examples.javaeditor.JavaDocumentProvider` as the default provider for files with the extension ".jav".

```
<extension point=
"org.eclipse.ui.editors.documentProviders"
>
<provider inputTypes=
"org.eclipse.ui.IStorageEditorInput"
class=
"org.eclipse.ui.editors.text.FileDocumentProvider"
id=
"org.eclipse.ui.editors.text.FileDocumentProvider"
```

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>

</provider>

</extension>

This example registers `org.eclipse.ui.editors.text.FileDocumentProvider` as the default provider for all editor inputs that are instance of `org.eclipse.ui.IStorageEditorInput`.

API Information:

Document providers registered for a file extension have precedence over those registered for input types.

Document providers must implement the interface

`org.eclipse.ui.texteditor.IDocumentProvider`. Editor inputs must be instance of `org.eclipse.ui.IEditorInput`.

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Marker Annotation Specification

Identifier:

org.eclipse.ui.editors.markerAnnotationSpecification

Since:

3.0 (originally named org.eclipse.ui.workbench.texteditor.markerAnnotationSpecification)

Description:

This extension point is used to define presentation properties of markers. Extensions provided for this extension point can be accessed using

`org.eclipse.ui.texteditor.MarkerAnnotationPreferences`. Use `org.eclipse.ui.texteditor.AnnotationPreferenceLookup` to get the annotation preference for a given annotation.

Note that an extension will only be returned from `MarkerAnnotationPreferences.getAnnotationPreferences` (and thus included in the preference pages) if it contains the following four attributes in addition to the required `annotationType`:

- `colorPreferenceKey`
- `colorPreferenceValue`
- `overviewRulerPreferenceKey`
- `textPreferenceKey`

Annotation preference types that extend another annotation preference are allowed to overwrite attributes already defined in a parent preference specification, but these will not be accessible from the preference page.

Configuration Markup:

```
<!ELEMENT extension (specification)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT specification EMPTY>
```

```
<!ATTLIST specification
```

```
annotationType CDATA #REQUIRED
```

```
colorPreferenceKey CDATA #IMPLIED
```

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overviewRulerPreferenceKey	CDATA #IMPLIED
verticalRulerPreferenceKey	CDATA #IMPLIED
textPreferenceKey	CDATA #IMPLIED
label	CDATA #IMPLIED
highlightPreferenceKey	CDATA #IMPLIED
colorPreferenceValue	CDATA #IMPLIED
presentationLayer	CDATA #IMPLIED
overviewRulerPreferenceValue	(true false)
verticalRulerPreferenceValue	(true false)
textPreferenceValue	(true false)
highlightPreferenceValue	(true false)
contributesToHeader	(true false)
showInNextPrevDropdownToolbarActionKey	CDATA #IMPLIED
showInNextPrevDropdownToolbarAction	(true false)
isGoToNextNavigationTargetKey	CDATA #IMPLIED
isGoToNextNavigationTarget	(true false)
isGoToPreviousNavigationTargetKey	CDATA #IMPLIED
isGoToPreviousNavigationTarget	(true false)
icon	CDATA #IMPLIED
symbolicIcon	(error warning info task bookmark)
annotationImageProvider	CDATA #IMPLIED
textStylePreferenceKey	CDATA #IMPLIED
textStylePreferenceValue	(SQUIGGLIES BOX UNDERLINE IBEAM NONE)
includeOnPreferencePage	(true false) "true">

- **annotationType** – The annotation type.
- **colorPreferenceKey** – The color preference key must be provided, otherwise this annotation type will not be included in the List returned from

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- MarkerAnnotationPreferences.getAnnotationPreferences() and thus not show in the preferences.
- **overviewRulerPreferenceKey** – The overview ruler preference key must be provided, otherwise this annotation type will not be included in the List returned from MarkerAnnotationPreferences.getAnnotationPreferences() and thus not show in the preferences.
 - **verticalRulerPreferenceKey** – The preference key for the show in vertical ruler preference. since: 3.0
 - **textPreferenceKey** – The text preference key must be provided, otherwise this annotation type will not be included in the List returned from MarkerAnnotationPreferences.getAnnotationPreferences() and thus not show in the preferences.
 - **label** –
 - **highlightPreferenceKey** – The preference key for highlighting in text. since: 3.0
 - **colorPreferenceValue** – The color preference value must be provided, otherwise this annotation type will not be included in the List returned from MarkerAnnotationPreferences.getAnnotationPreferences() and thus not show in the preferences.
 - **presentationLayer** –
 - **overviewRulerPreferenceValue** –
 - **verticalRulerPreferenceValue** – The default value for showing in vertical ruler. since: 3.0
 - **textPreferenceValue** –
 - **highlightPreferenceValue** – The default value for highlighting in text. since: 3.0
 - **contributesToHeader** –
 - **showInNextPrevDropdownToolBarActionKey** – The preference key for the visibility in the next/previous drop down toolbar action. since: 3.0
 - **showInNextPrevDropdownToolBarAction** – The default value for the visibility in the next/previous drop down toolbar action. since: 3.0
 - **isGoToNextNavigationTargetKey** – The preference key for go to next navigation enablement. since: 3.0
 - **isGoToNextNavigationTarget** – The default value for go to next navigation enablement. since: 3.0
 - **isGoToPreviousNavigationTargetKey** – The preference key for go to previous navigation enablement. since: 3.0
 - **isGoToPreviousNavigationTarget** – The default value for go to previous navigation enablement. since: 3.0
 - **icon** – The path to the icon to be drawn for annotations of this annotation type.
 - **symbolicIcon** – The symbolic name of the image that should be drawn to represent annotation of this annotation type. The image is only used when there is no vertical ruler icon specified for this annotation type. Possible values are: "error", "warning", "info", "task", "bookmark".
 - **annotationImageProvider** –
 - **textStylePreferenceKey** – The preference key for the text decoration property. since: 3.0
 - **textStylePreferenceValue** – The default value for the "show in text" decoration style. since: 3.0
 - **includeOnPreferencePage** – Defines whether this annotation type should be configurable via the standard annotation preference page. Default is true.

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Marker Updaters

Identifier:

org.eclipse.ui.editors.markerUpdaters

Since:

3.0 (originally named org.eclipse.ui.markerUpdaters)

Description:

This extension point is used for registering marker update strategies with marker annotation models. A resource that is opened in a text editor is associated with a marker annotation model. For each marker attached to the resource this model manages a position that is updated with each change applied to the text in the editor. If the resource is saved, the text in the editor and the position managed for a marker are passed over to the registered marker update strategies. These strategies can then update the marker's attributes based on the text and the position. Marker update strategies are requested to implement the interface `org.eclipse.ui.texteditor.IMarkerUpdater`. The update strategies can be registered either for a particular marker type or all marker types. The latter by omitting any marker type in the extension.

Configuration Markup:

```
<!ELEMENT extension (updater*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT updater EMPTY>
```

```
<!ATTLIST updater
```

```
id CDATA #REQUIRED
```

```
markerType CDATA #IMPLIED
```

```
class CDATA #REQUIRED>
```

- **id** – the unique id of this provider
- **markerType** – the name of the marker type

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- **class** – the qualified name of the marker updater class

Examples:

```
<extension point=
"org.eclipse.ui.editors.markerUpdaters"
>
<updater id=
"org.eclipse.jdt.ui.markerUpdaters.JavaSearchMarkerUpdater"
class=
"org.eclipse.jdt.internal.ui.search.JavaSearchMarkerUpdater"
markerType=
"org.eclipse.search.searchmarker"
>
</updater>
</extension>
```

This example registers `org.eclipse.jdt.internal.ui.search.JavaSearchMarkerUpdater` as a marker updater for all markers of the type `org.eclipse.search.searchmarker` including all its derived types.

```
<extension point=
"org.eclipse.ui.editors.markerUpdaters"
>
<updater id=
"org.eclipse.ui.texteditor.BasicMarkerUpdater"
class=
"org.eclipse.ui.texteditor.BasicMarkerUpdater"
>
```

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</updater>

</extension>

This example registers `org.eclipse.ui.texteditor.BasicMarkerUpdater` as a marker updater independent from the type of the marker.

API Information:

Registered marker updaters have to implement the interface `org.eclipse.ui.texteditor.IMarkerUpdater`.

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Editor Template

Identifier:

org.eclipse.ui.editors.templates

Since:

3.0

Description:

Templates are snippets of text or code which help the user enter reoccurring patterns into a text editor. Templates may contain variables which are resolved in the context where the template is inserted.

Configuration Markup:

```
<!ELEMENT extension (template* ,resolver* ,contextType* ,include*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT contextType EMPTY>
```

```
<!ATTLIST contextType
```

```
id CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
name CDATA #IMPLIED>
```

A context type defines a context within which templates are evaluated. A context type uses its resolvers to resolve a template.

- **id** – Unambiguously identifies this context type. Use of a qualified name is recommended.
- **class** – A subclass of `org.eclipse.jface.text.templates.TemplateContextType`.
- **name** – The display name of this context.

```
<!ELEMENT resolver EMPTY>
```

```
<!ATTLIST resolver
contextTypeId CDATA #REQUIRED
type          CDATA #REQUIRED
class         CDATA #REQUIRED
description   CDATA #IMPLIED
name          CDATA #IMPLIED
icon          CDATA #IMPLIED>
```

A template variable resolver can resolve a template variable in a certain context.

- **contextTypeId** – References the context type that this resolver is contributed to.
- **type** – The type of this variable resolver. This property will be set on the resolver once it gets created.
- **class** – A subclass of `org.eclipse.jface.text.templates.TemplateVariableResolver`.
- **description** – The description of this variable resolver. This property will be set on the resolver once it gets created.
- **name** – The display name of this resolver.
- **icon** – An icon that may be displayed in the user interface.

```
<!ELEMENT template (pattern)>
<!ATTLIST template
id          CDATA #REQUIRED
contextTypeId CDATA #REQUIRED
name        CDATA #REQUIRED
description CDATA #IMPLIED
icon        CDATA #IMPLIED>
```

A template is a snippet of code or text that will be evaluated in a given context. Variables which will be resolved in that context can be specified using the `${variable_type}` notation.

- **id** – Unambiguously identifies this template. Use of a qualified name is recommended.
- **contextTypeId** – References the context type that this template is contributed to.

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- **name** – The internationalizable name of the template which will show up in the UI, such as in template proposals.
- **description** – The description of this template.
- **icon** – An icon that may be displayed in the UI for this template, for example in content assist proposals.

```
<!ELEMENT pattern (#CDATA)>
```

The template pattern.

```
<!ELEMENT include EMPTY>
```

```
<!ATTLIST include
```

```
file      CDATA #REQUIRED
```

```
translations CDATA #IMPLIED>
```

A collection of templates encoded as XML can be included as a whole via this element.

- **file** – The XML file to import templates from.
- **translations** – An optional properties file with resources for the templates specified in `file`.

Examples:

```
<extension point=
```

```
"org.eclipse.ui.examples.templateeditor.template"
```

```
>
```

```
<template name=
```

```
"javac"
```

```
context=
```

```
"ant"
```

```
editorId=
```

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```
"org.eclipse.ui.examples.templateeditor.editors.TemplateEditor"
description=
"%ant.tasks.javac.description"
>
<pattern>
<javac srcdir=
"${src}"
destdir=
"${dst}"
classpath=
"${classpath}"
debug=
"${debug}"
/>
</pattern>
</template>
<resolver context=
"ant"
type=
"src"
editorId=
"org.eclipse.ui.examples.templateeditor.editors.TemplateEditor"
class=
"org.eclipse.ui.examples.templateeditor.editors.AntVariableResolver"
>
</resolver>
```

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```
<resolver context=  
"ant"  
type=  
"dst"  
editorId=  
"org.eclipse.ui.examples.templateeditor.editors.TemplateEditor"  
class=  
"org.eclipse.ui.examples.templateeditor.editors.AntVariableResolver"  
>  
</resolver>  
</extension>
```

API Information:

See the `org.eclipse.jface.text.templates` package in the `org.eclipse.text` plug-in for the relevant API.

Supplied Implementation:

See the `org.eclipse.jface.text.templates` package in the `org.eclipse.text` plug-in for the relevant classes.

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Reference Provider

Identifier:

org.eclipse.ui.workbench.texteditor.quickdiffReferenceProvider

Since:

3.0

Description:

Allows contributors to add reference providers for the quick diff display.

Configuration Markup:

```
<!ELEMENT extension (referenceprovider+)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – The fully qualified name of the extension point.
- **id** – The optional id of this extension.
- **name** – The optional name of this extension.

```
<!ELEMENT referenceprovider EMPTY>
```

```
<!ATTLIST referenceprovider
```

```
class CDATA #REQUIRED
```

```
label CDATA #IMPLIED
```

```
id CDATA #REQUIRED
```

```
default (true | false) >
```

The definition of a reference provider for the quick diff display.

- **class** – The class of the reference provider, which must implement `org.eclipse.ui.editors.quickdiff.IQuickDiffReferenceProvider`.

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- **label** – The display label for the provider, which will show up in the menu that allows the user to set the quick diff reference to this provider.
- **id** – A string uniquely identifying this reference provider.
- **default** – If this flag is set to `true`, this reference provider will be installed per default the first time quick diff is enabled for a document. If multiple providers are installed with the flag set are encountered, the first one is taken.

Examples:

The following is an example of a reference provider definition. It contributes a provider that uses the version of a document saved on disk as a reference.

```
<extension point=
"quickdiff.referenceprovider"
>
<referenceprovider id=
"default"
name=
"%LastSavedProvider.name"
label=
"%quickdiff.referenceprovider.label"
class=
"org.eclipse.ui.internal.editors.quickdiff.providers.LastSaveReferenceProvider"
>
</referenceprovider>
</extension>
```

API Information:

There is no additional API for managing reference providers.

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Supplied Implementation:

The `org.eclipse.ui.editors` plugin contributes `LastSaveReferenceProvider`. See its implementation as an example.

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Accelerator Configurations

Identifier:

org.eclipse.ui.acceleratorConfigurations

Since:

Release 2.0

Description:

WARNING: This extension point is DEPRECATED.

Do not use this extension point, it will be removed in future versions of this product. Instead, use the extension point [org.eclipse.ui.commands](#)

This extension point is used to register accelerator configuration extensions. Accelerator configurations are configurations to which accelerator sets may be registered. The workbench allows the user to select an accelerator configuration from the Workbench preference page. Only one accelerator configuration may be active at a time.

An accelerator configuration represents a general style or theme of accelerators for Workbench actions. For example, the Workbench provides the "Emacs" accelerator configuration. When the "Emacs" accelerator configuration is active, accelerators belonging to accelerator sets registered to the "Emacs" configuration are active. These accelerators are defined to mimic the accelerators in Emacs (a popular text editor amongst developers).

An accelerator set registers with an accelerator configuration by listing the configuration's id as the value of its "configurationId" attribute (see the Accelerator Sets extension point). Many accelerator sets can be registered to the same accelerator configuration.

Note the accelerator configuration name presented to the user is the same as the value of the attribute "name" of the extension element of org.eclipse.ui.acceleratorConfigurations extension point.

Configuration Markup:

```
<!ELEMENT extension (acceleratorConfiguration*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

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<!ELEMENT acceleratorConfiguration EMPTY>

<!ATTLIST acceleratorConfiguration

id CDATA #REQUIRED

name CDATA #REQUIRED

description CDATA #REQUIRED>

- **id** – a unique name that can be used to identify this accelerator configuration.
- **name** – a translatable name of the accelerator configuration to be presented to the user.
- **description** – a short description of the accelerator configuration.

Examples:

Following is an example of an accelerator configuration extension:

```
<extension point=
"org.eclipse.ui.acceleratorConfigurations"
>
<acceleratorConfiguration id=
"org.eclipse.ui.viAcceleratorConfiguration"
name=
"VI"
description=
"VI style accelerator configuration"
>
</acceleratorConfiguration>
<acceleratorConfiguration id=
"org.eclipse.ui.jonDoeAcceleratorConfiguration"
name=
"Jon Doe"
```

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description=

"Personal accelerator configuration for Jon Doe"

>

</acceleratorConfiguration>

</extension>

Supplied Implementation:

The workbench provides the Default and Emacs accelerator configurations.

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Commands

Identifier:

org.eclipse.ui.commands

Since:

2.1

Description:

The `org.eclipse.ui.commands` extension point is used to declare commands and command categories, using the `command` and `category` elements. Through this extension point, one can also assign key sequences to commands using the `keyBinding` element. Key sequences are bound to commands based on key configurations and contexts which are declared here as well, using the `keyConfiguration` and `context` elements.

Configuration Markup:

```
<!ELEMENT extension (activeKeyConfiguration , category , command , keyBinding , keyConfiguration , context)>
```

```
<!ATTLIST extension
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED
```

```
point CDATA #REQUIRED>
```

- **id** – An optional identifier of the extension instance.
- **name** – An optional name of the extension instance.
- **point** – A fully qualified identifier of the target extension point.

```
<!ELEMENT activeKeyConfiguration EMPTY>
```

```
<!ATTLIST activeKeyConfiguration
```

```
value CDATA #IMPLIED
```

```
keyConfigurationId CDATA #IMPLIED>
```

This element is used to define the initial active key configuration for Eclipse. If more than one of these elements exist, only the last declared element (in order of reading the plugin registry) is considered valid.

- **value** – The unique id (`id` attribute) of the `keyConfiguration` element one wishes to be initially active.

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- **keyConfigurationId** – The unique id (id attribute) of the keyConfiguration element one wishes to be initially active.

<!ELEMENT category EMPTY>

<!ATTLIST category

description CDATA #IMPLIED

id CDATA #REQUIRED

name CDATA #REQUIRED>

In the UI, commands are often organized by category to make them more manageable. This element is used to define these categories. Commands can add themselves to at most one category. If more than one of these elements exist with the same id attribute, only the last declared element (in order of reading the plugin registry) is considered valid.

- **description** – A translatable short description of this category for display in the UI.
- **id** – The unique identifier of this category.
- **name** – The translatable name of this category for display in the UI.

<!ELEMENT command EMPTY>

<!ATTLIST command

category CDATA #IMPLIED

description CDATA #IMPLIED

id CDATA #REQUIRED

name CDATA #REQUIRED

categoryId CDATA #IMPLIED>

This element is used to define commands. A command represents an request from the user that can be handled by an action, and should be semantically unique among other commands. Do not define a command if there is already one defined with the same meaning. If more than one of these elements exist with the same id attribute, only the last declared element (in order of reading the plugin registry) is considered valid. See the extension points [org.eclipse.ui.actionSets](#) and [org.eclipse.ui.editorActions](#) to understand how actions are connected to commands.

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- **category** – The unique id of the category for this command. If this command does not specify a category, it will still appear in all UI, alongside other specifically categorized commands. @deprecated Please use "categoryId" instead.
- **description** – A translatable short description of this command for display in the UI.
- **id** – The unique identifier of this command.
- **name** – The translatable name of this command for display in the UI. Command are typically named in the form of an imperative verb.
- **categoryId** – The unique id of the category for this command. If this command does not specify a category, it will still appear in all UI, alongside other specifically categorized commands.

<!ELEMENT keyBinding EMPTY>

<!ATTLIST keyBinding

configuration CDATA #IMPLIED

command CDATA #IMPLIED

locale CDATA #IMPLIED

platform CDATA #IMPLIED

contextId CDATA #IMPLIED

string CDATA #IMPLIED

scope CDATA #IMPLIED

keyConfigurationId CDATA #IMPLIED

commandId CDATA #IMPLIED

keySequence CDATA #IMPLIED>

This element allows one to assign key sequences to commands.

- **configuration** – The unique id of the key configuration of this key binding. @deprecated Please use keyConfigurationId instead.
- **command** – The unique identifier of the command to which the key sequence specified by this key binding is assigned. If the value of this attribute is an empty string, the key sequence is assigned to an internal 'no operation' command. This is useful for 'undefining' key bindings in specific key configurations and contexts which may have been borrowed from their parents. @deprecate Please use "commandId" instead.
- **locale** – An optional attribute indicating that this key binding is only defined for the specified locale. Locales are specified according to the format declared in `java.util.Locale`.
- **platform** – An optional attribute indicating that this key binding is only defined for the specified platform. The possible values of the `platform` attribute are the set of the possible values returned

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by `org.eclipse.swt.SWT.getPlatform()`.

- **contextId** – The unique id of the context of this key binding.
- **string** – The key sequence to assign to the command. Key sequences consist of one or more key strokes, where a key stroke consists of a key on the keyboard, optionally pressed in combination with one or more of the following modifiers: Ctrl, Alt, Shift, and Command. Key strokes are separated by spaces, and modifiers are separated by '+' characters. @deprecate Please use "keySequence" instead.
- **scope** – The unique id of the context of this key binding. @deprecated Please use "contextId" instead.
- **keyConfigurationId** – The unique id of the key configuration of this key binding.
- **commandId** – The unique identifier of the command to which the key sequence specified by this key binding is assigned. If the value of this attribute is an empty string, the key sequence is assigned to an internal 'no operation' command. This is useful for 'undefining' key bindings in specific key configurations and contexts which may have been borrowed from their parents.
- **keySequence** – The key sequence to assign to the command. Key sequences consist of one or more key strokes, where a key stroke consists of a key on the keyboard, optionally pressed in combination with one or more of the following modifiers: Ctrl, Alt, Shift, and Command. Key strokes are separated by spaces, and modifiers are separated by '+' characters.

<!ELEMENT keyConfiguration EMPTY>

<!ATTLIST keyConfiguration

description CDATA #IMPLIED

id CDATA #REQUIRED

name CDATA #REQUIRED

parent CDATA #IMPLIED

parentId CDATA #IMPLIED>

This element is used to define key configurations. If more than one of these elements exist with the same `id` attribute, only the last declared element (in order of reading the plugin registry) is considered valid.

- **description** – A translatable short description of this key configuration for display in the UI.
- **id** – The unique identifier of this key configuration.
- **name** – The translatable name of this key configuration for display in the UI. If this key configuration has a parent, it is not necessary to add "(extends ...)" to the name. This will be automatically added by the UI where necessary.
- **parent** – The unique id of the parent key configuration. If this key configuration has a parent, it will borrow all key bindings from its parent, in addition to the key bindings defined in its own key configuration.
- **parentId** – The unique id of the parent key configuration. If this key configuration has a parent, it will borrow all key bindings from its parent, in addition to the key bindings defined in its own key configuration.

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<!ELEMENT context EMPTY>

<!ATTLIST context

description CDATA #IMPLIED

id CDATA #REQUIRED

name CDATA #REQUIRED

parent CDATA #IMPLIED

parentId CDATA #IMPLIED>

This element is used to define contexts. If more than one of these elements exist with the same `id` attribute, only the last declared element (in order of reading the plugin registry) is considered valid.

- **description** – A translatable short description of this context for display in the UI.
- **id** – The unique identifier of this context.
- **name** – The translatable name of this context for display in the UI. If this context has a parent, it is not necessary to add "(extends parent)" to the name. This will be automatically added by the UI where necessary.
- **parent** – The unique id of the parent context. If this context has a parent, it will borrow all key bindings from its parent, in addition to the key bindings defined in its own context. @deprecated Please use "parentId" instead.
- **parentId** – The unique id of the parent context. If this context has a parent, it will borrow all key bindings from its parent, in addition to the key bindings defined in its own context.

<!ELEMENT handlerSubmission EMPTY>

<!ATTLIST handlerSubmission

commandId CDATA #REQUIRED

handler CDATA #REQUIRED>

This element declares a handler for a command. This handler is then associated with the command with the given restrictions. This association is done at start-up. Associating a handler does not mean that this handler will always be the one chosen by the workbench; the actual choice is done by examining the workbench state and comparing with the various handler submissions.

This particular API should still be considered experimental. While you may use it, you must be willing to accept that this API may change radically or be removed entirely at some point in the future. We appreciate feedback on this API to platform-ui-dev@eclipse.org.

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- **commandId** – The identifier of the command to which this handler should be associated.
- **handler** – The name of the class of the handler. If the class is an implementation of `IExecutableExtension`, then it is possible to pass data into the object. This handler will be proxied until the handler is queried for information — at which point the class will be loaded, and an instance created.

<!ELEMENT scope EMPTY>

<!ATTLIST scope

description CDATA #IMPLIED

id CDATA #REQUIRED

name CDATA #REQUIRED

parent CDATA #IMPLIED>

This element is used to define scopes. If more than one of these elements exist with the same `id` attribute, only the last declared element (in order of reading the plugin registry) is considered valid. @deprecated Please use the "org.eclipse.ui.contexts" extension point instead.

- **description** – A translatable short description of this scope for display in the UI. @deprecated Please use the "org.eclipse.ui.contexts" extension point instead.
- **id** – The unique identifier of this scope. @deprecated Please use the "org.eclipse.ui.contexts" extension point instead.
- **name** – The translatable name of this scope for display in the UI. If this scope has a parent, it is not necessary to add "(extends parent)" to the name. This will be automatically added by the UI where necessary. @deprecated Please use the "org.eclipse.ui.contexts" extension point instead.
- **parent** – The unique id of the parent scope. If this scope has a parent, it will borrow all key bindings from its parent, in addition to the key bindings defined in its own scope. @deprecated Please use the "org.eclipse.ui.contexts" extension point instead.

Examples:

The `plugin.xml` file in the `org.eclipse.ui` plugin makes extensive use of the `org.eclipse.ui.commands` extension point.

API Information:

This is no public API for declaring commands, categories, key bindings, key configurations, or contexts other than this extension point. Public API for querying and setting contexts, as well as registering actions to handle specific commands can be found in `org.eclipse.ui.IKeyBindingService`.

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Action Sets

Identifier:

org.eclipse.ui.actionSets

Description:

This extension point is used to add menus, menu items and toolbar buttons to the common areas in the Workbench window. These contributions are collectively known as an *action set* and appear within the Workbench window by the user customizing a perspective.

An action's enablement and/or visibility can be defined using the elements `enablement` and `visibility` respectively. These two elements contain a boolean expression that is evaluated to determine the enablement and/or visibility.

The syntax is the same for the `enablement` and `visibility` elements. Both contain only one boolean expression sub-element. In the simplest case, this will be an `objectClass`, `objectState`, `pluginState`, or `systemProperty` element. In the more complex case, the `and`, `or`, and `not` elements can be combined to form a boolean expression. Both the `and`, and `or` elements must contain 2 sub-elements. The `not` element must contain only 1 sub-element.

Configuration Markup:

```
<!ELEMENT extension (actionSet+)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT actionSet (menu* ,action*)>
```

```
<!ATTLIST actionSet
```

```
id CDATA #REQUIRED
```

```
label CDATA #REQUIRED
```

```
visible (true | false)
```

```
description CDATA #IMPLIED>
```

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This element is used to define a group of actions and/or menus.

- **id** – a unique identifier for this action set.
- **label** – a translatable name used by the Workbench to represent this action set to the user.
- **visible** – an optional attribute indicating whether the action set is initially visible when a perspective is open. This option is only honoured when the user opens a perspective which has not been customized. The user can override this option from the "Customize Perspective Dialog". This attribute should be used with great care so as not to overwhelm the user with too many actions.
- **description** – a translatable description used by the Workbench to represent this action set to the user.

```
<!ELEMENT action (selection* | enablement?)>
```

```
<!ATTLIST action
```

```
id          CDATA #REQUIRED
```

```
label       CDATA #REQUIRED
```

```
accelerator CDATA #IMPLIED
```

```
definitionId CDATA #IMPLIED
```

```
menubarPath CDATA #IMPLIED
```

```
toolbarPath CDATA #IMPLIED
```

```
icon        CDATA #IMPLIED
```

```
disabledIcon CDATA #IMPLIED
```

```
hoverIcon   CDATA #IMPLIED
```

```
tooltip     CDATA #IMPLIED
```

```
helpContextId CDATA #IMPLIED
```

```
style       (push|radio|toggle|pulldown) "push"
```

```
state       (true | false)
```

```
pulldown    (true | false)
```

```
class       CDATA #IMPLIED
```

```
retarget    (true | false)
```

```
allowLabelUpdate (true | false)
```

Action Sets

enablesFor CDATA #IMPLIED>

This element defines an action that the user can invoke in the UI.

- **id** – a unique identifier used as a reference for this action.
- **label** – a translatable name used either as the menu item text or toolbar button label. The name can include mnemonic information.
- **accelerator** – **Deprecated:** Use the `definitionId` attribute instead.
- **definitionId** – Specifies the command that this action will handle. By specifying an action, the key binding service can assign a key sequence to this action. See the extension point org.eclipse.ui.commands for more information.
- **menubarPath** – a slash-delimited path ('/') used to specify the location of this action in the menu bar. Each token in the path, except the last one, must represent a valid identifier of an existing menu in the hierarchy. The last token represents the named group into which this action will be added. If the path is omitted, this action will not appear in the menu bar.
- **toolbarPath** – a slash-delimited path ('/') that is used to specify the location of this action in the toolbar. The first token represents the toolbar identifier (with "Normal" being the default toolbar), while the second token is the named group within the toolbar that this action will be added to. If the group does not exist in the toolbar, it will be created. If `toolbarPath` is omitted, the action will not appear in the toolbar.
- **icon** – a relative path of an icon used to visually represent the action in its context. If omitted and the action appears in the toolbar, the Workbench will use a placeholder icon. The path is relative to the location of the `plugin.xml` file of the contributing plug-in. The icon will appear in toolbars but not in menus. Enabled actions will be represented in menus by the `hoverIcon`.
- **disabledIcon** – a relative path of an icon used to visually represent the action in its context when the action is disabled. If omitted, the normal icon will simply appear greyed out. The path is relative to the location of the `plugin.xml` file of the contributing plug-in. The disabled icon will appear in toolbars but not in menus. Icons for disabled actions in menus will be supplied by the OS.
- **hoverIcon** – a relative path of an icon used to visually represent the action in its context when the mouse pointer is over the action. If omitted, the normal icon will be used. The path is relative to the location of the `plugin.xml` file of the contributing plug-in.
- **tooltip** – a translatable text representing the action's tool tip. Only used if the action appears in the toolbar.
- **helpContextId** – a unique identifier indicating the help context for this action. If the action appears as a menu item, then pressing F1 while the menu item is highlighted will display help.
- **style** – an attribute to define the user interface style type for the action. If omitted, then it is `push` by default. The attribute value will be one of the following:
 - push** – as a regular menu item or tool item.
 - radio** – as a radio style menu item or tool item. Actions with the radio style within the same menu or toolbar group behave as a radio set. The initial value is specified by the `state` attribute.
 - toggle** – as a checked style menu item or as a toggle tool item. The initial value is specified by the `state` attribute.
 - pulldown** – as a cascading style menu item or as a drop down menu beside the tool item.
- **state** – an optional attribute indicating the initial state (either `true` or `false`). Used only when the `style` attribute has the value `radio` or `toggle`.
- **pulldown** – **Deprecated:** Use the `style` attribute with the value `pulldown`.

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- **class** – a fully qualified name of a class which implements `org.eclipse.ui.IWorkbenchWindowActionDelegate` or `org.eclipse.ui.IWorkbenchWindowPullDownDelegate`. The latter should be implemented in cases where the `style` attribute has the value `pullDown`. This class is the handler responsible for performing the action. If the `retarget` attribute is true, this attribute is ignored and should not be supplied.
- **retarget** – an optional attribute to retarget this action. When true, view and editor parts may supply a handler for this action using the standard mechanism for setting a global action handler on their site using this action's identifier. If this attribute is true, the `class` attribute should not be supplied.
- **allowLabelUpdate** – optional attribute indicating whether the retarget action allows the handler to override its label and tooltip. Only applies if `retarget` attribute is true.
- **enablesFor** – a value indicating the selection count which must be met to enable the action. If specified and the condition is not met, the action is disabled. If omitted, the action enablement state is not affected. The following attribute formats are supported:
 - ! – 0 items selected
 - ? – 0 or 1 items selected
 - + – 1 or more items selected
 - multiple, 2+** – 2 or more items selected
 - n** – a precise number of items selected. a precise number of items selected. For example: `enablesFor=" 4"` enables the action only when 4 items are selected
 - * – any number of items selected

<!ELEMENT menu (separator+ , groupMarker*)>

<!ATTLIST menu

id CDATA #REQUIRED

label CDATA #REQUIRED

path CDATA #IMPLIED>

This element is used to defined a new menu.

- **id** – a unique identifier that can be used to reference this menu.
- **label** – a translatable name used by the Workbench for this new menu. The name should include mnemonic information.
- **path** – the location of the new menu starting from the root of the menu. Each token in the path must refer to an existing menu, except the last token which should represent a named group in the last menu in the path. If omitted, the new menu will be added to the `additions` named group of the menu.

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<!ELEMENT separator EMPTY>

<!ATTLIST separator

name CDATA #REQUIRED>

This element is used to create a menu separator in the new menu.

- **name** – the name of the menu separator. This name can later be referenced as the last token in a menu path. Therefore, a separator also serve as named group into which actions and menus can be added.

<!ELEMENT groupMarker EMPTY>

<!ATTLIST groupMarker

name CDATA #REQUIRED>

This element is used to create a named group in the new menu. It has no visual representation in the new menu, unlike the `separator` element.

- **name** – the name of the group marker. This name can later be referenced as the last token in the menu path. It serves as named group into which actions and menus can be added.

<!ELEMENT selection EMPTY>

<!ATTLIST selection

class CDATA #REQUIRED

name CDATA #IMPLIED>

This element is used to help determine the action enablement based on the current selection. Ignored if the `enablement` element is specified.

- **class** – a fully qualified name of the class or interface that each object in the selection must implement in order to enable the action.
- **name** – an optional wild card filter for the name that can be applied to all objects in the selection. If specified and the match fails, the action will be disabled.

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<!ELEMENT enablement (and | or | not | objectClass | objectState | pluginState | systemProperty)>

This element is used to define the enablement for the extension.

<!ELEMENT visibility (and | or | not | objectClass | objectState | pluginState | systemProperty)>

This element is used to define the visibility for the extension.

<!ELEMENT and (and | or | not | objectClass | objectState | pluginState | systemProperty)>

This element represent a boolean AND operation on the result of evaluating it's two sub–element expressions.

<!ELEMENT or (and | or | not | objectClass | objectState | pluginState | systemProperty)>

This element represent a boolean OR operation on the result of evaluating it's two sub–element expressions.

<!ELEMENT not (and | or | not | objectClass | objectState | pluginState | systemProperty)>

This element represent a boolean NOT operation on the result of evaluating it's sub–element expressions.

<!ELEMENT objectClass EMPTY>

<!ATTLIST objectClass

name CDATA #REQUIRED>

This element is used to evaluate the class or interface of each object in the current selection. If each object in the selection implements the specified class or interface, the expression is evaluated as true.

- **name** – a fully qualified name of a class or interface. The expression is evaluated as true only if all objects within the selection implement this class or interface.

```
<!ELEMENT objectState EMPTY>
```

```
<!ATTLIST objectState
```

```
name CDATA #REQUIRED
```

```
value CDATA #REQUIRED>
```

This element is used to evaluate the attribute state of each object in the current selection. If each object in the selection has the specified attribute state, the expression is evaluated as true. To evaluate this type of expression, each object in the selection must implement, or adapt to, `org.eclipse.ui.IActionFilter` interface.

- **name** – the name of an object's attribute. Acceptable names reflect the object type, and should be publicly declared by the plug-in where the object type is declared.
- **value** – the required value of the object's attribute. The acceptable values for the object's attribute should be publicly declared.

```
<!ELEMENT pluginState EMPTY>
```

```
<!ATTLIST pluginState
```

```
id CDATA #REQUIRED
```

```
value (installed|activated) "installed">
```

This element is used to evaluate the state of a plug-in. The state of the plug-in may be one of the following: `installed` or `activated`.

- **id** – the identifier of a plug-in which may or may not exist in the plug-in registry.
- **value** – the required state of the plug-in. The state of the plug-in may be one of the following: `installed` or `activated`.

```
<!ELEMENT systemProperty EMPTY>
```

```
<!ATTLIST systemProperty
```

```
name CDATA #REQUIRED
```

```
value CDATA #REQUIRED>
```

This element is used to evaluate the state of some system property. The property value is retrieved from the `java.lang.System`.

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- **name** – the name of the system property.
- **value** – the required value of the system property.

Examples:

The following is an example of an action set (note the sub-elements and the way attributes are used):

```
<extension point =
```

```
"org.eclipse.ui.actionSets"
```

```
>
```

```
<actionSet id=
```

```
"com.xyz.actionSet"
```

```
label=
```

```
"My Actions"
```

```
>
```

```
<menu id=
```

```
"com.xyz.xyzMenu"
```

```
label=
```

```
"XYZ Menu"
```

```
path=
```

```
"additions"
```

```
>
```

```
<separator name=
```

```
"group1"
```

```
/>
```

```
<separator name=
```

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```
"option1"  
  
</>  
  
</menu>  
  
<action id=  
  
"com.xyz.runXYZ"  
  
label=  
  
"&Run XYZ Tool"  
  
style=  
  
"toggle"  
  
state=  
  
"false"  
  
menubarPath=  
  
"com.xyz.xyzMenu/group1"  
  
icon=  
  
"icons/runXYZ.gif"  
  
tooltip=  
  
"Run XYZ Tool"  
  
helpContextId=  
  
"com.xyz.run_action_context"  
  
class=  
  
"com.xyz.actions.RunXYZ"  
  
enablesFor=  
  
"1"  
  
>  
  
<selection class=  
  
"org.eclipse.core.resources.IFile"
```

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```
name=  
".*.java"  
/>  
</action>  
<action id=  
"com.xyz.runABC"  
label=  
"&Run ABC Tool"  
style=  
"push"  
menubarPath=  
"com.xyz.xyzMenu/group1"  
toolbarPath=  
"Normal/XYZ"  
icon=  
"icons/runABC.gif"  
tooltip=  
"Run ABC Tool"  
helpContextId=  
"com.xyz.run_abc_action_context"  
retarget=  
"true"  
allowLabelUpdate=  
"true"  
>  
<enablement>
```

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```
<and>

<objectClass name=
"org.eclipse.core.resources.IFile"

/>

<not>

<objectState name=
"extension"

value=
"java"

/>

</not>

</and>

</enablement>

</action>

<action id=
"com.xyz.runDEF"

label=
"&Run DEF Tool"

style=
"radio"

state=
"true"

menubarPath=
"com.xyz.xyzMenu/option1"

icon=
"icons/runDEF.gif"
```

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```
tooltip=
"Run DEF Tool"
class=
"com.xyz.actions.RunDEF"
helpContextId=
"com.xyz.run_def_action_context"
>
</action>
<action id=
"com.xyz.runGHI"
label=
"&Run GHI Tool"
style=
"radio"
state=
"false"
menubarPath=
"com.xyz.xyzMenu/option1"
icon=
"icons/runGHI.gif"
tooltip=
"Run GHI Tool"
class=
"com.xyz.actions.RunGHI"
helpContextId=
"com.xyz.run_ghi_action_context"
```


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```
>  
</action>  
<action id=  
"com.xyz.runJKL"  
label=  
"&Run JKL Tool"  
style=  
"radio"  
state=  
"false"  
menubarPath=  
"com.xyz.xyzMenu/option1"  
icon=  
"icons/runJKL.gif"  
tooltip=  
"Run JKL Tool"  
class=  
"com.xyz.actions.RunJKL"  
helpContextId=  
"com.xyz.run_jkl_action_context"  
>  
</action>  
</actionSet>  
</extension>
```

In the example above, the specified action set, named "My Actions", is not initially visible within each perspective because the `visible` attribute is not specified.

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The XYZ action will appear as a check box menu item, initially not checked. It is enabled only if the selection count is 1 and if the selection contains a Java file resource.

The ABC action will appear both in the menu and on the toolbar. It is enabled only if the selection does not contain any Java file resources. Note also this is a label retarget action therefore it does not supply a `class` attribute.

The actions DEF, GHI, and JKL appear as radio button menu items. They are enabled all the time, independent of the current selection state.

API Information:

The value of the `class` attribute must be the fully qualified name of a class that implements `org.eclipse.ui.IWorkbenchWindowActionDelegate` or `org.eclipse.ui.IWorkbenchWindowPulldownDelegate`. The latter should be implemented in cases where the `style` attribute has the value `pulldown`. This class is the handler responsible for performing the action. If the `retarget` attribute is true, this attribute is ignored and should not be supplied. This class is loaded as late as possible to avoid loading the entire plug-in before it is really needed.

The enablement criteria for an action extension is initially defined by `enablesFor`, and also either `selection` or `enablement`. However, once the action delegate has been instantiated, it may control the action enable state directly within its `selectionChanged` method.

It is important to note that the workbench does not generate menus on a plug-in's behalf. Menu paths must reference menus that already exist.

Action and menu labels may contain special characters that encode mnemonics using the following rules:

1. Mnemonics are specified using the ampersand ('&') character in front of a selected character in the translated text. Since ampersand is not allowed in XML strings, use `&` character entity.

If two or more actions are contributed to a menu or toolbar by a single extension the actions will appear in the reverse order of how they are listed in the `plugin.xml` file. This behavior is admittedly unintuitive. However, it was discovered after the Eclipse Platform API was frozen. Changing the behavior now would break every plug-in which relies upon the existing behavior.

The `selection` and `enablement` elements are mutually exclusive. The `enablement` element can replace the `selection` element using the sub-elements `objectClass` and `objectState`. For example, the following:

```
<selection class=  
"org.eclipse.core.resources.IFile"  
name=  
"*.java"  
>
```

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</selection>

can be expressed using:

<enablement>

<and>

<objectClass name=

"org.eclipse.core.resources.IFile"

/>

<objectState name=

"extension"

value=

"java"

/>

</and>

</enablement>

Supplied Implementation:

Plug-ins may use this extension point to add new top level menus. Plug-ins can also define named groups which allow other plug-ins to contribute their actions into them.

Top level menus are created by using the following values for the path attribute:

- additions – represents a group immediately to the left of the Window menu.

Omitting the path attribute will result in adding the new menu into the additions menu bar group.

The default groups in a workbench window are defined in the `IWorkbenchActionConstants` interface. These constants can be used in code for dynamic contribution. The values can also be copied into an XML file for fine grained integration with the existing workbench menus and toolbar.

Various menu and toolbar items within the workbench window are defined algorithmically. In these cases a separate mechanism must be used to extend the window. For example, adding a new workbench view results in a new menu item appearing in the Perspective menu. Import, Export, and New Wizards extensions are also added automatically to the window.

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Accelerator Scopes

Identifier:

org.eclipse.ui.acceleratorScopes

Since:

Release 2.0

Description:

WARNING: This extension point is DEPRECATED.

Do not use this extension point, it will be removed in future versions of this product. Instead, use the extension point [org.eclipse.ui.commands](#)

This extension point is used to register accelerator scope extensions. Accelerator scopes are scopes for which accelerator sets may be applicable. For example, if an accelerator set is applicable for the scope entitled "Text Editor Scope", the accelerators of that accelerator set will only operate if the "Text Editor Scope" or one of its children is active (in other words, if the active part is a participating text editor).

An accelerator set declares what scope it is applicable for by listing the scope's id as the value of its "scopeId" attribute (see the Accelerator Sets extension point). Many accelerator sets can be applicable for the same accelerator scope.

Configuration Markup:

```
<!ELEMENT extension (acceleratorScope*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT acceleratorScope EMPTY>
```

```
<!ATTLIST acceleratorScope
```

```
id CDATA #REQUIRED
```

```
name CDATA #REQUIRED
```

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description CDATA #REQUIRED

parentScope CDATA #IMPLIED>

- **id** – a unique name that can be used to identify this accelerator scope.
- **name** – a translatable name of the accelerator scope.
- **description** – a short description of the accelerator scope.
- **parentScope** – an optional attribute which represents a scope which is active whenever this scope is active. For most scopes, org.eclipse.ui.globalScope will be the parent scope

Examples:

Following is an example of an accelerator scope extension:

```
<extension point=
"org.eclipse.ui.acceleratorScopes"
>
<acceleratorScope id=
"org.eclipse.ui.globalScope"
name=
"Global"
description=
"Action accelerator key applicable to all views and editors unless explicitly overridden."
>
</acceleratorScope>
<acceleratorScope id=
"org.eclipse.ui.javaEditorScope"
name=
"Java Editor"
description=
"Action accelerator key applicable only when java editor active."
```

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parentScope=

"org.eclipse.ui.globalScope"

>

</acceleratorScope>

</extension>

API Information:

The method `public IKeyBindingService getKeyBindingService()` was added to `IEditorSite`.

Supplied Implementation:

The workbench provides the Global accelerator scope and the Text Editor accelerator scope.

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Accelerator Sets

Identifier:

org.eclipse.ui.acceleratorSets

Since:

Release 2.0

Description:

WARNING: This extension point is DEPRECATED.

Do not use this extension point, it will be removed in future versions of this product. Instead, use the extension point [org.eclipse.ui.commands](#)

This extension point is used to register accelerator set extensions. Accelerator sets are just what the name implies, sets of accelerators. An accelerator is an association between one or more sequences of accelerator keys and a workbench action. An accelerator key sequence may be of length one or greater.

An accelerator set is registered with an accelerator configuration (see the Accelerator Configuration extension point) and is applicable for an accelerator scope (see the Accelerator Scope extension point).

Configuration Markup:

```
<!ELEMENT extension (acceleratorSet*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT acceleratorSet (accelerator+)>
```

```
<!ATTLIST acceleratorSet
```

```
configurationId CDATA #REQUIRED
```

```
scopeId CDATA #REQUIRED>
```

- **configurationId** – a unique name that identifies the accelerator configuration to which this accelerator set is registered.

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- **scopeId** – a unique name that identifies the accelerator scope for which this accelerator set is applicable.

```
<!ELEMENT accelerator EMPTY>
```

```
<!ATTLIST accelerator
```

```
id    CDATA #IMPLIED
```

```
key   CDATA #REQUIRED
```

```
locale CDATA #IMPLIED
```

```
platform CDATA #IMPLIED>
```

- **id** – the unique identifier of the action definition of the action associated with this accelerator. If the id is not specified this accelerator deletes any mappings with the same key. This is used to delete a key binding for a specific Locale.
- **key** – an attribute representing the sequence(s) of accelerator keys used to perform the action associated with this accelerator. Sequences are separated by '|', and individual keys in a sequence are separated by a space. A key may be modified by the CTRL, ALT, or SHIFT keys. Depending on keyboard layout, some keys ('?' for example) may need the SHIFT to be accessed but the accelerator should be specified without the SHIFT so it will be independent of keyboard layout. E.g. if CTRL+? is specified as an accelerator, the user may have to press CTRL+SHIFT+? depending on the keyboard layout.
- **locale** – an optional attribute which specifies a locale for which the accelerator is applicable. If this attribute is not specified, the accelerator is applicable for all locales.
- **platform** – an optional attribute which specifies a platform on which the accelerator is applicable. If this attribute is not specified, the accelerator is applicable on all platforms.

Examples:

Following is an example of an accelerator set extension:

```
<extension point=
```

```
"org.eclipse.ui.acceleratorSets"
```

```
>
```

```
<acceleratorSet configurationId=
```

```
"org.eclipse.ui.exampleAcceleratorConfiguration"
```

```
scopeId=
```

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```
"org.eclipse.ui.globalScope"
```

```
>
```

```
<accelerator id=
```

```
"org.eclipse.ui.ExampleActionA"
```

```
key=
```

```
"CTRL+R CTRL+A "
```

```
>
```

```
</accelerator>
```

```
<accelerator id=
```

```
"org.eclipse.ui.ExampleActionB"
```

```
key=
```

```
"CTRL+R CTRL+B"
```

```
>
```

```
</accelerator>
```

```
<accelerator id=
```

```
"org.eclipse.ui.ExampleActionC"
```

```
key=
```

```
"CTRL+R CTRL+C || CTRL+SHIFT+DELETE"
```

```
>
```

```
</accelerator>
```

```
</acceleratorSet>
```

```
</extension>
```

API Information:

More than one accelerator may be specified for the same action in the accelerator set but only one will be used.

If the locale and/or the platform is specified, the accelerator that better matches the current locale and platform will be used. The current locale is determined by the API `Locale.getDefault()` and the platform by the API

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SWT.getPlatform(). If the platform and/or the locale is specified and it does not match the current locale and/or platform, the accelerator is discarded. If accelerator A defines only the locale and B defines only the platform, B is used. If accelerator A defines "ja" as its locale and B defines "ja_JP", B is used in case the current locale is "ja_JP".

If two accelerators are defined in accelerators sets in different plugins, the chosen accelerator will depend on the plugins. If plugin A depends on B, the accelerators defined in B is used. If A and B don't depend on each other, they will be alphabetically sorted by the plugin id.

If two accelerators are defined in different scopes, the accelerator defined in the current scope will be used. If an accelerator is not defined in the current scope or one of its parents it is discarded. If an accelerator is defined in a parent and child scope, the one in the child is used.

Supplied Implementation:

The workbench provides accelerator sets for the Default and Emacs accelerator configurations.

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Action Definitions

Identifier:

org.eclipse.ui.actionDefinitions

Since:

Release 2.0

Description:

WARNING: This extension point is DEPRECATED.

Do not use this extension point, it will be removed in future versions of this product. Instead, use the extension point [org.eclipse.ui.commands](#)

This extension point is used to register action definitions. Accelerators (see the Accelerator Sets extension point) use action definitions to reference actions. An action associates itself with a given accelerator by registering with that accelerator's associated action definition. An action registers itself with an action definition by calling the `setActionDefinitionId(String id)` method and supplying the action definition's id as an argument.

Configuration Markup:

```
<!ELEMENT extension (actionDefinition*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT actionDefinition EMPTY>
```

```
<!ATTLIST actionDefinition
```

```
id CDATA #REQUIRED
```

```
name CDATA #IMPLIED
```

```
description CDATA #IMPLIED>
```

- **id** – a unique name that can be used to identify this action.

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- **name** – the name of the action as displayed to the user.
- **description** – a short description of the action to display to the user.

Examples:

Following is an example of an action definition extension:

```
<extension point=
"org.eclipse.ui.actionDefinitions"
>
<actionDefinition id=
"org.eclipse.ui.file.save"
>
</actionDefinition>
<actionDefinition id=
"org.eclipse.ui.file.saveAll"
>
</actionDefinition>
<actionDefinition id=
"org.eclipse.ui.file.close"
>
</actionDefinition>
<actionDefinition id=
"org.eclipse.ui.file.closeAll"
>
</actionDefinition>
<actionDefinition id=
```

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```
"org.eclipse.ui.file.print"
```

```
>
```

```
</actionDefinition>
```

```
</extension>
```

API Information:

The methods `public void setActionDefinitionId(String id)` and `public String getActionDefinitionId()` have been added to `IAction`.

NOTE – other attributes may be added in the future, as needed.

Supplied Implementation:

The workbench provides many action definitions.

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<http://www.eclipse.org/legal/cpl-v10.html>

Action Set Part Associations

Identifier:

org.eclipse.ui.actionSetPartAssociations

Description:

This extension point is used to define an action set which should be added to a perspective when a part (view or editor) is opened in the perspective. In the case of an editor, the action set will remain visible while the editor is the current editor. In the case of a view, the action set will be visible when the view is the active part.

Configuration Markup:

```
<!ELEMENT extension (actionSetPartAssociation*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT actionSetPartAssociation (part*)>
```

```
<!ATTLIST actionSetPartAssociation
```

```
targetID CDATA #REQUIRED>
```

- **targetID** – the unique identifier of the action set (as specified in the registry) which is to be associated with particular workbench views and/or editors.

```
<!ELEMENT part EMPTY>
```

```
<!ATTLIST part
```

```
id CDATA #REQUIRED>
```

- **id** – the unique identifier of the part (view or editor) to be associated with the action set.

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Examples:

The following is an example of an action set part association (note the subelement and the way attributes are used):

```
<extension point=
"org.eclipse.ui.actionSetPartAssociations"
>
<actionSetPartAssociation targetID=
"org.eclipse.jdt.ui.refactoring.actionSet"
>
<part id=
"org.eclipse.jdt.ui.PackageExplorer"
/>
<part id=
"org.eclipse.jdt.ui.CompilationUnitError"
/>
</actionSetPartAssociation>
</extension>
```

In the example above, a view or editor are associated with the refactoring action set.

API Information:

The user may override these associations using the customize perspective dialog. Regardless of these associations, action sets which the user turns off will never appear and action sets which the user turns on will always be visible.

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Activities

Identifier:

org.eclipse.ui.activities

Since:

3.0

Description:

The `org.eclipse.ui.activities` extension point is used to declare activities and associated elements. Activities are used by the platform to filter certain plugin contributions from the users view until such a time that they express interest in them. This allows Eclipse to grow dynamically based on the usage pattern of a user.

Configuration Markup:

```
<!ELEMENT extension (activity , activityRequirementBinding , activityPatternBinding , category , categoryActivityBinding , defaultEnablement)*>
```

```
<!ATTLIST extension
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED
```

```
point CDATA #REQUIRED>
```

- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance
- **point** – a fully qualified identifier of the target extension point

```
<!ELEMENT activity EMPTY>
```

```
<!ATTLIST activity
```

```
description CDATA #IMPLIED
```

```
id CDATA #REQUIRED
```

```
name CDATA #REQUIRED>
```

This element is used to define activities. If more than one of these elements exist with the same `id` attribute, only the last declared element (in order of reading the registry) is considered valid.

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- **description** – a translatable short description of this activity for display in the UI
- **id** – the unique identifier of this activity
- **name** – the translatable name of this activity for display in the UI

```
<!ELEMENT activityRequirementBinding EMPTY>
```

```
<!ATTLIST activityRequirementBinding
```

```
requiredActivityId CDATA #REQUIRED
```

```
activityId CDATA #REQUIRED>
```

This element allows one to bind activities to activities. The relationship is such that if the activityId is ever enabled then the requiredActivityId is enabled as well.

- **requiredActivityId** – the unique identifier of required activity to bind
- **activityId** – the unique identifier of the activity to bind

```
<!ELEMENT activityPatternBinding EMPTY>
```

```
<!ATTLIST activityPatternBinding
```

```
activityId CDATA #REQUIRED
```

```
pattern CDATA #REQUIRED>
```

This element allows one to bind activities to patterns.

- **activityId** – the unique identifier of the activity to bind
- **pattern** – the pattern to be bound. Patterns are regular expressions which match unique identifiers. Please see the Java documentation for `java.util.regex.Pattern` for further details.

```
<!ELEMENT category EMPTY>
```

```
<!ATTLIST category
```

```
description CDATA #IMPLIED
```

```
id CDATA #REQUIRED
```

```
name CDATA #REQUIRED>
```

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This element is used to define categories. If more than one of these elements exist with the same `id` attribute, only the last declared element (in order of reading the registry) is considered valid.

- **description** – a translatable short description of this category for display in the UI
- **id** – the unique identifier of this category
- **name** – the translatable name of this category for display in the UI

```
<!ELEMENT categoryActivityBinding EMPTY>
```

```
<!ATTLIST categoryActivityBinding
```

```
activityId CDATA #REQUIRED
```

```
categoryId CDATA #REQUIRED>
```

This element allows one to bind categories to activities.

- **activityId** – the unique identifier of the activity to bind
- **categoryId** – the unique identifier of the category to bind

```
<!ELEMENT defaultEnablement EMPTY>
```

```
<!ATTLIST defaultEnablement
```

```
id CDATA #REQUIRED>
```

This element allows one to specify that a given activity should be enabled by default.

- **id** – the unique identifier of the activity

Examples:

The following is an example of several activity and category definitions as well as associated bindings.

```
<extension point=
```

```
"org.eclipse.ui.activities"
```

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>

<activity id=

"com.xyz.Activity"

description=

"Filters contributions from com.xyz"

name=

"My Activity"

/>

<activity id=

"com.xyz.OtherActivity"

description=

"Filters other contributions from com.xyz"

name=

"My Other Activity"

/>

<!-- other activity requires activity -->

<activityRequirementBinding activityId=

"com.xyz.OtherActivity"

requiredActivityId=

"com.xyz.Activity"

/>

<category id=

"com.xyz.Category"

description=

"com.xyz Activities"

name=

Activities

```
"My Category"  
  
</>  
  
<!-- put the activity in the category -->  
  
<categoryActivityBinding activityId=  
  
"com.xyz.Activity"  
  
categoryId=  
  
"com.xyz.Category"  
  
</>  
  
<!-- bind all contributions from plugin com.xyz -->  
  
<activityPatternBinding id=  
  
"com.xyz.Activity"  
  
pattern=  
  
"com\.\xyz\/.*"  
  
</>  
  
<!-- bind my.contribution from plugin com.xyz.other -->  
  
<activityPatternBinding id=  
  
"com.xyz.OtherActivity"  
  
pattern=  
  
"com\.\xyz\.\other\/my.contribution"  
  
</>  
  
<!-- our activity should be enabled by default -->  
  
<defaultEnablement id=  
  
"com.xyz.Activity"  
  
</>  
  
</extension>
```

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API Information:

There is currently no public API for declaring activities or associated elements other than this extension point. The state of activities in the workbench is accessible via `org.eclipse.ui.IWorkbench.getActivitySupport()`. From here you may query and update the set of currently enabled activities.

Supplied Implementation:

There are no "default activities" provided by the workbench. Activities are intended to be defined at the product level, such as the Eclipse SDK, so as to tightly integrate all of the (known) components that product contains.

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Cheat Sheet Content

Identifier:

org.eclipse.ui.cheatsheets.cheatSheetContent

Since:

3.0

Description:

This extension point is used to register cheat sheet content contributions. Cheat sheets appear as choices from the "Help" menu or from within the cheat sheet view, and are typically used to aid a user through a series of complex tasks to accomplish an overall goal.

The cheat sheets are organized into categories which usually reflect a particular problem domain. For instance, a Java oriented plug-in may define a category called "Java" which is appropriate for cheat sheets that would aid a user with any of the Java tools. The categories defined by one plug-in can be referenced by other plug-ins using the category attribute of a cheatsheet element. Uncategorized cheat sheets, as well as cheat sheets with invalid category paths, will end up in an "Other" category.

Cheat sheets may optionally specify a description subelement whose body should contain short text about the cheat sheet.

Configuration Markup:

```
<!ELEMENT extension (category |cheatsheet)*>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT category EMPTY>
```

```
<!ATTLIST category
```

```
id CDATA #REQUIRED
```

```
name CDATA #REQUIRED
```

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parentCategory CDATA #IMPLIED>

A category element in the cheatsheetContent extension point creates a new category in the cheat sheet menu. The cheat sheet menu is available from the help menu in the workbench. If a new category is specified, cheat sheets may be targeted to that category and will appear under it in the cheat sheet selection dialog.

- **id** – a unique name that can be used to identify this category
- **name** – a translatable name of the category that will be used in the dialog box
- **parentCategory** – a path to another category if this category should be added as a child

<!ELEMENT cheatsheet (description?)>

<!ATTLIST cheatsheet

id CDATA #REQUIRED

name CDATA #REQUIRED

category CDATA #IMPLIED

contentFile CDATA #IMPLIED

listener CDATA #IMPLIED>

A cheatsheet element is put into the cheatsheetContent extension point if there is a cheat sheet to be contributed to the workbench. A cheat sheet element must specify an id, a translatable name to appear in the selection options, a category id to specify which category this cheat sheet will be included in, and a content file. The cheat sheet content file is an XML file that describes the steps and actions that the cheat sheet has.

- **id** – a unique name that can be used to identify this cheat sheet
- **name** – a translatable name of the cheat sheet that will be used in the help menu and the selection dialog box
- **category** – a slash-delimited path ('/') of category IDs. Each token in the path must represent a valid category ID previously defined by this or some other plug-in. If omitted, the wizard will be added to the "Other" category.
- **contentFile** – the path of a cheat sheet content file. The content file is an XML file that contains the specifics of the cheat sheet ([cheat sheet content file format specification](#)). The content file is parsed at run time by the cheat sheet framework. Based on the settings in this file, a certain number of steps, actions, descriptions, and help links are shown to the user when the cheat sheet is opened. The path is interpreted as relative to the plug-in that declares the extension; the path may include special variables. In particular, use "\$nl\$" as the first segment of the path to indicate that there are locale-specific translations of the content file in subdirectories below "nl/". For more detail about the special variables, you can read the Java API document for [Platform.find](#).
- **listener** – listener is a fully qualified name of a Java class which must subclass `org.eclipse.ui.cheatsheets.CheatSheetListener`.

<!ELEMENT description (#CDATA)>

a short description of the cheat sheet

Examples:

Here is a sample usage of the cheatSheetContent extension point:

```
<extension point=
"org.eclipse.ui.cheatsheets.cheatSheetContent"
>
<category name=
"Example category"
id=
"com.example.category"
>
</category>
<cheatsheet name=
"Example cheat sheet"
category=
"com.example.category"
id=
"com.example.cheatSheet"
contentFile=
"ExampleCheatSheet.xml"
>
<description>
```

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This is a descriptive bit of text for my cheat sheet description.

</description>

</cheatsheet>

</extension>

API Information:

For further details see the spec for the org.eclipse.ui.cheatsheets API package.

Supplied Implementation:

There are no built-in cheat sheets.

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Cheat Sheet Content File XML Format

Version 3.0

This document describes the cheat sheet content file structure as a series of DTD fragments (machine readable [XML schema](#)).

cheatsheet

```
<!ELEMENT cheatsheet (intro, item+)>
<!ATTLIST cheatsheet
  title          CDATA #REQUIRED
>
```

The `<cheatsheet>` element defines the body of the cheat sheet content file. `<cheatsheet>` attributes are as follows:

- **title** – the title of the cheat sheet

intro

```
<!ELEMENT intro (description)>
<!ATTLIST intro
  contextId      CDATA #IMPLIED
  href           CDATA #IMPLIED
>
```

The `<intro>` element is used to describe the cheat sheet introduction to be displayed. The `<description>` subelement contains the body of the introduction. `<intro>` attributes are as follows:

- **contextId** – The optional help context id of the documentation for this cheat sheet. If supplied, context help for the given fully-qualified context id is shown to the user (typically in a small pop-up window) when they clicks the introduction's help link. If this attribute is supplied, the **href** attribute should not be supplied (**href** will be ignored if both are present).
- **href** – The optional help document describing this cheat sheet. If supplied, this help document is shown to the user (typically in a help browser shown in a separate window) when they clicks the introduction's help link. If this attribute is supplied, the **contextId** attribute should not be supplied (**href** will be ignored if both are present).

description

```
<!ELEMENT description EMPTY>
<!ATTLIST description
>
```

The `<description>` element holds the description of a cheat sheet or of a cheat sheet item. The description consists of text interspersed with simple formatting tags. The cheat sheet automatically formats and lays out the text to make it show up reasonably in the UI. Within the text, balanced `...` tags cause the enclosed text to be rendered in a bold font, and the `
` element can be used to force a line break. These are the only formatting tags supported at this time (however, others may be added in the future). Certain characters in the

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text have special significance for XML parsers; in particular, to write "<", ">", "&", "'", and "\"" (quotation mark) instead write "<", ">", "&", "'", and """ respectively. Whitespace (spaces and line breaks) is treated as a word separator; adjacent spaces and line breaks are treated as single unit and rendered as a single space or a line break. Whitespace immediately after the **<description>** and **
** tags is ignored, as is whitespace immediately before the **</description>** tag.

item

```
<!ELEMENT item (description ([action|perform-when] | (subitem|repeated-subitem|conditional-subitem)))
<!ATTLIST item
  title          CDATA #REQUIRED
  skip           ("true" | "false") "false"
  contextId     CDATA #IMPLIED
  href          CDATA #IMPLIED
>
```

Each `<item>` element describes one top-level step in a cheat sheet. The `<item>` is either simple or composite. `<item>` attributes are as follows:

- **title** – The title of the cheat sheet item.
- **skip** – `skip="true"` means that the whole step can be skipped; the UI generally shows a button that the user can press to indicate that they are skipping this step
- **contextId** – The optional help context id of the documentation for this cheat sheet step. If supplied, context help for the given fully-qualified context id is shown to the user (typically in a small pop-up window) when they clicks the step's help link. If this attribute is supplied, the **href** attribute should not be supplied (**href** will be ignored if both are present).
- **href** – The optional help document describing this cheat sheet step. If supplied, this help document is shown to the user (typically in a help browser shown in a separate window) when they clicks the step's help link. If this attribute is supplied, the **contextId** attribute should not be supplied (**href** will be ignored if both are present).

The `org.eclipse.ui.cheatsheets.cheatSheetItemExtension` allows additional custom controls for the item to be displayed in the UI. Contributions to this extension point declare the names of additional, string-valued attributes that may appear on `<item>` elements.

Simple items have a description and an optional action. In the typical presentation, the titles of cheat sheet items are shown to the user most of the time. An item's description is only shown while the step is in the process of being executed. The presence of an `<action>` (or `<perform-when>`) element is typically associated with a button that the user can press to perform the step's action. If no action is present, the step is one that the user must carry out manually and then overtly indicate that they have successfully completed the step.

Composite steps are broken down into sub-steps as specified by the `<subitem>` subelements. Unlike items, which the user must follow in strict sequence, the sub-items of a given item can be performed in any order. All sub-items within an item have to be attempted (or skipped) before progressing to the next item. (Which means actions that must be performed in a required sequence cannot be represented as sub-items.)

A `<conditional-subitem>` subelement allow a step to tailor the presentation of a sub-step based on cheat sheet variables whose values are acquired in earlier steps. A `<repeated-subitem>` subelement allows a step to include a set of similar sub-steps. Again, the exact set of sub-steps may be based on cheat sheet variables whose value are acquired in earlier steps.

subitem

```
<!ELEMENT subitem ( [action|perform-when] )>
<!ATTLIST subitem
  label          CDATA #REQUIRED
  skip           ( "true" | "false" ) "false"
  when          CDATA #IMPLIED
>
```

Each `<subitem>` element describes a sub-step in a cheat sheet. A `<subitem>` carries a simple text label, but has neither a lengthy description nor further sub-items. `<subitem>` attributes are as follows:

- **label** – The title of the cheat sheet sub-item. If the string contains substring occurrences of the form `"${var}"`, they are considered references to cheat sheet variables. All such occurrences in the string value will be replaced by the value of the corresponding variable in the context of the execution of the cheat sheet, or the empty string for variables that are unbound. The values of the variables are as of the beginning of the execution of the main step (when the `<item>` element is elaborated), rather than when the individual sub-step are run.
- **skip** – `skip="true"` means that the sub-step can be skipped. The UI generally shows a button that the user can press to indicate that they are skipping this sub-step.
- **when** – Indicates this subitem is to be used if and only if the value of the condition attribute of the containing `<conditional-subitem>` element matches this string value. This attribute is ignored if the `<subitem>` element is not a child of a `<conditional-subitem>` element.

Sub-items have an optional action. The presence of an `<action>` (or `<perform-when>`) element is typically associated with a button that the user can press to perform the sub-step's action. If no action is present, the sub-step is one that the user must carry out manually and then overtly indicate that they have successfully completed the step.

Unlike items, which must be followed in strict sequence, the sub-items of a given item can be performed in any order. All sub-items within an item have to be attempted (or skipped) before progressing to the next item. (Which means actions that must be performed in a required sequence should not be represented as sub-items.)

conditional-subitem

```
<!ELEMENT conditional-subitem (subitem+)>
<!ATTLIST conditional-subitem
  condition      CDATA #REQUIRED
>
```

Each `<conditional-subitem>` element describes a single sub-step whose form can differ based on a condition known at the time the item is expanded. `<conditional-subitem>` attributes are as follows:

- **condition** – Arbitrary string value used to select which child `<subitem>` will be used. If the attribute string has the form `"${var}"`, it is considered a reference to a cheat sheet variable `var`, and value of the condition will be the value of the variable for the cheat sheet at the start of execution of the containing `<item>` element (or the empty string if the variable is unbound at that time).

The **condition** attribute on the `<conditional-subitem>` element provides a string value (invariably this value comes from a cheat sheet variable). Each of the `<subitem>` children must carry a **when** attribute with a distinct string value. When the item is expanded, the `<conditional-subitem>` element is replaced by the `<subitem>`

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element with the matching value. It is considered an error if there is no `<subitem>` element with a matching value.

For example, if the cheat sheet variable named "v1" has the value "b" when the following item is expanded

```
<item ...>
  <conditional-subitem condition="{v1}">
    <subitem when="a" label="Step for A." />
    <subitem when="b" label="Step for B." />
  </conditional-subitem>
</item>
```

then the second sub-item is selected and the item expands to something equivalent to

```
<item ...>
  <subitem label="Step for B." />
</item>
```

repeated-subitem

```
<!ELEMENT repeated-subitem (subitem)>
<!ATTLIST repeated-subitem
  values          CDATA #REQUIRED
>
```

Each `<repeated-subitem>` element describes a sub-item that expands into 0, 1, or more similar sub-steps. `<repeated-subitem>` attributes are as follows:

- **values** – A string containing a comma-separated list of values. If the attribute string has the form `"${var}"`, it is considered a reference to a cheat sheet variable `var`, and value of the condition will be the value of the variable for the cheat sheet at the start of execution of the containing `<item>` element (or the empty string if the variable is unbound at that time).

The **values** attribute provides a list of comma-separated strings; the `<subitem>` child provide the template. When the item is expanded, the `<repeated-subitem>` element is replaced by copies of the `<subitem>` element with occurrences of the variable "this" replaced by the corresponding string value.

For example, if the cheat sheet variable named "v1" has the value "1,b,three" when the following item is expanded

```
<item ...>
  <repeated-subitem values="{v1}">
    <subitem label="Step ${this}.">
      <action class="com.xyz.myaction" pluginId="com.xyz" param1="{this}" />
    </subitem>
  </repeated-subitem>
</item>
```

then the item expands to something equivalent to:

```
<item ...>
  <subitem label="Step 1.">
    <action class="com.xyz.myaction" pluginId="com.xyz" param1="1" />
  </subitem>
  <subitem label="Step b.">
```

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```
<action class="com.xyz.myaction" pluginId="com.xyz" param1="b"/>
</subitem>
<subitem label="Step three.">
  <action class="com.xyz.myaction" pluginId="com.xyz" param1="three"/>
</subitem>
</item>
```

action

```
<!ELEMENT action EMPTY>
<!ATTLIST action
  class          CDATA #REQUIRED
  pluginId       CDATA #REQUIRED
  param1         CDATA #IMPLIED
  ...
  param9         CDATA #IMPLIED
  confirm        ("true" | "false") "false"
  when           CDATA #IMPLIED
>
```

Each <action> element describes an action in a cheat sheet. <action> attributes are as follows:

- **class** – The fully-qualified name of the Java class implementing `org.eclipse.jface.action.IAction`. If this action also implements `org.eclipse.ui.cheatsheets.ICheatSheetAction` it will be invoked via its `run(String[],ICheatSheetManager)` method and be passed the cheat sheet manager and action parameters. The `pluginId` attribute must be present whenever this attribute is present. It is strongly recommended that actions intended to be invoked from cheat sheets should report success/fail outcome if running the action might fail (perhaps because the user cancels the action from its dialog). (See `org.eclipse.jface.action.Action.notifyResult(boolean)` for details.)
- **pluginId** – The id of the plug-in which contains the Java class of the action class. This attribute must be present whenever the class attribute is present.
- **paramN** – For action classes that also implement `org.eclipse.ui.cheatsheets.ICheatSheetAction`, the string values of these attributes are passed to the action when it is invoked. You can pass up to 9 parameters to a cheat sheet action (**param1**, **param2**, etc.). The parameters supplied must start with parameter 1 and be contiguous; that is, it is illegal to specify **param2** without **param1** also being present. If the attribute string has the form `"${var}"`, it is considered a reference to a cheat sheet variable *var*, and value of the condition will be the value of the variable for the cheat sheet at the start of execution of the containing <item> element (or the empty string if the variable is unbound at that time).
- **confirm** – "true" indicates this step (or sub-step) requires the user to manually confirm that the action has been completed.
- **when** – Indicates this action is to be used if and only if the value of the condition attribute of the containing <perform-when> element matches this string value. This attribute is ignored if the <action> element is not a child of a <perform-when> element.

perform-when

```
<!ELEMENT perform-when (action+)>
<!ATTLIST perform-when
  condition      CDATA #REQUIRED
>
```

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Each `<perform-when>` element describes an action in a cheat sheet. `<perform-when>` attributes are as follows:

- **condition** – Arbitrary string value used to select which child `<action>` will be performed. If the attribute string has the form `"${var}"`, it is considered a reference to a cheat sheet variable *var*, and value of the condition will be the value of the variable for the cheat sheet at the start of execution of the containing `<item>` element (or the empty string if the variable is unbound at that time).

The **condition** attribute on the `<conditional-subitem>` element provides a string value (invariably this value comes from a cheat sheet variable). Each of the `<subitem>` children must carry a **when** attribute with a distinct string value. When the item is expanded, the `<conditional-subitem>` element is replaced by the `<subitem>` element with the matching value. It is considered an error if there is no `<subitem>` element with a matching value.

For example, if the cheat sheet variable named "v1" has the value "b" when the following item is expanded

```
<item ...>
  <subitem label="Main step">
    <perform-when condition="${v1}">
      <action when="a" class="com.xyz.action1" pluginId="com.xyz" />
      <action when="b" class="com.xyz.action2" pluginId="com.xyz" />
    </conditional-subitem>
  </subitem>
</item>
```

then the second action is selected and the item expands to something equivalent to

```
<item ...>
  <subitem label="Main step">
    <action class="com.xyz.action2" pluginId="com.xyz" />
  </subitem>
</item>
```

Example

The following is an example of a very simple cheat sheet content file:

```
<?xml version="1.0" encoding="UTF-8"?>
<cheatsheet title="Example">
  <intro>
    <description>Example cheat sheet with two steps.</description>
  </intro>
  <item title="Step 1">
    <description>This is a step with an action.</description>
    <action class="com.xyz.myaction" pluginId="com.xyz"/>
  </item>
  <item title="Step 2">
    <description>This is a fully manual step.</description>
  </item>
</cheatsheet>
```

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Cheat Sheet Item Extension

Identifier:

org.eclipse.ui.cheatsheets.cheatSheetItemExtension

Since:

3.0

Description:

This extension point should be used when an extra button needs to be added to a step in the cheat sheet. You can put a new attribute into the "item" tag in the cheat sheet content file, and when that value is read by the cheat sheet framework, it will check to see if there is a class registered through this extension point that will handle this attribute. The attribute name found in the cheat sheet content file is matched against all of the values found in the "itemAttribute" attribute of all of the registered cheatsheetItemExtension point implementations. If there is a match, the class specified to handle this item attribute is loaded by the cheat sheet framework and is called to handle the attribute specified in the cheat sheet content file. After having parsed the value of the item attribute, the class remains available to the cheat sheets framework. When the item is rendered for the cheat sheets view, the class is once again called to handle the addition of components to a Composite. The items that are added to this composite are displayed in the cheat sheet step (currently, beside the help icon). It is displayed only for the step that is described by the "item" tag that the attribute appeared in the cheat sheet content file. The suggested use of this extension point is adding a small (16x16) button with a graphic that opens a dialog box when pressed.

Configuration Markup:

```
<!ELEMENT extension (itemExtension)*>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT itemExtension EMPTY>
```

```
<!ATTLIST itemExtension
```

```
itemAttribute CDATA #REQUIRED
```

```
class CDATA #REQUIRED>
```

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Use this item extension to add elements to cheat sheet steps. You can use this extension point to add icons and buttons (currently, beside the help icon) for a step in the cheat sheet. You specify the name of an attribute that you will put into the cheat sheet item tag. You also specify a class that will handle the parsing of the attribute value from the cheat sheet content file when the cheat sheet is loaded. The attribute value must be a string. The specified class must subclass

`org.eclipse.ui.cheatsheets.AbstractItemExtensionElement`. After the cheat sheet content file is parsed and loaded, the class specified in the extension point is called again through the interface to add graphics or buttons to the step in the cheat sheet (currently, next to the help button).

- **itemAttribute** – This attribute value must be the string value of an attribute name that is put into an item tag in the cheat sheet content file. If this attribute string matches an attribute parsed from the item tag in the cheat sheet content file, the class specified will be loaded and will be called to parse the full value of the attribute using the w3 DOM specification. It will later be called to add controls to a Composite, and the added components (usually graphics or buttons) will appear in the step of the cheat sheet for the item specified (currently, beside the help icon for that step).
- **class** – The fully qualified class name of the class that subclasses `org.eclipse.ui.cheatsheet.AbstractItemExtensionElement` to handle unknown attributes in the cheat sheet content file and extend the steps in the cheat sheet. The class must be public, and have a public 1–argument constructor that accepts the attribute name (a `String`).

Examples:

Here is an example implementation of this extension point:

```
<extension point=
"org.eclipse.ui.cheatsheets.cheatSheetItemExtension"
>
<itemExtension itemAttribute=
"xyzButton"
class=
"com.example.HandleParsingAndAddButton"
>
</itemExtension>
</extension>
```

And here is the item attribute for that extension:

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```
<item title=  
"XYZ Title"  
xyzButton=  
"/icon/button.gif"  
>
```

Note that the value of the attribute in the item tag can be ANYTHING. It can be anything because the class that parses that attribute is the class `HandleParsingAndAddButton`, which in this example parses a string `/icon/button.gif` from the attribute. It later will use that info to load the gif and use it as the icon for a new button.

API Information:

See the Javadoc information for `org.eclipse.ui.cheatsheets.AbstractItemExtensionElement` for API details.

Supplied Implementation:

There is no supplied implementation at this time.

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Contexts

Identifier:

org.eclipse.ui.contexts

Since:

3.0

Description:

The `org.eclipse.ui.contexts` extension point is used to declare contexts and associated elements.

Configuration Markup:

```
<!ELEMENT extension (context , contextContextBinding)>
```

```
<!ATTLIST extension
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED
```

```
point CDATA #REQUIRED>
```

- **id** – An optional identifier of the extension instance.
- **name** – An optional name of the extension instance.
- **point** – A fully qualified identifier of the target extension point.

```
<!ELEMENT context EMPTY>
```

```
<!ATTLIST context
```

```
description CDATA #IMPLIED
```

```
id CDATA #REQUIRED
```

```
name CDATA #REQUIRED
```

```
parentId CDATA #IMPLIED>
```

This element is used to define contexts. If more than one of these elements exist with the same `id` attribute, only the last declared element (in order of reading the registry) is considered valid.

- **description** – A translatable short description of this context for display in the UI.
- **id** – The unique identifier of this context.

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- **name** – The translatable name of this context for display in the UI.
- **parentId** – The unique identifier of the parent of this context.

Examples:

The `plugin.xml` file in the `org.eclipse.ui` plugin makes use of the `org.eclipse.ui.contexts` extension point.

API Information:

There is currently no public API for declaring contexts or associated elements other than this extension point.

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Decorators

Identifier:

org.eclipse.ui.decorators

Since:

Release 2.0

Description:

This extension point is used to add decorators to views that subscribe to a decorator manager. As of 2.1 there is the concept of a lightweight decorator that will handle the image management for the decorator. It is also possible to declare a lightweight decorator that simply overlays an icon when enabled that requires no implementation from the plug-in.

An action's enablement and/or visibility can be defined using the elements `enablement` and `visibility` respectively. These two elements contain a boolean expression that is evaluated to determine the enablement and/or visibility.

The syntax is the same for the `enablement` and `visibility` elements. Both contain only one boolean expression sub-element. In the simplest case, this will be an `objectClass`, `objectState`, `pluginState`, or `systemProperty` element. In the more complex case, the `and`, `or`, and `not` elements can be combined to form a boolean expression. Both the `and`, and `or` elements must contain 2 sub-elements. The `not` element must contain only 1 sub-element.

Configuration Markup:

```
<!ELEMENT extension (decorator*)>
```

```
<!ATTLIST extension
```

```
  point CDATA #REQUIRED
```

```
  id CDATA #IMPLIED
```

```
  name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT decorator (description? , enablement?)>
```

```
<!ATTLIST decorator
```

```
  id CDATA #REQUIRED
```

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label CDATA #REQUIRED

class CDATA #IMPLIED

objectClass CDATA #IMPLIED

adaptable (true | false)

state (true | false)

lightweight (true|false)

icon CDATA #IMPLIED

location (TOP_LEFT|TOP_RIGHT|BOTTOM_LEFT|BOTTOM_RIGHT|UNDERLAY) >

- **id** – a unique name that will be used to identify this decorator.
- **label** – a translatable name that will be used in the workbench window menu to represent this decorator.
- **class** – a fully qualified name of a class which implements `org.eclipse.jface.viewers.ILabelDecorator` if *lightweight* is false or `org.eclipse.jface.viewers.ILightweightLabelDecorator` if *lightweight* is true. The default value is false. If there is no *class* element it is assumed to be true.
- **objectClass** – a fully qualified name of a class which this decorator will be applied to. Deprecated in 2.1. Make this value part of the enablement.
- **adaptable** – a flag that indicates if types that adapt to `IResource` should use this object contribution. This flag is used only if *objectClass* adapts to `IResource`. Default value is false.
- **state** – a flag that indicates if the decorator is on by default. Default value is false.
- **lightweight** – The *lightweight* flag indicates that the decorator is either declarative or implements `org.eclipse.jface.viewers.ILightweightLabelDecorator`.
- **icon** – if the decorator is *lightweight* and the *class* is not specified this is the path to the overlay image to apply
- **location** – if the decorator is *lightweight* this is the location to apply the decorator to. Defaults to `BOTTOM_RIGHT`.

<!ELEMENT description (#CDATA)>

an optional subelement whose body should contain text providing a short description of the decorator. This will be shown in the Decorators preference page so it is recommended that this is included. Default value is an empty String.

<!ELEMENT enablement (and | or | not | objectClass | objectState | pluginState | systemProperty)>

This element is used to define the enablement for the extension.

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<!ELEMENT visibility (and | or | not | objectClass | objectState | pluginState | systemProperty)>

This element is used to define the visibility for the extension.

<!ELEMENT and (and | or | not | objectClass | objectState | pluginState | systemProperty)>

This element represent a boolean AND operation on the result of evaluating it's two sub–element expressions.

<!ELEMENT or (and | or | not | objectClass | objectState | pluginState | systemProperty)>

This element represent a boolean OR operation on the result of evaluating it's two sub–element expressions.

<!ELEMENT not (and | or | not | objectClass | objectState | pluginState | systemProperty)>

This element represent a boolean NOT operation on the result of evaluating it's sub–element expressions.

<!ELEMENT objectClass EMPTY>

<!ATTLIST objectClass

name CDATA #REQUIRED>

This element is used to evaluate the class or interface of each object in the current selection. If each object in the selection implements the specified class or interface, the expression is evaluated as true.

- **name** – a fully qualified name of a class or interface. The expression is evaluated as true only if all objects within the selection implement this class or interface.

<!ELEMENT objectState EMPTY>

<!ATTLIST objectState

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name CDATA #REQUIRED

value CDATA #REQUIRED>

This element is used to evaluate the attribute state of each object in the current selection. If each object in the selection has the specified attribute state, the expression is evaluated as true. To evaluate this type of expression, each object in the selection must implement, or adapt to, `org.eclipse.ui.IActionFilter` interface.

- **name** – the name of an object's attribute. Acceptable names reflect the object type, and should be publicly declared by the plug-in where the object type is declared.
- **value** – the required value of the object's attribute. The acceptable values for the object's attribute should be publicly declared.

<!ELEMENT pluginState EMPTY>

<!ATTLIST pluginState

id CDATA #REQUIRED

value (installed|activated) "installed">

This element is used to evaluate the state of a plug-in. The state of the plug-in may be one of the following: `installed` or `activated`.

- **id** – the identifier of a plug-in which may or may not exist in the plug-in registry.
- **value** – the required state of the plug-in. The state of the plug-in may be one of the following: `installed` or `activated`.

<!ELEMENT systemProperty EMPTY>

<!ATTLIST systemProperty

name CDATA #REQUIRED

value CDATA #REQUIRED>

This element is used to evaluate the state of some system property. The property value is retrieved from the `java.lang.System`.

- **name** – the name of the system property.

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- **value** – the required value of the system property.

Examples:

The following are example of decorators:

A full decorator. The plug-in developer must handle their own image support.

```
<extension point=
"org.eclipse.ui.decorators"
>
<decorator id=
"com.xyz.decorator"
label=
"XYZ Decorator"
state=
"true"
class=
"com.xyz.DecoratorContributor"
>
<enablement>
<objectClass name=
"org.eclipse.core.resources.IResource"
/>
</enablement>
</decorator>
</extension>
```

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A lightweight decorator. There is a concrete class but as it is an `ILightweightLabelDecorator` it only needs to supply text and an `ImageDescriptor` and therefore needs no resource handling.

```
<extension point=
"org.eclipse.ui.decorators"
>
<decorator id=
"com.xyz.lightweight.decorator"
label=
"XYZ Lightweight Decorator"
state=
"false"
class=
"com.xyz.LightweightDecoratorContributor"
lightweight=
"true"
>
<enablement>
<objectClass name=
"org.eclipse.core.resources.IResource"
/>
</enablement>
</decorator>
</extension>
```

A declarative lightweight decorator. There is no concrete class so it supplies an icon and a quadrant to apply that icon.

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```
<extension point=
"org.eclipse.ui.decorators"
>
<decorator id=
"com.xyz.lightweight.declarative.decorator"
label=
"XYZ Lightweight Declarative Decorator"
state=
"false"
lightweight=
"true"
icon=
"icons/full/declarative.gif"
location=
"TOP_LEFT"
>
<enablement>
<objectClass name=
"org.eclipse.core.resources.IResource"
/>
</enablement>
</decorator>
</extension>
```

API Information:

The value of the `class` attribute must be the fully qualified name of a class that implements `org.eclipse.jface.viewers.ILabelDecorator` (if `lightweight` is false) or `org.eclipse.jface.viewers.ILightweightLabelDecorator`. This class is loaded as late as

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possible to avoid loading the entire plug-in before it is really needed. Declarative decorators do not entail any plug-in activation and should be used whenever possible. Non-lightweight decorators will eventually be deprecated.

Supplied Implementation:

Plug-ins may use this extension point to add new decorators to be applied to views that use the decorator manager as their label decorator. To use the decorator manager, use the result of `IViewPart.getDecoratorManager()` as the decorator for an instance of `DecoratingLabelProvider`. This is currently in use by the Resource Navigator.

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Drop Actions

Identifier:

org.eclipse.ui.dropActions

Description:

This extension point is used to add drop behaviour to views defined by other plugins.

Due to the UI layering imposed by the plugin mechanism, views are often not aware of the content and nature of other views. This can make drag and drop operations between plugins difficult. For example, one may wish to provide Java refactoring support whereby the user drags a method from the Java editor's content outliner into another java file in the resource navigator. Since the resource navigator doesn't know anything about Java content, it doesn't know how to behave when java methods are dropped onto it. Similarly, an ISV may want to drop some of their content into one of the Java viewers.

The `org.eclipse.ui.dropActions` extension point is provided by the Platform to address these situations. This mechanism delegates the drop behaviour back to the originator of the drag operation. This behaviour is contained in an action that must implement `org.eclipse.ui.part.IDropActionDelegate`. The viewer that is the source of the drag operation must support the `org.eclipse.ui.part.PluginTransfer` transfer type, and place a `PluginTransferData` object in the drag event. See `org.eclipse.jface.viewers.StructuredViewer#addDragSupport` to learn how to add drag support to a viewer.

Configuration Markup:

```
<!ELEMENT extension (action*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT action EMPTY>
```

```
<!ATTLIST action
```

```
id CDATA #REQUIRED
```

```
class CDATA #REQUIRED>
```

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- **id** – a unique identifier that can be used to reference this action
- **class** – the name of the fully qualified class that implements `org.eclipse.ui.part.IDropActionDelegate`.

Examples:

The following is an example of a drop action extension:

```
<extension point=
"org.eclipse.ui.dropActions"
>
<action id=
"my_drop_action"
class=
"com.xyz.eclipse.TestDropAction"
>
</action>
</extension>
```

Here is an example of a drag listener that makes use of the drop action defined above.

```
class MyDragListener extends DragSourceAdapter {
    public void dragSetData(DragSourceEvent event) {
        if (PluginTransfer.getInstance().isSupportedType(event.dataType)) {
            byte[] dataToSend = ...//enter the data to be sent.
            event.data = new PluginTransferData(
                my_drop_action, dataToSend);
        }
    }
}
```

For a more complete example, see the Platform readme example. In that example, a drop action is defined in `ReadmeDropActionDelegate`, and it is used by `ReadmeContentOutlineDragListener`.

API Information:

The value of the class attribute must be a fully qualified name of a Java class that implements `org.eclipse.ui.part.IDropActionDelegate`. This class is loaded as late as possible to avoid loading the entire plug-in before it is really needed

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Supplied Implementation:

The workbench does not provide an implementation for this extension point. Plug-ins can contribute to this extension point to add drop behavior to views defined by other plugins.

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Editor Menus, Toolbars and Actions

Identifier:

org.eclipse.ui.editorActions

Description:

This extension point is used to add actions to the menu and toolbar for editors registered by other plug-ins.

The initial contribution set for an editor is defined by another extension point (org.eclipse.ui.editors). One set of actions is created and shared by all instances of the same editor type. When invoked, these action act upon the active editor. This extension point follows the same pattern. Each action extension is created and shared by all instances of the same editor type. The action class is required to implement `org.eclipse.ui.IEditorActionDelegate`. The active editor is passed to the delegate by invoking `IEditorActionDelegate.setActiveEditor`.

An action's enablement and/or visibility can be defined using the elements `enablement` and `visibility` respectively. These two elements contain a boolean expression that is evaluated to determine the enablement and/or visibility.

The syntax is the same for the `enablement` and `visibility` elements. Both contain only one boolean expression sub-element. In the simplest case, this will be an `objectClass`, `objectState`, `pluginState`, or `systemProperty` element. In the more complex case, the `and`, `or`, and `not` elements can be combined to form a boolean expression. Both the `and`, and `or` elements must contain 2 sub-elements. The `not` element must contain only 1 sub-element.

Configuration Markup:

```
<!ELEMENT extension (editorContribution+)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT editorContribution (menu* ,action*)>
```

```
<!ATTLIST editorContribution
```

```
id CDATA #REQUIRED
```

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targetID CDATA #REQUIRED>

This element is used to define a group of editor actions and/or menus.

- **id** – a unique identifier used to reference this contribution.
- **targetID** – a unique identifier of a registered editor that is the target of this contribution.

<!ELEMENT action (selection* | enablement?)>

<!ATTLIST action

id CDATA #REQUIRED

label CDATA #REQUIRED

accelerator CDATA #IMPLIED

definitionId CDATA #IMPLIED

menubarPath CDATA #IMPLIED

toolbarPath CDATA #IMPLIED

icon CDATA #IMPLIED

disabledIcon CDATA #IMPLIED

hoverIcon CDATA #IMPLIED

tooltip CDATA #IMPLIED

helpContextId CDATA #IMPLIED

style (push|radio|toggle) "push"

state (true | false)

class CDATA #REQUIRED

enablesFor CDATA #IMPLIED

actionID CDATA #IMPLIED>

This element defines an action that the user can invoke in the UI.

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- **id** – a unique identifier used as a reference for this action.
- **label** – a translatable name used either as the menu item text or toolbar button label. The name can include mnemonic information.
- **accelerator** – **Deprecated:** Use the `definitionId` attribute instead.
- **definitionId** – Specifies the command that this action will handle. By specifying an action, the key binding service can assign a key sequence to this action. See the extension point org.eclipse.ui.commands for more information.
- **menubarPath** – a slash-delimited path ('/') used to specify the location of this action in the menu bar. Each token in the path, except the last one, must represent a valid identifier of an existing menu in the hierarchy. The last token represents the named group into which this action will be added. If the path is omitted, this action will not appear in the menu bar.
- **toolbarPath** – a slash-delimited path ('/') that is used to specify the location of this action in the toolbar. The first token represents the toolbar identifier (with "Normal" being the default toolbar), while the second token is the named group within the toolbar that this action will be added to. If the group does not exist in the toolbar, it will be created. If `toolbarPath` is omitted, the action will not appear in the toolbar.
- **icon** – a relative path of an icon used to visually represent the action in its context. If omitted and the action appears in the toolbar, the Workbench will use a placeholder icon. The path is relative to the location of the `plugin.xml` file of the contributing plug-in. The icon will appear in toolbars but not in menus. Enabled actions will be represented in menus by the `hoverIcon`.
- **disabledIcon** – a relative path of an icon used to visually represent the action in its context when the action is disabled. If omitted, the normal icon will simply appear greyed out. The path is relative to the location of the `plugin.xml` file of the contributing plug-in. The disabled icon will appear in toolbars but not in menus. Icons for disabled actions in menus will be supplied by the OS.
- **hoverIcon** – a relative path of an icon used to visually represent the action in its context when the mouse pointer is over the action. If omitted, the normal icon will be used. The path is relative to the location of the `plugin.xml` file of the contributing plug-in.
- **tooltip** – a translatable text representing the action's tool tip. Only used if the action appears in the toolbar.
- **helpContextId** – a unique identifier indicating the help context for this action. If the action appears as a menu item, then pressing F1 while the menu item is highlighted will display help.
- **style** – an optional attribute to define the user interface style type for the action. If defined, the attribute value will be one of the following:
 - push** – as a regular menu item or tool item.
 - radio** – as a radio style menu item or tool item. Actions with the radio style within the same menu or toolbar group behave as a radio set. The initial value is specified by the `state` attribute.
 - toggle** – as a checked style menu item or as a toggle tool item. The initial value is specified by the `state` attribute.
- **state** – an optional attribute indicating the initial state (either `true` or `false`), used when the `style` attribute has the value `radio` or `toggle`.
- **class** – the name of the fully qualified class that implements `org.eclipse.ui.IEditorActionDelegate`
- **enablesFor** – a value indicating the selection count which must be met to enable the action. If this attribute is specified and the condition is met, the action is enabled. If the condition is not met, the action is disabled. If no attribute is specified, the action is enabled for any number of items selected. The following attribute formats are supported:
 - !** – 0 items selected
 - ?** – 0 or 1 items selected

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- + – 1 or more items selected
- multiple, 2+** – 2 or more items selected
- n** – a precise number of items selected. a precise number of items selected. For example: enablesFor=" 4" enables the action only when 4 items are selected
- *** – any number of items selected

- **actionID** – Internal tag for use by the text editors. Should not be used by plug-in developers.

<!ELEMENT menu (separator+ , groupMarker*)>

<!ATTLIST menu

id CDATA #REQUIRED

label CDATA #REQUIRED

path CDATA #IMPLIED>

This element is used to defined a new menu.

- **id** – a unique identifier that can be used to reference this menu.
- **label** – a translatable name used by the Workbench for this new menu. The name should include mnemonic information.
- **path** – the location of the new menu starting from the root of the menu. Each token in the path must refer to an existing menu, except the last token which should represent a named group in the last menu in the path. If omitted, the new menu will be added to the `additions` named group of the menu.

<!ELEMENT separator EMPTY>

<!ATTLIST separator

name CDATA #REQUIRED>

This element is used to create a menu separator in the new menu.

- **name** – the name of the menu separator. This name can later be referenced as the last token in a menu path. Therefore, a separator also serve as named group into which actions and menus can be added.

<!ELEMENT groupMarker EMPTY>

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<!ATTLIST groupMarker

name CDATA #REQUIRED>

This element is used to create a named group in the new menu. It has no visual representation in the new menu, unlike the `separator` element.

- **name** – the name of the group marker. This name can later be referenced as the last token in the menu path. It serves as named group into which actions and menus can be added.

<!ELEMENT selection EMPTY>

<!ATTLIST selection

class CDATA #REQUIRED

name CDATA #IMPLIED>

This element is used to help determine the action enablement based on the current selection. Ignored if the `enablement` element is specified.

- **class** – a fully qualified name of the class or interface that each object in the selection must implement in order to enable the action.
- **name** – an optional wild card filter for the name that can be applied to all objects in the selection. If specified and the match fails, the action will be disabled.

<!ELEMENT enablement (and | or | not | objectClass | objectState | pluginState | systemProperty)>

This element is used to define the enablement for the extension.

<!ELEMENT visibility (and | or | not | objectClass | objectState | pluginState | systemProperty)>

This element is used to define the visibility for the extension.

<!ELEMENT and (and | or | not | objectClass | objectState | pluginState | systemProperty)>

This element represent a boolean AND operation on the result of evaluating it's two sub–element expressions.

```
<!ELEMENT or (and |_or |_not |_objectClass |_objectState |_pluginState |_systemProperty)>
```

This element represent a boolean OR operation on the result of evaluating it's two sub–element expressions.

```
<!ELEMENT not (and |_or |_not |_objectClass |_objectState |_pluginState |_systemProperty)>
```

This element represent a boolean NOT operation on the result of evaluating it's sub–element expressions.

```
<!ELEMENT objectClass EMPTY>
```

```
<!ATTLIST objectClass
```

```
name CDATA #REQUIRED>
```

This element is used to evaluate the class or interface of each object in the current selection. If each object in the selection implements the specified class or interface, the expression is evaluated as true.

- **name** – a fully qualified name of a class or interface. The expression is evaluated as true only if all objects within the selection implement this class or interface.

```
<!ELEMENT objectState EMPTY>
```

```
<!ATTLIST objectState
```

```
name CDATA #REQUIRED
```

```
value CDATA #REQUIRED>
```

This element is used to evaluate the attribute state of each object in the current selection. If each object in the selection has the specified attribute state, the expression is evaluated as true. To evaluate this type of expression, each object in the selection must implement, or adapt to, `org.eclipse.ui.IActionFilter` interface.

- **name** – the name of an object's attribute. Acceptable names reflect the object type, and should be publicly declared by the plug–in where the object type is declared.

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- **value** – the required value of the object's attribute. The acceptable values for the object's attribute should be publicly declared.

```
<!ELEMENT pluginState EMPTY>

<!ATTLIST pluginState
id CDATA #REQUIRED
value (installed|activated) "installed">
```

This element is used to evaluate the state of a plug-in. The state of the plug-in may be one of the following: `installed` or `activated`.

- **id** – the identifier of a plug-in which may or may not exist in the plug-in registry.
- **value** – the required state of the plug-in. The state of the plug-in may be one of the following: `installed` or `activated`.

```
<!ELEMENT systemProperty EMPTY>

<!ATTLIST systemProperty
name CDATA #REQUIRED
value CDATA #REQUIRED>
```

This element is used to evaluate the state of some system property. The property value is retrieved from the `java.lang.System`.

- **name** – the name of the system property.
- **value** – the required value of the system property.

Examples:

The following is an example of an editor action extension:

```
<extension point=
"org.eclipse.ui.editorActions">
```



```
>  
<editorContribution id=  
"com.xyz.xyzContribution"  
targetID=  
"com.ibm.XMLEditor"
```

```
>  
<menu id=  
"XYZ"  
label=  
"&XYZ Menu"
```

```
>  
<separator name=  
"group1"  
>
```

```
</menu>  
<action id=  
"com.xyz.runXYZ"  
label=  
"&Run XYZ Tool"  
menubarPath=  
"XYZ/group1"  
toolbarPath=  
"Normal/additions"  
style=  
"toggle"  
state=
```

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```
"true"

icon=

"icons/runXYZ.gif"

tooltip=

"Run XYZ Tool"

helpContextId=

"com.xyz.run_action_context"

class=

"com.xyz.actions.RunXYZ"

>

<selection class=

"org.eclipse.core.resources.IFile"

name=

"*.*java"

/>

</action>

</editorContribution>

</extension>
```

In the example above, the specified action will appear as a check box item in the new top-level menu named "XYZ Menu", and as a toggle button in the toolbar. The action is enabled if the selection contains only Java file resources.

The following is an other example of an editor action extension:

```
<extension point=

"org.eclipse.ui.editorActions"

>

<editorContribution id=
```

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```
"com.xyz.xyz2Contribution"
```

```
targetID=
```

```
"com.ibm.XMLEditor"
```

```
>
```

```
<menu id=
```

```
"XYZ2"
```

```
label=
```

```
"&XYZ2 Menu"
```

```
path=
```

```
"edit/additions"
```

```
>
```

```
<separator name=
```

```
"group1"
```

```
/>
```

```
</menu>
```

```
<action id=
```

```
"com.xyz.runXYZ2"
```

```
label=
```

```
"&Run XYZ2 Tool"
```

```
menubarPath=
```

```
"edit/XYZ2/group1"
```

```
style=
```

```
"push"
```

```
icon=
```

```
"icons/runXYZ2.gif"
```

```
tooltip=
```

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```
"Run XYZ2 Tool"  
  
helpContextId=  
"com.xyz.run_action_context2"  
  
class=  
"com.xyz.actions.RunXYZ2"  
  
>  
  
<enablement>  
  
<and>  
  
<objectClass name=  
"org.eclipse.core.resources.IFile"  
  
>  
  
<not>  
  
<objectState name=  
"extension"  
  
value=  
"java"  
  
>  
  
</not>  
  
</and>  
  
</enablement>  
  
</action>  
  
</editorContribution>  
  
</extension>
```

In the example above, the specified action will appear as a menu item in the sub-menu named "XYZ2 Menu" in the top level "Edit" menu. The action is enabled if the selection contains no Java file resources.

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API Information:

The value of the class attribute must be a fully qualified name of a Java class that implements `org.eclipse.ui.IEditorActionDelegate`. This class is loaded as late as possible to avoid loading the entire plug-in before it is really needed. The method `setActiveEditor` will be called each time an editor of the specified type is activated. Only one set of actions and menus will be created for all instances of the specified editor type, regardless of the number of editor instances currently opened in the Workbench.

This extension point can be used to contribute actions into menus previously created by the target editor. In addition, menus and actions can be contributed to the Workbench window. The identifiers for actions and major groups within the Workbench window are defined in `org.eclipse.ui.IWorkbenchActionConstants`. These should be used as a reference point for the addition of new actions. Top level menus are created by using the following values for the path attribute:

- `additions` – represents a named group immediately to the left of the Window menu.

Omitting the path attribute will result in adding the new menu into the additions menu bar group.

Actions and menus added into these paths will only be shown while the associated editor is active. When the editor is closed, menus and actions will be removed.

The enablement criteria for an action extension is initially defined by `enablesFor`, and also either `selection` or `enablement`. However, once the action delegate has been instantiated, it may control the action enable state directly within its `selectionChanged` method.

Action and menu labels may contain special characters that encode mnemonics using the following rules:

1. Mnemonics are specified using the ampersand ('&') character in front of a selected character in the translated text. Since ampersand is not allowed in XML strings, use `&` character entity.

If two or more actions are contributed to a menu or toolbar by a single extension the actions will appear in the reverse order of how they are listed in the `plugin.xml` file. This behavior is admittedly unintuitive. However, it was discovered after the Eclipse Platform API was frozen. Changing the behavior now would break every plug-in which relies upon the existing behavior.

The `selection` and `enablement` elements are mutually exclusive. The `enablement` element can replace the `selection` element using the sub-elements `objectClass` and `objectState`. For example, the following:

```
<selection class=  
"org.eclipse.core.resources.IFile"  
name=  
"*.*java"  
>
```

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</selection>

can be expressed using:

<enablement>

<and>

<objectClass name=

"org.eclipse.core.resources.IFile"

/>

<objectState name=

"extension"

value=

"java"

/>

</and>

</enablement>

Supplied Implementation:

The Workbench provides a built-in "Default Text Editor". Plug-ins can contribute into this default editor or editors provided by other plug-ins.

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<http://www.eclipse.org/legal/cpl-v10.html>

Internal and External Editors

Identifier:

org.eclipse.ui.editors

Description:

This extension point is used to add new editors to the workbench. An editor is a visual component within a workbench page. It is typically used to edit or browse a document or input object. To open an editor, the user will typically invoke "Open" on an `IFile`. When this action is performed the workbench registry is consulted to determine an appropriate editor for the file type and then a new instance of the editor type is created. The actual result depends on the type of the editor. The workbench provides support for the creation of internal editors, which are tightly integrated into the workbench, and external editors, which are launched in a separate frame window. There are also various level of integration between these extremes.

In the case of an internal editor tight integration can be achieved between the workbench window and the editor part. The workbench menu and toolbar are pre-loaded with a number of common actions, such as cut, copy, and paste. The active part, view or editor, is expected to provide the implementation for these actions. An internal editor may also define new actions which appear in the workbench window. These actions only appear when the editor is active.

The integration between the workbench and external editors is more tenuous. In this case the workbench may launch an editor but after has no way of determining the state of the external editor or collaborating with it by any means except through the file system.

Configuration Markup:

```
<!ELEMENT extension (editor*)>
```

```
<!ATTLIST extension
```

```
  point CDATA #REQUIRED
```

```
  id CDATA #IMPLIED
```

```
  name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT editor EMPTY>
```

```
<!ATTLIST editor
```

```
  id CDATA #REQUIRED
```

```
  name CDATA #REQUIRED
```

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icon CDATA #IMPLIED

extensions CDATA #IMPLIED

class CDATA #IMPLIED

command CDATA #IMPLIED

launcher CDATA #IMPLIED

contributorClass CDATA #IMPLIED

default (true | false) "false"

filenames CDATA #IMPLIED

symbolicFontName CDATA #IMPLIED>

- **id** – a unique name that will be used to identify this editor
- **name** – a translatable name that will be used in the UI for this editor
- **icon** – a relative name of the icon that will be used for all resources that match the specified extensions. An icon is not required if you specify a command rather than a class. In that case, the workbench will use the icon provided by the operating system.
- **extensions** – an optional field containing the list of file types understood by the editor. This is a string containing comma separate file extensions. For instance, an editor which understands hypertext documents may register for "htm, html".
- **class** – the name of a class that implements `org.eclipse.ui.IEditorPart`. The attributes `class`, `command`, and `launcher` are mutually exclusive. If this attribute is defined then `contributorClass` should also be defined.
- **command** – a command to run in order to launch an external editor. The executable command must be located on the system path or in the plug-in's directory. The attributes `class`, `command`, and `launcher` are mutually exclusive.
- **launcher** – the name of a class which that implements `org.eclipse.ui.IEditorLauncher`. A launcher will open an external editor. The attributes `class`, `command`, and `launcher` are mutually exclusive.
- **contributorClass** – the name of a class that implements `org.eclipse.ui.IEditorActionBarContributor`. This attribute should only be defined if the `class` attribute is defined. This class is used to add new actions to the workbench menu and tool bar which reflect the features of the editor type.
- **default** – if true, this editor will be used as the default editor for the type. This is only relevant in a case where more than one editor is registered for the same type. If an editor is not the default for the type, it can still be launched using "Open with..." submenu for the selected resource.
- **filenames** – an optional field containing the list of file names understood by the editor. This is a string containing comma separate file names. For instance, an editor which understands specific hypertext documents may register for "ejb.htm, ejb.html".
- **symbolicFontName** – the symbolic name of a font. The symbolic font name must be the id of a defined font (see `org.eclipse.ui.fontDefinitions`). If this attribute is missing or invalid then the font name is the value of "org.eclipse.jface.textfont" in the editor's preferences store. If there is no preference store or the key is not defined then the JFace text font will be used. The editor implementation decides if it uses this symbolic font name to set the font.

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Examples:

The following is an example of an internal editor extension definition:

```
<extension point=
"org.eclipse.ui.editors"
>
<editor id=
"com.xyz.XMLEditor"
name=
"Fancy XYZ XML editor"
icon=
"./icons/XMLEditor.gif"
extensions=
"xml"
class=
"com.xyz.XMLEditor"
contributorClass=
"com.xyz.XMLEditorContributor"
symbolicFontName=
"org.eclipse.jface.textfont"
default=
>false"
>
</editor>
</extension>
```

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API Information:

If the `command` attribute is used, it will be treated as an external program command line that will be executed in a platform-dependent manner.

If the `launcher` attribute is used the editor will also be treated as an external program. In this case the specified class must implement `org.eclipse.ui.IEditorLauncher`. The launcher will be instantiated and then `open(IFile file)` will be invoked to launch the editor.

If the `class` attribute is used, the workbench will assume that it is an internal editor and the specified class must implement `org.eclipse.ui.IEditorPart`. It is common practice to subclass `org.eclipse.ui.EditorPart` when defining a new editor type. It is also necessary to define a `contributorClass` attribute. The specified class must implement `org.eclipse.ui.IEditorActionBarContributor`, and is used to add new actions to the workbench menu and tool bar which reflect the features of the editor type.

Within the workbench there may be more than one open editor of a particular type. For instance, there may be one or more open Java Editors. To avoid the creation of duplicate actions and action images the editor concept has been split into two. An `IEditorActionBarContributor` is responsible for the creation of actions. The editor is responsible for action implementation. Furthermore, the contributor is shared by each open editor. As a result of this design there is only one set of actions for one or more open editors.

The contributor will add new actions to the workbench menu and toolbar which reflect the editor type. These actions are shared and, when invoked, act upon the active editor. The active editor is passed to the contributor by invoking `IEditorActionBarContributor.setActiveEditor`. The identifiers for actions and major groups within the workbench window are defined in `org.eclipse.ui.IWorkbenchActionConstants`. These should be used as a reference point for the addition of new actions. Top level menus are created by using the following values for the `path` attribute:

- `additions` – represents a group to the left of the Window menu.

Actions and menus added into these paths will only be shown while the associated editor is active. When the editor is closed, menus and actions will be removed.

Supplied Implementation:

The workbench provides a "Default Text Editor". The end user product may contain other editors as part of the shipping bundle. In that case, editors will be registered as extensions using the syntax described above.

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Element Factories

Identifier:

org.eclipse.ui.elementFactories

Description:

This extension point is used to add element factories to the workbench. An element factory is used to recreate `IAdaptable` objects which are persisted during workbench shutdown.

As an example, the element factory is used to persist editor input. The input for an editor must implement `org.eclipse.ui.EditorInput`. The life cycle of an `IEditorInput` within an editor has a number of phases.

1. The initial input for an editor is passed in during editor creation.
2. On shutdown the workbench state is captured. In this process the workbench will create a memento for each open editor and its input. The input is saved as a two part memento containing a factory ID and any primitive data required to recreate the element on startup. For more information see the documentation on `org.eclipse.ui.IPersistableElement`.
3. On startup the workbench state is read and the editors from the previous session are recreated. In this process the workbench will recreate the input element for each open editor. To do this it will map the original factory ID for the input element to a concrete factory class defined in the registry. If a mapping exists, and the factory class is valid, an instance of the factory class is created. Then the workbench asks the factory to recreate the original element from the remaining primitive data within the memento. The resulting `IAdaptable` is cast to an `IEditorInput` and passed to the new editor.

Configuration Markup:

```
<!ELEMENT extension (factory*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT factory EMPTY>
```

```
<!ATTLIST factory
```

```
id CDATA #REQUIRED
```

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class CDATA #REQUIRED>

- **id** – a unique name that will be used to identify this factory.
- **class** – a fully qualified name of a class that implements `org.eclipse.ui.IElementFactory`

Examples:

The following is an example of an element factory extension:

```
<extension point =  
"org.eclipse.ui.elementFactories"  
>  
<factory id =  
"com.xyz.ElementFactory"  
class=  
"com.xyz.ElementFactory"  
>  
</factory>  
</extension>
```

API Information:

The value of the `class` attribute must be a fully qualified name of a class that implements `org.eclipse.ui.IElementFactory`. An instance of this class must create an `IAdaptable` object from a workbench memo.

Supplied Implementation:

The workbench provides an `IResource` factory. Additional factories should be added to recreate other `IAdaptable` types commonly found in other object models, such as the Java Model.

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Export Wizards

Identifier:

org.eclipse.ui.exportWizards

Description:

This extension point is used to register export wizard extensions. Export wizards appear as choices within the "Export Dialog", and are used to export resources from the workbench.

Wizards may optionally specify a description subelement whose body should contain short text about the wizard.

Configuration Markup:

```
<!ELEMENT extension (wizard*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT wizard (description? , selection*)>
```

```
<!ATTLIST wizard
```

```
id CDATA #REQUIRED
```

```
name CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
icon CDATA #IMPLIED>
```

an element that will be used to create export wizard

- **id** – a unique name that will be used to identify this wizard
- **name** – a translatable name that will be used in the dialog box to represent this wizard

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- **class** – a fully qualified name of the class that implements `org.eclipse.ui.IExportWizard` interface
- **icon** – a relative name of the icon that will be used alongside the wizard name in the export engine listing.

<!ELEMENT description (#CDATA)>

an optional subelement whose body should represent a short description of the export engine functionality.

<!ELEMENT selection EMPTY>

<!ATTLIST selection

name CDATA #IMPLIED

class CDATA #REQUIRED>

an optional element that restricts the types and names of objects that can be selected when the wizard is invoked.

- **name** – an optional name filter. Each object in the workbench selection must match the name filter to be passed to the wizard.
- **class** – a fully qualified class name. If each object in the workbench selection implements this interface the selection will be passed to the wizard. Otherwise, an empty selection is passed.

Examples:

The following is an example of an export extension definition:

```
<extension point=
```

```
"org.eclipse.ui.exportWizards"
```

```
>
```

```
<wizard id=
```

```
"com.xyz.ExportWizard1"
```

```
name=
```

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```
"XYZ Web Exporter"  
  
class=  
  
"com.xyz.exports.ExportWizard1"  
  
icon=  
  
"./icons/import1.gif"  
  
>  
  
<description>  
  
A simple engine that exports Web project  
  
</description>  
  
<selection class=  
  
"org.eclipse.core.resources.IProject"  
  
</>  
  
</wizard>  
  
</extension>
```

API Information:

The value of the `class` attribute must be a name of the class that implements `org.eclipse.ui.IExportWizard`.

Supplied Implementation:

The workbench comes preloaded with basic export engines for files and directories.

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Font Definitions

Identifier:

org.eclipse.ui.fontDefinitions

Since:

Release 2.1

Description:

This extension point is used to register fonts with the JFace FontRegistry and with the workbench preference store for use by the Fonts preference page. This extension point has been deprecated in 3.0. You should now add fontDefinition elements to org.eclipse.ui.themes.

Configuration Markup:

```
<!ELEMENT extension (fontDefinition*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT fontDefinition (description?)>
```

```
<!ATTLIST fontDefinition
```

```
id CDATA #REQUIRED
```

```
label CDATA #REQUIRED
```

```
value CDATA #IMPLIED
```

```
categoryId CDATA #IMPLIED
```

```
defaultsTo CDATA #IMPLIED>
```

- **id** – a unique name that can be used to identify this font definition.
- **label** – a translatable name of the font to be presented to the user.

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- **value** – the font value. This is in the form: `fontname-style-height` where `fontname` is the name of a font, `style` is a font style (one of "regular", "bold", "italic", or "bold italic") and `height` is an integer representing the font height.

Example: `Times New Roman-bold-36`.

Only one (or neither) of `value` or `defaultsTo` may be used.

- **categoryId** – the optional id of the presentation category this font belongs to.
- **defaultsTo** – the id of another font definition that is the default setting for the receiver. When there is no preference for this font the font registry will have the value of `defaultsTo` set for it in the registry.

Only one or neither of `value` or `defaultsTo` may be used.

<!ELEMENT description EMPTY>

a short description of the fonts usage

Examples:

Following is an example of an a font definition extension:

```
<extension point=
"org.eclipse.ui.fontDefinition"
>
<fontDefinition id=
"org.eclipse.examples.textFont"
label=
"Text"
>
<description>
The text font
</description>
</fontDefinition>
```

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```
<fontDefinition id=
"org.eclipse.examples.userFont"
label=
"User"
defaultsTo=
"org.eclipse.jface.textFont"
>
<description>
The user font
</description>
</fontDefinition>
</extension>
```

API Information:

The defaultsTo tag is used as a directive by the Workbench to set the value of the font definition to the value of defaultsTo whenever the defaultsTo fontDefinition is updated. This only occurs if the fontDefinition is at its default value – once it is set by the user this updates will not occur. The workbench provides 4 fonts:

org.eclipse.jface.bannerfont. The banner font is used in wizard banners.

org.eclipse.jface.dialogfont. The dialog font is the font for widgets in dialogs.

org.eclipse.jface.headerfont. The header font is used for section headers in composite text pages.

org.eclipse.jface.textfont. The text font is used by text editors.

Supplied Implementation:

The workbench provides the font definitions for the text, dialog, banner and header fonts.

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HelpSupport

Identifier:

org.eclipse.ui.helpSupport

Since:

3.0 (originally named org.eclipse.help.support)

Description:

This extension point is for contributing the help system UI. The platform should be configured with no more than one help system UI.

Configuration Markup:

```
<!ELEMENT extension (config?)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT config EMPTY>
```

```
<!ATTLIST config
```

```
class CDATA #REQUIRED>
```

- **class** – the implementation class for displaying online and context-sensitive help. This class must implement the `org.eclipse.ui.help.AbstractHelpUI` interface.

Examples:

The following is a sample usage of the help support extension point:

```
<extension point=
```

```
"org.eclipse.ui.helpSupport"
```

```
>
```

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```
<config class=  
"com.example.XYZHelpUI"  
/>  
  
</extension>
```

API Information:

The supplied class must implement a subclass of `org.eclipse.ui.help.AbstractHelpUI`. Implementation of the abstract methods in that class determine what happens when a user asks for online help or context-sensitive help. The implementation should access contributed help information using `org.eclipse.help.HelpSystem`.

Supplied Implementation:

The `org.eclipse.help.ui` plug-in contains an implementation of the help system UI.

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Marker Help

Identifier:

org.eclipse.ui.ide.markerHelp

Since:

3.0 (originally added in release 2.0 as org.eclipse.ui.markerHelp)

Description:

This extension point is used to associate a help context id with a specific "kind" of marker (a marker of a certain type or having certain attribute values).

Configuration Markup:

```
<!ELEMENT extension (markerHelp*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT markerHelp (attribute*)>
```

```
<!ATTLIST markerHelp
```

```
markerType CDATA #IMPLIED
```

```
helpContextId CDATA #REQUIRED>
```

- **markerType** – the unique type of the marker for which the help context applies.
- **helpContextId** – the unique id of the help context.

```
<!ELEMENT attribute EMPTY>
```

```
<!ATTLIST attribute
```

```
name CDATA #REQUIRED
```

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value CDATA #REQUIRED>

- **name** – the name of the attribute whose value is being specified.
- **value** – the specified value of the attribute.

Examples:

The following is an example of a marker help extension (note the sub–element and the way attributes are used):

```
<extension point=
"org.eclipse.ui.ide.markerHelp"
>
<markerHelp markerType=
"org.eclipse.ui.examples.readmetool.readmemarker"
helpContextId=
"org.eclipse.ui.examples.readmetool.marker_example1_context"
>
<attribute name=
"org.eclipse.ui.examples.readmetool.id"
value=
"1234"
/>
</markerHelp>
</extension>
```

In the example above, a help context id is associated with markers of type `org.eclipse.ui.examples.readmetool.readmemarker` whose `org.eclipse.ui.examples.readmetool.id` attribute has a value of 1234.

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API Information:

It is up to the developer to ensure that only a single help context id is supplied for a given marker. If two or more help context ids are supplied for a given kind of marker, the workbench does not define which will be returned. However the workbench does define that the "most specific" context id will always be returned for a given marker. That is, a context id associated with three matching attribute values will be returned before a context id associated with only two.

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Marker Image Providers

Identifier:

org.eclipse.ui.ide.markerImageProviders

Since:

3.0 (originally added in release 2.1 as org.eclipse.ui.markerImageProviders)

Description:

The markerImageProvider extension point is the point for specifying the images for marker types in the defining plug-in.

Configuration Markup:

```
<!ELEMENT extension (imageprovider*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT imageprovider EMPTY>
```

```
<!ATTLIST imageprovider
```

```
id CDATA #REQUIRED
```

```
markertype CDATA #REQUIRED
```

```
icon CDATA #IMPLIED
```

```
class CDATA #IMPLIED>
```

- **id** – a unique name that can be used to identify this markerImageProvider.
- **markertype** – The markertype is the id of the type defined in `org.eclipse.core.resources.IMarker` that this definition is applied to.
- **icon** – If there is no class defined the icon attribute is used to define the icon that will be applied to this type of marker.
- **class** – The class is the fully qualified name of the class that will be used to look up an image. This class must implement `IMarkerImageProvider`.

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Examples:

The following is an example of the two forms of marker image providers. The first one is one where the image does not change and is declared directly. For the second one the image must be determined by an instance of `IMarkerImageProvider`.

```
<extension point=
"org.eclipse.ui.ide.markerImageProviders"
>
<imageprovider markertype=
"org.eclipse.core.resources.taskmarker"
icon=
"taskicon.gif"
id=
"myPlugin.declarativeMarkerProvider"
>
</imageprovider>
<imageprovider markertype=
"org.eclipse.core.resources.problemmarker"
class=
"myPlugin.MyIMarkerImageProvider"
id=
"myPlugin.implementedMarkerProvider"
>
</imageprovider>
</extension>
```

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API Information:

[Enter API information here.]

Supplied Implementation:

[Enter information about supplied implementation of this extension point.]

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Marker Resolutions

Identifier:

org.eclipse.ui.ide.markerResolution

Since:

3.0 (originally added in release 2.0 as org.eclipse.ui.markerResolution)

Description:

This extension point is used to associate a marker resolution generator with a specific "kind" of marker. (a marker of a certain type or having certain attribute values).

Configuration Markup:

```
<!ELEMENT extension (markerResolutionGenerator*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT markerResolutionGenerator (attribute*)>
```

```
<!ATTLIST markerResolutionGenerator
```

```
class CDATA #REQUIRED
```

```
markerType CDATA #IMPLIED>
```

- **class** – the name of the class implementing IMarkerResolutionGenerator
- **markerType** – the type of marker for which the help context applies.

```
<!ELEMENT attribute EMPTY>
```

```
<!ATTLIST attribute
```

```
name CDATA #REQUIRED
```

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value CDATA #REQUIRED>

- **name** – the name of the attribute whose value is being specified.
- **value** – the specified value of the attribute.

Examples:

The following is an example of a marker resolution generator extension (note the sub–element and the way attributes are used):

```
<extension point=
"org.eclipse.ui.ide.markerResolution"
>
<markerResolutionGenerator class=
"org.eclipse.ui.examples.readmetool.ReadmeMarkerResolutionGenerator"
markerType=
"org.eclipse.ui.examples.readmetool.readmemarker"
>
<attribute name=
"org.eclipse.ui.examples.readmetool.id"
value=
"1234"
/>
</markerResolutionGenerator>
</extension>
```

In the example above, a marker resolution generator is associated with markers of type `org.eclipse.ui.examples.readmetool.readmemarker` whose `org.eclipse.ui.examples.readmetool.id` attribute has a value of 1234.

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API Information:

More than one marker help generator may be supplied for a given marker.

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Project Nature Images

Identifier:

org.eclipse.ui.ide.projectNatureImages

Since:

3.0 (originally added in release 1.0 as org.eclipse.ui.projectNatureImages)

Description:

This extension point is used to associate an image with a project nature. The supplied image is used to form a composite image consisting of the standard project image combined with the image of its nature. The supplied image is drawn over the top right corner of the base image.

Configuration Markup:

```
<!ELEMENT extension (image*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT image (description?)>
```

```
<!ATTLIST image
```

```
id CDATA #REQUIRED
```

```
natureId CDATA #REQUIRED
```

```
icon CDATA #REQUIRED>
```

- **id** – a unique name that will be used to identify this nature image.
- **natureId** – the unique name of the nature for which the image is being supplied.
- **icon** – a relative name of the image that will be associated with this perspective.

```
<!ELEMENT description (#CDATA)>
```

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a short description of what this image represents.

Examples:

The following is an example of a nature image extension:

```
<extension point=
"org.eclipse.ui.ide.projectNatureImages"
>
<image id=
"org.eclipse.ui.javaNatureImage"
natureId=
"Resource"
icon=
"icons/javaNature.gif"
>
</image>
</extension>
```

API Information:

The value of the `natureId` attribute is the nature id as defined by the plugin creating the project.

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Resource Filters

Identifier:

org.eclipse.ui.ide.resourceFilters

Since:

3.0 (originally added in release 1.0 as org.eclipse.ui.resourceFilters)

Description:

This extension point is used to add predefined filters to views which show resources, such as the Navigator view. These filters can be selected to hide resources whose names match the filter's pattern.

Configuration Markup:

```
<!ELEMENT extension (filter*)>
```

```
<!ATTLIST extension
```

```
  point CDATA #REQUIRED
```

```
  id CDATA #IMPLIED
```

```
  name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT filter (description?)>
```

```
<!ATTLIST filter
```

```
  pattern CDATA #REQUIRED
```

```
  selected (true | false) "false">
```

- **pattern** – the pattern to match. May contain * and ? wildcards.
- **selected** – "true" if the pattern should be selected by default, "false" or undefined if not.

```
<!ELEMENT description (#CDATA)>
```

the description of the purpose of this filter.

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Examples:

The following is an example of a resource filter extension, which filters out class files, and is selected by default:

```
<extension point=
"org.eclipse.ui.ide.resourceFilters"
>
<filter pattern=
"*.class"
selected=
"true"
/>
</extension>
```

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Import Wizards

Identifier:

org.eclipse.ui.importWizards

Description:

This extension point is used to register import wizard extensions. Import wizards appear as choices within the "Import Dialog" and are used to import resources into the workbench.

Wizards may optionally specify a description subelement whose body should contain short text about the wizard.

Configuration Markup:

```
<!ELEMENT extension (wizard*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT wizard (description? , selection*)>
```

```
<!ATTLIST wizard
```

```
id CDATA #REQUIRED
```

```
name CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
icon CDATA #IMPLIED>
```

an element that will be used to create import wizard

- **id** – a unique name that will be used to identify this wizard
- **name** – a translatable name that will be used in the dialog box to represent this wizard

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- **class** – a fully qualified name of the class that implements `org.eclipse.ui.IImportWizard` interface
- **icon** – a relative name of the icon that will be used alongside the wizard name in the import engine listing.

<!ELEMENT description (#CDATA)>

an optional subelement whose body should represent a short description of the import engine functionality.

<!ELEMENT selection EMPTY>

<!ATTLIST selection

name CDATA #IMPLIED

class CDATA #REQUIRED>

an optional element that restricts the types and names of objects that can be selected when the wizard is invoked.

- **name** – an optional name filter. Each object in the workbench selection must match the name filter to be passed to the wizard.
- **class** – fully qualified class name. If each object in the workbench selection implements this interface the selection will be passed to the wizard. Otherwise, an empty selection is passed.

Examples:

The following is an example of an import extension definition:

```
<extension point=
```

```
"org.eclipse.ui.importWizards"
```

```
>
```

```
<wizard id=
```

```
"com.xyz.ImportWizard1"
```

```
name=
```

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```
"XYZ Web Scraper"

class=

"com.xyz.imports.ImportWizard1"

icon=

"./icons/import1.gif"

>

<description>

A simple engine that searches the Web and imports files

</description>

<selection class=

"org.eclipse.core.resources.IResource"

/>

</wizard>

</extension>
```

API Information:

The value of the `class` attribute must represent a name of the class that implements `org.eclipse.ui.IImportWizard`.

Supplied Implementation:

The workbench comes preloaded with the basic import engines for files and directories.

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Intro Part

Identifier:

org.eclipse.ui.intro

Since:

3.0

Description:

This extension point is used to register implementations of special workbench parts, called intro parts, that are responsible for introducing a product to new users. An intro part is typically shown the first time a product is started up. Rules for associating an intro part implementation with particular products are also contributed via this extension point.

The life cycle is as follows:

- The intro area is created on workbench start up. As with editor and view areas, this area is managed by an intro site (implementing `org.eclipse.ui.intro.IIntroSite`).
- The id of the current product (`Platform.getProduct()`) is used to choose the relevant intro part implementation.
- The intro part class (implementing `org.eclipse.ui.intro.IIntroPart`) is created and initialized with the intro site.
- While the intro part is showing to the user, it can transition back and forth between full and standby mode (either programmatically or explicitly by the user).
- Eventually the intro part is closed (either programmatically or explicitly by the user). The current perspective takes over the entire workbench window area.

Configuration Markup:

```
<!ELEMENT extension (intro* ,introProductBinding*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT intro EMPTY>
```

```
<!ATTLIST intro
```

```
id CDATA #REQUIRED
```

```
icon CDATA #IMPLIED
```

```
class CDATA #REQUIRED>
```

Specifies an introduction. An introduction is a product-specific presentation shown to first-time users on product start up.

- **id** – a unique identifier for this introduction
- **icon** – a plug-in-relative file name of the icon that will be associated with this introduction
- **class** – a fully qualified name of the class implementing the `org.eclipse.ui.intro.IIntroPart` interface. A common practice is to subclass `org.eclipse.ui.part.intro.IntroPart` in order to inherit the default functionality. This class implements the introduction.

```
<!ELEMENT introProductBinding EMPTY>
```

```
<!ATTLIST introProductBinding
```

```
productId CDATA #REQUIRED
```

```
introId CDATA #REQUIRED>
```

Specifies a binding between a product and an introduction. These bindings determine which introduction is appropriate for the current product (as defined by `org.eclipse.core.runtime.Platform.getProduct()`).

- **productId** – unique id of a product
- **introId** – unique id of an introduction

Examples:

The following is an example of an intro part extension that contributes an particular introduction and associates it with a particular product:

```
<extension point=  
"org.eclipse.ui.intro"  
>
```

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```
<intro id=
"com.example.xyz.intro.custom"
class=
"com.example.xyz.intro.IntroPart"
/>
<introProductBinding productId=
"com.example.xyz.Product"
introId=
"com.example.xyz.intro.custom"
/>
</extension>
```

API Information:

The value of the `class` attribute must be the fully qualified name of a class that implements `org.eclipse.ui.intro.IIntroPart` interface by subclassing `org.eclipse.ui.part.intro.IntroPart`.

Supplied Implementation:

There are no default implementations of the initial user experience. Each Eclipse-based product is responsible for providing one that is closely matched to its branding and function.

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Intro Part Configuration

Identifier:

org.eclipse.ui.intro.config

Since:

3.0

Description:

This extension point is used to register an intro configuration. This configuration provides presentation implementations and content for a given intro contribution. An intro appears when the workbench is first launched and as a choice from the "Help" menu. The intro is typically used to introduce a user to a product built on Eclipse.

The intros are organized into pages which usually reflect a particular category of introductory material. For instance, a What's New page may introduce new concepts or functionality since previous versions. The content defined by one intro configuration can be referenced and extended from other plug-ins using the [org.eclipse.ui.intro.configExtension](#) extension point.

Configuration Markup:

```
<!ELEMENT extension (config+)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT config (presentation)>
```

```
<!ATTLIST config
```

```
introId CDATA #REQUIRED
```

```
id CDATA #REQUIRED
```

```
content CDATA #REQUIRED>
```


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A config element can be used to configure a customizable Intro Part. A config element must specify an id, an introId, and a content file. The intro content file is an XML file that describes the pages, groups and links that the intro has.

- **introId** – the id of an intro part contribution that this configuration will be associated with.
- **id** – a unique name that can be used to identify this intro configuration
- **content** – an intro content file. The content file is an XML file that contains the specifics of the intro ([intro content file format specification](#)). The content file is parsed at run time by the intro framework. Based on the settings in this file, a certain number of pages, groups, and links are shown to the user when the intro is opened.

<!ELEMENT presentation ([implementation+](#))>

<!ATTLIST presentation

home-page-id CDATA #REQUIRED

standby-page-id CDATA #IMPLIED>

Presentation element that defines all the possible implementations of an intro part's presentation. It can have one or more implementation defined in it. Only one implementation will be chosen at startup, based the os/ws attributes of the implementations. Otherwise, the first one with no os/ws attributes defined will be chosen.

- **home-page-id** – the id of the home (root) page, which is the first page of the introduction. This page can be used as an entry point to the other main pages that make up the intro.
- **standby-page-id** – an optional attribute to define the id of the standby page. The standby page will be shown to the user when the Intro is set to standby.

<!ELEMENT implementation ([head?](#))>

<!ATTLIST implementation

kind (swt|html)

style CDATA #IMPLIED

os CDATA #IMPLIED

ws CDATA #IMPLIED>

The presentation of the Platform's out of the box experience has two implementations. One of them is SWT Browser based, while the other is UI Forms based. The customizable intro part can be configured to pick one of those two presentations based on the current OS and WS. The type of the implementation can be swt or

html.

- **kind** – Specifies the type of this implementation. The swt kind indicates a UI Forms based implementation, and the html kind indicates an SWT Browser based implementation
- **style** – The shared style that will be applied to all pages presented by this intro presentation implementation.
- **os** – The optional operating system specification used when choosing the presentation's implementation. It can be any of the os designators defined by Eclipse, e.g., win32, linux, etc (see Javadoc for `org.eclipse.core.runtime.Platform`).
- **ws** – The optional windowing system specification used when choosing the presentation's implementation. It can be any of the ws designators defined by Eclipse (see Javadoc for `org.eclipse.core.runtime.Platform`).

```
<!ELEMENT introContent (page+ , group* , extensionContent*)>
```

The introContent element defines the body of the intro content file. The content file is made up of pages, shared groups that can be included in multiple pages, and extensions to anchor points defined in other configurations.

```
<!ELEMENT page (group* | link* | text* | head* | img* | include* | html* | title? | anchor* | contentProvider*)>
```

```
<!ATTLIST page
```

```
url      CDATA #IMPLIED
```

```
id       CDATA #REQUIRED
```

```
style    CDATA #IMPLIED
```

```
alt-style CDATA #IMPLIED
```

```
filteredFrom (swt|html)
```

```
content  CDATA #IMPLIED
```

```
style-id CDATA #IMPLIED>
```

This element is used to describe a page to be displayed. The intro can display both dynamic and static pages. Content for dynamic pages is generated from the subelements of the page, described below. The style or alt-style will be applied depending on the presentation. The styles can be further enhanced by referencing the id or class-id.

Static pages allow for the reuse of existing HTML documents within one's introduction, and can be linked to from any static or dynamic page. Static pages are not defined in a page element, they are simply html files that

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can be linked to by other pages.

The home page, whose id is specified in the presentation element of the intro config extension point, can have a url indicating that it is a static page. If no url is specified then the home page is assumed to be dynamic. All other pages described using the page element are dynamic.

Also note that when the SWT presentation is used and a static page is to be displayed, an external browser is launched and the current page remains visible.

The subelements used in a dynamic page are as follows: A **group** subelement is used to group related content and apply style across the grouped content. A **link** subelement defines a link which can be used to link to a static or dynamic page and run an intro action/command. A link is normally defined at the page level to navigate between main pages versus links within a page. A **text** subelement defines textual content at the page level. A **head** subelement is only applicable for the Web based presentation and allows for additional html to be added to the HTML **head** section. This is useful for adding java scripts or extra style sheets. An **img** subelement defines image content for the page level. An **include** subelement allows for reuse of any element other than a page. An **html** subelement is only applicable for the Web based presentation and allows for the embedding or inclusion of html into the page's content. Embedding allows for a fully defined html file to be embedded within an HTML **object** by referencing the html file. Inclusion allows for including an html snippet directly from an html file. A **title** subelement defines the title of the page. An **anchor** subelement defines a point where external contributions can be made by an <extensionContent> element.

- **url** – The optional relative path to an HTML file. When using the Web based presentation, this HTML file will be displayed instead of any content defined for this page. This attribute is only applicable to the home page, which is identified in the presentation element of the intro config extension point. It is ignored for all other pages.
- **id** – A unique name that can be used to identify this page.
- **style** – A relative path to a CSS file which is applied to the page only when using the Web based presentation.
- **alt-style** – A relative path to a SWT presentation properties file which is applied to the page only when using the SWT based presentation.
- **filteredFrom** – an optional attribute that allows for filtering a given element out of a specific implementation. For example, if a group has filteredFrom = swt, it means that this group will not appear as content in the swt implementation.
- **content** – an optional attribute which can define the location of an introContent.xml file that represents the content of this page. When this attribute is defined, all children and attributes in this page element, except id, are ignored. This is because the content of this page is now assumed to reside in the xml file pointed to by the content file attribute. When resolving to the content of this file, the page with an id that matches the id defined in this page element is chosen. This separation of pages can be used when performance is an issue, as the content of a page is now loaded more lazily.
- **style-id** – A means to classify the page into a given category so that a common style may be applied.

```
<!ELEMENT group (group* |link* |text* |img* |include* |html* |anchor* |contentProvider*)>
```

```
<!ATTLIST group
```

```
id      CDATA #REQUIRED
```

```
label   CDATA #IMPLIED
```

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style-id CDATA #IMPLIED

filteredFrom (swt|html) >

Used to group related content, content that should have similar style applied, or content that will be included together in other pages.

- **id** – unique identifier of the group
- **label** – a label or heading for this group
- **style-id** – A means to classify this group into a given category so that a common style may be applied.
- **filteredFrom** – an optional attribute that allows for filtering a given element out of a specific implementation. For example, if a group has filteredFrom = swt, it means that this group will not appear as content in the swt implementation.

<!ELEMENT head EMPTY>

<!ATTLIST head

src CDATA #REQUIRED

encoding CDATA #IMPLIED>

Direct HTML to include in a page's HEAD content area. It allows for additional html to be added to the HTML HEAD section. This is useful for adding java scrips or extra styles sheets. This markup is only to be used with an HTML based intro part implementation. It is simply ignored in the case of a UI Forms implementation. A page can have more than one head element. An implementation can have one and only one head element (since it is a shared across all pages).

- **src** – relative or absolute URL to a file containing HTML to include directly into the HTML head section.
- **encoding** – an optional attribute to specify the encoding of the inlined file containing the head snippet. Default is UTF-8. Since 3.0.1

<!ELEMENT title EMPTY>

<!ATTLIST title

id CDATA #IMPLIED

style-id CDATA #IMPLIED

filteredFrom (swt|html) >

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a snippet of text that can optionally contain escaped HTML tags. It is only used as a Page Title, and so a given page can have a maximum of one title element.

- **id** – unique identifier of this title.
- **style-id** – A means to classify this element into a given category so that a common style may be applied
- **filteredFrom** – an optional attribute that allows for filtering a given element out of a specific implementation. For example, if a group has `filteredFrom = swt`, it means that this group will not appear as content in the swt implementation.

```
<!ELEMENT link (text? ,img?)>
```

```
<!ATTLIST link
```

```
id      CDATA #IMPLIED
```

```
label   CDATA #IMPLIED
```

```
url     CDATA #REQUIRED
```

```
style-id CDATA #IMPLIED
```

```
filteredFrom (swt|html) >
```

Can link to a static HTML file, an external web site, or can run an Intro URL action.

- **id** – A unique id that can be used to identify this link
- **label** – The text name of this link
- **url** – A valid URL to an external web site, a static html file, or an Intro URL that represents an Intro action. All intro URLs have the following form: `http://org.eclipse.ui.intro/<action name>?param1=value1¶m2=value2` and will be processed by the intro framework. The predefined actions will be described using this format:

action name – description of action

action parameter1 – description of parameter

action parameter2 (optional) – description of parameter

action parameter3 (optional) = ("true" | "false") "false" – description of parameter, choice of either true or false and "false" is the default

The following predefined actions are included in the intro framework:

close – closes the intro part
no parameters required

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navigate – navigate through the intro pages in a given direction or return to the home page
direction = ("backward" | "forward" | "home") – specifies the direction to navigate

openBrowser – open the url in an external browser

url – a valid URL to an external web site or a static HTML file

pluginId (optional) – only required if a static HTML file is specified. This is the id of the plug-in containing the file.

runAction – runs the specified action

class – the fully qualified class name of the class that implements one of

`org.eclipse.ui.intro.config.IIntroAction`,

`org.eclipse.jface.actino.IAction`, or `org.eclipse.ui.IActionDelegate`

pluginId – The id of the plug-in which contains the class.

standby (optional) = ("true" | "false") "false" – indicate whether to set the intro into standby mode after executing the action

additional parameters – any additional parameters are passed to actions that implement

`org.eclipse.ui.intro.config.IIntroAction`

setStandbyMode – sets the state of the intro part

standby = ("true" | "false") – true to put the intro part in its partially visible standby mode, and false to make it fully visible

showHelp – Open the help system.

no parameters required

showHelpTopic – Open a help topic.

id – the URL of the help resource. (See Javadoc for

`org.eclipse.ui.help.WorkbenchHelp.displayHelpResource`

showMessage – Displays a message to the user using a standard information dialog.

message – the message to show the user

showStandby – Sets the intro part to standby mode and shows the `standbyContentPart` with the given input

partId – the id of the `standbyContentPart` to show

input – the input to set on the `standbyContentPart`

showPage – show the intro page with the given id

id – the id of the intro page to show

standby (optional) = ("true" | "false") "false" – indicate whether to set the intro into standby mode after showing the page

- **style-id** – A means to classify this link into a given category so that a common style may be applied.
- **filteredFrom** – an optional attribute that allows for filtering a given element out of a specific implementation. For example, if a group has `filteredFrom = swt`, it means that this group will not appear as content in the `swt` implementation.

<!ELEMENT text EMPTY>

<!ATTLIST text

id CDATA #IMPLIED

style-id CDATA #IMPLIED

filteredFrom (swt|html) >

a snippet of text that can optionally contain escaped HTML tags. It can include **b** and **li** tags. It can also contain anchors for urls. If multiple paragraphs are needed, then the text can be divided into multiple sections each begining and ending with the **p** tag.

- **id** – unique identifier of this text.
- **style-id** – A means to classify this element into a given category so that a common style may be applied
- **filteredFrom** – an optional attribute that allows for filtering a given element out of a specific implementation. For example, if a group has `filteredFrom = swt`, it means that this group will not appear as content in the swt implementation.

<!ELEMENT img EMPTY>

<!ATTLIST img

id CDATA #REQUIRED

src CDATA #REQUIRED

alt CDATA #IMPLIED

style-id CDATA #IMPLIED

filteredFrom (swt|html) >

An image that represents intro content and not presentation (as opposed to decoration images defined in styles).

- **id** – unique identifier of this image
- **src** – the file to load the image from
- **alt** – the alternative text to use when the image can not be loaded and as tooltip text for the image.
- **style-id** – A means to classify this image into a given category so that a common style may be applied.
- **filteredFrom** – an optional attribute that allows for filtering a given element out of a specific implementation. For example, if a group has `filteredFrom = swt`, it means that this group will not appear as content in the swt implementation.

```
<!ELEMENT html (img |text)>
<!ATTLIST html
id      CDATA #REQUIRED
src     CDATA #REQUIRED
type    (inline|embed)
style-id CDATA #IMPLIED
filteredFrom (swt|html)
encoding CDATA #IMPLIED>
```

direct HTML to include in the page either by embedding the entire document, or inlining a snippet of HTML in-place. A fallback image or text must be defined for alternative swt presentation rendering. Embedding allows for a fully defined html file to be embedded within the dynamic page's content. An HTML **object** element is created that references the html file. Inclusion allows for including an html snippet directly from a file into the dynamic html page.

- **id** – unique identifier of this HTML element
- **src** – relative or absolute URL to a file containing HTML
- **type** – if 'embed', a valid (full) HTML document will be embedded using HTML 'OBJECT' tag. If 'inline', value of 'src' will be treated as a snippet of HTML to emit 'in-place'. (if type is not specified, this html object is ignored by the intro configuration).
- **style-id** – A means to classify this HTML element into a given category so that a common style may be applied.
- **filteredFrom** – an optional attribute that allows for filtering a given element out of a specific implementation. For example, if a group has filteredFrom = swt, it means that this group will not appear as content in the swt implementation.
- **encoding** – an optional attribute to specify the encoding of the inlined file (in the case where type=inline is specified). If not specified, the default is UTF-8. Since 3.0.1

```
<!ELEMENT include EMPTY>
<!ATTLIST include
configId CDATA #IMPLIED
path     CDATA #REQUIRED
merge-style (true | false) >
```


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expands an element targeted by the given path and optional configId attributes. Path should uniquely address an element within the specified configuration. It could point to a shared group defined at the configuration level, or any element in a page.

- **configId** – identifier of a configuration where the included element is defined. If specified, it is assumed that the element to be included is specified in another configuration, and not the enclosing configuration. In this case, that external config is loaded and the element is resolved from that new config. If not specified, enclosing (parent) configuration of this include is assumed.
- **path** – the path that uniquely represents the target element within the configuration (e.g. page/group1/group2). It may be a group element, or any element that may be contained in a group. You can not include a page.
- **merge-style** – if `true`, style belonging to the page that owns the included element will be added to list of styles of the including page. If `false` (the default), the including page is responsible for controlling properties of the included element.

<!ELEMENT anchor EMPTY>

<!ATTLIST anchor

id CDATA #REQUIRED>

an anchor is the element used to declare extensibility. It is a location in the configuration that allows for external contributions. Only anchors are valid target values for the path attribute in an extensionContent

- **id** – unique id to identify this anchor.

<!ELEMENT extensionContent (text | group | link | html | include)>

<!ATTLIST extensionContent

style CDATA #IMPLIED

alt-style CDATA #IMPLIED

path CDATA #REQUIRED>

The content to be added to the target anchor. Only one extensionContent is allowed in a given configExtension because if this extension could not be resolved (if the config could not be found, or the target anchor element could not be found) then the pages and/or groups in the extension need to be ignored.

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- **style** – A relative path to a CSS file which is applied to the page only when using the Web based presentation.
- **alt-style** – A relative path to a SWT presentation properties file which is applied to the page only when using the SWT based presentation.
- **path** – the path that uniquely represents the path to an anchor. (e.g. page/group1/group2/anchorId) within the target configuration to be extended. It can only be an anchor which can be in any page or group, including shared groups at configuration level

```
<!ELEMENT contentProvider (text?)>
```

```
<!ATTLIST contentProvider
```

```
id CDATA #REQUIRED
```

```
pluginId CDATA #IMPLIED
```

```
class CDATA #REQUIRED>
```

A proxy for an intro content provider, which allows an intro page to dynamically pull data from various sources (e.g., the web, eclipse, etc) and provide content at runtime based on this dynamic data. If the `IIntroContentProvider` class that is specified in the class attribute can not be loaded, then the contents of the text element will be rendered instead. This is a dynamic version of the html intro tag. While the html tag allows for embedding or inlining a static html content into the generated html intro page, the `contentProvider` tag allows for dynamic creation of that content at runtime. Another difference between the tags is that the html tag is only supported for the HTML presentation, while this `contentProvider` tag is supported for both the HTML and SWT presentations. Since 3.0.1

- **id** – unique identifier of this content provider element.
- **pluginId** – The id of the plugin that contains the `IContentProvider` class specified by the class attribute. This is an optional attribute that should be used if the class doesn't come from the same plugin that defined the markup.
- **class** – A class that implements the `IContentProvider` interface

Examples:

Here is a sample usage of the config extension point.

```
<extension id=
```

```
"intro"
```

```
point=
```

```
"org.eclipse.ui.intro.config"
```

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>

```
<config introId=
```

```
"com.org.xyz.intro"
```

```
id=
```

```
"com.org.xyz.introConfig"
```

```
content=
```

```
"introContent.xml"
```

>

```
<presentation home-page-id=
```

```
"root"
```

```
title=
```

```
"%intro.title"
```

>

```
<implementation ws=
```

```
"win32"
```

```
style=
```

```
"css/shared.css"
```

```
kind=
```

```
"html"
```

```
os=
```

```
"win32"
```

>

```
</implementation>
```

```
<implementation style=
```

```
"css/shared_swt.properties"
```

```
kind=
```

Intro Part Configuration

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"swt"

>

</implementation>

</presentation>

</config>

</extension>

API Information:

For further details see the spec for the org.eclipse.ui.intro.config API package.

Supplied Implementation:

The intro contributed by the org.eclipse.platform plugin is the only implementation within Eclipse.

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<http://www.eclipse.org/legal/cpl-v10.html>.

Intro Content File XML Format

Version 3.0.1

This document describes the intro content file structure as a series of DTD fragments (machine readable XML schema).

introContent

```
<!ELEMENT introContent (page+ ,group* ,extensionContent*)>
```

The introContent element defines the body of the intro content file. The content file is made up of pages, shared groups that can be included in multiple pages, and extensions to anchor points defined in other configurations.

page

```
<!ELEMENT page (group* |link* |text* |head* |img* |include* |html* |title? |anchor* |contentProvider*)>
```

```
<!ATTLIST page
```

```
url      CDATA #IMPLIED
```

```
id       CDATA #REQUIRED
```

```
style    CDATA #IMPLIED
```

```
alt-style CDATA #IMPLIED
```

```
filteredFrom (swt|html)
```

```
content  CDATA #IMPLIED
```

```
style-id CDATA #IMPLIED>
```

This element is used to describe a page to be displayed. The intro can display both dynamic and static pages.

Content for dynamic pages is generated from the sub elements of the page, described below. The style or alt-style will be applied depending on the presentation. The styles can be further enhanced by referencing the id or class-id.

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Static pages allow for the reuse of existing HTML documents within one's introduction, and can be linked to from any static or dynamic page. Static pages are not defined in a page element, they are simply html files that can be linked to by other pages.

The home page, whose id is specified in the presentation element of the intro config extension point, can have a url indicating that it is a static page. If no url is specified then the home page is assumed to be dynamic. All other pages described using the page element are dynamic.

Also note that when the SWT presentation is used and a static page is to be displayed, an external browser is launched and the current page remains visible.

The subelements used in a dynamic page are as follows: A **group** subelement is used to group related content and apply style across the grouped content. A **link** subelement defines a link which can be used to link to a static or dynamic page and run an intro action/command. A link is normally defined at the page level to navigate between main pages versus links within a page. A **text** subelement defines textual content at the page level. A **head** subelement is only applicable for the Web based presentation and allows for additional html to be added to the HTML **head** section. This is useful for adding java scripts or extra style sheets. An **img** subelement defines image content for the page level. An **include** subelement allows for reuse of any element other than a page. An **html** subelement is only applicable for the Web based presentation and allows for the embedding or inclusion of html into the page's content. Embedding allows for a fully defined html file to be embedded within an HTML **object** by referencing the html file. Inclusion allows for including an html snippet directly from an html file. A **title** subelement defines the title of the page. An **anchor** subelement defines a point where external contributions can be made by an <extensionContent> element.

- **url** – The optional relative path to an HTML file. When using the Web based presentation, this HTML file will be displayed instead of any content defined for this page. This attribute is only applicable to the home page, which is identified in the presentation element of the intro config extension point. It is ignored for all other pages.
- **id** – A unique name that can be used to identify this page.
- **style** – A relative path to a CSS file which is applied to the page only when using the Web based presentation.
- **alt-style** – A relative path to a SWT presentation properties file which is applied to the page only when using the SWT based presentation.
- **filteredFrom** – an optional attribute that allows for filtering a given element out of a specific implementation. For example, if a group has filteredFrom = swt, it means that this group will not appear as content in the swt implementation.
- **content** – an optional attribute which can define the location of an introContent.xml file that represents the content of this page. When this attribute is defined, all children and attributes in this page element, except id, are ignored. This is because the content of this page is now assumed to reside in the xml file pointed to by the content file attribute. When resolving to the content of this file, the page with an id that matches the id defined in this page element is chosen. This separation of pages can be used when performance is an issue, as the content of a page is now loaded more lazily.
- **style-id** – A means to classify the page into a given category so that a common style may be applied.

group

```
<!ELEMENT group (group* |link* |text* |img* |include* |html* |anchor*)>
```

<!ATTLIST group

id CDATA #REQUIRED

label CDATA #IMPLIED

style-id CDATA #IMPLIED

filteredFrom (swt|html) >

Used to group related content, content that should have similar style applied, or content that will be included together in other pages.

- **id** – unique identifier of the group
- **label** – a label or heading for this group
- **style-id** – A means to classify this group into a given category so that a common style may be applied.
- **filteredFrom** – an optional attribute that allows for filtering a given element out of a specific implementation. For example, if a group has filteredFrom = swt, it means that this group will not appear as content in the swt implementation.

link

<!ELEMENT link (text? ,img?)>

<!ATTLIST link

id CDATA #IMPLIED

label CDATA #IMPLIED

url CDATA #REQUIRED

style-id CDATA #IMPLIED

filteredFrom (swt|html) >

Can link to a static HTML file, an external web site, or can run an Intro URL action.

- **id** – A unique id that can be used to identify this link
- **label** – The text name of this link
- **url** – A valid URL to an external web site, a static html file, or an Intro URL that represents an Intro action. All intro URLs have the following form: `http://org.eclipse.ui.intro/<action name>?param1=value1¶m2=value2` and will be processed by the intro framework.

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The predefined actions will be described using this format:

action name – description of action

action parameter1 – description of parameter

action parameter2 (optional) – description of parameter

action parameter3 (optional) = ("true" | "false") "false" – description of parameter, choice of either true or false and "false" is the default

The following predefined actions are included in the intro framework:

close – closes the intro part

no parameters required

navigate – navigate through the intro pages in a given direction or return to the home page

direction = ("backward" | "forward" | "home") – specifies the direction to navigate

openBrowser – open the url in an external browser

url – a valid URL to an external web site or a static HTML file

pluginId (optional) – only required if a static HTML file is specified. This is the id of the plug-in containing the file.

runAction – runs the specified action

class – the fully qualified class name of the class that implements one of

`org.eclipse.ui.intro.config.IIntroAction`, `org.eclipse.jface.action.IAction`,
or `org.eclipse.ui.IActionDelegate`

pluginId – The id of the plug-in which contains the class.

standby (optional) = ("true" | "false") "false" – indicate whether to set the intro into standby mode after executing the action

additional parameters – any additional parameters are passed to actions that implement

`org.eclipse.ui.intro.config.IIntroAction`

setStandbyMode – sets the state of the intro part

standby = ("true" | "false") – true to put the intro part in its partially visible standby mode, and false to make it fully visible

showHelp – Open the help system.

no parameters required

showHelpTopic – Open a help topic.

id – the URL of the help resource. (See Javadoc for

`org.eclipse.ui.help.WorkbenchHelp.displayHelpResource`

showMessage – Displays a message to the user using a standard information dialog.

message – the message to show the user

showStandby – Sets the intro part to standby mode and shows the standbyContentPart with the given input

partId – the id of the standbyContentPart to show

input – the input to set on the standbyContentPart

showPage – show the intro page with the given id

id – the id of the intro page to show

standby (optional) = ("true" | "false") "false" – indicate whether to set the intro into standby mode after showing the page

- **style-id** – A means to classify this link into a given category so that a common style may be applied.
- **filteredFrom** – an optional attribute that allows for filtering a given element out of a specific implementation. For example, if a group has filteredFrom = swt, it means that this group will not appear as content in the swt implementation.

html

```
<!ELEMENT html (img |text)>
```

```
<!ATTLIST html
```

```
id      CDATA #REQUIRED
```

```
src     CDATA #REQUIRED
```

```
type    (inline|embed)
```

```
style-id CDATA #IMPLIED
```

```
filteredFrom (swt|html) >
```

```
encoding CDATA #IMPLIED
```

direct HTML to include in the page either by embedding the entire document, or inlining a snippet of HTML in-place. A fallback image or text must be defined for alternative swt presentation rendering.

Embedding allows for a fully defined html file to be embedded within the dynamic page's content. An HTML **object** element is created that references the html file.

Inclusion allows for including an html snippet directly from a file into the dynamic html page.

- **id** – unique identifier of this HTML element
- **src** – relative or absolute URL to a file containing HTML
- **type** – if 'embed', a valid (full) HTML document will be embedded using HTML 'OBJECT' tag. If 'inline', value of 'src' will be treated as a snippet of HTML to emit 'in-place'. (if type is not specified, this html object is ignored by the intro configuration).
- **style-id** – A means to classify this HTML element into a given category so that a common style may be applied.
- **filteredFrom** – an optional attribute that allows for filtering a given element out of a specific implementation. For example, if a group has filteredFrom = swt, it means that this group will not appear as content in the swt implementation.

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- **encoding** – an optional attribute to specify the encoding of the inlined file (in the case where type=inline is specified). If not specified, the default is UTF-8. Since 3.0.1

title

<!ELEMENT title EMPTY>

<!ATTLIST title

id CDATA #IMPLIED

style-id CDATA #IMPLIED

filteredFrom (swt|html) >

a snippet of text that can optionally contain escaped HTML tags. It is only used as a Page Title, and so a given page can have a maximum of one title element.

- **id** – unique identifier of this title.
- **style-id** – A means to classify this element into a given category so that a common style may be applied
- **filteredFrom** – an optional attribute that allows for filtering a given element out of a specific implementation. For example, if a group has filteredFrom = swt, it means that this group will not appear as content in the swt implementation.

text

<!ELEMENT text EMPTY>

<!ATTLIST text

id CDATA #IMPLIED

style-id CDATA #IMPLIED

filteredFrom (swt|html) >

a snippet of text that can optionally contain escaped HTML tags. It can include b and li tags. It can also contain anchors for urls. If multiple paragraphs are needed, then the text can be divided into multiple sections each beginning and ending with the p tag.

- **id** – unique identifier of this text.

- **style-id** – A means to classify this element into a given category so that a common style may be applied
- **filteredFrom** – an optional attribute that allows for filtering a given element out of a specific implementation. For example, if a group has `filteredFrom = swt`, it means that this group will not appear as content in the swt implementation.

include

<!ELEMENT include EMPTY>

<!ATTLIST include

configId CDATA #IMPLIED

path CDATA #REQUIRED

merge-style (true | false) >

expands an element targeted by the given path and optional configId attributes. Path should uniquely address an element within the specified configuration. It could point to a shared group defined at the configuration level, or any element in a page.

- **configId** – identifier of a configuration where the included element is defined. If specified, it is assumed that the element to be included is specified in another configuration, and not the enclosing configuration. In this case, that external config is loaded and the element is resolved from that new config. If not specified, enclosing (parent) configuration of this include is assumed.
- **path** – the path that uniquely represents the target element within the configuration (e.g. page/group1/group2). It may be a group element, or any element that may be contained in a group. You can not include a page.
- **merge-style** – if `true`, style belonging to the page that owns the included element will be added to list of styles of the including page. If `false` (the default), the including page is responsible for controlling properties of the included element.

head

<!ELEMENT head EMPTY>

<!ATTLIST head

src CDATA #REQUIRED>

encoding CDATA #IMPLIED

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Direct HTML to include in a page's HEAD content area. It allows for additional html to be added to the HTML HEAD section. This is useful for adding java scripts or extra styles sheets. This markup is only to be used with an HTML based intro part implementation. It is simply ignored in the case of a UI Forms implementation. A page can have more than one head element. An implementation can have one and only one head element (since it is a shared across all pages).

- **src** – relative or absolute URL to a file containing HTML to include directly into the HTML head section.
- **encoding** – an optional attribute to specify the encoding of the inlined file containing the head snippet. Default is UTF-8. Since 3.0.1

img

<!ELEMENT img EMPTY>

<!ATTLIST img

id CDATA #REQUIRED

src CDATA #REQUIRED

alt CDATA #IMPLIED

style-id CDATA #IMPLIED

filteredFrom (swt|html) >

An image that represents intro content and not presentation (as opposed to decoration images defined in styles).

- **id** – unique identifier of this image
- **src** – the file to load the image from
- **alt** – the alternative text to use when the image can not be loaded and as tooltip text for the image.
- **style-id** – A means to classify this image into a given category so that a common style may be applied.
- **filteredFrom** – an optional attribute that allows for filtering a given element out of a specific implementation. For example, if a group has filteredFrom = swt, it means that this group will not appear as content in the swt implementation.

extensionContent

<!ELEMENT extensionContent (text | group | link | html | include)>

img

```
<!ATTLIST extensionContent
style    CDATA #IMPLIED
alt-style CDATA #IMPLIED
path     CDATA #REQUIRED>
```

The content to be added to the target anchor. Only one extensionContent is allowed in a given configExtension because if this extension could not be resolved (if the config could not be found, or the target anchor element could not be found) then the pages and/or groups in the extension need to be ignored.

- **style** – A relative path to a CSS file which is applied to the page only when using the Web based presentation.
- **alt-style** – A relative path to a SWT presentation properties file which is applied to the page only when using the SWT based presentation.
- **path** – the path that uniquely represents the path to an anchor. (e.g. page/group1/group2/anchorId) within the target configuration to be extended. It can only be an anchor which can be in any page or group, including shared groups at configuration level

anchor

```
<!ELEMENT anchor EMPTY>
<!ATTLIST anchor
id CDATA #REQUIRED>
```

an anchor is the element used to declare extensibility. It is a location in the configuration that allows for external contributions. Only anchors are valid target values for the path attribute in an extensionContent

- **id** – unique id to identify this anchor.

contentProvider

```
<!ELEMENT contentProvider (text)>
<!ATTLIST contentProvider
id    CDATA #REQUIRED
```

anchor

pluginId CDATA #IMPLIED

class CDATA #REQUIRED>

A proxy for an intro content provider, which allows an intro page to dynamically pull data from various sources (e.g., the web, eclipse, etc) and provide content at runtime based on this dynamic data. If the `IIntroContentProvider` class that is specified in the class attribute can not be loaded, then the contents of the text element will be rendered instead. This is a dynamic version of the html intro tag. While the html tag allows for embedding or inlining a static html content into the generated html intro page, the `contentProvider` tag allows for dynamic creation of that content at runtime. Another difference between the tags is that the html tag is only supported for the HTML presentation, while this `contentProvider` tag is supported for both the HTML and SWT presentations. Since 3.0.1

- **id** – unique identifier of this content provider element.
- **pluginId** – The id of the plug-in that contains the `IContentProvider` class specified by the class attribute. This is an optional attribute that should be used if the class doesn't come from the same plug-in that defined the markup.
- **class** – A class that implements the `IContentProvider` interface

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Intro Part Configuration Extension

Identifier:

org.eclipse.ui.intro.configExtension

Since:

3.0

Description:

This extension point is used to extend an existing intro configuration by providing more content, additional StandbyContentParts or additional IntroUrl actions.

