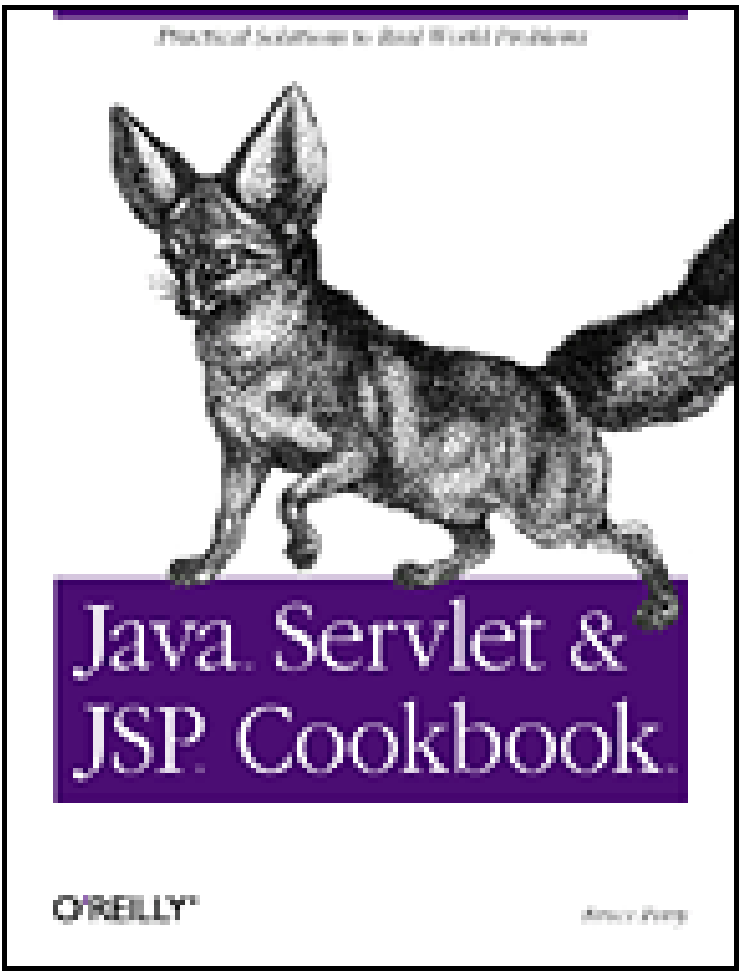


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Java Servlet & JSP Cookbook

By [Bruce W. Perry](#)

Publisher: O'Reilly
Pub Date: January 2004
ISBN: 0-596-00572-5
Pages: 746

With literally hundreds of examples and thousands of lines of code, the *Java Servlet and JSP Cookbook* yields tips and techniques that any Java web developer who uses JavaServer Pages or servlets will use every day, along with full-fledged solutions to significant web application development problems that developers can insert directly into their own applications.

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Preface

On a historical timeline, the saga of Java as a server-side programmer's tool of choice began in early 1997 when Sun Microsystems released the "Java™ Web Server" beta and Java Servlet Developers Kit.^[1] Servlets are a type of Java class that executes on a server. Servlets dynamically handle networked requests and responses, mostly using the Hypertext Transfer Protocol (HTTP). In June 1999, Sun introduced JavaServer Pages (JSPs), which intermingled Java code with JavaScript and HTML template text.

^[1] See Sun Microsystems Java milestones and history at: <http://java.sun.com/features/2000/06/time-line.html>.

JSPs, as they are now evolving (with JSP Version 2.0), are designed to encapsulate domain logic in standard and custom tags, and separate this domain layer from the JSP component's presentation logic. The latter concept means "the stuff that people see" when they interact with a web application, such as HTML-related screen widgets. Ideally, a JSP uses tags to interact with databases and encapsulate domain rules, and static or dynamically generated template text, such as XML or XHTML, to create the visual page for the user.

During the late 1990s, I was a freelance, backend web developer using a number of different languages. When server-side Java appeared on the scene, I greeted the news with as much relief as joy. Designed from the bottom up as object-oriented and modular, Java represented a reassuring alternative to the ad hoc, ill-designed, albeit well-intentioned masses of web-related code I would often encounter when an organization brought me into the midst of a project.

Not only can you easily create your own reusable components for, say, sending email simply by designing and uploading to your web application one or more Java classes,^[2] but you have the entire Java API at your disposal for dealing with essential, low-level items such as String-handling, file I/O, and Math calculations. What a deal!

^[2] For example, the installation of a binary Active Server Pages (ASP) component often required the scrutiny and permission of the hosting Internet Service Provider (ISP), because a badly written or malicious ASP component could wreak havoc on the server machine.

The other big benefit Java provides is its cross-platform nature. Web developers can design their web applications, neatly package them in a special JAR file for web components called a Web Application Archive file, then install the WARs on various servers hosted by different operating systems (OSes). Java web components are not bound to a single OS or to a particular vendor's server software like other web-related software technologies.

Jump ahead to the present. By late 2003, Java has achieved status as the granddaddy of server-side development. Servlets and JSPs are included in the Java 2 Enterprise Edition (J2EE), a widely accepted enterprise technology for network-based and distributed computing. Hundreds of thousands of developers throughout the world work on the "web tier" of J2EE-based technologies, using servlets, JSPs, and sometimes special web frameworks such as Struts.

In fact, many web developers now spend a fair amount of time getting to know various "application servers"-like BEA WebLogic, JBoss, or IBM's WebSphere-that pull together the web tier, business or domain objects (such as components that handle weather data or a customer's financial accounts),

and Enterprise Information Systems (EIS). These application servers represent the software host for servlets and JSPs. Many web developers, including myself, spend a lot of time working on web components that are hosted on Tomcat, a popular open source (<http://www.opensource.org>) servlet engine and "reference implementation" for the new servlet and JSP APIs.^[3]

^[3] A reference implementation is software that is based on a commonly agreed upon specification, and is freely available to software developers and others as a demonstration of how the specified software system is designed to function.

The rapid maturation and well-established nature of Java has naturally led to a "cookbook" approach for our book. This cookbook focuses on how to initiate certain web-related tasks in Java, rather than tutoring the reader on how to use the Java language, or explaining the servlet and JSP APIs in finely grained detail. Countless tutorial-oriented Java books still exist, however, in new or reissued form, which attests to the popularity of Java as a web-development platform.

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What's in the Book

In creating the recipes for this book, I tried to cover as many common and advanced web developer tasks as I could practically fit into one book. This amounts to about 230 different recipes. Each recipe shows how to implement a particular task using servlets, JSPs, and, in many cases, one or more supporting Java classes.

The recipes show how to:

- Authenticate web clients
- Interact with databases
- Send email
- Handle submitted data from a web form
- Read and set "cookies"
- Upload files from the client
- Integrate JavaScript with servlets and JSPs
- Embed multimedia files like digital movies and music in JSPs and servlets
- Handle web clients whose users speak different languages (internationalization)
- Log messages from servlets and JSPs
- Dynamically include chunks of content, as in traditional server-side include (SSI) code
- Interact with Enterprise JavaBeans (EJBs) from a JSP and servlet
- Use Amazon.com's and Google.com's Web Services APIs from a servlet or JSP

I have also included numerous technology-specific recipes, such as:

- Using "sessions" in your Java web applications (a concept that represents the tracking of a user's progress through a web site)
- Working with "filters"
- Using the open source ANT tool to build web applications
- Binding Java objects to a session or web application so they can be used as information or data containers
- Creating your own custom tags for JSPs

- Using the JavaServer Pages Standard Tag Library (JSTL), which is a large set of prebuilt tags you can use in JSPs

In short, the book is designed to help guide Java web developers in their everyday tasks, and to provide quick solutions to typical web-related problems.

BEA WebLogic Recipes

Because Java web developers tend to work with both Tomcat and a proprietary application server, I've included a number of different recipes to show how to implement common tasks with BEA WebLogic. As a practical matter, I could not cover the several other application servers that are available, such as IBM's WebSphere, JBoss, Jetty, Oracle 9/application server, or commercial servlet engines such as New Atlanta ServletExec and Caucho Resin. But I wanted to include recipes covering "how the other half lives" in terms of using various vendor tools for managing everyday web-application tasks. Solutions involving the deployment or revision of web components and deployment descriptors using visual interfaces such as WebLogic's Administration Console or WebLogic Builder can be quite different from those used with Tomcat.

As a result, this book includes a collection of basic WebLogic-related recipes, such as deploying web applications on WebLogic, and using a servlet to access a WebLogic DataSource. [Chapter 25](#) shows how a servlet can interact with an EJB installed on WebLogic.

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Audience

The recipes are mainly designed for experienced developers who design, build, deploy, and revise Java-based web applications. This includes JSP, servlet, and JavaBean developers.

The book is also appropriate for experienced web developers who are just learning Java and migrating from another web programming platform, such as Active Server Pages, PHP, or Perl. These developers are usually knowledgeable about the underlying mechanisms, such as sessions, cookies, file uploads, login authentication, and handling HTTP POST requests, but may not yet know how to implement these tasks in Java. The cookbook allows them to quickly look up a solution to a problem that they have probably already dealt with using another language.

Java developers who need to know how to implement new servlet API 2.4 and JSP 2.0 features (such as some of the new *web.xml*/`filter-mapping` elements for request dispatchers and embedding the Expression Language [EL] in a JSP's template text) will also find the cookbook handy.

What You Need to Know

Readers should know the basics of the Java language or be learning how to program with Java.

[Chapter 1](#), includes brief introductions to servlets, JSPs, and deployment descriptors for readers who are not yet up to speed on these concepts. However, since the cookbook's focus is on concise solutions to specific problems, it does not include long tutorials on the servlet and JSP APIs. Each recipe includes an introduction that provides enough information to get started with the various technologies and code samples. The recipes also include numerous references to online information resources, such as Javadoc pages and tutorials, for readers who need to explore a topic in greater depth.

Readers will benefit from having already been introduced to various J2EE subject areas such as Java Database Connectivity (JDBC), the Java Naming and Directory Interface (JNDI), and Enterprise JavaBeans (I have included one recipe that involves connecting a web component with EJBs using JNDI) .

Finally, a working knowledge of XML is also helpful, as Java web development involves XML-based deployment descriptors and configuration files.

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Organization

The book begins with three chapters that cover the nuts and bolts of writing servlets and JSPs, deploying servlets and JSPs, naming or registering your servlets, and using the Ant tool.

I then explore several basic topics on web development, such as dynamically including content in web pages, uploading files, handling data that has been posted from an HTML form, reading and setting cookies, tracking sessions, and integrating JavaScript with JSPs and servlets.

Next, the book includes some more advanced recipes, such as logging messages, authenticating clients, binding attributes, working with the client request, and creating servlet filters. [Chapter 20](#), and [Chapter 21](#), cover two common and complex web-development tasks with 20 different recipes.

[Chapter 22](#), and [Chapter 23](#) describe custom tags and the JSTL. [Chapter 24](#), discusses the crucial topic of internationalizing your web applications with servlets and JSPs.

For web developers whose web components must interact with EJBs using the Java JNDI, [Chapter 25](#), shows how to configure JNDI in both Tomcat and WebLogic, as well as how to access JNDI objects using both servers.

The book concludes with two chapters that describe different strategies for extracting data from web sites using Java web components. [Chapter 26](#), has recipes on harvesting or "scraping" data from web pages. [Chapter 27](#), describes how to use Google's and Amazon.com's web services APIs.

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Conventions Used in This Book

The following typographical conventions are used in this book:

Italic

Indicates new terms, example URLs, email addresses, filenames, file extensions, pathnames, directories, and Unix utilities.

`Constant width`

Indicates commands, options, switches, variables, attributes, keys, functions, types, classes, namespaces, methods, modules, properties, parameters, values, objects, events, event handlers, XML tags, HTML tags, macros, the contents of files, or the output from commands.

`Constant width bold`

Shows commands or other text that should be typed literally by the user, and is used to emphasize code in examples.

`Constant width italic`

Shows text that should be replaced with user-supplied values. In some cases where text is already italicized, user-supplied values are shown in angled brackets (< >)

 This icon signifies a tip, suggestion, or general note.

 This icon indicates a warning or caution.

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Acknowledgments

One night, more than a year ago, I dispatched an email to O'Reilly with an idea for a book. At that time, the likelihood that this casual email would eventually give rise to a published book seemed very remote. After numerous emailed "back and forths" between me and a couple of O'Reilly Java editors, and then several months of gentle nudging, solid editing, occasional reconceptualizations, and (of course) writing, writing, and more writing, the seed of the book idea germinated and reached fruition. Voilà, a cookbook is born!

The shaping of a book is always a collaboration among several people. This book probably would not have left the launching pad without my editor Brett McLaughlin's succinct and continuous reminders about what differentiates a cookbook from other book types. Brett is also a fine "word by word" copy editor, and having an editorial background myself, I appreciated his efforts from the writer's side. Also, Brett's knowledge of Java is deep, and his comments helped me avoid some awkward code design decisions.

I am very fortunate to have Jason Hunter and Sang Shin as technical editors. They are both well-known Java experts, and this is a much better book since they have read and commented on large chunks of it. Their review had a really short deadline, and this is a big book. I was amazed at the comprehensive coverage with such a short turnaround. As a technical writer, I am indebted to those who rescue me from embarrassing mistakes!

Some of us save our family members for last in acknowledging those who help us. Maybe that is because the last paragraph is the foundation on which the rest of the language sits, just as the family is every writer's foundation, giving them support and shielding them from distractions as they immerse themselves in prose and technology. This book would not have been created without the help from my wife Stacy, daughter Rachel, and even Scott, who inspires me from the tender vantage point of being less than one year old. I'll also repeat what I said in my AppleScript book; I thank my parents Robert and Anne Perry for installing in me a love of writing and books.

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Chapter 1. Writing Servlets and JSPs

[Introduction](#)

[Recipe 1.1. Writing a Servlet](#)

[Recipe 1.2. Writing a JSP](#)

[Recipe 1.3. Compiling a Servlet](#)

[Recipe 1.4. Packaging Servlets and JSPs](#)

[Recipe 1.5. Creating the Deployment Descriptor](#)

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Introduction

The purpose of this chapter is to bring relative newcomers up to speed in writing, compiling, and packaging servlets and JSPs. If you have never developed a servlet or JSP before, or just need to brush up on the technology to jumpstart your development, then the upcoming recipes provide simple programming examples and an overview of the components that you require on the user classpath to compile servlets.

[Recipe 1.1](#) and [Recipe 1.2](#) provide a brief introduction to servlets and JSPs, respectively. A comprehensive description of a servlet or JSP's role in the Java 2 Platform, Enterprise Edition (J2EE), is beyond the scope of these recipes. However, information that relates directly to J2EE technology, such as databases and JDBC; using servlets with the Java Naming and Directory Interface (JNDI); and using servlets with JavaMail (or email) is distributed throughout the book (and index!).

The "See Also" sections concluding each recipe provide pointers to closely related chapters, an online tutorial managed by Sun Microsystems, and other O'Reilly books that cover these topics in depth.

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Recipe 1.1 Writing a Servlet

Problem

You want to write a servlet that is part of a web application.

