Practical Eclipse Rich Client Platform Projects

ISBN-13 (pbk): 978-1-4302-1827-2

ISBN-13 (electronic): 978-1-4302-1828-9

Printed and bound in the United States of America 9 8 7 6 5 4 3 2 1

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CHAPTER 1

Foundations of Eclipse RCP

The Eclipse philosophy is simple and has been critical to its success. The Eclipse Platform was designed from the ground up as an integration framework for development tools. Eclipse also enables developers to easily extend products built on it with the latest object-oriented technologies.

Although Eclipse was designed to serve as an open development platform, it is architected so that its components can be used to build just about any client application. The minimal set of modules needed to build a rich client is collectively known as the *Rich Client Platform* (RCP).

This chapter focuses on the foundations of RCP. It begins with a summary of the benefits of Eclipse, and then discusses the architecture of RCP. Finally, you'll work through a practical exercise that demonstrates the power of this dynamic modular technology.

Benefits of Eclipse

Eclipse is an integrated development environment (IDE) written primarily in Java. However, it goes well beyond a Java development platform in the following ways:

- It is open and extensible. Extensible software can function as a component of a larger system. Eclipse's openness permits greater interoperability, opportunity, and choice.
- It provides multilanguage support. Eclipse supports an army of programming languages, including Java, Java Platform, Enterprise Edition (Java EE), AspectJ, C/C++, Ruby, Perl, COBOL, and many others.
- It provides a consistent feature set across all platforms. This allows developers to concentrate on the problem rather than the specific platform. More important, it functions the same way on each of these platforms.
- It provides a native look and feel, which is required by today's professional applications.
- A very active community is willing to help with any problem. Moreover, since Eclipse is the foundation for a number of commercial software products, many vendors offer additional support.
- Eclipse is at the forefront of the software tools industry. This means that you can depend on it as a viable, industrial-strength tool for the foreseeable future.

The bottom line is that Eclipse is extensible, configurable, free, and fully supported. It is so well designed for these purposes that many developers find it a pleasure to work with. Newcomers from other languages, especially C/C++ on Unix, will discover this after learning the basics.

How Is RCP Different from the Eclipse Workbench?

Many people struggle to understand the difference between the Eclipse IDE workbench and RCP. The answer is simple: there is no difference—well almost no difference. Both are based on a dynamic plug-in model, and the user interface (UI) for the workbench and RCP is built using the same toolkits and extension points. However, RCP has the following distinguishing features:

- In RCP, the layout and function of the Eclipse IDE workbench is under fine-grained control of the plug-in developer. In fact, the Eclipse IDE workbench itself is an RCP application for software development. Here is where the line between these two becomes thin.
- In RCP, the developer is responsible for defining the application and customizing the look and feel of the Eclipse IDE workbench to fit the needs of the application.
- In RCP, the platform application needs only the plug-ins `org.eclipse.ui` and `org.eclipse.core runtime` to run. However, RCP applications are free to use any platform plug-ins they need to provide their feature set.

Eclipse RCP Architecture

RCP employs a lightweight software component framework based on plug-ins. This architecture provides extensibility and seamless integration. Everything in RCP (and Eclipse, for that matter), with the exception of the runtime kernel, is a plug-in. It could be said that all features are created equal, as each plug-in integrates with Eclipse in exactly the same way. A plug-in can be anything: a dialog, a view, a web browser, a database explorer, a project explorer, and so forth.

RCP is architected so that its components can be put together to build just about any client application using a dynamic plug-in model, toolkits, and extension points. The layout and function of the workbench is under the fine-grained control of the plug-in developer. Under the covers, the following components constitute RCP:

- Equinox
- Core platform
- Standard Widget Toolkit
- JFace
- Eclipse IDE workbench

Let's take a closer look at each of these components.

Equinox OSGi

According to its developers, OSGi[1] is a dynamic module system for Java. OSGi was designed as a technology to tackle software complexity created by monolithic software products. Its focus is the development of new software, as well as the integration of existing software into new systems. By providing standards for the integration of software, the OSGi framework improves reusability and reliability, and reduces development costs.

At its core, OSGi provides a software framework that allows applications to be constructed from small, reusable, and collaborative components. These components, in turn, can be included in a bigger application and deployed.

Equinox is Eclipse's implementation of the OSGi framework. It defines an application life-cycle management model, a service registry, an execution environment, and modules. On top of this framework, a large number of OSGi layers, application program interfaces (APIs), and services have been defined.

An important concept in the OSGi framework is the *bundle*. A bundle is a dynamic component that can be remotely installed, started, stopped, updated, and uninstalled without requiring a reboot.

Life-cycle management is done via APIs, which allow for remote downloading of management policies. Such a dynamic component model is missing from today's stand-alone Java Virtual Machine (JVM) environments.