Configuration Markup:

```
<!ELEMENT extension (configExtension+ , standbyContentPart* , action*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT configExtension EMPTY>
```

```
<!ATTLIST configExtension
```

```
configId CDATA #REQUIRED
```

```
content CDATA #REQUIRED>
```

Defines an extension to an intro configuration. Any page or group in an intro part configuration can be extended, if it has declared extensability by defining anchors.

- **configId** – the id of an intro contribution that will be extended
- **content** – an intro content file. The content file is an XML file that contains the specifics of the intro ([intro content file format specification](#)). The content file is parsed at run time by the intro framework. Based on the settings in this file, a certain number of pages, groups, and links are shown to the user when the intro is opened.

```
<!ELEMENT standbyContentPart EMPTY>
```

```
<!ATTLIST standbyContentPart
```

```
id CDATA #REQUIRED
```

```
pluginId CDATA #REQUIRED
```

```
class CDATA #REQUIRED>
```

standbyContentPart registration. Once registered, standby parts can be launched through an introURL action of the following format:

```
http://org.eclipse.ui.intro/showStandby?partId=
```

```
<id of standbyContentPart>
```

- **id** – a unique id that identifies this standbyContentPart.
- **pluginId** – the name of the plugin that holds the class defined in the "class" attribute.
- **class** – the fully qualified class name of the class that implements `org.eclipse.ui.intro.config.IStandbyContentPart` to handle displaying alternative standby content, such as a cheat sheet.

```
<!ELEMENT action EMPTY>
```

```
<!ATTLIST action
```

```
name CDATA #REQUIRED
```

```
replaces CDATA #REQUIRED>
```

custom Intro URL action registration. This can be used to create new Intro URL actions or a shortCut to predefined actions.

- **name** – a unique name that identifies this action.
- **replaces** – the macro which replaces the action name in the Intro URL.

Examples:

Here is an example implementation of this extension point:

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```
<extension point=
"org.eclipse.ui.intro.configExtension"
>
<configExtension configId=
"com.org.xyz.introConfig"
content=
"extensionContent.xml"
/>
<standbyPart id=
"com.org.xyz.myStandbyPart"
class=
"com.org.xyz.internal.MyStandbyContent"
pluginId=
"com.org.xyz"
/>
<action name=
"shortcutAction"
replaces=
"http://org.eclipse.ui.intro/showStandby?partId=com.org.xyz.myStandbyPart"
/>
<action name=
"customAction"
replaces=
"runAction?pluginId=com.org.xyz&class=com.org.xyz.CustomAction&param1=value1"
/>
</extension>
```

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API Information:

For further details see the spec for the org.eclipse.ui.intro.config API package.

Supplied Implementation:

There are three supplied implementations:

- org.eclipse.jdt, makes use of configExtension
- org.eclipse.pde, makes use of configExtension
- org.eclipse.platform, makes use of standbyPoint

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Creation Wizards

Identifier:

org.eclipse.ui.newWizards

Description:

This extension point is used to register resource creation wizard extensions. Creation wizards appear as choices within the "New Dialog", and are typically used to create folders and files.

In the "New Dialog", wizards are organized into categories which usually reflect a particular problem domain. For instance, a Java oriented plugin may define a category called "Java" which is appropriate for "Class" or "Package" creation wizards. The categories defined by one plug-in can be referenced by other plug-ins using the category attribute. Uncategorized wizards, as well as wizards with invalid category paths, will end up in an "Other" category.

Wizards may optionally specify a description subelement whose body should contain short text about the wizard.

Configuration Markup:

```
<!ELEMENT extension (category | wizard | primaryWizard)*>
```

```
<!ATTLIST extension
```

```
  point CDATA #REQUIRED
```

```
  id CDATA #IMPLIED
```

```
  name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT category EMPTY>
```

```
<!ATTLIST category
```

```
  id CDATA #REQUIRED
```

```
  name CDATA #REQUIRED
```

```
  parentCategory CDATA #IMPLIED>
```

- **id** – a unique name that can be used to identify this category
- **name** – a translatable name of the category that will be used in the dialog box
- **parentCategory** – a path to another category if this category should be added as a child

<!ELEMENT wizard (description? , selection*)>

<!ATTLIST wizard

id CDATA #REQUIRED

name CDATA #REQUIRED

icon CDATA #IMPLIED

category CDATA #IMPLIED

class CDATA #REQUIRED

project (true | false)

finalPerspective CDATA #IMPLIED

preferredPerspectives CDATA #IMPLIED

helpHref CDATA #IMPLIED

descriptionImage CDATA #IMPLIED>

- **id** – a unique name that can be used to identify this wizard
- **name** – a translatable name of the wizard that will be used in the dialog box
- **icon** – a relative path of an icon that will be used together with the name to represent the wizard as one of the choices in the creation dialog box.
- **category** – a slash–delimited path (/) of category IDs. Each token in the path must represent a valid category ID previously defined by this or some other plug–in. If omitted, the wizard will be added to the "Other" category.
- **class** – a fully qualified name of the Java class implementing `org.eclipse.ui.INewWizard`.
- **project** – an optional attribute indicating the wizard will create an IProject resource. Also causes the wizard to appear as a choice within the "New Project Dialog".
- **finalPerspective** – an optional attribute which identifies a perspective to activate when IProject resource creation is finished.
- **preferredPerspectives** – an optional attribute specifying a comma–separated list of perspective IDs. If the current perspective is in this list, then no perspective activation occurs when IProject resource creation is finished.
- **helpHref** – a help url that can describe this wizard in detail.

Since 3.0

- **descriptionImage** – a larger image that can help describe this wizard.

Since 3.0

<!ELEMENT description (#CDATA)>

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an optional subelement whose body contains a short text describing what the wizard will do when started

```
<!ELEMENT selection EMPTY>
```

```
<!ATTLIST selection
```

```
class CDATA #REQUIRED
```

```
name CDATA #IMPLIED>
```

- **class** – a fully qualified class name. If each object in the workbench selection implements this interface the selection will be passed to the wizard. Otherwise, an empty selection is passed
- **name** – an optional name filter. Each object in the workbench selection must match the name filter to be passed to the wizard

```
<!ELEMENT primaryWizard EMPTY>
```

```
<!ATTLIST primaryWizard
```

```
id CDATA #REQUIRED>
```

a means of declaring that a wizard is "primary" in the UI. A primary wizard is emphasized in the new wizard dialog. Please note that this element is not intended to be used by plug in developers! This element exists so that product managers may emphasize a set of wizards for their products.

- **id** – the id of a wizard that should be made primary.

Examples:

Following is an example of creation wizard configuration:

```
<extension point=
```

```
"org.eclipse.ui.newWizards"
```

```
>
```

```
<category id=
```

```
"com.xyz.XYZ"
```

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```
name=
"XYZ Wizards"
>
</category>
<category id=
"com.xyz.XYZ.Web"
name=
"Web Wizards"
parentCategory=
"com.xyz.XYZ"
>
</category>
<wizard id=
"com.xyz.wizard1"
name=
"XYZ artifact"
category=
"com.xyz.XYZ/com.xyz.XYZ.Web"
icon=
"./icons/XYZwizard1.gif"
class=
"com.xyz.XYZWizard1"
>
<description>
Create a simple XYZ artifact and set initial content
</description>
```

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```
<selection class=  
"org.eclipse.core.resources.IResource"  
/>  
  
</wizard>  
  
</extension>
```

API Information:

The value of the class attribute must represent a class that implements `org.eclipse.ui.INewWizard`. If the wizard is created from within the New Wizard it will be inserted into the existing wizard. If the wizard is launched as a shortcut (from the File New menu or a toolbar button) it will appear standalone as a separate dialog box.

Supplied Implementation:

The workbench comes with wizards for creating empty resources of the following types: project, folder and file. These wizards are registered using the same mechanism as described above. Additional wizards may also appear, subject to particular platform installation.

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Perspective Extensions

Identifier:

org.eclipse.ui.perspectiveExtensions

Description:

This extension point is used to extend perspectives registered by other plug-ins. A perspective defines the initial contents of the window action bars (menu and toolbar) and the initial set of views and their layout within a workbench page. Other plug-ins may contribute actions or views to the perspective which appear when the perspective is selected. Optional additions by other plug-ins are appended to the initial definition.

Configuration Markup:

```
<!ELEMENT extension (perspectiveExtension*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT perspectiveExtension (actionSet | viewShortcut | perspectiveShortcut | newWizardShortcut | view | showInPart)*>
```

```
<!ATTLIST perspectiveExtension
```

```
targetID CDATA #REQUIRED>
```

- **targetID** – the unique identifier of the perspective (as specified in the registry) into which the contribution is made.

```
<!ELEMENT actionSet EMPTY>
```

```
<!ATTLIST actionSet
```

```
id CDATA #REQUIRED>
```

- **id** – the unique identifier of the action set which will be added to the perspective.

<!ELEMENT viewShortcut EMPTY>

<!ATTLIST viewShortcut

id CDATA #REQUIRED>

- **id** – the unique identifier of the view which will be added to the perspective's "Show View" submenu of the "Window" menu.

<!ELEMENT perspectiveShortcut EMPTY>

<!ATTLIST perspectiveShortcut

id CDATA #REQUIRED>

- **id** – the unique identifier of the perspective which will be added to the perspective's "Open Perspective" submenu of the "Window" menu.

<!ELEMENT newWizardShortcut EMPTY>

<!ATTLIST newWizardShortcut

id CDATA #REQUIRED>

- **id** – the unique identifier of the new wizard which will be added to the perspective's "New" submenu of the "File" menu.

<!ELEMENT showInPart EMPTY>

<!ATTLIST showInPart

id CDATA #IMPLIED>

- **id** – the unique identifier of the view which will be added to the perspective's "Show In..." prompter in the Navigate menu.

<!ELEMENT view EMPTY>

<!ATTLIST view

id CDATA #REQUIRED

relative CDATA #REQUIRED

relationship (stack|left|right|top|bottom|fast)

ratio CDATA #IMPLIED

visible (true | false)

closeable (true | false)

moveable (true | false)

standalone (true | false)

showTitle (true | false) >

- **id** – the unique identifier of the view which will be added to the perspective layout.
- **relative** – the unique identifier of a view which already exists in the perspective. This will be used as a reference point for placement of the view. The relationship between these two views is defined by `relationship`.
- **relationship** – specifies the relationship between `id` and `relative`. The following values are supported:
 - fast** – the view extension will be created as a fast view.
 - stack** – the view extension will be stacked with the relative view in a folder.
 - left, right, top, bottom** – the view extension will be placed beside the relative view. In this case a `ratio` must also be defined.
- **ratio** – the percentage of area within the relative view which will be donated to the view extension. If the view extension is a fast view, the ratio is the percentage of the workbench the fast view will cover when active. This must be defined as a floating point value and lie between 0.05 and 0.95.
- **visible** – whether the view is initially visible when the perspective is opened. This attribute should have a value of "true" or "false" if used. If this attribute is not used, the view will be initially visible by default.
- **closeable** – whether the view is closeable in the target perspective. This attribute should have a value of "true" or "false" if used. If this attribute is not used, the view will be closeable, unless the perspective itself is marked as fixed.
- **moveable** – whether the view is moveable. A non-moveable view cannot be moved either within the same folder, or moved between folders in the perspective. This attribute should have a value of "true" or "false" if used. If this attribute is not used, the view will be moveable, unless the perspective itself is marked as fixed.
- **standalone** – whether the view is a standalone view. A standalone view cannot be docked together with others in the same folder. This attribute should have a value of "true" or "false" if used. This attribute is ignored if the `relationship` attribute is "fast" or "stacked". If this attribute is not used, the view will be a regular view, not a standalone view (default is "false").
- **showTitle** – whether the view's title is shown. This attribute should have a value of "true" or "false" if used. This attribute only applies to standalone views. If this attribute is not used, the view's title will be shown (default is "true").

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Examples:

The following is an example of a perspective extension (note the subelements and the way attributes are used):

```
<extension point=
"org.eclipse.ui.perspectiveExtensions"
>
<perspectiveExtension targetID=
"org.eclipse.ui.resourcePerspective"
>
<actionSet id=
"org.eclipse.jdt.ui.JavaActionSet"
/>
<viewShortcut id=
"org.eclipse.jdt.ui.PackageExplorer"
/>
<newWizardShortcut id=
"org.eclipse.jdt.ui.wizards.NewProjectCreationWizard"
/>
<perspectiveShortcut id=
"org.eclipse.jdt.ui.JavaPerspective"
/>
<view id=
"org.eclipse.jdt.ui.PackageExplorer"
relative=
"org.eclipse.ui.views.ResourceNavigator"
```

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```
relationship=  
"stack"  
/>  
  
<view id=  
"org.eclipse.jdt.ui.TypeHierarchy"  
relative=  
"org.eclipse.ui.views.ResourceNavigator"  
relationship=  
"left"  
ratio=  
"0.50"  
/>  
  
</perspectiveExtension>  
  
</extension>
```

In the example above, an action set, view shortcut, new wizard shortcut, and perspective shortcut are contributed to the initial contents of the Resource Perspective. In addition, the Package Explorer view is stacked on the Resource Navigator and the Type Hierarchy View is added beside the Resource Navigator.

API Information:

The items defined within the perspective extension are contributed to the initial contents of the target perspective. Following this, the user may remove any contribution or add others to a perspective from within the workbench user interface.

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Perspectives

Identifier:

org.eclipse.ui.perspective

Description:

This extension point is used to add perspective factories to the workbench. A perspective factory is used to define the initial layout and visible action sets for a perspective. The user can select a perspective by invoking the "Open Perspective" submenu of the "Window" menu.

Configuration Markup:

```
<!ELEMENT extension (perspective*)>
```

```
<!--ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED-->
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT perspective (description?)>
```

```
<!--ATTLIST perspective
```

```
id CDATA #REQUIRED
```

```
name CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
icon CDATA #IMPLIED
```

```
fixed (true | false) >
```

- **id** – a unique name that will be used to identify this perspective.
- **name** – a translatable name that will be used in the workbench window menu bar to represent this perspective.
- **class** – a fully qualified name of the class that implements `org.eclipse.ui.IPerspectiveFactory` interface.
- **icon** – a relative name of the icon that will be associated with this perspective.

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- **fixed** – indicates whether the layout of the perspective is fixed. If true, then views created by the perspective factory are not closeable, and cannot be moved. The default is false.

<!ELEMENT description (#CDATA)>

an optional subelement whose body should contain text providing a short description of the perspective.

Examples:

The following is an example of a perspective extension:

```
<extension point=
"org.eclipse.ui.perspectives"
>
<perspective id=
"org.eclipse.ui.resourcePerspective"
name=
"Resource"
class=
"org.eclipse.ui.internal.ResourcePerspective"
icon=
"icons/MyIcon.gif"
>
</perspective>
</extension>
```

API Information:

The value of the `class` attribute must be the fully qualified name of a class that implements `org.eclipse.ui.IPerspectiveFactory`. The class must supply the initial layout for a perspective when asked by the workbench.

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The `plugin_customization.ini` file is used to define the default perspective. The *default perspective* is the first perspective which appears when the product is launched after install. It is also used when the user opens a page or window with no specified perspective. The default perspective is defined as a property within the `plugin_customization.ini`, as shown below. The user may also override this perspective from the workbench perspectives preference page.

```
defaultPerspectiveId = org.eclipse.ui.resourcePerspective
```

The perspectives which appear in the "Open Perspective" menu are shortcuts for perspective selection. This set is defined by the active perspective itself, and extensions made through the `perspectiveExtensions` extension point.

Supplied Implementation:

The workbench provides a "Resource Perspective". Additional perspectives may be added by plug-ins. They are selected using the "Open Perspective" submenu of the "Window" menu.

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Pop-up Menus

Identifier:

org.eclipse.ui.popupMenus

Description:

This extension point is used to add new actions to context menus owned by other plug-ins. Action contribution may be made against a specific object type (`objectContribution`) or against a specific context menu of a view or editor part (`viewerContribution`). When using `objectContribution`, the contribution will appear in all view or editor part context menus where objects of the specified type are selected. In contrast, using `viewerContribution`, the contribution will only appear in the specified view or editor part context menu, regardless of the selection.

When selection is heterogeneous, contribution will be applied if registered against a common type of the selection, if possible. If a direct match is not possible, matching against superclasses and superinterfaces will be attempted.

Selection can be further constrained through the use of a name filter. If used, all the objects in the selection must match the filter in order to apply the contribution.

Individual actions in an object contribution can use `attribute enablesFor` to specify if it should only apply for a single, multiple, or any other selection type.

If these filtering mechanisms are inadequate an action contribution may use the `filter` mechanism. In this case the attributes of the target object are described in a series of name value pairs. The attributes which apply to the selection are type specific and beyond the domain of the workbench itself, so the workbench will delegate filtering at this level to the actual selection.

An action's enablement and/or visibility can be defined using the elements `enablement` and `visibility` respectively. These two elements contain a boolean expression that is evaluated to determine the enablement and/or visibility.

The syntax is the same for the `enablement` and `visibility` elements. Both contain only one boolean expression sub-element. In the simplest case, this will be an `objectClass`, `objectState`, `pluginState`, or `systemProperty` element. In the more complex case, the `and`, `or`, and `not` elements can be combined to form a boolean expression. Both the `and`, and `or` elements must contain 2 sub-elements. The `not` element must contain only 1 sub-element.

Configuration Markup:

```
<!ELEMENT extension (objectContribution , viewerContribution)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```


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- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

<!ELEMENT objectContribution (filter* ,visibility? ,enablement? ,menu* ,action*)>

<!ATTLIST objectContribution

id CDATA #REQUIRED

objectClass CDATA #REQUIRED

nameFilter CDATA #IMPLIED

adaptable (true | false) "false">

This element is used to define a group of actions and/or menus for any viewer context menus for which the objects of the specified type are selected.

- **id** – a unique identifier used to reference this contribution
- **objectClass** – a fully qualified name of the class or interface that all objects in the selection must subclass or implement.
- **nameFilter** – an optional wild card filter for the name that can be applied to all objects in the selection. No contribution will take place if there is no match.
- **adaptable** – a flag that indicates if types that adapt to IResource should use this object contribution. This flag is used only if objectClass adapts to IResource. Default value is false.

<!ELEMENT viewerContribution (visibility? ,menu* ,action*)>

<!ATTLIST viewerContribution

id CDATA #REQUIRED

targetID CDATA #REQUIRED>

This element is used to define a group of actions and/or menus for a specific view or editor part context menu.

- **id** – a unique identifier used to reference this contribution
- **targetID** – the unique identifier of a context menu inside a view or editor part.

<!ELEMENT action (selection* ,enablement*)>

```

<!ATTLIST action
  id          CDATA #REQUIRED
  label       CDATA #REQUIRED
  definitionId CDATA #IMPLIED
  menubarPath CDATA #IMPLIED
  icon        CDATA #IMPLIED
  helpContextId CDATA #IMPLIED
  style       (push|radio|toggle|pull-down)
  state       (true | false)
  class       CDATA #REQUIRED
  enablesFor  CDATA #IMPLIED
  overrideActionId CDATA #IMPLIED
  tooltip     CDATA #IMPLIED>

```

This element defines an action that the user can invoke in the UI.

- **id** – a unique identifier used as a reference for this action.
- **label** – a translatable name used as the menu item text. The name can include mnemonic information.
- **definitionId** – This specifies the command that this action is handling. This is used to decide which key binding to display in the pop-up menu.
- **menubarPath** – a slash-delimited path ('/') used to specify the location of this action in the context menu. Each token in the path, except the last one, must represent a valid identifier of an existing menu in the hierarchy. The last token represents the named group into which this action will be added. If the path is omitted, this action will be added to the standard additions group defined by `IWorkbenchActionConstants.MB_ADDITIONS`.
- **icon** – a relative path of an icon used to visually represent the action in its context. The path is relative to the location of the `plugin.xml` file of the contributing plug-in.
- **helpContextId** – a unique identifier indicating the help context for this action. If the action appears as a menu item, then pressing F1 while the menu item is highlighted will display help.
- **style** – an optional attribute to define the user interface style type for the action. If defined, the attribute value will be one of the following:
 - push** – as a regular menu item or tool item.
 - radio** – as a radio style menu item or tool item. Actions with the radio style within the same menu or toolbar group behave as a radio set. The initial value is specified by the `state` attribute.
 - toggle**

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– as a checked style menu item or as a toggle tool item. The initial value is specified by the `state` attribute.

pulldown – as a cascading style menu item.

- **state** – an optional attribute indicating the initial state (either `true` or `false`), used when the style attribute has the value `radio` or `toggle`.
- **class** – a name of the fully qualified class that implements `org.eclipse.ui.IObjectActionDelegate` (for object contributions), `org.eclipse.ui.IViewActionDelegate` (for viewer contributions to a view part), or `org.eclipse.ui.IEditorActionDelegate` (for viewer contributions to an editor part). For backwards compatibility, `org.eclipse.ui.IActionDelegate` may be implemented for object contributions.
- **enablesFor** – a value indicating the selection count which must be met to enable the action. If this attribute is specified and the condition is met, the action is enabled. If the condition is not met, the action is disabled. If no attribute is specified, the action is enabled for any number of items selected. The following attribute formats are supported:

! – 0 items selected

? – 0 or 1 items selected

+ – 1 or more items selected

multiple, 2+ – 2 or more items selected

n – a precise number of items selected. a precise number of items selected. For example: `enablesFor=" 4"` enables the action only when 4 items are selected

* – any number of items selected

The enablement criteria for an action extension are initially defined by `enablesFor`, `selection` and `enablement`. However, once the action delegate has been instantiated it may control the action enable state directly within its `selectionChanged` method.

- **overrideActionId** – an optional attribute that specifies the identifier of an action which this action overrides. The action represented by this identifier will not be contributed to the context menu. The action identifier must be from a prerequisite plug-in only. This attribute is only applicable to action elements of an object contribution.
- **tooltip** – a translatable text representing the action's tool tip. Only used if the action appears in the toolbar.

```
<!ELEMENT filter EMPTY>
```

```
<!ATTLIST filter
```

```
name CDATA #REQUIRED
```

```
value CDATA #REQUIRED>
```

This element is used to evaluate the attribute state of each object in the current selection. A match only if each object in the selection has the specified attribute state. Each object in the selection must implement, or adapt to, `org.eclipse.ui.IActionFilter`.

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- **name** – the name of an object's attribute. Acceptable names reflect the object type, and should be publicly declared by the plug-in where the object type is declared.
- **value** – the required value of the object's attribute. The acceptable values for the object's attribute should be publicly declared.

```
<!ELEMENT menu (separator+ , groupMarker*)>
```

```
<!ATTLIST menu
```

```
id CDATA #REQUIRED
```

```
label CDATA #REQUIRED
```

```
path CDATA #IMPLIED>
```

This element is used to defined a new menu.

- **id** – a unique identifier that can be used to reference this menu.
- **label** – a translatable name used by the Workbench for this new menu. The name should include mnemonic information.
- **path** – the location of the new menu starting from the root of the menu. Each token in the path must refer to an existing menu, except the last token which should represent a named group in the last menu in the path. If omitted, the new menu will be added to the `additions` named group of the menu.

```
<!ELEMENT separator EMPTY>
```

```
<!ATTLIST separator
```

```
name CDATA #REQUIRED>
```

This element is used to create a menu separator in the new menu.

- **name** – the name of the menu separator. This name can later be referenced as the last token in a menu path. Therefore, a separator also serve as named group into which actions and menus can be added.

```
<!ELEMENT groupMarker EMPTY>
```

```
<!ATTLIST groupMarker
```

```
name CDATA #REQUIRED>
```

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This element is used to create a named group in the new menu. It has no visual representation in the new menu, unlike the `separator` element.

- **name** – the name of the group marker. This name can later be referenced as the last token in the menu path. It serves as named group into which actions and menus can be added.

```
<!ELEMENT selection EMPTY>
```

```
<!ATTLIST selection
```

```
class CDATA #REQUIRED
```

```
name CDATA #IMPLIED>
```

This element is used to help determine the action enablement based on the current selection. Ignored if the `enablement` element is specified.

- **class** – a fully qualified name of the class or interface that each object in the selection must implement in order to enable the action.
- **name** – an optional wild card filter for the name that can be applied to all objects in the selection. If specified and the match fails, the action will be disabled.

```
<!ELEMENT enablement (and | or | not | objectClass | objectState | pluginState | systemProperty)>
```

This element is used to define the enablement for the extension.

```
<!ELEMENT visibility (and | or | not | objectClass | objectState | pluginState | systemProperty)>
```

This element is used to define the visibility for the extension.

```
<!ELEMENT and (and | or | not | objectClass | objectState | pluginState | systemProperty)>
```

This element represent a boolean AND operation on the result of evaluating it's two sub–element expressions.

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<!ELEMENT or (and | or | not | objectClass | objectState | pluginState | systemProperty)>

This element represent a boolean OR operation on the result of evaluating it's two sub–element expressions.

<!ELEMENT not (and | or | not | objectClass | objectState | pluginState | systemProperty)>

This element represent a boolean NOT operation on the result of evaluating it's sub–element expressions.

<!ELEMENT objectClass EMPTY>

<!ATTLIST objectClass

name CDATA #REQUIRED>

This element is used to evaluate the class or interface of each object in the current selection. If each object in the selection implements the specified class or interface, the expression is evaluated as true.

- **name** – a fully qualified name of a class or interface. The expression is evaluated as true only if all objects within the selection implement this class or interface.

<!ELEMENT objectState EMPTY>

<!ATTLIST objectState

name CDATA #REQUIRED

value CDATA #REQUIRED>

This element is used to evaluate the attribute state of each object in the current selection. If each object in the selection has the specified attribute state, the expression is evaluated as true. To evaluate this type of expression, each object in the selection must implement, or adapt to, `org.eclipse.ui.IActionFilter` interface.

- **name** – the name of an object's attribute. Acceptable names reflect the object type, and should be publicly declared by the plug–in where the object type is declared.
- **value** – the required value of the object's attribute. The acceptable values for the object's attribute should be publicly declared.

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```
<!ELEMENT pluginState EMPTY>
```

```
<!ATTLIST pluginState
```

```
id CDATA #REQUIRED
```

```
value (installed|activated) "installed">
```

This element is used to evaluate the state of a plug-in. The state of the plug-in may be one of the following: `installed` or `activated`.

- **id** – the identifier of a plug-in which may or may not exist in the plug-in registry.
- **value** – the required state of the plug-in. The state of the plug-in may be one of the following: `installed` or `activated`.

```
<!ELEMENT systemProperty EMPTY>
```

```
<!ATTLIST systemProperty
```

```
name CDATA #REQUIRED
```

```
value CDATA #REQUIRED>
```

This element is used to evaluate the state of some system property. The property value is retrieved from the `java.lang.System`.

- **name** – the name of the system property.
- **value** – the required value of the system property.

```
<!ELEMENT enablement (not , and , or , instanceof , test , systemTest , equals , count , with , resolve , adapt , iterate)*>
```

A generic root element. The element can be used inside an extension point to define its enablement expression. The children of an enablement expression are combined using the and operator.

```
<!ELEMENT not (not | and | or | instanceof | test | systemTest | equals | count | with | resolve | adapt | iterate)>
```

This element represent a NOT operation on the result of evaluating it's sub-element expression.

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<!ELEMENT and (not , and , or , instanceof , test , systemTest , equals , count , with , resolve , adapt , iterate)*>

This element represent an AND operation on the result of evaluating all it's sub-elements expressions.

<!ELEMENT or (not , and , or , instanceof , test , systemTest , equals , count , with , resolve , adapt , iterate)*>

This element represent an OR operation on the result of evaluating all it's sub-element expressions.

<!ELEMENT instanceof EMPTY>

<!ATTLIST instanceof

value CDATA #REQUIRED>

This element is used to perform an instanceof check of the object in focus. The expression returns EvaluationResult.TRUE if the object's type is a sub type of the type specified by the attribute value. Otherwise EvaluationResult.FALSE is returned.

- **value** – a fully qualified name of a class or interface.

<!ELEMENT test EMPTY>

<!ATTLIST test

property CDATA #REQUIRED

args CDATA #IMPLIED

value CDATA #IMPLIED>

This element is used to evaluate the property state of the object in focus. The set of testable properties can be extended using the property tester extension point. The test expression returns EvaluationResult.NOT_LOADED if the property tester doing the actual testing isn't loaded yet.

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- **property** – the name of an object's property to test.
- **args** – additional arguments passed to the property tester. Multiple arguments are separated by commas. Each individual argument is converted into a Java base type using the same rules as defined for the value attribute of the test expression.
- **value** – the expected value of the property. Can be omitted if the property is a boolean property. The test expression is supposed to return `EvaluationResult.TRUE` if the property matches the value and `EvaluationResult.FALSE` otherwise. The value attribute is converted into a Java base type using the following rules:
 - ◆ the string "true" is converted into `Boolean.TRUE`
 - ◆ the string "false" is converted into `Boolean.FALSE`
 - ◆ if the string contains a dot then the interpreter tries to convert the value into a `Float` object. If this fails the string is treated as a `java.lang.String`
 - ◆ if the string only consists of numbers then the interpreter converts the value in an `Integer` object.
 - ◆ in all other cases the string is treated as a `java.lang.String`
 - ◆ the conversion of the string into a `Boolean`, `Float`, or `Integer` can be suppressed by surrounding the string with single quotes. For example, the attribute value="true" is converted into the string "true"

<!ELEMENT systemTest EMPTY>

<!ATTLIST systemTest

property CDATA #REQUIRED

value CDATA #REQUIRED>

Tests a system property by calling the `System.getProperty` method and compares the result with the value specified through the value attribute.

- **property** – the name of an system property to test.
- **value** – the expected value of the property. The value is interpreted as a string value.

<!ELEMENT equals EMPTY>

<!ATTLIST equals

value CDATA #REQUIRED>

This element is used to perform an equals check of the object in focus. The expression returns `EvaluationResult.TRUE` if the object is equal to the value provided by the attribute value. Otherwise `EvaluationResult.FALSE` is returned.

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- **value** – the operand of the equals tests. The value provided as a string is converted into a Java base type using the same rules as for the value attribute of the test expression.

<!ELEMENT count EMPTY>

<!ATTLIST count

value CDATA #REQUIRED>

This element is used to test the number of elements in a collection.

- **value** – an expression to specify the number of elements in a list. Following wildcard characters can be used:

*

any number of elements

?

no elements or one element

+

one or more elements

!

no elements

integer value

the list must contain the exact number of elements

<!ELEMENT with (not , and , or , instanceof , test , systemTest , equals , count , with , resolve , adapt , iterate)*>

<!ATTLIST with

variable CDATA #REQUIRED>

This element changes the object to be inspected for all its child element to the object referenced by the given variable. If the variable can not be resolved then the expression will throw a ExpressionException when evaluating it. The children of a with expression are combined using the and operator.

- **variable** – the name of the variable to be used for further inspection. It is up to the evaluator of an extension point to provide the variable in the variable pool.

<!ELEMENT resolve (not , and , or , instanceof , test , systemTest , equals , count , with , resolve , adapt , iterate)*>

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<!ATTLIST resolve

variable CDATA #REQUIRED

args CDATA #IMPLIED>

This element changes the object to be inspected for all its child element to the object referenced by the given variable. If the variable can not be resolved then the expression will throw a `ExpressionException` when evaluating it. The children of a with expression are combined using the and operator.

- **variable** – the name of the variable to be resolved. This variable is then used as the object in focus for child element evaluation. It is up to the evaluator of an extension point to provide a corresponding variable resolver (see `IVariableResolver`) through the evaluation context passed to the root expression element when evaluating the expression.
- **args** – additional arguments passed to the variable resolver. Multiple arguments are separated by commas. Each individual argument is converted into a Java base type using the same rules as defined for the value attribute of the test expression.

<!ELEMENT adapt (not , and , or , instanceof , test , systemTest , equals , count , with , resolve , adapt , iterate)*>

<!ATTLIST adapt

type CDATA #REQUIRED>

This element is used to adapt the object in focus to the type specified by the attribute type. The expression returns not loaded if either the adapter or the type referenced isn't loaded yet. It throws a `ExpressionException` during evaluation if the type name doesn't exist at all. The children of an adapt expression are combined using the and operator.

- **type** – the type to which the object in focus is to be adapted.

<!ELEMENT iterate (not , and , or , instanceof , test , systemTest , equals , count , with , resolve , adapt , iterate)*>

<!ATTLIST iterate

operator (or|and) >

This element is used to iterate over a variable that is of type `java.util.Collection`. If the object in focus is not of type `java.util.Collection` then an `ExpressionException` will be thrown while evaluating the expression.

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- **operator** – either "and" or "or". The operator defines how the child elements will be combined. If not specified, "and" will be used.

Examples:

The following is an example of a pop-up menu extension point:

```
<extension point=
"org.eclipse.ui.popupMenus"
>
<objectContribution id=
"com.xyz.C1"
objectClass=
"org.eclipse.core.resources.IFile"
nameFilter=
"*.*java"
>
<menu id=
"com.xyz.xyzMenu"
path=
"additions"
label=
"&XYZ Java Tools"
>
<separator name=
"group1"
/>
```

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```
</menu>

<action id=
"com.xyz.runXYZ"
label=
"&Run XYZ Tool"
style=
"push"
menubarPath=
"com.xyz.xyzMenu/group1"
icon=
"icons/runXYZ.gif"
helpContextId=
"com.xyz.run_action_context"
class=
"com.xyz.actions.XYZToolActionDelegate"
enablesFor=
"1"
>
</action>
</objectContribution>
<viewerContribution id=
"com.xyz.C2"
targetID=
"org.eclipse.ui.views.TaskList"
>
<action id=
Pop-up Menus
```

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```
"com.xyz.showXYZ"  
  
label=  
  
"&Show XYZ"  
  
style=  
  
"toggle"  
  
state=  
  
"true"  
  
menubarPath=  
  
"additions"  
  
icon=  
  
"icons/showXYZ.gif"  
  
helpContextId=  
  
"com.xyz.show_action_context"  
  
class=  
  
"com.xyz.actions.XYZShowActionDelegate"  
  
>  
  
</action>  
  
</viewerContribution>  
  
</extension>
```

In the example above, the specified object contribution action will only enable for a single selection (`enablesFor` attribute). In addition, each object in the selection must implement the specified interface (`IFile`) and must be a Java file. This action will be added into a submenu previously created. This contribution will be effective in any view that has the required selection.

In contrast, the viewer contribution above will only appear in the Tasks view context menu, and will not be affected by the selection in the view.

The following is an example of the filter mechanism. In this case the action will only appear for `IMarkers` which are completed and have high priority.

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```
<extension point=
"org.eclipse.ui.popupMenus"
>
<objectContribution id=
"com.xyz.C3"
objectClass=
"org.eclipse.core.resources.IMarker"
>
<filter name=
"done"
value=
"true"
/>
<filter name=
"priority"
value=
"2"
/>
<action id=
"com.xyz.runXYZ"
label=
"High Priority Completed Action Tool"
icon=
"icons/runXYZ.gif"
class=
"com.xyz.actions.MarkerActionDelegate"
```

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>

</action>

</objectContribution>

</extension>

The following is an other example of using the visibility element:

<extension point=

"org.eclipse.ui.popupMenus"

>

<viewerContribution id=

"com.xyz.C4"

targetID=

"org.eclipse.ui.views.TaskList"

>

<visibility>

<and>

<pluginState id=

"com.xyz"

value=

"activated"

/>

<systemProperty name=

"ADVANCED_MODE"

value=

"true"

/>

Pop-up Menu

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```
</and>

</visibility>

<action id=

"com.xyz.showXYZ"

label=

"&Show XYZ"

style=

"push"

menubarPath=

"additions"

icon=

"icons/showXYZ.gif"

helpContextId=

"com.xyz.show_action_context"

class=

"com.xyz.actions.XYZShowActionDelegate"

>

</action>

</viewerContribution>

</extension>
```

In the example above, the specified action will appear as a menu item in the Task view context menu, but only if the "com.xyz" plug-in is active and the specified system property is set to true.

API Information:

The value of the action attribute `class` must be a fully qualified class name of a Java class that implements `org.eclipse.ui.IObjectActionDelegate` in the case of object contributions, `org.eclipse.ui.IViewActionDelegate` for contributions to context menus that belong to views, or `org.eclipse.ui.IEditorActionDelegate` for contributions to context menus that belong to editors. In all cases, the implementing class is loaded as late as possible to avoid loading the entire plug-in before it is really needed.

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Note: For backwards compatibility, `org.eclipse.ui.IActionDelegate` may be implemented for object contributions.

Context menu extension within a part is only possible when the target part publishes a menu for extension. This is strongly encouraged, as it improves the extensibility of the product. To accomplish this each part should publish any context menus which are defined by calling `IWorkbenchPartSite.registerContextMenu`. Once this has been done the workbench will automatically insert any action extensions which exist.

A menu id must be provided for each registered menu. For consistency across parts the following strategy should be adopted by all part implementors.

- If the target part has only one context menu it should be registered with `id == part id`. This can be done easily by calling `registerContextMenu(MenuManager, ISelectionProvider)`. Extenders may use the part id itself as the `targetID` for the action extension.
- If the target part has more than one context menu a unique id should be defined for each. Prefix each id with the part id and publish these id's within the javadoc for the target part. Register each menu at runtime by calling `registerContextMenu(String, MenuManager, ISelectionProvider)`. Extenders will use the unique menu id as the `targetID` for the action extension.

Any context menu which is registered with the workbench also should contain a standard insertion point with id `IWorkbenchActionConstants.MB_ADDITIONS`. Other plug-ins will use this value as a reference point for insertion. The insertion point may be defined by adding a `GroupMarker` to the menu at an appropriate location for insertion.

An object in the workbench which is the selection in a context menu may define an `org.eclipse.ui.IActionFilter`. This is a filtering strategy which can perform type specific filtering. The workbench will retrieve the filter for the selection by testing to see if it implements `IActionFilter`. If that fails, the workbench will ask for a filter through the `IAdaptable` mechanism.

Action and menu labels may contain special characters that encode mnemonics which are specified using the ampersand ('&') character in front of a selected character in the translated text. Since ampersand is not allowed in XML strings, use `&#` character entity.

If two or more actions are contributed to a menu by a single extension the actions will appear in the reverse order of how they are listed in the `plugin.xml` file. This behavior is admittedly unintuitive. However, it was discovered after the Eclipse Platform API was frozen. Changing the behavior now would break every plug-in which relies upon the existing behavior.

The `selection` and `enablement` elements are mutually exclusive. The `enablement` element can replace the `selection` element using the sub-elements `objectClass` and `objectState`. For example, the following:

```
<selection class=
```

```
"org.eclipse.core.resources.IFile"
```

```
name=
```

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```
"*.java"
```

```
>
```

```
</selection>
```

can be expressed using:

```
<enablement>
```

```
<and>
```

```
<objectClass name=
```

```
"org.eclipse.core.resources.IFile"
```

```
/>
```

```
<objectState name=
```

```
"extension"
```

```
value=
```

```
"java"
```

```
/>
```

```
</and>
```

```
</enablement>
```

Supplied Implementation:

The workbench views have built-in context menus that already come loaded with a number of actions. Plug-ins can contribute to these menus. If a viewer has reserved slots for these contributions and they are made public, slot names can be used as paths. Otherwise, actions and submenus will be added at the end of the pop-up menu.

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Preference Pages

Identifier:

org.eclipse.ui.preferencePages

Description:

The workbench provides one common dialog box for preferences. The purpose of this extension point is to allow plug-ins to add pages to the preference dialog box. When preference dialog box is opened (initiated from the menu bar), pages contributed in this way will be added to the dialog box.

The preference dialog box provides for hierarchical grouping of the pages. For this reason, a page can optionally specify a `category` attribute. This attribute represents a path composed of parent page IDs separated by '/'. If this attribute is omitted or if any of the parent nodes in the path cannot be found, the page will be added at the root level.

Configuration Markup:

```
<!ELEMENT extension (page*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT page EMPTY>
```

```
<!ATTLIST page
```

```
id CDATA #REQUIRED
```

```
name CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
category CDATA #IMPLIED>
```

- **id** – a unique name that will be used to identify this page.
- **name** – a translatable name that will be used in the UI for this page.
- **class** – a name of the fully qualified class that implements `org.eclipse.ui.IWorkbenchPreferencePage`.

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- **category** – a path indicating the location of the page in the preference tree. The path may either be a parent node ID or a sequence of IDs separated by '/', representing the full path from the root node.

Examples:

The following is an example for the preference extension point:

```
<extension point=
"org.eclipse.ui.preferencePages"
>
<page id=
"com.xyz.prefpage1"
name=
"XYZ"
class=
"com.xyz.prefpages.PrefPage1"
>
</page>
<page id=
"com.xyz.prefpage2"
name=
"Keyboard Settings"
class=
"com.xyz.prefpages.PrefPage2"
category=
"com.xyz.prefpage1"
>
```

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</page>

</extension>

API Information:

The value of the attribute class must represent a fully qualified name of the class that implements `org.eclipse.ui.IWorkbenchPreferencePage`.

Supplied Implementation:

The workbench adds several pages for setting the preferences of the platform. Pages registered through this extension will be added after them according to their category information.

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Presentation Factories

Identifier:

org.eclipse.ui.workbench.presentationFactories

Since:

3.0

Description:

This extension point is used to add presentation factories to the workbench. A presentation factory defines the overall look and feel of the workbench, including how views and editors are presented.

Configuration Markup:

```
<!ELEMENT extension (factory*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT factory EMPTY>
```

```
<!ATTLIST factory
```

```
class CDATA #REQUIRED
```

```
id CDATA #REQUIRED
```

```
name CDATA #REQUIRED>
```

- **class** – Specify the fully qualified class to be used for the presentation factory. The specified value must be a subclass of `org.eclipse.ui.presentations.AbstractPresentationFactory`.
- **id** – a unique name that will be used to identify this presentation factory
- **name** – a translatable name that can be used to show this presentation factory in the UI

Examples:

The following is an example of a presentationFactory extension:

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```
<extension point=  
"org.eclipse.ui.presentationFactories"  
>  
<factory class=  
"org.eclipse.ui.workbench.ExampleWorkbenchPresentationFactory"  
>  
</extension>
```

API Information:

The class specified in the factory element must be a concrete subclass of `org.eclipse.ui.presentations.AbstractPresentationFactory`.

Supplied Implementation:

If a presentation factory is not specified or is missing then the implementation in `org.eclipse.ui.presentations.WorkbenchPresentationFactory` will be used.

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Property Pages

Identifier:

org.eclipse.ui.propertyPages

Description:

This extension point is used to add additional property page for objects of a given type. Once defined, these property pages will appear in the Properties Dialog for objects of that type.

A property page is a user friendly way to interact with the properties of an object. Unlike the Properties view, which restricts the space available for editing an object property, a property page may benefit from the freedom to define larger, more complex controls with labels, icons, etc. Properties which logically go together may also be clustered in a page, rather than scattered in the property sheet. However, in most applications it will be appropriate to expose some properties of an object via the property sheet and some via the property pages.

Property pages are shown in a dialog box that is normally visible when the "Properties" menu item is selected on a pop-up menu for an object. In addition to the object class, the name filter can optionally be supplied to register property pages only for specific object types.

If these filtering mechanisms are inadequate a property page may use the filter mechanism. In this case the attributes of the target object are described in a series of key value pairs. The attributes which apply to the selection are type specific and beyond the domain of the workbench itself, so the workbench will delegate filtering at this level to the actual selection.

Configuration Markup:

```
<!ELEMENT extension (page*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT page (filter*)>
```

```
<!ATTLIST page
```

```
id CDATA #REQUIRED
```

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name CDATA #REQUIRED

icon CDATA #IMPLIED

objectClass CDATA #REQUIRED

class CDATA #REQUIRED

nameFilter CDATA #IMPLIED

adaptable (true | false) >

- **id** – a unique name that will be used to identify this page
- **name** – a translatable name that will be used in the UI for this page
- **icon** – a relative path to an icon that will be used in the UI in addition to the page name
- **objectClass** – a fully qualified name of the class for which the page is registered.
- **class** – a fully qualified name of the class that implements `org.eclipse.ui.IWorkbenchPropertyPage`.
- **nameFilter** – an optional attribute that allows registration conditional on wild card match applied to the target object name.
- **adaptable** – a flag that indicates if types that adapt to `IResource` should use this property page. This flag is used if `objectClass` adapts to `IResource`. Default value is false.

<!ELEMENT filter EMPTY>

<!ATTLIST filter

name CDATA #REQUIRED

value CDATA #REQUIRED>

This element is used to evaluate the attribute state of each object in the current selection. A match only if each object in the selection has the specified attribute state. Each object in the selection must implement, or adapt to, `org.eclipse.ui.IActionFilter`.

- **name** – the name of an object attribute.
- **value** – the value of an object attribute. In combination with the name attribute, the name value pair is used to define the target object for a property page.

Examples:

The following is an example of the property page definition:

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```
<extension point=
"org.eclipse.ui.propertyPages"
>
<page id=
"com.xyz.projectPage"
name=
"XYZ Java Properties"
objectClass=
"org.eclipse.core.resources.IFile"
class=
"com.xyz.ppages.JavaPropertyPage"
nameFilter=
"*.*.java"
>
<filter name=
"readOnly"
value=
"true"
/>
</page>
</extension>
```

API Information:

The attribute `class` must specify a fully qualified name of the class that implements `org.eclipse.ui.IWorkbenchPropertyPage`.

Supplied Implementation:

Some objects provided by the workbench may have property pages registered. Plug-ins are allowed to add more property pages for these objects. Property pages are not limited to workbench resources: all objects

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showing up in the workbench (even domain specific objects created by the plug-ins) may have property pages and other plug-ins are allowed to register property pages for them.

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Startup

Identifier:

org.eclipse.ui.startup

Since:

Release 2.0

Description:

This extension point is used to register plugins that want to be activated on startup. The plugin class or the class given as the attribute on the startup element must implement the interface `org.eclipse.ui.IStartup`. Once the workbench is started, the method `earlyStartup()` will be called from a separate thread. If the startup element has a class attribute, the method `earlyStartup()` will be called on this class. Otherwise, this method will be called from the plugin class. These plugins are listed in the workbench preferences and the user may disable any plugin from early startup.

Configuration Markup:

<!ELEMENT extension (startup*)>

<!ATTLIST extension

point CDATA #REQUIRED

id CDATA #IMPLIED

name CDATA #IMPLIED>

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

<!ELEMENT startup EMPTY>

<!ATTLIST startup

class CDATA #IMPLIED>

- **class** – a fully qualified name of the class that implements `org.eclipse.ui.IStartup`. Since release 3.0.

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Examples:

Following is an example of a startup extension:

```
<p>  
<extension point=  
"org.eclipse.ui.startup"  
>  
</p>
```

API Information:

See interface `org.eclipse.ui.IStartup`.

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System Summary Sections

Identifier:

org.eclipse.ui.systemSummarySections

Since:

3.0

Description:

The Eclipse UI provides an AboutDialog that can be branded and reused by client product plugins. This dialog includes a SystemSummary dialog that contains configuration details. By extending the org.eclipse.ui.systemSummarySections extension point clients are able to put their own information into the log.

Configuration Markup:

```
<!ELEMENT extension (section+)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT section EMPTY>
```

```
<!ATTLIST section
```

```
class CDATA #REQUIRED
```

```
sectionTitle CDATA #REQUIRED
```

```
id CDATA #IMPLIED>
```

- **class** – The fully qualified name of a class the implements org.eclipse.ui.about.ISystemSummarySection. The class must provide a default constructor.
- **sectionTitle** – a translatable name that will be displayed as the title of this section in the system summary
- **id** – an optional, unique name that will be used to identify this system summary section

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Examples:

Following is an example of a systemSummarySections extension:

```
<extension point=
"org.eclipse.ui.systemSummarySections"
>
<section sectionTitle=
"Cookie Manager Plugin"
class=
"org.eclipse.ui.examples.rcp.browser.ConfigDetails"
id=
"RCPBrowser.ConfigDetails"
>
</section>
</extension>
```

API Information:

The class specified in the section element must be a concrete subclass of `org.eclipse.ui.about.ISystemSummarySection`.

Supplied Implementation:

The Workbench uses this extension point to provide the following sections in the system summary dialog: – System properties: The contents of the table returned by `java.lang.System.getProperties`. – Features: The id of all features found by eclipse. – Plug-in Registry: The id of all plugins found by eclipse. – User Preferences: The contents of the `Eclipse PreferencesService`. – Error Log: The contents of the platform's error log.

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Themes

Identifier:

org.eclipse.ui.themes

Description:

This extension point is used to customize the appearance of the UI. It allows definition of color and font entities as well as theme entities. Themes allow applications to selectively override default color and font specifications for particular uses.

Configuration Markup:

```
<!ELEMENT extension (theme* , colorDefinition* , fontDefinition* , themeElementCategory* , data* , categoryPresentationBinding*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT theme (colorOverride* , fontOverride* , description? , data*)>
```

```
<!ATTLIST theme
```

```
id CDATA #REQUIRED
```

```
name CDATA #REQUIRED>
```

A collection of font, color and data overrides. Such a collection may be used to alter the appearance of the workbench.

- **id** – a unique name that will be used to identify this theme
- **name** – a translatable name of the theme to be presented to the user

```
<!ELEMENT themeElementCategory (description)>
```

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```
<!ATTLIST themeElementCategory
id    CDATA #REQUIRED
parentId CDATA #IMPLIED
class CDATA #IMPLIED
label CDATA #IMPLIED>
```

A logical grouping of theme element definitions. This category may include colors and fonts.

- **id** – the id for this category
- **parentId** – the id of the parent category, if any.
- **class** – a class that implements `org.eclipse.ui.themes.IThemePreview`
- **label** – a translatable name of the theme element category to be presented to the user

```
<!ELEMENT colorDefinition (colorFactory? ,colorValue* ,description?)>
```

```
<!ATTLIST colorDefinition
id    CDATA #IMPLIED
label CDATA #REQUIRED
defaultsTo CDATA #IMPLIED
value CDATA #IMPLIED
categoryId CDATA #IMPLIED
colorFactory CDATA #IMPLIED
isEditable (true | false) >
```

A symbolic color definition.

- **id** – a unique id that can be used to identify this color definition.
- **label** – a translatable name of the color to be presented to the user.
- **defaultsTo** – the id of another color definition that is the default setting for the receiver. When there is no preference for this color the color registry will have the value of `defaultsTo` set for it in the registry. Only one of `defaultsTo`, `value` or `colorFactory` may be defined.
- **value** – The default value of this color. The value may be specified in the following ways:
 - ◆ a String containing comma separated integers in the form `red,green,blue`
 - ◆ a String that maps to an SWT color constant (ie: `COLOR_RED`).

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Only one of `defaultsTo`, `value` or `colorFactory` may be defined. If `value` is specified, additional value definitions may be specified on a per platform/windowing system basis via the `colorValue` element.

- **categoryId** – the optional id of the `themeElementCategory` this color belongs to.
- **colorFactory** – a class that implements `org.eclipse.ui.themes.IColorFactory`. This may be used instead of `value` to specify the default value of the color. Please be advised that this should be used with caution – usage of this attribute will cause plugin activation.
- **isEditable** – whether the user should be allowed to edit this color in the preference page. If this is `false` then the contribution is not shown to the user.

<!ELEMENT fontDefinition (fontValue* ,description?)>

<!ATTLIST fontDefinition

id CDATA #REQUIRED

label CDATA #REQUIRED

value CDATA #IMPLIED

categoryId CDATA #IMPLIED

defaultsTo CDATA #IMPLIED

isEditable (true | false) >

A symbolic font definition.

- **id** – a unique name that can be used to identify this font definition.
- **label** – a translatable name of the font to be presented to the user.
- **value** – the font value. This is in the form: `fontname-style-height` where `fontname` is the name of a font, `style` is a font style (one of "regular", "bold", "italic", or "bold italic") and `height` is an integer representing the font height.

Example: `Times New Roman-bold-36`.

Only one (or neither) of `value` or `defaultsTo` may be used.

If `value` is specified, additional value definitions may be specified on a per platform/windowing system basis via the `fontValue` element.

- **categoryId** – the optional id of the `themeElementCategory` this font belongs to.
- **defaultsTo** – the id of another font definition that is the default setting for the receiver. When there is no preference for this font the font registry will have the value of `defaultsTo` set for it in the registry.

Only one (or neither) of `value` or `defaultsTo` may be used.

- **isEditable** – whether the user should be allowed to edit this color in the preference page. If this is `false` then the contribution is not shown to the user.

```
<!ELEMENT colorOverride (colorFactory? ,colorValue*)>
```

```
<!ATTLIST colorOverride
```

```
id      CDATA #REQUIRED
```

```
value   CDATA #IMPLIED
```

```
colorFactory CDATA #IMPLIED>
```

Allows overriding of colors defined in `colorDefinition` elements. These colors will be applied when the theme is in use.

- **id** – a unique id that can be used to identify this color definition override. This should match an existing font identifier. Strictly speaking, you may override colors that do not exist in the base theme although this practice is not recommended. In effect, such overrides will have behaviour similar to `colorDefinitions` that have `isEditable` set to `false`.
- **value** – the overriding value of this color. The value may be specified in the following ways:
 - ◆ a String containing comma separated integers in the form `red,green,blue`
 - ◆ a String that maps to an SWT color constant (ie: `COLOR_RED`).Only one of `value` or `colorFactory` may be defined. Unlike a `colorDefinition`, you may not supply a `defaultsTo` for an override.
- **colorFactory** – a class that implements `org.eclipse.ui.themes.IColorFactory`. This may be used instead of `value` to specify the default value of the color. Please be advised that this should be used with caution – usage of this attribute will cause plugin activation.

```
<!ELEMENT fontOverride (fontValue*)>
```

```
<!ATTLIST fontOverride
```

```
id      CDATA #REQUIRED
```

```
value   CDATA #REQUIRED>
```

Allows overriding of fonts defined in `fontDefinition` elements. These fonts will be applied when the theme is in use.

- **id** – a unique id that can be used to identify this font definition override. This should match an existing font identifier. Strictly speaking, you may override fonts that do not exist in the base theme although this practice is not recommended. In effect, such overrides will have behaviour similar to `fontDefinitions` that have `isEditable` set to `false`.
- **value** – the overriding value of this font. This is in the form: `fontname-style-height` where `fontname` is the name of a font, `style` is a font style (one of `"regular"`, `"bold"`, `"italic"`,

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or "bold italic") and height is an integer representing the font height.

Example: Times New Roman-bold-36.

value must be defined for a font override. Unlike a fontDefinition, you may not supply a defaultsTo for a fontOverride.

<!ELEMENT description (#CDATA)>

A short description of the elements usage.

<!ELEMENT colorFactory (parameter*)>

<!ATTLIST colorFactory

class CDATA #REQUIRED

plugin CDATA #IMPLIED>

The element version of the colorFactory attribute. This is used when the colorFactory implements org.eclipse.core.runtime.IExecutableExtension and there is parameterized data that you wish used in its initialization.

- **class** – a class that implements org.eclipse.ui.themes.IColorFactory. It may also implement org.eclipse.core.runtime.IExecutableExtension.
- **plugin** – the identifier of the plugin that contains the class

<!ELEMENT parameter EMPTY>

<!ATTLIST parameter

name CDATA #REQUIRED

value CDATA #REQUIRED>

A parameter element to be used within the colorFactory element. This will be passed as initialization data to the colorFactory class.

- **name** – the parameter name
- **value** – the parameter value

```
<!ELEMENT data EMPTY>
```

```
<!ATTLIST data
```

```
name CDATA #REQUIRED
```

```
value CDATA #REQUIRED>
```

An element that allows arbitrary data to be associated with a theme or the default theme. This data may be gradient directions or percentages, labels, author information, etc.

This element has behaviour similar to definitions and overrides. If a key is present in both the default theme and an identified theme, then the identified themes value will be used when that theme is accessed. If the identified theme does not supply a value then the default is used.

- **name** – the data name,
- **value** – the data value

```
<!ELEMENT colorValue (colorFactory?)>
```

```
<!ATTLIST colorValue
```

```
os CDATA #IMPLIED
```

```
ws CDATA #IMPLIED
```

```
value CDATA #IMPLIED
```

```
colorFactory CDATA #IMPLIED>
```

This element allows specification of a color value on a per–platform basis.

- **os** – an optional os string to enable choosing of color based on current OS. eg: win32,linux
- **ws** – an optional os string to enable choosing of color based on current WS. eg: win32,gtk
- **value** – The default value of this color. The value may be specified in the following ways:
 - ◆ a String containing comma separated integers in the form red,green,blue
 - ◆ a String that maps to an SWT color constant (ie: COLOR_RED).Only one of `value` or `colorFactory` may be defined.
- **colorFactory** – a class that implements `org.eclipse.ui.themes.IColorFactory`. This may be used instead of `value` to specify the value of the color. Please be advised that this should be used with caution – usage of this attribute will cause plugin activation.

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<!ELEMENT fontValue EMPTY>

<!ATTLIST fontValue

os CDATA #IMPLIED

ws CDATA #IMPLIED

value CDATA #REQUIRED>

This element allows specification of a font value on a per-platform basis.

- **os** – an optional os string to enable choosing of font based on current OS. eg: win32,linux
- **ws** – an optional ws string to enable choosing of font based on current WS. eg: win32,gtk
- **value** – the font value. This is in the form: fontname-style-height where fontname is the name of a font, style is a font style (one of "regular", "bold", "italic", or "bold italic") and height is an integer representing the font height.

Example: Times New Roman-bold-36.

<!ELEMENT categoryPresentationBinding EMPTY>

<!ATTLIST categoryPresentationBinding

categoryId CDATA #REQUIRED

presentationId CDATA #REQUIRED>

This element allows a category to be bound to a specific presentation as described by the `org.eclipse.ui.presentationFactory` extension point. If a category has any presentation bindings then it (and it's children) is only configurable by the user if it is bound to the active presentation. This is useful for removing unused items from user consideration.

- **categoryId** –
- **presentationId** –

Examples:

The following is an example of several color and font definitions as well as a theme that overrides them.

<extension point=

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```
"org.eclipse.ui.themes"  
  
>  
  
<themeElementCategory id=  
  
"com.xyz.ThemeCategory"  
  
class=  
  
"com.xyz.XYZPreview"  
  
label=  
  
"XYZ Elements"  
  
</>  
  
<colorDefinition id=  
  
"com.xyz.Foreground"  
  
categoryId=  
  
"com.xyz.ThemeCategory"  
  
label=  
  
"XYZ Foreground Color"  
  
value=  
  
"COLOR_BLACK"  
  
>  
  
<!-- white should be used on GTK -->  
  
<colorValue value=  
  
"COLOR_WHITE"  
  
os=  
  
"linux"  
  
ws=  
  
"gtk"  
  
</>
```


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<description>

This color is used for the foreground color of the XYZ plugin editor.

</description>

</colorDefinition>

<colorDefinition id=

"com.xyz.Background"

categoryId=

"com.xyz.ThemeCategory"

label=

"XYZ Background Color"

>

<colorFactory class=

"org.eclipse.ui.themes.RGBBlendColorFactory"

plugin=

"org.eclipse.ui"

>

<parameter name=

"color1"

value=

"COLOR_WHITE"

/>

<parameter name=

"color2"

value=

"COLOR_BLUE"

/>

Themes

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```
</colorFactory>

<!-- black should be used on GTK -->

<colorValue value=

"COLOR_BLACK"

os=

"linux"

ws=

"gtk"

/>

<description>

This color is used for the background color of the XYZ plugin editor.

</description>

</colorDefinition>

<fontDefiniton id=

"com.xyz.TextFont"

categoryId=

"com.xyz.ThemeCategory"

label=

"XYZ Editor Font"

defaultsTo=

"org.eclipse.jface.textfont"

>

<description>

This font is used by the XYY plugin editor.

</description>

</fontDefintion>
```

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```
<data name=
"com.xyz.EditorMarginWidth"
value=
"5"
/>
<theme id=
"com.xyz.HarshTheme"
label=
"Harsh Colors for XYZ"
>
<colorOverride id=
"com.xyz.Foreground"
value=
"COLOR_CYAN"
/>
<colorOverride id=
"com.xyz.Background"
value=
"COLOR_MAGENTA"
/>
<data name=
"com.xyz.EditorMarginWidth"
value=
"1"
/>
</theme>
```

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</extension>

API Information:

The `org.eclipse.ui.IWorkbench.getThemeManager()` provides `org.eclipse.ui.themes.IThemeManager`. This class may be used to obtain a named theme (by id, including the default theme which has an id of `IThemeManager.DEFAULT_THEME`) or the current theme. From an `org.eclipse.ui.themes.ITheme` you may obtain a `org.eclipse.jface.resources.ColorRegistry`, an `org.eclipse.jface.resources.FontRegistry` and the arbitrary data associated with a theme.

Supplied Implementation:

The workbench provides the font definitions for the text, dialog, banner, header and part title fonts. It also supplies color definitions for the hyperlink, active hyperlink, error, active part (background gradient parts and foreground) and the inactive part (background gradient parts and foreground). The workbench also provides data constants for the title gradient percentages (active and inactive) and the gradient directions (active and inactive). The workbench does not provide any named themes.

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View Menus, Toolbars and Actions

Identifier:

org.eclipse.ui.viewActions

Description:

This extension point is used to add actions to the pulldown menu and toolbar for views registered by other plug-ins. Each view has a local pulldown menu normally activated by clicking on the top right triangle button. Other plug-ins can contribute submenus and actions to this menu. Plug-ins may also contribute actions to a view toolbar. View owners are first given a chance to populate these areas. Optional additions by other plug-ins are appended.

An action's enablement and/or visibility can be defined using the elements `enablement` and `visibility` respectively. These two elements contain a boolean expression that is evaluated to determine the enablement and/or visibility.

The syntax is the same for the `enablement` and `visibility` elements. Both contain only one boolean expression sub-element. In the simplest case, this will be an `objectClass`, `objectState`, `pluginState`, or `systemProperty` element. In the more complex case, the `and`, `or`, and `not` elements can be combined to form a boolean expression. Both the `and`, and `or` elements must contain 2 sub-elements. The `not` element must contain only 1 sub-element.

Configuration Markup:

```
<!ELEMENT extension (viewContribution+)>
```

```
<!ATTLIST extension
```

```
  point CDATA #REQUIRED
```

```
  id CDATA #IMPLIED
```

```
  name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT viewContribution (menu* , action*)>
```

```
<!ATTLIST viewContribution
```

```
  id CDATA #REQUIRED
```

```
  targetID CDATA #REQUIRED>
```

This element is used to define a group of view actions and/or menus.

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- **id** – a unique identifier used to reference this contribution.
- **targetID** – a unique identifier of a registered view that is the target of this contribution.

```
<!ELEMENT action (selection* | enablement?)>
```

```
<!ATTLIST action
```

```
id          CDATA #REQUIRED
```

```
label       CDATA #REQUIRED
```

```
menubarPath CDATA #IMPLIED
```

```
toolbarPath CDATA #IMPLIED
```

```
icon        CDATA #IMPLIED
```

```
disabledIcon CDATA #IMPLIED
```

```
hoverIcon   CDATA #IMPLIED
```

```
tooltip     CDATA #IMPLIED
```

```
helpContextId CDATA #IMPLIED
```

```
style       (push|radio|toggle) "push"
```

```
state       (true | false)
```

```
class       CDATA #REQUIRED
```

```
enablesFor  CDATA #IMPLIED>
```

This element defines an action that the user can invoke in the UI.

- **id** – a unique identifier used as a reference for this action.
- **label** – a translatable name used either as the menu item text or toolbar button label. The name can include mnemonic information.
- **menubarPath** – a slash-delimited path ('/') used to specify the location of this action in the pulldown menu. Each token in the path, except the last one, must represent a valid identifier of an existing menu in the hierarchy. The last token represents the named group into which this action will be added. If the path is omitted, this action will not appear in the pulldown menu.
- **toolbarPath** – a named group within the local toolbar of the target view. If the group does not exist, it will be created. If omitted, the action will not appear in the local toolbar.

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- **icon** – a relative path of an icon used to visually represent the action in its context. If omitted and the action appears in the toolbar, the Workbench will use a placeholder icon. The path is relative to the location of the plugin.xml file of the contributing plug-in. The icon will appear in the toolbar but not in the pulldown menu.
- **disabledIcon** – a relative path of an icon used to visually represent the action in its context when the action is disabled. If omitted, the normal icon will simply appear greyed out. The path is relative to the location of the plugin.xml file of the contributing plug-in. The disabled icon will appear in the toolbar but not in the pulldown menu.
- **hoverIcon** – a relative path of an icon used to visually represent the action in its context when the mouse pointer is over the action. If omitted, the normal icon will be used. The path is relative to the location of the plugin.xml file of the contributing plug-in.
- **tooltip** – a translatable text representing the action's tool tip. Only used if the action appears in the toolbar.
- **helpContextId** – a unique identifier indicating the help context for this action. If the action appears as a menu item, then pressing F1 while the menu item is highlighted will display help.
- **style** – an optional attribute to define the user interface style type for the action. If defined, the attribute value will be one of the following:
 - push** – as a regular menu item or tool item.
 - radio** – as a radio style menu item or tool item. Actions with the radio style within the same menu or toolbar group behave as a radio set. The initial value is specified by the `state` attribute.
 - toggle** – as a checked style menu item or as a toggle tool item. The initial value is specified by the `state` attribute.
- **state** – an optional attribute indicating the initial state (either `true` or `false`), used when the `style` attribute has the value `radio` or `toggle`.
- **class** – name of the fully qualified class that implements `org.eclipse.ui.IViewActionDelegate`.
- **enablesFor** – a value indicating the selection count which must be met to enable the action. If this attribute is specified and the condition is met, the action is enabled. If the condition is not met, the action is disabled. If no attribute is specified, the action is enabled for any number of items selected. The following attribute formats are supported:
 - !** – 0 items selected
 - ?** – 0 or 1 items selected
 - +** – 1 or more items selected
 - multiple, 2+** – 2 or more items selected
 - n** – a precise number of items selected. a precise number of items selected. For example: `enablesFor=" 4"` enables the action only when 4 items are selected
 - *** – any number of items selected

<!ELEMENT menu (separator+ , groupMarker*)>

<!ATTLIST menu

id CDATA #REQUIRED

label CDATA #REQUIRED

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path CDATA #IMPLIED>

This element is used to defined a new menu.

- **id** – a unique identifier that can be used to reference this menu.
- **label** – a translatable name used by the Workbench for this new menu. The name should include mnemonic information.
- **path** – the location of the new menu starting from the root of the menu. Each token in the path must refer to an existing menu, except the last token which should represent a named group in the last menu in the path. If omitted, the new menu will be added to the `additions` named group of the menu.

<!ELEMENT separator EMPTY>

<!ATTLIST separator

name CDATA #REQUIRED>

This element is used to create a menu separator in the new menu.

- **name** – the name of the menu separator. This name can later be referenced as the last token in a menu path. Therefore, a separator also serve as named group into which actions and menus can be added.

<!ELEMENT groupMarker EMPTY>

<!ATTLIST groupMarker

name CDATA #REQUIRED>

This element is used to create a named group in the new menu. It has no visual representation in the new menu, unlike the `separator` element.

- **name** – the name of the group marker. This name can later be referenced as the last token in the menu path. It serves as named group into which actions and menus can be added.

<!ELEMENT selection EMPTY>

<!ATTLIST selection

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class CDATA #REQUIRED

name CDATA #IMPLIED>

This element is used to help determine the action enablement based on the current selection. Ignored if the `enablement` element is specified.

- **class** – a fully qualified name of the class or interface that each object in the selection must implement in order to enable the action.
- **name** – an optional wild card filter for the name that can be applied to all objects in the selection. If specified and the match fails, the action will be disabled.

<!ELEMENT enablement (and | or | not | objectClass | objectState | pluginState | systemProperty)>

This element is used to define the enablement for the extension.

<!ELEMENT visibility (and | or | not | objectClass | objectState | pluginState | systemProperty)>

This element is used to define the visibility for the extension.

<!ELEMENT and (and | or | not | objectClass | objectState | pluginState | systemProperty)>

This element represent a boolean AND operation on the result of evaluating it's two sub–element expressions.

<!ELEMENT or (and | or | not | objectClass | objectState | pluginState | systemProperty)>

This element represent a boolean OR operation on the result of evaluating it's two sub–element expressions.

<!ELEMENT not (and | or | not | objectClass | objectState | pluginState | systemProperty)>

This element represent a boolean NOT operation on the result of evaluating it's sub–element expressions.

```
<!ELEMENT objectClass EMPTY>
```

```
<!ATTLIST objectClass
```

```
name CDATA #REQUIRED>
```

This element is used to evaluate the class or interface of each object in the current selection. If each object in the selection implements the specified class or interface, the expression is evaluated as true.

- **name** – a fully qualified name of a class or interface. The expression is evaluated as true only if all objects within the selection implement this class or interface.

```
<!ELEMENT objectState EMPTY>
```

```
<!ATTLIST objectState
```

```
name CDATA #REQUIRED
```

```
value CDATA #REQUIRED>
```

This element is used to evaluate the attribute state of each object in the current selection. If each object in the selection has the specified attribute state, the expression is evaluated as true. To evaluate this type of expression, each object in the selection must implement, or adapt to, `org.eclipse.ui.IActionFilter` interface.

- **name** – the name of an object's attribute. Acceptable names reflect the object type, and should be publicly declared by the plug-in where the object type is declared.
- **value** – the required value of the object's attribute. The acceptable values for the object's attribute should be publicly declared.

```
<!ELEMENT pluginState EMPTY>
```

```
<!ATTLIST pluginState
```

```
id CDATA #REQUIRED
```

```
value (installed|activated) "installed">
```

This element is used to evaluate the state of a plug-in. The state of the plug-in may be one of the following: `installed` or `activated`.

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- **id** – the identifier of a plug-in which may or may not exist in the plug-in registry.
- **value** – the required state of the plug-in. The state of the plug-in may be one of the following: installed or activated.

```
<!ELEMENT systemProperty EMPTY>
```

```
<!ATTLIST systemProperty
```

```
name CDATA #REQUIRED
```

```
value CDATA #REQUIRED>
```

This element is used to evaluate the state of some system property. The property value is retrieved from the `java.lang.System`.

- **name** – the name of the system property.
- **value** – the required value of the system property.

Examples:

The following is an example of a view action extension:

```
<extension point=
```

```
"org.eclipse.ui.viewActions"
```

```
>
```

```
<viewContribution id=
```

```
"com.xyz.xyzViewC1"
```

```
targetID=
```

```
"org.eclipse.ui.views.navigator.ResourceNavigator"
```

```
>
```

```
<menu id=
```

```
"com.xyz.xyzMenu"
```

```
label=
```

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```
"XYZ Menu"  
  
path=  
  
"additions"  
  
>  
  
<separator name=  
  
"group1"  
  
</>  
  
</menu>  
  
<action id=  
  
"com.xyz.runXYZ"  
  
label=  
  
"&Run XYZ Tool"  
  
menubarPath=  
  
"com.xyz.xyzMenu/group1"  
  
toolbarPath=  
  
"Normal/additions"  
  
style=  
  
"toggle"  
  
state=  
  
"true"  
  
icon=  
  
"icons/runXYZ.gif"  
  
tooltip=  
  
"Run XYZ Tool"  
  
helpContextId=  
  
"com.xyz.run_action_context"
```

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```
class=  
"com.xyz.actions.RunXYZ"  
>  
<selection class=  
"org.eclipse.core.resources.IFile"  
name=  
"*.*java"  
</>  
</action>  
</viewContribution>  
</extension>
```

In the example above, the specified action will only enable for a single selection (`enablesFor` attribute). In addition, the object in the selection must be a Java file resource.

The following is an other example of a view action extension:

```
<extension point=  
"org.eclipse.ui.viewActions"  
>  
<viewContribution id=  
"com.xyz.xyzViewC1"  
targetID=  
"org.eclipse.ui.views.navigator.ResourceNavigator"  
>  
<menu id=  
"com.xyz.xyzMenu"  
label=
```

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```
"XYZ Menu"  
  
path=  
  
"additions"  
  
>  
  
<separator name=  
  
"group1"  
  
</>  
  
</menu>  
  
<action id=  
  
"com.xyz.runXYZ2"  
  
label=  
  
"&Run XYZ2 Tool"  
  
menubarPath=  
  
"com.xyz.xyzMenu/group1"  
  
style=  
  
"push"  
  
icon=  
  
"icons/runXYZ2.gif"  
  
tooltip=  
  
"Run XYZ2 Tool"  
  
helpContextId=  
  
"com.xyz.run_action_context2"  
  
class=  
  
"com.xyz.actions.RunXYZ2"  
  
>  
  
<enablement>
```

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```
<and>

<objectClass name=
"org.eclipse.core.resources.IFile"

/>

<not>

<objectState name=
"extension"

value=
"java"

/>

</not>

</and>

</enablement>

</action>

</editorContribution>

</extension>
```

In the example above, the specified action will appear as a menu item. The action is enabled if the selection contains no Java file resources.

API Information:

The value of the `class` attribute must be a fully qualified name of a Java class that implements `org.eclipse.ui.IViewActionDelegate`. This class is loaded as late as possible to avoid loading the entire plug-in before it is really needed.

The interface `org.eclipse.ui.IViewActionDelegate` extends `org.eclipse.ui.IActionDelegate` and adds an additional method that allows the delegate to initialize with the view instance it is contributing into.

This extension point can be used to contribute actions into menus previously created by the target view. Omitting the menu path attribute will result in adding the new menu or action at the end of the pulldown menu.

The enablement criteria for an action extension is initially defined by `enablesFor`, and also either `selection` or `enablement`. However, once the action delegate has been instantiated, it may control the

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action enable state directly within its `selectionChanged` method.

Action and menu labels may contain special characters that encode mnemonics using the following rules:

1. Mnemonics are specified using the ampersand ('&') character in front of a selected character in the translated text. Since ampersand is not allowed in XML strings, use `&` character entity.

If two or more actions are contributed to a menu or toolbar by a single extension the actions will appear in the reverse order of how they are listed in the `plugin.xml` file. This behavior is admittedly unintuitive. However, it was discovered after the Eclipse Platform API was frozen. Changing the behavior now would break every plug-in which relies upon the existing behavior.

The `selection` and `enablement` elements are mutually exclusive. The `enablement` element can replace the `selection` element using the sub-elements `objectClass` and `objectState`. For example, the following:

```
<selection class=  
"org.eclipse.core.resources.IFile"  
name=  
"*.*java"  
>  
</selection>
```

can be expressed using:

```
<enablement>  
<and>  
<objectClass name=  
"org.eclipse.core.resources.IFile"  
>  
<objectState name=  
"extension"  
value=  
"java"
```


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/>

</and>

</enablement>

Supplied Implementation:

Each view normally comes with a number of standard items on the pulldown menu and local toolbar. Additions from other plug-ins will be appended to the standard complement.

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Working Sets

Identifier:

org.eclipse.ui.workingSets

Since:

Release 2.0

Description:

This extension point is used to define a working set wizard page. Working sets contain a number of elements of type IAdaptable and can be used to group elements for presentation to the user or for operations on a set of elements. A working set wizard page is used to create and edit working sets that contain elements of a specific type.

To select a working set the user is presented with a list of working sets that exist in the workbench. From that list a working set can be selected and edited using one of the wizard pages defined using this extension point. An existing working set is always edited with the wizard page that was used to create it or with the default resource based working set page if the original page is not available.

A new working set can be defined by the user from the same working set selection dialog. When a new working set is defined, the plugin provided wizard page is preceded by a page listing all available working set types. This list is made up of the name attribute values of each working set extension.

Views provide a user interface to open the working set selection dialog and must store the selected working set.

The resource navigator uses a working set to filter elements from the navigator view. Only parents and children of working set elements are shown in the view, in addition to the working set elements themselves.

Configuration Markup:

```
<!ELEMENT extension (workingSet*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT workingSet EMPTY>
```

```
<!ATTLIST workingSet
  id      CDATA #REQUIRED
  name    CDATA #REQUIRED
  icon    CDATA #IMPLIED
  pageClass CDATA #REQUIRED>
```

- **id** – a unique name that can be used to identify this working set dialog.
- **name** – the name of the element type that will be displayed and edited by the working set page. This should be a descriptive name like "Resource" or "Java Element".
- **icon** – the relative path of an image that will be displayed in the working set type list on the first page of the working set creation wizard as well as in the working set selection dialog.
- **pageClass** – the fully qualified name of a Java class implementing `org.eclipse.ui.dialogs.IWorkingSetPage`.

Examples:

Following is an example of how the resource working set dialog extension is defined to display and edit generic `IResource` elements:

```
<extension point=
"org.eclipse.ui.workingSets"
>
<workingSet id=
"org.eclipse.ui.resourceWorkingSetPage"
name=
"Resource"
icon=
"icons/resworkset.gif"
pageClass=
"org.eclipse.ui.internal.dialogs.ResourceWorkingSetPage"
>
```

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</workingSet>

</extension>

API Information:

The value of the pageClass attribute must represent a class that implements the `org.eclipse.ui.dialogs.IWorkingSetPage` interface.

Supplied Implementation:

The workbench provides a working set wizard page for creating and editing resource based working sets.

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Synchronize Participants

Identifier:

org.eclipse.team.ui.synchronizeParticipants

Since:

3.0

Description:

This extension point is used to register a synchronize participant. A synchronize participant is a component that displays changes between resources and typically allows the user to manipulate the changes. For example, CVS defines a workspace synchronize participant that allows showing changes between workspace resources and the resources at a remote location that is used to share those resources. Synchronize participants are typically created via a synchronize participant wizard or they can be created via a plug-in action and then registered with the ISynchronizeManager. The Synchronize View displays synchronize participants.

A participant is a generic component that provides access to creating a page and is shown to the user and a configuration that defines common configuration parameters for the page. The Synchronize View doesn't enforce any restrictions on how changes are shown to the user, and instead only manages the participants.

Configuration Markup:

```
<!ELEMENT extension (participant)>
```

```
<!ATTLIST extension
```

```
  point CDATA #REQUIRED
```

```
  id CDATA #IMPLIED
```

```
  name CDATA #IMPLIED>
```

- **point** – A fully qualified identifier of the target extension point
- **id** – An optional identifier of the extension instance.
- **name** – An optional name for this extension instance.

```
<!ELEMENT participant EMPTY>
```

```
<!ATTLIST participant
```

```
  icon CDATA #IMPLIED
```

```
  id CDATA #IMPLIED
```

```
  class CDATA #IMPLIED
```

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name CDATA #IMPLIED

persistent (true|false) >

- **icon** – An icon that will be used when showing this participant in lists and menus.
- **id** – A unique name that will be used to identify this type of participant.
- **class** – A fully qualified name of the class the extends
`org.eclipse.team.ui.synchronize.AbstractSynchronizeParticipant.`
- **name** – The name of the participant. This will be shown in the UI.
- **persistent** – By default participants will be persisted between sessions. Set this attribute to false if this participant should not be persisted between sessions.

Examples:

```
<extension point=
```

```
"org.eclipse.team.ui.synchronizeParticipants"
```

```
>
```

```
<participant name=
```

```
"CVS Workspace"
```

```
icon=
```

```
"icons/full/cview16/server.gif"
```

```
class=
```

```
"org.eclipse.team.internal.ccvs.ui.subscriber.WorkspaceSynchronizeParticipant"
```

```
id=
```

```
"org.eclipse.team.cvs.ui.cvsworkspace-participant"
```

```
>
```

```
</participant>
```

```
<participant name=
```

```
"CVS Merge"
```

```
icon=
```

```
"icons/full/obj16/prjversions_rep.gif"
```

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```
class=  
"org.eclipse.team.internal.ccvs.ui.subscriber.MergeSynchronizeParticipant"  
type=  
"dynamic"  
id=  
"org.eclipse.team.cvs.ui.cvsmerge-participant"  
>  
</participant>  
</extension>
```

API Information:

The value of the `class` attribute must represent a class that implements `org.eclipse.team.ui.synchronize.AbstractSynchronizeParticipant`.

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Breakpoints

Identifier:

org.eclipse.debug.core.breakpoints

Description:

This extension point defines a mechanism for defining new types of breakpoints.

Configuration Markup:

```
<!ELEMENT extension (breakpoint*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT breakpoint EMPTY>
```

```
<!ATTLIST breakpoint
```

```
id CDATA #REQUIRED
```

```
markerType CDATA #REQUIRED
```

```
class CDATA #REQUIRED>
```

- **id** – specifies a unique identifier for this breakpoint type.
- **markerType** – specifies the fully qualified identifier (id) of the corresponding marker definition for breakpoints of this type.
- **class** – specifies the fully qualified name of the java class that implements `IBreakpoint`.

Examples:

The following is an example of a launch configuration type extension point:

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```
<extension point=
"org.eclipse.debug.core.breakpoints"
>
<breakpoint id=
"com.example.ExampleBreakpoint"
markerType=
"com.example.ExampleBreakpointMarker"
class=
"com.example.ExampleBreakpointImpl"
>
</breakpoint>
</extension>
```

In the example above, the specified type of breakpoint is implemented by the class "com.example.BreakpointImpl". There is an associated marker definition for "com.example.ExampleBreakpointMarker", defining the attributes of this breakpoint.

API Information:

Value of the attribute **class** must be a fully qualified name of a Java class that implements the interface **org.eclipse.debug.core.model.IBreakpoint**.

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Launch Configuration Comparators

Identifier:

org.eclipse.debug.core.launchConfigurationComparators

Description:

This extension point provides a configurable mechanism for comparing specific attributes of a launch configuration. In general, launch configuration attributes can be compared for equality via the default implementation of `java.lang.Object.equals(Object)`. However, attributes that require special handling should implement this extension point. For example, when an attribute is stored as XML, it is possible that two strings representing an equivalent attribute have different whitespace formatting.

Configuration Markup:

```
<!ELEMENT extension (launchConfigurationComparator*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT launchConfigurationComparator EMPTY>
```

```
<!ATTLIST launchConfigurationComparator
```

```
id CDATA #REQUIRED
```

```
attribute CDATA #REQUIRED
```

```
class CDATA #REQUIRED>
```

- **id** – specifies a unique identifier for this extension.
- **attribute** – specifies the launch configuration attribute name that this comparator compares.
- **class** – specifies a fully-qualified name of a class that implements `java.util.Comparator`.

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Examples:

The following is an example of a launch configuration comparator extension point:

```
<extension point=
"org.eclipse.debug.core.launchConfigurationComparators"
>
<launchConfigurationComparator id=
"com.example.ExampleIdentifier"
attribute=
"com.example.ExampleAttributeName"
class=
"com.example.ComparatorImplementation"
>
</launchConfigurationComparator>
</extension>
```

In the example above, the specified type of launch configuration comparator will be consulted when comparing the equality of attributes keyed with name `com.example.ExampleAttributeName`.

API Information:

Value of the attribute **class** must be a fully-qualified name of a Java class that implements the interface **java.util.Comparator**.

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Launch Configuration Types

Identifier:

org.eclipse.debug.core.launchConfigurationTypes

Description:

This extension point provides a configurable mechanism for launching applications. Each launch configuration type has a name, supports one or more modes (run and/or debug), and specifies a delegate responsible for the implementation of launching an application.

Configuration Markup:

```
<!ELEMENT extension (launchConfigurationType*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT launchConfigurationType (fileExtension+)>
```

```
<!ATTLIST launchConfigurationType
```

```
id CDATA #REQUIRED
```

```
delegate CDATA #REQUIRED
```

```
modes CDATA #REQUIRED
```

```
name CDATA #REQUIRED
```

```
public (true | false)
```

```
category CDATA #IMPLIED
```

```
sourcePathComputerId CDATA #IMPLIED
```

```
sourceLocatorId CDATA #IMPLIED>
```

- **id** – specifies a unique identifier for this launch configuration type.

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- **delegate** – specifies the fully qualified name of the Java class that implements `ILaunchConfigurationDelegate`. Launch configuration instances of this type will delegate to instances of this class to perform launching.
- **modes** – specifies a comma-separated list of the modes this type of launch configuration supports – "run" and/or "debug".
- **name** – specifies a human-readable name for this type of launch configuration.
- **public** – specifies whether this launch configuration type is accessible by users. Defaults to true if not specified.
- **category** – an optional attribute that specifies this launch configuration type's category. The default value is unspecified (null). Categories are client defined. This attribute was added in the 2.1 release.
- **sourcePathComputerId** – The unique identifier of a `sourcePathComputers` extension that is used to compute a default source lookup path for launch configurations of this type
- **sourceLocatorId** – The unique identifier of a `sourceLocators` extension that is used to create the source locator for sessions launched using launch configurations of this type

<!ELEMENT fileExtension EMPTY>

<!ATTLIST fileExtension

extension CDATA #REQUIRED

default (true | false) >

- **extension** – specifies a file extension that this launch configuration type can be used for.
- **default** – specifies whether this launch configuration type should be the default launch configuration type for the specified file extension. Defaults to false if not specified.

Examples:

The following is an example of a launch configuration type extension point:

```
<extension point=
```

```
"org.eclipse.debug.core.launchConfigurationTypes"
```

```
>
```

```
<launchConfigurationType id=
```

```
"com.example.ExampleIdentifier"
```

```
delegate=
```

```
"com.example.ExampleLaunchConfigurationDelegate"
```

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```
modes=  
"run,debug"  
name=  
"Example Application"  
>  
<fileExtension extension=  
"txt"  
default=  
"true"  
</>  
<fileExtension extension=  
"gif"  
default=  
"false"  
</>  
</launchConfigurationType>  
</extension>
```

In the example above, the specified type of launch configuration supports both run and debug modes. The launch configuration is applicable to .txt and .gif files, and is the default launch configuration for .txt files.

API Information:

Value of the attribute **delegate** must be a fully qualified name of a Java class that implements the interface **org.eclipse.debug.core.model.ILaunchConfigurationDelegate**.

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Launch Delegates

Identifier:

org.eclipse.debug.core.launchDelegates

Since:

3.0

Description:

This extension point provides a mechanism for contributing a launch delegate to an existing launch configuration type for one or more launch modes. Since launch modes are extensible, it may be necessary to contribute additional launch delegates to an existing launch configuration type. Each launch delegate is contributed for a specific launch configuration type. A launch delegate supports one or more launch modes, and specifies a delegate responsible for the implementation of launching.

Configuration Markup:

```
<!ELEMENT extension (launchDelegate*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT launchDelegate EMPTY>
```

```
<!ATTLIST launchDelegate
```

```
id CDATA #REQUIRED
```

```
delegate CDATA #REQUIRED
```

```
modes CDATA #REQUIRED
```

```
type CDATA #REQUIRED>
```

- **id** – specifies a unique identifier for this launch delegate.
- **delegate** – specifies the fully qualified name of the Java class that implements `ILaunchConfigurationDelegate`. Launch configuration instances of this delegate's type will

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delegate to instances of this class to perform launching.

- **modes** – specifies a comma-separated list of the modes this launch delegate supports.
- **type** – identifier of an existing launch configuration type that this launch delegate is capable of launching.

Examples:

The following is an example of a launch delegate extension point:

```
<extension point=
"org.eclipse.debug.core.launchDelegates"
>
<launchDelegate id=
"com.example.ExampleProfileDelegate"
delegate=
"com.example.ExampleProfileDelegate"
type=
"org.eclipse.jdt.launching.localJavaApplication"
modes=
"profile"
>
</launchDelegate>
</extension>
```

In the example above, the specified launch delegate is contributed to launch Java applications in profile mode.

API Information:

Value of the attribute **delegate** must be a fully qualified name of a Java class that implements the interface **org.eclipse.debug.core.model.ILaunchConfigurationDelegate**.

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Launcher (Obsolete)

Identifier:

org.eclipse.debug.core.launchers

Description:

This extension point has been replaced by the `launchConfigurationTypes` extension point. Extensions of this type are obsolete as of release 2.0 and are ignored. This extension point was used to contribute launchers. A launcher was responsible for initiating a debug session or running a program and registering the result with the launch manager.

Configuration Markup:

<!ELEMENT extension (launcher*)>

<!ATTLIST extension

point CDATA #REQUIRED

id CDATA #IMPLIED

name CDATA #IMPLIED>

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

<!ELEMENT launcher EMPTY>

<!ATTLIST launcher

id CDATA #REQUIRED

class CDATA #REQUIRED

modes CDATA #REQUIRED

label CDATA #REQUIRED

wizard CDATA #IMPLIED

public (true | false)

description CDATA #IMPLIED

perspective CDATA #IMPLIED

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icon CDATA #IMPLIED>

- **id** – a unique identifier that can be used to reference this launcher.
- **class** – fully qualified name of the class that implements `org.eclipse.debug.core.model.ILauncherDelegate`.
- **modes** – A comma separated list of modes this launcher supports. The two supported modes are "run" and "debug" – as defined in `org.eclipse.debug.core.ILaunchManager`. A launcher may be capable of launching in one or both modes.
- **label** – a label to use for the launcher. This attribute is used by the debug UI.
- **wizard** – fully qualified name of the class that implements `org.eclipse.debug.ui.ILaunchWizard`. This attribute is used by the debug UI. A launcher may contribute a wizard that allows users to configure and launch specific attributes.
- **public** – whether a launcher is publically visible in the debug UI. If "true", the launcher will be available from the debug UI – the launcher will appear as a choice for a default launcher, launches created by this launcher will appear in the launch history, and the launcher will be available from the drop-down run/debug toolbar actions.
- **description** – a description of the launcher. Currently only used if the wizard attribute is specified.
- **perspective** – the identifier of the perspective that will be switched to on a successful launch. Default value is the identifier for the debug perspective. This attribute is used by the debug UI.
- **icon** – a relative path of an icon that will represent the launcher in the UI if specified.

Examples:

The following is an example of a launcher extension point:

```
<extension point =  
"org.eclipse.debug.core.launchers"  
>  
<launcher id =  
"com.example.ExampleLauncher"  
class =  
"com.example.launchers.ExampleLauncher"  
modes =  
"run, debug"  
label =  
"Example Launcher"
```

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```
wizard =  
"com.example.launchers.ui.ExampleLaunchWizard"  
  
public =  
"true"  
  
description =  
"Launches example programs"  
  
perspective=  
"com.example.JavaPerspective"  
  
>  
  
</launcher>  
  
</extension>
```

In the example above, the specified launcher supports both run and debug modes. Following a successful launch, the debug UI will change to the Java perspective. When the debug UI presents the user with a list of launchers to choose from, "Example Launcher" will appear as one of the choices with the "Launches example programs" as the description, and the wizard specified by `com.example.launchers.ui.ExampleLaunchWizard` will be used to configure any launch specific details.

API Information:

Value of the attribute `class` must be a fully qualified class name of a Java class that implements the interface `org.eclipse.debug.core.ILauncherDelegate`. Value of the attribute `wizard` must be a fully qualified class name of a Java class that implements `org.eclipse.debug.ui.ILaunchWizard`.

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Launch Modes

Identifier:

org.eclipse.debug.core.launchModes

Since:

3.0

Description:

This extension point provides a mechanism for contributing launch modes to the debug platform. The debug platform defines modes for "run", "debug", and "profile".

Configuration Markup:

```
<!ELEMENT extension (launchMode*)>
```

```
<!ATTLIST extension
```

```
  point CDATA #REQUIRED
```

```
  id CDATA #IMPLIED
```

```
  name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT launchMode EMPTY>
```

```
<!ATTLIST launchMode
```

```
  mode CDATA #REQUIRED
```

```
  label CDATA #REQUIRED>
```

- **mode** – specifies a unique identifier for this launch mode. The launch modes contributed by the debug platform are "run", "debug", and "profile".
- **label** – A human-readable label that describes the launch mode

Examples:

The following is an example of a launch delegate extension point:

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```
<extension point=  
"org.eclipse.debug.core.launchModes"  
>  
<launchMode mode=  
"profile"  
label=  
"Profile"  
>  
</launchMode>  
</extension>
```

In the example above, the profile launch mode is contributed.

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Logical Structure Types

Identifier:

org.eclipse.debug.core.logicalStructureTypes

Since:

3.0

Description:

This extension point allows debuggers to present alternative logical structures of values. Often, complex data structures are more convenient to navigate in terms of their logical structure, rather than in terms of their implementation. For example, no matter how a list is implemented (linked, array, etc.), a user may simply want to see the elements in the list in terms of an ordered collection. This extension point allows the contribution of logical structure types, to provide translations from a raw implementation value to a logical value.

Configuration Markup:

```
<!ELEMENT extension (logicalStructureType*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT logicalStructureType EMPTY>
```

```
<!ATTLIST logicalStructureType
```

```
id CDATA #REQUIRED
```

```
description CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
modelIdentifier CDATA #REQUIRED>
```

- **id** – a unique identifier for this logical structure type
- **description** – a description of this logical structure

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- **class** – fully qualified name of a Java class that implements `ILogicalStructureTypeDelegate`
- **modelIdentifier** – identifier of the debug model this logical structure type is associated with

Examples:

The following is an example of a logical structure type extension point:

```
<extension point=
"org.eclipse.debug.core.logicalStructureTypes"
>
<logicalStructureType id=
"com.example.ExampleLogicalStructure"
class=
"com.example.ExampleLogicalStructureDelegate"
modelIdentifier=
"com.example.debug.model"
description=
"Ordered Collection"
>
</logicalStructureType>
</extension>
```

In the example above, the specified logical structure type will be consulted for alternative logical values for values from the `com.example.debug.model` debug model as they are displayed in the variables view.

API Information:

Value of the attribute **class** must be a fully qualified name of a Java class that implements the interface **`org.eclipse.debug.core.model.ILogicalStructureTypeDelegate`**.

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Process Factories

Identifier:

org.eclipse.debug.core.processFactories

Since:

3.0

Description:

This extension point provides a mechanism for specifying a process factory to be used with a launch configuration to create the appropriate instance of **IProcess**. The launch configuration will require the **DebugPlugin.ATTR_PROCESS_FACTORY_ID** attribute set to the appropriate process factory ID that will be used to create the **IProcess**

Configuration Markup:

```
<!ELEMENT extension (processFactory*)>
```

```
<!ATTLIST extension
```

```
  point CDATA #REQUIRED
```

```
  id CDATA #IMPLIED
```

```
  name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT processFactory EMPTY>
```

```
<!ATTLIST processFactory
```

```
  id CDATA #REQUIRED
```

```
  class CDATA #REQUIRED>
```

- **id** – specifies a unique identifier for this process factory.
- **class** – specifies the fully qualified name of the Java class that implements IProcessFactory.

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Examples:

The following is an example of a process factory extension point:

```
<extension point=  
"org.eclipse.debug.core.processFactories"  
>  
<processFactory id=  
"com.example.ExampleIdentifier"  
class=  
"com.example.ExampleProcessFactory"  
>  
</processFactory>  
</extension>
```

API Information:

Value of the attribute **class** must be a fully qualified name of a Java class that implements the interface **org.eclipse.debug.core.IProcessFactory**.

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Source Container Types

Identifier:

org.eclipse.debug.core.sourceContainerTypes

Since:

3.0

Description:

This extension point allows for an extensible set of source container types to be contributed by the debug platform source lookup facilities.

Configuration Markup:

```
<!ELEMENT extension (sourceContainerType*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT sourceContainerType EMPTY>
```

```
<!ATTLIST sourceContainerType
```

```
id CDATA #REQUIRED
```

```
name CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
description CDATA #IMPLIED>
```

- **id** – The unique id used to refer to this type
- **name** – The name of this source container type use for presentation purposes.
- **class** – A class that implements `ISourceContainerTypeDelegate`
- **description** – A short description of this source container for presentation purposes.

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Examples:

The following is an example of a source container type definition:

```
<extension point=
"org.eclipse.debug.core.sourceContainerTypes"
>
<sourceContainerType name=
"Project"
class=
"org.eclipse.debug.internal.core.sourcelookup.containers.ProjectSourceContainerType"
id=
"org.eclipse.debug.core.containerType.project"
description=
"A project in the workspace"
>
</sourceContainerType>
</extension>
```

API Information:

Value of the attribute **class** must be a fully qualified name of a Java class that implements the interface **ISourceContainerType**.

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Source Locators

Identifier:

org.eclipse.debug.core.sourceLocators

Description:

This extension point provides a mechanism specifying a source locator to be used with a launch configuration.

Configuration Markup:

```
<!ELEMENT extension (sourceLocator*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT sourceLocator EMPTY>
```

```
<!ATTLIST sourceLocator
```

```
id CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
name CDATA #REQUIRED>
```

- **id** – specifies a unique identifier for this source locator.
- **class** – specifies the fully qualified name of the Java class that implements `IPersistableSourceLocator`.
- **name** – a human-readable name, describing the type of this source locator.

Examples:

The following is an example of a source locator extension point:

```
<extension point=
```

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```
"org.eclipse.debug.core.sourceLocators"
```

```
>
```

```
<sourceLocator id=
```

```
"com.example.ExampleIdentifier"
```

```
class=
```

```
"com.example.ExampleSourceLocator"
```

```
name=
```

```
"Example Source Locator"
```

```
>
```

```
</sourceLocator>
```

```
</extension>
```

API Information:

Value of the attribute **class** must be a fully qualified name of a Java class that implements the interface **org.eclipse.debug.core.model.IPersistableSourceLocator**.

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Source Path Computers

Identifier:

org.eclipse.debug.core.sourcePathComputers

Since:

3.0

Description:

Defines an extension point to register a computer that can describe a default source lookup path for a launch configuration. Source path computers are associated with launch configuration types via the `launchConfigurationTypes` extension point. As well, a source path computer can be associated with a specific launch configuration via the launch configuration attribute `ATTR_SOURCE_PATH_COMPUTER_ID`.

Configuration Markup:

```
<!ELEMENT extension (sourcePathComputer*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT sourcePathComputer EMPTY>
```

```
<!ATTLIST sourcePathComputer
```

```
id CDATA #REQUIRED
```

```
class CDATA #REQUIRED>
```

Defines an extension point to register a computer that can describe a default source lookup path for a launch configuration.

- **id** – The unique id used to refer to this computer.
- **class** – A class that implements `ISourcePathComputerDelegate`.

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Examples:

Following is an example source path computer definition:

```
<extension point=
"org.eclipse.debug.core.sourcePathComputers"
>
<sourcePathComputer id=
"org.eclipse.example.exampleSourcePathComputer"
class=
"org.eclipse.example.SourcePathComputer"
>
</sourcePathComputer>
</extension>
```

API Information:

Value of the attribute **class** must be a fully qualified name of a Java class that implements the interface **ISourcePathComputer**.

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Status Handlers

Identifier:

org.eclipse.debug.core.statusHandlers

Description:

This extension point provides a mechanism for separating the generation and resolution of an error. The interaction between the source of the error and the resolution is client-defined. It is a client responsibility to look up and delegate to status handlers when an error condition occurs.

Configuration Markup:

```
<!ELEMENT extension (statusHandler*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT statusHandler EMPTY>
```

```
<!ATTLIST statusHandler
```

```
id CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
plugin CDATA #REQUIRED
```

```
code CDATA #REQUIRED>
```

- **id** – specifies a unique identifier for this status handler.
- **class** – specifies the fully qualified name of the Java class that implements IStatusHandler.
- **plugin** – Plug-in identifier that corresponds to the plug-in of the status this handler is registered for. (i.e. IStatus.getPlugin()).
- **code** – specifies the status code this handler is registered for.

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Examples:

The following is an example of a status handler extension point:

```
<extension point=
"org.eclipse.debug.core.statusHandlers"
>
<statusHandler id=
"com.example.ExampleIdentifier"
class=
"com.example.ExampleStatusHandler"
plugin=
"com.example.ExamplePluginId"
code=
"123"
>
</statusHandler>
</extension>
```

In the example above, the specified status handler will be registered for to handle status objects with a plug-in identifier of `com.example.ExamplePluginId` and a status code of 123.

API Information:

Value of the attribute **class** must be a fully qualified name of a Java class that implements the interface **org.eclipse.debug.core.IStatusHandler**.

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watchExpressionDelegates

Identifier:

org.eclipse.debug.core.watchExpressionDelegates

Since:

3.0

Description:

This extension provides a mechanism for providing delegates to evaluate watch expressions on a per debug model basis. Watch expression delegates perform evaluations for watch expressions and report the results asynchronously.

Configuration Markup:

```
<!ELEMENT extension (watchExpressionDelegate*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT watchExpressionDelegate EMPTY>
```

```
<!ATTLIST watchExpressionDelegate
```

```
debugModel CDATA #REQUIRED
```

```
delegateClass CDATA #REQUIRED>
```

- **debugModel** – specifies the id of the debug model that this delegate provides evaluations for
- **delegateClass** – specifies a Java class which implements `org.eclipse.debug.core.model.IWatchExpressionDelegate`, which is used to evaluate the value of an expression.

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Examples:

The following is the definition of a watch expression delegate for the `com.example.foo` plug-in:

```
<extension point=
"org.eclipse.debug.core.watchExpressionDelegates"
>
<watchExpressionDelegate debugModel=
"org.eclipse.jdt.debug"
delegateClass=
"org.eclipse.jdt.internal.debug.ui.JavaWatchExpressionDelegate"
/>
</extension>
```

API Information:

Value of the attribute **delegateClass** must be a fully qualified name of a Java class that implements the interface **org.eclipse.debug.core.model.IWatchExpressionDelegate**.

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Console Color Providers

Identifier:

org.eclipse.debug.ui.consoleColorProviders

Since:

2.1

Description:

This extension point provides a mechanism for contributing a console document coloring scheme for a process. The color provider will be used to color output in the console.

Configuration Markup:

```
<!ELEMENT extension (consoleColorProvider*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT consoleColorProvider EMPTY>
```

```
<!ATTLIST consoleColorProvider
```

```
id CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
processType CDATA #REQUIRED>
```

- **id** – specifies a unique identifier for this console color provider.
- **class** – specifies a fully qualified name of a Java class that implements `IConsoleColorProvider`
- **processType** – specifies the type of process this color provider is for. This attribute corresponds to the process attribute `IProcess.ATTR_PROCESS_TYPE`.

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Examples:

The following is an example of a console color provider extension point:

```
<extension point=
"org.eclipse.debug.ui.consoleColorProviders"
>
<consoleColorProvider id=
"com.example.ExampleConsoleColorProvider"
class=
"com.example.ExampleConsoleColorProvider"
processType=
"ExampleProcessType"
>
</consoleColorProvider>
</extension>
```

In the above example, the contributed color provider will be used for processes of type "ExampleProcessType", which corresponds to the process attribute `IProcess.ATTR_PROCESS_TYPE`. Process types are client defined, and are set by clients that create processes.

API Information:

Value of the attribute **class** must be a fully qualified name of a Java class that implements the interface **org.eclipse.debug.ui.console.IConsoleColorProvider**.

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Console Line Trackers

Identifier:

org.eclipse.debug.ui.consoleLineTrackers

Since:

2.1

Description:

This extension point provides a mechanism to listen to console output for a type of process.

Configuration Markup:

```
<!ELEMENT extension (consoleLineTracker*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT consoleLineTracker EMPTY>
```

```
<!ATTLIST consoleLineTracker
```

```
id CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
processType CDATA #REQUIRED>
```

- **id** – specifies a unique identifier for this console line tracker.
- **class** – specifies a fully qualified name of a Java class that implements `IConsoleLineTracker`
- **processType** – specifies the type of process this line tracker is for. This attribute corresponds to the process attribute `IProcess.ATTR_PROCESS_TYPE`.

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Examples:

The following is an example of a console line tracker extension point:

```
<extension point=
"org.eclipse.debug.ui.consoleLineTrackers"
>
<consoleLineTracker id=
"com.example.ExampleConsoleLineTracker"
class=
"com.example.ExampleConsoleLineTracker"
processType=
"ExampleProcessType"
>
</consoleLineTracker>
</extension>
```

In the above example, the contributed line tracker will be notified as lines are appended to the console for processes of type "ExampleProcessType", which corresponds to the process attribute `IProcess.ATTR_PROCESS_TYPE`. Process types are client defined, and are set by clients that create processes.

API Information:

Value of the attribute **class** must be a fully qualified name of a Java class that implements the interface **org.eclipse.debug.ui.console.IConsoleLineTracker**.

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Context View Bindings

Identifier:

org.eclipse.debug.ui.contextViewBindings

Since:

3.0

Description:

This extension point provides a mechanism for associating a view with a context identifier. When a context is activated by the Debug view, views associated with it (and also views associated with any parent contexts) are opened, closed, or activated. Contributors have the option to override the automatic open and close behavior.

Configuration Markup:

```
<!ELEMENT extension (contextViewBinding*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT contextViewBinding EMPTY>
```

```
<!ATTLIST contextViewBinding
```

```
contextId CDATA #REQUIRED
```

```
viewId CDATA #REQUIRED
```

```
autoOpen (true | false)
```

```
autoClose (true | false) >
```

- **contextId** – Specifies the context identifier that this binding is for.
- **viewId** – Specifies the identifier of the view which should be associated with the specified context. When the specified context is enabled, this view will be automatically brought to the front. When elements are selected in the Debug view, contexts associated with those elements (as specified by extensions of the debugModelContextBindings extension point) are automatically enabled. Note that

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this only occurs in perspectives for which the user has requested "automatic view management" via the preferences (by default, only in the Debug perspective).

- **autoOpen** – Specifies whether the view should be automatically opened when the given context is enabled. If unspecified, the value of this attribute is true. If this attribute is specified false, the view will not be automatically opened, but it will still be brought to the front if it is open when the given context is enabled. Clients are intended to specify false to avoid cluttering the perspective with views that are used infrequently.
- **autoClose** – Clients are not intended to specify this attribute except in rare cases. Specifies whether the view should be automatically closed when the given context is disabled (this occurs when all debug targets that contained the specified context have terminated). When unspecified, the value of this attribute is true. This attribute should only be specified false in the unlikely case that a debugging view must remain open even when the user is not debugging.

Examples:

The following is an example of a context view binding contribution:

```
<extension point=
"org.eclipse.debug.ui.contextViewBindings"
>
<contextViewBinding contextId=
"com.example.mydebugger.debugging"
viewId=
"com.example.view"
autoOpen=
"true"
autoClose=
"false"
>
</contextViewBinding>
</extension>
```

In the above example, when a context with the specified identifier is activated by the Debug view, the given view will be automatically opened. When a context which is bound to a different debug model is activated that isn't associated with the view, the view will not be automatically closed.

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Debug Model Context Bindings

Identifier:

org.eclipse.debug.ui.debugModelContextBindings

Since:

3.0

Description:

This extension point provides a mechanism for specifying a context that should be associated with the given debug model. The Debug view uses these bindings to automatically enable contexts. When an element in the Debug view which provides an `IDebugModelProvider` adapter or a stack frame with the specified debug model identifier is selected, the context with the given identifier will be enabled.

Configuration Markup:

<!ELEMENT extension (modelContextBinding*)>

<!ATTLIST extension

point CDATA #REQUIRED

id CDATA #IMPLIED

name CDATA #IMPLIED>

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

<!ELEMENT modelContextBinding EMPTY>

<!ATTLIST modelContextBinding

debugModelId CDATA #REQUIRED

contextId CDATA #REQUIRED>

- **debugModelId** – specifies the debug model identifier this binding is for
- **contextId** – specifies the context identifier of the context that should be associated with the given debug model

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Examples:

The following is an example of a debug model context binding contribution:

```
<extension point=
"org.eclipse.debug.ui.debugModelContextBindings"
>
<modelContextBinding contextId=
"com.example.myLanguage.debugging"
debugModelId=
"com.example.myLanguageDebugModel"
>
</modelContextBinding>
</extension>
```

In the above example, when a stack frame with the debug model identifier of "com.example.myLanguageDebugModel" is selected, the context with the identifier "com.example.myLanguage.debugging" will be enabled.

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Debug Model Presentation

Identifier:

org.eclipse.debug.ui.debugModelPresentations

Description:

This extension point allows tools to handle the presentation aspects of a debug model. A debug model presentation is responsible for providing labels, images, and editors for elements in a specific debug model.

Configuration Markup:

```
<!ELEMENT extension (debugModelPresentation*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT debugModelPresentation EMPTY>
```

```
<!ATTLIST debugModelPresentation
```

```
class CDATA #REQUIRED
```

```
id CDATA #REQUIRED
```

```
detailsViewerConfiguration CDATA #IMPLIED>
```

- **class** – fully qualified name of a Java class that implements the `org.eclipse.debug.ui.IDebugModelPresentation` interface.
- **id** – the identifier of the debug model this presentation is responsible for
- **detailsViewerConfiguration** – the fully qualified name of the Java class that is an instance of `org.eclipse.jface.text.source.SourceViewerConfiguration`. When specified, the source viewer configuration will be used in the "details" area of the variables and expressions view when displaying the details of an element from the debug model associated with this debug model presentation. When unspecified, a default configuration is used.

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Examples:

The following is an example of a debug model presentations extension point:

```
<extension point =  
"org.eclipse.debug.ui.debugModelPresentations"  
>  
<debugModelPresentation class =  
"com.example.JavaModelPresentation"  
id =  
"com.example.JavaDebugModel"  
>  
</debugModelPresentation>  
</extension>
```

In the example above, the class `com.example.JavaModelPresentation` will be used to render and present debug elements originating from the debug model identified by `com.example.JavaDebugModel`.

API Information:

Value of the action attribute `class` must be a fully qualified class name of a Java class that implements `org.eclipse.debug.ui.IDebugModelPresentation`.

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Launch Configuration Tab Groups

Identifier:

org.eclipse.debug.ui.launchConfigurationTabGroups

Description:

This extension point provides a mechanism for contributing a group of tabs to the launch configuration dialog for a type of launch configuration.

Configuration Markup:

```
<!ELEMENT extension (launchConfigurationTabGroup*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT launchConfigurationTabGroup (launchMode*)>
```

```
<!ATTLIST launchConfigurationTabGroup
```

```
id CDATA #REQUIRED
```

```
type CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
helpContextId CDATA #IMPLIED
```

```
description CDATA #IMPLIED>
```

- **id** – specifies a unique identifier for this launch configuration tab group.
- **type** – specifies a launch configuration type that this tab group is applicable to (corresponds to the id of a launch configuration type extension).
- **class** – specifies a fully qualified name of a Java class that implements `ILaunchConfigurationTabGroup`.
- **helpContextId** – an optional identifier that specifies the help context to associate with this tab group's launch configuration type
- **description** – A description of the Launch Configuration Type

```
<!ELEMENT launchMode EMPTY>
```

```
<!ATTLIST launchMode
```

```
mode      CDATA #REQUIRED
```

```
perspective CDATA #IMPLIED
```

```
description CDATA #IMPLIED>
```

A launch mode element specifies a launch mode this tab group is specific to. A tab group can be associated with one or more launch modes. For backwards compatibility (previous to 3.0), a launch mode does not need to be specified. When unspecified, a tab group is registered as the default tab group for the associated launch configuration type (i.e. applicable to all supported launch modes for which a specific tab group has not been contributed).

- **mode** – identifier for a launch mode this tab group is specific to.
- **perspective** – the default perspective identifier associated with this launch configuration type and launch mode. This allows an extension to cause a perspective switch (or open) when a corresponding launch is registered with the debug plug-in. When unspecified, it indicates that by default, no perspective switch should occur.
- **description** – A description of the Launch Configuration Type specific to this launchMode.

Examples:

The following is an example of a launch configuration tab group extension point:

```
<extension point=
"org.eclipse.debug.ui.launchConfigurationTabGroups"
>
<launchConfigurationTabGroup id=
"com.example.ExampleTabGroup"
type=
"com.example.ExampleLaunchConfigurationTypeIdentifier"
class=
```

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```
"com.example.ExampleLaunchConfigurationTabGroupClass"
```

```
>
```

```
</launchConfigurationTabGroup>
```

```
</extension>
```

In the above example, the contributed tab group will be shown for the launch configuration type with identifier `com.example.ExampleLaunchConfigurationTypeIdentifier`.

API Information:

Value of the attribute **class** must be a fully qualified name of a Java class that implements the interface **org.eclipse.debug.ui.ILaunchConfigurationTabGroup**.

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Launch Configuration Type Images

Identifier:

org.eclipse.debug.ui.launchConfigurationTypeImages

Description:

This extension point provides a way to associate an image with a launch configuration type.

Configuration Markup:

```
<!ELEMENT extension (launchConfigurationTypeImage*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT launchConfigurationTypeImage EMPTY>
```

```
<!ATTLIST launchConfigurationTypeImage
```

```
id CDATA #REQUIRED
```

```
configTypeID CDATA #REQUIRED
```

```
icon CDATA #REQUIRED>
```

- **id** – specifies a unique identifier for this launch configuration type image.
- **configTypeID** – specifies the fully qualified ID of a launch configuration type.(in 2.1, this attribute can also be specified using the "type" attribute, to be consistent with the launchConfigurationTabGroups extension point).
- **icon** – specifies the plugin–relative path of an image file.

Examples:

The following is an example of a launch configuration type image extension point:

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```
<extension point=
"org.eclipse.debug.ui.launchConfigurationTypeImages"
>
<launchConfigurationTypeImage id=
"com.example.FirstLaunchConfigurationTypeImage"
configTypeID=
"com.example.FirstLaunchConfigurationType"
icon=
"icons/FirstLaunchConfigurationType.gif"
>
</launchConfigurationTypeImage>
</extension>
```

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Launch Groups

Identifier:

org.eclipse.debug.ui.launchGroups

Since:

2.1

Description:

This extension point provides support for defining a group of launch configurations to be viewed together in the launch configuration dialog, and support a launch history (recent and favorite launches).

Configuration Markup:

```
<!ELEMENT extension (launchGroup*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT launchGroup EMPTY>
```

```
<!ATTLIST launchGroup
```

```
id CDATA #REQUIRED
```

```
mode CDATA #REQUIRED
```

```
category CDATA #IMPLIED
```

```
label CDATA #REQUIRED
```

```
image CDATA #REQUIRED
```

```
bannerImage CDATA #REQUIRED
```

```
public CDATA #IMPLIED>
```

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- **id** – specifies a unique identifier for this launch group.
- **mode** – specifies the launch mode associated with this group – i.e. run or debug.
- **category** – specifies the category of launch configurations in this group. When unspecified, the category is null.
- **label** – specifies a translatable label used to render this group.
- **image** – specifies a plug-in relative path to an image used to render this group in trees, lists, tabs, etc.
- **bannerImage** – specifies a plug-in relative path to an image used to render this group in a wizard or dialog banner area.
- **public** – specifies whether this launch group is public and should be have a visible launch history tab in the debug preferences. The implied value is true, when not specified.

Examples:

The following is an example of a launch group extension point:

```
<extension point=
"org.eclipse.debug.ui.launchGroups"
>
<launchGroup id=
"com.example.ExampleLaunchGroupId"
mode=
"run"
label=
"Run"
image=
"icons\run.gif"
bannerImage=
"icons\runBanner.gif"
>
</launchGroup>
</extension>
```

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In the above example, the launch group will consist of all launch configurations with no category that support run mode.

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Launch Shortcuts

Identifier:

org.eclipse.debug.ui.launchShortcuts

Description:

This extension point provides support for selection sensitive launching. Extensions register a shortcut which appears in the run and/or debug cascade menus to launch the workbench selection or active editor.

Configuration Markup:

```
<!ELEMENT extension (shortcut*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT shortcut (perspective* ,contextualLaunch? ,enablement?)>
```

```
<!ATTLIST shortcut
```

```
id CDATA #REQUIRED
```

```
modes CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
label CDATA #REQUIRED
```

```
icon CDATA #IMPLIED
```

```
category CDATA #IMPLIED
```

```
helpContextId CDATA #IMPLIED
```

```
path CDATA #IMPLIED>
```

- **id** – specifies a unique identifier for this launch shortcut.
- **modes** – specifies a comma-separated list of modes this shortcut supports.

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- **class** – specifies the fully qualified name of a class which implements `org.eclipse.debug.ui.ILaunchShortcut`.
- **label** – specifies a label used to render this shortcut.
- **icon** – specifies a plugin–relative path to an image used to render this shortcut. Icon is optional because it is up to other plugins (i.e. Views) to render it.
- **category** – specifies the launch configuration type category this shortcut is applicable for. When unspecified, the category is null (default).
- **helpContextId** – an optional identifier that specifies the help context to associate with this launch shortcut
- **path** – an optional menu path used to group launch shortcuts in menus. Launch shortcuts are grouped alphabetically based on the `path` attribute, and then sorted alphabetically within groups based on the `label` attribute. When unspecified, a shortcut appears in the last group. This attribute was added in the 3.0.1 release.

<!ELEMENT perspective EMPTY>

<!ATTLIST perspective

id CDATA #REQUIRED>

- **id** – the unique identifier of a perspective in which a menu shortcut for this launch shortcut will appear.

<!ELEMENT contextualLaunch (contextLabel*, enablement?)>

Holds all descriptions for adding shortcuts to the Run context menu (pop–up).

<!ELEMENT contextLabel EMPTY>

<!ATTLIST contextLabel

mode (run|debug|profile)

label CDATA #REQUIRED>

Specify the label for a contextual launch mode.

- **mode** – specifies a mode from the set {"run","debug","profile"}
- **label** – specifies the label to appear in the contextual launch menu.

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<!ELEMENT enablement (not , and , or , instanceof , test , systemTest , equals , count , with , resolve , adapt , iterate)*>

A generic root element. The element can be used inside an extension point to define its enablement expression. The children of an enablement expression are combined using the and operator.

<!ELEMENT not (not | and | or | instanceof | test | systemTest | equals | count | with | resolve | adapt | iterate)>

This element represent a NOT operation on the result of evaluating it's sub–element expression.

<!ELEMENT and (not , and , or , instanceof , test , systemTest , equals , count , with , resolve , adapt , iterate)*>

This element represent an AND operation on the result of evaluating all it's sub–elements expressions.

<!ELEMENT or (not , and , or , instanceof , test , systemTest , equals , count , with , resolve , adapt , iterate)*>

This element represent an OR operation on the result of evaluating all it's sub–element expressions.

<!ELEMENT instanceof EMPTY>

<!ATTLIST instanceof

value CDATA #REQUIRED>

This element is used to perform an instanceof check of the object in focus. The expression returns EvaluationResult.TRUE if the object's type is a sub type of the type specified by the attribute value. Otherwise EvaluationResult.FALSE is returned.

- **value** – a fully qualified name of a class or interface.

<!ELEMENT test EMPTY>

<!ATTLIST test

property CDATA #REQUIRED

args CDATA #IMPLIED

value CDATA #IMPLIED>

This element is used to evaluate the property state of the object in focus. The set of testable properties can be extended using the property tester extension point. The test expression returns `EvaluationResult.NOT_LOADED` if the property tester doing the actual testing isn't loaded yet.

- **property** – the name of an object's property to test.
- **args** – additional arguments passed to the property tester. Multiple arguments are separated by commas. Each individual argument is converted into a Java base type using the same rules as defined for the value attribute of the test expression.
- **value** – the expected value of the property. Can be omitted if the property is a boolean property. The test expression is supposed to return `EvaluationResult.TRUE` if the property matches the value and `EvaluationResult.FALSE` otherwise. The value attribute is converted into a Java base type using the following rules:
 - ◆ the string "true" is converted into `Boolean.TRUE`
 - ◆ the string "false" is converted into `Boolean.FALSE`
 - ◆ if the string contains a dot then the interpreter tries to convert the value into a `Float` object. If this fails the string is treated as a `java.lang.String`
 - ◆ if the string only consists of numbers then the interpreter converts the value into an `Integer` object.
 - ◆ in all other cases the string is treated as a `java.lang.String`
 - ◆ the conversion of the string into a `Boolean`, `Float`, or `Integer` can be suppressed by surrounding the string with single quotes. For example, the attribute `value="true"` is converted into the string "true"

<!ELEMENT systemTest EMPTY>

<!ATTLIST systemTest

property CDATA #REQUIRED

value CDATA #REQUIRED>

Tests a system property by calling the `System.getProperty` method and compares the result with the value specified through the value attribute.

- **property** – the name of an system property to test.
- **value** – the expected value of the property. The value is interpreted as a string value.

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<!ELEMENT equals EMPTY>

<!ATTLIST equals

value CDATA #REQUIRED>

This element is used to perform an equals check of the object in focus. The expression returns EvaluationResult.TRUE if the object is equal to the value provided by the attribute value. Otherwise EvaluationResult.FALSE is returned.

- **value** – the operand of the equals tests. The value provided as a string is converted into a Java base type using the same rules as for the value attribute of the test expression.

<!ELEMENT count EMPTY>

<!ATTLIST count

value CDATA #REQUIRED>

This element is used to test the number of elements in a collection.

- **value** – an expression to specify the number of elements in a list. Following wildcard characters can be used:

*

any number of elements

?

no elements or one element

+

one or more elements

!

no elements

integer value

the list must contain the exact number of elements

<!ELEMENT with (not , and , or , instanceof , test , systemTest , equals , count , with , resolve , adapt , iterate)*>

<!ATTLIST with

variable CDATA #REQUIRED>

This element changes the object to be inspected for all its child element to the object referenced by the given variable. If the variable can not be resolved then the expression will throw a ExpressionException when

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evaluating it. The children of a with expression are combined using the and operator.

- **variable** – the name of the variable to be used for further inspection. It is up to the evaluator of an extension point to provide the variable in the variable pool.

```
<!ELEMENT resolve (not , and , or , instanceof , test , systemTest , equals , count , with , resolve , adapt , iterate)*>
```

```
<!ATTLIST resolve
```

```
variable CDATA #REQUIRED
```

```
args CDATA #IMPLIED>
```

This element changes the object to be inspected for all its child element to the object referenced by the given variable. If the variable can not be resolved then the expression will throw a ExpressionException when evaluating it. The children of a with expression are combined using the and operator.

- **variable** – the name of the variable to be resolved. This variable is then used as the object in focus for child element evaluation. It is up to the evaluator of an extension point to provide a corresponding variable resolver (see IVariableResolver) through the evaluation context passed to the root expression element when evaluating the expression.
- **args** – additional arguments passed to the variable resolver. Multiple arguments are separated by commas. Each individual argument is converted into a Java base type using the same rules as defined for the value attribute of the test expression.

```
<!ELEMENT adapt (not , and , or , instanceof , test , systemTest , equals , count , with , resolve , adapt , iterate)*>
```

```
<!ATTLIST adapt
```

```
type CDATA #REQUIRED>
```

This element is used to adapt the object in focus to the type specified by the attribute type. The expression returns not loaded if either the adapter or the type referenced isn't loaded yet. It throws a ExpressionException during evaluation if the type name doesn't exist at all. The children of an adapt expression are combined using the and operator.

- **type** – the type to which the object in focus is to be adapted.

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```
<!ELEMENT iterate (not , and , or , instanceof , test , systemTest , equals , count , with , resolve , adapt ,  
iterate)*>
```

```
<!ATTLIST iterate
```

```
operator (or|and) >
```

This element is used to iterate over a variable that is of type `java.util.Collection`. If the object in focus is not of type `java.util.Collection` then an `ExpressionException` will be thrown while evaluating the expression.

- **operator** – either "and" or "or". The operator defines how the child elements will be combined. If not specified, "and" will be used.

Examples:

The following is an example of a launch shortcut extension point:

```
<extension point=  
"org.eclipse.debug.ui.launchShortcuts"  
>  
<shortcut id=  
"com.example.ExampleLaunchShortcutId"  
modes=  
"run,debug"  
class=  
"com.example.ExampleLaunchShortcutImpl"  
label=  
"Example Launch Shortcut"  
icon=  
"icons/examples.gif"  
>
```

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```
<perspective id=  
"org.eclipse.jdt.ui.JavaPerspective"  
/>  
  
<perspective id=  
"org.eclipse.debug.ui.DebugPerspective"  
/>  
  
</shortcut>  
  
</extension>
```

In the above example, a launch shortcut will be shown in the run and debug cascade menus with the label "Example Launch Shortcut", in the JavaPerspective and the DebugPerspective.

API Information:

Value of the attribute **class** must be a fully qualified name of a Java class that implements the interface **org.eclipse.debug.ui.ILaunchShortcut**.

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Source Container Presentations

Identifier:

org.eclipse.debug.ui.sourceContainerPresentations

Since:

3.0

Description:

Extension point to define a presentation aspects of a source container type.

Configuration Markup:

```
<!ELEMENT extension (sourceContainerPresentation*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT sourceContainerPresentation EMPTY>
```

```
<!ATTLIST sourceContainerPresentation
```

```
id CDATA #REQUIRED
```

```
icon CDATA #IMPLIED
```

```
containerTypeID CDATA #REQUIRED
```

```
browserClass CDATA #IMPLIED>
```

An extension point to define presentation aspects of a source container type.

- **id** – The unique id used to refer to this implementation.
- **icon** – The icon that should be displayed for the source container type and instances.

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- **containerTypeID** – The unique identifier of the source container type for which this presentation is being provided.
- **browserClass** – A class that can be called to display a browse dialog for the source container type. Must implement `ISourceLocationBrowser`.

Examples:

Following is an example of an source container presentation definition.

```
<extension point=
"org.eclipse.debug.ui.sourceContainerPresentations"
>
<sourceContainerPresentation browserClass=
"org.eclipse.debug.internal.ui.sourcelookup.browsers.ProjectSourceContainerBrowser"
containerTypeID=
"org.eclipse.debug.core.containerType.project"
icon=
"icons/full/obj16/prj_obj.gif"
id=
"org.eclipse.debug.ui.containerPresentation.project"
>
</sourceContainerPresentation>
</extension>
```

API Information:

Value of the attribute **browserClass** must be a fully qualified name of a Java class that implements the interface **ISourceLocationBrowser**.

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String Variable Presentations

Identifier:

org.eclipse.debug.ui.stringVariablePresentations

Since:

2.1

Description:

This extension point provides a mechanism for contributing a user interface/presentation for a string substitution variable (i.e. a context variable or value variable).

Configuration Markup:

```
<!ELEMENT extension (variablePresentation*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT variablePresentation EMPTY>
```

```
<!ATTLIST variablePresentation
```

```
variableName CDATA #REQUIRED
```

```
argumentSelector CDATA #REQUIRED>
```

- **variableName** – specifies the variable this presentation is for
- **argumentSelector** – specifies a fully qualified name of a Java class that implements `IArgumentSelector`

Examples:

The following is an example of a variable presentation contribution:

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```
<extension point=
"org.eclipse.debug.ui.stringVariablePresentations"
>
<variablePresentation variableName=
"example_variable"
argumentSelector=
"com.example.ExampleArgumentChooser"
>
</variablePresentation>
</extension>
```

In the above example, the contributed presentation will be used for the variable named "example_variable". An argument selector is specified to configure an argument applicable to the variable.

API Information:

Value of the attribute **argumentSelector** must be a fully qualified name of a Java class that implements the interface **org.eclipse.debug.ui.stringsubstitution.IArgumentSelector**.

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Help Content Producer

Identifier:

org.eclipse.help.contentProducer

Since:

3.0

Description:

For providing dynamic, generated at run time, help content.

Configuration Markup:

```
<!ELEMENT extension (contentProducer?)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT contentProducer (producer)>
```

```
<!ATTLIST contentProducer
```

```
producer CDATA #IMPLIED>
```

- **producer** – the implementation class for the help content producer. This class must implement the `org.eclipse.help.IHelpContentProducer` interface. This attribute may be omitted, and the nested `producer` element may be provided instead.

```
<!ELEMENT producer (parameter*)>
```

```
<!ATTLIST producer
```

```
class CDATA #REQUIRED>
```

- **class** – the implementation class for the help content producer. This class must implement the `org.eclipse.help.IHelpContentProducer` interface.

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<!ELEMENT parameter EMPTY>

<!ATTLIST parameter

name CDATA #REQUIRED

value CDATA #REQUIRED>

- **name** – name of a parameter passed to the implementation class
- **value** – value of a parameter passed to the implementation class

Examples:

The following is a sample usage of the browser extension point:

```
<extension point=
"org.eclipse.help.contentProducer"
id=
"org.eclipse.myPlugin.myDynamicHelpProducer"
name=
"My Dynamic Help Content"
>
<contentProducer producer=
"org.eclipse.myPlugin.myPackage.Myproducer"
/>
</extension>
```

API Information:

The supplied content producer class must implement the `org.eclipse.help.IHelpContentProducer` interface. The producer is responsible for providing content for dynamic help resources from a plug-in. The method of content producer is called by help for every help resource obtained from the plug-in.

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Supplied Implementation:

None. If a documentation plug-in does not provide help content producer or a call to it results in null, help system searches doc.zip and file system in the plug-in install location for a static document and displays its content.

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Contexts

Identifier:

org.eclipse.help.contexts

Description:

For defining context-sensitive help for an individual plug-in.

Configuration Markup:

```
<!ELEMENT extension (contexts*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT contexts EMPTY>
```

```
<!ATTLIST contexts
```

```
file CDATA #REQUIRED
```

```
plugin CDATA #IMPLIED>
```

- **file** – the name of the manifest file which contains the context-sensitive help documentation for this plug-in.

Configuration Markup for what goes into the contexts manifest file:

```
<!ELEMENT contexts (context)* >

<!ELEMENT context (description?,topic*) >
<!ATTLIST context id ID #REQUIRED >

<!ELEMENT description (#PCDATA)>

<!ELEMENT topic EMPTY >
<!ATTLIST topic label CDATA #REQUIRED >
<!ATTLIST topic href CDATA #IMPLIED >
```

The contexts manifest files provide all the information needed when context-sensitive help is requested by the user. The id is passed by the platform to identify the currently active context. The context definitions with matching IDs are then retrieved. The IContext object is then created by help

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system that contains descriptions and topics from all context definitions for a given ID. The description is to be displayed to the user, and related topics might be useful to the user for understanding the current context. The related topic are html files packaged in doc.zip, together with topics that are part of on line help.

- **plugin** – Plugin to which its context definitions are extended with extra information.

If a plugin defines some context id's, one can extend the description or related links of a context by declaring another context with the same id.

Examples:

The following is an example of using the contexts extension point:
(in file `plugin.xml`)

```
<extension point=  
"org.eclipse.help.contexts"
```

```
>
```

```
<contexts file=
```

```
"xyzContexts.xml"
```

```
/>
```

```
</extension>
```

(in file `xyzContexts.xml`)

```
<contexts>  
  <context id="generalContextId">  
    <description> This is a sample F1 help string.</description>  
    <topic href="contexts/RelatedContext1.html" label="Help Related  
Topic 1"/>  
    <topic href="contexts/RelatedContext2.html" label="Help Related  
Topic 2"/>  
  </context>  
</contexts>
```

Externalizing Strings The Context XML files can be translated and the resulting copy (with translated descriptions labels) should be placed in `nl/<language>/<country>` or `nl/<language>` directory. The `<language>` and `<country>` stand for two letter language and country codes as used in locale codes. For example, Traditional Chinese translations should be placed in the `nl/zh/TW` directory. The `nl/<language>/<country>` directory has a higher priority than `nl/<language>`. Only if no file is found in the `nl/<language>/<country>`, the file residing in `nl/<language>` will be used. The the root directory of a plugin

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will be searched last.

The related topics contained in doc.zip can be localized by creating a doc.zip file with translated version of documents, and placing doc.zip in nl/<language>/<country> or nl/<language> directory. The help system will look for the files under this directories before defaulting to plugin directory.

API Information:

No code is required to use this extension point. All that is needed is to supply the appropriate manifest file(s) mentioned in the plugin.xml file.

Supplied Implementation:

The optional default implementation of the help system UI supplied with the Eclipse platform fully supports the `contexts` extension point.

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Browser

Identifier:

org.eclipse.help.base.browser

Since:

3.0 (originally added in release 2.0 as org.eclipse.help.ui.browser)

Description:

For providing web browsers capable of displaying html documents at a given URL.

Configuration Markup:

```
<!ELEMENT extension (browser*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT browser (factoryclass)>
```

```
<!ATTLIST browser
```

```
id CDATA #REQUIRED
```

```
factoryclass CDATA #IMPLIED
```

```
name CDATA #REQUIRED>
```

- **id** – the unique ID of the browser.
- **factoryclass** – the implementation class for the browser factory. This class must implement the `org.eclipse.help.browser.IBrowserFactory` interface. This attribute may be omitted, and the nested `factoryclass` element may be provided instead.
- **name** – the name of the browser (translatable).

```
<!ELEMENT factoryclass (parameter*)>
```

```
<!ATTLIST factoryclass
```

```
class CDATA #REQUIRED>
```

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- **class** – the implementation class for the browser factory. This class must implement the `org.eclipse.help.browser.IBrowserFactory` interface.

```
<!ELEMENT parameter EMPTY>
```

```
<!ATTLIST parameter
```

```
name CDATA #REQUIRED
```

```
value CDATA #REQUIRED>
```

- **name** – name of a parameter passed to the implementation class
- **value** – value of a parameter passed to the implementation class

Examples:

The following is a sample usage of the browser extension point:

```
<extension point=  
"org.eclipse.help.base.browser"  
>  
<browser id=  
"org.eclipse.myPlugin.myBrowserID"  
factoryClass=  
"org.eclipse.myPlugin.myPackage.MyFactoryClass"  
name=  
"My Browser"  
>  
</browser>  
</extension>
```

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API Information:

The supplied factory class must implement the `org.eclipse.help.browser.IBrowserFactory` interface. Methods in that interface determine whether the factory is available on the given system, i.e. is capable of supplying browser instances, and create browser instances that implement `IBrowser` interface.

Supplied Implementation:

The `org.eclipse.help.base` and `org.eclipse.help.ui` plug-ins contain implementation of browsers on common platforms. Other plug-ins can provide different implementations. In the preferences, the user can select the default browser from among available browsers.

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Lucene Analyzer

Identifier:

org.eclipse.help.base.luceneAnalyzer

Since:

3.0 (originally added in release 2.0 as org.eclipse.help.luceneAnalyzer)

Description:

This extension point is used to register text analyzers for use by help when indexing and searching documentation.

Help exploits capabilities of the Lucene search engine, that allows indexing of token streams (streams of words). Analyzers create tokens from the character stream. They examine text content and provide tokens for use with the index. The text stream can be tokenized in many unique ways. A trivial analyzer can tokenize streams at white space, a different one can perform filtering of tokens, based on the application needs. Since the documentation is mostly human-readable text, it is desired that analyzers used by the help system perform language and grammar aware tokenization and normalization of indexed text. For some languages, the quality of search increases significantly if stop word removal and stemming is performed on the indexed text.

The analyzer contributed to this extension point will override the one provided by the Eclipse help system for a given locale.

Configuration Markup:

```
<!ELEMENT extension (analyzer*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT analyzer EMPTY>
```

```
<!ATTLIST analyzer
```

```
locale CDATA #REQUIRED
```

```
class CDATA #REQUIRED>
```

- **locale** – a string identifying locale for which the supplied analyzer is to be used. If two letters, language is provided, and the analyzer will be available to all locales of that language.

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- **class** – a fully qualified name of the Java class extending `org.apache.lucene.analysis.Analyzer`.

Examples:

Following is an example of Lucene Analyzer configuration:

```
<extension id=
"com.xyx.XYZ"
point=
"org.eclipse.help.base.luceneAnalyzer"
>
<analyzer locale=
"ll_CC"
class=
"com.xyz.ll_CCAnalyzer"
/>
</extension>
```

API Information:

The value of the `locale` attribute must represent either a five- or two-character locale string. If the analyzer is configured for a language by specifying two-letter language designation, the analyzer is going to be used for all locales of this language. If the analyzer is configured that matches a five-character locale, it is going to be used instead.

The value of the `class` attribute must represent a class that extends `org.apache.lucene.analysis.Analyzer`. It is recommended that this analyzer performs lowercase filtering for languages where it is possible to increase number of search hits by making search case-sensitive.

Supplied Implementation:

The Eclipse help system provides analyzers for all languages. For English and German, the analyzers perform stop word filtering, lowercase filtering, and stemming. For all the other languages the supplied analyzer only performs lowercase filtering.

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Ant Properties

Identifier:

org.eclipse.ant.core.antProperties

Since:

3.0

Description:

Allows plug-ins to define Ant properties for use in Ant build files.

Configuration Markup:

```
<!ELEMENT extension (antProperty*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT antProperty EMPTY>
```

```
<!ATTLIST antProperty
```

```
name CDATA #REQUIRED
```

```
value CDATA #IMPLIED
```

```
class CDATA #IMPLIED
```

```
headless (true | false)
```

```
eclipseRuntime (true | false) >
```

- **name** – The name of the property.
- **value** – The value of the property. If a value is provided here, the "class" attribute is ignored.
- **class** – If there is no 'value' attribute provided, this class is called to return the dynamic value for the Ant property. If null is returned, the value is not set.

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- **headless** – indicates whether this property is suitable for use in a "headless" Ant environment. If running headless and the attribute is "false", the property will not be set and any specified `org.eclipse.ant.core.IAntPropertyProvider` will not be instantiated. The implied value is true, when not specified.
- **eclipseRuntime** – indicates whether this property should only be considered when run in the same VM as Eclipse. The implied value is true, when not specified.

Examples:

The following is an example of an Ant properties extension point:

```
<extension point=
"org.eclipse.ant.core.antProperties"
>
<antProperty name=
"eclipse.home"
class=
"org.eclipse.ant.internal.core.AntPropertyValueProvider"
/>
<antProperty name=
"eclipse.running"
value=
"true"
/>
</extension>
```

API Information:

The class named in the `class` property must implement the `org.eclipse.ant.core.IAntPropertyProvider` interface.

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Supplied Implementation:

The platform uses this mechanism to set the Ant property eclipse.home to the Eclipse installation directory and to set the eclipse.running property.

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Ant Tasks

Identifier:

org.eclipse.ant.core.antTasks

Description:

Allows plug-ins to define arbitrary Ant tasks for use by the Ant infrastructure. The standard Ant infrastructure allows for the addition of arbitrary tasks. Unfortunately, it is unlikely that the Ant Core plug-in would have the classes required by these tasks on its classpath (or that of any of its prerequisites). To address this, clients should define an extension which plugs into this extension-point and maps a task name onto a class. The Ant plug-in can then request that the declaring plug-in load the specified class.

Configuration Markup:

```
<!ELEMENT extension (antTask*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT antTask EMPTY>
```

```
<!ATTLIST antTask
```

```
name CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
library CDATA #REQUIRED
```

```
headless (true | false)
```

```
eclipseRuntime (true | false) >
```

- **name** – name of the task to be defined
- **class** – the fully qualified name of a Java class implementing the task. Generally this class must be a subclass of `org.apache.tools.ant.Task`.
- **library** – a path relative to the plug-in install location for the library containing the task.

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- **headless** – indicates whether this task is suitable for use in a "headless" Ant environment. If running headless and the attribute is "false", the task will not be loaded or defined. As well, the plugin class loader will not be added as a parent classloader to the Ant classloader. The implied value is true, when not specified.
- **eclipseRuntime** – indicates whether this task requires an Eclipse runtime (i.e. must be run in the same VM as Eclipse). The implied value is true, when not specified.

Examples:

The following is an example of an Ant tasks extension point:

```
<extension point=  
  "org.eclipse.ant.core.antTasks"  
>  
<antTask name=  
  "coolTask"  
  class=  
    "com.example.CoolTask"  
  library=  
    "lib/antSupport.jar"  
>  
</extension>
```

Supplied Implementation:

The platform itself supplies a number of tasks including `eclipse.incrementalBuild` and `eclipse.refreshLocal`.

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Ant Types

Identifier:

org.eclipse.ant.core.antTypes

Description:

Allows plug-ins to define arbitrary Ant datatypes for use by the Ant infrastructure. The standard Ant infrastructure allows for the addition of arbitrary datatypes. Unfortunately, it is unlikely that the Ant Core plug-in would have the classes required by these datatypes on its classpath (or that of any of its prerequisites). To address this, clients should define an extension which plugs into this extension-point and maps a datatype name onto a class. The Ant plug-in can then request that the declaring plug-in load the specified class.

Configuration Markup:

```
<!ELEMENT extension (antType*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT antType EMPTY>
```

```
<!ATTLIST antType
```

```
name CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
library CDATA #REQUIRED
```

```
headless (true | false)
```

```
eclipseRuntime (true | false) >
```

- **name** – name of the type to be defined
- **class** – the fully qualified name of a Java class implementing the datatype. Generally this class must be a subclass of `org.apache.tools.ant.types.DataType`.
- **library** – a path relative to the plug-in install location for the library containing the type.

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- **headless** – indicates whether this type is suitable for use in a "headless" Ant environment. If running headless and the attribute is "false", the type will not be loaded or defined. As well, the plugin class loader will not be added as a parent classloader to the Ant classloader. The implied value is true, when not specified.
- **eclipseRuntime** – indicates whether this type requires an Eclipse runtime (i.e. must be run in the same VM as Eclipse). The implied value is true, when not specified.

Examples:

The following is an example of an Ant types extension point:

```
<extension point=  
"org.eclipse.ant.core.antTypes"  
>  
<antType name=  
"coolType"  
class=  
"com.example.CoolType"  
library=  
"lib/antSupport.jar"  
>  
</extension>
```

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Extra Ant Classpath Entries

Identifier:

org.eclipse.ant.core.extraClasspathEntries

Description:

Allows plug-ins to define arbitrary JARs for use by the Ant infrastructure. These JARs are put into the Ant classpath at runtime. Besides the JAR, the plug-in classloader of the plug-in providing the JAR is also added to the classpath.

Configuration Markup:

```
<!ELEMENT extension (extraClasspathEntry*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT extraClasspathEntry EMPTY>
```

```
<!ATTLIST extraClasspathEntry
```

```
library CDATA #REQUIRED
```

```
headless (true | false)
```

```
eclipseRuntime (true | false) >
```

- **library** – a path relative to the plug-in install location for the library.
- **headless** – indicates whether this extra classpath entry is suitable for use in a "headless" Ant environment. If running headless and the attribute is "false", this entry will not be added to the Ant classpath. As well, the plugin class loader will not be added as a parent classloader to the Ant classloader. The implied value is true, when not specified.
- **eclipseRuntime** – indicates whether this extra classpath entry should only be considered for builds run in the same VM as Eclipse. The implied value is true, when not specified.

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Examples:

The following is an example of an extra classpath entries extension point:

```
<extension point=
"org.eclipse.ant.core.extraClasspathEntries"
>
<extraClasspathEntry library=
"myExtraLibrary.jar"
/>
</extension>
```

Supplied Implementation:

The platform itself supplies an Ant support jar (antsupportlib.jar).

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ContentMerge Viewers

Identifier:

org.eclipse.compare.contentMergeViewers

Description:

This extension point allows a plug-in to register compare/merge viewers for specific content types. The viewer is expected to extend `org.eclipse.jface.viewers.Viewer`. However, since viewers don't have a default constructor, the extension point must implement the factory interface for viewers `org.eclipse.compare.IViewerCreator`.

Configuration Markup:

```
<!ELEMENT extension (viewer* , contentTypeBinding*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT viewer EMPTY>
```

```
<!ATTLIST viewer
```

```
id CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
extensions CDATA #IMPLIED>
```

- **id** – a unique identifier that can be used to reference the viewer
- **class** – a fully qualified name of a class that implements a factory for the content merge viewer and implements `org.eclipse.compare.IViewerCreator`
- **extensions** – a comma separated list of file extensions e.g. "java, gif"

```
<!ELEMENT contentTypeBinding EMPTY>
```

```
<!ATTLIST contentTypeBinding
```

```
contentTypeId CDATA #REQUIRED
```

```
contentMergeViewerId CDATA #REQUIRED>
```

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- **contentType** –
- **contentMergeViewerId** –

Examples:

The following is an example of a compare/merge viewer for text files (extension "txt"):

```
<extension point =  
"org.eclipse.compare.contentMergeViewers"  
>  
<viewer id=  
"org.eclipse.compare.contentmergeviewer.TextMergeViewer"  
class=  
"org.eclipse.compare.internal.TextMergeViewerCreator"  
extensions=  
"txt"  
>  
</extension>
```

API Information:

The contributed class must implement `org.eclipse.compare.IViewerCreator`

Supplied Implementation:

The Compare UI plugin defines content viewers for text, binary contents, and images.

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Content Viewers

Identifier:

org.eclipse.compare.contentViewers

Description:

This extension point allows a plug-in to register viewers for specific content types. These viewers are used in the `EditionSelectionDialog` when presenting an edition of a resource or a subsection thereof. The viewer is expected to extend `org.eclipse.jface.viewers.Viewer`. However since viewers don't have a default constructor the extension point must implement the factory interface for viewers `org.eclipse.compare.IViewerCreator`.

Configuration Markup:

```
<!ELEMENT extension (viewer* ,contentTypeBinding*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT viewer EMPTY>
```

```
<!ATTLIST viewer
```

```
id CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
extensions CDATA #IMPLIED>
```

- **id** – a unique identifier that can be used to reference the viewer
- **class** – a fully qualified name of a class that implements a factory for the content viewer and implements `org.eclipse.compare.IViewerCreator`
- **extensions** – a comma separated list of file extensions e.g. "java, gif"

```
<!ELEMENT contentTypeBinding EMPTY>
```

```
<!ATTLIST contentTypeBinding
```

```
contentTypeId CDATA #REQUIRED
```

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contentViewerId CDATA #REQUIRED>

- **contentType** –
- **contentViewerId** –

Examples:

The following is an example of a viewer for text files (extension "txt"):

```
<extension point =  
"org.eclipse.compare.contentViewers"  
>  
<viewer id=  
"org.eclipse.compare.internal.TextViewer"  
class=  
"org.eclipse.compare.internal.TextViewerCreator"  
extensions=  
"txt"  
>  
</extension>
```

API Information:

The contributed class must implement `org.eclipse.compare.IViewerCreator`

Supplied Implementation:

The Compare UI plugin defines content viewers for text and images.

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Stream Merger

Identifier:

org.eclipse.compare.streamMergers

Since:

3.0

Description:

This extension point allows a plug-in to register a stream merger for specific content types. The stream merger is expected to perform a three-way merge on three input streams and writes the result to an output stream. The extension point must implement the interface `org.eclipse.compare.IStreamMerger`.

Configuration Markup:

```
<!ELEMENT extension (streamMerger* ,contentTypeBinding*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT streamMerger EMPTY>
```

```
<!ATTLIST streamMerger
```

```
id CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
extensions CDATA #IMPLIED>
```

- **id** – a unique identifier that can be used to reference the stream merger
- **class** – a fully qualified name of a class that implements `org.eclipse.compare.IStreamMerger`
- **extensions** – a comma separated list of file extensions e.g. "java, properties"

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```
<!ELEMENT contentTypeBinding EMPTY>  
<!ATTLIST contentTypeBinding  
contentTypeId CDATA #REQUIRED  
streamMergerId CDATA #REQUIRED>
```

- **contentTypeId** –
- **streamMergerId** –

Examples:

The following is an example of a stream merger for property files (extension "properties"):

```
<extension point =  
"org.eclipse.compare.streamMergers"  
>  
<streamMerger id=  
"org.eclipse.compare.internal.merge.TextStreamMerger"  
class=  
"org.eclipse.compare.internal.merge.TextStreamMerger"  
extensions=  
"properties"  
>  
</extension>
```

API Information:

The contributed class must implement `org.eclipse.compare.IStreamMerger`

Supplied Implementation:

The Compare UI plugin defines a stream merger for line oriented text files.

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Structure Creators

Identifier:

org.eclipse.compare.structureCreators

Description:

This extension point allows a plug-in to register a structure creator for specific content types. The structure creator is expected to create a tree of `IStructureComparators` for a given content. This tree is used as the input for the structural compare. The extension point must implement the interface `org.eclipse.compare.structuremergeviewer.IStructureCreator`.

Configuration Markup:

```
<!ELEMENT extension (structureCreator* ,contentTypeBinding*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT structureCreator EMPTY>
```

```
<!ATTLIST structureCreator
```

```
id CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
extensions CDATA #IMPLIED>
```

- **id** – a unique identifier that can be used to reference the structure creator
- **class** – a fully qualified name of a class that implements `org.eclipse.compare.structuremergeviewer.IStructureCreator`
- **extensions** – a comma separated list of file extensions e.g. "java, properties"

```
<!ELEMENT contentTypeBinding EMPTY>
```

```
<!ATTLIST contentTypeBinding
```

```
contentTypeId CDATA #REQUIRED
```

```
structureCreatorId CDATA #REQUIRED>
```

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- **contentTypeId** –
- **structureCreatorId** –

Examples:

The following is an example of a structure creator for java files (extension "java"):

```
<extension point =  
"org.eclipse.compare.structureCreators"  
>  
<structureCreator id=  
"org.eclipse.compare.JavaStructureCreator"  
class=  
"org.eclipse.compare.JavaStructureCreator"  
extensions=  
"java"  
>  
</extension>
```

API Information:

The contributed class must implement
`org.eclipse.compare.structuremergeviewer.IStructureCreator`

Supplied Implementation:

The Compare UI plugin defines a structure creator for zip archives.

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StructureMerge Viewers

Identifier:

org.eclipse.compare.structureMergeViewers

Description:

This extension point allows a plug-in to register compare/merge viewers for structural content types. The viewer is expected to extend `org.eclipse.jface.viewers.Viewer`. However, since viewers don't have a default constructor, the extension point must implement the factory interface for viewers `org.eclipse.compare.IViewerCreator`.

Configuration Markup:

```
<!ELEMENT extension (viewer* , contentTypeBinding*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT viewer EMPTY>
```

```
<!ATTLIST viewer
```

```
id CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
extensions CDATA #REQUIRED>
```

- **id** – a unique identifier that can be used to reference the viewer
- **class** – a fully qualified name of a class that implements a factory for the structure merge viewer and implements `org.eclipse.compare.IViewerCreator`
- **extensions** – a comma separated list of file extensions e.g. "zip, jar"

```
<!ELEMENT contentTypeBinding EMPTY>
```

```
<!ATTLIST contentTypeBinding
```

```
contentTypeId CDATA #REQUIRED
```

```
structureMergeViewerId CDATA #REQUIRED>
```

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- `contentType` –
- `structureMergeViewerId` –

Examples:

The following is an example of compare/merge viewer for zip files (extension "zip"):

```
<extension point =  
"org.eclipse.compare.structureMergeViewers"  
>  
<viewer id=  
"org.eclipse.compare.ZipCompareViewer"  
class=  
"org.eclipse.compare.ZipCompareViewerCreator"  
extensions=  
"zip"  
>  
</extension>
```

API Information:

The contributed class must implement `org.eclipse.compare.IViewerCreator`

Supplied Implementation:

The Compare UI plugin defines a structure compare viewer for zip archives.

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Property Testers

Identifier:

org.eclipse.jdt.ui.propertyTesters

Since:

3.0

Description:

This extension point allows to add properties to an already existing type. Those properties can then be used inside the expression language's test expression element.

Configuration Markup:

```
<!ELEMENT extension (propertyTester*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT propertyTester EMPTY>
```

```
<!ATTLIST propertyTester
```

```
id CDATA #REQUIRED
```

```
type CDATA #REQUIRED
```

```
namespace CDATA #REQUIRED
```

```
properties CDATA #REQUIRED
```

```
class CDATA #REQUIRED>
```

- **id** – unique identifier for the property tester
- **type** – the type to be extended by this property tester
- **namespace** – a unique id determining the name space the properties are added to
- **properties** – a comma separated list of properties provided by this property tester

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- **class** – the name of the class that implements the testing methods. The class must be public and extend `org.eclipse.core.expressions.PropertyTester` with a public 0–argument constructor.

Examples:

The following is an example of a property tester contribution:

```
<extension point=
"org.eclipse.core.expressions.propertyTesters"
>
<propertyTester id=
"org.eclipse.jdt.ui.IResourceTester"
type=
"org.eclipse.core.resources.IResource"
namespace=
"org.eclipse.jdt.ui"
properties=
"canDelete"
class=
"org.eclipse.jdt.ui.internal.ResourceTester"
>
</propertyTester>
</extension>
```

API Information:

The contributed class must extend `org.eclipse.core.expressions.PropertyTester`

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Dynamic String Substitution Variables

Identifier:

org.eclipse.core.variables.dynamicVariables

Since:

3.0

Description:

This extension point provides a mechanism for defining dynamic variables used in string substitution. The value of a dynamic variable is resolved at the time a string substitution is performed, with an optional argument.

Configuration Markup:

```
<!ELEMENT extension (variable*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT variable EMPTY>
```

```
<!ATTLIST variable
```

```
name CDATA #REQUIRED
```

```
resolver CDATA #REQUIRED
```

```
description CDATA #REQUIRED
```

```
supportsArgument (true | false) >
```

- **name** – specifies a unique name for this variable.
- **resolver** – specifies a Java class which implements `org.eclipse.core.variables.IDynamicVariableResolver`, which is used to determine the value of the variable
- **description** – specifies a human-readable description of this variable

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- **supportsArgument** – Whether this variable supports an argument. When unspecified, the implied value is `true`.

Examples:

The following is a definition of a dynamic variable that resolves to the name of the selected resource:

```
<extension point=
"org.eclipse.core.variables.dynamicVariables"
>
<variable name=
"resource_name"
expanderClass=
"com.example.ResourceNameExpander"
description=
"The name of the selected resource"
>
</variable>
</extension>
```

API Information:

Value of the attribute **resolver** must be a fully qualified name of a Java class that implements the interface **org.eclipse.core.variables.IDynamicVariableResolver**.

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Value Variables

Identifier:

org.eclipse.core.variables.valueVariables

Since:

3.0

Description:

This extension point provides a mechanism for defining variables used for string substitution. A value variable has a static value.

Configuration Markup:

```
<!ELEMENT extension (variable*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT variable EMPTY>
```

```
<!ATTLIST variable
```

```
name CDATA #REQUIRED
```

```
initialValue CDATA #IMPLIED
```

```
initializerClass CDATA #IMPLIED
```

```
description CDATA #IMPLIED>
```

- **name** – specifies a unique name for this variable.
- **initialValue** – specifies the initial value for this variable. When specified, an `initializerClass` attribute must not be specified.
- **initializerClass** – specifies the fully qualified name of the Java class that implements `org.eclipse.core.variables.IValueVariableInitializer`. When specified, an `initialValue` attribute must not be specified.

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- **description** – specifies a human-readable description of this variable.

Examples:

The following is an example of a value variable contribution with an initial value:

```
<extension point=
"org.eclipse.core.variables.valueVariables"
>
<variable name=
"FOO_HOME"
initialValue=
"/usr/local/foo"
>
</variable>
</extension>
```

In the example above, the specified variable is created with the initial value `"/usr/local/foo"`. The following is an example of a value variable contribution with an initializer class:

```
<extension point=
"org.eclipse.core.variables.valueVariables"
>
<variable name=
"FOO_HOME"
initializerClass=
"com.example.FooLocator"
>
```

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</variable>

</extension>

In the example above, the variable FOO_HOME is created and the class "com.example.FooLocator" will be used to initialize the value the first time it's requested.

API Information:

Value of the attribute **initializerClass** must be a fully qualified name of a Java class that implements the interface **org.eclipse.core.variables.IValueVariableInitializer**.

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Search Pages

Identifier:

org.eclipse.search.searchPages

Description:

This extension point allows a plug-in to register search pages for specialized searches. When the search action is performed on a resource, the search infrastructure locates the most specific registered search page for it.

Configuration Markup:

```
<!ELEMENT extension (page*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT page EMPTY>
```

```
<!ATTLIST page
```

```
id CDATA #REQUIRED
```

```
label CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
icon CDATA #IMPLIED
```

```
sizeHint CDATA #IMPLIED
```

```
tabPosition CDATA #IMPLIED
```

```
extensions CDATA #IMPLIED
```

```
searchViewHelpContextId CDATA #IMPLIED
```

```
showScopeSection (true | false)
```

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enabled (true | false)

canSearchEnclosingProjects (true | false) >

- **id** – a unique name that will be used to identify this search page
- **label** – a translatable label that will be used in the search page tab
- **class** – a name of the class which implements `org.eclipse.search.ui.ISearchPage`. We recommend subclassing `org.eclipse.jface.dialogs.DialogPage`.
- **icon** – a relative name of the image that will be used for all resources that match the specified extensions. If omitted, the search page's tab will only contain a label.
- **sizeHint** – a hint for the initial size of the page. This is a string containing the width and height separated by comma (e.g. "50, 60"). In the case this hint is omitted the page will be no larger than the other pages.
- **tabPosition** – an integer defining where the page is placed in the page book. The value does not define the absolute position but the position relative to the other pages. The ordering of pages is as follows:
 1. if neither page defines the tab position then they are ordered alphabetically according to their labels
 2. if both pages have the tab position specified then the page with the lower value comes first. If the values are equal then the pages are treated as if the values would not exist (see 1.)
 3. if only one page has the value specified then this page comes first
- **extensions** – a comma separated list with file extensions on which the search page can operate. Each extension must also include a weight (0 meaning lowest weight) which enables the search infrastructure to find the best fitting page. The weight is separated from the extension by a colon. If a search page can search all possible resources then "*" can be used.
- **searchViewHelpContextId** – an optional help context ID of the Search view displaying results of this page. If this attribute is missing then the default search help context ID (`org.eclipse.search.search_view_context`) is used.
- **showScopeSection** – If this attribute is missing or set to "false", then the scope section is not shown in the Search dialog. To see the scope section, this attribute has to be set to "true". Plug-ins which add their own Search page and want to see the scope section have to add this to their plugin.xml.
- **enabled** – If this attribute is missing or set to "false", then the page is not initially shown in the Search dialog. The page can be activated by the user via the "Customize..." button on the Search dialog.
- **canSearchEnclosingProjects** – If this attribute is missing or set to "false", the "Enclosing Projects" search scope is not shown in the search dialog's scope part. If the attribute "showScopeSection" is missing or set to "false", this attribute will be ignored.

Examples:

The following is an example of a search page extension definition:

```
<extension point=
```

```
"org.eclipse.search.searchPages"
```

```
>
```

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```
<page id=
"org.eclipse.search.ui.text.TextSearchPage"
label=
"Text Search"
icon=
"icons/full/obj16/tsearch_pref.gif"
sizeHint=
"250,160"
tabPosition=
"1"
extensions=
"*:1"
showScopeSection=
"true"
class=
"org.eclipse.search.ui.text.TextSearchPage"
>
</page>
</extension>
```

API Information:

The contributed class must implement `org.eclipse.search.ui.ISearchPage`

Supplied Implementation:

The search infrastructure provides a search page for full-text search.

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Result Sorters

Identifier:

org.eclipse.search.searchResultSorters

Description:

This extension point allows a plug-in to contribute search result sorters to the search result view's Sort context menu.

Configuration Markup:

```
<!ELEMENT extension (sorter*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance
- **name** – an optional name of the extension instance

```
<!ELEMENT sorter EMPTY>
```

```
<!ATTLIST sorter
```

```
id CDATA #REQUIRED
```

```
pageId CDATA #REQUIRED
```

```
label CDATA #REQUIRED
```

```
tooltip CDATA #IMPLIED
```

```
icon CDATA #IMPLIED
```

```
class CDATA #REQUIRED>
```

- **id** – a unique name that will be used to identify this search result sorter.
- **pageId** – the ID of a registered search page for which the sorter will be activated. "*" activates the sorter for all pages.
- **label** – a translatable label that will be used as the menu item's label.
- **tooltip** – a translatable text that will be used as the menu item's tool tip . If omitted, the menu item will have no tool tip.

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- **icon** – a relative name of the image that will be shown in the context menu along with the label. If omitted, the menu entry will only contain a label.
- **class** – a name of the class that extends `org.eclipse.jface.viewers.ViewerSorter`

Examples:

The following is an example of a search page extension definition:

```
<extension point=
"org.eclipse.search.searchResultSorters"
>
<sorter id=
"org.eclipse.search.internal.ui.FileNameSorter"
pageId=
"*"
label=
"%FileNameSorter.label"
tooltip=
"%FileNameSorter.tooltip"
icon=
"icons/full/ecl16/search_sort.gif"
class=
"org.eclipse.search.internal.ui.FileNameSorter"
>
</sorter>
</extension>
```

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API Information:

The contributed class must implement `org.eclipse.jface.viewers.ViewerSorter`

Supplied Implementation:

The search infrastructure provides a sorter that sorts the matches by the resource name.

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Search Result View Pages

Identifier:

org.eclipse.search.searchResultViewPages

Since:

3.0

Description:

This extension point allows clients to plug pages into the search result view.

Configuration Markup:

```
<!ELEMENT extension (viewPage)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED>
```

- **point** – a fully qualified identifier of the target extension point
- **id** – an optional identifier of the extension instance

```
<!ELEMENT viewPage EMPTY>
```

```
<!ATTLIST viewPage
```

```
searchResultClass CDATA #REQUIRED
```

```
class CDATA #REQUIRED
```

```
id CDATA #REQUIRED>
```

- **searchResultClass** – The fully qualified class name of the `ISearchResult` implementation this search result page supposed to show.
- **class** – the fully qualified class name implementing this search result page. The class must implement `org.eclipse.search.ui.ISearchResultPage`.
- **id** – the id, typically the same as the fully qualified class name

Examples:

As an example, here is the markup for the file search result page.

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```
<extension id=
"FileSearchPage"
point=
"org.eclipse.search.searchResultViewPages"
>
<viewPage id=
"org.eclipse.search.text.FileSearchResultPage"
searchResultClass=
"org.eclipse.search.internal.ui.text.FileSearchResult"
class=
"org.eclipse.search.internal.ui.text.FileSearchPage"
>
</viewPage>
</extension>
```

API Information:

The contributed class must implement `org.eclipse.search.ui.ISearchResultPage`

Supplied Implementation:

The search plugin provide a search result page for file searches.