Solution

Create a Java class that extends `javax.servlet.http.HttpServlet`. Make sure to import the classes from *servlet.jar* (or *servlet-api.jar*)-you'll need them to compile the servlet.

Discussion

A servlet is a Java class that is designed to respond with dynamic content to client requests over a network. If you are familiar with Common Gateway Interface (CGI) programs, then servlets are a Java technology that can replace CGI programs. Often called a *web component* (along with JSPs), a servlet is executed within a runtime environment provided by a *servlet container* or *web container* such as Jakarta Tomcat or BEA WebLogic.

A web container can be an add-on component to an HTTP server, or it can be a standalone server such as Tomcat, which is capable of managing HTTP requests for both static content (HTML files) as well as for servlets and JSPs.

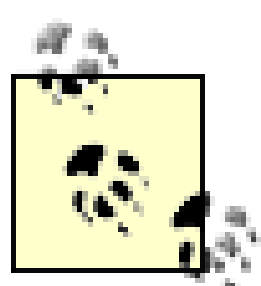
Servlets are installed in web containers as part of *web applications*. These applications are collections of web resources such as HTML pages, images, multimedia content, servlets, JavaServer Pages, XML configuration files, Java support classes, and Java support libraries. When a web application is deployed in a web container, the container creates and loads instances of the Java servlet class into its Java Virtual Machine (JVM) to handle requests for the servlet.

A servlet handles each request as a separate thread. Therefore, servlet developers have to consider whether to synchronize access to instance variables, class variables, or shared resources such as a database connection, depending on how these resources are used.

All servlets implement the `javax.servlet.Servlet` interface. Web application developers typically write servlets that extend `javax.servlet.http.HttpServlet`, an abstract class that implements the `Servlet` interface and is specially designed to handle HTTP requests.

The following basic sequence occurs when the web container creates a servlet instance:

1. The servlet container calls the servlet's `init()` method, which is designed to initialize resources that the servlet might use, such as a logger (see [Chapter 14](#)). The `init()` method gets called only once during the servlet's lifetime.
2. The `init()` method initializes an object that implements the `javax.servlet.ServletConfig` interface. This object gives the servlet access to initialization parameters declared in the deployment descriptor (see [Recipe 1.5](#)). `ServletConfig` also gives the servlet access to a `javax.servlet.ServletContext` object, with which the servlet can log messages, dispatch requests to other web components, and get access to other web resources in the same application (see [Recipe 13.5](#)).



Servlet developers are not required to implement the `init()` method in their `HttpServlet` subclasses.

3. The servlet container calls the servlet's `service()` method in response to servlet requests. In terms of `HttpServlets`, `service()` automatically calls the appropriate HTTP method to handle the request by calling (generally) the servlet's `doGet()` or `doPost()` methods. For example, the servlet responds to a user sending a `POST` HTTP request with a `doPost()` method execution.
4. When calling the two principal `HttpServlet` methods, `doGet()` or `doPost()`, the servlet container creates `javax.servlet.http.HttpServletRequest` and `HttpServletResponse` objects and passes them in as parameters to these request handler methods. `HttpServletRequest` represents the request; `HttpServletResponse` encapsulates the servlet's response to the request.

[Example 1-1](#) shows the typical uses of the request and response objects. It is a good idea to read the servlet API documentation (at <http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/http/package-summary.html>), as many of the method names (e.g., `request.getContextPath()`) are self-explanatory.

5. The servlet or web container, not the developer, manages the servlet's lifecycle, or how long an instance of the servlet exists in the JVM to handle requests. When the servlet container is set to remove the servlet from service, it calls the servlet's `destroy()` method, in which the servlet can release any resources, such as a database connection.

[Example 1-1](#) shows a typical servlet idiom for handling an HTML form. The `doGet()` method displays the form itself. The `doPost()` method handles the submitted form data, since in `doGet()`, the HTML `form` tag specifies the servlet's own address as the target for the form data.

The servlet (named `FirstServlet`) specifies that the declared class is part of the `com.jspservletcookbook` package. It is important to create packages for your servlets and utility

classes, and then to store your classes in a directory structure beneath *WEB-INF* that matches these package names.

The `FirstServlet` class imports the necessary classes for compiling a basic servlet, which are the emphasized `import` statements in [Example 1-1](#). The Java class extends `HttpServlet`. The only defined methods are `doGet()`, which displays the HTML form in response to a `GET` HTTP request, and `doPost()`, which handles the posted data.

Example 1-1. A typical HttpServlet used for handling an HTML form

```
package com.jspervletcookbook;

import java.io.IOException;
import java.io.PrintWriter;

import java.util.Enumeration;

import javax.servlet.ServletException;

import javax.servlet.http.HttpServlet;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;

public class FirstServlet extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        //set the MIME type of the response, "text/html"
        response.setContentType("text/html");

        //use a PrintWriter to send text data to the client who has requested the
        //servlet
        java.io.PrintWriter out = response.getWriter( );

        //Begin assembling the HTML content
        out.println("<html><head>");

        out.println("<title>Help Page</title></head><body>");
        out.println("<h2>Please submit your information</h2>");

        //make sure method="post" so that the servlet service method
        //calls doPost in the response to this form submit
        out.println(
            "<form method=\"post\" action =\"" + request.getContextPath( ) +
            "/firstservlet\" >");

        out.println("<table border=\"0\"><tr><td valign=\"top\">");
        out.println("Your first name: </td> <td valign=\"top\">");
        out.println("<input type=\"text\" name=\"firstname\" size=\"20\">");
```



```

        out.println("</td></tr><tr><td valign=\"top\">");
        out.println("Your last name: </td> <td valign=\"top\">");
        out.println("<input type=\"text\" name=\"lastname\" size=\"20\">");
        out.println("</td></tr><tr><td valign=\"top\">");
        out.println("Your email: </td> <td valign=\"top\">");
        out.println("<input type=\"text\" name=\"email\" size=\"20\">");
        out.println("</td></tr><tr><td valign=\"top\">");

        out.println("<input type=\"submit\" value=\"Submit Info\"></td></tr>");
        out.println("</table></form>");
        out.println("</body></html>");

    } //doGet
    public void doPost(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        //display the parameter names and values
        Enumeration paramNames = request.getParameterNames( );

        String parName;//this will hold the name of the parameter

        boolean emptyEnum = false;

        if (! paramNames.hasMoreElements( ))
            emptyEnum = true;

        //set the MIME type of the response, "text/html"
        response.setContentType("text/html");

        //use a PrintWriter to send text data to the client
        java.io.PrintWriter out = response.getWriter( );

        //Begin assembling the HTML content
        out.println("<html><head>");
        out.println("<title>Submitted Parameters</title></head><body>");

        if (emptyEnum){
            out.println(
                "<h2>Sorry, the request does not contain any parameters</h2>");
        } else {
            out.println(
                "<h2>Here are the submitted parameter values</h2>");
        }

        while(paramNames.hasMoreElements( )){

            parName = (String) paramNames.nextElement( );

            out.println(
                "<strong>" + parName + "</strong> : " +

```



```
        request.getParameter(parName));

        out.println("<br />");

    } //while

    out.println("</body></html>");

} // doPost
}
```

You might have noticed that `doGet()` and `doPost()` each throw `ServletException` and `IOException`. The servlet throws `IOException` because the `response.getWriter()` (as well as `PrintWriter.close()`) method call can throw an `IOException`. The `doPost()` and `doGet()` methods can throw a `ServletException` to indicate that a problem occurred when handling the request. For example, if the servlet detected a security violation or some other request problem, then it could include the following code within `doGet()` or `doPost()`:

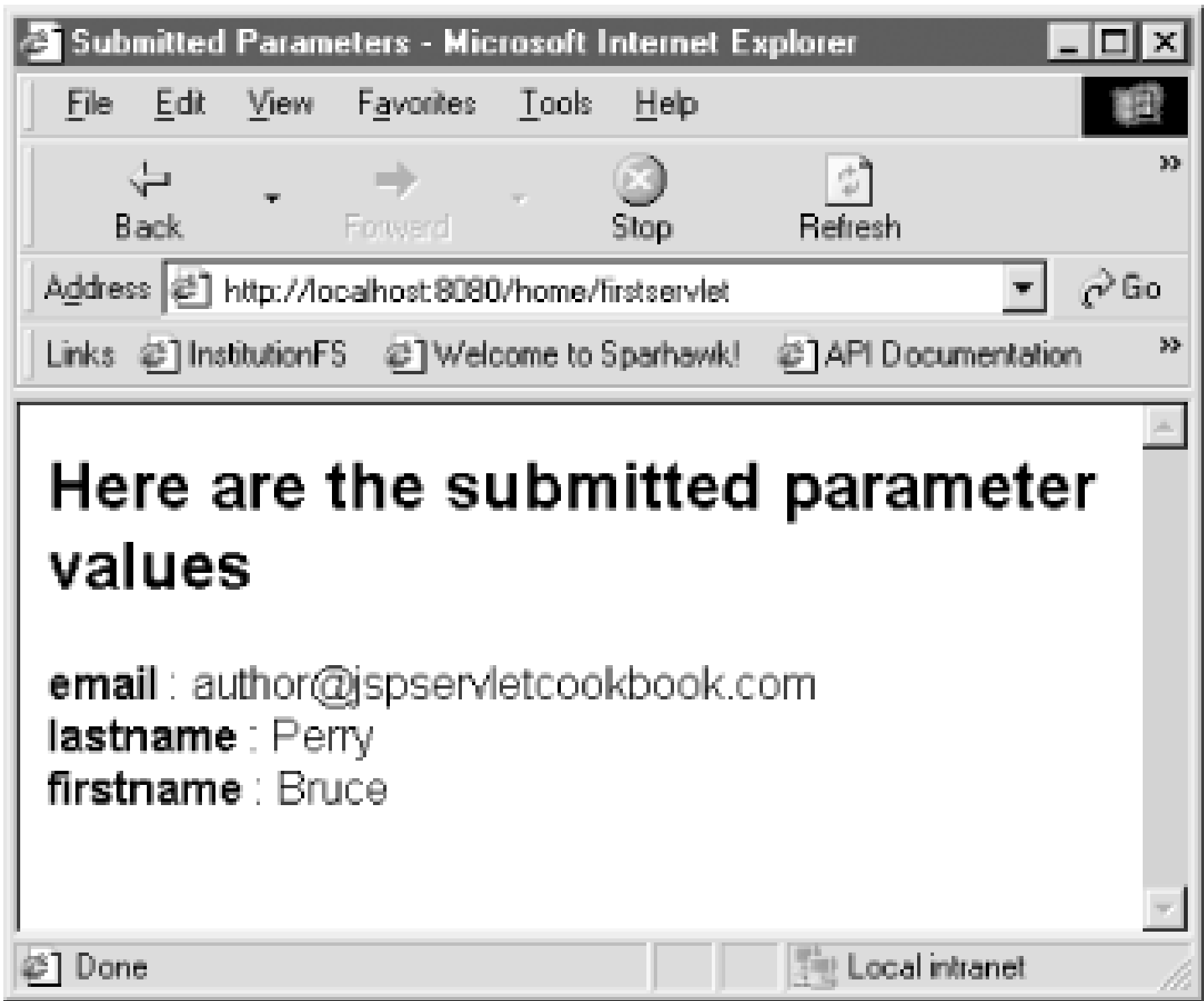
```
//detects a problem that prevents proper request handling...
throw new ServletException("The servlet cannot handle this request.");
```

[Figure 1-1](#) shows the output displayed by the servlet's `doGet()` method in a browser.

Figure 1-1. The servlet's output for `doGet()` method

[Figure 1-2](#) shows the servlet's output for the `doPost()` method.

Figure 1-2. The servlet's output for the `doPost()` method



See Also

[Recipe 1.3](#) on compiling a servlet; [Recipe 1.4](#) on packaging servlets and JSPs; [Recipe 1.5](#) on creating the deployment descriptor; [Chapter 2](#) on deploying servlets and JSPs; [Chapter 3](#) on naming servlets; the `javax.servlet.http` package JavaDoc: <http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/http/package-summary.html>; the J2EE tutorial from Sun Microsystems: http://java.sun.com/j2ee/tutorial/1_3-fcs/doc/J2eeTutorialTOC.html; Jason Hunter's *Java Servlet Programming* (O'Reilly).

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Recipe 1.2 Writing a JSP

Problem

You want to create a JSP and include it in a web application.

Solution

Create the JSP as a text file using HTML template text as needed. Store the JSP file at the top level of the web application.

Discussion

A JavaServer Pages (JSP) component is a type of Java servlet that is designed to fulfill the role of a user interface for a Java web application. Web developers write JSPs as text files that combine HTML or XHTML code, XML elements, and embedded JSP actions and commands. JSPs were originally designed around the model of embedded server-side scripting tools such as Microsoft Corporation's ASP technology; however JSPs have evolved to focus on XML elements, including custom-designed elements, or *custom tags*, as the principal method of generating dynamic web content.

JSP files typically have a *.jsp* extension, as in *mypage.jsp*. When a client requests the JSP page for the first time, or if the developer precompiles the JSP (see Chapter 5), the web container translates the textual document into a servlet.

The JSP 2.0 specification refers to the conversion of a JSP into a servlet as the *translation phase*. When the JSP (now a servlet class) responds to requests, the specification calls this stage the *request phase*. The resulting servlet instance is called the *page implementation object*.

A JSP compiler (such as Tomcat's Jasper component) automatically converts the text-based document into a servlet. The web container creates an instance of the servlet and makes the servlet available to handle requests. These tasks are transparent to the developer, who never has to handle the translated servlet source code (although they can examine the code to find out what's happening behind the scenes, which is always instructive).

The developer focuses on the JSP's dynamic behavior and which JSP elements or custom-designed tags she uses to generate the response. Developing the JSP as a text-based document rather than Java source code allows a professional designer to work on the graphics, HTML, or dynamic HTML, leaving the XML tags and dynamic content to programmers.

Example 1-2 shows a JSP that displays the current date and time. The example JSP shows how to import and use a custom tag library, which Chapter 23 describes in great detail. The code also uses the `jsp:useBean` standard action, a built-in XML element that you can use to create a new Java object for use

in the JSP page. Here are the basic steps for writing a JSP:

1. Open up a text editor, or a programmer's editor that offers JSP syntax highlighting.
2. If you are developing a JSP for handling HTTP requests, then input the HTML code just as you would for an HTML file.
3. Include any necessary JSP directives, such as the `taglib` directive in Example 1-2, at the top of the file. A directive begins with the `<%@` s.
4. Type in the standard actions or custom tags wherever they are needed.
5. Save the file with a `.jsp` extension in the directory you have designated for JSPs. A typical location is the top-level directory of a web application that you are developing in your filesystem.



Some JSPs are developed as XML files, or *JSP documents*, consisting solely of well-formed XML elements and their attributes. The JSP 2.0 specification recommends that you give these files a `.jspx` extension. See Recipe 5.5 for further details on JSP documents.