OSGi provides a powerful dynamic component model, which is why the Eclipse Foundation selected it as the underlying runtime for Eclipse RCP and the IDE.

Core Platform

The core platform includes a runtime engine that starts the platform base and dynamically discovers and runs plug-ins.

Core Platform Responsibilities

The core platform is responsible for the following:

- Defining a structure for plug-ins and the implementation details: bundles and class-loaders
- Finding and executing the main application, and maintaining a registry of plug-ins, their extensions, and extension points
- Providing miscellaneous utilities, such as logging, debug trace options, adapters, a preference store, and a concurrency infrastructure

The runtime is defined by the plug-ins `org.eclipse.osgi` and `org.eclipse.core.runtime` on which all other plug-ins depend. It effectively holds all the pieces together.

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1. OSGi originally stood for Open Services Gateway initiative, but that name is now obsolete. Visit `http://www.osgi.org` for more information about OSGi.

■ **Note** Because plug-ins are implemented using the OSGi framework, a plug-in is essentially the same thing as an OSGi bundle. I will use these terms interchangeably, unless discussing particular framework classes.

Runtime Plug-in Model

The plug-in model is structured around the following concepts:

Plug-in: A plug-in is a structured bundle of code and/or data that contributes functionality to the system. Some plug-ins can contribute to the UI using an extension point model. Others supply class libraries that can be used to implement system extensions.

Extension points: An extension point is a well-defined place where other plug-ins can add functionality. Plug-ins can add extensions to the platform by implementing an extension point. Defining an extension point can be thought of as defining an API, with the difference that the extension point is declared in Extensible Markup Language (XML) instead of code.

OSGi manifest and plug-in manifest: These manifests allow the plug-in to describe itself to the system. The extensions and extension points are declared in the plug-in manifest file, which is called `plugin.xml`. The platform maintains a registry of installed plug-ins and the functions they provide in the `MANIFEST.MF` file.

Dynamic loading: In the OSGi services model, software bundles do not pay a memory or performance penalty for components that are installed but not used. A plug-in can be installed and added to the registry, but it will not be activated unless a function that it provides is requested at runtime.

Resource management: Resources within the user's workspace are managed by the plug-in `org.eclipse.core.resources`. This plug-in provides services for accessing the projects, folders, and files stored in the user's workspace or alternate file systems, such as network file systems or a database. This plug-in is most useful for Eclipse IDE applications.

The overall philosophy of the core platform revolves around the idea of building plug-ins to extend the system. For example, the Eclipse Software Development Kit (SDK) includes the basic platform plus two major tools: the full-featured Java development tools (JDT) and a Plug-in Developer Environment (PDE) to facilitate the development of plug-ins and extensions. These tools provide an example of how new tools can be composed by building plug-ins that extend the system.

Standard Widget Toolkit

The Standard Widget Toolkit (SWT) is the graphical widget toolkit used by Eclipse. Originally developed by IBM, it was created to overcome the limitations of the Swing graphical user interface (GUI) toolkit introduced by Sun. Swing is 100% Java and employs a lowest common

denominator to draw its components by using Java 2D to call low-level operating system primitives. SWT, on the other hand, implements a common widget layer with fast native access to multiple platforms.

SWT's goal is to provide a common API, but avoid the lowest common denominator problem typical of other portable GUI toolkits. SWT was designed for the following:

Performance: SWT claims higher performance and responsiveness, and lower system resource usage than Swing.[2]

Native look and feel: Because SWT is a wrapper around native window systems such as GTK+ and Motif, SWT widgets have the exact same look and feel as native ones. This is in contrast to the Swing toolkit, where widgets are close copies of native ones. This is clearly evident just by looking at Swing applications.

Extensibility: Critics of SWT may claim that the use of native code does not allow for easy inheritance and hurts extensibility. However, both Swing and SWT support writing new widgets using Java code only.

Perhaps a shortcoming is that, unlike Swing, SWT requires manual object deallocation, as opposed to the standard automatic garbage collection of Swing. SWT objects must be explicitly disposed of; otherwise, memory leaks or other unintended behavior may result. This is due to the native nature of SWT, as widgets are not tracked by the JVM, which is unable to garbage-collect them. Some claim that this increases development time and costs for the average Java developer. But the truth of the matter is that the only SWT objects a developer must explicitly dispose of are the subclasses of `Image`, `Color`, and `Font` objects.

JFace

JFace is a window-system-independent GUI toolkit for handling many common programming tasks. JFace is designed to work with SWT without hiding it, and implements a model-view-controller (MVC) architecture.

The following are some of the UI components in JFace:

- Image and font registries
- Text, dialog, preference, and wizard frameworks
- Viewers
- Actions

Viewers are used to simplify the interaction between an underlying data model and the widgets used to present that model. Table and tree viewers are the most typical examples.