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Configuration Duplication Maps

Identifier:

org.eclipse.ui.externaltools.configurationDuplicationMaps

Since:

3.0

Description:

This is an internal extension point to declare the launch configuration type that should be created when duplicating an existing configuration as a project builder. Clients are not intended to use this extension point.

Configuration Markup:

```
<!ELEMENT extension (configurationMap*)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

```
<!ELEMENT configurationMap EMPTY>
```

```
<!ATTLIST configurationMap
```

```
sourceType CDATA #REQUIRED
```

```
builderType CDATA #REQUIRED>
```

- **sourceType** – specifies the identifier of the launch configuration type for which this mapping is provided
- **builderType** – specifies the identifier of the launch configuration type which should be created when a configuration of type "sourceType" is imported to be a project builder

Examples:

The following example specifies that when the user chooses to import a launch configuration of the type "org.eclipse.ui.externaltools.ProgramLaunchConfigurationType", a new launch configuration of the type "org.eclipse.ui.externaltools.ProgramBuilderLaunchConfigurationType" should be created.

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```
<extension point=
"org.eclipse.ui.externaltools.configurationDuplicationMaps"
>
<configurationMap sourceType=
"org.eclipse.ui.externaltools.ProgramLaunchConfigurationType"
builderType=
"org.eclipse.ui.externaltools.ProgramBuilderLaunchConfigurationType"
>
</configurationMap>
</extension>
```

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Feature Type Factory

Identifier:

org.eclipse.update.core.featureTypes

Description:

The platform update mechanism supports pluggable feature type implementations. A new feature type can be registered in order to support alternate packaging and verification schemes.

The `featureTypes` extension point allows alternate feature implementations to be registered using a symbolic type identifier. Whenever the type is referenced using this identifier, the supplied factory is used to create the correct concrete feature implementation.

Configuration Markup:

```
<!ELEMENT extension (feature-factory+)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – must be specified as **org.eclipse.update.core.featureTypes**
- **id** – must be specified. Identifies the new feature type
- **name** – optional displayable label for the new feature type

```
<!ELEMENT feature-factory EMPTY>
```

```
<!ATTLIST feature-factory
```

```
class CDATA #REQUIRED>
```

- **class** – fully qualified name of the factory class for the identified feature type

Examples:

The following is an example of new feature type registration:

```
<extension id=
```

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```
"custom"  
  
point=  
  
"org.eclipse.update.core.featureTypes"  
  
name=  
  
"Custom packaged feature"  
  
>  
  
<feature-factory class=  
  
"com.xyz.update.CustomFeatureFactory"  
  
>  
  
</feature-factory>  
  
</extension>
```

API Information:

Registered factory classes must implement **org.eclipse.update.core.IFeatureFactory**

Supplied Implementation:

The platform supplies two standard implementations of feature types. One representing the default packaged feature type, and the other representing an installed feature type.

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Global Install Handlers

Identifier:

org.eclipse.update.core.installHandlers

Description:

Extension point for registering global install handlers. Global install handlers can be referenced by features (using the `<feature>` `<install-handler>` tags) without having to include a copy of the handler code as part of the downloadable feature.

Configuration Markup:

```
<!ELEMENT extension (install-handler+)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – must be specified as **org.eclipse.update.core.installHandlers**
- **id** – must be specified. Identifies the new install handler
- **name** – optional displayable label for the new install handler

```
<!ELEMENT install-handler EMPTY>
```

```
<!ATTLIST install-handler
```

```
class CDATA #REQUIRED>
```

- **class** – fully qualified name of the handler implementation class for the identified install handler

Examples:

The following is an example of new global install handler registration:

```
<extension id=
```

```
"custom"
```

```
point=
```

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```
"org.eclipse.update.core.installHandlers"
```

```
name=
```

```
"Custom install handler"
```

```
>
```

```
<install-handler class=
```

```
"com.xyz.update.CustomInstallHandler"
```

```
>
```

```
</install-handler>
```

```
</extension>
```

API Information:

Registered install handler classes must implement `org.eclipse.update.core.IInstallHandler` interface. Implementers should extend base class `org.eclipse.update.core.BaseInstallHandler`.

Supplied Implementation:

The platform supplies a simple install handler that is registered as `org.eclipse.update.core.DefaultInstallHandler`. If used, it will copy any non-plug-in data entries provided with the feature into the feature installation directory.

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Site Type Factory

Identifier:

org.eclipse.update.core.siteTypes

Description:

The platform update mechanism supports pluggable site type implementations. A new site type can be registered in order to support alternate site layout schemes.

The `siteTypes` extension point allows alternate site implementations to be registered using a symbolic type identifier. Whenever the type is referenced using this identifier, the supplied factory is used to create the correct concrete site implementation.

Configuration Markup:

```
<!ELEMENT extension (site-factory+)>
```

```
<!ATTLIST extension
```

```
point CDATA #REQUIRED
```

```
id CDATA #IMPLIED
```

```
name CDATA #IMPLIED>
```

- **point** – must be specified as **org.eclipse.update.core.siteTypes**
- **id** – must be specified. Identifies the new site type
- **name** – optional displayable label for the new site type

```
<!ELEMENT site-factory EMPTY>
```

```
<!ATTLIST site-factory
```

```
class CDATA #REQUIRED>
```

- **class** – fully qualified name of the factory class for the identified site type

Examples:

The following is an example of new site type registration.

```
<extension id=
```

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```
"custom"  
  
point=  
  
"org.eclipse.update.core.siteTypes"  
  
name=  
  
"Custom site"  
  
>  
  
<site-factory class=  
  
"com.xyz.update.CustomSiteFactory"  
  
>  
  
</site-factory>  
  
</extension>
```

API Information:

Registered factory classes must implement **org.eclipse.update.core.ISiteFactory**

Supplied Implementation:

The platform supplies two standard implementations of site types. One representing the default update server type, and the other representing the local file system site.

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Runtime overview

The Eclipse runtime defines the plug-ins (**org.eclipse.osgi** and **org.eclipse.core.runtime**) on which all other plug-ins depend. The runtime is responsible for defining a structure for plug-ins and the implementation detail (bundles and classloaders) behind them. The runtime is also responsible for finding and executing the main Eclipse application and for maintaining a registry of plug-ins, their extensions, and extension points.

The runtime also provides an assortment of utilities, such as logging, debug trace options, adapters, a preference store, and a concurrency infrastructure. Of course, as a minimal kernel, the runtime is only interesting once plug-ins that make use of it and perform some kind of task are created. Like Atlas, the runtime plug-in stoically resides at the bottom of the plug-in heap, holding the Eclipse universe aloft on its steady shoulders.

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The runtime plug-in model

The platform runtime engine is started when a user starts an application developed with Eclipse. The runtime implements the basic **plug-in** model and infrastructure used by the platform. It keeps track of all of the installed plug-ins and the function that they provide.

A plug-in is a structured component that contributes code (or documentation or both) to the system and describes it in a structured way. Plug-ins can define **extension points**, well-defined function points that can be extended by other plug-ins. When a plug-in contributes an implementation for an extension point, we say that it adds an **extension** to the platform. These extensions and extension points are declared in the plug-in's manifest (**plugin.xml**) file.

Using a common extension model provides a structured way for plug-ins to describe the ways they can be extended, and for client plug-ins to describe the extensions they supply. Defining an extension point is much like defining any other API. The only difference is that the extension point is declared using XML instead of a code signature. Likewise, a client plug-in uses XML to describe its specific extension to the system.

A general goal of the runtime is that the end user should not pay a memory or performance penalty for plug-ins that are installed, but not used. The declarative nature of the platform extension model allows the runtime engine to determine what extension points and extensions are supplied by a plug-in without ever running it. Thus, many plug-ins can be installed, but none will be activated until a function provided by a plug-in has been requested according to the user's activity. This is an important feature in providing providing a scalable, robust platform.

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Plug-ins and bundles

The mechanics for supporting plug-ins are implemented using the OSGi framework. From this standpoint, a plug-in is the same thing as an OSGi **bundle**. The bundle and its associated classes specify and implement the process for Java class-loading, prerequisite management, and the bundle's life-cycle. For the rest of this discussion, we use the terms **plug-in** and **bundle** interchangeably, unless discussing a particular class in the framework.

Plugin

The **Plugin** class represents a plug-in that is running in the platform. It is a convenient place to centralize the life-cycle aspects and overall semantics of a plug-in. A plug-in can implement specialized function for the **start** and **stop** aspects of its life-cycle. Each life-cycle method includes a reference to a **BundleContext** which can supply additional information.

The **start** portion of the life-cycle is worth particular discussion. We've seen already that information about a plug-in can be obtained from the plug-in's manifest file without ever running any of the plug-in's code. Typically, some user action in the workbench causes a chain of events that requires the starting of a plug-in. From an implementation point of view, a plug-in is never started until a class contained the in the plug-in needs to be loaded.

The **start** method has been a convenient place to implement initialization and registration behavior for a plug-in. However, it is important to realize that your plug-in can be started in many different circumstances. Something as simple as obtaining an icon to decorate an object can cause one of your plug-in's classes to be loaded, thus starting your plug-in. Over-eager initialization can cause your plug-in's code and data to be loaded long before it is necessary. Therefore, it's important to look closely at your plug-in's initialization tasks and consider alternatives to performing initialization at start-up.

- **Registration** activities such as registering listeners or starting background threads are appropriate during plug-in start-up if they can be performed quickly. However, it is advisable to trigger these actions as part of accessing the plug-in's data if the registration activities have side-effects such as initializing large data structures or performing unrelated operations.
- **Initialization** of data is best done lazily, when the data is first accessed, rather than automatically in the start-up code. This ensures that large data structures are not built until they are truly necessary.

Bundle Context

Life-cycle management is where the OSGi "bundle" terminology and the platform's "plug-in" terminology meet. When your plug-in is started, it is given a reference to a **BundleContext** from which it can obtain information related to the plug-in. The **BundleContext** can also be used to find out about other bundles/plug-ins in the system.

BundleContext.getBundles() can be used to obtain an array of all bundles in the system. Listeners for **BundleEvent** can be registered so that your plug-in is aware when another bundle has a change in its life-cycle status. See the javadoc for **BundleContext** and **BundleEvent** for more information.

*Prior to 3.0, a plugin registry (**IPluginRegistry**) was provided to supply similar information. For example, it could be queried for the plug-in descriptors of all plug-ins in the system. This registry is now deprecated and **BundleContext** should be used for this purpose. The platform registry is now used exclusively for information about extensions and extension points.*

Bundle Activator

The **BundleActivator** interface defines the start and stop behavior implemented in **Plugin**. Although the **Plugin** class is a convenient place to implement this function, a plug-in developer has complete freedom to implement the interface for **BundleActivator** in any class appropriate for the plug-in's design. In fact, your plug-in need not implement this interface at all if it does not have specific life-cycle management needs.

Bundles

Underneath every plug-in lies an OSGi bundle managed by the framework. The **Bundle** is the OSGi unit of modularity. Fundamentally, a bundle is just a collection of files (resources and code) installed in the platform. Each bundle has its own Java class loader, and includes protocol for starting, stopping, and uninstalling itself. From the Eclipse platform point of view, **Bundle** is merely an implementation class. Plug-in developers do not extend the bundle class, but use **Plugin** or other **BundleActivator** implementations to represent the plug-in.

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org.osgi.framework Interface BundleContext

public interface **BundleContext**

A bundle's execution context within the Framework. The context is used to grant access to other methods so that this bundle can interact with the Framework.

BundleContext methods allow a bundle to:

- Subscribe to events published by the Framework.
- Register service objects with the Framework service registry.
- Retrieve `ServiceReferences` from the Framework service registry.
- Get and release service objects for a referenced service.
- Install new bundles in the Framework.
- Get the list of bundles installed in the Framework.
- Get the `Bundle` object for a bundle.
- Create `File` objects for files in a persistent storage area provided for the bundle by the Framework.

A `BundleContext` object will be created and provided to this bundle when it is started using the `BundleActivator.start(org.osgi.framework.BundleContext)` method. The same `BundleContext` object will be passed to this bundle when it is stopped using the `BundleActivator.stop(org.osgi.framework.BundleContext)` method. `BundleContext` is generally for the private use of this bundle and is not meant to be shared with other bundles in the OSGi environment. `BundleContext` is used when resolving `ServiceListener` and `EventListener` objects.

The `BundleContext` object is only valid during an execution instance of this bundle; that is, during the period from when this bundle is called by `BundleActivator.start` until after this bundle is called and returns from `BundleActivator.stop` (or if `BundleActivator.start` terminates with an exception). If the `BundleContext` object is used subsequently, an `IllegalStateException` must be

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thrown. When this bundle is restarted, a new `BundleContext` object must be created.

The Framework is the only entity that can create `BundleContext` objects and they are only valid within the Framework that created them.

Method Summary	
<code>void</code>	<u>addBundleListener</u> (<u>BundleListener</u> listener) Adds the specified <code>BundleListener</code> object to this context bundle's list of listeners if not already present.
<code>void</code>	<u>addFrameworkListener</u> (<u>FrameworkListener</u> listener) Adds the specified <code>FrameworkListener</code> object to this context bundle's list of listeners if not already present.
<code>void</code>	<u>addServiceListener</u> (<u>ServiceListener</u> listener) Adds the specified <code>ServiceListener</code> object to this context bundle's list of listeners.
<code>void</code>	<u>addServiceListener</u> (<u>ServiceListener</u> listener, <code>java.lang.String</code> filter) Adds the specified <code>ServiceListener</code> object with the specified filter to this context bundle's list of listeners.
<u>Filter</u>	<u>createFilter</u> (<code>java.lang.String</code> filter) Creates a <code>Filter</code> object.
<u>Bundle</u>	<u>getBundle</u> () Returns the <code>Bundle</code> object for this context bundle.
<u>Bundle</u>	<u>getBundle</u> (<code>long</code> id) Returns the bundle with the specified identifier.
<u>Bundle[]</u>	<u>getBundles</u> () Returns a list of all installed bundles.
<code>java.io.File</code>	<u>getDataFile</u> (<code>java.lang.String</code> filename) Creates a <code>File</code> object for a file in the persistent storage area provided for the bundle by the Framework.
<code>java.lang.String</code>	<u>getProperty</u> (<code>java.lang.String</code> key) Returns the value of the specified property.
<code>java.lang.Object</code>	<u>getService</u> (<u>ServiceReference</u> reference) Returns the specified service object for a service.
<u>ServiceReference</u>	<u>getServiceReference</u> (<code>java.lang.String</code> clazz) Returns a <code>ServiceReference</code> object for a service that implements, and was registered under, the specified class.
<u>ServiceReference[]</u>	<u>getServiceReferences</u> (<code>java.lang.String</code> clazz, <code>java.lang.String</code> filter) Returns a list of <code>ServiceReference</code> objects.
<u>Bundle</u>	<u>installBundle</u> (<code>java.lang.String</code> location) Installs the bundle from the specified location string.

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<u>Bundle</u>	<u>installBundle</u> (java.lang.String location, java.io.InputStream input) Installs the bundle from the specified InputStream object.
<u>ServiceRegistration</u>	<u>registerService</u> (java.lang.String[] clazzes, java.lang.Object service, java.util.Dictionary properties) Registers the specified service object with the specified properties under the specified class names into the Framework.
<u>ServiceRegistration</u>	<u>registerService</u> (java.lang.String clazz, java.lang.Object service, java.util.Dictionary properties) Registers the specified service object with the specified properties under the specified class name with the Framework.
void	<u>removeBundleListener</u> (<u>BundleListener</u> listener) Removes the specified BundleListener object from this context bundle's list of listeners.
void	<u>removeFrameworkListener</u> (<u>FrameworkListener</u> listener) Removes the specified FrameworkListener object from this context bundle's list of listeners.
void	<u>removeServiceListener</u> (<u>ServiceListener</u> listener) Removes the specified ServiceListener object from this context bundle's list of listeners.
boolean	<u>ungetService</u> (<u>ServiceReference</u> reference) Releases the service object referenced by the specified ServiceReference object.

Method Detail

getProperty

```
public java.lang.String getProperty(java.lang.String key)
```

Returns the value of the specified property. If the key is not found in the Framework properties, the system properties are then searched. The method returns null if the property is not found.

The Framework defines the following standard property keys:

- ◇ Constants.FRAMEWORK_VERSION – The OSGi Framework version.
- ◇ Constants.FRAMEWORK_VENDOR – The Framework implementation vendor.
- ◇ Constants.FRAMEWORK_LANGUAGE – The language being used. See ISO 639 for possible values.
- ◇ Constants.FRAMEWORK_OS_NAME – The host computer operating system.

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◇ `Constants.FRAMEWORK_OS_VERSION` – The host computer operating system version number.

◇ `Constants.FRAMEWORK_PROCESSOR` – The host computer processor name.

All bundles must have permission to read these properties.

Note: The last four standard properties are used by the `Constants.BUNDLE_NATIVECODE` Manifest header's matching algorithm for selecting native language code.

Parameters:

key – The name of the requested property.

Returns:

The value of the requested property, or null if the property is undefined.

Throws:

`java.lang.SecurityException` – If the caller does not have the appropriate `PropertyPermission` to read the property, and the Java Runtime Environment supports permissions.

getBundle

```
public Bundle getBundle()
```

Returns the `Bundle` object for this context bundle.

The context bundle is defined as the bundle that was assigned this `BundleContext` in its `BundleActivator`.

Returns:

The context bundle's `Bundle` object.

Throws:

`java.lang.IllegalStateException` – If this context bundle has stopped.

installBundle

```
public Bundle installBundle(java.lang.String location)  
    throws BundleException
```

Installs the bundle from the specified location string. A bundle is obtained from `location` as interpreted by the Framework in an implementation dependent manner.

Every installed bundle is uniquely identified by its location string, typically in the form of a URL.

The following steps are required to install a bundle:

1. If a bundle containing the same location string is already installed, the `Bundle` object for that bundle is returned.
2. The bundle's content is read from the location string. If this fails, a `BundleException` is thrown.
3. The bundle's `Bundle-NativeCode` dependencies are resolved. If this fails, a `BundleException` is thrown.

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4. The bundle's associated resources are allocated. The associated resources minimally consist of a unique identifier, and a persistent storage area if the platform has file system support. If this step fails, a `BundleException` is thrown.
5. If the bundle has declared an `Bundle-RequiredExecutionEnvironment` header, then the listed execution environments must be verified against the installed execution environments. If they are not all present, a `BundleException` must be thrown.
6. The bundle's state is set to `INSTALLED`.
7. A bundle event of type `BundleEvent.INSTALLED` is broadcast.
8. The `Bundle` object for the newly installed bundle is returned.

Postconditions, no exceptions thrown

- ◊ `getState()` in `{INSTALLED, RESOLVED}`.
- ◊ `Bundle` has a unique ID.

Postconditions, when an exception is thrown

- ◊ `Bundle` is not installed and no trace of the bundle exists.

Parameters:

`location` – The location identifier of the bundle to install.

Returns:

The `Bundle` object of the installed bundle.

Throws:

- `BundleException` – If the installation failed.
- `java.lang.SecurityException` – If the caller does not have the appropriate `AdminPermission`, and the Java Runtime Environment supports permissions.

installBundle

```
public Bundle installBundle(java.lang.String location,  
                           java.io.InputStream input)  
    throws BundleException
```

Installs the bundle from the specified `InputStream` object.

This method performs all of the steps listed in `BundleContext.installBundle(String location)`, except that the bundle's content will be read from the `InputStream` object. The location identifier string specified will be used as the identity of the bundle.

This method must always close the `InputStream` object, even if an exception is thrown.

Parameters:

- `location` – The location identifier of the bundle to install.
- `in` – The `InputStream` object from which this bundle will be read.

Returns:

The `Bundle` object of the installed bundle.

Throws:

- `BundleException` – If the provided stream cannot be read or the installation failed.
- `java.lang.SecurityException` – If the caller does not have the appropriate `AdminPermission`, and the Java Runtime Environment supports permissions.

See Also:

[installBundle\(java.lang.String\)](#)

getBundle

```
public Bundle getBundle(long id)
```

Returns the bundle with the specified identifier.

Parameters:

`id` – The identifier of the bundle to retrieve.

Returns:

A `Bundle` object, or `null` if the identifier does not match any installed bundle.

getBundles

```
public Bundle[] getBundles()
```

Returns a list of all installed bundles.

This method returns a list of all bundles installed in the OSGi environment at the time of the call to this method. However, as the Framework is a very dynamic environment, bundles can be installed or uninstalled at anytime.

Returns:

An array of `Bundle` objects; one object per installed bundle.

addServiceListener

```
public void addServiceListener(ServiceListener listener,  
                                java.lang.String filter)  
    throws InvalidSyntaxException
```

Adds the specified `ServiceListener` object with the specified `filter` to this context bundle's list of listeners.

See `getBundle()` for a definition of context bundle, and `Filter` for a description of the filter syntax. `ServiceListener` objects are notified when a service has a lifecycle state change.

If this context bundle's list of listeners already contains a listener `l` such that `(l==listener)`, this method replaces that listener's filter (which may be `null`) with the specified one (which may be `null`).

The listener is called if the filter criteria is met. To filter based upon the class of the service, the filter should reference the `Constants.OBJECTCLASS` property. If `filter` is `null`, all services are considered to match the filter.

When using a `filter`, it is possible that the `ServiceEvents` for the complete life cycle of a service will not be delivered to the listener. For example, if the `filter` only matches when the property `x` has the value `1`, the listener will not be called if the service is registered with the property `x` not set to the value `1`. Subsequently, when the service is modified setting property `x` to the value `1`, the filter will match and the listener will be called with a `ServiceEvent` of type `MODIFIED`. Thus, the listener will not be called with a `ServiceEvent` of type `REGISTERED`.

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If the Java Runtime Environment supports permissions, the `ServiceListener` object will be notified of a service event only if the bundle that is registering it has the `ServicePermission` to get the service using at least one of the named classes the service was registered under.

Parameters:

`listener` – The `ServiceListener` object to be added.
`filter` – The filter criteria.

Throws:

[`InvalidSyntaxException`](#) – If `filter` contains an invalid filter string which cannot be parsed.
`java.lang.IllegalStateException` – If this context bundle has stopped.

See Also:

[`ServiceEvent`](#), [`ServiceListener`](#), [`ServicePermission`](#)

addServiceListener

```
public void addServiceListener(ServiceListener listener)
```

Adds the specified `ServiceListener` object to this context bundle's list of listeners.

This method is the same as calling

```
BundleContext.addServiceListener(ServiceListener listener, String filter)
```

 with `filter` set to null.

Parameters:

`listener` – The `ServiceListener` object to be added.

Throws:

`java.lang.IllegalStateException` – If this context bundle has stopped.

See Also:

[`addServiceListener\(ServiceListener, String\)`](#)

removeServiceListener

```
public void removeServiceListener(ServiceListener listener)
```

Removes the specified `ServiceListener` object from this context bundle's list of listeners. See [`getBundle\(\)`](#) for a definition of context bundle.

If `listener` is not contained in this context bundle's list of listeners, this method does nothing.

Parameters:

`listener` – The `ServiceListener` to be removed.

Throws:

`java.lang.IllegalStateException` – If this context bundle has stopped.

addBundleListener

```
public void addBundleListener(BundleListener listener)
```

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Adds the specified `BundleListener` object to this context bundle's list of listeners if not already present. See [getBundle\(\)](#) for a definition of context bundle. `BundleListener` objects are notified when a bundle has a lifecycle state change.

If this context bundle's list of listeners already contains a listener `l` such that `(l==listener)`, this method does nothing.

Parameters:

`listener` – The `BundleListener` to be added.

Throws:

`java.lang.IllegalStateException` – If this context bundle has stopped.

See Also:

[BundleEvent](#), [BundleListener](#)

removeBundleListener

```
public void removeBundleListener(BundleListener listener)
```

Removes the specified `BundleListener` object from this context bundle's list of listeners. See [getBundle\(\)](#) for a definition of context bundle.

If `listener` is not contained in this context bundle's list of listeners, this method does nothing.

Parameters:

`listener` – The `BundleListener` object to be removed.

Throws:

`java.lang.IllegalStateException` – If this context bundle has stopped.

addFrameworkListener

```
public void addFrameworkListener(FrameworkListener listener)
```

Adds the specified `FrameworkListener` object to this context bundle's list of listeners if not already present. See [getBundle\(\)](#) for a definition of context bundle. `FrameworkListeners` are notified of general Framework events.

If this context bundle's list of listeners already contains a listener `l` such that `(l==listener)`, this method does nothing.

Parameters:

`listener` – The `FrameworkListener` object to be added.

Throws:

`java.lang.IllegalStateException` – If this context bundle has stopped.

See Also:

[FrameworkEvent](#), [FrameworkListener](#)

removeFrameworkListener

```
public void removeFrameworkListener(FrameworkListener listener)
```


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Removes the specified `FrameworkListener` object from this context bundle's list of listeners. See [getBundle\(\)](#) for a definition of context bundle.

If listener is not contained in this context bundle's list of listeners, this method does nothing.

Parameters:

listener – The `FrameworkListener` object to be removed.

Throws:

`java.lang.IllegalStateException` – If this context bundle has stopped.

registerService

```
public ServiceRegistration registerService(java.lang.String[] clazzes,  
                                           java.lang.Object service,  
                                           java.util.Dictionary properties)
```

Registers the specified service object with the specified properties under the specified class names into the Framework. A `ServiceRegistration` object is returned. The `ServiceRegistration` object is for the private use of the bundle registering the service and should not be shared with other bundles. The registering bundle is defined to be the context bundle. See [getBundle\(\)](#) for a definition of context bundle. Other bundles can locate the service by using either the [getServiceReferences\(java.lang.String, java.lang.String\)](#) or [getServiceReference\(java.lang.String\)](#) method.

A bundle can register a service object that implements the [ServiceFactory](#) interface to have more flexibility in providing service objects to other bundles.

The following steps are required to register a service:

1. If service is not a `ServiceFactory`, an `IllegalArgumentException` is thrown if service is not an instance of all the classes named.
2. The Framework adds these service properties to the specified `Dictionary` (which may be null): a property named `Constants.SERVICE_ID` identifying the registration number of the service, and a property named `Constants.OBJECTCLASS` containing all the specified classes. If any of these properties have already been specified by the registering bundle, their values will be overwritten by the Framework.
3. The service is added to the Framework service registry and may now be used by other bundles.
4. A service event of type `ServiceEvent.REGISTERED` is synchronously sent.
5. A `ServiceRegistration` object for this registration is returned.

Parameters:

clazzes – The class names under which the service can be located. The class names in this array will be stored in the service's properties under the key `Constants.OBJECTCLASS`.

service – The service object or a `ServiceFactory` object.

properties – The properties for this service. The keys in the properties object must all be `String` objects. See `Constants` for a list of standard service property keys. Changes should not be made to this object after calling this method. To update the service's properties the [ServiceRegistration.setProperties\(java.util.Dictionary\)](#) method must be called. properties may be null if the service has no properties.

Returns:

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A `ServiceRegistration` object for use by the bundle registering the service to update the service's properties or to unregister the service.

Throws:

`java.lang.IllegalArgumentException` – If one of the following is true:

- `service` is null.
- `service` is not a `ServiceFactory` object and is not an instance of all the named classes in `clazzes`.
- `properties` contains case variants of the same key name.

`java.lang.SecurityException` – If the caller does not have the `ServicePermission` to register the service for all the named classes and the Java Runtime Environment supports permissions.

`java.lang.IllegalStateException` – If this context bundle was stopped.

See Also:

[ServiceRegistration](#), [ServiceFactory](#)

registerService

```
public ServiceRegistration registerService(java.lang.String clazz,  
                                           java.lang.Object service,  
                                           java.util.Dictionary properties)
```

Registers the specified service object with the specified properties under the specified class name with the Framework.

This method is otherwise identical to [registerService\(java.lang.String\[\], java.lang.Object, java.util.Dictionary\)](#) and is provided as a convenience when `service` will only be registered under a single class name. Note that even in this case the value of the service's `Constants.OBJECTCLASS` property will be an array of strings, rather than just a single string.

See Also:

[registerService\(java.lang.String\[\], java.lang.Object, java.util.Dictionary\)](#)

getServiceReferences

```
public ServiceReference[] getServiceReferences(java.lang.String clazz,  
                                               java.lang.String filter)  
    throws InvalidSyntaxException
```

Returns a list of `ServiceReference` objects. This method returns a list of `ServiceReference` objects for services which implement and were registered under the specified class and match the specified filter criteria.

The list is valid at the time of the call to this method, however as the Framework is a very dynamic environment, services can be modified or unregistered at anytime.

`filter` is used to select the registered service whose properties objects contain keys and values which satisfy the filter. See [Filter](#) for a description of the filter string syntax.

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If `filter` is null, all registered services are considered to match the filter.

If `filter` cannot be parsed, an `InvalidSyntaxException` will be thrown with a human readable message where the filter became unparsable.

The following steps are required to select a service:

1. If the Java Runtime Environment supports permissions, the caller is checked for the `ServicePermission` to get the service with the specified class. If the caller does not have the correct permission, null is returned.
2. If the filter string is not null, the filter string is parsed and the set of registered services which satisfy the filter is produced. If the filter string is null, then all registered services are considered to satisfy the filter.
3. If `clazz` is not null, the set is further reduced to those services which are an instance of and were registered under the specified class. The complete list of classes of which a service is an instance and which were specified when the service was registered is available from the service's `Constants.OBJECTCLASS` property.
4. An array of `ServiceReference` to the selected services is returned.

Parameters:

`clazz` – The class name with which the service was registered, or null for all services.
`filter` – The filter criteria.

Returns:

An array of `ServiceReference` objects, or null if no services are registered which satisfy the search.

Throws:

`InvalidSyntaxException` – If `filter` contains an invalid filter string which cannot be parsed.

getServiceReference

```
public ServiceReference getServiceReference(java.lang.String clazz)
```

Returns a `ServiceReference` object for a service that implements, and was registered under, the specified class.

This `ServiceReference` object is valid at the time of the call to this method, however as the Framework is a very dynamic environment, services can be modified or unregistered at anytime.

This method is the same as calling `getServiceReferences(java.lang.String, java.lang.String)` with a null filter string. It is provided as a convenience for when the caller is interested in any service that implements the specified class.

If multiple such services exist, the service with the highest ranking (as specified in its `Constants.SERVICE_RANKING` property) is returned.

If there is a tie in ranking, the service with the lowest service ID (as specified in its `Constants.SERVICE_ID` property); that is, the service that was registered first is returned.

Parameters:

`clazz` – The class name with which the service was registered.

Returns:

A `ServiceReference` object, or `null` if no services are registered which implement the named class.

See Also:

[`getServiceReferences\(java.lang.String, java.lang.String\)`](#)

getService

```
public java.lang.Object getService(ServiceReference reference)
```

Returns the specified service object for a service.

A bundle's use of a service is tracked by the bundle's use count of that service. Each time a service's service object is returned by [`getService\(org.osgi.framework.ServiceReference\)`](#) the context bundle's use count for that service is incremented by one. Each time the service is released by [`ungetService\(org.osgi.framework.ServiceReference\)`](#) the context bundle's use count for that service is decremented by one.

When a bundle's use count for a service drops to zero, the bundle should no longer use that service. See [`getBundle\(\)`](#) for a definition of context bundle.

This method will always return `null` when the service associated with this `reference` has been unregistered.

The following steps are required to get the service object:

1. If the service has been unregistered, `null` is returned.
2. The context bundle's use count for this service is incremented by one.
3. If the context bundle's use count for the service is currently one and the service was registered with an object implementing the `ServiceFactory` interface, the [`ServiceFactory.getService\(org.osgi.framework.Bundle, org.osgi.framework.ServiceRegistration\)`](#) method is called to create a service object for the context bundle. This service object is cached by the Framework. While the context bundle's use count for the service is greater than zero, subsequent calls to get the service's service object for the context bundle will return the cached service object. If the service object returned by the `ServiceFactory` object is not an instance of all the classes named when the service was registered or the `ServiceFactory` object throws an exception, `null` is returned and a Framework event of type [`FrameworkEvent.ERROR`](#) is broadcast.
4. The service object for the service is returned.

Parameters:

`reference` – A reference to the service.

Returns:

A service object for the service associated with `reference`, or `null` if the service is not registered or does not implement the classes under which it was registered in the case of a Service Factory.

Throws:

`java.lang.SecurityException` – If the caller does not have the `ServicePermission` to get the service using at least one of the named classes the service

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was registered under, and the Java Runtime Environment supports permissions.
`java.lang.IllegalStateException` – If the context bundle has stopped.

See Also:

[`ungetService\(org.osgi.framework.ServiceReference\)`](#),
[`ServiceFactory`](#)

ungetService

```
public boolean ungetService(ServiceReference reference)
```

Releases the service object referenced by the specified `ServiceReference` object. If the context bundle's use count for the service is zero, this method returns `false`. Otherwise, the context bundle's use count for the service is decremented by one. See [`getBundle\(\)`](#) for a definition of context bundle.

The service's service object should no longer be used and all references to it should be destroyed when a bundle's use count for the service drops to zero.

The following steps are required to unget the service object:

1. If the context bundle's use count for the service is zero or the service has been unregistered, `false` is returned.
2. The context bundle's use count for this service is decremented by one.
3. If the context bundle's use count for the service is currently zero and the service was registered with a `ServiceFactory` object, the [`ServiceFactory.ungetService\(org.osgi.framework.Bundle, org.osgi.framework.ServiceRegistration, java.lang.Object\)`](#) method is called to release the service object for the context bundle.
4. `true` is returned.

Parameters:

`reference` – A reference to the service to be released.

Returns:

`false` if the context bundle's use count for the service is zero or if the service has been unregistered; `true` otherwise.

Throws:

`java.lang.IllegalStateException` – If the context bundle has stopped.

See Also:

[`getService\(org.osgi.framework.ServiceReference\)`](#), [`ServiceFactory`](#)

getDataFile

```
public java.io.File getDataFile(java.lang.String filename)
```

Creates a `File` object for a file in the persistent storage area provided for the bundle by the Framework. This method will return `null` if the platform does not have file system support.

A `File` object for the base directory of the persistent storage area provided for the context bundle by the Framework can be obtained by calling this method with an empty string (" ") as `filename`. See

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[getBundle\(\)](#) for a definition of context bundle.

If the Java Runtime Environment supports permissions, the Framework will ensure that the bundle has the `java.io.FilePermission` with actions `read`, `write`, `delete` for all files (recursively) in the persistent storage area provided for the context bundle.

Parameters:

`filename` – A relative name to the file to be accessed.

Returns:

A `File` object that represents the requested file or `null` if the platform does not have file system support.

Throws:

`java.lang.IllegalStateException` – If the context bundle has stopped.

createFilter

```
public Filter createFilter(java.lang.String filter)
    throws InvalidSyntaxException
```

Creates a `Filter` object. This `Filter` object may be used to match a `ServiceReference` object or a `Dictionary` object. See [Filter](#) for a description of the filter string syntax.

If the filter cannot be parsed, an `InvalidSyntaxException` will be thrown with a human readable message where the filter became unparseable.

Parameters:

`filter` – The filter string.

Returns:

A `Filter` object encapsulating the filter string.

Throws:

`InvalidSyntaxException` – If `filter` contains an invalid filter string that cannot be parsed.

`NullPointerException` – If `filter` is null.

Since:

1.1

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org.osgi.framework Class BundleEvent

`java.lang.Object`

|

`createFilter`

Welcome to Eclipse

```
+--java.util.EventObject
|
+--org.osgi.framework.BundleEvent
```

All Implemented Interfaces:

java.io.Serializable

public class **BundleEvent**
extends java.util.EventObject

A Framework event describing a bundle lifecycle change.

BundleEvent objects are delivered to BundleListener objects when a change occurs in a bundle's lifecycle. A type code is used to identify the event type for future extendability.

OSGi reserves the right to extend the set of types.

See Also:

[Serialized Form](#)

Field Summary	
static int	<u>INSTALLED</u> The bundle has been installed.
static int	<u>RESOLVED</u> The bundle has been resolved.
static int	<u>STARTED</u> The bundle has been started.
static int	<u>STOPPED</u> The bundle has been stopped.
static int	<u>UNINSTALLED</u> The bundle has been uninstalled.
static int	<u>UNRESOLVED</u> The bundle has been unresolved.
static int	<u>UPDATED</u> The bundle has been updated.

Fields inherited from class java.util.EventObject

source

Constructor Summary

createFilter

```
BundleEvent(int type, Bundle bundle)  
Creates a bundle event of the specified type.
```

Method Summary

<u>Bundle</u>	getBundle () Returns the bundle which had a lifecycle change.
int	getType () Returns the type of lifecycle event.

Methods inherited from class `java.util.EventObject`

`getSource`, `toString`

Methods inherited from class `java.lang.Object`

`clone`, `equals`, `finalize`, `getClass`, `hashCode`, `notify`, `notifyAll`, `wait`, `wait`, `wait`

Field Detail

INSTALLED

```
public static final int INSTALLED
```

The bundle has been installed.

The value of `INSTALLED` is `0x00000001`.

See Also:

`BundleContext.installBundle\(java.lang.String\)`

STARTED

```
public static final int STARTED
```

The bundle has been started.

The value of `STARTED` is `0x00000002`.

See Also:

`Bundle.start\(\)`

STOPPED

```
public static final int STOPPED
```

The bundle has been stopped.

The value of STOPPED is 0x00000004.

See Also:

[Bundle.stop\(\)](#)

UPDATED

```
public static final int UPDATED
```

The bundle has been updated.

The value of UPDATED is 0x00000008.

See Also:

[Bundle.update\(\)](#)

UNINSTALLED

```
public static final int UNINSTALLED
```

The bundle has been uninstalled.

The value of UNINSTALLED is 0x00000010.

See Also:

[Bundle.uninstall\(\)](#)

RESOLVED

```
public static final int RESOLVED
```

The bundle has been resolved.

The value of RESOLVED is 0x00000020.

See Also:

[Bundle.RESOLVED](#)

Since:

1.3 **EXPERIMENTAL**

UNRESOLVED

```
public static final int UNRESOLVED
```

The bundle has been unresolved.

The value of UNRESOLVED is 0x00000040.

See Also:

[Bundle.INSTALLED](#)

Since:

1.3 **EXPERIMENTAL**

Constructor Detail

BundleEvent

```
public BundleEvent(int type,  
                   Bundle bundle)
```

Creates a bundle event of the specified type.

Parameters:

type – The event type.

bundle – The bundle which had a lifecycle change.

Method Detail

getBundle

```
public Bundle getBundle()
```

Returns the bundle which had a lifecycle change. This bundle is the source of the event.

Returns:

A bundle that had a change occur in its lifecycle.

getType

```
public int getType()
```

Returns the type of lifecycle event. The type values are:

- ◇ [INSTALLED](#)
- ◇ [STARTED](#)
- ◇ [STOPPED](#)
- ◇ [UPDATED](#)
- ◇ [UNINSTALLED](#)
- ◇ [RESOLVED](#)
- ◇ [UNRESOLVED](#)

Returns:

The type of lifecycle event.

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org.osgi.framework Interface BundleActivator

All Known Implementing Classes:
[XMLParserActivator](#)

public interface **BundleActivator**

Customizes the starting and stopping of this bundle.

BundleActivator is an interface that may be implemented when this bundle is started or stopped. The Framework can create instances of this bundle's BundleActivator as required. If an instance's BundleActivator.start method executes successfully, it is guaranteed that the same instance's BundleActivator.stop method will be called when this bundle is to be stopped.

BundleActivator is specified through the Bundle-Activator Manifest header. A bundle can only specify a single BundleActivator in the Manifest file. The form of the Manifest header is:

```
Bundle-Activator: class-name
```

where class-name is a fully qualified Java classname.

The specified BundleActivator class must have a public constructor that takes no parameters so that a BundleActivator object can be created by Class.newInstance().

Method Summary

void	start (BundleContext context) Called when this bundle is started so the Framework can perform the bundle-specific activities necessary to start this bundle.
void	stop (BundleContext context) Called when this bundle is stopped so the Framework can perform the bundle-specific activities necessary to stop the bundle.

Method Detail

start

```
public void start(BundleContext context)
    throws java.lang.Exception
```

Called when this bundle is started so the Framework can perform the bundle-specific activities necessary to start this bundle. This method can be used to register services or to allocate any resources that this bundle needs.

This method must complete and return to its caller in a timely manner.

Parameters:

`context` – The execution context of the bundle being started.

Throws:

`java.lang.Exception` – If this method throws an exception, this bundle is marked as stopped and the Framework will remove this bundle's listeners, unregister all services registered by this bundle, and release all services used by this bundle.

See Also:

[Bundle.start\(\)](#)

stop

```
public void stop(BundleContext context)
    throws java.lang.Exception
```

Called when this bundle is stopped so the Framework can perform the bundle-specific activities necessary to stop the bundle. In general, this method should undo the work that the `BundleActivator.start` method started. There should be no active threads that were started by this bundle when this bundle returns. A stopped bundle should be stopped and should not call any Framework objects.

This method must complete and return to its caller in a timely manner.

Parameters:

`context` – The execution context of the bundle being stopped.

Throws:

`java.lang.Exception` – If this method throws an exception, the bundle is still marked as stopped, and the Framework will remove the bundle's listeners, unregister all services registered by the bundle, and release all services used by the bundle.

See Also:

[Bundle.stop\(\)](#)

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org.osgi.framework Interface Bundle

public interface **Bundle**

An installed bundle in the Framework.

A `Bundle` object is the access point to define the life cycle of an installed bundle. Each bundle installed in the OSGi environment will have an associated `Bundle` object.

A bundle will have a unique identity, a `long`, chosen by the Framework. This identity will not change during the life cycle of a bundle, even when the bundle is updated. Uninstalling and then reinstalling the bundle will create a new unique identity.

A bundle can be in one of six states:

- [UNINSTALLED](#)
- [INSTALLED](#)
- [RESOLVED](#)
- [STARTING](#)
- [STOPPING](#)
- [ACTIVE](#)

Values assigned to these states have no specified ordering; they represent bit values that may be ORed together to determine if a bundle is in one of the valid states.

A bundle should only execute code when its state is one of `STARTING`, `ACTIVE`, or `STOPPING`. An `UNINSTALLED` bundle can not be set to another state; it is a zombie and can only be reached because invalid references are kept somewhere.

The Framework is the only entity that is allowed to create `Bundle` objects, and these objects are only valid within the Framework that created them.

Field Summary	
static int	ACTIVE This bundle is now running.
static int	INSTALLED

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	This bundle is installed but not yet resolved.
static int	<u>RESOLVED</u> This bundle is resolved and is able to be started.
static int	<u>STARTING</u> This bundle is in the process of starting.
static int	<u>STOPPING</u> This bundle is in the process of stopping.
static int	<u>UNINSTALLED</u> This bundle is uninstalled and may not be used.

Method Summary	
long	<u>getBundleId()</u> Returns this bundle's identifier.
java.net.URL	<u>getEntry()</u> (java.lang.String name) Returns a URL to the specified entry in this bundle.
java.util.Enumeration	<u>getEntryPaths()</u> (java.lang.String path) Returns enumeration of all the paths to entries within the bundle whose longest sub-path matches the supplied path argument.
java.util.Dictionary	<u>getHeaders()</u> Returns this bundle's Manifest headers and values.
java.util.Dictionary	<u>getHeaders()</u> (java.lang.String localeString) Returns this bundle's Manifest headers and values localized to the specified locale.
java.lang.String	<u>getLocation()</u> Returns this bundle's location identifier.
<u>ServiceReference[]</u>	<u>getRegisteredServices()</u> Returns this bundle's ServiceReference list for all services it has registered or null if this bundle has no registered services.
java.net.URL	<u>getResource()</u> (java.lang.String name) Find the specified resource in this bundle.
<u>ServiceReference[]</u>	<u>getServicesInUse()</u> Returns this bundle's ServiceReference list for all services it is using or returns null if this bundle is not using any services.
int	<u>getState()</u> Returns this bundle's current state.
java.lang.String	<u>getSymbolicName()</u> Returns the symbolic name of this bundle as specified by its Bundle-SymbolicName manifest header.
boolean	<u>hasPermission()</u> (java.lang.Object permission) Determines if this bundle has the specified permissions.

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<code>java.lang.Class</code>	<u>loadClass</u> (<code>java.lang.String name</code>) Loads the specified class using this bundle's classloader.
<code>void</code>	<u>start</u> () Starts this bundle.
<code>void</code>	<u>stop</u> () Stops this bundle.
<code>void</code>	<u>uninstall</u> () Uninstalls this bundle.
<code>void</code>	<u>update</u> () Updates this bundle.
<code>void</code>	<u>update</u> (<code>java.io.InputStream in</code>) Updates this bundle from an <code>InputStream</code> .

Field Detail

UNINSTALLED

```
public static final int UNINSTALLED
```

This bundle is uninstalled and may not be used.

The UNINSTALLED state is only visible after a bundle is uninstalled; the bundle is in an unusable state and all references to the `Bundle` object should be released immediately.

The value of UNINSTALLED is 0x00000001.

INSTALLED

```
public static final int INSTALLED
```

This bundle is installed but not yet resolved.

A bundle is in the INSTALLED state when it has been installed in the Framework but cannot run.

This state is visible if the bundle's code dependencies are not resolved. The Framework may attempt to resolve an INSTALLED bundle's code dependencies and move the bundle to the RESOLVED state.

The value of INSTALLED is 0x00000002.

RESOLVED

```
public static final int RESOLVED
```

This bundle is resolved and is able to be started.

A bundle is in the **RESOLVED** state when the Framework has successfully resolved the bundle's dependencies. These dependencies include:

- ◇ The bundle's class path from its `Constants.BUNDLE_CLASSPATH` Manifest header.
- ◇ The bundle's package dependencies from its `Constants.EXPORT_PACKAGE` and `Constants.IMPORT_PACKAGE` Manifest headers.

Note that the bundle is not active yet. A bundle must be put in the **RESOLVED** state before it can be started. The Framework may attempt to resolve a bundle at any time.

The value of **RESOLVED** is 0x00000004.

STARTING

```
public static final int STARTING
```

This bundle is in the process of starting.

A bundle is in the **STARTING** state when the `start()` method is active. A bundle will be in this state when the bundle's `BundleActivator.start(org.osgi.framework.BundleContext)` is called. If this method completes without exception, then the bundle has successfully started and will move to the **ACTIVE** state.

The value of **STARTING** is 0x00000008.

STOPPING

```
public static final int STOPPING
```

This bundle is in the process of stopping.

A bundle is in the **STOPPING** state when the `stop()` method is active. A bundle will be in this state when the bundle's `BundleActivator.stop(org.osgi.framework.BundleContext)` method is called. When this method completes the bundle is stopped and will move to the **RESOLVED** state.

The value of **STOPPING** is 0x00000010.

ACTIVE

```
public static final int ACTIVE
```

This bundle is now running.

A bundle is in the ACTIVE state when it has been successfully started.

The value of ACTIVE is 0x00000020.

Method Detail

getState

```
public int getState()
```

Returns this bundle's current state.

A bundle can be in only one state at any time.

Returns:

An element of UNINSTALLED, INSTALLED, RESOLVED, STARTING, STOPPING, ACTIVE.

start

```
public void start()  
    throws BundleException
```

Starts this bundle. If the Framework implements the optional Start Level service and the current start level is less than this bundle's start level, then the Framework must persistently mark this bundle as started and delay the starting of this bundle until the Framework's current start level becomes equal or more than the bundle's start level.

Otherwise, the following steps are required to start a bundle:

1. If this bundle's state is UNINSTALLED then an `IllegalStateException` is thrown.
2. If this bundle's state is STARTING or STOPPING then this method will wait for this bundle to change state before continuing. If this does not occur in a reasonable time, a `BundleException` is thrown to indicate this bundle was unable to be started.
3. If this bundle's state is ACTIVE then this method returns immediately.
4. If this bundle's state is not RESOLVED, an attempt is made to resolve this bundle's package dependencies. If the Framework cannot resolve this bundle, a `BundleException` is thrown.
5. This bundle's state is set to STARTING.
6. The `BundleActivator.start(org.osgi.framework.BundleContext)` method of this bundle's `BundleActivator`, if one is specified, is called. If the `BundleActivator`

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is invalid or throws an exception, this bundle's state is set back to `RESOLVED`.

Any services registered by the bundle will be unregistered.

Any services used by the bundle will be released.

Any listeners registered by the bundle will be removed.

A `BundleException` is then thrown.

7. If this bundle's state is `UNINSTALLED`, because the bundle was uninstalled while the `BundleActivator.start` method was running, a `BundleException` is thrown.
8. Persistently record that this bundle has been started. When the Framework is restarted, this bundle will be automatically started.
9. This bundle's state is set to `ACTIVE`.
10. A bundle event of type `BundleEvent.STARTED` is broadcast.

Preconditions

◊ `getState()` in `{INSTALLED, RESOLVED}`.

Postconditions, no exceptions thrown

◊ `getState()` in `{ACTIVE}`.

◊ `BundleActivator.start()` has been called and did not throw an exception.

Postconditions, when an exception is thrown

◊ `getState()` not in `{STARTING, ACTIVE}`.

Throws:

`BundleException` – If this bundle couldn't be started. This could be because a code dependency could not be resolved or the specified `BundleActivator` could not be loaded or threw an exception.

`java.lang.IllegalStateException` – If this bundle has been uninstalled or this bundle tries to change its own state.

`java.lang.SecurityException` – If the caller does not have the appropriate `AdminPermission`, and the Java Runtime Environment supports permissions.

stop

```
public void stop()  
    throws BundleException
```

Stops this bundle.

The following steps are required to stop a bundle:

1. If this bundle's state is `UNINSTALLED` then an `IllegalStateException` is thrown.
2. If this bundle's state is `STARTING` or `STOPPING` then this method will wait for this bundle to change state before continuing. If this does not occur in a reasonable time, a `BundleException` is thrown to indicate this bundle was unable to be stopped.
3. Persistently record that this bundle has been stopped. When the Framework is restarted, this bundle will not be automatically started.
4. If this bundle's state is not `ACTIVE` then this method returns immediately.
5. This bundle's state is set to `STOPPING`.
6. The `BundleActivator.stop(org.osgi.framework.BundleContext)` method of this bundle's `BundleActivator`, if one is specified, is called. If this method throws an exception, it will continue to stop this bundle. A `BundleException` will be thrown after completion of the remaining steps.
7. Any services registered by this bundle must be unregistered.
8. Any services used by this bundle must be released.

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9. Any listeners registered by this bundle must be removed.
10. If this bundle's state is UNINSTALLED, because the bundle was uninstalled while the `BundleActivator.stop` method was running, a `BundleException` must be thrown.
11. This bundle's state is set to RESOLVED.
12. A bundle event of type `BundleEvent.STOPPED` is broadcast.

Preconditions

◊ `getState()` in {ACTIVE}.

Postconditions, no exceptions thrown

◊ `getState()` not in {ACTIVE, STOPPING}.

◊ `BundleActivator.stop` has been called and did not throw an exception.

Postconditions, when an exception is thrown

◊ None.

Throws:

`BundleException` – If this bundle's `BundleActivator` could not be loaded or threw an exception.

`java.lang.IllegalStateException` – If this bundle has been uninstalled or this bundle tries to change its own state.

`java.lang.SecurityException` – If the caller does not have the appropriate `AdminPermission`, and the Java Runtime Environment supports permissions.

update

```
public void update()  
    throws BundleException
```

Updates this bundle.

If this bundle's state is ACTIVE, it will be stopped before the update and started after the update successfully completes.

If the bundle being updated has exported any packages, these packages will not be updated. Instead, the previous package version will remain exported until the `PackageAdmin.refreshPackages` method has been called or the Framework is relaunched.

The following steps are required to update a bundle:

1. If this bundle's state is UNINSTALLED then an `IllegalStateException` is thrown.
2. If this bundle's state is ACTIVE, STARTING or STOPPING, the bundle is stopped as described in the `Bundle.stop` method. If `Bundle.stop` throws an exception, the exception is rethrown terminating the update.
3. The download location of the new version of this bundle is determined from either the bundle's `Constants.BUNDLE_UPDATELOCATION` Manifest header (if available) or the bundle's original location.
4. The location is interpreted in an implementation dependent manner, typically as a URL, and the new version of this bundle is obtained from this location.
5. The new version of this bundle is installed. If the Framework is unable to install the new version of this bundle, the original version of this bundle will be restored and a `BundleException` will be thrown after completion of the remaining steps.
6. If the bundle has declared an `Bundle-RequiredExecutionEnvironment` header, then the listed execution environments must be verified against the installed execution environments. If they

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do not all match, the original version of this bundle will be restored and a `BundleException` will be thrown after completion of the remaining steps.

7. This bundle's state is set to `INSTALLED`.
8. If this bundle has not declared an `Import-Package` header in its Manifest file (specifically, this bundle does not depend on any packages from other bundles), this bundle's state may be set to `RESOLVED`.
9. If the new version of this bundle was successfully installed, a bundle event of type `BundleEvent.UPDATED` is broadcast.
10. If this bundle's state was originally `ACTIVE`, the updated bundle is started as described in the `Bundle.start` method. If `Bundle.start` throws an exception, a Framework event of type `FrameworkEvent.ERROR` is broadcast containing the exception.

Preconditions

◇ `getState()` not in `{UNINSTALLED}`.

Postconditions, no exceptions thrown

◇ `getState()` in `{INSTALLED, RESOLVED, ACTIVE}`.

◇ This bundle has been updated.

Postconditions, when an exception is thrown

◇ `getState()` in `{INSTALLED, RESOLVED, ACTIVE}`.

◇ Original bundle is still used; no update occurred.

Throws:

`BundleException` – If the update fails.

`java.lang.IllegalStateException` – If this bundle has been uninstalled or this bundle tries to change its own state.

`java.lang.SecurityException` – If the caller does not have the appropriate `AdminPermission`, and the Java Runtime Environment supports permissions.

See Also:

`stop()`, `start()`

update

```
public void update(java.io.InputStream in)
    throws BundleException
```

Updates this bundle from an `InputStream`.

This method performs all the steps listed in `Bundle.update()`, except the bundle will be read from the supplied `InputStream`, rather than a URL.

This method will always close the `InputStream` when it is done, even if an exception is thrown.

Parameters:

`in` – The `InputStream` from which to read the new bundle.

Throws:

`BundleException` – If the provided stream cannot be read or the update fails.

`java.lang.IllegalStateException` – If this bundle has been uninstalled or this bundle tries to change its own state.

`java.lang.SecurityException` – If the caller does not have the appropriate `AdminPermission`, and the Java Runtime Environment supports permissions.

See Also:

`update()`

uninstall

```
public void uninstall()  
    throws BundleException
```

Uninstalls this bundle.

This method causes the Framework to notify other bundles that this bundle is being uninstalled, and then puts this bundle into the UNINSTALLED state. The Framework will remove any resources related to this bundle that it is able to remove.

If this bundle has exported any packages, the Framework will continue to make these packages available to their importing bundles until the `PackageAdmin.refreshPackages` method has been called or the Framework is relaunched.

The following steps are required to uninstall a bundle:

1. If this bundle's state is UNINSTALLED then an `IllegalStateException` is thrown.
2. If this bundle's state is ACTIVE, STARTING or STOPPING, this bundle is stopped as described in the `Bundle.stop` method. If `Bundle.stop` throws an exception, a Framework event of type `FrameworkEvent.ERROR` is broadcast containing the exception.
3. This bundle's state is set to UNINSTALLED.
4. A bundle event of type `BundleEvent.UNINSTALLED` is broadcast.
5. This bundle and any persistent storage area provided for this bundle by the Framework are removed.

Preconditions

◇ `getState()` not in {UNINSTALLED}.

Postconditions, no exceptions thrown

◇ `getState()` in {UNINSTALLED}.

◇ This bundle has been uninstalled.

Postconditions, when an exception is thrown

◇ `getState()` not in {UNINSTALLED}.

◇ This Bundle has not been uninstalled.

Throws:

BundleException – If the uninstall failed. This can occur if another thread is attempting to change the bundle's state and does not complete in a timely manner.

`java.lang.IllegalStateException` – If this bundle has been uninstalled or this bundle tries to change its own state.

`java.lang.SecurityException` – If the caller does not have the appropriate `AdminPermission`, and the Java Runtime Environment supports permissions.

See Also:

`stop()`

getHeaders

```
public java.util.Dictionary getHeaders()
```

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Returns this bundle's Manifest headers and values. This method returns all the Manifest headers and values from the main section of the bundle's Manifest file; that is, all lines prior to the first blank line.

Manifest header names are case-insensitive. The methods of the returned `Dictionary` object will operate on header names in a case-insensitive manner. If a Manifest header value starts with "%", it will be localized with the localization properties file for the default locale.

For example, the following Manifest headers and values are included if they are present in the Manifest file:

```
Bundle-Name  
Bundle-Vendor  
Bundle-Version  
Bundle-Description  
Bundle-DocURL  
Bundle-ContactAddress
```

This method will continue to return Manifest header information while this bundle is in the UNINSTALLED state.

Returns:

A `Dictionary` object containing this bundle's Manifest headers and values.

Throws:

`java.lang.SecurityException` – If the caller does not have the `AdminPermission`, and the Java Runtime Environment supports permissions.

See Also:

[Constants.BUNDLE_LOCALIZATION](#)

getBundleId

```
public long getBundleId()
```

Returns this bundle's identifier. The bundle is assigned a unique identifier by the Framework when it is installed in the OSGi environment.

A bundle's unique identifier has the following attributes:

- ◇ Is unique and persistent.
- ◇ Is a `long`.
- ◇ Its value is not reused for another bundle, even after the bundle is uninstalled.
- ◇ Does not change while the bundle remains installed.
- ◇ Does not change when the bundle is updated.

This method will continue to return this bundle's unique identifier while this bundle is in the UNINSTALLED state.

Returns:

The unique identifier of this bundle.

getLocation

```
public java.lang.String getLocation()
```

Returns this bundle's location identifier.

The bundle location identifier is the location passed to `BundleContext.installBundle(java.lang.String)` when a bundle is installed.

This method will continue to return this bundle's location identifier while this bundle is in the UNINSTALLED state.

Returns:

The string representation of this bundle's location identifier.

Throws:

`java.lang.SecurityException` – If the caller does not have the appropriate `AdminPermission`, and the Java Runtime Environment supports permissions.

getRegisteredServices

```
public ServiceReference[] getRegisteredServices()
```

Returns this bundle's `ServiceReference` list for all services it has registered or null if this bundle has no registered services.

If the Java runtime supports permissions, a `ServiceReference` object to a service is included in the returned list only if the caller has the `ServicePermission` to get the service using at least one of the named classes the service was registered under.

The list is valid at the time of the call to this method, however, as the Framework is a very dynamic environment, services can be modified or unregistered at anytime.

Returns:

An array of `ServiceReference` objects or null.

Throws:

`java.lang.IllegalStateException` – If this bundle has been uninstalled.

See Also:

[ServiceRegistration](#), [ServiceReference](#), [ServicePermission](#)

getServicesInUse

```
public ServiceReference[] getServicesInUse()
```

Returns this bundle's `ServiceReference` list for all services it is using or returns null if this bundle is not using any services. A bundle is considered to be using a service if its use count for that service is greater than zero.

If the Java Runtime Environment supports permissions, a `ServiceReference` object to a service is included in the returned list only if the caller has the `ServicePermission` to get the service using at least one of the named classes the service was registered under.

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The list is valid at the time of the call to this method, however, as the Framework is a very dynamic environment, services can be modified or unregistered at anytime.

Returns:

An array of `ServiceReference` objects or null.

Throws:

`java.lang.IllegalStateException` – If this bundle has been uninstalled.

See Also:

[ServiceReference](#), [ServicePermission](#)

hasPermission

```
public boolean hasPermission(java.lang.Object permission)
```

Determines if this bundle has the specified permissions.

If the Java Runtime Environment does not support permissions, this method always returns `true`.

`permission` is of type `Object` to avoid referencing the `java.security.Permission` class directly. This is to allow the Framework to be implemented in Java environments which do not support permissions.

If the Java Runtime Environment does support permissions, this bundle and all its resources including nested JAR files, belong to the same `java.security.ProtectionDomain`; that is, they will share the same set of permissions.

Parameters:

`permission` – The permission to verify.

Returns:

`true` if this bundle has the specified permission or the permissions possessed by this bundle imply the specified permission; `false` if this bundle does not have the specified permission or `permission` is not an instance of `java.security.Permission`.

Throws:

`java.lang.IllegalStateException` – If this bundle has been uninstalled.

getResource

```
public java.net.URL getResource(java.lang.String name)
```

Find the specified resource in this bundle. This bundle's class loader is called to search for the named resource. If this bundle's state is `INSTALLED`, then only this bundle will be searched for the specified resource. Imported packages cannot be searched when a bundle has not been resolved.

Parameters:

`name` – The name of the resource. See `java.lang.ClassLoader.getResource` for a description of the format of a resource name.

Returns:

a URL to the named resource, or null if the resource could not be found or if the caller does not have the `AdminPermission`, and the Java Runtime Environment supports permissions.

Throws:

`java.lang.IllegalStateException` – If this bundle has been uninstalled.

Since:

1.1

getHeaders

```
public java.util.Dictionary getHeaders(java.lang.String localeString)
```

Returns this bundle's Manifest headers and values localized to the specified locale.

This method performs the same function as `Bundle.getHeaders()` except the manifest header values are localized to the specified locale. If a Manifest header value starts with "%", it will be localized with the localization properties file for the specified locale. If `null` is specified as the locale string, the header values will be localized using the default locale. If the empty string ("") is specified as the locale string, the header values will not be localized but any leading "%"s will be stripped off of the header values.

This method will continue to return Manifest header information while this bundle is in the UNINSTALLED state, however the header values will only be localized to the default locale.

Returns:

A `Dictionary` object containing this bundle's Manifest headers and values.

Throws:

`java.lang.SecurityException` – If the caller does not have the `AdminPermission`, and the Java Runtime Environment supports permissions.

Since:

1.3 **EXPERIMENTAL**

See Also:

[`getHeaders\(\)`](#), [`Constants.BUNDLE_LOCALIZATION`](#)

getSymbolicName

```
public java.lang.String getSymbolicName()
```

Returns the symbolic name of this bundle as specified by its `Bundle-SymbolicName` manifest header. The name must be unique, it is recommended to use a reverse domain name naming convention like that used for java packages. If the bundle does not have a specified symbolic name then `null` is returned.

This method will continue to return this bundle's symbolic name while this bundle is in the UNINSTALLED state.

Returns:

The symbolic name of this bundle.

Since:

1.3 **EXPERIMENTAL**

loadClass

```
public java.lang.Class loadClass(java.lang.String name)
                               throws java.lang.ClassNotFoundException
```

Loads the specified class using this bundle's classloader.

If this bundle's state is `INSTALLED`, this method will attempt to resolve the bundle before attempting to load the class.

If the bundle cannot be resolved, a Framework event of type `FrameworkEvent.ERROR` is broadcast containing a `BundleException` with details of the reason the bundle could not be resolved. This method must then throw a `ClassNotFoundException`.

If this bundle's state is `UNINSTALLED`, then an `IllegalStateException` is thrown.

Parameters:

name – The name of the class to load.

Returns:

The Class object for the requested class.

Throws:

`java.lang.ClassNotFoundException` – If no such class can be found or if the caller does not have the `AdminPermission`, and the Java Runtime Environment supports permissions.

`java.lang.IllegalStateException` – If this bundle has been uninstalled.

Since:

1.3 **EXPERIMENTAL**

getEntryPaths

```
public java.util.Enumeration getEntryPaths(java.lang.String path)
```

Returns enumeration of all the paths to entries within the bundle whose longest sub-path matches the supplied path argument. The bundle's classloader is not used to search for entries. Only the contents of the bundle is searched. A specified path of "/" indicates the root of the bundle.

Returned paths indicating subdirectory paths end with a "/". The returned paths are all relative to the root of the bundle and have a leading "/".

This method returns an empty enumeration if no entries could be found that match the specified path or if the caller does not have `AdminPermission` and the Java Runtime Environment supports permissions.

Parameters:

path – the path name to get the entry path names for.

Returns:

An Enumeration of the entry paths that are contained in the specified path.

Throws:

`java.lang.IllegalStateException` – If this bundle has been uninstalled.

Since:

1.3 **EXPERIMENTAL**

getEntry

```
public java.net.URL getEntry(java.lang.String name)
```

Returns a URL to the specified entry in this bundle. The bundle's classloader is not used to search for the specified entry. Only the contents of the bundle is searched for the specified entry. A specified path of "/" indicates the root of the bundle.

This method returns a URL to the specified entry, or null if the entry could not be found or if the caller does not have the `AdminPermission` and the Java Runtime Environment supports permissions.

Parameters:

name – The name of the entry. See `java.lang.ClassLoader.getResource` for a description of the format of a resource name.

Returns:

A URL to the specified entry, or null if the entry could not be found or if the caller does not have the `AdminPermission` and the Java Runtime Environment supports permissions.

Throws:

`java.lang.IllegalStateException` – If this bundle has been uninstalled.

Since:

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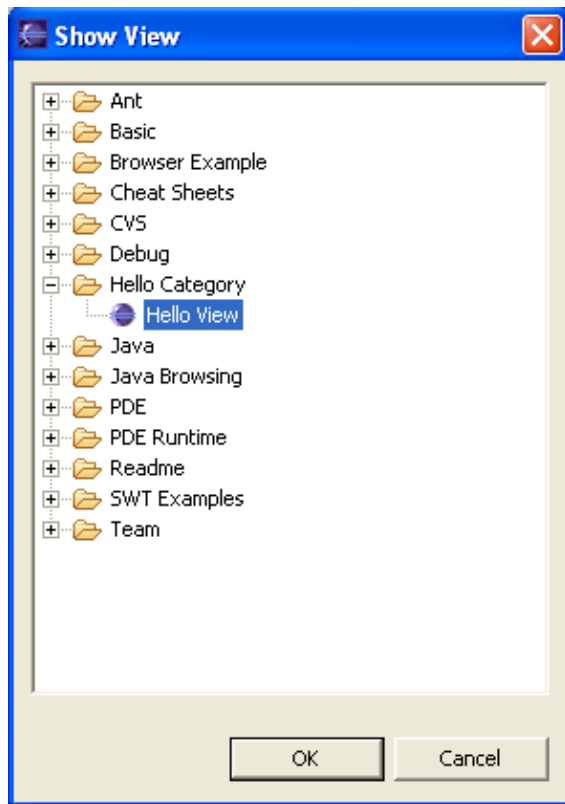
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Extension points and the registry

While the "bundle" aspects of a plug-in may be interesting to the runtime plug-in and runtime tools, it is much more common that a plug-in is concerned with what extension points have been defined by plug-ins and what extensions are contributed by plug-ins. This information is provided by the platform extension registry, [IExtensionRegistry](#).

Why might a plug-in want to know what extensions are present? A concrete example will help show the need for this information and the protocol for getting it.

Recall the workbench **Show View** dialog which shows all of the available views that have been installed in the platform.



We know that the category names and view names of all contributed views are specified in the **plugin.xml** file for any plug-in that contributes an extension for **org.eclipse.ui.views**. But how does the workbench find out this information? From the platform extension registry. The following code is a simplified snippet based on the workbench implementation of the **Show View** dialog:

```

...
IExtensionRegistry registry = Platform.getExtensionRegistry();
IExtensionPoint point = registry.getExtensionPoint("org.eclipse.ui.views");
if (point == null) return;
IExtension[] extensions = point.getExtensions();
for (int i = 0; i < extensions.length; i++)
    readExtension(extensions[i]); //get the information about each extension
...

```

We see above that the registry can be obtained from the **Platform** class. The protocol in **IExtensionRegistry** is used to find the extension point named **org.eclipse.ui.views**. Information in the registry about particular extension points or extensions can be found using protocol defined in **IExtensionRegistry**, **IExtensionPoint**, and **IExtension**. The javadoc for these classes provides detailed information about the registry protocol.

Once the extension definition of interest has been found, protocol in **IConfigurationElement** can be used to examine the individual attributes of an extension.

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Runtime preferences

The **org.eclipse.core.runtime.preferences** package provides infrastructure for storing a plug-in's preferences. Preferences typically map to settings controlled by the user on the workbench **Preferences** page,

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although this is not required by the underlying infrastructure. Plug-in preferences are key/value pairs, where the key describes the name of the preference, and the value is one of several different types (boolean, double, float, int, long, or string). Preferences can be stored and retrieved by the platform from the file system. The exact location of the saved preferences depends upon the **scope** of the preference.

Preference scopes

The **scope** of a preference is closely related to where the preference is stored. Plug-in developers can decide which of the standard scopes apply for their preferences, or can define new scopes that make sense for their plug-in. Let's look first at the scopes defined by the platform runtime:

- **Instance** scoped preferences are stored per workspace, or per running instance of the platform.
- **Configuration** scoped preferences are stored per installation of the platform. They are shared between workspaces. For example, if a user has a single installation of the platform, but runs several different workspaces, preferences scoped at the configuration level will be shared between the workspaces.
- **Default** scoped preferences represent the default values for preferences. These are not changed or stored by the platform. However, the values originate from files stored with the plug-in's product or primary feature. (See [What is a product?](#) for an explanation of products and primary features, and their related files.)

You can think of the overall preference store as a hierarchy of nodes, where each main branch of the hierarchy represents a particular scope. The children of any particular node depend upon how that scope is defined. For the instance and configuration scopes, the child nodes are the preferences for a particular plug-in as specified by a preference **qualifier**, usually the plug-in's **id**.

If all of this sounds confusing, don't worry. If you don't care about scopes and nodes, you need not worry about any particular scope or about which node of the tree actually contains your preference value. The preferences API will automatically traverse the nodes in the proper order (instance, configuration, default) when you query a preference value and use the supplied qualifier and preference name to find the node that actually contains the value.

Preferences are accessed using **IPreferencesService** protocol. The platform's default preference service can be accessed using the **Platform** class.

```
...
IPreferencesService sePlatform.getPreferencesService();
...
```

Once the preference service is obtained, preference values can be queried by name using any of **get...** methods provided in **IPreferencesService**. For example, the following snippet queries the value of the "MyPreference" preference in the plug-in "com.example.myplugin".

```
...
IPreferencesService service = Platform.getPreferencesService();
boolean value = service.getBoolean("com.example.myplugin", "MyPreference", null);
//do something with the value.
...
```

The last parameter in the query method is an array of scope contexts to use when searching for the preference node. If the array is **null**, then the platform assumes that the default scope search order should be used and guesses the appropriate preference node. If an array of scopes contexts is passed, then this determines the

scope lookup order that should be used to find the preference node. The default scope lookup order is always consulted if no node can be found using the specified scopes.

Using scopes and nodes

If a plug-in needs finer control over the scope search order, classes that represent the scopes can be used to access the actual node that represents the preference at a particular scope. In this way, an array of nodes can be created that specifies the particular search order required. The following snippet queries the preferences service for the same preference used above, but searches the configuration scope for the plug-in, followed by the instance scope for the plug-in. When nodes are specified for the search order, the default scoping is not considered. That is, the platform will only search the exact nodes that have been provided.

```
...
IPreferencesService service = Platform.getPreferencesService();
Preferences configurationNode = new ConfigurationScope().getNode("com.example.myplugin");
Preferences instanceNode = new InstanceScope().getNode("com.example.myplugin");
Preferences[] nodes = new Preferences[] {configurationNode, instanceNode};
stringValue = service.get("MyPreference", "true", nodes);
//do something with the value.
...
```

A plug-in may also implement its own traversal through the preference tree nodes. The root node of the preference tree can be obtained from the preferences service. The scope classes can be used to further traverse the tree. The following snippet traverses to a specific node and retrieves the preference value from the node itself.

```
...
IPreferencesService service = Platform.getPreferencesService();
Preferences root = service.getRootNode();
Preferences myInstanceNode = root.node(InstanceScope.SCOPE).node("com.example.myplugin");
if (myInstanceNode != null) {
    value = node.getBoolean("MyPreference", "true");
    //do something with the value.
}
...
```

Extending the scopes

Plug-ins may define their own specialized scopes using the [org.eclipse.core.runtime.preferences](#) extension. In this extension, the plug-in defines the name of the new scope, as well a class that can create preference nodes for the new scope. Optionally, it can specify the name of a class that initializes the default preference values at that scope. When a plug-in defines a new scope, it is up to that plug-in to implement the traversal order for any new scope relative to the platform traversal order. We'll look at this capability in more detail using the specific example of [Project-scoped preferences](#).

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Products and features

An Eclipse based **product** is a stand-alone program built with the Eclipse platform. A product may optionally be packaged and delivered as one or more **features**, which are simply groupings of plug-ins that are managed as a single entity by the Eclipse update mechanisms.

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Products include all the code and plug-ins needed to run them. This includes a Java runtime environment (JRE) and the Eclipse platform code. The plug-in code, JRE, and Eclipse platform are typically installed with a product-specific installation program. Product providers are free to use any installation tool or program that is appropriate for their needs.

Once installed, the user launches the product and is presented with an Eclipse workbench configured specifically for the purpose supported by the product, such as web development, C++ program development, or any other purpose. The platform makes it easy to configure labels, about dialogs, graphics, and splash screens, so that the user has no concept of a platform workbench, but instead views the workbench as the main window of the product itself.

The top level directory structure of such a product looks something like this for a hypothetical product called "AcmeWeb" that has been installed on a Windows platform:

```
acmeweb/
acmeweb.exe          (product executable)
eclipse/            (directory for installed Eclipse files)
.eclipseproduct     (marker file)
eclipse.exe
    startup.jar
    configuration/
        config.ini
    jre/
    fastweb features if any)
com.example.acme.acmefeature_1.0.0/
    feature.xml
    ...
    plugins/
        com.example.acme.acmefeature_1.0.0/
            plugin.xml
            about.ini
            about.html
            about.mappings
            about.properties
            acme.gif
            splash.jpg
        com.example.acme.acmewebsupport_1.0.0/
        ...
    links/
    ...
```

There are actually two ways of defining a product in Eclipse. The preferred mechanism is to use the products extension point (new to Eclipse 3.0). This extension point allows you to define your product and customize branding such as splash screens, window icons, and the like. The older mechanism (used in Eclipse 2.1) uses features, and in particular assumes the existence of a primary feature. Under the covers, Eclipse 3.0 uses the products extension point mechanism, but provides compatibility functions that integrate the legacy definitions into the new model if necessary.

We'll look at both mechanisms and how they are used to customize a product. Even when the products extension point mechanism is used, features can still be used as a way to group functionality that is delivered by the update manager. In the next few topics, we'll assume that feature groupings are present in our plug-in, in addition to product definitions.

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Products extension point

The preferred mechanism for defining a product based on the Eclipse platform is to contribute to the **org.eclipse.core.runtime.products** extension point. To do this, a plug-in simply declares the name and id of its product, as well as the id of the application extension that should be run when the product is invoked. This is the technique used by the Eclipse platform itself in defining the Eclipse product. Here is the extension definition found in **org.eclipse.platform**:

```
<extension id="ide" point="org.eclipse.core.runtime.products">
  product<name="%productName" application="org.eclipse.ui.ide.workbench" description="%productBlurb"
    <property name="windowImages" value="eclipse.gif,eclipse32.gif"/>
    <property name="aboutImage" value="eclipse_lg.gif"/>
    <property name="aboutText" value="%productBlurb"/>
    <property name="appName" value="Eclipse"/>
    <property name="preferenceCustomization" value="plugin_customization.ini"/>
  </product>
</extension>
```

A product extension is defined whose **application** id is "org.eclipse.ui.ide.workbench". This is the application id defined by the plug-in **org.eclipse.ui.ide** in its contribution to the **org.eclipse.core.runtime.applications** extension point.

```
<extension
id="workbench"
  point="org.eclipse.core.runtime.applications">
  <application>
    <run
      class="org.eclipse.ui.internal.ide.IDEApplication">
    </run>
  </application>
</extension>
```

This extension is defined with the same id that is referenced in the **application** property of the product extension. (The fully qualified name, with plug-in prefix, is used when referring to the application id from the other plug-in.) Using this mechanism, a separate plug-in can define all of the product-specific branding, and then refer to an existing plug-in's application as the application that is actually run when the product is started.

In addition to the application, the **org.eclipse.core.runtime.products** extension describes product customization properties that are used to configure the product's branding information. This information is described as named properties. Let's look again at that portion of the markup for the platform plug-in.

```
<property name="windowImages" value="eclipse.gif,eclipse32.gif"/>
<property name="aboutImage" value="eclipse_lg.gif"/>
<property name="aboutText" value="%productBlurb"/>
<property name="appName" value="Eclipse"/>
<property name="preferenceCustomization" value="plugin_customization.ini"/>
```

The possible property names that are honored by the platform for product customization are defined in **IProductConstants**. See the javadoc for a complete description of these properties and their values. We'll look at these further in [Customizing a product](#).

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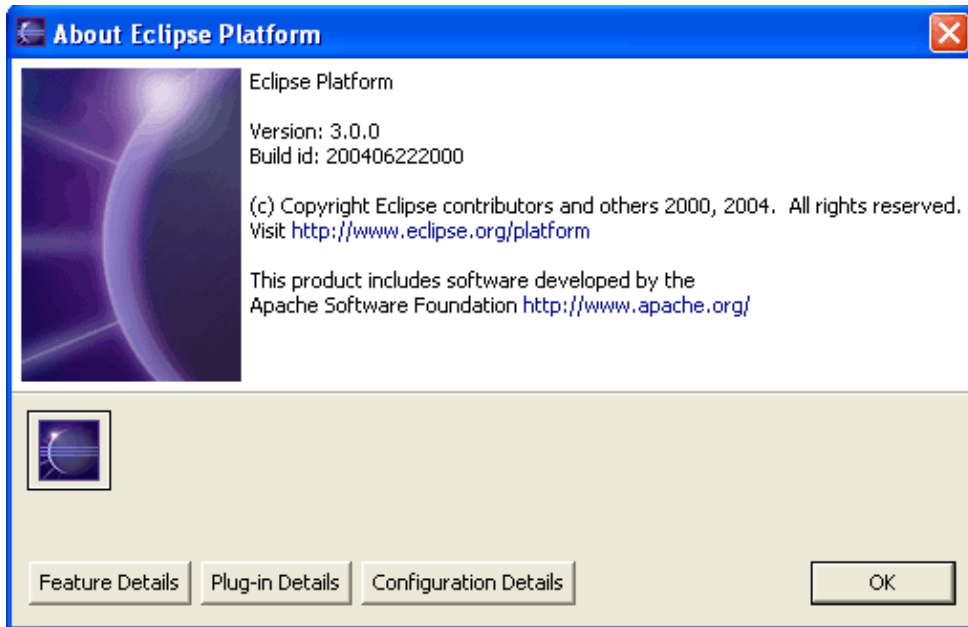
Customizing a product

There are many customizable aspects of a product, such as its splash screen, about dialog text, window icons, etc. Most of these customizations are defined in the contribution to the [org.eclipse.core.runtime.products](http://www.eclipse.org/core/runtime/products) extension point.

Let's look at how some of the more common customizable elements are defined.

About dialogs

The platform "about" dialog is shown whenever the user selects **Help > About** in the workbench menu.



The upper part of the about dialog shows product level information while the lower part details the features (if any) and plug-ins installed. The feature details (branding if you will) are supplied using **about.ini**, **about.properties** and **about.html** files in the plug-in associated with the feature. This information is displayed when the user requests feature details and selects a particular feature.

The product branding (top half of the dialog) is specify by extension properties that describe the text and images that are shown in this dialog. For example, the following extract from the Eclipse Platform product declaration.

```
<property
    name="aboutText "
    value="%aboutText" />
<property
    name="aboutImage"
    value="icons/eclipse_lg.gif" />
</product>
```

- **aboutText** specifies the text to show in the about dialog
- **aboutImage** specifies an image that should be used in the about dialog. Large images will be shown by themselves, and smaller images will be shown along with the about text.

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See [IProductConstants](#) for more information about these properties.

Window images

A 16x16 pixel color image can be used to brand windows created by the product. It will appear in the upper left hand corner of product windows. It is specified in the **windowImage** attribute in the products extension definition. Alternatively, the **windowImages** attribute can be used to describe an array of images of different sizes that should be used in the upper left hand corner.

```
<property
  name="windowImages"
  value="icons/eclipse.gif,icons/eclipse32.gif" />
```

The **windowImages** property supercedes the **windowImage** property if both are specified.

Welcome page

Products using the Eclipse 2.1 welcome page mechanism can specify the name and location of their welcome page file in the **welcomePage** property.

```
<property
  name="welcomePage"
  value="$nl$/welcome.xml" />
```

Use of this property is discouraged in Eclipse 3.0 in favor of the [org.eclipse.ui.intro](#) extension point. See [Intro support](#) for more detail about the new welcome/intro mechanisms.

Preferences defaults

The **preferenceCustomization** property can be used to specify a file containing default preference values for the product.

```
<property
  name="preferenceCustomization"
  value="plugin_customization.ini" />
```

This file is a **java.io.Properties** format file. Typically this file is used to set the values for preferences that are published as part of a plug-in's public API. That is, you are taking a risk if you refer to preferences that are used by plug-ins but not defined formally in the API.

Splash screens

The product splash screen is specified in the `config.ini` which is located underneath the product's configuration directory. The **osgi.splashPath** property in this file describes places to search for a file called **splash.bmp**. The **osgi.splashLocation** property identifies a complete and exact path to the splash screen file to use. Specifying a splash path allows for locale specific splash screens to be used as the given search path can indicate several plug-ins or fragments to search as well as `nl` style paths. See the platform SDK's `config.ini` file for a complete description of properties that can be configured in this file. The image should be supplied in 24-bit color BMP format (RGB format) and should be approximately 500x330 pixels in size.

Intro support

Intro support is a set of extension points and workbench parts that allow plug-ins to define specialized pages that introduce a platform product to new users. The intro information is typically shown the first time a product is started. Intro support is typically configured at the product level, although individual plug-ins can contribute intro information to known product intro configurations.

From a workbench point of view, the root of the intro support is in the **intro part**. This part is specified in an extension definition. When the workbench initializes, it creates an intro site that reserves space for the intro page. The intro part implementation for the site is determined using product configuration information. Once an intro part is shown, it can move between two modes:

- in **full mode**, the intro part takes over the main workbench area.
- in **standby mode**, the intro part moves to the side, allowing the current perspective to remain visible.

Once an intro part is established, it must be configured with intro information. This is done using an **intro config** which is also contributed using an extension. Individual plug-ins can add to the basic product intro config using their own extensions.

We'll look at the platform SDK intro page as an example in order to better understand these concepts.

Defining an intro part

The **IIntroPart** interface and the **org.eclipse.ui.intro** extension point make up the generic mechanism that can be used to create your own intro support for a given product. The main purpose of this extension is to define the class that implements **IIntroPart** and to specify the binding between a product id and an intro part. For example, the following contribution defines a hypothetical intro part to be shown by the workbench on startup:

```
<extension
    point="org.eclipse.ui.intro">
    <intro
        class="com.example.SampleIntroPart"
        id="someId">
        icon="someIcon.gif"
    </intro>
    <introProductBinding
        introId="someId"
        productId="com.example.someProductId">
    </introProductBinding>
</extension>
```

This contribution first defines the intro part and assigns it the id "someId". It then binds this intro part to a product whose id is "com.example.someProductId". On platform startup, the class specified in the **class** attribute will be instantiated by the workbench and presented to the user as the introduction to the product. This is the lowest level integration into the **IIntroPart** interface.

The platform supplies its own **IIntroPart** implementation called **CustomizableIntroPart** that allows for the content and presentation of the intro to be customized. Below is the snippet that defines the intro part for the workbench. We won't go over the mechanics of implementing an intro part since we want to focus on defining the intro content. (See the extension point documentation and javadoc referenced above for more detail if you

need it.)

```
<extension
  point="org.eclipse.ui.intro">
  <intro
    class="org.eclipse.ui.intro.config.CustomizableIntroPart "
    id="org.eclipse.platform.intro">
  </intro>
  <introProductBinding
    introId="org.eclipse.platform.intro"
    productId="org.eclipse.platform">
  </introProductBinding>
</extension>
```

The above contribution defines the **CustomizableIntroPart** as the intro part to be used for the Eclipse SDK platform. The rest of this discussion shows you how to use and extend this part.

Using the CustomizableIntroPart

The platform's **CustomizableIntroPart** allows for the content and presentation of the intro to be customized using the **org.eclipse.ui.intro.config** extension point. (This intro config can be extended using the **org.eclipse.ui.intro.configExtension** extension point.) This structure allows product plug-in developers to focus on developing their intro content rather than implementing an intro part scheme from scratch. If a different intro class is specified, then these two extension points are not utilized and the specified class must implement its own scheme for intro content format and configuration.

Defining an intro config

org.eclipse.ui.intro.config describes the id of the intro config that is to show our content, and the name of the XML file that contains the specific definition for the intro content. It is expected that only one intro config should be defined for a given **CustomizableIntroPart**. (Only the first intro config found can be shown in a **CustomizableIntroPart**.)

```
<extension
  id="intro"
  point="org.eclipse.ui.intro.config">
<config
  introId="org.eclipse.platform.intro"
  id="org.eclipse.platform.introConfig"
  content="$nl$/introContent.xml">
  <presentation
    home-page-id="root" standby-page-id="standby">
    <implementation
      ws="win32"
      style="css/shared.css"
      kind="html"
      os="win32">
    </implementation>
    <implementation
      kind="swt">
    </implementation>
  </presentation>
</config>
</extension>
```

The path for the file is relative to the plug-in's directory. (Note the use of the \$nl\$ variable in the directory name, which means the file will be located in a directory specific to the national language of the target

environment.)

The config extension allows you to specify both the content and the presentation of the content. While the **content** element focuses on defining pages, the **presentation** element describes presentation-related attributes that describe how pages will be shown. The page id for the intro home page (in **full mode**) must be specified, and the standby page id (in **standby mode**) is optional. The home page is the page that is shown when the product is first started. A presentation can specify one or more **implementations** for showing the pages. Implementations are specified per platform and windowing system, allowing you to take advantage of platform-specific features for showing page content. For example, the windows platform has a robust HTML browser widget, so an HTML-based implementation is used for intro content. Other platforms without this capability use an SWT-based implementation that maps page descriptions to an SWT-based form. An implementation that does not specify either a windowing system or operating system will be considered the generic implementation; to ensure an intro is shown on all platforms, it is important to define such an implementation. The workbench will first look for an implementation that matches the current operating system and windowing system. If one cannot be found, it will choose the generic implementation. Most of these details are handled at the product configuration level, so we won't discuss them any further here.

Defining intro content

Now we can look at the content itself. Content is described in terms of pages. All pages have an **id** attribute. This is the id that is used when defining the home and standby pages, and other places where there is a reference to a page. Otherwise, the relevant attributes depend on the kind of page that is defined. There are two basic types of pages:

- **Static pages** are plain HTML files. These pages use the normal HTML mechanisms to link to other pages. Static pages need not be defined in the config content file, except for the home page. Since the home page is specified by id (**home-page-id**) in the **presentation** element, there must be a page definition using that id in the content file. This page need only define a **url**. All other subelements will be ignored since the HTML page itself will describe the page content. All other HTML intro pages contributed by the plug-in must be included with the plug-in, but do not need to be specified in the content file. HTML files located in other plug-ins or on the web may be referenced also.
- **Dynamic pages** are described in the XML content file using subelements that describe the content of the page. The subelements are UI items often found in HTML-like pages. Depending on the implementation, these pages will either be dynamically translated to HTML (when the implementation **kind** is html) or else dynamically created as SWT-based UI forms (when the implementation **kind** is swt). The following subelements can be defined in a page:
 - ◆ A **group** is used to group other subelements and define a consistent style across the group.
 - ◆ A **link** defines a link that can be displayed using an image and text. The link can navigate to another page and optionally run an intro action. Actions are specified as commands in the URL.
 - ◆ The **text** and **img** elements show text and image content.
 - ◆ The **include** element includes a previously defined subelement. The element is referred to by its id.
 - ◆ The **head** element defines additional HTML to be included in the head section of the page when the html implementation is used.
 - ◆ The **html** element defines additional HTML to be included in the body of the page when the html implementation is used.

A **title** for a page may also be defined. A page may also specify that its content is defined in a separate **content** file. Breaking up pages into separate files may be useful when performance is a concern, since an intro page's contents won't be initialized until needed.

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The best way to get a feel for the content definition format is to browse the implementations in the SDK. The following snippet shows just the first part of the content for the SDK root page, which is the first intro page shown.

```
<introContent>
  <page alt-style="css/root_swt.properties" style="css/root.css" id="root" style-id="page">
    <title style-id="intro-header">Welcome to Eclipse Platform 3.0</title>
    <group id="links-background">
      <group id="page-links">
        <link label="Overview" url="http://org.eclipse.ui.intro/showPage?id=overview" id="overview">
          <text>Find out what Eclipse is all about</text>
        </link>
        <link label="Tutorials" url="http://org.eclipse.ui.intro/showPage?id=tutorials" id="tutorials">
          <text>Let us guide you through Eclipse end-to-end tutorials</text>
        </link>
        <link label="Samples" url="http://org.eclipse.ui.intro/showPage?id=samples" id="samples">
          <text>Explore Eclipse development through code samples</text>
        </link>
        <link label="Whats New" url="http://org.eclipse.ui.intro/showPage?id=news" id="news" style-id="news">
          <text>Find out what is new in this release</text>
        </link>
      </group>
    </group>
  </page>
</introContent>
```

Elements on a page can also be **filtered** from a particular implementation. This allows page designers to design with particular platforms in mind. There are many more powerful attributes that can be used when describing a page and its contents. See the extension point documentation for [org.eclipse.ui.intro.config](#) and its associated [intro content file format specification](#) for a complete reference of valid elements, subelements, and their attributes.

Extending an intro config

An intro configuration can be extended in three ways:

- content of an existing intro config can be extended.
- a custom standby content part, such as Cheat Sheet, can be contributed to provide content for the standby area of the Intro part.
- custom IntroURL actions can be defined.

Extending the content of an intro config

Plug-ins can contribute intro content to a page defined elsewhere. However, the defining page must define an **anchor** attribute that acts as a location placeholder for new content. The SDK overview page defines two anchors for adding JDT and PDE related elements on the overview page.

```
<group id="page-content">
  <text style-id="page-title" id="page-title">OVERVIEW</text>
  <text style-id="page-description" id="page-description">Eclipse is a kind of universal tool</text>
  <group id="overview-links">
    <link label="Workbench basics" url="http://org.eclipse.ui.intro/showHelpTopic?id=org.eclipse.ui.intro.workbench" id="workbench">
      <text>Learn about basic Eclipse workbench concepts</text>
    </link>
    <link label="Team support" url="http://org.eclipse.ui.intro/showHelpTopic?id=org.eclipse.ui.intro.team" id="team">
      <text>Find out how to collaborate with other developers</text>
    </link>
  </group>
</group>
<anchor id="jdtAnchor"/>
  <anchor id="pdeAnchor"/>
```

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```
</group>
</group>
```

These anchors can be referenced by plug-ins that add content to the page. Content is added using the **`org.eclipse.ui.intro.configExtension`** extension. In addition to extending page content, this extension point also allows one to contribute standby content parts and custom actions.

To extend an existing intro config, you can use the **`configExtension`** element. In this element, you specify the **`configId`** of the intro config being extended and the **`content`** file that describes the new content.

```
<extension
  point="org.eclipse.ui.intro.configExtension">
  <configExtension
    configId="org.eclipse.platform.introConfig"
    content="$nl$/overviewExtensionContent.xml"/>
  ...
</extension>
```

The format of the content file is similar to that of the intro config content, except that it must contain an **`extensionContent`** element that defines the path to the anchor where the extension content should be inserted.

```
<introContent>
  <extensionContent alt-style="css/swt.properties" style="css/overviewpaths#overview/page-con
    <link label="Java development" url="http://org.eclipse.ui.intro/showHelpTopic?id=
      <text>Get familiar with developing Java programs using Eclipse</text>
    </link>
  </extensionContent>
</introContent>
```

After contributing custom content to an intro's predefined anchor points, a given product can bind itself to that intro using the **`org.eclipse.ui.intro`** discussed above. When the product is run, the intro that was extended will be shown with the additional content. This allows the product to have its own branding and other product-specific information, while reusing a closely related product's intro along with key content of its own.

A given intro could also selectively include pieces of a related product's intro. In this case, the product could define its own intro and intro config, and then reference important elements defined in another intro's config using an **`include`** in the content file. This mechanism is valuable in situations where related products are built on top of one another and it is necessary to introduce users to key concepts in the higher level products.

Contributing a standby content part

Plug-ins can also implement a part for displaying alternative content when the intro page is in standby mode. For example, the platform defines a standby part that will show a cheat sheet for related intro content. The part is launched using a page link with a specialized URL. Standby parts are launched using a URL containing a special command for showing a standby part, such as `http://org.eclipse.ui.intro/showStandby?partId=somePartId`. The part is defined in the **`standbyContentPart`** subelement in the **`org.eclipse.ui.intro.configExtension`** extension. An **`id`**, **`pluginId`**, and **`class`** must be specified for the part. The class must implement **`IStandbyContentPart`**. The following snippet shows how the platform defines a standby part for showing cheat sheets.

```
<extension point="org.eclipse.ui.intro.configExtension">
  <standbyContentPart
    id="org.eclipse.platform.cheatsheet"
    class="org.eclipse.platform.internal.CheatSheetStandbyContent"
    pluginId="org.eclipse.platform"/>
```

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`</extension>`

This cheat sheet could be launched from an intro page using a **link** subelement whose URL is `http://org.eclipse.ui.intro/showStandby?partId=org.eclipse.platform.cheatsheet&`. This IntroURL would launch the `org.eclipse.platform.cheatsheet` standby content part and set its input to `"org.eclipse.pde.helloworld"`. The detailed mechanics for implementing a standby part are beyond the scope of this discussion. See **IStandbyContentPart** and its related classes for more information.

Defining a custom IntroURL action

Using the **org.eclipse.ui.intro.configExtension** extension point, plug-ins can contribute their own custom actions that can be used as a **url** value for a link element in a page. For example, consider the following link:

`http://org.eclipse.ui.intro/runAction?pluginId=org.eclipse.pde.ui&class=org.ecl`

This IntroURL will run an action class called **ShowSampleAction**, which is in a package `"org.eclipse.pde.ui.internal.samples"` in the plug-in `"org.eclipse.pde.ui"`. The id of the sample to run is `"org.eclipse.sdk.samples.swt.examples"`.

To define a custom version of this intro URL, you can use the following markup:

```
<extension point="org.eclipse.ui.intro.configExtension">
  <action
    name="myCommand"
    replaces="runAction?pluginID=org.eclipse.pde.ui&class=org.eclipse.pde.ui.internal.samples.ShowSam
  </action>
</extension>
```

With the above extension you can now use the following URL to run the same action:

`http://org.eclipse.ui.intro/myCommand?id=org.eclipse.sdk.samples.swt.examples`

The action `"myCommand"` will be replaced by the value of the **replaces** attribute and any remaining URL parameters will be appended to the end. Once the substitution is made, the resulting URL will be expanded back into:

`http://org.eclipse.ui.intro/runAction?pluginId=org.eclipse.pde.ui&class=org.ecl`

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Features

A **feature** is a way of grouping and describing different functionality that makes up a product. Grouping plug-ins into features allows the product to be installed and updated using the Eclipse update server and related support. The platform itself is partitioned into three major features:

- Platform
- JDT (Java Development Tooling)
- PDE (Plug-in Developer Environment)

There are other minor features, such as examples and OS-dependent portions of the platform.

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*Note: The platform installation and update framework allows you to build your own custom implementations of the concepts discussed here. That is, you can define your own types of **features**, (their packaging formats, install procedures, etc.), as well as your own types of server sites for updating your features. The remainder of this discussion is focused on the platform default implementations for features and update sites.*

Features do not contain any code. They merely describe a set of plug-ins that provide the function for the feature and information about how to update it. Features are packaged in a feature archive file and described using a feature manifest file, feature.xml. The following is the first part of the manifest for the platform feature:

```
<?xml version="1.0" encoding="UTF-8"?>
<feature
  id="org.eclipse.platform"
  label="%featureName"
  version="3.0.0"
  provider-name="%providerName"
  plugin=""
  image="eclipse_update_120.jpg"
  primary="true"
  application="org.eclipse.ui.ide.workbench">

  <description>
    %description
  </description>

  <license url="%licenseURL">
    %license
  </license>

  <url>
    <update label="%updateSiteName" url="http://update.eclipse.org/updates/3.0"/>
    <discovery label="%updateSiteName" url="http://update.eclipse.org/updates/3.0"/>
  </url>

  <plugin
    id="org.apache.ant"
    download-size="0"
    install-size="0"
    version="1.6.1"/>

  <plugin
    id="org.apache.lucene"
    download-size="0"
    install-size="0"
    version="1.3.0"/>
    ...
</feature>
```

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Feature Archives

The feature packaging information is placed into a separate Java .jar. Standard Java jar facilities are used for constructing feature archives. Feature archives reference separately packaged plug-in archives (see next section) and non-plug-in files.

Features are identified using a structured identifier based on the provider internet domain name. For example, organization eclipse.org produces feature org.eclipse.jdt. The character set used for feature identifiers is as specified for plug-in identifiers (see [Plug-in Manifest](#)).

The recommended convention for naming the feature archives is
`<id>_<version>.jar`

Where `<id>` is the feature identifier and `<version>` is the full version identifier contained in the respective feature.xml. Note that this is a recommended convention that minimizes chance of collisions, but is not required by the Eclipse architecture. For example, the following are valid feature archive names

```
org.eclipse.jdt_2.0.0.jar
org.eclipse.pde_2.0.0.jar
my_feature.jar
```

Internally, each feature archive is packaged relative to its feature directory (but not including the directory path element). The archive has the following structure

```
feature.xml
feature<_locale>.properties (see "Translated Feature Information")
other feature files and subdirectories (TBD)
META-INF/
    Java jar manifest and security files
```

Note that feature archives do not contain their constituent plug-ins and fragments.

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Eclipse platform plug-in manifest

Version 3.0 – Last revised June 24, 2004

The manifest markup definitions below make use of various naming tokens and identifiers. To eliminate ambiguity, here are some production rules for these [are referenced in text below]. In general, all identifiers are case-sensitive.

```
SimpleToken := sequence of characters from ('a-z','A-Z','0-9','_')
ComposedToken := SimpleToken | (SimpleToken '.' ComposedToken)
JavaClassName := ComposedToken
PlugInId := ComposedToken
PlugInPrereq := PlugInId | 'export' PlugInId
ExtensionId := SimpleToken
ExtensionPointId := SimpleToken
ExtensionPointReference := ExtensionPointID | (PlugInId '.' ExtensionPointId)
```

The remainder of this section describes the plugin.xml file structure as a series of DTD fragments. File [plugin.dtd](#) presents the DTD definition in its entirety.

```
<?xml encoding="US-ASCII"?>
<!ELEMENT plugin (requires?, runtime?, extension-point*, extension*)>
<!ATTLIST plugin
  name          CDATA #REQUIRED
  id            CDATA #REQUIRED
  version       CDATA #REQUIRED
  provider-name CDATA #IMPLIED
  class         CDATA #IMPLIED
>
```

The <plugin> element defines the body of the manifest. It optionally contains definitions for the plug-in runtime, definitions of other plug-ins required by this one, declarations of any new extension points being introduced by the plug-in, as well as configuration of functional extensions (configured into extension points defined by other plug-ins, or introduced by this plug-in). <plugin> attributes are as follows:

- **name** – user displayable (translatable) name for the plug-in
- **id** – unique identifier for the plug-in.
 - To minimize potential for naming collisions, the identifier should be derived from the internet domain id of the supplying provider (reversing the domain name tokens and appending additional name tokens separated by dot [.]). For example, provider ibm.com could define plug-in identifier com.ibm.db2
 - [production rule: PlugInId]
- **version** – plug-in version number. See org.eclipse.core.runtime.PluginVersionIdentifier for details. Plug-in version format is **major.minor.service.qualifier**. Change in the major component is interpreted as an incompatible version change. Change in the minor component is interpreted as a compatible version change. Change in the service component is interpreted as *cumulative* service applied to the minor version. Change in the qualifier component is interpreted as different source code control version of the same component.
- **provider-name** – user-displayable name of the provider supplying the plug-in.
- **class** – name of the plug-in class for this plug-in. The class must be a subclass of org.eclipse.core.runtime.Plugin.

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The XML DTD construction rule *element** means zero or more occurrences of the element; *element?* means zero or one occurrence of the element; and *element+* (used below) means one or more occurrences of the element. Based on the <plugin> definition above, this means, for example, that a plug-in containing only a run-time definition and no extension point declarations or extension configurations is valid (for example, common libraries that other plug-ins depend on). Similarly, a plug-in containing only extension configurations and no runtime or extension points of its own is also valid (for example, configuring classes delivered in other plug-ins into extension points declared in other plug-ins).

The <requires> section of the manifest declares any dependencies on other plug-ins.

```
<!ELEMENT requires (import+)>
<!ELEMENT import EMPTY>
<!ATTLIST import
  plugin          CDATA #REQUIRED
  version         CDATA #IMPLIED
  match           (perfect | equivalent | compatible | greaterOrEqual) "compatible"
  export          (true | false) "false"
  optional        (true | false) "false"
>
```

Each dependency is specified using an <import> element. It contains the following attributes:

- **plugin** – identifier of the required plug-in
- **version** – optional version specification
- **match** – version matching rule. Ignored if version attribute is not specified. Determines whether the dependency is satisfied only with a plug-in that has this exact specified version, with a plug-in that has a service or qualifier more recent than this one, with any compatible version (including a more recent minor version of the plug-in) or with any more recent version of this plug-in
- **export** – specifies whether the dependent plug-in classes are made visible (are (re)exported) to users of this plug-in. By default, dependent classes are not exported (are not made visible)
- **optional** – specifies whether or not this dependency will be strictly enforced. If set to <true> and this dependency cannot be satisfied, the dependency will be ignored

The <runtime> section of the manifest contains a definition of one or more libraries that make up the plug-in runtime. The referenced libraries are used by the platform execution mechanisms (the plug-in class loader) to load and execute the correct code required by the plug-in.

```
<!ELEMENT runtime (library+)>
<!ELEMENT library (export*, packages?)>
<!ATTLIST library
  name          CDATA #REQUIRED
  type          (code | resource) "code"
>
<!ELEMENT export EMPTY>
<!ATTLIST export
  name          CDATA #REQUIRED
>
<!ELEMENT packages EMPTY>
<!ATTLIST packages
  prefixes      CDATA #REQUIRED
>
```

The <runtime> element has no attributes.

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The `<library>` elements collectively define the plug-in runtime. At least one `<library>` must be specified. Each `<library>` element has the following attributes:

- **name** – string reference to a library file or directory containing classes (relative to the plug-in install directory). Directory references must contain trailing file separator.
- **type** – specifies whether this library contains executable code (`<code>`) or just resources. If the library is of type `<code>` accessing anything in this library will cause activation of the plug-in. Accessing a `<resource>` will not cause plug-in activation (a potential for significant performance improvement). It should be noted that specifying a library of type `<code>` allows it to contain both code and resources. But specifying a library of type `<resource>` assumes it will only be used for resources.

Each `<library>` element can specify which portion of the library should be exported. The export rules are specified as a set of export masks. By default (no export rules specified), the library is considered to be private. Each export mask is specified using the **name** attribute, which can have the following values:

- `*` – indicates all contents of library are exported (public)
- `package.name.*` – indicates all classes in the specified package are exported. The matching rules are the same as in the Java import statement.
- `package.name.ClassName` – fully qualified java class name

Eclipse 2.1 plug-ins only: Each library can also specify the package prefixes. These are used to enhance the classloading performance for the plug-in and/or fragment. If the `<packages>` element is not specified, then by default the classloading enhancements are not used. The `<packages>` element has the following attribute:

- **prefixes** – a comma-separated list of package prefixes for the runtime library

The platform's architecture is based on the notion of configurable extension points. The platform itself predefines a set of extension points that cover the task of extending the platform and desktop (for example, adding menu actions, contributing embedded editor). In addition to the predefined extension points, each supplied plug-in can declare additional extension points. By declaring an extension point the plug-in is essentially advertising the ability to configure the plug-in function with externally supplied extensions. For example, the Page Builder plug-in may declare an extension point for adding new Design Time Controls (DTCs) into its builder palette. This means that the Page Builder has defined an architecture for what it means to be a DTC and has implemented the code that looks for DTC extensions that have been configured into the extension points.

```
<!ELEMENT extension-point EMPTY>
<!ATTLIST extension-point
  name          CDATA #REQUIRED
  id            CDATA #REQUIRED
  schema        CDATA #IMPLIED
>
```

The `<extension-point>` element has the following attributes:

- **name** – user-displayable (translatable) name for the extension point
- **id** – simple id token, unique within this plug-in. The token cannot contain dot (.) or whitespace.
 - [production rule: `ExtensionPointId`]
- **schema** – schema specification for this extension point. The exact details are being defined as part of the Plug-In Development Environment (PDE). The schema is currently not used at runtime. The reference is a file name relative to the plug-in installation location.

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Actual extensions are configured into extension points (predefined, or newly declared in this plug-in) in the `<extension>` section. The configuration information is specified as well-formed XML contained between the `<extension>` and `</extension>` tags. The platform does not specify the actual form of the configuration markup (other than requiring it to be well-formed XML). The markup is defined by the supplier of the plug-in that declared the extension point. The platform does not actually interpret the configuration markup. It simply passes the configuration information to the plug-in as part of the extension point processing (at the time the extension point logic queries all of its configured extensions).

```
<!ELEMENT extension ANY>
<!ATTLIST extension
  point          CDATA #REQUIRED
  id             CDATA #IMPLIED
  name          CDATA #IMPLIED
>
```

The `<extension>` element has the following attributes:

- **point** – reference to an extension point being configured. The extension point can be one defined in this plug-in or another plug-in
 - [production rule: `ExtensionPointReference`]
- **id** – optional identifier for this extension point configuration instance. This is used by extension points that need to uniquely identify (rather than just enumerate) the specific configured extensions. The identifier is specified as a simple token unique within the definition of the declaring plug-in. When used globally, the extension identifier is qualified by the plug-in identifier
 - [production rule: `ExtensionId`]
- **name** – user-displayable (translatable) name for the extension

Important: The content of the `<extension>` element is declared using the ANY rule. This means that any well-formed XML can be specified within the extension configuration section (between `<extension>` and `</extension>` tags).

Fragments are used to increase the scope of a plug-in. An example would be to incorporate data such as messages or labels in another language.

```
<?xml encoding="US-ASCII"?>
<!ELEMENT fragment (requires?, runtime?, extension-point*, extension*)>
<!ATTLIST fragment
  name          CDATA #REQUIRED
  id            CDATA #REQUIRED
  version       CDATA #REQUIRED
  provider-name CDATA #IMPLIED
  plugin-id     CDATA #REQUIRED
  plugin-version CDATA #REQUIRED
  match         (perfect | equivalent | compatible | greaterOrEqual) "compatible"
>
```

Each fragment must be associated with a specific plug-in. The associated plug-in is identified with `<plugin-id>`, `<plugin-version>` and optionally, `<match>`. Note that if this specification matches more than one plug-in, the matching plug-in with the highest version number will be used.

The `<requires>`, `<runtime>`, `<extension-point>`, and `<extension>` components of a fragment will be logically added to the matching plug-in.

`<fragment>` attributes are as follows:

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- **name** – user displayable (translatable) name for the fragment
- **id** – unique identifier for the fragment.
 - To minimize potential for naming collisions, the identifier should be derived from the id of the associated plug-in in addition to something which identifies the scope of this fragment. For example, org.eclipse.core.runtime.nl1 could define a natural language fragment for the org.eclipse.core.runtime plug-in
 - [production rule: PlugInId]
- **version** – fragment version number. See org.eclipse.core.runtime.PluginVersionIdentifier for details. Fragment version format is the same as plug-in version format.
- **provider-name** – user-displayable name of the provider supplying the fragment.
- **plugin-id** – matches the id of the associated plug-in
- **plugin-version** – matches the version of the associated plug-in
- **match** – the matching rule used to find an associated plug-in using <plugin-id> and <plugin-version>. See the definition of <match> in the <requires> clause for complete details.

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```
<?xml encoding="US-ASCII" ?>
```

```
<!ELEMENT plugin (requires?, runtime?, extension-point*, extension*)> <!ATTLIST plugin name CDATA #REQUIRED id CDATA #REQUIRED version CDATA #REQUIRED provider-name CDATA #IMPLIED class CDATA #IMPLIED >
```

```
<!ELEMENT fragment (requires?, runtime?, extension-point*, extension*)> <!ATTLIST fragment name CDATA #REQUIRED id CDATA #REQUIRED version CDATA #REQUIRED provider-name CDATA #IMPLIED plugin-id CDATA #REQUIRED plugin-version CDATA #REQUIRED match (perfect | equivalent | compatible | greaterOrEqual) "compatible" >
```

```
<!ELEMENT requires (import+)> <!ELEMENT import EMPTY> <!ATTLIST import plugin CDATA #REQUIRED version CDATA #IMPLIED match (perfect | equivalent | compatible | greaterOrEqual) "compatible" export (true | false) "false" optional (true | false) "false" >
```

```
<!ELEMENT runtime library+>
```

```
<!ELEMENT library (export*, packages?)> <!ATTLIST library name CDATA #REQUIRED type (code | resource) "code" >
```

```
<!ELEMENT export EMPTY> <!ATTLIST export name CDATA #REQUIRED >
```

```
<!ELEMENT packages EMPTY> <!ATTLIST packages prefixes CDATA #REQUIRED >
```

```
<!ELEMENT extension-point EMPTY> <!ATTLIST extension-point name CDATA #REQUIRED id CDATA #REQUIRED schema CDATA #IMPLIED >
```

```
<!ELEMENT extension ANY> <!ATTLIST extension point CDATA #REQUIRED name CDATA #IMPLIED id CDATA #IMPLIED >
```

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Eclipse platform feature manifest

Version 3.0 – Last revised June 22, 2004

The feature manifest format is defined by the following dtd:

```
<?xml encoding="ISO-8859-1"?>

<!ELEMENT feature (install-handler? | description? | copyright? |
license? | url? | includes* | requires? | plugin* | data*)>
<!ATTLIST feature
  id          CDATA #REQUIRED
  version     CDATA #REQUIRED
  label       CDATA #IMPLIED
  provider-name CDATA #IMPLIED
  image       CDATA #IMPLIED
  os          CDATA #IMPLIED
  arch        CDATA #IMPLIED
  ws          CDATA #IMPLIED
  nl          CDATA #IMPLIED
  colocation-affinity
              CDATA #IMPLIED
  primary     (true | false) "false"
  exclusive   (true | false) "false"
  plugin      CDATA #IMPLIED
  application CDATA #IMPLIED
>

<!ELEMENT install-handler EMPTY>
<!ATTLIST install-handler
  library     CDATA #IMPLIED
  handler     CDATA #IMPLIED
>

<!ELEMENT description (#PCDATA)>
<!ATTLIST description
  url         CDATA #IMPLIED
>

<!ELEMENT copyright (#PCDATA)>
<!ATTLIST copyright
  url         CDATA #IMPLIED
>

<!ELEMENT license (#PCDATA)>
<!ATTLIST license
  url         CDATA #IMPLIED
>

<!ELEMENT url (update?, discovery*)>
```


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```
<!ELEMENT update EMPTY>
<!ATTLIST update
  url          CDATA #REQUIRED
  label        CDATA #IMPLIED
>

<!ELEMENT discovery EMPTY>
<!ATTLIST discovery
  type          (web | update) "update"
  url           CDATA #REQUIRED
  label         CDATA #IMPLIED
>

<!ELEMENT includes EMPTY>
<!ATTLIST includes
  id            CDATA #REQUIRED
  version       CDATA #REQUIRED
  name          CDATA #IMPLIED
  optional      (true | false) "false"
  search-location (root | self | both) "root"
  os            CDATA #IMPLIED
  arch          CDATA #IMPLIED
  ws            CDATA #IMPLIED
  nl            CDATA #IMPLIED
>

<!ELEMENT requires (import+)>

<!ELEMENT import EMPTY>
<!ATTLIST import
  plugin        CDATA #IMPLIED
  feature       CDATA #IMPLIED
  version       CDATA #IMPLIED
  match         (perfect | equivalent | compatible | greaterOrEqual)
"compatible"
  patch        (true | false) "false"
>

<!ELEMENT plugin EMPTY>
<!ATTLIST plugin
  id            CDATA #REQUIRED
  version       CDATA #REQUIRED
  fragment      (true | false) "false"
  os            CDATA #IMPLIED
  arch          CDATA #IMPLIED
  ws            CDATA #IMPLIED
  nl            CDATA #IMPLIED
  download-size CDATA #IMPLIED
  install-size  CDATA #IMPLIED
  unpack        (true | false) "true"
>
```

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```
<!ELEMENT data EMPTY>
<!ATTLIST data
  id          CDATA #REQUIRED
  os          CDATA #IMPLIED
  arch        CDATA #IMPLIED
  ws          CDATA #IMPLIED
  nl          CDATA #IMPLIED
  download-size CDATA #IMPLIED
  install-size CDATA #IMPLIED
>
```

The element and attribute definitions are as follows:

- <feature> – defines the feature
 - ◆ id – required feature identifier (eg. com.xyz.myfeature)
 - ◆ version – required component version (eg. 1.0.3)
 - ◆ label – optional displayable label (name). Intended to be translated.
 - ◆ provider-name – optional display label identifying the organization providing this component. Intended to be translated.
 - ◆ image – optional image to use when displaying information about the feature. Specified relative to the feature.xml.
 - ◆ os – optional operating system specification. A comma-separated list of os designators defined by Eclipse (see Javadoc for `org.eclipse.core.runtime.Platform`). Indicates this feature should only be installed on one of the specified os systems. If this attribute is not specified, the feature can be installed on all systems (portable implementation). This information is used as a hint by the installation and update support (user can force installation of feature regardless of this setting).
 - ◆ arch – optional machine architecture specification. A comma-separated list of architecture designators defined by Eclipse (see Javadoc for `org.eclipse.core.runtime.Platform`). Indicates this feature should only be installed on one of the specified systems. If this attribute is not specified, the feature can be installed on all systems (portable implementation). This information is used as a hint by the installation and update support (user can force installation of feature regardless of this setting).
 - ◆ ws – optional windowing system specification. A comma-separated list of ws designators defined by Eclipse (see Javadoc for `org.eclipse.core.runtime.Platform`). Indicates this feature should only be installed on one of the specified ws systems. If this attribute is not specified, the feature can be installed on all systems (portable implementation). This information is used as a hint by the installation and update support (user can force installation of feature regardless of this setting).
 - ◆ nl – optional locale specification. A comma-separated list of locale designators defined by Java. Indicates this feature should only be installed on a system running with a compatible locale (using Java locale-matching rules). If this attribute is not specified, the feature can be installed on all systems (language-neutral implementation). This information is used as a hint by the installation and update support (user can force installation of feature regardless of this setting).
 - ◆ colocation-affinity – optional reference to another feature identifier used to select the default installation location for this feature. When this feature is being installed as a new feature (no other versions of it are installed), an attempt is made to install this feature in the same installation location as the referenced feature.

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- ◆ primary – optional indication specifying whether this feature can be used as a primary feature. Default is *false* (not a primary feature).
- ◆ application – optional identifier of the Eclipse application that is to be used during startup when the declaring feature is the primary feature. The application identifier must represent a valid application registered in the `org.eclipse.core.runtime.applications` extension point. Default is `org.eclipse.ui.ide.workbench`.
- ◆ plugin – optional identifier that represents the id of the plug-in listed in the feature that is used to carry branding information for the feature (images, translations, splash screens in case of primary feature etc.). If not specified, the assumption will be made the attribution plug-in has the same id as the feature.
- ◆ exclusive – optional flag that, if "true", indicates that the feature cannot be installed in a group with other features.
- <install-handler>
 - ◆ library – optional .jar library containing the install handler classes. If specified, the referenced .jar must be contained in the feature archive. It is specified as a path within the feature archive, relative to the feature.xml entry. If not specified, the feature archive itself is used to load the install handler classes. This attribute is only interpreted if *class* attribute is also specified
 - ◆ handler – optional identifier of the install handler. The value is interpreted depending on the value of the *library* attribute. If *library* is specified, the value is interpreted as a fully qualified name of a class contained in the specified *library*. If *library* is not specified, the value is interpreted as an extension identifier of an extension registered in the `org.eclipse.update.installHandlers` extension point. In either case, the resulting class must implement the *IInstallHandler* interface. The class is dynamically loaded and called at specific points during feature processing. When the handler is specified as a class, it has visibility to the API classes from the `org.eclipse.update.core` plug-in, and Eclipse plug-ins required by this plug-in; otherwise, when is specified as extension, it has access to all the classes as the plug-in defining the extension.
- <description> – brief component description as simple text. Intended to be translated.
 - ◆ url – optional URL for the full description as HTML. The URL can be specified as absolute or relative. If relative, it is assumed to be relative to (and packaged in) the feature archive. Note, that for NL handling the URL value should be separated to allow alternate URLs to be specified for each national language.
- <copyright> – feature copyright as simple text. Intended to be translated.
 - ◆ url – optional URL for the full description as HTML. The URL can be specified as absolute or relative. If relative, it is assumed to be relative to (and packaged in) the feature archive. Note, that for NL handling the URL value should be separated to allow alternate URLs to be specified for each national language.
- <license> – feature "click-through" license as simple text. Intended to be translated. It is displayed in a standard dialog with [Accept] [Reject] actions during the download/ installation process. Note, that click-through license must be specified for any feature that will be selected for installation or update using the Eclipse update manager. When using nested features, only the nesting parent (i.e. the feature selected for installation or update) must have click-through license text defined. The license text is required even if the optional *url* attribute is specified.
 - ◆ url – optional URL for the full description as HTML. The URL can be specified as absolute or relative. If relative, it is assumed to be relative to (and packaged in) the feature archive. Note, that for NL handling the URL value should be separated to allow alternate URLs to be specified for each national language. Note, that the "content" of this URL is **not** what is presented as the click-through license during installation processing. The click-through license is the actual value of the *<license>* element (eg. `<license>click through text</license>`)

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- `<url>` – optional URL specifying site(s) contain feature updates, or new features
 - ◆ `<update>` – URL to go to for updates to this feature
 - ◇ `url` – actual URL
 - ◇ `label` – displayable label (name) for the referenced site
 - ◆ `<discovery>` – URL to go to for new features. In general, a provider can use this element to reference its own site(s), or site(s) of partners that offer complementary features. Eclipse uses this element simply as a way to distribute new site URLs to the clients. Sites that belong to root features (at the top of the hierarchy) typically appear in "Sites to Visit" in Update Manager.
 - ◇ `url` – actual URL
 - ◇ `label` – displayable label (name) for the referenced site
 - ◇ `type` (new in 2.1) – by default, discovery sites are assumed to be update sites ("update"). By setting the value of this attribute to "web", it is possible to indicate to Eclipse that the URL should be treated as a regular Web hyperlink that can be directly displayed in a suitable browser.
- `<includes>` – optional reference to a nested feature that is considered to be part of this feature. Nested features must be located on the same update site as this feature
 - ◆ `id` – required nested feature identifier. If the feature is a patch (see the `<requires>` section below), this must be the id of another patch.
 - ◆ `version` – required nested feature version
 - ◆ `optional` – it is possible to include a feature as optional when this attribute is "true". Users are allowed to not install optional features, disable them if they are installed, and install them later. A missing optional feature is not treated as an error.
 - ◆ `name` – if an optional feature is missing, Eclipse cannot render its name properly. This attribute can be used as a 'place holder' to allow Eclipse to render the name of the optional feature when it is not installed.
 - ◆ `search-location` – an included feature can be updated by patches. By default, search location is "root" which means that URL specified in the "update" element within the "url" element of the parent will be considered. If an included feature has its own "update" element defined, it will be ignored by default. If the parent feature wants to allow the child to be updated from its own location, it can set this attribute to "both" or "self".
 - ◆ `os` – optional operating system specification. A comma-separated list of os designators defined by Eclipse (see Javadoc for `org.eclipse.core.runtime.Platform`). Indicates this entry should only be installed on one of the specified os systems. If this attribute is not specified, the entry can be installed on all systems (portable implementation). This information is used as a hint by the installation and update support (user can force installation of entry regardless of this setting).
 - ◆ `arch` – optional machine architecture specification. A comma-separated list of architecture designators defined by Eclipse (see Javadoc for `org.eclipse.core.runtime.Platform`). Indicates this feature should only be installed on one of the specified systems. If this attribute is not specified, the feature can be installed on all systems (portable implementation). This information is used as a hint by the installation and update support (user can force installation of feature regardless of this setting).
 - ◆ `ws` – optional windowing system specification. A comma-separated list of ws designators defined by Eclipse (see Javadoc for `org.eclipse.core.runtime.Platform`). Indicates this entry should only be installed on one of the specified ws systems. If this attribute is not specified, the entry can be installed on all systems (portable implementation). This information is used as a hint by the installation and update support (user can force installation of entry regardless of this setting).

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- ◆ nl – optional locale specification. A comma-separated list of locale designators defined by Java. Indicates this entry should only be installed on a system running with a compatible locale (using Java locale-matching rules). If this attribute is not specified, the entry can be installed on all systems (language-neutral implementation). This information is used as a hint by the installation and update support (user can force installation of entry regardless of this setting).
- <requires> – optional feature dependency information. Is expressed in terms of plug-in dependencies. If specified, is enforced by the installation and update support at the time of installation
 - ◆ <import> – dependency entry. Specification and processing is a subset of the <import> specification in plugin.xml
 - ◇ plugin – identifier of dependent plug-in, if plug-in is used to express dependency
 - ◇ feature (new in 2.1) – identifier of dependent feature, if feature is used to express dependency. **Either plugin or feature attribute must be set, but not both.** If "patch" is "true", feature attribute must be used.
 - ◇ version – optional plug-in version specification. If "patch" is "true", version must be set.
 - ◇ match – optional matching rule. Valid values and processing are as follows:
 - if version attribute is not specified, the match attribute (if specified) is ignored.
 - **perfect** – dependent plug-in version must match exactly the specified version. If "patch" is "true", "perfect" is assumed and other values cannot be set.
 - **equivalent** – dependent plug-in version must be at least at the version specified, or at a higher service level (major and minor version levels must equal the specified version).
 - **compatible** – dependent plug-in version must be at least at the version specified, or at a higher service level or minor level (major version level must equal the specified version).
 - **greaterOrEqual** – dependent plug-in version must be at least at the version specified, or at a higher service, minor or major level.
 - ◇ patch – if "true", this constraint declares the enclosing feature to be a patch for the referenced feature. Certain rules must be followed when this attribute is set:
 - feature attribute must be used to identifier of feature being patched
 - version attribute must be set
 - match attribute should not be set and "perfect" value will be assumed.
 - if other features are <include>'ed, they must also be patches.

A patch is a special feature that carries newer versions of plug-ins for the feature it is patching. It does not replace the feature. A patch can also carry other patches by inclusion.
- <plugin> – identifies referenced plug-in
 - ◆ id – required plug-in identifier (from plugin.xml)
 - ◆ version – required plug-in version (from plugin.xml)
 - ◆ fragment – optional specification indicating if this entry is a plug-in fragment. Default is "false"
 - ◆ os – optional operating system specification. A comma-separated list of os designators defined by Eclipse (see Javadoc for `org.eclipse.core.runtime.Platform`). Indicates this entry should only be installed on one of the specified os systems. If this attribute is not specified, the entry can be installed on all systems (portable implementation). This information is used as a hint by the installation and update support (user can force

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- installation of entry regardless of this setting).
- ◆ arch – optional machine architecture specification. A comma-separated list of architecture designators defined by Eclipse (see Javadoc for `org.eclipse.core.runtime.Platform`). Indicates this feature should only be installed on one of the specified systems. If this attribute is not specified, the feature can be installed on all systems (portable implementation). This information is used as a hint by the installation and update support (user can force installation of feature regardless of this setting).
- ◆ ws – optional windowing system specification. A comma-separated list of ws designators defined by Eclipse (see Javadoc for `org.eclipse.core.runtime.Platform`). Indicates this entry should only be installed on one of the specified ws systems. If this attribute is not specified, the entry can be installed on all systems (portable implementation). This information is used as a hint by the installation and update support (user can force installation of entry regardless of this setting).
- ◆ nl – optional locale specification. A comma-separated list of locale designators defined by Java. Indicates this entry should only be installed on a system running with a compatible locale (using Java locale-matching rules). If this attribute is not specified, the entry can be installed on all systems (language-neutral implementation). This information is used as a hint by the installation and update support (user can force installation of entry regardless of this setting).
- ◆ download-size – optional hint supplied by the feature packager, indicating the download size in KBytes of the referenced plug-in archive. If not specified, the download size is not known (**Implementation Note:** the implementation needs to distinguish between "not known" and 0 size)
- ◆ install-size – optional hint supplied by the feature packager, indicating the install size in KBytes of the referenced plug-in archive. If not specified, the install size is not known (**Implementation Note:** the implementation needs to distinguish between "not known" and 0 size)
- ◆ unpack (new in 3.0) – optional specification supplied by the feature packager, indicating that plugin is capable of running from a jar, and contents of plug-in jar should not be unpacked into a directory. Default is "true". (**Implementation Note:** partial plug-ins – delivered in a feature specifying `org.eclipse.update.core.DeltaInstallHandler` as an install handler should not set unpack to "false")
- <data> – identifies non-plugin data that is part of the feature
 - ◆ id – required data identifier in the form of a relative path.
 - ◆ os – optional operating system specification. A comma-separated list of os designators defined by Eclipse (see Javadoc for `org.eclipse.core.runtime.Platform`). Indicates this entry should only be installed on one of the specified os systems. If this attribute is not specified, the entry can be installed on all systems (portable implementation). This information is used as a hint by the installation and update support (user can force installation of entry regardless of this setting).
 - ◆ arch – optional machine architecture specification. A comma-separated list of architecture designators defined by Eclipse (see Javadoc for `org.eclipse.core.runtime.Platform`). Indicates this feature should only be installed on one of the specified systems. If this attribute is not specified, the feature can be installed on all systems (portable implementation). This information is used as a hint by the installation and update support (user can force installation of feature regardless of this setting).
 - ◆ ws – optional windowing system specification. A comma-separated list of ws designators defined by Eclipse (see Javadoc for `org.eclipse.core.runtime.Platform`). Indicates this entry should only be installed on one of the specified ws systems. If this

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attribute is not specified, the entry can be installed on all systems (portable implementation). This information is used as a hint by the installation and update support (user can force installation of entry regardless of this setting).

- ◆ `nl` – optional locale specification. A comma-separated list of locale designators defined by Java. Indicates this entry should only be installed on a system running with a compatible locale (using Java locale-matching rules). If this attribute is not specified, the entry can be installed on all systems (language-neutral implementation). This information is used as a hint by the installation and update support (user can force installation of entry regardless of this setting).
- ◆ `download-size` – optional hint supplied by the feature packager, indicating the download size in KBytes of the referenced data archive. If not specified, the download size is not known (**Implementation Note:** the implementation needs to distinguish between "not known" and 0 size)
- ◆ `install-size` – optional hint supplied by the feature packager, indicating the install size in KBytes of the referenced data archive. If not specified, the install size is not known (**Implementation Note:** the implementation needs to distinguish between "not known" and 0 size)

When interacting with the update site, the feature implementation maps the `<plugin>` and `<data>` elements into path identifiers used by the site to determine the actual files to download and install. The default feature implementation supplied by Eclipse constructs the path identifiers as follows:

- `<plugin>` element results in a path entry in the form
"plugins/`<pluginId>`_`<pluginVersion>`.jar" (for example,
"plugins/org.eclipse.core.boot_2.0.0.jar")
- `<data>` element results in a path entry in the form
"features/`<featureId>`_`<featureVersion>`/`<dataId>`" (for example,
"features/com.xyz.tools_1.0.3/examples.zip")

Note, that in general the feature.xml manifest documents should specify UTF-8 encoding. For example

```
<?xml version="1.0" encoding="UTF-8"?>
```

Translatable text contained in the feature.xml can be separated into feature`<_locale>`.properties files using Java property bundle conventions. Note that the translated strings are used at installation time (i.e. do not employ the plug-in fragment runtime mechanism).

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Primary feature

In Eclipse 2.1, the notion of a **primary feature** was used to customize the product-branding aspects of a product. This mechanism is still supported in Eclipse 3.0, but is effectively deprecated. Newly developed products should use the products extension point to define a product.

The remainder of this discussion describes the legacy product definition using primary features.

When the Eclipse platform is started, exactly one feature can control the overall "personality" or "branding" of the platform, including the splash screen, window images, about box, welcome page, and other customizable aspects of the platform. This feature is called the product's **primary feature**.

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Let's look again at the description of the platform feature from Eclipse 2.1:

```
<?xml version="1.0" encoding="UTF-8"?>
<feature
  id="org.eclipse.platform"
  label="%featureName"
  version="2.1.0"
  provider-name="%providerName"
  plugin=""
  image="eclipse_update_120.jpg"
  primary="true"
  application="org.eclipse.ui.ide.workbench">
  ...
```

The platform feature has been designated as a primary feature. Although it's possible to designate many features as primary features in their **feature.xml** files, only one primary feature gets control when the platform is launched. This is controlled by setting the **eclipse.product** property in the product's **config.ini** file underneath the **eclipse/configuration** directory. If there are multiple eligible primary features, the **-product** command line option for **eclipse.exe** overrides the choice made in **config.ini**.

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Project-scoped preferences

In [Runtime preferences](#), we looked at the infrastructure for defining and storing preferences with different scopes. We also saw that the [org.eclipse.core.runtime.preferences](#) extension can be used to define additional scopes for preferences. The platform resources plug-in defines its own preference scope, called "Project," in order to define project-scoped preferences. Project-scoped preferences are stored in a file located inside the project. This makes it easy to store a set of preferences and exchange them with other users using resource-oriented mechanisms such as a version control system.

Specifying the scope

The definition for new scopes is pretty simple. The plug-in defines the name of the scope, as well as the class that implements it. The resources plug-in defines the project scope as follows:

```
<extension id="preferences" point="org.eclipse.core.runtime.preferences" name="preferences"
  <scope name="project" class="org.eclipse.core.internal.resources.ProjectPreferences" />
</extension>
```

The specified class must implement the [IScope](#) interface, which means it must be capable of creating preference nodes for the scope.

Project-scoped preference nodes

Since the project scope for preferences is not one of the standard runtime scopes, the node representing a project-level preference must be obtained specifically. From the root preference node, you must navigate to the project-scoped preference. This can be achieved using the **ProjectScope**:

```
IScopeContext projectScope = new ProjectScope(MyProject);
```

Once the project scope for a particular project is found, the preference values can be obtained using the same mechanisms seen earlier. Preferences are named using the string name of the preference. The names are

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qualified with another string (often a plug-in id) that qualifies the namespace of the preference. The following snippet gets a preference node from the project scope. You'll notice that once the correct scope is obtained, working with the nodes is no different than with nodes from other scopes.

```
...
Preferences projectNode = projectScope.node("com.example.myplugin");
if (projectNode != null) {
    value = node.getBoolean("MyPreference", "true");
    //do something with the value.
}
...
```

To save the value to a file in the project, the node is flushed. The resources plug-in handles the logistics for managing the project-level preferences file.

```
projectNode.flush();
```

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Content types

The **org.eclipse.core.runtime.content** package provides support for defining content-types for data streams. Content types are used by several content-sensitive features of Eclipse, such as automatic encoding determination, comparison editor selection, and menu contributions. A central content registry managed by an **IContentTypeManager** allows plug-ins to define content types and specify a class that knows how to read and describe the content. In order to contribute content types, a basic understanding of the content framework is necessary.

*Note: For this discussion, we specifically avoid the use of the word **file** when talking about content. The runtime content engine does not assume that content is contained in a file in the file system. However, it does include protocol that allows content types to be associated with file-naming patterns. In practice, these file names represent files in the file system, but nothing in the implementation of the content system assumes that the content is located in the file system. [File encoding and content types](#) discusses the file-oriented content types contributed by the platform resources plug-in.*

Defining and describing content

The platform defines some fundamental content types, such as plain text and XML data streams. These content types are defined the same way as those contributed by other plug-ins. We'll look at how the platform defines the text content type in order to better understand the content type framework.

Plug-ins define content types by contributing an extension for the extension point **org.eclipse.core.runtime.contentTypes**. In this extension, a plug-in specifies an id and name for the content type, and an **IContentDescriber** which can read an input stream and supply a description of the content. The following snippet is the runtime plug-in's contribution for the text content type:

```
<extension point="org.eclipse.core.runtime.contentTypes">
    <content-type id="text" name="%textContentTypeName">
        priority="high"
        file-extensions="txt">
<describer class="org.eclipse.core.internal.content.TextContentDescriber"/>
    </content-type>
```

...

The **TextContentDescriber** is responsible for reading an input stream and quickly determining whether the supplied content is a valid sample of text. The method **describe(inputStream, description)** is called whenever the platform is trying to determine the content for a particular data stream. The **IContentDescriber** is responsible for quickly determining whether the contents represent a valid sample for its content type and returning a constant that indicates whether the content matches its type. If the content does match its type, the describer should also fill in the supplied **IContentDescription** with information about the data.

The **IContentDescription** stores content-specific attributes in key/value pairs. These attributes are specific to the particular content type. The platform specifies attributes for the character set and the byte order of a text file, but others can be defined.

Finding out about content types

IContentTypeManager defines the protocol for the content registry. Clients can use this class to test a content stream or to find out about other content types in the system.

- **findContentType...** methods allow clients to obtain the content type (or types) for a stream and file-name pattern.
- **getAllContentTypes** allows clients to get all of the content types defined in the platform.
- **getContentType** allows clients to obtain a content type by its unique identifier.
- **getDescriptionFor...** methods allow clients to obtain a content description for a given stream and file-name pattern.

Content types are represented by **IContentType**. This class represents a unique content type that knows how to read a data stream and interpret content type-specific information. Content types are hierarchical in nature. For example, a content type for XML data is considered a child of the text content type.

```
<content-type id="xml" name="%xmlContentTypeName"
base-type="text"
    priority="high"
    file-extensions="xml"
    default-charset="UTF-8">
    <describer class="org.eclipse.core.internal.content.XMLContentDescriber" />
</content-type>
```

This allows new content types to leverage the attributes or behavior of more general content types.

Character sets

The platform text content type does not define a character set for text content. Children of the text content type are free to specify different default character sets when appropriate, as the XML content type does. The default character set for XML streams is UTF-8, which means that when an XML file does not have its encoding explicitly stated in its contents, its encoding will be deemed as UTF-8.

Content type collisions

It is conceivable that two independent plug-ins contribute a content type for the same kind of content. In this case, the platform will select only one content describer for the content. The describer selected is determined using a **priority** attribute that can be specified in the contentTypes extension. If two plug-ins contribute a content type for the same content with the same priority, it is indeterminate which content describer will be

selected. Once a content describer is selected, however, all registry references to the "losing" content describer will be aliased to the one that was chosen.

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Concurrency infrastructure

One of the major challenges of a complex system is to remain responsive while tasks are being performed. This challenge is even greater in an extensible system, when components that weren't designed to run together are sharing the same resources. The [org.eclipse.core.runtime.jobs](#) package addresses this challenge by providing infrastructure for scheduling, executing, and managing concurrently running operations. This infrastructure is based on the use of *jobs* to represent a unit of work that can run asynchronously.

Jobs

The **Job** class represents a unit of asynchronous work running concurrently with other jobs. To perform a task, a plug-in creates a job and then *schedules* it. Once a job is scheduled, it is added to a job queue managed by the platform. The platform uses a background scheduling thread to manage all of the pending jobs. As a running job completes, it is removed from the queue and the platform decides which job to run next. When a job becomes active, the platform invokes its **run()** method. Jobs are best demonstrated with a simple example:

```
class TrivialJob extends Job {
    public TrivialJob() {
        super("Trivial Job");
    }
    public IStatus run(IProgressMonitor monitor) {
        System.out.println("This is a job");
        return Status.OK_STATUS;
    }
}
```

The job is created and scheduled in the following snippet:

```
TrivialJob job = new TrivialJob();
System.out.println("About to schedule a job");
job.schedule();
System.out.println("Finished scheduling a job");
```

The output of this program is timing dependent. That is, there is no way to be sure when the job's **run** method will execute in relation to the thread that created the job and scheduled it. The output will either be:

```
About to schedule a job
This is a job
Finished scheduling a job
```

or:

```
About to schedule a job
Finished scheduling a job
This is a job
```

If you want to be certain that a job has completed before continuing, you can use the **join()** method. This method will block the caller until the job has completed, or until the calling thread is interrupted. Let's rewrite our snippet from above in a more deterministic manner:

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```
TrivialJob job = new TrivialJob();
System.out.println("About to schedule a job");
job.schedule();
job.join();
if (job.getResult().isOk())
    System.out.println("Job completed with success");
else
    System.out.println("Job did not complete successfully");
```

Assuming the `join()` call is not interrupted, this method is guaranteed to return the following result:

```
About to schedule a job
This is a job
Job completed with success
```

Of course, it is generally not useful to join a job immediately after scheduling it, since you obtain no concurrency by doing so. In this case you might as well do the work from the job's run method directly in the calling thread. We'll look at some examples later on where the use of `join` makes more sense.

The last snippet also makes use of the job **result**. The result is the **IStatus** object that is returned from the job's `run()` method. You can use this result to pass any necessary objects back from the job's run method. The result can also be used to indicate failure (by returning an **IStatus** with severity **IStatus.ERROR**), or cancellation (**IStatus.CANCEL**).

Common job operations

We've seen how to schedule a job and wait for it complete, but there are many other interesting things you can do jobs. If you schedule a job but then decide it is no longer needed, the job can be stopped using the `cancel()` method. If the job has not yet started running when canceled, the job is immediately discarded and will not run. If, on the other hand, the job has already started running, it is up to the job whether it wants to respond to the cancellation. When you are trying to cancel a job, waiting for it using the `join()` method comes in handy. Here is a common idiom for canceling a job, and waiting until the job is finished before proceeding:

```
if (!job.cancel())
    job.join();
```

If the cancellation does not take effect immediately, then `cancel()` will return false and the caller will use `join()` to wait for the job to successfully cancel.

Slightly less drastic than cancellation is the `sleep()` method. Again, if the job has not yet started running, this method will cause the job to be put on hold indefinitely. The job will still be remembered by the platform, and a `wakeUp()` call will cause the job to be added to the wait queue where it will eventually be executed.

Job states

A job goes through several states during its lifetime. Not only can it be manipulated through API such as `cancel()` and `sleep()`, but its state also changes as the platform runs and completes the job. Jobs can move through the following states:

- **WAITING** indicates that the job been scheduled to run, but is not running yet.
- **RUNNING** indicates that the job is running.
- **SLEEPING** indicates that the job is sleeping due to a sleep request or because it was scheduled to run after a certain delay.

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- **NONE** indicates that the job is not waiting, running, or sleeping. A job is in this state when it has been created but is not yet scheduled. It is also in this state after it is finished running or when it has been canceled.

A job can only be put to sleep if it is currently **WAITING**. Waking up a sleeping job will put it back in the **WAITING** state. Canceling a job will return it to the **NONE** state.

If your plug-in needs to know the state of a particular job, it can register a *job change listener* that is notified as the job moves through its life-cycle. This is useful for showing progress or otherwise reporting on a job.

Job change listeners

The **Job** method **addJobChangeListener** can be used to register a listener on a particular job. **IJobChangeListener** defines protocol for responding to the state changes in a job:

- **aboutToRun** is sent when the job is about to be run.
- **awake** is sent when a previously sleeping job is now waiting to be run.
- **done** is sent when a job finishes execution.
- **running** is sent when a job starts running.
- **scheduled** is sent when a job is scheduled and waiting in the queue of jobs.
- **sleeping** is sent when a waiting job is put to sleep.

In all of these cases, the listener is provided with an **IJobChangeEvent** that specifies the job undergoing the state change and status on its completion (if it is done).

*Note: Jobs also define the **getState()** method for obtaining the (relatively) current state of a job. However, this result is not always reliable since jobs run in a different thread and may change state again by the time the call returns. Job change listeners are the recommended mechanism for discovering state changes in a job.*

The job manager

IJobManager defines protocol for working with all of the jobs in the system. Plug-ins that show progress or otherwise work with the job infrastructure can use **IJobManager** to perform tasks such as suspending all jobs in the system, finding out which job is running, or receiving progress feedback about a particular job. The platform's job manager can be obtained using **Platform** API:

```
IJobManager jobMan = Platform.getJobManager();
```

Plug-ins interested in the state of all jobs in the system can register a job change listener on the job manager rather than registering listeners on many individual jobs.

Job families

It is sometimes easier for a plug-in to work with a group of related jobs as a single unit. This can be accomplished using *job families*. A job declares that it belongs to a certain family by overriding the **belongsTo** method:

```
public static final String MY_FAMILY = "myJobFamily";  
...  
class FamilyJob extends Job {
```

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```
...
public boolean belongsTo(Object family) {
    return family == MY_FAMILY;
}
}
```

IJobManager protocol can be used to cancel, join, sleep, or find all jobs in a family:

```
IJobManager jobMan = Platform.getJobManager();
jobMan.cancel(MY_FAMILY);
jobMan.join(MY_FAMILY, null);
```

Since job families are represented using arbitrary objects, you can store interesting state in the job family itself, and jobs can dynamically build family objects as needed. It is important to use family objects that are fairly unique, to avoid accidental interaction with the families created by other plug-ins.

Families are also a convenient way of locating groups of jobs. The method **IJobManager.find(Object family)** can be used to locate instances of all running, waiting, and sleeping jobs at any given time.

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Reporting progress

Long running jobs (those lasting more than a second) should report progress to the **IProgressMonitor** that is passed to the job's **run** method. The workbench progress view will show all progress messages and units of completed work given to this monitor.

The supplied progress monitor should also be used to check for cancellation requests made from the progress view. When a user (or plug-in using job API) attempts to cancel a job, the **IProgressMonitor** method **isCanceled()** will return **true**. It is the job's responsibility to frequently check the cancellation status of a job and respond to a cancellation by exiting the **run** method as soon as possible once it detects a cancellation. The following **run** method reports progress and responds to job cancellation:

```
public IStatus run(IProgressMonitor monitor) {
    final int ticks = 6000;
    monitor.beginTask("Doing some work", ticks);
    try {
        for (int i = 0; i < ticks; i++) {
            if (monitor.isCanceled())
                return Status.CANCEL_STATUS;
            monitor.subTask("Processing tick #" + i);
            //... do some work ...
            monitor.worked(1);
        }
    } finally {
        monitor.done();
    }
    return Status.OK_STATUS;
}
```

The **beginTask** method is used to name the task in the corresponding progress view and to establish the total amount of work to be done so that the view can compute progress. The **subTask** messages will appear as a child in the progress tree as work is done. The progress view will calculate and display a percent completion based on the amount of work reported in the **worked** calls.

Progress monitors and the UI

As you can see, the **IProgressMonitor** class is designed with corresponding UI support in mind. The platform's UI plug-in provides support so that the workbench can show progress for jobs that are running. You can set up your jobs with this in mind, so that you can control how they are presented.

See [Workbench Concurrency Support](#) for a detailed look at the APIs available for showing progress for jobs.

System jobs

What if your job is a low-level implementation detail that you don't want to show to users? You can flag your job as a *system job*. A system job is just like any other job, except the corresponding UI support will not set up a progress view or show any other UI affordances associated with running a job. If your job is not either directly initiated by a user, or a periodic task that can be configured by a user, then your job should be a system job. The protocol for setting a system job is simple:

```
class TrivialJob extends Job {
    public TrivialJob() {
        super("Trivial Job");
        setSystem(true);
    }
    ...
}
```

The **setSystem** call must be made before the job is scheduled. An exception will be triggered if you attempt this call on a job that is currently waiting, sleeping, or running.

User jobs

If your job is a long running operation that is initiated by a user, then you should flag your job as a *user job*. A user job will appear in a modal progress dialog that provides a button for moving the dialog into the background. The workbench defines a user preference that controls whether these dialogs are ever modal. By defining your job as a user job, your progress feedback will automatically conform with the user preference for progress viewing. The protocol for setting a user job is similar:

```
class TrivialJob extends Job {
    public TrivialJob() {
        super("Trivial Job");
        setUser(true);
    }
    ...
}
```

The **setUser** call must also be made before the job is scheduled.

Progress groups

Progress groups are another mechanism that can be used to influence the way that a job is shown in the UI. When it is more appropriate to show the aggregate progress of several related jobs in the UI, a special **IProgressMonitor** that represents a group of related jobs can be created. This monitor is created using **IJobManager** protocol. The following snippet shows how to create a progress group and associate it with a job.

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```
...
IJobManager jobMan = Platform.getJobManager();
myGroup = jobMan.createProgressGroup();
job.setProgressGroup(myGroup, 600); // specify the units of work the job needs to show.
job.schedule()
...
```

The group facility allows plug-ins to break tasks into multiple jobs if needed, but to report them to the user as if they are a single task. The progress group monitor will handle the details for computing the percentage completion relative to all of the jobs in the group.

A job must be placed into the progress group before it is scheduled. After a job finishes running, its reference to the progress group is lost. If the job is to be scheduled again, it must be set into the group once again before it is scheduled.

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Workbench concurrency support

We've seen that the JFace UI framework provides basic support for showing task progress in a dialog (see [Long running operations](#) for details). In [Concurrency infrastructure](#), we reviewed the platform runtime support for concurrency and long running operations. Now we will look at how the platform UI enhances this infrastructure in the [org.eclipse.ui.progress](#) package. This package supplies the UI for showing job progress in the workbench and defines additional support for jobs that run in the UI thread.

Before we introduce the new APIs let's start by reviewing some concepts. We first have to distinguish between different kinds of background operations:

- *User initiated.* These jobs are set to be user jobs ([Job#setUser](#)). The workbench will automatically show user jobs in a modal progress dialog with a button to allow the user to run the operation in the background and continue working. A global preference is used to indicate if user jobs should always run in the background.

Examples of user jobs include building, checking out a project, synchronizing with the repository, exporting a plug-in and searching.

- *Automatically triggered.* These operations have a meaning for users but were not initiated by the user. This is the default variety of job. These jobs are shown in the progress view and in the status line but the modal progress dialog won't show when they are run. Examples include autobuild and scheduled synchronization.
- *System operations.* Operations that are not triggered by the user and can be considered as an implementation detail. These jobs are created by setting the system flag ([Job#setSystem](#)). Examples of system jobs include jobs that lazily populate widgets or compute decorations and annotations for views.

Given an environment where several things may be happening at the same time the user needs:

- Indication when a long running operation has started.

User jobs are shown to the user in a progress dialog giving immediate feedback, whereas

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automatically triggered jobs are shown in the status line and progress view. Also, jobs that affect a part should be scheduled or registered with the part so that the workbench can provide hints to the user that something is running that affects the part.

- Indication when an operation has ended.

The user can easily know when user jobs ends because the progress dialog closes. But for non-user jobs there are a couple of feedback mechanisms available. If the job was scheduled or registered with a part then the parts progress hint will show when it is complete. If a job returns an error, an error indicator will appear in the bottom right of the status line showing a hint that an error has occurred.

- Indication of interesting new results, or new information, without stealing focus with dialogs shown by a background operation.

A user job can directly show the results to the user when the operation completes. For non-user jobs, it is recommended to not interrupt the user with a dialog. Instead, if the jobs results are shown in a view, the view can be opened when the job starts and the results shown in the view. This won't disrupt the users workflow. In addition, you can add properties to the job to indicate that it should be kept in the progress view and has an action that will show the results. A warning indication will appear in the bottom right corner of the status line when a job remains in the progress view and has results to show the user.

- A general feeling of being in control of what is running, with the ability to monitor and cancel background operations.

User jobs provides the best control to the user since they are easily cancelled and provide strong indication of blocking or concurrent operations running via the **Details** tab of the progress dialog. Note that the enhanced progress dialog that provides the **Details** area is only shown when users call IProgressService#busyCursorWhile or IProgressService#runInUI. In addition, the progress view provides access to jobs that are running.

- All installed plug-ins must consistently show progress in the same way.

The advantage of using the progress service API is that users get a consistent progress experience.

Next we will go into detail on how the new APIs can be used.

Progress service

The workbench progress service (IProgressService) is the primary interface to the workbench progress

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support. It can be obtained from the workbench and then used to show progress for both background operations and operations that run in the UI thread. The main purpose of this class is to provide one-stop shopping for running operations, removing the need for plug-in developers to decide what mechanism should be used for showing progress in a given situation. Another advantage is that the progress dialog shown with these methods provides good support for indicating when an operation is blocked by another and gives the user control to resolve the conflict. Where possible, long running operations should be run using [IProgressService#busyCursorWhile](#):

```
IProgressService progressService = PlatformUI.getWorkbench().getProgressService();
progressService.busyCursorWhile(new IRunnableWithProgress() {
    public void run(IProgressMonitor monitor) {
        //do non-UI work
    }
});
```

This method will initially put up a busy cursor, and replace it with a progress dialog if the operation lasts longer than a specified time threshold. The advantage of this method over using a progress dialog is that if the operation is short running the progress dialog won't be shown. If your operation must update the UI, you can always post an [Display.asyncExec](#) or [Display.syncExec](#) to run the code that modifies the UI. If an operation must be run in its entirety in the UI thread, then you should call [IProgressService#runInUI](#). Again, the advantage of this method is that it will display a progress dialog if the operation is blocked and give the user control.

```
progressService.runInUI(
    PlatformUI.getWorkbench().getProgressService(),
    new IRunnableWithProgress() {
        public void run(IProgressMonitor monitor) {
            //do UI work
        }
    },
    Platform.getWorkspace().getRoot());
```

The third parameter can be null, or a scheduling rule for the operation. In this case we are specifying the workspace root which will essentially lock the workspace while this UI operation is run.

You can also register with the progress service an icon for a job family so that the progress view can show the icon next to the running job. Here is an example of how the auto-build is associated with its icon:

```
IProgressService service = PlatformUI.getWorkbench().getProgressService();
ImageDescriptor newImage = IDEInternalWorkbenchImages.getImageDescriptor(
    IDEInternalWorkbenchImages.IMG_ETOOL_BUILD_EXEC);
service.registerIconForFamily(newImage, ResourcesPlugin.FAMILY_MANUAL_BUILD);
service.registerIconForFamily(newImage, ResourcesPlugin.FAMILY_AUTO_BUILD);
```

Showing that a part is busy

[IWorkbenchSiteProgressService](#) adds API for scheduling jobs that change the appearance of a workbench part while the job is running. If your plug-in is running background operations that affect the state of a part you can schedule the job via the part and the user will get feedback that the part is busy. Here is an example:

```
IWorkbenchSiteProgressService siteService =
    (IWorkbenchSiteProgressService)view.getSite().getAdapter(IWorkbenchSiteProgressService.class);
siteService.schedule(job, 0 /* now */, true /* use half-busy cursor in part */);
```

Progress Properties for Jobs

There are a set of predefined properties defined in [IProgressConstants](#) that can be used to control how a job is shown in the progress view. These can be used to tell the progress view to keep ([IProgressConstants#KEEP_PROPERTY](#)) your job in the view after it has finished, or only keep one ([IProgressConstants#KEEPONE_PROPERTY](#)) job at a time in the view. You can also associate an action ([IProgressConstants#ACTION_PROPERTY](#)) with a job. When a job has an associated action, the progress view shows a hyperlink so that a user can run the action. You can also find out if a user job is currently being shown in a progress dialog ([IProgressConstants#PROPERTY_IN_DIALOG](#)). A hint is provided in the bottom right of the status line when an action is available. Here is an example that uses these properties:

```
Job job = new Job("Do Work") {
    public IStatus run(IProgressMonitor monitor) {
        // do some work then only keep the finished job in the progress view if
        // not running in the progress dialog
        Boolean inDialog = (Boolean)getProperty(IProgressConstants.PROPERTY_IN_DIALOG);
        if(!inDialog.booleanValue())
            setProperty(IProgressConstants.KEEP_PROPERTY, Boolean.TRUE);
    }
};
job.setProperty(IProgressConstants.ICON_PROPERTY, Plugin.getImageDescriptor(WORK_IMAGE));
IAction gotoAction = new Action("Results") {
    public void run() {
        // show the results
    }
};
job.setProperty(IProgressConstants.ACTION_PROPERTY, gotoAction);
job.setUser(true);
job.schedule();
```

Workbench jobs

Where possible, long running operations should be performed outside of the UI thread. However, this cannot always be avoided when the operation's purpose is to update the UI. [SWT threading issues](#) explains how this can be done using the SWT [Display](#). The workbench defines a special job, [UIJob](#), whose run method runs inside an SWT `asyncExec`. Subclasses of [UIJob](#) should implement the method `runInUIThread` instead of the `run` method.

[WorkbenchJob](#) extends [UIJob](#) so that the job can only be scheduled or run when the workbench is running. As always, you should avoid excessive work in the UI thread because the UI will not refresh for the duration of the UI Job.

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Long-running operations

The [org.eclipse.jface.operations](#) package defines interfaces for long-running operations that require progress indicators or allow user cancellation of the operation.

Runnable and progress

The platform runtime defines a common interface, [IProgressMonitor](#), which is used to report progress to the user while long running operations are in progress. The client can provide a monitor as a parameter in many

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platform API methods when it is important to show progress to the user.

`JFace` defines more specific interfaces for objects that implement the user interface for a progress monitor.

`IRunnableWithProgress` is the interface for a long-running operation. The `run` method for this interface has an **`IProgressMonitor`** parameter that is used to report progress and check for user cancelation.

`IRunnableContext` is the interface for the different places in the UI where progress can be reported. Classes that implement this interface may choose to use different techniques for showing progress and running the operation. For example, **`ProgressMonitorDialog`** implements this interface by showing a progress dialog. **`IWorkbenchWindow`** implements this interface by showing progress in the workbench window's status line. **`WizardDialog`** implements this interface to show long running operations inside the wizard status line.

*Note: The workbench UI provides additional support for operations in **`WorkspaceModifyOperation`**. This class simplifies the implementation of long-running operations that modify the workspace. It maps between **`IRunnableWithProgress`** and **`IWorkspaceRunnable`**. See the javadoc for further detail.*

Modal operations

The **`ModalContext`** class is provided to run an operation that is modal from the client code's perspective. It is used inside the different implementations of **`IRunnableContext`**. If your plug-in needs to wait on the completion of a long-running operation before continuing execution, **`ModalContext`** can be used to accomplish this while still keeping the user interface responsive.

When you run an operation in a modal context, you can choose to fork the operation in a different thread. If `fork` is false, the operation will be run in the calling thread. If `fork` is true, the operation will be run in a new thread, the calling thread will be blocked, and the UI event loop will be run until the operation terminates.

For more information on the UI event loop, see [Threading issues for clients](#).

IProgressService

New in Eclipse 3.0 is support for long-running operations without having to worry about which runnable context to use run a long running operation. In addition the new `IProgressService` APIs provide progress dialogs that have details areas that allow the user to have control over background operations that may be blocking the given operation. See the [Workbench Concurrency Support](#) documentation.

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Threading issues

When working with a widget toolkit, it is important to understand the underlying thread model that is used for reading and dispatching platform GUI events. The implementation of the UI thread affects the rules that applications must follow when using Java threads in their code.

Native event dispatching

Underneath any GUI application, regardless of its language or UI toolkit, the OS platform detects GUI events and places them in application event queues. Although the mechanics are slightly different on different OS

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platforms, the basics are similar. As the user clicks the mouse, types characters, or surfaces windows, the OS generates application GUI events, such as mouse clicks, keystrokes, or window paint events. It determines which window and application should receive each event and places it in the application's event queue.

The underlying structure for any windowed GUI application is an event loop. Applications initialize and then start a loop which simply reads the GUI events from the queue and reacts accordingly. Any work that is done while handling one of these events must happen quickly in order to keep the GUI system responsive to the user.

Long operations triggered by UI events should be performed in a separate thread in order to allow the event loop thread to return quickly and fetch the next event from the application's queue. However, access to the widgets and platform API from other threads must be controlled with explicit locking and serialization. An application that fails to follow the rules can cause an OS call to fail, or worse, lock up the entire GUI system.

Toolkit UI threads

Native GUI programmers using C are quite familiar with the design considerations for working with the platform event loop. However, higher level widget toolkits in Java often attempt to shield application developers from UI threading issues by hiding the platform event loop.

A common way to achieve this is to set up a dedicated toolkit UI thread for reading and dispatching from the event loop, and posting the events to an internal queue that is serviced by applications running in separate threads. This allows the toolkit to respond in sufficient time to the operating system, while not placing any restrictions on the application's timing in handling the event. Applications must still use special locking techniques to access UI code from their application thread, but it is done consistently throughout the code since all application code is running in a non–UI thread.

Although it sounds tempting to "protect" applications from UI threading issues, it causes many problems in practice.

It becomes difficult to debug and diagnose problems when the timing of GUI events is dependent on the Java threading implementation and application performance.

Modern GUI platforms perform many optimizations with the event queue. A common optimization is to collapse consecutive paint events in the queue. Every time that part of a window must be repainted, the queue can be checked for overlapping or redundant paint events that have not been dispatched yet. These events can be merged into one paint event, causing less flicker and less frequent execution of the application's paint code. This optimization will be defeated if the widget toolkit is pulling the events off the queue quickly and posting them to an internal queue.

Changing the developer's perception of the threading model causes confusion for programmers that have experience with programming the native GUI system in other languages and toolkits.

SWT UI thread

SWT follows the threading model supported directly by the platforms. The application program runs the event loop in its main thread and dispatches events directly from this thread. This is the application's "UI thread."

*Note: Technically, the UI thread is the thread that creates the **Display**. In practice, this is also the thread that runs the event loop and creates the widgets.*

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Since all event code is triggered from the application's UI thread, application code that handles events can freely access the widgets and make graphics calls without any special techniques. However, the application is responsible for forking computational threads when performing long operations in response to an event.

*Note: SWT will trigger an **SWTException** for any calls made from a non–UI thread that must be made from the UI thread.*

The main thread, including the event loop, for an SWT application looks like the following:

```
public static void main (String [] args) {
    Display display = new Display ();
    Shell shell = new Shell (display);
    shell.open ();
    // start the event loop. We stop when the user has done
    // something to dispose our window.
    while (!shell.isDisposed ()) {
        if (!display.readAndDispatch ())
            display.sleep ();
    }
    display.dispose ();
}
```

Once the widgets are created and the shell is opened, the application reads and dispatches events from the OS queue until the shell window is disposed. If there are no events available for us in the queue, we tell the display to sleep to give other applications a chance to run.

Note: The most common threading model for an SWT application is to run a single UI thread and perform long operations in computational threads. However, SWT does not restrict developers to this model. An application could run multiple UI–threads with a separate event loop in each thread.

SWT provides special access methods for calling widget and graphics code from a background thread.

Executing code from a non–UI thread

Applications that wish to call UI code from a non–UI thread must provide a **Runnable** that calls the UI code. The methods **syncExec(Runnable)** and **asyncExec(Runnable)** in the **Display** class are used to execute these runnables in the UI thread at an appropriate time.

- **syncExec(Runnable)** should be used when the application code in the non–UI thread depends on the return value from the UI code or otherwise needs to ensure that the runnable is run to completion before returning to the thread. SWT will block the calling thread until the runnable has been run from the application's UI thread. For example, a background thread that is computing something based on a window's current size would want to synchronously run the code to get the window's size and then continue with its computations.
- **asyncExec(Runnable)** should be used when the application needs to perform some UI operations, but is not dependent upon the operations being completed before continuing. For example, a background thread that updates a progress indicator or redraws a window could request the update asynchronously and continue with its processing. In this case, there is no guaranteed relationship between the timing of the background thread and the execution of the runnable.