Example 1-2. A JSP file that displays the date

```
<%-- use the 'taglib' directive to make the JSTL 1.0 core tags available; use the uri
"http://java.sun.com/jsp/jstl/core" for JSTL 1.1 --%>
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>


<%-- use the 'jsp:useBean' standard action to create the Date object; the object is set
as an attribute in page scope
--%>
<jsp:useBean id="date" class="java.util.Date" />

<html>
<head><title>First JSP</title></head>
<body>
<h2>Here is today's date</h2>

<c:out value="${date}" />

</body>
</html>
```

To view the output of this file in a browser, request the file by typing the URL into the browser location field, as in: `http://localhost:8080/home/first.jsp`. The name of the file is *first.jsp*. If this is the first time that anyone has requested the JSP, then you will notice a delay as the JSP container converts your text into Java source code, then compiles the source into a servlet.



You can avoid delays by precompiling the JSP. If you request the JSP with a `jsp_precompile=true` parameter, Tomcat converts the JSP, but does not send back a response. An example is `http://localhost:8080/home/firstJ.jsp?jsp_precompile=true`.

Figure 1-3 shows the JSP output in a browser.

Figure 1-3. Output from the firstJ.jsp page



If you select "View Source" from the browser menu to view the page's source code, you won't see any of the special JSP syntax: the comment characters (`<%-- --%>`), the `taglib` directive, the `jsp:useBean` action, or the `c:out` tag. The servlet sends only the template text and the generated date string to the client.

See Also

Recipe 5.1 -Recipe 5.3 on precompiling JSPs; Chapter 2 on deploying servlets and JSPs; Recipe 1.1 and Recipe 1.3 on writing and compiling a servlet; Recipe 1.4 on packaging servlets and JSPs; Recipe 1.5 on creating the deployment descriptor; the J2EE tutorial from Sun Microsystems: http://java.sun.com/j2ee/tutorial/1_3-fcs/doc/J2eeTutorialTOC.html ; Hans Bergsten's *JavaServer Page*. (O'Reilly).

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Recipe 1.3 Compiling a Servlet

Problem

You have written a servlet, and now you want to compile it into a class file.

Solution

Make sure that *servlet.jar* (for Tomcat 4.1.24) or *servlet-api.jar* (for Tomcat 5) is on your user classpath. Use `javac` as you would for any other Java source file.

Discussion

At a minimum, you have to place the servlet classes on your classpath in order to compile a servlet. These classes are located in these Java packages:

- `javax.servlet`
- `javax.servlet.http`

Tomcat 5 supports the servlet API 2.4; the JAR file that you need on the classpath is located at *<Tomcat-5-installation-directory>/common/lib/servlet-api.jar*. Tomcat 4.1.24 uses the servlet 2.3 API. The servlet classes are located at: *<Tomcat-4-installation-directory>/common/lib/servlet.jar*.

For BEA WebLogic 7.0, the servlet classes and many other subpackages of the `javax` package (e.g., *javax.ejb*, *javax.mail*, *javax.sql*) are located at: *<WebLogic-installation-directory>/weblogic700/server/lib/weblogic.jar*.

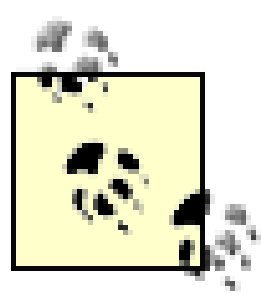
If you are using Ant to compile servlet classes, then proceed to [Recipe 4.4](#), do not pass Go, do not collect \$200. That recipe is devoted specifically to the topic of using Ant to compile a servlet. If you use an IDE, follow its instructions for placing a JAR file on the classpath.

The following command line compiles a servlet in the *src* directory and places the compiled class, nested within its package-related directories, in the *build* directory:

```
javac -classpath K:\tomcat5\jakarta-tomcat-5\dist\common\lib\servlet-api.jar  
      -d ./build ./src/FirstServlet.java
```

For this command line to run successfully, you must change to the parent directory of the *src*

directory.



[Recipe 1.4](#) explains the typical directory structure, including the *src* directory, for developing a web application.

If the servlet depends on any other libraries, you have to include those JAR files on your classpath as well. I have included only the *servlet-api.jar* JAR file in this command line.

You also have to substitute the directory path for your own installation of Tomcat for this line of the prior command-line sequence:

```
K:\tomcat5\jakarta-tomcat-5\dist\common\lib\servlet-api.jar
```

This command line uses the built-in `javac` compiler that comes with the Sun Microsystems Java Software Development Kit (JDK). For this command to work properly, you have to include the location of the Java SDK that you are using in the `PATH` environment variable. For example, on a Unix-based Mac OS X 10.2 system, the directory path `/usr/bin` must be included in the `PATH` variable. On my Windows NT machine, the `PATH` includes `h:\j2sdk1.4.1_01\bin`.

See Also

[Chapter 2](#) on deploying servlets and JSPs; [Chapter 3](#) on naming servlets; [Recipe 1.4](#) on packaging servlets and JSPs; [Recipe 1.5](#) on creating the deployment descriptor; the J2EE tutorial from Sun Microsystems: http://java.sun.com/j2ee/tutorial/1_3-fcs/doc/J2eeTutorialTOC.html; Jason Hunter's *Java Servlet Programming* (O'Reilly).

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Recipe 1.4 Packaging Servlets and JSPs

Problem

You want to set up a directory structure for packaging and creating a Web ARchive (WAR) file for servlets and JSPs.

Solution

Set up a directory structure in your filesystem, then use the `jar` tool or Ant to create the WAR.

Discussion

Except in the rarest of circumstances, you'll usually develop a servlet or JSP as part of a web application. It is relatively easy to set up a directory structure on your filesystem to hold web-application components, which include HTML files, servlets, JSPs, graphics, JAR libraries, possibly movies and sound files, as well as XML configuration files (such as the deployment descriptor; see [Recipe 1.5](#)).

The simplest organization for this structure is to create the exact layout of a web application on your filesystem, then use the `jar` tool to create a WAR file.

A WAR file is like a ZIP archive. You deploy your web application into a web container by deploying the WAR. See [Chapter 2](#) for recipes about various deployment scenarios.

The web application structure involving the *WEB-INF* subdirectory is standard to all Java web applications and specified by the servlet API specification (in the section named *Web Applications*). Here is what this directory structure looks like, given a top-level directory name of *myapp*.

```
/myapp
  /images
  /WEB-INF
    /classes
    /lib
```

The servlet specification specifies a *WEB-INF* subdirectory and two child directories, *classes* and *lib*. The *WEB-INF* subdirectory contains the application's deployment descriptor, named *web.xml*. The JSP files and HTML live in the top-level directory (*myapp*). Servlet classes, JavaBean classes, and any other utility classes are located in the *WEB-INF/classes* directory, in a structure that matches their

package name. If you have a fully qualified class name of `com.myorg.MyServlet`, then this servlet class must be located in *WEB-INF/classes/com/myorg/MyServlet.class*.

The *WEB-INF/lib* directory contains any JAR libraries that your web application requires, such as database drivers, the *log4j.jar*, and the required JARs for using the JavaServer Pages Standard Tag Library (see [Chapter 23](#)).

Once you are ready to test the application in WAR format, change to the top-level directory. Type the following command, naming the WAR file after the top-level directory of your application. These command-line phrases work on both Windows and Unix systems (I used them with Windows NT 4 and Mac OS X 10.2):

```
jar cvf myapp.war .
```

Don't forget the final dot (.) character, which specifies to the `jar` tool to include the current directory's contents and its subdirectories in the WAR file. This command creates the *myapp.war* file in the current directory.



The WAR name becomes the application name and context path for your web application. For example, *myapp.war* is typically associated with a context path of */myapp* when you deploy the application to a web container.

If you want to view the contents of the WAR at the command line, type this:

```
jar tvf alpine-final.war
```

If the WAR file is very large and you want to view its contents one page at a time, use this command

```
jar tvf alpine-final.war |more
```

Here is example output from this command:

```
H:\classes\webservices\finalproj\dist>jar tvf alpine-final.war
 0 Mon Nov 18 14:10:36 EST 2002 META-INF/
48 Mon Nov 18 14:10:36 EST 2002 META-INF/MANIFEST.MF
555 Tue Nov 05 17:08:16 EST 2002 request.jsp
914 Mon Nov 18 08:53:00 EST 2002 response.jsp
 0 Mon Nov 18 14:10:36 EST 2002 WEB-INF/
 0 Mon Nov 18 14:10:36 EST 2002 WEB-INF/classes/
 0 Tue Nov 05 11:09:34 EST 2002 WEB-INF/classes/com/
 0 Tue Nov 05 11:09:34 EST 2002 WEB-INF/classes/com/parker/river/
CONTINUED...
```

Many development teams are using Ant to compile and create WAR files for their servlets and JSPs. [Recipe 2.6](#) describes using Ant for developing and updating web applications.

I jumpstart your progress toward that recipe by showing the kind of directory structure you might use for a comprehensive web application, one that contains numerous servlets, JSPs, static HTML files, as well as various graphics and multimedia components. When using Ant to build a WAR file from this kind of directory structure, you can filter out the directories that you do not want to include in the final WAR, such as the top-level *src*, *dist*, and *meta* directories.


```
myapp
  /build
  /dist
  /lib
  /meta
  /src
  /web
    /images
    /multimedia
  /WEB-INF
    /classes
    /lib
    /tlds
    /jspf
```



The *WEB-INF/tlds* and *WEB-INF/jspf* optional directories may contain Tag Library Descriptor files and JSP fragments (chunks of JSPs that are designed to be included in other JSPs, such as server-side includes), respectively.

See Also

[Chapter 2](#) on deploying servlets and JSPs; [Chapter 3](#) on naming servlets; The deployment sections of *Tomcat: The Definitive Guide*, by Brittain and Darwin (O'Reilly); the J2EE tutorial from Sun Microsystems: http://java.sun.com/j2ee/tutorial/1_3-fcs/doc/J2eeTutorialTOC.html.

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Recipe 1.5 Creating the Deployment Descriptor

Problem

You want to create the deployment descriptor for your application.

Solution

Name the XML file *web.xml* and place it in the *WEB-INF* directory of your web application. If you do not have an existing example of *web.xml*, then cut and paste the examples given in the servlet v2.3 or 2.4 specifications and start from there.

Discussion

The deployment descriptor is a very important part of your web application. It conveys the requirements for your web application in a concise format that is readable by most XML editors. The *web.xml* file is where you:

- Register and create URL mappings for your servlets
- Register or specify any of the application's filters and listeners
- Specify context init parameter name/value pairs
- Configure error pages
- Specify your application's welcome files
- Configure session timeouts
- Specify security settings that control who can request which web components

This is just a subset of the configurations that you can use with *web.xml*. While a number of chapters in this book contain detailed examples of *web.xml* (refer to the "See Also" section), this recipe shows simplified versions of the servlet v2.3 and v2.4 deployment descriptors.

Example 1-3 shows a simple web application with a `servlet`, a `filter`, a `listener`, and a `session-config` element, as well as an `error-page` configuration. The *web.xml* in Example 1-3 uses the servlet v2.3 Document Type Definition (DTD). The main difference between the deployment descriptors of 2.3 and 2.4 is that 2.3 uses a DTD and 2.4 is based on an XML schema. You'll notice that the old version of *web.xml* has the `DOCTYPE` declaration at the top of the file, while the 2.4 version uses the namespace attributes of the `web-app` element to refer to the XML schema. The XML elements of Example 1-3 have to be in the same order as specified by the DTD.

Example 1-3. The deployment descriptor for servlet API 2.3

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE web-app
    PUBLIC "-//Sun Microsystems, Inc.//DTD Web Application 2.3//EN"
        "http://java.sun.com/dtd/web-application_2_3.dtd"
>

<web-app>

    <display-name>Servlet 2.3 deployment descriptor</display-name>

    <filter>
        <filter-name>RequestFilter</filter-name>
        <filter-class>com.jspervletcookbook.RequestFilter</filter-class>
    </filter>

    <filter-mapping>
        <filter-name>RequestFilter</filter-name>
        <url-pattern>/*</url-pattern>
    </filter-mapping>

    <listener>
        <listener-class>com.jspervletcookbook.RegListener</listener-class>
    </listener>

    <servlet>
        <servlet-name>MyServlet</servlet-name>
        <servlet-class>com.jspervletcookbook.MyServlet</servlet-class>
    </servlet>

    <servlet-mapping>
        <servlet-name> MyServlet </servlet-name>
        <url-pattern>/myservlet</url-pattern>
    </servlet-mapping>

    <session-config>
        <session-timeout>15</session-timeout>
    </session-config>

    <error-page>
        <error-code>404</error-code>
        <location>/err404.jsp</location>
    </error-page>

</web-app>
```

Example 1-3 shows the *web.xml* file for an application that has just one servlet, accessed at the path *<context path>/myservlet*. Sessions time out in 15 minutes with this application. If a client requests a URL that cannot be found, the web container forwards the request to the */err404.jsp* page, based on the **error-page** configuration. The filter named **RequestFilter** applies to all requests for static and dynamic content in this context. At startup, the web container creates an instance of the listener class

`com.jspServletcookbook.RegListener` .

Everything about Example 1-4 is the same as Example 1-3 , except that the `web-app` element at the top of the file refers to an XML schema with its namespace attributes. In addition, elements can appear in arbitrary order with the servlet v2.4 deployment descriptor. For instance, if you were so inclined you could list your servlets and mappings before your listeners and filters.

Example 1-4. A servlet v2.4 deployment descriptor

```
<?xml version="1.0" encoding="ISO-8859-1"?>

<web-app xmlns="http://java.sun.com/xml/ns/j2ee"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation=
    "http://java.sun.com/xml/ns/j2ee
      http://java.sun.com/xml/ns/j2ee/web-app_2_4.xsd" version="2.4">

<!-- the rest of the file is the same as Example 1-3 after the web-app opening tag -->