Actions are essential for the developer. They may fire when a toolbar button or a menu item is clicked or when a defined key sequence is invoked. They are most useful when contributed to the workbench declaratively in `plugin.xml`.

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2. See "Why I choose SWT against Swing" (November 19, 2004), on Ozgur Akan's blog. (`http://weblogs.java.net/blog/aiqa/archive/2004/11/why_i_choose_sw.html`).

The Eclipse Workbench

The Eclipse IDE workbench is the basic development environment in Eclipse. It is built around the following concepts:

Perspectives: A perspective defines the initial set and layout of the views in your workbench window. Perspectives are focused on a specific development task, such as Java, Java EE, plug-in, and so on.

Views: Views are the small windows and sidebars around the edges of the workbench. Views are used to navigate the workbench and present information in different ways.

Editors: Editors are used to do the actual coding. For example, you might use editors to code in Java, JavaScript, Hypertext Markup Language (HTML), or Cascading Style Sheets (CSS).

Workspaces: A workspace is the disk folder where the actual work will be stored.

Projects: A project is a container used by the workbench to group associated folders and files.

■ **Note** All the exercises in this book were written using Eclipse 3.4 (Ganymede). This is important, as the UI is somewhat different from that of version 3.3.

Hands-on Exercise: Getting Your Feet Wet with the OSGi Console

Programming with Eclipse can be thought of as a game. The more you practice, the better you get at it. The goal of this exercise is to get you started by building a plug-in project that uses the OSGi console. We'll go beyond of the typical Hello World example.

In this exercise, you will write a plug-in to embed a tiny Jetty web server that uses Equinox to define a simple servlet class that returns the headers of the HTTP request. This plug-in will use the extension point `org.eclipse.equinox.http.registry.servlets` to define the servlet alias `/servlet1`, which will be accessed through the browser as `http://localhost:8080/servlet1`.

Starting a New Plug-in Project

Starting a new plug-in project is easy with the Plug-in Project wizard.

1. From the Eclipse IDE main menu, select File ➤ New Project (or click the New Project icon on the toolbar) and choose Plug-in Project, as shown in Figure 1-1. Then click Next.
2. Enter a project name and use the default target platform, as shown in Figure 1-2. Click Next to continue.

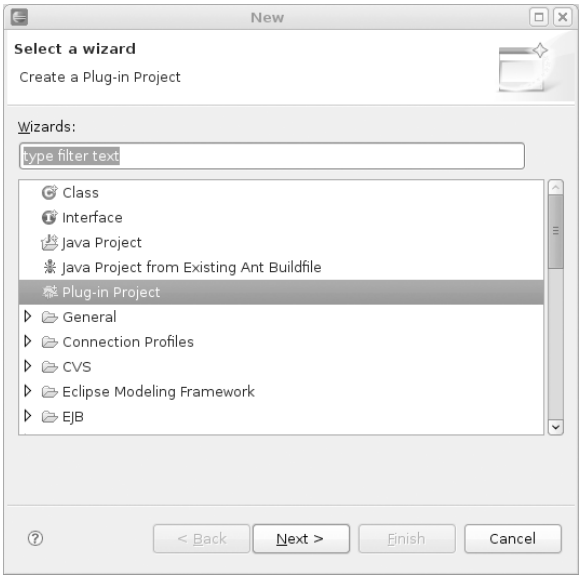


Figure 1-1. *Selecting to create a plug-in project*

Figure 1-2. *Naming and targeting the plug-in project*

3. Enter the plug-in information. The plug-in ID uniquely identifies the plug-in within the core runtime. In the Plug-in Options section, you need to choose to generate an activator class to control the plug-in life cycle. Leave the option "This plug-in will make contributions to the UI" unchecked, as the plug-in will not display a UI. You do not want to create a rich client application, so leave the final option set to No, as shown in Figure 1-3. Click Finish to create the plug-in project.

Figure 1-3. *Specifying plug-in content*

The wizard builds the project, and then presents the plug-in manifest editor, as shown in Figure 1-4. The two most important files are `Activator.java` and `MANIFEST.MF`.