The following code snippet demonstrates the pattern for using these methods:

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```
// do time-intensive computations
...
// now update the UI. We don't depend on the result,
// so use async.
display.asyncExec (new Runnable () {
    public void run () {
        myWindow.redraw ();
    }
});
// now do more computations
...
```

The workbench and threads

The threading rules are very clear when you are implementing an SWT application from the ground up since you control the creation of the event loop and the decision to fork computational threads in your application.

If you are contributing plug-in code to the workbench, there is no threading "magic" hidden in the JFace or workbench code. The rules are straightforward:

- Your workbench plug-in code executes in the workbench's UI thread.
- If you receive an event from the workbench, it is always executing in the UI thread of the workbench.
- If your plug-in forks a computational thread, it must use the ***Display.asyncExec(Runnable)*** or ***syncExec(Runnable)*** methods when calling any API for the workbench, JFace, or SWT.
- Workbench and JFace API calls do not check that the caller is executing in the UI thread. However, SWT triggers an ***SWTException*** for all API calls made from a non-UI thread.
- If your plug-in uses the JFace ***IRunnableContext*** interface to invoke a progress monitor and run an operation, it supplies an argument to specify whether a computational thread is forked for running the operation.

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Job scheduling

Our examples so far have demonstrated simple job creation, scheduling, and progress reporting. The job scheduling mechanism is actually more powerful than we've shown so far. You can have more fine-grained control over the way your job is scheduled by using priorities, delays, and custom scheduling conditions.

Job priorities

A job *priority* can be used to establish the importance of a job relative to other jobs in the system. Setting the priority of a job won't affect a job that is already running, but it will affect how a waiting job is scheduled relative to other jobs. The priority of a job can be one of several pre-defined priority constants:

- **INTERACTIVE** jobs generally have priority over other jobs. They should be short-running or low on processor usage, so that they don't block other **INTERACTIVE** jobs from running.
- **SHORT** jobs typically complete within a second, but may take a little longer. They run in the background and have priority over all jobs except **INTERACTIVE** jobs.
- **LONG** jobs are for longer running background jobs. They run only after **INTERACTIVE** and **SHORT** jobs have been run.
- **BUILD** jobs are for jobs associated with building tasks. They are a lower priority than **LONG**. **BUILD** jobs only run when all **LONG** jobs are complete.

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- **DECORATE** jobs are the lowest priority in the system. They are used for tasks that provide information that may help supplement the UI, but that the user is not generally waiting for.

The default priority for a job is LONG. The following snippet creates the trivial job we used earlier, but sets the priority to DECORATE to indicate that it is the lowest level priority:

```
TrivialJob job = new TrivialJob();
job.setPriority(Job.DECORATE);
job.schedule();
```

Scheduling with a delay

Another technique for controlling how a job is scheduled is to use a scheduling delay. A scheduling delay can be specified when the job is scheduled. The job will be delayed for the specified number of milliseconds before it is scheduled.

```
TrivialJob job = new TrivialJob();
job.schedule(1000); // wait one second before scheduling
```

Rescheduling a job

Scheduling a job that is already waiting or is sleeping has no effect. However, scheduling a job that is already running will cause it to be rescheduled after it is finished. This is a convenient mechanism for repetitive jobs such as background polling loops. If the job is rescheduled multiple times while it is running, it will only be rescheduled once with the most recently supplied delay. The following snippet defines a job that reschedules itself to run 10 seconds after it finishes the current iteration.

```
class RepetitiveTrivialJob extends Job {
    public RepetitiveTrivialJob() {
        super("Repetitive Trivial Job");
    }
    public IStatus run(IProgressMonitor monitor) {
        System.out.println("Running the job.");
        // reschedule after 10 seconds
        schedule(10000);
        return Status.OK_STATUS;
    }
}
```

Custom scheduling conditions

Additional protocol in the **Job** class allows a job to check for preconditions just before it is scheduled or run. This is best demonstrated by example:

```
class JobWithPreconditions extends Job {
    ...
    public shouldSchedule() {
        return super.shouldSchedule() && checkJobPreconditions();
    }
    public shouldRun() {
        return super.shouldRun() && checkJobPreconditions();
    }
    ...
}
```


The **shouldSchedule** method is called just before the job manager places the job in the queue. This allows the job to cancel itself if basic preconditions for scheduling are not met. The job should return `false` if it is inappropriate to schedule it. Likewise, the **shouldRun** method is called just before the job manager runs the job. Any additional conditions that must be met before the job is run must be checked at this time.

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Scheduling rules

Job *scheduling rules* can be used to control when your jobs run in relation to other jobs. In particular, scheduling rules allow you to prevent multiple jobs from running concurrently in situations where concurrency can lead to inconsistent results. They also allow you to guarantee the execution order of a series of jobs. The power of scheduling rules is best illustrated by an example. Let's start by defining two jobs that are used to turn a light switch on and off concurrently:

```
public class LightSwitch {
    private boolean isOn = false;
    public boolean isOn() {
        return isOn;
    }
    public void on() {
        new LightOn().schedule();
    }
    public void off() {
        new LightOff().schedule();
    }
    class LightOn extends Job {
        public LightOn() {
            super("Turning on the light");
        }
        public IStatus run(IProgressMonitor monitor) {
            System.out.println("Turning the light on");
            isOn = true;
            return Status.OK_STATUS;
        }
    }
    class LightOff extends Job {
        public LightOff() {
            super("Turning off the light");
        }
        public IStatus run(IProgressMonitor monitor) {
            System.out.println("Turning the light off");
            isOn = false;
            return Status.OK_STATUS;
        }
    }
}
```

Now we create a simple program that creates a light switch and turns it on and off again:

```
LightSwitch light = new LightSwitch();
light.on();
light.off();
System.out.println("The light is on? " + light.isOn());
```

If we run this little program enough times, we will eventually obtain the following output:

```
Turning the light off
```

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```
Turning the light on  
The light is on? true
```

How can that be? We told the light to turn on and then off, so its final state should be off! The problem is that there was nothing preventing the `LightOff` job from running at the same time as the `LightOn` job. So, even though the "on" job was scheduled first, their concurrent execution means that there is no way to predict the exact execution order of the two concurrent jobs. If the `LightOff` job ends up running before the `LightOn` job, we get this invalid result. What we need is a way to prevent the two jobs from running concurrently, and that's where scheduling rules come in.

We can fix this example by creating a simple scheduling rule that acts as a *mutex* (also known as a *binary semaphore*):

```
class Mutex implements ISchedulingRule {  
    public boolean isConflicting(ISchedulingRule rule) {  
        return rule == this;  
    }  
    public boolean contains(ISchedulingRule rule) {  
        return rule == this;  
    }  
}
```

This rule is then added to the two light switch jobs from our previous example:

```
public class LightSwitch {  
    final MutexRule rule = new MutexRule();  
    ...  
    class LightOn extends Job {  
        public LightOn() {  
            super("Turning on the light");  
            setRule(rule);  
        }  
        ...  
    }  
    class LightOff extends Job {  
        public LightOff() {  
            super("Turning off the light");  
            setRule(rule);  
        }  
        ...  
    }  
}
```

Now, when the two light switch jobs are scheduled, the job infrastructure will call the `isConflicting` method to compare the scheduling rules of the two jobs. It will notice that the two jobs have conflicting scheduling rules, and will make sure that they run in the correct order. It will also make sure they never run at the same time. Now, if you run the example program a million times, you will always get the same result:

```
Turning the light on  
Turning the light off  
The light is on? false
```

Rules can also be used independently from jobs as a general locking mechanism. The following example acquires a rule within a try/finally block, preventing other threads and jobs from running with that rule for the duration between invocations of `beginRule` and `endRule`.

```
IJobManager manager = Platform.getJobManager();
```

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```
try {
    manager.beginRule(rule, monitor);
    ... do some work ...
} finally {
    manager.endRule(rule);
}
```

You should exercise extreme caution when acquiring and releasing scheduling rules using such a coding pattern. If you fail to end a rule for which you have called `beginRule`, you will have locked that rule forever.

Making your own rules

Although the job API defines the contract of scheduling rules, it does not actually provide any scheduling rule implementations. Essentially, the generic infrastructure has no way of knowing what sets of jobs are ok to run concurrently. By default, jobs have no scheduling rules, and a scheduled job is executed as fast as a thread can be created to run it.

When a job does have a scheduling rule, the `isConflicting` method is used to determine if the rule conflicts with the rules of any jobs that are currently running. Thus, your implementation of `isConflicting` can define exactly when it is safe to execute your job. In our light switch example, the `isConflicting` implementation simply uses an identity comparison with the provided rule. If another job has the identical rule, they will not be run concurrently. When writing your own scheduling rules, be sure to read and follow the API contract for `isConflicting` carefully.

If your job has several unrelated constraints, you can compose multiple scheduling rules together using a [MultiRule](#). For example, if your job needs to turn on a light switch, and also write information to a network socket, it can have a rule for the light switch and a rule for write access to the socket, combined into a single rule using the factory method `MultiRule.combine`.

Rule hierarchies

We have discussed the `isConflicting` method on [ISchedulingRule](#), but thus far have not mentioned the `contains` method. This method is used for a fairly specialized application of scheduling rules that many clients will not require. Scheduling rules can be logically composed into hierarchies for controlling access to naturally hierarchical resources. The simplest example to illustrate this concept is a tree-based file system. If an application wants to acquire an exclusive lock on a directory, it typically implies that it also wants exclusive access to the files and sub-directories within that directory. The `contains` method is used to specify the hierarchical relationship among locks. If you do not need to create hierarchies of locks, you can implement the `contains` method to simply call `isConflicting`.

Here is an example of a hierarchical lock for controlling write access to `java.io.File` handles.

```
public class FileLock implements ISchedulingRule {
    private String path;
    public FileLock(java.io.File file) {
        this.path = file.getAbsolutePath();
    }
    public boolean contains(ISchedulingRule rule) {
        if (this == rule)
            return true;
        if (rule instanceof FileLock)
            return path.startsWith(((FileLock) rule).path);
    }
}
```

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```
    if (rule instanceof MultiRule) {
        MultiRule multi = (MultiRule) rule;
        ISchedulingRule[] children = multi.getChildren();
        for (int i = 0; i < children.length; i++)
            if (!contains(children[i]))
                return false;
        return true;
    }
    return false;
}
public boolean isConflicting(ISchedulingRule rule) {
    if (!(rule instanceof FileLock))
        return false;
    String otherPath = ((FileLock)rule).path;
    return path.startsWith(otherPath) || otherPath.startsWith(path);
}
}
```

The `contains` method comes into play if a thread tries to acquire a second rule when it already owns a rule. To avoid the possibility of deadlock, any given thread can only own *one* scheduling rule at any given time. If a thread calls `beginRule` when it already owns a rule, either through a previous call to `beginRule` or by executing a job with a scheduling rule, the `contains` method is consulted to see if the two rules are equivalent. If the `contains` method for the rule that is already owned returns `true`, the `beginRule` invocation will succeed. If the `contains` method returns `false` an error will occur.

To put this in more concrete terms, say a thread owns our example `FileLock` rule on the directory at `"c:\temp"`. While it owns this rule, it is only allowed to modify files within that directory subtree. If it tries to modify files in other directories that are not under `"c:\temp"`, it should fail. Thus a scheduling rule is a concrete specification for what a job or thread is allowed or not allowed to do. Violating that specification will result in a runtime exception. In concurrency literature, this technique is known as *two-phase locking*. In a two-phase locking scheme, a process must specify in advance all locks it will need for a particular task, and is then not allowed to acquire further locks during the operation. Two-phase locking eliminates the hold-and-wait condition that is a prerequisite for circular wait deadlock. Therefore, it is impossible for a system using only scheduling rules as a locking primitive to enter a deadlock.

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Locks

It's possible that multiple jobs in the system need to access and manipulate the same object. **ILock** defines protocol for granting exclusive access to a shared object. When a job needs access to the shared object, it *acquires* a lock for that object. When it is finished manipulating the object, it *releases* the lock.

A lock is typically created when the shared object is created or first accessed by a plug-in. That is, code that has a reference to the shared object also has a reference to its lock. We'll start by creating a lock, **`myLock`**, that will be used to control access to **`myObject`**:

```
...
myObject = initializeImportantObject();
IJobManager jobMan = Platform.getJobManager();
myLock = jobMan.newLock();
...
```

A robust implementation of **ILock** is provided by the platform. The job manager provides instances of this lock for use by clients. These locks are aware of each other and can avoid circular deadlock. (We'll explain

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more about that statement in a moment.)

Whenever code in a job requires access to **myObject**, it must first acquire the lock on it. The following snippet shows a common idiom for working with a lock:

```
...
// I need to manipulate myObject, so I get its lock first.
try {
myLock.acquire();
    updateState(myObject); // manipulate the object
} finally {
lock.release();
}
...
```

The **acquire()** method will not return until the calling job can be granted exclusive access to the lock. In other words, if some other job has already acquired the lock, then this code will be blocked until the lock is available. Note that the code that acquires the lock and manipulates **myObject** is wrapped in a `try` block, so that the lock can be released if any exceptions occur while working with the object.

Seems simple enough, right? Fortunately, locks are pretty straightforward to use. They are also reentrant, which means you don't have to worry about your job acquiring the same lock multiple times. Each lock keeps a count of the number of acquires and releases for a particular thread, and will only release from a job when the number of releases equals the number of acquires.

Deadlock

Earlier we noted that locks provided by the job manager are aware of each other and can avoid circular deadlock. To understand how deadlock occurs, let's look at a simple scenario. Suppose "Job A" acquires "Lock A" and subsequently tries to acquire "Lock B." Meanwhile, "Lock B" is held by "Job B" which is now blocked waiting on "Lock A." This kind of deadlock indicates an underlying design problem with the use of the locks between the jobs. While this simple case can be avoided easily enough, the chances of accidentally introducing deadlock increase as the number of jobs and locks used in your design increase.

Fortunately, the platform will help you in identifying deadlocks. When the job manager detects a deadlock condition, it prints diagnostic information to the log describing the deadlock condition. Then it breaks the deadlock by temporarily granting access to the locks owned by a blocked job to other jobs that are waiting on them. It is important to carefully test any implementation involving multiple locks and fix any deadlock conditions that are reported by the platform.

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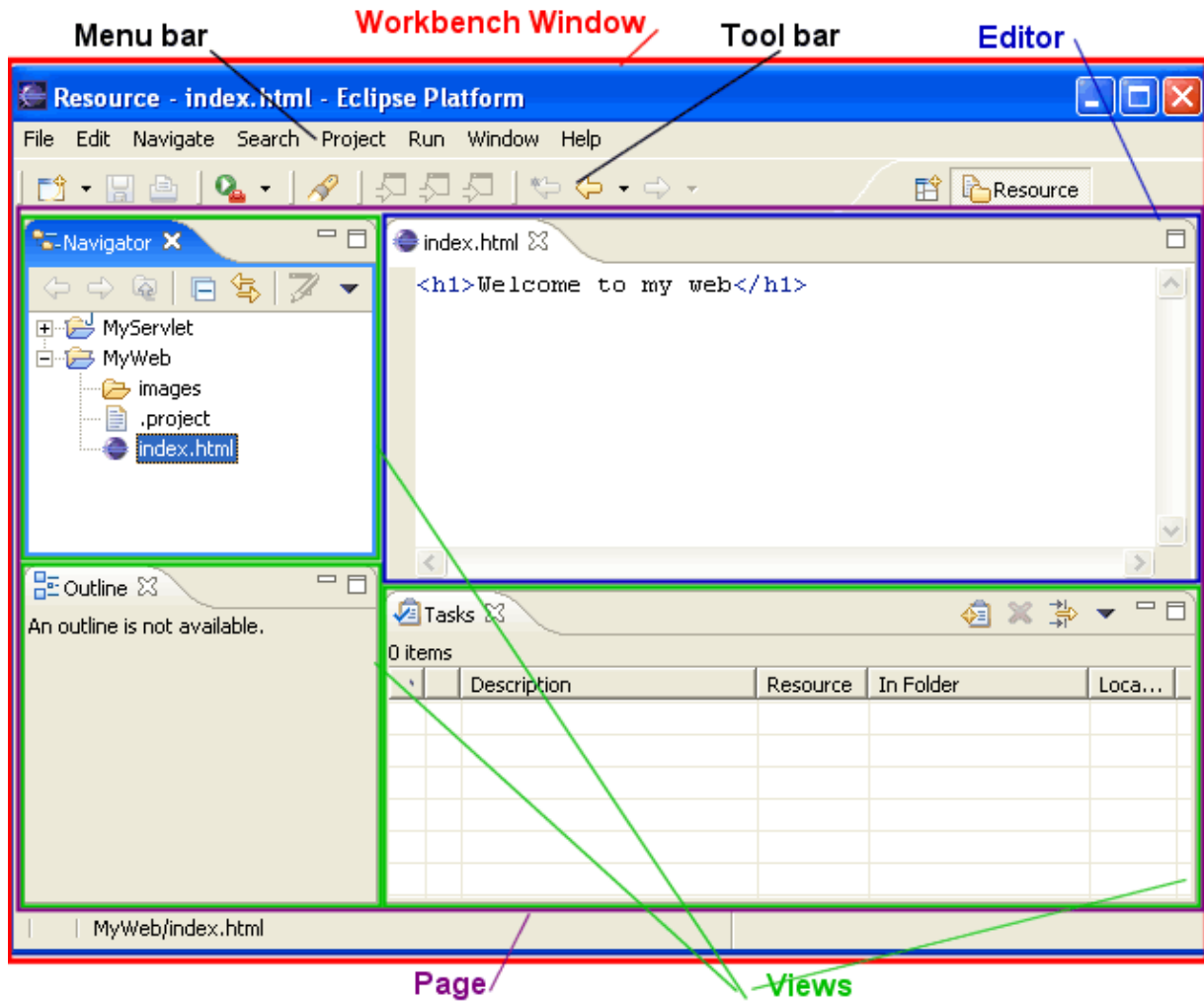
Workbench under the covers

The workbench provides an extensive set of classes and interfaces for building complex user interfaces. Fortunately you don't need to understand all of them to do something simple. We'll start by looking at some concepts that are exposed in the workbench user interface and their corresponding structure under the covers.

Workbench

We've been using the term **workbench** loosely to refer to "that window that opens when you start the platform." Let's drill down a little and look at some of the visual components that make up the workbench.

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For the rest of this discussion, when we use the term workbench, we will be referring to the workbench window (**IWorkbenchWindow**). The workbench window is the top-level window in a workbench. It is the frame that holds the menu bar, tool bar, status line, short cut bar, and pages. In general, you don't need to program to the workbench window. You just want to know that it's there.

Note: You can open multiple workbench windows; however each workbench window is a self-contained world of editors and views, so we'll just focus on a single workbench window.

From the user's point of view, a workbench contains views and editors. There are a few other classes used to implement the workbench window.

Page

Inside the workbench window, you'll find one page (**IWorkbenchPage**) that in turn contains parts. Pages are an implementation mechanism for grouping parts. You typically don't need to program to the page, but you'll see it in the context of programming and debugging.

Perspectives

Perspectives provide an additional layer of organization inside the workbench page. A perspective defines an appropriate collection of views, their layout, and applicable actions for a given user task. Users can switch between perspectives as they move across tasks. From an implementation point of view, the user's active perspective controls which views are shown on the workbench page and their positions and sizes. Editors are not affected by a change in perspective.

Views and editors

Views and editors are where we move beyond implementation details into some common plug-in programming. When you add a visual component to the workbench, you must decide whether you want to implement a view or an editor. How do you decide this?

- A **view** is typically used to navigate a hierarchy of information, open an editor, or display properties for the active editor. For example, the **navigator** view allows you to navigate the workspace hierarchy. The **properties** and **outline** views show information about an object in the active editor. Any modifications that can be made in a view (such as changing a property value) are saved immediately.
- An **editor** is typically used to edit or browse a document or input object. Modifications made in an editor follow an open-save-close model, much like an external file system editor. The platform text editor and Java editor are examples of workbench editors.

In either case, you will be building your view or editor according to a common lifecycle.

- You implement a **createPartControl** method to create the SWT widgets that represent your visual component. You must determine which widgets to use and allocate any related UI resources needed to display your view or editor.
- When your view or editor is given focus, you'll receive a **setFocus** notification so that you can set the focus to the correct widget.
- When the view or editor is closed, you will receive a **dispose** message to signify that the view or editor is being closed. At this point the controls allocated in **createPartControl** have already been disposed for you, but you must dispose of any graphics resources (such as cursors, icons, or fonts) that you allocated for the view or editor.

Throughout this lifecycle, events will fire from the containing workbench page to notify interested parties about the opening, activation, deactivation, and closing of the views and editors.

Seem simple? It can be. That's the beauty of workbench views and editors. They're just widget holders, and can be as simple or complex as you need them to be. We saw the simplest of views earlier when we built a hello world view. Let's look at it again now that we've explained more about what's going on.

```
package org.eclipse.examples.helloworld;

import org.eclipse.swt.widgets.Composite;
import org.eclipse.swt.widgets.Label;
import org.eclipse.swt.SWT;
import org.eclipse.ui.part.ViewPart;

public class HelloWorldView extends ViewPart {
    Label label;
    public HelloWorldView() {
```

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```
}  
public void createPartControl(Composite parent) {  
    label = new Label(parent, SWT.WRAP);  
    label.setText("Hello World");  
}  
public void setFocus() {  
    // set focus to my widget.  For a label, this doesn't  
    // make much sense, but for more complex sets of widgets  
    // you would decide which one gets the focus.  
}  
}
```

Notice that we didn't have to implement a **dispose()** method since we didn't do anything but create a label in the **createPartControl(parent)** method. If we had allocated any UI resources, such as images or fonts, we would have disposed of them here. Since we extended the **ViewPart** class, we inherit the "do nothing" implementation of **dispose()**.

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org.eclipse.ui.views

A view is a workbench part that can navigate a hierarchy of information or display properties for an object. Only one instance of any given view is open in a workbench page. When the user makes selections or other changes in a view, those changes are immediately reflected in the workbench. Views are often provided to support a corresponding editor. For example, an **outline** view shows a structured view of the information in an editor. A **properties** view shows the properties of an object that is currently being edited.

The extension point **org.eclipse.ui.views** allows plug-ins to add views to the workbench. Plug-ins that contribute a view must register the view in their **plugin.xml** file and provide configuration information about the view, such as its implementation class, the category (or group) of views to which it belongs, and the name and icon that should be used to describe the view in menus and labels.

The interface for views is defined in **IViewPart**, but plug-ins can choose to extend the **ViewPart** class rather than implement an **IViewPart** from scratch.

We implemented a minimal view extension in the hello world example. Now we'll look at one that is aware of other workbench views and responds to user navigation and selection changes in the workbench. First, let's take a look at the declaration of the extension in the **plugin.xml**.

```
<extension  
  point="org.eclipse.ui.views">  
  <category  
    id="org.eclipse.ui.examples.readmetool"  
    name="%Views.category">  
  </category>  
  <view  
    id="org.eclipse.ui.examples.readmetool.views.SectionsView"  
    name="%Views.ReadmeSections"  
    icon="icons/view16/sections.gif"  
    category="org.eclipse.ui.examples.readmetool"  
    class="org.eclipse.ui.examples.readmetool.ReadmeSectionsView">  
  </view>  
</extension>
```

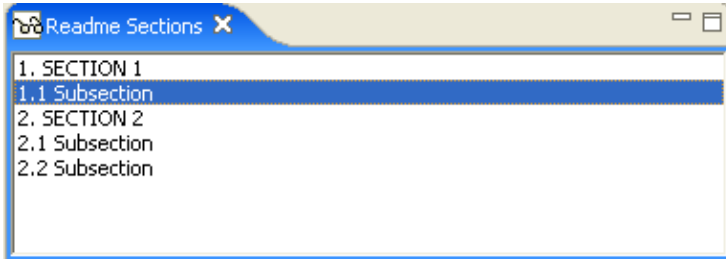
This should look pretty familiar. We see that a new view, **ReadmeSectionsView**, is contributed to the

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workbench. The **view id**, **name**, and **category** are specified as we've seen before. An **icon** is also provided for the view, using a path relative to the plug-in's installation directory.

Let's look at the **ReadmeSectionsView**. You can show any view in the workbench by choosing **Window**→**Show View**→**Other...** and selecting the view from the **Show View** list.

When we show the **ReadmeSectionsView**, a view with a list in it pops up. The list is empty unless we click on a file with an extension of **.readme**, in which case the list is populated with sections from the readme file.



How does the plug-in recognize the readme file and how did it know about selection changes? If we can track down the answers to these questions, we are well on our way to understanding how to build integrated workbench plug-ins.

We'll start with the familiar **createPartControl** method. As we saw in the Hello World example, this is where the widgets that represent a view are created. We'll ignore some of the code to get started.

```
public void createPartControl(Composite parent) {
    viewer = new ListViewer(parent);
    ...
    // add myself as a global selection listener
    getSite().getPage().addSelectionListener(this);

    // prime the selection
    selectionChanged(null, getSite().getPage().getSelection());
}
```

The view creates and stores a `ListViewer` and registers itself as a selection listener on its page. It obtains the page from an **IViewSite**, which contains information about the view's context, such as its workbench window, its containing page, and its plug-in. When we are notified of a selection change, what happens? The following code is executed:

```
public void selectionChanged(IWorkbenchPart part, ISelection sel) {
    //if the selection is a readme file, get its sections.
    AdaptableList input = ReadmeModelFactory.getInstance().getSections(sel);
    viewer.setInput(input);
}
```

It looks like the **ReadmeModelFactory** class is responsible for turning the selection into readme sections and these sections are input for the viewer that we created in the **createPartControl** method.

But how did the viewer populate its list widgets? For now, let's assume that once the viewer was told its input element, it knew how to populate its list widget with the information – it is a `ListViewer`, after all. If you must know right now what this viewer is all about, go to [Viewers](#).

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We still do not know how readme files are detected or where the file's section information comes from. A quick look at the **ReadmeModelFactory** sheds some light.

```
public AdaptableList getSections(ISelection sel) {
    // If sel is not a structured selection just return.
    if (!(sel instanceof IStructuredSelection))
        return null;
    IStructuredSelection structured = (IStructuredSelection)sel;

    //if the selection is a readme file, get its sections.
    Object object = structured.getFirstElement();
    if (object instanceof IFile) {
        IFile file = (IFile) object;
        String extension = file.getFileExtension();
        if (extension != null && extension.equals(IReadmeConstants.EXTENSION)) {
            return getSections(file);
        }
    }

    //the selected object is not a readme file
    return null;
}
```

We check the selection to see if it is a structured (multiple) selection. (The concept of a structured selection comes from [JFace_viewers](#).) For the first object in the selection, we check to see whether it is a file (**IFile**) resource. If it is, we check its extension to see if it matches the ".readme" extension. Once we know we have a readme file, we can use other methods to parse the sections. You can browse the rest of **ReadmeModelFactory**, **MarkElement**, and **DefaultSectionsParser** for the details about the file parsing.

We've covered a lot of common workbench concepts by studying this extension. Now we'll move on to some other workbench extensions and examine how your plug-in can further contribute to the workbench UI.

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Viewers

Why would you ever want to use a viewer when we have already seen that workbench UI contributions like views, editors, wizards, and dialogs can be implemented directly with SWT widgets?

Viewers allow you to create widgets while still using your model objects. If you use an SWT widget directly, you have to convert your objects into the strings and images expected by SWT. Viewers act as adapters on SWT widgets, handling the common code for handling widget events that you would otherwise have to implement yourself.

We first saw a viewer in the readme tool's view contribution, inside the **ReadmeSectionsView**.

```
public void createPartControl(Composite parent) {
    viewer = new ListViewer(parent);
    ...
}
```

*Note: Viewers can be used to provide the implementation for both workbench views and editors. The term viewer does not imply that they are only useful for implementing views. For example, the **TextViewer** is used in the implementation in many of the workbench and plug-in editors.*

Standard viewers

JFace provides viewers for most of the non-trivial widgets in SWT. Viewers are most commonly used for list, tree, table, and text widgets.

Each viewer has an associated SWT widget. This widget can be created implicitly by supplying the parent **Composite** in a convenience viewer constructor, or explicitly by creating it first and supplying it to the viewer in its constructor.

List-oriented viewers

Lists, trees, and tables share many common capabilities from a user's point of view, such as population with objects, selection, sorting, and filtering.

These viewers keep a list of domain objects (called **elements**) and display them in their corresponding SWT widget. A list viewer knows how to get a text label from any element in the list. It obtains the label from an **ILabelProvider** which can be set on the viewer. List viewers know how to map from the widget callbacks back into the world of elements known by the viewer client.

Clients that use a plain SWT widget have to operate at the SWT level – where items are strings and events often relate to an index within the list of strings. Viewers provide higher level semantics. Clients are notified of selections and changes to the list using the elements they provided to the viewer. The viewer handles all the grunt work for mapping indexes back to elements, adjusting for a filtered view of the objects, and re-sorting when necessary.

Filtering and sorting capability is handled by designating a viewer sorter (**ViewerSorter**) and/or viewer filter (**ViewerFilter**) for the viewer. (These can be specified for tree and table viewers in addition to list viewers.) The client need only provide a class that can compare or filter the objects in the list. The viewer handles the details of populating the list according to the specified order and filter, and maintaining the order and filter as elements are added and removed.

Viewers are not intended to be extended by clients. To customize a viewer, you can configure it with your own content and label providers.

A **ListViewer** maps elements in a list to an SWT **List** control.

A **TreeViewer** displays hierarchical objects in an SWT **Tree** widget. It handles the details for expanding and collapsing items. There are several different kinds of tree viewers for different SWT tree controls (plain tree, table tree, checkbox tree).

A **TableView** is very similar to a list viewer, but adds the ability to view multiple columns of information for each element in the table. Table viewers significantly extend the function of the SWT table widget by introducing the concept of editing a cell. Special cell editors can be used to allow the user to edit a table cell using a combo box, dialog, or text widget. The table viewer handles the creation and placement of these widgets when needed for user editing. This is done using the **CellEditor** classes, such as **TextCellEditor** and **CheckboxCellEditor**.

Text viewer

Text widgets have many common semantics such as double click behavior, undo, coloring, and navigating by index or line. A **TextViewer** is an adapter for an SWT **StyledText** widget. Text viewers provide a document model to the client and manage the conversion of the document to the styled text information provided by the text widget.

Text viewers are covered in more detail in [Workbench Editors](#).

Viewer architecture

To understand a viewer, you must become familiar with the relationship between a viewer's input element, its contents, its selection, and the information actually displayed in the widget that it is manipulating.

Input elements

An **input element** is the main object that the viewer is displaying (or editing). From the viewer's point of view, an input element can be any object at all. It does not assume any particular interface is implemented by the input element. (We'll see why in a moment when we look at content providers.)

A viewer must be able to handle a change of input element. If a new input element is set into a viewer, it must repopulate its widget according to the new element, and disassociate itself from the previous input element. The semantics for registering as a listener on an input element and populating the widget based on the element are different for each kind of viewer.

Content viewers

A **content viewer** is a viewer that has a well defined protocol for obtaining information from its input element. Content viewers use two specialized helper classes, the **IContentProvider** and **ILabelProvider**, to populate their widget and display information about the input element.

IContentProvider provides basic lifecycle protocol for associating a content provider with an input element and handling a change of input element. More specialized content providers are implemented for different kinds of viewers. The most common content provider is **IStructuredContentProvider**, which can provide a list of objects given an input element. It is used in list-like viewers, such as lists, tables, or trees. In general, the content provider knows how to map between the input element and the expected viewer content.

ILabelProvider goes a step further. Given the content of a viewer (derived from the input element and content provider), it can produce the specific UI elements, such as names and icons, that are needed to display the content in the viewer. Label providers can aid in saving icon resources since they can ensure the same instance of the icon is used for all like types in a viewer.

Note: Instances of particular content and label providers are not intended to be shared across multiple viewers. Even if all your viewers use the same type of content or label provider, each viewer should be initialized with its own instance of the provider class. The provider life cycle protocol is designed for a 1-to-1 relationship between a provider and its viewer.

Input elements, content providers, and label providers allow viewers to hide most of the implementation details for populating widgets. Clients of a viewer need only worry about populating a viewer with the right

kind of input and content provider. The label provider must know how to derive the UI information from the viewer content.

Viewers and the workbench

The flexibility provided by viewers, content providers, and label providers can be demonstrated by looking at how the workbench uses them.

The **WorkbenchContentProvider** is a structured content provider that obtains contents from an input element by asking for its children. The concept of adapters is used again in order to implement generic function. When asked for the list of elements from its input element, the **WorkbenchContentProvider** obtains an **IWorkbenchAdapter** for the input element. If an **IWorkbenchAdapter** has been registered for the input element, then the content provider can safely assume that the element can be queried for its children. **WorkbenchContentProvider** also does the work needed to keep its viewer up to date when the workspace changes.

The **WorkbenchLabelProvider** is a label provider that obtains an **IWorkbenchAdapter** from an object in order to find its text and image. The concept of a label provider is particularly helpful for workbench objects because it allows a single label provider to cache images that are commonly used in a viewer. For example, once the **WorkbenchLabelProvider** obtains an image to use for an **IProject**, it can cache that image and use it for all **IProject** objects shown in the viewer.

By defining a common adapter, **IWorkbenchAdapter**, and registering it for many of the platform types, we make it possible for these types to be represented correctly in many of the common viewers and the workbench views that contain them.

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org.eclipse.ui.viewActions

It is common for plug-ins to contribute behavior to views that already exist in the workbench. This is done through the **org.eclipse.ui.viewActions** extension point. This extension point allows plug-ins to contribute menu items, submenus and tool bar entries to an existing view's local pull-down menu and local tool bar.

You may have noticed an item in the navigator's local tool bar that becomes enabled whenever a readme file is selected. This item also appears in the navigator's local pull-down menu. These actions appear because the readme tool plug-in contributes them using the **viewActions** extension.



The relevant **plugin.xml** contribution is below.

```
<extension
```

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```
point = "org.eclipse.ui.viewActions">
  <viewContribution
    id="org.eclipse.ui.examples.readmetool.vcl"
    targetID="org.eclipse.ui.views.ResourceNavigator">
    <action id="org.eclipse.ui.examples.readmetool.val"
      label="%PopupMenu.ResourceNav.label"
      menubarPath="additions"
      toolbarPath="additions"
      icon="icons/obj16/editor.gif"
      tooltip="%PopupMenu.ResourceNav.tooltip"
      helpContextId="org.eclipse.ui.examples.readmetool.view_action_context"
      class="org.eclipse.ui.examples.readmetool.ViewActionDelegate"
      enablesFor="1">
      <selection class="org.eclipse.core.resources.IFile" name="*.readme"/>
    </action>
  </viewContribution>
</extension>
```

A view contribution with a unique id is specified. The view to which we are adding the action is specified in the **targetID**. We are contributing to the resource navigator's menu. We specify the label and the menu bar and tool bar locations for the new action. (For a complete discussion of menu and toolbar locations, see [Menu and toolbar paths](#)).

We also specify the conditions under which the action should be enabled. You can see that this action will be enabled when there is one selection (**enablesFor="1"**) of type **IFile** (**class="org.eclipse.core.resources.IFile"**), whose name has **".readme"** in the file extension (**name="*.readme"**). Sure enough, that's exactly what happens when you click around in the resource navigator.

The information in the **plugin.xml** is all that's needed to add items to menus and tool bars since plug-in code will only run when the action is actually selected from the menu or toolbar. To provide the action behavior, the implementation class specified in the **plugin.xml** must implement the **IViewActionDelegate** interface.

In this example, the readme plug-in supplies **ViewActionDelegate** to implement the action. If you browse this class you will see that it includes methods for remembering its view, handling selection changes, and invoking its action. When invoked the action itself simply launches a dialog that announces it was executed.

```
public void run(org.eclipse.jface.action.IAction action) {
    MessageDialog.openInformation(view.getSite().getShell(),
        MessageUtil.getString("Readme_Editor"),
        MessageUtil.getString("View_Action_executed"));
}
```

Although this action is simple, we can imagine how using selections and more functional dialogs could make this action do something more interesting.

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org.eclipse.ui.editors

An editor is a workbench part that allows a user to edit an object (often a file). Editors operate in a manner similar to file system editing tools, except that they are tightly integrated into the platform workbench UI. An editor is always associated with an input object (**IEditorInput**). You can think of the input object as the document or file that is being edited. Changes made in an editor are not committed until the user saves them.

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Only one editor can be open for any particular editor input in a workbench page. For example, if the user is editing `readme.txt` in the workbench, opening it again in the same perspective will activate the same editor. (You can open another editor on the same file from a different workbench window or perspective). Unlike views, however, the same editor type, such as a text editor, may be open many times within one workbench page for different inputs.

The workbench extension point `org.eclipse.ui.editors` is used by plug-ins to add editors to the workbench. Plug-ins that contribute an editor must register the editor extension in their `plugin.xml` file, along with configuration information for the editor. Some of the editor information, such as the implementation `class` and the `name` and the `icon` to be used in the workbench menus and labels, is similar to the view information. In addition, editor extensions specify the file extensions or file name patterns of the file types that the editor understands. Editors can also define a `contributorClass`, which is a class that adds actions to workbench menus and tool bars when the editor is active.

The interface for editors is defined in `IEditorPart`, but plug-ins can choose to extend the `EditorPart` class rather than implement an `IEditorPart` from scratch.

Note: An editor extension can also be configured to launch an external program or to call pre-existing java code. In this discussion, we are focusing on those editors that are actually tightly integrated with the workbench and are implemented using `IEditorPart`.

The readme tool provides a custom editor primarily for the purpose of contributing its own content outliner page to the workbench outline view.

The configuration for the editor extension is defined as follows.

```
<extension
  point = "org.eclipse.ui.editors">
  <editor
    id = "org.eclipse.ui.examples.readmetool.ReadmeEditor"
    name="%Editors.ReadmeEditor"
    icon="icons/obj16/editor.gif"
    class="org.eclipse.ui.examples.readmetool.ReadmeEditor"
    extensions="readme"
    contributorClass="org.eclipse.ui.examples.readmetool.ReadmeEditorActionBarContributor"
  </editor>
</extension>
```

We see the familiar configuration markup for `id`, `name`, `icon`, and `class`. The `extensions` attribute describes the file types that the editor understands. (You could also specify `filenames` if you need to be more specific.) The `class` implements the editor, and the `contributorClass` is responsible for providing editor-related actions. Let's look at the contributor in more detail.

Editor action contributors

The contributor class adds editor-related actions to the workbench menu and toolbar. It must implement the `IEditorActionBarContributor` interface. The contributor is separate from the editor itself since any given workbench page can have multiple editors of the same type. A single contributor is shared by all the editors of a specific type, rather than having each instance of an editor create actions and images.

In `ReadmeEditorActionBarContributor`, we contribute three actions, "Editor Action1," "Editor Action2," and "Editor Action3." These are set up in the constructor.

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```
public ReadmeEditorActionBarContributor() {
    ...
    action1 = new EditorAction(MessageUtil.getString("Editor_Action1"));
    action1.setToolTipText(MessageUtil.getString("Readme_Editor_Action1"));
    action1.setDisabledImageDescriptor(ReadmeImages.EDITOR_ACTION1_IMAGE_DISABLE);
    action1.setImageDescriptor(ReadmeImages.EDITOR_ACTION1_IMAGE_ENABLE);
    ...
    action2 = new RetargetAction(IReadmeConstants.RETARGET2, MessageUtil.getString("Editor_Ac
    action2.setToolTipText(MessageUtil.getString("Readme_Editor_Action2"));
    action2.setDisabledImageDescriptor(ReadmeImages.EDITOR_ACTION2_IMAGE_DISABLE);
    action2.setImageDescriptor(ReadmeImages.EDITOR_ACTION2_IMAGE_ENABLE);
    ...
    action3 = new LabelRetargetAction(IReadmeConstants.LABELRETARGET3, MessageUtil.getString(
    action3.setDisabledImageDescriptor(ReadmeImages.EDITOR_ACTION3_IMAGE_DISABLE);
    action3.setImageDescriptor(ReadmeImages.EDITOR_ACTION3_IMAGE_ENABLE);
    ...
}
```

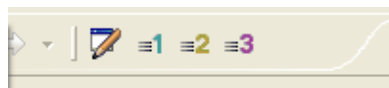
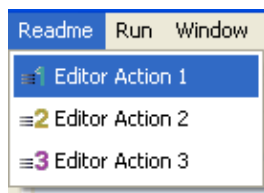
The names and icons for the actions are set up in the code rather than in the **plugin.xml**. (We'll ignore the differences in the action classes for now until we look at [retargetable actions](#).)

Note how similar the action information is to the **viewActions** information we saw in the markup for the view action. The actions are set up in code since we have to manage the sharing of the actions among different instances of the same editor. When the actions are created in the constructor, they are independent of any particular instance of the editor.

When an editor becomes active and it has actions that need to be installed in the workbench menus and tool bar, the **setActiveEditor** message is sent to the contributor. The contributor connects the editor actions to a specific editor.

```
public void setActiveEditor(IEditorPart editor) {
    ...
    action1.setActiveEditor(editor);
    ...
}
```

As you can see, the actions show up in the workbench menu and tool bar when a readme editor is active.

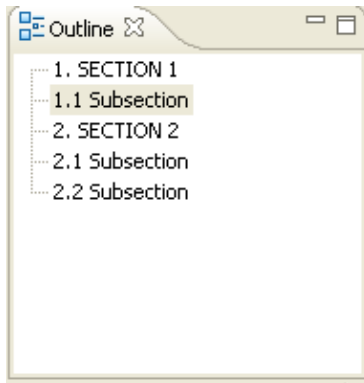


These menu and tool bar items are only shown when the editor is active. The location for the menu and tool bar items can be specified as described in [Menu and toolbar paths](#).

Editors and content outliners

The readme editor itself, **ReadmeEditor**, is not very complicated. It extends the **TextEditor** class so that it can contribute a customized content outliner page to the outline view when a readme file is being edited. It

does not change any behavior inside the text editor.



Editors often have corresponding content outliners that provide a structured view of the editor's contents and assist the user in navigating through the contents of the editor. See [Content outliners](#) for more detail.

We'll look at the implementation of text editors in [Text editors and platform text](#).

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Contributing new retargetable actions

The workbench is not the only plug-in that can create retargetable actions. Your plug-in can define its own retargetable action, so that views and editors within your plug-in can share the same menu actions. There are two ways to contribute retargetable actions from your plug-in:

- An **editor** can define a retargetable action for which the editor and related views can hook handlers. The action is only available in the menu bar when the editor is open.
- An **action set** can define a retargetable action for which editors and views can hook handlers. The action will be visible as long as the action set is visible, but it will only be enabled if the active part has hooked a handler for the action.

This mechanism is useful for providing tight integration between editors and related views. For example, a content outline view can implement a handler for an action defined by its associated editor.

The [readme tool](#) example demonstrates both of these techniques.

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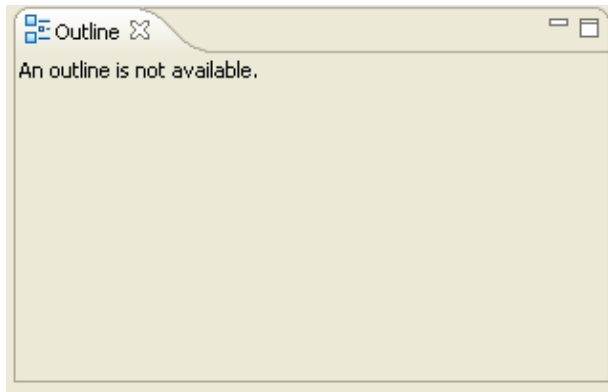
Content outliners

Editors often have corresponding **content outliners** that provide a structured view of the editor contents and assist the user in navigating through the contents of the editor.

The workbench provides a standard **Outline** view for this purpose. The workbench user controls when this view is visible using the **Window > Show View** menu.

Since the generic **TextEditor** doesn't know anything about the structure of its text, it cannot provide behavior for an interesting outline view. Therefore, the default **Outline** view, shown below, doesn't do much.

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Editors in the text framework can supply their own content outliner page to the outline view. The outliner for an editor is specified when the workbench requests an adapter of type **IContentOutlinePage**.

```
public Object getAdapter(Class required) {
    if (IContentOutlinePage.class.equals(required)) {
        if (fOutlinePage == null) {
            JavaContentOutlinePage widget = getDocumentProvider(), this);
            if (getEditorInput() != null)
                fOutlinePage.setInput(getEditorInput());
        }
        return fOutlinePage;
    }
    return super.getAdapter(required);
}
```

A content outliner page must implement **IContentOutlinePage**. This interface combines the ability to notify selection change listeners (**ISelectionProvider**) with the behavior of being a page in a view (**IPage**). Content outliners are typically implemented using JFace viewers. The default implementation of a content outliner (**ContentOutlinePage**) uses a JFace tree viewer to display a hierarchical representation of the outline. This representation is suitable for many structured outliners, including **JavaContentOutlinePage**.

Let's take a look at the implementation of the page. When the outline page is created by the editor in the snippet above, its input element is set to the editor's input element. This input can often be passed directly to the outline page's viewer, as is done below.

```
public void createControl(Composite parent) {
    super.createControl(parent);

    TreeViewer viewer= getTreeViewer();
    viewer.setContentProvider(new ContentProvider());
    viewer.setLabelProvider(new LabelProvider());
    viewer.addSelectionChangedListener(this);

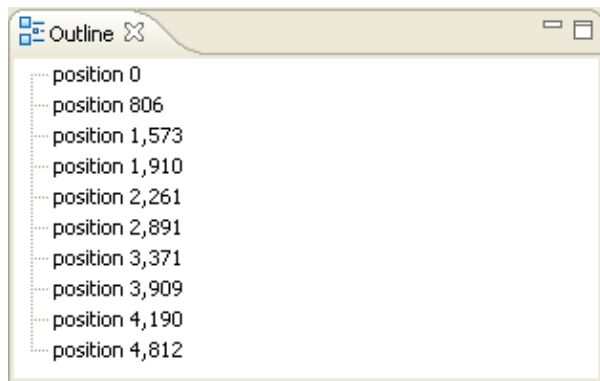
    if (fInput != null)
        viewer.setInput(fInput);
}
```

The tree viewer creation is inherited from **ContentOutlinePage**. The standard label provider is used. The content provider is provided inside **JavaContentOutlinePage** and is responsible for parsing the editor input into individual segments whenever it changes.

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```
public void inputChanged(Viewer viewer, Object oldInput, Object newInput) {
    ...
    if (newInput != null) {
        IDocument document= fDocumentProvider.getDocument(newInput);
        if (document != null) {
            document.addPositionCategory(SEGMENTS);
            document.addPositionUpdater(fPositionUpdater);
            parse(document);
        }
    }
}
```

The text is parsed into ranges, called segments, within the document. These segments are displayed by name in the outline view.



When the selection changes, the selected segment is retrieved. Its offsets are used to set the highlight range in the editor.

```
public void selectionChanged(SelectionChangedEvent event) {

    super.selectionChanged(event);

    ISelection selection= event.getSelection();
    if (selection.isEmpty())
        fTextEditor.resetHighlightRange();
    else {
        Segment segment= (Segment) ((IStructuredSelection) selection).getFirstElement();
        int start= segment.position.getOffset();
        int length= segment.position.getLength();
        try {
            fTextEditor.setHighlightRange(start, length, true);
        } catch (IllegalArgumentException x) {
            fTextEditor.resetHighlightRange();
        }
    }
}
```

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Text editors and platform text

The platform text facility is used to implement the default text editor for the workbench. The interface for text editing is defined in **ITextEditor** as a text specific extension of **IEditorPart**.

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The implementation of **ITextEditor** in the platform is structured in layers. **AbstractTextEditor** defines the framework for extending the editor to support source code style editing of text. This framework is defined in **org.eclipse.ui.texteditor**.

The concrete implementation class **TextEditor** defines the behavior for the standard platform text editor. It is defined in the package **org.eclipse.ui.editors.text**.

The text editor framework provides a model-independent editor that supports the following features:

- presentation and user modification of text
- standard text editing operations such as cut/copy/paste, find/replace
- support for context and pulldown menus
- visual presentation of text annotations in rulers or as squiggles in the text
- automatic update of annotations as the user edits text
- presentation of additional information such as line numbers
- syntax highlighting
- content assist
- text outlining pages that show the hierarchical structure of the text
- context sensitive behavior
- hover support over rulers and text
- key binding contexts
- preference handling

We will explore how these features can be implemented in an editor by studying the **org.eclipse.ui.examples.javaeditor** example. This example shows how complex features like text coloring, hover help, and automatic indenting can be implemented.

In discussing these features we will be moving between the abstract framework, the platform editor **TextEditor**, and the example's subclass, **JavaEditor**.

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org.eclipse.ui.editorActions

We've just seen how editors can contribute their own actions to the workbench menus and tool bar when they become active. The **org.eclipse.ui.editorActions** extension point allows a plug-in to add to the workbench menus and tool bar when another plug-in's editor becomes active.

In the readme example, the plug-in uses the **editorActions** extension point to contribute additional actions to the menu contributed by the readme editor. The definition in our **plugin.xml** should look pretty familiar by now.

```
<extension
  point = "org.eclipse.ui.editorActions">
  <editorContribution
    id="org.eclipse.ui.examples.readmetool.ec1"
    targetID="org.eclipse.ui.examples.readmetool.ReadmeEditor">
    <action id="org.eclipse.ui.examples.readmetool.ea1"
      label="%Editors.Action.label"
      toolbarPath="ReadmeEditor"
      icon="icons/obj16/editor.gif"
      tooltip="%Editors.Action.tooltip"
      class="org.eclipse.ui.examples.readmetool.EditorActionDelegate"
```

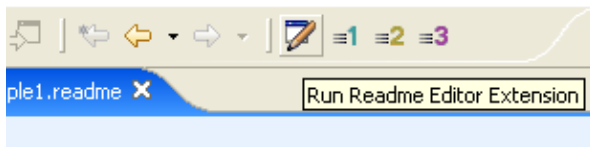
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```
        />  
    </editorContribution>  
</extension>
```

Similar to a view action, the extension must specify the **targetID** of the editor to which it is contributing actions. The action itself is very similar to a view action (**id**, **label**, **icon**, **toolbarPath**, ...), except that the specified class must implement **IEditorActionDelegate**.

Note that a menu bar path is not specified in this markup. Therefore, the action will appear in the workbench tool bar when the editor is active, but not in the workbench menu bar. (See [Menu and toolbar paths](#) for a discussion of toolbar and menu paths.)

Sure enough, when the editor is active, we see our editor action on the tool bar next to the actions that were contributed by the editor itself.



The readme tool supplies **EditorActionDelegate** to implement the action. This class is very similar to the view action delegate we saw earlier.

```
public void run(IAction action) {  
    MessageDialog.openInformation(editor.getSite().getShell(),  
        MessageUtil.getString("Readme_Editor"),  
        MessageUtil.getString("Editor_Action_executed"));  
}
```

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org.eclipse.ui.popupMenus

The **org.eclipse.ui.popupMenus** extension point allows a plug-in to contribute to the popup menus of other views and editors.

You can contribute an action to a specific popup menu by its id (**viewerContribution**), or by associating it with a particular object type (**objectContribution**).

- An **objectContribution** will cause the menu item to appear in popup menus for views or editors where objects of the specified type are selected.
- A **viewerContribution** will cause the menu item to appear in the popup menu of a view or editor specified by id in the markup.

The readme tool defines both. Let's look at the object contribution first.

```
<extension point = "org.eclipse.ui.popupMenus">  
    <objectContribution  
        id="org.eclipse.ui.examples.readmetool"  
        objectClass="org.eclipse.core.resources.IFile"  
        nameFilter="*.readme">  
        <action id="org.eclipse.ui.examples.readmetool.action1"  
            label="%PopupMenu.action"  
            icon="icons/ctool16/openbrwsr.gif"
```

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```
menubarPath="additions"  
helpContextId="org.eclipse.ui.examples.readmetool.open_browser_action_context"  
class="org.eclipse.ui.examples.readmetool.PopupMenuActionDelegate"  
enablesFor="1">  
</action>  
</objectContribution>  
...
```

Object contribution

The action "Show Readme Action" is contributed for the object class **IFile**. This means that any view containing **IFile** objects will show the contribution if **IFile** objects are selected. We see that the selection criteria is restricted further with a name filter (**nameFilter="*.readme"**) and for single selections (**enablesFor="1"**). As we've discussed before, the registration of this menu does not run any code from our plug-in until the menu item is actually selected.

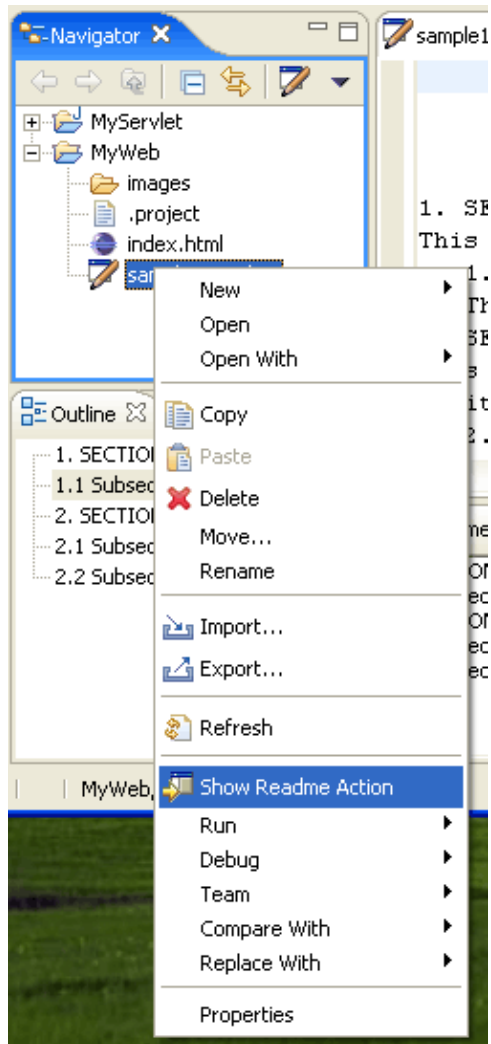
When the menu item is selected, the workbench will run the specified class. Since the popup is declared as an **objectContribution**, the supplied class must implement **IObjectActionDelegate**.

The action is implemented in **PopupMenuActionDelegate**.

```
public void run(IAction action) {  
    MessageDialog.openInformation(  
        this.part.getSite().getShell(),  
        "Readme Example",  
        "PopupMenu Action executed");  
}
```

We can see the popup menu contribution when we select a readme file from the resource navigator.

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Viewer contribution

A viewer contribution is used to contribute to a specific view or editor's popup menu by using its id. Here is the readme tool's viewer contribution:

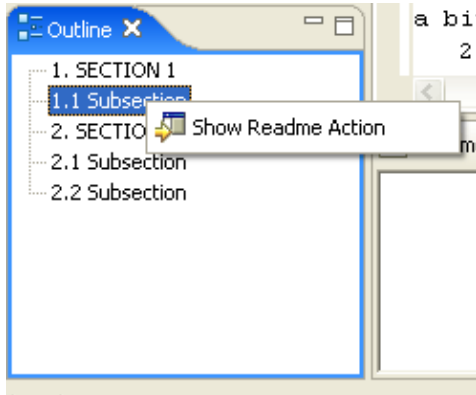
```
...
<viewerContribution
  id="org.eclipse.ui.examples.readmetool2"
  targetID="org.eclipse.ui.examples.readmetool.outline">
  <action id="org.eclipse.ui.examples.readmetool.action1"
    label="%PopupMenu.action"
    icon="icons/ctool16/openbrwsr.gif"
    menubarPath="additions"
    helpContextId="org.eclipse.ui.examples.readmetool.open_browser_action_context"
    class="org.eclipse.ui.examples.readmetool.ViewActionDelegate">
  </action>
</viewerContribution>
</extension>
```

*Note: The name **viewerContribution** is somewhat misleading, as it does not relate to JFace viewers. A better name would be **popupMenuContribution**.*

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When the extension is a **viewerContribution**, the supplied class must implement the **IEditorActionDelegate** or **IViewActionDelegate** interface, depending on whether the action is contributed to an editor's or view's popup menu.

The **targetID** specifies the view whose popup menu will be altered. In this case, we are adding an action to one of the readme tool views, the outliner. The action itself is similar to others that we've seen. We specify the **id**, **label**, and **icon** of the action, and the **path** within the popup for our contribution. The action will be shown only in the readme outline view's popup menu.



The interfaces required to contribute a **viewerContribution** to the **popupMenus** extension point are the same as those required by the **viewActions** and **editorActions** extension points. If you want to contribute the same action to the popup menu and the local menu of a view or editor, you can use the same class for both extensions.

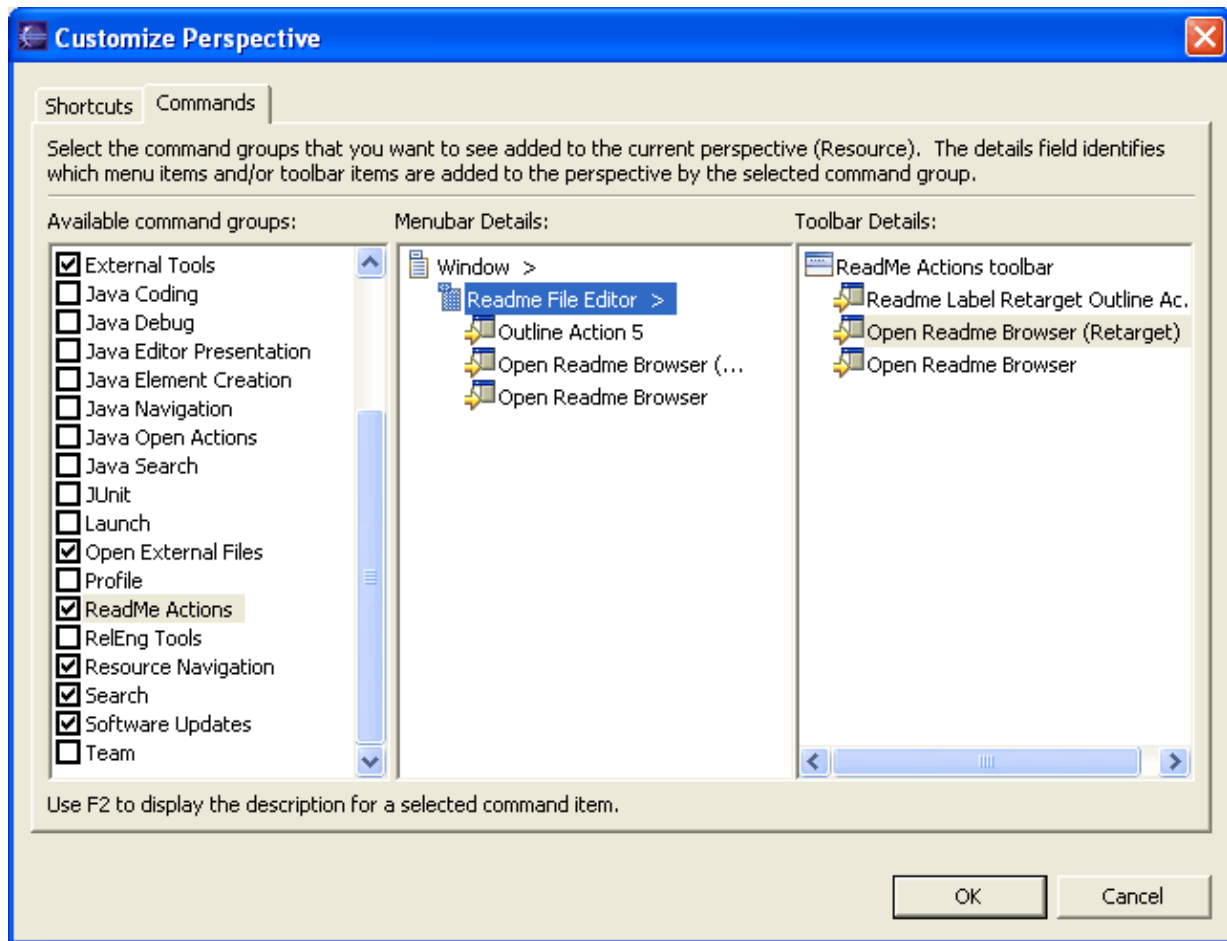
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org.eclipse.ui.actionSets

Your plug-in can contribute menus, menu items, and tool bar items to the workbench menus and toolbar by using the **org.eclipse.ui.actionSets** extension point. In order to reduce the clutter that would be caused by having every plug-in's menu contributions shown at once, the contributions are grouped into action sets which can be made visible by user preference.

You can see which action sets have been contributed to your workbench by choosing **Window->Customize Perspective...** from the workbench menu. This option will show you a dialog that lists action sets as groups of commands. A checkmark by a command group means that the menu and tool bar actions are visible in the workbench. You can select the name of the command group to see the list of available menu and toolbar actions to the right. The figure below shows the list of command groups available in our workbench. (Your workbench may look different depending on which plug-ins you have installed and which perspective is active.)

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The readme tool uses an action set to contribute several different "Open Readme Browser" actions to the workbench menu. (We contributed a similar action to the popup menu of the resource navigator.) The markup follows:

```
<extension point = "org.eclipse.ui.actionSets">
  <actionSet id="org.eclipse.ui.examples.readmetool.actionSet"
    label="%ActionSet.name"
    visible="true">
    <menu id="org.eclipse.ui.examples.readmetool"
      label="%ActionSet.menu"
      path="window/additions">
      <separator name="slot1"/>
      <separator name="slot2"/>
      <separator name="slot3"/>
    </menu>
    <action id="org.eclipse.ui.examples.readmetool.readmeAction"
      menubarPath="window/org.eclipse.ui.examples.readmetool/slot1"
      toolbarPath="readme"
      label="%ReadmeAction.label"
      tooltip="%ReadmeAction.tooltip"
      helpContextId="org.eclipse.ui.examples.readmetool.open_browser_action"
      icon="icons/ctool16/openbrwsr.gif"
      class="org.eclipse.ui.examples.readmetool.OpenReadmeBrowserAction"
      enablesFor="1">
      <selection class="org.eclipse.core.resources.IFile"
        name="*.readme">
      </selection>
    </action>
  </actionSet>
</extension point>
```

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```
...  
</actionSet>  
</extension>
```

Wow, there's a lot going on here! Let's take it a step at a time, looking only at the first action for now.

First, the action set is declared and given a **label**. The label "ReadMe Actions" (defined for **%ActionSet.name** key in the plug-in's properties file) is used to display the action set in the dialog shown above. Since we set **visible** to true, the workbench will initially have the action set checked in the action set list and the actions will be visible.

The rest of the action set declaration is concerned with defining the menu in which the actions appears and the actions themselves.

We define a menu whose **label** appears in the workbench menus. The menu's **path** tells the workbench to place the new menu in the **additions** slot of the **window** menu. (For a discussion of menu paths and slots, see [Menu and toolbar paths](#).) We also define some slots in our new menu so that actions can be inserted at specific locations in our menu.

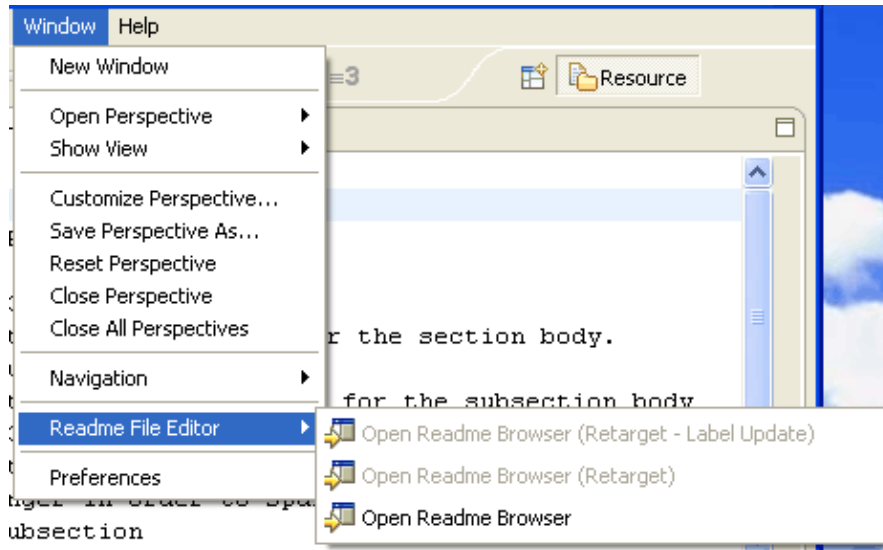
This markup alone is enough to cause the menu to appear in the workbench **Window** menu.



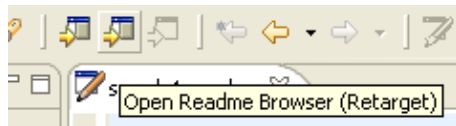
Next, we define the actions themselves.

The action definition (**id**, **label**, **icon**, **class**) is similar to the other actions we've seen in views, editors, and popups. We'll focus here on what's different: where does the action go? We use **menubarPath** and **toolbarPath** to indicate its location. First, we define the **menubarPath** to add the action to a slot in the menu that we just defined ("**window/org.eclipse.ui.examples.readmetool/slot1**").

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Then, we define a new **toolbarPath** to insert our actions in the workbench tool bar. Since we've defined a new tool path, "**readme**", the workbench will decide where it goes relative to other plug-in's toolbar contributions.



What happens when the action is selected by the user? The action is implemented by the class specified in the **class** attribute. The action **class** must implement **IWorkbenchWindowActionDelegate**, or **IWorkbenchWindowPulldownDelegate** if the action will be shown as a pull-down tool item in the tool bar. Since we are not creating a pull-down tool item, we provide **WindowActionDelegate**. This class is similar to **ObjectActionDelegate**. It launches the readme sections dialog when the user chooses the action. (We'll discuss the sections dialog in [Application dialogs](#).)

The action also supplies enabling conditions for its menu item and tool bar item. The menu and tool bar items will only be enabled when a single (**enablesFor="1"**) readme file (**selectionClass** = "**org.eclipse.core.resources.IFile** **name="*.readme"**) is selected. This action's menu and toolbar item appear and are enabled by virtue of the markup in the **plugin.xml** file. None of the plug-in code will execute until the user chooses the action and the workbench runs the action **class**.

We'll look at the other two actions later in the context of [retargetable actions](#).

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Application dialogs

When a standard dialog is too simple for your plug-in, you can build your own dialog using the **Dialog** class. Earlier, we saw how the readme tool contributed an "Open Readme Browser" action in an action set. This action set is shown in the workbench tool bar and **Window**->**Readme File Editor** menu.

Now we are ready to look at the implementation of this action in the readme tool's **WindowActionDelegate**.

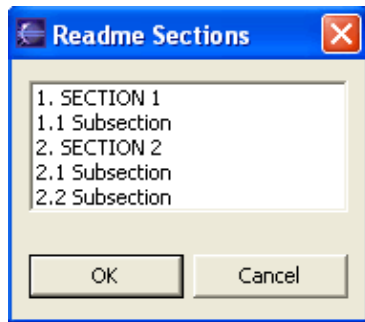
```
public void run(IAction action) {
```

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```
SectionsDialog dialog = new SectionsDialog(window.getShell(),
    ReadmeModelFactory.getInstance().getSections(selection));
dialog.open();
}
```

The window action delegate for the action set uses the current selection in the resource navigator view (the **.readme** file) to get a list of sections in the readme file. This list and the workbench window's shell are passed to the **SectionsDialog**.

When the user selects the action, the **SectionsDialog** is opened.



The **SectionsDialog** is implemented in the readme tool plug-in by subclassing the **Dialog** class in the **org.eclipse.jface.dialogs** package.

The **Dialog** class provides basic support for building a dialog shell window, creating the common dialog buttons, and launching the dialog. The subclasses are responsible for handling the content of the dialog itself:

- **createDialogArea** creates the SWT controls that represent the dialog contents. This is similar to creating the controls for a view or editor.

The **SectionsDialog** creates an SWT list to display the list of sections. It uses a JFace viewer to populate the list. (We'll look at JFace viewers in [Viewers](#).) Note that our dialog does not have to create any of the buttons for the dialog since this is done by our superclass.

```
protected Control createDialogArea(Composite parent) {
    Composite composite = (Composite)super.createDialogArea(parent);
    List list = new List(composite, SWT.BORDER);
    ...
    ListViewer viewer = new ListViewer(list);
    ...
    return composite;
}
```

- **configureShell** is overridden to set an appropriate title for the shell window.

```
protected void configureShell(Shell newShell) {
    super.configureShell(newShell);
    newShell.setText(MessageUtil.getString("Readme Sections"));
    ...
}
```

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- **okButtonPressed** is overridden to perform whatever action is necessary when the user presses the OK button. (You can also override **cancelButtonPressed** or **buttonPressed(int)** depending on the design of your dialog.)

SectionsDialog does not implement an **okButtonPressed** method. It inherits the "do-nothing" implementation from **Dialog**. This is not typical. Your dialog usually performs some processing in response to one of the dialog buttons being pressed.

Dialogs can be as simple or as complicated as necessary. When you implement a dialog, most of your dialog code is concerned with creating the SWT controls that represent its content area and handling any events necessary while the dialog is up. Once a button is pressed by the user, the dialog can query the state of the various controls (or viewers) that make up the dialog to determine what to do.

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Preference pages

The platform UI provides support for storing plug-in preferences and showing them to the user on pages in the workbench **Preferences** dialog. Plug-in preferences are key/value pairs, where the key describes the name of the preference, and the value is one of several different types. (See [Runtime preferences](#) for a detailed description of the runtime preferences infrastructure.)

How does a plug-in contribute a page for showing its preferences? We will use the readme tool example to see how it contributes a preference page to the workbench and then look at some of the underlying support for building preference pages.

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Contributing a preference page

The [org.eclipse.ui.preferencePages](#) extension point allows you to contribute pages to the workbench preferences (**Window**→**Preferences**) dialog. The preferences dialog presents a hierarchical list of user preference entries. Each entry displays a corresponding preference page when selected.

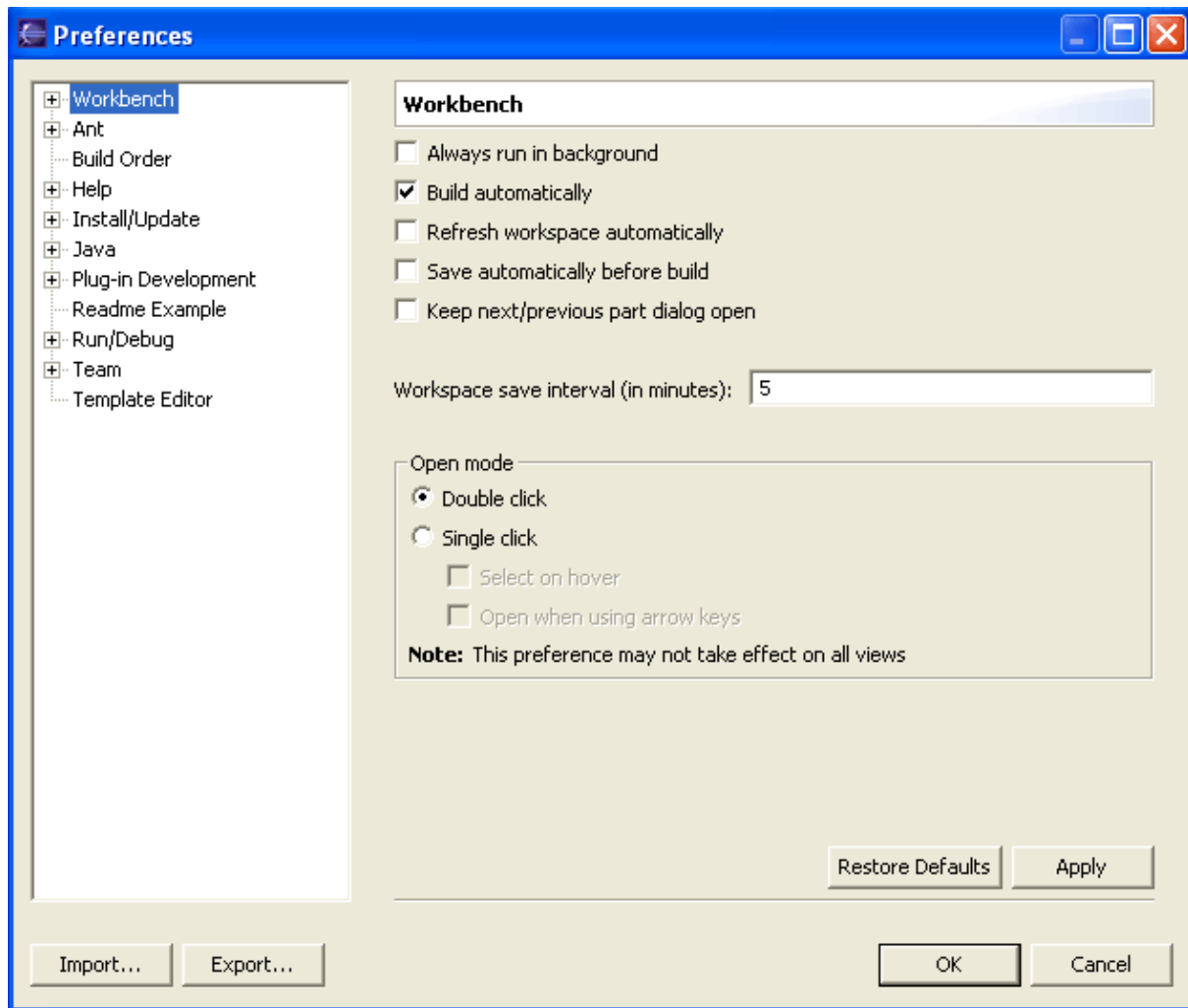
The readme tool uses this extension point to add the Readme Example preferences page.

```
<extension
  point = "org.eclipse.ui.preferencePages">
  <page id="org.eclipse.ui.examples.readmetool.Page1"
    class="org.eclipse.ui.examples.readmetool.ReadmePreferencePage"
    name="%PreferencePage.name">
  </page>
</extension>
```

This markup defines a preference page named "Readme Example" which is implemented by the class **ReadmePreferencePage**. The class must implement the [IWorkbenchPreferencePage](#) interface.

The workbench uses the core runtime's preference mechanisms to access all nodes in the preference tree and their corresponding pages. This list can be initialized from information in the preferences service without running any plug-in code.

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The "Readme Example" preference is added to the top level of the preference tree on the left. Why? Because a preference page contribution will be added as a root of the tree unless a **category** attribute is specified. (The name **category** is somewhat misleading. Perhaps a better name is **path**.) The **category** attribute specifies the id (or a sequence of ids from the root) of the parent page. For example, the following markup would create a second readme tool preference page, "Readme Example Child Page," as a child of the original page.

```
<extension
  point = "org.eclipse.ui.preferencePages">
  <page
    id="org.eclipse.ui.examples.readmetool.Page1"
    class="org.eclipse.ui.examples.readmetool.ReadmePreferencePage"
    name="%PreferencePage.name">
  </page>
  <page
    id="org.eclipse.ui.examples.readmetool.Page2"
    class="org.eclipse.ui.examples.readmetool.ReadmePreferencePage2"
    name="Readme Example Child Page"
    category="org.eclipse.ui.examples.readmetool.Page1">
  </page>
</extension>
```

Once the user selects the entry for a preference page in the tree on the left, the workbench will create and display a preference page using the **class** specified in the extension definition. This action is what activates

the plug-in (if it wasn't already activated due to another user operation).

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Implementing a preference page

Defining the page

Implementing a preference page is similar to creating a page for a wizard. The preference page supplies a **createContents** method that creates the SWT controls representing the page content and adds listeners for any events of interest. The page is responsible for creating and returning the composite that will parent all of the controls in the page. The following snippet shows the highlights:

```
protected Control createContents(Composite parent)
{
    ...
    //composite_textField << parent
    Composite composite_textField = createComposite(parent, 2);
    Label label_textField = createLabel(composite_textField, MessageUtil.getString("Text_Field"));
    textField = createTextField(composite_textField);
    pushButton_textField = createPushButton(composite_textField, MessageUtil.getString("Change"));

    //composite_tab << parent
    Composite composite_tab = createComposite(parent, 2);
    Label label1 = createLabel(composite_tab, MessageUtil.getString("Radio_Button_Options"));

    //
    tabForward(composite_tab);
    //radio button composite << tab composite
    Composite composite_radioButton = createComposite(composite_tab, 1);
    radioButton1 = createRadioButton(composite_radioButton, MessageUtil.getString("Radio_button_1"));
    radioButton2 = createRadioButton(composite_radioButton, MessageUtil.getString("Radio_button_2"));
    radioButton3 = createRadioButton(composite_radioButton, MessageUtil.getString("Radio_button_3"));

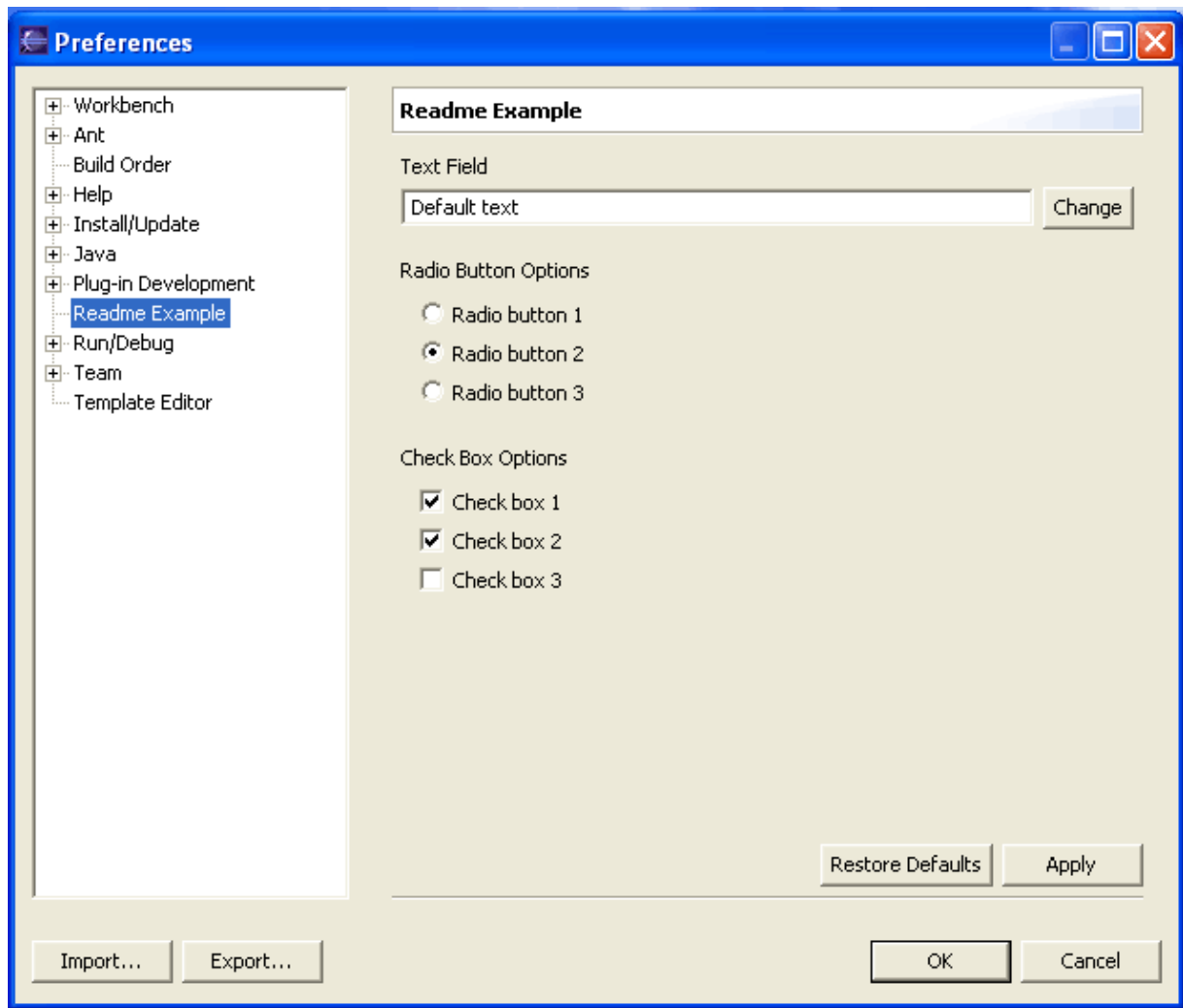
    //composite_tab2 << parent
    Composite composite_tab2 = createComposite(parent, 2);
    Label label2 = createLabel(composite_tab2, MessageUtil.getString("Check_Box_Options"));

    //
    tabForward(composite_tab2);
    //composite_checkBox << composite_tab2
    Composite composite_checkBox = createComposite(composite_tab2, 1);
    checkBox1 = createCheckBox(composite_checkBox, MessageUtil.getString("Check_box_1"));
    checkBox2 = createCheckBox(composite_checkBox, MessageUtil.getString("Check_box_2"));
    checkBox3 = createCheckBox(composite_checkBox, MessageUtil.getString("Check_box_3"));

    initializeValues();

    return new Composite(parent, SWT.NULL);
}
```

Most of the code in this method is concerned with creating and laying out the controls, so we won't dissect it here. Here is what the corresponding page looks like:



The other primary responsibility of a preference page is to react to the **performOk** message. Typically, this method updates and stores the user preferences and, if necessary, updates any other plug-in objects to reflect the change in preferences. The **performDefaults** method is used to restore preferences to their default state when the user presses the **Restore Defaults** button.

You may override **performApply** if you have additional processing when the user selects **Apply**. The default implementation is to call **performOk**.

Preference pages should override the **doGetPreferenceStore()** method to return a preference store for storing their values.

Plug-in preference store

Preference stores are similar in nature to dialog settings. In [Dialog settings](#), we saw how the **AbstractUIPlugin** class maintains dialog settings during the lifetime of a plug-in. A similar strategy is employed for user preferences. Preference stores are merely a convenience mechanism – they provide plug-in level access to preferences that are actually stored using the runtime preferences service. Your plug-in can add entries to a preference store and update the values as the user changes the settings in your preferences page. Since preference stores use the platform preferences service, they will take care of saving these values at the appropriate scope and location, and initializing the preference store using the appropriate mechanisms.

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The following code in the **ReadmePreferencePage** obtains the preference store for the **ReadmePlugin**.

```
protected IPreferenceStore doGetPreferenceStore() {
    return ReadmePlugin.getDefault().getPreferenceStore();
}
```

Because **ReadmePlugin** extends the **AbstractUIPlugin** class, it automatically inherits a preference store. This preference store is initialized using the platform preferences service. The only thing the **ReadmePlugin** has to do is implement a method that initializes the preference controls to their default values. These values are used the first time the preference page is shown or when the user presses the **Defaults** button in the preferences page.

```
protected void initializeDefaultPreferences(IPreferenceStore store) {
    // These settings will show up when Preference dialog
    // opens up for the first time.
    store.setDefault(IReadmeConstants.PRE_CHECK1, true);
    store.setDefault(IReadmeConstants.PRE_CHECK2, true);
    store.setDefault(IReadmeConstants.PRE_CHECK3, false);
    store.setDefault(IReadmeConstants.PRE_RADIO_CHOICE, 2);
    store.setDefault(IReadmeConstants.PRE_TEXT, MessageUtil.getString("Default_text")); //NON-NLS
}
```

Note: If there are no preferences saved anywhere for a plug-in, the plug-in will get an empty preference store.

Retrieving and saving preferences

Once you've associated your plug-in's preference store with your preference page, you can implement the logic for retrieving and saving the preferences.

Preference pages are responsible for initializing the values of their controls using the preferences settings from the preference store. This process is similar to initializing dialog control values from dialog settings. The **ReadmePreferencePage** initializes all of its controls in a single method, **initializeValues**, which is called from its **createContents** method.

```
private void initializeValues() {
    IPreferenceStore store = getPreferenceStore();
    checkBox1.setSelection(store.getBoolean(IReadmeConstants.PRE_CHECK1));
    checkBox2.setSelection(store.getBoolean(IReadmeConstants.PRE_CHECK2));
    checkBox3.setSelection(store.getBoolean(IReadmeConstants.PRE_CHECK3));
    ...
}
```

When the **OK** (or **Apply**) button is pressed, the current values of the controls on the preference page should be stored back into the preference store. The **ReadmePreferencePage** implements this logic in a separate method, **storeValues**.

```
private void storeValues() {
    IPreferenceStore store = getPreferenceStore();
    store.setValue(IReadmeConstants.PRE_CHECK1, checkBox1.getSelection());
    store.setValue(IReadmeConstants.PRE_CHECK2, checkBox2.getSelection());
    store.setValue(IReadmeConstants.PRE_CHECK3, checkBox3.getSelection());
    ...
}
```

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When the user presses the **Defaults** button, the platform will restore all preference store values to the default values specified in the plug-in class. However, your preference page is responsible for reflecting these default values in the controls on the preference page. The **ReadmePreferencePage** implements this in **initializeDefaults**.

```
private void initializeDefaults() {
    IPreferenceStore store = getPreferenceStore();
    checkBox1.setSelection(store.getDefaultBoolean(IReadmeConstants.PRE_CHECK1));
    checkBox2.setSelection(store.getDefaultBoolean(IReadmeConstants.PRE_CHECK2));
    checkBox3.setSelection(store.getDefaultBoolean(IReadmeConstants.PRE_CHECK3));
    ...
}
```

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Field editors

The implementation of a preference page is primarily SWT code. SWT code is used to create the preference page controls, set the values of the controls, and retrieve the values of the controls. The **org.eclipse.jface.preference** package provides helper classes, called **field editors**, that create the widgets and implement the value setting and retrieval code for the most common preference types. The platform provides field editors for displaying and updating many value types, including booleans, colors, strings, integers, fonts, and file names.

FieldEditorPreferencePage implements a page that uses these field editors to display and store the preference values on the page. Instead of creating SWT controls to fill its contents, a **FieldEditorPreferencePage** subclass creates field editors to display the contents. All of the fields on the page must be implemented as field editors. The following is a snippet from the debug UI preferences page:

```
protected void createFieldEditors() {
    addField(new BooleanFieldEditor(IDebugUIConstants.PREF_BUILD_BEFORE_LAUNCH,
        DebugPreferencesMessages.getString("DebugPreferencePage.auto_build_before_launch",
            SWT.NONE, getFieldEditorParent()));
    ...
    String[][] perspectiveNamesAndIds = getPerspectiveNamesAndIds();
    addField(new ComboFieldEditor(IDebugUIConstants.PREF_SHOW_DEBUG_PERSPECTIVE_DEFAULT,
        DebugPreferencesMessages.getString("DebugPreferencePage.Default_perspective_for_D",
            perspectiveNamesAndIds,
            getFieldEditorParent()));
    ...
}
```

Each field editor is assigned the name of its corresponding preference key and the text label for the SWT control that it will create. The kind of control created depends on the type of field editor. For example, a boolean field editor creates a checkbox.

Since the preference page is associated with a preference store (specified in the **doGetPreferenceStore** method), the code for storing the current values, for initializing the control values from the preference store, and for restoring the controls to their default values can all be implemented in the **FieldEditorPreferencePage**.

The **FieldEditorPreferencePage** will use a grid layout with one column as the default layout for field editor widgets. For special layout requirements, you can override the **createContents** method.

The plug-in class

So far, we've been looking at the different extensions that are provided by the readme tool. Let's look at the general definition of the readme tool plug-in.

Plug-in definition

The readme tool plug-in is defined at the top of the **plugin.xml** file.

```
<?xml version="1.0" encoding="UTF-8"?>
<?eclipse version="3.0"?>
<plugin
  id="org.eclipse.ui.examples.readmetool"
  name="%Plugin.name"
  version="2.1.0"
  provider-name="%Plugin.providerName"
  class="org.eclipse.ui.examples.readmetool.ReadmePlugin">

  <runtime>
    <library name="readmetool.jar"/>
  </runtime>
  <requires>
    <import plugin="org.eclipse.ui"/>
    <import plugin="org.eclipse.core.resources"/>
    <import plugin="org.eclipse.core.runtime.compatibility"/>
    <import plugin="org.eclipse.ui.views"/>
    <import plugin="org.eclipse.ui.ide"/>
    <import plugin="org.eclipse.jface.text"/>
    <import plugin="org.eclipse.text"/>
    <import plugin="org.eclipse.ui.workbench.texteditor"/>
    <import plugin="org.eclipse.ui.editors"/>
  </requires>
  ...

```

The plug-in definition includes the **name**, **id**, **version**, and **provider name** of the plug-in. We saw most of these parameters before in our hello world plug-in. The readme tool also defines a specialized plug-in class, **ReadmePlugin**.

The name of the jar file is also provided. File names specified in a **plugin.xml** file are relative to the plug-in's directory, so the readme tool's jar file should be located directly in the plug-in's directory.

The **requires** element informs the platform of the readme tool's dependencies. The workbench UI plug-ins are listed as required plug-ins, along with the various core, jface, and text plug-ins.

AbstractUIPlugin

The **ReadmePlugin** class represents the readme tool plug-in and manages the life cycle of the plug-in. As we saw in the Hello World example, you don't have to specify a plug-in class. The platform will provide one for you. In this case, our plug-in needs to initialize UI related data when it starts up. The platform class **AbstractUIPlugin** provides a structure for managing UI resources and is extended by **ReadmePlugin**.

AbstractUIPlugin uses the generic startup and shutdown methods to manage images, dialog settings, and a

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preference store during the lifetime of the plug-in. We'll look at the specifics of the **ReadmePlugin** class when we work with dialogs and preferences.

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Dialogs and wizards

We've seen how to extend the workbench UI by adding views, editors, and actions to the workbench. Now we can tie it all together by launching our own dialogs in response to these actions.

The JFace UI framework provides several standard dialogs and a framework for building your own dialogs and wizards. We'll look at the different kinds of dialogs and wizards and how to build them.

We'll also cover some simple workbench extensions for contributing wizards.

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Standard dialogs

The package `org.eclipse.jface.dialogs` defines the basic support for dialogs. This package provides standard dialogs for displaying user messages and obtaining simple input from the user.

- **MessageDialog** displays a message to the user. You can set the dialog title, image, button text, and message in the constructor for this dialog.
- **ErrorDialog** displays information about an error. You can set the dialog title and message for the dialog. You can also supply an IStatus object which the dialog will use to obtain an error message.
- **InputDialog** allows the user to enter text. You can set the dialog title, default text value, and supply an object that will validate the text input.
- **ProgressMonitorDialog** shows progress to the user during the running of a long operation.

The standard dialogs are designed so that you can completely specify the dialog in its constructor. We saw a **MessageDialog** in action in the readme tool's view action:

```
MessageDialog.openInformation(  
    view.getSite().getShell(), "Readme Editor", "View Action executed");
```

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Dialog settings

The `org.eclipse.jface.dialogs` package provides a utility class, **DialogSettings**, for storing and retrieving keyed values. You can use this class to save and retrieve primitive data types and string values that you associate with key names. The settings are loaded and saved using an XML file.

AbstractUIPlugin provides support for plug-in wide dialog settings stored in an XML file in your plug-in's directory. If a dialog settings file is not found in your plug-in directory, an empty **DialogSettings** will be created for you. When the plug-in is shut down, any settings that were added to it will be saved in an XML file and retrieved the next time the plug-in is started up.

You can access your dialog settings anywhere in your plug-in code. The following snippet shows how you could obtain the dialog settings for the readme tool.

```
IDialogSettings settings = ReadmePlugin.getDefault().getDialogSettings();
```

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Values are stored and retrieved using get and put methods. The get methods are named after the type of primitive that is being accessed. You can store and retrieve boolean, long, double, float, int, array, and string values. The following snippet shows how we could use dialog settings to initialize control values in a dialog.

```
protected Control createDialogArea(Composite parent) {
    IDialogSettings settings = ReadmePlugin.getDefault().getDialogSettings();
    checkbox = new Button(parent, SWT.CHECK);
    checkbox.setText("Generate sample section titles");
    // initialize the checkbox according to the dialog settings
    checkbox.setSelection(settings.getBoolean("GenSections"));
}
```

The value of the setting can be stored later when the ok button is pressed.

```
protected void okPressed() {
    IDialogSettings settings = ReadmePlugin.getDefault().getDialogSettings();
    // store the value of the generate sections checkbox
    settings.put("GenSections", checkbox.getSelection());
    super.okPressed();
}
```

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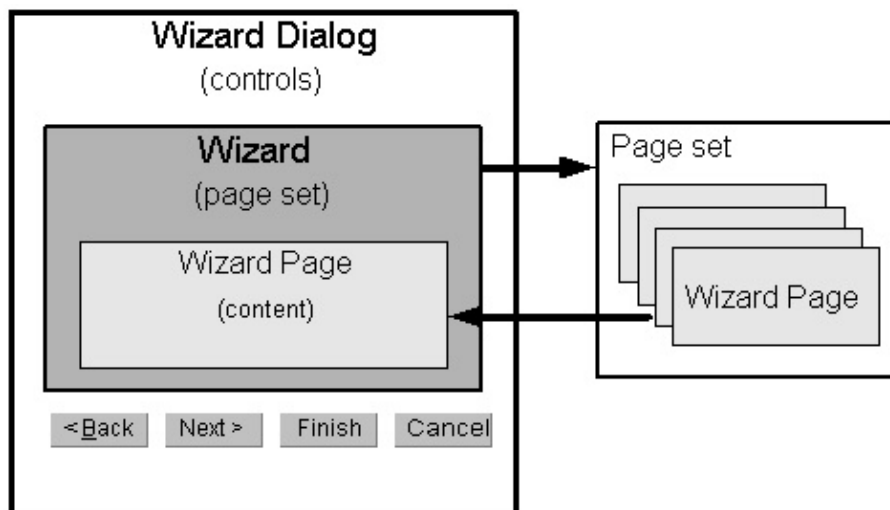
Wizards

Wizards are used to guide the user through a sequenced set of tasks. Your plug-in can contribute wizards at predefined extension points in the workbench. It can also create and launch its own wizards.

When you contribute to a workbench wizard extension point, the actions that launch the wizard are already set up by the workbench. You need only supply the wizard that will be used.

If you need to launch other wizards that are not already defined in workbench wizard extension points, you must launch them yourself. You can launch your own wizards by adding an action to a view, editor, popup, or an action set.

A wizard is composed of several different underlying parts.



Wizard dialog

The wizard dialog (**WizardDialog**) is the top level dialog in a wizard. It defines the standard wizard buttons and manages a set of pages that are provided to it.

When you contribute to a workbench wizard extension, you do not have to create a wizard dialog. One is created on your behalf by the workbench, and your wizard is set into it.

The wizard dialog performs the enabling and disabling of the **Next**, **Back**, and **Finish** buttons based on information it obtains from the wizard and the current wizard page.

Wizard

The wizard (**IWizard**) controls the overall appearance and behavior of the wizard, such as title bar text, image, and the availability of a help button. Wizards often use a corresponding **DialogSettings** to obtain (and store) the default values for the settings of controls on the wizard pages.

The **Wizard** class implements many of the details for standard wizard behavior. You typically extend this class to implement behavior specific to your wizard. The primary responsibilities of your wizard will include:

- Creating and adding your pages to your wizard
- Implementing the behavior that should occur when the user presses the **Finish** button.

Wizard page

The wizard page (**IWizardPage**) defines the controls that are used to show the content of the wizard page. It responds to events in its content areas and determines when the page is completed.

Your wizard page typically extends the **WizardPage** class. The primary responsibilities of your wizard page will include:

- creating the SWT controls that represent the page
- determining when the user has supplied enough information to complete the page (that is, when the user can move to the next page.)

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org.eclipse.ui.newWizards

You can add a wizard to the **File > New >** menu options in the workbench using the **org.eclipse.ui.newWizards** extension point. The readme tool example uses this extension point definition to add the Readme File wizard:

```
<extension
  point = "org.eclipse.ui.newWizards">
  <category
    id = "org.eclipse.ui.examples.readmetool.new"
    parentCategory="org.eclipse.ui.Examples"
    name="%NewWizard.category">
```

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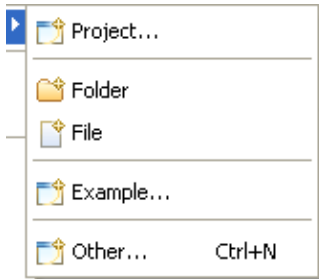
```
</category>
<wizard
  id = "org.eclipse.ui.examples.readmetool.wizards.new.file"
  name = "%NewWizard.name"
  class="org.eclipse.ui.examples.readmetool.ReadmeCreationWizard"
  category="org.eclipse.ui.Examples/org.eclipse.ui.examples.readmetool.new"
  icon="icons/obj16/newreadme_wiz.gif">
  <description>%NewWizard.desc</description>
  <selection class="org.eclipse.core.resources.IResource"/>
</wizard>
</extension>
```

The **category** describes the grouping for the wizard. An optional **parentCategory** establishes the new category as a child of an existing category.

Top level categories will appear in the **File > New** menu. In this example, the **parentCategory** is set to an "Examples" category. Where did the parent category come from? The **org.eclipse.ui** plug-in defines a standard examples category in its markup:

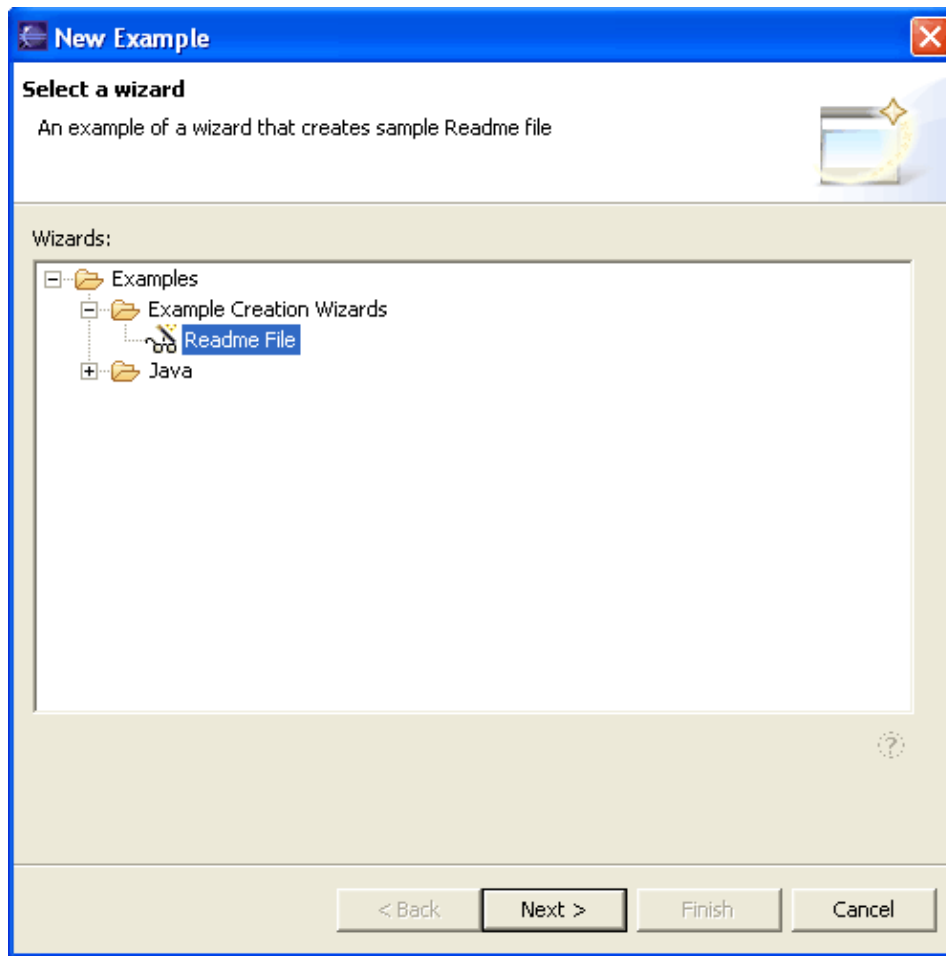
```
<extension
  point="org.eclipse.ui.newWizards">
  <category
    name="%NewWizards.Category.Examples"
    id="org.eclipse.ui.Examples">
  </category>
  ...
```

This category appears in the **File > New** menu.



The readme tool's category **name** defines the label that is used for the next layer of grouping underneath the parent category. These categories are shown as the second level in the tree shown in the **New Example** wizard. The wizard's **name** and **icon** are shown underneath when you expand the category. The **description** of the selected wizard is shown at the top of the wizard when you select it.

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This information about the wizard appears solely because of the markup in the **plugin.xml** file. None of the plug-in code runs until the user chooses the **Next** button. Once this happens, the workbench will instantiate the wizard **class** specified in the markup and pass it an expected selection **class**.

The class identified in this extension (**ReadmeCreationWizard**) must implement the **INewWizard** interface. Most wizards do so by extending the platform **Wizard** class although this is an implementation mechanism and not required by the extension point.

The wizard itself does little but create the pages inside of it. Let's look at the implementation of the page first, and then come back to the wizard.

Pages

The workbench provides base wizard page classes that support the type of processing performed for each wizard extension point. You can use these pages, or extend them to add additional processing.

The goal of the **ReadmeCreationWizard** is to create a new file, add the required content to the file, and as an option, open an editor on the file. Our page needs to define the controls that let the user specify what content goes in the file and whether an editor should be launched.

We create the wizard page, **ReadmeCreationPage**, by extending **WizardNewFileCreationPage**. The controls for a wizard page are defined in a fashion similar to the definition of the controls for a view or an editor. The page implements a **createControl** method, creating the necessary SWT widgets as children of the

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supplied **Composite**. Since the superclass already adds widgets that support new file processing, we need only extend the **createControl** method in our wizard page to add the additional checkboxes that control generation of sections and opening of the editor.

```
public void createControl(Composite parent) {
    // inherit default container and name specification widgets
    super.createControl(parent);
    Composite composite = (Composite)getControl();
    ...
    // sample section generation group
    Group group = new Group(composite,SWT.NONE);
    group.setLayout(new GridLayout());
    group.setText(MessageUtil.getString("Automatic_sample_section_generation"));
    group.setLayoutData(new GridData(GridData.GRAB_HORIZONTAL |
        GridData.HORIZONTAL_ALIGN_FILL));
    ...
    // sample section generation checkboxes
    sectionCheckbox = new Button(group,SWT.CHECK);
    sectionCheckbox.setText(MessageUtil.getString("Generate_sample_section_titles"));
    sectionCheckbox.setSelection(true);
    sectionCheckbox.addListener(SWT.Selection,this);

    subsectionCheckbox = new Button(group,SWT.CHECK);
    subsectionCheckbox.setText(MessageUtil.getString("Generate_sample_subsection_titles"));
    subsectionCheckbox.setSelection(true);
    subsectionCheckbox.addListener(SWT.Selection,this);
    ...
    // open file for editing checkbox
    openFileCheckbox = new Button(composite,SWT.CHECK);
    openFileCheckbox.setText(MessageUtil.getString("Open_file_for_editing_when_done"));
    openFileCheckbox.setSelection(true);
    ...
}
```

You should be able to follow this code if you understand the concepts in [Standard Widget Toolkit](#).

The basic patterns for implementing a page include:

- Add listeners to any controls that affect dynamic behavior of the page. For example, if selecting an item in a list or checking a box affects the state of other controls of the page, add a listener so you can change the state of the page.
- Populate the controls with data based on the current selection when the wizard was launched. Some of the data may depend on the values in other controls. Some of the controls may use dialog settings to initialize their values.
- Use **setPageComplete(true)** when enough information is provided by the user to exit the page (and move to the next page or finish the wizard.)

The **ReadmeCreationPage** class inherits a lot of this behavior from the [WizardNewFileCreationPage](#). Browse the implementation of these classes for further information.

Now that we understand what a page does, let's look again at the wizard.

Wizard

The wizard is responsible for creating the pages and providing the "finish" logic.

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The basic patterns for implementing a wizard include:

- Implement the **init** method to set up local variables for context information such as the workbench and the current selection.

```
public void init(IWorkbench workbench, IStructuredSelection selection) {
    this.workbench = workbench;
    this.selection = selection;
    setWindowTitle(MessageUtil.getString("New_Readme_File"));
    setDefaultPageImageDescriptor(ReadmeImages.README_WIZARD_BANNER);
}
```

- Implement **addPages** by creating instances of the pages.

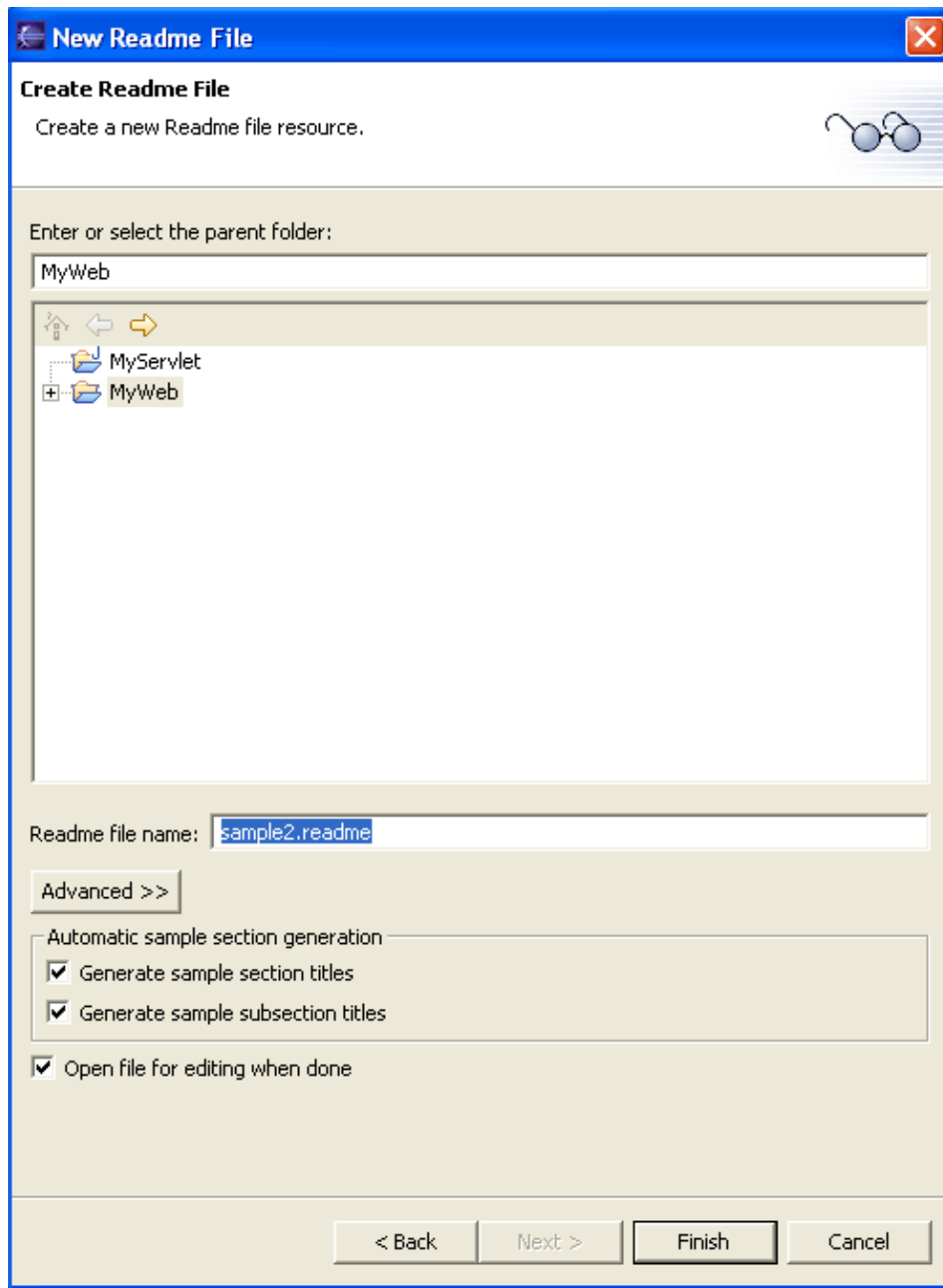
```
public void addPages() {
    mainPage = new ReadmeCreationPage(workbench, selection);
    addPage(mainPage);
}
```

- Implement **performFinish** to finish the task.

Multi-page wizards typically handle the finish logic in the wizard itself, since each page will contribute information that determines how the task is implemented. Single page wizards can implement the logic in the wizard or ask the page to finish the job. The approach you take largely depends on where your important state is kept. In the case of the readme wizard, we are going to ask our page to handle the finish processing.

```
public boolean performFinish() {
    return mainPage.finish();
}
```

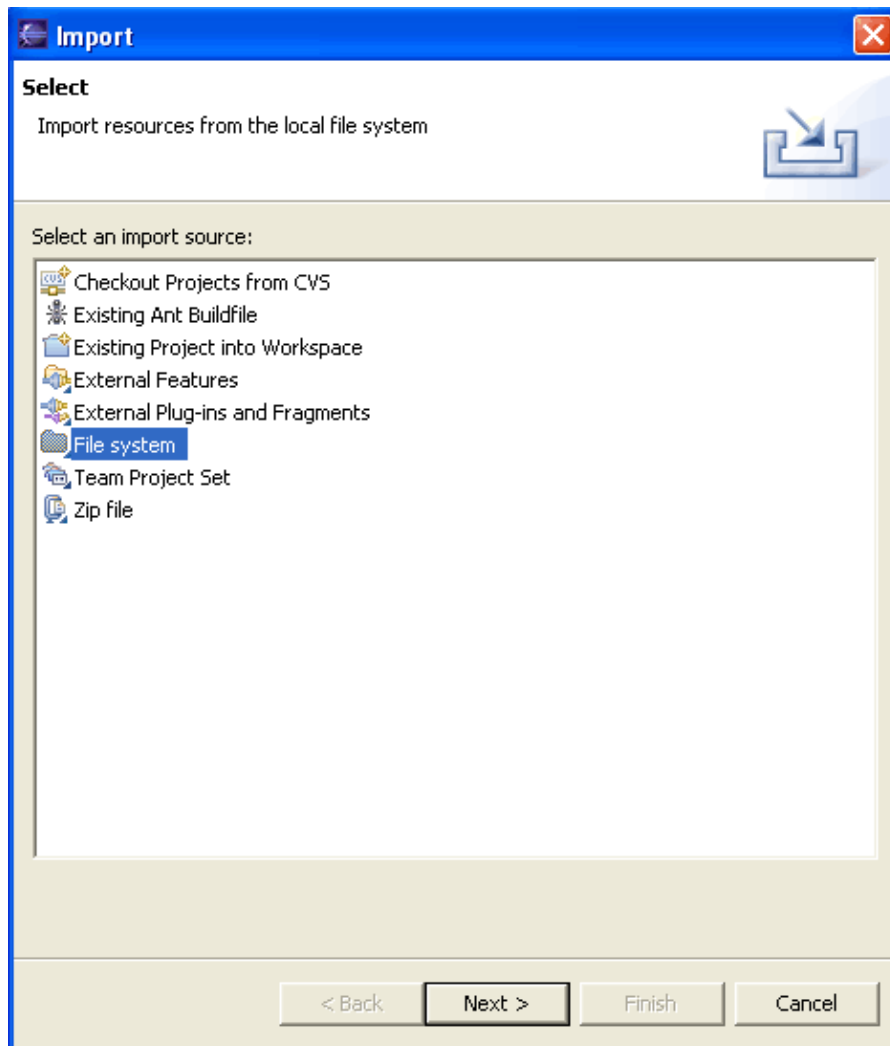
The completed wizard looks like this:



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org.eclipse.ui.importWizards

You can add a wizard to the **File > Import** menu option in the workbench using the **org.eclipse.ui.importWizards** extension point. The process for defining the extension and implementing the wizard is similar to **org.eclipse.ui.newWizards**. The primary difference in the markup is that import wizards do not define or assign categories for the wizards themselves. The wizards appear uncategorized in a wizard dialog.

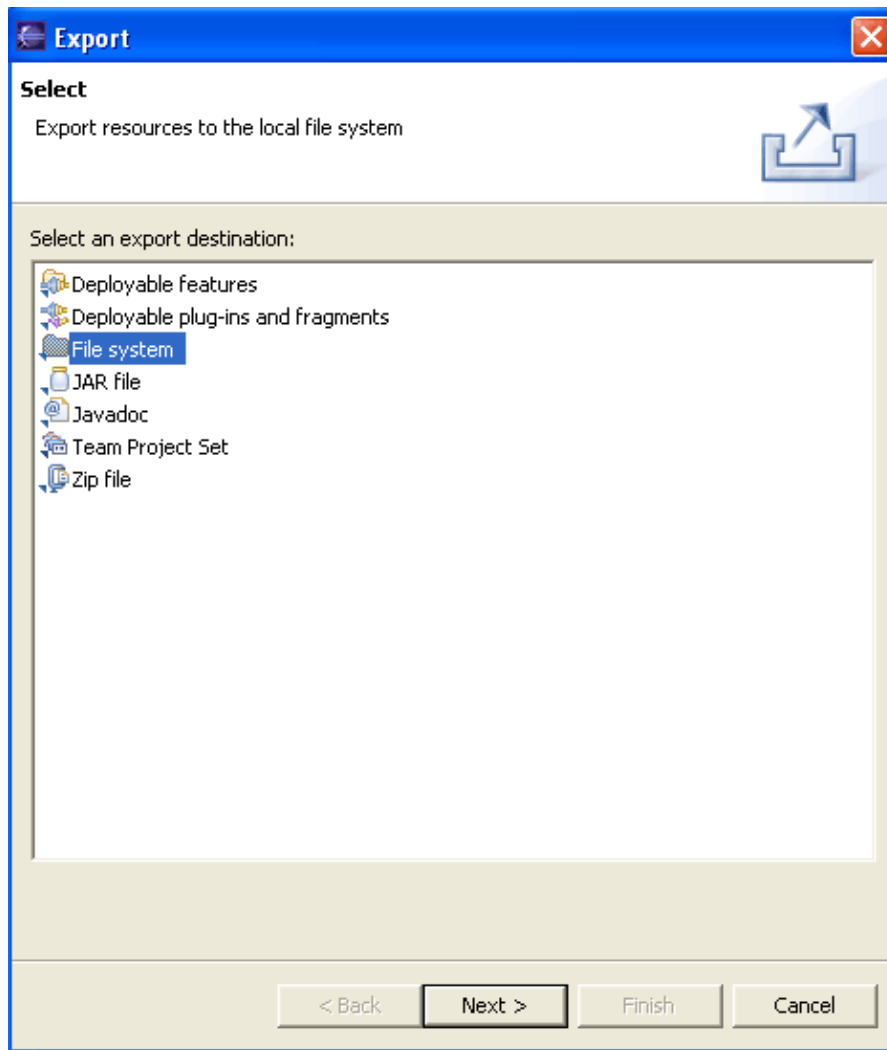


The wizard supplied in the class parameter of the markup must implement **ImportWizard**. Its pages are typically extended from **WizardImportPage**.

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org.eclipse.ui.exportWizards

You can add a wizard to the **File > Export** menu option in the workbench using the **org.eclipse.ui.exportWizards** extension point. The process for defining the extension and implementing the wizard is similar to **org.eclipse.ui.newWizards**. The primary difference in the markup is that export wizards do not define or assign categories for the wizards themselves. The wizards appear uncategorized in a wizard dialog.



The wizard supplied in the class parameter of the markup must implement **IEExportWizard**. Its pages are typically extended from **WizardExportPage**.

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Wizard dialogs

The previous example supplied a wizard for a specified extension point. Another, perhaps more common, case is that you want to launch your own plug-in's wizard from some action that you have defined. (In [Workbench menu contributions](#), we discuss the ways you can contribute actions to the workbench.)

Wizards are displayed in the UI by placing them in a containing dialog. This detail is handled for you when you contribute to a wizard extension. When you are launching your own wizard, you must display it yourself by wrapping it in a **WizardDialog**.

For example, the **ReadmeCreationWizard** could be launched independently by creating a wizard dialog and associating it with the **ReadmeCreationWizard**. The following code snippet shows how this could be done from some action delegate. (The method assumes that we know the workbench and the selection.)

```
public void run(IAction action) {
```

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```
// Create the wizard
ReadmeCreationWizard wizard = new ReadmeCreationWizard();
wizard.init(getWorkbench(), selection);

// Create the wizard dialog
WizardDialog dialog = new WizardDialog
    (getWorkbench().getActiveWorkbenchWindow().getShell(), wizard);
// Open the wizard dialog
dialog.open();
}
```

If you need to embed a wizard anywhere else in your plug-in's user interface, the interface **IWizardContainer** defines the necessary protocol for hosting a wizard.

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Multi-page wizards

If your wizard implements a complex task, you may want to use more than one page to obtain information from the user.

In general, the implementation pattern is the same as for a single page wizard.

- Create a **WizardPage** subclass for each page in your wizard. Each wizard page should use **setPageComplete(true)** when it has enough information.
- Create a **Wizard** subclass which adds each page to the wizard.
- Implement a **performFinish** method to perform the finish logic.

When you design a wizard, it's good practice to put all the required information on the first page if possible. This way, the user does not have to traverse the entire set of pages in order to finish the task. Optional information can go on subsequent pages.

When a page requires input from the user before it can be considered complete, use **setPageComplete(false)** to signify that it is not complete. As the page receives events from its controls, it rechecks to see if the page is complete. Once the required input is provided, **setPageComplete(true)** signals completion.

The **Wizard** class handles the logic required to enable and disable the **Finish** button according to the completion state of the pages. The **Finish** button is only enabled for a wizard when each of its pages have set its completion state to true.

Validation and page control

The classes **WizardNewFileCreationPage** and **CreateReadme1** show a common pattern for implementing page validation.

WizardNewFileCreationPage defines a common event handler for all SWT events which validates the page. This means the page will be validated whenever an event is received from a widget to which the page added a listener.

```
public void handleEvent(Event event) {
    setPageComplete(validatePage());
}
```

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Once the **ReadmeCreationPage** creates its controls, it sets the state of the page using **validatePage**.

```
public void createControl(Composite parent) {
    super.createControl(parent);
    // create controls, add listeners, and layout the page
    ...
    // sample section generation checkboxes
    sectionCheckbox = new Button(group, SWT.CHECK);
    sectionCheckbox.setText(MessageUtil.getString("Generate_sample_section_titles"));
    sectionCheckbox.setSelection(true);
    sectionCheckbox.addListener(SWT.Selection, this);

    subsectionCheckbox = new Button(group, SWT.CHECK);
    subsectionCheckbox.setText(MessageUtil.getString("Generate_sample_subsection_titles"));
    subsectionCheckbox.setSelection(true);
    subsectionCheckbox.addListener(SWT.Selection, this);
    ...
    setPageComplete(validatePage());
}
```

Using this pattern, a wizard page can put all of its page validation code in one method, **validatePage()**. This method determines the initial state of the page and recalculates the state any time it receives an event from a widget on its page.

Since we added a listener to the section checkbox, we will recompute the valid state of the page whenever that checkbox receives a selection event. Note that the page's **handleEvent** method must call super to ensure that the inherited page validation behavior occurs in addition to any specific event handling for this page.

```
public void handleEvent(Event e) {
    Widget source = e.widget;
    if (source == sectionCheckbox) {
        if (!sectionCheckbox.getSelection())
            subsectionCheckbox.setSelection(false);
        subsectionCheckbox.setEnabled(sectionCheckbox.getSelection());
    }
    super.handleEvent(e);
}
```

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Actions and contributions

The action classes allow you to define user commands independently from their presentation in the UI. This gives you the flexibility to change the presentation of an action in your plug-in without changing the code that actually performs the command once it has been chosen. The contribution classes are used to manage the actual UI items representing the commands. You don't program to the contribution classes, but you will see them in some of the workbench and JFace API.

Actions

An action (**IAction**) represents a command that can be triggered by the end user. Actions are typically associated with buttons, menu items, and items in tool bars.

Although actions do not place themselves in the UI, they do have UI oriented properties, such as tool tip text, label text, and an image. This allows other classes to construct widgets for the presentation of the action.

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When the user triggers the action in the UI, the action's run method is invoked to do the actual work. A common pattern in the run method is to query the workbench selections and manipulate the objects that are selected. Another common pattern is to launch a wizard or dialog when an action is chosen.

You should not directly implement the **IAction** interface. Instead, you should subclass the **Action** class. Browse the subclasses of this class to see many of the common patterns for actions. The code below implements the "About" action. It is one of the simpler actions in the workbench.

```
public void run() {  
    new AboutDialog(workbenchWindow.getShell()).open();  
}
```

Earlier we saw the workbench interfaces **IViewActionDelegate** and **IEditorActionDelegate**. These interfaces are used when contributing view actions or editor actions to the workbench. The workbench action delegates are initialized with a reference to their associated view or editor. With this knowledge, they can navigate to the workbench page or window, accessing selections or any other information needed to perform the action.

You will implement your own action classes whenever you want to define a command in your plug-in. If you are contributing actions to other views and editors, you will implement action delegates.

Contribution items

A contribution item (**IContributionItem**) represents the UI portion of an action. More specifically, it represents an item that is contributed to a shared UI resource such as a menu or tool bar.

Contribution items know how to fill a specific SWT widget with the appropriate SWT item that represents the contribution.

You don't have to worry about creating a contribution item when you are contributing actions to the workbench UI. This is done on your behalf when the workbench creates UI items for the actions that you have defined.

Contribution managers

A contribution manager (**IContributionManager**) represents a collection of contribution items that will be presented in the UI. You can add and insert contribution items using named contribution ids to place the items in the appropriate order. You can also find items by id and remove individual items.

Each implementation of **IContributionManager** knows how to fill a specific SWT widget with its items. JFace provides contribution managers for menus (**IMenuManager**), tool bars (**IToolBarManager**), and status lines (**IStatusLineManager**).

As a plug-in developer, you do not need to implement these interfaces, but you will see references to some of these managers in API methods.

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User interface resources

The **org.eclipse.jface.resource** package defines classes that help plug-ins manage UI resources such as fonts

and icons.

Many of the workbench extension points allow plug-ins to supply icons that can be used to show their contributions in the workbench. Since GUI operating systems support a limited number of images or fonts in memory at once, a plug-in's UI resources must be carefully managed and sometimes shared between widgets.

We've already seen several references to icons in the readme tool plug-in. Some of its icons are specified in the **plugin.xml** markup.

```
<extension
  point="org.eclipse.ui.views">
  <category
    id="org.eclipse.ui.examples.readmetool"
    name="%Views.category">
  </category>
  <view
    id="org.eclipse.ui.examples.readmetool.views.SectionsView"
    name="%Views.ReadmeSections"
    icon="icons/view16/sections.gif"
    category="org.eclipse.ui.examples.readmetool"
    class="org.eclipse.ui.examples.readmetool.ReadmeSectionsView">
  </view>
</extension>
```

We've also seen code that describes images on the fly. The following is from the readme tool's **ReadmeEditorActionBarContributor**.

```
public ReadmeEditorActionBarContributor() {
    ...
    action1 = new EditorAction(MessageUtil.getString("Editor_Action1"));
    action1.setToolTipText(MessageUtil.getString("Readme_Editor_Action1"));
    action1.setDisabledImageDescriptor(ReadmeImages.EDITOR_ACTION1_IMAGE_DISABLE);
    action1.setImageDescriptor(ReadmeImages.EDITOR_ACTION1_IMAGE_ENABLE);
    ...
}
```

JFace provides the basic support classes that allow plug-ins to manage their icons and fonts without worrying about when the corresponding platform graphics objects are created and destroyed. These support classes are used directly by plug-ins as shown above, or indirectly when the workbench uses these classes to obtain images that are described in extension point markup.

Image descriptors and the registry

The SWT **Image** class represents an image from the operating system's perspective. Because most GUI operating systems have a limit on the number of images that can be open at once, plug-ins should be very careful when creating them, and ensure that they also dispose of them properly when finished using them. By using the JFace **ImageDescriptor** and **ImageRegistry** classes instead of the SWT image, plug-ins can generally avoid creating, managing, and disposing these images directly.

Image descriptor

The **ImageDescriptor** class can be used as a lightweight description of an image. It specifies everything that is needed to create an image, such as the URL or filename where the image can be obtained.

ImageDescriptors do not allocate an actual platform image unless specifically requested using the **createImage()** method.

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Image descriptors are the best strategy when your code is structured such that it defines all the icons in one place and allocates them as they are needed. Image descriptors can be created at any time without concern for OS resources, making it convenient to create them all in initialization code.

Image registry

The **ImageRegistry** class is used to keep a list of named images. Clients can add image descriptors or SWT images directly to the list. When an image is requested by name from the registry, the registry will return the image if it has been created, or create one from the descriptor. This allows clients of the registry to share images.

Images that are added to or retrieved from the registry must not be disposed by any client. The registry is responsible for disposing of the image since the images are shared by multiple clients. The registry will dispose of the images when the platform GUI system shuts down.

Plug-in patterns for using images

Specifying the image in the plugin.xml

Where possible, specify the icon for your plug-in's UI objects in the **plugin.xml** file. Many of the workbench extension points include configuration parameters for an icon file. By defining your icons in your extension contribution in the plugin.xml, you leave the image management strategy up to the platform. Since the icons are typically kept in your plug-in's directory, this allows you to specify the icons and manage the files all in one place.

The other patterns should only be considered when you can't specify the icon as part of your extension contribution.

Explicit creation

Explicitly creating an image is the best strategy when the image is infrequently used and not shared. The image can be created directly in SWT and disposed after it is used.

Images can also be created explicitly using an **ImageDescriptor** and invoking the **createImage()** method. As in the first case, the **dispose()** method for the image must be invoked after the image is no longer needed. For example, if a dialog creates an image when it is opened, it should dispose the image when it is closed.

Image registry

When an image is used frequently in a plug-in and shared across many different objects in the UI, it is useful to register the image descriptor with an **ImageRegistry**. The images in the registry will be shared with any object that queries an image by the same name. You must not dispose any images in the registry since they are shared by other objects.

Adding an image to the image registry is the best strategy when the image is used frequently, perhaps through the lifetime of the plug-in, and is shared by many objects. The disadvantage of using the registry is that images in the registry are not disposed until the GUI system shuts down. Since there is a limit on the number of platform (SWT) images that can be open at one time, plug-ins should be careful not to register too many icons in a registry.

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The class **AbstractUIPlugin** includes protocol for creating a plug-in wide image registry.

Label providers

When an icon is used frequently to display items in a particular viewer, it can be shared among similar items in the viewer using a label provider. Since a label provider is responsible for returning an image for any object in a viewer, it can control the creation of the image and any sharing of images across objects in the viewer.

The label provider can use any of the previously discussed techniques to produce an image. If you browse the various implementations of **getImage()** in the **LabelProvider** subclasses, you will see a variety of approaches including caching a single icon for objects and maintaining a table of images by type. Images created by a label provider must be disposed in the provider's **dispose()** method, which is called when the viewer is disposed.

Using a label provider is a good compromise between explicit creation and the image registry. It promotes sharing of icons like the image registry, yet still maintains control over the creation and disposal of the actual image.

Plug-in wide image class

When fine-tuning a plug-in, it is common to experiment with all of these different image creation patterns. It can be useful to isolate the decision making regarding image creation in a separate class and instruct all clients to use the class to obtain all images. This way, the creation sequence can be tuned to reflect the actual performance characteristics of the plug-in.

Font registry

Fonts are another limited resource in platform operating systems. The creation and disposal issues are the same for fonts as for images, requiring similar speed/space tradeoffs. In general, fonts are allocated in SWT by requesting a font with a platform dependent font name.

The **FontRegistry** class keeps a table of fonts by their name. It manages the allocation and disposal of the font.

In general, plug-ins should avoid allocating any fonts or describing fonts with platform specific names. Although the font registry is used internally in JFace, it is typically not used by plug-ins. The **JFaceResources** class should be used to access common fonts.

It is very common to allow users to specify their preferences for the application's fonts in a preference page. In these cases, the **FontFieldEditor** should be used to obtain the font name from the user, and a **FontRegistry** may be used to keep the font. The **FontFieldEditor** is only used in preference pages.

JFaceResources

The class **JFaceResources** controls access to common platform fonts and images. It maintains an internal font and image registry so that clients can share named fonts and images.

There are many techniques used in the workbench and other plug-ins to share images where required. The **JFaceResources** image registry is not widely used across the workbench and plug-in code.

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Use of fonts is much simpler. The workbench and most plug-ins use the **JFaceResources** class to request fonts by logical name. Methods such as **getDialogFont()** and **getDefaultFont()** are provided so that plug-ins can use the expected fonts in their UI.

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Widgets

SWT includes many rich features, but a basic knowledge of the system's core – *widgets*, *layouts*, and *events* – is all that is needed to implement useful and robust applications.

Widget application structure

When you are contributing UI elements using platform workbench extensions, the mechanics of starting up SWT are handled for you by the workbench.

If you are writing an SWT application from scratch outside of the workbench, you must understand more about SWT's application structure.

A typical stand-alone SWT application has the following structure:

- Create a ***Display*** which represents an SWT session.
- Create one or more ***Shell***s which serve as the main window(s) for the application.
- Create any other widgets that are needed inside the shell.
- Initialize the sizes and other necessary state for the widgets. Register listeners for widget events that need to be handled.
- Open the shell window.
- Run the event dispatching loop until an exit condition occurs, which is typically when the main shell window is closed by the user.
- Dispose the display.

The following code snippet is adapted from the [**org.eclipse.swt.examples.helloworld.HelloWorld2**](#) application. Since the application only displays the string "Hello World," it does not need to register for any widget events.

```
public static void main (String [] args) {
    Display display = new Display ();
    Shell shell = new Shell (display);
    Label label = new Label (shell, SWT.CENTER);
    label.setText ("Hello_world");
    label.setBounds (shell.getClientArea ());
    shell.open ();
    while (!shell.isDisposed ()) {
        if (!display.readAndDispatch ()) display.sleep ();
    }
    display.dispose ();
}
```

Display

The ***Display*** represents the connection between SWT and the underlying platform's GUI system. Displays are primarily used to manage the platform event loop and control communication between the UI thread and other

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threads. (See [Threading issues for clients](#) for a complete discussion of UI threading issues.)

For most applications you can follow the pattern that is used above. You must create a display before creating any windows, and you must dispose of the display when your shell is closed. You don't need to think about the display much more unless you are designing a multi-threaded application.

Shell

A *Shell* is a "window" managed by the OS platform window manager. Top level shells are those that are created as a child of the display. These windows are the windows that users move, resize, minimize, and maximize while using the application. Secondary shells are those that are created as a child of another shell. These windows are typically used as dialog windows or other transient windows that only exist in the context of another window.

Parents and children

All widgets that are not top level shells must have a parent. Top level shells do not have a parent, but they are created in association with a particular *Display*. You can access this display using *getDisplay()*. All other widgets are created as descendants (direct or indirect) of top level shells.

Composite widgets are widgets that can have children.

When you see an application window, you can think of it as a widget tree, or hierarchy, whose root is the shell. Depending on the complexity of the application, there may be a single child of the shell, several children, or nested layers of composites with children.

Widget life cycle

When your application creates a widget, SWT immediately creates the underlying platform widget. This eliminates the need for code that operates differently depending upon whether the underlying OS widget exists. It also allows a majority of the widget's data to be kept in the platform layer rather than replicating it in the toolkit. This means that the toolkit's concept of a widget lifecycle must conform to the rules of the underlying GUI system.

Widget creation

Most GUI platforms require you to specify a parent when you create a widget. Since SWT creates a platform widget as soon as you create a toolkit widget, the parent widget must be specified in the constructor for the widget.

Style bits

Some widget properties must be set in the OS at the time a widget is created and cannot be subsequently changed. For example, a list may be single or multi-selection, and may or may not have scroll bars.

These properties, called *styles*, must be set in the constructor. All widget constructors take an *int* argument that specifies the bitwise *OR* of all desired styles. In some cases, a particular style is considered a hint, which means that it may not be available on all platforms, but will be gracefully ignored on platforms that do not support it.

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The style constants are located in the [SWT](#) class as public static fields. A list of applicable constants for each widget class is contained in the API Reference for [SWT](#).

Resource disposal

The OS platforms underneath SWT require explicit allocation and freeing of OS resources. In keeping with the SWT design philosophy of reflecting the platform application structure in the widget toolkit, SWT requires that you explicitly free any OS resources that you have allocated. In SWT, the *Widget.dispose()* method is used to free resources associated with a particular toolkit object.

The rule of thumb is that if you create the object, you must dispose of it. Here are some specific ground rules that further explain this philosophy:

- If you create a widget or graphic object using a constructor, you must dispose of it manually when you are finished using it.
- If you get a widget or graphic object without using a constructor, you must not dispose of it manually since you did not allocate it.
- If you pass a reference to your widget or graphic object to another object, you must take care not to dispose of it while it is still being used. (Similar to the rule described in [Plug-in patterns for using images](#).)
- When the user closes a *Shell*, the shell and all of its child widgets are recursively disposed. In this case, you do not need to dispose of the widgets themselves. However, you must free any graphics resources allocated in conjunction with those widgets.
- If you create a graphic object for use during the lifetime of one of your widgets, you must dispose of the graphic object when the widget is disposed. This can be done by registering a dispose listener for your widget and freeing the graphic object when the *dispose* event is received.

There is one exception to these rules. Simple data objects, such as *Rectangle* and *Point*, do not use operating system resources. They do not have a *dispose()* method and you do not have to free them. If in doubt, check the javadoc for a particular class.

See [Managing operating resources](#) for further discussion of this topic.

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SWT standalone example – Hello World

The Hello World examples are a set of introductory examples that show how to get started on creating an application with SWT. They cover the creation of a shell, the use of event listeners, using layouts, processing events in an event loop, and drawing with a Graphics Context.

Hello World 1

This example demonstrates how to open a Shell and process the events.

Hello World 2

This example builds on HelloWorld1 and demonstrates how to display a Label inside of the Shell.

Hello World 3

This example builds on HelloWorld2 and demonstrates how to use a listener mechanism to resize the Label when the Shell size changes.

Hello World 4

This example builds on HelloWorld2 and demonstrates how to use a Layout to resize the Label when the Shell size changes.

Hello World 5

This example builds on HelloWorld1 and demonstrates how to draw directly on an SWT Control using a Graphics Context.

Running the example

Follow the [SWT standalone examples setup](#) instructions to install and run the example from your workspace.

The "Main" class is `org.eclipse.swt.examples.helloworld.HelloWorld[1-5]`.

This example can also be run using the [Example Launcher](#). Select one of the *Hello World* items from the *Standalone* category and click *Run*.

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SWT standalone examples setup

Importing example source

*** In the following description, substitute the location in which you installed Eclipse for `INSTALLDIR` ***

Import the example code and all its required resources into your workspace:

1. Create a Java Project called "SWT Examples".
2. Select the project "SWT Examples" in the Packages view.
3. Select the **File > Import** menu, then select **Zip File** from the subsequent dialog and click *Next*.
4. Locate the source zip file for the SWT examples. For example:

◆ *win32:*

`INSTALLDIR\eclipse\plugins\org.eclipse.sdk.examples.source_3.0.0\src\`

◆ **ix:*

`INSTALLDIR/eclipse/plugins/org.eclipse.sdk.examples.source_3.0.0/src\`

5. Click *Finish*.

6. Select the **File > Import** menu, then select **Zip File** from the subsequent dialog and click *Next*.

7. Locate the jar file for the SWT examples. For example:

◆ *win32:*

`INSTALLDIR\eclipse\plugins\org.eclipse.swt.examples_3.0.0\swtexamples`

◆ **ix:*

`INSTALLDIR/eclipse/plugins/org.eclipse.swt.examples_3.0.0/swtexamples`

8. Expand the top level directory of the jar file (/), uncheck "META-INF", and click *Finish*.

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9. In the resulting "Overwrite?" prompter click **No To All** so that only non-class resources will be imported.

Now you need to compile the SWT examples. In order to do this, you must add the SWT jar(s) to the compile path:

1. Select the project "SWT Examples" in the Packages view, and from its context menu select **Properties**.
2. Select the **Java Build Path** page, and then select its **Libraries** tab.
3. Click on the **Add External JARs...** button.
4. Locate the swt jar for the platform on which you wish to run:
 - ◆ *win32*:
INSTALLDIR\eclipse\plugins\org.eclipse.swt.win32_3.0.0\ws\win32\swt.jar
 - ◆ *gtk*:
INSTALLDIR/eclipse/plugins/org.eclipse.swt.gtk_3.0.0/ws/gtk/swt.jar
 - ◆ *motif*:
INSTALLDIR/eclipse/plugins/org.eclipse.swt.motif_3.0.0/ws/motif/swt.jar
 - ◆ *photon*:
INSTALLDIR/eclipse/plugins/org.eclipse.swt.photon_3.0.0/ws/photon/swt.jar
 - ◆ *macosx*:
INSTALLDIR/eclipse/plugins/org.eclipse.swt.carbon_3.0.0/ws/carbon/swt.jar
5. Click on OK.

NOTE: For some platforms, such as GTK, more than one jar is required to run SWT (on GTK there is a swt.jar and a swt-pi.jar and a swt-mozilla.jar file). In this case all of the required jars must be added to the class path. This is done by repeating the steps above for each jar file. All jar files are located in the same directory/folder.

At this point your SWT examples should be compiled without any errors. Check the Tasks view for errors. If you get an error like "java.lang.Object not found" it means you have not configured a JRE. Go to the **Window > Preferences** dialog and select the **Java > Installed JREs** preference page and ensure that a JRE is installed and that the path to the JRE is correct.

Running the Example

Now you have to configure Eclipse to run the example. This requires putting the SWT JNI libraries on the library path so that the VM can find them:

1. Open the Java perspective.
2. In the Packages view, select the main class that you want to run. For example, the main class for the Address Book example is `org.eclipse.swt.examples.addressbook.AddressBook`.
3. Select **Run > Run...** from the main menu.
4. In the Launch Configurations dialog that appears, select **Java Application** and click on the **New** button.
5. Fill in the **Name**, **Project** and **Main** class fields according to the example that you wish to run.
6. Select the **Arguments** tab. In the **VM Arguments** area specify the location of the SWT library depending on your target platform as follows:
 - ◆ *win32*:
-Djava.library.path=INSTALLDIR\plugins\org.eclipse.swt.win32_3.0.0\os
 - ◆ *linux gtk*:

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- Djava.library.path=INSTALLDIR/eclipse/plugins/org.eclipse.swt.gtk_3
- ◆ *linux motif*:
 - Djava.library.path=INSTALLDIR/eclipse/plugins/org.eclipse.swt.motif
- ◆ *solaris motif*:
 - Djava.library.path=INSTALLDIR/eclipse/plugins/org.eclipse.swt.motif
- ◆ *aix motif*:
 - Djava.library.path=INSTALLDIR/eclipse/plugins/org.eclipse.swt.motif
- ◆ *hpux motif*:
 - Djava.library.path=INSTALLDIR/eclipse/plugins/org.eclipse.swt.motif
- ◆ *photon qnx*:
 - Djava.library.path=INSTALLDIR/eclipse/plugins/org.eclipse.swt.photon
- ◆ *macosx*:
 - Djava.library.path=INSTALLDIR/eclipse/plugins/org.eclipse.swt.carbon

7. Click on the **Run** button.

Examples Overview

Consult the documentation of each individual example for the name of its main class and additional details. The following examples are included in the `swtexamples.jar`:

- [Address Book](#)
- [Clipboard](#)
- [Controls](#)
- [Custom Controls](#)
- [File Viewer](#)
- [Hello World \[1–5\]](#)
- [Hover Help](#)
- [Image Analyzer](#)
- [Java Syntax Viewer](#)
- [Layouts](#)
- [Text Editor](#)

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SWT standalone example – Address Book

The `AddressBook` example shows how a `Table` control can be used to present information in a tabular format. The application can save and load data from a file, sort the entries, and search for strings within the fields.

Running the example

Follow the [SWT standalone examples setup](#) instructions to install and run the example from your workspace.

The "Main" class is `org.eclipse.swt.examples.addressbook.AddressBook`.

This example can also be run using the [Example Launcher](#). Select the **Address Book** item from the **Standalone** category and click **Run**.

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SWT standalone example – Clipboard

The Clipboard example shows the various SWT clipboard transfer types in use. The example can cut, copy and paste using Text, RTF, Binary and File transfer types.

Running the example

Follow the [SWT standalone examples setup](#) instructions to install and run the example from your workspace.

The "Main" class is `org.eclipse.swt.examples.clipboard.ClipboardExample`.

This example can also be run using the [Example Launcher](#). Select the *Clipboard* item from the *Standalone* category and click **Run**.

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SWT standalone example – File Viewer

The File Viewer example shows how a simple application can be implemented using SWT. This application provides the ability to navigate files and folders on the local file system and manipulate them using drag and drop. It uses alternate threads for long actions and demonstrates the use of the Tree, Table, and Toolbar widgets and the Program class.

Running the example

Follow the [SWT standalone examples setup](#) instructions to install and run the example from your workspace.

The "Main" class is `org.eclipse.swt.examples.fileviewer.FileViewer`.

This example can also be run using the [Example Launcher](#). Select the *File Viewer* item from the *Standalone* category and click **Run**.

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SWT standalone example – Hover Help

The Hover Help example shows how to implement custom tooltips and hover help support on various SWT controls including Buttons, TableItems, ToolItems and TreeItems. To see the custom tooltips in action, hover over an item or button in the UI, and notice that images appear in the left-hand corner of the tooltip. To see the custom hover help in action, hover over an item or button in the UI until the tooltip is displayed. Then, without moving the mouse, press **FI** and a new Shell will be shown with the extended hover help information for the UI element.

Running the example

Follow the [SWT standalone examples setup](#) instructions to install and run the example from your workspace.

The "Main" class is `org.eclipse.swt.examples.hoverhelp HoverHelp`.

This example can also be run using the [Example Launcher](#). Select the *Hover Help* item from the *Standalone* category and click **Run**.

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SWT standalone example – Image Analyzer

The ImageAnalyzer example opens image files and displays their visual contents and an image data summary. The user can make adjustments to various elements of the image such as scaling and Alpha blending, and can save these changes to a file.

The ImageAnalyzer can load and display image files of type GIF, JPEG, BMP, ICO, and PNG. If a loaded file is an interlaced GIF or PNG, or a progressive JPEG, and *Incremental Display* is selected, then the ImageAnalyzer will display the image increments as they are loaded. If the file contains an animated GIF, then the *Next*, *Previous*, and *Animate* buttons become enabled, and can be used to cycle through and animate the images in the file. If a GIF defines a background color, as many animated GIFs do, then selecting *Background* will use the GIF's background color. If the image has transparency, which is possible with images of type GIF, PNG, and ICO, then selecting *Display Mask* will draw the image's transparency mask to the right of the image. You can change the background color of the ImageAnalyzer in order to see the transparency work. To turn off transparency, deselect *Display Transparency*. After an image is loaded, it can be scaled with the *Scale* combo, or have alpha transparency applied to it using the *Alpha-K* combo and *Alpha* menu. *File > Reopen* restores the scaling and alpha attributes to their default values and reloads the current image file. If the image has transparency, *File > Save Mask As...* can be used to save the image's transparency mask.

When SWT loads an image file, an instance of `org.eclipse.swt.graphics.ImageData` is created (though in the case of an ICO file or multi-image GIF an array of `ImageData` instances is created). The ImageAnalyzer displays all of the data stored in the `ImageData` instance(s) for the currently loaded image file, including the pixel data. Hovering over a pixel in the image display will show the RGB color data for that pixel. For certain images, particularly animated GIFs, additional data is stored in the `org.eclipse.swt.graphics.ImageLoader` instance that is used to load the image. The ImageAnalyzer displays this data as well.

Running the example

Follow the [SWT standalone examples setup](#) instructions to install and run the example from your workspace.

The "Main" class is `org.eclipse.swt.examples.imageanalyzer.ImageAnalyzer`.

This example can also be run using the [Example Launcher](#). Select the *Image Analyzer* item from the *Standalone* category and click **Run**.

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SWT standalone example – Java Syntax Viewer

This example shows how to implement a user-defined line styler for the StyledText widget. The example provides a typical editor interface. To see the effect of the line styler, open a *.java file, and when the contents of the file are displayed in the editor area, notice that the keywords have been highlighted.

Running the example

Follow the [SWT standalone examples setup](#) instructions to install and run the example from your workspace.

The "Main" class is `org.eclipse.swt.examples.javaviewer.JavaViewer`.

This example can also be run using the [Example Launcher](#). Select the *Java Syntax Viewer* item from the *Standalone* category and click *Run*.

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SWT standalone example – Text Editor

This example demonstrates how to use a StyledText widget to implement a text editor with formatting support. The example has a typical text editor interface. The *Edit* menu contains *Cut*, *Copy*, *Paste* and *Set Font* items. The toolbar provides a bold text toggle, three colour tools, and a reset button, all of which operate on the current selection.

Running the example

Follow the [SWT standalone examples setup](#) instructions to install and run the example from your workspace.

The "Main" class is `org.eclipse.swt.examples.texteditor.TextEditor`.

This example can also be run using the [Example Launcher](#). Select the *Text Editor* item from the *Standalone* category and click *Run*.

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Controls

So far we have used the term *widget* without a formal definition. In the SWT class hierarchy, a **Widget** is the abstract class for any UI object that can be placed inside another widget. A **Control** is a widget that typically has a counterpart representation, denoted by an OS window handle, in the underlying platform.

We tend to use the terms widget and control interchangeably. Although the distinction matters in the SWT implementation, we don't focus on this difference from an application's point of view. If you review the SWT widget hierarchy, you will see that a **Control** is something that you can create and place anywhere you want in your widget parent/child tree. Widgets that are not controls are typically more specialized UI objects that can be created only for certain types of parents.

The [SWT API reference](#) and examples are full of information about the different kinds of controls and their usage. The [org.eclipse.swt.widgets](#) package defines the core set of widgets in SWT. The following table

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summarizes the concrete types of controls provided in this package and their purpose. (Abstract classes are eliminated from this list).

Widget	Purpose	Styles	Events
<u>Button</u>	Selectable control that issues notification when pressed and/or released.	<i>BORDER, CHECK, PUSH, RADIO, TOGGLE, FLAT, LEFT, RIGHT, CENTER, ARROW</i> (with <i>UP, DOWN</i>)	Dispose, Control*, Selection
<u>Canvas</u>	Composite control that provides a surface for drawing arbitrary graphics. Often used to implement custom controls.	<i>BORDER, H_SCROLL, V_SCROLL, NO_BACKGROUND, NO_FOCUS, NO_MERGE_PAINTS, NO_REDRAW_RESIZE, NO_RADIO_GROUP</i>	Dispose, Control*
<u>Caret</u>	An i-beam that is typically used as the insertion point for text.		Dispose
<u>Combo</u>	Selectable control that allows the user to choose a string from a list of strings, or optionally type a new value into an editable text field. Often used when limited space requires a pop-down presentation of the available strings rather than using a single selection list box.	<i>BORDER, DROP_DOWN, READ_ONLY, SIMPLE</i>	Dispose, Control*, DefaultSelection, Modify, Selection
<u>Composite</u>	Control that is capable of containing other widgets.	<i>BORDER, H_SCROLL, V_SCROLL</i>	Dispose, Control*
<u>CoolBar</u>	Composite control that allows users to dynamically reposition the cool items contained in the bar.	<i>BORDER</i>	Dispose, Control*
<u>CoolItem</u>	Selectable user interface object that represents a dynamically positionable area of a cool bar.	<i>DROP_DOWN</i>	Dispose
<u>Group</u>	Composite control that groups other widgets and surrounds them with an etched border and/or label.	<i>BORDER, SHADOW_ETCHED_IN, SHADOW_ETCHED_OUT, SHADOW_IN, SHADOW_OUT, SHADOW_NONE</i>	Dispose, Control*
<u>Label</u>	Non-selectable control that displays a string or an image.	<i>BORDER, CENTER, LEFT, RIGHT, WRAP, SEPARATOR</i> (with <i>HORIZONTAL, SHADOW_IN, SHADOW_OUT, SHADOW_NONE, VERTICAL</i>)	Dispose, Control*

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<u>List</u>	Selectable control that allows the user to choose a string or strings from a list of strings.	<i>BORDER, H_SCROLL, V_SCROLL, SINGLE, MULTI</i>	Dispose, Control*, Selection, DefaultSelection
<u>Menu</u>	User interface object that contains menu items.	<i>BAR, DROP_DOWN, NO_RADIO_GROUP, POP_UP</i>	Dispose, Help, Hide, Show
<u>MenuItem</u>	Selectable user interface object that represents an item in a menu.	<i>CHECK, CASCADE, PUSH, RADIO, SEPARATOR</i>	Dispose, Arm, Help, Selection
<u>ProgressBar</u>	Non-selectable control that displays progress to the user, typically in the form of a bar graph.	<i>BORDER, INDETERMINATE, SMOOTH, HORIZONTAL, VERTICAL</i>	Dispose, Control*
<u>Sash</u>	Selectable control that allows the user to drag a rubber banded outline of the sash within the parent window. Used to allow users to resize child widgets by repositioning their dividing line.	<i>BORDER, HORIZONTAL, VERTICAL</i>	Dispose, Control*, Selection
<u>Scale</u>	Selectable control that represents a range of numeric values.	<i>BORDER, HORIZONTAL, VERTICAL</i>	Dispose, Control*, Selection
<u>ScrollBar</u>	Selectable control that represents a range of positive numeric values. Used in a Composite that has V_SCROLL and/or H_SCROLL styles.	<i>HORIZONTAL, VERTICAL</i>	Dispose, Selection
<u>Shell</u>	Window that is managed by the OS window manager. Shells can be parented by a Display (top level shells) or by another shell (secondary shells).	<i>BORDER, H_SCROLL, V_SCROLL, CLOSE, MIN, MAX, NO_TRIM, RESIZE, TITLE</i> (see also <i>SHELL_TRIM, DIALOG_TRIM</i>)	Dispose, Control*, Activate, Close, Deactivate, Deiconify, Iconify
<u>Slider</u>	Selectable control that represents a range of numeric values. A slider is distinguished from a scale by providing a draggable thumb that can adjust the current value along the range.	<i>BORDER, HORIZONTAL, VERTICAL</i>	Dispose, Control*, Selection
<u>TabFolder</u>	Composite control that groups pages that can be selected by the user using labeled tabs.	<i>BORDER</i>	Dispose, Control*, Selection
<u>TabItem</u>	Selectable user interface object corresponding to a tab for a page in a tab folder.		Dispose
<u>Table</u>	Selectable control that displays a list of table items that can be selected by the user. Items are presented in rows that display multiple columns representing different aspects of the	<i>BORDER, H_SCROLL, V_SCROLL, SINGLE, MULTI, CHECK, FULL_SELECTION, HIDE_SELECTION,</i>	Dispose, Control*, Selection, DefaultSelection

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	items.	<i>VIRTUAL</i>	
<i>TableColumn</i>	Selectable user interface object that represents a column in a table.	<i>LEFT, RIGHT, CENTER</i>	Dispose, Move, Resize, Selection
<i>TableItem</i>	Selectable user interface object that represents an item in a table.		Dispose
<i>Text</i>	Editable control that allows the user to type text into it.	<i>BORDER, SINGLE, READ_ONLY, LEFT, CENTER, RIGHT, WRAP, MULTI (with H_SCROLL, V_SCROLL)</i>	Dispose, Control*, DefaultSelection, Modify, Verify
<i>ToolBar</i>	Composite control that supports the layout of selectable tool bar items.	<i>BORDER, FLAT, WRAP, RIGHT, SHADOW_OUT HORIZONTAL, VERTICAL</i>	Dispose, Control*,
<i>ToolItem</i>	Selectable user interface object that represents an item in a tool bar.	<i>PUSH, CHECK, RADIO, SEPARATOR, DROP_DOWN</i>	Dispose, Selection
<i>Tracker</i>	User interface object that implements rubber banding rectangles.	<i>LEFT, RIGHT, UP, DOWN, RESIZE</i>	Dispose, Move, Resize
<i>Tree</i>	Selectable control that displays a hierarchical list of tree items that can be selected by the user.	<i>BORDER, H_SCROLL, V_SCROLL, SINGLE, MULTI, CHECK</i>	Dispose, Control*, Selection, DefaultSelection, Collapse, Expand
<i>TreeItem</i>	Selectable user interface object that represents a hierarchy of tree items in a tree.		Dispose

Control* = Events inherited from ***Control***: FocusIn, FocusOut, Help, KeyDown, KeyUp, MouseDoubleClick, MouseDown, MouseEnter, MouseExit, MouseHover, MouseUp, MouseMove, Move, Paint, Resize

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Events

Once we create a display and some widgets, and start up the application's message loop, where does the real work happen? It happens every time an event is read from the queue and dispatched to a widget. Most of the application logic is implemented as responses to user events.

The basic pattern is that you add a listener to some widget that you have created, and when the appropriate event occurs the listener code will be executed. This simple example is adapted from ***org.eclipse.swt.examples.helloworld.HelloWorld3***:

```

Display display = new Display ();
Shell shell = new Shell (display);
Label label = new Label (shell, SWT.CENTER);
...
shell.addControlListener (new ControlAdapter () {
    public void controlResized (ControlEvent e) {
        label.setBounds (shell.getClientArea ());
    }
});

```


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For each type of listener, there is an interface that defines the listener (*XYZListener*), a class that provides event information (*XYZEvent*), and an API method to add the listener (*addXYZListener*). If there is more than one method defined in the listener interface then an adapter (*XYZAdapter*) that implements the listener interface and provides empty methods is provided as well. All of the events, listeners, and adapters are defined in the package org.eclipse.swt.events.

The following table summarizes the events that are available and the widgets that support each event.

Event Type	Description	Widgets
<i>Arm</i>	Generated when a widget, such as a menu item, is armed.	<i>MenuItem</i>
<i>Control</i>	Generated when a control is moved or resized.	<i>Control, TableColumn, Tracker</i>
<i>Dispose</i>	Generated when a widget is disposed, either programmatically or by the user.	<i>Widget</i>
<i>Focus</i>	Generated when a control gains or loses focus.	<i>Control</i>
<i>Help</i>	Generated when the user requests help for a widget, such as pressing the F1 key.	<i>Control, Menu, MenuItem</i>
<i>Key</i>	Generated when the user presses or releases a keyboard key when the control has keyboard focus.	<i>Control</i>
<i>Menu</i>	Generated when a menu is hidden or shown.	<i>Menu</i>
<i>Modify</i>	Generated when a widget's text is modified.	<i>CCombo, Combo, Text, StyledText</i>
<i>Mouse</i>	Generated when the user presses, releases, or double clicks the mouse over the control.	<i>Control</i>
<i>MouseMove</i>	Generated as the user moves the mouse across the control.	<i>Control</i>
<i>MouseTrack</i>	Generated when the mouse enters, exits, or hovers over the control.	<i>Control</i>
<i>Paint</i>	Generated when the control needs to be repainted.	<i>Control</i>
<i>Selection</i>	Generated when the user selects an item in the control.	<i>Button, CCombo, Combo, CoolItem, CTabFolder, List, MenuItem, Sash, Scale, ScrollBar, Slider, StyledText, TabFolder, Table, Table Cursor, TableColumn, TableTree, Text, ToolItem, Tree</i>
<i>Shell</i>	Generated when a shell is minimized, maximized, activated, deactivated, or closed.	<i>Shell</i>
<i>Traverse</i>	Generated when a control is	<i>Control</i>

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	traversed by the user using keystrokes.	
Tree	Generated when the user expands or collapses items in the tree.	Tree, TableTree
Verify	Generated when a widget's text is about to be modified. Gives the application a chance to alter the text or prevent the modification.	Text, StyledText

Untyped events

The typed event system described above is implemented with a low level, untyped widget event mechanism. This mechanism is not intended to be used by applications, but you will see it used inside of the SWT implementation. It is also used in many of the workbench wizard page implementations.

The untyped mechanism relies on a constant to identify the event type and defines a generic listener that is supplied with this constant. This allows the listener to implement a "case style" listener. In the following snippet, we define a generic event handler and add several listeners to a shell.