</web-app>
```



The servlet 2.4 version of the deployment descriptor also contains definitions for various elements that are not included in the servlet 2.3 *web.xml*/version: `jsp-config` , `message-destination` , `message-destination-ref` , and `service-ref` . The syntax for these elements appears in the specifications for JSP v2.0 and J2EE v1.4.

See Also

Chapter 2 on deploying servlets and JSPs; Chapter 3 on naming servlets; Chapter 9 on configuring the deployment descriptor for error handling; the J2EE tutorial from Sun Microsystems: http://java.sun.com/j2ee/tutorial/1_3-fcs/doc/J2eeTutorialTOC.html .

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Chapter 2. Deploying Servlets and JSPs

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Introduction

This chapter describes how to take servlets or Java Server Pages (JSPs) and make them available to receive web requests on Tomcat's servlet container or BEA WebLogic Server 7.0. This discussion begins with deploying servlets and JSPs; in other words, getting them running on Tomcat or WebLogic, either alone or as part of a web application.

Developing and compiling a servlet or JSP within an integrated development environment (IDE) is one thing. Having the web component respond to HTTP requests is another. This is what *deployment* is all about with web-related software: placing the software into service within a web container like Tomcat or an application server such as BEA WebLogic Server 7.0. The following recipes detail deployment of servlets and JSPs on these web containers, first individually, and then as part of a web application.

The wonderful open source Jakarta Ant build and automation tool is commonly used for this purpose. It is mentioned wherever it is relevant in the following recipes, and [Chapter 4](#) is completely devoted to installing and using Ant.

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Recipe 2.1 Deploying an Individual Servlet on Tomcat

Problem

You want to take a compiled servlet and install it in Tomcat to find out if it is working. You are doing a preliminary test and do not want to take the time to build a complete web application for the servlet.

Solution

Copy and paste the class file into Tomcat's default web application (or into a web application that you have already installed), then request it using the invoker servlet. Or use an Ant *build.xml* file to move the file temporarily into the Tomcat default web application.

Discussion

Sometimes you design a servlet and are anxious to see if the servlet works. Unless the servlet depends on other servlets or components in the application, you can test it on Tomcat by pasting the class file (including its package-related directories) into the default Tomcat web application. By default, this application is located at the path *<Tomcat-installation-directory>/webapps/ROOT*.

If the fully qualified class name of the servlet is `jspServletcookbook.CookieServlet`, then here is the entire process for manually getting a single servlet going on Tomcat:

- Shut down the Tomcat server by executing the shell script *<tomcat-installation-directory>/bin/shutdown* or by executing a shell script your server administrator has provided. An alternative is to "stop" the default application by requesting this URL in your browser: *http://localhost:8080/manager/stop?path=/.*
- Create the *jspServletcookbook* directory in the *<Tomcat-installation-directory>/webapps/ROOT/WEB-INF/classes* directory (make the classes directory if it does not already exist).
- Paste the `CookieServlet` class file into the *<Tomcat-installation-directory>/webapps/ROOT/WEB-INF/classes/jspServletcookbook* directory.
- Start up the Tomcat server by executing the shell script *<Tomcat-installation-directory>/bin/startup*, or a shell script that your server administrator has provided. An alternative is to start the default application by requesting this URL in your browser: *http://localhost:8080/manager/start?path=/.*
- Request the servlet in your browser with the URL *http://localhost:8080/servlet/jspServletcookbook.CookieServlet*.

By now you are probably saying, "There must be a more elegant alternative to this slow, manual installation of a single servlet!" You are correct, and can use Jakarta Ant to convert this manual process to an automated one.

The *build.xml* file in Example 2-1 accomplishes the same testing process, assuming you have downloaded and installed Ant as described in Chapter 4. Place this build file in a convenient directory. Create in that directory a *global.properties* file that is customized according to your needs (see Example 2-2). Change that directory in a command-line window and type **ant**. Ant takes care of the rest of the tasks, including starting and stopping Tomcat's default web application.

Example 2-1. Installing a servlet in the default web application

```
<project name="Cookbook" default="deploy-servlet" basedir=".">

    <taskdef name="start" classname="org.apache.catalina.ant.StartTask" />
    <taskdef name="stop" classname="org.apache.catalina.ant.StopTask" />

<!-- Load in some global properties -->

    <property file="global.properties" />
    <target name="init" description="Initializes some properties.">

        <echo message="Initializing properties." />
        <property name="build" value=".\\build" />
        <property name="src" value=".\\src" />

        <!-- The context-path is just a slash character when it is the ROOT application;
             see the start and stop targets, which already include the slash as part of
             the URL pattern -->

        <property name="context-path" value="" />
    </target>

    <target name="prepare" depends="init">
        <echo message="Cleaning up the build directory." />
        <delete dir="${build}" />
        <mkdir dir="${build}" />
    </target>

<!-- Set the CLASSPATH to various Tomcat .jar files -->

    <path id="classpath">
        <fileset dir="${tomcat.dir}/common/lib">
            <include name="*.jar" />
        </fileset>
        <fileset dir="${tomcat.dir}/common/endorsed">
            <include name="*.jar" />
        </fileset>
    </path>

<!-- start the default Tomcat web application -->

    <target name="start"
        description="Starts the default Web application">
        <echo message="Starting the default application...." />
```

```

        <start
            url="${url}"
            username="${username}"
            password="${password}"
            path="/${context-path}"
        />
    </target>

<!-- stop the default Tomcat web application -->

    <target name="stop"
        description="Stops the default Web application">
        <echo message="Stopping the application...."/>
        <stop
            url="${url}"
            username="${username}"
            password="${password}"
            path="/${context-path}"
        />
    </target>

<!-- stop the default Tomcat web application, compile your servlet, add it to the default
Web application, then start the default web application -->

    <target name="deploy-servlet" depends="prepare"
        description=
            "Compile the specified servlet, then move it into Tomcat's default
            Web application.">

        <echo message="Stopping the default Tomcat application...."/>
        <antcall target="stop"/>
        <echo message="Compiling the servlet...."/>
        <javac srcdir="${src}" destdir="${build}">
            <include name="${compiled.servlet}.java" />
            <classpath refid="classpath"/>
        </javac>
        <echo message=
            "Copying the servlet to Tomcat ROOT web application..."/>

        <copy todir="${tomcat.webapps}/WEB-INF/classes">
            <fileset dir="${build}" />
        </copy>
        <echo message="Starting the default application...."/>
        <antcall target="start"/>
    </target>

</project>

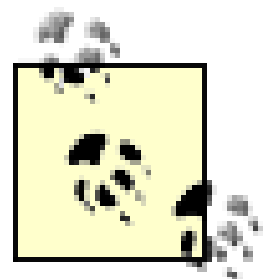
```

The *global.properties* file that sits in the same directory as *build.xml* looks like Example 2-2 .

Example 2-2. global.properties file for Ant


```
tomcat.webapps=k:/jakarta-tomcat-4.1.12/webapps/ROOT
tomcat.dir=k:/jakarta-tomcat-4.1.12
url=http://localhost:8080/manager
compiled.servlet=CookieServlet
username=tomcat
password=tomcat
```

global.properties is just a list of *property-name = value* pairs. In other words, each line is composed of a string of characters that represents the property name (optionally including a period character), followed by an "=" sign and another bunch of characters that represents the value.



Jakarta Ant's online manual is located at:
<http://jakarta.apache.org/ant/manual/index.html> .

Here is what *build.xml* does:

1. Defines two tasks with a `taskDef` element, called `start` and `stop` . These tasks will be used by the targets `start` and `stop` later on in the *build.xml* file. These tasks allow you to use the Tomcat "manager" application-deployment tool from your Ant files.
2. Uses a `property` task to load in the set of properties that are defined in the *global.properties* file. This means that the property name `tomcat.dir` is now available for use later on in the *build.xml* file. The `path` element uses the `tomcat.dir` property by including its value (in the example, "k:/jakarta-tomcat-4.1.12") as part of a classpath definition. You get the value of these imported properties by using a reference like `${tomcat.dir}` . Any time you want to give the property a different value before executing an Ant file, you can just change the properties file by typing in a new value in a text editor.
3. Creates an `init` target that echoes a message to the console and creates three properties (`build` , `src` , and `context-path`). The values of these properties are available only after the `init` target has been executed. For example, if the `prepare` target does not have "init" as the value of its `depends` attribute, the `deploy-servlet` target, which depends on `prepare` , cannot use the property values defined by `init` .
4. Defines a target called `prepare` .
5. Builds a reusable classpath (with the ID "classpath") out of all of the JAR files located in a couple of Tomcat directories.
6. Creates the `start` and `stop` targets. These targets echo a message to the console and then call the tasks (such as `stop`) that were defined with `taskDef` elements at the top of the *build.xml* file. The `start` and `stop` targets are actually invoked by the all-in-one target `deploy-servlet` .
7. Creates the `deploy-servlet` target. This target does all the major work inside the *build.xml* file. Notice that its `depends` attribute has the value "prepare." This means that prior to executing the instructions contained within the `deploy-servlet` target, Ant first executes the `init` and `prepare` targets. Since the `prepare` target depends on the `init` target, `deploy-servlet` calls `prepare` , which itself calls its own dependency, the `init` target. So just by launching the `deploy-servlet` target, you have triggered a target chain that looks like `init` `prepare` `deploy-servlet` . Using an

element called `antcall` with which a target may explicitly call another target, `deploy-servlet` calls both the `stop` and `start` targets. In this way it can:

- a. Stop the default Tomcat application.
 - b. Compile the servlet using the `javac` task. The `javac` task includes the servlet that is specified the `compiled.servlet` property, which is set inside the `global.properties` file.
8. Copies the compiled servlet to the `WEB-INF/classes` directory of Tomcat's default web application. The `copy` task creates this `classes` directory if it does not already exist.
 9. Starts the default web application so that you can request your servlet in the browser.

See Also

The deployment sections of *Tomcat: The Definitive Guide*, by Brittain and Darwin (O'Reilly); Recipe 2.2, Recipe 2.4, and Recipe 2.6; the Jakarta Ant online manual at: <http://jakarta.apache.org/ant/manual/index.html>

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Recipe 2.2 Using a Context Element in Tomcat'sserver.xml

Problem

You want to deploy and redeploy a servlet on Tomcat 4.1.x without restarting the Tomcat web container.

Solution

Deploy the servlet as part of a `Context` element in Tomcat's *server.xml* file.

Discussion

You can paste a recompiled servlet class over an existing servlet class and invoke the servlet without restarting Tomcat:

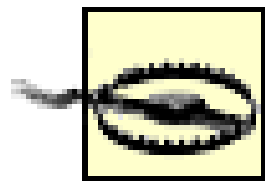
1. Locate the `Context` element for your web application or create a new `Context` element in the *<tomcat-installation-directory>/conf/server.xml* file. `Context` elements must be nested within the `Host` element that represents the *virtual host* under which your web application is running.
2. Set the `reloadable` attribute of your `Context` element to `true`. This signals Tomcat to monitor the contents of *WEB-INF/classes* and *WEB-INF/lib* for any changes. If changes are detected, Tomcat automatically reloads the web application.

The `Context` element in *server.xml* looks like this:

```
<Context className="org.apache.catalina.core.StandardContext"
  crossContext="false" reloadable="true"
  mapperClass="org.apache.catalina.core.StandardContextMapper"
  useNaming="true" debug="0" swallowOutput="false"
  privileged="false" displayName="Home Web App"
  wrapperClass="org.apache.catalina.core.StandardWrapper"
  docBase="h:\home" cookies="true" path="/home"
  cachingAllowed="true"
  charsetMapperClass="org.apache.catalina.util.CharsetMapper"
/>
```

The `path` attribute represents the context path for the application. The `docBase` attribute points to the directory that represents the top level of this web application. Most of the example's other attributes have values that are shared by other `Contexts`. For example, `cookies="true"` indicates

that the `Context` will use cookies for the session identifier, and `crossContext="false"` prevents the servlets in this web application from obtaining request dispatchers for other web applications running in the virtual host.



Setting the `reloadable` attribute to `true` incurs significant runtime overhead, so this configuration is recommended only for web applications in development mode.

Under this configuration, Tomcat 4.1.x displays a console message after a slight delay when you paste a new servlet class over the old one in the web application. Here is an example of a console message in response to a dynamic servlet reload:

```
WebappClassLoader:  Resource  '/WEB-INF/classes/com/jspServletcookbook/OracleTest.class' was modified;
Date is now: Sun Feb 02 22:17:41 EST 2003 Was: Sun Feb 02 21:38:52 EST 2003
```

See Also

The deployment sections of *Tomcat: The Definitive Guide*, by Brittain and Darwin (O'Reilly); [Recipe 2.1](#), [Recipe 2.4](#), and [Recipe 2.6](#); Jakarta Tomcat documentation for the `Context` element: <http://jakarta.apache.org/tomcat/tomcat-4.1-doc/config/context.html>.

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Recipe 2.3 Deploying an Individual Servlet on WebLogic

Problem

You want to take your compiled servlet and install it in BEA WebLogic Server 7.0 to find out if it is working.

Solution

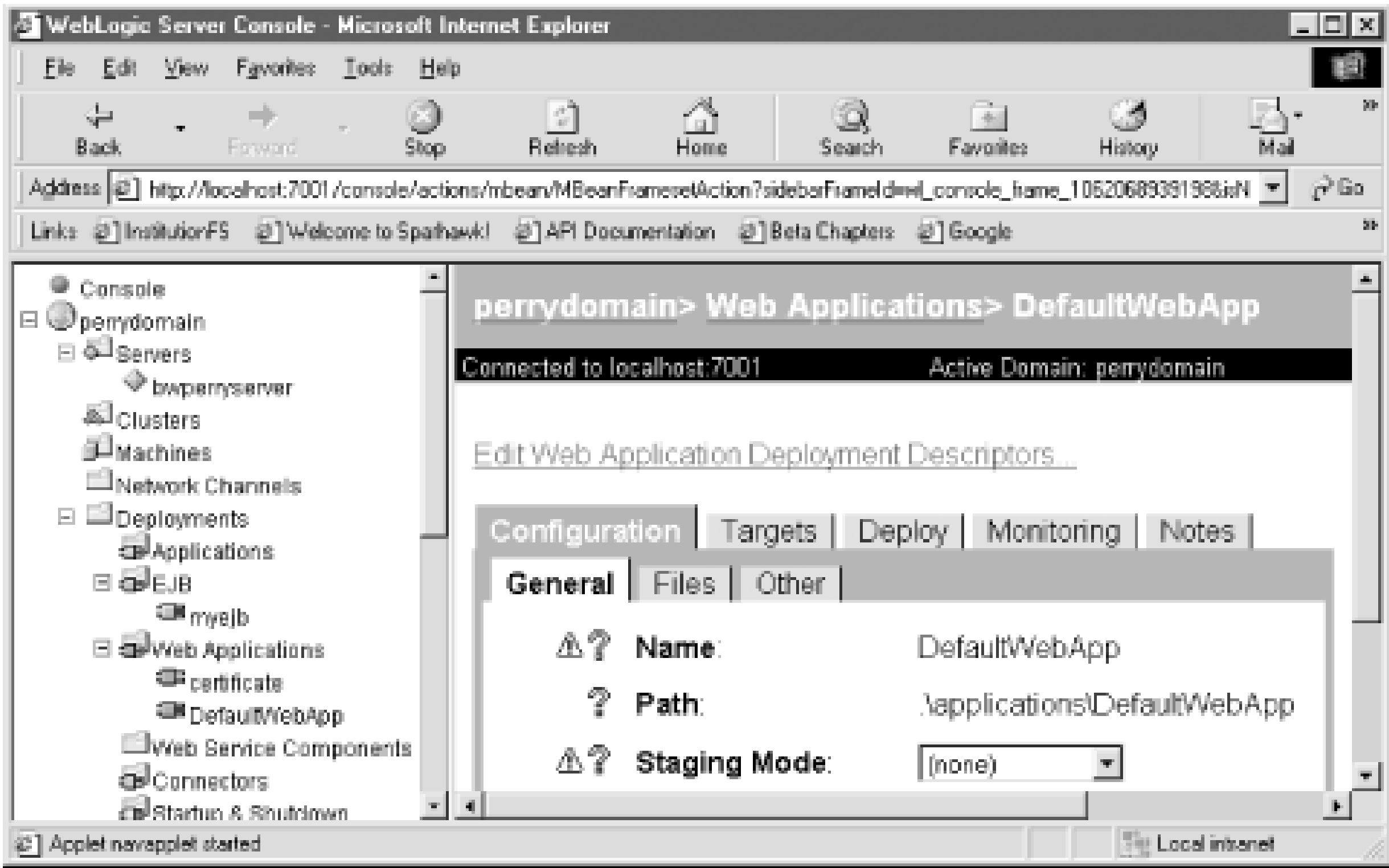
Copy and paste the class file into WebLogic's default web application (or into a web application that you have already installed). Use the WebLogic Administration Console to alter the *web.xml*/file and give the servlet a sensible name with which to request it in a browser, or use an Ant build file to move the file temporarily into the WebLogic default web application.

Discussion

WebLogic 7.0's default web application is located on the following path: *<WebLogic-installation-directory>/user_projects/<mydomain>/applications/DefaultWebApp*. In the default installation of the WebLogic 7.0 server, not much exists in the default web application but a *web.xml*/deployment descriptor, and some image files. To add a servlet to the default application, paste your servlet class, including its package-related directories, into the *DefaultWebApp/WEB-INF/classes* directory. You might have to create a *classes* directory the first time you do this. Change the *web.xml*/file to give the servlet a name (which is easier through the Administration Console) before redeploying the web application as described in [Recipe 2.4](#).

Use the Administration Console to edit the *web.xml*/file in order to give the new servlet a registered name and `servlet-mapping` element. You can also use another available tool, such as WebLogic Builder ([Recipe 2.9](#)) or a text editor. [Figure 2-1](#) shows the DefaultWebApp in the Administration Console. Click on "Edit Web Application Deployment Descriptors . . .".

Figure 2-1. WebLogic Server Administration Console



This displays the screen shown in [Figure 2-2](#). This screen provides an easy graphical method of editing the `web.xml` file for any web application (in this case, the WebLogic default web application).

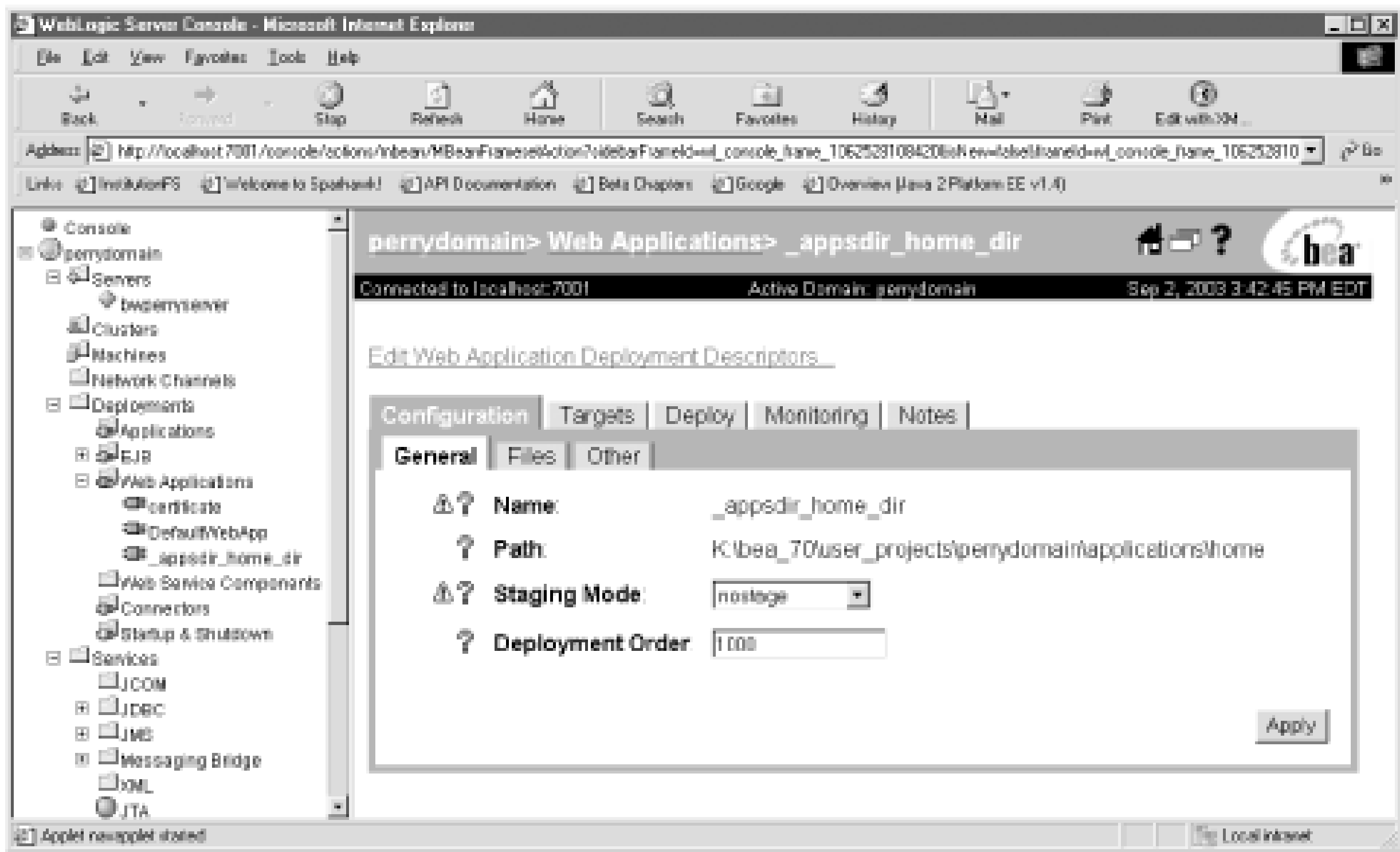
Figure 2-2. Editing the web.xml file graphically

With this graphical editor, create the `servlet` and `servlet-mapping` elements for the servlet that you just added. Make sure to click on the "Web Descriptor" button in the left column of the [Figure 2-2](#) window and then persist the changes that you made in the `web.xml` file. This action rewrites the `web.xml` file, adding the new `servlet` and `servlet-mapping` elements.

Now redeploy the web application, which is just a matter of clicking a few hypertext links in the Console. Choose the name of your web application in the left column of the Console, under the

mydomain → Deployments → Web Applications node of the tree navigation structure in this lefthand column. [Figure 2-3](#) shows the resulting window.

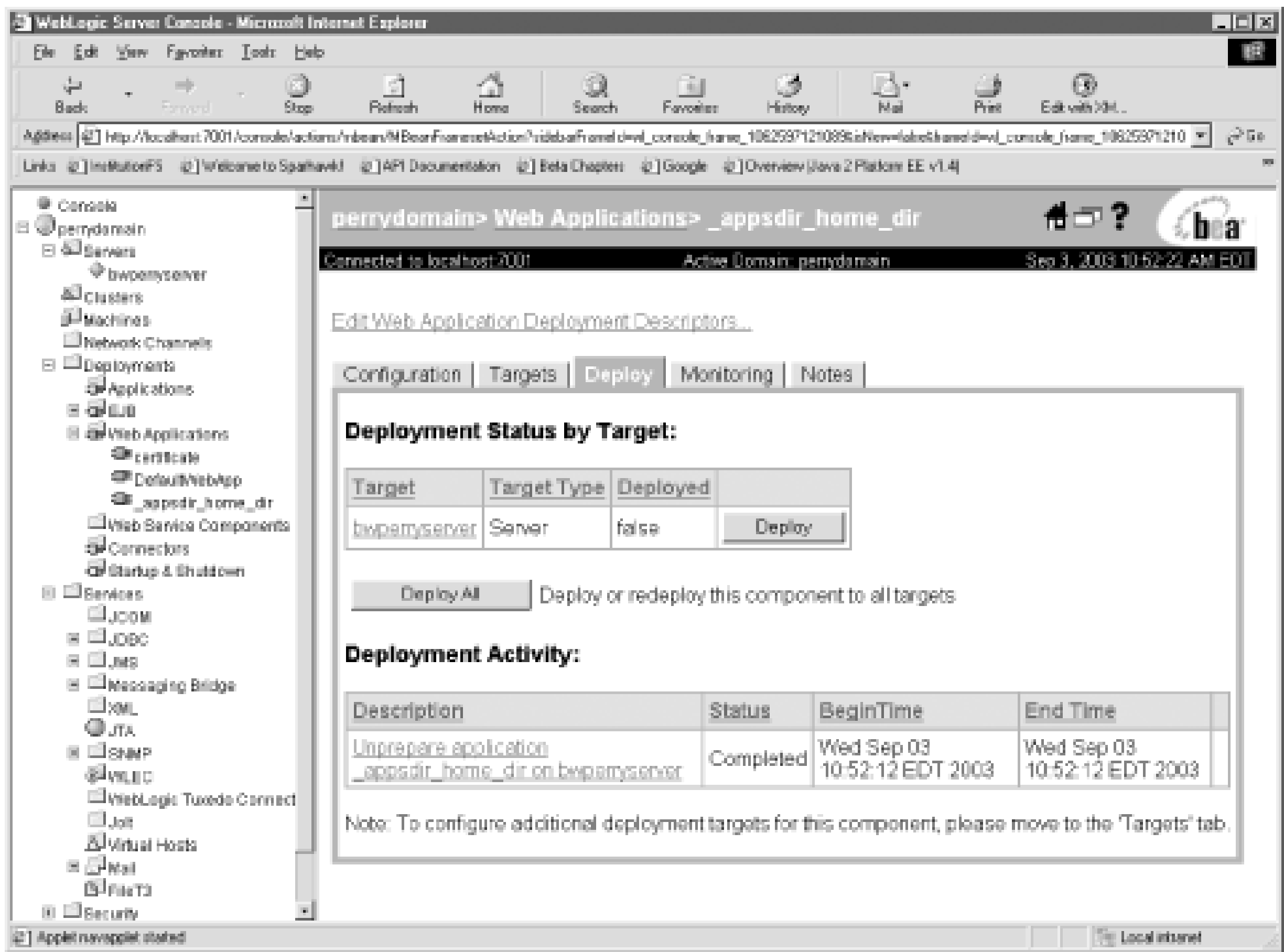
Figure 2-3. Using the Console to redeploy a web application



Click on the "Deploy" tab, then click the "Undeploy" button in the resulting HTML table. The web application is now unavailable for service.

To redeploy the application, click the "Deploy" tab, then select the "Deploy" button, as shown in [Figure 2-4](#).

Figure 2-4. Graphically deploying a servlet



If the servlet that you are working on already exists in the web application, then you can also copy and paste a new servlet class over the old one in the *WEB-INF/classes* directory of the web application. The new servlet version becomes available immediately, without using the Console to redeploy the entire web application.

You can also use an Ant file to compile the servlet and copy it into WebLogic's default web application. The build file in [Example 2-3](#) is very similar to the one used and described in [Recipe 2.1](#); it's just revised for use with WebLogic's web container instead of Tomcat's.

Example 2-3. Using an Ant file with a WebLogic servlet

```
<project name="Cookbook" default="deploy-servlet" basedir=". ">

    <property file="wl.properties" />

    <target
        name="init"
        description="Initializes some properties.">
        <echo message="Initializing properties."/>
        <property name="build" value=".\\build" />
        <property name="src" value=".\\src" />
    </target>

    <target name="prepare" depends="init">
        <echo message="Cleaning up the build directory."/>
        <delete dir="${build}" />
        <mkdir dir="${build}" />
    </target>
```

```

<path id="classpath">
    <fileset dir="${wl.dir}\server\lib">
        <include name="*.jar" />
    </fileset>
</path>

<target name="deploy-servlet" depends="prepare"
        description="Compile the specified servlet, then move it into
        WL's default Web application.">

    <echo message="Compiling the servlet ${compiled.servlet}...."/>
    <javac srcdir="${src}" destdir="${build}">
        <include name="${compiled.servlet}.java" />
        <classpath refid="classpath"/>
    </javac>
    <echo message="Copying the servlet to WL default web application..."/>
    <copy todir="${wl.webapp}/WEB-INF/classes">
        <fileset dir="${build}" />
    </copy>

</target>
</project>

```

This Ant build file first loads a set of properties contained in a file called *wl.properties*, which is located in the same directory as the build file. The build file typically has the name *build.xml*, however, you can call another build file in the same directory by using the `-buildfile` command-line option, as in `ant -buildfile wl_build.xml`. The *wl.properties* file for this example is shown in [Example 2-4](#).

Example 2-4. wl.properties for WebLogic Ant build file

```

wl.webapp=k:/bea/user_projects/bwpdomain/applications/DefaultWebApp
wl.dir=k:/bea/weblogic700
compiled.servlet=test

```

The `deploy-servlet` target depends on a target named `prepare` that is also defined in this build file. The `prepare` target in turn has "init" as its `depends` attribute, which means that the `init` target executes prior to the `prepare` target. So calling the `deploy-servlet` target creates a chain of executing targets: `init` `prepare` `deploy-servlet`. In all, this is what the build file accomplishes:

1. `init` creates a couple of properties (`build` and `source`) that point to directories.
2. The `prepare` target deletes and then remakes the *build* directory, so that you start with a clean build.
3. `deploy-servlet` compiles the servlet into the *build* directory, then copies it into the directory specified by the `wl.webapp` property (which contains its value in the *wl.properties* file).

The `path` element creates a classpath out of the JAR files found in the *k:/bea/weblogic700/server/lib* directory. This directory path is how Ant resolves the phrase `"${wl.dir}\server\lib,"` which is parsed

by attaching the value of the property `wl.dir` to the string `"\server\lib."`

See Also

[Recipe 2.5](#), [Recipe 2.7](#)-[Recipe 2.10](#); the deployment sections of *WebLogic: The Definitive Guide*, by Mountjoy and Chugh (O'Reilly); WebLogic's Server 7.0 programmer documentation: <http://e-docs.bea.com/wls/docs70/programming.html> .

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Recipe 2.4 Deploying an Individual JSP on Tomcat

Problem

You want to place a JSP file into a web application.

Solution

Copy the new or revised JSP file into the top-level directory of the default Tomcat web application or of another deployed web application.

Discussion

The easiest way to test a new JSP file is to place it at the top level of Tomcat's default web application. This application is located in the *<Tomcat-installation-directory>/webapps/ROOT/* directory. Tomcat 4.1.x compiles (or recompiles, if you are pasting a new JSP file over an old one) the JSP and display its response in a web page. You do not have to stop and start Tomcat using the Tomcat manager application for the new JSP file to be available to your web application.

Placing a JSP file in a deployed web application will *not* work if the JSP depends on application-specific resources such as servlets, custom tags, or other Java classes, because there is no guarantee that the temporary host web application you are using for the JSP has access to those resources.

If you have to deploy a JSP separately from its web application, you can also place a JSP file in a deployed web application other than the Tomcat default application. This makes the JSP page available to application users without having to stop and restart Tomcat. Remember that the JSP files belong in the top level of the web application, which has the following directory structure:

```
index.html
default.jsp
anotherJsp.jsp
images/logo.jpeg
WEB-INF/classes/jspServletcookbook/myservlet.class
WEB-INF/lib/helperclasses.jar
WEB-INF/lib/utilities.jar
WEB-INF/web.xml
WEB-INF/mytags.tld
```

In other words, the top level of the directory contains the HTML and JSP files, as well as the *WEB-INF*

directory. The *WEB-INF* directory contains:

- The *web.xml*/deployment descriptor
- The *classes* directory, which contains package-related directories and servlet or support classes like JavaBeans
- The */lib* directory, which stores any Java Archive (JAR) files containing utility or helper classes that your web application uses
- Optionally, any Tag Library Descriptor files (files with *.tld* suffixes)
- Any optional directories for images, video files, XML files, or other web resources

See Also

The deployment sections of *Tomcat: The Definitive Guide* (O'Reilly); [Recipe 2.1](#), [Recipe 2.2](#), and [Recipe 2.6](#).

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Recipe 2.5 Deploying an Individual JSP on WebLogic

Problem

You want to quickly test a JSP without deploying it as part of a new web application.

Solution

Copy and paste the JSP into the top-level directory of BEA WebLogic Server 7.0's default web application, then request the JSP in a browser.

Discussion

A JSP file can be "hot deployed" on WebLogic 7.0's default web application without having to redeploy the entire web application. This default web application is located at *<WebLogic-installation-directory>/user_projects/<name-of-your-domain>/applications/DefaultWebApp*. If you paste your JSP file into this directory (*DefaultWebApp*), it will be available to receive requests without redeploying the default web application. If your JSP file is named *newfile.jsp*, then the URL for requests to this page would be *http://localhost:7001/newfile.jsp*. Note the absence of a context path or application name in the URL. If the request is for the default web application, then the JSP files appear following the forward slash (/) after the *host:port* part of the URL (in other words, after the *localhost:7001*/part).

To repeat a prior caveat: placing a JSP file in a deployed web application in order to test it will *not* work if the JSP depends on application-specific resources such as servlets, custom tags, or other Java classes, because there is no guarantee that the temporary host web application you are using for the JSP has access to those resources.

In most cases, the JSP is already part of a web application, and several tools exist to redeploy a web application, including Ant, BEA WebLogic Builder, and the WebLogic Administration Console.

Finally, you can also copy and paste a JSP file into another WebLogic web application. However, that application must be deployed in exploded directory format, meaning that the application has not been deployed in archive form (as a WAR or EAR file). Therefore, place the JSP file in the application's top-level directory. If the application is named "newapp," this directory is named *<WebLogic-installation-directory>/user_projects/<name-of-your-domain>/applications/newapp*.

See Also

[Recipe 2.3](#); [Recipe 2.7](#)-[Recipe 2.10](#); WebLogic's Server 7.0 programmer documentation: <http://e-docs.bea.com/wls/docs70/programming.html>.

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Recipe 2.6 Deploying a Web Application on Tomcat

Problem

You want to deploy an entire web application on Tomcat 4.1.x.

Solution

Create a Jakarta Ant build file. Ant can automatically compile your servlet classes, create a web application archive (*.war*) file, then deploy the WAR to the Tomcat 4.1.x server.

Discussion

The recommended method for the compilation and deployment of web applications is to use the Jakarta Ant automation tool. If you change anything in the application (such as altering a servlet or JSP), then all it takes is a single command-line execution of `ant` to compile, package, and redeploy the application on Tomcat. You do not have to go to the trouble of manually recompiling a changed servlet, creating a new WAR file, starting and stopping Tomcat, and redeploying the application.

Another method of deploying a web application on Tomcat is to place a directory containing a web application in the required directory structure in the Tomcat *webapps* folder. The name of the web application directory (such as *myapp*) then becomes the context path or name of the new web application. This deployment method is not guaranteed to work with other application servers, however, so it is an ineffective strategy for creating portable applications. In addition, since this manual method is not automated in any manner, it is awkward to replace and keep track of any changed servlet or JavaBean classes in these web application directories.

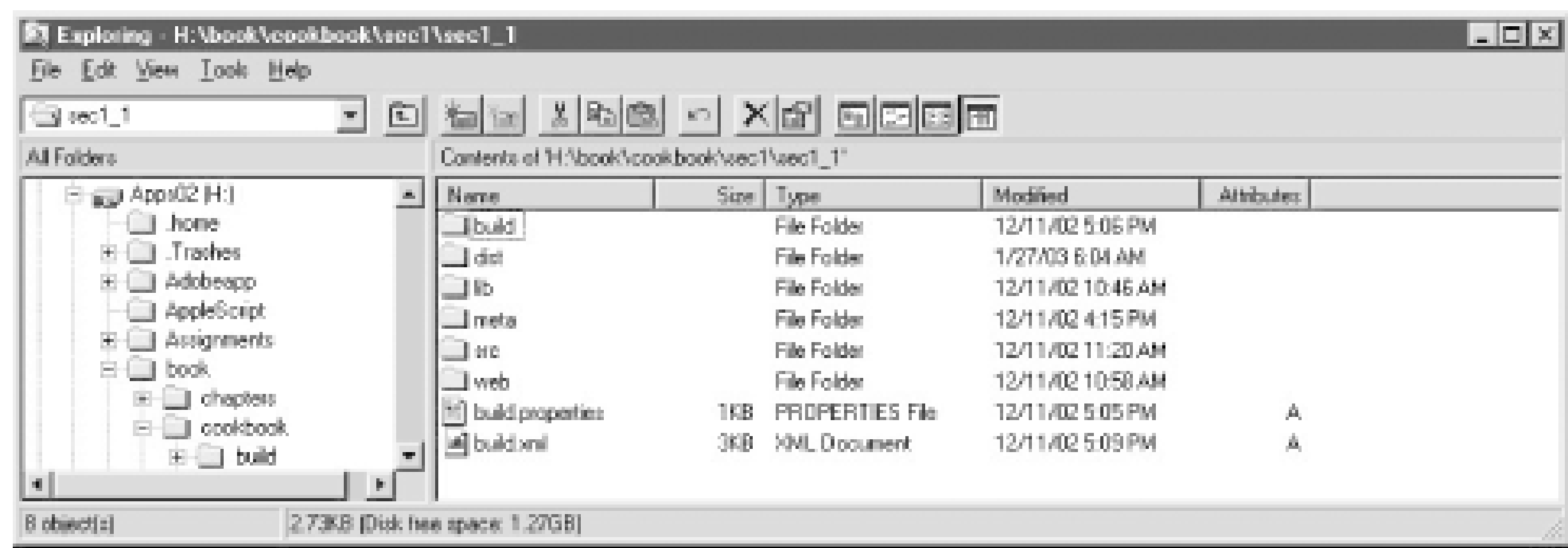
The end of this discussion describes how to configure Tomcat's *server.xml*/configuration file so that a context path points to an unpacked web application directory elsewhere on the server. As an alternative to creating an archived application (a WAR file), Tomcat developers can use this method of deployment during development and testing.

Using Ant for deployment

Using Ant to compile and deploy an application involves the following steps:

1. Choose a directory to hold the Ant *build.xml* file, any *build.properties* files, and all of the contents of your web application.
2. Create the directories to hold the Java servlet source files, any JSP or HTML files, Java Archive (JAR) files for components (such as database drivers) and the web application archive file (WAR file). One way to create this directory structure is shown in Figure 2-5.

Figure 2-5. Web application directory structure



- 3. In this example, the *src* directory contains the Java source files for servlets and JavaBeans. The *web* directory contains the files that reside at the top level of the web application, such as JSP and HTML files. The *meta* directory holds XML deployment descriptors (at the very least, *web.xml*). The *build* directory is where Ant compiles the Java source files. These files will end up in the *WEB-INF/classes* directory of the web application. The *lib* directory is for any JAR files that your web application uses, such as database drivers and/or tag libraries. Finally, the *dist* directory contains the WAR file.
- 4. Create the Java source code for the application and move any other related files (like JSPs and *web.xml*) into their specified directories.
- 5. Create any necessary property values in the *build.properties* file that *build.xml* will use during the compilation and deployment process. These properties will be described in more detail in the upcoming discussion.
- 6. Run the *build.xml* file on the command line by changing to the directory containing the *build.xml* file and typing `ant`.

Example 2-5 is the *build.properties* file that is referenced in step 5.

The file does not have to be called *build.properties*; this name is used purely by convention. You could call it *global.props*, for instance.

Example 2-5. build.properties for web application deployment

```
tomcat.webapps=k:/jakarta-tomcat-4.1.12/webapps/  
tomcat.dir=k:/jakarta-tomcat-4.1.12  
url=http://localhost:8080/manager  
username=tomcat  
password=tomcat  
manager.path=${tomcat.dir}/work/standalone/localhost/manager
```

Each of these properties is made available to or imported into the *build.xml* file by the following line within this file:

```
<property file="build.properties" />
```

This line represents a `property` task or XML element within the *build.xml*/XML file. For example, the value of the `tomcat.dir` property inside the Ant XML file is "k:/jakarta-tomcat-4.1.12."

Example 2-6 is the entire *build.xml*/file. It can be used to compile Java classes, create a WAR file, and deploy it to Tomcat-just by executing `ant` on the command line. The chief advantage of using Ant is that it automates an otherwise complicated process. If you have to change or add a servlet in the web application, for instance, you can recompile and redeploy the web application simply by running Ant. This *build.xml*/file is fairly complex and introduces some advanced features of Ant.

Example 2-6. An Ant build file for deploying a web application

```
<project name="Deploy Project" default="deploy-application">

  <taskdef name="deploy" classname="org.apache.catalina.ant.DeployTask" />
  <taskdef name="undeploy" classname="org.apache.catalina.ant.UndeployTask" />
  <property file="build.properties" />

  <path id="classpath">
    <fileset dir="${tomcat.dir}/common/lib">
      <include name="*.jar" />
    </fileset>
    <fileset dir="${tomcat.dir}/common/endorsed">
      <include name="*.jar" />
    </fileset>
  </path>

  <target name="init"
    description="Initializes some properties.">
    <echo message="Initializing properties." />
    <property name="build" value=".\\build" />
    <property name="src" value=".\\src" />
    <property name="dist" value=".\\dist" />
    <property name="lib" value=".\\lib" />
    <property name="web" value=".\\web" />
    <property name="meta" value=".\\meta" />
    <property name="context-path" value="myapp" />
  </target>

  <target name="prepare" depends="init">
    <echo message="Cleaning up the build and dist directories." />
    <delete dir="${build}" />
    <mkdir dir="${build}" />
    <delete dir="${dist}" />
    <mkdir dir="${dist}" />
  </target>

  <target name="deploy"
    description="Deploys a Web application">
    <deploy url="${url}" username="${username}" password="${password}"
```



```

        path="/${context-path}" war="file:${dist}/${context-path}.war"
    />
</target>

<target name="undeploy"
    description="Undeploys a Web application" if="already.deployed">
    <undeploy url="${url}" username="${username}" password="${password}"
        path="/ ${context-path}" />
</target>

<target name="create-war" description="creates a web application archive file">
    <war destfile="${dist}/${context-path}.war" webxml="${meta}/web.xml">
        <classes dir="${build}" />
        <lib dir="${lib}" />
        <fileset dir="${web}" />
    </war>
</target>

<target name="deploy-application" depends="prepare"
    description="Compile the web application....">
    <echo message="Undeploying the application only if it's deployed..." />
    <available file="${manager.path}/${context-path}.war" property="already.deployed" />
    <antcall target="undeploy" />
    <echo message="Compiling the application files..." />
    <javac srcdir="${src}" destdir="${build}">
        <include name="*.java" />
        <classpath refid="classpath" />
    </javac>
    <echo message="creating the WAR file...." />
    <antcall target="create-war" />
    <antcall target="deploy" />
</target>
</project>

```

The `create-war` target uses the `war` Ant task to generate the WAR file, based on certain attribute values and nested elements. For example, the `web.xml` file that will be included in the WAR is specified as the value for the `war` task's `webxml` attribute. In addition, the classes that will be included in the WAR file's `WEB-INF/classes` directory are specified by this nested element of the war task:

```
<classes dir="${build}" />
```

The nice thing about this `classes` element, along with the `lib` and `fileset` nested elements, is that all of the nested directories inside the `build`, `lib`, and `web` directories are automatically included in the WAR. For example, the `web` directory includes an `images` directory containing the application's various GIF files. The `images` directory is included at the top level of the WAR file, along with any HTML or JSP files that are stored in the `web` directory, just by including this nested element:

```
<fileset dir="${web}" />
```

Also examine the `deploy-application` target, which embodies the meat of this `build.xml` file. As long as you properly set the `PATH` environment variable to point at the Ant component, the `deploy-application` target is called by default when you type `ant` at the command line.

First, the target finds out whether the web application has already been deployed on Tomcat. This function is included because this build file will presumably be run over and over again, not just the first time the web application is deployed. This line uses an `available` task, which sets a property to the value "true" only if the file specified in its `file` attribute exists:

```
<available file="${manager.path}/${context-path}.war"
           property="already.deployed"/>
<antcall target="undeploy"/>
```

If this particular file is found, it means that the Tomcat Manager application has already deployed the WAR file, and that the `already.deployed` property is set to true. This allows the *build.xml* file to conditionally undeploy the application, before the application is redeployed after any changes. In other words, it undeploys the application only if the web application is already deployed (otherwise, running the `undeploy` target raises an error and halts execution of the build file). The `undeploy` target runs only if the `already.deployed` property is set to true:

```
<target name="undeploy"
        description="Undeploys a Web application"
        if="already.deployed">
```

The handy `antcall` task calls another target in the file, similar to calling a method. Finally, the `deploy-application` target uses the `javac` task to compile the application's servlets into the *build* directory, then uses the `antcall` task to create the WAR file and deploy the new or changed application to Tomcat. The target echoes various messages to the console to help indicate to the developer what it is doing:

```
<target name="deploy-application" depends="prepare"
        description="Compile the web application....">
    ...
    <echo message="Compiling the application files..."/>
    <javac srcdir="${src}" destdir="${build}">
        <include name="*.java" />
        <classpath refid="classpath"/>
    </javac>
    <echo message="creating the WAR file..."/>
    <antcall target="create-war"/>
    <antcall target="deploy"/>
</target>
```

As an alternative to using the prior deployment method, you can configure Tomcat to point to an external directory that contains a valid web application. This strategy deploys the web application the next time Tomcat is restarted. It is an acceptable strategy when the application is under development, because you can configure Tomcat to automatically reload the application (Recipe 2.2) when a servlet is changed, or when a JAR file is added to *WEB-INF/lib*. However, developers should deploy applications as WAR files when the time comes to run the application on a production server.

Create a file that contains a `Context` element as this element would appear in *server.xml*. Give this file a *.xml* extension. It is sensible to call this file the same name as the context path or application name (for example, *myapp.xml*), but not required. Your file content might look like this:

```
<Context className="org.apache.catalina.core.StandardContext"
         crossContext="false" reloadable="true"
         mapperClass="org.apache.catalina.core.StandardContextMapper">
```