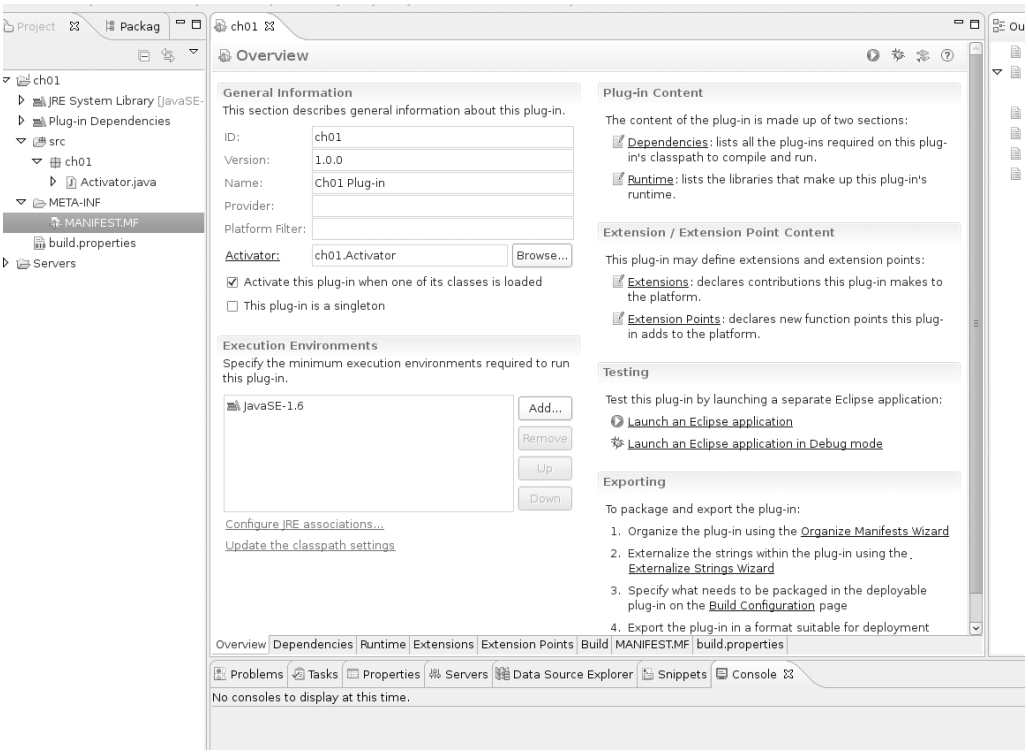


Figure 1-4. *Plug-in manifest editor for this exercise*

Creating the Plug-in

The activator class controls the life-cycle aspects and overall semantics of a plug-in. A plug-in can implement specialized functions for the start and stop aspects of its life cycle. Each life-cycle method includes a reference to a `BundleContext`, as follows:

```
public void start(BundleContext context) throws Exception {
    super.start(context);
    plugin = this;

    log.info("Activator Start");
}

public void stop(BundleContext context) throws Exception {
    plugin = null;
    super.stop(context);

    log.info("Activator Stop");
}
```

`BundleContext` is a reference that contains information related to the plug-in and other bundles/plug-ins in the system. Chapter 2 provides more information about the `BundleContext` methods.

The Dependencies tab of the plug-in manifest editor is used to add references to other bundles. You also need to add an extension point and implement the servlet, which you can do through the Extensions tab of the editor.

1. To add references to other bundles, click the Dependencies tab, and then click the Add button in the Required Plug-ins section. This displays the Plug-in Selection dialog, as shown in Figure 1-5. For this exercise, add the following references, which are required by the servlet extension point:
   - `javax.servlet`
   - `org.eclipse.equinox.http.jetty`
   - `org.eclipse.equinox.http.registry`
   - `org.eclipse.equinox.http.servlet`