```
Shell shell = new Shell ();
Listener listener = new Listener () {
    public void handleEvent (Event e) {
        switch (e.type) {
            case SWT.Resize:
                System.out.println ("Resize received");
                break;
            case SWT.Paint:
                System.out.println ("Paint received");
                break;
            default:
                System.out.println ("Unknown event received");
        }
    }
};
shell.addListener (SWT.Resize, listener);
shell.addListener (SWT.Paint, listener);
```

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Custom widgets

Occasionally, you may find that none of the controls provided in SWT meet the need of your application. In these cases, you may want to extend SWT by implementing your own custom widget. SWT itself provides a package, org.eclipse.swt.custom, which contains custom controls that are not in the core set of SWT controls but are needed to implement the platform workbench.

Control	Purpose	Styles	Events
<u>CCombo</u>	Similar to Combo, but custom drawn to allow for using a combo without a border. This class was developed for using combos inside table cells.	BORDER, FLAT, READ_ONLY	Dispose, Control*, Selection

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<u>CLabel</u>	Similar to Label, but supports clipping of text with ellipsis. Also supports a gradient effect for the background color as seen in the active workbench view. Does not support wrapping.	<i>CENTER, LEFT, RIGHT, SHADOW_IN, SHADOW_OUT, SHADOW_NONE</i>	Dispose, Control*
<u>CTabFolder</u>	Similar to TabFolder, but supports additional configuration of the visual appearance of tabs (top or bottom) and borders.	<i>BORDER, FLAT, BOTTOM, TOP</i>	Dispose, Control*, Selection
<u>CTabItem</u>	Selectable user interface object corresponding to a tab for a page in a CTabFolder.		Dispose, Control*
<u>SashForm</u>	Composite control that lays out its children in a row or column arrangement and uses a Sash to separate them so that the user can resize them.	<i>BORDER, HORIZONTAL, VERTICAL</i>	Dispose, Control*
<u>ScrolledComposite</u>	Composite control that scrolls its contents and optionally stretches its contents to fill the available space.	<i>BORDER, H_SCROLL, V_SCROLL</i>	Dispose, Control*
<u>StyledText</u>	Editable control that allows the user to type text. Ranges of text inside the control can have distinct colors (foreground and background) and font styles (bold and regular).	<i>BORDER, FULL_SELECTION, MULTI, SINGLE, WRAP, READ_ONLY</i>	Dispose, Control*, ExtendedModify, LineGetBackground, LineGetSegments, LineGetStyle, Modify, Selection, Verify, VerifyKey
<u>TableTree</u>	Selectable control that displays a hierarchical list of items that can be selected by the user. Items are presented in rows that display multiple columns representing different aspects of the items.	<i>BORDER, SINGLE, MULTI, CHECK, FULL_SELECTION</i>	Dispose, Control*, Selection, DefaultSelection, Collapse, Expand
<u>TableTreeItem</u>	Selectable user interface object that represents a hierarchy of tree items in a TableTree.		
<u>ViewForm</u>	Composite control that lays out three children horizontally and allows programmatic control of layout and border parameters. Used in the workbench to implement a view's label/toolbar/menu local bar.	<i>BORDER, FLAT</i>	Dispose, Control*

*Control** = Events inherited from **Control**: *FocusIn, FocusOut, Help, KeyDown, KeyUp, MouseDoubleClick, MouseDown, MouseEnter, MouseExit, MouseHover, MouseUp, MouseMove, Move, Paint, Resize*

Before implementing a custom widget, you should consider several important issues:

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- Can an existing SWT control be used as a simpler or plainer version of your widget? If so, consider using the existing control and finishing your application. You can always write a custom widget later that is API compatible with the simpler control.
- Does the widget have to be portable? If so, does a native widget exist on all platforms? If you are comfortable writing native platform code, you can provide a native implementation for each platform that your application supports. If it does not exist on any (or all) platforms, you will also have to provide a portable implementation.
- Can the function be achieved by extending the behavior of an existing control? If so, consider using an existing control and wrapping it with additional behavior.
- Will your widget contain other controls from the user's point of view? It's useful to think about this issue in advance because it influences your implementation and API.

Once you've determined that you need a custom widget and have decided which platforms must be supported, you can consider several implementation techniques for your widget. These techniques can be mixed and matched depending on what is available in the underlying OS platform.

Native implementation

If your application requires a native widget that is not provided by SWT, you will need to implement it natively. This may be a platform widget, a third party widget, or any other widget in a platform shared library.

Each SWT platform is shipped with both a shared library (for example, a DLL on Windows) and a JAR (for the Java class files). The shared library contains all of the native function required for SWT, but it was not meant to be a complete set of the functions available on the platform. To expose native function or native widgets that were not exposed by SWT, you need to write your own shared library. If you are using a combination of native code on one platform and portable code on another, make sure you call your shared library on the platform with the native widget, and your jar on the platform with the portable widget.

To implement a native widget, you must understand the Java Native Interface (JNI), the API of the widget in the shared library, and the underlying OS platform APIs in C.

The basic process for implementation is to decide which part of the API of the native widget will be exposed in the Java API and writing the Java code that calls the natives to implement the behavior. JNI C code must be written to call the shared library.

It is a good idea to follow the design principles used to implement SWT when building your own native widget implementation. For example, your JNI natives should map one to one with the API calls being made into the shared library.

A complete example of a native custom widget implementation can be found in [Creating Your Own Widgets using SWT.](#)

Extending an existing widget

If your new widget is similar in concept or implementation to an existing widget, you may want to wrap an existing SWT widget. This technique is used for the implementation of [TableTree](#).

To wrap a widget, you create a subclass of the [Composite](#) or [Canvas](#) widget (depending on whether your control will have children). In the constructor for the custom widget, create the wrapped widget. The resulting widget will be 100% Java portable since you are calling the wrapped widget's API for your implementation.

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Wrapping a widget is often a simpler way to implement custom widgets than starting from scratch. However, you must be careful in designing the API of your new widget. Here are some important tips:

Consider whether your widget is a "kind of" wrapped widget or whether it just uses one for its implementation. For example, a table tree is not a kind of table. It doesn't refer to items by row number index. The ***TableTree*** just uses a table to implement the presentation and adds tree behavior. If you are wrapping a widget purely for implementation reasons, then your API may not look similar to the underlying widget's API.

Forward as few methods and events as possible. Don't reimplement the entire API of the wrapped widget or you'll be constantly playing catch-up when the wrapped API changes in a future release. Methods that are common to most widgets, such as ***setFont***, ***setForeground***, ***setBackground***, should be forwarded.

If you find yourself implementing most of the wrapped widget's API, consider exposing the wrapped widget at the API level and letting the application code use the wrapped widget directly. In this case, you may want to reconsider whether providing a new widget makes sense at all. It may be better to implement your feature as an "adapter" which adds behavior to a widget but does not pretend to be a widget. (JFace viewers follow this pattern.)

Note: This discussion has focused solely on extending the behavior of a widget by wrapping it. Extending a widget by subclassing it is highly discouraged, since it will make your widget dependent on the implementation of the superclass.

Custom drawn implementation

In some cases, you don't have any native code or existing widgets that help you in the implementation of your new widget. This means you must draw the widget yourself using SWT graphics calls. Although this technique can become quite complicated, it has the advantage of producing a completely portable implementation.

Custom drawn controls are implemented by subclassing the ***Canvas*** or ***Composite*** class using these rules:

- Subclass ***Canvas*** if your widget will not have any children. This means you do not intend to allow applications to create children of your widget, and that you do not intend to create any children in order to implement your widget. ***Canvas*** is used for both simple controls, such as stylized labels, and for more complex controls, such as the styled text editor. In both cases, the widget is implemented completely internally using graphics calls and no children are added by applications.
- Subclass ***Composite*** if your widget will have children from the application's perspective, or if you will be creating children to implement your widget. ***Composite*** is used when you are combining widgets to create a new widget, such as using a text and list to implement a combo control. It is also used when you implement a widget without children that allows clients to add children. This is the case with the ***ViewForm*** control. The ***SashForm*** widget represents both cases: it uses widgets (sashes) internally for its implementation and allows clients to add their own children.

In a custom drawn control, your internal state is kept in Java instance variables. You define your API and styles according to the requirements of your widget.

The internal implementation of a custom drawn widget usually involves these major tasks:

- Create any graphics objects needed in your constructor and store them in an instance variable. Register a listener for the ***dispose*** event on your canvas or composite so that you can free these objects when the widget is destroyed.

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- Add a *paintListener* to your canvas or composite and paint the widget according to your design. For complex widgets, a lot of work goes into optimizing this process by calculating and repainting only what's absolutely necessary.
- Ensure that any API calls that affect the appearance of your widget trigger a repaint of the widget. In general, you should use *redraw* to damage your widget when you know you must repaint, rather than call your internal painting code directly. This gives the platform a chance to collapse the paint you want to generate with any other pending paints and helps streamline your code by funneling all painting through one place.
- If your widget defines events in its API, determine what low level *Canvas* or *Composite* events will trigger your widget's events. For example, if you have a clicked event, you will want to register a mouse event on your canvas and perform calculations (such as hit testing) to determine whether the mouse event in your canvas should trigger your widget event.

Many of the widgets implemented in the [org.eclipse.swt.custom](#) use this approach. A simple example can be found in [CLabel](#).

Further information on custom widgets can be found in [Creating your own widgets using SWT](#).

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Layouts

We have seen some simple examples that show how to size or position child widgets based on the size of the parent. So far, this kind of computation has occurred in response to a resize listener. This is often the best way to handle simple widget positioning. However, there are common patterns used by applications when placing widgets. These patterns can be structured as configurable layout algorithms that can be reused by many different applications.

SWT defines *layouts* that provide general purpose positioning and sizing of child widgets in a composite. Layouts are subclasses of the abstract class *Layout*. The SWT standard layouts can be found in the [org.eclipse.swt.layout](#) package.

You should understand some general definitions when resizing and positioning widgets:

- The *location* of a widget is its x,y coordinate location within its parent widget.
- The *preferred size* of a widget is the minimum size needed to show its content. This is computed differently for each kind of widget. In the case of a composite, the preferred size is the minimum size that contains the composite and all of its children at their preferred sizes.
- The *clientArea* is the size of a widget's content area.
- The *trim* is the distance between a widget's client area and its actual border. Trim is occupied by the widget's borders or extra space at its edge. The size and appearance of the trim is widget and platform dependent.

These concepts are relevant for applications regardless of whether a layout is used. You can think of a layout as a convenient way to package resize functionality for reuse.

Some additional concepts are introduced by layouts:

- Some layouts support *spacing* between widgets in the layout.
- Some layouts support a *margin* between the edge of the layout and the widget adjacent to the edge.

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See [Understanding layouts in SWT](#) for further discussion and pictures demonstrating these concepts.

The following code snippet shows the simple case of an application using a resize callback to size a label to the size of its parent shell:

```
Display display = new Display ();
Shell shell = new Shell (display);
Label label = new Label (shell, SWT.CENTER);
shell.addControlListener (new ControlAdapter () {
    public void controlResized (ControlEvent e) {
        label.setBounds (shell.getClientArea ());
    }
});
```

The next snippet uses a layout to achieve the same effect:

```
Display display = new Display ();
Shell shell = new Shell (display);
Label label = new Label (shell, SWT.CENTER);
shell.setLayout (new FillLayout ());
```

Even for this simple example, using a layout reduces the application code. For more complex layouts, the simplification is much greater.

SWT provides four default layout classes that can be used for many situations.

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FillLayout

FillLayout is the simplest layout class. It lays out widgets in a single row or column, forcing them all to be the same size. Initially, the widgets will all be as tall as the tallest widget and as wide as the widest. ***FillLayout*** does not wrap, and you cannot specify margins or spacing.

You might use a ***FillLayout*** to lay out buttons in a task bar or tool bar, or to stack checkboxes in a ***Group***. ***FillLayout*** can also be used when a ***Composite*** only has one child. In the example above, the ***FillLayout*** forces the label to completely fill its parent shell.

The following table summarizes the attributes of ***FillLayout***.

Attribute	Description
<i>type</i>	Can be one of <i>HORIZONTAL</i> (layout in a row), <i>VERTICAL</i> (layout in a column).

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RowLayout

RowLayout lays out widgets in rows, but is more flexible than ***FillLayout***. The ***type*** field controls whether the widgets will be placed in horizontal rows or vertical columns.

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It can optionally *wrap* the widgets, creating as many rows or columns as are needed to display them. It also provides configurable margins on each edge of the layout, and configurable spacing between widgets within the layout. You can *pack* a *RowLayout*, which will force all widgets to be the same size. If you *justify* a *RowLayout*, extra space remaining in the *Composite* will be allocated as margins between the widgets.

The height and width of each widget in a *RowLayout* can be specified in a *RowData* object which should be set in the widget using *setLayoutData(Object)*.

The following table summarizes the attributes of *RowLayout*.

Attribute	Description
<i>justify</i>	Can be one of <i>HORIZONTAL</i> (layout in a row), <i>VERTICAL</i> (layout in a column).
<i>marginBottom</i>	Specifies the number of pixels to be placed along the bottom edge of the layout.
<i>marginLeft</i>	Specifies the number of pixels to be placed along the left edge of the layout.
<i>marginRight</i>	Specifies the number of pixels to be placed along the right edge of the layout.
<i>marginTop</i>	Specifies the number of pixels to be placed along the top edge of the layout.
<i>pack</i>	Specifies whether all widgets should be forced to be the same size.
<i>spacing</i>	Specifies the number of pixels between one cell and its adjacent cells
<i>type</i>	Can be one of <i>HORIZONTAL</i> (layout in rows), <i>VERTICAL</i> (layout in columns).
<i>wrap</i>	Specifies whether a control will be wrapped to the next row or column if there is insufficient space in the current row or column.

The following table summarize the attributes of *RowData*.

Attribute	Description
<i>width</i>	Specifies the width of the cell in pixels.
<i>height</i>	Specifies the height of the cell in pixels.

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FormLayout

FormLayout lays out widgets using an attachment model. A *FormAttachment* can be defined for each side of a widget and stored in its layout data (*FormData*). The *FormData* can be used to designate a requested *width* and *height* for the widget, provided that these values do not conflict with the attachment constraints.

A *FormAttachment* is used to attach a designated side of the widget to the parent *Composite* or another widget in the layout. You typically do not set attachments on all sides of a widget. It is very common to specify only one horizontal (*left* or *right*) attachment and one vertical (*top* or *bottom*) attachment and allow the widgets to take the size specified in their *FormData*, or their preferred size if no size is specified in the *FormData*.

Attachments can be configured in a variety of ways:

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- You can attach the specified side of a widget to a *position* (percentage value 0–100) in the parent widget. An optional pixel *offset* can be added.
- You can attach the specified side of a widget to the adjacent side of a target widget inside the composite. An optional pixel *offset* can be added. The side where the target widget is attached is inferred based upon the side specified in the source widget. For example, attaching the *top* edge to a widget implies that it is being attached to the *bottom* edge of the adjacent widget.
- You can attach the specified side of a widget to a particular side of a target widget inside the composite. An optional pixel *offset* can be added. This can be used, for example, to align the top of a widget with the top of another widget so that they will always line up vertically.
- You can center the widget relative to a target widget. The center need only be specified for one side (*left* or *right*, *top* or *bottom*) in the direction being centered.

The following table summarizes the attributes of a *FormLayout*:

Attribute	Description
<i>marginHeight</i>	Specifies the number of pixels of vertical margin that will be placed along the top and bottom edges of the layout.
<i>marginWidth</i>	Specifies the number of pixels of horizontal margin that will be placed along the left and right edges of the layout.

The following table summarizes the attributes of a *FormData*:

Attribute	Description
<i>top</i>	Specifies the attachment for the top side of the control.
<i>left</i>	Specifies the attachment for the left side of the control.
<i>bottom</i>	Specifies the attachment for the bottom side of the control.
<i>right</i>	Specifies the attachment for the right side of the control.
<i>width</i>	Specifies the preferred width in pixels of the control in the form.
<i>height</i>	Specifies the preferred height in pixels of the control in the form.

The following table summarizes the attributes of a *FormAttachment*:

Attribute	Description
<i>alignment</i>	Specifies the alignment of the control side that is attached to a control. DEFAULT indicates that the widget should be attached to the adjacent side of the specified <i>control</i> . For top and bottom attachments, TOP , BOTTOM , and CENTER are used to indicate attachment of the specified side of the widget to the specified side of the <i>control</i> . For left and right attachments, LEFT , RIGHT , and CENTER are used to indicate attachment of the specified side of the widget to the specified side of the <i>control</i> . (For example, using TOP indicates that the <i>top</i> side of the attachment's widget should be attached to the top side of the specified <i>control</i> .)
<i>control</i>	Specifies the target control to which the attachment's widget is attached.
<i>denominator</i>	Specifies the denominator of the "a" term in the equation, $y=ax+b$, which defines the attachment.
<i>numerator</i>	Specifies the numerator of the "a" term in the equation $y=ax+b$, which defines the attachment.

<i>offset</i>	Specifies the offset in pixels of the control side from the attachment position. Can be positive or negative. This is the "b" term in the equation $y=ax+b$, which defines the attachment.
---------------	---

See [Understanding layouts in SWT](#) for further descriptions and example screen captures using the various attachment styles.

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GridLayout

GridLayout is one of the more powerful and complex layouts. ***GridLayout*** lays out widgets in a grid, providing many configurable parameters that control the sizing behavior of the grid rows and columns when the composite is resized.

The ***GridLayout*** defines API that controls the overall strategy of the layout. The most important attribute is ***numColumns***, which determines the horizontal size of the grid. Typically you decide on this value when you first design your window's appearance. The order of the widgets in the grid is the same as the order in which you create them. To change the order of the widgets in the grid, you can use the ***Control*** methods ***moveAbove(Control)*** and ***moveBelow(Control)***. These methods allow widgets to be inserted before or after each other in the layout. (The "above" and "below" refer to the widget Z ordering, not to the location in the grid itself).

The following table summarizes the configurable parameters for a ***GridLayout***:

Attribute	Description
<i>horizontalSpacing</i>	Number of pixels between the right edge of one cell and the left edge of its neighboring cell.
<i>makeColumnsEqualWidth</i>	Specifies whether all columns should be forced to the same width.
<i>marginWidth</i>	Number of pixels used for margin on the right and left edge of the grid.
<i>marginHeight</i>	Number of pixels used for margin on the top and bottom edge of the grid.
<i>numColumns</i>	Number of columns that should be used to make the grid.
<i>verticalSpacing</i>	Number of pixels between the bottom edge of one cell and the top edge of its neighboring cell.

GridLayout supports many other layout parameters for each widget in the grid. These properties are specified in a ***GridData*** object. You must set a ***GridData*** as the layout data for each widget in the grid.

The ***GridData*** class defines style constants that let you specify commonly used combinations of layout parameters in the ***GridData*** constructor. You can also set these attributes individually using the public methods in ***GridData***.

You can achieve some highly dynamic and complex layouts using the ***GridData***. Tweaking these values for different widgets in the grid can produce many different combinations of layouts. The ability to allow widgets to span across cells produces many layouts that don't even look like a grid.

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The following table summarizes the configurable parameters for *GridData*. See [Understanding layouts in SWT](#) for further description and example screen captures using the various grid parameters.

Attribute	Description
<i>grabExcessHorizontalSpace</i>	Specifies whether a cell should grow to use any extra horizontal space available in the grid. After the cell sizes in the grid are calculated based on the widgets and their grid data, any extra space remaining in the Composite will be allocated to those cells that grab excess space.
<i>grabExcessVerticalSpace</i>	Specifies whether a cell should grow to use any extra vertical space available in the grid.
<i>heightHint</i>	Specifies a minimum height for the widget (and therefore for the row that contains it).
<i>horizontalAlignment</i>	Can be one of <i>BEGINNING</i> , <i>CENTER</i> , <i>END</i> , <i>FILL</i> . <i>FILL</i> means that the widget will be sized to take up the entire width of its grid cell.
<i>horizontalIndent</i>	Number of pixels between the widget and the left edge of its grid cell.
<i>horizontalSpan</i>	Specifies the number of columns in the grid that the widget should span. By default, a widget takes up one cell in the grid. It can take additional cells horizontally by increasing this value.
<i>verticalAlignment</i>	Can be one of <i>BEGINNING</i> , <i>CENTER</i> , <i>END</i> , <i>FILL</i> . <i>FILL</i> means that the widget will be sized to take up the entire height of its grid cell.
<i>verticalSpan</i>	Specifies the number of rows in the grid that the widget should span. By default, a widget takes up one cell in the grid. It can take additional cells vertically by increasing this value.
<i>widthHint</i>	Specifies a minimum width for the widget (and therefore the column that contains it).

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StackLayout

StackLayout creates a conceptual stack of widgets. The widgets are all set to have the same size and location, and the one that is designated as being on top is shown.

The designated top widget can be changed by setting the layout's *topControl* field to the desired widget and then invoking *layout()* on the *Composite* with the stack layout. The height and width of the margins used by the layout can be specified by setting the layout's *marginHeight* and *marginWidth* attributes accordingly.

The following table summarizes the attributes of *StackLayout*.

Attribute	Description
<i>marginHeight</i>	Specifies the number of pixels to be placed along the top and bottom edges of the layout.
<i>marginWidth</i>	Specifies the number of pixels to be placed along the left and right edges of the layout.
<i>topControl</i>	Specifies the conceptual top control in the stack. All other controls will not be shown.

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Custom layouts

Occasionally you may need to write your own custom *Layout* class. This is most appropriate when you have a complex layout that is used in many different places in your application. It may be appropriate when you can optimize layout using application specific knowledge. Before building a custom layout you should consider the following:

- Can the layout be achieved with an existing layout such as *GridLayout* or by nesting several different layouts?
- Can the layout be isolated into a common resize listener?
- Are you defining a general layout algorithm with programmer supplied configuration parameters or just positioning widgets specifically for your application?

Unless you are writing a very generic layout that will be used by several *Composite* widgets, it is often simpler and easier to calculate sizes and position children in a resize listener. Many of the SWT custom widgets were written this way. Although a new widget can be implemented as a *Composite/Layout* pair, implementing it as a *Composite* that does its layout in a resize listener and computes its preferred size in *computeSize(...)* is clearer, and does not require the writing of an extra class.

If you still believe that you need a custom layout class then it is a good idea to first implement the layout algorithm in a resize listener. This makes for simpler debugging of the algorithm itself. Be sure to test the various cases for layout, which are resizing smaller, resizing larger, wrapping, and clipping. Once you have the algorithm working, the code can be refactored into a subclass of *Layout*.

Layouts are responsible for implementing two methods:

- *computeSize(...)* calculates the width and height of a rectangle that encloses all of the composite's children once they have been sized and placed according to the layout algorithm. The hint parameters allow the width and/or height to be constrained. For example, a layout may choose to grow in one dimension if constrained in another.
- *layout(...)* positions and sizes the composite's children. A layout can choose to cache layout-related information, such as the preferred extent of each of the children. The *flushCache* parameter tells the *Layout* to flush cached data, which is necessary when other factors besides the size of the composite have changed, such as the creation or removal of children, or a change in the widget's font.

Further discussion of custom layouts can be found in [Understanding layouts in SWT](#).

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Error handling

SWT has a well defined strategy for triggering errors and exceptions. Where possible, exceptions are triggered consistently across platforms. However, some errors are specific to an SWT implementation on a particular platform.

SWT can trigger three types of exceptions: *IllegalArgumentException*, *SWTException*, and *SWTError*. Applications should not have to catch any other kind of exception or error when calling SWT.

Note: If any other exception besides these three is thrown from SWT, it should be considered a bug in the SWT implementation.

IllegalArgumentException

The arguments passed in SWT API methods are checked for appropriate state and range before any other work is done. An *IllegalArgumentException* will be thrown when it is determined that an argument is invalid.

SWT throws this exception consistently across all platforms. Code that causes an *IllegalArgumentException* on one platform will cause the same exception on a different platform.

SWTException

SWTException is thrown when a recoverable error occurs internally in SWT. The error code and message text provide a further description of the problem.

SWT throws this exception consistently across all platforms. On all platforms, SWT remains in a known stable state after throwing the exception. For example, this exception is thrown when an SWT call is made from a non–UI thread.

SWTError

SWTError is thrown when an unrecoverable error occurs inside SWT.

SWT will throw this error when an underlying platform call fails, leaving SWT in an unknown state, or when SWT is known to have an unrecoverable error, such as running out of platform graphics resources.

Once an SWT error has occurred, there is little that an application can do to correct the problem. These errors should not be encountered during normal course of operation in an application, but high reliability applications should still catch and report the errors.

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Graphics

SWT provides a robust graphics engine for drawing graphics and displaying images in widgets. You can get pretty far without ever programming to the graphics interface, since widgets handle the painting of icons, text, and other data for you. However, if your application displays custom graphics, or if you are implementing a custom drawn widget, then you will need to understand some basic drawing objects in SWT.

Graphics context

The graphics context, GC, is the focal point for SWT graphics support. Its API describes all of the drawing capabilities in SWT.

A GC can be used for drawing on a control (the most common case), on an image, on a display, or to a printer. When drawing on a control, you use the GC supplied to you in the control's paint event. When drawing on an image, display, or printer, you must create a GC configured for it, and dispose of the GC when you are finished using it.

Once you've got a GC, you can set its attributes, such as color, line width, and font, which control the

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appearance of the graphics drawn in the GC.

The API Reference for GC describes the complete set of graphics functions.

Fonts

The Font and FontData classes are used when manipulating fonts in SWT.

FontData describes the characteristics of a font. You can create a FontData by specifying a font name, style, and size. FontData includes API for querying these attributes. Since FontData does not allocate any OS resources, you do not need to dispose of it.

The Font is the actual graphic object representing a font that is used in the drawing API. You create a Font for a Display by specifying the Display and the FontData of the font that you want. You can also query a Font for its FontData.

You must dispose of an allocated Font when you are finished using it.

Colors

Colors are similar to fonts. You create a Color for a Display by specifying the RGB values for the desired color. You must dispose of an allocated color when you are finished using it.

The Display method `getSystemColor(int)` allows you to query the predefined system colors for the OS platform. You should not free colors obtained using this technique.

The color model is discussed in detail in the article SWT color model.

Images

The Image, ImageData, and ImageLoader classes are used when manipulating Images in SWT.

ImageData describes the actual pixels in the image, using the PaletteData class to describe the utilized color values. ImageData is a device- and platform-independent description of an image.

ImageLoader loads and saves ImageData in different file formats. SWT currently supports loading and saving of *BMP* (Windows Bitmap), *ICO* (Windows Icon), *JPEG*, *GIF*, and *PNG* image formats.

The Image is the actual graphic object representing the image that is used in the drawing API. You create an image for a particular Display. Images can be created in several ways:

- use an ImageData to initialize the image's contents
- copy an existing Image
- load an Image from a file

Regardless of how you create the Image, you are responsible for disposing it.

Graphics object lifecycle

Most of the graphics objects used for drawing in SWT allocate resources in the underlying OS and must be explicitly freed. The same rule discussed earlier applies here. If you create it using a constructor, you should free it. If you get access to it from somewhere else, do not free it.

Creation

Graphics objects such as graphics contexts, fonts, colors, and images are allocated in the OS as soon as the object is created. How you plan to use your graphics objects determines when you should create them.

For graphics objects that are used heavily throughout the application, you can create them at the time that you create your widgets. This is commonly done for colors and fonts. In other cases, it is more appropriate to create your graphics objects on the fly. For example, you might create a graphics context in one of your widget event handlers in order to perform some calculations.

If you are implementing a custom widget, you typically allocate graphics objects in the constructor if you always make use of them. You might allocate them on the fly if you do not always use them or if they are dependent upon the state of some attribute.

Painting

Once you have allocated your graphics objects, you are ready to paint. *You should always do your painting inside of a paint listener.* There are rare cases, particularly when implementing custom widgets, when you paint while responding to some other event. However this is generally discouraged. If you think you need to paint while handling some other event, you should first try to use the *redraw()* method, which will generate another paint event in the OS. Drawing outside of the paint method defeats platform optimizations and can cause bugs depending upon the number of pending paints in the event queue.

When you receive a paint event, you will be supplied with a GC pre-configured for drawing in the widget. *Do not free this GC!* You did not create it.

Any other graphics objects must be allocated while handling the event (or beforehand). Below is a snippet based on the *org.eclipse.swt.examples.HelloWorld5* sample. The color red was previously allocated when creating the widget, so it can be used here.

```
shell.addPaintListener (new PaintListener () {
    public void paintControl (PaintEvent event) {
        GC gc = event.gc;
        gc.setForeground (red);
        Rectangle rect = event.widget.getClientArea ();
        gc.drawRectangle (rect.x + 10, rect.y + 10, rect.width - 20, rect.height - 20);
        gc.drawString (resHello.getString("Hello_world"), rect.x + 20, rect.y + 20);
    }
});
```

Disposal

Every graphics object that you allocate must be freed when you are finished using it.

The timing of the disposal depends upon when you created the object. If you create a graphics object while creating your widget, you should generally add a dispose listener onto the widget and dispose of the graphics

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when the widget is disposed. If you create an object on the fly while painting, you should dispose of it when finished painting.

The next code snippet shows a slightly modified version of our paint listener. In this example, it allocates and frees the color red while painting.

```
shell.addPaintListener (new PaintListener () {
    public void paintControl (PaintEvent event) {
        GC gc = event.gc;
        Color red = new Color (event.widget.getDisplay (), 0xFF, 0, 0);
        gc.setForeground (red);
        Rectangle rect = event.widget.getClientArea ();
        gc.drawRectangle (rect.x + 10, rect.y + 10, rect.width - 20, rect.height - 20);
        gc.drawString (resHello.getString ("Hello_world"), rect.x + 20, rect.y + 20);
        red.dispose ();
    }
});
```

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Resources and the workspace

The central hub for your user's data files is called a **workspace**. You can think of the platform workbench as a tool that allows the user to navigate and manipulate the workspace. The resources plug-in provides APIs for creating, navigating, and manipulating resources in a workspace. The workbench uses these APIs to provide this functionality to the user. Your plug-in can also use these APIs.

From the standpoint of a resource-based plug-in, there is exactly one workspace, and it is always open for business as long as the plug-in is running. The workspace gets opened automatically when the resources plug-in is activated, and closed when the platform is shut down. If your plug-in requires the resources plug-in, then the resources plug-in will be started before your plug-in, and the workspace will be available to you.

The workspace contains a collection of resources. From the user's perspective, there are three different types of resources: **projects**, **folders**, and **files**. A project is a collection of any number of files and folders. It is a container for organizing other resources that relate to a specific area. Files and folders are just like files and directories in the file system. A folder contains other folders or files. A file contains an arbitrary sequence of bytes. Its content is not interpreted by the platform.

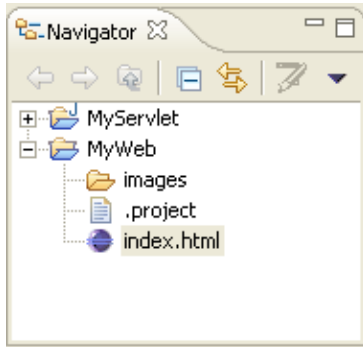
A workspace's resources are organized into a tree structure, with projects at the top, and folders and files underneath. A special resource, the workspace root resource, serves as the root of the resource tree. The workspace root is created internally when a workspace is created and exists as long as the workspace exists.

A workspace can have any number of projects.

A sample resource tree

The tree below (represented in the workbench navigator view) illustrates a typical hierarchy of resources in a workspace. The (implied) root of the tree is the workspace root. The projects are immediate children of the workspace root. Each node (other than the root) is one of the three kinds of resources, and each has a name that is different from its siblings.

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Resource names are arbitrary strings (almost — they must be legal file names). The platform itself does not dictate resource names, nor does it specify any names with special significance. (One exception is that you cannot name a project **".metadata"** since this name is used internally.)

Projects contain files and folders, but not other projects. Projects and folders are like directories in a file system. When you delete a project, you will be asked whether you want to delete all of the files and folders that it contains. Deleting a folder from a project will delete the folder and all of its children. Deleting a file is analogous to deleting a file in the file system.

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Resources and the local file system

When the platform is running and the resources plug-in is active, the workspace is represented by an instance of **IWorkspace**, which provides protocol for accessing the resources it contains. An **IWorkspace** instance represents an associated collection of files and directories in the local file system. You can access the workspace from the resources plug-in class (defined in [org.eclipse.core.resources](#)).

```
IWorkspace workspace = ResourcesPlugin.getWorkspace();
```

When the resources plug-in is not running, the workspace exists solely in the local file system and is viewed or manipulated by the user via standard file-based tools. Let's look at what a workspace looks like on disk as we explain the resources plug-in API.

Our sample tree on disk

When you installed the platform SDK, you unzipped the files into a directory of your choosing. We will call this directory the platform root directory. This is the directory that contains the **plugins** directory, among others. Inside the platform root directory, there is a **workspace** directory which is used to hold the resources that are created and manipulated by the platform. If you look in your **workspace** directory, you'll see separate subdirectories for each project that exists in the workspace. Within these subdirectories are the folders and files that each project contains.

If the SDK in our example is installed in **c:\MySDK**, then inside the **c:\MySDK\workspace** directory we find subdirectories named after the workspace's projects, **MyWeb** and **MyServlet**. These are called the projects' content directories. Content directories are created by the platform when the user creates a project.

Inside each directory, we find the files and folders within the project, laid out exactly the same as they are in the workspace's resource tree. All file names are the same, and the files' contents are the same whether

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accessed from the file system or from the workspace. The only surprise is the **.project** file, explained in a moment.

```
C:\MySDK\workspace (workspace root)
  .metadata\ (platform metadata directory)
  MyWeb\ (project content directory for MyWeb)
    .project
    index.html
    images\
      logo.gif
  MyServlet\ (project content directory for MyServlet)
    .project
    src\
      main.java
    bin\
      main.class
```

The platform has a special **.metadata** directory for holding platform internal information. The **.metadata** directory of a workspace is considered to be a "black box." Important information about the workspace structure, such as a project's references or a resource's properties, is stored in the metadata portion of the workspace and should only be accessed by tools through the platform API. These files should never be edited or manipulated using generic file system API.

In addition, each project has its own **.project** file, where metadata about the project is kept. This file is basically an on-disk equivalent of the information found in a project's **IProjectDescription**.

Apart from the **.metadata** directory and the **.project** files, the folders and files in the workspace directory are fair game for other tools. The files and folders can be manipulated by non-integrated tools, such as text editors and file system utilities. The only issue is that the user must be careful when editing these files both in the workbench and externally. (This is no different than when a user edits a file using two independent stand-alone tools.) The workbench provides refresh operations to reconcile the workspace view of resources with the actual state in the file system and periodically refreshes the workspace based on the state of the file system.

Our sample tree in code

The resource API allows us to manipulate this resource tree in code. Here we will look at some code snippets for a quick taste of the resource API. The resource API is defined in a series of interfaces in **org.eclipse.core.resources**. There are interfaces for all of the resource types, such as **IProject**, **IFolder**, and **IFile**. Extensive common protocol is defined in **IResource**. We also make use of the **org.eclipse.core.runtime** interface **IPath**, which represents segmented paths such as resource or file system paths.

Manipulating resources is very similar to manipulating files using **java.io.File**. The API is based on **handles**. When you use API like **getProject** or **getFolder**, you are returned a handle to the resource. There is no guarantee or requirement that the resource itself exists until you try to do something with the handle. If you expect a resource to exist, you can use **exists** method to ensure this is the case.

To navigate the workspace from a plug-in, we must first obtain the **IWorkspaceRoot**, which represents the top of the resource hierarchy in the workspace.

```
IWorkspaceRoot myWorkspaceRoot = ResourcesPlugin.getWorkspace().getRoot();
```

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Once we have a workspace root, we can access the projects in the workspace.

```
IProject myWebProject = myWorkspaceRoot.getProject("MyWeb");
// open if necessary
if (myWebProject.exists() && !myWebProject.isOpen())
    myWebProject.open(null);
```

Before we can manipulate a project, we must open it. Opening the project reads the project's structure from disk and creates the in-memory object representation of the project's resource tree. Opening a project is an explicit operation since each open project consumes memory to represent the resource tree internally and open projects participate in various resource lifecycle events (such as building) which can be lengthy. In general, closed projects cannot be accessed and will appear empty even though the resources are still present in the file system.

You'll notice that many of these resource examples pass a **null** parameter when manipulating resources. Many resource operations are potentially heavyweight enough to warrant progress reporting and user cancellation. If your code has a user interface, you will typically pass an **IProgressMonitor**, which allows the resources plug-in to report progress as the resource is manipulated and allows the user to cancel the operation if desired. For now, we simply pass **null**, indicating no progress monitor.

Once we have an open project, we can access its folders and files, as well as create additional ones. In the following example we create a file resource from the contents of a file located outside of our workspace.

```
IFolder imagesFolder = myWebProject.getFolder("images");
if (imagesFolder.exists()) {
    // create a new file
    IFile newLogo = imagesFolder.getFile("newLogo.gif");
    FileInputStream fileStream = new FileInputStream(
        "c:/MyOtherData/newLogo.gif");
    newLogo.create(fileStream, false, null);
    // create closes the file stream, so no worries.
}
```

In the example above, the first line obtains a handle to the images folder. We must check that the folder **exists** before we can do anything interesting with it. Likewise, when we get the file **newLogo**, the handle does not represent a real file until we create the file in the last line. In this example, we create the file by populating it with the contents of **logo.gif**.

The next snippet is similar to the previous one, except that it copies the **newLogo** file from the original logo rather than create a new one from its contents.

```
IFile logo = imagesFolder.getFile("logo.gif");
if (logo.exists()) {
    IPath newLogoPath = new Path("newLogo.gif");
    logo.copy(newLogoPath, false, null);
    IFile newLogo = imagesFolder.getFile("newLogo.gif");
    ...
}
```

Finally, we'll create another images folder and move the newly created file to it. We rename the file as a side effect of moving it.

```
...
IFolder newImagesFolder = myWebProject.getFolder("newimages");
newImagesFolder.create(false, true, null);
```

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```
IPath renamedPath = newImagesFolder.getFullPath().append("renamedLogo.gif");
newLogo.move(renamedPath, false, null);
IFile renamedLogo = newImagesFolder.getFile("renamedLogo.gif");
```

Many of the resource API methods include a **force** boolean flag which specifies whether resources that are out of synch with the corresponding files in the local file system will be updated anyway. See [IResource](#) for more information. You can also use [IResource.isSynchronized](#) to determine whether a particular resource is in synch with the file system.

Mapping resources to disk locations

In the sample resource tree, we've assumed that all of the project content directories are in the **workspace** directory underneath the platform root directory (`C:\MySDK\workspace`). This is the default configuration for projects. However, a project's content directory can be remapped to any arbitrary directory in the file system, perhaps on a different disk drive.

The ability to map the location of a project independent of other projects allows the user to store the contents of a project in a place that makes sense for the project and the project team. A project's content directory should be considered "out in the open." This means that users can create, modify, and delete resources by using the workbench and plug-ins, or by directly using file system based tools and editors.

Resource path names are not complete file system paths. Resource paths are always based on the project's location (usually the **workspace** directory). To obtain the full file system path to a resource, you must query its location using [IResource.getLocation](#). However, you cannot use [IProjectDescription.setLocation](#) to change its location, because that method is just a simple setter for a data structure.

Conversely, if you want to get the corresponding resource object given a file system path, you can use [IWorkspaceRoot.getFileForLocation](#) or [IWorkspaceRoot.getContainerForLocation](#).

Resource API and the file system

When we use the resources API to modify our workspace's resource tree, the files are changed in the file system in addition to updating our resource objects. What about changes to resource files that happen outside of the platform's API?

External changes to resources will not be reflected in the workspace and resource objects until detected by the resources plug-in. The resources plug-in also uses a mechanism appropriate for each particular native operating system for discovering external changes made in the file system. In addition, clients can use resource API to reconcile workspace and resource objects with the local file system quietly and without user intervention. The user can also explicitly force a refresh in the resource navigator view of the workbench.

Many of the methods in the resource APIs include a force parameter which specifies how resources that are out of sync with the file system should be handled. The API Reference for each method provides specific information about this parameter. Additional methods in the API allow programmatic control of file system refresh, such as [IResource.refreshLocal\(int depth, IProgressMonitor monitor\)](#). See [IResource](#) for information on correct usage and costs.

Plug-ins that wish to supply their own mechanism for periodically refreshing the workspace based on the state of the external file system may do so using the [org.eclipse.core.resources.refreshProviders](#) extension point. See [Refresh providers](#) for more information.

Refresh providers

The [org.eclipse.core.resources.refreshProviders](#) extension point allows plug-ins to register and implement their own mechanisms for monitoring the external file system and refreshing the workspace appropriately. This extension point is intended for plug-ins that implement specialized, often native, schemes for monitoring file system changes.

The plug-in fragment [org.eclipse.core.resources.win32](#) implements a native refresh monitor based on file system callbacks. A more naive refresh monitor based on polling is defined for other platforms.

The following snippet shows the definition for this extension in the [org.eclipse.core.resources.win32](#) fragment.

```
<extension
  id="win32"
  point="org.eclipse.core.resources.refreshProviders">
  <refreshProvider
    name="%win32MonitorFactoryName"
    class="org.eclipse.core.internal.resources.refresh.win32.Win32RefreshProvider">
  </refreshProvider>
</extension>
```

The **class** attribute must be a class that extends [RefreshProvider](#). This class is responsible for installing a monitor on a specific resource and its resource subtree if it is a project or folder. The monitor must implement [IRefreshMonitor](#).

File encoding and content types

The platform runtime plug-in defines infrastructure for defining and discovering **content types** for data streams. (See [Content types](#) for an overview of the content framework.) An important part of the content type system is the ability to specify different encodings (character sets) for different kinds of content. The resources API further allows default character sets to be established for projects, folders, and files. These default character sets are consulted if the content of the file itself does not define a particular encoding inside its data stream.

Setting a character set

We've seen in [Content types](#) that default file encodings can be established for content types. More fine-grained control is provided by the resources API.

[IContainer](#) defines protocol for setting the default character set for a particular project or folder. This gives plug-ins (and ultimately the user) more freedom in determining an appropriate character set for a set of files when the default character sets from the content type may not be appropriate.

[IFile](#) defines API for setting the default character set for a particular file. If no encoding is specified inside the file contents, then this character set will be used. The file's default character set takes precedence over any default character set specified in the file's folder, project, or content type.

Both of these features are available to the end–user in the properties page for a resource.

Querying the character set

IFile also defines API for querying the character set of a file. A boolean flag specifies whether only the character set explicitly defined for the file should be returned, or whether an implied character set should be returned. For example:

```
String charset = myFile.getCharset(false);
```

returns null if no character set was set explicitly on myFile. However,

```
String charset = myFile.getCharset(true);
```

will first check for a character set that was set explicitly on the file. If none is found, then the content of the file will be checked for a description of the character set. If none is found, then the file's containing folders and projects will be checked for a default character set. If none is found, the default character set defined for the content type itself will be checked. And finally, the platform default character set will be returned if there is no other designation of a default character set. The convenience method **getCharset()** is the same as using **getCharset(true)**.

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Resource markers

We know that plug–ins can define specialized file extensions and contribute editors that provide specialized editing features for these file types. During the course of editing (or building) a resource, a plug–in may need to tag resources to communicate problems or other information to the user. The resource marker mechanism is used to manage this kind of information.

A **marker** is like a yellow sticky note stuck to a resource. On the marker you can record information about a problem (e.g., location, severity) or a task to be done. Or you can simply record a location for a marker as a bookmark.

Users can quickly jump to the marked location within a resource. The workbench UI supports presentation of bookmarks, breakpoints, tasks, and problems along the side of the editor. These markers can also be shown as items in views, such as the tasks or bookmarks view.

The platform resources API defines methods for creating markers, setting marker values, and extending the platform with new marker types. While the platform manages markers, it is the plug–ins that control their creation, removal and attribute values.

Markers are intended to be small, lightweight objects. There could be hundreds, even thousands of markers in a single project. For example, the Java compiler uses a marker to flag each problem it finds in source code.

The platform will throw away markers attached to resources that are deleted, but plug–ins are responsible for removing their stale markers when they no longer apply to a resource that still exists.

Marker operations

Manipulating a marker is similar to manipulating a resource. Markers are **handle** objects. You can obtain a marker handle from a resource, but you don't know if it actually exists until you use **exists()** protocol or otherwise try to manipulate it. Once you've established that a marker exists, you can query named attributes that may have been assigned to it.

Markers are owned and managed by the platform, which takes care of making markers persistent and notifying listeners as markers are added, deleted, or changed. Plug-ins are responsible for creating any necessary markers, changing their attributes, and removing them when they are no longer needed.

Marker creation

Markers are not directly created using a constructor. They are created using a factory method (**IResource.createMarker()**) on the associated resource.

```
IMarker marker = file.createMarker(IMarker.TASK);
```

To create a marker that has global scope (not associated with any specific resource), you can use the workspace root (**IWorkspace.getRoot()**) as the resource.

Marker deletion

The code for deleting a marker is straightforward.

```
try {
    marker.delete();
} catch (CoreException e) {
    // Something went wrong
}
```

When a marker is deleted, its marker object (handle) becomes "stale." Plug-ins should use the **IMarker.exists()** protocol to make sure a marker object is still valid.

Markers can be deleted in batch by asking a resource to delete its markers. This method is useful when removing many markers at once or if individual marker references or ids are not available.

```
int depth = IResource.DEPTH_INFINITE;
try {
    resource.deleteMarkers(IMarker.PROBLEM, true, depth);
} catch (CoreException e) {
    // something went wrong
}
```

When deleting a group of markers, you specify a marker **type** to delete, such as **IMarker.PROBLEM**, or **null** to delete all markers. The second argument indicates whether you want to delete subtype markers. (We'll look a subtypes in a moment when we define new marker types.) The **depth** argument controls the depth of deletion.

You can also delete markers using **IWorkspace.deleteMarkers(IMarker [])**.

Marker attributes

Given a marker, you can ask for its associated resource, its id (unique relative to that resource), and its type. You can also access additional information via generic attributes.

Each type of marker has a specific set of attributes that are defined by the creator of the marker type using naming conventions. The **IMarker** interface defines a set of constants containing the standard attribute names (and some of the expected values) for the platform marker types. The following method manipulates attributes using the platform constants.

```
IMarker marker = file.createMarker(IMarker.TASK);
if (marker.exists()) {
    try {
        marker.setAttribute(IMarker.MESSAGE, "A sample marker message");
        marker.setAttribute(IMarker.PRIORITY, IMarker.PRIORITY_HIGH);
    } catch (CoreException e) {
        // You need to handle the case where the marker no longer exists
    }
}
```

Attributes are maintained generically as name/value pairs, where the names are strings and a value can be any one of the supported value types (boolean, integer, string). The limitation on value types allows the platform to persist the markers quickly and simply.

Querying markers

Resources can be queried for their markers and the markers of their children. For example, querying the workspace root with infinite depth considers all of the markers in the workspace.

```
IMarker[] problems = null;
int depth = IResource.DEPTH_INFINITE;
try {
    problems = resource.findMarkers(IMarker.PROBLEM, true, depth);
} catch (CoreException e) {
    // something went wrong
}
```

The result returned by **findMarkers** depends on the arguments passed. In the snippet above, we are looking for all markers of type **PROBLEM** that appear on the resource and all of its direct and indirect descendants.

If you pass **null** as the marker type, you will get all the marker types associated with the resource. The second argument specifies whether you want to look at the resource's children. The **depth** argument controls the depth of the search when you are looking at the resource's children. The depth can be **DEPTH_ZERO** (just the given resource), **DEPTH_ONE** (the resource and all of its direct children) or **DEPTH_INFINITE** (the resource and all of its direct and indirect descendants).

Marker persistence

The platform standard markers (task, problem, and bookmark) are **persistent**. This means that their state will be saved across workbench shutdown and startup. However, markers of a persistent type may be selectively made transient by setting the reserved attribute *transient* to true.

New marker types declared by plug-ins are not persistent unless they are declared as such.

Extending the platform with new marker types

Plug-ins can declare their own marker types using the [org.eclipse.core.resources.markers](#) extension point. The standard marker types for problems, tasks and bookmarks are declared by the platform in the resources plug-in's markup.

```
<extension
  id="problemmarker"
  point="org.eclipse.core.resources.markers"
  name="%problemName">
  <super type="org.eclipse.core.resources.marker" />
  <persistent value="true" />
  <attribute name="severity" />
  <attribute name="message" />
  <attribute name="location" />
</extension>
<extension
  id="taskmarker"
  point="org.eclipse.core.resources.markers"
  name="%taskName">
  <super type="org.eclipse.core.resources.marker" />
  <persistent value="true" />
  <attribute name="priority" />
  <attribute name="message" />
  <attribute name="done" />
  <attribute name="userEditable" />
</extension>
<extension
  id="bookmark"
  point="org.eclipse.core.resources.markers"
  name="%bookmarkName">
  <super type="org.eclipse.core.resources.marker" />
  <persistent value="true" />
  <attribute name="message" />
  <attribute name="location" />
</extension>
```

New marker types are derived from existing ones using multiple inheritance. New marker types inherit all of the attributes from their super types and add any new attributes defined as part of the declaration. They also transitively inherit attributes from the super types of their super types. The following markup defines a new kind of marker in a hypothetical **com.example.markers** plug-in.

```
<extension
  id="mymarker"
  point="org.eclipse.core.resources.markers" />
<extension
  id="myproblem"
  point="org.eclipse.core.resources.markers">
  <super type="org.eclipse.core.resources.problemmarker" />
  <super type="com.example.markers.mymarker" />
  <attribute name="myAttribute" />
  <persistent value="true" />
</extension>
```

Note that the type **org.eclipse.core.resources.problemmarker** is actually one of the pre-defined types (aka **IMarker.PROBLEM**).

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The only aspect of a marker super type that is not inherited is its **persistence** flag. The default value for persistence is false, so any marker type that should be persistent must specify `<persistent value="true"/>`.

After declaring the new marker type in your plug-in manifest file, you can create instances of `com.example.markers.myproblem` marker type and freely set or get the `myAttribute` attribute.

Declaring new attributes allows you to associate data with markers that you plan to use elsewhere (in your views and editors). Markers of a particular type do not have to have values for all of the declared attributes. The attribute declarations are more for solving naming convention problems (so everyone uses "message" to talk about a marker's description) than for constraining content.

```
public IMarker createMyMarker(IResource resource) {
    try {
        IMarker marker = resource.createMarker("com.example.markers.myproblem");
        marker.setAttribute("myAttribute", "MYVALUE");
        return marker;
    } catch (CoreException e) {
        // You need to handle the cases where attribute value is rejected
    }
}
```

You can query your own marker types in the same way you query the platform marker types. The method below finds all **mymarkers** associated with the given target resource and all of its descendants. Note that this will also find all **myproblems** since true is passed for the `includeSubtypes` argument.

```
public IMarker[] findMyMarkers(IResource target) {
    String type = "com.example.markers.mymarker";
    IMarker[] markers = target.findMarkers(type, true, IResource.DEPTH_INFINITE);
}
```

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Modifying the workspace

In the course of performing its function, your plug-in may need to make changes to resources in the workspace. The workspace is an important data model for many plug-ins in the system, many of which rely on keeping up with the current state of the workspace. Plug-ins may even be concurrently updating the workspace. It's important for your plug-in to act as a responsible workspace citizen when making changes to resources. What makes a plug-in a good workspace citizen?

- **Batching** of changes where possible to avoid flooding the system with unnecessary events or triggering unnecessary processing on an interim state.
- **Listening** to resource change events and updating models as the workspace changes.
- **Fine-grained locking** of the workspace when making modifications instead of locking the entire workspace.

The next few sections look at these concepts in more detail.

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Batching resource changes

When you need to modify resources in the workspace, it is important to keep in mind that other plug-ins might be working with the same resources. The resources API provides robust mechanisms for keeping plug-ins informed about changes in the workspace, and for making sure that multiple plug-ins do not modify the same resource at the same time. Where possible, your plug-in's modifications to the workspace should be batched in units of work inside a **workspace runnable**. These runnables help to reduce the amount of change notifications generated by changes. They also allow you to declare which part of the workspace is to be modified, so that other plug-ins can be locked out of changing the same part of the workspace.

The protocol for **IWorkspaceRunnable** is fairly simple. A workspace runnable looks just like a long-running operation or platform job. The actual work is done inside a **run** method, with progress reported to the supplied **IProgressMonitor**. Code that manipulates the workspace is performed inside the **run** method.

```
IWorkspaceRunnable myRunnable =
    new IWorkspaceRunnable() {
public void run(IProgressMonitor monitor) throws CoreException {
    //do the actual work in here
    ...
}
}
```

When it is time to run the code, your plug-in tells the workspace to run the code on its behalf. This way, the workspace can generate any necessary change events and ensure that no two plug-ins are modifying the same resource at the same time. (Even if your plug-in is not using background jobs and the concurrency framework to modify the workspace, other plug-ins may be doing so.)

Scheduling rules and locking

IWorkspace protocol is used to run a workspace runnable. The preferred technique is using the long form of the **run** method which supplies a scheduling rule and specifies how resource change events are broadcast.

Specifying a scheduling rule when running a workspace runnable allows the workspace to determine whether the resource changes will conflict with workspace changes happening in other threads. (See [Scheduling rules](#) for an overview of scheduling rules and **ISchedulingRule** protocol.) Fortunately, **IResource** protocol includes the protocol for **ISchedulingRule**, which means that a resource can often be used as a scheduling rule for itself.

Confused? Code can help to clarify this point. Suppose your plug-in is getting ready to modify a bunch of resources in a particular project. It can use the project itself as the scheduling rule for making the changes. The following snippet runs the workspace runnable that we created earlier:

```
IWorkspace workspace = ResourcesPlugin.getWorkspace();
workspace.run(myRunnable, myProject, IWorkspace.AVOID_UPDATE, null);
```

The runnable is passed to the workspace, followed by the project that the code is manipulating. This tells the workspace that all of the changes in the runnable are confined to `myProject`. Any requests by other threads to change `myProject` will be blocked until this runnable completes. Likewise, this call will block if some other thread is already modifying `myProject`. By specifying which part of the resource tree will be modified by the runnable, you are allowing other threads to continue modifying other portions of the workspace. It is important to be sure that your resource rule matches the work being done inside the runnable. Any attempt to access a resource outside the scope of the scheduling rule will trigger an exception.

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The third parameter to the **run** method specifies whether any periodic resource change events should be broadcast during the scope of this call. Using `IWorkspace.AVOID_UPDATE` tells the platform to suppress any resource change events while the runnable is running and to broadcast one event at the end of the changes. During this call, any other runnables created in the runnable will be considered part of the parent batch operation. Resource changes made in those runnables will appear in the parent's resource change notification.

Resource rule factory

In the example above, we assumed that the code inside our runnable only modified resources in a particular project. This made it very easy to specify a scheduling rule for the runnable. In practice, it can be more difficult to compute what parts of the workspace are affected by a particular change. For example, moving a resource from one project to another affects both projects. **IResourceRuleFactory** can be used to help compute an appropriate resource rule for certain kinds of resource changes. You can get a resource rule factory from the workspace itself.

```
IWorkspace workspace = ResourcesPlugin.getWorkspace();
IResourceRuleFactory ruleFactory = workspace.getRuleFactory();
```

The factory can supply rules appropriate for many kinds of operations. If your runnable is moving a resource from one location to another, it can obtain a rule appropriate for this operation:

```
ISchedulingRule movingRule = ruleFactory.moveResource(sourceResource, destinationResource);
workspace.run(myRunnable, movingRule, IWorkspace.AVOID_UPDATE, null);
```

See the javadoc for **IResourceRuleFactory** for the list of available rules. The resources plug-in uses these rules itself to implement most resource operations. Browsing the code that references these rule methods will help demonstrate how they are used in practice.

Multiple rules can be combined using **MultiRule**.

```
ISchedulingRule movingRule = ruleFactory.moveResource(sourceResource, destinationResource);
ISchedulingRule modifyRule = ruleFactory.modifyResource(destinationResource);
workspace.run(myRunnable, MultiRule.combine(movingRule, modifyRule), IWorkspace.AVOID_UPDATE, null);
```

Ignoring the rules

The short form of the **run** method in **IWorkspace** is also available. It is retained for backward compatibility. The short form does not include a rule or an update flag.

```
workspace.run(myRunnable, null);
```

is effectively the same as calling

```
workspace.run(myRunnable, workspace.getRoot(), IWorkspace.AVOID_UPDATE, null);
```

Specifying the workspace root as the scheduling rule will put a lock on the entire workspace until the runnable is finished. This is the most conservative way to perform a workspace update, but it is not very friendly to other concurrency-minded plug-ins.

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Tracking resource changes

We've just seen how to batch resource changes in a runnable ([Batching resource changes](#)). Let's look at the other side of the coin. What if you want to keep track of all of the changes to the workspace that happen while your plug-in is running? You can register an **IResourceChangeListener** with the workspace. Your listener will be notified of the changes via an **IResourceChangeEvent** object, which describes the changes.

Registering a listener

First, you must register a resource change listener with the workspace.

```
IResourceChangeListener listener = new MyResourceChangeReporter();
ResourcesPlugin.getWorkspace().addResourceChangeListener(
    listener, IResourceChangeEvent.POST_CHANGE);
```

Your listener will be notified after modifications to the workspace resources have been made. Resource API methods that modify resources trigger these events as part of their documented behavior. The method comment for a resource API method explicitly states whether or not it triggers a resource change event. For example, the following is included in the **IFile.setContents()** comment:

```
This method changes resources; these changes will be reported in a subsequent
resource change event, including an indication that this file's content have
been changed.
```

Methods that create, delete, or change a resource typically trigger these events. Methods that read, but do not write, resources typically do not trigger these events.

Resource change events

The resource change event describes the specifics of the change (or set of changes) that have occurred in the workspace. The event contains a **resource delta** that describes the *net* effect of the changes. For example, if you add a resource and later delete it during one batch of changes, the resource will not appear in the delta.

The resource delta is structured as a tree rooted at the workspace root. The resource delta tree describes these types of changes:

- Resources that have been created, deleted, or changed. If you have deleted (or added) a folder, the resource delta will include the folder and all files contained in the folder.
- Resources that have been moved or renamed using the **IResource.move()** API.
- Markers that have been added, removed, or changed. Marker modification is considered to be a workspace modification operation.
- Files that have been modified. Changed files are identified in the resource delta, but you do not have access to the previous content of the file in the resource delta.

To traverse a resource delta tree, you may implement the **IResourceDeltaVisitor** interface or traverse the tree explicitly using **IResource.getAffectedChildren**. Resource delta visitors implement a **visit** method that is called by the resource delta as it enumerates each change in the tree.

Note: Changes made to resource session properties or resource persistent properties are not identified in the resource delta.

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Resource change events are sent whenever a change (or batched set of changes) is made to the workspace. In addition, resource change events are sent for certain specific workspace operations. The table below summarizes the types of resource change events and when they are reported.

Event type	Description
PRE_CLOSE	Notifies listeners that a project is about to be closed. This event can be used to extract and save necessary information from the in-memory representation (e.g., session properties) of a project before it is closed. (When a project is closed, the in-memory representation is disposed). The workspace is locked (no resources can be updated) during this event. The event contains the project that is being closed.
PRE_DELETE	Notifies listeners that a project is about to be deleted. This event can be used to perform clean-up operations, such as removing any saved state that is related to the project from your plug-in's directory. The workspace is locked (no resources can be updated) during this event. The event contains the project that is being deleted.
PRE_AUTOBUILD	Notifies listeners before any auto-building occurs. This event is broadcast when the platform detects an auto-build needs to occur, regardless of whether auto-building is actually enabled. The workspace is not locked during this event (resources can be updated). The event contains a resource delta describing the changes that have occurred since the last POST_CHANGE event was reported.
POST_AUTOBUILD	Notifies listeners after any auto-building has occurred. This event is broadcast after the platform would have performed an auto-build, regardless of whether auto-building is actually enabled. The workspace is not locked during this event (resources can be updated). The event contains a resource delta describing the changes that have occurred since the last POST_CHANGE event was reported.
POST_CHANGE	Describes a set of changes that have occurred to the workspace since the last POST_CHANGE event was reported. Triggered after a resource change API is used individually or in a batched set of workspace changes. Also triggered after any PRE_AUTOBUILD or POST_AUTOBUILD notification is complete. The event contains a resource delta describing the net changes since the last POST_CHANGE event. The workspace is locked (no resources can be updated) during this event.

Implementing a resource change listener

The following example implements a console-based resource change listener. A resource change listener is registered for specific types of events and information about these events is printed to the console:

```
IResourceChangeListener listener = new MyResourceChangeReporter();
ResourcesPlugin.getWorkspace().addResourceChangeListener(listener,
    IResourceChangeEvent.PRE_CLOSE
    | IResourceChangeEvent.PRE_DELETE
    | IResourceChangeEvent.PRE_AUTO_BUILD
    | IResourceChangeEvent.POST_AUTO_BUILD
    | IResourceChangeEvent.POST_CHANGE);
```

The listener checks for each event type and reports information about the resource that was changed and the kinds of changes that occurred. Although this example is designed to show a general listener that handles all the types of resource events, a typical listener would register for just one type of event.

The implementation for **POST_CHANGE** uses another class that can be used to visit the changes in the resource delta.

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```
import org.eclipse.resources.*;
import org.eclipse.runtime.*;

public class MyResourceChangeReporter implements IResourceChangeListener {
    public void resourceChanged(IResourceChangeEvent event) {
        IResource res = event.getResource();
        switch (event.getType()) {
            case IResourceChangeEvent.PRE_CLOSE:
                System.out.print("Project ");
                System.out.print(res.getFullPath());
                System.out.println(" is about to close.");
                break;
            case IResourceChangeEvent.PRE_DELETE:
                System.out.print("Project ");
                System.out.print(res.getFullPath());
                System.out.println(" is about to be deleted.");
                break;
            case IResourceChangeEvent.POST_CHANGE:
                System.out.println("Resources have changed.");
                event.getDelta().accept(new DeltaPrinter());
                break;
            case IResourceChangeEvent.PRE_AUTO_BUILD:
                System.out.println("Auto build about to run.");
                event.getDelta().accept(new DeltaPrinter());
                break;
            case IResourceChangeEvent.POST_AUTO_BUILD:
                System.out.println("Auto build complete.");
                event.getDelta().accept(new DeltaPrinter());
                break;
        }
    }
}
```

The **DeltaPrinter** class implements the **IResourceDeltaVisitor** interface to interrogate the resource delta. The **visit()** method is called for each resource change in the resource delta. The visitor uses a return value to indicate whether deltas for child resources should be visited.

```
class DeltaPrinter implements IResourceDeltaVisitor {
    public boolean visit(IResourceDelta delta) {
        IResource res = delta.getResource();
        switch (delta.getKind()) {
            case IResourceDelta.ADDED:
                System.out.print("Resource ");
                System.out.print(res.getFullPath());
                System.out.println(" was added.");
                break;
            case IResourceDelta.REMOVED:
                System.out.print("Resource ");
                System.out.print(res.getFullPath());
                System.out.println(" was removed.");
                break;
            case IResourceDelta.CHANGED:
                System.out.print("Resource ");
                System.out.print(res.getFullPath());
                System.out.println(" has changed.");
                break;
        }
        return true; // visit the children
    }
}
```

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Further information can be obtained from the supplied resource delta. The following snippet shows how the **IResourceDelta.CHANGED** case could be implemented to further describe the resource changes.

```
...
case IResourceDelta.CHANGED:
    System.out.print("Resource ");
    System.out.print(delta.getFullPath());
    System.out.println(" has changed.");
    int flags = delta.getFlags();
    if ((flags & IResourceDelta.CONTENT) != 0) {
        System.out.println("--> Content Change");
    }
    if ((flags & IResourceDelta.REPLACED) != 0) {
        System.out.println("--> Content Replaced");
    }
    if ((flags & IResourceDelta.MARKERS) != 0) {
        System.out.println("--> Marker Change");
        IMarkerDelta[] markers = delta.getMarkerDeltas();
        // if interested in markers, check these deltas
    }
    break;
...
```

For a complete description of resource deltas, visitors, and marker deltas, consult the API specification for **IResourceDelta**, **IResourceDeltaVisitor**, and **IMarkerDelta**.

Note: Resource change listeners are useful for tracking changes that occur to resources while your plug-in is activated. If your plug-in registers a resource change listener during its startup code, it's possible that many resource change events have been triggered before the activation of your plug-in. The resource delta contained in the first resource change event received by your plug-in will not contain all of the changes made since your plug-in was last activated. If you need to track changes made between activations of your plug-in, you should use the support provided for workspace saving. This is described in [Workspace save participation](#).

Note: Some resource change events are triggered during processing that occurs in a background thread. Resource change listeners should be thread-safe. See [Threading issues](#) for a discussion about thread safety with the UI.

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Concurrency and the workspace

We've already seen that workspace code must be aware of concurrency even if it is not using the concurrency framework. Batching of workspace changes and use of scheduling rules helps in sharing the workspace with other plug-ins (and their threads) that are modifying the workspace. Once your plug-in is using batching and rules (see [Batching resource changes](#)), it is easy to perform the same work using the platform concurrency mechanisms.

Workspace jobs

A **Job** is a basic unit of asynchronous work running concurrently with other jobs. The resources plug-in defines **WorkspaceJob** as a convenient mechanism for defining asynchronous resource modifications. Code that would normally be batched in an **IWorkspaceRunnable** is instead put in the **runInWorkspace** method

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of a workspace job subtype. Instead of running the code using **IWorkspace** protocol, the job is scheduled just like any other job. The appropriate scheduling rules must be added on the job before it is scheduled.

Let's look at an example workspace runnable and what we should do to make it a job:

```
IWorkspaceRunnable myRunnable =
    new IWorkspaceRunnable() {
        public void run(IProgressMonitor monitor) throws CoreException {
            //do the actual work in here
            doSomeWork();
            ...
        }
    }
```

The work is moved to the appropriate method of our **WorkspaceJob** subtype.

```
class MyWorkspaceJob extends WorkspaceJob {
    public MyWorkspaceJob() {
        super("My Workspace Job");
    }
    public IStatus runInWorkspace(IProgressMonitor monitor) {
        //do the actual work in here
        doSomeWork();
        return Status.OK_STATUS;
    }
}
```

Our runnable had to be invoked specifically:

```
IWorkspace workspace = ResourcesPlugin.getWorkspace();
workspace.run(myRunnable, myProject, IWorkspace.AVOID_UPDATE, null);
```

Our job is scheduled like any other job. The platform job manager will run it according to its priority, other jobs in the queue, and the scheduling rules. Note that we must attach the scheduling rule to the job in order to prevent simultaneous modification of myProject.

```
MyWorkspaceJob job = new MyWorkspaceJob();
job.setRule(myProject);
job.schedule();
```

Now that the operation has been structured as a job, all of the scheduling mechanisms (priority, delay, rescheduling) can be used. Resource change events will be batched until the job is finished running.

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Incremental project builders

An **incremental project builder** is an object that manipulates the resources in a project in a particular way. Incremental project builders are often used to apply a transformation on a resource to produce a resource or artifact of another kind.

Plug-ins contribute incremental project builders to the platform in order to implement specialized resource transformations. For example, the Java development tools (JDT) define an incremental project builder that compiles a Java source file into a class file any time a file is added or modified in a Java project. It also keeps track of dependent files and recompiles them when necessary.

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From an API point of view, the platform defines two basic types of builds:

- A **full build** performs a build from scratch. It treats all resources in a project as if they have never been seen by the builder.
- An **incremental build** uses a "last build state," maintained internally by the builder, to do an optimized build based on the changes in the project since the last build.

Incremental builds are seeded with a resource change delta. The delta reflects the net effect of all resource changes since the builder last built the project. This delta is similar to the one used inside resource change events.

Projects can be periodically **cleaned** by the user in order to force a rebuild of a complete project the next time an incremental build is performed on that project. Cleaning a project removes build information such as problem markers and class files.

Builders are best understood by example. The JDT Java compiler is driven by a Java incremental project builder which recompiles the files in a project that are affected by changes. When a full build is triggered, (or an incremental build after a clean), all of the **.java** files in the project are compiled. Any compile problems encountered are added as problem markers on the affected **.java** files. When an incremental build is triggered, the builder selectively recompiles the added, changed, or otherwise affected **.java** files that are described in the resource delta and updates the problem markers as necessary. Any **.class** files or markers that are no longer appropriate are removed.

Incremental building has obvious performance benefits for projects with hundreds or thousands of resources, most of which are unchanging at any given point in time.

The technical challenge for incremental building is to determine exactly what needs to be rebuilt. For example, the internal state maintained by the Java builder includes things like a dependency graph and a list of compilation problems reported. This information is used during an incremental build to identify which classes need to be recompiled in response to a change in a Java resource.

Although the basic structure for building is defined in the platform, the real work is done in the builder code. Patterns for implementing complex incremental builders are beyond the scope of this discussion, since the implementation is dependent on the specific builder design.

Invoking a build

A builder can be invoked explicitly in one of the following ways:

- **IProject.build()** runs the build processing on the receiving project according to the build method's arguments.
- **IWorkspace.build()** runs the build processing on all open projects in the workspace.

In practice, the workbench user triggers a build by selecting corresponding commands in the resource navigator menu.

Incremental project builders are also invoked implicitly by the platform during an auto-build. If enabled, auto-builds run whenever the workspace is changed.

Defining an incremental project builder

The `org.eclipse.core.resources.builders` extension point is used to contribute an incremental project builder to the platform. The following markup shows how the hypothetical plug-in `com.example.builders` could contribute an incremental project builder.

```
<extension
  id="mybuilder" name="My Sample Builder" point="org.eclipse.core.resources.builders">
  <builder
    <run
      class="com.example.builders.BuilderExample">
      <parameter name="optimize" value="true" />
      <parameter name="comment" value="Builder comment" />
    </run>
  </builder>
</extension>
```

The **class** identified in the extension point must extend the platform class `IncrementalProjectBuilder`.

```
public class BuilderExample extends IncrementalProjectBuilder {
    IProject[] build(int kind, Map args, IProgressMonitor monitor)
        throws CoreException {
        // add your build logic here
        return null;
    }
    protected void startupOnInitialize() {
        // add builder init logic here
    }
    protected void clean(IProgressMonitor monitor) {
        // add builder clean logic here
    }
}
```

Build processing begins with the `build()` method, which includes information about the kind of build that has been requested. The build is one of the following values:

- **FULL_BUILD** indicates that all resources in the project should be built.
- **INCREMENTAL_BUILD** indicates that the build is incremental.
- **AUTO_BUILD** indicates that an incremental build is being triggered automatically because a resource has changed and the autobuild feature is on.

If an incremental build has been requested, a resource delta is provided to describe the changes in the resources since the last build. The following snippet further refines the `build()` method.

```
protected IProject[] build(int kind, Map args, IProgressMonitor monitor
    throws CoreException {
    if (kind == IncrementalProjectBuilder.FULL_BUILD) {
        fullBuild(monitor);
    } else {
        IResourceDelta delta = getDelta(getProject());
        if (delta == null) {
            fullBuild(monitor);
        } else {
            incrementalBuild(delta, monitor);
        }
    }
    return null;
}
```

```
}
```

It sometimes happens that when building project "X," a builder needs information about changes in some other project "Y." (For example, if a Java class in X implements an interface provided in Y.) While building X, a delta for Y is available by calling `getDelta(Y)`. To ensure that the platform can provide such deltas, X's builder must have declared the dependency between X and Y by returning an array containing Y from a previous `build()` call. If a builder has no dependencies, it can simply return null. See [IncrementalProjectBuilder](#) for further information.

Full build

The logic required to process a full build request is specific to the plug-in. It may involve visiting every resource in the project or even examining other projects if there are dependencies between projects. The following snippet suggests how a full build might be implemented.

```
protected void fullBuild(final IProgressMonitor monitor) throws CoreException {
    try {
        getProject().accept(new MyBuildVisitor());
    } catch (CoreException e) { }
}
```

The build visitor would perform the build for the specific resource (and answer true to continue visiting all child resources).

```
class MyBuildVisitor implements IResourceVisitor {
    public boolean visit(IResource res) {
        //build the specified resource.
        //return true to continue visiting children.
        return true;
    }
}
```

The visit process continues until the full resource tree has been traveled.

Incremental build

When performing an incremental build, the builder works with a resource change delta instead of a complete resource tree.

```
protected void incrementalBuild(IResourceDelta delta,
    IProgressMonitor monitor) throws CoreException {
    // the visitor does the work.
    delta.accept(new MyBuildDeltaVisitor());
}
```

The visit process continues until the complete resource delta tree has been traveled. The specific nature of changes is similar to that described in [Implementing a resource change listener](#). One important difference is that with incremental project builders, you are working with a resource delta based on a particular project, not the entire workspace.

Cleaning before a build

The workbench allows users to **clean** a project or set of projects before initiating a build. This feature allows the user to force a rebuild from scratch on only certain projects. Builders should implement this method to

clean up any problem markers and derived resources in the project.

Associating an incremental project builder with a project

To make a builder available for a given project, it must be included in the build spec for the project. A project's build spec is a list of commands to run, in sequence, when the project is built. Each command names a single incremental project builder.

The following snippet adds a new builder as the first builder in the existing list of builders.

```
IProjectDescription desc = project.getDescription();
ICommand[] commands = desc.getBuildSpec();
boolean found = false;

for (int i = 0; i < commands.length; ++i) {
    if (commands[i].getBuilderName().equals(BUILDER_ID)) {
        found = true;
        break;
    }
}
if (!found) {
    //add builder to project
    ICommand command = desc.newCommand();
    command.setBuilderName(BUILDER_ID);
    ICommand[] newCommands = new ICommand[commands.length + 1];

    // Add it before other builders.
    System.arraycopy(commands, 0, newCommands, 1, commands.length);
    newCommands[0] = command;
    desc.setBuildSpec(newCommands);
    project.setDescription(desc, null);
}
```

Configuring a project's builder is done just once, usually as the project is being created.

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Derived resources

Many resources get created in the course of translating, compiling, copying, or otherwise processing files that the user creates and edits. **Derived resources** are resources that are not original data, and can be recreated from their source files. It is common for derived files to be excluded from certain kinds of processing.

For example, derived resources are typically not kept in a team repository, since they clutter the repository, change regularly, and can be recreated from their source files. It is not practical for team providers to make decisions about which files are derived. The resource API provides a common mechanism for plug-ins to indicate the resources they create that are derived.

Plug-ins may use **`IResource.setDerived(boolean)`** to indicate that a resource is derived from other resources. Newly created resources are not derived by default, so this method must be used to explicitly mark the resource as derived. A common use is to mark a subfolder of the project as derived when an "output" folder (such as the "bin" folder in Java projects) is created by the plug-in.

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Other plug-ins, usually team providers, can use **`IResource.isDerived`** to determine whether a particular resource should be managed by the repository. Attempts to mark projects or the workspace root as derived will be ignored.

Note: The concept of derived resources is provided for other (non-team) plug-ins to indicate which resources are inappropriate for repository management. Special files created by team implementations to manage their data should not be marked as derived resources. See [Team private resources](#) for a technique for marking team-related implementation resources hidden.

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Team private resources

It is common for repository implementations to use extra files and folders to store information specific about the repository implementation. Although these files may be needed in the workspace, they are of no interest to other plug-ins or to the end user.

Team providers may use **`IResource.setTeamPrivateMember(boolean)`** to indicate that a resource is private to the implementation of a team provider. Newly created resources are not private members by default, so this method must be used to explicitly mark the resource as team private. A common use is to mark a subfolder of the project as team private when the project is configured for team and the subfolder is created.

Other resource API that enumerates resources (such as resource delta trees) will exclude team private members unless explicitly requested to include them. This means that most clients will not "see" the team private resources and they will not be shown to the user. The resource navigator does not show team private members by default, but users can indicate via Preferences that they would like to see team private resources.

Attempts to mark projects or the workspace root as team private will be ignored.

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Workspace save participation

Workspace save processing is triggered when the workbench is shut down by the user and at other times periodically by the platform. Plug-ins can participate in the workspace save process so that critical plug-in data is saved to disk whenever the rest of the workspace's persistent data is saved.

The workspace save process can also be used to track changes that occur between activations of your plug-in.

Implementing a save participant

To participate in workspace saving, you must add a save participant to the workspace. This is typically done during your plug-in's startup method. This is also where you read any state that you might have saved when your plug-in was last shut down.

Let's look at a simple plug-in which will demonstrate the save process.

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```
package com.example.saveparticipant;

import org.eclipse.core.runtime.*;
import org.eclipse.core.resources.*;
import java.io.File;
import java.util.*;

public class MyPlugin extends Plugin {
    private static MyPlugin plugin;

    public MyPlugin(IPluginDescriptor descriptor) {
        super(descriptor);
        plugin = this;
    }

    public static MyPlugin getDefault() {
        return plugin;
    }

    protected void readStateFrom(File target) {
    }

    public void startup() throws CoreException {
        super.startup();
        ISaveParticipant saveParticipant = new MyWorkspaceSaveParticipant();
        ISavedState lastState =
            ResourcesPlugin.getWorkspace().addSaveParticipant(this, saveParticipant);
        if (lastState == null)
            return;
        IPath location = lastState.lookup(new Path("save"));
        if (location == null)
            return;
        // the plugin instance should read any important state from the file.
        File f = getStateLocation().append(location).toFile();
        readStateFrom(f);
    }

    protected void writeImportantState(File target) {
    }
}
```

ISaveParticipant defines the protocol for a workspace save participant. Implementors of this interface can provide behavior for different stages of the save process. Let's look at the stages and how our class **WorkspaceSaveParticipant** implements each of these steps.

- **prepareToSave** notifies the participant that the workspace is about to be saved and that it should suspend normal operation until further notice. Our save participant does nothing here.

```
public void prepareToSave(ISaveContext context) throws CoreException {
}
```

- **saving** tells the participant to save its important state.

```
public void saving(ISaveContext context) throws CoreException {
    switch (context.getKind()) {
        case ISaveContext.FULL_SAVE:
            MyPlugin myPluginInstance = MyPlugin.getDefault();
            // save the plug-in state
            int saveNumber = context.getSaveNumber();
            String saveFileName = "save-" + Integer.toString(saveNumber);
```

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```
File f = myPluginInstance.getStateLocation().append(saveFileName).ToFile();
// if we fail to write, an exception is thrown and we do not update the path
myPluginInstance.writeImportantState(f);
context.map(new Path("save"), new Path(saveFileName));
context.needSaveNumber();
break;
case ISaveContext.PROJECT_SAVE:
    // get the project related to this save operation
    IProject project = context.getProject();
    // save its information, if necessary
    break;
case ISaveContext.SNAPSHOT:
    // This operation needs to be really fast because
    // snapshots can be requested frequently by the
    // workspace.
    break;
}
}
```

The **ISaveContext** describes information about the save operation. There are three kinds of save operations: **FULL_SAVE**, **SNAPSHOT**, and **PROJECT_SAVE**. Save participants should be careful to perform the processing appropriate for the kind of save event they have received. For example, snapshot events may occur quite frequently and are intended to allow plug-ins to save their critical state. Taking a long time to save state which can be recomputed in the event of a crash will slow down the platform.

A save number is used to create data save files that are named using sequential numbers (**save-1**, **save-2**, etc.) Each save file is mapped to a logical file name (**save**) that is independent of the save number. Plug-in data is written to the corresponding file and can be retrieved later without knowing the specific save number of the last successful save operation. Recall that we saw this technique in our plug-in's startup code:

```
IPath location = lastState.lookup(new Path("save"));
```

After we have saved our data and mapped the file name, we call **needSaveNumber** to indicate that we have actively participated in a workspace save and want to assign a number to the save activity. The save numbers can be used to create data files as above.

- **doneSaving** notifies the participant that the workspace has been saved and the participant can continue normal operation.

```
public void doneSaving(ISaveContext context) {
    MyPlugin myPluginInstance = MyPlugin.getDefault();

    // delete the old saved state since it is not necessary anymore
    int previousSaveNumber = context.getPreviousSaveNumber();
    String oldFileName = "save-" + Integer.toString(previousSaveNumber);
    File f = myPluginInstance.getStateLocation().append(oldFileName).ToFile();
    f.delete();
}
```

Here, we clean up the save information from the previous save operation. We use **getPreviousSaveNumber** to get the save number that was assigned in the previous save operation (not the one we just completed). We use this number to construct the name of the file that we need to delete. Note that we do not use the save state's logical file map since we've already mapped our current save file number.

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- **rollback** tells the participant to rollback the important state because the save operation has failed.

```
public void rollback(ISaveContext context) {
    MyPlugin myPluginInstance = MyPlugin.getDefault();

    // since the save operation has failed, delete the saved state we have just written
    int saveNumber = context.getSaveNumber();
    String saveFileName = "save-" + Integer.toString(saveNumber);
    File f = myPluginInstance.getStateLocation().append(saveFileName).toFile();
    f.delete();
}
```

Here, we delete the state that we just saved. Note that we use the current save number to construct the file name of the file we just saved. We don't have to worry about the fact that we mapped this file name into the **ISaveContext**. The platform will discard the context when a save operation fails.

If your plug-in throws an exception at any time during the save lifecycle, it will be removed from the current save operation and will not get any of the remaining lifecycle methods. For example, if you fail during your **saving** method, you will not receive a **rollback** or **doneSaving** message.

Using previously saved state

When you add a save participant to the workspace, it will return an **ISavedState** object, which describes what your plug-in saved during its last save operation (or **null** if your plug-in has not previously saved any state). This object can be used to access information from the previous save file (using the save number and file map) or to process changes that have occurred between activations of a plug-in.

Accessing the save files

If a file map was used to save logically named files according to the save number, this same map can be used to retrieve the data from the last known save state.

```
ISaveParticipant saveParticipant = new MyWorkspaceSaveParticipant();
ISavedState lastState =
    ResourcesPlugin.getWorkspace().addSaveParticipant(myPluginInstance, saveParticipant);

if (lastState != null) {
    String saveFileName = lastState.lookup(new Path("save")).toString();
    File f = myPluginInstance.getStateLocation().append(saveFileName).toFile();
    // the plugin instance should read any important state from the file.
    myPluginInstance.readStateFrom(f);
}
```

Processing resource deltas between activations

Recall that any number of resource change events could occur in the workspace before your plug-in is ever activated. If you want to know what changes have occurred since your plug-in was deactivated, you can use the save mechanism to do so, even if you don't need to save any other data.

The save participant must request that the platform keep a resource delta on its behalf. This is done as part of the save operation.

```
public void saving(ISaveContext context) throws CoreException {
```

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```
// no state to be saved by the plug-in, but request a
// resource delta to be used on next activation.
context.needDelta();
}
```

During plug-in startup, the previous saved state can be accessed and change events will be created for all changes that have occurred since the last save.

```
ISaveParticipant saveParticipant = new MyWorkspaceSaveParticipant();
ISavedState lastState =
    ResourcesPlugin.getWorkspace().addSaveParticipant(myPluginInstance, saveParticipant);
if (lastState != null) {
    lastState.processResourceChangeEvents(new MyResourceChangeReporter());
}
```

The provided class must implement **IResourceChangeListener**, as described in [Tracking resource changes](#). The changes since the last save are reported as part of the **POST_AUTO_BUILD** resource change event.

*Note: Marker changes are not reported in the change events stored in an **ISavedState**. You must assume that any or all markers have changed since your last state was saved.*

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Menu and toolbar paths

We've seen many action contributions that specify the path for the location of their action. Let's take a close look at what these paths mean.

Menu paths

We'll look at menu paths first by looking at the workbench **Help** menu.

Named groups in the workbench

The locations for inserting new menus and menu items are defined using named groups. You can think of a named group as a slot or placeholder that allows you to insert your menu items at certain points in a menu bar or pulldown menu.

The workbench defines all of its group slot names in the classes **IWorkbenchActionConstants** and **IIDEActionConstants**. (Two different classes are used since resource-related menu items are factored out of the generic workbench). For each workbench menu, named groups are placed in the menu at locations where it is expected that plug-ins will insert new actions.

The following description of the help menu is adapted from the **IWorkbenchActionConstants** class definition.

```
Standard Help menu actions
Start group - HELP_START - "start"
End group - HELP_END - "end"
```

The standard workbench help menu defines a named group called "**start**," followed by a named group called "**end**". Defining two groups gives plug-ins a little more control over where their contributed items will be

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positioned within the help menu. When you define a menu, you can define as many slots as you like. Adding more slots gives other plug-ins more control over where their contributions appear relative to existing contributions.

Plug-ins that add a menu item to the help menu can use these group names to decide where their menu item will go. For example, the cheatsheet plug-in adds an action set containing the "Cheat Sheets..." menu to the workbench. Here's the markup from the `org.eclipse.ui.cheatsheets` plug-in's `plugin.xml`.

```
<extension
    point="org.eclipse.ui.actionSets">
    <actionSet
        label="%CHEAT_SHEETS"
        visible="true"
        id="org.eclipse.ui.cheatsheets.actionSet">
        <action
            label="%CHEAT_SHEETS_MENU"
            class="org.eclipse.ui.internal.cheatsheets.actions.CheatSheetHelpMenuAction"
            id="org.eclipse.ui.cheatsheets.actions.CheatSheetHelpMenuAction">
            <menubarPath="help/helpStart"
                id="org.eclipse.ui.cheatsheets.actions.CheatSheetHelpMenuAction">
            </action>
        </actionSet>
    </extension>
```

The new help action will be placed in the help menu, inside the `helpStart` group.

Fully qualified menu paths

A complete menu path is simply "menu name/group name." Most menu names for the workbench are defined in `IWorkbenchActionConstants`. (Resource-related menu names are defined in `IIDEActionConstants`.) If we look for the name of the help menu in this class, we'll find that the fully qualified path name for our help action is `help/helpEnd`.

Some menus have nested submenus. This is where longer paths come into play. If the help menu had defined a submenu called `submenu` with a named group called `submenuStart`, then the fully qualified menu path for an action in the new submenu would be `help/submenu/submenuStart`.

Externalizing UI labels

The example above demonstrates a technique for externalizing strings that appear in the UI. Externalized strings are used to make translating the plug-in's UI to other languages simpler. We can externalize the strings in our `plugin.xml` files by replacing the string with a key (`%CHEAT_SHEETS_MENU`) and creating entries in the `plugin.properties` file of the form:

```
CHEAT_SHEETS_MENU = Cheat Sheets...
```

The `plugin.properties` file can be translated for different languages and the `plugin.xml` will not need to be modified.

Adding new menus and groups

In many of the examples we've seen so far, the actions contributed by the sample plug-ins have been added to existing named groups within menus.

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The **actionSets**, **viewActions**, **editorActions**, and **popupMenus** extension points also allow you to define new menus and groups within your contribution. This means that you can define new submenus or new pull-down menus and contribute your actions to these new menus. In this case, the path for your new action will contain the name of your newly defined menu.

We saw this technique when the readme tool defined a new menu for its action set. Let's look at the markup one more time now that we've looked at menu paths in more detail.

```
<extension point = "org.eclipse.ui.actionSets">
<actionSet id="org_eclipse_ui_examples_readmetool_actionSet"
  label="%ActionSet.name"
  visible="true">
  menu id="org_eclipse_ui_examples_readmetool"
    label="%ActionSet.menu"
  path="window/additions">
    <separator name="slot1"/>
    <separator name="slot2"/>
    <separator name="slot3"/>
  </menu>
  <action id="org_eclipse_ui_examples_readmetool_readmeAction"
  menubarPath="window/org_eclipse_ui_examples_readmetool/slot1"
  toolbarPath="readme"
  label="%ReadmeAction.label"
  tooltip="%ReadmeAction.tooltip"
  helpContextId="org.eclipse.ui.examples.readmetool.open_browser_action_context"
  icon="icons/ctool16/openbrwsr.gif"
  class="org.eclipse.ui.examples.readmetool.WindowActionDelegate"
  enablesFor="1">
  <selection class="org.eclipse.core.resources.IFile"
    name="*.readme">
  </selection>
</action>
...
```

We added a new menu called **"org_eclipse_ui_examples_readmetool"** whose label is defined in by the key **"%ActionSet.name"** in the properties file. Within this menu, we define three named groups: **"slot1"**, **"slot2"**, and **"slot3."** We add this new menu to the path **"window/additions."**

If we go back to **IWorkbenchActionConstants**, we see this definition of the window menu in the javadoc:

```
* <h3>Standard Window menu actions</h3>
* <ul>
* <li>Extra Window-like action group (<code>WINDOW_EXT</code></li>
```

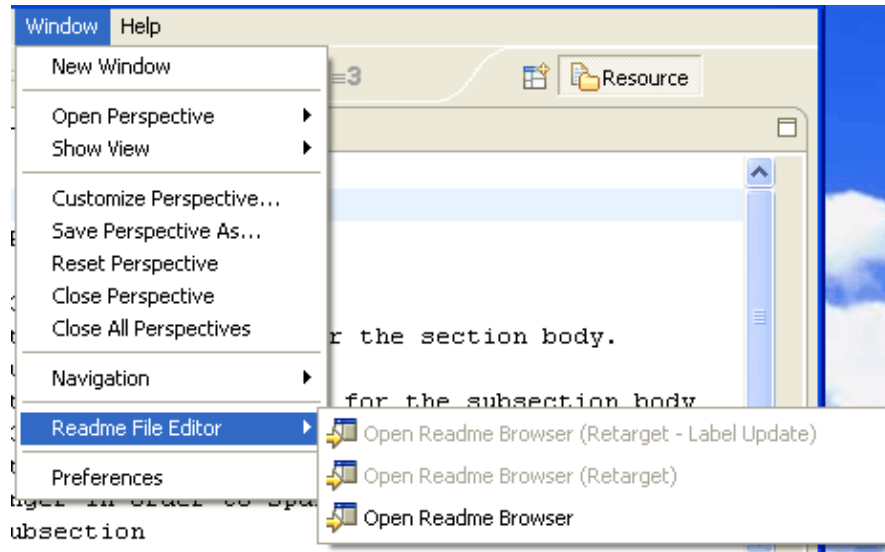
If we look further at the class definition, we will see these related definitions:

```
public static final String MENU_PREFIX = "";
...
public static final String M_WINDOW = MENU_PREFIX+"window";
...
public static final String MB_ADDITIONS = "additions"; // Group.
...
public static final String WINDOW_EXT = MB_ADDITIONS; // Group.
```

From this information, we can piece together the path for adding something to the workbench "Window" menu. The menu itself is called **"window"** and it defines one slot called **"additions."** We use the path **"window/additions"** to add our new menu.

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In the action set declaration, we add an action to our newly defined menu, using the path **"window/org_eclipse_ui_examples_readmetool/slot1."**



Other plug-ins could add to our menu by using this same path (or perhaps one of the other slots) to add one of their own menus.

In the readme tool example, we use the **separator** attribute to identify the group names. This will cause a separator line to appear between these groups when they contain items. We could instead use the **groupMarker** attribute if we want to define a named group without showing any separators in the menu to distinguish between the groups.

Tool bar paths

Tool bar paths work similarly to menu paths.

Named tool bars in the workbench

The workbench tool bar is composed of tool bars contributed by different plug-ins, including the workbench itself. Within any particular tool bar, there are named groups or slots that can be used for inserting new tool bar items.

The following description of the workbench tool bars is adapted from the **IWorkbenchActionConstants** class definition.

```
// Workbench toolbar ids
public static final String TOOLBAR_FILE = "org.eclipse.ui.workbench.file"
public static final String TOOLBAR_NAVIGATE = "org.eclipse.ui.workbench.navigate";

// Workbench toolbar group ids. To add an item at the beginning of the group,
// use the GROUP id. To add an item at the end of the group, use the EXT id.
public static final String PIN_GROUP = "pin.group";
public static final String HISTORY_GROUP = "history.group";
public static final String NEW_GROUP = "new.group";
public static final String SAVE_GROUP = "save.group";
public static final String BUILD_GROUP = "build.group";
```

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In the simplest case, a plug-in can contribute a tool bar item in its own tool bar. For example, the readme tool actions contributed to the menu are also given a tool bar path:

```
...
<action id="org.eclipse.ui.examples.readmetool.readmeAction"
  menubarPath="window/org.eclipse.ui.examples.readmetool/slot1"
  toolbarPath="readme"
...

```

Since there is no reference to the workbench tool bar paths or groups, the readme actions appear in their own group on the tool bar. Specifying the following path would instead place the item in the file tool bar in the save group:

```
...
<action id="org.eclipse.ui.examples.readmetool.readmeAction"
  menubarPath="window/org.eclipse.ui.examples.readmetool/slot1"
  toolbarPath="org.eclipse.ui.workbench.file/save.group"
...

```

The paths defined in [IWorkbenchActionConstants](#) may be referenced in the tool bar paths of other plug-ins.

Adding to action sets of another plug-in

Suppose a plug-in wants its tool bar items better integrated with actions from a different plug-in? Let's look at how the external tools plug-in ([**org.eclipse.ui.externaltools**](#)) integrates its action with the debugger tool bar. The debugger ([**org.eclipse.debug.ui**](#)) defines its tool bar actions like this:

```
<extension
  point="org.eclipse.ui.actionSets">
  <actionSet
    label="%LaunchActionSet.label"
    visible="false"
    id="org.eclipse.debug.ui.launchActionSet">
    ...
    <action
      toolbarPath="debug"
      id="org.eclipse.debug.internal.ui.actions.RunDropDownAction"
      hoverIcon="icons/full/ctool16/run_exc.gif"
      class="org.eclipse.debug.internal.ui.actions.RunToolbarAction"
      disabledIcon="icons/full/dtool16/run_exc.gif"
      icon="icons/full/etool16/run_exc.gif"
      helpContextId="run_action_context"
      label="%RunDropDownAction.label"
      pulldown="true">
    </action>
    ...
  </actionSet>

```

Just like the readme tool, the debugger plug-in defines its own tool bar path, which means its tool bar items will be inside their own tool bar on the workbench. What does the external tools plug-in do?

```
<extension point="org.eclipse.ui.actionSets">
  <actionSet
    id="org.eclipse.ui.externaltools.ExternalToolsSet"
    label="%ActionSet.externalTools"
    visible="true">
    ...
    <action
      id="org.eclipse.ui.externaltools.ExternalToolMenuDelegateToolbar"

```

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```
        definitionId= "org.eclipse.ui.externaltools.ExternalToolMenuDelegateToolb
        label="%Action.externalTools"
toolbarPath="org.eclipse.debug.ui.launchActionSet/debug"
        disabledIcon="icons/full/dtool16/external_tools.gif"
        icon="icons/full/etool16/external_tools.gif"
        hoverIcon="icons/full/ctool16/external_tools.gif"
        tooltip="%Action.externalToolsTip"
        pulldown="true"
        class="org.eclipse.ui.externaltools.internal.menu.ExternalToolMenuDelegat
    </action>
</actionSet>
</extension>
```

Note the use of the action set ID of the debugger in the tool bar path. Using an action set ID in the path denotes that the tool bar item should be placed in the tool bar used by the referenced action set. Within a toolbar group, items are ordered by action set id, so for our example, the external tools action will appear after the debugger actions.

When adding to an action set's tool bar, new groups can also be defined. If the external tools plug-in defined its **toolbarpath** as "**org.eclipse.debug.ui.launchActionSet/external**" a new group would be created for the action on the tool bar. As with menus, tool bar groups are delineated by separators.

Using paths from another plug-in

In general, it's not good practice to contribute to another plug-in's menu or tool bar by deriving the path name from the **plugin.xml** unless it has been marked specifically as being available for clients. It's possible that a future version of the plug-in could change the names of the paths. Two common ways to mark your plug-in's action set ids and paths as fair game are:

- annotate the XML with comments that explicitly mark the menu path or action set as usable by clients
- define a public interface (much like **IWorkbenchActionConstants**) which specifies exactly which menus, tool bar groups, and slots are considered fair game for use by other plug-ins

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Action set part associations

Once your plug-in defines an action set, it can use the **org.eclipse.ui.actionSetPartAssociations** extension point to specify that an action set should be made visible when a particular view or editor is active.

Ultimately, the user controls the appearance of action sets using **Window->Customize Perspectives...** in the workbench menu. If the user marks an action set visible, it will always be visible when the perspective is active, regardless of the active view or editor. Likewise, if the user marks the action set as hidden, it will always be hidden when the perspective is active. If the user does not change the state of an action set in this dialog, then the action set part associations are used to determine the visibility of the action set.

The markup for an action set part association is straightforward. The following example comes from the Java development tools (JDT) UI plug-in.

```
<extension point="org.eclipse.ui.actionSetPartAssociations">
    <actionSetPartAssociation
targetID="org.eclipse.jdt.ui.CodingActionSet">
        <part id="org.eclipse.jdt.ui.PackageExplorer"/>
    </actionSetPartAssociation>
</extension>
```

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```
<part id="org.eclipse.jdt.ui.TypeHierarchy" />
<part id="org.eclipse.jdt.ui.CompilationUnitEditor"/>
<part id="org.eclipse.jdt.ui.ClassFileEditor"/>
<part id="org.eclipse.jdt.ui.ProjectsView"/>
<part id="org.eclipse.jdt.ui.PackagesView"/>
<part id="org.eclipse.jdt.ui.TypesView"/>
<part id="org.eclipse.jdt.ui.MembersView"/>
</actionSetPartAssociation>
</extension>
```

The **targetID** specifies the action set. (The **CodingActionSet** was previously defined in the JDT plug-in manifest.) One or more **part** attributes can be specified to indicate which views and editors will cause the action set to become visible in the menus and toolbar. The effect of this extension contribution is that the actions associated with writing Java code will only be visible when one of the specified views is active.

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Boolean expressions and action filters

When a plug-in contributes an action to the workbench UI using one of the menu extension points, it can specify the conditions under which the menu item is visible and/or enabled in the menu. In addition to supplying simple enabling conditions, such as selection counts and selection classes, plug-ins can use **boolean expressions** to make an action visible or enabled.

Boolean expressions

The boolean expressions can contain simple boolean operators (NOT, AND, OR) and predefined expressions that can evaluate the following conditions:

- **objectClass** – true if each object in the selection subclasses or implements the class.
- **objectState** – true if the named attribute equals the specified value. **IActionFilter** assists in evaluating the expression. An action filter dynamically computes the enablement criteria for an action based on the target selection and the value of named attributes.
- **systemProperty** – true if the named system property equals the specified value.
- **pluginState** – specifies whether the specified plugin (by **id**) should be **installed** or **activated**

For example, the following snippets represent enablement expressions that could be used on a hypothetical action in an action set:

```
<action id="org.eclipse.examples.actionEnablement.class"
  label="Red Element"
  menubarPath="additions"
  class="org.eclipse.examples.actionEnablement.ObjectTestAction">
  <enablement>
    <and>
      <objectClass name="org.eclipse.examples.actionEnablement.TestElement"/>
      <objectState name="name" value="red"/>
    </and>
  </enablement>
</action>
```

```
<action id="org.eclipse.examples.actionEnablement.property"
  label="Property"
  menubarPath="additions"
  class="org.eclipse.examples.actionEnablement.PropertyTestAction">
```


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```

<enablement>
  <systemProperty name="MyTestProperty" value="puppy"/>
</enablement>
</action>

<action id="org.eclipse.examples.actionEnablement.pluginState"
  label="Installed"
  menubarPath="additions"
  class="org.eclipse.examples.actionEnablement.PluginTestAction">
  <enablement>
    <pluginState id="x.y.z.anotherPlugin" value="installed"/>
  </enablement>
</action>

```

See the reference documentation of the extension points below for more elaborate samples of these expressions and a complete description of the XML.

The following table lists extension points that contribute actions and summarizes how XML markup attributes and boolean expressions can be used to affect enablement.

Extension point name	Attributes affecting enablement	Boolean expressions
<u>viewActions</u> , <u>editorActions</u> , <u>actionSets</u>	<p>enablesFor – specifies the selection count that must be met for the action to be enabled</p> <p>selection class – the class that the selected objects must subclass or implement in order for the action to be enabled</p> <p>selection name – a wild card filter that can be applied to the objects in the selection.</p>	<p>visibility – a boolean expression. Controls whether the menu item is visible in the menu.</p> <p>enablement – a boolean expression. Controls whether the menu item is enabled in the menu. The enablesFor attribute and the selection class and name, and must be satisfied before applying the enablement expression.</p>
<u>popupMenus</u>	<p>(For object contributions only.)</p> <p>objectClass – specifies the class that objects in the selection must subclass or implement</p> <p>(For both object and viewer contributions)</p> <p>enablesFor – specifies the selection count that must be met for the action to be enabled</p> <p>selection class – the class that the selected objects must subclass or implement to enable the action</p> <p>selection name – a wild card filter that can be applied to the objects in the selection.</p>	<p>(For both object and viewer contributions)</p> <p>visibility – a boolean expression. Controls whether the menu item is visible in the menu.</p> <p>enablement – a boolean expression. Controls whether the menu item is enabled in the menu. The enablesFor attribute and the selection class and name, and must be satisfied before applying the enablement expression.</p>

Using objectState with content types

The ability to define content types (see [Content types](#)) can be combined with boolean expressions to define very specific enablement or visibility conditions based on the content type of a resource. For example, the following snippet makes a popup menu item visible only if the selected file's content matches the plug-in's specialized content types.

```
<extension point="org.eclipse.ui.popupMenus">
  <objectContribution
    id="com.example.objectContributions"
    objectClass="org.eclipse.core.resources.IFile"
    nameFilter="*.xml">
    <visibility>
      <or>
        <objectState
          name="contentType"
          value="com.example.employeeRecordContentType"/>
        <objectState
          name="contentType"
          value="com.example.customerRecordContentType"/>
      </or>
    </visibility>
    <action id="com.example.action1"
    ...
```

The **contentType** attribute can be used in an objectState expression to check the content type of the selected xml file. This allows a plug-in to apply very specific content checking before enabling or showing menu actions related to specific types of files. See [Content types](#) for more detail about the content type extension.

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Retargetable actions

It is common for a plug-in's views and editors to implement actions that are semantically similar to existing workbench actions, such as clipboard cut/copy/paste, view refresh, or properties. The popup menu for views and editors can become quite cluttered if every view or editor has to define unique actions for these operations and include them in their menus.

To solve this problem, the workbench defines **retargetable** (also called **global**) actions that can be handled by any view or editor. When a view or editor is active, its handler will be run when the user chooses the action from the workbench menu or toolbar. This allows views and editors to share workbench menu space for semantically similar actions.

[IWorkbenchActionConstants](#) documents all of the workbench actions and denotes retargetable actions as global. For example, here is the definition of the **Properties** action.

```
public static final String PROPERTIES = "properties"; // Global action.
```

The following table summarizes some of the more common retargetable actions that are implemented by views and editors:

	File menu	Edit menu	Navigate	Project
--	------------------	------------------	-----------------	----------------

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			menu	menu
views	move rename refresh properties		go into go to resource sync with editor back forward up next previous	open close build rebuild
editors	revert print	find		
views and editors		cut copy paste delete select all undo redo		

Retargetable actions are created using **RetargetAction**. The following snippet is from **WorkbenchActionBuilder**.

```
propertiesAction = createGlobalAction(IWorkbenchActionConstants.PROPERTIES, "file", false);
```

The **createGlobalAction** method shows us exactly how to make a **RetargetAction**.

```
private RetargetAction createGlobalAction(String id, String actionDefPrefix, boolean labelRetargetable) {
    RetargetAction action;
    if (labelRetargetable) {
        action = new LabelRetargetAction(id, WorkbenchMessages.getString("Workbench." + id));
    }
    else {
        action = new RetargetAction(id, WorkbenchMessages.getString("Workbench." + id));
    }
    ...
    return action;
}
```

When creating a retargetable action, the workbench assigns the id for the action and the default label. Note that there are two styles of retarget actions. **RetargetAction** simply allows a view or editor to reimplement an action. **LabelRetargetAction** also allows views and editors to reset the label of the action. This is useful for making the menu label more specific, such as relabeling an **Undo** action as **Undo Typing**.

Now we know how the retarget actions are defined by the workbench. Let's look next at how your view or editor can provide an implementation for a retargetable action. This is done by setting a global action handler.

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Setting a global action handler

A plug-in contributes a retargetable action for a view or editor part by implementing an **Action** and registering it as a global action handler with the part's action bars. This is usually done at the time that the part creates its actions and controls. The name of the retargeted action (as defined in **IWorkbenchActionConstants**) is used to specify which action the handler is intended for. The following shows how the workbench task list registers its handler for the **PROPERTIES** action.

```
public void createPartControl(Composite parent) {
    ...
    makeActions();
    ...

    // Add global action handlers.
    ...
    getViewSite().getActionBars().addGlobalActionHandler(
        IWorkbenchActionConstants.PROPERTIES,
        propertiesAction);
    ...
}
```

The properties action is created in the local method **makeActions**:

```
void makeActions() {
    ...
    // properties
    propertiesAction = new TaskPropertiesAction(this, "properties");
    propertiesAction.setText(TaskListMessages.getString("Properties.text"));
    propertiesAction.setToolTipText(TaskListMessages.getString("Properties.tooltip"));
    propertiesAction.setEnabled(false);
}
}
```

That's all that is needed. Your action will be run when the user chooses the action from the workbench menu bar or tool bar and your view or editor is active. The workbench handles the details of ensuring that the retargeted action is always associated with the currently active view or editor.

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Retargetable editor actions

Recall that the readme tool defines its own editor which contributes actions to the workbench menu bar using its **ReadmeEditorActionBarContributor**.

```
<extension
    point = "org.eclipse.ui.editors">
    <editor
        id = "org.eclipse.ui.examples.readmetool.ReadmeEditor"
        name = "%Editors.ReadmeEditor"
        icon = "icons/obj16/editor.gif"
        class = "org.eclipse.ui.examples.readmetool.ReadmeEditor"
        extensions = "readme"
        contributorClass = "org.eclipse.ui.examples.readmetool.ReadmeEditorActionBarContributor"
    </editor>
</extension>
```

Let's look closer at what happens in the contributor class.

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```
public ReadmeEditorActionBarContributor() {
    ...
    actionRetargetAction(IReadmeConstants.RETARGET2, MessageUtil.getString("Editor_Action2"));
    action2.setToolTipText(MessageUtil.getString("Readme_Editor_Action2"));
    action2.setDisabledImageDescriptor(ReadmeImages.EDITOR_ACTION2_IMAGE_DISABLE);
    action2.setImageDescriptor(ReadmeImages.EDITOR_ACTION2_IMAGE_ENABLE);
    ...
    actionLabelRetargetAction(IReadmeConstants.LABELRETARGET3, MessageUtil.getString("Editor_
    action3.setDisabledImageDescriptor(ReadmeImages.EDITOR_ACTION3_IMAGE_DISABLE);
    action3.setImageDescriptor(ReadmeImages.EDITOR_ACTION3_IMAGE_ENABLE);
    ...
    handler2 = new EditorAction(MessageUtil.getString("Editor_Action2"));
    ...
    handler3 = new EditorAction(MessageUtil.getString("Editor_Action3"));
    ...
}
```

When the contributor is created, it creates two retargetable actions (one that allows label update and one that does not). Creation of the actions uses the same technique that the workbench uses. It also creates two handlers that will be used for the actions when the editor is the active part.

But where are the handlers for the actions registered? Setting the global handlers is done a little differently when your editor defines the retargeted actions. Why? Because your contributor is in charge of tracking the active view and hooking different handlers as different views or the editor itself becomes active. (The workbench does this for you when you set a handler for one of its global actions). Here's how the **ReadmeEditorActionBarContributor** sets things up:

```
public void init(IActionBars bars, IWorkbenchPage page) {
    super.init(bars, page);
    bars.setGlobalActionHandler(IReadmeConstants.RETARGET2, handler2);
    bars.setGlobalActionHandler(IReadmeConstants.LABELRETARGET3, handler3);
    ...
}
```

First, the contributor registers its handlers for the retargeted actions. This ensures that the contributor's actions will be run when the editor itself is active. The next step is to register each **RetargetAction** as a part listener on the page.

```
...
// Hook retarget actions as page listeners
page.addPartListener(action2);
page.addPartListener(action3);
IWorkbenchPart activePart = page.getActivePart();
if (activePart != null) {
    action2.partActivated(activePart);
    action3.partActivated(activePart);
}
}
```

Adding each **RetargetAction** as a part listener means that it will be notified when the active part changes. The action can get the correct global handler from the newly activated part. (See the implementation of **RetargetAction** for all the details.) Note that to start, the action is seeded with the currently active part.

When the editor contributor is disposed, it should unhook the retargetable actions as page listeners.

```
public void dispose() {
    // Remove retarget actions as page listeners
    getPage().removePartListener(action2);
    getPage().removePartListener(action3);
}
```

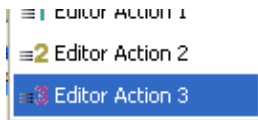
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```
}
```

Finally, recall that action bar contributors are shared among instances of the same editor class. For this reason, the handlers must be notified when the active editor changes so that they can connect to the proper editor instance.

```
public void setActiveEditor(IEditorPart editor) {  
    ...  
    handler2.setActiveEditor(editor);  
    handler3.setActiveEditor(editor);  
    ...  
}
```

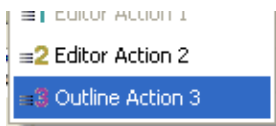
That completes the setup on the editor side. When the editor is open and active, the handlers (and their labels) as defined by the **ReadmeEditorActionBarContributor** will appear in the workbench menu bar.



Now that the editor's contributions are in place, what does a view do to register a handler? The code on the client side is similar to registering a handler for a workbench action, except that the action id is the one defined by the plug-in's editor. The **ReadmeContentOutlinePage** registers a handler for these actions.

```
public void createControl(Composite parent) {  
    super.createControl(parent);  
    ...  
    getSite().getActionSet().setGlobalActionHandler(  
        IReadmeConstants.RETARGET2,  
        new OutlineAction(MessageUtil.getString("Outline_Action2")));  
  
    OutlineAction action = new OutlineAction(MessageUtil.getString("Outline_Action3"));  
    action.setToolTipText(MessageUtil.getString("Readme_Outline_Action3"));  
    getSite().getActionSet().setGlobalActionHandler(  
        IReadmeConstants.LABELRETARGET3,  
        action);  
    ...  
}
```

Note that the outliner sets tool tip text and a label on the second action, since it allows relabeling. When the readme outliner view is made active, its handlers (and their labels) will now appear in the workbench menu bar.



Note that the relabeled action shows the new label.

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Retargetable action set actions

The readme tool action set also defines retargetable actions. The action remains visible as long as the readme action set is visible, but it is only enabled when a view or editor that implements the action is active. When

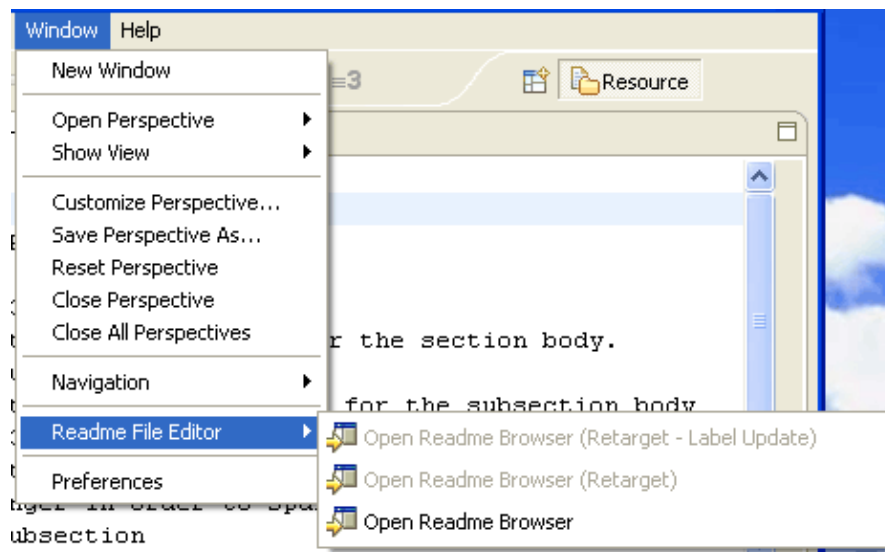
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using action sets to define retargetable actions, the actions are created in the action set markup rather than in code. The following is from the readme tool's action set definition:

```
<extension point = "org.eclipse.ui.actionSets">
    <actionSet id="org_eclipse_ui_examples_readmetool_actionSet"
        label="%ActionSet.name"
        visible="true">
...
<action id="org_eclipse_ui_examples_readmetool_readmeRetargetAction"
    menubarPath="window/org_eclipse_ui_examples_readmetool/slot1"
    toolbarPath="readme"
    label="%ReadmeRetargetAction.label"
    tooltip="%ReadmeRetargetAction.tooltip"
    helpContextId="org.eclipse.ui.examples.readmetool.open_browser_action_context"
    icon="icons/ctool16/openbrwsr.gif"
    retarget="true">
</action>
<action id="org_eclipse_ui_examples_readmetool_readmeRelabelRetargetAction"
    menubarPath="window/org_eclipse_ui_examples_readmetool/slot1"
    toolbarPath="readme"
    label="%ReadmeRelabelRetargetAction.label"
    tooltip="%ReadmeRelabelRetargetAction.tooltip"
    helpContextId="org.eclipse.ui.examples.readmetool.open_browser_action_context"
    icon="icons/ctool16/openbrwsr.gif"
    retarget="true"
    allowLabelUpdate="true">
</action>
...
```

Retargeted actions are specified by using the **retarget="true"** attribute. This will cause a **RetargetAction** to be created in the action set. Note that the retargetable actions do not specify an implementing **class** since it is up to each view or editor in the plug-in to set up a handler that implements each action. If the **allowLabelUpdate** is true, then a **LabelRetargetAction** will be created instead.

The retargeted actions will be visible in the window menu when the readme action set is visible. However, they will not be enabled if the readme tool's editor or outline view are not active.



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What do the editor and view have to do? Again, the client side is similar to registering a handler for the workbench or an editor's retargetable action. The action id specified in the markup must be used when registering a global action handler.

The **ReadmeEditorActionBarContributor** takes care of this for the editor. First, it defines the handlers for the actions.

```
public ReadmeEditorActionBarContributor() {
    ...
    handler4 = new EditorAction(MessageUtil.getString("Editor_Action4"));
    handler5 = new EditorAction(MessageUtil.getString("Editor_Action5"));
    handler5.setToolTipText(MessageUtil.getString("Readme_Editor_Action5"));
    ...
}
```

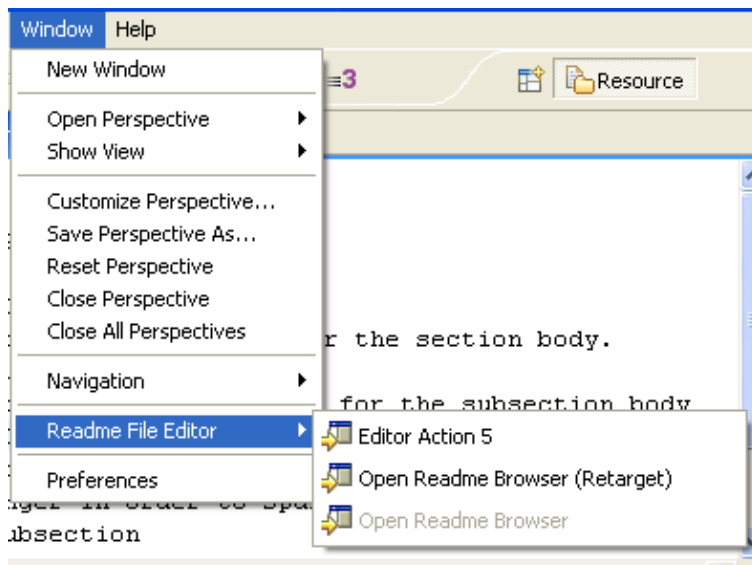
The handlers are registered at the same time that the handlers for the editor retargetable actions were registered.

```
public void init(IActionBars bars, IWorkbenchPage page) {
    ...
    bars.setGlobalActionHandler(IReadmeConstants.ACTION_SET_RETARGET4, handler4);
    bars.setGlobalActionHandler(IReadmeConstants.ACTION_SET_LABELRETARGET5, handler5);
    ...
}
```

Recall that action bar contributors are shared among different instances of the same editor. This means the handlers must be notified if the active editor for the **ReadmeEditorActionBarContributor** changes.

```
public void setActiveEditor(IEditorPart editor) {
    ...
    handler4.setActiveEditor(editor);
    handler5.setActiveEditor(editor);
    ...
}
```

That's it for the editor. We should see these actions enable when the editor is activated.



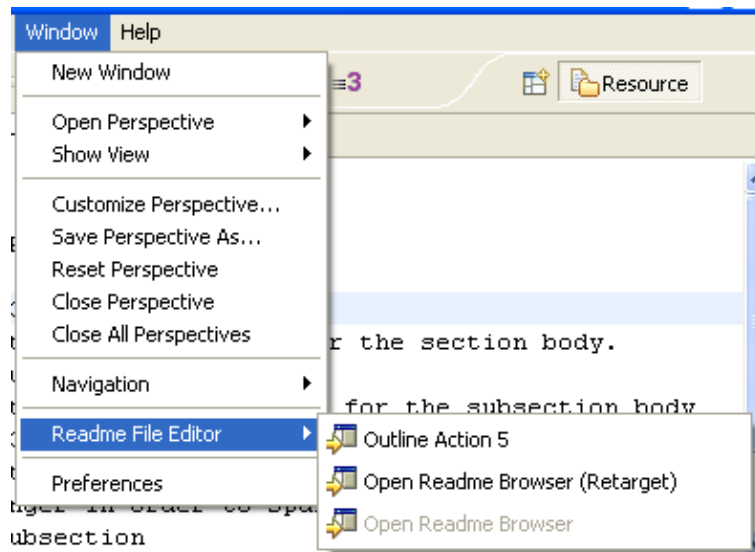
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Note that the label for the first retargetable action ("Editor Action 4") was not used since the action set XML markup did not set **allowLabelUpdate**.

The **ReadmeContentOutlinePage** defines its handlers in the same place it defined handlers for the editor's retargetable actions:

```
public void createControl(Composite parent) {
    ...
    action = new OutlineAction(MessageUtil.getString("Outline_Action4"));
    getSite().getActionBars().setGlobalActionHandler(
        IReadmeConstants.ACTION_SET_RETARGET4,
        action);
    action = new OutlineAction(MessageUtil.getString("Outline_Action5"));
    action.setToolTipText(MessageUtil.getString("Readme_Outline_Action5"));
    getSite().getActionBars().setGlobalActionHandler(
        IReadmeConstants.ACTION_SET_LABELRETARGET5,
        action);
}
```

We should see its relabeled action when the content outliner is active.



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Perspectives

We've already seen some ways the workbench allows the user to control the appearance of plug-in functionality. Views can be hidden or shown using the **Window >Show View** menu. Action sets can be hidden or shown using the **Window >Customize Perspective...** menu. These features help the user organize the workbench.

Perspectives provide an additional layer of organization inside a workbench window. Users can switch between perspectives as they move across tasks. A perspective defines a collection of views, a layout for the views, and the visible action sets that should be used when the user first opens the perspective.

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Perspectives are implemented using **IPerspectiveFactory**. Implementors of **IPerspectiveFactory** are expected to configure an **IPageLayout** with information that describes the perspective and its perspective page layout.

Workbench part layout

One of the main jobs of an **IPageLayout** is to describe the placement of the editor and the views in the workbench window. Note that these layouts are different than the **Layout** class in SWT. Although **IPageLayout** and **Layout** solve a similar problem (sizing and positioning widgets within a larger area), you do not have to understand SWT layouts in order to supply a perspective page layout.

A perspective page layout is initialized with one area for displaying an editor. The perspective factory is responsible for adding additional views relative to the editor. Views are added to the layout relative to (top, bottom, left, right) another part. Placeholders (empty space) can also be added for items that are not initially shown.

To organize related views and reduce clutter, you can use **IFolderLayout** to group views into tabbed folders. For example, the Resource perspective places the resource navigator inside a folder at the top left corner of the workbench. Placeholders are commonly used with folder layouts. The Resource perspective defines a placeholder for the bookmarks view in the same folder as the resource navigator. If the user shows the bookmarks view, it will appear in the same folder with the navigator, with a tab for each view.

IPageLayout also allows you to define the available actions and shortcuts inside a perspective.

- **addActionSet** is used to add action sets to a perspective.
- **addNewWizardShortcut** adds a new entry to the **File >New** menu for a perspective.
- **addShowViewShortcut** adds the names of views that should appear in the **Window >Show View** menu when the perspective is active.
- **addPerspectiveShortcut** adds the names of perspectives that should appear in the **Window >Open Perspective** menu when the perspective is active.

Linking views and editors with "show-in"

Another valuable service provided by perspectives and the **IPageLayout** is to aid in navigation between an editor and its related views. We typically think of views as helping the user find the objects to work with in editors. However, the converse operation is also useful: a user working with an object in an editor may need to navigate to that object inside a view. This can be accomplished using the workbench **Navigate > Show In** menu. This command allows the user to jump to one of any number of related views in the context of the currently edited (or selected) object. For example, a user editing a file may want to jump over to that file in the resource navigator.

The plug-in architecture of the workbench allows developers to contribute views and editors in different plug-ins that are not even aware of each other. By implementing support for "show in," your view or editor can support convenient navigation to or from the views and editors contributed by other plug-ins.

This navigation allows users to move quickly between views and to easily open a view that is not usually shown in a particular perspective. For example, a user working in the Java perspective can use **Navigate > Show In** to view the currently edited Java file in the Navigator view.

Show-in source

If you want to allow users to use **Navigate > Show In** from your editor or view to jump to another view, you must implement **IShowInSource**. Your part can supply its **IShowInSource** directly using protocol (**getShowInSource()**) or as an adapter. **IShowInSource** allows your part to supply a context (**ShowInContext**) which is used by the target to decide how to show the source. The show in context for an editor is typically its input element. For a view, the context is typically its selection. Both a selection and an input element are provided in a **ShowInContext** to give the target flexibility in determining how to show the source.

A default context for editors is provided, so that your editor can participate in "show-in" without any special coding. For editors, the input element and selection are used to create an appropriate context.

For views, **IShowInSource** must be implemented by the view in order to offer **Navigate > Show In** functionality.

Show-in target

You must implement **IShowInTarget** if you want your view to be a valid target for a "show in" operation. The target is responsible for showing a given context in a manner appropriate for its presentation. For example, the Navigator view expands its tree to select and reveal a resource specified in the context.

A target should check the selection in the **ShowInContext** first in deciding what to show, since this is the more specific information. It should show the input element only if no selection is indicated.

Presenting appropriate targets

How is the list of available targets determined? You can specify the available targets for your perspective in its **IPageLayout**. Recall that a "show in" navigation may open a view that is not already present in the perspective. Using **IPageLayout.addShowInPart**, you can specify a valid "show in" target by id. In this way, the valid targets can be established without unnecessarily creating any views.

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org.eclipse.ui.perspectives

The platform itself defines one perspective, the **Resource** perspective. Other platform plug-ins, such as the help system and the Java tooling, define additional perspectives. Your plug-in can define its own perspective by contributing to the **org.eclipse.ui.perspectives** extension point.

The specification of the perspective in the **plugin.xml** is straightforward. The following markup is used by the workbench in defining its own resource perspective.

```
<extension
    point="org.eclipse.ui.perspectives">
    <perspective
        name="%Perspective.resourcePerspective"
        icon="icons/full/cview16/resource_persp.gif"
        class="org.eclipse.ui.internal.ResourcePerspective"
        id="org.eclipse.ui.resourcePerspective">
    </perspective>
</extension>
```

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A plug-in must supply an **id** and **name** for the perspective, along with the name of the **class** that implements the perspective. An **icon** can also be specified. The perspective class should implement **IPerspectiveFactory**.

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org.eclipse.ui.perspectiveExtensions

Plug-ins can add their own action sets, views, and various shortcuts to existing perspectives by contributing to the **org.eclipse.ui.perspectiveExtensions** extension point.

The contributions that can be defined for new perspectives (action sets, wizard entries, view layout, view shortcuts, and perspective shortcuts) can also be supplied for an existing perspective. One important difference is that these contributions are specified in the **plugin.xml** markup instead of configuring them into an **IPageLayout**.

The following markup shows how the JDT extends the platform's debug perspective.

```
<extension point="org.eclipse.ui.perspectiveExtensions">
  <perspectiveExtension
    targetID="org.eclipse.debug.ui.DebugPerspective">
    <actionSet id="org.eclipse.jdt.debug.ui.JDTDebugActionSet"/>
    <view id="org.eclipse.jdt.debug.ui.DisplayView"
      relative="org.eclipse.debug.ui.ExpressionView"
      relationship="stack"/>
    <view id="org.eclipse.jdt.ui.PackageExplorer"
      relative="org.eclipse.debug.ui.DebugView"
      relationship="stack"
      visible="false"/>
    <view id="org.eclipse.jdt.ui.TypeHierarchy"
      relative="org.eclipse.debug.ui.DebugView"
      relationship="stack"
      visible="false"/>
    <view id="org.eclipse.search.SearchResultView"
      relative="org.eclipse.debug.ui.ConsoleView"
      relationship="stack"
      visible="false"/>
    <viewShortcut id="org.eclipse.jdt.debug.ui.DisplayView"/>
  </perspectiveExtension>
</extension>
```

The **targetID** is the id of the perspective to which the plug-in is contributing new behavior. The **actionSet** parameter identifies the **id** of a previously declared action set that should be added to the target perspective. This markup is analogous to using **IPageLayout.addActionSet** in the **IPerspectiveFactory**.

Contributing a view to a perspective is a little more involved, since the perspective page layout information must be declared. The **visible** attribute controls whether the contributed view is initially visible when the perspective is opened. In addition to supplying the **id** of the contributed view, the id of a view that already exists in the perspective (a **relative** view) must be specified as a reference point for placing the new view. The **relationship** parameter specifies the layout relationship between the new view and the **relative** view.

- **stack** indicates that the view will be stacked with the relative view in a folder
- **fast** indicates that the view will be shown as a fast view
- **left, right, top, or bottom** indicate that the new view will be placed beside the **relative** view. In this case, a **ratio** between 0.0 and 1.0 must be defined, which indicates the percentage of area in the **relative** view that will be allocated to the new view.

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Specifying a **perspectiveShortcut** indicates that another perspective (specified by **id**) should be added to the **Window->Open Perspective...** menu of the target perspective. This markup is analogous to calling **IPageLayout.addPerspectiveShortcut** in the original perspective definition in the **IPerspectiveFactory**. Plug-ins can also add view shortcuts and new wizard shortcuts in a similar manner.

You can also specify one or more views as a valid **showInPart**. The views should be specified by the id used in their **org.eclipse.ui.views** extension contribution. This controls which views are available as targets in the **Navigate > Show In** menu. The ability to specify a "show in" view in the extension markup allows you to add your newly contributed views as targets in another perspective's "show in" menus. See [Linking views and editors](#) for more information on "show in."

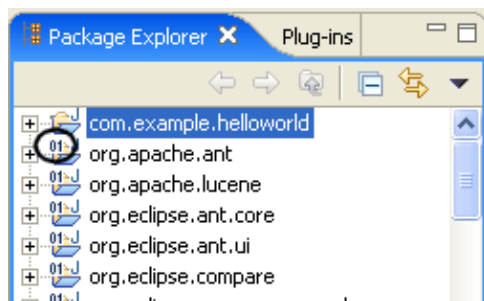
See [org.eclipse.ui.perspectiveExtensions](#) for a complete definition of the extension point.

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Decorators

Your plug-in can use **decorators** to annotate the images for resources and other objects that appear in the workbench views. Decorators are useful when your plug-in adds functionality for existing resource types. Many of the standard workbench views participate in showing decorations.

For example, PDE contributes decorators that allow you to distinguish between binary and source projects.



The **com.example.helloworld** project is the only source project shown in the navigator. Note how all of the other binary projects show the binary decorator at the top left of the Java project icon. This decorator is contributed by PDE using the [org.eclipse.ui.decorators](#) extension point.

```
<extension
  point="org.eclipse.ui.decorators">
  <decorator
    lightweight="true"
    quadrant="TOP_LEFT"
    adaptable="true"
    label="%decorator.label"
    icon="icons/full/ovr16/binary_co.gif"
    state="false"
    id="org.eclipse.pde.ui.binaryProjectDecorator">
    <description>
      %decorator.desc
    </description>
    <enablement>
      ...
    </enablement>
  </decorator>
</extension>
```

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```
</enablement>
</decorator>
</extension>
```

There are several different ways to supply a decorator implementation. This markup uses the simplest way, known as a **declarative lightweight** decorator. When a declarative lightweight decorator is defined, the markup contains a complete description of the decorator's icon, placement, and enabling conditions. Declarative decorators are useful when only an icon is used to decorate the label. The plug-in need only specify the **quadrant** where the decorator should be overlaid on the regular icon and the **icon** for the overlay. As shown in the picture, the PDE binary icon is overlaid in the top left quadrant of the package icon.

If your plug-in needs to manipulate the label text in addition to the icon, or if the type of icon is determined dynamically, you can use a non-declarative **lightweight** decorator. In this case, an implementation **class** that implements **ILightweightLabelDecorator** must be defined. The designated class is responsible for supplying a prefix, suffix, and overlay image at runtime which are applied to the label. The mechanics of concatenating the prefix and suffix with the label text and performing the overlay are handled by the workbench code in a background thread. Thus, any work performed by your plug-in in its **ILightweightLabelDecorator** implementation must be UI-thread safe. (See [Executing code from a non-UI thread](#) for more details.)

The following markup shows how the CVS client defines its decorator using this technique:

```
<extension
  point="org.eclipse.ui.decorators">
  <decorator
    objectClass="org.eclipse.core.resources.IResource"
    adaptable="true"
    label="%DecoratorStandard.name"
    state="false"
    lightweight= "true"
    quadrant = "BOTTOM_RIGHT"
    class="org.eclipse.team.internal.cvs.ui.CVSLightweightDecorator"
    id="org.eclipse.team.cvs.ui.decorator">
    <description>
      %DecoratorStandard.desc
    </description>
  </decorator>
</extension>
```

Decorators are ultimately controlled by the user via the workbench **Label Decorations** preferences page. Individual decorators can be turned on and off. Even so, it is a good idea to design your decorators so that they do not overlap or conflict with existing platform SDK decorators. If multiple plug-ins contribute lightweight decorators to the same quadrant, the conflicts are resolved non-deterministically.

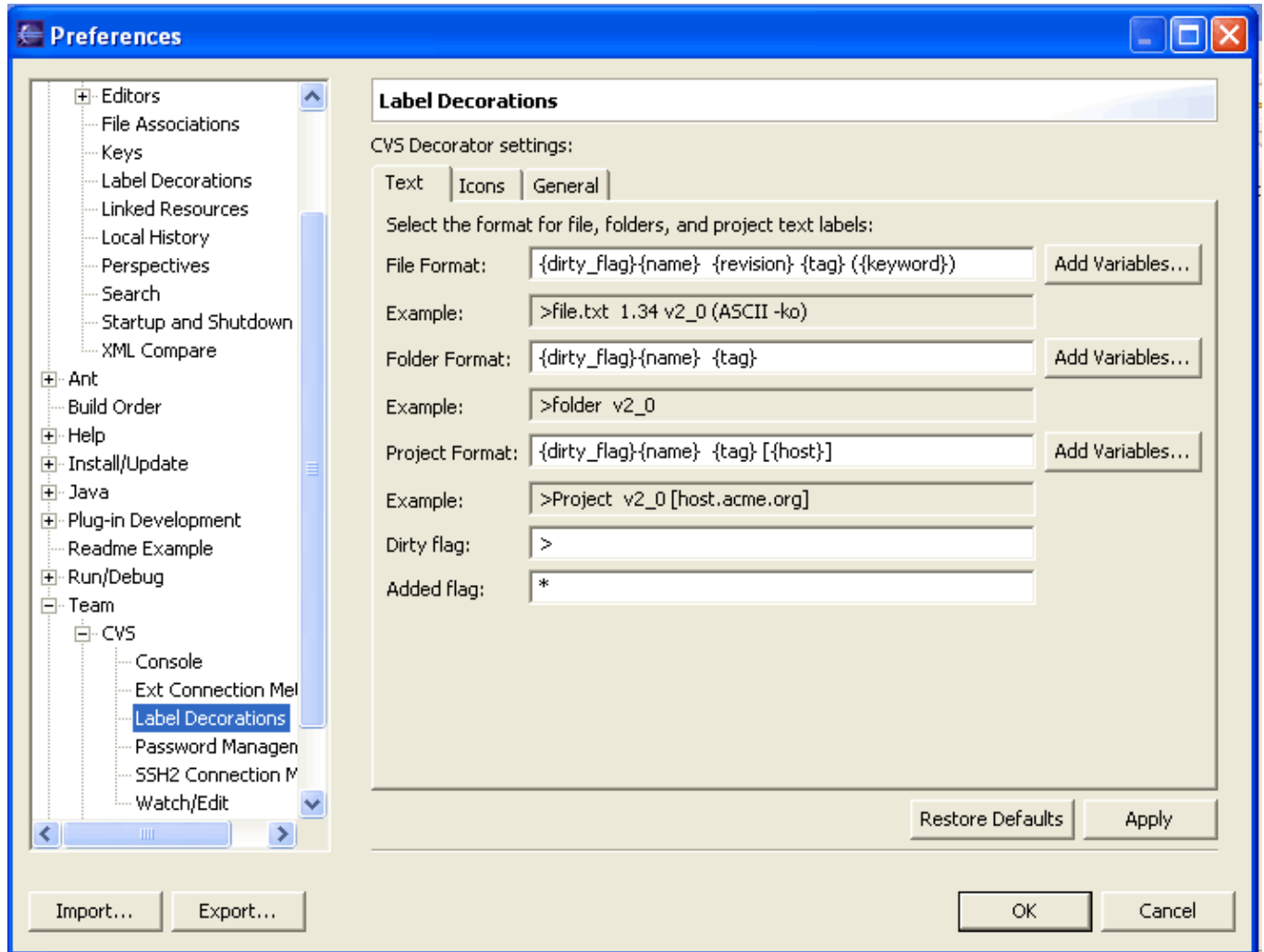
Your plug-in may also do all of the image and label management itself. In this case, the **lightweight** attribute should be set to false and the **class** attribute should name a class that implements **ILabelDecorator**. This class allows you to decorate the original label's image and text with your own annotations. It gives you increased flexibility since you aren't limited to prefixes, suffixes, and simple quadrant overlays.

Other attributes of a decorator are independent of the particular implementation style. The **label** and **description** attributes designate the text that is used to name and describe the decorator in the preferences dialog. The **objectClass** names the class of objects to which the decorator should be applied. The **enablement** attribute allows you to describe the conditions under which the object should be decorated. The **adaptable** flag indicates whether objects that adapt to **IResource** should also be decorated. The **state** flag

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controls whether the decorator is visible by default.

If your decorators include information that is expensive to compute or potentially distracting, you may want to contribute your own preferences that allow the user to further fine-tune the decorator once it is on. This technique is used by the CVS client.



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Workbench key bindings

The workbench defines many keyboard accelerators for invoking common actions with the keyboard. In early versions of the platform, plug-ins could define the accelerator key to be used for their action when the action was defined. However, this strategy can cause several problems:

- Different plug-ins may define the same accelerator key for actions that are not related.
- Plug-ins may define different accelerator keys for actions that are semantically the same.
- Plug-ins may define accelerator keys that later conflict with the workbench (as the workbench is upgraded).

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In order to alleviate these problems, the platform defines a configurable key binding strategy that is extendable by plug-ins. It solves the problems listed above and introduces new capabilities:

- The user can control which key bindings should be used.
- Plug-ins can define key bindings that emulate other tools that may be familiar to users of the plug-in.
- Plug-ins can define scopes for key bindings so that they are only active in certain situations.

The basic strategy is that plug-ins use **commands** to define semantic actions. Commands are simply declarations of an action and its associated category, key binding, and scope. Commands do not define an implementation for the action. When a plug-in defines an action for an editor, action set, or view, the action can specify that it is an implementation of one of these commands. This allows semantically similar actions to be associated with the same command.

Once a command is defined, a **key binding** may be defined that references the command. The key binding defines the key sequence that should be used to invoke the command. A key binding may reference a **key configuration** which is used to group key bindings into different named configurations that the user may activate via the Preferences dialog.

This is all best understood by walking through the workbench and looking at how commands and key bindings are declared. We'll look at all of this from the point of view of defining key bindings for existing workbench actions.

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Commands

A **command** is the declaration of a user action by **id**. Commands are used to declare semantic actions so that action implementations defined in action sets and editors can associate themselves with a particular semantic command. The separation of the command from the action implementation allows multiple plug-ins to define actions that implement the same semantic command. The command is what gets associated with a particular key binding.

The workbench defines many common commands in its **plugin.xml** file, and plug-ins are encouraged to associate their own actions with these commands where it makes sense. In this way, semantically similar actions implemented in different plug-ins may share the same key binding.

Defining a command

Commands are defined using the **org.eclipse.ui.commands** extension point. The following comes from the workbench markup:

```
<extension
    point="org.eclipse.ui.commands">
    ...
    <command
        name="%command.save.name"
        description="%command.save.description"
        categoryId="org.eclipse.ui.category.file"
        id="org.eclipse.ui.file.save">
    </command>
    ...
```


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The command definition specifies a **name**, **description**, and **id** for the action. It also specifies the id of a category for the command, which is used to group commands in the preferences dialog. The categories are also defined in the **org.eclipse.ui.commands** extension point:

```
...
<category
  name="%category.file.name"
  description="%category.file.description"
  id="org.eclipse.ui.category.file">
</category>
...
```

Note that there is no implementation specified for a command. A command only becomes concrete when a plug-in associates its action with the command id.

Associating an action with a command

Actions can be associated with a command in code or in the **plugin.xml** for action sets. Your choice depends on where the action is defined.

Actions that are instantiated in code can also be associated with an action definition using **IAction** protocol. This is typically done when the action is created. The **SaveAction** uses this technique when it initializes itself.

```
public SaveAction(IWorkbenchWindow window) {
    ...
    setText...
    setToolTipText...
    setImageDescriptor...
    setActionDefinitionId("org.eclipse.ui.file.save");
}
```

(Note: The method name **setActionDefinitionID** could more appropriately be named **setCommandID**. The method name reflects the original implementation of key bindings and uses outdated terminology.)

By invoking **setActionDefinitionID**, the implementation action (**SaveAction**) is associated with the command id that was used in the command definition markup. It is good practice to define constants for your action definitions so that they are easily referenced in code.

If you define an action in an action set, then you typically do not need to instantiate an action yourself. The workbench will do it for you when the user invokes your action from a menu or the keyboard. In this case, you can associate your action with a command ID in your XML markup. The following shows a hypothetical markup for an action set:

```
<extension point = "org.eclipse.ui.actionSets">
  <actionSet id="com.example.actions.actionSet"
    label="Example Actions"
    visible="true">
    <action id="com.example.actions.action1"
      menubarPath="additions"
      label="Example Save Action"
      class="org.example.actions.ExampleActionDelegate"
      definitionID="org.eclipse.ui.file.save">
    </action>
  ...
</extension point>
```

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```
    </actionSet>  
</extension>
```

The **definitionID** attribute is used to declare a command ID for the action.

Using either technique, associating your action with a command ID causes any key bindings that get defined for the command **org.eclipse.ui.file.save** to invoke your action when appropriate.

Now let's look at how these key bindings get defined.

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Key bindings

The association between a command and the key combinations that should invoke the command is called a **key binding**. Plug-ins can define key bindings along with commands in the **org.eclipse.ui.commands** extension point. The workbench defines key bindings after it defines the commands in the markup:

```
...  
<keyBinding  
    string="Ctrl+S"  
    command="org.eclipse.ui.file.save"  
    configuration="org.eclipse.ui.defaultAcceleratorConfiguration">  
</keyBinding>  
...
```

There is our friend **org.eclipse.ui.file.save**. Recall our hypothetical action definition:

```
<extension point = "org.eclipse.ui.actionSets">  
    <actionSet id="com.example.actions.actionSet"  
        label="Example Actions"  
        visible="true">  
        <action id="com.example.actions.action1"  
            menubarPath="additions"  
            label="Example Save Action"  
            class="org.example.actions.ExampleActionDelegate"  
            definitionID="org.eclipse.ui.file.save">  
            </action>  
            ...  
        </actionSet>  
</extension>
```

The **string** attribute for a key binding defines the key combination that is used to invoke a command. So, it follows that when our example action set is active, our save action will be invoked when the user chooses **Ctrl+S**.

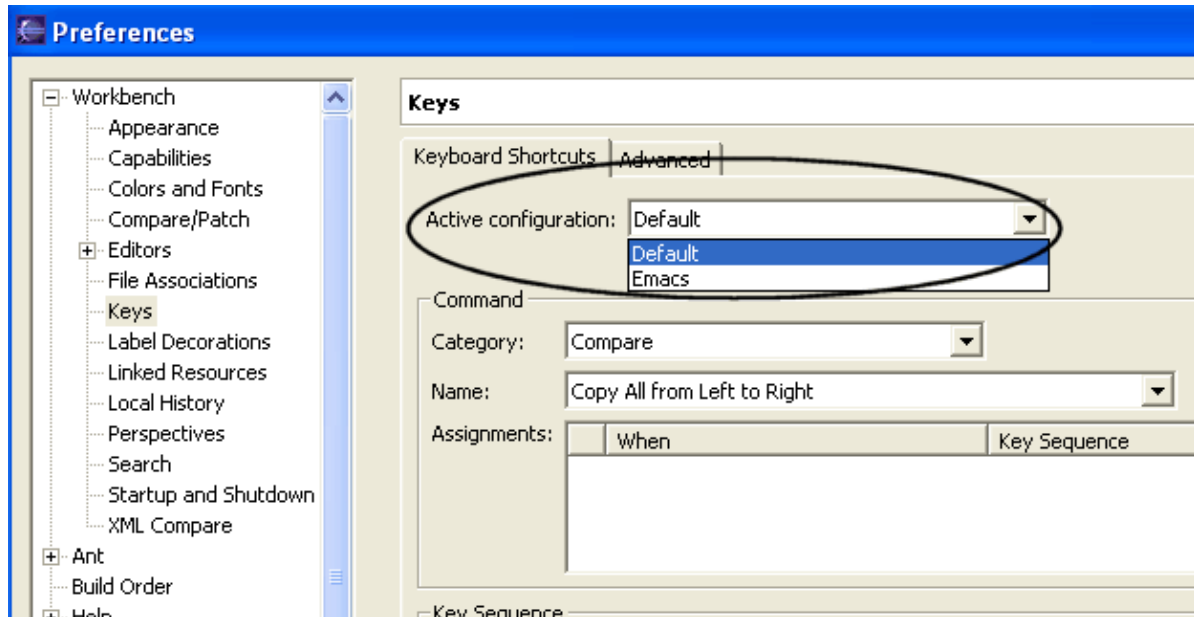
Likewise, when the workbench **SaveAction** is active, the same key combination will invoke it instead, since the workbench uses the same command id for its **SaveAction**.

To complete the example, we need to understand what the **configuration** is all about.

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Key configurations

Key configurations are used to represent a general style or theme of key bindings. For example, the Workbench provides a "Standard" key configuration and an "Emacs" key configuration. Only one key configuration is active at any given time. End users control which one is active using the workbench **Preferences** dialog.



From an implementation point of view, key configurations are simply named groupings of key bindings. A key configuration won't accomplish anything on its own unless there are key bindings associated with it.

Let's look again at the workbench markup for [org.eclipse.ui.commands](#) to find the key binding definitions and how a key configuration gets associated with a key binding.

```
...
<keyBinding
  string="Ctrl+S"
  command="org.eclipse.ui.file.save"
  configuration="org.eclipse.ui.defaultAcceleratorConfiguration">
</keyBinding>
...
<keyBinding
  string="Ctrl+X Ctrl+S"
  command="org.eclipse.ui.file.save"
  configuration="org.eclipse.ui.emacsAcceleratorConfiguration">
</keyBinding>
...
```

There are two different key bindings defined for the "org.eclipse.ui.file.save" command. Note that each one has a different **configuration** defined. When the standard configuration is active, the "Ctrl+S" key binding will invoke the command. When the emacs configuration is active, the sequence "Ctrl+X Ctrl+S" will invoke the command.

Defining new key configurations

When your plug-in defines a key binding, it will most likely assign it to an existing key configuration. However, your plug-in may want to define a completely new style of key configurations. If this is the case, you can define a new type of key configuration inside the [org.eclipse.ui.commands](#) definition. The workbench markup that defines the standard and emacs key configurations are shown below:

```
...
<keyConfiguration
  name="%keyConfiguration.standard.name"
  description="%keyConfiguration.standard.description"
  id="org.eclipse.ui.defaultAcceleratorConfiguration">
</keyConfiguration>
<keyConfiguration
  name="%keyConfiguration.emacs.name"
  parent="org.eclipse.ui.defaultAcceleratorConfiguration"
  description="%keyConfiguration.emacs.description"
  id="org.eclipse.ui.emacsAcceleratorConfiguration">
</keyConfiguration>
...
```

Note that the **name** defined here is the one used in the preferences page in the list of configurations.

Activating a key configuration

The user controls the active configuration via the preferences page. However, you can define the default active configuration as part of the [org.eclipse.ui.commands](#) definition. The workbench establishes the standard key configuration as the default when it defines the extension:

```
<extension
  point="org.eclipse.ui.commands">
  <activeKeyConfiguration
    value="org.eclipse.ui.defaultAcceleratorConfiguration">
  </activeKeyConfiguration>
  ...
```

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Contexts and key bindings

A **context** can be specified for a key binding so that the binding is only available when the user is working within a specific context. Contexts are declared in the [org.eclipse.ui.contexts](#) extension point.

A context can be bound to a key binding by specifying the id of the context when the key binding is defined. For example, if we only wanted the save command to work while the user is editing text, we could specify a context for the key binding:

```
<keyBinding
  string="Ctrl+S"
  command="org.eclipse.ui.file.save"
  contextId="org.eclipse.ui.textEditorScope"
  configuration="org.eclipse.ui.defaultAcceleratorConfiguration">
</keyBinding>
...
```

(See [Contexts](#)) for a more detailed discussion of contexts and how they are defined.

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Contexts

A **context** can be used to influence what commands are available to the user at any given moment. Contexts are much more dynamic than activities. While an activity represents a broad set of function that is available to the user most of the time, contexts describe a focus of the user at a specific point in time. For example, the commands available to a user while editing text might be different than those available to a user while editing Java text or browsing packages in the package explorer.

Defining a context

Contexts are declared in the **[org.eclipse.ui.contexts](#)** extension point. Consider the following context which is defined for editing text:

```
<extension
  point="org.eclipse.ui.contexts">
  <context
    name="%context.editingText.name"
    description="%context.editingText.description"
    id="org.eclipse.ui.textEditorScope"
    parentId="org.eclipse.ui.contexts.window">
  </context>
```

Contexts are assigned a name and description that are used when showing information about the context to the user. The id of the context is used when binding UI contributions such as commands to a particular context.

Context hierarchies

Contexts are hierarchical in nature. When a context is active, the commands available in the context and in its parent contexts are also available. This is useful for defining levels of contexts that move from very general situations down to more specific contexts. In the context definition above, note that there is an id of a parent assigned to the context:

```
  <context
    name="%context.editingText.name"
    description="%context.editingText.description"
    id="org.eclipse.ui.textEditorScope"
    parentId="org.eclipse.ui.contexts.window">
  </context>
```

The parent context defines the more general context of working within a window. Its parent defines an even more general context of working within a window or a dialog.

```
<context
  name="%context.window.name"
  description="%context.window.description"
  id="org.eclipse.ui.contexts.window"
  parentId="org.eclipse.ui.contexts.dialogAndWindow">
</context>
<context
  name="%context.dialogAndWindow.name"
  description="%context.dialogAndWindow.description"
```

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```
id="org.eclipse.ui.contexts.dialogAndWindow">
</context>
```

Associating a contribution with a context

So far, all we've done is define a hierarchy of contexts. The context becomes useful when it is referenced in the description of another UI contribution. The most common use of contexts is in key bindings. When a context is associated with a key binding, the key binding will only be active when the user is in that context. For example, the following markup specifies the root dialog and window context as the context for a key binding:

```
<keyBinding
    commandId="org.eclipse.ui.edit.cut"
    contextId="org.eclipse.ui.contexts.dialogAndWindow"
    keySequence="M1+X"
    keyConfigurationId="org.eclipse.ui.defaultAcceleratorConfiguration">
</keyBinding>
```

Using Context API

The workbench context support includes an API for working with the defined contexts and defining criteria under which a particular context should become enabled. Most plug-ins need not be concerned with this API, but it is useful when defining specialized views or editors that define new contexts.

The starting point for working with contexts in the workbench is **IWorkbenchContextSupport**. Plug-ins can obtain the context support instance from the workbench.

```
IWorkbenchContextSupport workbenchContextSupport = PlatformUI.getWorkbench().getContextSupport();
```

The workbench context support API can be used to add or remove an **EnabledSubmission**, which describes criteria that should cause a particular context to become enabled. Criteria include information such as the active part or active shell. The workbench support also provides access to an **IContextManager**.

```
IContextManager contextManager = workbenchContextSupport.getContextManager();
```

IContextManager defines protocol for getting all defined or enabled context ids, and for getting the associated **IContext** for a particular id. These objects can be used to traverse the definition for a context in API, such as getting the id, name, or id of the parent context. Listeners can be registered on the context manager or on the contexts themselves to detect changes in the definition of a particular context or in the context manager itself. See the package **org.eclipse.ui.contexts** for more information.

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Element factories

Element factories are used to recreate workbench model objects from data that was saved during workbench shutdown.

Before we look closely at the element factory extension, we need to review a general technique that is used throughout the platform to add plug-in specific behavior to common platform model objects.

IAdeptables and workbench adapters

When browsing the various workbench classes, you will notice that many of the workbench interfaces extend the **IAdeptable** interface.

Plug-ins use adapters to add specific behavior to pre-existing types in the system. For example, the workbench may want resources to answer a label and an image for display purposes. We know that it's not good design to add UI specific behavior to low-level objects, so how can we add this behavior to the resource types?

Plug-ins can register adapters that add behavior to pre-existing types. Application code can then query an object for a particular adapter. If there is one registered for it, the application can obtain the adapter and use the new behaviors defined in the adapter.

By providing a facility to dynamically query an adapter for an object, we can improve the flexibility of the system as it evolves. New adapters can be registered for platform types by new plug-ins without having to change the definitions of the original types. The pattern to ask an object for a particular adapter is as follows:

```
//given an object o, we want to do "workbench" things with it.
if (!(o instanceof IAdeptable)) {
    return null;
}
IWorkbenchAdapter adapter = (IWorkbenchAdapter)o.getAdapter(IWorkbenchAdapter.class);
if (adapter == null)
    return null;
// now I can treat o as an IWorkbenchAdapter
...
```

If there is no adapter registered for the object in hand, null will be returned as the adapter. Clients must be prepared to handle this case. There may be times when an expected adapter has not been registered.

The workbench uses adapters to obtain UI information from the base platform types, such as **IResource**. Adapters shield the base types from UI-specific knowledge and allow the workbench to evolve its interfaces without changing the definitions of the base.

Without adapters, any class that might be passed around in the workbench API would have to implement the UI interfaces, which would increase the number of class definitions, introduces tight coupling, and create circular dependencies between the core and UI classes. With adapters, each class implements **IAdeptable** and uses the adapter registry to allow plug-ins to extend the behavior of the base types.

Throughout the workbench code, you'll see cases where a platform core type is queried for an adapter. The query is used to obtain an object that knows how to answer UI oriented information about the type.

Element factories

When the workbench is shut down by the user, it must save the current state of the **IAdeptable** objects that are shown in the workbench. An object's state is stored by saving the primitive data parameters of the object in a special format, an **IMemento**. The id of a factory that can recreate the object from an **IMemento** is also stored and the data is saved in the file system.

When the platform is restarted, the workbench finds the element factory associated with the **IMemento**'s factory id. It finds the factory by checking the plug-in registry for contributions to the

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org.eclipse.ui.elementFactories extension.

The markup is pretty simple. We just have to specify the id of the factory and the corresponding class that implements the factory.

The following code snippet is from the workbench **plugin.xml**.

```
<extension
    point="org.eclipse.ui.elementFactories">
    <factory
        class="org.eclipse.ui.internal.model.ResourceFactory"
        id="org.eclipse.ui.internal.model.ResourceFactory">
    </factory>
    <factory
        class="org.eclipse.ui.internal.model.WorkspaceFactory"
        id="org.eclipse.ui.internal.model.WorkspaceFactory">
    </factory>
    <factory
        class="org.eclipse.ui.part.FileEditorInputFactory"
        id="org.eclipse.ui.part.FileEditorInputFactory">
    </factory>
    <factory
        class="org.eclipse.ui.internal.dialogs.WelcomeEditorInputFactory"
        id="org.eclipse.ui.internal.dialogs.WelcomeEditorInputFactory">
    </factory>
    <factory
        class="org.eclipse.ui.internal.WorkingSetFactory"
        id="org.eclipse.ui.internal.WorkingSetFactory">
    </factory>
</extension>
```

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Accessible user interfaces

The term accessible is used to refer to software that has been designed so that people who have disabilities have a successful interaction with it. Accessible software takes many different kinds of disabilities into account:

- visual – people with color blindness, low vision, or who are completely blind
- audio – people who are hard of hearing or are completely deaf
- mobility – people who have physical impairments that limit their movement and fine motor controls
- cognitive – people who have learning disabilities and may need more consistency or simplicity in their interfaces

Assistive technology

Assistive technology is equipment or software that is used to increase the accessibility of existing operating systems and applications. While it is beyond the scope of this programmer's guide to cover the broad scope of assistive technologies, it is important for you to know that they exist. Why? Because simple things you can do when programming your software or documentation, such as providing alternate text descriptions for images in your HTML, or keyboard equivalents for all of your software actions, can greatly improve the effectiveness of assistive technologies that make use of these techniques.

Accessibility resources

There are some basic coding tips you can use when building plug-in user interfaces that will increase the accessibility of your software. See [Tips for Making User Interfaces More Accessible](#) for more information.

[IBM's Accessibility Center Website](#) has many useful resources for accessibility, including [guidelines and checklists](#) for developing software and web interfaces.

SWT and accessibility

Because SWT uses the operating system's native widgets, user interfaces built with SWT will inherit any assistive technologies that have been installed on the host operating system. SWT implements an interface, [AccessibleListener](#), which provides basic accessibility information, such as descriptions of controls, help text, and keyboard shortcuts, to clients. If you are developing assistive technologies that need more information or want to improve upon the basic accessibility of the workbench, you can add your own listeners and override the default accessibility behavior in the platform. See the package [org.eclipse.swt.accessibility](#) for more detail.

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Tips for making user interfaces accessible

Below is a series of tips for making something usable to the IAccessibility interface provided by Windows.

1) Use Groups instead of Labels

If you use a Label to title a group of related widgets remove the label and replace their parent composite with a Group whose text is the same as the title Label.

2) Avoid intermediate Composites.

IAccessibility tools will read as far up the parent hierarchy of a widget with focus as there are widgets to read. Be sure there are no widgets without text anywhere in the tree.

3) Use Read Only Texts instead of Labels

A text can be accessed using the keyboard and should be used if you want the information in a label to be accessible to keyboard navigation. Please note that a label beside a text will be treated as a title and so if you have a title:value pair you wish to show it is only required that you make the value widget a Text.

4) Read and understand the IBM checklist. <http://www-3.ibm.com/able/accesssoftware.html>

5) Assign mnemonics to all menus and menu items.

Ensure they are unique within a given menu. If a menu is dynamically composed from multiple plugins, it may be better to not assign mnemonics since conflicts cannot be avoided in general (e.g. the **File > New** list, or **Window > Show View** list)

6) Assign mnemonics to all labels of controls in dialogs / preference pages / property pages (e.g. buttons, checkboxes, radio buttons, etc)

Ensure they are unique within the dialog. Be careful to avoid collisions with the default buttons (e.g. Restore & Defaults, & Apply in preference pages; & Next, & Back, & Finish in wizards). Do not assign mnemonics to OK and Cancel buttons. If you make OK the default button of the shell, and Cancel is equivalent to closing the shell, then Enter and Esc map to these by default. Generally doing something with Esc or Enter is a bad idea.

7) If a control does not have its own label (e.g. a text field), use a preceding label ending with ':' and assign a mnemonic to it. Screen readers like JAWS will read this label when the control has focus (e.g. see **Window > Preferences > Workbench**)

8) Avoid extra freestanding labels as you cannot navigate to them with the keyboard and screen readers like JAWS skip these since they don't take focus

9) Do not assign mnemonics on controls in the main window (other than main menus and main menu items), even if it looks like a dialog (e.g. the form editors in WSAD) as these will usually conflict with menu mnemonics

10) Assign shortcut keys for frequently used functions (and –only– frequently used functions).

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There are currently only two ways to hook shortcut keys in SWT:

- ◆ by setting an accelerator on a menu item in the main menubar (they are ignored in context menus)– JFace actions have support for this
- ◆ by hooking a key listener on a particular control (e.g. in the implementation of a view or editor)

Consult the table of Eclipse SDK shortcut keys (available off of eclipse.org -> Projects -> Eclipse Project -> Platform -> UI -> Development Resources -> Accessibility) to avoid collision.

12) Avoid Alt+{key} combinations since they may conflict with menu mnemonics

13) Avoid Ctrl+Alt+{key} combinations since they often conflict with entering special characters on international keyboards (alt Gr = Ctrl+Alt)

14) Avoid Ctrl+Space+{key} combinations since Ctrl-Space is used for mode switching in Asian languages.

15) Try to save navigation context.

e.g. in Workbench / Preferences, we now remember which page you had selected last. This avoids having to navigate through the list each time

16) Assign a specific person on the team to be responsible for accessibility on your project.

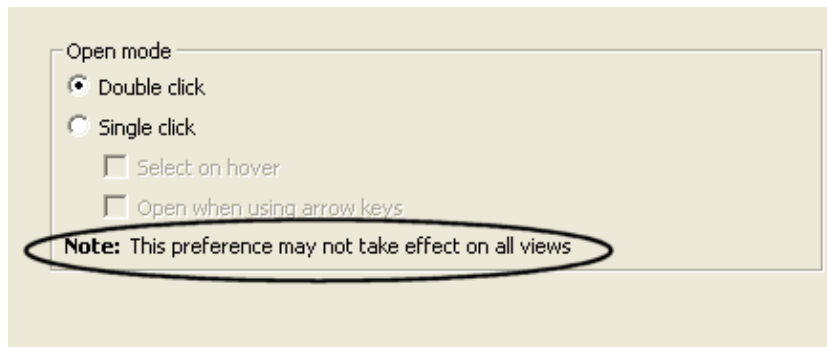
17) Test for accessibility.

Have your team hold an occasional "unplug your mouse day" where they try to use the product using keyboard only. Get a copy of JAWS™ (<http://www.freedomscientific.com/>) and ensure that your UI is usable with it

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Honoring single click support

The workbench **Preferences** allow users to specify whether views should open their objects on single or double click.



Why the disclaimer about this preference not working for all views? Because views contributed by plug-ins must explicitly support this preference in their implementation.

Recall that a view can be implemented by creating SWT controls and writing standard SWT code, or by using [JFace viewers](#) to handle the low level details. Honoring the single click preference can be done at either level. Most views that open other objects present them in a structured, list-like view. We'll focus on that kind of view for now. If your view displays objects in a different manner, you'll likely use the SWT-level concepts to support single click.

Single click in JFace viewers

If you are using a [JFace list-oriented viewer](#) to present your objects, supporting single click is straightforward. Instead of using `addDoubleClickListener` to trigger opening the items in your view, use `addOpenListener`. The open listener honors the current workbench preference, firing the open event when the specified mouse event occurs.

You may still wish to use `addDoubleClickListener` for non-open actions, such as expanding the items in a tree on double-click.

Single click in SWT controls

JFace provides a utility class, [OpenStrategy](#), to handle the logistics of single and double click at the SWT control level. The [OpenStrategy](#) is configured by the workbench **Preferences** dialog so that it honors the current workbench open preference. In fact, the JFace viewers use this class to implement the open listener.

You must create an [OpenStrategy](#) and associate it with your SWT control. The [OpenStrategy](#) will hook the appropriate events and interpret them based on the user preferences. Your job is to add an open listener to the strategy that implements the code for open. In this way, you are shielded from knowledge about which widget event triggered the open event.

```
OpenStrategy openHandler = new OpenStrategy(control);
openHandler.addOpenListener(new IOpenEventListener() {
    public void handleOpen(SelectionEvent e) {
        // code to handle the open event.
        ...
    }
})
```

The other workbench preferences for open (select on hover, open using arrow keys) are also handled by [OpenStrategy](#). This means that the "right thing" will happen if you use JFace viewers or the [OpenStrategy](#) class to implement open behavior.

Activating editors on open

When handling an open event, you should use `OpenStrategy.activateOnOpen()` to determine whether an opened editor should be activated by default. Activating an editor switches the focus from the view to the editor, which can be particularly confusing and undesirable in single click mode.

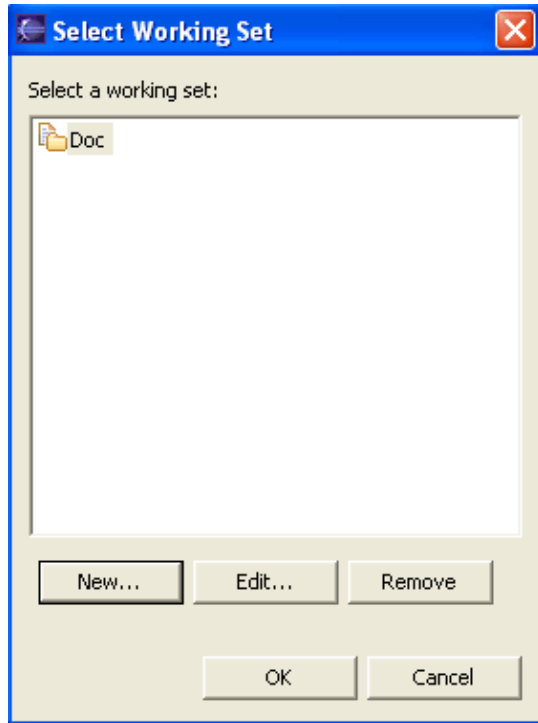
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Working sets

Users often find it necessary to filter views such as the navigator view in order to reduce clutter. Plug-ins can assist in filtering using different techniques.

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- **Resource filters** can be used to filter by file name. Plug-ins contribute resource filters that the user can enable using a view's filter selection dialog.
- **Working sets** can be used to filter resources by only including specified resources. Working sets are selected using the view's working set dialog.



If your plug-in implements a view that shows resources (or objects that are adaptable to **IResource**), you should support working sets. **IWorkingSetManager** provides API for manipulating working sets. You can obtain an **IWorkingSetManager** using **IWorkbench** API.

```
IWorkingSetManager manager = workbench.getWorkingSetManager();
```

IWorkingSetManager allows you to manipulate and create working sets:

- **createWorkingSetSelectionDialog** – returns a working set dialog that shows the user the current working sets. You can get the selected working sets from the dialog once it is closed.
- **createWorkingSetEditWizard** – returns a working set edit wizard for editing the specified working set
- **getWorkingSets()** – returns a list of all defined working sets
- **getWorkingSet(String name)** – returns a working set specified by name

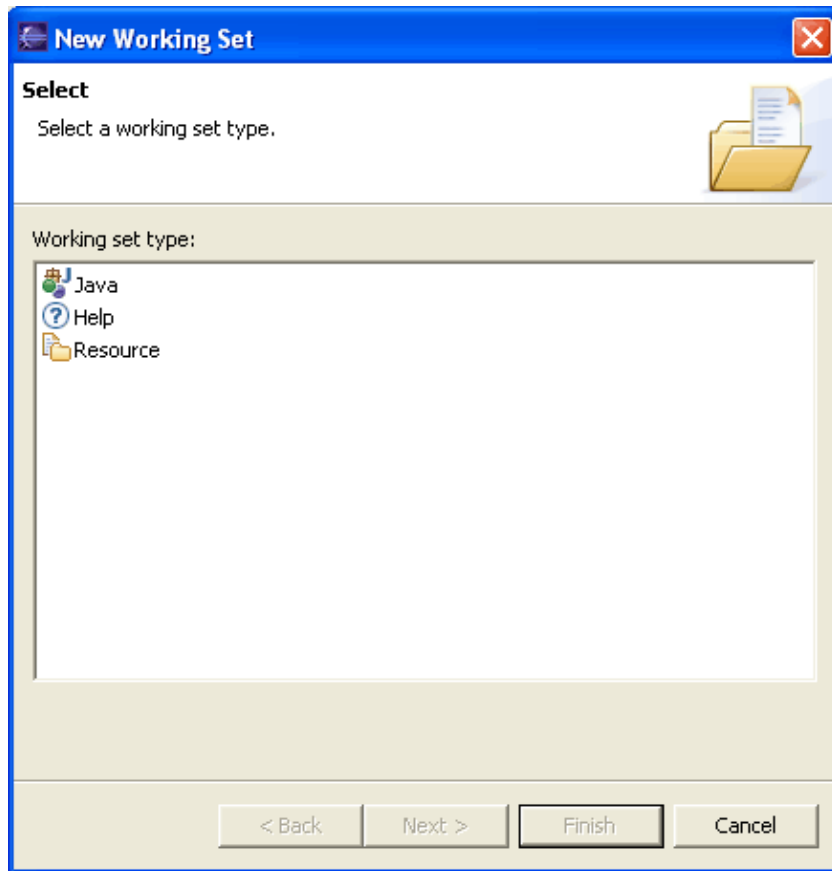
IWorkingSetManager also provides property change notification as working sets are added, removed, or as they change. If your view or editor needs to respond to changes in the selected working set, it can add a listener for **CHANGE_WORKING_SET_CONTENT_CHANGE**.

Adding new working set types

For many plug-ins, using **IWorkingSetManager** to provide resource filtering is sufficient. If your plug-in needs to define working sets differently, it can register a new type of working set using **org.eclipse.ui.workingSets**. The Java tooling uses this feature to define a Java working set type. Working

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set types are shown when the user decides to add a working set.



When you define your own type of working set, you can use **`IWorkingSet.getId`** protocol to ensure that the working set matches the type that you have defined. Any working sets that you create programmatically must have their id set to the id of a working set page that can display the working set elements. This id is used to ensure that the proper working set edit page is launched when the user edits the working set. A null id indicates that the working set should use the default resource working set type.

See the [org.eclipse.ui.workingSets](#) extension point documentation and **`IWorkingSet`** protocol for more detail.

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Contributing resource filters

The resource filters extension allows plug-ins to define filters that are useful for filtering out file types in the resource navigator view. This extension is useful when special file types are used to represent internal plug-in information but you do not want the files to be shown in the workbench or manipulated by the user.

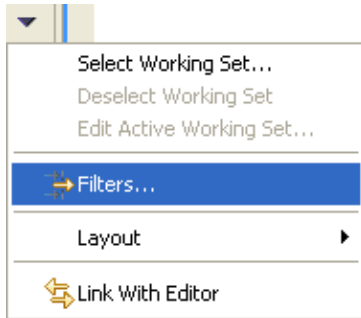
The workbench filters out the pattern `"*"` to exclude internal files such as `.metadata` from the resource navigator. Likewise, the JDT plug-in filters out `"*.class"` files to hide compiled classes.

The markup for the resource filters extension is simple. The following is from the workbench **`plugin.xml`**.

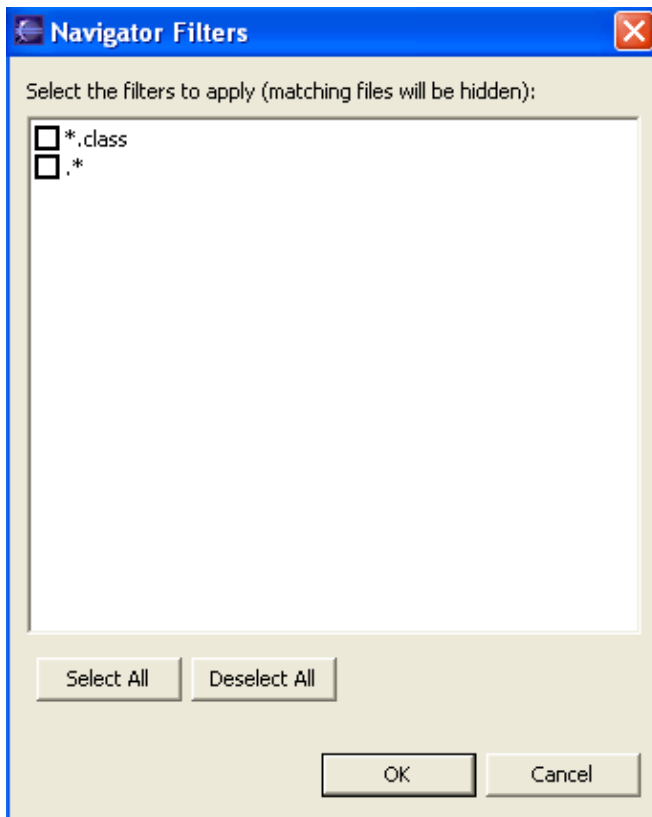
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```
<extension
  point="org.eclipse.ui.ide.resourceFilters">
  <filter
    selected="false"
    pattern=".*">
  </filter>
</extension>
```

The filters can be enabled by the user using the resource navigator's local pull-down menu.



In addition to declaring the **filter pattern**, the plug-in can use the **selected** attribute to specify whether the filter should be enabled in the resource navigator. This attribute only determines the initial state of the filter pattern. The user can control which filter patterns are active.



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Filtering large user interfaces

The rich extensibility mechanisms in the workbench provide many ways for plug-ins to contribute to the platform UI. However, extensibility can introduce its own set of problems. While allowing for a rich set of features contributed by many different developers, it can also create an overwhelming experience for the new user who is trying to navigate through vast menus and preferences pages. As the Eclipse platform matures, the need for filtering mechanisms that help reduce the UI clutter and guide the user to their desired tasks has become apparent.

The activity and context mechanisms address the problem of too much clutter in the user interface:

- **Activities** allow platform integrators to define large-grained groupings of function that are only shown when a particular user activity is enabled. Users can explicitly (or implicitly through trigger points) enable or disable activities.
- **Contexts** are used to dynamically enable function while the user is performing a specific task. They influence what commands are available to the user at any given moment.

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Activities

An **activity** is a logical grouping of function that is centered around a certain kind of task. For example, developing Java software is an activity commonly performed by users of the platform, and the JDT defines many UI contributions (views, editors, perspectives, preferences, etc.) that are only useful when performing this activity. Before we look at the mechanics for defining an activity, let's look at how they are used to help "declutter" the UI.

The concept of an activity is exposed to the user, although perhaps not apparent to a new user. When an activity is enabled in the platform, the UI contributions associated with that activity are shown. When an activity is disabled in the platform, its UI contributions are not shown. Users can enable and disable activities as needed using the **Workbench>Capabilities** preference page. (Activities are referred to as "capabilities" in the user interface, even though we use activity terminology in the API).

Certain user operations serve as **trigger points** for enabling an activity. For example, creating a new Java project could trigger the enabling of the Java development activity. In this way, users are exposed to new function as they need it, and gradually learn about the activities that are available to them and how they affect the UI. When a user first starts the platform, it is desirable for as many activities as possible to be disabled, so that the application is as simple as possible. Choices made in the welcome page can help determine what activities should be enabled.

Activities vs. perspectives

We've seen (in [Perspectives](#)) how perspectives are used to organize different view layouts and action sets into tasks. Why do we need activities? While perspectives and activities define similar kinds of tasks, the main difference is how the UI contributions for a plug-in are associated with them. UI contributions are associated with perspectives in the extension definition of the contribution. That is, a plug-in is in charge of determining what perspectives its views and action sets belong to. Plug-ins are also free to define their own perspectives. Even when a perspective is not active, the user can access the views and actions associated with the perspective through commands such as **Show View**.

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Activities are a higher level of organization. Individual UI contributions are not aware of activities and do not refer to the activities in their extension definitions. Rather, the activities are expected to be configured at a higher level such as platform integration/configuration or product install. Individual plug-ins typically do not define new activities, unless the plug-in is a systems-level plug-in defined by a systems integrator. In a typical scenario, a systems integrator determines how function is grouped into activities and which ones are enabled by default. Activities are associated with UI contributions using **activity pattern bindings**, patterns that are matched against the id of the UI contributions made by plug-ins. An example will help demonstrate these concepts.

Defining an activity

Activities are defined using the [org.eclipse.ui.activities](#) extension point. Let's look at a simplified version of how the Eclipse SDK plug-in defines two activities – one for developing Java software and one for developing plug-ins:

```
<extension
  point="org.eclipse.ui.activities">
  <activity
    name="Java Activity"
    description="Developing Java Software"
    id="org.eclipse.javaDevelopment">
  </activity>

  <activity
    name="Plug-in Activity"
    description="Developing Eclipse Plug-ins"
    id="org.eclipse.pluginDevelopment">
  </activity>
  ...
```

Activities are assigned a name and description that can be shown to the user whenever the user is enabling and disabling activities, or otherwise shown information about an activity. The id of the activity is used when defining pattern bindings or other relationships between activities. For example, we can decide that one activity requires another activity.

```
<activityRequirementBinding
  activityId="org.eclipse.pluginDevelopment"
  requiredActivityId="org.eclipse.javaDevelopment">
</activityRequirementBinding>
```

The requirement binding states that the plug-in development activity can only be enabled when the Java development activity is enabled. Related activities can also be bound into **categories**, that are shown to the user when the user is working with activities.

```
<category
  name="Development"
  description="Software Development"
  id="org.eclipse.categories.developmentCategory">
</category>

<categoryActivityBinding
  activityId="org.eclipse.javaDevelopment"
  categoryId="org.eclipse.categories.developmentCategory">
</categoryActivityBinding>

<categoryActivityBinding
```

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```
        activityId="org.eclipse.pluginDevelopment"  
        categoryId="org.eclipse.categories.developmentCategory">  
</categoryActivityBinding>
```

The category groups the related development activities together. This category is shown to the user when the user manually configures activities.

Binding activities to UI contributions

Activities are associated with UI contributions using pattern matching. The pattern matching used in activity pattern bindings follows the rules described in the **java.util.regex** package for regular expressions. The patterns used by the workbench are composed of two parts. The first part uses the identifier of the plug-in that is contributing the UI extension. The second part is the id used by plug-in itself when defining the contribution (which may or may not also include the plug-in id as part of the identifier). The following format is used:

```
plug-in-identifier + "/" + local-identifier
```

For example, the following activity pattern binding states that a UI contribution from any JDT plug-in id (`org.eclipse.jdt.*`) is associated with the Java development activity regardless of its local identifier (`.*`).

```
<activityPatternBinding  
    activityId="org.eclipse.javaDevelopment"  
    pattern="org\.eclipse\.jdt\..*/.*">  
</activityPatternBinding>
```

The next binding is more specific. It states that the contribution named `javanature` defined in the JDT core (`org.eclipse.jdt.core`) is associated with the Java development activity.

```
<activityPatternBinding  
    activityId="org.eclipse.javaDevelopment"  
    pattern="org\.eclipse\.jdt\.core/javanature">  
</activityPatternBinding>
```

As you can see, activity pattern bindings can be used to associate large groups of contributions with a particular activity, or to associate very specific contributions to an activity. The following contributions are affected by activities:

- Views and editors
- Perspectives
- Preference and property pages
- Menus and toolbars
- New project wizard

The convention used by the workbench (plug-in id + local id) allows easy binding to plug-ins that do not necessarily follow the naming practice of prefixing their UI contribution identifiers with their plug-in's identifier. Plug-ins that directly interact with the activity API are free to use their own format for identifying contributions and for pattern-matching against those names.

Binding activities to help contributions

Activities are associated with help contributions using the same pattern matching scheme used for UI contributions. The second part of the identifier (the local identifier) indicates the name of the table of contents (TOC) file. For example, the following activity pattern binding associates all TOC files contributed by JDT plug-ins (`org.eclipse.jdt.*`) with the Java development activity:

```
<activityPatternBinding
    activityId="org.eclipse.javaDevelopment"
    pattern="org\.\eclipse\.jdt\..*\.*">
</activityPatternBinding>
```

When the Java development activity is disabled, help books contributed by JDT plug-ins, or any sub-books (TOCs linked to, or linked by JDT books), even if contributed by a different plug-in, will not show in the help UI. The topics defined in these books will also not show in the search results. In the case where JDT TOCs were not displayed as primary TOCs, but were instead linked from another TOC to appear as sub-trees in a book, disabling the JDT activity has the effect of hiding the sub-trees. The containing book will appear to define less topics in the UI.

Using more specific binding, it is possible to associate activities with selected TOCs from plug-ins that contribute multiple TOCs to the help system. For example, the following activity pattern binding associates the "Examples" TOC with the Java development examples activity.

```
<activityPatternBinding
    activityId="org.eclipse.javaDevelopmentExamples"
    pattern="org\.\eclipse\.jdt\.doc\.isv\.topics_Samples.xml">
</activityPatternBinding>
```

With such pattern binding, disabling the Java development examples activity will hide the "Examples" section from the "JDT Plug-in Developer Guide" book.

Using the activities API

The workbench activity support includes an API for working with the defined activities and changing their enabled state. Most plug-ins need not be concerned with this API, but it is useful when implementing function that allows the user to work with activities, or for implementing the trigger points that enable a particular activity. It is assumed that any plug-in that is manipulating activities through API is quite aware of the ways that activities are configured for a particular product. For example, the workbench itself uses the API to trigger the enablement of activities such as Java development. We'll look at how the workbench uses the generic activity API to implement triggers.

The hub of all activity in the workbench is **IWorkbenchActivitySupport**. The activity support works in tandem with an **IActivityManager**. Plug-ins can obtain the activity support instance from the workbench, and the activity manager from there.

```
IWorkbenchActivitySupport workbenchActivitySupport = PlatformUI.getWorkbench().getActivitySupport();
IActivityManager activityManager = workbenchActivitySupport.getActivityManager();
```

The following snippet enables the Java development activity (if it is not already enabled). It shows a simplified version of a trigger.

```
...
//the user did something Java related. Enable the Java activity.
```

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```
Set enabledActivityIds = new HashSet(activityManager.getEnabledActivityIds());
if (enabledIds.add("org.eclipse.javaDevelopment"))
    workbenchActivitySupport.setEnabledActivityIds(enabledActivityIds);
```

IActivityManager also defines protocol for getting all defined activity and category ids, and for getting the associated **IActivity** or **ICategory** for a particular id. These objects can be used to traverse the definition for an activity or category in API, such as getting the pattern bindings or requirement bindings. Listeners can be registered on the activity manager or on the activities and categories themselves to detect changes in the definition of a particular activity or in the activity manager itself. See the package [org.eclipse.ui.activities](#) for more information.

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Guiding the user through tasks

Even when the platform UI filters out unneeded functionality, there is still a steep learning curve faced by a new user. The platform UI introduces several mechanisms for helping the user choose what task needs to be done and guiding the user through the steps in that task. These mechanisms are used by the workbench itself to help guide Eclipse SDK users through tasks.

- **Cheat sheets** can help guide the user through a series of complex tasks in order to achieve some overall goal. Some steps can be performed by the cheat sheet, and some are described so that the user can manually complete the task.
- **Intro support** allows plug-ins to define pages that help introduce the product to the end user the first time the platform is started. These pages can reference help content or launch the appropriate cheat sheet for a task.

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Cheat sheets

Cheat sheets are special views that help guide the user through a series of complex tasks to achieve an overall goal. For example, a cheat sheet could be used to help guide the user through all the steps needed to create, compile, and run a simple Java program. Cheat sheets are launched from the **Help>Cheat Sheets...** menu item. Cheat sheets can also be launched from an intro page.

Cheat sheets are defined using the [org.eclipse.ui.cheatsheets.cheatSheetContent](#) extension point. The cheat sheet content itself is defined in a separate file so that it can be more easily translated into other languages.

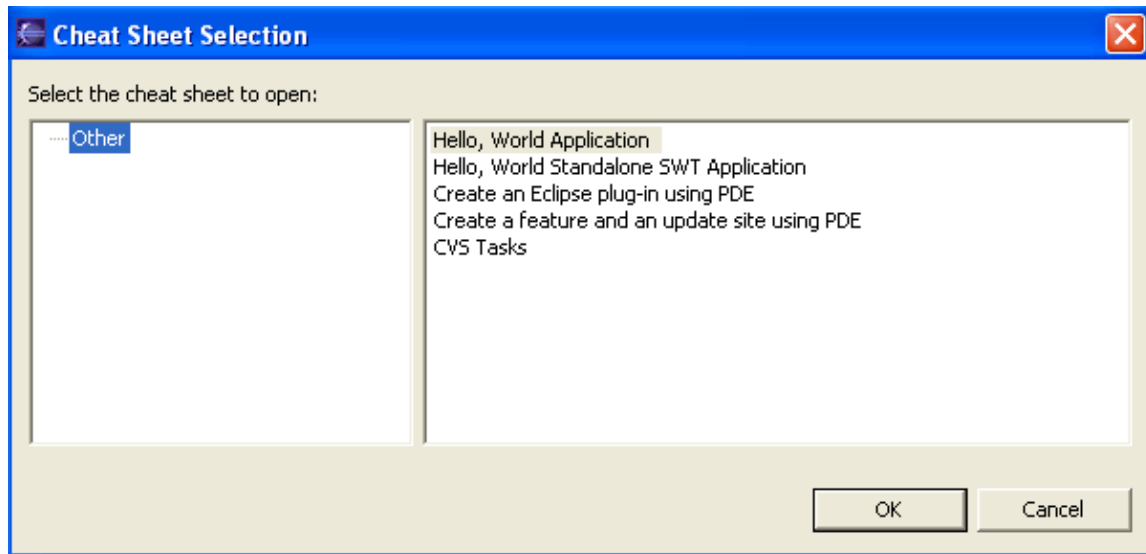
Contributing a cheat sheet

Contributing a cheat sheet is pretty straightforward. Let's look at a cheat sheet contributed by the JDT for building a simple Java application.

```
<extension point="org.eclipse.ui.cheatsheets.cheatSheetContent">
    <cheatsheet
        name="%cheatsheet.helloworld.name"
        contentFile="$nl$/cheatsheets/HelloWorld.xml"
        id="org.eclipse.jdt.helloworld">
        <description>%cheatsheet.helloworld.desc</description>
    </cheatsheet>
    ...
```

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Much like other workbench contributions, a name, description, and id can be specified for the cheat sheet. The name and description are shown when the user accesses the **Help>Cheat Sheets...** list. A category for the cheat sheet can also be defined if you want to place several cheat sheets into a logical grouping. If no category is specified, the cheat sheet will appear in the **Other** category.



Cheat sheet items

The real work for cheat sheets is done in the content file. The content file is an XML file whose name and location are specified in the **contentFile** attribute. The path for the file is relative to the plug-in's directory. (Note the use of the `$n1$` variable in the directory name, which means the file will be located in a directory specific to the national language of the target environment.)

The file format itself includes overview information about the cheat sheet followed by a description of each step (called an *item*) that the user will perform. At its simplest, an item is just a detailed description of the step that the user should take. However, an item can also specify an action that can be run to perform the step on behalf of the user. Let's look at the first part of the content file (`HelloWorld.xml`) for the Java cheat sheet.

```
<?xml version="1.0" encoding="UTF-8" ?>
<cheatsheet title="Simple Java Application">
  <intro
    href="/org.eclipse.ui.cheatsheets.doc/tasks/tcheatst.htm">
    <description>
Welcome to the Hello, World Java tutorial.
It will help you build the famous "hello world" application and try it out. You will create a jav
Let's get started!
    </description>
  </intro>
  <item
    href="/org.eclipse.platform.doc.user/concepts/concepts-4.htm"
    title="Open the Java Perspective">
<action
    pluginId="org.eclipse.ui.cheatsheets"
    class="org.eclipse.ui.internal.cheatsheets.actions.OpenPerspective"
    param1="org.eclipse.jdt.ui.JavaPerspective"/>
  <description>
Select Window->Open Perspective->Java in the menubar at the top of the workbench.
This step changes the perspective to set up the Eclipse workbench for Java development.
You can click the "Click to Perform" button to have the "Java" perspective opened automatically.
```

```

</description>
</item>
...

```



The title and intro information are shown at the top of the cheat sheet. Then, the items are described. The first item for this cheat sheet describes how to open the Java perspective. Better still, the **action** attribute specifies a class that can be used to run the action on behalf of the user. The class must implement **IAction**. This is rather convenient, as it allows you to reuse the action classes written for menu or toolbar contributions.

The class for the action can optionally implement **ICheatSheetAction** if the action uses parameters or needs to be aware of the cheat sheet and its state. In this case, the action will be passed an array of parameters and a reference to the **ICheatSheetManager** so that it can request additional information about the cheat sheet. Any necessary parameters can be passed to the action's run method using the **paramN** attributes.

It is strongly recommended that actions invoked from cheat sheets report a success/fail outcome if running the action might fail. (For example, the user might cancel the action from its dialog.) See **IAction**.notifyResult(boolean) for more detail.

Items do not have to define actions. If your item must be performed manually by the user, you need not specify an action at all. Below is the third step of the Java cheat sheet, which merely tells the user how to code the simple application. When no action is specified, the item description must instruct the user to press the appropriate button after the task has been completed.

```

<item
  href="/org.eclipse.jdt.doc.user/tasks/tasks-54.htm"
  title="Add a System.out.println line in your main method">
  <description>
Now that you have your HelloWorld class,
In the "public static void main" method, add the following statement: System.out.println("Hello
  </description>
</item>

```

Additional attributes control whether the item can be skipped completely and what document should be launched if the user requests help during the step. See the **org.eclipse.ui.cheatsheets.cheatSheetContent**

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extension point documentation for a description of all of the attributes that can be defined inside a cheat sheet.

Subitems

Subitems may be defined to further organize the presentation of an item. Unlike items, subitems do not have to be visited in any particular order. Subitems may also define actions that automatically perform the subtask for the user. Subitem actions are described in the same way as item actions.

Conditional expressions and cheat sheet variables

Conditional expressions can be used to define cheat sheet elements whose content or behavior depends upon a particular condition being true. Conditions are described in the **condition** element of a subitem using arbitrary string values that are matched against the **when** attribute for each choice. Conditions typically reference cheat sheet variables using the form `${var}`, where *var* refers to the name of a cheat sheet variable. A few simple examples will help demonstrate how conditional expressions work.

Conditional subitems can be used to choose one subitem from a list of possible subitems. Only the first subitem whose **when** attribute matches the condition attribute is included in the cheat sheet. For example:

```
<item ...>
  <conditional-subitem condition="${v1}">
    <subitem when="a" label="Step for A." />
    <subitem when="b" label="Step for B." />
  </conditional-subitem>
</item>
```

This item specifies two possible subitems that depend on the value of the variable `v1`. If the variable value is `a`, then the first subitem will be included. If the variable value is `b`, then the second subitem will be included. If the variable is neither value, it is considered an error.

Conditional actions are similar to conditional subitems. The **perform-when** element specifies a condition for performing one action among a list of possible actions. The condition is described the same way, using an arbitrary string that often references a variable. The action whose **when** attribute matches the condition is the one that will be performed. For example:

```
<item ...>
  <perform-when condition="${v1}">
    <action when="a" class="com.example.actionA" pluginId="com.example" />
    <action when="b" class="com.example.actionB" pluginId="com.example" />
  </perform-when>
</item>
```

The action to be performed is chosen based on the value of the `v1` variable. If the variable value is neither `a` or `b`, it is considered an error.

Repeated subitems

Repeated subitems describe a subitem that can expand into 0, 1, or more similar substeps. The substeps are individualized using the special variable `${this}`. This variable will be replaced by the values specified in the **values** attribute. The values attribute is a string of values that are separated by commas. A variable that expands into a list of values may be used in the values attribute. For example:

```
<item ...>
  <repeated-subitem values="${v1}">
```

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```
<subitem label="Step ${this}" />
</repeated-subitem>
</item>
```

If the value of the variable is `1`, `b`, `three`, then three subitems will appear in the cheat sheet, each having a unique label ("Step 1," "Step b," "Step three"). The variable can be used in the label or the action parameter value. It can also be accessed from the [**ICheatSheetManager**](#) while the action is executing.

Cheat sheet listeners

In some cases, you may want to change other parts of your UI if a cheat sheet is active. For example, you may have an editor that shows special annotations if a cheat sheet is guiding the user through an editing task. In this case, a **listener** can be specified as an attribute of the cheatsheet. The listener attribute must be the fully qualified name of a Java class that subclasses [**CheatSheetListener**](#). Listeners will receive notifications along with an [**ICheatSheetEvent**](#) when there is a change in the cheat sheet's life cycle, such as when it opens, closes, or completes.

Contributing attributes to an existing cheat sheet

The [**org.eclipse.ui.cheatsheets.cheatSheetItemExtension**](#) extension can be used to contribute arbitrary attributes to a pre-existing cheat sheet. The purpose of this extension point is to allow a plug-in to add additional buttons that will aid the user for a given step. These additional buttons are displayed beside the help icon.

To use this mechanism, you can define any arbitrary attribute inside an item definition in the cheat sheet XML file. The attribute name will be matched against any attributes contributed in extensions to [**org.eclipse.ui.cheatsheets.cheatSheetItemExtension**](#). See the extension point documentation for more detail.

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Workbench resource support

The Eclipse platform is structured so that you can develop a workbench application even if your application has nothing to do with the platform resource model. However, the workbench does provide support for working with resources in a separate plug-in, [**org.eclipse.ui.ide**](#). This plug-in contains the parts of the SDK workbench that focus on IDE building and manipulating the workspace.

If your plug-in uses the platform resource model, you may want to take advantage of the resource-oriented features in the workbench. These include resource property pages, resource marker UI, resource filtering, and other utilities.

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Contributing a property page

You can contribute a property page for an object by using the [**org.eclipse.ui.propertyPages**](#) extension point. An object's property page is invoked using the **Properties** menu in any view that shows objects, such as the resource navigator view. This menu is available when a single object is selected.

The readme tool contributes two property pages.

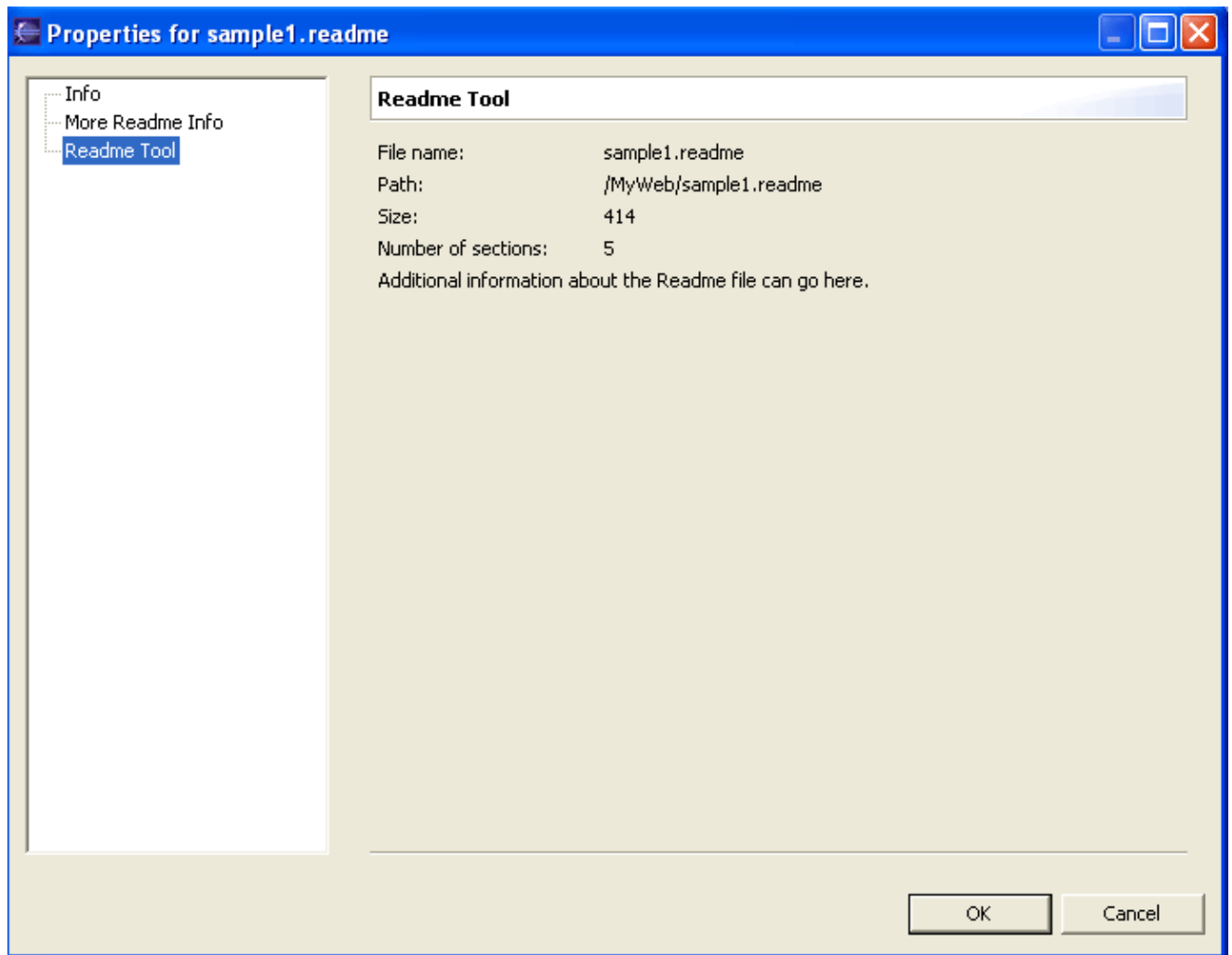
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```
<extension
  point = "org.eclipse.ui.propertyPages">
  <page
    id="org.eclipse.ui.examples.readmetool.FilePage"
    name="%PropertiesPage.filePage"
    objectClass="org.eclipse.core.resources.IFile"
    class="org.eclipse.ui.examples.readmetool.ReadmeFilePropertyPage"
    nameFilter="*.readme">
  </page>
  <page
    id="org.eclipse.ui.examples.readmetool.FilePage2"
    name="%PropertiesPage.filePage2"
    objectClass="org.eclipse.core.resources.IFile"
    class="org.eclipse.ui.examples.readmetool.ReadmeFilePropertyPage2"
    nameFilter="*.readme">
  </page>
</extension>
```

When you define a property page, you specify the **objectClass** for which this page is valid. Objects of this class will include your page when the properties are shown. You may optionally supply a **nameFilter** that further refines the class. In the readme tool example, both pages are contributed for objects of type **IFile** with a **.readme** file extension.

Property pages are not limited to workbench resources. All objects showing up in the workbench (even domain-specific objects created by other plug-ins) may have property pages. Any plug-in may register property pages for any object type.

Property pages look a lot like preference pages, except there is no hierarchy or categorization of property pages. In the dialog below, both readme property pages appear in the main list of pages.



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Implementing a property page

When the workbench creates and launches a properties page, it sets the selected resource into the page. The page can use the `getElement()` method to obtain its element, an **IAdaptable**.

The pattern for creating property pages is similar to that of preference pages, so we will only focus on what is different. Property pages show information about their element. This information can be obtained by accessing the element in order to query or compute the relevant information. The information can also be stored and retrieved from the resource's properties.

The **ReadmeFilePropertyPage** computes most of its information using its element. The following snippet shows how the number of sections is computed and displayed in a label.

```
...
IResource resource = (IResource) getElement();
...
IAdaptable sections = getSections(resource);
if (sections instanceof AdaptableList) {
    AdaptableList list = (AdaptableList)sections;
    label = createLabel(panel, String.valueOf(list.size()));
}
```

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...

When a property is computed, there is no need for corresponding logic to save the value, since the user cannot update this value.

Properties pages are commonly used for viewing and for setting the application-specific properties of a resource. (See [Resource properties](#) for a discussion of session and persistent properties.) Since the property page knows its resource, the resources API can be used in the page to initialize control values or to set new property values based on user selections in the properties page.

The following snippet shows a checkbox value being initialized from a property on a property page's element.

```
private void initializeValues() {
    ...
    IResource resource = (IResource) getElement();
    label.setText(resource.getPersistentProperty("MyProperty"));
    ...
}
```

The corresponding code for saving the checkbox value back into the property looks like this:

```
private void storeValues() {
    ...
    IResource resource = (IResource) getElement();
    resource.setPersistentProperty("MyProperty", label.getText());
    ...
}
```

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Marker help and resolution

In [Resource markers](#), we saw how plug-ins can define specialized marker types in order to annotate resources with information. The [readme tool](#) example defines its own markers in order to demonstrate two marker-related workbench extensions: **marker help** and **marker resolutions**. The marker definition is in the readme plug-in's manifest markup:

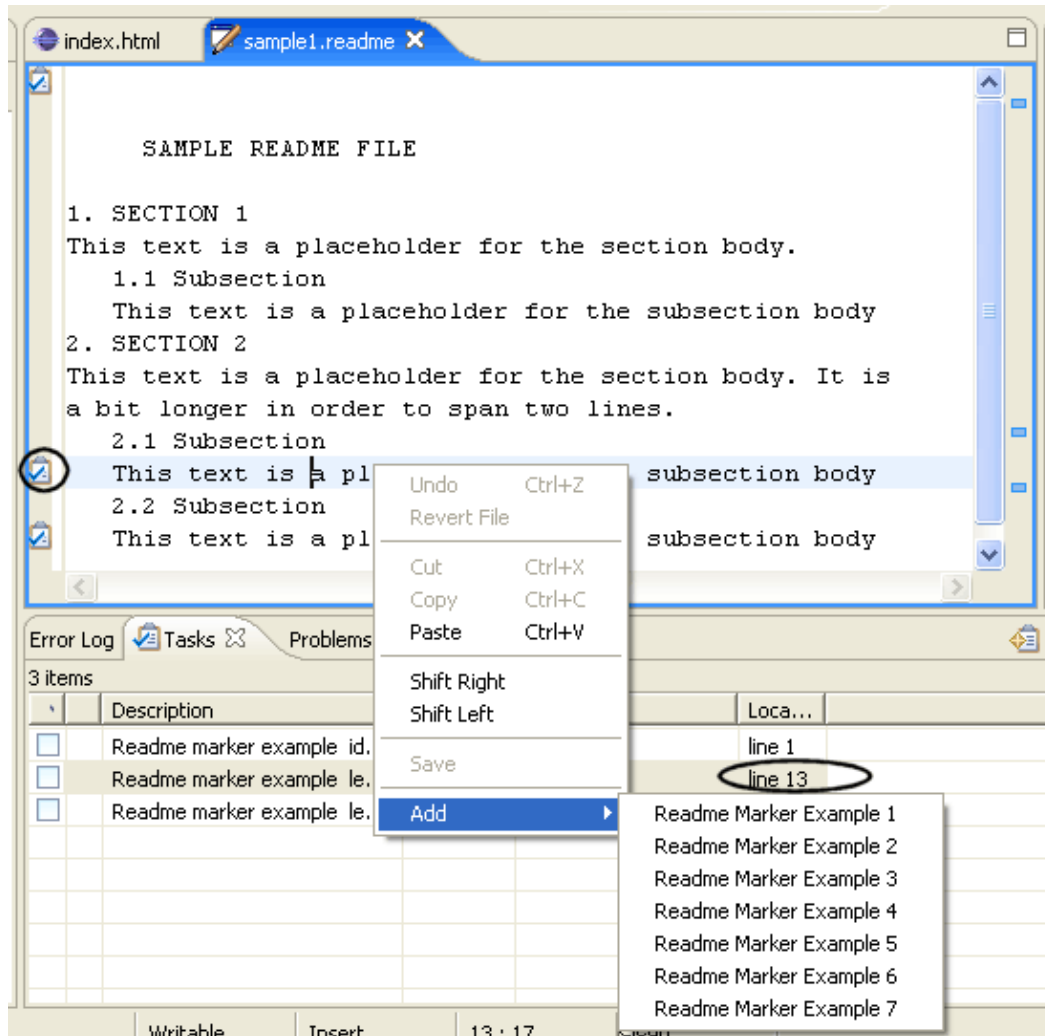
```
<extension id="readmemarker" point="org.eclipse.core.resources.markers" name="%ReadmeMarker.name"
    <super type="org.eclipse.core.resources.taskmarker"/>
    <super type="org.eclipse.core.resources.textmarker"/>
    <persistent value="true"/>
    <attribute name="org.eclipse.ui.examples.readmetool.id"/>
    <attribute name="org.eclipse.ui.examples.readmetool.level"/>
    <attribute name="org.eclipse.ui.examples.readmetool.department"/>
    <attribute name="org.eclipse.ui.examples.readmetool.code"/>
    <attribute name="org.eclipse.ui.examples.readmetool.language"/>
</extension>
```

The tool defines a marker that inherits from the platform's text marker and task marker. It also defines named attributes for the marker. Marker attributes can be set and queried.

Since the new readme marker is a kind of text marker, it inherits the text marker attributes. The text marker attributes include the character location of the marker.

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Markers can be added to a **.readme** file using the readme editor's popup menu. (The popup menu actions are added dynamically in **ReadmeTextEditor.editorContextMenuAboutToShow(IMenuManager parentMenu)**). Once added, the markers appear on the left side of the editor and in the tasks view.



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Contributing marker help

Now we are ready to look at how to add help to the readme tool's markers. Adding marker help is done using the **org.eclipse.ui.ide.markerHelp** extension point. This extension point allows plug-ins to associate a help context id with a particular type of marker. The marker can be qualified by marker type only, or it can be further qualified by the value of one or more of its attributes. The readme tool declares several different help contexts:

```
<extension point="org.eclipse.ui.ide.markerHelp">
  <markerHelp
    markerType="org.eclipse.ui.examples.readmetool.readmemarker"
    helpContextId="org.eclipse.ui.examples.readmetool.marker_example1_context">
    <attribute name="org.eclipse.ui.examples.readmetool.id" value="1234"/>
  </markerHelp>
  <markerHelp
    markerType="org.eclipse.ui.examples.readmetool.readmemarker"
    helpContextId="org.eclipse.ui.examples.readmetool.marker_example2_context">
```

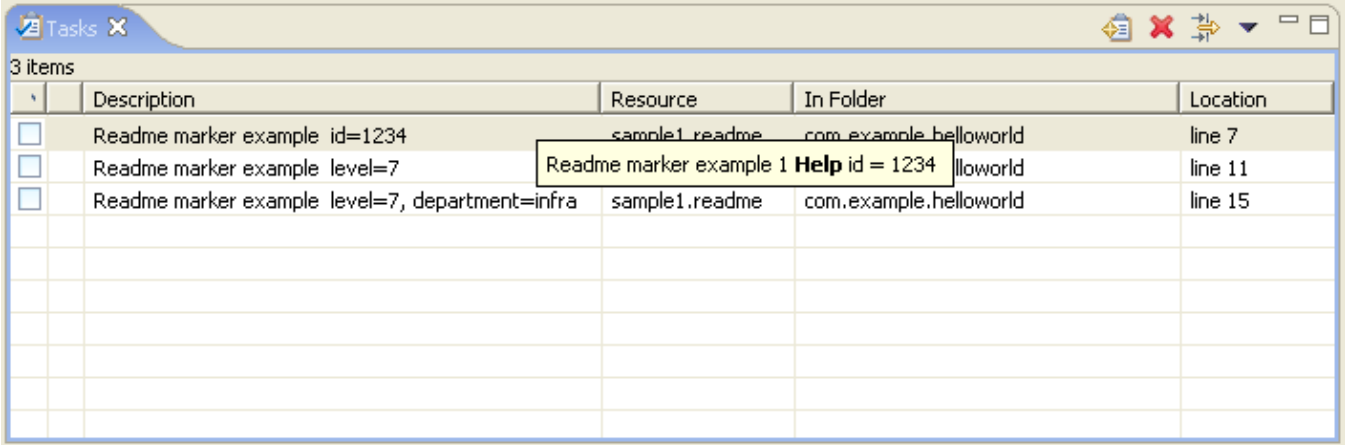
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```
<attribute name="org.eclipse.ui.examples.readmetool.level" value="7"/>
</markerHelp>
<markerHelp
  markerType="org.eclipse.ui.examples.readmetool.readmemarker"
  helpContextId="org.eclipse.ui.examples.readmetool.marker_example3_context">
  <attribute name="org.eclipse.ui.examples.readmetool.level" value="7"/>
  <attribute name="org.eclipse.ui.examples.readmetool.department" value="infra"/>
</markerHelp>
...
```

Each marker help context is defined for the readme marker type. However, each help context is associated with a different combination of attribute values. The first marker help context will be used for markers whose **id** attribute is set to "1234". The help contexts are defined in the plug-in's **HelpContexts.xml** file:

```
<context id="marker_example1_context" >
<description>Readme marker example 1 <b>Help</b> id = 1234 </description> </context>
```

Sure enough, when we select a readme marker with id="1234" and select help using F1, we see our help description.



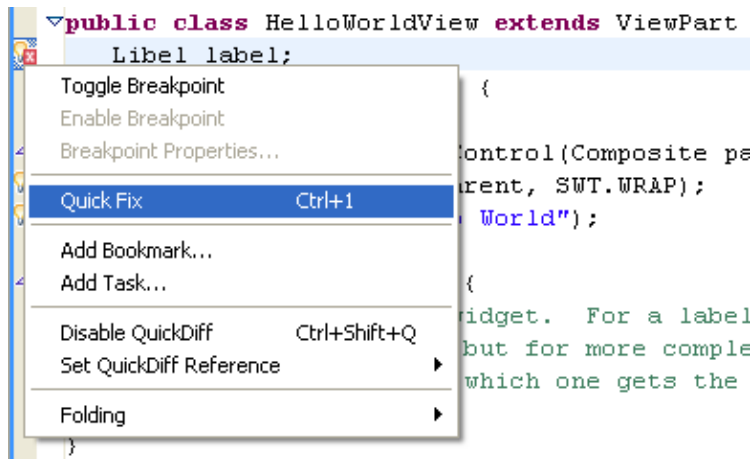
	Description	Resource	In Folder	Location
<input type="checkbox"/>	Readme marker example id=1234	sample1.readme	com.example.helloworld	line 7
<input type="checkbox"/>	Readme marker example level=7	sample1.readme	com.example.helloworld	line 11
<input type="checkbox"/>	Readme marker example level=7, department=infra	sample1.readme	com.example.helloworld	line 15

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Contributing marker resolution

Plug-ins can also define marker resolutions, so that their problem markers can participate in the workbench **Quick Fix** feature. Users can select a problem marker and choose a **Quick Fix** from a popup containing the list of supplied fixes contributed for the marker.

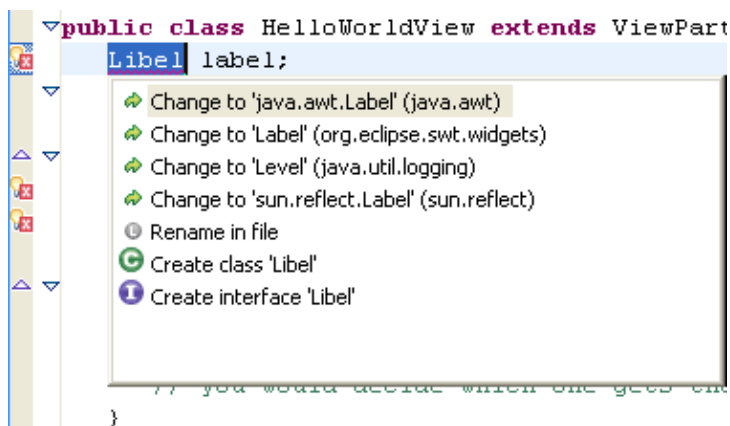
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Marker resolutions are contributed using the [org.eclipse.ui.ide.markerResolution](#) extension point. This extension point allows plug-ins to associate a class that implements [IMarkerResolutionGenerator](#) with a particular type of marker. The marker can be qualified by marker type only, or it can be further qualified by the value of one or more of its attributes. The JDT contributes a marker resolution for Java problems:

```
<extension
  point="org.eclipse.ui.ide.markerResolution">
  <markerResolutionGenerator
    markerType="org.eclipse.jdt.core.problem"
    class="org.eclipse.jdt.internal.ui.text.correction.CorrectionMarkerResolutionGene
  </markerResolutionGenerator>
</extension>
```

The marker resolution generator is responsible for returning an array of marker resolutions ([IMarkerResolution](#)) that will be shown in the **Quick Fix** popup. The resolution will be `run()` if the user selects one of the fixes.

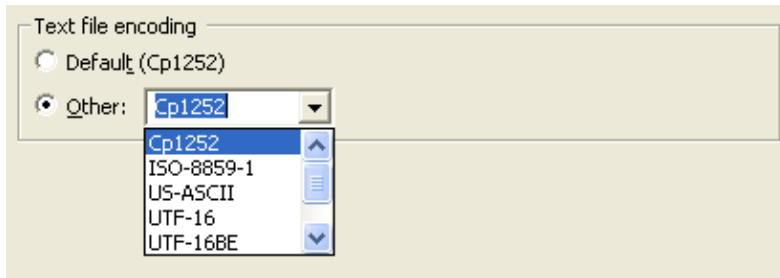


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Text file encoding

If your plug-in reads text files, it should honor the **text file encoding** preference in the workbench.

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Text files are encoded differently depending on the platform and the locale. Most of the time, using the default text file encoding for the locale of the host operating system is good enough. However, a user may want to work with text files that originate from another source. Given the ability to use the platform in a networked team environment, it's certainly possible that users will want to work with text files that use a different encoding scheme than their native encoding scheme so that they can easily interchange files with another team.

For this reason, the workbench defines its own encoding profile that is specified by the user in the **Preferences** dialog. Users may choose from the available encoding choices in the **Workbench > Editors** preference page or type in their own encoding. Plug-ins that interpret text files, such as editors and builders, should consult the workbench encoding preference rather than assume that the installed operating system encoding is in use.

You can obtain the encoding preference using **ResourcesPlugin.getEncoding()**. This encoding should be passed to **java.io** readers instead of using the default system encoding. If you need to track changes to this preference, you can hook a listener on the **ResourcesPlugin** preferences and react to changes in **ResourcesPlugin.PREF_ENCODING**. The following example comes from the default text editor:

```
public void initialize(StatusTextEditor textEditor) {

    fTextEditor= textEditor;

    fPropertyChangeListener= new Preferences.IPropertyChangeListener() {
        public void propertyChange(Preferences.PropertyChangeEvent e) {
            if (ResourcesPlugin.PREF_ENCODING.equals(e.getProperty()))
                setEncoding(null, false);
        }
    };

    Preferences p= ResourcesPlugin.getPlugin().getPluginPreferences();
    p.addPropertyChangeListener(fPropertyChangeListener);

    fEncodingActionGroup= new EncodingActionGroup(fTextEditor);
    fEncodingActionGroup.update();
}
```

Users may also change the encoding for a particular file in the **Edit > Encoding** menu of an editor. If you are manipulating text inside an open editor, you should use **IEncodingSupport.getEncoding()** instead in order to get the encoding for the particular editor. The following example shows how to obtain this information from an editor:

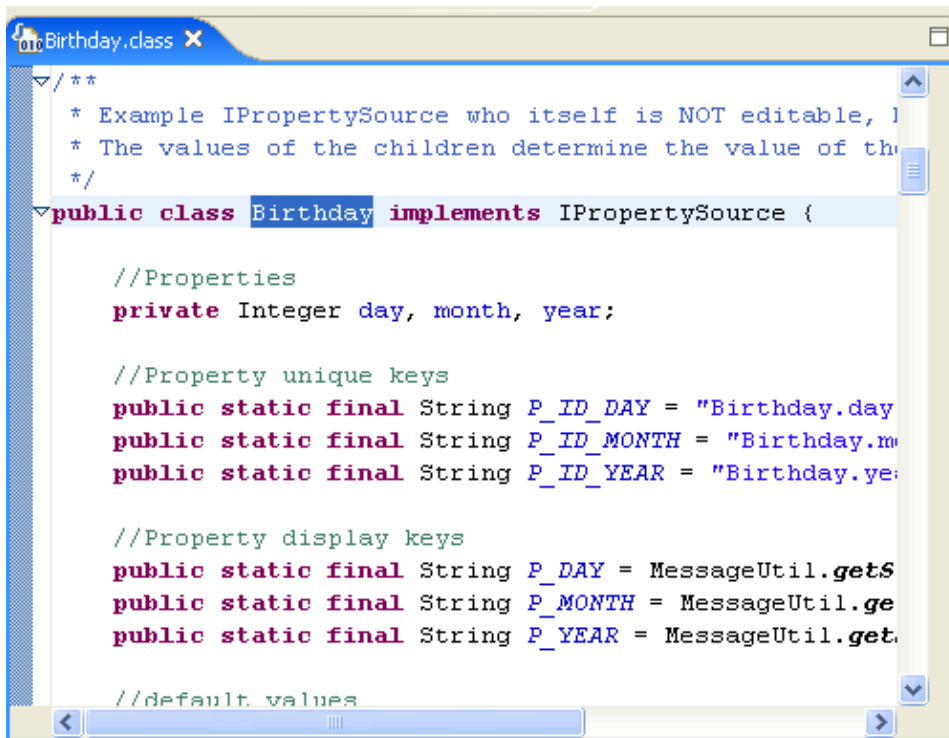
```
IEncodingSupport encodingSupport = (IEncodingSupport) editor.getAdapter(IEncodingSupport.class);
String encoding = encodingSupport.getEncoding();
```

Editors

We have seen how plug-ins can contribute an editor to the workbench, but we haven't yet looked at the implementation of an editor.

There is no "typical" implementation pattern for an editor, because editors usually provide application-specific semantics. A tool that edits and manages a particular content type will provide customized behavior for manipulating the data represented by the resource.

Editors can come in all shapes and sizes. If a plug-in's editor is text-based, then the editor can either use the existing default text editor, or create a customized text editor by using the facilities provided in the platform. The latter approach is used by the Java example editor.



```
BirthDay.class x
/**
 * Example IPropertySource who itself is NOT editable, I
 * The values of the children determine the value of the
 */
public class Birthday implements IPropertySource {

    //Properties
    private Integer day, month, year;

    //Property unique keys
    public static final String P_ID_DAY = "Birthday.day
    public static final String P_ID_MONTH = "Birthday.m
    public static final String P_ID_YEAR = "Birthday.ye

    //Property display keys
    public static final String P_DAY = MessageUtil.getS
    public static final String P_MONTH = MessageUtil.ge
    public static final String P_YEAR = MessageUtil.get

    //default values
```

If a plug-in's editor is not text based, then a custom editor must be implemented by the plug-in. There are several approaches for building custom editors, all of which depend on the look and behavior of the editor.

- Form-based editors can layout controls in a fashion similar to a dialog or wizard. The Plug-in Development Environment (PDE) uses this approach in building its manifest editors.
- Graphics intensive editors can be written using SWT level code. For example, an editor could create its own SWT window for displaying the information, or it could use a custom SWT control that is optimized for the application.
- List-oriented editors can use JFace list, tree, and table viewers to manipulate their data.

Once the implementation model for the editor has been determined, implementing the editor is much like programming a stand-alone JFace or SWT application. Platform extensions are used to add actions, preferences, and wizards needed to support the editor. But the internals of the editor are largely dependent on your application design principles and internal model.

Workbench editors

Although the implementation of a workbench editor will be specific to your plug-in and the content that you want to edit, the workbench provides a general structure for building an editor. The following concepts apply to all workbench editors.

Editor parts and their inputs

An editor must implement **IEditorPart** and is often built by extending the **EditorPart** class. An editor implements its user interface in the **createPartControl** method. This method is used to assemble the SWT widgets or JFace viewers that present the editor contents.

An **editor input** is a description of something to be edited. You can think of an editor input as a file name, though it is more general. **IEditorInput** defines the protocol for an editor input, including the name of the input and the image that should be used to represent it in the labels at the top of the editor.



Two generic editor inputs are provided in the platform. **IFileEditorInput** represents an input that is a file in the file system. **IStorageEditorInput** represents an input that is a stream of bytes. These bytes may come from sources other than the file system.

Resetting the editor input

If your editor can support the replacement of the editor's input object on the fly, you should implement **IReusableEditor**. Implementing this interface allows the workbench to "recycle" your editor. Workbench user preferences allow the user to dictate that editors should be reused after a certain number of them are open.

Navigating the editor input

If you want to implement a navigation history in your editor, you should implement **INavigationLocationProvider**. This provides a mechanism for the workbench to request a current navigation location (**INavigationLocation**) as needed to keep a navigation history. The workbench handles the mechanics of the navigation user interface. Your **INavigationLocation** will be notified when it needs to restore the editor to the location that it represents.

The rest of your editor's implementation depends on the content that you are trying to present. We'll look next at the most common type of editor – the text editor.

Documents and partitions

The platform text framework defines a document model for text and provides a viewer that displays text using this model. We will start by looking at the Java editor example and how it uses this model. We will not focus on the basic mechanics of registering an editor extension, since we've already seen this in the section

discussing [**org.eclipse.ui.editors**](#). Instead, we'll look at the specifics of how the editor class is implemented in the example.

Document providers and documents

In the workbench, an editor is typically opened when the user selects a domain element (such as a file or an element stored inside an archive file) and opens it. When the editor is created, it is associated with an editor input ([**IEditorInput**](#)), which describes the object being edited.

The Java editor example opens when the user opens a file with the "*.jav" extension. In this case, the input to the editor is an [**IFileEditorInput**](#). The platform text framework assumes little about the editor input itself. It works with a presentation model, called an [**IDocument**](#), for the input, so that it can effectively display and manipulate text.

This means that there must be a way to map from an expected domain model (the editor input) to the presentation model. This mapping is defined in an [**IDocumentProvider**](#). Given an editor input, the document provider returns an appropriate [**IDocument**](#).

The Java editor example inherits the [**TextFileDocumentProvider**](#) defined by the plug-in [**org.eclipse.ui.editors**](#). The extension [**org.eclipse.ui.editors.documentProviders**](#) is used to define mappings between editor input types (or file extensions) and document providers. The editors plug-in defines its document provider as follows:

```
<extension
  point="org.eclipse.ui.editors.documentProviders">
  <provider
    class="org.eclipse.ui.editors.text.TextFileDocumentProvider"
    inputTypes="org.eclipse.ui.IStorageEditorInput"
    id="org.eclipse.ui.editors.text.StorageDocumentProvider">
  </provider>
</extension>
```

This extension point allows plug-ins to register document providers and associate them with either a file extension or an editor input class. Since the Java editor example does not define its own document provider extension, it inherits the generic document provider specified for all input types that are [**IStorageEditorInput**](#). When the user opens a file for editing, the platform manages the details of creating the proper document provider instance. If a specific document provider is registered for the file extension, that one will be used. If there is no specific document provider for the file extension, then the editor input type will be used to find the appropriate provider.

By using the generic platform document provider, the Java editor example can take advantage of all of the features of the document provider, such as file buffering and other optimizations.

Document setup

Since the Java editor uses the platform text document provider, how can it supply any specialized behavior for handling Java files?

The extension [**org.eclipse.core.filebuffers.documentSetup**](#) is used to define mappings between file extensions and an [**IDocumentSetupParticipant**](#). The setup participant will set up the document with any special features once it has been provided to the editor.

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```
<extension
    id="ExampleJavaDocumentSetupParticipant"
    name="%documentSetupParticipantName"
    point="org.eclipse.core.filebuffers.documentSetup">
    <participant
        extensions="jav"
class="org.eclipse.ui.examples.javaeditor.JavaDocumentSetupParticipant">
        </participant>
    </extension>
```

This extension definition is what gives the example a chance to setup the document for Java specific tasks. So what does **JavaDocumentSetupParticipant** do? We'll look at a simplified version of the **setup** method.

```
public void setup(IDocument document) {
    ...
    IDocumentPartitioner partitioner= new DefaultPartitioner(JavaEditorExamplePlugin.
    partitioner.connect(document);
    ...
}
```

The setup code configures an object called a **partitioner**.

Partitions

The partitioner (**IDocumentPartitioner**) is responsible for dividing the document into non-overlapping regions called partitions. Partitions (represented by **ITypedRegion**) are useful for treating different sections of the document differently with respect to features like syntax highlighting or formatting.

In the case of the Java editor example, the document is divided into partitions that represent the javadoc comments, multi line comments, and everything else. Each region is assigned a content type and its position in the document. Positions are updated as the user edits text.

Rule based document partitioning

It is up to each editor to determine the appropriate implementation for a document partitioner. Support is provided in **org.eclipse.jface.text.rules** for rule-based document scanning. Using a rule-based scanner allows an editor to use the **DefaultPartitioner** provided by the framework.

```
IDocumentPartitioner partitioner= new DefaultPartitioner(JavaEditorExamplePlugin.getDefault().get
```

RuleBasedPartitionScanner is the superclass for rule based scanners. Subclasses are responsible for enumerating and implementing the rules that should be used to distinguish tokens such as line delimiters, white space, and generic patterns when scanning a document. The example's **JavaPartitionScanner** defines rules for distinguishing single line comments, character constants, javadoc, multi line comments, and words. This is done in the scanner's constructor:

```
public JavaPartitionScanner() {
    super();
    IToken javaDoc= new Token(JAVA_DOC);
    IToken comment= new Token(JAVA_MULTILINE_COMMENT);

    List rules= new ArrayList();
    // Add rule for single line comments.
    rules.add(new EndOfLineRule("//", Token.UNDEFINED));

    // Add rule for strings and character constants.
```

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```
rules.add(new SingleLineRule("\"", "\"", Token.UNDEFINED, '\\\\'));
rules.add(new SingleLineRule("'", "'", Token.UNDEFINED, '\\\\'));

// Add special case word rule.
rules.add(new WordPredicateRule(comment));

// Add rules for multi-line comments and javadoc.
rules.add(new MultiLineRule("/**", "*/", javaDoc, (char) 0, true));
rules.add(new MultiLineRule("/*", "*/", comment, (char) 0, true));

IPredicateRule[] result= new IPredicateRule[rules.size()];
rules.toArray(result);
setPredicateRules(result);
}
```

See the classes in [org.eclipse.jface.text.rules](#) for more details about defining rules and the types of rules available. We'll look at the scanners again when we look at [syntax coloring](#).

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Syntax coloring

Syntax coloring is provided in the platform text framework using a model of damage, repair, and reconciling. For each change applied to a document, a presentation reconciler determines which region of the visual presentation should be invalidated and how to repair it. Different strategies can be used for different content types in the document.

Implementing syntax coloring (and doing so with a presentation reconciler) is optional. By default, **SourceViewerConfiguration** does not install a presentation reconciler since it does not know the document model used for a particular editor, and has no generic behavior for syntax highlighting.

In order to use the reconciling classes to implement syntax highlighting, your editor's source viewer configuration must be [configured](#) to define a presentation reconciler. Once again, we start with **JavaSourceViewerConfiguration** to see how a presentation reconciler is defined for our editor.

```
public IPresentationReconciler getPresentationReconciler(ISourceViewer sourceViewer) {
    PresentationReconciler reconciler= new PresentationReconciler();
    ...
    return reconciler;
}
```

To understand what a presentation reconciler does, we must first look at the concepts of damage, repair, and reconciling.

Damage, repair, and reconciling

As the user modifies text in an editor, parts of the editor must be redisplayed to show the changes. Computing the text that must be redisplayed is known as computing **damage**. When syntax coloring is involved, the amount of damage caused by an editing operation becomes more extensive, since the presence or absence of a single character could change the coloring of the text around it.

Damagers (**IPresentationDamager**) determine the region of a document's presentation which must be rebuilt because of a document change. A presentation damager is assumed to be specific to a particular document

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content type (or region). It must be able to return a damage region that is valid input for a presentation repairer (**IPresentationRepairer**). A repairer must be able to derive all of the information it needs from a damage region in order to successfully describe the **repairs** that are needed for a particular content type.

Reconciling describes the overall process of maintaining the presentation of a document as changes are made in the editor. A presentation reconciler (**IPresentationReconciler**) monitors changes to the text through its associated viewer. It uses the document's regions to determine the content types affected by the change and notifies a damager that is appropriate for the affected content type. Once the damage is computed, it is passed to the appropriate repairer which will construct repair descriptions that are applied to the viewer to put it back in sync with the underlying content.

The classes in **org.eclipse.jface.text.reconciler** define additional support classes for synchronizing a document model with external manipulation of the document.

Presentation reconcilers should be provided with a repairer and damager pair for each content type to be found in the document. It is up to each editor to determine the appropriate implementation for a presentation reconciler. However, the platform provides support in **org.eclipse.jface.text.rules** for using rule-based document scanners to compute and repair damage. Default damagers and repairers are defined in this package. They can be used along with the standard reconcilers in **org.eclipse.jface.text.presentation** to implement syntax coloring by defining scanning rules for the document.

Rule based reconciling

Now we have enough background to look in detail at the creation of the example presentation reconciler. Recall that the Java editor example implements a **JavaPartitionScanner** which partitions the document into content types representing javadoc, multi line comments, and everything else.

For each of these content types, a damager/repairer pair must be specified. This is done below using the **PresentationReconciler** and the **DefaultDamagerRepairer**.

```
JavaColorProvider provider= JavaEditorEnvironment.getJavaColorProvider();
PresentationReconciler reconciler= new PresentationReconciler();

DefaultDamagerRepairer dr= new DefaultDamagerRepairer(JavaEditorEnvironment.getJavaCodeScanner());
reconciler.setDamager(dr, IDocument.DEFAULT_CONTENT_TYPE);
reconciler.setRepairer(dr, IDocument.DEFAULT_CONTENT_TYPE);

dr= new DefaultDamagerRepairer(new SingleTokenScanner(new TextAttribute(provider.getColorForJavaDoc()));
reconciler.setDamager(dr, JavaPartitionScanner.JAVA_DOC);
reconciler.setRepairer(dr, JavaPartitionScanner.JAVA_DOC);

dr= new DefaultDamagerRepairer(new SingleTokenScanner(new TextAttribute(provider.getColorForJavaDoc()));
reconciler.setDamager(dr, JavaPartitionScanner.JAVA_MULTILINE_COMMENT);
reconciler.setRepairer(dr, JavaPartitionScanner.JAVA_MULTILINE_COMMENT);

return reconciler;
```

Note that the example provide scanners for each content type.

The default content type is set up with a **JavaCodeScanner** so that keywords can be detected and colored. The **JavaCodeScanner** builds rules for detecting different kinds of tokens, such as single line comments, white space, and words. It describes the colors that should be used for words of different token types.

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The other content types are set up with a **SingleTokenScanner** and given a color to be used for tokens in these content types.

All of the details for damaging and repairing the proper parts of the documents according to the scanning rules are handled by **DefaultDamagerRepairer**. These details typically don't need to be understood by plug-in code. Your plug-in should focus on building a set of rules that are appropriate for partitioning and scanning its editor content.

Dynamically installing a reconciler

The Java editor example provides a subclass of **SourceViewerConfiguration** for installing the presentation reconciler as seen earlier. A presentation reconciler can also be installed dynamically on a text viewer using **IPresentationReconciler** protocol. There is no particular runtime benefit to doing it either way, but putting all of the pluggable behavior overrides in a subclass of **SourceViewerConfiguration** provides the advantage of consolidating all of the behavioral overrides in one place. The dynamic protocol may be useful when different presentation reconcilers are attached to a viewer throughout the life of an editor.

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Configuring a source viewer

So far we've looked at **SourceViewer** in the context of managing source code annotations.

The **SourceViewer** is also the central hub for configuring your editor with pluggable behavior such as text hovering and syntax highlighting. For these features, the editor supplies a **SourceViewerConfiguration** that is used to configure the **SourceViewer** when it is created. The Java example editor need only to supply a **SourceViewerConfiguration** appropriate for its needs. The following snippet shows how the **JavaTextEditor** creates its configuration:

```
protected void initializeEditor() {
    super.initializeEditor();
    setSourceViewerConfiguration(new JavaSourceViewerConfiguration());
    ...
}
```

What does the **JavaSourceViewerConfiguration** do? Much of its behavior is inherited from **SourceViewerConfiguration**, which defines default strategies for pluggable editor behaviors such as auto indenting, undo behavior, double-click behavior, text hover, syntax highlighting, and formatting. Public methods in **SourceViewerConfiguration** provide the helper objects that implement these behaviors.

If the default behavior defined in **SourceViewerConfiguration** does not suit your editor, you should override **initializeEditor()** as shown above and set your own source viewer configuration into the editor. Your configuration can override methods in **SourceViewerConfiguration** to supply customized helper objects that implement behavior for your editor. The following snippet shows two of the ways the **JavaSourceViewerConfiguration** supplies customized helper objects for the Java editor example:

```
public IAnnotationHover getAnnotationHover(ISourceViewer sourceViewer) {
    return new JavaAnnotationHover();
}

public IAutoIndentStrategy getAutoIndentStrategy(ISourceViewer sourceViewer, String contentType)
```

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```
    return (IDocument.DEFAULT_CONTENT_TYPE.equals(contentType) ? new JavaAutoIndentStrategy()  
  }
```

In the first method, a customized helper class is provided for implementing annotation hovering. In the second method, the default content type of the document is queried to determine whether a customized auto-indent strategy or the default strategy should be used.

See the API reference for [SourceViewerConfiguration](#) for all the ways you can configure a source viewer by overriding methods.

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Source viewers and annotations

The editor and its corresponding text viewer are largely responsible for the implementation of the document's presentation and the configuration of any needed helper classes. (See [Viewers](#) if you are not familiar with the concept of a viewer.)

A [TextViewer](#) handles all of the low level details of mapping the document model and its partitions into the colored and formatted text that a user sees. For source code style editors, a [SourceViewer](#) is provided. A source viewer introduces the notion of source code annotations. These annotations can be shown in a vertical ruler on the left side of the text, an overview ruler on the right side of the text, or as colored squiggles underneath text.

[SourceViewer](#) and its helper classes are used throughout the [AbstractTextEditor](#) hierarchy. The package [org.eclipse.jface.text.source](#) defines this viewer and the other classes supporting annotation presentation.

Annotations and rulers

Annotations, like partitions, are largely dependent on the kind of document being edited. The [IAnnotationModel](#) for a document is what holds the annotations, enumerates them on request, and listens for text changes in order to keep the annotations up to date with the text. Annotation models are registered in the [org.eclipse.core.filebuffers.annotationModelCreation](#) extension. This extension point allows plug-ins to register a class that will create an annotation model appropriate for a given file extension. The Java Editor example does not use this extension point, so it inherits the annotation model defined by the platform.

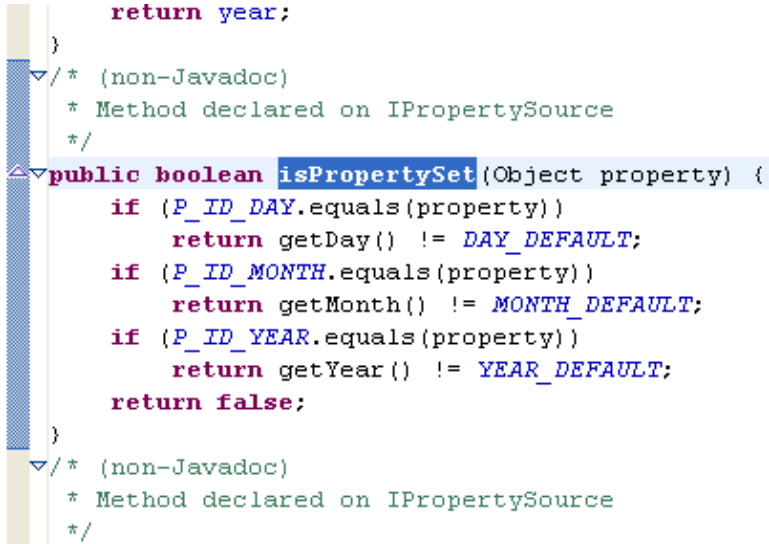
```
<extension  
  point="org.eclipse.core.filebuffers.annotationModelCreation">  
  <factory  
    extensions="*"   
  class="org.eclipse.ui.texteditor.ResourceMarkerAnnotationModelFactory">  
    </factory>  
</extension>
```

The supplied factory class will create a [ResourceMarkerAnnotationModel](#) for files with any extension. This class displays annotations that represent a marker on a resource in the workspace. (See [Resource markers](#) for more information on markers.) It assigns an image and description to each marker and monitors its resource for changes in the markers.

To see how an annotation model is displayed in a text editor, we'll examine the platform text editor and its use of rulers and annotations. The specifics of how different annotations are shown in the rulers and text can be controlled by the user in the **Workbench > Editors > Annotations** preferences.

Vertical ruler

A vertical ruler to the left of the editing area is used by platform text editors to show text ranges and line-based annotations adjacent to their text line.



```

    return year;
}
/* (non-Javadoc)
 * Method declared on IPropertySource
 */
public boolean isPropertySet(Object property) {
    if (P_ID_DAY.equals(property))
        return getDay() != DAY_DEFAULT;
    if (P_ID_MONTH.equals(property))
        return getMonth() != MONTH_DEFAULT;
    if (P_ID_YEAR.equals(property))
        return getYear() != YEAR_DEFAULT;
    return false;
}
/* (non-Javadoc)
 * Method declared on IPropertySource
 */

```

These annotations are described in the supplied [ResourceMarkerAnnotationModel](#). This model is set into the [SourceViewer](#) when the source viewer is initialized by the editor. The following snippet from [AbstractTextEditor](#) shows how the document and the annotation model are associated with the viewer.

```

private void initializeSourceViewer(IEditorInput input) {

    IAnnotationModel model= getDocumentProvider().getAnnotationModel(input);
    IDocument document= getDocumentProvider().getDocument(input);

    if (document != null) {
fSourceViewer.setDocument(document, model);
        ...
    }
}

```

Once the source viewer is configured with the proper document and annotation model, it has enough information to present the document and ensure the correct annotations are shown in the vertical ruler to the left. The model is associated with the ruler when the document is set. The following snippet shows what happens when a document is set into the source viewer. It has been simplified from the actual code in [SourceViewer](#) for clarity:

```

public void setDocument(IDocument document, IAnnotationModel annotationModel) {
    ...
    // create visual annotation model from the supplied model and store
    // in fVisualAnnotationModel
    ...
    if (fVerticalRuler != null)
fVerticalRuler.setModel(fVisualAnnotationModel);
}

```

In this way, the ruler is associated with the appropriate annotation model.

Let's look at the ruler itself. It is created by the text editor and then connected with the editor's viewer. Since the Java editor example does not define any special behavior for rulers, it inherits the ruler as defined in [TextEditor](#).

Welcome to Eclipse

```
protected IVerticalRuler createVerticalRuler() {
    CompositeRuler ruler= new CompositeRuler();
    ruler.addDecorator(0, new AnnotationRulerColumn(VERTICAL_RULER_WIDTH));
    if (isLineNumberRulerVisible())
        ruler.addDecorator(1, createLineNumberRulerColumn());
    return ruler;
}
```

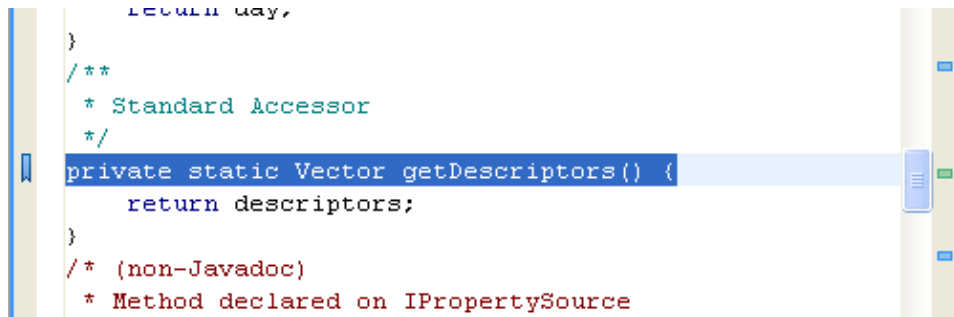
The text editor uses a `CompositeRuler`. This ruler does not have a visual presentation of its own. The presentation is provided by a list of decorators that show columns (**`IVerticalRulerColumn`**) in the ruler. In this example, a ruler column that shows annotations (**`AnnotationRulerColumn`**) is always added, and a line number ruler column is added based on user preferences. The annotation ruler column handles the particulars of displaying the annotation images in the proper locations.

Despite all the classes involved in showing a ruler, note that the example editor needed only to subclass framework classes to get ruler behavior. **`JavaDocumentProvider`** inherits an appropriate marker annotation model from **`FileDocumentProvider`**. The `JavaTextEditor` inherits the ruler presentation from **`TextEditor`**.

Overview ruler

An overview ruler on the right hand side of the editing area is used to show annotations concerning the entire document. These annotations are shown relative to their position in the document and do not move as the user scrolls the document. There usually is a corresponding annotation on the vertical ruler when that portion of the document is visible.

The vertical ruler below shows that there are two tasks in the document and one bookmark. Since the bookmarked text is visible, its annotation is also shown on the left.



The user can navigate to the location of the annotation in the code by clicking on the annotation itself.

The types of annotations shown in the overview ruler are determined by adding annotation types to the ruler. In the following snippet from **`SourceViewerDecorationSupport`**, annotation types are dynamically added to the ruler. (See next section for more information about **`SourceViewerDecorationSupport`**.)

```
private void showAnnotationOverview(Object annotationType) {
    if (fOverviewRuler != null) {
        Color c= getAnnotationTypeColor(annotationType);
        fOverviewRuler.setAnnotationTypeColor(annotationType, c);
        int l= getAnnotationTypeLayer(annotationType);
        fOverviewRuler.setAnnotationTypeLayer(annotationType, l);
        fOverviewRuler.addAnnotationType(annotationType);
        fOverviewRuler.update();
    }
}
```

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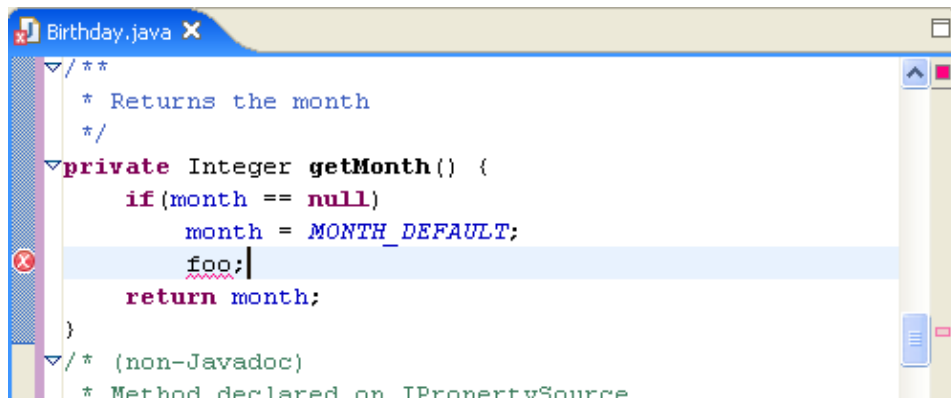
The overview ruler is also supplied with an **IAnnotationAccess** that is used to provide information about a particular annotation, such as its type and how it is to be displayed. The **TextEditor** uses a **DefaultMarkerAnnotationAccess** which interprets annotations according to their marker types and consults the user preferences to see which marker types should be shown in the overview ruler.

```
protected IAnnotationAccess createAnnotationAccess() {
    return new DefaultMarkerAnnotationAccess(fAnnotationPreferences);
}
```

Consult the implementation of **DefaultMarkerAnnotationAccess** and **MarkerAnnotation** for more detail about presenting markers in the overview ruler.

Text annotations

In addition to showing annotations in the rulers, a source viewer can show annotations as colored squiggly marks in the text.



We'll look again at the creation of the source viewer in **TextEditor**.

```
protected ISourceViewer createSourceViewer(Composite parent, IVerticalRuler ruler, int styles) {
    ...
    ISourceViewer sourceViewer= new SourceViewer(parent, ruler, fOverviewRuler, isOverviewRuler);
    fSourceViewerDecorationSupport= new SourceViewerDecorationSupport(sourceViewer, fOverviewRuler, fOverviewRuler);
    configureSourceViewerDecorationSupport();

    return sourceViewer;
}
```

The class **SourceViewerDecorationSupport** handles many of the decorations shown in a source viewer, including text annotations, colored margins, colored cursor lines, and the like. It is configured with the user preferences so that it can respond to dynamic updates of user preference changes. Most editors need not be concerned with the details of how these decorations are painted. (See **SourceViewerDecorationSupport** and related classes such as **AnnotationPainter** if you must!). The important thing to know is what decorations are available so that the **SourceViewer** and its supporting **SourceViewerDecorationSupport** are configured correctly.

Configuring a SourceViewerDecorationSupport

Let's look at the configuration used by **TextEditor** for the decoration support.

Welcome to Eclipse

```
protected void configureSourceViewerDecorationSupport() {  
  
    Iterator e= fAnnotationPreferences.getAnnotationPreferences().iterator();  
    while (e.hasNext())  
        fSourceViewerDecorationSupport.setAnnotationPreference((AnnotationPreference) e.n  
    fSourceViewerDecorationSupport.setAnnotationPainterPreferenceKeys(DefaultMarkerAnnotation  
  
    fSourceViewerDecorationSupport.setCursorLinePainterPreferenceKeys(CURRENT_LINE, CURRENT_L  
    fSourceViewerDecorationSupport.setMarginPainterPreferenceKeys(PRINT_MARGIN, PRINT_MARGIN_  
    fSourceViewerDecorationSupport.setSymbolicFontName(getFontPropertyPreferenceKey());  
}
```

Note that the annotation preferences are used to define annotation types for all of the annotations shown in the user preferences. This includes annotations contributed by any plug-in and is not limited to the workbench-supplied annotations. If you do not wish to show all available annotations in your editor, you should override this method and set up the **SourceViewerDecorationSupport** with only those types you want to show.

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Text and ruler hover

Hover support is provided in the platform text framework, allowing you to implement informational hovers (or infopops) over the text and the rulers shown in your editor.

Hover support is optional. By default, **SourceViewerConfiguration** does not install hover behavior since there is no useful general information to show. In order to provide text or ruler hover, your editor's source viewer configuration must be configured to define a pluggable hover object.

Let's look again at **JavaSourceViewerConfiguration** to see which methods define the hover behavior:

```
public ITextHover getTextHover(ISourceViewer sourceViewer, String contentType) {  
    return new JavaTextHover();  
}  
public IAnnotationHover getAnnotationHover(ISourceViewer sourceViewer) {  
    return new JavaAnnotationHover();  
}
```

Hover helper classes can also be installed dynamically using **SourceViewer** protocol (**setTextHover** and **setAnnotationHover**). There is no particular runtime benefit to doing it either way, but putting all of the pluggable behavior overrides in a subclass of **SourceViewerConfiguration** provides the advantage of consolidating all of the definitions in one place.

Let's look at the specifics of providing both kinds of hover.

Text hover

Text hover allows you to provide informational text about text shown in the editor. This is done using the **ITextHover** interface. A text hover is responsible for computing the region that should be used as the source of hover information, given an offset into the document. It is also responsible for providing the informational text about a specific region. **JavaTextHover** is pretty simple. It checks to see if the supplied offset for hover is contained inside the text selection. If so, it supplies the selection range as hover region.

```
public class JavaTextHover implements ITextHover {
```

Welcome to Eclipse

```
...

public IRegion getHoverRegion(ITextViewer textViewer, int offset) {
    Point selection= textViewer.getSelectedRange();
    if (selection.x <= offset && offset < selection.x + selection.y)
        return new Region(selection.x, selection.y);
    return new Region(offset, 0);
}
}
```


Given its own computed hover region, it obtains the selected text from its document and returns that as the hover info.

```
public class JavaTextHover implements ITextHover {

    public String getHoverInfo(ITextViewer textViewer, IRegion hoverRegion) {
        if (hoverRegion != null) {
            try {
                if (hoverRegion.getLength() > -1)
                    return textViewer.getDocument().get(hoverRegion.getOffset());
            } catch (BadLocationException x) {
            }
        }
        return JavaEditorMessages.getString("JavaTextHover.emptySelection");
    }
    ...
}
```

Sure enough, we can see that if we hover over a selection in the editor, the hover text shows the selection.

```
public Birthday(int day, int month, int year) {
    super();
    setDay(new Integer(day));
    setMonth(new Integer(month));
    setYear(new Integer(year));
}
/**
 * Returns the day
 */
```



More complicated contextual information can be used to compute useful hover information. Examples of this can be found in the **JavaTextHover** implemented with the JDT editor.

Ruler hover

Hover on the vertical ruler is useful for showing show line-oriented information. The hover class is configured as described above. **IAnnotationHover** is the interface for ruler hover objects. Although the name implies that the hover is designed for annotations in the ruler, it is really up to an individual editor to determine what is appropriate. A ruler hover is responsible for returning the info string associated with a particular line number, regardless of the presence of markers on that line.

The Java example editor's **JavaAnnotationHover** implements hover for all lines. It uses the line number to obtain all of the text on the hover line and returning it as the info string.

```
public String getHoverInfo(ISourceViewer sourceViewer, int lineNumber) {
```

Welcome to Eclipse

```
IDocument document= sourceViewer.getDocument();

try {
    IRegion info= document.getLineInformation(lineNumber);
    return document.get(info.getOffset(), info.getLength());
} catch (BadLocationException x) {
}
return null;
}

private Integer getDay() {
    if(day == null) {day == null}
        day = DAY_DEFAULT;
    return day;
}
```

Since the hover has access to the document and the source viewer, it has all the context needed to make more complicated contextual decisions about the info that should be shown. For example, the annotation model could be retrieved from the source viewer in order to provide hover info for any annotations shown in the vertical ruler. The **JavaAnnotationHover** provided by the JDT editor provides this capability.

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Content assist

Content assist allows you to provide context sensitive content completion upon user request. This functionality is implemented by the platform text framework in **org.eclipse.jface.text.contentassist**. Popup windows (infopops) are used to propose possible text choices to complete a phrase. The user can select these choices for insertion in the text. Content assist also supports contextual infopops for providing the user with information that is related to the current position in the document.

Implementing content assist is optional. By default, **SourceViewerConfiguration** does not install a content assistant since it does not know the document model used for a particular editor, and has no generic behavior for content assist.

In order to implement content assist, your editor's source viewer configuration must be configured to define a content assistant. This is done in the Java editor example inside the **JavaSourceViewerConfiguration**.

```
public IContentAssistant getContentAssistant(ISourceViewer sourceViewer) {

    ContentAssistant assistant= new ContentAssistant();
    assistant.setContentAssistProcessor(new JavaCompletionProcessor(), IDocument.DEFAULT_CONTENT_TYPE);
    assistant.setContentAssistProcessor(new JavaDocCompletionProcessor(), JavaPartitionScanner.DEFAULT_PARTITIONING);
    ...
    return assistant;
}
```

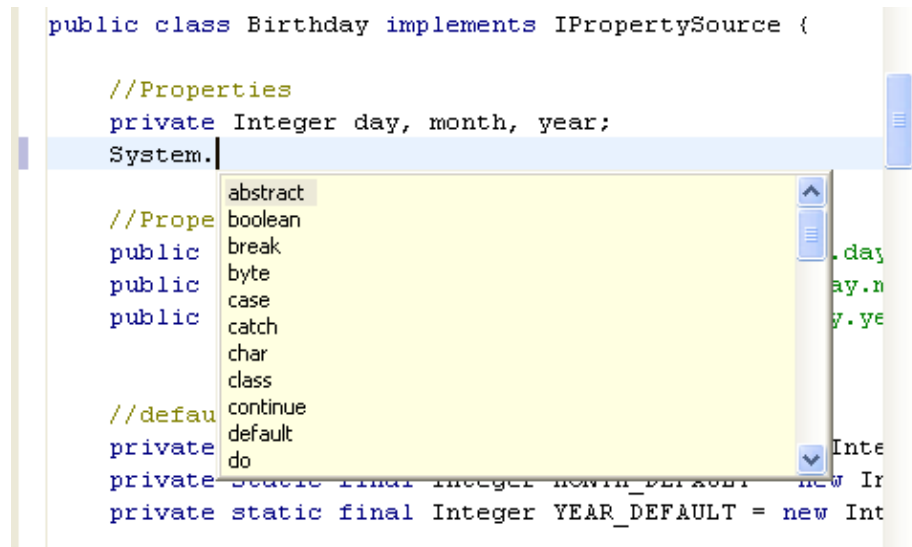
Content assist behavior is defined in the interface **IContentAssistant**. Setting up a content assistant is somewhat similar to setting up syntax highlighting. The assistant should be configured with different phrase completion strategies for different document content types. The completion strategies are implemented using **IContentAssistProcessor**. A processor proposes completions and computes context information for an offset within particular content type.

Content assist processors

Not all content types need to have content assistance. In the Java example editor, content assist processors are provided for the default content type and javadoc, but not for multi-line comments. Let's look at each of these processors.

The **JavaCompletionProcessor** is quite simple. It can only propose keywords as completion candidates. The keywords are defined in a field, `fgProposals`, and these keywords are always proposed as the candidates:

```
public ICompletionProposal[] computeCompletionProposals(ITextViewer viewer, int documentOffset) {
    ICompletionProposal[] result= new ICompletionProposal[fgProposals.length];
    for (int i= 0; i < fgProposals.length; i++) {
        IContextInformation info= new ContextInformation(fgProposals[i], MessageFormat.format(
            result[i]= new CompletionProposal(fgProposals[i], documentOffset, 0, fgProposals[i]
        )
    }
    return result;
}
```



Completion can be triggered by user request or can be automatically triggered when the "(" or "." character is typed:

```
public char[] getCompletionProposalAutoActivationCharacters() {
    return new char[] { '.', '(' };
}
```

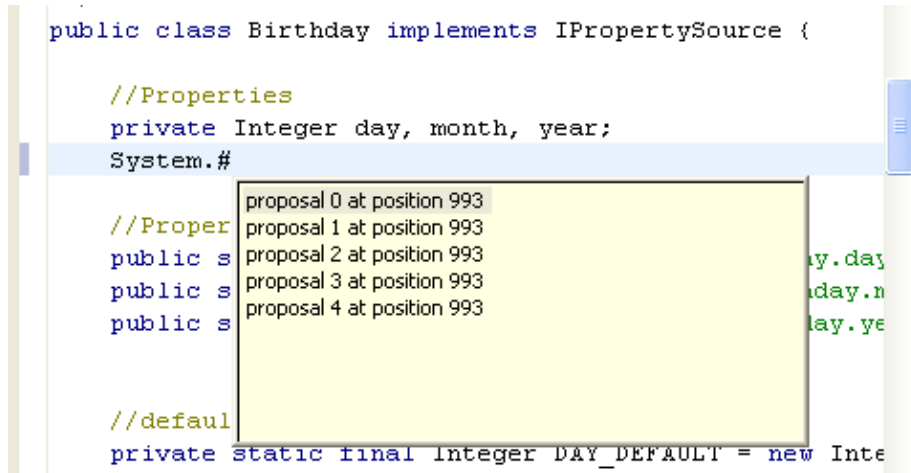
In addition to proposing completions, the **JavaCompletionProcessor** defines context information that can be requested by the user. Context information includes a description of the pieces of information available in a given context and the detailed information message.

In the Java editor example, the information is not really contextual. An array containing five similar context information objects is computed for the current offset when the user requests context info. All of these context information objects define a context that contains the five characters in front of the offset and the five after the offset. If any one of these five proposals is selected, the detailed information will appear near the cursor and will stay as long as the cursor is within the context of the five characters around the offset.

```
public IContextInformation[] computeContextInformation(ITextViewer viewer, int documentOffset) {
```

Welcome to Eclipse

```
IContextInformation[] result= new IContextInformation[5];
for (int i= 0; i < result.length; i++)
    result[i]= new ContextInformation(
        MessageFormat.format(JavaEditorMessages.getString("CompletionProcessor.Co
        MessageFormat.format(JavaEditorMessages.getString("CompletionProcessor.Co
return result;
}
```



This context information is shown automatically when the "#" character is typed:

```
public char[] getContextInformationAutoActivationCharacters() {
    return new char[] { '#' };
}
```

Content assist configuration

The appearance and behavior of content assist can be configured using **IContentAssistant**. For example, you can configure the auto activation time out, and the orientation and color of information popups.

```
public IContentAssistant getContentAssistant(ISourceViewer sourceViewer) {

    ContentAssistant assistant= new ContentAssistant();

    ...

    assistant.enableAutoActivation(true);
    assistant.setAutoActivationDelay(500);
    assistant.setProposalPopupOrientation(IContentAssistant.PROPOSAL_OVERLAY);
    assistant.setContextInformationPopupOrientation(IContentAssistant.CONTEXT_INFO_ABOVE);
    assistant.setContextInformationPopupBackground(JavaEditorEnvironment.getJavaColorProvider

    return assistant;
}
```

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Registering editor actions

The text editor framework provides many utility classes that aid in presenting and updating text and source code. Now we will turn our attention to the workbench in which the editor is but one part. How does the editor interact with other workbench features such as context menus, menu bars, and tool bars?

Editor menu bar actions

To understand how editors register themselves with the workbench and provide actions for the workbench menu bar, see the section discussing [org.eclipse.ui.editors](#). We won't rehash that information here. We'll just take a quick look at the markup where the Java example editor registers its editor.

```
<extension
  point="org.eclipse.ui.editors">
  <editor
    name="%javaEditorName"
    icon="icons/obj16/java.gif"
    extensions="jav"
    contributorClass="org.eclipse.ui.examples.javaeditor.JavaActionContributor"
    class="org.eclipse.ui.examples.javaeditor.JavaEditor"
    id="org.eclipse.ui.JavaEditor">
  </editor>
</extension>
```

Workbench menu bar actions are contributed by the **JavaActionContributor**. It implements actions that are placed in the workbench **Edit** menu and the workbench tool bar.

```
public JavaActionContributor() {
    super();
    fContentAssistPrnpsR&retargetTextEditorAction(JavaEditorMessages.getResourceBundle(), "Con
    ...
    fContentAssistTip= new RetargetTextEditorAction(JavaEditorMessages.getResourceBundle(), "
    ...
    fTogglePresentation= new PresentationAction();
}
```

The first two actions are defined as retargetable text editor actions. The principle is similar to the [retargetable actions](#) provided by the workbench. Retargetable text editor actions represent menu entries which the action contributor dynamically binds to corresponding actions provided by the active editor. When the active editor changes, the action to which a retargetable text editor action is bound changes as well. The following snippet shows that the editor action contributor finds the corresponding action by asking the editor for an action of a given id:

```
protected final IAction getAction(ITextEditor editor, String actionId) {
    return (editor == null ? null : editor.getAction(actionId));
}

public void setActiveEditor(IEditorPart part) {
    super.setActiveEditor(part);
    ITextEditor editor= null;
    if (part instanceof ITextEditor)
        editor= (ITextEditor) part;
    fContentAssistProposal.setAction(getAction(editor, "ContentAssistProposal"));
    fContentAssistTip.setAction(getAction(editor, "ContentAssistTip"));
    fTogglePresentation.setEditor(editor);
    fTogglePresentation.update();
}
```



```
}
```

The id must be the same under which the action is registered with the editor as given here for the **JavaTextEditor**. (See also next section.):

```
protected void createActions() {
    super.createActions();

    IAction a= new TextOperationAction(JavaEditorMessages.getResourceBundle(), "ContentAssist
a.setActionDefinitionId(ITextEditorActionDefinitionIds.CONTENT_ASSIST_PROPOSALS);
    setAction("ContentAssistProposal", a);

    a= new TextOperationAction(JavaEditorMessages.getResourceBundle(), "ContentAssistTip.", t
    a.setActionDefinitionId(ITextEditorActionDefinitionIds.CONTENT_ASSIST_CONTEXT_INFORMATION
    setAction("ContentAssistTip", a);
}
```

The third action in the contributor is a concrete action added to the workbench tool bar. It toggles the state of the editor between showing the highlighted range (as dictated by the Java example's content outliner) and showing the entire file. This action only appears in the tool bar.

Editor context menus

The editor context menus are created and managed in the **AbstractTextEditor** and **TextEditor** framework.

The method **createActions** is used to register actions with the editor. This includes actions appropriate for the editor context menus or any actions contributed in extension definitions. In the Java example editor, only the actions that get bound to the retargetable actions are created. However, the Java example editor also inherits the actions created by **TextEditor** and its superclasses. These actions can be used in the editor context menus.

The **TextEditor** method **editorContextMenuAboutToShow** is used in the framework to allow editors to add actions to the context menu for the editing area. You can use a menu path to decide exactly where your action should appear. Valid menu paths inside the editor context menu are defined in the implementation of this method in **AbstractTextEditor**.

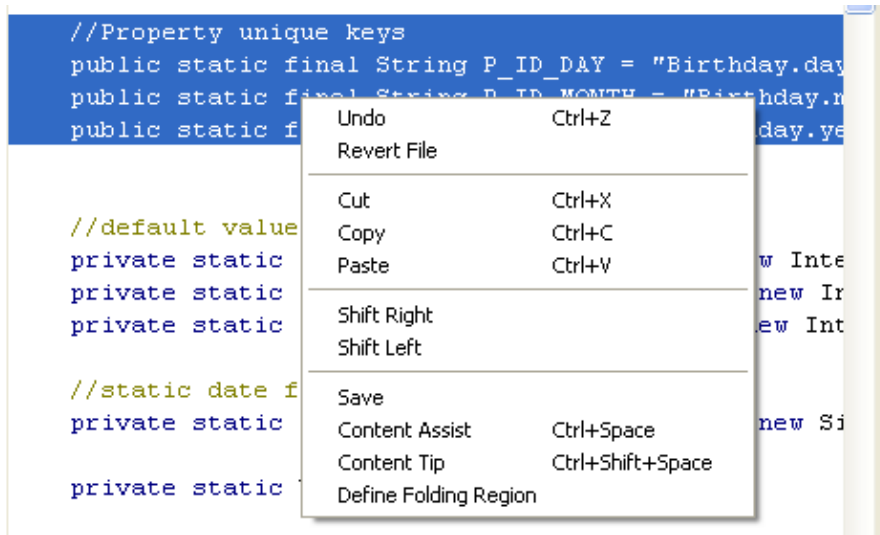
There are several ways to add an action to this menu. The first way is by adding an action using only the id under which it is registered with the editor. For example, the **JavaTextEditor** adds its actions for content assistance to the menu when this method is called. Actions will not appear in the menu when no action is registered under the used id.

```
public void editorContextMenuAboutToShow(MenuManager menu) {
    super.editorContextMenuAboutToShow(menu);
    addAction(menu, "ContentAssistProposal");
    addAction(menu, "ContentAssistTip");
}
```

The superclass **TextEditor** adds actions a second way – by specifying a menu group in the context menu for placing the action. In this case the actions (**Shift Left**, **Shift Right**) do appear in the context menu in the group defined by **AbstractTextEditor**.

```
protected void editorContextMenuAboutToShow(IMenuManager menu) {
    super.editorContextMenuAboutToShow(menu);
    addAction(menu, ITextEditorActionConstants.GROUP_EDIT, ITextEditorActionConstants.SHIFT_R
    addAction(menu, ITextEditorActionConstants.GROUP_EDIT, ITextEditorActionConstants.SHIFT_L
}
```

Welcome to Eclipse



The method `rulerContextMenuAboutToShow` is used in the same way before the ruler's context menu is shown. The implementation of this method in `AbstractTextEditor` defines the groups in which items can be added to the menu.

Menu ids

The editor context and ruler context menus can be assigned ids so that other plug-ins can contribute to these menus in their extensions. The scheme for establishing menu ids is more flexible since the original version of the platform. However, the framework can run in a compatibility mode in order to remain compatible with plug-ins developed for the original version. You can use `AbstractTextEditor.setCompatibilityMode()` to control this behavior. The default setting is true.

1.0 compatible menu ids

When the compatibility mode is true, the ids of the editor and ruler context menus can be set using `AbstractTextEditor` protocol. The methods `setEditorContextMenuId` and `setRulerContextMenuId` can be used for this purpose. Resetting the ids can be useful if you want to prevent inheriting menus that were contributed to superclass menus. For example, the `JavaTextEditor` in the example resets its context menu ids to be Java specific in order to prevent inheriting any generic text contributions from other plug-ins.

```
protected void initializeEditor() {
    super.initializeEditor();
    JavaEditorEnvironment.connect(this);
    setSourceViewerConfiguration(new JavaSourceViewerConfiguration());
    setEditorContextMenuId("#JavaEditorContext");
    setRulerContextMenuId("#JavaRulerContext");
}
```

If no id is set anywhere in the concrete hierarchy, the default ids defined by `AbstractTextEditor` will be used.

1.0 non-compatible menu ids

The editor context menu id is always `<editor id>.EditorContext`, where `<editor id>` is the id of the editor. The id of an editor is defined in the xml declaration of the editor. The ruler context menu id is always `<editor id>.RulerContext`.

Other text editor responsibilities

The Java example editor inherits a lot of useful default behavior from **AbstractTextEditor**. The text editing framework handles several other responsibilities that you can customize by overriding methods in **AbstractTextEditor**. Browse the implementation of this class and its subclasses to see how behavior is customized in the framework.

The following are some of the useful framework features that can be configured.

Preference handling

Text editors typically contribute user preferences that control the presentation and behavior of the editor. In the text framework, each text editor instance has an associated preference store that is used for accessing user preferences. This preference store can be set up by your editor, or you can inherit from preference stores already used in the framework.

In the case of the Java example editor, it inherits the preference store initialized by **TextEditor**. This is the preference store defined by the workbench editors plug-in.

```
protected void initializeEditor() {
    ...
    setPreferenceStore(EditorsPlugin.getDefault().getPreferenceStore());
}
```

The editors plug-in preferences can be manipulated in the **Workbench > Editors** and **Workbench > Editors > Text Editor** preference pages.

If you do not want to use the standard workbench text preferences for your editor, you can set a different preference store. This is typically done by overriding **initializeEditor** and setting your own preference store. If you do use your own preference store, you will also need to override the method **handlePreferenceStoreChanged()** which is triggered whenever a preference is updated.

Key bindings

Key binding contexts are useful for establishing a lookup order for key bindings. Having contextual key bindings reduces the chances of different plug-ins contributing conflicting key sequences. By default, the workbench operates in a generic context for working with windows or dialogs. When a text editor becomes active, it is responsible for resetting the context to the text editing context, so that editor specific key bindings will be active.

In the platform text framework, each text editor instance has an associated array of key binding scopes. It is responsible for setting the correct scopes when it becomes active. **AbstractDecoratedTextEditor** defines this scope and takes care of making it active. The scope is assigned in a method that is called from the constructor:

```
protected void initializeKeyBindingScopes() {
    setKeyBindingScopes(new String[] { "org.eclipse.ui.textEditorScope" });
}
```

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The argument to the method is an array of ids that have been defined for contexts. If you want your editor to define its own key binding context, then you can override this method in your editor class, or set the scope dynamically using `setKeybindingScopes`.

The context itself must be defined with the corresponding id in the `org.eclipse.ui.contexts` extension point. The following is the definition for the text editing context.

```
<extension
  point="org.eclipse.ui.contexts">
  <context
    name="%context.editingText.name"
    description="%context.editingText.description"
    id="org.eclipse.ui.textEditorScope"
    parentId="org.eclipse.ui.contexts.window">
  </context>
  ...
```

(Note: We use the terms **scope** and **context** interchangeably in this discussion. The method names in the text classes still refer to key binding contexts as scopes. These method names reflect the original implementation of contexts as scopes and use outdated terminology.)

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Building a help plug-in

In this example, we assume that a documentation author has already supplied you with the raw documentation in the form of HTML files. The granularity and structure of these files is completely up to the documentation team. Once the documentation is delivered, setting up the plug-in and topics can be done independently.

We start by assuming that the documentation has already been provided in the following tree.

```
html/
  concepts/
    concept1.html
    concept1_1.html
    concept1_2.html
  tasks/
    task1.html
    task2.html
    task3_1.html
    task3_2.html
  ref/
    ref1.html
    ref2.html
```

We will assume that the plug-in name is `com.example.helpexample`.

The first step is to create a plug-in directory, `com.example.helpexample` underneath the platform **plugins** directory. The `doc\` sub tree shown above should be copied into the directory.

Documentation plug-ins need a manifest just like code plug-ins. The following markup defines the documentation plug-in.

```
<?xml version="1.0" ?>
<plugin name="Online Help Sample"
```

```
id="com.example.helpexample"  
version="1.0"  
provider-name="MyExample" />
```

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Table of contents (toc) files

Now that we have our sample content files we can create a table of contents (**toc**) file. A toc file defines the key entry points into the HTML content files by mapping a topic label to a reference in one of the HTML files.

Applications that are being migrated to the platform can reuse existing documentation by using the toc file to define entry points into that documentation.

A plug-in can have one or more toc files. Our example documentation is organized into three main categories: concepts, tasks and reference. How do we make toc files that represent this structure?

We could make one large toc file, or we could create a separate toc file for each main category of content. This decision should be made according to the way your documentation teams work together. If a different author owns each category, it might be preferable to keep separate toc files for each category. It is not dictated by the platform architecture.

In this example, we will create a toc file for each major content category. For such a small number of files, having separate toc files for each category may not be necessary. We will build this example as if we had many more files or had separate authors who own each content category.

Our files look like this:

toc_Concepts.xml

```
<toc label="Concepts">  
  <topic label="Concept1" href="html/concepts/concept1.html">  
    <topic label="Concept1_1" href="html/concepts/concept1_1.html"/>  
    <topic label="Concept1_2" href="html/concepts/concept1_2.html"/>  
  </topic>  
</toc>
```

toc_Tasks.xml

```
<toc label="Tasks">  
  <topic id="plainTasks" label="Plain Stuff">  
    <topic label="Task1" href="html/tasks/task1.html"/>  
    <topic label="Task2" href="html/tasks/task2.html"/>  
  </topic>  
  <topic id="funTasks" label="Fun Stuff" >  
    <topic label="Task3_1" href="html/tasks/task3_1.html"/>  
    <topic label="Task3_2" href="html/tasks/task3_2.html"/>  
  </topic>  
</toc>
```

toc_Ref.xml

```
<toc label="Reference">
  <topic label="Ref1" href="html/ref/ref1.html"/>
  <topic label="Ref2" href="html/ref/ref2.html"/>
</toc>
```

A topic can be a simple link to content. For example, "Task1" provides a **label** and an **href** linking to the content. A topic can also be a hierarchical grouping of sub topics with no content of its own. For example, "Fun Stuff" has only a **label** and sub topics, but no **href**. Topics can do both, too. "Concept1" has an **href** and sub topics.

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Help server and file locations

The platform utilizes its own documentation server to provide the actual web pages for your plug-in's documentation. A custom server allows the platform to handle HTML content in a browser independent manner and to provide plug-in aware support. The main difference to you as a plug-in developer is that you have a little more flexibility in the way you structure your files and specify your links.

Documentation can be delivered in a zip file, avoiding problems that may result when a large number of files are present in a plug-in directory. In our example plug-in, we created a sub-directory called **html**. Alternatively, we could have placed our html files into a zip file called **doc.zip**. This zip file must mimic the file structure underneath the plug-in directory. In our case, it must contain the sub-directory **html** and all the contents underneath **html**.

When resolving file names, the help server looks in the **doc.zip** file for documents before it looks in the plug-in directory itself. When used as a link, the argument in an **href** is assumed to be relative to the current plug-in. Consider the following link:

```
<topic label="Ref1" href="html/ref/ref1.html"/>
```

The help plug-in will look for this file as follows:

- look in **doc.zip** for the file **/html/ref/ref1.html**
- look for the file **ref1.html** in the **/html/ref** sub-directory structure underneath the plug-in directory.

Since 3.0 release, the entire plug-in can be installed in a zipped format, and run directly from a jar. A plug-in installation jar is not expanded into a plug-in directory when value of `unpack` attribute of the `plugin` element is specified as `true` in the feature manifest. In such plug-in, the documentation is compressed in the plug-in's jar, together with other plug-in files. There is no need for documentation to be additionally contained in doc.zip, and such set-up of doc.zip in an unexploded plug-in jar is not supported by help system.

A fully qualified link can be used to refer to any content on the web.

```
<topic label="Ref1" href="http://www.example.com/myReference.html"/>
```

National language and translated documentation

The platform help system uses the same national language directory lookup scheme used by the rest of the platform for finding translated files. (See [Locale specific files](#) for an explanation of this directory structure.) If you are using a **doc.zip** file, you should produce a **doc.zip** file for **each** locale and place it inside the correct locale directory. (You should not replicate the **nl** locale directory structure inside the doc.zip file.)

Cross plug-in referencing

The **href** argument can also refer to content from another plug-in. This is done by using a special cross plug-in referencing notation that is resolved by the help server:

```
<topic label="Ref1" href=".."another_plugin_id"/ref/ref1.html"/>
```

For example, you could link to this chapter of the programmer's guide using the following topic:

```
<topic label="Help Chapter in Platform Doc" href=".."org.eclipse.platform.doc.isv/guide/help.h
```

Note: When referencing content from another plug-in, be sure to use the plug-in's **id**, as declared in its **plugin.xml** file, not its directory name. While these are often the same in practice, it's important to check that you are using the id and not the directory name.

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Completing the plug-in manifest

We started this example by creating our plug-in and document files. Next we created toc files to describe the organization of our content. The remaining piece of work is to pull everything together into a master toc and update our **plugin.xml** to actually contribute the master toc.

We start by creating a **toc.xml** to contribute the three tocs we created initially. Instead of providing an **href** for each topic, we use the **link** attribute to refer to our existing toc files.

```
<toc label="Online Help Sample" topic="html/book.html">
  <topic label="Concepts">
    <link toc="toc_Concepts.xml" />
  </topic>
  <topic label="Tasks">
    <link toc="toc_Tasks.xml" />
  </topic>
  <topic label="Reference">
    <link toc="toc_Ref.xml" />
  </topic>
</toc>
```

Then we update the **plugin.xml** to contribute our master toc:

```
<extension point="org.eclipse.help.toc">
  <toc file="toc.xml" primary="true" />
</extension>
```

Welcome to Eclipse

Note the use of the **primary** attribute. Setting this attribute to true indicates that the toc should always appear in the navigation, even if it is not referenced by any other toc. This way, our "master" toc is always guaranteed to show up in the topics list. It appears at the top level list of books since no other toc references it.

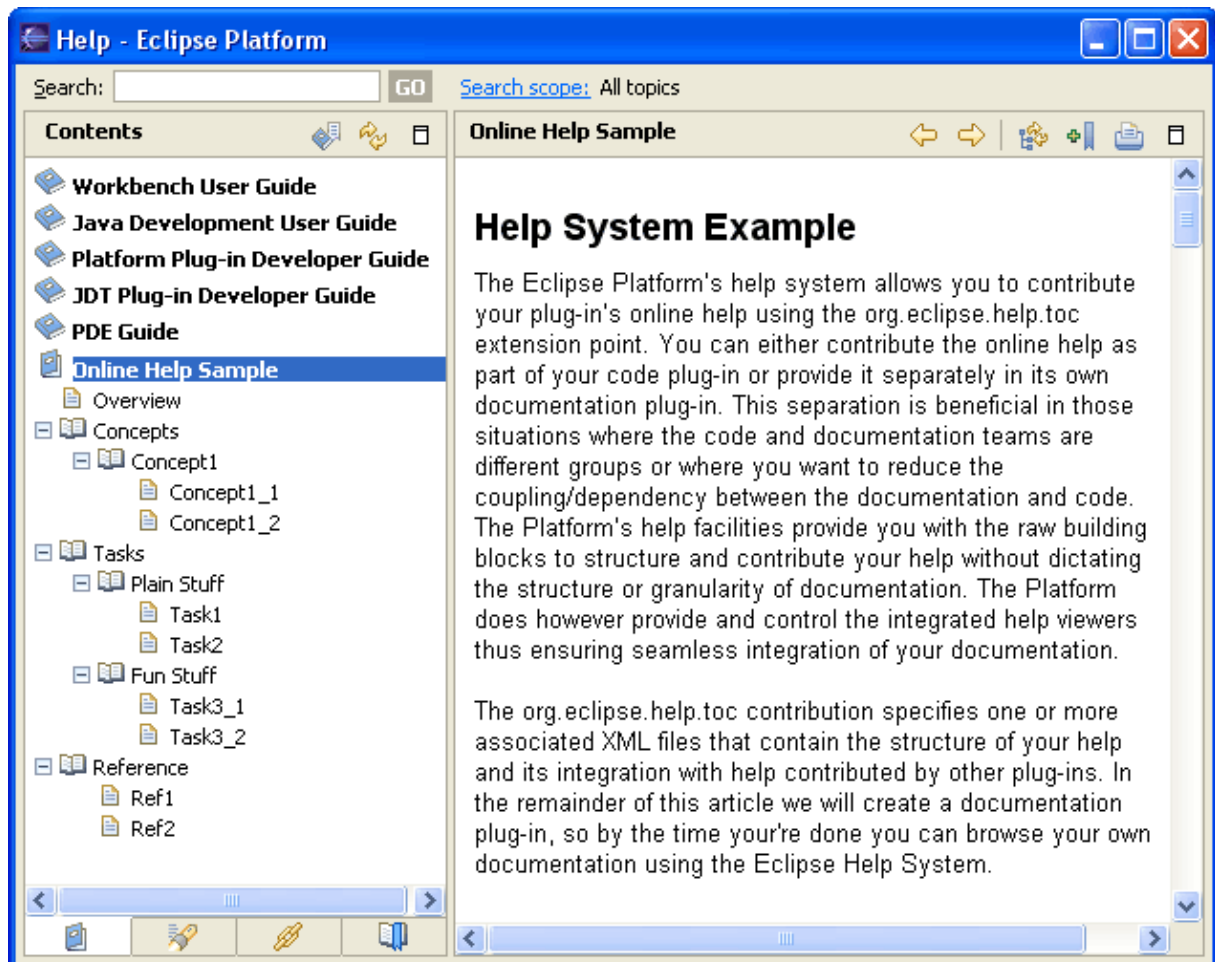
Note: If more files were associated with this toc but not present in the navigation, but just linked from other topics, then to have those topics available to the search engine we would have to use the **extradir** attribute in the toc.

Finally, we contribute our individual toc files.

```
<extension point="org.eclipse.help.toc">
  <toc file="toc_Concepts.xml" />
  <toc file="toc_Tasks.xml" />
  <toc file="toc_Reference.xml" />
</extension>
```

These toc files will not appear in the top level list of books because we did not set the **primary** attribute. Toc files that are not designated as primary will only appear in the documentation web if they are referred to from some toc that is a primary toc or is linked in by a primary toc.

That's it. If you copy your plug-in directory to the platform's **plugins** directory, start the platform, and choose **Help**→**Help Contents**, you should see your example appear in the list of books. If you click on the "Online Help Sample", you'll see your toc structure:



Building nested documentation structures

As plug-ins contribute function to the platform, it's common to add documentation that describes the new function. How can this documentation be structured so that the user sees a cohesive and complete set of documentation instead of many individual contributions? The table of contents definition provides mechanisms for building documentation in both a top-down and bottom-up fashion.

Top-down nesting

Top-down nesting refers to the technique of defining a master table of contents which refers to all other included tocs. Top-down nesting is a convenient method for breaking up known content into smaller pieces. With top-down nesting, the **link** attribute is used in the table of contents definition to refer to linked tocs rather than providing an **href**.

```
<toc label="Online Help Sample" topic="html/book.html">
  <topic label="Concepts">
    <link toc="toc_Concepts.xml" />
  </topic>
  <topic label="Tasks">
    <link toc="toc_Tasks.xml" />
  </topic>
  <topic label="Reference">
    <link toc="toc_Ref.xml" />
  </topic>
</toc>
```

The basic structure stays the same (Concepts, Tasks, Reference), but the individual tocs are free to evolve. They in turn might link to other sub-tocs.

Bottom-up composition

Bottom-up composition is more flexible in that it lets new plug-ins decide where the documentation should exist in the toc structure. Bottom-up composition is accomplished using **anchor** attributes. A toc defines named anchor points where other plug-ins can contribute documentation. In our example, we could add anchors so that plug-ins can contribute additional material between the concepts, tasks, and reference sections.

```
<toc label="Online Help Sample" topic="html/book.html">
  <topic label="Concepts">
    <link toc="toc_Concepts.xml" />
    <anchor id="postConcepts" />
  </topic>
  <topic label="Tasks">
    <link toc="toc_Tasks.xml" />
    <anchor id="postTasks" />
  </topic>
  <topic label="Reference">
    <link toc="toc_Ref.xml" />
    <anchor id="postReference" />
  </topic>
</toc>
```

Other plug-ins can then contribute to the anchor from their plug-in. This is done using the **link_to** attribute

when defining a toc.

```
<toc link_to="../../com.example.helpexample/toc.xml#postConcepts" label="Late breaking info about co
    <topic>
```

```
... </topic> </toc>
```

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Dynamic help

In addition to static HTML files present in doc.zip or file system under plug-in directory, help can display documents that are dynamically generated by the documentation plug-in. Such plug-in needs to contain Java code capable of producing contents that would otherwise be read from static files by help system. If a class implementing org.eclipse.help.IHelpContentProducer is contributed by a plug-in to help system using org.eclipse.help.contentProducer extension point, the help system will call getInputStream for every document accessed from this plug-in. If that results in not null InputStream, it will be sent to the browser for displaying. If IHelpContentProducer returns null, help system will default to searching doc.zip and plug-in directory for a document.

Content producer example

For example, an implementation of IHelpContentProducer as follows:

```
package com.my.company.doc;
public class DynamicTopics implements IHelpContentProducer {
    public InputStream getInputStream(
        String pluginID,
        String name,
        Locale locale) {
        if (name.indexOf("dynamic") >= 0)
return new ByteArrayInputStream(
            ("<html><body>Content generated "
                + new Date().toString()
                + ".</body></html>")
                .getBytes());
        else
            return
                null;
    }
}
```

identified by extension in plugin.xml file as:

```
<extension point="org.eclipse.help.contentProducer"
    name="dynamicTopics"
    id="my.company.doc.dynamicTopics">
    <contentProducer producer="com.my.company.doc.DynamicTopics" />
</extension>
```

will produce an HTML document content for all document references that have a word "dynamic" as part of the path or file name.

Constraints

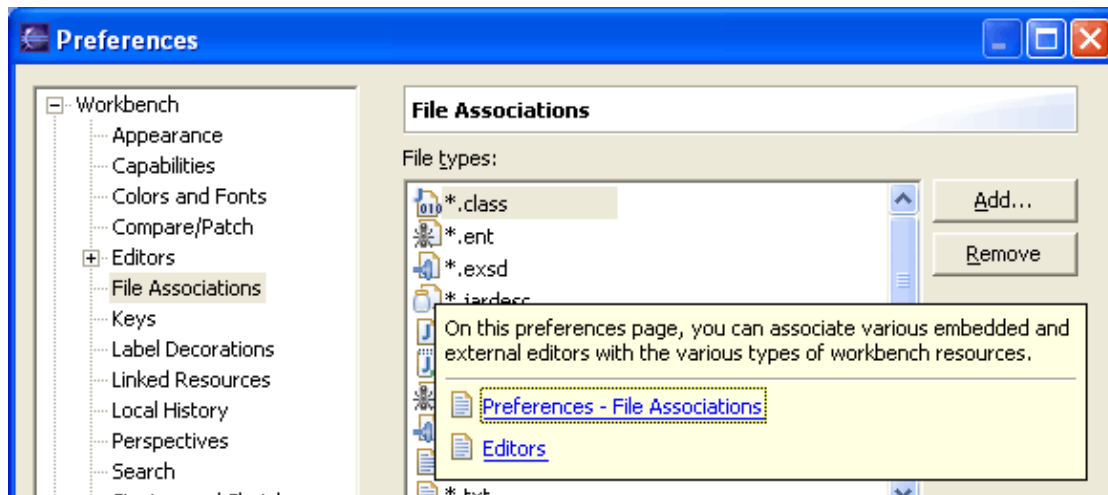
A plug-in has a complete freedom of the method of method or underlying framework that is used to produce the content. It should however ensure that content is generated in correct language and encoded accordingly that a browser can display it. A locale used by the user is provided to the `getInputStream` method. If it is incapable of providing translatable content, it should default to content for the default locale of the platform.

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Infopops

An infopop is a small window associated with a particular SWT widget in a plug-in's user interface. It displays context-sensitive help and links to related help topics for the widget. It is activated when the user puts focus on the widget and presses the F1 key (Ctrl+F1 on GTK, and Help key on Carbon).

To associate an infopop with a widget, you must first assign a context ID to the widget and then provide the description and links for the infopop. Here is an infopop that has been defined on a workbench preferences page:



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Declaring a context id

The `setHelp` method in `org.eclipse.ui.help.WorkbenchHelp` is used to associate a context id with a Control, IAction, Menu, or MenuItem. The context id should be fully qualified with the plug-in id. For example, the following snippet associates the id "com.example.helpexample.panic_button" with a button in the application.

```
WorkbenchHelp.setHelp(myButton, com.example.helpexample.panic_button);
```

The following UI controls cannot have context ids (and therefore cannot have infopops):

- Toolbar buttons (ToolItem)
- CTabItem
- TabItem
- TableColumn
- TableItem

- TableTreeItem
- TreeItem

Widgets that do not get focus should not be assigned context ids, since they will never trigger an infopop.

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Describing and packaging infopop content

Infopops are described by associating the context id declared in the UI code with a description and list of links to related topics in the online help. These associations are made inside an XML file. You can create any number of XML files containing infopop associations for each plug-in. The description and links for each context id is made inside `<context>` elements in the XML file. Each context element can have an optional `<description>` element which is used to describe the UI object and any number of `<topic>` elements which link to the on-line documentation.

```
<contexts>
  <context id="panic_button">
    <description>This is the panic button.</description>
    <topic href="tasks/pushing_the_panic_button.htm" label="Pushing the panic button" />
    <topic href="reference/panic_button.htm" label="Panic Button Reference" />
  </context>
  ...
</contexts>
```

Once the contexts have been described in the XML file (or files), you are ready to refer to the context files in your plug-in manifest. Note that the context id is not fully qualified above. This is allowed, as long as the context file is contributed in the manifest of the plug-in that defined the context id. In other words, the context id is resolved to the id of the plug-in that contributed the XML file.

A plug-in contributes context files using the [org.eclipse.help.contexts](#) extension point.

```
<extension point="org.eclipse.help.contexts">
  <contexts name="myInfopops.xml" />
</extension>
```

You can reference context files from other plug-ins by including the **plugin** attribute. This allows you to group all of your documentation, including infopops, in one plug-in, and refer to it from the UI code plug-in or some other related plug-in.

```
<extension point="org.eclipse.help.contexts">
  <contexts name="myInfopops.xml" plugin="com.example.helpExample" />
</extension>
```

As you can see, you have a lot of flexibility in organizing your infopops into one or more files contained in one or more plug-ins. The main consideration is that the context ids in the files resolve correctly. If you do not fully qualify a context id, then you must contribute the context XML files in the plug-in that declared the context ids. If you use fully qualified context ids in your context XML file, then you have complete flexibility in the location of your XML files and which plug-in contributes the contexts.

Infopops from multiple plug-ins

Another level of flexibility is the ability to contribute infopops for the same context id from different plug-ins. This is useful, for example, if there are different sets of documentation plug-ins that may or may not be installed in a user's configuration. This allows each documentation plug-in to declare its contexts independently. The end user will see the merged infopop content for all plug-ins that contributed contexts for the widget's id.

Note that the fully qualified context id for the widget must be used, since none of the documentation plug-ins declared the context id. When multiple plug-ins contribute infopops for the same context ID, the content defined in the plug-in that declared the context (the UI plug-in) is shown first. Additional descriptions and links are appended in no guaranteed order.

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Active help

Active help is the ability to invoke Eclipse code from on-line documentation. It is implemented by including some JavaScript in your documentation that describes a class that should be run inside the Eclipse platform.

For example, instead of writing, "Go to the Window Menu and open the message dialog," your on-line help can include a link that will open your application's message dialog for the user. Active help links look like hyperlinks in the on-line help.

Below is an active help link that opens a message dialog in the workbench. We will take a look at how to make this work.

[Click here for a Message.](#)

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Writing the help action

The interface **ILiveHelpAction** is used to build an active help action.

It is straightforward to implement an **ILiveHelpAction**. You must implement two methods.

- **run()** – This method is called to run the live help action. This method will be called by the help system from a non-UI thread, so UI access must be wrapped in a **Display.syncExec()** method.
- **setInitializationString(String)** – This method is called to initialize your action with a String data parameter you can specify in the HTML which runs the JavaScript **liveAction**. If you don't need initialization data, you can just implement this method to do nothing. This method is called before **run()**.

Here is a simple implementation of a live help action that opens a message dialog. We don't need any information from the JavaScript, so the initialization data is ignored.

```
package org.eclipse.platform.doc.isv.activeHelp;
```

Welcome to Eclipse

```
import org.eclipse.help.ILiveHelpAction;
import org.eclipse.jface.dialogs.MessageDialog;
import org.eclipse.swt.widgets.*;
import org.eclipse.ui.*;
/**
 * Sample Active Help action.
 */
public class ActiveHelpOpenDialogAction implements ILiveHelpAction {

    public void setInitializationString(String data) {
        // ignore the data. We do not use any javascript parameters.
    }

    public void run() {
        // Active help does not run on the UI thread, so we must use syncExec
        Display.getDefault().syncExec(new Runnable() {
            public void run() {
                IWorkbenchWindow window =
                    PlatformUI.getWorkbench().getActiveWorkbenchWindow();
                if (window != null) {
                    // Bring the Workbench window to the top of other windows;
                    // On some Windows systems, it will only flash the Workbench
                    // icon on the task bar
                    Shell shell = window.getShell();
                    shell.setMinimized(false);
                    shell.forceActive();
                    // Open a message dialog
                    MessageDialog.openInformation(
                        window.getShell(),
                        "Hello World.",
                        "Hello World.");
                }
            }
        });
    }
}
```

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Invoking the action from HTML

To include active help links in your documentation, you must first declare the use of the active help JavaScript in the **HEAD** tag of your HTML:

```
<script language="JavaScript" src="../../org.eclipse.help/livehelp.js" </script>
```

The live help JavaScript is located in the **org.eclipse.help** plug-in. You can refer to it using the help system's cross plug-in referencing technique.

In this example, we have to navigate up two levels in the directory structure. The document with the active help link is located in the sub-directory **guide** underneath our plug-in directory. So we must navigate up one directory to reach our plug-in's root, and another level to reach the "virtual" location of all plug-ins. Then we can refer to the **org.eclipse.help** plug-in.

In the body of your documentation, you invoke the liveAction script.

```
<a href='javascript:liveAction(
    "org.eclipse.platform.doc.isv",
```

Welcome to Eclipse

```
"org.eclipse.platform.doc.isv.activeHelp.ActiveHelpOpenDialogAction",  
"")'>Click here for a Message.</a>
```

The parameters for **liveAction** are

- the ID of the plug-in that contains the action
- the name of the class that implements the action
- the String that will be passed to the live help action using **setInitializationString**. We don't need to pass any information from the HTML page, so we just pass an empty string.

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Tips for debugging active help

The code and markup that triggered our active help link looks pretty straightforward. But what do you do if your active help link doesn't seem to work?

Test your action ahead of time

If your action implementation is fairly involved, you should invoke the action yourself with some test code inside Eclipse. This way, you'll know that the action is error-free before invoking it from the JavaScript.

Ensure the JavaScript is running

You can modify "plugins/org.eclipse.help_2.1.0/liveHelp.js" to include a call to the **alert** function as the first statement in the **liveAction** function:

```
function liveAction(pluginId, className, argument)  
{  
    alert("liveAction called");  
    ...  
}
```

The **alert** function opens a warning dialog in the browser and can be used to verify that the **liveAction** was properly invoked in your HTML. If you don't see a warning dialog when you click on your help link, then you have a problem in the HTML markup.

Debug the active help action

Once you know that the JavaScript is running, you can debug your action from inside Eclipse. To do this, you can set a breakpoint in your help action class and start up a self-hosted Eclipse instance. You must test your active help with the Help browser from the newly launched Eclipse instance, not from your host instance, since the JavaScript from your help HTML calls a servlet on the Eclipse help server that launched the browser.

If nothing happens after you've set up the breakpoint and clicked on the active help link, it's likely that your plug-in and active help class were not correctly specified in the JavaScript.

Once you've managed to stop at the breakpoint in your action, you can debug the action as you would any other Java code.

Make sure your UI code is wrapped in Display.syncExec

A common runtime problem is improperly accessing UI code from the thread that invokes the active help. If your live help action came from code that ran originally in a UI thread, it will need to be modified to handle the fact that it is running from a non–UI thread.

```
public void run() {
    // Active help does not run on the UI thread, so we must use syncExec
    Display.getDefault().syncExec(new Runnable() {
        public void run() {
            //do the UI work in here;
        }
    });
}
```

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Search support

If your plug-in defines and manipulates its own resource types, you may have special requirements for searching a resource. For example, the Java IDE plug-in implements a search engine specialized for Java files.

The **search** plug-in allows you to add a specialized page describing your search to the workbench search dialog. This allows you to obtain any specialized information needed from the user and perform a search using your plug-in's internal model.

You should also provide a specialized class for displaying the search results. Abstract implementations of a search result page are provided to give you a head start.

These services are contributed using search plug-in extension points.

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Contributing a search page

When the user selects a resource and chooses the search command, the search plug-in launches a dialog containing pages for different kinds of content searches. These pages are contributed using the **org.eclipse.search.searchPages** extension point.

The markup for contributing a search page is straightforward. The following example is the JDT plug-in's contribution of the Java search page:

```
<extension point="org.eclipse.search.searchPages">
  <page id="org.eclipse.jdt.ui.JavaSearchPage"
        icon="icons/full/obj16/jsearch_obj.gif"
        label="%JavaSearchPage.label"
        sizeHint="460,160"
        extensions="java:90, jav:90"
        showScopeSection="true"
        canSearchEnclosingProjects="true"
class="org.eclipse.jdt.internal.ui.search.JavaSearchPage">
    </page>
</extension>
```

The **class** that implements the search page must be specified. This class must implement the **ISearchPage** interface and typically extends **DialogPage**. The **label** and **icon** that can be used to describe the search in the search dialog are also specified. Additional parameters control the size of the page and the location of the page within the search dialog.

The **extensions** attribute specifies the resources on which the search page can operate. It is formatted as a comma separated list of file extensions. Each file extension should be followed by a numeric weight value, where 0 is the lowest weight, separated by a colon. The weight value is a relative value used to allow the search infrastructure to find the search page most appropriate for a given resource.

If a search page can search all possible resources then "*" should be used.

Implementing the search page

The protocol for **ISearchPage** is simple. Your search page must implement `performAction()` which is called when the **Search** button is pressed. Of course, your particular search implementation depends on your plug-in's function, but it is typical to open a results viewer in this method using the **NewSearchUI** method `activateSearchResultView()`.

Your plug-in is responsible for showing its results in the search result view.

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Contributing a search result page

You can contribute a customized search results page using the **org.eclipse.search.searchResultViewPages** extension point.

When contributing a search result view page, you specify the class of search result that the page should be used for, and the name of the class that implements the page. The following example is the JDT plug-in's contribution of the Java search results page:

```
<extension
  id="JavaSearchResultPage"
  point="org.eclipse.search.searchResultViewPages">
  <viewPage
    id="org.eclipse.jdt.ui.JavaSearchResultPage"
    searchResultClass="org.eclipse.jdt.internal.ui.search.JavaSearchResult"
    class="org.eclipse.jdt.internal.ui.search.JavaSearchResultPage">
  </viewPage>
</extension>
```

The **class** must implement the **ISearchResultPage** interface and often extends **AbstractTextSearchViewPage**.

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Compare support

If your plug-in defines and manipulates its own resource types, you may have special requirements for comparing resources. Resources are often compared when working with local history or with files from a repository. The **compare** plug-in supports merging of multiple content streams and the implementation of advanced compare views. Services provided by this plug-in include:

- Interfaces for merging multiple text streams into a single output stream
- Two and three-way compare and merge components for hierarchical structures inferred from text
- Differencing engines for hierarchical structures and character ranges in text

These services are used in the platform to assist with user tasks such as integrating patch files and comparing/merging the workspace with local history.

Compare viewers

All compare viewers are standard [JFace viewers](#) that expect an input object implementing the **[ICompareInput](#)** interface.

Compare viewers are said to be content-oriented if they compare flat inputs such as text or images and structure-oriented if they compare hierarchically structured input elements.

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Implementing a content viewer

The compare plug-in allows you to supply specialized viewers for viewing and merging content differences between unstructured elements.

Simple content viewers

A **content viewer** is used in places where only a single input is available and therefore no compare is necessary. A typical example for this is the "**Restore from Local History**" function. The **[org.eclipse.compare.contentViewers](#)** extension point allows you to define a specialized content viewer that does not compare its inputs.

```
<extension
    point="org.eclipse.compare.contentViewers">
    <viewer
        extensions="java,java2"
        class="org.eclipse.jdt.internal.ui.compare.JavaTextViewerCreator"
        id="org.eclipse.jdt.internal.ui.compare.JavaTextViewerCreator">
    </viewer>
    <contentTypeBinding
        contentTypeId="org.eclipse.jdt.core.javaSource"
        contentViewerId="org.eclipse.jdt.internal.ui.compare.JavaTextViewerCreator">
    </contentTypeBinding>
</extension>
```

Specialized viewers contributed by your plug-in are designated in the **viewer** element. You must specify the **id** of the viewer and the **class** that creates it. You may also specify any file **extensions** for which the content

viewer should be used.

You may also use the **contentTypeBinding** element to associate a content type with a content viewer.

Content merge viewers

A **content merge viewer** performs a two-way or three-way compare of its inputs and presents the result side-by-side or in any other suitable way. The viewer lets the user merge between the inputs. Content merge viewers are common for text or images.

If the standard merge viewers are not appropriate for your plug-in's function, you may choose to implement your own content merge viewer. Your content merge viewer should be registered with the platform using the **org.eclipse.compare.contentMergeViewers** extension point. The following markup shows the definition of specialized content merge viewers for viewing Java files and properties files in the Java IDE:

```
<extension
    point="org.eclipse.compare.contentMergeViewers">
    <viewer
        extensions="java,java2"
        class="org.eclipse.jdt.internal.ui.compare.JavaContentViewerCreator"
        id="org.eclipse.jdt.internal.ui.compare.JavaContentViewerCreator">
    </viewer>
    <contentTypeBinding
        contentTypeId="org.eclipse.jdt.core.javaProperties"
        contentMergeViewerId="org.eclipse.compare.TextMergeViewerCreator">
    </contentTypeBinding>
    <contentTypeBinding
        contentTypeId="org.eclipse.jdt.core.javaSource"
        contentMergeViewerId="org.eclipse.jdt.internal.ui.compare.JavaContentViewerCreato
    </contentTypeBinding>
</extension>
```

Similar to content viewers, specialized merge viewers contributed by your plug-in are designated in the **viewer** element. You must specify the **id** of the viewer and the **class** that creates it. You may also specify any file **extensions** for which the content merge viewer should be used.

Also similar to content viewers, you can use **contentTypeBinding** to associate a content type with a merge viewer. The JDT plug-in binds content merge viewers to two different content types: Java source and Java properties files.

ContentMergeViewer is an abstract compare and merge viewer with two side-by-side content areas and an optional content area for a common ancestor (for three-way compare). Because the implementation makes no assumptions about the content type, the subclass is responsible for dealing with the specific content type.

ImageMergeViewer in **org.eclipse.compare.internal** shows how to implement a simple merge viewer for images using a **ContentMergeViewer**. A **ContentMergeViewer** accesses its model by means of a content provider which must implement the **IMergeViewerContentProvider** interface.

Text merging

If your viewer uses text, additional classes that compare and merge text content can be used.

TextMergeViewer is the concrete subclass of **ContentMergeViewer** used for comparing and merging text

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content. A text merge viewer uses the **RangeDifferencer** to perform a textual, line-by-line comparison of two (or three) input documents.

For text lines that differ, the **TextMergeViewer** uses an **ITokenComparator** to find the longest sequences of matching and non-matching tokens. The **TextMergeViewer**'s default token compare works on characters separated by white space. If a different strategy is needed (for example, Java tokens in a Java-aware merge viewer), clients can create their own token comparators by implementing the **ITokenComparator** interface.

TextMergeViewer works on whole documents and on sub ranges of documents. For partial documents, the viewer's input must be an **IDocumentRange** instead of an **IDocument**.

Range differencing

RangeDifferencer finds the longest sequences of matching and non-matching comparable entities in text content. Its implementation is based on an objectified version of the algorithm described in: *A File Comparison Program*, by Webb Miller and Eugene W. Myers, *Software Practice and Experience*, Vol. 15, Nov. 1985. Clients must supply an input to the differencer that implements the **IRangeComparator** interface. **IRangeComparator** breaks the input data into a sequence of entities and provides a method for comparing one entity with the entity in another **IRangeComparator**.

For example, to compare two text documents and find the longest common sequences of matching and non-matching lines, the implementation of **IRangeComparator** must break the document into lines and provide a method for testing whether two lines are considered equal. See **org.eclipse.compare.internal.DocLineComparator** for an example of how this can be done.

The differencer returns the differences among these sequences as an array of **RangeDifference** objects. Every single **RangeDifference** describes the kind of difference (no change, change, addition, deletion) and the corresponding ranges of the underlying comparable entities in the two or three inputs.

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Implementing a structure viewer

A structure merge viewer performs a two-way or three-way compare of its inputs, presents the result in a hierarchical view, and lets the user merge between the inputs. Structure merge viewers are common for workspace resources or the members of an archive file.

Tree-like structure viewers

Because the implementation of many structure compare viewers is based on a tree, the compare plug-in provides a generic tree-based **StructureDiffViewer**. Your plug-in is responsible for supplying a **structure creator** that breaks a single input object into a hierarchical structure. The **StructureDiffViewer** performs the compare on the resulting structure and displays the result as a tree.

You designate a structure creator for your plug-in using the **org.eclipse.compare.structureCreators** extension. Much like content viewers, a structure creator can be specified for a set of file **extensions**, or a **contentTypeBinding** can be used to associate a **content type** with a particular structure creator. We won't review the markup here since it's so similar to content viewers. The JDT plug-in defines several contributions

for [org.eclipse.compare.structureCreators](#).

Other hierarchical structure viewers

In some cases, the tree-based [StructureDiffViewer](#) may not be appropriate for your plug-in. The [org.eclipse.compare.structureMergeViewers](#) extension point allows you to define your own implementation for a structure merge viewer. A structure merge viewer can be specified for file **extensions**, or a **contentTypeBinding** can be used to associate a [content type](#) with a particular structure merge viewer. See the JDT plug-in for examples of [org.eclipse.compare.structureMergeViewers](#) contributions.

The search plug-in provides several utility classes to help you implement a search viewer.

Differencer

[Differencer](#) is a differencing engine for hierarchically structured data. It takes two or three inputs and performs a two-way or three-way compare on them.

If the input elements to the differencing engine implement the [IStructureComparator](#) interface, the engine recursively applies itself to the children of the input element. Leaf elements must implement the [IStreamContentAccessor](#) interface so that the differencer can perform a byte wise comparison on their contents.

There are several good examples of differencers included in the platform implementation:

- [ResourceNode](#) implements both interfaces (and more) for platform workspace resources ([org.eclipse.core.resources.IResource](#)).
- [DocumentRangeNode](#) is used to compare hierarchical structures that are superimposed on a document. Nodes and leaves correspond to ranges in a document ([IDocumentRange](#)). Typically, [DocumentRangeNodes](#) are created while parsing a document and they represent the semantic entities of the document (e.g. a Java class, method or field). The two subclasses [JavaNode](#) (in [org.eclipse.jdt.internal.ui.compare](#)) and [PropertyNode](#) (in [org.eclipse.jdt.internal.ui.compare](#)) are good examples for this.

By default the differencing engine returns the result of the compare operation as a tree of [DiffNode](#) objects. A [DiffNode](#) describes the changes among two or three inputs. The type of result nodes can be changed by overriding a single method of the engine.

Difference Viewers

A tree of [DiffNodes](#) can be displayed in a [DiffTreeView](#). The [DiffTreeView](#) requires that inner nodes of the tree implement the [IDiffContainer](#) interface and leaves implement the [IDiffElement](#) interface.

The typical steps to compare hierarchically structured data and to display the differences are as follows:

1. Map the input data into a tree of objects implementing both the [IStructureComparator](#) and [IStreamContentAccessor](#) interfaces
2. Perform the compare operation by means of the [Differencer](#)
3. Feed the differencing result into the [DiffTreeView](#)

The [StructureDiffViewer](#) is a specialized [DiffTreeView](#) that automates the three steps from above. It takes

a single input object of type **ICompareInput** from which it retrieves the two or three input elements to compare. It uses an **IStructureCreator** to extract a tree containing **IStructureComparator** and **IStreamContentAccessor** objects from them. These trees are then compared with the differencing engine and the result is displayed in the tree viewer.

The **ZipFileStructureCreator** is an implementation of the **IStructureCreator** interface and makes the contents of a zip archive available as a hierarchical structure of **IStructureComparator**s which can be easily compared by the differencing engine (**Differencer**). It is a good example for how to make structured files available to the hierarchical compare functionality of the compare plug-in.

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Merging multiple streams

The search plug-in allows you to customize views that assist the user in merging different content streams. In some cases, however, the ability to merge streams without the assist of a user is desirable. The extension point **org.eclipse.compare.streamMergers** allows you to contribute a class that merges three different input streams into a single output stream. Stream mergers can be associated with file extensions or bound to a particular content type. The search plug-in defines a stream merger for merging three streams of plain text:

```
<extension
  point="org.eclipse.compare.streamMergers">
  <streamMerger
    extensions="txt "
    class="org.eclipse.compare.internal.merge.TextStreamMerger"
    id="org.eclipse.compare.internal.merge.TextStreamMerger">
  </streamMerger>
  <contentTypeBinding
    contentTypeId="org.eclipse.core.runtime.text"
    streamMergerId="org.eclipse.compare.internal.merge.TextStreamMerger">
  </contentTypeBinding>
</extension>
```

The stream merger itself is described in the **streamMerger** element. You must specify the **id** of the merger and the **class** that implements it. You may also specify any file **extensions** for which the the stream merger should be used.

You may also use the **contentTypeBinding** element to associate a content type with a stream merger.

Stream mergers must implement **IStreamMerger**. This simple interface merges the contents from three different input streams into a single output stream. The not-so-simple implementation depends upon your plug-in and its content types.

New **IStreamMergers** can be created for registered types with the createStreamMerger methods of **CompareUI**.

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Advanced compare techniques

This section provides additional information about advanced API in the compare plug-in.

Writing compare operations

A compare operation must be implemented as a subclass of **CompareEditorInput**. A **CompareEditorInput** runs a (potentially lengthy) compare operation under progress monitor control, creates a UI for drilling-down into the compare results, tracks the dirty state of the result in case of merge, and saves any changes that occurred during a merge.

CompareUI defines the entry point to initiate a configurable compare operation on arbitrary resources. The result of the compare is opened into a compare editor where the details can be browsed and edited in dynamically selected structure and content viewers.

NavigationAction is used to navigate (step) through the individual differences of a **CompareEditorInput**.

CompareConfiguration configures various UI aspects of compare/merge viewers like title labels and images, or whether a side of a merge viewer is editable. It is passed to the **CompareEditorInput** on creation.

When implementing a hierarchical compare operation as a subclass of **CompareEditorInput**, clients must provide a tree of objects where each node implements the interface **IStructureComparator**. This interface is used by the hierarchical differencing engine (**Differencer**) to walk the tree.

In addition every leaf of the tree must implement the **IStreamContentAccessor** interface in order to give the differencing engine access to its stream content.

BufferedContent provides a default implementation for the **IStreamContentAccessor** and **IContentChangeNotifier** interfaces. Its subclass **ResourceNode** adds an implementation for the **IStructureComparator** and **ITypedElement** interfaces based on platform workbench resources (**IResource**). It can be used without modification as the input to the differencing engine.

Compare functionality outside of compare editors

If you want to use compare functionality outside of the standard compare editor (for example, in a dialog or wizard) the compare plug-in provides additional helper classes.

CompareViewerPane is a convenience class which provides a label and local toolbar for a compare viewer (or any other subclass of a **JFace viewer**). Its abstract subclass **CompareViewerSwitchingPane** supports **dynamic viewer switching**, that is the viewer installed in the pane is dynamically determined by the pane's input object.

EditionSelectionDialog is a simple selection dialog where one input element can be compared against a list of historic variants (**editions**) of the same input element. The dialog is used to implement functions like **"Replace with Local History"** on workbench resources.

In addition it is possible to specify a subsection of the input element (e.g. a method in a Java source file) by means of a **path**. In this case the dialog compares only the subsection (as specified by the path) with the corresponding subsection in the list of editions. This functionality can be used to implement **"Replace with Element from Local History"** for Java Elements.

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The **EditionSelectionDialog** requires that the editions implement the **IStreamContentAccessor** and **IModificationDate** interfaces. The **HistoryItem** is a convenience class that implements these interfaces for **IFileState** objects.

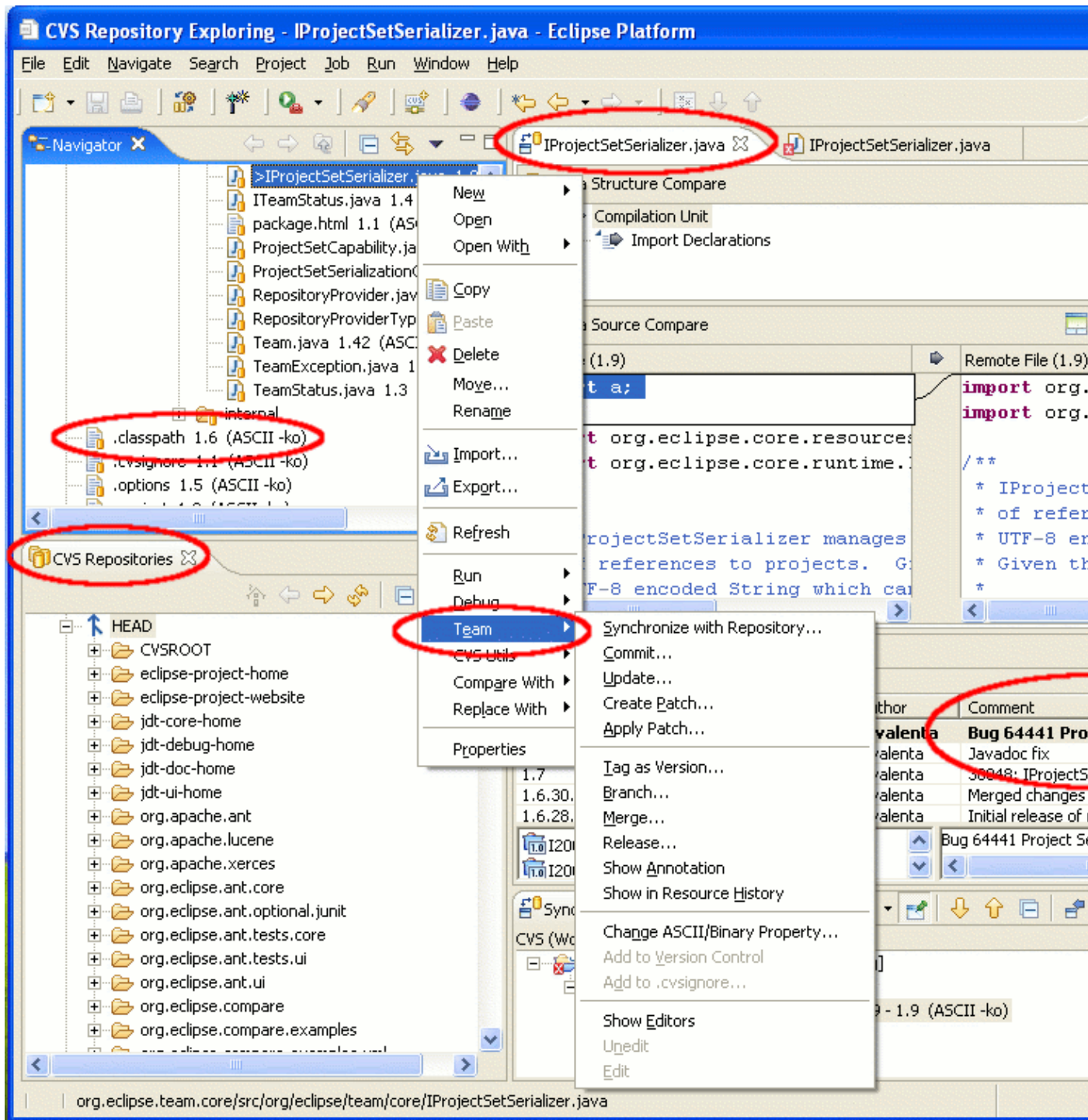
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Rich Team Integration

Integrating your repository's support with the platform starts with good solid design. The goal is to integrate the workflow that your repository users know with the concepts defined in the workbench. Because there are many ways to extend workbench UI and functionality, you have a lot of flexibility in how you achieve integration. So where to start?

Building a team provider is not just a matter of learning Team API. (Subsequent sections will focus on the specific support introduced by the team plug-in.) It's a matter of understanding workbench integration. So let's start with the big picture. We'll be using the CVS client as a case study for integrating a team provider with the platform. Let's look at some of the function the CVS provider supplies and what workbench and team facilities you can use to achieve similar levels of integration.

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The CVS client integrates seamlessly with the existing workbench resource perspective. It allows users to configure a project for CVS, adds functionality to a resource's menu, decorates resources with team-specific information, provides customized views that show team-specific information, adds team-oriented tasks to the task list... The list goes on and on. How can your provider achieve similar integration? Here are some basic steps to start with and links for information (both team-specific and workbench-oriented) on these topics.

Getting started

Define a RepositoryProvider that represents your implementation.	<ul style="list-style-type: none"> • <u>Define your provider using org.eclipse.team.core.repository.</u> • Subclass RepositoryProvider and <u>implement the necessary methods.</u>
Provide a configuration wizard so that users can associate your provider with their projects.	<ul style="list-style-type: none"> • <u>Contribute a wizard using org.eclipse.team.ui.configurationWizards.</u>
Add your actions to the Team menu.	<ul style="list-style-type: none"> • <u>Add your actions to the Team menu.</u> • Use the popupMenus extension to define the menu items.

Enhancing resource views

Add provider-specific properties to the properties page for a resource.	<ul style="list-style-type: none"> • <u>Implement and contribute</u> property pages to show team-specific properties for your resource.
Implement specialized decorators to show team-related attributes	<ul style="list-style-type: none"> • <u>Contribute decorators</u> to resource views.
Reduce clutter by filtering out any resources that are used in implementing team support.	<ul style="list-style-type: none"> • Use <u>team-private resources</u> to hide implementation files and folders.

Handling user editing and changes to resources

Intervene in the saving of resources so you can check permissions before a user changes a file.	<ul style="list-style-type: none"> • Implement the <u>fileModificationValidator</u> hook. • Use <u>validateSave</u> to prevent or intervene in saving of files.
Intervene before a user edits a file to see if it's allowed.	<ul style="list-style-type: none"> • Implement the <u>fileModificationValidator</u> hook. • Use <u>validateEdit</u> to prevent or intervene in saving of files.
Track changes to resources in the workspace so you can allow associated changes in the repository.	<ul style="list-style-type: none"> • Use the <u>move/delete hooks</u> to prevent or enhance moving and deleting of resources. • See IMoveDeleteHook for more detail about what you can do.
Ensure that the proper resource locks are obtained for resource	<ul style="list-style-type: none"> • Use the <u>resource rule factory</u> to ensure that the proper rules are obtained for resource

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operations that invoke the move/delete hook or fileModificationValidator.	operations. <ul style="list-style-type: none">• See ResourceRuleFactory for more details.
Enable the use of linked resources	<ul style="list-style-type: none">• See Team and linked resources

Streamlining repository–related tasks

Provide an easy way to export a description of your projects.	<ul style="list-style-type: none">• Use project sets to export your projects without exporting the content so that users can rebuild projects from the repository.
Reduce clutter in the repository by ignoring files that can be regenerated.	<ul style="list-style-type: none">• Honor the ignore extension when handling files and use ignore for your plug–in's derived files.

Enhancing platform integration

Add provider–specific preferences to the preferences page.	<ul style="list-style-type: none">• Add your preferences to the Team category.• Build your preference page using workbench support.
Implement custom views to show detailed information about repositories or their resources.	<ul style="list-style-type: none">• Use the views extension to contribute a view.• See the CVS provider's repository view for an example.
Add your views or actions to existing workbench perspectives if appropriate.	<ul style="list-style-type: none">• Use the perspectiveExtension extension to add your plug–in's shortcuts or views to existing perspectives.
Implement a repository–specific perspective to streamline repository administration or browsing.	<ul style="list-style-type: none">• Use the perspectives extension to define your own perspective, views, short cuts, and page layout.

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Adding team actions

The team UI plug–in defines a popup menu extension in order to consolidate all team–related actions in one place. The team menu includes many subgroup slots so that team provider plug–ins can contribute actions and have some amount of control over the order of items in the menu. The following markup is from the team UI's plug–in manifest:

```
<extension
  point="org.eclipse.ui.popupMenus">
```

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```
<objectContribution
  id="org.eclipse.team.ui.ResourceContributions"
  objectClass="org.eclipse.core.resources.IResource" adaptable="true">
  <menu
    team.main"      id="
                    path="additions"
                    label="%TeamGroupMenu.label">
<separator name="group1"/>
                    <separator name="group2"/>
                    <separator name="group3"/>
                    <separator name="group4"/>
                    <separator name="group5"/>
                    <separator name="group6"/>
                    <separator name="group7"/>
                    <separator name="group8"/>
                    <separator name="group9"/>
                    <separator name="group10"/>
                    <separator name="targetGroup"/>
                    <separator name="projectGroup"/>
                </menu>
    ...
</extension>
```

A team menu is added to the popup menu of all views that show resources (or objects that adapt to resources.) Your plug-in can use the id of this menu and the separator groups in order to add your own menu items. There is nothing to keep you from defining your own popup menus, action sets, or view and editor actions. However, adding your actions to the predefined team menu makes it easier for the end user to find your actions.

Let's look at a CVS action that demonstrates some interesting points:

```
<extension
  point="org.eclipse.ui.popupMenus">
  <objectContribution
    objectClass="org.eclipse.core.resources.IFile"
    adaptable="true"
    id="org.eclipse.team.ccvs.ui.IFileContributions">
    <filter
      name="projectPersistentProperty"
      value="org.eclipse.team.core.repository=org.eclipse.team.ccvs.core.cvsnature">
    </filter>
    <action
      label="%IgnoreAction.label"
      tooltip="%IgnoreAction.tooltip"
      class="org.eclipse.team.internal.ccvs.ui.actions.IgnoreAction"
      menubarPath="team.main/group3"
      helpContextId="org.eclipse.team.ccvs.ui.team_ignore_action_context"
      id="org.eclipse.team.ccvs.ui.ignore">
    </action>
    ...
</extension>
```

Note that the action is contributed using the [org.eclipse.ui.popupMenus](#) workbench extension point. Here are some team-specific things happening in the markup:

- the action is filtered by a project persistent property which identifies team providers. The value of the property must be of the format "**org.eclipse.team.core.repository=<your repository id>**" where **<your repository id>** is the **id** provided in the [org.eclipse.team.core.repository](#) markup. This filter ensures that the CVS popup menu items only appear for files that appear in projects that have been

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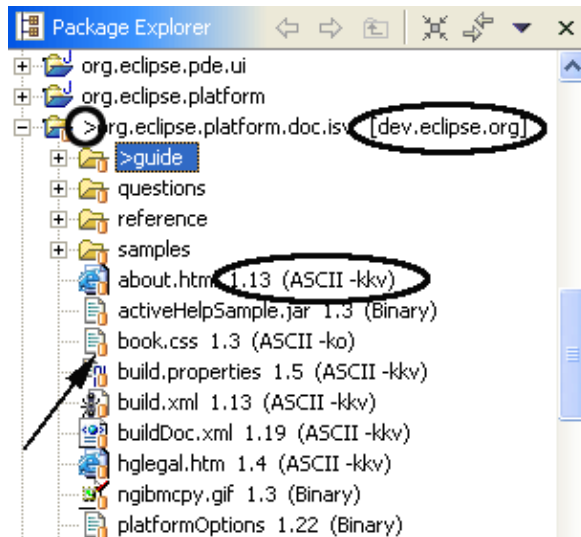
- mapped to the CVS repository id.
- the action is added to a group in the menu that was specified above in the team UI plug-in

The implementation of an action is largely dependent on your specific provider.

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Team decorators

Since any view that shows resources can contain projects that are configured with different team providers, it is helpful for team providers to contribute decorators that distinguish resources configured for their repository. The CVS client uses decorators to show information such as a dirty flag, tags, keywords, and revisions.



Some decorators may be expensive to compute, so it's a good idea to allow the users some control over the use, or even content, of decorators. The CVS client provides a preference page that allows users to control the presentation and content of decorators.

See [org.eclipse.ui.decorators](#) for a complete description of the decorator extension point. The CVS decorator markup is as follows:

```
<extension
  point="org.eclipse.ui.decorators">
  <decorator
    objectClass="org.eclipse.core.resources.IResource"
    adaptable="true"
    label="%DecoratorStandard.name"
    state="false"
    class="org.eclipse.team.internal.cvs.ui.CVSDecorator"
    id="org.eclipse.team.cvs.ui.decorator">
    <description>
      %DecoratorStandard.description
    </description>
```

```
</decorator>  
</extension>
```

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Team and linked resources

A project may contain resources that are not located within the project's directory in the local file system. These resources are referred to as linked resources.

Consequences for Repository Providers

Linked resources can pose particular challenges for repository providers which operate directly against the file system. This is a consequence of the fact that linked resources by design do not exist in the immediate project directory tree in the file system.

Providers which exhibit the following characteristics may be affected by linked resources:

1. Those which call out to an external program that then operates directly against the file system.
2. Those which are implemented in terms of `IResource` but assume that all the files/folders in a project exist as direct descendents of that single rooted directory tree.

In the first case, let's assume the user picks a linked resource and tries to perform a provider operation on it. Since the provider calls a command line client, we can assume that the provider does something equivalent to first calling `IResource.getLocation().toOSString()`, feeding the resulting file system location as an argument to the command line program. If the resource in question is a linked resource, this will yield a file/folder outside of the project directory tree. Not all command line clients may expect and be able to handle this case. In short, if your provider ever gets the file system location of a resource, it will likely require extra work to handle linked resources.

The second case is quite similar in that there is an implicit assumption that the structure of the project resources is 1:1 with that of the file system files/folders. In general, a provider could be in trouble if they mix `IResource` and `java.io.File` operations. For example, for links, the parent of `IFile` is not the same as the `java.io.File`'s parent and code which assumes these to be the same will fail.

Backwards Compatibility

It was important that the introduction of linked resources did not inadvertently break existing providers. Specifically, the concern was for providers that reasonably assumed that the local file system structure mirrored the project structure. Consequently, by default linked resources can not be added to projects that are mapped to such a provider. Additionally, projects that contain linked resources can not by default be shared with that provider.

Strategies for Handling Linked Resources

In order to be "link friendly", a provider should allow projects with linked resources to be version controlled, but can disallow the version controlling of linked resources themselves.

A considerably more complex solution would be to allow the versioning of the actual linked resources, but this should be discouraged since it brings with it complex scenarios (e.g. the file may already be version controlled under a different project tree by another provider). Our recommendation therefore is to support

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version controlled projects which contain non-version controlled linked resources.

Technical Details for Being "Link Friendly"

Repository provider implementations can be upgraded to support linked resources by overriding the **RepositoryProvider.canHandleLinkedResources()** method to return *true*. Once this is done, linked resources will be allowed to exist in projects shared with that repository provider. However, the repository provider must take steps to ensure that linked resources are handled properly. As mentioned above, it is strongly suggested that repository providers ignore all linked resources. This means that linked resources (and their children) should be excluded from the actions supported by the repository provider. Furthermore, the repository provider should use the default move and delete behavior for linked resources if the repository provider implementation overrides the default **IMoveDeleteHook**.

Team providers can use **IResource.isLinked()** to determine if a resource is a link. However, this method only returns true for the root of a link. The following code segment can be used to determine if a resource is the child of a link.

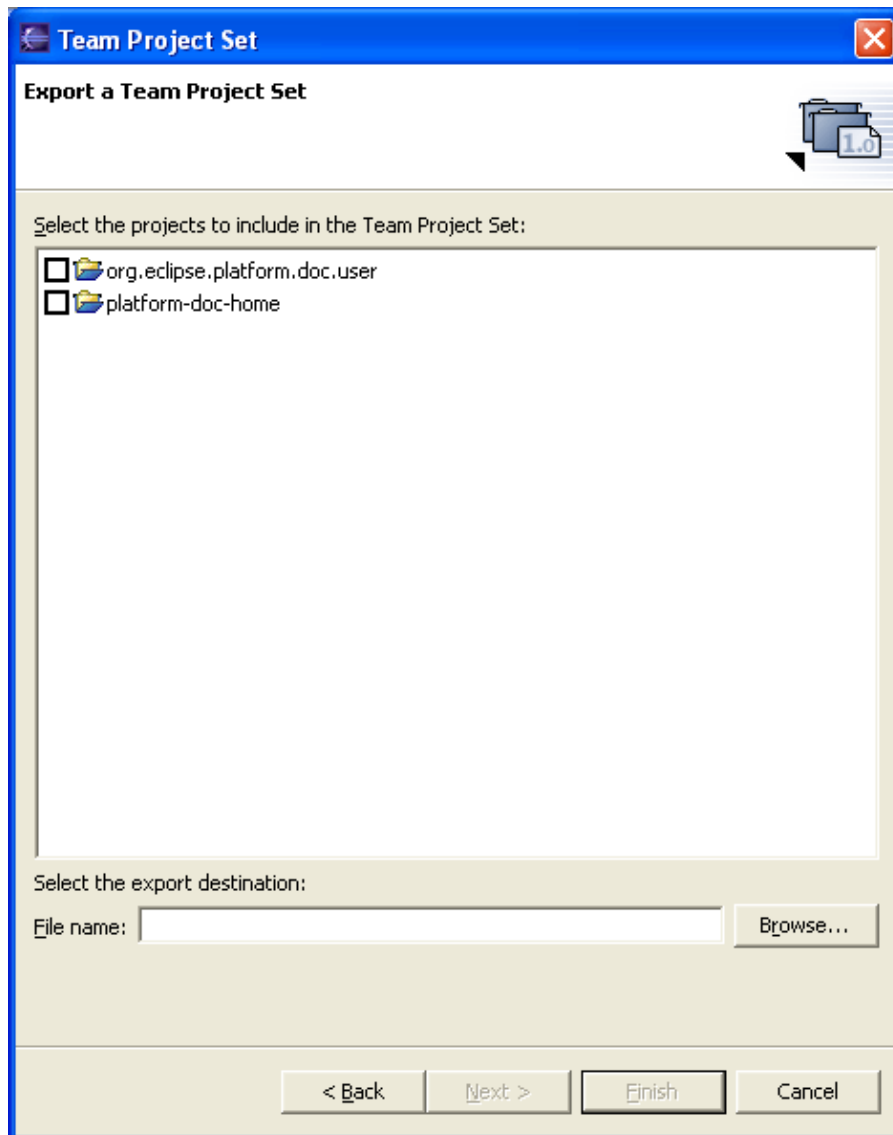
```
String linkedParentName = resource.getProjectRelativePath().segment(0);
IFolder linkedParent = resource.getProject().getFolder(linkedParentName);
boolean isLinked = linkedParent.isLinked();
```

Repository providers should ignore any resource for which the above code evaluates to *true*.

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Project sets

Since the resources inside a project under version control are kept in the repository, it is possible to share projects with team members by sharing a reference to the repository specific information needed to reconstruct a project in the workspace. This is done using a special type of file export for **team project sets**.



In 3.0, API was added to [ProjectSetCapability](#) to allow repository providers to declare a class that implements project saving for projects under their control. When the user chooses to export project sets, only the projects configured with repositories that define project sets are shown as candidates for export. This API replaces the old project set serialization API (see below).

The project set capability class for a repository provider is obtained from the [RepositoryProviderType](#) class which is registered in the same extension as the repository provider. For example:

```
<extension point="org.eclipse.team.core.repository">
  <repository
    typeClass="org.eclipse.team.internal.cvs.core.CVSTeamProviderType"
    class="org.eclipse.team.internal.cvs.core.CVSTeamProvider"
    id="org.eclipse.team.cvs.core.cvsnature">
  </repository>
</extension>
```

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Prior to 3.0, The [org.eclipse.team.core.projectSets](#) extension point allowed repository providers to declare a class that implements project saving for projects under their control. When the user chooses to export project sets, only the projects configured with repositories that define project sets are shown as candidates for export.

For example, the CVS client declares the following:

```
<extension point="org.eclipse.team.core.projectSets">
    <projectSets id="org.eclipse.team.cvs.core.cvsnature" class="org.eclipse.team.internal.cvs.CvsNature" />
</extension>
```

The specified class must implement [IProjectSetSerializer](#). Use of this interface is still supported in 3.0 but has been deprecated.

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File types

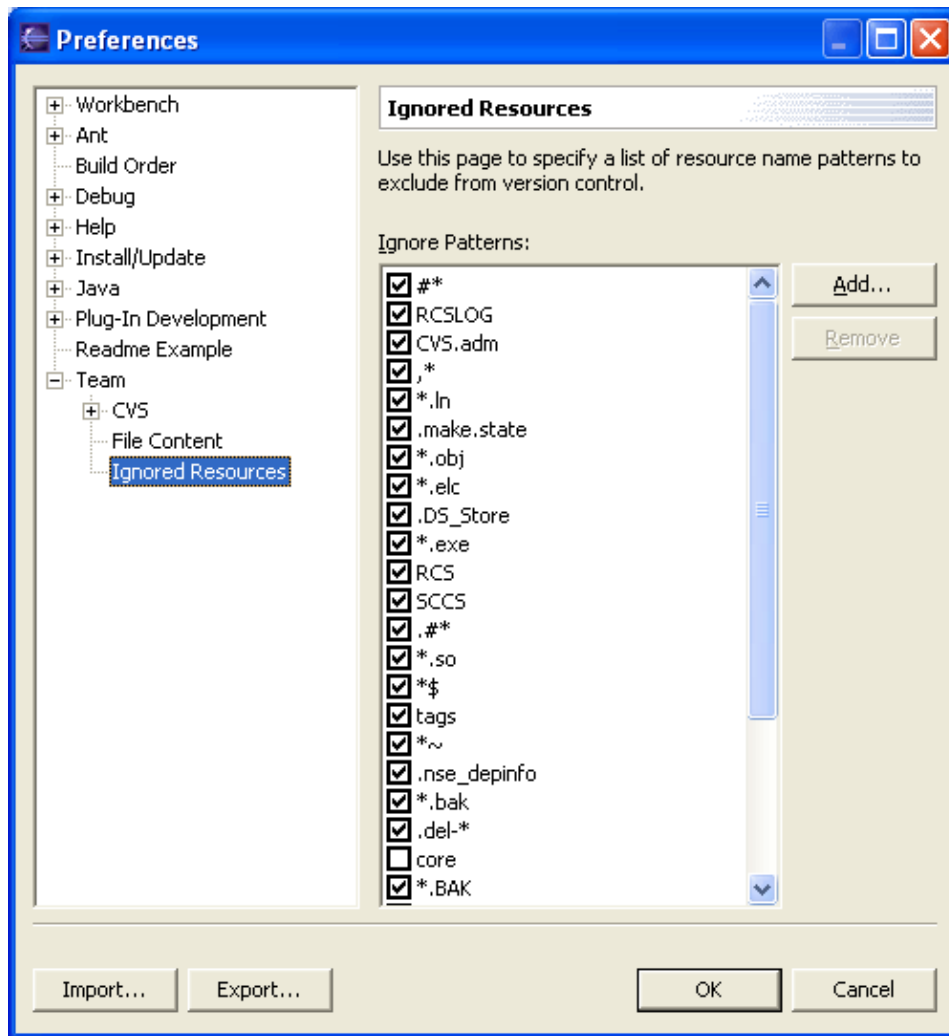
The presence of a repository management system may dictate special handling needs for files. For example, some files should be omitted from version control. Some providers have special handling for text vs. binary files. The team plug-in defines extension points that allow other plug-ins to provide information about their file types. In all cases, special handling is ultimately left up to the user via the team Preferences page. These extensions allow plug-ins to seed the preferences with values appropriate for the plug-in.

Ignored files

In several cases, it may be unnecessary to keep certain files under repository control. For example, resources that are derived from existing resources can often be omitted from the repository. For example, compiled source files, (such as Java ".class" files), can be omitted since their corresponding source (".java") file is in the repository. It also may be inappropriate to version control metadata files that are generated by repository providers. The [org.eclipse.team.core.ignore](#) extension point allows providers to declare file types that should be ignored for repository provider operations. For example, the CVS client declares the following:

```
<extension point="org.eclipse.team.core.ignore">
    <ignore pattern = ".#*" selected = "true"/>
</extension>
```

The markup simply declares a file name **pattern** that should be ignored and a **selected** attribute which declares the default selection value of the file type in the preferences dialog. It is ultimately up to the user to decide which files should be ignored. The user may select, deselect, add or delete file types from the default list of ignored files.