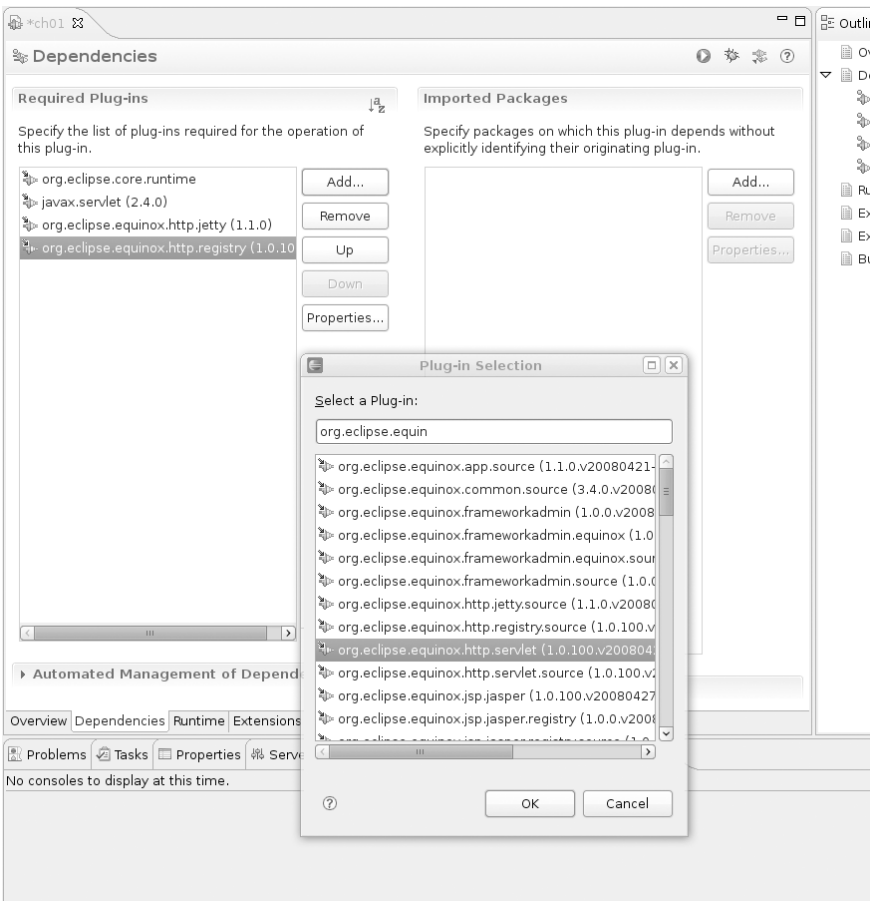


Figure 1-5. *Adding dependencies*

2. Click the Extensions tab. Click the Add button and select the extension point `org.eclipse.equinox.http.registry.servlets`. A servlet class name and alias will be inserted automatically. The servlet alias (`/servlet1`) will be used to reference the servlet from a web browser. Internally, the XML for this extension point looks like this:

```
<?xml version="1.0" encoding="UTF-8"?>
<?eclipse version="3.2"?>
<plugin>
   <extension
         point="org.eclipse.equinox.http.registry.servlets">
      <servlet
            alias="/servlet1"
            class="ch01.Servlet1">
      </servlet>
   </extension>
</plugin>
```

3. To implement the servlet class, click the class label link in the Extensions tab, as shown in Figure 1-6. This launches the New Java Class wizard.

■ **Note** You can also implement a new class manually by adding the class name (`ch01.Servlet1` in this example) to the plug-in manifest editor, and then right-clicking the plug-in project folder and selecting New ➤ Java Class.

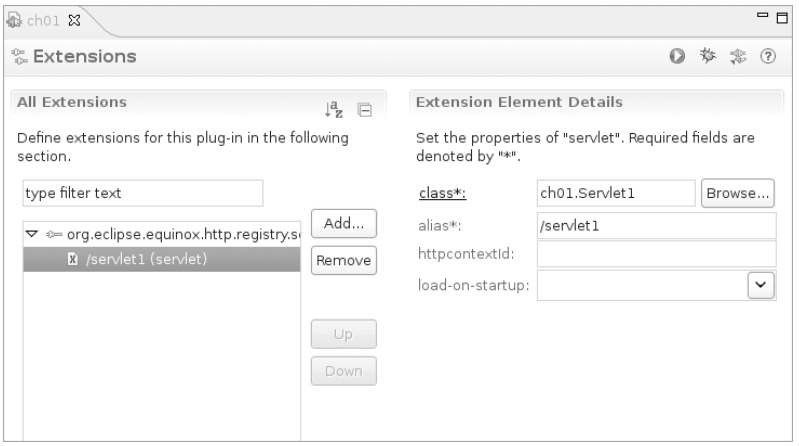


Figure 1-6. *Servlet extension point details*

4. Enter the class information, select `javax.servlet.http.HttpServlet` as the superclass, and click Finish. The Java class will be created automatically.
5. Use the plug-in manifest editor to override the `doGet` method to return the headers of the HTTP request to the browser, as follows:

```
@Override
protected void doGet(HttpServletRequest req, HttpServletResponse resp)
            throws ServletException, IOException
{
        resp.setContentType("text/html");
        dumpHttpHeaders(req, resp.getWriter());
}

@SuppressWarnings("unchecked")
private void dumpHttpHeaders(HttpServletRequest req, PrintWriter out)
{
        out.println("URI:" + req.getRequestURI() + "<br/>");

        Enumeration<String> names = req.getHeaderNames();

        while (names.hasMoreElements()) {
            final String name = names.nextElement();
            out.println(name + "=" + req.getHeader(name) + "<br/>");
        }
}
```

Testing the Plug-in

Now that you've created the plug-in, you can test it. You'll see that the OSGi console is very useful for examining the OSGi framework and debugging missing dependencies.

1. From the main menu, select Run ➤ Configurations to open the Run Configurations dialog.
2. To create a new configuration under the OSGi framework, right-click and select New. Make sure your plug-in is selected in the Bundles list, under Workspace, as shown in Figure 1-7. You must also select all required bundles under Target Platform. To make sure all required bundles are selected, unselect all bundles under Target Platform, and then click Add Required Bundles. This will ensure only the required dependencies are used at runtime. Then click Run.