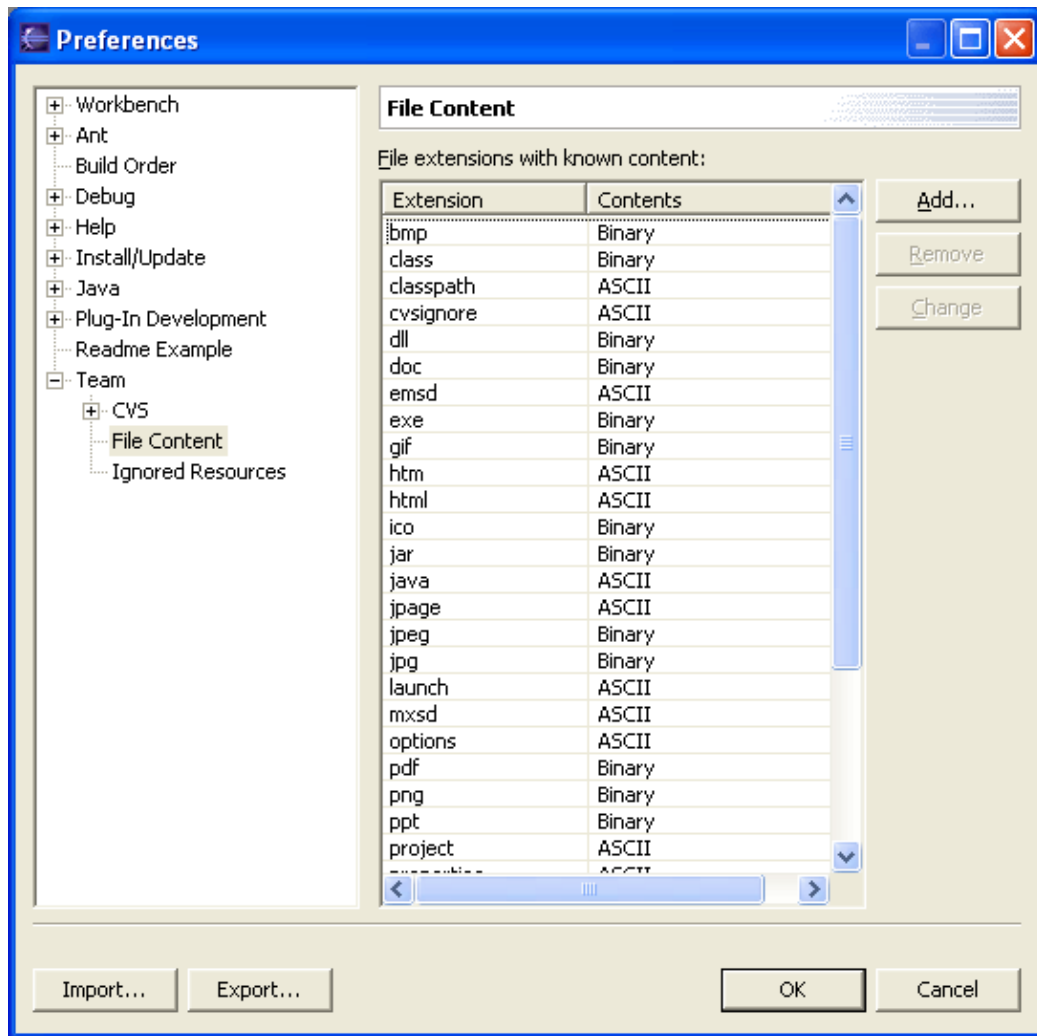


Text vs. binary files

Some repositories implement different handling for text vs. binary files. The [org.eclipse.team.core.fileTypes](http://www.eclipse.org/core/fileTypes) extension allows plug-ins to declare file types as text or binary files. For example, the Java tooling declares the following:

```
<extension point="org.eclipse.team.core.fileTypes">
  <fileTypes extension="java" type="text"/>
  <fileTypes extension="classpath" type="text"/>
  <fileTypes extension="properties" type="text"/>
  <fileTypes extension="class" type="binary"/>
  <fileTypes extension="jar" type="binary"/>
  <fileTypes extension="zip" type="binary"/>
</extension>
```

The markup lets plug-ins define a file type by **extension** and assign a **type** of text or binary. As with ignored files, it is ultimately up to the user to manage the list of text and binary file types.



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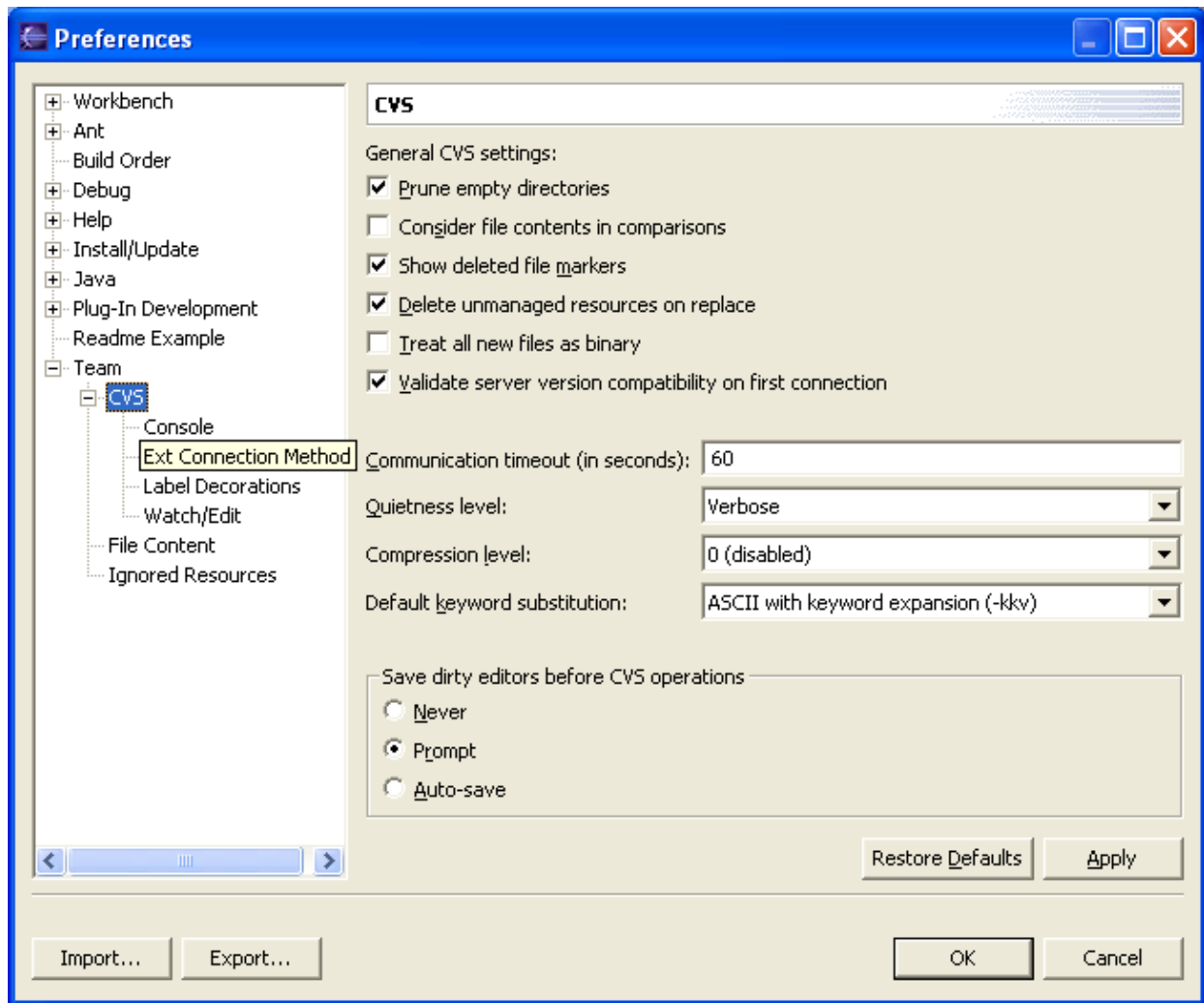
Adding preferences and properties

Preferences and properties can be contributed by team UI plug-ins using the standard techniques. The only difference for a team plug-in is that preferences should be contributed using the team category, so that all team related preferences are grouped together. The CVS markup for the main preferences page looks like this:

```
<extension
  point="org.eclipse.ui.preferencePages">
  <page
    name="%PreferencePage.name"
    category="org.eclipse.team.ui.TeamPreferences"
    class="org.eclipse.team.internal.cvs.ui.CVSPreferencesPage"
    id="org.eclipse.team.cvs.ui.CVSPreferences">
  </page>
</extension>
```

The preferences dialog shows the CVS preferences underneath the team category.

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Properties are added as described by [org.eclipse.ui.propertyPages](#). There is no special team category for properties, since a resource can only be configured for one repository provider at a time. However, you must set up your property page to filter on the team project persistent property (similar to the way we filtered resources for popup menu actions.)

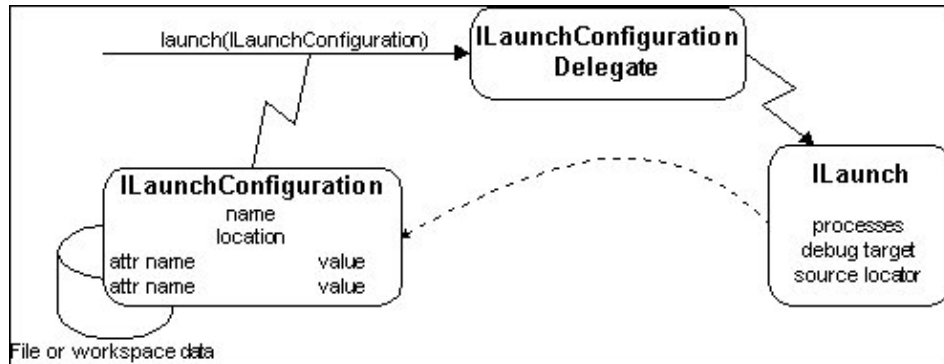
```
<extension
  point="org.eclipse.ui.propertyPages">
  <page
    objectClass="org.eclipse.core.resources.IFile"
    adaptable="true"
    name="%CVS"
    class="org.eclipse.team.internal.cvs.ui.CVSFilePropertiesPage"
    id="org.eclipse.team.cvs.ui.propertyPages.CVSFilePropertiesPage">
    <filter
      name="projectPersistentProperty"
      value="org.eclipse.team.core.repository=org.eclipse.team.cvs.core.cvsnature">
    </filter>
  </page>
  ...
```

Launching a program

The platform debug plug-ins allow you to extend the platform so that your program can be launched properly, obtaining input from the user if necessary.

The class **ILaunchConfiguration** is used to describe how a program should be launched. A launch configuration keeps a set of named attributes that can be used to store data specific for a particular kind of launcher. Users interact with a launch configuration dialog to set up the parameters for different types of launches. These configurations can be stored in a file to be shared with other users or stored locally in the workspace.

Plug-ins can contribute additional types of launchers and provide an **ILaunchConfigurationDelegate** that knows how to launch a program given the expected type of launch configuration. Once the program is launched, an **ILaunch** object is used to represent the launched session. This object can be queried for information such as running processes, debug session information, and source code location. A launch knows the configuration that was used to create it.



Adding launchers to the platform

Your plug-in can add launch configuration types to the platform using the **org.eclipse.debug.core.launchConfigurationTypes** extension point. This extension point allows you to declare a configuration type using a unique id. You must provide a corresponding implementation of **ILaunchConfigurationDelegate** in your plug-in. You can also specify which modes (run and/or debug) are supported by your launcher and a name that should be used when showing launchers of this type to the user.

The following markup shows how the Java tools declare a Java launch configuration for launching local Java programs:

```

<extension point = "org.eclipse.debug.core.launchConfigurationTypes">
  <launchConfigurationType
    id="org.eclipse.jdt.launching.localJavaApplication"
    name="%localJavaApplication"
    delegate="org.eclipse.jdt.internal.launching.JavaLocalApplicationLaunchConfigurationDe
    modes= "run, debug">
  
```

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```
</launchConfigurationType>  
</extension>
```

Defining source locators

For each type of launch configuration that supports debug mode, it is important to define a way to find the source code that corresponds with the current execution point in the code. **ISourceLocator** and **IPersistableSourceLocator** define an interface for mapping from an executing program back to the source code.

Source locators are typically implemented to work with a corresponding launch configuration and launch configuration delegate. Since launch configurations can be persisted, source locators may also be stored with the launch configuration. This is accomplished by setting an attribute of the launch configuration to an id of a source locator. When a launch configuration is read from disk, the id of the source locator must be mapped back to the implementation class. This is achieved using the **org.eclipse.debug.core.sourceLocators** extension point.

The extension point allows you to register your class that implements **IPersistableSourceLocator** and associate it with an id that will be stored with the launch configuration. This allows the debug plug-in to look up source locator classes by id when it's time to instantiate a launch configuration.

The following markup is from the Java tooling:

```
<extension point = "org.eclipse.debug.core.sourceLocators">  
  <sourceLocator  
    id = "org.eclipse.jdt.debug.ui.javaSourceLocator"  
    class="org.eclipse.jdt.debug.ui.JavaUISourceLocator"  
    name="%javaSourceLocator"/>  
</extension>
```

Comparing launch configurations

Plug-ins use named attributes and values to store important data with a launch configuration. Since the interpretation of any attribute is not known by the platform, an extension point is provided that allows you to supply a comparator for a specific attribute. This comparator is used to determine whether attributes of the specified name are equal. In many cases, the simple string compare provided by `java.lang.Object.equals(Object)` is suitable for comparing attributes. This method will be used if no comparator has been provided. However, some attribute values may require special handling, such as stripping white space values from text before comparing for equality.

Comparators are contributed using the **org.eclipse.debug.core.launchConfigurationComparators** extension point.

The Java tools supply launch configuration comparators for comparing program source paths and class paths.

```
<extension point = "org.eclipse.debug.core.launchConfigurationComparators">  
  <launchConfigurationComparator  
    id = "org.eclipse.jdt.launching.classpathComparator"  
    class = "org.eclipse.jdt.internal.launching.RuntimeClasspathEntryListComparator"  
    attribute = "org.eclipse.jdt.launching.CLASSPATH"/>  
  <launchConfigurationComparator  
    id = "org.eclipse.jdt.launching.sourcepathComparator"  
    class = "org.eclipse.jdt.internal.launching.RuntimeClasspathEntryListComparator"  
    attribute = "org.eclipse.jdt.launching.SOURCE_PATH"/>
```

```
</extension>
```

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Handling errors from a launched program

If you have defined your own type of launch configuration, it's likely that you will want to handle errors or other information that arises during the running of the program. For example, you may want to prompt or alert the user when certain types of errors occur during a launch, or provide information messages for certain status changes in the program. Since it's good practice to separate UI handling from core function, you do not want to have direct references from your launch delegate to status handling classes.

This problem is addressed by the **org.eclipse.debug.core.statusHandlers** extension point. It allows you to associate a status handler with a specific status code. Using this extension point, you can define all of the possible status and error codes in your launch delegate and core classes, while registering unique handlers for the different status codes from another plug-in.

The extension point does not designate any association between a status handler and a launch configuration. It is up to the implementation of the launch delegate to detect errors, find the appropriate status handler, and invoke it. The extension merely provides a registry so that the status handlers can be found for particular status codes. Clients find status handlers by querying the **DebugPlugin**.

```
IStatusHandler handler = DebugPlugin.getDefault().getStatusHandler(status);
```

Status handlers should implement **IStatusHandler**. The status handling class is specified in the extension definition, along with its associated status code and the plug-in that is expected to generate the status codes.

The following markup shows how the Java tools declare status handlers:

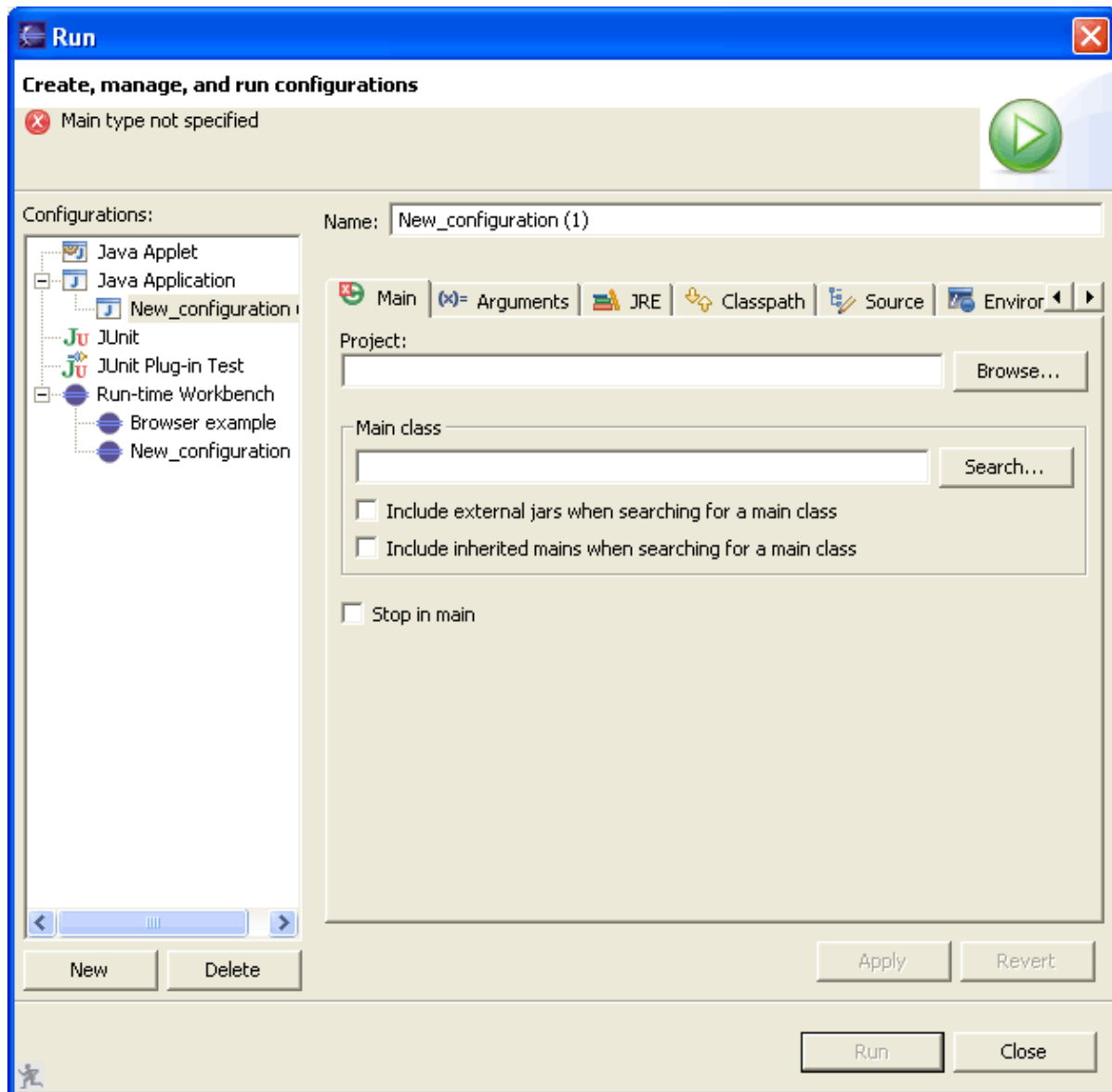
```
<extension point = "org.eclipse.debug.core.statusHandlers">
  <statusHandler
    id="org.eclipse.jdt.debug.ui.statusHandler.workingDirectory"
    class="org.eclipse.jdt.internal.debug.ui.launcher.WorkingDirectoryStatusHandler"
    plugin ="org.eclipse.jdt.launching"
    code="115">
  </statusHandler>
  <statusHandler
    id="org.eclipse.jdt.debug.ui.statusHandler.vmConnectTimeout"
    class="org.eclipse.jdt.internal.debug.ui.launcher.VMConnectTimeoutStatusHandler"
    plugin ="org.eclipse.jdt.launching"
    code="117">
  </statusHandler>
  ...
</extension>
```

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Launch configuration dialog

Launch configurations can most easily be visualized by looking at their corresponding UI. Users interact with a launch configuration dialog to create instances of the different types of launch configurations that have been contributed by plug-ins. Each type of launch configuration defines a group of tabs that collect and display information about the configuration. The tab group for local Java applications is shown below.

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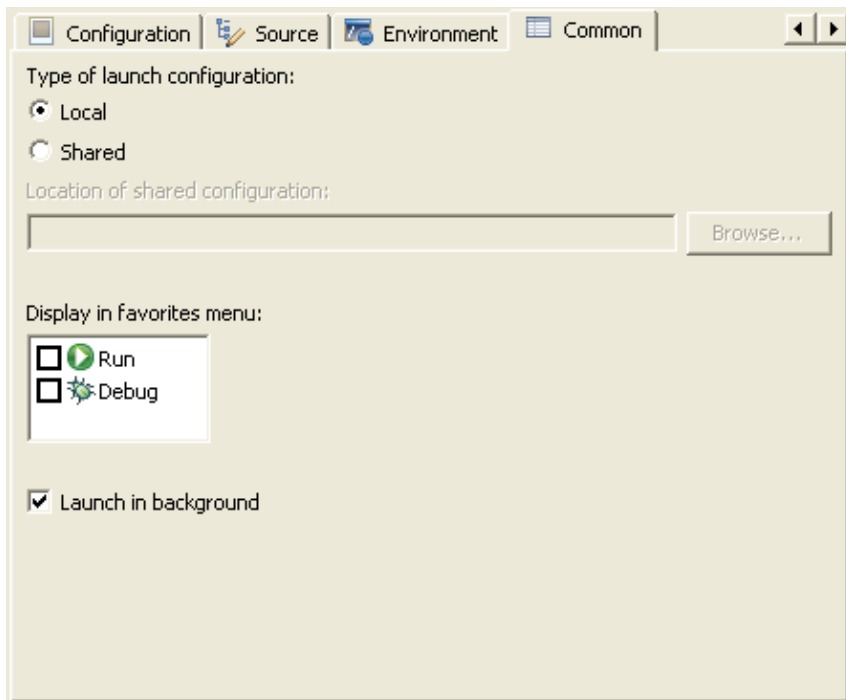


The tabs are contributed using the [org.eclipse.debug.ui.launchConfigurationTabGroups](#) extension point. The markup for this extension is straightforward. You associate the id of a configuration type (contributed using [org.eclipse.debug.core.launchConfigurationTypes](#)) with a class that implements [ILaunchConfigurationTabGroup](#). The Java application tab group is contributed like this:

```
<extension point = "org.eclipse.debug.ui.launchConfigurationTabGroups">
  <launchConfigurationTabGroup
    id="org.eclipse.jdt.debug.ui.launchConfigurationTabGroup.localJavaApplication"
    type ="org.eclipse.jdt.launching.localJavaApplication"
    class="org.eclipse.jdt.internal.debug.ui.launcher.LocalJavaApplicationTabGroup">
  </launchConfigurationTabGroup>
</extension>
```

Your tab group class is responsible for creating the necessary tabs and displaying and saving the relevant data from the launch configuration attributes. A tab that is common to all configurations, [CommonTab](#), is already implemented and can be created by any configuration. This tab manages the saving of the launch configuration as well as collecting common preferences.

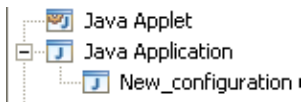
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Launch configuration type images

The image that is shown for a launch configuration type in the launch dialog is contributed using the [org.eclipse.debug.ui.launchConfigurationTypeImages](#) extension point. This extension associates an image file with the id of a configuration type.



The markup for the Java application image is as follows:

```
<extension point="org.eclipse.debug.ui.launchConfigurationTypeImages">
  <launchConfigurationTypeImage
    id="org.eclipse.jdt.debug.ui.launchConfigurationTypeImage.localJavaApplication"
    configTypeID="org.eclipse.jdt.launching.localJavaApplication"
    icon="icons/full/ctool16/java_app.gif">
  </launchConfigurationTypeImage>
</extension>
```

In order to maintain consistency with other extension points that reference launch configuration types, please note that in 2.1 the **configTypeID** attribute may also be specified as **type**.

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Launch shortcuts

Once a launch configuration has been defined using the dialog, it can be shown in the run and/or debug menus. The `org.eclipse.debug.ui.launchShortcuts` extension point is used to register launch shortcuts. In the extension definition, you can specify in which modes (run or debug) and in which perspectives the shortcuts are shown. For each shortcut, you must specify an implementation of `ILaunchShortcut`. This class is used to launch a program given a particular selection in a view or editor.

The following markup registers shortcuts for launching a Java application:

```
<extension point = "org.eclipse.debug.ui.launchShortcuts">
  <shortcut
    id="org.eclipse.jdt.debug.ui.localJavaShortcut"
    class="org.eclipse.jdt.internal.debug.ui.launcher.JavaApplicationShortcut"
    label="%JavaApplicationShortcut.label"
    icon="icons/full/ctool16/java_app.gif"
    helpContextId="org.eclipse.jdt.debug.ui.shortcut_local_java_application"
    modes="run, debug">
    <perspective id="org.eclipse.jdt.ui.JavaPerspective"/>
    <perspective id="org.eclipse.jdt.ui.JavaHierarchyPerspective"/>
    <perspective id="org.eclipse.jdt.ui.JavaBrowsingPerspective"/>
    <perspective id="org.eclipse.debug.ui.DebugPerspective"/>
  </shortcut>
</extension>
```

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Debugging a program

When you define a launch configuration for running a program, you can specify which modes (run and/or debug) your program supports. If you support debug mode, then you need to implement a debug model and UI that allow users to interact with your programs under debug. The core platform debug plug-in provides support for:

- a generic debug model
- debug events and listeners
- breakpoint management
- expression management

The debug UI plug-in provides utility classes for implementing debug user interfaces.

Since it's difficult to discuss generic debugging in any meaningful detail, we'll review the platform debug model and UI classes from the perspective of the Java debugger.

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Platform debug model

The platform debug model defines generic debug interfaces that are intended to be implemented and extended in concrete, language-specific implementations.

Artifacts

The model includes classes that represent different artifacts in a program under debug. All of the artifacts implement **IDebugElement** in addition to their own interfaces. The model includes definitions for the following artifacts:

- Debug targets (**IDebugTarget**) – a debuggable execution context, such as a process or virtual machine
- Expressions (**IExpression**) – a snippet of code that can be evaluated to produce a value
- Memory blocks (**IMemoryBlock**) – a contiguous segment of memory in an execution context
- Registers (**IRegister**) – a named variable in a register group
- Register groups (**IRegisterGroup**) – a group of registers assigned to a stack frame
- Stack frames (**IStackFrame**) – an execution context in a suspended thread containing local variables and arguments
- Threads (**IThread**) – a sequential flow of execution in a debug target containing stack frames
- Values (**IValue**) – the value of a variable
- Variables (**IVariable**) – a visible data structure in a stack frame or value

Plug-ins that implement language-specific debuggers typically extend these interfaces to include language-specific behavior. All debug elements can return the id of the plug-in that originated them. This is important for registering other classes that are associated with a debug model, such as UI classes.

Actions

The model also includes interfaces that define a set of debug actions that are common behaviors among debug artifacts. These interfaces are implemented by debug elements where appropriate. They include the following actions:

- Disconnect (**IDisconnect**) – the ability to end a debug session with a target program and allow the target to continue running
- Step (**IStep**) – the ability to step into, over, and return from the current execution point
- Filtered step (**IFilteredStep**) – the ability to step with a set of filters applied to the operation
- Suspend and resume (**ISuspendResume**) – the ability to suspend and resume execution
- Terminate (**ITerminate**) – the ability to terminate an execution context
- Modify a value (**IValueModification**) – the ability to modify the value of a variable

If you look at the definitions for the platform debug elements, you will see that different elements implement different debug actions. Standard interfaces for the elements and their behaviors allow the platform to provide abstract implementations of utility classes and UI support that can be extended for concrete implementations of debuggers.

Events

Debug events (**DebugEvent**) are used to describe events that occur as a program is being debugged. Debug events include the debug element that is associated with the event. Each kind of debug element has a specific set of events that it supports as documented in **DebugEvent**.

Debugger UI classes typically listen to specific events for elements in order display information about changes that occur in the elements. Debug events arrive in groups called **debug event sets**. Events that occur at the same point of execution in a program arrive in the same set. Clients should implement an **IDebugEventSetListener** and register the listener with the **org.eclipse.debug.core** plug-in in order to

receive debug events.

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Breakpoints

Breakpoints allow users to suspend the execution of a program at a particular location. Breakpoints are typically shown in the UI along with the source code. You can add an **IBreakpointListener** to an **IBreakpointManager** in order to be notified as breakpoints are added and removed. When a breakpoint is encountered during execution of a program, the program suspends and triggers a **SUSPEND** debug event with **BREAKPOINT** as the reason.

Plug-ins that define their own debug models and launch configurations often need to define their own breakpoint types. You can implement breakpoints for your particular debug model by defining a class that implements **IBreakpoint**.

Breakpoints are implemented using resource markers. Recall that resource markers allow you to associate meta information about a resource in the form of named attributes. By implementing a breakpoint using markers, the debug model can make use of all the existing marker function such as persistence, searching, adding, deleting, and displaying in editors.

Why is it important to know about markers when using breakpoints? When you create a breakpoint type, you must also specify an associated marker type. Every extension of **org.eclipse.debug.core.breakpoints** should be accompanied by an extension of **org.eclipse.core.resources.markers**. This is best demonstrated by looking at the extensions defined by the Java tooling for Java breakpoints.

```
<extension id="javaBreakpointMarker" point="org.eclipse.core.resources.markers">
  <super type="org.eclipse.debug.core.breakpointMarker" />
</extension>

<extension id="javaExceptionBreakpointMarker" point="org.eclipse.core.resources.markers">
  <super type="org.eclipse.jdt.debug.javaBreakpointMarker" />
  <persistent value="true" />
  <attribute name="org.eclipse.jdt.debug.core.caught" />
  <attribute name="org.eclipse.jdt.debug.core.uncaught" />
  <attribute name="org.eclipse.jdt.debug.core.checked" />
</extension>

<extension point="org.eclipse.debug.core.breakpoints">
  <breakpoint
    id="javaExceptionBreakpoint"
    org.eclipse.jdt.debug.javaExceptionBreakpointMarker"
    class="org.eclipse.jdt.internal.debug.core.breakpoints.JavaExceptionBreakpoint">
  </breakpoint>
</extension>
```

The debug plug-in defines a special type of marker, **org.eclipse.debug.core.breakpointMarker**. When you define a marker, you should declare it using this marker as a super type. This allows the debug model to find all possible breakpoints within a source file by searching for subtypes of its marker. In the example above, the **javaExceptionBreakpointMarker** has a super type, **javaBreakpointMarker**, whose super type is the **breakpointMarker**. The **javaExceptionBreakpoint** (defined in the breakpoint extension) designates the **javaExceptionBreakpointMarker** as its marker.

What does all of this mean? When the debug code obtains a source code resource, it can search for all markers whose super type is **org.eclipse.debug.core.breakpointMarker**. Having found all of the markers, it can then use the plug-in registry to map the markers to their associated breakpoint classes. In this way, the platform debug code can generically find all breakpoint types that have been set

on a particular source file.

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Expressions

An **expression** is a snippet of code that can be evaluated to produce a value. The context for an expression depends on the particular debug model. Some expressions may need to be evaluated at a specific location in the program so that the variables can be referenced. **IExpression** defines a general interface for debug expressions.

An expression manager (**IExpressionManager**) keeps track of all of the expressions in the workspace. It will also fire events to interested listeners as expressions are added, removed, or changed.

Expressions can be used to implement "watch lists," "inspectors," or even "scrapbooks" that let users evaluate code snippets. The Java tooling uses expressions to implement the expression generated when the user inspects the source code.

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Debug model presentation

Since there is a generic, uniform model for debug elements in the platform, it's possible to provide a starting point for implementing debugger UI classes. The heart of the debugger UI support is the **debug model presentation** (**IDebugModelPresentation**). The debug model presentation is responsible for providing labels, images, and editors associated with specific debug elements.

Plug-ins that define their own debug model typically provide a debug model presentation for displaying debug elements in the model. This is done using the **org.eclipse.debug.ui.debugModelPresentations** extension point. This extension point allows an implementation of **IDebugModelPresentation** to be associated with the identifier of a particular debug model.

Recall that **debug model elements** know the id of their originating debug model. This means that given any debug element, the debug platform can obtain the id of the debug model and then query the plug-in registry for any corresponding debug model presentations.

The markup for adding a debug model presentation looks like this:

```
<extension point = "org.eclipse.debug.ui.debugModelPresentations">
  <debugModelPresentation
    class = "org.eclipse.jdt.internal.debug.ui.JDIModelPresentation"
    id = "org.eclipse.jdt.debug"
    detailsViewerConfiguration = "org.eclipse.jdt.internal.debug.ui.display.DetailsViewewerConfiguration"
  </debugModelPresentation>
</extension>
```

An optional **detailsViewerConfiguration** can be specified in addition to the debug model presentation. The details viewer must extend the JFace **SourceViewerConfiguration** class. The meaning of "details" is interpreted by the debug model. The details are computed by the debug model presentation and passed to the details viewer. For example, the Java debugger uses the details viewer to show code assist in the variables

view when expressions are evaluated.

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Debug UI utility classes

The debug UI plug-in provides some classes that provide good building blocks for building debugger user interfaces.

DebugUITools implements function commonly used by debug user interfaces:

- Storage and retrieval of images on behalf of debug UI clients
- Lookup of debug model presentations associated with a given debug model
- Retrieval of the debug plug-in preference store
- Information about the current debug view in the workbench
- Information about the current program under debug
- Opening the launch configuration dialog

IDebugView provides common function for debug views. It provides access to an underlying viewer and its debug model presentation. Typically, clients should extend **AbstractDebugView** rather than implement the interface from scratch. **AbstractDebugView** provides additional common functions:

- Storage of actions in an action registry
- Generic handling of the underlying viewer's context menu
- General implementations of delete key and double click function
- Mechanism for displaying an error message in the view

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Platform Ant support

Ant is a Java-based build tool that uses XML-based configuration files to describe build tasks. The Eclipse platform allows you to run Ant buildfiles from your plug-in and contribute new [Ant tasks, types](#) and [properties](#) using extension points. The rest of this discussion assumes that you have a basic understanding of Ant.

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Running Ant buildfiles programmatically

The Ant support built into Eclipse allows plug-ins to programmatically run Ant buildfiles. This is done via the [AntRunner](#) class included in the `org.eclipse.ant.core` plug-in.

The following code snippet shows an example of how to use the [AntRunner](#) from within code of another plug-in:

```
import org.eclipse.ant.core.AntRunner;
import org.eclipse.core.runtime.IProgressMonitor;

...

public void runBuild() {
    IProgressMonitor monitor = ...
    AntRunner runner = new AntRunner();
    runner.setBuildFileLocation("c:/buildfiles/build.xml");
    runner.setArguments("-Dmessage=Building -verbose");
    runner.run(monitor);
}
```

If a progress monitor is used, it is made available for the running tasks. See [Progress Monitors](#) for more details.

Note that only one Ant build can occur at any given time if the builds do not occur in separate VMs. See [AntRunner.isBuildRunning\(\)](#);

Special care for native libraries if build occurs within the same JRE as the workspace

Every time an Ant buildfile runs in Eclipse a new classloader is created. Since a library can only be loaded by one classloader in Java, tasks making use of native libraries could run into problems during multiple buildfile runs. If the previous classloader has not been garbage collected at the time the new classloader tries to load the native library, an exception is thrown indicating the problem and the build fails. One way of avoiding this problem is having the library load be handled by a class inside a plug-in library. The task can make use of that class for accessing native methods. This way, the library is loaded by the plug-in classloader and it does not run into the load library conflict.

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Ant tasks provided by the platform

The platform provides some useful Ant tasks and properties that interact with the workspace. They can be used with buildfiles that are set to build within the same JRE as the workspace.

eclipse.refreshLocal

This task is a wrapper to the **IResource.refreshLocal()** method. Example:

```
<eclipse.refreshLocal resource="MyProject/MyFolder" depth="infinite"/>
```

- **resource** is a resource path relative to the workspace
- **depth** can be one of the following: **zero**, **one** or **infinite**

eclipse.incrementalBuild

This task is a wrapper to **IProject.build()** and **IWorkspace.build()** methods. Examples:

```
<eclipse.incrementalBuild/>
```

```
<eclipse.incrementalBuild project="MyProject"/>
```

- **project** the project to be built

eclipse.convertPath

Converts a file system path to a resource path and vice-versa. The resulting value is assigned to the given property. Examples:

```
<eclipse.convertPath filePath="${basedir}" property="myPath"/>
```

```
<eclipse.convertPath resourcePath="MyProject/MyFile" property="myPath"/>
```

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Contributing tasks and types

When your plug-in contributes Ant tasks and types, the tasks and types have access to all of the classes inside the contributing plug-in. For example, the **eclipse.refreshLocal** task contributed by **org.eclipse.core.resources** plug-in is a wrapper for the **IResource.refreshLocal()** method.

Tasks and types contributed by plug-ins must not be placed in any of the plug-in libraries. They have to be in a separate JAR. This means that the plug-in classes do not have access to the tasks and types provided by the plug-in. (See Why a separate JAR for tasks and types? for more information.)

The [org.eclipse.ant.core.antTasks](#) extension point provides an example of how to specify a new task in the `plugin.xml` file.

Progress Monitors

The Eclipse Ant support provides access to an [IProgressMonitor](#) if one is passed when invoking the `AntRunner`. One of the advantages of having access to a progress monitor is that a long-running task can check to see if the user has requested its cancellation. The progress monitor object is obtained from the Ant project's references. Note that a monitor is only made available if the method [AntRunner.run\(IProgressMonitor\)](#) was called with a valid progress monitor. The following code snippet shows how to obtain a progress monitor from the task's project:

```
import org.apache.tools.ant.BuildException;
import org.apache.tools.ant.Task;
import org.eclipse.ant.core.AntCorePlugin;
import org.eclipse.core.runtime.IProgressMonitor;

public class CoolTask extends Task {

public void execute() throws BuildException {
    IProgressMonitor monitor =
        (IProgressMonitor) getProject().getReferences().get(AntCorePlugin.ECLIPSE_PROGRESS_MONITOR);
    if (monitor == null) {
        ...
    } else {
        ...
    }
}
}
```

Important rules when contributing tasks and types

The following should work as a checklist for plug-in developers:

- The JAR containing the tasks must not be a plug-in library (declared in `<library></library>`).
- The task or type can reference any class available for the plug-in but plug-in classes must not access the tasks or types.
- Native libraries should be loaded by the plug-in library classes and not tasks or types.

Why a separate JAR for tasks and types?

There are basically two requirements for running Ant in Eclipse that do not fit the plug-in model very well:

- Change the Ant classpath at runtime
- Change the Ant version at runtime

During runtime plug-in classloaders cannot have their classpaths expanded and plug-ins cannot change their dependencies. At the same time having separate JARs for the tasks and types is a good isolation from the plug-in classloading mechanism. Having these extra JARs declared by a plug-in permits adding the contributing plug-in to the Ant classpath as well.

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Developing Ant tasks and types within Eclipse

The following guidelines should be followed when developing and debugging Ant tasks and types within Eclipse. These requirements stem from the fact that Ant tasks and types must be loaded by the Ant classloader, rather than a plug-in classloader, when Ant is run in the same VM as Eclipse. To avoid having the Ant tasks and types loaded by a plug-in classloader, the tasks and types need to be stored in a location that is not visible to any plug-in classloader. Also see [Contributing tasks and types](#).

- Contributed Ant tasks or types should be defined in their own source folder within a plug-in (i.e. separate from the source folders containing regular plug-in classes)
- Each source folder containing the Ant tasks and types should have its own output location that does not overlap with the output location of the regular plug-in classes.
- When testing/debugging the new Ant tasks or types, the project contributing the Ant tasks or types must be configured to **exclude** the output folders containing the Ant tasks and types. Use the **Properties** dialog for the project to correctly configure the **Self-Hosting** configuration by removing the Ant output directories from the plug-ins classpath.

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Expanding the Ant classpath

Plug-ins can contribute [extra JARs](#) to the Ant classpath. The plug-in contributing the JARs is also added to the Ant classpath. As a consequence, classes inside the extra JARs have access to all classes available for the plug-in. These extra JARs cannot be plug-in libraries; they must be separate JARs. The consequences are that plug-in classes do not have access to the classes provided by these extra JARs. The [org.eclipse.ant.core.extraClasspathEntries](#) extension point provides an example of how to specify the extra JARs in the plugin.xml file.

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Packaging and delivering Eclipse based products

The Eclipse platform is designed so you can add plug-ins that provide function for the software development tools community. Commercial software vendors can build, brand, and package products using the platform as a base technology. These products can be sold and supported commercially.

The Eclipse SDK can be downloaded and used as a Java IDE and Eclipse plug-in development tool, but it is not marketed as a commercial product. The platform provides the raw ingredients for a product without a box, label, or price tag. It defines a file and directory structure that lets you easily customize the platform's about dialog and splash screen to brand your product.

The license governing the Eclipse platform gives you a lot of freedom over how to build and configure a product. However, Eclipse based products will coexist more easily on a user's system if the products use similar standards for packaging, configuring, and installing their products.

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Customizing a primary feature

Product customization works differently when using the primary feature mechanism. The branding information for the feature is located in a plug-in identified by the primary feature (or the plug-in of the same name as the primary feature if none is specified). The files that designate and define branding information for our hypothetical acmeweb application are highlighted in the sample directory structure below:

```
acmeweb/  
acmeweb.exe (product executable - invokes eclipse.exe and specifies the primary feature)  
eclipse/  
.eclipseproduct  
eclipse.exe  
    startup.jar  
    install.ini  
    .config/  
    platform.cfg  
    jre/  
    features/  
com.example.acme.acmefeature_1.0.0/ (primary feature)  
    feature.xml  
    plugins/  
com.example.acme.acmefeature_1.0.0/ (plug-in for primary feature. Contains branding info.)  
    plugin.xml  
about.ini  
    about.html  
    about.mappings  
    about.properties  
    acme.gif  
    plugin_customization.ini  
    splash.jpg  
    welcome.xml  
    com.example.acme.acmewebsupport_1.0.0/  
    ...  
links/  
    ...
```

The plug-in associated with a primary feature is where the branding information for a product is specified. There are many customizable aspects of a product. Product-level customizations are defined using the

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about.ini file and other files described therein. Products can also control the default preference values of other plug-ins. This is done using the **plugin_customization.ini** file.

Referring once again to our sample product's primary feature plug-in, let's look closer at how the product is customized.

```
com.example.acme.acmefeature_1.0.0/  
    plugin.xml  
about.ini  
    about.html  
    about.mappings  
    about.properties  
    acme.gif  
    plugin_customization.ini  
    plugin_customization.properties  
    splash.bmp  
    welcome.xml
```

We'll review the same customizations that we reviewed for the products extension point, focusing on how the specification differs using the primary feature mechanism.

About dialogs

As discussed with the product-level customization, all features and plug-ins should contribute an **about.html** file that provides information about that particular plug-in.

The primary feature also supplies the information and graphics for the overall product. Additional files are used to specify this information.

- **about.ini** specifies the about text and images for features, windows, and the about dialog itself. It also specifies the welcome page. See [Customization using about.ini](#) for a complete description of the format of this file.
- **about.properties** should be used to hold translated strings from the **about.ini** file (using "%var" as the value in about.ini paired with an entry for the key "var" in about.properties. This file is a **java.io.Properties** format file.
- **about.mappings** can be used to fill in values for fill-in fields in the about text. This is useful when the about text contains information specific to a particular install, such as license key, install date, or licensed user. For example, the about text could be defined as "AcmeWeb is licensed to {0}". The about.mappings file could be generated at install time based on input from the user. The final form should contain a mapping for the field, such as "0=Joe Q. Webuser". The about.mappings file is a **java.io.Properties** format file.

Window images

A 16x16 pixel color image can be used to brand windows created by the product. It will appear in the upper left hand corner of product windows. It is specified in the **windowImage** attribute in the **about.ini** file. The path should be specified as a plug-in relative path. A proper entry for the directory structure shown above would be as follows:

```
windowImage=acme.gif
```

Welcome page

Plug-ins using the Eclipse 2.1 Welcome mechanisms should specify the welcome page file in the `welcomePage` attribute in the `about.ini` file. The path should be specified as a plug-in relative path. A proper entry for the directory structure shown above would be as follows:

```
welcomePage=welcome.xml
```

You can also specify an national language lookup for the file. (See [Locale specific files](#) for more detail.)

```
welcomePage=${nl$}/welcome.xml
```

Splash screens

The product splash screen is supplied in a **splash.bmp** file located in the primary feature plug-in directory. The image should be supplied in 24-bit color BMP format (RGB format) and should be approximately 500x330 pixels in size. If splash screens need to be customized for different locales, they can be placed in a fragment of the primary feature's plug-in.

Preferences defaults

The **plugin_customization.ini** file is used to set the default preference values for preferences defined by other plug-ins. This file is a **java.io.Properties** format file. Typically this file is used to set the values for preferences that are published as part of a plug-in's public API. That is, you are taking a risk if you refer to preferences that are used by plug-ins but not defined formally in the API.

One common customization is to set the default perspective for the workbench. This preference is defined in the **org.eclipse.ui** plug-in. The following example assumes that the product should be launched with the resource perspective as the default perspective.

```
org.eclipse.ui/defaultPerspectiveId=org.eclipse.ui.resourcePerspective
```

If you discover you need to change the default value for one of another plug-in's preferences, consult the API documentation for that plug-in to see if the preference is considered public.

The **plugin_customization.properties** file contains translated strings for the **plugin_customization.ini** file.

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About.ini File Format

Last revised March 25, 2003 for Eclipse 2.1

A feature's "about" information is given by properties in the "about.ini" file located within the feature's *plug-in*. This is a [java.io.Properties](#) format file (ISO 8859-1 character encoding with \uxxxx Unicode escapes), with the following keys:

- "aboutText" – A multi-line text description of the feature containing copyright, license terms, license registration info, etc. URLs found in text are presented as links. Line breaks are indicated by "\n"; lines should be no longer than 75 characters each, and there is a limit of 15 lines. This information is shown in the main "about" dialog (used in conjunction with a half-sized image), and on the secondary "about" dialog describing individual features. All features are required to have this property.
- "windowImage" – A 16x16 pixel color image used to brand windows created by a product. The value of this property is a plug-in-relative path to an image file. This property is only required for primary features; other features may omit it.
- "featureImage" – A 32x32 pixel color image used as an icon for this feature. The value of this property is a plug-in-relative path to an image file. This image is shown on the "about" dialog describing individual features, and is also used on the main "about" dialog to indicate that the feature is present. This property is optional. Related features supplied by a single provider should contain copies of the identical image file; this allows duplicate images to be eliminated.
- "aboutImage" – A large color image that appears in the main "about" dialog for a product. The value of this property is a plug-in-relative path to an image file. This property is only required for primary features; other features should omit it. Both graphic-and-text, and graphic only layouts are supported, depending on the size of image provided. A half-size image of up to 250 pixels wide by 330 pixels high is shown on the main "about" dialog with text ("aboutText" property) beside it. A full-size image of up to 500 pixels wide by 330 pixels high is shown without text.
- "welcomePage" – A welcome page. The value of this property is a plug-in-relative path to an XML-format file containing the feature's welcome page. This property is recommended for all major features; other features may omit it.
- "welcomePerspective" – The preferred perspective in which to show the welcome page. The value of this property is a workbench perspective id. This property is recommended for features with welcome pages that show better in the context of the feature's views and editors. Features that do not have welcome pages, or have no strong opinion where the welcome pages is shown, should omit it.
- "appName" – A short, non-translatable string used to associate a name with the application on platforms where this makes sense. In operating environments with the Motif window system, the value is used for Motif resource lookup (see xrdp and related). In addition, on the CDE window manager (used on Solaris and AIX), this is the name which shows up under the icon for windows which are minimized to the desktop. This property is required for primary features; other features may omit it.
- "tipsAndTricksHref" – Tips and tricks section of help documentation. The value of this property is a reference to a help book containing the feature's tips and trick section; for example, `tipsAndTricksHref=/org.eclipse.jdt.doc.user/tips/jdt_tips.html`. This property is recommended for all major features; other features may omit it.

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Locale specific files

Fragments are a convenient way to package national language translations. Let's look more closely at the directory structure used for installing locale-specific translation files. This directory structure is used regardless of whether the translated files are packaged in a fragment or delivered in the original plug-in.

There are three mechanisms for locating locale specific files in a plug-in.

- **Platform core mechanism** (the platform's runtime locale-specific sub-directory search)
- **Java resource bundles** (`java.util.ResourceBundle`)
- **The plugin.properties mechanism** (Translating values from the `plugin.xml` files)

It is important to understand which mechanism is used to access any given file that must be translated so that you'll know what to name the file and where to put it in the file system relative to the plug-in.

Platform core mechanism

The platform core defines a directory structure that uses locale-specific subdirectories for files that differ by locale. Translated files are placed in a directory called **nl** under the plug-in. For example, the following install tree shows a trivial (no code) plug-in with locale-specific translations of its **about.properties** file. The various translations are shown as coming from a plug-in fragment rather than the plug-in itself. This is typical for shipping translations separately from the base, but you could also place the **nl** sub-directory under the plug-in itself.

```
acmeweb/
  eclipse/
    plugins/
      com.example.acme.acmewebsupport_1.0.0/
        plugin.xml
        about.properties (default locale)
      com.example.acme.fragmentofacmewebsupport_1.0.0/
        fragment.xml (a fragment of com.example.acme.acmewebsupport 1.0.0)
      nl/
        fr/
          about.properties (French locale)
          CA/
            about.properties (French Canadian locale)
          FR/
            EURO/
              about.properties (French France Euros)
        en/
          about.properties (English locale)
          CA/
            about.properties (English Canadian locale)
          US/
            about.properties (English US locale)
        de/
          about.properties (German locale)
```

The files to be translated are not contained in JAR files. Each file should have exactly the same file name, but be located in subdirectories underneath the **nl** sub-directory in the fragment's (or plug-in's) root.

Only the most specific file is accessed at runtime. The file paths are searched as part of the **Platform.find**, **IPluginDescriptor.find** and **Plugin.find** mechanism. For example, suppose the default locale is **en_CA**, and a plug-in searches for the **about.properties** as follows:

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```
somePlugin.find("$nl$/about.properties");
```

The method will return a URL corresponding to the first place **about.properties** is found according to the following order:

```
com.example.acme.acmewebsupport_1.0.0/nl/en/CA/about.properties
com.example.acme.fragmentofacmewebsupport_1.0.0/nl/en/CA/about.properties
...
    <any other fragments>
com.example.acme.acmewebsupport_1.0.0/nl/en/about.properties
com.example.acme.fragmentofacmewebsupport_1.0.0/nl/en/about.properties
...
com.example.acme.acmewebsupport_1.0.0/about.properties
com.example.acme.fragmentofacmewebsupport_1.0.0/about.properties
```

This mechanism is used by plug-ins to search for well known file names inside other plug-ins. This includes the following well known file names:

- **preferences.properties** (externalized strings for plug-in –specific preference default overrides)
- **about.properties** (externalized strings for feature "about" information)
- **plugin_customization.properties** (externalized strings for product–specific preference default overrides)
- **splash.bmp** (product–specific splash screens)

*(Note: The **plugin.properties** and **fragment.xml** are conspicuously absent from this list. They are treated in a slightly different way described below.)*

Java resource bundles

The standard Java handling of property resource bundles is used for other files. Translated files are contained in a JAR file, with each properties file having a locale–specific name, such as "**message_en_CA.properties**". The files are in package–specific subdirectories and may appear in the plug-in itself or one of its fragments. Each translated properties file may be partial since lookup of keys accesses a well–defined chain of properties files.

The plugin.properties mechanism

The mechanism used to translate plugin.properties files uses the Java resource bundles naming convention. However the files must be located in the root of the plug-in or in the root of a fragment of this plug-in. The same rules apply to the translation of MANIFEST.MF.

Defining NL fragments

The shape of NL fragments has evolved slightly since 2.1. Previously all translation files (including the plugin.properties) were provided in a jar. This was inconsistent since the plugin.properties file was provided at the root of the plug-in.

To adapt your NL fragment to the new model, remove the plugin.properties translation files from the jar and put them at the root of the fragment as siblings of fragment.xml. For example, the new shape of the NL fragment for org.eclipse.ui.workbench is the following:

```
org.eclipse.ui.workbench.nl/
    fragment.xml
    plugin_fr.properties
    plugin_pt_BR.properties
```

...
n11.jar

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Plug-ins and fragments

Features are described in terms of the plug-ins that comprise them. This means that plug-ins are the fundamental unit for packaging function.

While features are organized for the purposes of distributing and updating products, plug-ins are organized to facilitate the development of the product function among the product team. The development team determines when to carve up program function into a separate plug-in.

Plug-ins are packaged in a plug-in archive file and described using a plug-in manifest file, **plugin.xml**.

Plug-in **fragments** are separately packaged files whose contents are treated as if they were in the original plug-in archive file. They are useful for adding plug-in functionality, such as additional national language translations, to an existing plug-in after it has been installed. Fragments are ideal for shipping function that may trail the initial product release, since they can be used to add function without repackaging or reinstalling the original plug-in. When a fragment is detected by the platform, its contents are merged with the function in the original plug-in. In other words, if you query the platform plug-in registry, you would see the extensions and other function provided in the fragment as if it was in the original plug-in.

Fragments are described using a fragment manifest file, **fragment.xml**. It is similar to the plug-in manifest file. Since a fragment shares many properties with its plug-in, some attributes in the plug-in manifest are not valid, such as the plug-in class and plug-in imports.

Plug-in archive files can contain plug-ins or fragments.

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Plug-in Archives

Plug-ins and plug-in fragments are individually packaged as separate Java .jars. Standard Java jar facilities are used for constructing plug-in archives. There is no distinction made between a plug-in archive containing a plug-in and one containing a plug-in fragment.

The recommended convention for naming the plug-in archives is
`<id>_<version>.jar`

Where `<id>` is the plug-in or fragment identifier and `<version>` is the full version identifier contained in the respective `plugin.xml` or `fragment.xml`. Note that this is a recommended convention that minimizes chance of collisions, but is not required by the Eclipse architecture. For example, the following are valid plug-in archive names

```
org.eclipse.platform_1.0.3.jar
org.eclipse.ui.nl_2.0.jar
my_plugin.jar
```

Internally, each plug-in archive packages all the relevant plug-in or fragment files relative to its plug-in or fragment directory (but not including the directory path element). The archive has the following structure

```
plugin.xml *OR* fragment.xml
other plug-in or fragment files and subdirectories
META-INF/
    Java jar manifest and security files
```

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Product installation guidelines

The platform provides standard tools for updating and extending products. In order to participate in the platform mechanisms for updating and extending products, your packaged product should follow the following guidelines. This will allow your product to peacefully coexist with, or even enhance, other Eclipse based products.

Consider again the sample directory structure for the acmeweb product:

```
acmeweb/
acmeweb.exe
eclipse/
.eclipseproduct
eclipse.exe
    startup.jar
    install.ini
    .config/
        platform.cfg
    jre/
    features/
com.example.acme.acmefeature_1.0.0/
    feature.xml
    org.eclipse.platform_2.0.0/
    org.eclipse.platform.win32_2.0.0/
    ...
```

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```
plugins/
  com.example.acme.acmefeature_1.0.0/
    plugin.xml
    about.ini
    about.html
    about.mappings
    about.properties
    acme.gif
    plugin_customization.ini
    splash.jpg
    welcome.xml
  com.example.acme.acmewebsupport_1.0.0/
  org.eclipse.platform_2.0.0/
  ...
links/
  ...
```

Where did these files come from? Let's look at the product content from the perspective of the development team. The installed files can be grouped into five main categories:

- top-level product files (such as the `acmeweb.exe`)
- product features and plug-ins
- the Eclipse platform itself
- the Java runtime environment (JRE)
- files generated by the installation process itself

A proper installation script will produce the appropriate directory structure by doing the following:

- allow the user to specify the top level directory of the install (such as `c:\acmeweb`. We will refer to it as **acmeweb** for the remaining steps.)
- ensure that a product is not already installed in the location
- copy the files as follows:
 - ◆ Top-level product files are copied to **acmeweb**
 - ◆ Eclipse files are copied to **acmeweb/eclipse** using the expected feature and plugin directory structures
 - ◆ JRE files are copied to **acmeweb/eclipse/jre**. If a JRE is already located elsewhere, then the application shortcut should be setup to invoke eclipse with the `-vm` command line argument so that the location of the JRE is known by the platform
 - ◆ Product features and plug-ins are copied to **acmeweb/eclipse/features** and **acmeweb/eclipse/plugins**
- create a marker file, **.eclipseproduct**, in **acmeweb/eclipse**. The marker file is a **java.io.Properties** format file that indicates the name, id, and version of the product.
- store any necessary install info (user, license, date) that is to be shown in the about dialog in **acmeweb/eclipse/plugins/com.example.acmefeature_1.0.0/about.mappings**
- replace the **acmeweb/eclipse/install.ini** with one that sets the property **feature.default.id** to the product's primary feature
- invoke the product executable using the `-initialize` option. This causes the platform to quietly perform all time-consuming first-time processing and cache the results, so that when the user starts the product it comes up promptly in an open-for-business state.

Multi-user issues

When a product is installed for the intention of allowing multiple users, care must be taken to separate

individual users' data (such as the **workspace** directory) from the shared product install directory.

Uninstall issues

When a product is uninstalled, the following concepts are important.

- **all** files in the **eclipse/features** and **eclipse/plugins** directories should be removed, even if they weren't originally installed by the installation program. This ensures that files added by the platform update manager are removed when the product is removed.
- except for the point above, **only** those files installed by the installation program in other directories should be removed. It is important to preserve any important data, such as the **workspace** directory, so that reinstalling the product after an uninstall will produce expected results.

Reinstalling the product

When the product is already installed, the installer should allow a service update or upgrade if one is available. The existence of the product can be confirmed by looking for **acmeweb/eclipse/.eclipseproduct**. The information in this marker file can be used to confirm with the user that the correct product is being updated. The availability of updates can be confirmed with pattern matches against feature names. For example, the presence of **acmeweb/eclipse/plugins/com.example.acmefeature_1.0.1** would indicate that the 1.0.1 version update had already been applied to the product.

Once the validity of the reinstall is established, the install program should copy or replace files as needed. If the version of the underlying Eclipse platform has not changed, there is a good chance that complete directories can be ignored. The version numbers appended to the platform features and plugins can be used to determine whether any changes underneath a plug-in or feature's directory are necessary.

Additional information on installing products can be found in [How to write an Eclipse installer](#).

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How to write an Eclipse installer

Last modified 15:20 Friday June 18, 2004

Eclipse-based products need to be correctly installed on the end user's computer. Special-purpose packaging tools, such as [InstallShield](#) and [RPM](#), are often used to build executable installers that automate installing, updating, and uninstalling. This note describes how to write an installer for an Eclipse-based product, and for separately-installable extensions to Eclipse-based products.

We assume that a product development team is responsible for providing the raw ingredients that will need to find their way to end users' computers packaged as an executable installer. The creation of executable installers is scripted, as are the install time actions needed to interact with the end user and deposit files on their computer. This note described in detail what these installers need to do and how they should work.

This note should be treated as a recipe for the person responsible for writing an installer for an Eclipse-based products. Two good reasons why we recommend all installers writers follow our recipe:

- **Product and extension interoperability.** By behaving in standard ways, an installer for one Eclipse-based product or extension automatically works with products and extensions laid down by other installers. Otherwise the idiosyncrasies of one product's installer would require matching quirks in all extension installers that expected to work with that product.
- **Uniformity of install time user interaction.** All installers for Eclipse-based products and extension should interact with the user in the same manner. There is nothing to having gratuitous variety in this matter.

Product installer creation script

A product installer should be self-contained – the kind of thing that could be distributed on a CD and installed on any machine with a suitable operating system.

Eclipse requires a Java2 Java Runtime Environment (JRE) to run Java code. JREs are licensed software, obtained from Java vendors. With a license to redistribute a JRE from a JRE vendor, a company can include a JRE with its product, and install it on the end user's computer at the same time as the product. The alternative is to require that a JRE be pre-installed on the end user's computer, and associated with at product install time. One way or the other, an Eclipse-based product requires a suitable JRE, and the product installer must play a role in either installing a JRE or locating and linking to a pre-existing JRE.

Assume that a JRE is to be installed with the product. A directory containing the JRE is one input to the installer creation script. Denote this directory `<JRE>`. This directory must have a standard JRE directory structure, with the Java executable is located at `jre/bin/java.exe` and the class library at `jre/lib/rt.jar` below the `<JRE>` directory. For reference, the skeletal structure of this directory looks like:

```
<JRE>/
  jre/
    bin/
      java.exe
    lib/
      rt.jar
```

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There are additional files (and subdirectories) in these directories; we've only shown a sample to give the general structure. Italicized names in italics are product-specific.

The second input to the installer creation script is a directory, *<product head>*, containing the product-specific executable launcher and any files unrelated to Eclipse. For reference, the skeletal structure of this directory would look like (italics indicate file names that will vary from product to product):

```
<product head>/  
  acmeproduct.exe
```

The third input to the installer creation script is a directory, *<product body>*, containing the features and plug-ins developed for the product. For reference, the skeletal structure of this directory would look like:

```
<product body>/  
  eclipse/  
    features/  
      com.example.acme.acmefeature_1.0.0/  
        feature.xml  
      com.example.acme.otherfeature_1.0.0/  
        feature.xml  
    plugins/  
      com.example.acme.acmefeature_1.0.0/  
        plugin.xml  
        about.ini  
        about.properties  
        about.mappings  
        plugin_customization.ini  
        splash.bmp  
      com.example.acme.otherfeature_1.0.0/  
        plugin.xml  
        about.ini  
        about.properties  
        about.mappings  
      com.example.acme.myplugin_1.0.0/  
        plugin.xml  
        myplugin.jar  
      com.example.acme.otherplugin_1.0.0/  
        plugin.xml  
        otherplugin.jar
```

The fourth input to the installer creation script is a directory, *<platform>*, containing the features and plug-ins for the Eclipse platform itself and any third-party tools being included. This directory also includes the standard Eclipse executable launcher, *eclipse.exe*, (named *eclipse* on Unix operating environment), its companion *startup.jar*, and any other Eclipse platform files required to be at the root of the install. For reference, the skeletal structure of this directory would look like:

```
<platform>  
  eclipse/  
    eclipse.exe  
    startup.jar  
    features/
```

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```
org.eclipse.platform_2.0.0/  
org.eclipse.platform.win32_2.0.0/  
org.eclipse.jdt_2.0.0/  
org.eclipse.pde_2.0.0/  
plugins/  
  org.eclipse.platform_2.0.0/  
  org.eclipse.core.runtime_2.0.0/  
  org.eclipse.core.boot_2.0.0/  
  org.eclipse.core.resources_2.0.0/  
  org.eclipse.ui_2.0.0/  
  org.eclipse.jdt_2.0.0/  
  org.eclipse.jdt.core_2.0.0/  
  org.eclipse.jdt.ui_2.0.0/  
  org.eclipse.pde_2.0.0/  
  org.eclipse.pde.core_2.0.0/  
  org.eclipse.pde.ui_2.0.0/  
  (more org.eclipse.* plug-in directories)
```

The exact contents of the `<JRE>`, `<product head>`, `<product body>`, and `<platform>` input directories determine what files will eventually be installed on the end user's computer.

The final inputs to the installer creation script are the id and version strings for the product's primary feature; e.g., `"com.example.acme.acmefeature"`, and `"1.0.0"`; and the name of the product executable; e.g., `"acmeproduct.exe"`. For products that do not require their own product executable, this would be the path of the standard Eclipse executable launcher `"eclipse/eclipse.exe"`. These strings have special significance to the installer, appearing in file and directory names, and in the contents of marker files created at install time.

At install time, the installer should behave in the standard manner (further details follow the list of steps):

1. warn user to exit all programs
2. introduce the product to be installed
3. if appropriate, ask the user for the name of the registered owner and for the license key
4. display the product's licensing agreement and ask the user to accept
5. recommend a location on the disk to install the product (but allow user to override this default)
6. check that a product or extension is not already stored at the specified location
7. ask user to confirm all details of the install
8. create marker file to mark root of product install
9. copy files to disk (see below)
10. if appropriate, insert name of registered owner and license key into the "about " description
11. create a desktop shortcut to run the product executable
12. create an appropriate entry to allow the user to uninstall the product
13. launch the product executable with `-initialize` option to perform all first-time processing
14. offer to show the product release notes ("readme" file)

If the location specified in step 5 is `<install>`, the installer copies all the files in the `<JRE>`, `<platform>`, `<product>`, and `<product plug-ins>` directories into `<install>`.

Input file	Installed file
<code><JRE>/*</code>	<code><install>/eclipse/</code> *

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<code><product head>/*</code>	<code><install>/*</code>
<code><product body>/*</code>	<code><install>/*</code>
<code><platform>/*</code>	<code><install>/*</code>

The marker file created in step 8 is `<install>/eclipse/.eclipseproduct` is used to mark a directory into which an Eclipse-based product has been installed, primarily for extension installers to locate. This marker file is a `java.io.Properties` format file (ISO 8859-1 character encoding with "\" escaping) and contains the following information that identifies the product to the user and distinguishes one Eclipse-based product from one another:

```
name=Acme Visual Tools Pro
id=com.example.acme.acmefeature
version=1.0.0
```

The values of the "id" and "version" property are inputs to the installer creation script; the name of the product is presumably known and hard-wired. (Products would not ordinarily access this marker file; only product and extension installers write or read it.)

Step 6 requires checking for an existing `<install>/eclipse/.eclipseproduct` or `<install>/eclipse/.eclipseextension` file. A product cannot be installed in exactly the same place as another product or extension.

After installing all files, the top-level structure of the install directory would contain the following files and subdirectories (and perhaps others):

```
<install>/
  acmeproduct.exe
  eclipse/
    .eclipseproduct
    eclipse.exe
    startup.jar
    features/
    plugins/
    jre/
```

If a product installer solicits license information from the user, such as the name of the registered owner and the license key, this information should make it into the product "about" dialog (step 10).

This is done by recording the user responses in the "about.mapping" file in the primary feature's plug-in. For example, at

```
<install>/plugins/com.example.acme.acmefeature_1.0.0/about.mapping. The "about.mapping" file may be pre-existing in the <product head> input, or may need to be created by the installer at install time. The keys are numbers; the value of the "n" key is substituted for the substring "{n}" in the "aboutText" property. For example, if a license key was field number 0, an "about.mapping" file containing a line like "0=T42-24T-ME4U-U4ME" should be created.
```

N.B. The "about.mapping" file is a `java.io.Properties` format file (ISO 8859-1 character encoding with "\" escaping). When the native character encoding at install time is different from ISO 8859-1, the installer is responsible for converting the native character encoding to Unicode and for adding "\" escapes where required. Escaping is required when the strings contain special characters (such as "\") or non-Latin

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characters. For example, field number 1 containing the first 3 letters of the Greek alphabet would be written "1=\u03B1\u03B2\u03B3".

At step 12, the product installer launches the product executable, *<install>/acmeproduct.exe*, with the special `-initialize` option [exact details TBD]. This causes the Eclipse platform to quietly perform all time-consuming first-time processing and cache the results, so that when the user starts the product it comes up promptly in an open-for-business state.

Uninstaller behavior

At uninstall time, the uninstaller should behave in the standard manner:

1. warn user to exit all programs, especially the product being uninstalled
2. ask user to confirm that the product is to be uninstalled
3. remove all installed files from the *<install>* directory, and **all** files in *<install>/eclipse/features* and *<install>/eclipse/plugins* including ones put there by parties other than this installer (e.g., by the Eclipse update manager)
4. remove desktop shortcut for the product executable
5. remove entry for product uninstaller
6. inform user of any files that were not removed

When the product is uninstalled, files deposited at install time should be deleted, along with updated features and plug-ins created by the Eclipse update manager. **Important:** At uninstall time, there may be other directories and files in the *<install>* directory, notably *<install>/eclipse/workspace/*, *<install>/eclipse/links/*, and *<install>/eclipse/configuration/*, that contain important data which must be retained when the product is uninstalled. The user must be able to uninstall and reinstall a product at the same location without losing important data.

Installer behavior when product already installed

When the product is already installed on the user's computer, the installer should allow a service update or version upgrade to be applied to the installed product.

At install time, the installer should behave in the standard manner:

1. warn user to exit all programs, especially the product being updated
2. locate the installed product to be updated, if necessary by searching the disk for an existing product install or by allowing the user to locate it
3. determine where this installer is a compatible update
4. if appropriate, ask the user for the name of the registered owner and for the license key
5. display the product's updated licensing agreement and ask the user to accept
6. ask user to confirm all details of the update
7. update files to disk (see below)
8. if required, alter the desktop shortcut to run the product executable
9. should add modified or newly added files to the list of ones to be removed at uninstall time (where feasible)
10. offer to show the product release notes ("readme" file)

In step 2, an installed product can be recognized by the presence of an "eclipse" directory immediately containing a file named ".eclipseproduct". The parent of the "eclipse" directory is a product's install

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directory; i.e., `<install>/eclipse/.eclipseproduct`. The information contained within this marker file should be shown to the user for confirmation that the correct product is being updated (there may be several Eclipse-based product on the user's computer).

The installer should perform compatibility checks in step 3 by simple pattern matching against subdirectories in the `<install>/eclipse/features` directory. For example, the presence of a folder matching `"com.example.acme.otherfeature_1.0.1"` would ensure that a certain service update had been applied to the installed product.

For step 7, the installer may delete or replace any of the files that it originally installed, and add more files. **Important:** Several files and directories, including `<install>/eclipse/workspace/`, `<install>/eclipse/configuration`, may be co-located with the install and contain important data files which need to be retained when the product is upgraded.

In upgrade situations, there is a good chance that most of the files below `<install>/eclipse/plugins/` are the same (likewise for `<install>/eclipse/features/`). There is significant opportunity for optimization in `<install>/eclipse/plugins/` since the sub-directory name, which embeds the plug-in (or fragment) version number, changes if and only if any of the files below it change. In other words, there is no need to touch any files in `<install>/eclipse/plugins/org.eclipse.ui_2.0.0/` if this sub-directory should also exist after the upgrade; if any of the plug-in's files were to change, the plug-in's version number is revised, causing the files for the upgraded plug-in to be installed in a parallel directory `<install>/eclipse/plugins/org.eclipse.ui_2.0.1/`.

Associating a JRE installed elsewhere

The JRE is expected to be located at `<install>/eclipse/jre/bin/javaw.exe`. If it is located elsewhere, the absolute path should be specified using the `-vm` option on the command line; e.g., `-vm C:\j2jre1.3.0\jre\bin\javaw.exe`. In which case, the installer should add this option to the command line of the desktop shortcut it creates.

Extension installer creation script

By extension we mean a separately installable set of features and their plug-ins that can be associated with, and used from, one or more Eclipse-based products installed on the same computer. In contrast to a product, an extension is not self-contained; an extension does not include a product executable, the Eclipse platform, a JRE.

Without loss of generality, assume that an extension consists of a single feature. The first input to the installer creation script is a directory, `<extension>`, containing its feature and plug-ins. We are assuming that an extension has no files that are related to Eclipse; if it did, they would go in `<extension>/`, and not in `<extension>/eclipse/`. For reference, the skeletal structure of this directory would look like:

```
<extension>/
  eclipse/
    features/
      com.example.wiley.anvilfeature_1.0.0/
        feature.xml
    plugins/
      com.example.wiley.anvilfeature_1.0.0/
```

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```
plugin.xml
about.ini
about.properties
about.mappings
com.example.wiley.mainplugin_1.0.0/
com.example.wiley.otherplugin_1.0.0/
```

The exact contents of the `<extension>` input directory determines what files will eventually be installed on the end user's computer.

The final inputs to the installer creation script are the id and version strings for the extension's feature; e.g., `"com.example.wiley.anvil"` and `"1.0.0"`. These strings have special significance to the installer, appearing in file and directory names, and in the contents of marker files created at install time.

An extension installer is similar to a product installer in most respects. The areas where it differs are highlighted below:

At install time, the installer behaves in the standard manner:

1. warn user to exit all programs
2. introduce the extension to be installed
3. if appropriate, ask the user for the name of the registered owner and for the license key
4. display the extension's licensing agreement and ask the user to accept
5. recommend a location on the disk to install the extension (but allow user to override this default)
6. check that a product or a different extension is not already stored at the specified location
7. ask user which product(s) to use this extension (search disk; browse; or skip)
8. optionally, determine if extension is compatible with selected products
9. ask user to confirm all details of the install
10. create marker file to mark root of extension install
11. copy files to disk (see below)
12. insert name of registered owner and license key into the "about " description
13. create an appropriate entry to allow the user to uninstall the extension
14. write link file in each of the selected products to associate extension with product
15. offer to show the extension release notes ("readme" file)

If the location specified in step 5 is `<install>`, the installer copies all the files in the `<extension>` directory into `<install>` in step 11.

Input file	Installed file
<code><extension>/*</code>	<code><install>/*</code>

For step 7, any Eclipse product might be a candidate. Eclipse-based product can be recognized by the presence of a `<product install>/eclipse/.eclipseproduct` file; the user should be able to request a limited disk search for installed products (a "search for installed products" button), or would navigate to a directory containing a product (i.e., a "browse" button).

The installer should perform compatibility checks in step 8 by simple pattern matching against subdirectories in the `<product install>/eclipse/features` directory. For example, the presence of a folder matching `"org.eclipse.jdt_2.*"` means that JDT is included in the installed product.

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The marker file created in step 10 is `<install>/eclipse/.eclipseextension` is used to mark a directory into which an Eclipse-based extension has been installed, primarily for extension installers to locate (analogous to a product's `.eclipseproduct` marker file). This marker file is a [java.io.Properties](#) format file (ISO 8859-1 character encoding with "\" escaping) and contains the following information that identifies the extension to the user and distinguishes one Eclipse-based extension from one another:

```
name=Wiley Anvil Enterprise Edition
id=com.example.wiley.anvilfeature
version=1.0.0
```

The values of the "id" and "version" property are inputs to the installer creation script; the name of the extension is presumably known and hard-wired. (Products would not ordinarily access this marker file; only product and extension installers write or read it.)

After installing all files, the top-level structure of the install directory would contain the following files and subdirectories:

```
<install>/
  eclipse/
    .eclipseextension
    features/
    plugins/
```

The only significant difference from a product installer is that an extension installer also creates link files in other Eclipse-based products already installed on the user's computer. (This saves the user from having to manually associate the new extension from within each product using the Eclipse update manager.)

The link file created in step 14 is `<product`

`install>/eclipse/links/com.example.wiley.anvilfeature.link`; that is, the file has the same name of as the extension's feature directory less the version number suffix. A link file is a [java.io.Properties](#) format file (ISO 8859-1 character encoding with "\" escaping). The key is "path" and the value is the absolute path of the installed extension, `<install>`; e.g., an entry might look like "path=C:\\Program Files\\Wiley\\Anvil". The installer is responsible for converting from native character encoding to Unicode and adding "\" escapes where required. Escaping is usually required since `<install>` typically contains special characters (such as "\") and may mention directories with non-Latin characters in their names. The product reads link files when it starts up. The installer keeps a record of any link files it creates so that they can be located when the extension is updated or uninstalled.

Uninstaller behavior

At an install time, the un installer should behave in the standard manner:

1. warn user to exit all programs, especially products using the extension being uninstalled
2. ask user to confirm that the extension is to be un installed
3. remove all installed files from the `<install>` directory, and **all** files in `<install>/eclipse/features` and `<install>/eclipse/plugins` including ones put there by parties other than this installer (e.g., by the Eclipse update manager)
4. if feasible, remove the link file from any products to which it had been added
5. remove entry for extension uninstaller
6. inform user of any files that were not removed

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When an extension is uninstalled, all plug-in and feature files should be deleted; there are no important data files to be kept in these subdirectories. This allows the user to uninstall an extension completely, including any updates applied by the Eclipse update manager.

Installer behavior when extension already installed

When the extension is already installed on the user's computer, the installer should allow a service update or version upgrade to be applied to the installed extension.

At install time, the installer should behave in the standard manner:

1. warn user to exit all programs, especially products using the extension being updated
2. locate the installed extension to be updated, if necessary by searching the disk for an existing extension install or by allowing the user to locate it
3. determine where this installer is a compatible update
4. if appropriate, ask the user for the name of the registered owner and for the license key
5. display the product's updated licensing agreement and ask the user to accept
6. ask user to confirm all details of the update
7. update files on disk (see below)
8. should add modified or newly added files to the list of ones to be removed at uninstall time (where feasible)
9. offer to show the extension release notes ("readme" file)

In step 2, an installed extension can be recognized by the presence of an "eclipse" directory immediately containing a file named ".eclipseextension". The parent of the "eclipse" directory is an extension's install directory; i.e., `<install>/eclipse/.eclipseextension`. The information contained within this marker file should be shown to the user for confirmation that the correct extension is being updated (there may be several Eclipse-based extension on the user's computer).

For step 7, the installer should not delete or overwrite any of the files that it originally installed; rather, it should only add the files for new versions of features and plug-in, and possibly rewrite the marker file `<install>/eclipse/.eclipseextension`. Leaving the old versions around gives the user the option to back out of the update. As with upgrading a product install, there is no need to touch any files in `<install>/eclipse/plugins/com.example.wiley.otherplugin_1.0.0/` if this sub-directory should also exist after the upgrade; if any of the plug-in's files were to change, the plug-in's version number is revised, causing the files for the upgraded plug-in to be installed in a parallel directory `<install>/eclipse/plugins/com.example.wiley.otherplugin_1.0.1/`.

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Product extensions

An **extension** is a set of Eclipse features and plug-ins that are designed to extend the functionality of already-installed Eclipse based products. Extensions are installed separately, but used only in conjunction with other Eclipse based products. This means that an extension does not need to install a JRE, the Eclipse platform, or a primary feature. The recommended directory structure for extensions allows a single installation to be used with multiple Eclipse based products.

The following directory structure shows how an extension for a hypothetical product, **betterwebs**, could be used to extend the function of the **acmeweb** product.

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```
betterwebs/  
eclipse/                (directory for installed Eclipse files)  
.eclipseextension      (marker file)  
    features(installed features)  
com.example.betterwebs.betterfeature_1.0.0/  
    feature.xml  
    plugins/  
        com.example.betterwebs.betterfeature_1.0.0/  
            plugin.xml  
            about.html  
        com.example.betterwebs.betterwebsupport_1.0.0/
```

The relationship between an extension and the product that it is designed to enhance is set up in the **links** directory of the original product. Recall the following directory in the acmeweb product:

```
acmeweb/  
...  
eclipse/                (directory for installed Eclipse files)  
...  
    jre/  
    features(installed features)  
    ...  
    plugins/  
    ...  
    links/  
        com.example.betterwebs.betterfeature.link
```

When an extension is installed, it creates a link file in the **links** directory of any product that it is intending to extend. This link file makes the original product aware of the existence of the extension.

Installing and uninstalling extensions

The install process for extensions is similar to that for products except for the following differences:

- Determine which already–installed product is to be extended (by asking the user or searching the computer for the appropriate marker file)
- Create an **.eclipseextension** marker file (instead of an **.eclipseproduct** marker file). The format and content are similar to the product markers.
- Create a link file for the extension and write it into the **links** directory of the associated product. The link file has the same name as the extension's feature directory without the version suffix. The link file is a **java.io.Properties** format file which defines the path to the installed extension.

The uninstall process for extensions is similar to that for products except that the uninstall must remove the link file from any products where it added one.

Additional information on installing extensions can be found in [How to write an Eclipse installer](#).

A product extension can be "softly" linked to an eclipse installation by using the update manager: open **Help > Software Updates > Manage Configuration** and click on the "Add an extension location" link on the right pane.

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Updating a product or extension

By following the prescribed procedures for packaging and installing products, we can take advantage of the **platform update manager**, which treats products and extensions in a uniform way and allows users to discover and install updated versions of products and extensions.

Before looking at the implementation of such a server, it's important to revisit some important concepts:

- The platform provides a framework for defining **features** and update **sites**. The platform itself defines a concrete implementation of features and sites. This concrete implementation is what allows the update server to upgrade and install additional features.
- The platform **update server** can be used to **update** products by installing new versions of features. It can also be used to **install** or **update** extensions by adding or upgrading features. This is only possible for products and extensions that conform to the platform's concrete implementation of features and sites and conform to the appropriate install guidelines.
- Developers are free to use native installers and uninstallers to upgrade their own products and extensions without regard to sites and the update manager.

That said, what do we do if we want to fully participate in the platform update support as defined by the default implementation?

Feature and plug-in packaging

The previous example product and extension directory structures show how features and plug-ins are laid out once they are installed. In order to install features using the update server, the features must be packaged in a feature archive file. This is described in [Feature Archive Files](#).

Plug-ins and fragments must be packaged according to the format described in [Plug-in Archive Files](#).

Update server layout

The update server must be a URL-accessible server with a fixed layout. The list of available features and plug-ins provided by the server is described in a site map file, **site.xml**. The update server URL can be specified a full URL to the site map file, or a URL of a directory path containing the site map. The site map file contains a list of all the available features and the location of the feature archives on the server. It also describes the locations of the plug-in archives that are referenced in the feature manifest.

A simple site layout for our example web product and extension could look something like this:

```
<site root>/
  site.xml
  features(contains feature archive files)
    com.example.acme.acmefeature_1.0.1.jar
    com.example.betterwebs.betterfeature_1.0.1.jar
    ...
  plugins(contains plug-in archive files)
    com.example.acme.acmefeature_1.0.1.jar
    com.example.acme.acmewebsupport_1.0.3.jar
    com.example.betterwebs.betterfeature_1.0.1.jar
    com.example.betterwebs.betterwebsupport_1.0.1.jar
    ...
```


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The complete definition for the site map is described in [Update Server Site Map](#).

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Update server site map

The default Eclipse update server is any URL-accessible server. The default implementation assumes a fixed-layout server. The content of the server (in terms of available features and plug-ins) is described in a site map file, *site.xml*. This file can be manually maintained, or can be dynamically computed by the server.

Site Map

The update server URL can be specified as a full URL to the site map file, or a URL of a directory path containing the site map file (similar to index.html processing). The site map *site.xml* format is defined by the following dtd:

```
<?xml encoding="ISO-8859-1"?>

<!ELEMENT site (description?, feature*, archive*, category-def*)>
<!ATTLIST site
  type          CDATA #IMPLIED
  url           CDATA #IMPLIED
>

<!ELEMENT description (#PCDATA)>
<!ATTLIST description
  url           CDATA #IMPLIED
>

<!ELEMENT feature (category*)>
<!ATTLIST feature
  type          CDATA #IMPLIED
  id            CDATA #IMPLIED
  version       CDATA #IMPLIED
  url           CDATA #REQUIRED
  patch        (false | true) false

  os           CDATA #IMPLIED
  nl           CDATA #IMPLIED
  arch         CDATA #IMPLIED
  ws           CDATA #REQUIRED
>

<!ELEMENT archive EMPTY>
<!ATTLIST archive
  path         CDATA #REQUIRED
  url         CDATA #REQUIRED
>

<!ELEMENT category EMPTY>
<!ATTLIST category
  name        CDATA #REQUIRED
>
```

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```
<!ELEMENT category-def (description?)>
<!ATTLIST category-def
  name          CDATA #REQUIRED
  label         CDATA #REQUIRED
>
```

The element and attribute definitions are as follows:

- `<site>` – defines the site map
 - ◆ `type` – optional site type specification. The value refers to a type string registered via the install framework extension point. If not specified, the type is assumed to be the default Eclipse site type (as specified in this document).
 - ◆ `url` – optional URL defining the update site baseline URL (used to determine individual `<feature>` and `<archive>` location). Can be relative or absolute. If relative, is relative to `site.xml`. If not specified, the default is the URL location of the `site.xml` file.
- `<description>` – brief description as simple text. Intended to be translated.
 - ◆ `url` – optional URL for the full description as HTML. The URL can be specified as absolute or relative. If relative, is relative to `site.xml`.

Note, that for NL handling the URL value should be separated to allow alternate URLs to be specified for each national language.

- `<feature>` – identifies referenced feature archive
 - ◆ `type` – optional feature type specification. The value refers to a type string registered via the install framework extension point. If not specified, the type is assumed to be the default feature type for the site. If the site type is the default Eclipse site type, the default feature type is the packaged feature type (as specified in this document).
 - ◆ `id` – optional feature identifier. The information is used as a performance optimization to speed up searches for features. Must match the identifier specified in the `feature.xml` of the referenced archive (the `url` attribute). If specified, the `version` attribute must also be specified.
 - ◆ `version` – optional feature version. The information is used as a performance optimization to speed up searches for features. Must match the version specified in the `feature.xml` of the referenced archive (the `url` attribute). If specified, the `id` attribute must also be specified.
 - ◆ `url` – required URL reference to the feature archive. Can be relative or absolute. If relative, it is relative to the location of the `site.xml` file. **Note:** the default site implementation allows features to be accessed without being explicitly declared using a `<feature>` entry. By default, an undeclared features reference is interpreted as `"features/<id>_<version>.jar"`. **Note:** for better lookup performance, always define the `id` and `version` attributes.
 - ◆ `patch` – optional attribute to denote that this is a patch (special type of feature). **Note:** for better lookup performance, always define this attribute.
 - ◆ `os` – optional operating system specification. A comma-separated list of os designators defined by Eclipse (see Javadoc for `org.eclipse.core.runtime.Platform`). Indicates this feature should only be installed on one of the specified os systems. If this attribute is not specified, the feature can be installed on all systems (portable implementation). This information is used as a hint by the installation and update support (user can force installation of feature regardless of this setting).
 - ◆ `arch` – optional machine architecture specification. A comma-separated list of architecture designators defined by Eclipse (see Javadoc for `org.eclipse.core.runtime.Platform`). Indicates this feature should only be installed on one of the specified systems. If this attribute is not specified, the feature can be installed on all systems (portable implementation). This information is used as a hint by the

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installation and update support (user can force installation of feature regardless of this setting).

- ◆ ws – optional windowing system specification. A comma-separated list of ws designators defined by Eclipse (see Javadoc for `org.eclipse.core.runtime.Platform`). Indicates this feature should only be installed on one of the specified ws systems. If this attribute is not specified, the feature can be installed on all systems (portable implementation). This information is used as a hint by the installation and update support (user can force installation of feature regardless of this setting).
- ◆ nl – optional locale specification. A comma-separated list of locale designators defined by Java. Indicates this feature should only be installed on a system running with a compatible locale (using Java locale-matching rules). If this attribute is not specified, the feature can be installed on all systems (language-neutral implementation). This information is used as a hint by the installation and update support (user can force installation of feature regardless of this setting).
- `<archive>` – identifies referenced "storage" archive (the actual files referenced via the `<plugin>` or `<data>` elements in the feature manifest). The site simply manages archives as a path-to-URL map. The default Eclipse site implementation does not require the `<archive>` section to be included in the site map (`site.xml`). Any archive reference not explicitly defined as part of an `<archive>` section is assumed to be mapped to a url in the form "`<archivePath>`" relative to the location of the `site.xml` file.
 - ◆ path – required archive path identifier. This is a string that is determined by the feature referencing this archive and is not otherwise interpreted by the site (other than as a lookup token).
 - ◆ url – required URL reference to the archive. Can be relative or absolute. If relative, it is relative to the location of the `site.xml` file.
- `<category-def>` – an optional definition of a category that can be used by installation and update support to hierarchically organize features
 - ◆ name – category name. Is specified as a path of name tokens separated by /
 - ◆ label – displayable label. Intended to be translated.
- `<category>` – actual category specification for a feature entry

name – category name Note, that in general the `feature.xml` manifest documents should specify UTF-8 encoding. For example

```
<?xml version="1.0" encoding="UTF-8"?>
```

Translatable text contained in the `site.xml` can be separated into `site<_locale>.properties` files using Java property bundle conventions. Note that the translated strings are used at installation time (ie. do not employ the plug-in fragment runtime mechanism). The property bundles are located relative to the `site.xml` location.

Default Site Layout

```
<site root>/
  site.xml
  features/
    feature archives    (eg. org.eclipse.javatools_1.0.1.jar)
    <featureId>_<featureVersion>/    (optional)
    non-plug-in files for feature
  plugins/
    plug-in archives    (eg. org.eclipse.ui_1.0.3.jar)
```

Controlling Access

The default Eclipse site implementation provides support for http access with basic user authentication (userid and password).

Custom access control mechanisms can be added to base Eclipse in one of 2 ways:

- by supplying server-side logic on the update server (eg. implementing servlets that compute the site.xml map, and control access to individual archives based on some user criteria)
- by supplying a custom concrete implementation of the site object (installed on the client machine, update server specified `<site type=" ">`). The custom concrete site implementation, together with any server-side logic support the required control mechanisms.

Eclipse provides an example demonstrating an implementation of an access mechanism based on feature key files.

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Building a Rich Client Platform application

While the Eclipse platform is designed to serve as an open tools platform, it is architected so that its components could be used to build just about any client application. The minimal set of plug-ins needed to build a rich client application is collectively known as the **Rich Client Platform**.

Applications that don't require a common resource model can be built using a subset of the platform. These rich applications are still based on a dynamic plug-in model, and the UI is built using the same toolkits and extension points. The layout and function of the workbench is under fine-grained control of the plug-in developer in this case. Up until now, we've been adding all of our visible function to the platform SDK workbench. In a rich client application, we are responsible for defining the application and its workbench.

When we say that the Rich Client Platform is the minimal set of plug-ins needed to build a platform application with a UI, we mean that your application need only require two plug-ins, **org.eclipse.ui** and **org.eclipse.core.runtime**. However, rich client applications are free to use any API deemed necessary for their feature set, and can require any plug-ins above the bare minimum. The [Map of platform plug-ins](#) is a useful reference when determining what plug-ins should be required when using various platform API.

The main thing that differentiates a rich client application from the platform workbench is that the application is responsible for defining which class should be run as the main application. We'll look at how this is done in the context of an example.

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Eclipse Platform

Map of Platform Plug-ins

The Eclipse Platform provides basic support for plug-ins, resources, and the workbench.

The Eclipse Platform itself is divided up into a number of separate plug-ins. The following table shows which API packages are found in which plug-ins as of Eclipse 3.0. This table is useful for determining which plug-ins a given plug-in should include as prerequisites.

API Package	Required plug-in id	Notes
org.apache.tools.ant[.*]	org.apache.ant	
org.eclipse.ant.core[.*]	org.eclipse.ant.core	
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org.eclipse.variables	org.eclipse.variables	
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org.eclipse.ui.editors.text org.eclipse.ui.editors.text.templates org.eclipse.ui.texteditor (split)	org.eclipse.ui.editors	[6]
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org.eclipse.ui.contentassist org.eclipse.ui.texteditor (split) org.eclipse.ui.texteditor.link org.eclipse.ui.texteditor.quickdiff org.eclipse.ui.texteditor.templates	org.eclipse.ui.workbench.texteditor	[6]
org.eclipse.update.core[.*]	org.eclipse.update.core	
org.eclipse.update.configurator	org.eclipse.update.configurator	
org.eclipse.update.ui	org.eclipse.update.ui	

Note 1: Plug-ins needing access to the Eclipse runtime API must list `org.eclipse.core.runtime` (or `org.eclipse.core.runtime.compatibility`) as a prerequisite plug-in. `org.eclipse.core.runtime` re-exports API from the OSGi-specific plug-ins (e.g., `org.eclipse.osgi`). The OSGi plug-ins should never be explicitly listed as prerequisites.

Note 2: These pre-3.0 API packages are obsolete and have been moved to the `org.eclipse.core.runtime.compatibility` plug-in.

Note 3: Plug-ins needing access to the JFace API must list `org.eclipse.ui` as a prerequisite plug-in. `org.eclipse.ui` re-exports API from the JFace plug-in. The `org.eclipse.jface` plug-in should never be explicitly listed as a prerequisite.

Note 4: Some of the JFace text packages are split between the `org.eclipse.jface.text` and the `org.eclipse.text` plug-ins.

Note 5: Plug-ins needing access to the SWT API must list `org.eclipse.ui` as a prerequisite plug-in. `org.eclipse.ui` re-exports API from the SWT plug-in. The `org.eclipse.swt` plug-in should never be explicitly listed as a prerequisite.

Note 6: The `org.eclipse.ui.texteditor` package is split between the `org.eclipse.ui.editors` and the `org.eclipse.ui.workbench.texteditor` plug-ins.

Note 7: Plug-ins needing access to the Workbench UI API must list `org.eclipse.ui` as a prerequisite plug-in. `org.eclipse.ui` re-exports API from the `org.eclipse.ui.workbench` plug-in. The `org.eclipse.ui.workbench` plug-in should never be explicitly listed as a prerequisite.

Note 8: Some of the UI packages are split between the `org.eclipse.ui` and the `org.eclipse.ui.ide` plug-ins.

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The browser example

We will look at how to build a Rich Client Platform application by going through a simple web browser example. This example is not included in the R3.0 SDK, but can be downloaded from the project org.eclipse.ui.examples.rcp.browser. If you are working in Eclipse, you may simply check out the project from the Eclipse CVS repository (see the [Eclipse CVS How-To](#) if you are not familiar with the procedure for checking out projects from CVS).

To run the RCP Browser example from within the Eclipse SDK:

1. Load the project `org.eclipse.ui.examples.rcp.browser` from the Eclipse CVS repository.
2. Choose **Run>Run...** from the workbench menu bar and create a new "Run-time workbench" configuration named "Browser Example".
3. On the **Arguments** tab, select **Run a product** and select "`org.eclipse.ui.examples.rcp.browser.product`" from the drop-down.
4. On the **Plug-ins** tab, select **Choose plug-ins and fragments to launch from the list** so that you can select which plug-ins are needed.
5. Press **Deselect All** to start with a clean slate.
6. Check "`org.eclipse.ui.examples.rcp.browser`".
7. Press **Add Required Plug-ins**.
8. Check "`org.eclipse.update.configurator`".
9. Run or debug the new run configuration.



As you can see, it's hard to tell that this application has anything at all to do with Eclipse (apart from the default web site that it browses!). There is no resource navigator, no mention of the Eclipse Platform, and none of the familiar menu bar items from the platform workbench. (The few Eclipse-related features, such as the window icon, could also be reconfigured if desired.)

Hopefully this example helps clarify what's exciting about the Rich Client Platform. Let's take a look under the covers so we can learn what's involved in building one. We'll assume that you are familiar with the basic workbench extensions discussed in [Plugging into the workbench](#).

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Defining a rich client application

The definition of a rich client application plug-in starts out similarly to the other plug-ins we've been studying. The only difference in the first part of the markup is that the list of required plug-ins is much smaller than we've been used to!

```
<?xml version="1.0" encoding="UTF-8"?>
<?eclipse version="3.0"?>
<plugin
  id="org.eclipse.ui.examples.rcp.browser"
  name="%pluginName"
  version="3.0.0"
  provider-name="%providerName">

  <runtime>
    <library name="browser.jar">
    </library>
  </runtime>
  <requires>
    <import plugin="org.eclipse.core.runtime"/>
    <import plugin="org.eclipse.ui"/>
  </requires>
```

Up to now, we've contributed function to the platform workbench by declaring extensions that add elements to the workbench. In all of the `plugin.xml` content that we've reviewed so far, we've only looked at individual contributions to a workbench that is assumed to be there. On the rich client platform, there is no application already defined. Your rich client plug-in is the one responsible for specifying the class that should be executed when the platform is started. This is done in the [org.eclipse.core.runtime.applications](#) extension.

```
<extension
  point="org.eclipse.core.runtime.applications"
  id="app"
  name="%appName">
  <application>
    <run
      class="org.eclipse.ui.examples.rcp.browser.BrowserApp">
    </run>
  </application>
</extension>
```

In this extension, we specify the class that should be run when the platform is first started. This class must implement **IPlatformRunnable**, which simply means that it must implement a **run** method. The run method is responsible for creating the SWT display and starting up a workbench. The class **PlatformUI** implements convenience methods for performing these tasks.

```
public Object run(Object args) throws Exception {
    Display display = PlatformUI.createDisplay();
    try {
        int code = PlatformUI.createAndRunWorkbench(display,
new BrowserAdvisor());
        // exit the application with an appropriate return code
        return code == PlatformUI.RETURN_RESTART
            ? EXIT_RESTART
            : EXIT_OK;
    } finally {
        if (display != null)
            display.dispose();
    }
}
```

```

    }
}

```

The call to **createAndRunWorkbench** will not return until the workbench is closed. The SWT event loop and other low-level logistics are handled inside this method. At this stage, it's not so important that you understand the underlying mechanics in running an SWT application. This code can be copied to your rich client application with minimal changes. In fact, the hook for you to add your own functionality is the **WorkbenchAdvisor** that is passed as an argument when the workbench is created. Let's take a closer look.

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Customizing the workbench

The "entry point" for supplying custom workbench behavior is the designation of a **WorkbenchAdvisor** for configuring the workbench. Your rich client plug-in should extend this abstract class to provide the application-specific configuration for the workbench. The browser example does this using the **BrowserAdvisor** class.

```

...
    int code = PlatformUI.createAndRunWorkbench(display,
new BrowserAdvisor());
...

```

A workbench advisor is responsible for overriding methods to configure the workbench with its desired layout and features, such as the action bar items or intro page.

The workbench life-cycle

Life-cycle methods provided by the workbench advisor allow your application to hook into the creation of the workbench at any point in time and influence the behavior. The following list of advisor life-cycle methods that can be overridden comes from the javadoc for **WorkbenchAdvisor**.

- `initialize` – called first; before any windows; use to register things
- `preStartup` – called second; after initialize but before first window is opened; use to temporarily disable things during startup or restore
- `postStartup` – called third; after first window is opened; use to reenables things temporarily disabled in previous step
- `postRestore` – called after the workbench and its windows have been recreated from a previously saved state; use to adjust the restored workbench
- `preWindowOpen` – called as each window is being opened; use to configure aspects of the window other than action bars
- `fillActionBars` – called after `preWindowOpen` to configure a window's action bars
- `postWindowRestore` – called after a window has been recreated from a previously saved state; use to adjust the restored window
- `postWindowCreate` – called after a window has been created, either from an initial state or from a restored state; used to adjust the window
- `openIntro` – called immediately before a window is opened in order to create the introduction component, if any.
- `postWindowOpen` – called after a window has been opened; use to hook window listeners, etc.
- `preWindowShellClose` – called when a window's shell is closed by the user; use to pre-screen window closings

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- `eventLoopException` – called to handle the case where the event loop has crashed; use to inform the user that things are not well
- `eventLoopIdle` – called when there are currently no more events to be processed; use to perform other work or to yield until new events enter the queue
- `preShutdown` – called just after event loop has terminated but before any windows have been closed; allows the application to veto the shutdown
- `postShutdown` – called last; after event loop has terminated and all windows have been closed; use to deregister things registered during initialize

As you can see, a rich client application has a lot of control over how the workbench is configured and implemented. In the browser example, the primary function of the **BrowserAdvisor** is to configure the action bars with menu items appropriate for a browser. This is done in the **fillActionBars** method:

```
public void fillActionBars(IWorkbenchWindow window, IActionBarConfigurer configurator, int
    ...
    BrowserActionBuilder builder = new BrowserActionBuilder(window);
    getWorkbenchConfigurer().getWindowConfigurer(window).setData(BUILDER_KEY, builder);
    builder.fillActionBars(configurator, flags);
}
```

In this method, the workbench is configured with a specialized action builder. This action builder is used to fill the action bars of the workbench. We'll look at the details for how the actions are specified in [Defining the actions](#). For now, we are focusing on how we configure the workbench.

Note the use of the `getWorkbenchConfigurer()` method above. The **IWorkbenchConfigurer** and **IWorkbenchWindowConfigurer** are used in conjunction with the **WorkbenchAdvisor** to customize the window. These classes allow you to override many aspects of workbench creation at different levels. For example, the **IWorkbenchWindowConfigurer** defines protocol that assumes a particular configuration of controls in the workbench window, such as an action bar, status line, perspective bar, cool bar, etc. Its protocol allows you to customize and populate these items. The **IWorkbenchConfigurer** operates at a higher level, allowing you to store application-specific data with the workbench. The **WorkbenchAdvisor** provides access to these configurers in the life-cycle methods noted above. Lower level methods inside **WorkbenchAdvisor** may be overridden to completely replace default behavior. For example, your workbench advisor could override the method that creates the SWT controls in the window in order to provide a completely different implementation for the main window.

In other words, there are many ways to customize the workbench and several different levels at which these techniques can be used. The javadoc for **WorkbenchAdvisor**, **IWorkbenchConfigurer**, and **IWorkbenchWindowConfigurer** includes a complete description of the available protocol. See also the complete implementation of **BrowserAdvisor** for comments on alternate implementations.

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Defining the actions

The primary customization provided by the **BrowserAdvisor** in the browser example is the designation of the action bar content for the workbench window:

```
public void fillActionBars(IWorkbenchWindow window, IActionBarConfigurer configurator, int
    ...
    BrowserActionBuilder builder = new BrowserActionBuilder(window);
    getWorkbenchConfigurer().getWindowConfigurer(window).setData(BUILDER_KEY, builder);
    builder.fillActionBars(configurator, flags);
```

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```
}
```

Let's take a closer look at how these actions are defined in the **BrowserActionBuilder**. In particular, let's look at the actions that are handled by the browser view.

```
private void makeActions() {
    ...
    backAction = new RetargetAction("back", "&Back");
    backAction.setToolTipText("Back");
    backAction.setImageDescriptor(images.getImageDescriptor(ISharedImages.IMG_TOOL_BACK));
    window.getPartService().addPartListener(backAction);

    forwardAction = new RetargetAction("forward", "&Forward");
    forwardAction.setToolTipText("Forward");
    forwardAction.setImageDescriptor(images.getImageDescriptor(ISharedImages.IMG_TOOL_FORWARD));
    window.getPartService().addPartListener(forwardAction);

    stopAction = new RetargetAction("stop", "Sto&p");
    stopAction.setToolTipText("Stop");
    window.getPartService().addPartListener(stopAction);

    refreshAction = new RetargetAction("refresh", "&Refresh");
    refreshAction.setToolTipText("Refresh");
    window.getPartService().addPartListener(refreshAction);
    ...
}
```

The actions are defined as retargetable actions so that individual views can implement the handler actions. The **BrowserView** associates its handler actions with the window's retargetable actions when it creates the controls for the view:

```
private Browser createBrowser(Composite parent, final IActionBars actionBars) {
    ...
    actionBars.setGlobalActionHandler("back", backAction);
    actionBars.setGlobalActionHandler("forward", forwardAction);
    actionBars.setGlobalActionHandler("stop", stopAction);
    actionBars.setGlobalActionHandler("refresh", refreshAction);
    ...
}
```

These actions are created when the view is first created.

```
private Action backAction = new Action("Back") {
    public void run() {
        browser.back();
    }
};
```

See [Retargetable actions](#) for a complete discussion of retargetable actions and how they are defined and implemented.

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Making UI contributions

So far, we've seen that the main difference between a rich client platform plug-in and an Eclipse SDK plug-in is that the rich client plug-in is responsible for specifying the class that should be run when the platform is started. This class creates and runs a workbench window that is configured appropriately. What else is different about a rich client application? Not much, actually.

Once the infrastructure for the application workbench is in place, the techniques for adding function to the workbench are the same as those we used when we were extending the platform SDK workbench. The workbench UI extension points are used to add views, editors, menus, and all of the other contributions we know and love. In the case of the browser example, we'll be adding extensions for a perspective and a couple of views.

We were introduced to these extensions in [Plugging into the workbench](#). For completeness, we'll take a look at how the browser example uses these extensions, but we'll assume that we already have a working knowledge of these concepts.

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Adding the perspective

When a rich client application uses the **WorkbenchAdvisor** as the primary means for customizing the workbench, it must supply a perspective that is shown in the workbench window. This perspective must be identified in the application's workbench advisor class. The following is specified in the **BrowserAdvisor** class:

```
public String getInitialWindowPerspectiveId() {
    return BrowserApp.BROWSER_PERSPECTIVE_ID;
}
```

While **BrowserApp** defines:

```
public static final String PLUGIN_ID = "org.eclipse.ui.examples.rcp.browser";
public static final String BROWSER_PERSPECTIVE_ID = PLUGIN_ID + ".browserPerspective";
```

The corresponding perspective is defined in the browser plug-in's manifest:

```
<extension
    point="org.eclipse.ui.perspectives">
    <perspective
        id="org.eclipse.ui.examples.rcp.browser.browserPerspective"
        name="%perspectives.browser.name"
        class="org.eclipse.ui.examples.rcp.browser.BrowserPerspectiveFactory"
        fixed="true"/>
    </extension>
```

The **BrowserPerspectiveFactory** is responsible for laying out the views appropriately.

```
public void createInitialLayout(IPageLayout layout) {
    layout.addView(BrowserApp.BROWSER_VIEW_ID, IPageLayout.RIGHT, .25f, IPageLayout.I
    layout.addPlaceholder(BrowserApp.HISTORY_VIEW_ID, IPageLayout.LEFT, .3f, IPageLay
    IViewLayout historyLayout = layout.getViewLayout(BrowserApp.HISTORY_VIEW_ID);
    historyLayout.setCloseable(true);
    layout.setEditorAreaVisible(false);
}
```



```
}
```

The browser perspective defines two views (one visible, with a placeholder for the other), and makes the editor area invisible. For a complete discussion of perspectives and their corresponding layout, see [Perspectives](#).

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Adding views

The browser example defines two views in its workbench. One view shows the browser content and the other displays the history of visited links. We first saw these views when they were added to the browser's perspective:

```
public void createInitialLayout(IPageLayout layout) {
layout.addView(BrowserApp.BROWSER_VIEW_ID, IPageLayout.RIGHT, .25f, IPageLayout.ID_EDITOR_AREA);
    layout.addPlaceholder(BrowserApp.HISTORY_VIEW_ID, IPageLayout.LEFT, .3f, IPageLayout.ID_EDITOR_AREA);
    IViewLayout historyLayout = layout.getViewLayout(BrowserApp.HISTORY_VIEW_ID);
    historyLayout.setCloseable(true);
    layout.setEditorAreaVisible(false);
}
```

The corresponding views are also defined in the browser plug-in's manifest:

```
<extension
    point="org.eclipse.ui.views">
    <category
        id="org.eclipse.ui.examples.rcp.browser"
        name="%views.category.name" />
    <view
        id="org.eclipse.ui.examples.rcp.browser.browserView"
        name="%views.browser.name"
        icon="icons/eclipse.gif"
        class="org.eclipse.ui.examples.rcp.browser.BrowserView"
        category="org.eclipse.ui.examples.rcp.browser"
        allowMultiple="true" />
    <view
        id="org.eclipse.ui.examples.rcp.browser.historyView"
        name="%views.history.name"
        icon="icons/eclipse.gif"
        class="org.eclipse.ui.examples.rcp.browser.HistoryView"
        category="org.eclipse.ui.examples.rcp.browser" />
</extension>
```

The **BrowserView** and **HistoryView** create the necessary SWT controls for showing the browser content and history. The implementation of these views is no different for rich client plug-ins, so we won't review them here. See the example classes and [org.eclipse.ui.views](#) for more information.

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OSGi Service Platform
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Other Reference Information

The following specifications, white papers, and design notes describe various aspects of the Eclipse Platform.

Basic platform information

- [Runtime options](#)
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Eclipse.org articles index

The eclipse corner site contains technical articles about many topics of interest. Check the index regularly for the latest technical information regarding Eclipse.

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The Eclipse runtime options

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The Eclipse platform is highly configurable. Configuration input takes the form of command line arguments and System property settings. In many cases the command line arguments are simply short cuts for setting the related System properties. In fact, there are many more System property settings than command line arguments.

Command line arguments

Listed below are the command line arguments processed by various parts of the Eclipse runtime. Many of these values can also be specified using System properties either on the command line using `-D VM` arguments or by specifying their values in a `config.ini` file. Using this latter technique it is possible to customize your Eclipse without using command line arguments at all.

For each argument in the list, its corresponding System property key is given (in `{ }`). Also given is the Eclipse runtime layer in which the command line argument is processed (in `()`). This is useful for people replacing parts of the runtime to suit special needs.

- `-application <id>` (*Runtime*)
equivalent to setting `eclipse.application` to `<id>`
- `-arch <architecture>` (*OSGi*)
equivalent to setting `osgi.arch` to `<architecture>`
- `-clean` (*OSGi*) *NEW*
equivalent to setting `osgi.clean` to `"true"`
- `-configuration <location>` (*Main*)
equivalent to setting `osgi.configuration.area` to `<location>`
- `-console [port]` (*OSGi*) *NEW*
equivalent to setting `osgi.console` to `[port]` or the empty string if the default port is to be used (i.e., when the port is not specified)
- `-consoleLog` (*Runtime*)
equivalent to setting `eclipse.consoleLog` to `"true"`
- `-data <location>` (*OSGi*)
equivalent to setting `osgi.instance.area` to `<location>`
- `-debug [options file]` (*OSGi*)
equivalent to setting `osgi.debug` to `[options file]` or the empty string to simply enable debug (i.e., if the options file location is not specified)
- `-dev [entries]` (*OSGi*)
equivalent to setting `osgi.dev` to `[entries]` or the empty string to simply enable dev mode (i.e., if entries are not specified)
- `-endSplash <command>` (*Main*)
specifies the command to use to take down the splash screen. Typically supplied by the Eclipse executable.
- `-feature <feature id>` (*Runtime*)
equivalent to setting `eclipse.product` to `<feature id>`
- `-framework <location>` (*Main*) *NEW*
equivalent to setting `osgi.framework` to `<location>`
- `-initialize` (*Main*)

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initializes the configuration being run. All runtime related data structures and caches are refreshed. Any user/plugin-defined configuration data is not purged. No application is run, any product specifications are ignored and no UI is presented (e.g., the splash screen is not drawn)

- `-install <location> (Main)`
equivalent to setting `osgi.install.area` to `<location>`
- `-keyring <location> (Runtime)`
the location of the authorization database on disk. This argument has to be used together with the `-password` argument.
- `-nl <locale> (OSGi)`
equivalent to setting `osgi.nl` to `<locale>`
- `-noLazyRegistryCacheLoading (Runtime)`
equivalent to setting `eclipse.noLazyRegistryCacheLoading` to `"true"`
- `-noRegistryCache (Runtime)`
equivalent to setting `eclipse.noRegistryCache` to `"true"`
- `-noSplash (Executable, Main)`
controls whether or not the splash screen is shown
- `-os <operating system> (OSGi)`
equivalent to setting `osgi.os` to `<operating system>`
- `-password <password> (Runtime)`
the password for the authorization database
- `-pluginCustomization <location> (Runtime)`
equivalent to setting `eclipse.pluginCustomization` to `<location>`
- `-product <id> (OSGi) NEW`
equivalent to setting `eclipse.product` to `<id>`
- `-showSplash <command> (Main)`
specifies the command to use to show the splash screen. Typically supplied by the Eclipse executable.
- `-user <location> (OSGi) NEW`
equivalent to setting `osgi.user.area` to `<location>`
- `-vm <path to java executable> (Executable, Main) NEW`
when passed to the Eclipse executable, this option is used to locate the Java VM to use to run Eclipse. It must be the full filesystem path to an appropriate Java executable. If not specified, the Eclipse executable uses a search algorithm to locate a suitable VM. In any event, the executable then passes the path to the actual VM used to Java Main using the `-vm` argument. Java Main then stores this value in `eclipse.vm`.
- `-vmargs [vmargs*] (Executable, Main) NEW`
when passed to the Eclipse, this option is used to customize the operation of the Java VM to use to run Eclipse. If specified, this option must come at the end of the command line. Even if not specified on the executable command line, the executable will automatically add the relevant arguments (including the class being launched) to the command line passed into Java using the `-vmargs` argument. Java Main then stores this value in `eclipse.vmargs`.
- `-ws <window system> (OSGi)`
equivalent to setting `osgi.ws` to `<window system>`

Obsolete command line arguments

The following command line arguments are no longer relevant or have been superseded and are consumed by the runtime and not passed on to the application being run to maintain backward compatibility. .

- `-boot`
see `-configuration`

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-classLoaderProperties
no longer relevant

-firstUse
no longer relevant

-newUpdates
no longer relevant

-noPackagePrefixes
no longer relevant

-noUpdate
no longer relevant

-plugins
no longer relevant

-update
no longer relevant

Others

The following command line arguments are defined by various Eclipse plug-ins and are only supported if the defining plug-in is installed, resolved and activated.

-noVersionCheck (workbench)
<description>

-perspective (workbench)
<description>

-refresh (org.eclipse.core.resources)
<description>

-showLocation (org.eclipse.ui.ide.workbench)
<description>

-allowDeadlock
<description>

System properties

The following System properties are used by the Eclipse runtime. Note that those starting with "osgi" are specific to the OSGi framework implementation while those starting with "eclipse" are particular to the Eclipse runtime layered on top of the OSGi framework.

Many of these properties have command line equivalents (see the [command line arguments](#) section and the value in braces {}). Users are free to use either command line or property settings to specify a value.

Properties can be set in the following ways:

- use `-DpropName=propValue` as a VM argument to the Java VM
- set the desired property in the `config.ini` file in the appropriate configuration area

eclipse.application {-application}
the identifier of the application to run. The value given here overrides any application defined by the product (see [eclipse.product](#)) being run

eclipse.commands
sdf

eclipse.consoleLog

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if "true", any log output is also sent to Java's System.out (typically back to the command shell if any). Handy when combined with `-debug`

eclipse.debug.startupTime

the time in milliseconds when the Java VM for this session was started

eclipse.exitcode

<description>

eclipse.exitdata

<description>

eclipse.manifestConverter

the class name of the manifest converter class to use when converting legacy plugin.xml files to manifest.mf files

eclipse.noExtensionMunging

if "true", legacy registry extension are left as-is. By default such extensions are updated to use the new extension point ids found in Eclipse 3.0.

eclipse.noLazyRegistryCacheLoading {*-noLazyRegistryCacheLoading*}

if "true", the platform's plug-in registry cache loading optimization is deactivated. By default, configuration elements are loaded from the registry cache (when available) only on demand, reducing memory footprint. This option forces the registry cache to be fully loaded at startup.

eclipse.noRegistryCache {*-noRegistryCache*}

if "true", the internal extension registry cache is neither read or written

eclipse.pluginCustomization {*-pluginCustomization*}

the file system location of a properties file containing default settings for plug-in preferences. These default settings override default settings specified in the primary feature. Relative paths are interpreted relative to the current working directory for eclipse itself.

eclipse.product {*-product*}

the identifier of the product being run. This controls various branding information and what application is used.

eclipse.vm {*-vm*}

the path to the Java executable used to run Eclipse. This information is used to construct relaunch command lines.

eclipse.vargs {*-vargs*}

lists the VM arguments used to run Eclipse. This information is used to construct relaunch command lines.

osgi.adaptor

the class name of the OSGi framework adaptor to use.

osgi.arch {*-arch*}

see `-arch`

osgi.baseConfiguration.area

asf

osgi.bundles

The comma-separated list of bundles which are automatically installed and optionally started once the system is up and running. Each entry is of the form:

```
<URL | simple bundle location>[@ [<start-level>] [":start"]]
```

If the start-level (>0 integer) is omitted then the framework will use the default start level for the bundle. If the "start" tag is added then the bundle will be marked as started after being installed. Simple bundle locations are interpreted as relative to the framework's parent directory. The start-level indicates the OSGi start level at which the bundle should run. If this value is not set, the system computes an appropriate default.

osgi.clean

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if set to "true", any cached data used by the OSGi framework and eclipse runtime will be wiped clean. This will clean the caches used to store bundle dependency resolution and eclipse extension registry data. Using this option will force eclipse to reinitialize these caches.

osgi.configuration.cascaded

if set to "true", this configuration is cascaded to a parent configuration. See the section on [locations](#) for more details.

osgi.configuration.area {–configuration}

the configuration location for this run of the platform. The configuration determines what plug–ins will run as well as various other system settings. See the section on [locations](#) for more details.

osgi.configuration.area.default

the default configuration location for this run of the platform. The configuration determines what plug–ins will run as well as various other system settings. This value (i.e., the default setting) is only used if no value for the *osgi.configuration.area* is set. See the section on [locations](#) for more details.

osgi.console {–console}

if set to a non–null value, the OSGi console (if installed) is enabled. If the value is a suitable integer, it is interpreted as the port on which the console listens and directs its output to the given port. Handy for investigating the state of the system.

osgi.console.class

the class name of the console to run if requested

osgi.debug {–debug}

if set to a non–null value, the platform is put in debug mode. If the value is a string it is interpreted as the location of the .options file. This file indicates what debug points are available for a plug–in and whether or not they are enabled. If a location is not specified, the platform searches for the .options file under the install directory.

osgi.dev {–dev}

if set to the empty string, dev mode is simply turned on. This property may also be set to a comma–separated class path entries which are added to the class path of each plug–in or a URL to a Java properties file containing custom classpath additions for a set of plug–ins. For each plug–in requiring a customized dev time classpath the file will contain an entry of the form

```
<plug-in id>=<comma separated list of classpath entries to add>
```

where plug–in id "*" matches any plug–in not otherwise mentioned.

osgi.framework

the URL location of the OSGi framework. Useful if the Eclipse install is disjoint. See the section on [locations](#) for more details.

osgi.frameworkClassPath

a comma separated list of classpath entries for the OSGi framework implementation. Relative locations are interpreted as relative to the framework location (see [osgi.framework](#))

osgi.install.area {–install}

the install location of the platform. This setting indicates the location of the basic Eclipse plug–ins and is useful if the Eclipse install is disjoint. See the section on [locations](#) for more details.

osgi.instance.area {–data}

the instance data location for this session. Plug–ins use this location to store their data. For example, the Resources plug–in uses this as the default location for projects (aka the workspace). See the section on [locations](#) for more details.

osgi.instance.area.default

the default instance data location for this session. Plug–ins use this location to store their data. For example, the Resources plug–in uses this as the default location for projects (aka the workspace). This value (i.e., the default setting) is only used if no value for the *osgi.instance.area* is set. See the section on [locations](#) for more details.

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osgi.manifest.cache

the location where generated manifests are discovered and generated. The default is in the configuration area but the manifest cache can be stored separately.

osgi.nl {-nl}

the name of the locale on which Eclipse platform will run. NL values should follow the standard Java locale naming conventions.

osgi.os {-os}

the operating system value. The value should be one of the Eclipse processor architecture names known to Eclipse (e.g., x86, sparc, ...).

osgi.splashLocation

the absolute URL location of the splash screen (.bmp file) to show while starting Eclipse. This property overrides any value set in [osgi.splashPath](#).

osgi.splashPath

a comma separated list of URLs to search for a file called splash.bmp. This property is overridden by any value set in [osgi.splashLocation](#).

osgi.user.area {-user}

the location of the user area. The user area contains data (e.g., preferences) specific to the OS user and independent of any Eclipse install, configuration or instance. See the section on [locations](#) for more details.

osgi.user.area.default

the default location of the user area. The user area contains data (e.g., preferences) specific to the OS user and independent of any Eclipse install, configuration or instance. This value (i.e., the default setting) is only used if no value for the *osgi.user.area* is set. See the section on [locations](#) for more details.

osgi.ws {-ws}

the window system value. The value should be one of the Eclipse window system names known to Eclipse (e.g., win32, motif, ...).

osgi.syspath

<xxx still used? fix the name>

Locations

The Eclipse runtime defines a number of *locations* which give plug-in developers context for reading/storing data and Eclipse users a control over the scope of data sharing and visibility. Eclipse defines the following notions of location:

User (*-user*) {[osgi.user.area](#)} [*@none*, *@noDefault*, *@user.home*, *@user.dir*, *filepath*, *url*]

User locations are specific to, go figure, users. Typically the user location is based on the value of the Java `user.home` system property but this can be overridden. Information such as user scoped preferences and login information may be found in the user location.

Install (*-install*) {[osgi.install.area](#)} [*@user.home*, *@user.dir*, *filepath*, *url*]

An install location is where Eclipse itself is installed. In practice this location is the directory (typically "eclipse") which is the parent of the `startup.jar` or `eclipse.exe` being run. This location should be considered read-only to normal users as an install may be shared by many users. It is possible to set the install location and decouple `startup.jar` from the rest of Eclipse.

Configuration (*-configuration*) {[osgi.configuration.area](#)} [*@none*, *@noDefault*, *@user.home*, *@user.dir*, *filepath*, *url*]

Configuration locations contain files which identify and manage the (sub)set of an install to run. As such, there may be many configurations per install. Installs may come with a default configuration area but typical startup scenarios involve the runtime attempting to find a more

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writable configuration location.

Instance (-data) {osgi.instance.area} [@none, @noDefault, @user.home, @user.dir, filepath, url]

Instance locations contain user-defined data artifacts. For example, the Resources plug-in uses the instance area as the workspace location and thus the default home for projects. Other plugins are free to write whatever files they like in this location.

While users can set any of these locations, Eclipse will compute reasonable defaults if values are not given. The most common usecase for setting location is the instance area or, in the IDE context, the workspace. To run the default Eclipse configuration on a specific data set you can specify:

```
eclipse -data c:\mydata
```

More detail

Locations are URLs. For simplicity, file paths are also accepted and automatically converted to file: URLs. For better control and convenience, there are also a number of predefined symbolic locations which can be used. Note that not all combinations of location type and symbolic value are valid. A table below details which combinations are possible. Since the default case is for all locations to be set, valid and writable, some plug-ins may fail in other setups even if they are listed as possible. For example, it is unreasonable to expect a plugin focused on user data (e.g., the Eclipse Resources plug-in) to do much if the instance area is not defined. It is up to plug-in developers to choose the setups they support and design their function accordingly.

@none

Indicates that the corresponding location should never be set either explicitly or to its default value. For example, an RCP style application which has no user data may use `osgi.instance.area=@none` to prevent extraneous files being written to disk. `@none` must not be followed by any additional path segments.

@noDefault

Forces a location to be undefined or explicitly defined (i.e., Eclipse will not automatically compute a default value). This is useful where you want to allow for data in the corresponding location but the Eclipse default value is not appropriate. `@noDefault` must not be followed by any additional path segments.

@user.home

Directs Eclipse to compute a location value relative to the user's home directory. `@user.home` can be followed by additional path segments. In all cases, the string "`@user.home`" is simply replaced with the value of the Java "user.home" System property. For example, setting

```
osgi.instance.area=@user.home/myWorkspace
```

results in a value of

```
file:/users/bob/myWorkspace
```

@user.dir

Directs Eclipse to compute a location value relative to the current working directory.

`@user.dir` can be followed by additional path segments. In all cases, the string "`@user.dir`" is simply replaced with the value of the Java "user.dir" System property. For example, setting

```
osgi.instance.area=@user.dir/myWorkspace
```

results in a value of

```
file:/usr/share/eclipse/myWorkspace
```

location/value	supports default	file/URL	@none	@noDefault	@user.home	@user.dir
instance	yes	yes	yes	yes	yes	yes (default)

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configuration	yes	yes	yes*	yes*	yes	yes
install	no	yes	no	no	yes	yes
user	yes	yes	yes	yes	yes	yes

* indicates that this setup is technically possible but pragmatically quite difficult to manage. In particular, without a configuration location the Eclipse runtime may only get as far as starting the OSGi framework.

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Starting Eclipse from Java

Last modified 09:00 Wednesday June 23, 2004

The Eclipse Platform makes heavy use of Java class loaders for loading plug-ins. Even the Eclipse Runtime itself and the OSGi framework need to be loaded by special class loaders. Client programs, such as a Java main program or a servlet, cannot directly reference any part of Eclipse directly. Instead, a client must use the **EclipseStarter** class in **org.eclipse.core.runtime.adaptor** to start the platform, invoking functionality defined in plug-ins, and shutting down the platform when done.

Clients that do not need to access any particular function, but just need to start the platform, can use `Main.run()` in `startup.jar`. However, clients that need to invoke specific function should use **EclipseStarter**. See the javadoc inside this class for details.

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Eclipse platform API rules of engagement

Version 0.15 – Last revised 12:00 May 30, 2001

Here are the rules of engagement for clients of the Eclipse platform API (and other components).

What it means to be API

The Eclipse platform defines API elements for use by its clients, namely ISVs writing plug-ins. These plug-ins may in turn define API elements for their clients, and so on. API elements are the public face: they carry a specification about what they are supposed to do, and about how they are intended to be used. API elements are supported: the Eclipse platform team will fix implementation bugs where there is a deviation from the specified behavior. Since there is often a high cost associated with breaking API changes, the Eclipse platform team will also try to evolve API elements gracefully through successive major releases.

How to tell API from non-API

By their very nature, API elements are documented and have a specification, in contrast to non-API elements which are internal implementation details usually without published documentation or specifications. So if you cannot find the documentation for something, that's usually a good indicator that it's not API.

To try to draw the line more starkly, the code base for the platform is separated into API and non-API packages, with all API elements being declared in designated API packages.

- **API package** – a Java package that contains at least one API class or API interface. The names of API packages are advertised in the documentation for that component; where feasible, all other packages containing only implementation details have "internal" in the package name. The names of API packages may legitimately appear in client code. For the Eclipse platform proper, these are:
 - ◆ `org.eclipse.foo.*` – for example, `org.eclipse.swt.widgets`, `org.eclipse.ui`, or `org.eclipse.core.runtime`
 - ◆ `org.eclipse.foo.internal.*` – not API; internal implementation packages
 - ◆ `org.eclipse.foo.examples.*` – not API; these are examples
 - ◆ `org.eclipse.foo.tests.*` – not API; these are test suites
- **API class or interface** – a `public` class or interface in an API package, or a `public` or `protected` class or interface member declared in, or inherited by, some other API class or interface. The names of API classes and interfaces may legitimately appear in client code.
- **API method or constructor** – a `public` or `protected` method or constructor either declared in, or inherited by, an API class or interface. The names of API methods may legitimately appear in client code.
- **API field** – a `public` or `protected` field either declared in, or inherited by, an API class or interface. The names of API fields may legitimately appear in client code.

Everything else is considered internal implementation detail and off limits to all clients. Legitimate client code must never reference the names of non-API elements (not even using Java reflection). In some cases, the Java language's name accessibility rules are used to disallow illegal references. However, there are many cases where this is simply not possible. Observing this one simple rule avoids the problem completely:

- **Stick to officially documented APIs.** Only reference packages that are documented in the *published API Javadoc* for the component. Never reference a package belonging to another component that has "internal" in its name—these are never API. Never reference a package for which there is no published API Javadoc—these are not API either.

General rules

The specification of API elements is generated from Javadoc comments in the element's Java source code. For some types of elements, the specification is in the form of a contract. For example, in the case of methods, the contract is between two parties, the caller of the method and the implementor of the method. The fundamental ground rule is:

- **Honor all contracts.** The contracts are described in the published Javadoc for the API elements you are using.

The term "must", when used in an API contract, means that it is incumbent on the party to ensure that the condition would always be met; any failure to do so would be considered a programming error with unspecified (and perhaps unpredictable) consequences.

- **You must honor "must".** Pay especially close heed to conditions where "must" is used.

Other common sense rules:

- **Do not rely on incidental behavior.** Incidental behavior is behavior observed by experiment or in practice, but which is not guaranteed by any API specification.
- **Do not treat null as an object.** Null is more the lack of an object. Assume everything is non-null unless the API specification says otherwise.
- **Do not try to cheat with Java reflection.** Using Java reflection to circumvent Java compiler checking buys you nothing more. There are no additional API contracts for uses of reflection; reflection simply increases the likelihood of relying on unspecified behavior and internal implementation detail.
- **Use your own packages.** Do not declare code in a package belonging to another component. Always declare your own code in your own packages.

Calling public API methods

For most clients, the bulk of the Eclipse API takes the form of public methods on API interfaces or classes, provided for the client to call when appropriate.

- **Ensure preconditions.** Do ensure that an API method's preconditions are met before calling the method. Conversely, the caller may safely assume that the method's postconditions will have been achieved immediately upon return from the call.
- **Null parameters.** Do not pass null as a parameter to an API method unless the parameter is explicitly documented as allowing null. This is perhaps the most frequently made programming error.
- **Restricted callers.** Do not call an API method that is documented as available only to certain callers unless you're one of them. In some situations, methods need to be part of the public API for the benefit of a certain class of callers (often internal); calling one of these methods at the wrong time has unspecified (and perhaps unpredictable) consequences.
- **Debugging methods.** Do not call an API method labelled "for debugging purposes only". For example, most `toString()` methods are in this category.

- **Parameter capture.** Do not pass an array, collection, or other mutable object as a parameter to an API method and then modify the object passed in. This is just asking for trouble.

Instantiating platform API classes

Not all concrete API classes are intended to be instantiated by just anyone. API classes have an instantiation contract indicating the terms under which instances may be created. The contract may also cover things like residual initialization responsibilities (for example, configuring a certain property before the instance is fully active) and associated lifecycle responsibilities (for example, calling `dispose()` to free up OS resources hung on to by the instance). Classes that are designed to be instantiated by clients are explicitly flagged in the Javadoc class comment (with words like "Clients may instantiate.").

- **Restricted instantiators.** Do not instantiate an API class that is documented as available only to certain parties unless you're one of them. In some situations, classes need to be part of the public API for the benefit of a certain party (often internal); instantiating one of these classes incorrectly has unspecified (and perhaps unpredictable) consequences.

Subclassing platform API classes

Only a subset of the API classes were designed to be subclassed. API classes have a subclass contract indicating the terms under which subclasses may be declared. This contract also covers initialization responsibilities and lifecycle responsibilities. Classes that are designed to be subclassed by clients are explicitly flagged in the Javadoc class comment (with words like "Clients may subclass.").

- **Restricted subclassers.** Do not subclass an API class that is not intended to be subclassed. Treat these classes as if they had been declared final. (These are sometimes referred to as "soft final" classes).

Calling protected API methods

Calling inherited protected and public methods from within a subclass is generally allowed; however, this often requires more care to correctly call than to call public methods from outside the hierarchy.

Overriding API methods

Only a subset of the public and protected API methods were designed to be overridden. Each API method has a subclass contract indicating the terms under which a subclass may override it. By default, overriding is not permitted. It is important to check the subclass contract on the actual method implementation being overridden; the terms of subclass contracts are not automatically passed along when that method is overridden.

- **Do not override a public or protected API method unless it is explicitly allowed.** Unless otherwise indicated, treat all methods as if they had been declared final. (These are sometimes known as "soft final" methods). If the kind of overriding allowed is:
 - "**implement**" – the abstract method declared on the subclass must be implemented by a concrete subclass
 - "**extend**" – the method declared on the subclass must invoke the method on the superclass (exactly once)
 - "**re-implement**" – the method declared on the subclass must not invoke the method on the superclass

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"**override**" – the method declared on the subclass is free to invoke the method on the superclass as it sees fit

- **Ensure postconditions.** Do ensure that any postconditions specified for the API method are met by the implementation upon return.
- **Proactively check preconditions.** Do not presume that preconditions specified for the API method have necessarily been met upon entry. Although the method implementation would be within its rights to not check specified preconditions, it is usually a good idea to check preconditions (when feasible and reasonably inexpensive) in order to blow the whistle on misbehaving callers.
- **Null result.** Do not return null as a result from an API method unless the result is explicitly documented (on the specifying interface or superclass) as allowing null.
- **Return copies.** Do not return an irreplaceable array, collection, or other mutable object as the result from an API method. Always return a copy to avoid trouble from callers that might modify the object.

Implementing platform API interfaces

Only a subset of the API interfaces were designed to be implemented by clients. API interfaces have a contract indicating the terms under which it may be implemented. Interfaces that are designed to be implemented by clients are explicitly flagged in the Javadoc class comment (with words like "Clients may implement."). A client may declare a subinterface of an API interface if and only if they are allowed to implement it.

- **Restricted implementors.** Do not implement an API interface that is documented as available only to certain parties unless you're one of them. In many situations, interfaces are used to hide internal implementation details from view.

Implementing public API methods

See "Overriding API methods".

Accessing fields in API classes and interfaces

Clients may read API fields, most of which are final. Certain struct-like objects may have non-final public fields, which clients may read and write unless otherwise indicated.

- **Null fields.** Do not set an API field to null unless this is explicitly allowed.

Casting objects of a known API type

An object of a known API type may only be cast to a different API type (or conditionally cast using `instanceof`) if this is explicitly allowed in the API.

- **Cast and instanceof.** Do not use `instanceof` and cast expressions to increase what is known about an object beyond what the API supports. Improper use exposes incidental implementation details not guaranteed by the API.

And, of course, casting any object to a non-API class or interface is always inappropriate.

Not following the rules

Whether done knowingly or unwittingly, there are consequences for transgressing the rules. It might be easier for all involved if there were API police that would bust you for breaking the rules. However, that is not the case. For the most part, API conformance operates as an honor system, with each client responsible for knowing the rules and adhering to them.

The contracts on the API elements delimit the behavior that is supported and sustained. As the Eclipse platform matures and evolves, it will be the API contracts that guide how this evolution happens. Outside of these contracts, everything is unsupported and subject to change, without notice, and at any time (even mid-release or between different OS platforms). Client code that oversteps the above rules might fail on different versions and patch levels of the platform; or when run on different underlying OSes; or when run with a different mix of co-resident plug-ins; or when run with a different workbench perspective; and so on. Indeed, no one is even particularly interested in speculating exactly how any particular transgression might come back to bite you. To those who choose to ignore the rules, don't say that you weren't warned. And don't expect much more than a sympathetic "Told you so."

On the other hand, client plug-in code that lives by the above rules should continue to work across different versions and patch levels of the platform, across different underlying OSes, and should peacefully co-exist with other plug-ins. If everyone plays by the rules, the Eclipse platform will provide a stable and supported base on which to build exciting new products.

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Eclipse Platform Naming Conventions

Last revised June 24, 2002 – version for Eclipse project R2.0

Naming conventions and guidelines for the Eclipse Platform:

- [Java packages](#)
- [Classes and interfaces](#)
- [Methods](#)
- [Variables](#)
- [Plug-ins and extension points](#)

Java Packages

The Eclipse Platform consists of a collection of Java packages. The package namespace is managed in conformance with [Sun's package naming guidelines](#); subpackages should not be created without prior approval from the owner of the package sub-tree. The packages for the Eclipse platform are all subpackages **org.eclipse**. The first package name component after **org.eclipse** is called the *major* package name. The following major packages of **org.eclipse** are assigned in the Eclipse 2.0 release:

```
org.eclipse.ant[.*] – Ant support
org.eclipse.compare[.*] – Compare support
org.eclipse.core[.*] – Platform core
org.eclipse.debug[.*] – Debug
org.eclipse.help[.*] – Help support
org.eclipse.jdi[.*] – Eclipse implementation of Java Debug Interface (JDI)
org.eclipse.jdt[.*] – Java development tools
org.eclipse.jface[.*] – JFace
org.eclipse.pde[.*] – Plug-in Development Environment
org.eclipse.search[.*] – Search support
org.eclipse.swt[.*] – Standard Widget Toolkit
org.eclipse.team[.*] – Team support and Version and Configuration Management
org.eclipse.tomcat[.*] – Apache tomcat support
org.eclipse.ui[.*] – Workbench
org.eclipse.update[.*] – Update/install
org.eclipse.webdav[.*] – WebDAV support
```

The following package name segments are reserved:

```
internal – indicates an internal implementation package that contains no API
tests – indicates a non-API package that contains only test suites
examples – indicates a non-API package that contains only examples
```

These name are used as qualifiers, and must only appear following the major package name. For example,

```
org.eclipse.core.internal.resources – Correct usage
org.eclipse.internal.core.resources – Incorrect. internal precedes major
package name.
```


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`org.eclipse.core.resources.internal` – Incorrect. `internal` does not immediately follow major package name.

Aside on how the Eclipse Platform is structured: The Eclipse Platform is divided up into *Core* and *UI*. Anything classified as Core is independent of the window system; applications and plug-ins that depend on the Core and not on the UI can run headless. The distinction between Core and UI does not align with the distinction between API and non-API; both Core and UI contain API. The UI portion of the Eclipse Platform is known as the Workbench. The Workbench is a high-level UI framework for building products with sophisticated UIs built from pluggable components. The Workbench is built atop JFace, SWT, and the Platform Core. SWT (Standard Widget Toolkit) is a low-level, OS-platform-independent means of talking to the native window system. JFace is a mid-level UI framework useful for building complex UI pieces such as property viewers. SWT and JFace are UI by definition. The Java tooling is a Java IDE built atop the workbench. End aside.

API Packages API packages are ones that contain classes and interfaces that must be made available to ISVs. The names of API packages need to make sense to the ISV. The number of different packages that the ISV needs to remember should be small, since a profusion of API packages can make it difficult for ISVs to know which packages they need to import. Within an API package, all public classes and interfaces are considered API. The names of API packages should not contain `internal`, `tests`, or `examples` to avoid confusion with the scheme for naming non-API packages.

Internal Implementation Packages All packages that are part of the platform implementation but contain no API that should be exposed to ISVs are considered internal implementation packages. All implementation packages should be flagged as `internal`, with the tag occurring just after the major package name. ISVs will be told that all packages marked `internal` are out of bounds. (A simple text search for `".internal."` detects suspicious reference in source files; likewise, `"/internal/"` is suspicious in `.class` files).

Test Suite Packages All packages containing test suites should be flagged as `tests`, with the tag occurring just after the major package name. Fully automated tests are the norm; so, for example, `org.eclipse.core.tests.resources` would contain automated tests for API in `org.eclipse.core.resources`. Interactive tests (ones requiring a hands-on tester) should be flagged with `interactive` as the *last* package name segment; so, for example, `org.eclipse.core.tests.resources.interactive` would contain the corresponding interactive tests.

Examples Packages All packages containing examples that ship to ISVs should be flagged as `examples`, with the tag occurring just after the major package name. For example, `org.eclipse.swt.examples` would contain examples for how to use the SWT API.

Additional rules:

- Package names should contain only lowercase ASCII alphanumerics, and avoid underscore `_` or dollar sign `$` characters.

Classes and Interfaces

[Sun's naming guidelines](#) states

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Class names should be nouns, in mixed case with the first letter of each internal word capitalized. Try to keep your class names simple and descriptive. Use whole words – avoid acronyms and abbreviations (unless the abbreviation is much more widely used than the long form, such as URL or HTML).

Examples:

```
class Raster;  
class ImageSprite;
```

Interface names should be capitalized like class names.

For interface names, we follow the "I"-for-interface convention: all interface names are prefixed with an "I". For example, "IWorkspace" or "IIndex". This convention aids code readability by making interface names more readily recognizable. (Microsoft COM interfaces subscribe to this convention).

Additional rules:

- The names of exception classes (subclasses of `Exception`) should follow the common practice of ending in "Exception".

Methods

Sun's naming guidelines states

Methods should be verbs, in mixed case with the first letter lowercase, with the first letter of each internal word capitalized.

Examples:

```
run();  
runFast();  
getBackground();
```

Additional rules:

- The named of methods should follow common practice for naming getters (`getX()`), setters (`setX()`), and predicates (`isX()`, `hasX()`).

Variables

Sun's naming guidelines states

Except for variables, all instance, class, and class constants are in mixed case with a lowercase first letter. Internal words start with capital letters. Variable names should not start with underscore `_` or dollar sign `$` characters, even though both are allowed.

Variable names should be short yet meaningful. The choice of a variable name should be mnemonic – that is, designed to indicate to the casual observer the intent of its use. One-character variable names should be avoided except for temporary "throwaway" variables. Common names for temporary variables are `i`, `j`, `k`, `m`, and `n` for integers; `c`, `d`, and `e` for characters.

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Examples:

```
int i;  
char c;  
float myWidth;
```

(Note: we are no longer following the convention that prefixes non-constant field names with "f", such as "fWidget".)

Constants

Sun's naming guidelines states

The names of variables declared class constants and of ANSI constants should be all uppercase with words separated by underscores ("_").

Examples:

```
static final int MIN_WIDTH = 4;  
static final int MAX_WIDTH = 999;  
static final int GET_THE_CPU = 1;
```

Plug-ins and Extension Points

All plug-ins, including the ones that are part of the Eclipse Platform, like the Resources and Workbench plug-ins, must have unique identifiers following the same naming pattern as Java packages. For example, workbench plug-ins are named **org.eclipse.ui[.*]**.

The plug-in namespace is managed hierarchically; do not create plug-in without prior approval from the owner of the enclosing namespace.

Extension points that expect multiple extensions should have plural names. For example, "builders" rather than "builder".

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Glossary of terms

It can be confusing when one person refers to the same thing with different terms, and downright misleading if they refer to different things using the same term. That's why it's important to choose the right words when referring to things in comments, code, and documentation.

Eclipse

Eclipse is the name for the overall project supporting the construction of integrated tools for developing applications. It represents a collection of related projects that include the Eclipse Platform, the Java development tools (JDT), and the Plug-in Development Environment (PDE).

Eclipse Platform

Eclipse Platform is the name for the core frameworks and services upon which plug-in extensions are created. It provides the runtime in which plug-ins are loaded and run. In order to use the term with the right degree of (im)precision, it is useful to know some things about the Platform. First off, the Eclipse Platform itself is not really a true product that would ship by itself. The Platform's direct consumers are tool builders, or ISVs, since they add the value to the Eclipse Platform that makes it useful to people.

The Eclipse Platform is divided up into *Core* and *UI*. Anything classified as "UI" needs a window system, whereas things classified as "Core" can run "headless". The UI portion of the Eclipse Platform is known as the Workbench. The core portion of the Eclipse Platform is simply called the Platform Core, or Core.

So the Eclipse Platform is just the nucleus around which tool builders build tool plug-ins.

Eclipse SDK

The Eclipse SDK is the Eclipse Platform, JDT, and PDE. In addition to the Platform, the SDK provides the development tools required to, among other things, enable Eclipse to be a development environment for itself.

Platform – Short for "Eclipse Platform".

Workbench – Short for "Eclipse Platform UI".

The Workbench is a high-level UI framework for building products with sophisticated UIs built from pluggable components. The Workbench is built atop JFace, SWT, and the Platform Core.

Core – Short for "Eclipse Platform Core".

All the UI-free infrastructure of the Eclipse Platform. The major divisions are: platform runtime and plug-in management, workspaces and resource management, and version and configuration management.

Runtime – Short for "Eclipse Platform Core Runtime".

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The lowest level part of the Platform Core, responsible for the plug-in registry and plug-ins. Note that the Platform Core Runtime does not include workspaces and resources (they're in the Resources plug-in).

Workspace

A workspace is the general umbrella for managing resources in the Eclipse Platform. Note that workspaces and resources are an optional part of the Platform; some configurations of the Platform will not have a workspace.

UI – Short for "Eclipse Platform UI".

All-inclusive term for the UI portion of the Eclipse Platform.

JFace

JFace is the mid-level UI framework useful for building complex UI pieces such as property viewers. JFace works in conjunction with SWT.

SWT

SWT (Standard Widget Toolkit) is a small, fast widget toolkit with a portable API and a native implementation. So far, SWT has been ported to Windows, Linux (GTK and Motif window systems), AIX (Motif), Solaris (Motif), HP-UX (Motif), QNX (Photon) and Mac OS X (Carbon).

JDT

Java development tools (n.b. "development tools" in lowercase, for legal reasons) adds Java program development capability to the Eclipse Platform.

PDE

The Plug-in Development Environment adds specialized tools for developing Eclipse plug-ins.

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The project description file

Description: When a project is created in the workspace, a project description file is automatically generated that describes the project. The purpose of this file is to make the project self-describing, so that a project that is zipped up or released to a server can be correctly recreated in another workspace. This file is always called ".project", and is located as a direct member of the project's content area. The name of the file is exposed through the static field `DESCRIPTION_FILE_NAME` on `org.eclipse.core.resources.IProjectDescription`.

The name, location, and content of this file are part of the workspace API. This means they are guaranteed not to change in a way that would break existing users of the file. However, the right to add additional elements and attributes to the markup is reserved for possible future additions to the file. For this reason, clients that read the description file contents should tolerate unknown elements and attributes.

Clients that modify, delete, or replace the project description file do so at their own risk. Projects with invalid or missing description files will not be generally usable. If a project with an invalid description file is discovered on workspace startup, the project is closed, and it will not be possible to open it until the project description file has been repaired. The workspace will not generally attempt to automatically repair a missing or invalid description file. One exception is that missing project description files will be regenerated during workspace save and on calls to `IProject.setDescription`.

Modifications to the project description file have mostly the same effect as changing the project description via `IProject.setDescription`. One exception is that adding or removing project natures will not trigger the corresponding nature's `configure` or `deconfigure` method. Another exception is that changes to the project name are ignored.

If a new project is created at a location that contains an existing project description file, the contents of that description file will be honoured as the project description. One exception is that the project name in the file will be ignored if it does not match the name of the project being created. If the description file on disk is invalid, the project creation will fail.

Configuration Markup:

```
<!ELEMENT projectDescription (name, comment, projects, buildSpec, natures, linkedResources)>
```

```
<!ELEMENT name EMPTY>
```

- **name** – the name of the project. Ignored if it does match the name of the project using this description. Corresponds to `IProjectDescription.getName()`.

```
<!ELEMENT comment EMPTY>
```

- **comment** – a comment for the project. The comment can have arbitrary contents that are not interpreted by the project or workspace. Corresponds to `IProjectDescription.getComment()`.

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```
<!ELEMENT projects (project)*>
<!ELEMENT project EMPTY>
```

- **projects** – the names of the projects that are referenced by this project. Corresponds to `IProjectDescription.getReferencedProjects()`.

```
<!ELEMENT buildSpec (buildCommand)*>
<!ELEMENT buildCommand (name, arguments)>
<!ELEMENT name EMPTY>
<!ELEMENT arguments (dictionary?)>
<!ELEMENT dictionary (key, value)*>
<!ELEMENT key EMPTY>
<!ELEMENT value EMPTY>
```

- **buildSpec** – the ordered list of build commands for this project. Corresponds to `IProjectDescription.getBuildSpec()`.
- **buildCommand** – a single build commands for this project. Corresponds to `org.eclipse.core.resources.ICommand`.
- **name** – the symbolic name of an incremental project builder. Corresponds to `ICommand.getBuilderName()`.
- **arguments** – optional arguments that may be passed to the project builder. Corresponds to `ICommand.getArguments()`.
- **dictionary** – a list of <key, value> pairs in the argument list. Analogous to `java.util.Map`.

```
<!ELEMENT natures (nature)*>
<!ELEMENT nature EMPTY>
```

- **natures** – the names of the natures that are on this project. Corresponds to `IProjectDescription.getNatureIds()`.
- **nature** – the name of a single natures on this project.

```
<!ELEMENT linkedResources (link)*>
<!ELEMENT link (name, type, location)>
<!ELEMENT name EMPTY>
<!ELEMENT type EMPTY>
<!ELEMENT location EMPTY>
```

- **linkedResources** – the list of linked resources for this project.
- **link** – the definition of a single linked resource.
- **name** – the name of the linked resource as it appears in the workspace.

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- **type** – the resource type. Value values are: "1" for a file, or "2" for a folder.
- **location** – the file system path of the target of the linked resource. Either an absolute path, or a relative path whose first segment is the name of a workspace path variable.

Examples: The following is a sample project description file. The project has a single nature and builder configured, and some project references.

```
<?xml version="1.0" encoding="UTF-8"?>
<projectDescription>
  <name>WinterProject</name>
  <comment>This is a cool project.</comment>
  <projects>
    <project>org.seasons.sdt</project>
    <project>CoolStuff</project>
  </projects>
  <buildSpec>
    <buildCommand>
      <name>org.seasons.sdt.seasonBuilder</name>
      <arguments>
        <dictionary>
          <key>climate</key>
          <value>cold</value>
        </dictionary>
      </arguments>
    </buildCommand>
  </buildSpec>
  <natures>
    <nature>org.seasons.sdt.seasonNature</nature>
  </natures>
</projectDescription>
```

API Information: The contents of the project description file map to the `org.eclipse.core.resources.IProjectDescription` interface. The project description file can be overwritten by the method `IProject.setDescription()`.

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Pre-built documentation index

When user searches help contents of a product, the search is performed within a documentation index. By default, this index is created on the first invocation of help search, but can be pre-built and delivered to the user with a product. This avoids indexing from occurring on the user machine and lets user obtain first search results faster.

Building an index for a product

To build an index follow the steps:

- build a product, including all documentation plug-ins,
- create an index for a desired locale by running this command:

```
eclipse -nosplash -application org.eclipse.help.base.indexTool -vmargs -DindexOutput=output
```

from the directory containing the product. The following arguments need to be set :

outputDirectory – specifies path of the directory where the index is to be saved

locale – specifies locale for which the index will be built

For example, running

```
eclipse -nosplash -application org.eclipse.help.base.indexTool -vmargs -DindexOutput=d:/build/com
```

will result in file **doc_index.zip** being saved in the **nl/en** directory that will be created under **d:/build/com.my.plugin**. The zip will contain index of contents of documents that are available to users when they run the product in the **en** locale.

Packaging and Installation of pre-built index

Pre-built indices, the **doc_index.zip** files, need to be packaged as a plug-in. You can choose to use a plug-in associated with the primary feature, or choose to package the index for each language into separate fragments.

For example, if product's documentation is available in three languages, say English, German and Simplified Chinese, a plug-in `com.my.plugin` can have the following structure:

```
com.my.plugin/  
  plugin.xml  
  nl/  
    de/  
      doc_index.zip  
    en/  
      doc_index.zip  
    zh/  
      CN/  
        doc_index.zip  
  other files of this plugin
```

The ID of the plugin needs to be specified as a **productIndex** preference for `org.eclipse.help.base` plugin. For

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plugin in the above example, the `plugin_customization.ini` file needs to contain the entry

```
org.eclipse.help.base/productIndex=com.my.plugin
```

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Installing the stand-alone help system

If you are creating an application that is not based on the Eclipse framework, you can still use the Eclipse help system. Your application can package and install the stand-alone help system, a very small version of Eclipse that has everything except the help system stripped out of it. Then, your application can make API calls from its Help menu, or from UI objects, to launch the help browser. The stand-alone help system has all the features of the integrated help system, except infopops and active help. When an application is not Java based, or help is required when the application is not running, it is possible to use stand-alone help from a system shell, a shell script or a desktop shortcut and provide command line options instead of calling Java APIs.

The stand-alone help system allows passing number of options that can be used to customize various aspects of the help system. The following options are supported:

- **-eclipsehome** *eclipseInstallPath* – specifies Eclipse installation directory. This directory is a parent to "plugins" directory and eclipse executable. The option must be provided, when current directory from which infocenter is launched, is not the same as Eclipse installation directory.
- **-host** *helpServerHost* – specifies host name of the interface that help server will use. It overrides host name specified the application server plugin preferences.
- **-port** *helpServerPort* – specifies port number that help server will use. It overrides port number specified the application server plugin preferences.
- **-dir rtl** – sets right-to-left rendering direction of help UI in the browser.
- Additionally, most options accepted by Eclipse executable can be passed. They are especially useful during debugging and for applying customization to Eclipse. For example, passing an option

```
-nl fr_FR
```

will start help system in French language instead of a language specified by the machine's locale.

Installation/packaging

These steps are for the help system integrator and are not meant to address all the possible scenarios. It is assumed that all your documentation is delivered as Eclipse plug-ins and, in general, you are familiar with the eclipse help system.

1. Download the Eclipse Platform Runtime Binary driver from www.eclipse.org.
2. Install (unzip) the driver under your application directory, for example, *d:\myApp*. This will create an eclipse sub-directory, *d:\myApp\eclipse* that contains the code required for the Eclipse platform (which includes the help system).

How to call the help classes from Java

1. Make sure *d:\myApp\eclipse\plugins\org.eclipse.help.base_3.0.1\helpbase.jar* is on your app classpath. The class you use to start, launch, and shut down the help system is *org.eclipse.help.standalone.Help*.
2. Create an array of String containing options that you want to pass to help system support. Typically, the *eclipsehome* option is needed.

```
String[] options = new String[] { "-eclipsehome", "d:\\myApp\\eclipse" };
```

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3. In your application, create an instance of the Help class by passing the options. This object should be held onto until the end of your application.

```
Help helpSystem = new Help(options);
```

4. To start the help system:

```
helpSystem.start();
```

5. To invoke help when needed:

```
helpSystem.displayHelp();
```

You can also call help on specific primary TOC files or topics:

```
helpSystem.displayHelp("/com.mycompany.mytool.doc/toc.xml");  
helpSystem.displayHelp("/com.mycompany.mytool.doc/tasks/task1.htm");
```

6. To launch context sensitive help, call `helpSystem.displayContext(contextId, x, y)` where `contextId` is a fully qualified context id. The screen coordinates, `x` and `y`, are not currently used.
7. At the end of your application, to shutdown the help system:

```
helpSystem.shutdown();
```

How to call the help from command line

The `org.eclipse.help.standalone.Help` class has a main method that you can use to launch stand-alone help from a command line. The command line arguments syntax is:

```
-command start | shutdown | (displayHelp [href]) [-eclipsehome eclipseInstallPath] [-host helpServer]
```

A simple way to display help is to invoke

```
java -classpath d:\myApp\eclipse\plugins\org.eclipse.help.base_3.0.1\helpbase.jar org.eclipse.help
```

from within `d:\myApp\eclipse` directory. To display specific TOC file or topic use

```
java -classpath d:\myApp\eclipse\plugins\org.eclipse.help.base_3.0.1\helpbase.jar org.eclipse.help
```

The calls above to display help will cause help system to start, display help, and keep running to allow a user to continue browsing help after the command is executed. To control the life cycle of the help system, use start and shutdown commands, in addition to the `displayHelp` command. For example, you may call

```
java -classpath d:\myApp\eclipse\plugins\org.eclipse.help.base_3.0.1\helpbase.jar org.eclipse.help
```

[Optional] Installing a minimal set of plug-ins

The stand-alone help does not require the entire Eclipse Platform package. It is possible to run the stand-alone help with the following plug-ins (located in the `eclipse\plugins` directory):

```
org.apache.ant  
org.apache.lucene  
org.eclipse.core.runtime  
org.eclipse.help
```

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```
org.eclipse.help.appserver
org.eclipse.help.base
org.eclipse.help.webapp
org.eclipse.osgi
org.eclipse.tomcat
org.eclipse.update.configurator
```

On Windows and Linux, the following plugins and fragments are required on top of the minimal configuration to provide robust browser support (an SWT-embedded Internet Explorer on Windows and Mozilla on Linux or stand-alone system browser on Windows).

```
org.eclipse.core.expressions
org.eclipse.help.ui
org.eclipse.jface
org.eclipse.swt
org.eclipse.swt.win32 or org.eclipse.swt.gtk
org.eclipse.ui
org.eclipse.ui.workbench
```

Some documentation plug-ins may have dependencies on other plug-ins, usually by specifying required plug-ins in their plugin.xml. The dependent plug-ins need to be installed on the infocenter as well. Additionally, plug-ins that were designed for earlier than 3.0 version of Eclipse implicitly require an `org.eclipse.core.runtime.compatibility` being present plug-in to work.

See [Help System Preferences](#) for more information on customizing help system.

[org.eclipse.help.base preferences](#) © Copyright IBM Corporation and others 2000, 2004.

Help System Preferences

The Eclipse help system can be configured and branded to suit your product by specifying custom defaults for number of help preferences.

The Help system itself is divided up into a number of separate plug-ins. These tables shows available preferences, and which plug-in defines them. Consult [Customizing a product](#) on how to override some of these preferences.

org.eclipse.help plug-in:

Preference key	Usage	Default
baseTOCS	Toc ordering. Ordered list of help TOC's (books) as they would appear on the bookshelf. All the other TOCS will be follow these books. Non-present TOC's on this list will be ignored. Use the location of each TOC as /pluginId/path/to/toc.xml.	/org.eclipse.platform.doc.user/toc.xml, /org.eclipse.jdt.doc.user/toc.xml, /org.eclipse.platform.doc.isv/toc.xml, /org.eclipse.jdt.doc.isv/toc.xml, /org.eclipse.pde.doc.user/toc.xml

org.eclipse.help.base plug-in:

Preference key	Usage	Default
banner	Location of the banner page to display in the top frame Example: banner=/org.eclipse.help.webapp/advanced/banner.html	
banner_height	Height of the banner frame Example: banner_height=60	
help_home	The page to show in the content area when opening help. Specify your html page as /pluginId/path/to/home.html.	/org.eclipse.help.base/doc/help
linksView	Set to true or false to control the visibility of the related links view. Note: this option has no effect in the infocenter.	true
bookmarksView	Set to true or false to control the visibility of the bookmarks view. Note: this option has no effect in the infocenter.	true
windowTitlePrefix	Set to true or false to control the title of the browser window. If true, the title will have a form "Help - <PRODUCT_NAME>", otherwise the title will be "<PRODUCT_NAME>", where <PRODUCT_NAME> is the name of Eclipse product set in the primary feature.	true
loadBookAtOnceLimit	The maximum number of topics a book can have, for the navigation to be loaded by the browser as one document. Navigation for larger books is loaded dynamically, few levels at a time. More topics are downloaded as necessary, when branches are expanded.	1000

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dynamicLoadDepthsHint	Suggested number of levels in topic navigation downloaded to the browser for large books. The value needs to be greater than 0. The actual number of levels can differ for wide tree if suggested number of levels contains large number of topics.	3
imagesDirectory	Directory containing images used in the help view. Images must have the same name as those in the org.eclipse.help.webapp plug-in. Use the /pluginID/directory format.	images
advanced.toolbarBackground	CSS background for toolbars. Value is used in browsers that display advanced help UI.	ButtonFace
advanced.viewBackground	CSS background for navigation views. Value is used in browsers that display advanced help UI.	Window
advanced.toolbarFont	CSS font for toolbars. Value is used in browsers that display advanced help UI.	icon
advanced.viewFont	CSS font for navigation views. Value is used in browsers that display advanced help UI.	icon
basic.toolbarBackground	Background color for toolbars. Value is used in browsers displaying basic help UI.	#D4D0C8
basic.viewBackground	Background color for navigation views. Value is used in browsers displaying basic help UI.	#FFFFFF
locales	List of locales that infocenter will recognize and provide a customized content for; if locales (or languages) accepted by client browser are not matched with any locales in this list, the browser will be served content for default locale – the server locale, or locale specified by eclipse -nl command line option; if list is not specified, the browser will be served contents for its preferred locale; note: not providing this option may result in a large memory and disk space requirements as navigations and indexes will be created for each distinct preferred locale among browsers accessing the infocenter. Example: locales=en ja zh_CN zh_TW	
productIndex	If pre-built documentation index is provided with the product, the ID of the plug-in delivering the index must be specified to the help system here.	
always_external_browser	Use embedded when possible (on Windows or Linux), or always external. Setting to true will force use of external browser. Option has no effect if embedded browser is not available on a given platform.	false
default_browser	Default external browser. ID of one of the external web browsers contributed to org.eclipse.help.base.browser extension point that help system will use. The browser's adapter available() method must return true on the current system.	default dynamically set based on browser available on a given system
custom_browser_path	Executable path for custom browser	C:\Program Files\Internet Explorer\IEXPLORE.EXE" %

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		Windows, "mozilla %1" – on other platform
showDisabledActivityTopics	<p>Help system filters topics from disabled capabilities. This option controls this behavior and existence of Show All Topics button.</p> <p>Accepted values: never, off, on, always</p> <p>never – topic from disabled capabilities are not shown</p> <p>off – user can choose to show all topics, disabled topics initially hidden</p> <p>on – user can choose to show all topics, all topics initially shown</p> <p>always – topic from disabled capabilities are shown (filtering disabled)</p>	off
activeHelp	<p>Allows enabling and disabling execution of active help. The option has no effect in the infocenter setup, where active help is disabled.</p> <p>Accepted values:</p> <p>true – default active help actions enabled</p> <p>false – active help framework disabled</p>	true

org.eclipse.help.appserver plug-in:

Preference key	Usage	Default
port	The port number on which the sever listens for http requests. If the port is 0 and arbitrary port is picked by the system.	0
host	The host address or name to use for connecting to the server. The default is nothing, and eclipse will pick up an available local address.	

org.eclipse.tomcat plug-in:

Preference key	Usage	Default
acceptCount	The maximum queue length for incoming connection requests when all possible request processing threads are in use. Any requests received when the queue is full will be refused.	100
maxProcessors	The maximum number of request processing threads to be created by this Connector, which therefore determines the maximum number of simultaneous requests that can be handled.	75
minProcessors	The number of request processing threads that will be created when this Connector is first started. This attribute should be set to a value smaller than that set for maxProcessors.	5

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Installing the help system as an infocenter

You can allow your users to access the help system over the Internet or an intranet, by installing the infocenter and the documentation plug-ins on a server. Clients view help by navigating to a URL, and the help system is shown in their web browser. The infocenter help system can be used both for client applications and for web applications, either of which can have their help accessed remotely. All features of help system except infopops and active help are supported.

The infocenter help system allows passing number of options that can be used to customize various aspects of the infocenter. The following options are supported:

- **-eclipsehome** *eclipseInstallPath* – specifies Eclipse installation directory. This directory is a parent to "plugins" directory and eclipse executable. The option must be provided, when current directory from which infocenter is launched, is not the same as Eclipse installation directory.
- **-host** *helpServerHost* – specifies host name of the interface that help server will use. It overrides host name specified in the application server plugin preferences.
- **-port** *helpServerPort* – specifies port number that help server will use. It overrides port number specified in the application server plugin preferences.
- **-locales** *localeList* – specifies a list of locales that infocenter will recognize and provide a customized content for. If the option is not specified, infocenter will build navigation, and index documents for each preferred locale of the browsers accessing the infocenter. When the option is present, locales from browser requests will be matched with locales in the list. If browser preferred locale does not exist in the list, but its language part does, it will be used. Subsequently, additional browser locales in decreased order of preference will be matched against the list. If none of the browser locales (or its language part) matches any locale on the list, the client will be served content in the default locale – server locale or locale passed with `-nl` option. For example using options

```
-nl en -locales de en es fr it ja ko pt_BR zh_CN zh_TW
```

will cause infocenter operating in 10 locales. All other locales will receive content for en locale.

- **-dir rtl** – sets right-to-left rendering direction of help UI in the browser.
- **-noexec** – indicates that Eclipse executable should not be used. You may need to use this option when running on a platform for which Eclipse executable is not available.
- Additionally, most options accepted by Eclipse executable can be passed. They are especially useful during debugging and for applying customization to Eclipse. For example, passing options

```
-vmargs -Xmx256M
```

increases memory available to the infocenter and will allow serving a larger book collection.

Installation/packaging

These steps are for the help system integrator and are not meant to address all the possible scenarios. It is assumed that all your documentation is delivered as Eclipse plug-ins and, in general, you are familiar with the eclipse help system.

1. Download the Eclipse Platform Runtime Binary driver from www.eclipse.org.
2. Install (unzip) the driver in a directory, *d:\myApp*. This will create an eclipse sub-directory, *d:\myApp\eclipse* that contains the code required for the Eclipse platform (which includes the help system).

How to start or stop infocenter from command line

The `org.eclipse.help.standalone.Infocenter` class has a main method that you can use to launch infocenter from a command line. The command line arguments syntax is:

```
-command start | shutdown | [-eclipsehome eclipseInstallPath] [-host helpServerHost] [-locales lo
```

To start an infocenter on port 8081 issue a start command by running

```
java -classpath d:\myApp\eclipse\plugins\org.eclipse.help.base_3.0.1\helpbase.jar org.eclipse.hel
```

To shut the infocenter down issue a shutdown command by running

```
java -classpath d:\myApp\eclipse\plugins\org.eclipse.help.base_3.0.1\helpbase.jar org.eclipse.hel
```

Using the infocenter

Start the web server. Point a web browser to the path "help" web application running on a port specified when starting the infocenter. On the machine the infocenter is installed, this would be `http://localhost:8081/help/`.

How to start or stop infocenter from Java

When including infocenter as part of another application, it may be more convenient to start it and stop using Java APIs instead of using system commands. Follow the steps if it is the case:

1. Make sure `d:\myApp\eclipse\plugins\org.eclipse.help.base_3.0.1\helpbase.jar` is on your app classpath. The class you use to start, and shut down the infocenter is `org.eclipse.help.standalone.Infocenter`.
2. Create an array of String containing options that you want to pass to the infocenter. Typically, the `eclipsehome` and `port` options are needed.

```
String[] options = new String[] { "-eclipsehome", "d:\\myApp\\eclipse" , "-port", "8081" }
```

3. In your application, create an instance of the `Help` class by passing the options.

```
Infocenter infocenter = new Help(options);
```

4. To start the help system:

```
helpSystem.start();
```

5. To shut the infocenter down:

```
helpSystem.shutdown();
```

Making infocenter available on the web

Eclipse contains a complete infocenter and does not require other server software to run. However, in an unsecure environment like Internet, it is recommended infocenter is not accessed directly by clients, but is made available through an HTTP server or an application server. Most servers come with modules or servlets for delegating certain request to other web resources. For example, one may configure a proxy module of Apache HTTP Server to redirect requests made to `http://mycompany.com/myproduct/infocenter` to `http://internalserver:8081/help` that runs an infocenter. Adding the lines

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```
LoadModule proxy_module modules/ApacheModuleProxy.dll
ProxyPass /myproduct/infocenter http://internalserver:8081/help
ProxyPassReverse /myproduct/infocenter http://internalserver:8081/help
```

to `conf/httpd.conf` file of Apache server running mycompany web site accomplishes this.

Some versions of Apache HTTP server, may contain `AddDefaultCharset` directive enabled in configuration file. Remove the directive or replace with

```
AddDefaultCharset Off
```

to have browsers display documents using correct character set.

Running multiple instance of infocenter

Multiple instances of infocenter can be run on a machine from one installation. Each started instance must use its own port and be provided with a workspace, hence `-port` and `-data` options must be specified. The instances can serve documentation from different set of plug-ins, by providing a valid platform configuration with `-configuration` option.

If `-configuration` is not used and configuration directory is shared among multiple infocenter instances, with overlapping set of locales, it must be ensured that all search indexes are created by one infocenter instance before another instance is started. Indexes are saved in the configuration directory, and write access is not synchronized across infocenter processes.

[Optional] Installing a minimal set of plug-ins

The infocenter does not require the entire Eclipse Platform package. It is possible to run the infocenter with the following plug-ins (located in the `eclipse\plugins` directory):

```
org.apache.ant
org.apache.lucene
org.eclipse.core.runtime
org.eclipse.help
org.eclipse.help.appserver
org.eclipse.help.base
org.eclipse.help.webapp
org.eclipse.osgi
org.eclipse.tomcat
org.eclipse.update.configurator
```

Some documentation plug-ins may have dependencies on other plug-ins, usually by specifying required plug-ins in their `plugin.xml`. The dependent plug-ins need to be installed on the infocenter as well. Additionally, plug-ins that were designed for earlier than 3.0 version of Eclipse implicitly require an `org.eclipse.core.runtime.compatibility` being present plug-in to work.

Infocenter plug-ins can be updated without restarting the infocenter, using commands explained in [Updating a running infocenter from command line](#) topic. To use this functionality, the minimal set of plug-ins must include `org.eclipse.update.core` plug-in.

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See [Help System Preferences](#) for more information on customizing help system.

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Updating a running infocenter from command line

In addition to the start and shutdown commands supported by the infocenter and documented in [Installing the help system as an infocenter](#), infocenter supports set of command for invoking update manager operations in running eclipse. You can install, update, enable, disable features, or list installed features, or features available on an update site, or adding an extension site to the running infocenter. In effect, you can change set of running documentation plug-ins without a need for shutting the infocenter down or restarting it.

Start infocenter as explained in [Installing the help system as an infocenter](#). If you are running minimal set of plug-ins, add org.eclipse.update.core plug-in to the list of plug-ins before launching infocenter using the start command.

Launch infocenter update commands as follows, where [] means optional argument and arguments in italics must be provided by the user.

After performing updates as needed, apply the changes by issuing the apply command as the last step. It reflects the changes in the current session. If you do not call apply command, the changes will take effect the next time infocenter is started.

Installing a feature from a remote site:

```
java -cp plugins/org.eclipse.help.base_3.0.1/helpbase.jar org.eclipse.help.standalone.Infocenter
  -command install
  -featureId feature_id
  -version version
  -from remote_site_url
  [-to target_site_dir]
```

Example: java -cp plugins/org.eclipse.help.base_3.0.1/helpbase.jar org.eclipse.help.standalone.Infocenter -command install -from http://dev.eclipse.org/viewcvs/index.cgi/%7Echeckout%7E/platform-update-home/op -featureId com.example.root -version 1.0.0

Updating an existing feature or all features:

```
java -cp plugins/org.eclipse.help.base_3.0.1/helpbase.jar org.eclipse.help.standalone.Infocenter
  -command update
  [-featureId feature_id ]
  [-version version ]
```

Enabling (configuring) a specified feature:

```
java -cp plugins/org.eclipse.help.base_3.0.1/helpbase.jar org.eclipse.help.standalone.Infocenter
  -command enable
  -featureId feature_id
  -version version
  [-to target_site_dir]
```

Disabling (unconfiguring) a specified feature:

```
java -cp plugins/org.eclipse.help.base_3.0.1/helpbase.jar org.eclipse.help.standalone.Infocenter
  -command disable
  -featureId feature_id
  -version version
  [-to target_site_dir]
```

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Uninstalling a specified feature:

```
java -cp plugins/org.eclipse.help.base_3.0.1/helpbase.jar org.eclipse.help.standalone.Infocenter
  -command uninstall
  -featureId feature_id
  -version version
  [-to target_site_dir]
```

In all the above commands where the `-to target_site_dir` is specified, corresponding configured target site at given directory will be used. If it is not specified, then the default local product site is used.

If you only need to verify if the operation would succeed, in the above commands, (i.e. it satisfies the constraints), without actually performing it, then add `-verifyOnly=true` to the list of arguments.

Searching a remote site, listing all available features for install:

```
java -cp plugins/org.eclipse.help.base_3.0.1/helpbase.jar org.eclipse.help.standalone.Infocenter
  -command search
  -from remote_site_url
```

Listing installed features:

```
java -cp plugins/org.eclipse.help.base_3.0.1/helpbase.jar org.eclipse.help.standalone.Infocenter
  -command listFeatures
  -from local_site_dir
```

The features are listed as:

```
Site: site url
  Feature: id version enabled (or disabled)
```

Adding a local site with more features:

```
java -cp plugins/org.eclipse.help.base_3.0.1/helpbase.jar org.eclipse.help.standalone.Infocenter
  -command addSite
  -from local_site_dir
```

Removing a local site:

```
java -cp plugins/org.eclipse.help.base_3.0.1/helpbase.jar org.eclipse.help.standalone.Infocenter
  -command removeSite
  -to local_site_dir
```

Applying the changes:

```
java -cp plugins/org.eclipse.help.base_3.0.1/helpbase.jar org.eclipse.help.standalone.Infocenter
  -command apply
```

Eclipse Update Policy Control

Eclipse Update allows users to search for updates to the currently installed features. For each installed feature, Update uses the embedded URL to connect to the remote server and search for new versions. If there are updates, Eclipse allows users to initiate the install procedure. After downloading, installing and restarting the platform, new feature version is ready for use.

In companies with many users of the same Eclipse-based product (typically a commercial one), several problems can arise from this model:

1. Updates for very large products (e.g. 500+ plug-ins) are also large. I/T support teams may not like the idea of hundreds of developers individually downloading 500MEG updates to their individual machines. In addition to the bandwidth hit, such a large download request may fail, leading to repeated attempts and increased developers' downtime.
2. Some companies explicitly don't want the developers downloading updates directly from the Internet. For example, they can set up a local support team that may not be ready to handle requests related to the version of the product already available from the provider's update site. They may want to restrict updates and fixes to the internally approved list. Ideally, they would do that by setting up 'proxy' update sites on the LAN (behind the firewall).
3. Once updates are set in the proxy sites as above, administrators need a way of letting users know that updates are available.

2. Update policy to the rescue

2.1 Support for creating local (proxy) update sites

First step for a product administrator would be to set up a local Eclipse update site on a server connected to the company's LAN (behind the firewall). The update site would be a subset of the product's update site on the Internet because it would contain only features and plug-ins related to the updates that the company wants applied at the moment. Technically, this site would be a regular Eclipse update site with site.xml, feature and plug-in archives.

Administrators would construct this site in two ways:

1. Product support teams would make a zip file of the update site readily available for this particular purpose. Administrators would simply need to download the zip file from the product support web page using the tool of their choice and unzip it in the local server. This approach is useful for very large zip files that require modern restartable downloading managers (those that can pick up where they left off in case of the connection problems).
2. Eclipse Update provides a tool to mirror remote update sites entirely or allow administrators to select updates and fixes to download. This mirroring capability would be fully automated and would greatly simplify administrator's task but it relies on Update network connection support.

2.2 Common update policy control

Since features have the update site URL embedded in the manifest, they are unaware of the local update sites set up by the administrators. It is therefore important to provide **redirection capability**. This and other update policy settings can be set for an Eclipse product by creating an update policy file and configuring Update to use that file when searching.

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The file in question uses XML format and can have any name. The file can be set in **Preferences>Install/Update** in the **Update Policy** field. The text field is empty by default: users may set the URL of the update policy file. The file is managed by the local administrator and is shared for all the product installations. Sharing can be achieved in two ways:

- If users install the product: users are told to open the preference page and enter the provided URL
- If administrators install the product: administrators edit the file 'plugin_customization.ini' in the primary product feature and set the default value of the 'updatePolicyFile' property as follows:

```
org.eclipse.update.core/updatePolicyFile = <URL value>
```

This will cause all the installations to have this file set by default.

The policy file must conform to the following DTD:

```
<?xml encoding="ISO-8859-1"?>

<!ELEMENT update-policy (url-map)*>
<!ATTLIST update-policy
>

<!ELEMENT url-map EMPTY>
<!ATTLIST url-map
    pattern    CDATA #REQUIRED
    url        CDATA #REQUIRED
>
```

url-map

- **pattern** – a string that represents prefix of a feature ID (up to and including a complete ID). A value of "*" matches all the features.
- **url** – a URL of the alternative update site that should be used if the feature ID begins with the pattern. If the string is empty, features matching pattern will not be updateable.

This element is used to override Update URLs embedded in feature manifests. When looking for new updates, Eclipse search will check the update policy (if present) and check if **url-map** for the matching feature prefix is specified. If a match is found, the mapped URL will be used **instead** of the embedded one. This way, administrators can configure Eclipse products to search for updates in the local server behind the firewall. Meanwhile, third-party features installed by Eclipse Update will continue to be updated using the default mechanism because they will not find matches in the policy.

Several **url-map** elements may exist in the file. Feature prefixes can be chosen to be less or more specific. For example, to redirect all Eclipse updates, the pattern attribute would be "org.eclipse". Similarly, it is possible to use a complete feature ID as a pattern if redirection is required on a per-feature basis.

Patterns in the file may be chosen to progressively narrow the potential matches. This may result in multiple matches for a given feature. In this case, the **match with a longest pattern** will be used. For example:

```
<?xml version="1.0" encoding="UTF-8"?>
<update-policy>
```


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```
<url-map pattern="org.eclipse" url="URL1"/>
  <url-map pattern="org.eclipse.jdt" url="URL2"/>
</update-policy>
```

In the case above, all Eclipse features will be updated from URL1, except `org.eclipse.jdt` that will use URL2.

Update policy files do not contain translatable strings and therefore do not require special NL handling. In general, the files should use UTF-8 encoding.

2.3 Automatic discovery of updates

Automatic updates will allow Eclipse to run update search on a specified schedule (on each startup (the default), once a day, once a week etc.).

3. Summary

Here is the complete sequence of steps that comprise the solution:

1. Administrator allocates a server on the company LAN for hosting local product updates. Initially it contains no update sites. The machine must have an HTTP server running.
2. Administrator sets up an update policy file on that server and instructs all users to set the update policy preference the provided URL.
3. As the product provider ships updates and fixes on their update sites, administrator downloads supported updates onto the local server.
4. Automatic update executed at the scheduled frequency when the client's product is up picks up the local updates and notifies the user
5. User chooses to install the discovered updates

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Running update manager from command line

In addition to the install wizard and configuration dialog, it is possible to perform update manager operations by running eclipse in a command line mode. You can install, update, enable, disable features, or list installed features, or features available on an update site, or adding an extension product site to the local install, etc. You can also, mirror chosen features from an update site to a local update site location.

Launch eclipse as follows, where [] means optional argument and arguments in italics must be provided by the user.

Installing a feature from a remote site:

```
java -cp startup.jar org.eclipse.core.launcher.Main
  -application org.eclipse.update.core.standaloneUpdate
  -command install
  -featureId feature_id
  -version version
  -from remote_site_url
  [-to target_site_dir]
```

Example: `java -cp startup.jar org.eclipse.core.launcher.Main -application org.eclipse.update.core.standaloneUpdate -command install -from http://dev.eclipse.org/viewcvs/index.cgi/%7Echeckout%7E/platform-update-home/op -featureId com.example.root -version 1.0.0`

Updating an existing feature or all features:

```
java -cp startup.jar org.eclipse.core.launcher.Main
  -application org.eclipse.update.core.standaloneUpdate
  -command update
  [-featureId feature_id ]
  [-version version ]
```

Enabling (configuring) a specified feature:

```
java -cp startup.jar org.eclipse.core.launcher.Main
  -application org.eclipse.update.core.standaloneUpdate
  -command enable
  -featureId feature_id
  -version version
  [-to target_site_dir]
```

Disabling (unconfiguring) a specified feature:

```
java -cp startup.jar org.eclipse.core.launcher.Main
  -application org.eclipse.update.core.standaloneUpdate
  -command disable
  -featureId feature_id
  -version version
  [-to target_site_dir]
```

Uninstalling a specified feature:

```
java -cp startup.jar org.eclipse.core.launcher.Main
```

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```
-application org.eclipse.update.core.standaloneUpdate
-command uninstall
-featureId feature_id
-version version
[-to target_site_dir]
```

In all the above commands where the `-to target_site_dir` is specified, corresponding configured target site at given directory will be used. If it is not specified, then the default local product site is used.

If you only need to verify if the operation would succeed, in the above commands, (i.e. it satisfies the constraints), without actually performing it, then add `-verifyOnly=true` to the list of arguments.

Searching a remote site, listing all available features for install:

```
java -cp startup.jar org.eclipse.core.launcher.Main
  -application org.eclipse.update.core.standaloneUpdate
  -command search
  -from remote_site_url
```

Listing installed features:

```
java -cp startup.jar org.eclipse.core.launcher.Main
  -application org.eclipse.update.core.standaloneUpdate
  -command listFeatures
  -from local_site_dir
```

The features are listed as:

```
Site: site url
  Feature: id version enabled (or disabled)
```

Adding a local site with more features:

```
java -cp startup.jar org.eclipse.core.launcher.Main
  -application org.eclipse.update.core.standaloneUpdate
  -command addSite
  -from local_site_dir
```

Removing a local site:

```
java -cp startup.jar org.eclipse.core.launcher.Main
  -application org.eclipse.update.core.standaloneUpdate
  -command removeSite
  -to local_site_dir
```

Mirroring feature(s) from a remote site:

```
java -cp startup.jar org.eclipse.core.launcher.Main
  -application org.eclipse.update.core.standaloneUpdate
  -command mirror
  -from remote_site_url
  -to target_site_dir
  [-featureId feature_id]
  [-version version]
  [-mirrorURL mirror_site_url]
```

If `-mirrorURL` is specified, an update policy will be generated in `<target_site_dir>/policy.xml` file. The

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resulting `policy.xml` maps all features from the mirror site to the specified URL. The `policy.xml` can be used as is, or its fragments can be included into custom designed policy file.

The return code for each command is either 0 (success) or 1 (failure).

Additionally, most options accepted by Eclipse executable can be passed. They are especially useful during debugging and for specifying target environment for installed features. For example, passing option `-data some_path` will set the workspace to `some_path`.

Migration

- [Introduction](#)
- [FAQ](#)
- [Incompatibilities](#)
- [Adopting 3.0 Mechanisms and API](#)

Eclipse 3.0 Plug-in Migration Guide

This guide covers migrating Eclipse 2.1 (or earlier) plug-ins to Eclipse 3.0.

One of the goals of Eclipse 3.0 was move Eclipse forward while remaining compatible with previous versions to the greatest extent possible. That is, plug-ins written against the Eclipse 2.1 APIs should continue to work in 3.0 in spite of the API changes.

The key kinds of compatibility are API contract compatibility and binary compatibility. API contract compatibility means that valid use of 2.1 APIs remains valid for 3.0, so there is no need to revisit working code. Binary compatibility means that the API method signatures, etc. did not change in ways that would cause existing compiled ("binary") code to no longer link and run with the new 3.0 libraries.

While every effort was made to avoid breakage, there are a few areas of incompatibility. This document describes the areas where Eclipse changed in incompatible ways between 2.1 and 3.0, and provides instructions for migrating 2.1 plug-ins to 3.0.

- [Eclipse 3.0 Plug-in Migration FAQ](#)
- [Incompatibilities between Eclipse 2.1 and 3.0](#)
- [Adopting 3.0 mechanisms and API](#)

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Eclipse 3.0 Plug-in Migration FAQ

Why did Eclipse API change in incompatible ways between 2.1 and 3.0?

Eclipse 3.0 is an evolution of Eclipse 2.1. There were a few areas where we could not evolve Eclipse while maintaining perfect compatibility across the board. The four main sources of incompatibilities are:

- The Eclipse 3.0 runtime is now based on OSGi.
- The Eclipse 3.0 UI workbench is now split into RCP and IDE parts.
- The Xerces plug-in has been dropped from 3.0.
- Eclipse 3.0 performs more work in background threads.

The list of specific [incompatibilities](#).

Will a 2.1 plug-in work in Eclipse 3.0?

Yes, except in a few cases. If a plug-in relies only on Eclipse 2.1 APIs, then it will continue to work in 3.0. The very few exceptions are places in the API where the changes between 2.1 and 3.0 could not be done in any compatible way; if a plug-in uses one of these, it will not work.

My 2.1 plug-in makes use of classes in internal packages. Will it still work in Eclipse 3.0?

If a plug-in relies on internal classes or behavior not specified in the Eclipse 2.1 API, it's impossible to make blanket claims one way or the other about whether the plug-in might work in 3.0. You'll need to try it.

How do I run my plug-in in Eclipse 3.0 without touching it?

Install your 2.1 plug-in in the eclipse/plugins/ subdirectory of an Eclipse 3.0-based product and restart Eclipse. Eclipse will recognize that the plug-in is an unconverted 2.1 plug-in (by the header on the plugin.xml) and automatically make adjustments to compensate for changes to Platform plug-in dependencies and renamed Platform extension points.

Will a 2.1 plug-ins need to be changed to compile properly in Eclipse 3.0?

Yes in all cases. There are certain differences between Eclipse 2.1 and 3.0 that necessitate changes to all plug-ins going forward. If you have a plug-in written for 2.1 and wish to recompile it, it needs to be migrated to 3.0 before it can be developed further for 3.0.

How do I migrate my plug-in to Eclipse 3.0?

Once you've loaded (or imported) your plug-in project into an Eclipse 3.0 workspace, use **PDE Tools > Migrate to 3.0** (project context menu) to convert the plug-in's manifest to the 3.0 format and automatically adjust the list of required Platform plug-ins and references to Platform extension points that were renamed. In most cases, the code for the plug-in should then compile and run successfully. The code for the plug-in should then be reviewed to make sure that it is not dependent on one of the areas of incompatible API change.

Can I trust that a plug-in will have compile errors or warnings if it relies on API that has changed incompatibly?

No. There are some areas of incompatible change that do not get flagged by the Java compiler.

Can I safely ignore warnings in the code coming from use of deprecated API?

Yes, in the short term. Wherever possible, obsolete APIs are marked as deprecated rather than being deleted outright and continue to work (albeit possibly only under limited conditions). So while there is usually no urgency to get off the deprecated API, the fact that it is now considered obsolete means that there is now a better way to do something. Plug-ins should be weaned off all usage to deprecated API at the earliest convenience.

Once I migrate my plug-in to Eclipse 3.0, can I still install and run the resulting binary plug-in in Eclipse 2.1?

No. This is not supported, and probably wouldn't work due to the renamed extension points.

What is the purpose of org.eclipse.core.runtime.compatibility?

The move in 3.0 to an OSGi-base runtime made some of the existing core runtime APIs obsolete. Wherever possible, obsolete APIs in the org.eclipse.core.runtime.* packages, along with the implementation behind it, were moved from the org.eclipse.core.runtime plug-in to a new org.eclipse.core.runtime.compatibility plug-in. By default, newly-created plug-ins depend on org.eclipse.core.runtime and are expected to use only non-deprecated runtime APIs. On the other hand, existing plug-ins migrating from 2.1 will depend by default on org.eclipse.core.runtime.compatibility and can make use of the old APIs as well (the org.eclipse.core.runtime.compatibility plug-in re-exports APIs of org.eclipse.core.runtime). While the org.eclipse.core.runtime.compatibility plug-in is likely to be included in Eclipse IDE configurations, it's dead wood that's unlikely to be included in products based on RCP configurations.

What is the purpose of org.eclipse.ui.workbench.compatibility?

org.eclipse.ui.workbench.compatibility is a plug-in fragment that provides enhanced binary compatibility for 2.1 plug-ins being run in an Eclipse 3.0-based product. In 3.0, six methods with an explicit dependence on IFile or IMarker were moved from the org.eclipse.ui.IWorkbenchPage interface in order to cleanly separate the workbench from workspace and resources. The org.eclipse.ui.workbench.compatibility fragment arranges to add back these methods so that existing 2.1 plug-ins can run without modification. Note, however, that plug-ins being migrated to 3.0 that reference the moved methods will see compile errors that can (only) be resolved by calling the replacement methods now located on org.eclipse.ui.ide.IDE.

The IWorkbenchPage methods in question are: openEditor(IFile), openEditor(IFile, String), openEditor(IFile, String, boolean), openEditor(IMarker), openEditor(IMarker, boolean), and openSystemEditor(IFile).

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Incompatibilities between Eclipse 2.1 and 3.0

Eclipse changed in incompatible ways between 2.1 and 3.0 in ways that affect plug-ins. The following entries describe the areas that changed and provide instructions for migrating 2.1 plug-ins to 3.0. Note that you only need to look here if you are experiencing problems running your 2.1 plug-in on 3.0.

1. [Plug-in manifest version](#)
2. [Restructuring of Platform UI plug-ins](#)
3. [Restructuring of Platform Core Runtime plug-ins](#)
4. [Removal of Xerces plug-in](#)
5. [Eclipse 3.0 is more concurrent](#)
6. [Opening editors on IFiles](#)
7. [Editor goto marker](#)
8. [Editor launcher](#)
9. [Editor registry](#)
10. [Workbench marker help registry](#)
11. [Text editor document providers](#)
12. [Text editors](#)
13. [Headless annotation support](#)
14. [Console view](#)
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16. [Clipboard access in UI thread](#)
17. [Key down events](#)
18. [Tab traversal of custom controls](#)
19. [Selection event order in SWT table and tree widgets](#)
20. [New severity level in status objects](#)
21. [Build-related resource change notifications](#)
22. [Intermediate notifications during workspace operations](#)
23. [URL stream handler extensions](#)
24. [Class load order](#)
25. [Class loader protection domain not set](#)
26. [PluginModel object casting](#)
27. [ILibrary implementation incomplete](#)
28. [Invalid assumptions regarding form of URLs](#)
29. [BootLoader methods moved/deleted](#)
30. [Plug-in export does not include the plug-in's JARs automatically](#)
31. [Re-exporting runtime API](#)
32. [Plug-in parsing methods on Platform](#)
33. [Plug-in libraries supplied by fragments](#)
34. [Changes to build scripts](#)
35. [Changes to PDE build Ant task](#)
36. [Changes to eclipse.build Ant task](#)
37. [Changes to eclipse.fetch Ant task](#)
38. [Replacement of install.ini](#)

1. Plug-in manifest version

The header of the manifest files for plug-ins (and plug-in fragments) has changed to include a new line which identifies the appropriate plug-in manifest version. Prior to 3.0, plug-ins did not carry one of these

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<?eclipse ...?> lines; after 3.0, they must always have one. This change is to allow the Eclipse runtime to reliably recognize pre-3.0 plug-ins that have not been ported to 3.0, so that it can automatically provide greater binary compatibility for such plug-ins. This is the general form of the plugin.xml file (fragment.xml is similar):

```
<?xml version="1.0" encoding="UTF-8"?>
<?eclipse version="3.0"?>
<plugin ...>
    ...
</plugin>
```

Plug-in manifests created by PDE 3.0 automatically have this form. ***It is strongly recommended that you use the PDE plug-in migration tool.*** It automatically inserts the indicated line into the manifest of 2.1 plug-ins and plug-in fragments and addresses many of the other changes described here.

If you do add this directive to a plugin.xml (manually or using PDE), the file must also be updated to explicitly list the plug-ins on which it depends. For example, prior to Eclipse 3.0 dependencies on org.eclipse.core.runtime and org.eclipse.core.boot were implicit. With 3.0, org.eclipse.core.boot is no longer needed and developers must choose org.eclipse.core.runtime or org.eclipse.core.runtime.compatibility (or neither) as appropriate.

Note: This is one of the incompatibilities that does **not** impact how 2.1 binary plug-ins are run by Eclipse 3.0.

2. Restructuring of Platform UI plug-ins

The org.eclipse.ui plug-in, which used to be the main Platform UI plug-in, now provides just the API and extension points for the generic (i.e., non-IDE-specific) workbench. Optional and IDE-specific API and extension points have moved to other plug-ins.

The impact of this change is two-fold: (1) the moved org.eclipse.ui extension points have new extension point ids; and (2) the list of required plug-ins has changed.

The org.eclipse.ui extension points in the following table have moved to different plug-ins, causing their extension point ids to change. If an existing plug-in contributes an extension to the moved extension points, then the reference in the "point" attribute of the <extension> element in the plug-in manifest file must be changed to refer to the corresponding new ones extension point id. The PDE plug-in migration tool makes these fix-ups.

Note: This is one of the incompatibilities that does **not** impact how 2.1 binary plug-ins are run by Eclipse 3.0. The Eclipse 3.0 runtime automatically detects pre-3.0 plug-ins (by the absence of the aforementioned <?eclipse version="3.0"?> line in the plug-in manifest) and automatically compensates for these extension point and plug-in dependency changes.

Old extension point id	New extension point id
org.eclipse.ui.markerHelp	org.eclipse.ui.ide.markerHelp
org.eclipse.ui.markerImageProviders	org.eclipse.ui.ide.markerImageProviders
org.eclipse.ui.markerResolution	org.eclipse.ui.ide.markerResolution
org.eclipse.ui.projectNatureImages	org.eclipse.ui.ide.projectNatureImages
org.eclipse.ui.resourceFilters	org.eclipse.ui.ide.resourceFilters

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org.eclipse.ui.markerUpdaters	org.eclipse.ui.editors.markerUpdaters
org.eclipse.ui.documentProviders	org.eclipse.ui.editors.documentProviders
org.eclipse.ui.workbench.texteditor. markerAnnotationSpecification	org.eclipse.ui.editors.markerAnnotationSpecification

The following table lists the API packages formerly provided by the org.eclipse.ui plug-in that have been moved to different plug-ins. (The names of the API packages, classes, fields, and methods did not change.) In some cases, the API packages are now split across more than one plug-in. Since the API classes visible to any given plug-in are determined by that plug-in's list of required plug-ins, these changes may require adjusting "<requires>" elements in an existing plug-in's manifest to regain access to API class.

This change only affects plug-ins that depend on the org.eclipse.ui plug-in (that is, includes <import plugin="org.eclipse.ui"/> in the <requires> section of the plug-in manifest); all other plug-ins are unaffected. If it is affected, you *may* need to change the <import> element, or add additional <import> elements, so that all the API classes your plug-in needs are in scope. We strongly recommend that plug-ins only state dependencies on the plug-ins that they actually use. Including unnecessary dependencies reduces runtime performance because the Java class loader must search for classes in all dependents. (The PDE plug-in migration tool will fix up the dependencies, and help to determine a minimal set.)

API package	2.1 plug-in	Corresponding 3.0 plug-in(s)
org.eclipse.jface.text.*	org.eclipse.ui	org.eclipse.jface.text
org.eclipse.text.*	org.eclipse.ui	org.eclipse.jface.text
org.eclipse.ui	org.eclipse.ui	org.eclipse.ui, org.eclipse.ui.ide
org.eclipse.ui.actions	org.eclipse.ui	org.eclipse.ui, org.eclipse.ui.ide
org.eclipse.ui.dialogs	org.eclipse.ui	org.eclipse.ui, org.eclipse.ui.ide
org.eclipse.ui.editors.*	org.eclipse.ui	org.eclipse.ui.editor
org.eclipse.ui.model	org.eclipse.ui	org.eclipse.ui, org.eclipse.ui.ide
org.eclipse.ui.part	org.eclipse.ui	org.eclipse.ui, org.eclipse.ui.ide
org.eclipse.ui.texteditor	org.eclipse.ui	org.eclipse.ui.workbench.texteditor, org.eclipse.ui.editors
org.eclipse.ui.texteditor.*	org.eclipse.ui	org.eclipse.ui.workbench.texteditor
org.eclipse.ui.views.bookmarkexplorer	org.eclipse.ui	org.eclipse.ui.ide
org.eclipse.ui.views.contentoutline	org.eclipse.ui	org.eclipse.ui.views
org.eclipse.ui.views.markers	org.eclipse.ui	org.eclipse.ui.ide
org.eclipse.ui.views.navigator	org.eclipse.ui	org.eclipse.ui.ide
org.eclipse.ui.views.properties	org.eclipse.ui	org.eclipse.ui.views
org.eclipse.ui.views.tasklist	org.eclipse.ui	org.eclipse.ui.ide
org.eclipse.ui.wizards.datatransfer	org.eclipse.ui	org.eclipse.ui.ide
org.eclipse.ui.wizards.newresource	org.eclipse.ui	org.eclipse.ui.ide

3. Restructuring of Platform Core Runtime plug-ins

The Eclipse 3.0 Platform Runtime is based on OSGi, necessitating changes to the structure of the two Platform Runtime plug-ins, org.eclipse.core.runtime and org.eclipse.core.boot.

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A new `org.eclipse.core.runtime.compatibility` plug-in provides an implementation bridge between the old and new APIs, and is the new home for many of the obsolete APIs formerly found in `org.eclipse.core.runtime` and `org.eclipse.core.boot`. Platform Runtime extension points are unaffected by the restructuring.

When migrating the existing plug-in to 3.0, the plug-in's manifest needs to be updated to reflect the new structure of the Eclipse Platform Runtime plug-ins. The PDE plug-in manifest migration tool will add a dependency to `org.eclipse.core.runtime.compatibility` if required.

Note also that if you mark your plug-in as 3.0 (using `<?eclipse version="3.0"?>`) and your plug-in defines a `Plugin` class, you must either explicitly `<import plugin="org.eclipse.core.runtime.compatibility"/>` in the plug-in manifest or ensure that the `Plugin` class defines the default constructor.

Note: This is one of the incompatibilities that does **not** impact how 2.1 binary plug-ins are run by Eclipse 3.0. The Eclipse 3.0 runtime automatically detects pre-3.0 plug-ins (by the absence of the `<?eclipse version="3.0"?>` line in the plug-in manifest) and automatically compensates for these changes to the Platform Runtime.

4. Removal of Xerces plug-in

The `org.eclipse.xerces` plug-in is no longer necessary and has been deleted. XML parsing support is built in to J2SE 1.4, and the presence of the Xerces plug-in creates class loader conflicts. The `javax.xml.parsers`, `org.w3c.dom.*`, and `org.xml.sax.*` API packages formerly provided by the `org.eclipse.xerces` plug-in are now available from the J2SE libraries.

If your plug-in requires the `org.eclipse.xerces` plug-in, you must change your plug-in manifest to remove this stated dependency. Once that is done, the plug-in's code should compile and run without further change.

A 2.1 binary plug-ins with a stated dependency on the `org.eclipse.xerces` plug-in will be missing a prerequisite when run in a standard Eclipse 3.0 configuration. The plug-in will not be activated as a consequence.

5. Eclipse 3.0 is more concurrent

Prior to Eclipse 3.0, Eclipse operated mostly in a single thread. Most API methods and extension points operated either in the UI thread, or in a thread spawned from a progress dialog that blocked the UI thread. Most plug-in writers did not have to worry much about thread safety, apart from ensuring that all UI activity occurred in the UI thread. In Eclipse 3.0, there is generally much more concurrency. Many operations now occur in a background thread, where they may run concurrently with other threads, including the UI thread. All plug-ins whose code runs in a background thread must now be aware of the thread safety of their code.

In addition to plug-ins that are explicitly running operations in the background using the `org.eclipse.core.runtime.jobs` API, there are several platform API facilities and extension points that make use of background threads. Plug-ins that hook into these facilities need to ensure that their code is thread safe. The following table summarizes the API and extension points that run some or all of their code in a background thread in Eclipse 3.0:

Extension point or API class	Notes
<code>org.eclipse.core.runtime.IRegistryChangeListener</code>	New in Eclipse 3.0, runs in background
<code>org.eclipse.core.resources.IResourceChangeListener</code>	AUTO_BUILD events now in background

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<code>org.eclipse.core.resources.builders</code> (ext. point)	Auto-build now in background
<code>org.eclipse.core.resources.ISaveParticipant</code>	SNAPSHOT now in background
<code>org.eclipse.ui.workbench.texteditor.quickdiffReferenceProvider</code> (ext. point)	New in Eclipse 3.0, runs in background
<code>org.eclipse.ui.decorators</code> (ext. point)	Already in background in Eclipse 2.1
<code>org.eclipse.ui.startup</code> (ext. point)	Already in background in Eclipse 2.1
<code>org.eclipse.team.core.org.eclipse.team.core.repository</code> (ext. point)	Many operations now in background
<code>org.eclipse.team.ui.synchronizeParticipants</code> (ext. point)	New in Eclipse 3.0, runs in background
<code>org.eclipse.debug.core.launchConfigurationTypes</code> (ext. point)	Now runs in background
<code>org.eclipse.jdt.core.IElementChangeListener</code>	<code>ElementChangedEvent.PRE_AUTO_BUILD</code> now runs in background, <code>POST_RECONCILE</code> already ran in the background

There are various strategies available for making code thread safe. A naive solution is to ensure all work occurs in the UI thread, thus ensuring serialized execution. This is a common approach for UI plug-ins that are not doing CPU-intensive processing. When doing this, be aware of the deadlock risk inherent in `Display.syncExec`. `Display.asyncExec` is generally safer as it does not introduce deadlock risk, at the expense of losing precise control over when the code is executed.

Other techniques for making thread safe code include:

- Wrapping unsafe code in semaphores or Java monitors. The new concurrency infrastructure includes one such semaphore object: `org.eclipse.core.runtime.jobs.ILock`. The advantage of `ILock` over generic locks is that they transfer automatically to the UI thread when doing a `syncExec`, and there is deadlock detection support built into their implementation that logs and then resolves deadlocks.
- Message queues. Code can be serialized by forwarding all processing to a message queue that is processed serially in a single thread. One such example is the SWT deferred event queue (`Display.asyncExec`), which is processed entirely in the UI thread.
- Immutable objects. Make data structures immutable, and make new copies on modification. This is the approach used to make data structures such as `java.lang.String` and `org.eclipse.core.runtime.IPath` thread safe. The advantage of immutable objects is extremely fast read access, at the cost of extra work on modification.

6. Opening editors on IFiles

The following methods were deleted from the `org.eclipse.ui.IWorkbenchPage` interface. `IWorkbenchPage` is declared in the generic workbench, but the methods are inherently resource-specific.

- `public IEditorPart openEditor(IFile input)`
- `public IEditorPart openEditor(IFile input, String editorID)`
- `public IEditorPart openEditor(IFile input, String editorID, boolean activate)`
- `public IEditorPart openEditor(IMarker marker)`
- `public IEditorPart openEditor(IMarker marker, boolean activate)`
- `public void openSystemEditor(IFile input)`

Clients of these `IWorkbenchPage.openEditor` methods should instead call the corresponding public static

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methods declared in the class `org.eclipse.ui.ide.IDE` (in the `org.eclipse.ui.ide` plug-in).

Clients of these `IWorkbenchPage.openSystemEditor(IFile)` method should convert the `IFile` to an `IEditorInput` using new `FileEditorInput(IFile)` and then call the `openEditor(IEditorInput,String)` method. In other words, rewrite `page.openSystemEditor(file)` as `page.openEditor(new FileEditorInput(file), IEditorRegistry.SYSTEM_EXTERNAL_EDITOR_ID)`. Note: clients using editor id `IEditorRegistry.SYSTEM_EXTERNAL_EDITOR_ID` must pass an editor input which implements `org.eclipse.ui.IPathEditorInput` (which `FileEditorInput` does).

Note: This is one of the incompatibilities that does **not** impact how 2.1 binary plug-ins are run by Eclipse 3.0. Eclipse 3.0 includes a binary runtime compatibility mechanism that ensures existing 2.1 plug-in binaries using any of the deleted `openEditor` and `openSystemEditor` methods continue to work as in 2.1 in spite of this API change. (The deleted methods are effectively "added back" by the `org.eclipse.ui.workbench.compatibility` fragment.)

7. Editor goto marker

The following method was deleted from the `org.eclipse.ui.IEditorPart` interface. `IEditorPart` is declared in the generic workbench, but the method is inherently resource-specific.

- `public void gotoMarker(IMarker marker)`

The corresponding methods were also deleted from the classes in the `org.eclipse.ui.part` package that implement `IEditorPart`, namely `EditorPart`, `MultiEditor`, `MultiPageEditorPart`, and `MultiPageEditor`.

Clients that call this method should instead test if the editor part implements or adapts to `org.eclipse.ui.ide.IGotoMarker` (in the `org.eclipse.ui.ide` plug-in) and if so, call `gotoMarker(IMarker)`. The IDE class has a convenience method for doing so: `IDE.gotoMarker(editor, marker)`;

Clients that implement an editor that can position itself based on `IMarker` information should implement or adapt to `org.eclipse.ui.ide.IGotoMarker`.

Since `IGotoMarker`'s only method is `gotoMarker(IMarker)` and has the same signature and specification as the old `IEditorPart.gotoMarker(IMarker)`, existing editor implementations can adapt to this change simply by including `IGotoMarker` in the implements clause of the class definition.

A 2.1 binary plug-ins with code that calls this method will get an class linking error exception when run in a standard Eclipse 3.0 configuration.

8. Editor launcher

The editor launcher interface `org.eclipse.ui.IEditorLauncher` is implemented by plug-ins that contribute external editors. The following method was removed from this interface. `IEditorLauncher` is declared in the generic workbench, but the method is inherently resource-specific.

- `public void open(IFile file)`

It was replaced by

- `public void open(IPath file)`

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Clients that call `IEditorLauncher.open(file)` should instead call `IEditorLauncher.open(file.getLocation())`. Clients that implement this interface should replace (or augment) their implementation of `open(IFile)` by one for `open(IPath)`.

A 2.1 binary plug-ins with code that calls this method will get an class linking error exception when run in a standard Eclipse 3.0 configuration.

9. Editor registry

The following methods were removed from the `org.eclipse.ui.IEditorRegistry` interface. `IEditorRegistry` is declared in the generic workbench, but the methods are inherently resource-specific.

- `public IEditorDescriptor getDefaultEditor(IFile file)`
- `public void setDefaultEditor(IFile file, String editorId)`
- `public IEditorDescriptor[] getEditors(IFile file)`
- `public ImageDescriptor getImageDescriptor(IFile file)`

Clients that call `getEditors(file)` or `getImageDescriptor(file)` should call the "String" equivalent methods:

- Rewrite `registry.getEditors(file)` to be `registry.getEditors(file.getName())`
- Rewrite `registry.getImageDescriptor(file)` to be `registry.getImageDescriptor(file.getName())`

Clients that call `setDefaultEditor(IFile file, String editorId)` and `getDefaultEditor(IFile file)` should instead call the corresponding public static methods declared in the class `org.eclipse.ui.ide.IDE` (in the `org.eclipse.ui.ide` plug-in):

- Rewrite `registry.getDefaultEditor(file)` to be `IDE.getDefaultEditor(file)`
- Rewrite `registry.setDefaultEditor(file, id)` to be `IDE.setDefaultEditor(file, id)`

Also, the API contract for the method `IEditorRegistry.getDefaultEditor()` was changed. This method, which is also now deprecated, and will always return the System External Editor editor descriptor. This change impacts clients that assumed the default editor returned would be a text editor.

There are new constants that represent the system external editor and system in-place editor identifiers (`SYSTEM_EXTERNAL_EDITOR_ID` and `SYSTEM_INPLACE_EDITOR_ID`). These two editors require an editor input that implements or adapts to `org.eclipse.ui.IPathEditorInput`. Note that the in-place editor descriptor will not exist in Eclipse configurations that do not support in-place editing.

10. Workbench marker help registry

The following method was deleted from the `org.eclipse.ui.IWorkbench` interface. `IWorkbench` is declared in the generic workbench, but the method is inherently resource-specific.

- `public IMarkerHelpRegistry getMarkerHelpRegistry()`

Clients of `IWorkbench.getMarkerHelpRegistry()` should instead call the public static method `org.eclipse.ui.ide.IDE.getMarkerHelpRegistry()` (in the `org.eclipse.ui.ide` plug-in).

A 2.1 binary plug-ins with code that calls this method will get an exception when run in a standard Eclipse 3.0 configuration.

11. Text editor document providers

In order to make `org.eclipse.ui.texteditor.AbstractTextEditor` independent of `IFile`, `org.eclipse.ui.texteditor.AbstractDocumentProvider` introduces the concept of a document provider operation (`DocumentProviderOperation`) and a document provider operation runner (`IRunnableContext`). When requested to perform reset, save, or synchronize, `AbstractDocumentProvider` creates document provider operations and uses the operation runner to execute them. The runnable context can be provided by subclasses via the `getOperationRunner` method. Here is a summary of the changes that clients must adapt to:

- Added protected abstract `IRunnableContext getOperationRunner()`; non-abstract subclasses must implement this method in order to provide their own operation runner.
- The method `resetDocument` has been changed to final in order to allow the document provider to wrap the function with a document provider operation. The document provider operation calls the newly introduced `doResetDocument` method. `AbstractDocumentProvider.doResetDocument` contains the code that originally resided inside `AbstractDocumentProvider.resetDocument`. Subclasses must change their implementation of `resetDocument` to `doResetDocument` and any contained call of `super.resetDocument` to `super.doResetDocument`.
- The method `saveDocument` has been changed to final in order to allow the document provider to wrap the function with a document provider operation. The document provider operation calls the newly introduced `doSaveDocument` method. `AbstractDocumentProvider.doSaveDocument` contains the code that originally resided inside `AbstractDocumentProvider.saveDocument`. Subclasses must change their implementation of `saveDocument` to `doSaveDocument` and any contained call of `super.saveDocument` to `super.doSaveDocument`.
- The method `synchronize` has been changed to final in order to allow the document provider to wrap the function with a document provider operation. The document provider operation calls the newly introduced `doSynchronize` method. `AbstractDocumentProvider.doSynchronize` contains the code that originally resided inside `AbstractDocumentProvider.synchronize`. Subclasses must change their implementation of `synchronize` to `doSynchronize` and any contained call of `super.synchronized` to `super.doSynchronize`.

The `AbstractDocumentProvider` subclass `org.eclipse.ui.editors.text.StorageDocumentProvider` implements the `getOperationRunner` method to always return null. This means that subclasses of `StorageDocumentProvider` should not be affected by this change.

The `StorageDocumentProvider` subclass `org.eclipse.ui.editors.text.FileDocumentProvider` implements the `getOperationRunner` method that returns an `IRunnableContext` for executing the given `DocumentProviderOperations` inside a `WorkspaceModifyOperation`. Other changes to `FileDocumentProvider` are:

- `resetDocument(Object)` has been replaced by `doResetDocument(Object, IProgressMonitor)`.
- `synchronize(Object)` has been replaced by `doSynchronize(Object, IProgressMonitor)`.

12. Text editors

Changes to `org.eclipse.ui.texteditor.AbstractTextEditor`:

- The method `IEditorPart.gotoMarker(IMarker marker)` was removed from the `IEditorPart` interface because it was resource-specific. The default implementation provided by `AbstractTextEditor` has been removed from `AbstractTextEditor` and has been moved to `AbstractDecoratedTextEditor`. Direct subclasses of `AbstractTextEditor` or `StatusTextEditor` that want to provide that functionality should

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follow the migration instructions for `IEditorPart` [ref Editor goto marker].

- `AbstractTextEditor` no longer differentiates between implicit and explicit document providers as the concrete implementation was resource specific. This functionality has been moved to `AbstractDecoratedTextEditor`. Direct subclasses of `AbstractTextEditor` or `StatusTextEditor` must perform the following steps:
 - ◆ Override `getDocumentProvider`.
 - ◆ Override the newly introduced hook method for disposing the document provider (`disposeDocumentProvider`)
 - ◆ Override the newly introduced hook method `setDocumentProvider(IEditorInput)` that is called while updating the document provider for the new editor input. I.e., that is the method in which you can configure the appropriate implicit document provider for the given editor input.
- All internal occurrences of `WorkspaceModifyOperation` have been removed. The editor now calls the document provider methods directly (see described changes for document providers);
 - ◆ Removed `createSaveOperation`, changed `performSaveOperation` to `performSave`. Subclasses of `AbstractTextEditor` overriding `createSaveOperation` or `performSaveOperation` must now override `performSave`.
 - ◆ Removed `createRevertOperation`, changed `performRevertOperation` to `performRevert`. Subclasses overriding `createRevertOperation` or `performRevertOperation` must now override `performRevert`.
 - ◆ The implementation of the method `handleEditorInputChanged` has been changed to not use `WorkbenchModifyingOperation`. Subclasses overriding `handleEditorInputChange` must adapt accordingly. Please use the changes applied to `AbstractTextEditor.handleEditorInputChange` as the blueprint.
- `AbstractTextEditor.createActions` no longer registers any actions under `ITextEditorActionConstants.ADD_TASK` and `ITextEditorActionConstant.BOOKMARK` as those actions are IDE-specific. The registration of these actions has been moved to `AbstractDecoratedTextEditor`. Direct subclasses of `AbstractTextEditor` or `StatusTextEditor` should override the `createActions` method and add the following lines (accordingly adapted to their circumstances):
- ```
ResourceAction action= new AddMarkerAction(TextEditorMessages.getResourceBundle(), "Editor.
action.setHelpContextId(ITextEditorHelpContextIds.BOOKMARK_ACTION);
action.setActionDefinitionId(ITextEditorActionDefinitionIds.ADD_BOOKMARK);
setAction(IDEActionFactory.BOOKMARK.getId(), action);

action= new AddTaskAction(TextEditorMessages.getResourceBundle(), "Editor.AddTask.", thi
action.setHelpContextId(ITextEditorHelpContextIds.ADD_TASK_ACTION);
action.setActionDefinitionId(ITextEditorActionDefinitionIds.ADD_TASK);
setAction(IDEActionFactory.ADD_TASK.getId(), action);
```

The `AbstractTextEditor` subclass `org.eclipse.ui.texteditor.StatusTextEditor` provides the predicate method `isErrorStatus(IStatus)`. Subclasses may override in order to decide whether a given status must be considered an error or not.

Changes to `org.eclipse.ui.editors.text.AbstractDecoratedTextEditor`:

- The `IEditorPart` method `gotoMarker(IMarker marker)` has been deprecated to allow a future change of its visibility. Clients of this method must follow the migration instructions in the deprecation message.
- `AbstractDecoratedTextEditor` returns an adapter for `IGotoMarker`.
- `AbstractDecoratedTextEditor` implements the concept of implicit/explicit document providers previously provided by `AbstractTextEditor`, as discussed above.

## 13. Headless annotation support

As part of the introduction of headless annotation support, the following changes to Annotation were made:

- Removed static `Annotation.drawImage` methods, use `org.eclipse.jface.text.source.ImageUtilities` instead.
- Removed `setLayer`, `getLayer`, and `paint` methods from `Annotation`, annotations which want to draw themselves should implement `IAnnotationPresentation`.
- `MarkerAnnotation` now directly implements the methods removed from `Annotation` (`setLayer`, `getLayer`, `paint`).
- The following classes have been moved from the plug-in `org.eclipse.jface.text` to the plug-in `org.eclipse.text`, the package names remain the same and `org.eclipse.jface.text` reexports the classes from `org.eclipse.jface.text`, such that this change is transparent to clients:

```
org.eclipse.jface.text.source.Annotation
org.eclipse.jface.text.source.AnnotationModel
org.eclipse.jface.text.source.AnnotationModelEvent
org.eclipse.jface.text.source.IAnnotationModel
org.eclipse.jface.text.source.IAnnotationModelListener
org.eclipse.jface.text.source.IAnnotationModelListenerExtension
```

## 14. Console view

Eclipse 3.0 has new generic console support. The generic console is available via the `Window > Show View > Basic > Console`, and is used by the Eclipse debug and Ant integration.

The view id for the console has changed from `org.eclipse.debug.ui.ConsoleView` to `org.eclipse.ui.console.ConsoleView`. 2.1 plug-ins that programmatically open the console will be unsuccessful because that the old view no longer exists.

## 15. Java breakpoint listeners

In 3.0, the return types for the methods

`org.eclipse.jdt.debug.core.IJavaBreakpointListener.breakpointHit(IJavaBreakpoint, IJavaThread)` and `installingBreakpointing(IJavaTarget, IJavaBreakpoint, IJavaType)` changed from `boolean` to `int` to allow listeners to vote "don't care". In releases prior to 3.0, listeners could only vote "suspend" or "don't suspend" when a breakpoint was hit, and "install" or "don't install" when a breakpoint was about to be installed. In 3.0, listeners can also vote "don't care" for either of these notifications. This allows clients to only make a decisive vote in situations that they care about. For "breakpoint hit" notifications, the breakpoint will suspend if any listeners vote "suspend", or all listeners vote "don't care"; and it will not suspend if at least one listener votes "don't suspend" and no listeners vote "suspend". Similarly, for "breakpoint installing" notifications, the breakpoint will be installed if any listeners vote to install, or all listeners vote "don't care"; and it will not be installed if at least one listener votes "don't install" and no listeners vote "install". In general, implementors should return `DONT_CARE` unless they have a strong opinion one way or the other. It is important to keep in mind, for example, that voting "suspend" will override any other listener's vote of "don't suspend".

The `IJavaBreakpointListener` interface is implemented by clients that create or react to breakpoints in Java code. There are likely few clients beyond JDT itself, save the one that reported the problem ([bug 37760](#)) that this change remedies. This is a breaking change for existing code that implements the `IJavaBreakpointListener` interface. This code needs to be modified to return an appropriate `int` value before it will compile or run in 3.0.

## 16. Clipboard access in UI thread

Prior to 3.0, the methods on the SWT class `org.eclipse.swt.dnd.Clipboard` were tacitly permitted to run in threads other than the UI thread. This oversight resulted in failures on GTK where the operating system requires that all clipboard interactions be performed in the UI thread. The oversight was not revealed earlier because many applications are single-threaded and receive most of their testing on Windows. In order for the Clipboard API to be sustainable and cross-platform, in 3.0 the specification and implementation of all Clipboard API methods have been changed to throw an SWT Exception (`ERROR_THREAD_INVALID_ACCESS`) if invoked from a non-UI thread. Clipboard services are commonly provided automatically by Eclipse components such as the text editor, which insulate many clients from this breaking change. Existing code that does make direct use of Clipboard should ensure that the API methods are called on the correct thread, using `Display.asyncExec` or `syncExec` when appropriate to shift accesses into the UI thread.

## 17. Key down events

In 3.0, SWT reports key down events before the work is done in the OS. This is much earlier than it was prior to 3.0. This change was made to support key bindings in Eclipse which necessitates intercepting key events before any widget has a chance to process the character. Consequences of this change are visible to code that handles low-level `org.eclipse.swt.SWT.KeyDown` events directly. For example, it means that when a listener on a Text widget receives a key down event, the widget's content (`getText()`) will not yet include the key just typed (it would have prior to 3.0). The recommended way to get the full text from the widget including the current key is to handle the higher-level `SWT.Modify` or `SWT.Verify` events rather than the low-level `SWT.KeyDown` event; code that already does it this way is unaffected by this change.

## 18. Tab traversal of custom controls

Prior to 3.0, when the focus was in the SWT class `org.eclipse.swt.widgets.Canvas` or one of its subclasses (including custom widgets), typing `Ctrl+Tab`, `Shift+Tab`, `Ctrl+PgUp`, or `Ctrl+PgDn` would automatically trigger traversal to the next/previous widget without reporting a key event. This behavior was unspecified, and runs counter to the rule that Canvases see every key typed in them. The proper way to handle traversal is by registering a traverse listener. In order to properly support Eclipse key bindings in 3.0, the default behavior was changed so that Canvas now sees `Ctrl+Tab`, `Shift+Tab`, `Ctrl+PgUp`, and `Ctrl+PgDn` key events instead of traversing. If you use a raw Canvas or define a subclass of Canvas, ensure that that you register a traverse listener.

## 19. Selection event order in SWT table and tree widgets

Mouse selections of items in the SWT classes `org.eclipse.swt.widgets.Table` and `Tree` generate the event sequence `MouseDown-Selection-MouseUp` uniformly in all operating environments. Similarly, keyboard selections generate the event sequence `KeyDown-Selection-KeyUp` uniformly in all operating environments. Prior to 3.0, the event order was not uniform, with Motif and Photon at variance with the rest by always reporting the Selection event first; i.e., `Selection-MouseDown-MouseUp` or `Selection-KeyDown-KeyUp`. For 3.0, the event order on Motif and Photon has been changed to match the others. Existing code that was functioning correctly on `{Windows, GTK}` and on `{Motif, Photon}` is unlikely to be affected. But it is wise to check your code to ensure that it does not rely on an invalid event order.

## 20. New severity level in status objects

`org.eclipse.core.runtime.IStatus` has a new severity constant, `IStatus.CANCEL`, that can be used to indicate cancelation. Callers of `IStatus.getSeverity()` that rely on the set of possible severities being limited to `IStatus.OK`, `INFO`, `WARNING`, and `ERROR` are affected by this addition. Callers of `getSeverity` should update their code to include the new severity.

## 21. Build-related resource change notifications

In Eclipse 3.0, workspace auto-builds now occur in a background thread. This required an API contract change to `org.eclipse.core.resources.IResourceChangeEvent`. The contract of `IResourceChangeEvent` previously guaranteed the following ordering of events for all workspace changes:

1. `PRE_DELETE` or `PRE_CLOSE` event notification if applicable
2. Perform the operation
3. `PRE_AUTO_BUILD` event notification
4. If auto-build is on, perform incremental workspace build
5. `POST_AUTO_BUILD` event notification
6. `POST_CHANGE` event notification

With auto-build now running in the background, there is no longer any guarantee about the temporal relationship between the `AUTO_BUILD` events and the `POST_CHANGE` event. In Eclipse 3.0, steps 3–5 in the above structure are removed from the operation. The resulting picture looks like this:

1. `PRE_DELETE` or `PRE_CLOSE` event notification if applicable
2. Perform the operation
3. `POST_CHANGE` event notification

Periodically, the platform will perform a background workspace build operation. Note that this happens regardless of the whether auto-build is on or off. The exact timing of when this build occurs will not be specified. The structure of the build operation will look like this:

1. `PRE_BUILD` event notification (`PRE_BUILD` is the new name for `PRE_AUTO_BUILD`)
2. If auto-build is on, perform incremental workspace build
3. `POST_BUILD` event notification (`POST_BUILD` is the new name for `POST_AUTO_BUILD`)
4. `POST_CHANGE` event notification

The reference point for the deltas received by auto-build listeners will be different from post-change listeners. Build listeners will receive notification of all changes since the end of the last build operation. Post-change listeners will receive a delta describing all changes since the last post-change notification. This new structure retains three characteristics of resource change listeners that have been true since Eclipse 1.0:

- `POST_CHANGE` listeners receive notification of absolutely all resource changes that occur during the time they are registered. This includes changes made by builders, and changes made by other listeners.
- `PRE_AUTO_BUILD` listeners receive notification of all resource changes **except** changes made by builders and resource change listeners.
- `POST_AUTO_BUILD` listeners receive notification of all resource changes **except** changes made by other `POST_AUTO_BUILD` listeners.

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However, there are some important differences with this approach. Prior to Eclipse 3.0, auto-build listeners were always called before `POST_CHANGE` listeners. For this reason, the delta received by auto-build listeners was always a subset of the delta received by the `POST_CHANGE` listeners. This relationship is now essentially reversed. Auto-build listeners will receive a delta that is a super-set of all deltas supplied to `POST_CHANGE` listeners since the end of the last background build. As before, auto-build listeners will be allowed to modify the workspace, and post-change listeners will not.

It will no longer be true that upon completion of a workspace changing operation, that `AUTO_BUILD` event listeners will have been notified. Client code that registers resource change listeners with `IWorkspace.addResourceChangeListener(IResourceChangeListener)` is unlikely to be affected by this change because `AUTO_BUILD` events were never reported to these listeners. However, clients that use `IWorkspace.addResourceChangeListener(IResourceChangeListener, int)` and specify an event mask that includes `AUTO_BUILD` events are likely to be broken by this change if they make assumptions about when auto-build listeners run or what thread they run in. For example, if an auto-build listener is updating a domain model to reflect changes to the workspace, then this update might not have happened when the workspace changing operation returns. It is worth noting that only UI-level code can be affected in this way. Core-level code that is called via API may be called within the scope of an `IWorkspaceRunnable`, so it can never be sure about when resource change listeners will be called. The suggested fix for this breakage is to use `POST_CHANGE` instead of build listeners if it is necessary to have notification occur before the operation completes.

## 22. Intermediate notifications during workspace operations

It will no longer be guaranteed that all resource changes that occur during the dynamic scope of an `IWorkspaceRunnable` will be batched in a single notification. This mechanism can still be used for batching changes to avoid unnecessary builds and notifications, but the Platform may now decide to perform notifications during the operation. This API contract change is not likely to be a breaking change for existing clients. It is equivalent to the Platform deciding to call `IWorkspace.checkpoint` periodically during a long running operations. The reason for this change is that it is now possible for multiple threads to be modifying the workspace concurrently. When one thread finishes modifying the workspace, a notification is required to prevent responsiveness problems, even if the other operation has not yet completed. This change also allows users to begin working on a set of resources before the operation completes. For example, a user can now begin browsing files in a project that is still in the process of being checked out. The new method `IWorkspace.run(IWorkspaceRunnable, ISchedulingRule, int, IProgressMonitor)` has an optional flag, `AVOID_UPDATE`, which operations can use as a hint to the platform to specify whether periodic updates are desired.

## 23. URL stream handler extensions

**What is affected:** Plug-ins that contribute extensions to the `org.eclipse.core.runtime.urlHandlers` extension point.

**Description:** The contract for the `org.eclipse.core.runtime.urlHandlers` extension point was changed to use the URL Stream Handler service provided by OSGi. The OSGi support is superior to the one in Eclipse 2.1, and correctly handles dynamic handlers. Because of various design issues with the base Java URL handler mechanism, `URLStreamHandlers` registered with the OSGi handler service must implement `org.osgi.service.url.URLStreamHandlerService`.

**Action required:** Formerly, the handler class had to implement `java.net.URLStreamHandler` and extend the `urlHandlers` extension point. The extension point is no longer supported and the handler must be

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updated to implement `org.osgi.service.url.URLStreamHandlerService` interface. The OSGi framework provides an abstract base class (`org.osgi.service.url.AbstractURLStreamHandlerService`) that can be trivially subclassed to fill this role.

Instead of registering the handler using an extension point, plug-ins must now do so by registering their handler as a service. For example,

```
Hashtable properties = new Hashtable(1);
properties.put(URLConstants.URL_HANDLER_PROTOCOL, new String[] {MyHandler.PROTOCOL});
String serviceClass = URLStreamHandlerService.class.getName();
context.registerService(serviceClass, new MyHandler(), properties);
```

## 24. Class load order

**What is affected:** Plug-ins which supply packages provided which are also supplied by other plug-ins. A very limited number of plug-ins are affected by this change and some of those affected will actually benefit (see below).

**Description:** In Eclipse 2.x, class loaders search for classes in the following order: consult (1) parent class loader (in practice this is the Java boot class loader), then (2) its own classpath contents, and finally (3) all of its prerequisites in the order declared. OSGi offers an optimization over this model. In this approach a class loader will consult (1) parent class loader (again, effectively the Java boot classloader), then either (2a) a single prerequisite known to contribute classes in the package being queried or (2b) its own classpath entries for the desired class.

The class loader determines whether to consult self or its prerequisites based on its imported and required packages. This information is inferred from the plug-in content in the case of traditional plug-ins and directly specified in the case of plug-ins with explicit OSGi bundle manifest. In either case, it is known *a priori* which class loaders will supply the classes for which packages. This offers performance improvements as well as a solution to the vexing problem of multiple prerequisites contributing the same classes.

Take for example the case of Xerces and Xalan, both of which contain various classes from `org.xml` packages. Using the first approach, the Xerces plug-in would see its copy of these classes while the Xalan plug-in would see their copy. Since these plug-ins need to communicate, `ClassCastException`s occur. Using the second approach, only one of the two plug-ins contributes the duplicate classes and both plug-ins see the same copies.

**Action required:** The action required depends on the particulars of the usecase. Affected developers need to review their classpath and resolve any conflicts which may be happening.

## 25. Class loader protection domain not set

**What is affected:** Plug-ins that expect the protection domain of their class loader to be set at all times.

**Description:** In Eclipse 2.1 plug-in class loaders were `java.security.SecureClassloaders` and, as such, always had a protection domain set. In Eclipse 3.0, class loaders do not extend `SecureClassLoader` and only set the protection domain if Java security is turned on (not the normal case).

**Action required:** The action required will depend on the scenario in which the plug-in is using the protection domain.

## 26. PluginModel object casting

**What is affected:** Plug-ins which cast objects of type `org.eclipse.core.runtime.IPlugin*` to `org.eclipse.core.runtime.model.Plugin*Model`. Even though the relationship between these interfaces and the model classes is not specified in the Eclipse 2.1 API, we are explicitly calling out this change as we have found instances of plug-ins relying on this relationship in the 2.1 implementation.

**Description:** The Eclipse API provides a series of interfaces (e.g., `IPluginDescriptor`) and so-called "model" classes (e.g., `PluginDescriptorModel`) related to plug-ins and the plug-in registry. In the Eclipse 2.1 implementation it happens that the model classes implement the relevant interfaces. In the new OSGi-based runtime, the plug-in registry has been significantly reworked to allow for a separation between the class loading and prerequisite aspects of plug-ins and the extension and extension-point aspects. As such the Eclipse 3.0 runtime is unable to maintain the implementation relationship present in 2.1.

**Action required:** Plug-ins relying on this non-API relationship need to be reworked code according to their usecase. More information on this is given in the recommended changes section of this document and in the Javadoc for the related classes and methods.

## 27. ILibrary implementation incomplete

**What is affected:** Plug-ins that use `org.eclipse.core.runtime.ILibrary`.

**Description:** The new runtime maintains the classpath entries in a different and incompatible form from Eclipse. As a result, the compatibility layer is unable to correctly model the underlying OSGi structures as `ILibrary` objects. The runtime's compatibility support creates `ILibrary` objects but must assume default values for everything except the library's path.

**Action required:** Users of `ILibrary` should consider accessing the desired header values (e.g., `Bundle-Classpath`) from the appropriate `Bundle` (see `Bundle.getHeaders()`) and using the `ManifestElement` helper class to interpret the entries. See the class Javadoc for more details.

## 28 Invalid assumptions regarding form of URLs

**What is affected:** Plug-ins that make assumptions regarding their installation structure, location and the local file system layout.

**Description:** Methods such as `IPluginDescriptor.getInstallURL()` return URLs of a particular form. Despite their form being unspecified, various plug-ins are making assumptions based on the current implementation. For example, they may expect to get a `file:` URL and use `URL.getFile()` and use `java.io.File` manipulation on the result. To date, this has been a workable but rather fragile approach. For example, if a plug-in is installed on a web server, it is possible that an `http:` URL would be returned. The new Eclipse 3.0 runtime is even more flexible and opens more possibilities for execution configurations (e.g., maintaining whole plug-ins in JARs rather than exploded in directories). That is, while the new OSGi-based runtime does not actually break 2.1 API, it exposes more cases where assumptions made in current plug-ins are invalid.

**Action required:** Plug-in writers should ensure that the information to which they need access is available via `getResource()` (and is on the classpath) or use the relevant API for accessing the contents of a plug-in (e.g., `Bundle.getEntry(String)`).

## 29. BootLoader methods moved/deleted

**What is affected:** Non–plug–in code that calls certain methods from the class `org.eclipse.core.boot.BootLoader`.

**Description:** The static methods `BootLoader.startup()`, `shutdown()` and `run()` were moved to `org.eclipse.core.runtime.adaptor.EclipseStarter`, which is part of the OSGi framework. This API is the interface between the `main()` in `startup.jar` and the OSGi framework/Eclipse runtime. The restructuring of the runtime did not permit these methods to remain on `BootLoader`. The old `BootLoader` class is now located in the runtime compatibility layer and is deprecated, and the moved methods are stubbed to do nothing.

There is no replacement for the old `BootLoader.getRunnable()` as the runtime can no longer support the acquisition of individual applications. Rather, users must indicate the application of interest when they start the platform.

**Action required:** In general this API is used by very few people (it cannot be used from within an Eclipse plug–in). In the rare case that it is, the code must be adapted to use the corresponding methods on `EclipseStarter`.

## 30. Plug–in export does not include the plug–in's JARs automatically

**What is affected:** All plug–ins.

**Description:** In Eclipse 2.1, a plug–in's `bin.includes` line from their `build.properties` did not have to contain the list of JARs from their library declaration in the `plugin.xml` file; these JARs were added for free. In Eclipse 3.0 the list of files in the `bin.includes` section of the `build.properties` is an exhaustive list and must include all files which plug–in developers intend to be included in their plug–in when building or exporting.

**Action required:** Ensure that the `bin.includes` line from the `build.properties` file includes all of the JARs listed in your `plugin.xml` file.

## 31. Re–exporting runtime API

**What is affected:** Plug–ins that expose API that includes elements from changed runtime API.

**Description:** Various plug–ins expose API that includes elements from the runtime API. With the changes to the Eclipse 3.0 runtime outlined here, client plug–ins must re–evaluate their use of runtime API in their API.

**Action required:** This scenario is quite rare as very little of the Eclipse runtime API is changing. Depending on the scenario, clients may have to change their API or continue to rely on the the compatibility layer.

## 32. Plug–in parsing methods on Platform

**What is affected:** Plug–ins that use `org.eclipse.core.runtime.Platform.parsePlugins(..., Factory)`.

**Description:** The method `org.eclipse.core.runtime.Platform.parsePlugins(..., Factory)` has been moved. The API associated with the `Factory` argument has been moved from the `org.eclipse.core.runtime` plug–in up to the `org.eclipse.core.runtime.compatibility` plug–in (which depends on the runtime plug–in). As a result, the parsing method has been moved as well.



**Action required:** Users of this method should use the same method on the class `org.eclipse.core.runtime.model.PluginRegistryModel`.

### 33. Plug-in libraries supplied by fragments

**What is affected:** Plug-ins that specify code on their classpath but do not supply that code (i.e., the JAR is supplied by a fragment; for example, the `org.eclipse.swt` plug-in).

**Description:** The new runtime must convert `plug.xml` files to `manifest.mf` files behind the scenes. This is done through a straight mechanical transformation and an analysis of the jars listed and supplied by the plug-in. In the case where a plug-in specifies a jar on its classpath but does not supply the jar, there is no code to analyze and the plug-in convertor cannot generate a correct `manifest.mf`.

**Action required:** Providers of such plug-ins must either change to supply the appropriate jar in the plug-in itself or hand craft/maintain a `META-INF/MANIFEST.MF` file for their plug-in. Typically this can be done using PDE to get the initial manifest and then adding in the appropriate `Provide-Package` header.

### 34. Changes to build scripts

**What is affected:** Scripts (e.g., Ant `build.xml` files) which define classpaths containing runtime-related jars and class directories.

**Description:** The new runtime contains a number of new plug-ins and jars. Their introduction was mandated by the refactoring of the runtime into configurable pieces. For most runtime situations these changes are transparent. However, if you have custom `build.xml` (or similar) scripts which currently compile code against `org.eclipse.core.runtime`, you will need to update them before they will function correctly. A typical script contains a classpath entry in a `<javac>` task that references the `org.eclipse.core.runtime` plug-in as follows:

```
../org.eclipse.core.runtime/bin;../org.eclipse.core.runtime/runtime.jar
```

The runtime plug-in continues to contain much of the original runtime code. However, various parts of the runtime which are there only for compatibility purposes are contained in a compatibility plug-in (`org.eclipse.core.runtime.compatibility`). Most of the new runtime code is contained in a collection of plug-ins (`org.eclipse.osgi.*`).

**Action required:** Developers should add the entries below as needed to eliminate compilation errors. While the complete set of jars supplied is listed below, typical uses require only a subset on the classpath at compile time. As usual, the inclusion of the `/bin` directories is discretionary. The entries are given here in logical groupings by supplying plug-in:

- `../org.eclipse.core.runtime.compatibility/bin;../org.eclipse.core.runtime.compatibility/compatibility.jar;`
- `../org.eclipse.osgi/bin;../org.eclipse.osgi/osgi.jar;`
- `../org.eclipse.update.configurator/bin;../org.eclipse.update.configurator/configurator.jar;`
- `../org.eclipse.osgi.util/util.jar;`

In addition the following jars may be required in special cases:

- `../org.eclipse.osgi/core.jar; ../org.eclipse.osgi/resolver.jar; ../org.eclipse.osgi/defaultAdaptor.jar;`  
`../org.eclipse.osgi/eclipseAdaptor.jar; ../org.eclipse.osgi/console.jar`

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While updating such scripts, you should also take the opportunity to clean up (i.e., remove) references to `org.eclipse.core.boot`. This plug-in is obsolete and longer contains any code. The entries can be left on the classpath but they serve no purpose and should be removed. Look to remove:

```
../org.eclipse.core.boot/bin;../org.eclipse.core.boot/boot.jar
```

### 35. Changes to PDE build Ant task

**What is affected:** Scripts (e.g., Ant build.xml files) using the `eclipse.buildScript` task.

**Description:** PDE Build introduced a new property to the `eclipse.buildScript` task to control the generation of plug-ins build scripts. This was mandated by the introduction of the new OSGi-based runtime.

**Action required:** If you want to use Eclipse 3.0 to build a 2.1 based product, then introduce in `eclipse.buildScript` the property "buildingOSGi" and set it to false. For example:

```
<eclipse.buildScript ... buildingOSGi="false"/>
```

### 36. Changes to eclipse.build Ant task

**What is affected:** Scripts (e.g., Ant build.xml files) using the `eclipse.buildScript` task.

**Description:** PDE Build introduced a new property to the `eclipse.buildScript` task to control the generation of plug-ins build scripts. This was mandated by the introduction of the new OSGi-based runtime.

**Action required:** If you want to use Eclipse 3.0 to build a 2.1 based product, then introduce in `eclipse.buildScript` the property "buildingOSGi" and set it to false. For example:

```
<eclipse.buildScript ... buildingOSGi="false"/>
```

### 37. Changes to eclipse.fetch Ant task

**What is affected:** Scripts (e.g., Ant build.xml files) using the `eclipse.buildScript` task.

**Description:** PDE Build changed the behaviour of the `eclipse.fetch` task to ease building eclipse in an automated build style. The elements style now only support one entry at a time and the `scriptName` is always ignored.

**Action required:** If you had a list of entries in the "elements" tag of an `eclipse.fetch` call, spread them out over several call to `eclipse.fetch`. If you use to set the `scriptName`, note that now the generated fetch script is always called "fetch\_{elementId}". For example:

```
<eclipse.fetch elements="plugin@org.eclipse.core.runtime, feature@org.eclipse.platform" .../>
```

becomes

```
<eclipse.fetch elements="plugin@org.eclipse.core.runtime" .../>
<eclipse.fetch elements="feature@org.eclipse.platform" .../>
```

## 38. Replacement of install.ini

The install.ini file is no longer included. In its place is the new config.ini file in the configuration sub-directory. Products that used the install.ini file to specify a primary feature (e.g., to provide branding information) need to make changes to the config.ini file instead. In addition to the new filename, the names of the keys have changed.

The value of the feature.default.id key in 2.1 should be set as the value of the new eclipse.product key. The value of the eclipse.application should be set to "org.eclipse.ui.ide.workbench".

Finally, in 2.1 the image for the splash image was always splash.bmp in the branding plug-in's directory. In 3.0 the location of the splash image is provided explicitly by the osgi.splashPath key in the config.ini file.

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## Changes required when adopting 3.0 mechanisms and APIs

This section describes changes that are required if you are trying to change your 2.1 plug-in to adopt the 3.0 mechanisms and APIs.

### Getting off of org.eclipse.core.runtime.compatibility

The Eclipse 3.0 runtime is significantly different. The underlying implementation is based on the OSGi framework specification. Eclipse 3.0 runtime includes a compatibility layer (in the org.eclipse.core.runtime.compatibility plug-in) which maintains the 2.1 APIs. Plug-in developers interested in additional performance and function should consider adopting the 3.0 APIs and removing their dependence on the compatibility layer. Compatibility code shows up in three places:

- org.eclipse.core.boot – entire plug-in is legacy
- org.eclipse.core.runtime.compatibility – entire plug-in is legacy
- org.eclipse.core.runtime – various classes and methods are legacy

The text below gives more detail on the which classes and methods are present for compatibility purposes as well as guidance on how to update your plug-in.

### Plug-ins and bundles

The Eclipse runtime has been refactored into two parts; classloading and prerequisite management, and extension/extension-point management. This split allows for natural/seamless adoption of the OSGi framework specification for classloading and prerequisite management. This in turn enables a range of new capabilities in the runtime from dynamic plug-in install/update/uninstall to security and increased configurability.

While we continue to talk about *plug-ins*, in the new runtime a plug-in is really a *bundle* plus some extensions and extension-points. The term *bundle* is defined by the OSGi framework specification and refers to a collection of types and resources and associated inter-bundle prerequisite information. The *extension registry* is the new form of the plug-in registry and details only extension and extension-point information. By-in-large the extension registry API is the same as the relevant plug-in registry API (for more information see [Registries](#)).

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In the Eclipse 2.x runtime, the plug-in object has a number of roles and responsibilities:

- Lifecycle – The `Plugin` class implements method such as `startup()` and `shutdown()`. The runtime uses these methods to signal the plug-in that someone is interested in the function it provides. In response, plug-ins typically do a combination of:
  - ◆ Registration – Hook various event mechanisms (e.g., register listeners) and otherwise make their presence known in the system (e.g., start needed threads).
  - ◆ Initialization – Initialize or prime their data structures and load models so they are ready for use.
- Plug-in global data/function – While never explicitly put forth for this role, in common practice plug-in classes have become a place to hang data and function which is effectively global to the plug-in itself. In some cases this data/function is API in others it is internal. For example, the UI plug-in exposes as API methods such as `getDialogSettings()` and `getWorkbench()`.
- Context – The standard `Plugin` class provides access to various runtime-provided function such as preferences and logging.

In the Eclipse 3.0 runtime picture, these roles and responsibilities are factored into distinct objects.

### ***Bundle***

Bundles are the OSGi unit of modularity. There is one classloader per bundle and Eclipse-like inter-bundle class loading dependency graphs can be constructed. Bundles have lifecycle for start and stop and the OSGi framework broadcasts bundle related events (e.g., install, resolve, start, stop, uninstall, ...) to interested parties. Unlike the Eclipse `Plugin` class, the OSGi `Bundle` class is not extensible. That is, developers do not have the opportunity to define their own bundle class.

### ***BundleActivator***

`BundleActivator` is an interface defined by the OSGi framework. Each bundle can define a bundle activator class much like a plug-in can define its `Plugin` class. The specified class is instantiated by the framework and used to implement the `start()` and `stop()` lifecycle processing. There is a major difference however in the nature of this lifecycle processing. In Eclipse it is common (though not recommended) to have the `Plugin` classes do both initialization and registration. In OSGi activators must only do registration. Doing large amounts of initialization (or any other work) in `BundleActivator.start()` threatens the liveness of the system.

### ***BundleContext***

`BundleContexts` are the OSGi mechanism for exposing general system function to individual bundles. Each bundle has a unique and *private* instance of `BundleContext` which they can use to access system function (e.g., `getBundles()` to discover all bundles in the system).

### ***Plugin***

The new `Plugin` is very much like the original Eclipse `Plugin` class with the following exceptions: `Plugin` objects are no longer required or managed by the runtime and various methods have been deprecated. It is essentially a convenience mechanism providing a host of useful function and mechanisms but is no longer absolutely required. Much of the function provided there is also available on the `Platform` class in the runtime.

`Plugin` also implements `BundleActivator`. This recognizes the convenience of having one central object representing the lifecycle and semantic of a plug-in. Note that this does not however sanction the eager initialization of data structures that is common in plug-ins today. We cannot stress enough that plug-ins can be activated because a somewhat peripheral class was referenced during verification of a class in some other plug-in. That is, just because your plug-in has been activated does not necessarily mean that its function is needed. Note also

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that you are free to define a different `BundleActivator` class or not have a bundle activator at all.

The steps required to port a 2.x `Plugin` class to Eclipse 3.0 depends on what the class is doing. As outlined above, most startup lifecycle work falls into one of the following categories:

### *Initialization*

Datastructure and model initialization is quite often done in `Plugin.startup()`. The natural/obvious mapping would be to do this work in a `BundleActivator.start()`, that is to leave the function on `Plugin`. **This is strongly discouraged.** As with 2.x plug-ins, 3.0 plug-ins/bundles may be started for many different reasons in many different circumstances.

An actual example from Eclipse 2.0 days illuminates this case. There was a plug-in which initialized a large model requiring the loading of some 11MB of *code* and many megabytes of data. There were quite common usecases where this plug-in was activated to discover if the project icon presented in the navigator should be decorated with a particular markup. This test did not require any of the initialization done in `startup()` but yet all users, in all usecases had to pay the memory and time penalty for this eager initialization.

The alternative approach is to do such initialization in a classic lazy style. For example, rather than having models initialized when the plug-in/bundle is activated, do it when they are actually needed (e.g., in a centralized model accessor method). For many usecases this will amount to nearly the same point in time but for other scenarios this approach will defer initialization (perhaps indefinitely). We recommend taking time while porting 2.1 plug-ins to reconsider the initialization strategy used.

### *Registration*

Plug-in startup is a convenient time to register listeners, services etc. and start background processing threads (e.g., listening on a socket). `Plugin.start()` may be a reasonable place to do this work. It may also make sense to defer until some other trigger (e.g., the use of a particular function or data element).

### *Plug-in global data*

Your `Plugin` class can continue to play this role. The main issue is that `Plugin` objects are no longer globally accessible via a system-managed list. In Eclipse 2.x you could discover any plug-in's `Plugin` object via the plug-in registry. This is no longer possible. In most circumstances this type of access is not required. `Plugins` accessed via the registry are more typically used as generic `Plugins` rather than calling domain-specific methods. The equivalent level of capability can be had by accessing and manipulating the corresponding `Bundle` objects.

## Registries and the plug-in model

In the new runtime there is a separation between the information and structures needed to execute a plug-in and that related to a plug-in's extensions and extension points. The former is defined and managed by the OSGi framework specification. The latter are Eclipse-specific concepts and are added by the Eclipse runtime code. Accordingly, the original plug-in registry and related objects have been split into OSGi *bundles* and the Eclipse *extension registry*.

The parts of `IPluginRegistry` dealing with execution specification (e.g., `IPluginDescriptor`, `ILibrary`, `IPrequisite`) have been deprecated and the remaining parts related to extensions and extension point have been moved to `IExtensionRegistry`. Further, the so-called model objects related to the plug-in registry as a whole are now deprecated. These types were presented and instantiated by the runtime primarily to support tooling such as PDE. Unfortunately, it was frequently the case that the level of

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information needed exceeded the runtime's capabilities or interests (e.g., remembering line numbers for `plugin.xml` elements) and in the end, the potential consumers of the runtime's information had to maintain their own structures anyway.

In the new runtime we have re-evaluated the facilities provided by the runtime and now provide only those which are either essential for runtime execution or are extraordinarily difficult for others to do. As mentioned above, the plug-in registry model objects have been deprecated as has the plug-in parsing API. The new extensions registry maintains the essential extension-related information. A new *state* (see `org.eclipse.osgi.service.resolver.State` and friends) structure represents and allows the manipulation of the essential execution-related information.

## NL fragment structure

In Eclipse 3.0 the NL fragment structure has been updated to be more consistent. Previously the translations for files like `plugin.properties` were assumed to be inside of JARs supplied by fragments. Since the original files are found in the root of the relevant host plug-in, a more consistent location would have the translated files located in the root of the NL fragments. For example,

```
org.eclipse.ui.workbench.nl/
 fragment.xml
 plugin_fr.properties
 plugin_pt_BR.properties
 ...
 nl1.jar
```

Note here that the file `nl1.jar` previously would have contained the translations for `plugin.properties`. These files are now at the root of the fragment and the JAR contains translations of any translatable resources (i.e., files loaded via the classloader) in the host plug-in.

Of course, the Eclipse 2.1 NL fragment structure is still supported for 2.1 host plug-ins running in Eclipse 3.0. You cannot however use a 2.1 NL fragment on a 3.0 plug-in. The fragment must be updated to the new structure.

## API changes overview

### **org.eclipse.core.boot (package org.eclipse.core.boot)**

The entire `org.eclipse.core.boot` package has been deprecated. `BootLoader` has been merged with `org.eclipse.core.runtime.Platform` since it no longer made sense to have a split between boot and runtime. Note that in fact, the `org.eclipse.core.boot` plug-in has been broken up and all its code moved to either the new runtime or the compatibility layer.

`IPlatformConfiguration` has always been a type defined by and for the Eclipse Install/Update component. With the reorganization of the runtime we are able to repatriate this type to its rightful home. This class remains largely unchanged and has been repackaged as `org.eclipse.update.configurator.IPlatformConfiguration`.

`IPlatformRunnable` has been moved to `org.eclipse.core.runtime.IPlatformRunnable`.

## **IExtension and IExtensionPoint (package org.eclipse.core.runtime)**

The `getDeclaringPlugin()` method (on both classes) gives an upward link to the plug-in which declares the extension or extension-point (respectively). The new registry model separates the execution aspects of plug-ins from the extension/extension-point aspects and no longer contains `IPluginDescriptors`. Users of this API should consider the new method `getParentIdentifier()` found on both `IExtension` and `IExtensionPoint`.

## **ILibrary, IPluginDescriptor, IPluginRegistry and IPrerequisite (package org.eclipse.core.runtime)**

In the original runtime, the plug-in registry maintained a complete picture of the runtime configuration. In Eclipse 3.0 this picture is split over the OSGi framework and the extension registry. As such, these classes have been deprecated. The deprecation notices contain details of how you should update your code.

## **Platform and Plugin (package org.eclipse.core.runtime)**

In the new runtime, `Plugin` objects are no longer managed by the runtime and so cannot be accessed generically via the `Platform`. Similarly, the plug-in registry no longer exists or gives access to plug-in descriptors. There are however suitable replacement methods available and detailed in the Javadoc of the deprecated methods in these classes.

## **org.eclipse.core.runtime.model (package org.eclipse.core.runtime.model)**

All types in this package are now deprecated. See the discussion on [registries](#) for more information.

## **IWorkspaceRunnable and IWorkspace.run (package org.eclipse.core.resources)**

Clients of the `IWorkspace.run(IWorkspaceRunnable, IProgressMonitor)` method should revisit their uses of this method and consider using the richer method `IWorkspace.run(IWorkspaceRunnable, ISchedulingRule, int, IProgressMonitor)`. The old `IWorkspace.run` method acquires a lock on the entire workspace for the duration of the `IWorkspaceRunnable`. This means that an operation done with this method will never be able to run concurrently with other operations that are changing the workspace. In Eclipse 3.0, many long-running operations have been moved into background threads, so the likelihood of conflicts between operations is greatly increased. If a modal foreground operation is blocked by a long running background operation, the UI becomes blocked until the background operation completes, or until one of the operations is canceled.

The suggested solution is to switch all references to old `IWorkspace.run` to use the new method with a scheduling rule parameter. The scheduling rule should be the most fine-grained rule that encompasses the rules for all changes by that operation. If the operation tries to modify resources outside of the scope of the scheduling rule, a runtime exception will occur. The precise scheduling rule required by a given workspace operation is not specified, and may change depending on the installed repository provider on a given project. The factory `IResourceRuleFactory` should be used to obtain the scheduling rule for a resource-changing operation. If desired, a `MultiRule` can be used to specify multiple resource rules, and the `MultiRule.combine` convenience method can be used to combine rules from various resource-changing operations.

If no locking is required, a scheduling rule of `null` can be used. This will allow the runnable to modify all resources in the workspace, but will not prevent other threads from also modifying the workspace concurrently. For simple changes to the workspace this is often the easiest and most concurrency-friendly

solution.

### **IWorkbenchPage (package org.eclipse.ui)**

- The constant EDITOR\_ID\_ATTR is now deprecated. This is an IMarker attribute name that specifies the preferred editor id to open the IMarker resource with. This constant is now on org.eclipse.ui.ide.IDE class.

### **IEditorDescriptor (package org.eclipse.ui)**

- There are new API methods to determine whether the editor will open internally to the workbench page (isInternal), in-place to the workbench window (isOpenInPlace), or externally to the workbench (isExternal). While this is not a breaking change, it is a good opportunity for clients that are illegally down-casting IEditorDescriptor to org.eclipse.ui.internal.model.EditorDescriptor to call isInternal to bring their code back into line.

### **ISharedImages (package org.eclipse.ui)**

- The following fields were removed (deprecated) from this interface because they were IDE-specific:
  - ◆ String IMG\_OBJ\_PROJECT
  - ◆ String IMG\_OBJ\_PROJECT\_CLOSED
  - ◆ String IMG\_OPEN\_MARKER
  - ◆ String IMG\_OBJ\_TASK\_TSK
  - ◆ String IMG\_OBJ\_BKMRK\_TSK
- Existing clients should instead use the fields of the same names declared on IDE.SharedImages in the org.eclipse.ui.ide package of the org.eclipse.ui.ide plug-in.

### **IWorkbenchActionConstants (package org.eclipse.ui)**

- The following fields were removed (deprecated) from this interface; they are subsumed by the new ActionFactory class:
  - ◆ String ABOUT
  - ◆ String BACK
  - ◆ String CLOSE
  - ◆ String CLOSE\_ALL
  - ◆ String COPY
  - ◆ String CUT
  - ◆ String DELETE
  - ◆ String EXPORT
  - ◆ String FIND
  - ◆ String FORWARD
  - ◆ String IMPORT
  - ◆ String MOVE
  - ◆ String NEW
  - ◆ String NEXT
  - ◆ String PASTE
  - ◆ String PREVIOUS
  - ◆ String PRINT
  - ◆ String PROPERTIES
  - ◆ String QUIT
  - ◆ String REDO



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- ◆ String REFRESH
- ◆ String RENAME
- ◆ String REVERT
- ◆ String SAVE
- ◆ String SAVE\_ALL
- ◆ String SAVE\_AS
- ◆ String SELECT\_ALL
- ◆ String UNDO
- ◆ String UP
- Clients should instead call `getID()` on the fields of the same names declared on `ActionFactory` in the `org.eclipse.ui.actions` package (`org.eclipse.ui` plug-in). For example, change `IWorkbenchActionConstants.CUT` to `ActionFactory.CUT.getID()`.
- The following fields were removed (deprecated) from this interface because they were IDE-specific.
  - ◆ String ADD\_TASK
  - ◆ String BOOKMARK
  - ◆ String BUILD
  - ◆ String BUILD\_PROJECT
  - ◆ String CLOSE\_PROJECT
  - ◆ String FIND
  - ◆ String OPEN\_PROJECT
  - ◆ String REBUILD\_ALL
  - ◆ String REBUILD\_PROJECT
- Clients should instead call `getID()` on the fields of the same names declared on `IDEActionFactory` in the `org.eclipse.ui.ide` package (`org.eclipse.ui.ide` plug-in). For example, change `IWorkbenchActionConstants.BUILD` to `IDEActionFactory.BUILD.getID()`.

### **IWorkbenchPreferenceConstants (package `org.eclipse.ui`)**

- The following fields were removed (deprecated) from this interface because they were IDE-specific:
  - ◆ String PROJECT\_OPEN\_NEW\_PERSPECTIVE
- Clients should instead use the fields of the same names declared on `IDE.Preferences` in the `org.eclipse.ui.ide` package.

### **IExportWizard (package `org.eclipse.ui`)**

- Prior to 3.0, the selection passed to `IWorkbenchWizard.init(IWorkbench, IStructuredSelection)` for an export wizard was preprocessed. If any of the selections were `IResources`, or adaptable to `IResource`, then the selection consisted only of these resources. In 3.0, the generic export wizard does not do any preprocessing.
- The selection passed to the wizard is generally used to prime the particular wizard page with contextually appropriate values.
- Client that implement `IExportWizard` and requires this resource-specific selection transformation should add the following to their `init(IWorkbench, IStructuredSelection selection)` method to compute `filteredSelection` from `selection`:
  - ◆ 

```
IStructuredSelection filteredSelection = selection;
List selectedResources =
IDE.computeSelectedResources(currentSelection);
if (!selectedResources.isEmpty()) {
 filteredSelection = new
StructuredSelection(selectedResources);
}
```

## **IImportWizard (package org.eclipse.ui)**

- Prior to 3.0, the selection passed to `IWorkbenchWizard.init(IWorkbench, IStructuredSelection)` for an import wizard was preprocessed. If any of the selections were `IResources`, or adaptable to `IResource`, then the selection consisted only of these resources. In 3.0, the generic import wizard does not do any preprocessing.
- The selection passed to the wizard is generally used to prime the particular wizard page with contextually appropriate values.
- Client that implement `IImportWizard` and requires this resource-specific selection transformation should add the following to their `init(IWorkbench, IStructuredSelection selection)` method to compute a filtered selection from the selection passed in:

```

 ◆ IStructuredSelection filteredSelection = selection;
 List selectedResources =
 IDE.computeSelectedResources(currentSelection);
 if (!selectedResources.isEmpty()) {
 filteredSelection = new
 StructuredSelection(selectedResources);
 }

```

## **INewWizard (package org.eclipse.ui)**

- Prior to 3.0, the selection passed to `IWorkbenchWizard.init(IWorkbench, IStructuredSelection)` for a new wizard was preprocessed. If there was no structured selection at the time the wizard was invoked, but the active workbench window had an active editor open on an `IFile`, then the selection passed in would consist of that `IFile`. In 3.0, the generic new wizard does not do any preprocessing, and an empty selection will be passed when there is no structured selection.
- The selection passed to the wizard is generally used to prime the particular wizard page with contextually appropriate values.
- Client that implement `INewWizard` and requires this capability should add the following to their `init(IWorkbench, IStructuredSelection selection)` method to compute a selection from the active editor's input:

```

if (selection.isEmpty()) {
 IWorkbenchWindow window = PlatformUI.getWorkbench().getActiveWorkbenchWindow();
 if (window != null) {
 IWorkbenchPart part = window.getPartService().getActivePart();
 if (part instanceof IEditorPart) {
 IEditorInput input = ((IEditorPart) part).getEditorInput();
 if (input instanceof IFileEditorInput) {
 selection = new StructuredSelection(((IFileEditorInput) input).getFile());
 }
 }
 }
}

```

## **WorkbenchHelp (package org.eclipse.ui.help)**

- The following `WorkbenchHelp` method was removed (deprecated) from this class because its result (`IHelp`) was removed (deprecated):
  - ◆ `public static IHelp getHelpSupport()`
- Clients that called this method to obtain an `IHelp` should instead call the static methods on `HelpSystem` or `WorkbenchHelp`.

## **IHelp (package org.eclipse.help)**

- This interface has been removed (deprecated). `WorkbenchHelp.getHelpsupport()` was the only way to get hold of an `IHelp` object. This method has also been removed (deprecated).
- The following `IHelp` methods now appear as static methods on a new `HelpSystem` class in the same package:
  - ◆ `public IToc[] getTocs()`
  - ◆ `public IContext getContext(String contextId)`
- The rest of the `IHelp` methods now appear as static method on `WorkbenchHelp`.
- This interface was formerly mentioned in the contract for the `org.eclipse.help.support` extension point. This extension point has been renamed "`org.eclipse.ui.helpSupport`", and the contract simplified so that the implementer only needs supply the display methods. For these purposes, `IHelp` has been replaced by `AbstractHelpUI` (in the `org.eclipse.ui.help` package).
- There should be no clients implementing this interface beyond the Platform which supplied the sole implementation of this interface.

## **ITextEditorActionConstants (package org.eclipse.ui.texteditor)**

- This interface additionally includes newly defined constants that redefine deprecated constants inherited from `org.eclipse.ui.IWorkbenchActionConstants`. This change allows clients to free their code from deprecation warnings. The constants `ADD_TASK` and `BOOKMARK` have not been redefined as they are IDE specific. When using these two constants in your code, please follow the instructions given in the deprecation message.

## **IAbstractTextEditorHelpContextIds (package org.eclipse.ui.texteditor)**

- `BOOKMARK_ACTION` and `ADD_TASK_ACTION` have been deprecated because they are IDE specific. Use the constants defined in `org.eclipse.ui.editors.text.ITextEditorHelpContextIds` instead.

## **BasicTextEditorActionContributor (package org.eclipse.ui.texteditor)**

- `BasicTextEditorActionContributor` no longer assigns any editor action as global action for `org.eclipse.ui.IWorkbenchActionConstants.ADD_TASK` and `org.eclipse.ui.IWorkbenchActionConstants.BOOKMARK` because these actions are IDE specific. This is now done by the `org.eclipse.ui.editors.text.TextEditorActionContributor`. If your editors are not configured to use `TextEditorActionContributor` but uses a contributor that is a subclass of `BasicTextEditorActionContributor`, this contributor has to be extended to also assign global action handlers for `ADD_TASK` and `BOOKMARK`. This can be done by adding the following lines to the `setActiveEditor` method of the editor action contributor:
  - ```
IActionBars actionBars= getActionBars();
if (actionBars != null) {
    actionBars.setGlobalActionHandler(IDEActionFactory.ADD_TASK.getId(), getAction(textEdit
    actionBars.setGlobalActionHandler(IDEActionFactory.BOOKMARK.getId(), getAction(textEdit
}
```

TextEditorActionContributor (package org.eclipse.ui.editors.text)

- `TextEditorActionContributor` assigns global action handlers for `IWorkbenchActionConstants.ADD_TASK` (now `IDEActionFactory.ADD_TASK.getId()`) and `IWorkbenchActionConstants.BOOKMARK` (now `IDEActionFactory.BOOKMARK.getId()`). These action handlers have previously been registered by `BasicTextEditorActionContributor`. See migration notes for `BasicTextEditorActionContributor`.

annotationTypes extension point (plug-in org.eclipse.ui.editors)

There is now the explicit notion of an annotation type. See `Annotation.getType()` and `Annotation.setType()`. The type of an annotation can change over its lifetime. A new extension point has been added for the declaration of annotation types: "org.eclipse.ui.editors.annotationTypes". An annotation type has a name and can be declared as being a subtype of another declared annotation type. An annotation type declaration may also use the attributes "markerType" and "markerSeverity" in order to specify that markers of a given type and a given severity should be represented in text editors as annotations of a particular annotation type. The attributes "markerType" and "markerSeverity" in the "org.eclipse.ui.editors.markerAnnotationSpecification" should no longer be used. Marker annotation specifications are thus becoming independent from markers and the name thus misleading. However, the name is kept in order to ensure backward compatibility.

Instances of subclasses of `AbstractMarkerAnnotationModel` automatically detect and set the correct annotation types for annotations they create from markers. In order to programmatically retrieve the annotation type for a given marker or a given pair of `markerType` and `markerSeverity` use `org.eclipse.ui.texteditor.AnnotationTypeLookup`.

Access to the hierarchy of annotation types is provided by `IAnnotationAccessExtension`. For a given annotation type you can get the chain of super types and check whether an annotation type is a subtype of another annotation type. `DefaultMarkerAnnotationAccess` implements this interface.

markerAnnotationSpecification extension point (plug-in org.eclipse.ui.editors)

The annotation type is the key with which to find the associated marker annotation specification. As annotation types can extend other annotation types, there is an implicit relation between marker annotation specifications as well. Therefore a marker annotation specification for a given annotation type is completed by the marker annotation specifications given for the super types of the given annotation type. Therefore, marker annotation specifications do not have to be complete as this was required before. Marker annotation specifications are retrieved by `AnnotationPreferences`. By using `org.eclipse.ui.texteditor.AnnotationPreferenceLookup`, you can retrieve an annotation preference for a given annotation type that transparently performs the completion of the preference along the annotation super type chain.

Marker annotation specification has been extended with three additional attributes in order to allow the definition of custom appearances of a given annotation type in the vertical ruler. These attributes are: "icon", "symbolicIcon", and "annotationImageProvider". The value for "icon" is the path to a file containing the icon image. The value of "symbolicIcon" can be one of "error", "warning", "info", "task", "bookmark". The attribute "symbolicIcon" is used to tell the platform that annotation should be depicted with the same images that are used by the platform to present errors, warnings, infos, tasks, and bookmarks respectively. The value of "annotationImageProvider" is a class implementing `org.eclipse.ui.texteditor.IAnnotationImageProvider` that allows for a full custom annotation presentation.

The vertical ruler uses its associated `IAnnotationAccess/IAnnotationAccessExtension` to draw annotations. The vertical ruler does not call `Annotation.paint` any longer. In general, Annotations are no longer supposed to draw themselves. The "paint" and "getLayer" methods have been deprecated in order to make annotation eventually UI independent. `DefaultMarkerAnnotationAccess` serves as default implementation of `IAnnotationAccess/IAnnotationAccessExtension`. `DefaultMarkerAnnotationAccess` implements the following strategy for painting annotations: If an annotation implements `IAnnotationPresentation`, `IAnnotationPresentation.paint` is called. If not, the annotation image provider is looked up in the annotation preference. The annotation image provider is only available if specified and if the plug-in defining the enclosing marker annotation specification has already been loaded. If there is an annotation image provider,

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the call is forwarded to it. If not, the specified "icon" is looked up. "symbolicIcon" is used as the final fallback. For drawing annotations, the annotation presentation layer is relevant.

DefaultMarkerAnnotationAccess looks up the presentation layer using the following strategy: If the annotation preference specifies a presentation layer, the specified layer is used. If there is no layer and the annotation implements IAnnotationPresentation, IAnnotationPresentation.getLayer is used otherwise the default presentation layer (which is 0) is returned.

Migration to annotationTypes extension point (plug-in org.eclipse.ui.editors)

The following annotation types are declared by the org.eclipse.ui.editors plug-in:

```
<extension point="org.eclipse.ui.editors.annotationTypes">
  <type
    name="org.eclipse.ui.workbench.texteditor.error"
    markerType="org.eclipse.core.resources.problemmarker"
    markerSeverity="2">
  </type>
  <type
    name="org.eclipse.ui.workbench.texteditor.warning"
    markerType="org.eclipse.core.resources.problemmarker"
    markerSeverity="1">
  </type>
  <type
    name="org.eclipse.ui.workbench.texteditor.info"
    markerType="org.eclipse.core.resources.problemmarker"
    markerSeverity="0">
  </type>
  <type
    name="org.eclipse.ui.workbench.texteditor.task"
    markerType="org.eclipse.core.resources.taskmarker">
  </type>
  <type
    name="org.eclipse.ui.workbench.texteditor.bookmark"
    markerType="org.eclipse.core.resources.bookmark">
  </type>
</extension>
```

The defined markerAnnotationSpecification extension no longer provide "markerType" and "markerSeverity" attributes. They define the "symbolicIcon" attribute with the according value. Thus, MarkerAnnotation.paint and MarkerAnnotation.getLayer are not called any longer, i.e. overriding these methods does not have any effect. Affected clients should implement IAnnotationPresentation.

ILaunchConfigurationType (package org.eclipse.debug.core)

With the introduction of extensible launch modes in 3.0, more than one launch delegate can exist for a launch configuration type. Releases prior to 3.0 only supported one launch delegate per launch configuration type. The method ILaunchConfigurationType.getDelegate() is now deprecated. The method getDelegate(String mode) should be used in its place to retrieve the launch delegate for a specific launch mode. The deprecated method has been changed to return the launch delegate for the run mode.

ILaunchConfigurationTab and ILaunchConfigurationTabGroup (package org.eclipse.debug.ui)

Launch tab groups and launch tabs are no longer notified when a launch completes. The method launched(ILaunch) in the interfaces ILaunchConfigurationTab and

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`ILaunchConfigurationTabGroup` has been deprecated and is no longer called. Relying on this method for launch function was always problematic, since tabs only exist when launching is performed from the launch dialog. Also, with the introduction of background launching, this method can no longer be called, as the launch dialog is closed before the resulting launch object exists.

ILaunchConfigurationTab and AbstractLaunchConfigurationTab (package `org.eclipse.debug.ui`)

Two methods have been added to the `ILaunchConfigurationTab` interface – `activated` and `deactivated`. These new life cycle methods are called when a tab is entered and exited respectively. Existing implementations of `ILaunchConfigurationTab` that subclass the abstract class provided by the debug plug-in (`AbstractLaunchConfigurationTab`) are binary compatible since the methods are implemented in the abstract class.

In prior releases, a tab was sent the message `initializeFrom` when it was activated, and `performApply` when it was deactivated. In this way, the launch configuration tab framework provided inter-tab communication via a launch configuration (by updating the configuration with current attribute values when a tab is exited, and updating the newly entered tab). However, since many tabs do not perform inter-tab communication, this can be inefficient. As well, there was no way to distinguish between a tab being activated, and a tab displaying a selected launch configuration for the first time. The newly added methods allow tabs to distinguish between activation and initialization, and deactivation and saving current values.

The default implementation of `activated`, provided by the abstract tab, calls `initializeFrom`. And, the default implementation of `deactivated` calls `performApply`. Tabs wishing to take advantage of the new API should override these methods as required. Generally, for tabs that do not perform inter-tab communication, the recommended approach is to re-implement these methods to do nothing.

launchConfigurationTabGroup extension point Type (package `org.eclipse.debug.ui`)

In prior releases, perspective switching was specified on a launch configuration, via the launch configuration attributes `ATTR_TARGET_DEBUG_PERSPECTIVE` and `ATTR_TARGET_RUN_PERSPECTIVE`. With the addition of extensible launch modes in 3.0, this approach no longer scales. Perspective switching is now specified on launch configuration type basis, per launch mode that a launch configuration type supports. API has been added to `DebugUITools` to set and get the perspective associated with a launch configuration type for a specific launch mode.

An additional, optional, `launchMode` element has been added to the `launchConfigurationTabGroup` extension point, allowing a contributed tab group to specify a default perspective for a launch configuration type and mode.

From the Eclipse user interface, users can edit the perspective associated with a launch configuration type by opening the launch configuration dialog, and selecting a launch configuration type node in the tree (rather than an individual configuration). A tab is displayed allowing the user to set a perspective with each supported launch mode.

[JDT only] IVMRunner (package `org.eclipse.jdt.launching`)

Two methods have been added to the `VMRunnerConfiguration` class to support the setting and retrieving of environment variables. Implementors of `IVMRunner` should call `VMRunnerConfiguration.getEnvironment()` and pass that environment into the executed JVM. Clients who use `DebugPlugin.exec(String[] cmdLine, File workingDirectory)` can do

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this by calling `DebugPlugin.exec(String[] cmdLine, File workingDirectory, String[] envp)` instead. Simply passing in the result from `getEnvironment()` is sufficient.

[JDT only] VMRunnerConfiguration and Bootstrap Classes (package `org.eclipse.jdt.launching`)

In prior releases, the `VMRunnerConfiguration` had one attribute to describe a boot path. The attribute is a collection of `Strings` to be specified in the `-Xbootclasspath` argument. Three new attributes have been added to the `VMRunnerConfiguration` to support JVMs that allow for prepending and appending to the boot path. The new methods/attributes added are:

- `getPrependBootClassPath()` – returns a collection of entries to be prepended to the boot path (the `-Xbootclasspath/p` argument)
- `getMainBootClassPath()` – returns a collection of entries to be placed on the boot path (the `-Xbootclasspath` argument)
- `getAppendBootClassPath()` – returns a collection of entries to be appended to the boot path (the `-Xbootclasspath/a` argument)

The old attribute, `getBootClassPath()`, still exists and contains a complete path equivalent to that of the three new attributes. However, `VMRunners` that support the new boot path options should take advantage of the new attributes.

[JDT only] Improved support for working copies (package `org.eclipse.jdt.core`)

The Java model working copy facility has been reworked in 3.0 to provide greatly increased functionality. Prior to 3.0, the Java model allowed creation of individual working copies of compilation units. Changes could be made to the working copy and later committed. There was support for limited analysis of a working copy in the context of the rest of the Java model. However, there was no way these these analyses could ever take into account more than one of the working copies at a time.

The changes in 3.0 make it possible to create and manage sets of working copies of compilation units, and to perform analyses in the presence of all working copies in a set. For example, it is now possible for a client like JDT refactoring to create working copies for one or more compilation units that it is considering modifying and then to resolve type references between the working copies. Formerly this was only possible after the changes to the compilation unit working copies had been committed.

The Java model API changes in 2 ways to add this improved support:

(1) The functionality formerly found on `IWorkingCopy` and inherited by `ICompilationUnit` has been consolidated into `ICompilationUnit`. The `IWorkingCopy` interface was only used in this one place, and was gratuitously more general than needed to be. This change simplifies the API. `IWorkingCopy` has been deprecated. Other places in the API where `IWorkingCopy` is used as a parameter or result type have been deprecated as well; the replacement API methods mention `ICompilationUnit` instead of `IWorkingCopy`.

(2) The interface `IBufferFactory` has been replaced by `WorkingCopyOwner`. The improved support for working copies requires that there be an object to own the working copies. Although `IBufferFactory` is in the right place, the name does not adequately convey how the new working copy mechanism works. `WorkingCopyOwner` is much more suggestive. In addition, `WorkingCopyOwner` is declared as an abstract class, rather than as an interface, to allow the notion of working copy owner to evolve in the future. The one method on `IBufferFactory` moves to `WorkingCopyOwner` unaffected.

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`WorkingCopyOwner` does not implement `IBufferFactory` to make it clear that `IBufferFactory` is a thing of the past. `IBufferFactory` has been deprecated. Other places in the API where `IBufferFactory` appears as a parameter or result type have been deprecated as well; the replacement API methods mention `WorkingCopyOwner` instead of `IBufferFactory`.

These changes do not break binary compatibility.

When migrating, all references to the type `IWorkingCopy` should instead reference `ICompilationUnit`. The sole implementation of `IWorkingCopy` implements `ICompilationUnit` as well, meaning objects of type `IWorkingCopy` can be safely cast to `ICompilationUnit`.

A class that implements `IBufferFactory` will need to be replaced by a subclass of `WorkingCopyOwner`. Although `WorkingCopyOwner` does not implement `IBufferFactory` itself, it would be possible to declare the subclass of `WorkingCopyOwner` that implements `IBufferFactory` thereby creating a bridge between old and new (`IBufferFactory` declares `createBuffer(IOpenable)` whereas `WorkingCopyOwner` declares `createBuffer(ICompilationUnit); ICompilationUnit extends IOpenable`).

Because the changes involving `IWorkingCopy` and `IBufferFactory` are intertwined, we recommend dealing with both at the same time. The details of the deprecations are as follows:

- `IWorkingCopy` (package `org.eclipse.jdt.core`)
 - ◆ `public void commit(boolean, IProgressMonitor)` has been deprecated.
 - ◇ The equivalent functionality is now provided on `ICompilationUnit` directly:
 - `public void commitWorkingCopy(boolean, IProgressMonitor)`
 - ◇ Rewrite `wc.commit(b, monitor)` as `((ICompilationUnit) wc).commitWorkingCopy(b, monitor)`
 - ◆ `public void destroy()` has been deprecated.
 - ◇ The equivalent functionality is now provided on `ICompilationUnit` directly:
 - `public void discardWorkingCopy(boolean, IProgressMonitor)`
 - ◇ Rewrite `wc.destroy()` as `((ICompilationUnit) wc).discardWorkingCopy()`
 - ◆ `public IJavaElement findSharedWorkingCopy(IBufferFactory)` has been deprecated.
 - ◇ The equivalent functionality is now provided on `ICompilationUnit` directly:
 - `public ICompilationUnit findWorkingCopy(WorkingCopyOwner)`
 - ◇ Note: `WorkingCopyOwner` substitutes for `IBufferFactory`.
 - ◆ `public IJavaElement getOriginal(IJavaElement)` has been deprecated.
 - ◇ The equivalent functionality is now provided on `IJavaElement`:
 - `public IJavaElement getPrimaryElement()`
 - ◇ Rewrite `wc.getOriginal(elt)` as `elt.getPrimaryElement()`
 - ◇ Note: Unlike `IWorkingCopy.getOriginal`, `IJavaElement.getPrimaryElement` does not return null if the receiver is not a working copy.
 - ◆ `public IJavaElement getOriginalElement()` has been deprecated.
 - ◇ The equivalent functionality is now provided on `ICompilationUnit` directly:
 - `public ICompilationUnit getPrimary()`

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- ◊ Rewrite `wc.getOriginalElement()` as `((ICompilationUnit) wc).getPrimary()`
- ◊ Note: Unlike `IWorkingCopy.getOriginalElement`, `IWorkingCopy.getPrimary` does not return null if the receiver is not a working copy.
- ◆ `public IJavaElement[] findElements(IJavaElement)` has been deprecated.
 - ◊ The method is now declared on `ICompilationUnit` directly.
 - ◊ Rewrite `wc.findElements(elts)` as `((ICompilationUnit) wc).findElements(elts)`
- ◆ `public IType findPrimaryType()` has been deprecated.
 - ◊ The method is now declared on `ICompilationUnit` directly.
 - ◊ Rewrite `wc.findPrimaryType()` as `((ICompilationUnit) wc).findPrimaryType()`
- ◆ `public IJavaElement getSharedWorkingCopy(IProgressMonitor, IBufferFactory, IProblemRequestor)` has been deprecated.
 - ◊ The equivalent functionality is now provided on `ICompilationUnit` directly:
 - `public ICompilationUnit getWorkingCopy(WorkingCopyOwner, IProblemRequestor, IProgressMonitor)`
 - ◊ Note: the parameter order has changed, and `WorkingCopyOwner` substitutes for `IBufferFactory`.
- ◆ `public IJavaElement getWorkingCopy()` has been deprecated.
 - ◊ The equivalent functionality is now provided on `ICompilationUnit` directly:
 - `public ICompilationUnit getWorkingCopy(IProgressMonitor)`
 - ◊ Rewrite `wc.getWorkingCopy()` as `((ICompilationUnit) wc).getWorkingCopy(null)`
- ◆ `public IJavaElement getWorkingCopy(IProgressMonitor, IBufferFactory, IProblemRequestor)` has been deprecated.
 - ◊ The equivalent functionality is now provided on `ICompilationUnit` directly:
 - `public ICompilationUnit getWorkingCopy(WorkingCopyOwner, IProblemRequestor, IProgressMonitor)`
 - ◊ Note: the parameter order has changed, and `WorkingCopyOwner` substitutes for `IBufferFactory`.
- ◆ `public boolean isBasedOn(IResource)` has been deprecated.
 - ◊ The equivalent functionality is now provided on `ICompilationUnit` directly:
 - `public boolean hasResourceChanged()`
 - ◊ Rewrite `wc.isBasesOn(res)` as `((ICompilationUnit) wc).hasResourceChanged()`
- ◆ `public boolean isWorkingCopy()` has been deprecated.
 - ◊ The method is now declared on `ICompilationUnit` directly.
 - ◊ Rewrite `wc.isWorkingCopy()` as `((ICompilationUnit) wc).isWorkingCopy()`
- ◆ `public IMarker[] reconcile()` has been deprecated.
 - ◊ The equivalent functionality is now provided on `ICompilationUnit` directly:
 - `public void reconcile(boolean, IProgressMonitor)`
 - ◊ Rewrite `wc.reconcile()` as `((ICompilationUnit) wc).reconcile(false, null)`
 - ◊ Note: The former method always returned null; the replacement method does not return a result.

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- ◆ `public void reconcile(boolean, IProgressMonitor)` has been deprecated.
 - ◇ The method is now declared on `ICompilationUnit` directly.
 - ◇ Rewrite `wc.reconcile(b,monitor)` as `((ICompilationUnit) wc).reconcile(b.monitor)`
- ◆ `public void restore()` has been deprecated.
 - ◇ The method is now declared on `ICompilationUnit` directly.
 - ◇ Rewrite `wc.restore()` as `((ICompilationUnit) wc).restore()`
- `IType` (package `org.eclipse.jdt.core`)
 - ◆ `public ITypeHierarchy newSupertypeHierarchy(IWorkingCopy[], IProgressMonitor)` has been deprecated.
 - ◇ The replacement method is provided on the same class:
 - `public ITypeHierarchy newSupertypeHierarchy(c, IProgressMonitor)`
 - ◇ Note: The Java language rules for array types preclude casting `IWorkingCopy[]` to `ICompilationUnit[]`.
 - ◆ `public ITypeHierarchy newTypeHierarchy(IWorkingCopy[], IProgressMonitor)` has been deprecated.
 - ◇ The replacement method is provided on the same class:
 - `public ITypeHierarchy newTypeHierarchy(ICompilationUnit[], IProgressMonitor)`
 - ◇ Note: The Java language rules for array types preclude casting `IWorkingCopy[]` to `ICompilationUnit[]`.
- `IClassFile` (package `org.eclipse.jdt.core`)
 - ◆ `public IJavaElement getWorkingCopy(IProgressMonitor, IBufferFactory)` has been deprecated.
 - ◇ The replacement method is provided on the same class:
 - `public ICompilationUnit getWorkingCopy(WorkingCopyOwner, IProgressMonitor)`
 - ◇ Note: the parameter order has changed, and `WorkingCopyOwner` substitutes for `IBufferFactory`.
- `JavaCore` (package `org.eclipse.jdt.core`)
 - ◆ `public IWorkingCopy[] getSharedWorkingCopies(IBufferFactory)` has been deprecated.
 - ◇ The replacement method is provided on the same class:
 - `public ICompilationUnit[] getWorkingCopies(WorkingCopyOwner)`
 - ◇ Note: `WorkingCopyOwner` substitutes for `IBufferFactory`.
 - ◇ Note: The Java language rules for array types preclude casting `ICompilationUnit[]` to `IWorkingCopy[]`.
- `SearchEngine` (package `org.eclipse.jdt.core.search`)
 - ◆ `public SearchEngine(IWorkingCopy[])` has been deprecated.
 - ◇ The replacement constructor is provided on the same class:
 - `public SearchEngine(ICompilationUnit[])`
 - ◇ Note: The Java language rules for array types preclude casting `IWorkingCopy[]` to `ICompilationUnit[]`.

Restructuring of `org.eclipse.help` plug-in

The `org.eclipse.help` plug-in, which used to hold APIs and extension points for contributing to and extending help system, as well as displaying help, now contains just APIs and extension points for contributing and

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accessing help resources. A portion of default help UI implementation contained in that plug-in has been moved to a new plug-in `org.eclipse.help.base` together with APIs for extending the implementation. The APIs and extension point for contributing Help UI and displaying help have been moved to `org.eclipse.ui` plug-in. This restructuring allows applications greater flexibility with regard to the help system; the new structure allows applications based on the generic workbench to provide their own Help UI and/or Help implementation, or to omit the help system entirely.

Because the extension points and API packages affected are intended only for use by the help system itself, it is unlikely that existing plug-ins are affected by this change. They are included here only for the sake of completeness:

- API packages `org.eclipse.ui.help.browser` and `org.eclipse.ui.help.standalone`, formerly provided by the `org.eclipse.help` plug-in, have been moved to the `org.eclipse.help.base` plug-in.
- Extension points `org.eclipse.help.browser`, `org.eclipse.help.luceneAnalyzer`, and `org.eclipse.help.webapp`, formerly defined by the `org.eclipse.help` plug-in, have been moved to the `org.eclipse.help.base` plug-in, with a corresponding change in extension point id.
- Extension point `org.eclipse.help.support` has been replaced by the `org.eclipse.ui.helpSupport` extension point. The contract for this extension point changed as well (see entry for `IHelp`).

New Search UI API

A new API for implementing custom searches has been added in 3.0. The original API is deprecated in 3.0 and we recommend that clients port to the new API in the packages `org.eclipse.search.ui` and `org.eclipse.search.ui.text`.

Clients will have to create implementations of `ISearchQuery`, `ISearchResult` and `ISearchResultPage`. The `ISearchResultPage` implementation must then be contributed into the new `org.eclipse.search.searchResultViewPages` extension point.

Default implementations for `ISearchResult` and `ISearchResultPage` are provided in the package `org.eclipse.search.ui.text`.

null messages in `MessageBox` and `DirectoryDialog` (package `org.eclipse.swt.widgets`)

Prior to 3.0, calling SWT's `DirectoryDialog.setMessage(String string)` or `MessageBox.setMessage(String string)` with a null value for `string` would result in a dialog with no text in the title. This behavior was unspecified (passing null has never been permitted) and creates problems with `getMessage` which is not permitted to return null. In 3.0, passing null now results in an `IllegalArgumentException` exception being thrown, and the specifications have been changed to state this, bringing it into line with the method on their superclass `Dialog.setMessage`. If you use `Dialog.setMessage`, ensure that that the string passed in is never null. Simply pass an empty string if you want a dialog with no text in the title.

Improving modal progress feedback

Supporting concurrent operations requires more sophisticated ways to show modal progress. As part of the responsiveness effort additional progress support was implemented in the class `IProgressService`. The existing way to show progress with the `ProgressMonitorDialog` is still working. However, to improve the user experience we recommend migrating to the new `IProgressService`.

The document [Showing Modal Progress in Eclipse 3.0](#) describes how to migrate to the new `IProgressService`.

Debug Action Groups removed

The Debug Action Groups extension point (`org.eclipse.debug.ui.debugActionGroups`) has been removed. In Eclipse 3.0, the workbench introduced support for Activities via the `org.eclipse.platform.ui.activities` extension point. This support provides everything that Debug Action Groups provided and is also easier to use (it supports patterns instead of specifying all actions exhaustively) and has a programmatic API to support it. Failing to remove references to the old extension point won't cause any failures. References to the extension point will simply be ignored. Product vendors are encouraged to use the workbench Activities support to associate language-specific debugger actions with language-specific activities (for example, C++ debugging actions might be associated with an activity called "Developing C++").

BreakpointManager can be disabled

`IBreakpointManager` now defines the methods `setEnabled(boolean)` and `isEnabled()`. When the breakpoint manager is disabled, debuggers should ignore all registered breakpoints. The debug platform also provides a new listener mechanism, `IBreakpointManagerListener` which allows clients to register with the breakpoint manager to be notified when its enablement changes. The Breakpoints view calls this API from a new toggle action that allows the user to "Skip All Breakpoints." Debuggers which do not honor the breakpoint manager's enablement will thus appear somewhat broken if the user tries to use this feature.

[JDT only] Java search participants (package `org.eclipse.jdt.core.search`)

Languages close to Java (such as JSP, SQLJ, JWS, etc.) should be able to participate in Java searching. In particular, implementors of such languages should be able to:

- index their source by converting it into Java equivalent source, and feeding it to the Java indexer
- index their source by parsing it themselves, but record Java index entries
- locate matches in their source by converting it into Java equivalent source, and feeding it to the Java match locator
- locate matches in their source by matching themselves, and return Java matches

Such an implementor is called a search participant. It extends the `SearchParticipant` class. Search participants are passed to search queries (see `SearchEngine.search(SearchPattern, SearchParticipant[], IJavaSearchScope, SearchRequestor, IProgressMonitor)`).

For either indexing or locating matches, a search participant needs to define a subclass of `SearchDocument` that can retrieve the contents of the document by overriding either `getBytesContents()` or `getCharContents()`. An instance of this subclass is returned in `getDocument(String)`.

A search participant wishing to index some document will use `SearchParticipant.scheduleDocumentIndexing(SearchDocument, IPath)` to schedule the indexing of the given document in the given index. Once the document is ready to be indexed, the underlying framework calls `SearchParticipant.indexDocument(SearchDocument, IPath)`. The search participant then gets the document's content, parses it and adds index entries using `SearchDocument.addIndexEntry(char[], char[])`.

Once indexing is done, one can then query the indexes and locate matches using `SearchEngine.search(SearchPattern, SearchParticipant[], IJavaSearchScope, SearchRequestor, IProgressMonitor)`. This first asks each search participant for the indexes needed by this query using `SearchParticipant.selectIndexes(SearchPattern, IJavaSearchScope)`. For each index entry that matches the

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given pattern, a search document is created by asking the search participant (see `getDocument(String)`). All these documents are passed to the search participant so that it can locate matches using `locateMatches(SearchDocument[], SearchPattern, IJavaSearchScope, SearchRequestor, IProgressMonitor)`. The search participant notifies the `SearchRequestor` of search matches using `acceptSearchMatch(SearchMatch)` and passing an instance of a subclass of `SearchMatch`.

A search participant can delegate part of its work to the default Java search participant. An instance of this default participant is obtained using `SearchEngine.getDefaultSearchParticipant()`. For example when asked to locate matches, an SQLJ participant can create documents `.java` documents from its `.sqlj` documents and delegate the work to the default participant passing it the `.java` documents.

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Examples

- [Installing the examples](#)
- Standard Widget Toolkit
 - ◆ [Using the SWT example launcher](#)
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 - ◆ [Java editor](#)
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SWT Example Launcher

The Example Launcher is used to launch SWT examples, which can either be Workbench views or standalone applications.

- Workbench views are examples that are integrated into Eclipse. When the launcher starts a Workbench view, it is opened in the currently active perspective.
- Standalone applications are launched in a separate window.

For information on how to run the standalone examples without the SWT Example Launcher, refer to [SWT standalone examples setup](#).

The SWT Workbench view examples can also be launched directly without using the SWT Example

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Launcher. SWT Workbench view examples can be found under the *SWT Examples* category of the *Show Views* dialog.

Running the Example Launcher

From Eclipse's *Window* menu, select *Show View > Other*. In the *Show View* dialog, expand *SWT Examples* and select the *SWT Example Launcher* view. A view containing a list of examples will appear in your current perspective. When you select an example from the list a brief description of the example is displayed. Click on the *Run* button to launch the example.

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SWT example – Browser

The Browser Example is a simple demonstration of the SWT Browser widget. It consists of a composite containing a Browser widget to render HTML and some additional widgets to implement actions commonly found on browsers (toolbar with back, forward, refresh and stop buttons, status bar etc.).

Running the example

Follow the [SWT standalone examples setup](#) instructions to install and run the example from your workspace.

The "Main" class is `org.eclipse.swt.examples.browserexample.BrowserExample`.

This example can also be run using the [Example Launcher](#). Select the *Browser* item from the *Workbench Views* category and click *Run*.

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SWT example – Controls

The Controls Example is a simple demonstration of common SWT controls. It consists of a tab folder where each tab in the folder allows the user to interact with a different control. The user can change styles and settings and view how this affects each control.

Running the example

Follow the [SWT standalone examples setup](#) instructions to install and run the example from your workspace.

The "Main" class is `org.eclipse.swt.examples.controlexample.ControlExample`.

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This example can also be run using the [Example Launcher](#). Select the *Controls* item from the *Workbench Views* category and click *Run*.

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SWT example – Custom Controls

The Custom Controls example is a simple demonstration of emulated SWT controls. It consists of a tab folder where each tab in the folder allows the user to interact with a different emulated control. The user can change styles and settings and view how this affects each control.

Running the example

Follow the [SWT standalone examples setup](#) instructions to install and run the example from your workspace.

The "Main" class is

```
org.eclipse.swt.examples.controlexample.CustomControlExample.
```

This example can also be run using the [Example Launcher](#). Select the *Custom Controls* item from the *Workbench Views* category and click *Run*.

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SWT example – Layouts

This example is a simple demonstration of common SWT layouts. It consists of a tab folder where each tab in the folder allows the user to interact with a different SWT layout. The user can insert widgets into a layout and set the values of the layout data using a property sheet. When the user has a suitable arrangement, the underlying code can be generated by clicking on the *Code* button.

Running the example

Follow the [SWT standalone examples setup](#) instructions to install and run the example from your workspace.

The "Main" class is `org.eclipse.swt.examples.layoutexample.LayoutExample`.

This example can also be run using the [Example Launcher](#). Select the *Layouts* item from the *Workbench Views* category and click *Run*.

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SWT example – OLE Web Browser

This example shows how to embed an Active X control into an SWT application or an Eclipse view.

When the view is opened, it will create an instance of the Windows Internet Explorer control. The OLE web browser has **Back** and **Forward** buttons to take you to recently visited pages. The browser also contains a **Home** button to take you to the web browser's home page, a **Stop** button which stops the current transfer, a **Search** button which will search for text typed in the **Address** text field, and a **Refresh** button which re-draws the contents of the currently displayed page. There is also a **Go** button which, when clicked, will attempt to load the page specified in the **Address** field.

Running the example

From Eclipse's **Window** menu select **Show View > Other**. In the **Show View** dialog, expand **SWT Examples** and select the view named **OLE Web Browser (win32)**. A view containing a web browser will appear.

This example can also be run using the [Example Launcher](#). Select the **OLE Web Browser** item from the **Win32 only** category and click **Run**.

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SWT example – Paint Tool

This example demonstrates the use of SWT graphics operations in the form of a rudimentary bitmap painting program. The Paint Tool implementation also demonstrates a mechanism for managing timed GUI operations in the background that are triggered by user input.

Select a tool with which to draw in the drawing area. There are a number of tools to choose from on the toolbar. To change the color selection, click on a color in the palette below the drawing area; left-click to set the foreground color, right-click to set the background color.

Running the example

From Eclipse's **Window** menu select **Show View > Other**. In the **Show View** dialog, expand **SWT Examples** and select the view named **Paint**. A view containing the paint program will appear.

This example can also be run using the [Example Launcher](#). Select the **Paint** item from the **Workbench Views** category and click **Run**.

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Example – Java Editor

Introduction

The Java Editor example demonstrates the standard features available for custom text editors. It also shows how to register an editor for a file extension (in this case .jav) and how to define a custom Document provider for use by that editor. This example is only for demonstration purposes. Java editing support is provided by the Eclipse Java Tooling.

Features demonstrated in the example editor

- syntax highlighting
- content type sensitive content assist (JavaDoc and Java code)
- communication between content outliner and editor, i.e. content outliner selection feeds the highlight range of the editor
- two different presentation modes
 - ◆ marking the highlight range using a visual range indicator
 - ◆ confining the editor to show only text within the highlight range (e.g. show a single method of a Java class)
- marker handling
- document sharing

Features not demonstrated

- content formatting
- dynamic reconciling of content outline page

Running the example editor

1. Create a project
2. Create a file with the file extension ".jav" in the newly created project. The Java example editor opens automatically.
3. Insert Java code. The Java code is dynamically colored. The example editor presents the following language elements in different colors: multi-line comments, single line comments, Java language reserved words, string and character constants, regular Java code, as well as multi-line comments following the JavaDoc guidelines. Inside those JavaDoc comments, JavaDoc keywords and tags are differently colored.
4. Open a new Java multi-line comment by inserting "/*" outside a Java comment. All the text between the inserted "/*" and the first occurrence of "*/" or the end of the text changes its color to red. Append another "*/". The red range changes color to green as the regular multi-line comment now is considered containing JavaDoc. Invoke code assist using CTRL-SPACE. The function of content assist is to support the user in writing code. So on invocation, content assist should list all possible valid completions at the invocation location. Inside JavaDoc, the example editor always proposes all JavaDoc keywords.
5. Outside a Java comment invoke content tip using CTRL+SHIFT+SPACE. Five proposals are listed. Select one and press ENTER. A small floating red window appears above the current line displaying the selected proposal. The anticipated use of content tips is to let the user express her intention, e.g. to enter a method call and to present contextual information which guides the user by doing so. In the example editor, the proposal is considered valid five characters around the initial invocation location.

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While the content tip is visible, invoke content assist using CTRL+SPACE. Content assist invoked in this situation should help the user to accomplish her stated intention visible in the content tip. Inside regular Java code, the example editor always proposes all Java keywords.

6. Save the Java code. Saving updates the content outliner. The content outliner contains ten entries each of them representing one of ten equally sized segments of the Java code in the editor. This style of content outline has been chosen to show that the semantics of highlight ranges can arbitrarily be defined. (See next steps.)
7. Select one of the entries in the content outliner. The corresponding lines are marked with a blue bar in the editor's left vertical ruler.
8. Now switch to the segmented presentation mode of the Java editor. For that make sure that the editor has the focus and press that button in the desktop's toolbar whose hover help says "Enable/Disable segmented source viewer". This functionality is anticipated to be used, e.g., for single method views.
9. Select a different entry in the content outliner. Now the editor only shows the selected segment. By deselecting the entry in the content outliner, the complete Java code is shown again.
10. Select an entry in the content outliner, select a fraction of the visible text, and add a task for the selection. The task shows up in the task list. Modify the visible code. In the task list, select the previously created task and press the "Go to file" button. The task is selected in the visible area, correctly taking the previously applied modifications into account.
11. Select another entry in the content outliner. Reveal the previously added task from the task list. The editor's highlight range is automatically enlarged to enclose the range of the revealed task.
12. Open a new workspace. In the new workspace, open a Java editor for the same file as in the original workspace. Modify the editor content. Switch back to the original workspace. The editor shows the changes made in the other workspace. The two editors showing the same file are lively linked.

Principles for creating custom text editors

The following steps are usually necessary do develop a custom text editor.

1. Create a document provider. A document provider (see `IDocumentProvider`) produces and manages documents (see `IDocument`) containing a textual representation of editor input elements. It is important to decide how the translation between element and textual representation looks like and whether the document provider should be shared between multiple editors or not. See the class `FileDocumentProvider` in the Java example editor.
2. Create a document partitioner. A document partitioner (see `IDocumentPartitioner`) divides a document into disjoint regions. The partitioner assigns each region one content type out of a set of content types predefined by the partitioner. On each document change the document's partitioning must be updated. See the class `JavaPartitioner` in the Java example editor. The `JavaPartitioner` determines regions of the types multi-line comments, `JavaDoc` comments, and everything else. It must be ensured that the document provider is set on each document produced by the document provider.
3. Determine which of the source viewer plugins should be provided. Among other supported plugins are auto indent strategies, double click strategies, content formatter, and text presentation reconciler. The subsequent description will be restricted to the text presentation reconciler (see `IPresentationReconciler`). In the Java example editor, the text presentation reconciler is utilized to implement syntax highlighting.
4. Create for all source viewer plugins the appropriate extensions for each supported content type. As seen above, the document partitioner defines the supported content types. The default implementation of `IPresentationReconciler` supports `IPresentationDamagers` and `IPresentationRepairers` as extensions. Those extensions are considered being specific for a particular content type. Thus, for a custom editor, the user must first select a subset of the supported content types. Regions of a type being a member of the selected subset will, e.g., be syntax highlighted. For each of those types the extensions must be

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- implemented. See `JavaDamagerRepairer` and `JavaDocDamagerRepairer` in the example editor.
5. Build a source viewer configuration using the previously created plugins and extensions. See `JavaSourceViewerConfiguration` in the example editor.
 6. Customize the class `TextEditor` or `AbstractTextEditor` with the developed document partitioner and source viewer configuration. Add or replace actions and adapt the construction of the editor's context menu. In the actual version, this customization must be done in a subclass. See `JavaEditor` in the example editor.
 7. Set up an appropriate action bar contributor who contributes editor–related actions to the desktop's toolbar and menus. See `JavaActionContributor` in the example editor.
 8. Extend the XML configuration file of the editor's plugin, so that the editor registers at the predefined editor extension point for a specific set of file extensions. Also set up the action bar contributor in the XML file. See `plugin.xml` of this example.

Code organization of the example

The example code is organized in four packages:

- `org.eclipse.ui.examples.javaeditor` contains all the editor specific classes.
- `org.eclipse.ui.examples.javaeditor.java` contains all Java specific source viewer plugins such as the `JavaDamagerRepairer` as well as the Java specific document partitioner.
- `org.eclipse.ui.examples.javaeditor.javadoc` contains all JavaDoc specific source viewer plugins such as the `JavaDocDamagerRepairer`.

`org.eclipse.ui.examples.javaeditor.util` contains convenience classes shared by the three other packages.

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Example – Template Editor

Introduction

The Template Editor example demonstrates how to add template support to an editor. The example is based on the PDE example editor project that can be created using the new project wizard. The editor is a simple XML editor; it is only for demonstration purposes.

Features demonstrated in the template editor

- creating a template context for an editor
- setting up a content assist processor that will propose template completions
- contributing a context type and variable resolvers to an editor via `plugin.xml`

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- contributing templates to a context type via plugin.xml
- adding a preference page for handling templates, both contributed and user-added

Features not demonstrated

- template formatting

Code organization of the template editor example

The example code is organized in three packages:

- `org.eclipse.ui.examples.templateeditor.editors` contains all the editor specific classes. See XMLConfiguration to see how the TemplateCompletionProcessor is added in the getContentAssistant method.
- `org.eclipse.ui.examples.templateeditor.preferences` contains the contributed template preference page.
- `org.eclipse.ui.examples.templateeditor.template` contains the example context type, the completion processor and the variable resolver that is contributed via plugin.xml.

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Example – Multi–page Editor

Introduction

The Multi Page Editor Example adds an editor for files with the .mpe extension. It shows how to create an editor that uses multiple pages by defining both an editor and a page contributor that can add entries to an action bar.

Running the example

To start using the Multi–page Editor Example, create a new file with .mpe extension. Select the file, bring up the popup menu, select the Open With menu and from the sub–menu select the Multi Page Editor Example menu item. You can then select the different editors by selecting the different tabs.

Creating a new mpe file

Create a new file with file extension .mpe. From the File menu, select New and then select Other... from the sub–menu. Click on Simple in the wizard, then select File in the list on the left. Click on Next to supply the file name (make sure the extension is .mpe) and the folder in which the file should be contained.

Details

The Multi Page Editor Example demonstrates how to create an multi page editor with a custom page contributor.

The Multi Page Editor Example is constructed with two extensions – a document contributor (MultiPageContributor) and an editor (MultiPageEditor). The document contributor is a subclass of `org.eclipse.ui.part.MultiPageEditorActionBarContributor` and defines the actions that are added to an editor when the `setActivePage` method is called. The editor is an `org.eclipse.ui.part.MultiPageEditorPart` that creates 3 pages whose activation is handled by the `pageChange` method that in turn sends `setActivePage` to the contributor. These two classes do not refer to each other directly – the contributor for the editor is set using the `contributorClass` tag in the `plugin.xml`

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Example – Property Sheet

Introduction

The Property Sheet Example adds an editor for files with the `.usr` extension and also demonstrates how to add properties and outline views on a file.

Running the example

To start using the Property Sheet Example, create a file with extension `.usr`. Open the file and the Outline and Properties views to see the example in action. Click on items in the Outline view and look in the Properties view for details of the selected item in the Outline view. The people items in the list show the most detail in the Properties view.

Creating a new usr file

Create a new file with file extension `.usr`. From the File menu, select New and then select Other... from the sub-menu. Click on Simple in the wizard, then select File in the list on the left. Click on Next to supply the file name (make sure the extension is `.usr`) and the folder in which the file should be contained.

Details

The Property Sheet Example demonstrates how to provide properties to the Property Sheet View.

The tree viewer of the Content Outline View contains and presents `OrganizationElements`. When an element is selected in the Content Outline View the Workspace will invoke `getAdapter` on the selected

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OrganizationElement. If an adapter is requested for IPropertySource, the OrganizationElement returns itself as it implements IPropertySource. The Property Sheet View then use the Organization Element as its source.

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Help

Introduction

This example illustrates the use of the help system online documentation.

Running the example

To run the Help Example, pull down the Help menu. Select Help Contents menu to launch the help view, and select the Online Help Sample from the list of books. The main topic will provide detailed information on how the help sample plugin was created.

Details

The Help Example illustrates the following tasks that need to be done in order to create a simple, proper help topics contribution:

- using the help toc extension point
- help documentation in doc.zip
- defining topics and navigation structure for help documents

The name of the plugin directory that contains the help examples is **org.eclipse.help.examples.ex1**.

See the documentation for the **org.eclipse.help.toc** extension point for more detail on how to contribute help content.

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Team – File System Repository Provider Example

Introduction

The File System and Pessimistic Repository Providers examples shows how to define your own repository

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provider. In particular you this example shows how to:

- Extend the `RepositoryProvider` class and register a new repository provider.
- Register a sharing wizard that will appear in the **Team > Share...** wizard.
- Add resource actions to the Team menu.
- Implement synchronization support that shows up the Synchronize View.
- Use decorators to show the repository state of the local resources.
- How to implement a file modification validator.
- Adding a repository provider to a capability.

The example includes two separate repository providers, the basic file system and the pessimistic file system. The basic provider illustrates the synchronization support whereas the pessimistic provider is more focused to allowing you to test the workbench behavior with pessimistic repository providers. There is a preference page for the pessimistic provider that allows configuring the behavior of the file modification validator.

Running the example

To start using this example create a project and select **Team > Share Project...** from the project's popup menu. Click the show all wizards button. This will show both the file system provider and the pessimistic provider.

- **Basic file system provider:** you will have to enter the location in the local file system where you would like to connect the project to. The Get and Put operations in the Team menu will now transfer to and from the selected location. And if you open the Synchronize View you can browse the synchronization between the local workspace and the remote file system location the files are stored in. If you edit a file and then create a Synchronization you can browse changes between the local and the remote.
- **Pessimistic file system provider:** the sharing wizard next page doesn't actually require any user input. The pessimistic provider doesn't actually copy the local files anywhere, and instead simply simulates a check in/check out by flipping the read-only bit on files. Once a project is shared with the pessimistic provider you can add files to control and the check in and check out.

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Team – Local History Synchronize Participant Example

Introduction

The Local History Synchronize Participant example illustrates how to intergate a participant into the synchronize view. It covers such things as:

- Creating a simple subscriber for accessing the local history
- Creating a synchronize participant
- Adding a cusotm action to a participant
- Showing custom label decorations
- Add a synchronize wizard

Running the example

To start using this example, open the *Team Synchronizing* perspective, click on the global Synchronize toolbar action and choose *Synchronize with Latest from Local History*. A more detailed look at this example is available in the [Local History Synchronization Example](#) guide section.

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Compare Example – Structural Compare for Key/Value Pairs

Introduction

This example demonstrates how to support structural compare for files consisting of key/value pairs. It shows how to implement and register a custom structure creator that parses key/value pairs into a tree structure that is used as the input to the structural compare framework provided by the Compare plugin. In addition, it registers a standard text viewer for the individual key/value pairs.

This example is only for demonstration purposes. Structural compare support for Java property files (another key/value format) is provided by the Eclipse Java Tooling.

Running the example

1. Create a project (not necessarily a Java project)
2. Create a key/value pair file f1.kv
3. Open *Window > Preferences > Workbench > File Association* and associate the default text editor with the file extension "kv"
4. Open f1.kv with the editor and enter this contents

```
lastname=Doe
firstname=John
city=Chicago
state=IL
```

5. Make a copy of this file and rename it f2.kv
6. Open f2.kv and change the firstname "John" to "Mary"
7. Add another key/value pair "country=US" to f2.kv
8. Select both files f1.kv and f2.kv
9. From the context menu select *Compare With > Each Other*
10. A new compare editor opens that shows the structural differences of both files in its top pane. Selecting one of the properties "firstname" or "country" feeds the text of the corresponding key/value pair into the standard text compare viewer in the bottom pane.

Code organization of the example

The example code is organized in a single package
`org.eclipse.compare.examples.structurecreator:`

- `KeyValuePairStructureCreator`
is the structure creator that parses the contents of a stream into a tree of `IStructureComparators`.

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- `TextMergeViewerCreator`
is a factory for `TextMergeViewers`. It is registered for the type "kvtxt" which is the type of an individual key/value pair.
- `Util`
provides utility methods for NLS support and for reading an `InputStream` as a `String`.

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IBM Eclipse Platform XML Compare

The XML Compare plugin allows you to perform a structural compare of two XML documents. It returns a difference tree which indicates which XML elements have been added or removed and – for modified XML elements – what differences there are with respect to attributes or body text.

Installing the plugin

- Copy the folder `org.eclipse.compare.examples.xml` to the `plugins` subfolder of Eclipse.

Using the plugin

The plugin is automatically used when comparing files with the extension `.xml`.

By default, the XML compare uses the *Unordered* compare method, which ignores the order in which the XML elements appear in the document and matches them so that elements which are most similar are matched. There is also an *Ordered* compare method, which simply compares the XML elements exactly in the order in which they appear in the document. In most cases, this compare method will not be of much use. The compare method can be changed from a drop–down list in the toolbar of the structure view.

When an XML document contains elements that can uniquely be identified by an attribute or the text of a child element, it is recommended that an ID Mapping Scheme be created for this type of XML document.

See [Tutorial and Examples](#) for more information on using the plugin.

ID Mapping Schemes

An ID Mapping Scheme specifies for XML elements an attribute or the text of a child element that uniquely identifies this element. This assures that – in the compare process – the right elements will be matched and therefore compared with each other. If for an XML element no ID Mapping is specified, a general matching algorithm is used. However, this general matching algorithm does not always return the desired result. The reason for this is that the general matching algorithm looks for a matching of the nodes of the two parsed trees to compare that minimizes the differences. The effect is that often two XML elements are matched with are structurally similar but represent two completely different entities of information.

Ordered entries

When using the default *Unordered* compare (with or without id mappings) it is sometimes desired to specify that the children of certain elements be compared in ordered fashion instead of the usual *unordered* method. For example, when comparing ANT files the order of appearance of the children of `target` elements is important.

In such cases one can create an *Ordered entry*. An *Ordered entry* specifies that the direct children of an xml element, identified by its path, will be compared in ordered fashion (attributes however are still compared in *unordered* way). The children of these children will continue to be compared in *unordered* way, unless otherwise specified.

Defining ID Mapping Schemes and Ordered entries

ID Mapping Schemes can be created in three different ways:

1. By extending the extension point *idMapping*
2. Using the XML Compare Preference page.
3. Using the Create new Id Map Scheme button in the toolbar and the context menu

Method 1 creates a so-called *internal* mapping scheme. An internal ID Mapping Scheme cannot be edited at runtime. However, using the Edit Copy button in the Preference Page, an editable copy of the internal ID Mapping Scheme can be created.

Methods 2 and 3 create so-called *user* mapping schemes. These are created by the user at runtime and can be modified anytime in the Preference Page.

Internal and user mapping schemes can be associated with a file extension. As a result, when comparing two XML files with this file extension, the particular ID Mapping scheme with this extension is automatically used.

When creating or editing the ID mapping for a particular XML element, four items must be specified (see example):

1. The element name.
 2. The element path. This is the path of the element from the root of the XML document to the element's parent.
 3. The name of the id which will identify the element
 4. Whether the id name in point 3 is the name of an attribute of the element or the name of one of its children (in which case the text of this child element will be used as id).
-

Extension Points

Only one extension point is available in the XML Compare plugin. It is used to create internal ID Mapping Schemes:

- [org.eclipse.compare.examples.xml.idMapping](#)

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Tutorial and Examples

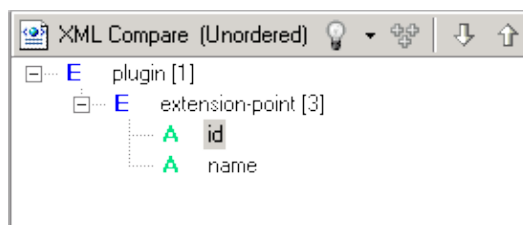
General Matching vs. ID Mapping Schemes: How to create an ID Mapping Scheme to improve compare results

Consider an example XML file in two slightly different versions, left and right. Assume that the element `extension-point` is uniquely identified by the attribute `id`. The textual differences are shown in bold.

```
<?xml version="1.0" encoding="UTF-8"?>
<plugin
  name="%Plugin.name"
  id="org.eclipse.ui"
  version="1.0"
  provider-name="Object Technology International,
  Inc."
  class="org.eclipse.ui.internal.WorkbenchPlugin">
  <extension-point name="%ExtPoint.editorMenus "
  id="editorActions"/>
  <extension-point name="%ExtPoint.popupMenus "
  id="popupMenus"/>
  <extension-point
  name="%ExtPoint.importWizards"
  id="importWizards"/>
</plugin>

<?xml version="1.0" encoding="UTF-8"?>
<plugin
  name="%Plugin.name"
  id="org.eclipse.ui"
  version="1.0"
  provider-name="Object Technology International,
  Inc."
  class="org.eclipse.ui.internal.WorkbenchPlugin">
  <extension-point name="%ExtPoint.editorMenus "
  id="editorActions"/>
  <extension-point name="%ExtPoint.popupMenus "
  id="popupMenus"/>
  <extension-point
  name="%ExtPoint.exportWizards"
  id="exportWizards"/>
</plugin>
```

Assume that the order of the elements should be ignored. The structural difference between the two documents consists in the `extension-point` element on the left with `id="importWizards"` being replaced on the right with a new `extension-point` with `id="exportWizards"`. Using the general matching algorithm called *Unordered*, because it ignores the order in which the XML elements appear in the document, we obtain the following tree of differences.



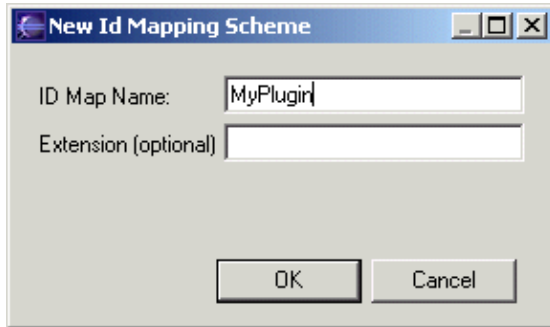
The first two `extension-point` elements are identical and are therefore matched and are not shown in the difference tree. There remains the third `extension-point` element on both sides which, having the same element name, are also matched. The difference tree then shows the differences between the third `extension-point` element left and the third `extension-point` element right. These differences

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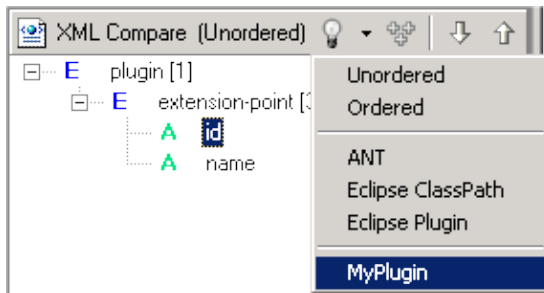
consist in the values of the attributes `id` and `name`.

However, this is not what we would like to see. We would like the difference tree to show us that an `extension-point` element was removed from the left side and a new `extension-point` element was added on the right side.

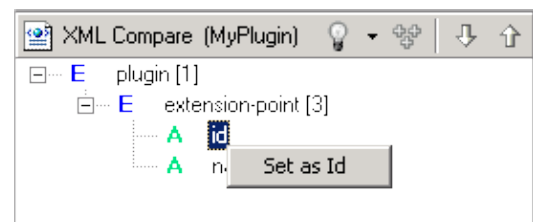
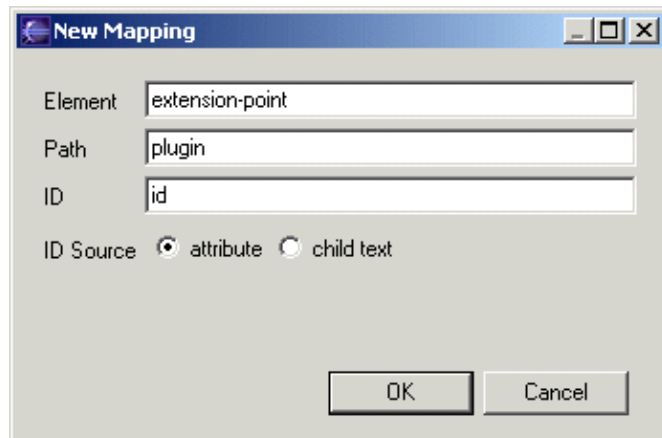
To achieve this, we create a new ID Mapping Scheme. We can do this by using the appropriate button on toolbar.



Assume we call the ID Mapping Scheme *MyPlugin*. We now select the ID Mapping Scheme *MyPlugin* from the drop-down list in the Toolbar



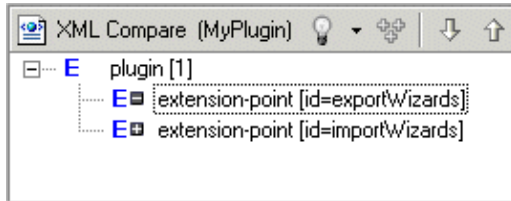
and add to it the following Mapping:



This can be done from the preference page (left) or from the context menu in the structure view (right).

The difference tree now becomes:

(To refresh the structure view, click on the  button of the drop-down list in the toolbar.)



This is the compare result that we wanted and that we achieved by created an ID Mapping Scheme.

The XML Compare Plugin already comes with a ID Mapping Scheme for Plugin files, which can be customized for particular Plugin files.

Warning:

If an ID Mapping is created, it is assumed that the id is unique, i.e. there are no two XML elements with the same name and path that have the same id. Should this not be the case, the ID Mapping Scheme may not deliver a sensible difference tree.

When an id can appear more than once, one should rely on the general algorithm.

Also, when an ID Mapping Scheme is used and there are elements with no id mapping specified, the *Unordered* compare method will be used, i.e. elements are matched by their similarity and not by the order in which they appear in the document. To specify that the children of an element should be compared in order of appearance. See the next section on Ordered entries.

Adding Ordered entries

Ordered entries are used to specify that the direct children (excluding attributes) of an xml element – identified by its path – should be compared in ordered way instead of the default unordered method. As an example consider the following ANT file in two slightly different versions:

```

<?xml version="1.0" encoding="UTF-8"?>
<project name="org.junit.wizards" default="export"
basedir=".">
  <target name="export" depends="build">
    <mkdir dir="${destdir}" />
    <delete dir="${dest}" />
    <mkdir dir="${dest}" />
    <jar
      jarfile="${dest}/JUnitWizard.jar"
      basedir="bin"
    />
  />
</project>

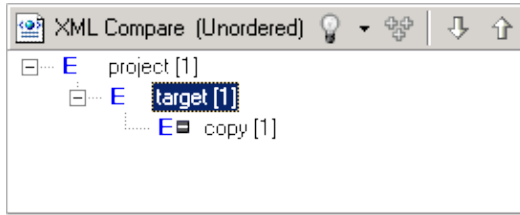
<?xml version="1.0" encoding="UTF-8"?>
<project name="org.junit.wizards"
default="export" basedir=".">
  <target name="export" depends="build">
    <mkdir dir="${destdir}" />
    <mkdir dir="${dest}" />
    <delete dir="${dest}" />
    <jar
      jarfile="${dest}/JUnitWizard.jar"
      basedir="bin"
    />
    <copy file="plugin.xml"
todir="${dest}" />
  />
</project>

```

The differences between the two documents are shown in bold. Two elements have been swapped (<mkdir dir="\${dest}" /> and <delete dir="\${dest}" />) and a new element (<copy ... />) has been appended to the target element.

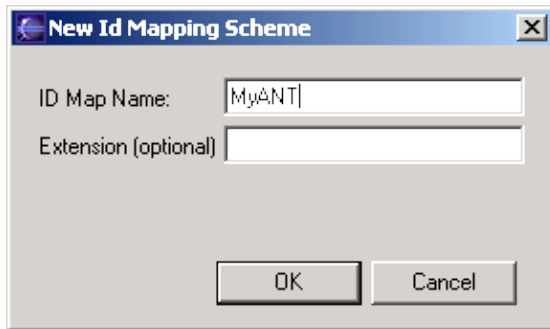
Performing an unordered compare will result in the following tree of differences:

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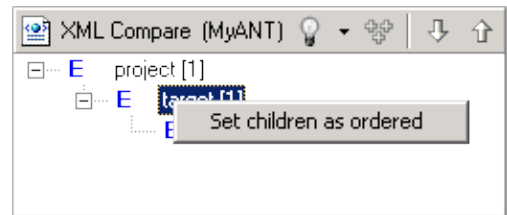
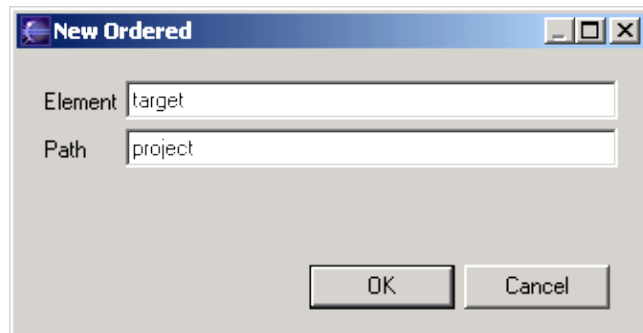
The fact that two elements have been swapped is not shown since the order of elements is ignored. However, from an ANT point of view, the two documents cause very different behaviour, because the order of the elements inside a `target` is important. We therefore want to create an *ordered entry* for `target` to instruct the compare engine to compare the direct children of `target` in ordered fashion.

We do so by first creating a new ID Mapping Scheme. This can be done using the appropriate button in the toolbar.



Assume we call the ID Mapping Scheme *MyANT*.

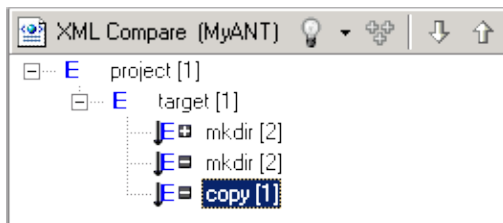
We now select the ID Mapping Scheme *MyANT* from the drop-down list in the Toolbar and add to it the following Ordered Entry:



This can be done from the preference page (left) or from the context menu in the structure view (right).

The difference tree now becomes:

(To refresh the structure view, click on the  button of the drop-down list in the toolbar.)



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This is the compare result that we wanted and that we achieved by creating an Ordered Entry.

Additionally, Id Mappings (see [previous section](#)) can be used to uniquely identify ordered children. Especially when there are many changes, this will improve compare results.

The XML Compare Plugin already comes with a ID Mapping Scheme for ANT files, which can be customized for particular ANT files.

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Notices

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idMapping

Identifier: org.eclipse.compare.examples.xml.idMapping

Description: This extension point allows to define internal XML ID Mapping schemes using the *mapping* element. These schemes can then be used when performing an XML compare to uniquely identify XML elements by the value of an attribute or the text in a child element. Additionally, *ordered* elements can be used to specify that the direct children of an element should be compared in ordered fashion instead of the default unordered way.

Configuration Markup:

```
<!ELEMENT idmap (mapping*)>
<!ATTLIST idmap
  name          CDATA #REQUIRED
  extension     CDATA
>
```

- **name** – the name of the ID Mapping scheme. Should be unique.
- **extension** – (optional) a file extension associated with this ID Mapping Scheme. When comparing files with this extension, the current ID Mapping Scheme will automatically be used. If an extension is specified, then the extension should also be added in the plugin.xml file of the XML Compare Plugin. For example, if we create an ID Mapping Scheme with extension *cd*, the plugin.xml of the XML Compare Plugin is updated as follows (update shown in bold):

```
<extension
  point="org.eclipse.compare.structureMergeViewers">
  <structureMergeViewer
    extensions="xml,classpath,cd"
    class="org.eclipse.compare.xml.XMLStructureViewerCreator">
  </structureMergeViewer>
```

Warning: If an extension is associated more than once, only the first association will be considered. Also, internal ID Mapping schemes have priority over user ID Mapping schemes when duplicate extensions are defined.

Warning: When an internal ID Mapping scheme with extension association is removed (from a plugin.xml), the XML Compare plugin has to be reloaded to disassociate itself from the extension. If not, on the first compare of files with this extension, the XML Compare plugin will be used with the default *Unordered* algorithm. (However, at this point the extension will have been disassociated from the XML Plugin, as the plugin has been loaded.)

```
<!ELEMENT mapping EMPTY>
<!ATTLIST mapping
  signature     CDATA #REQUIRED
  id            CDATA #REQUIRED
  id-source     CDATA
>
```

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- **signature** – the XML path from the root to the current element (see examples below).
- **id** – the attribute that identifies this element or the name of the child element whose text identifies this element.
- **id-source** – (optional) if *id* is the name of a child element, then this attribute must have the value *body*. If *id-source* is left out, it is assumed that *id* is an attribute.

```
<!ELEMENT ordered EMPTY>
<!ATTLIST ordered
  signature CDATA #REQUIRED
>
```

- **signature** – the XML path from the root to the element whose direct children will be compared in ordered fashion instead of the default unordered way.

Examples:

The following is an example ID Mappings Scheme for ANT files.

project elements are identified by an attribute *name*. *target* elements (which are children of *project*) are also identified by an attribute *name*. Also, the children of *target* will be compared in the order in which they appear in the document.

```
<idmap name="ANT">
  <mapping signature="project" id="name"/>
  <mapping signature="project>target" id="name"/>
  <ordered signature="project>target"/>
</idmap>
```

The following example illustrates a case where the text of a child element is used as id:

```
<idmap name="Book Catalog" extension="book">
  <mapping signature="catalog>book" id="isbn" id-source="body"/>
</idmap>
```

Supplied Implementation:

The XML Compare plugin defines an ID Mapping scheme for Eclipse `plugin.xml` files, one for `.classpath` files and one for ANT files.

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Welcome to Eclipse

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Welcome to Eclipse

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Welcome to Eclipse

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Welcome to Eclipse

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Welcome to Eclipse

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