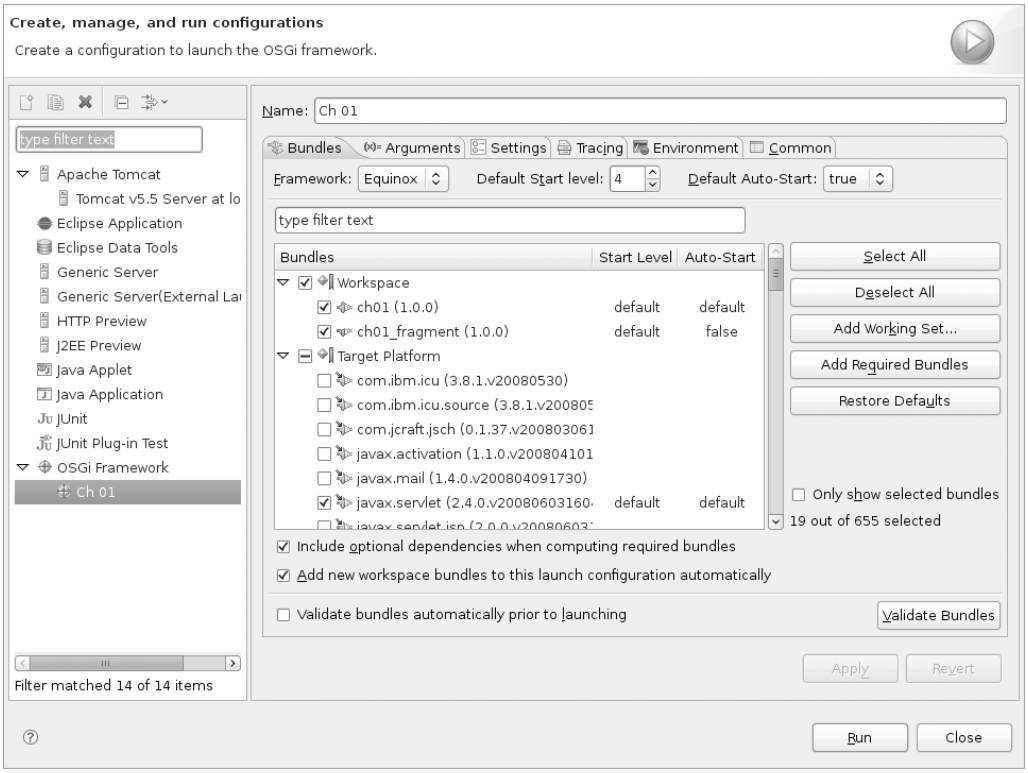


Figure 1-7. *Run configuration dialog showing both the exercise plug-in (ch01) and the logging fragment (ch01_fragment) discussed later in this chapter*

3. Click the Arguments tab. Note the runtime arguments:
   - `os ${target.os}`: The target operating system
   - `ws ${target.ws}`: The target window system
   - `arch ${target.arch}`: The target architecture
   - `nl ${target.nl}`: The locale
   - `Console`: Start the OSGi console; handy for investigating the state of the system

   Also note the VM argument:
   - `osgi.noShutdown`: If `true`, the VM will not exit after the Eclipse application has ended; useful for examining the OSGi framework after the application has ended

   When the plug-in runs, the console starts and is ready to receive user commands. This is a handy tool to inspect the state of the system. From the following output, you can see that Jetty started on port 80, which is the default in Windows.

■ **Note** Under Linux environments, Jetty may fail to start on port 80, as ports lower than 1024 require `sysadmin` access. In that case, add the VM argument `-Dorg.eclipse.equinox.http.jetty.http.port=8080` to start Jetty on port 8080.

```
osgi> Jun 21, 2008 6:21:10 PM ch01.Activator start
INFO: Activator Start
Jun 21, 2008 6:21:10 PM org.mortbay.http.HttpServer doStart
INFO: Version Jetty/5.1.x
Jun 21, 2008 6:21:11 PM org.mortbay.util.Container start
INFO: Started org.eclipse.equinox.http.jetty.internal.Servlet25Handler@1a99561
Jun 21, 2008 6:21:11 PM org.mortbay.util.Container start
INFO: Started HttpContext[/,/]
Jun 21, 2008 6:21:11 PM org.mortbay.http.SocketListener start
INFO: Started SocketListener on 0.0.0.0:80
Jun 21, 2008 6:21:11 PM org.mortbay.util.Container start
INFO: Started org.mortbay.http.HttpServer@1ea0252
osgi>
```

4. Point the browser to `http://localhost/servlet1`. You should see the output shown in Figure 1-8.

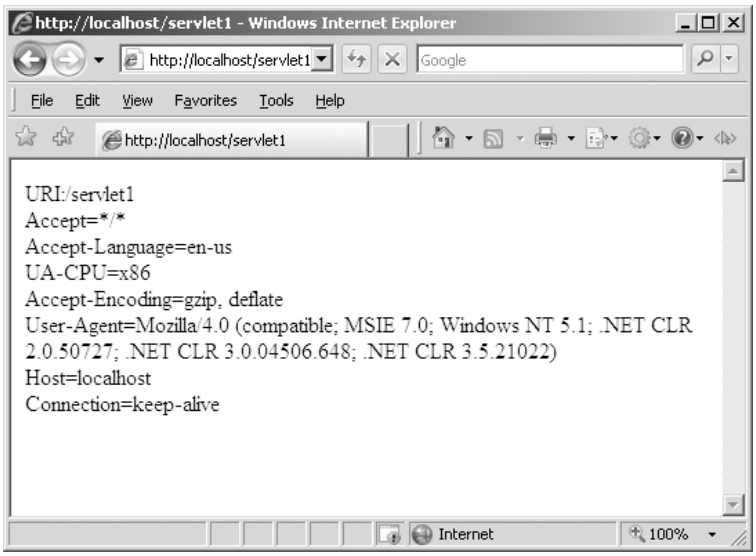


Figure 1-8. *Output of the exercise*

Using OSGi Console Commands

The console is a handy tool to inspect your plug-in and identify problems. The following are some of the most useful commands:

- `start [<id>|<name>]`: Starts a bundle given an ID or symbolic name
- `stop [<id>|<name>]`: Stops a bundle given an ID or symbolic name
- `install {URL}`: Adds a bundle given a URL for the current instance
- `uninstall [<id>|<name>]`: Removes a bundle given a URL for the current instance
- `ss`: Lists a short status of all the bundles registered in the current instance
- `help`: Shows information about all available commands

For example, to look at all the registered bundles, use the `ss` command, as follows:

```
osgi> ss

Framework is launched.

Id  State       Bundle
0  ACTIVE      org.eclipse.osgi_3.4.0.v20080605-1900
1  ACTIVE      org.eclipse.osgi.services_3.1.200.v20071203
2  ACTIVE      org.eclipse.core.jobs_3.4.0.v20080512
3  RESOLVED    ch01_fragment_1.0.0
               Master=12
4  ACTIVE      org.mortbay.jetty_5.1.14.v200806031611
5  ACTIVE      org.eclipse.core.runtime.compatibility.auth_3.2.100.v20070502
6  ACTIVE      org.eclipse.equinox.http.servlet_1.0.100.v20080427-0830
7  ACTIVE      org.eclipse.equinox.registry_3.4.0.v20080516-0950
               Fragments=16
8  ACTIVE      org.apache.commons.logging_1.0.4.v20080605-1930
9  ACTIVE      org.eclipse.core.runtime_3.4.0.v20080512
10  ACTIVE      org.eclipse.equinox.http.registry_1.0.100.v20080427-0830
11  ACTIVE      org.eclipse.core.contenttype_3.3.0.v20080604-1400
12  ACTIVE      org.apache.log4j_1.2.13.v200806030600
               Fragments=3
13  ACTIVE      javax.servlet_2.4.0.v200806031604
14  ACTIVE      org.eclipse.equinox.common_3.4.0.v20080421-2006
15  ACTIVE      ch01_1.0.0
16  RESOLVED    org.eclipse.core.runtime.compatibility.registry_3.2.200.v20070717
               Master=7
17  ACTIVE      org.eclipse.equinox.preferences_3.2.200.v20080421-2006
18  ACTIVE      org.eclipse.equinox.app_1.1.0.v20080421-2006
19  ACTIVE      org.eclipse.equinox.http.jetty_1.1.0.v20080425

osgi>
```

To start and stop your plug-in, simply use the bundle ID. (The bundle name can also be used, but who wants to type such long names?)

```
osgi> stop 15
271770 [OSGi Console] INFO  ch01.Activator  - Activator Stop
Jun 21, 2008 6:25:42 PM ch01.Activator stop
INFO: Activator Stop

osgi> start 15
Jun 21, 2008 6:25:47 PM ch01.Activator start
INFO: Activator Start
277188 [OSGi Console] INFO  ch01.Activator  - Activator Start
```

Using Logging Services

Enabling a logging service within a plug-in is somewhat different from logging in a traditional Java application. It is a bit trickier because of the dynamic component nature of the runtime.

To enable log4j in a traditional Java application, for example, the developer would create a `log4j.properties` file in the project classpath, and then use statements such as the following:

```
// Log4J Logger
private static final Logger logger = Logger.getLogger(Activator.class);

public void start(BundleContext context) throws Exception {
    super.start(context);
    plugin = this;

    logger.info("Activator Start");
}
```

However, putting `log4j.properties` in the plug-in class will not work, because the OSGi framework manages a per-bundle classpath. It returns this message:

```
log4j:WARN No appenders could be found for logger (ch01.Activator).
log4j:WARN Please initialize the log4j system properly.
```

The solution is to have the plug-in find `log4j.properties` in the classpath at runtime and use it. However, this is a little tricky. One way to handle this is to create a plug-in fragment and set the host plug-in ID to `org.apache.log4j`, as shown in Figure 1-9. This fragment will have a `log4j.properties` file at the main level. Then, at runtime, the fragment will attach itself to the log4j bundle classpath, thus finding the required `log4j.properties` file. The fragment must also be included in the run configuration for the plug-in.

■ **Note** *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 language translations, to an existing plug-in after it has been installed. Fragments are discussed further in Chapter 2.

Figure 1-9. *Attaching a log4j.properties to the log4j bundle at runtime using a fragment*

Here is the procedure to create the fragment for this example:

1. From the Eclipse IDE main menu, select File ➤ New ➤ Other ➤ Plug-in Development ➤ Plug-in Fragment.
2. In the New Fragment Project dialog, enter the plug-in information as shown in Figure 1-9. Make sure the host plug-in points to `org.apache.log4j`. You can click the Browse button to find and select that plug-in ID. Then click Finish.
3. In the fragment folder, add a `log4j.properties` file with the log configuration shown in the following fragment. To add a text file, right-click the fragment folder and select New ➤ File. Make sure the file name is `log4j.properties`.

```
# Set root logger level to debug and its only appender to default.
log4j.rootLogger=debug, default

# default is set to be a ConsoleAppender.
log4j.appender.default=org.apache.log4j.ConsoleAppender

# default uses PatternLayout.
log4j.appender.default.layout=org.apache.log4j.PatternLayout
log4j.appender.default.layout.ConversionPattern=%-4r [%t] %-5p %c %x - %m%n
```

This technique should enable the log4j logging service in your plug-in. However, if this seems too complicated, a simpler way is to use the Commons Logging service within the main plug-in, using this code:

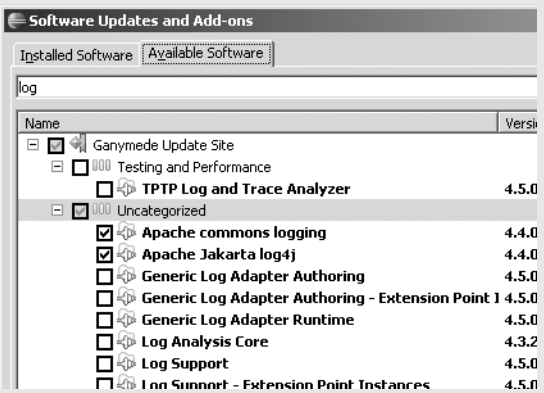
```
// Commons Log
private static final  Log log = LogFactory.getLog(Activator.class);

public void start(BundleContext context) throws Exception {
    super.start(context);
    plugin = this;
    log.info("Activator Start");
}
```

This fragment is much simpler; however, it will use the default Java logging service, which I personally dislike. It is up to you to choose the logging service that best fits your needs.

USING THE ECLIPSE 3.4 SOFTWARE UPDATE MANAGER

The Eclipse 3.4 (Ganymede) distribution does not ship with a log service such as Apache log4j or Commons Logging. However, the new Software Update Manager can be used to quickly discover and install software, including logging plug-ins.

To use the Software Update Manager, from the Eclipse IDE main menu, select Help ➤ Software Updates. In the Software Updates and Add-ons dialog, click the Available Software tab. From here, you can search for and install the Jakarta log4j and Commons Logging plug-ins.



This concludes the exercise in this chapter. The goal of this exercise has been to provide an introduction to the power of the OSGi console and the basic plug-in life cycle, using a simple Jetty servlet extension point to listen for HTTP requests.

Summary

This chapter introduced Eclipse RCP. The following are the important points to take away from this chapter:

- In today's heterogeneous software world, there is a quest for openness and extensibility. A platform that addresses interoperability challenges and supports collaboration is of critical importance.
- Eclipse provides a consistent feature set on multiple platforms. It allows developers to concentrate on the problem at hand, rather than the details of the specific platform.
- The plug-in architecture makes it possible for Eclipse to support many programming languages and development paradigms.
- Eclipse is open source, free, and fully supported.
- Eclipse is designed to be extensible and configurable.
- Eclipse is at the forefront of the software tools industry. This means that you can depend on it as a viable, industrial-strength tool for the foreseeable future.
- The foundation of RCP includes Equinox, the core platform, SWT, JFace, and the Eclipse workbench.
    - Equinox is an implementation of the OSGi framework, a dynamic component model for remote component management. This is something that is missing in stand-alone JVM environments.
    - The core runtime implements the basic plug-in model based on extension points declared in XML in a manifest file (`plugin.xml`). The 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.
    - SWT is a GUI toolkit with fast native access to multiple platform widget sets, providing a common API. It is designed for performance, native look and feel, and extensibility.
    - JFace is a window-system-independent GUI toolkit for handling many common programming tasks. It implements text, dialog, preference, and wizard frameworks, as well as actions and data viewers.
    - The workbench is the basic development environment in the Eclipse universe. It is divided into perspectives, viewers, editors, workspaces, and projects.