```
useNaming="true" debug="0" swallowOutput="false"
privileged="false"
wrapperClass="org.apache.catalina.core.StandardWrapper"
docBase="h:\book\cookbook\sec1\sec1_1\dist"
cookies="true" path="/newapp" cachingAllowed="true"
charsetMapperClass="org.apache.catalina.util.CharsetMapper">
</Context>
```

The `reloadable` attribute value of "true" configures Tomcat to monitor the classes in *WEB-INF/classes* and the components in *WEB-INF/lib* for any changes. Tomcat automatically reloads the web application if it detects any changes.

The value for the `docBase` attribute can be an absolute path to the directory that contains the web application, or the context root. It can also be the path to a WAR file. The `docBase` attribute can also be a path name relative to the *appBase* directory of the enclosing `Host` element in *server.xml*, such as relative to the *<Tomcat-installation-directory>/webapps* directory. The `path` attribute declares the context path for the new application, as in *http://localhost:8080/newapp/* (where */newapp* is the context path).

Place this file in the *<Tomcat-installation-directory>/webapps* directory (or whichever directory is configured as the `appBase` in the enclosing `Host` element in *conf/server.xml*) and restart Tomcat. This web application can now be invoked on Tomcat.

See Also

The deployment sections of *Tomcat: The Definitive Guide* by Brittain and Darwin (O'Reilly); Recipe 2.1 , Recipe 2.2 , and Recipe 2.4 .

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Recipe 2.7 Deploying a Web Application on WebLogic Using Ant

Problem

You want to deploy a web application on WebLogic Server 7.0 using Jakarta Ant.

Solution

Create a Jakarta Ant build file. Ant can automatically compile your servlet classes, create a web-application archive (*.war*) file, and then deploy the WAR to WebLogic Server 7.0.

Discussion

You can either manually cut and paste web components into the WebLogic *applications* directory (as described in the sidebar), or use Ant to automate the process of compiling, generating a WAR file, and copying the WAR to this directory. An example directory path to *applications* is *k:\bea\user_projects\bpwdomain\applications*. This method would entail a minor edit of the *build.xml* and *build.properties* files described in [Recipe 2.6](#).

Manually Deploying a Web Application

When BEA WebLogic Server 7.0 is running in development mode, if a WAR file, an enterprise archive application (EAR) file, or a directory that contains a valid web application is placed in the *applications* directory, then those applications are automatically deployed and become available on the server.

A valid web application contains a *WEB-INF/web.xml* deployment descriptor that does not generate any parsing exceptions. If the directory that you place in the *applications* folder does not contain a deployment descriptor, then WebLogic will *not* automatically deploy the application, even if the server is running in development mode. WebLogic raises an exception similar to this one in the console in which the server was started up:

```
<Unable to activate application, _appsdir_dist_dir, from source, K:\bea\user_projects\bpwdomain\applications\dist. Reason: No J2EE deployment descriptor found at "K:\bea\user_projects\bpwdomain\applications\dist".>
```

This `deploy-application` Ant target is edited in *build.xml* to deploy on WebLogic 7.0:


```

<target name="deploy-application" depends="prepare"
  description="Compile the web application....">
  <echo message="Compiling the application files..." />
  <javac srcdir="${src}" destdir="${build}">
    <include name="*.java" />
    <classpath refid="classpath" />
  </javac>
  <echo message="creating the WAR file...." />
  <antcall target="create-war" />
  <copy todir="${wl.applications}">
    <fileset dir="${dist}" />
  </copy>
</target>

```

In addition, the *build.properties* file could define the `wl.applications` property with a value such as "k:\bea\user_projects\bwppdomain\applications". Once the WAR file is copied to this special directory, a WebLogic server that is started in development mode will automatically deploy it.



In the *luser_project\bwppdomain* directory (depending on your server domain name) the WebLogic start script is called *startWebLogic.cmd* on Windows and *startWebLogic.sh* on Unix. To start the server in development mode, the line in the start script should be `set STARTMODE=` (the value is an empty string here) or `set STARTMODE=false`. The server starts in production mode if it is `set STARTMODE=true`.

See Also

[Recipe 2.3](#); [Recipe 2.8-Recipe 2.10](#); WebLogic's Server 7.0 programmer documentation: <http://e-docs.bea.com/wls/docs70/programming.html>.

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Recipe 2.8 Using the WebLogic Administration Console

Problem

You want to deploy a web application using WebLogic's Administration Console.

Solution

Bring up the Administration Console in your web browser and use its graphical interface to deploy either a WAR file or a web-application directory.

Discussion

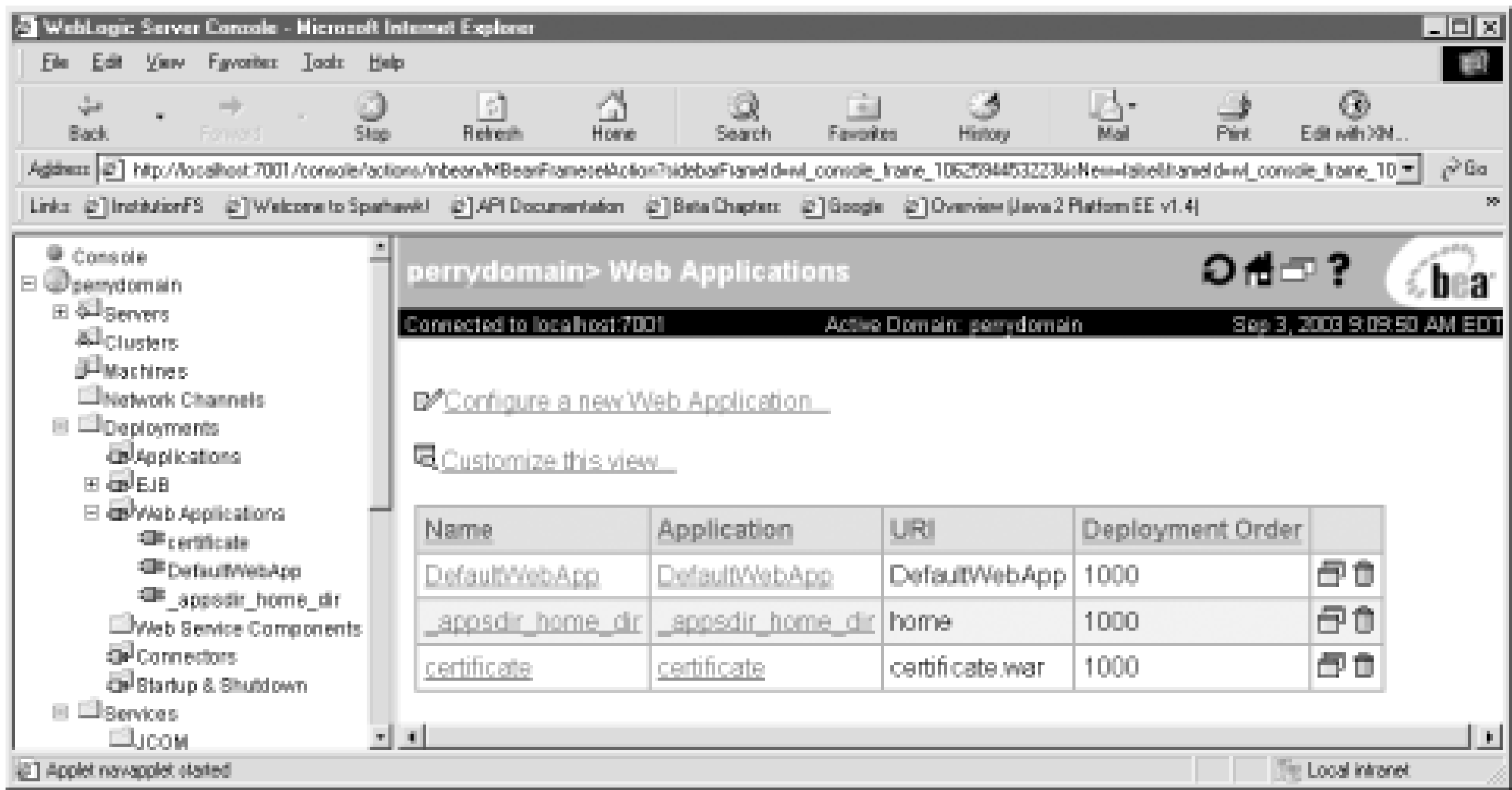
The WebLogic Administration Console is a servlet- and browser-based tool for managing WebLogic server resources and Java 2 Enterprise Edition (J2EE) applications. To use the Console, WebLogic Server must be running. First, request the URL *http://localhost:7001/console* (or whichever your server address and port is, as in *http://<weblogic-server-address>:<port>/console*). Then enter your login name and password to gain entry to the browser-based tool. The resulting screen looks like [Figure 2-6](#), with a hierarchical list of choices in the lefthand column and the current screen choice in the righthand column.

Figure 2-6. WebLogic Administration Console

In the left column, choose the name of your domain by clicking on the plus sign (+), which displays the domain's subnodes. The subnodes of the domain include Servers, Clusters, Machines, Network

Channels, Deployments, Services, and Security. Then choose the "Deployments" node, which gives you the choice of selecting its "Web Applications" subnode. Open up the "Web Applications" node by clicking on its plus sign. The resulting screen looks like [Figure 2-7](#).

Figure 2-7. Web Applications node



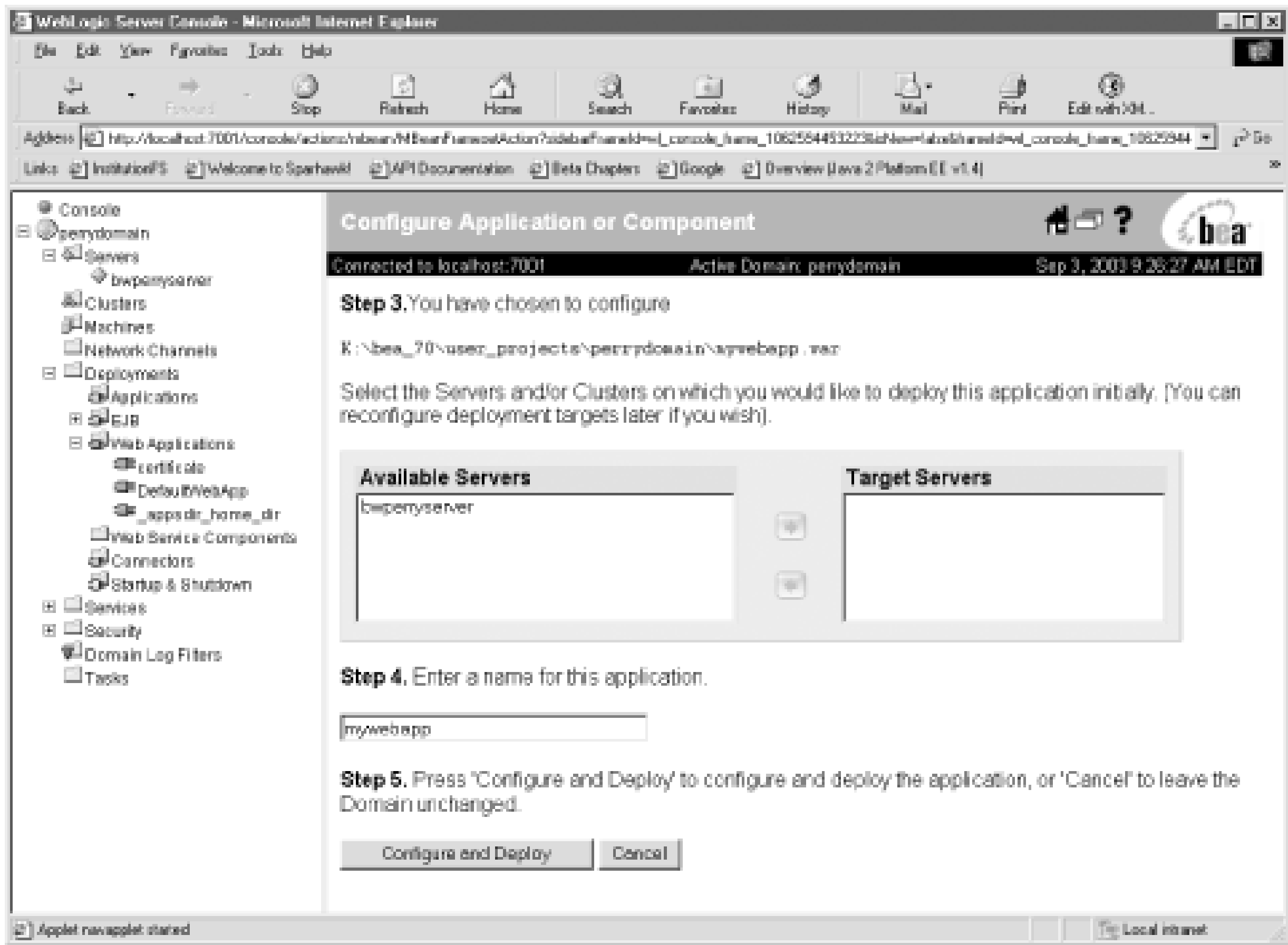
In the Web Applications window, click the "Configure a New Web Application . . . " hyperlink. The next screen gives you the option of uploading the Web Application Archive (WAR) or Enterprise Application Archive (EAR) file through your browser to the server's filesystem, as shown in [Figure 2-8](#).

Figure 2-8. Deploying a web application as a WAR or EAR file

Initiate this upload and then click on the "select" link next to the WAR file. Complete the three steps

that Figure [Figure 2-9](#) shows: click the arrow buttons to deploy the application from the "Available Servers" column to the "Target Servers" column, name the application (leave the name the same as the WAR filename minus the *.war* suffix), then press the "Configure and Deploy" button. That is all it takes to deploy the WAR file to the target server.

Figure 2-9. Final steps for deploying the WAR file

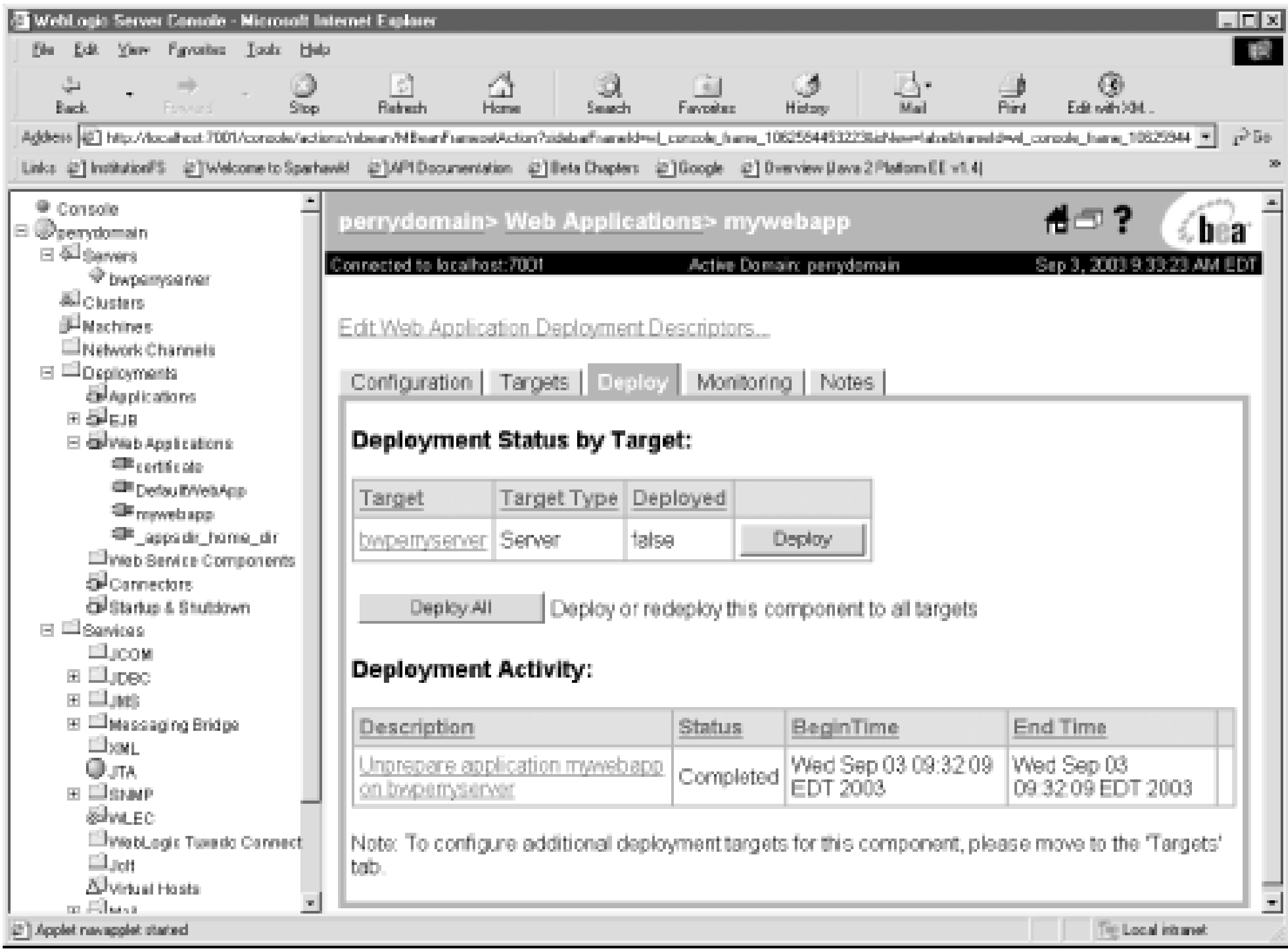


Now test the deployment by requesting one of the servlets in the browser, using the name that you gave the application as the context path. An example URL is *http://localhost:7001/cookbook/cookieservlet*. This URL requests a servlet that has been mapped to the name *"/cookieservlet"*. The web-application context path is */cookbook*.

Redeploying a previously undeployed web application using the WebLogic Administration Console involves the following steps:

1. Select the name of your application under the Web Applications node in the Console's lefthand column. This shows a screen similar to [Figure 2-10](#).

Figure 2-10. Selecting a web application in the Console



2. Click the "Deploy" button in the righthand screen. This reactivates the application, so that it can receive requests in the WebLogic web container.

If you want to delete a web application using the WebLogic Administration Console, click on the name of your domain in the lefthand column of the Console screen, then on the "Deployments" and "Web Applications" nodes. Clicking the trash can icon associated with the application, as shown in [Figure 2-11](#), deletes the application from the WebLogic server.

Figure 2-11. Deleting a web application

Deleting a web application in this manner means that the application is no longer available to receive requests in the WebLogic web container.

See Also

[Recipe 2.3](#) and [Recipe 2.7](#); [Recipe 2.9](#) and [Recipe 2.10](#); WebLogic's Server 7.0 programmer documentation: <http://e-docs.bea.com/wls/docs70/programming.html>.

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Recipe 2.9 Using WebLogic Builder to Deploy a Web Application

Problem

You want to use WebLogic Builder to deploy a web application.

Solution

WebLogic Builder installs with the WebLogic 7.0 Server, so you can launch the Builder application and use its graphical tools to deploy the web application.

Discussion

WebLogic Builder is a graphical tool that installs with WebLogic Server 7. It can be used to edit deployment descriptor files such as *web.xml* and *weblogic.xml*, as well as for deploying web applications to a server. Using WebLogic Builder, you can open up, edit, and deploy web applications that exist as either WAR files or in exploded directory format.

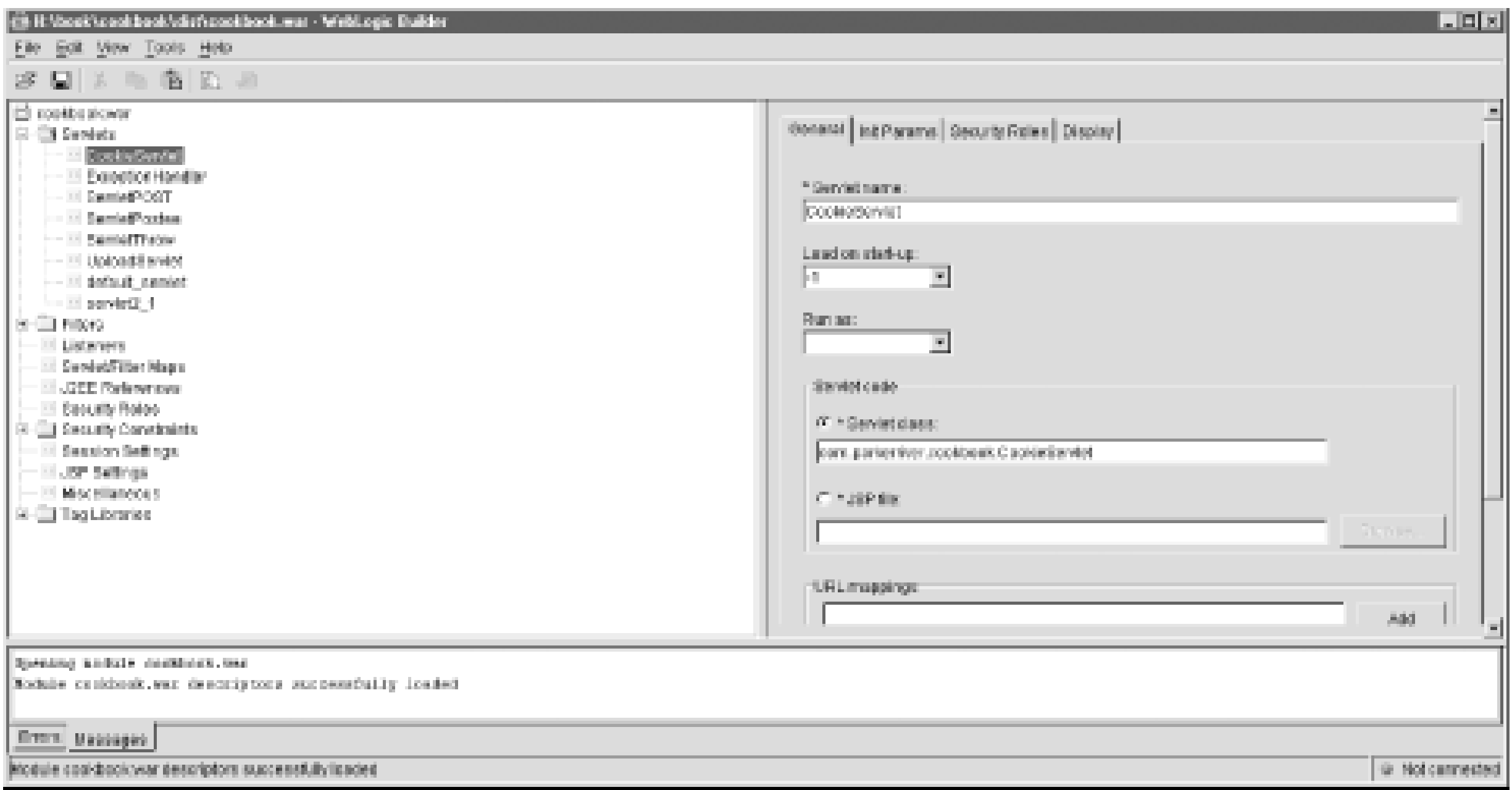
Exploded directory format is a web-application directory structure as it would appear in your filesystem, but that is not in archived or in WAR form. To be deployed on WebLogic as a web application, the root directory must contain the *WEB-INF/web.xml* deployment descriptor and any other properly structured application components, such as a the *WEB-INF/classes* directory containing your servlets (including any package-related directories).

You can launch WebLogic Builder on Windows from either the "Start" menu or the command line. The start script for Builder is at: *<BEA_HOME>/weblogic700/server/bin/startWLBuilder.cmd* (or *startWLBuilder.sh* on Unix). *<BEA_HOME>* is the directory where WebLogic Server 7.0 is installed.

It is easy to open up and edit the deployment descriptor for a web application in WebLogic Builder. Go to the File Open menu and navigate to the WAR file or root directory for the application.

The result is the window depicted in [Figure 2-12](#). The navigation tree in the upper-left window lets you configure web resources (such as servlets) and deployment descriptor elements (such as security constraints), then save the changes to *web.xml*.

Figure 2-12. Opening a WAR file in WebLogic Builder



You can add or delete elements for servlets, servlet mappings, and filters, for instance. The changes are persisted to the deployment descriptor if you make *and* save changes to the application from within WebLogic Builder. You can then optionally connect to the server from the "Tools" menu, and deploy the application.

The "Deploy Module" window indicates whether the application is already deployed.[Figure 2-13](#) shows this window. If you have already deployed the application, you can still make deployment-descriptor changes in Builder, then deploy the application again from the "Tools" menu. WebLogic Builder specifically undeploys the application, then redeploys it with the changes that you included in *web.xml*.

Figure 2-13. WebLogic Builder's Deploy Module window

WebLogic Builder does *not* show any JSP files that may be part of the web application. It will show any servlet mappings that are associated with JSP files.

See Also

[Recipe 2.3](#), [Recipe 2.7](#), [Recipe 2.8](#), and [Recipe 2.10](#); WebLogic's Server 7.0 programmer documentation: <http://e-docs.bea.com/wls/docs70/programming.html>; the local WebLogic Builder Help documentation: `<BEA_HOME>\weblogic700\server\builder\index.html`.

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Recipe 2.10 Using the weblogic.DeployerCommand-Line Tool

Problem

You want to use the command line to deploy a web application on WebLogic Server 7.0.

Solution

Use the Java-based `weblogic.Deployer` command-line utility, which is installed with WebLogic Server 7.0.

Discussion

For developers or administrators who need to use the command line or shell scripts for deploying and redeploying web applications, WebLogic Server 7.0 provides the Java-based `Deployer` utility. This utility accomplishes the same tasks as using the graphical interface of the WebLogic Administration Console to deploy or redeploy a web application. First, this recipe describes how to deploy and redeploy a web application on the command line using the `Deployer` utility. Then the recipe provides an example of a Windows batch file that invokes the `Deployer` utility.

The `Deployer` utility can initiate other tasks, such as redeploying individual web components in a web application. The online documentation for the `Deployer` utility can be found at <http://e-docs.bea.com/wls/docs70/programming/deploying.html#1094693>.

The `Deployer` utility is a Java-based program that requires the following JAR file on your classpath before the program can run: `<BEA_HOME>\server\lib\weblogic.jar`. `<BEA_HOME>` represents the directory where WebLogic Server 7.0 was installed. The following command-line script on a Windows NT 4.0 machine redeploys the `cookbook.war` web application on a server named `bwpserver`:

```
java -cp k:\bea\weblogic700\server\lib\weblogic.jar;  
      %CLASSPATH% weblogic.Deployer  
      -adminurl http://localhost:7001  
      -user bwperry -name cookbook -source .\dist\cookbook.war  
      -targets bwpserver -activate
```

This command-line invocation deploys the web application represented by the archive file `cookbook.war`, so the application is now available to receive requests with the context path `/cookbook`. When run on the command line, the program prompts the user for a password if you have not included it in the script with the `-password` option. The `-source` option specifies the location of the WAR file or web-application directory. The `-targets` option specifies one or more servers on which to deploy the web application. Th

final command for deploying the application is `-activate` .

This command-line invocation deactivates (makes unavailable) an existing web application on the server *bwpserver*. It prompts for the user password first, unless you add the `-password` option to the command line:

```
java -cp k:\bea\weblogic700\server\lib\weblogic.jar;
      %CLASSPATH% weblogic.Deployer
      -adminurl http://localhost:7001
      -user bwpererry -name cookbook
      -targets bwpserver -deactivate
```

The `-cp` option specifies the classpath to use for running the `Deployer` Java utility, and must include the *weblogic.jar* JAR file. The `-adminurl` switch specifies the administration server (the default value is *http://localhost:7001*, so it does not have to be included here). The `-name` option specifies the name of the application to be deactivated, and the `-targets` option names the server where the application is running. The following command-line invocation redeploys the same "cookbook" application:

```
java -cp k:\bea\weblogic700\server\lib\weblogic.jar;
      %CLASSPATH% weblogic.Deployer
      -user bwpererry -name cookbook -activate
```

This time, the `-adminurl` and `-targets` options were omitted. The default values for these switches are *http://localhost:7001* and all current targets (if the developer is redeploying an existing application), respectively. If the application is being deployed for the first time, the default target for the `-targets` option is the administration server.

It is easier to run shell commands from a batch file, because there is less typing for complicated command-line programs and the shell scripts can be permanently saved. Example 2-7 is the first example rewritten as a batch file on Windows NT 4.0.

Example 2-7. Deploying an application

```
@echo off
set WL_HOME=K:\bea\weblogic700

set BEA_CLASSPATH=%WL_HOME%\server\lib\weblogic.jar;%CLASSPATH%

java -cp %BEA_CLASSPATH% weblogic.Deployer -adminurl http://localhost:7001 -user bwpererry
-name cookbook -source .\dist\cookbook.war -targets bwpserver -activate
```

This batch file sets two environment variables: `WL_HOME` and `BEA_CLASSPATH` . These are used to make sure that the classpath includes the *weblogic.jar* file, which contains the `Deployer` utility. If the script was saved as *deploy.bat*, this is how it would be run on the command line:

```
H:\book\cookbook>deploy
```

The resulting console output looks like this.

```
Enter a password for the user "bwpererry":bwpserver_1968
Operation started, waiting for notifications...
....
#TaskID Action                Status  Target                Type    Application            Source
```

15 Activate Success bwpserver Server cookbook H:\book\
cookbook\.\dist\cook

See Also

Recipe 2.3 and Recipe 2.5 ; Recipe 2.7 -Recipe 2.9 ; WebLogic's Server 7.0 programmer documentation:
<http://e-docs.bea.com/wls/docs70/programming.html> .

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Chapter 3. Naming Your Servlets

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Introduction

An important web application configuration task is to create the path by which your servlet is requested by web users. This is what the user types into the address field of his browser in order to make a request to the servlet. While this is sometimes the full name of the servlet, that convention often results in an awkward URI. For example, a web site might have a servlet that dynamically assembles a "Resources" page, instead of a static *resources.html* page. Using the full servlet name, the request URL might be

http://www.myorganization.com/servlet/com.organization.servlets.resources.ResourceServlet. This is quite a path to type in; it makes much more sense to map this to a *servlet path*, which is an alias for the servlet. Using the servlet path, the (new) address for the dynamic page might be *http://www.myorganization.com/resources*. The servlet path, in this case, is */resources*.

This servlet path is also the identifier used by other servlets or JSPs that forward requests to this particular servlet, as well as the address that an HTML form tag uses in its `action` attribute to launch parameter names and values toward the servlet. The servlet specification offers an intuitive and flexible way to map HTTP requests to servlets in the *web.xml*/deployment descriptor.

This chapter describes how you can use the *web.xml*/deployment descriptor to create one or more aliases (servlet paths) to your servlet. It also discusses how to invoke the servlet with other types of URLs, such as one that looks like a JSP page request (e.g., *info.jsp*) or one that looks like an HTML page request (*info.html*). [Recipe 3.5](#) also describes how to access a servlet *without* a mapping in *web.xml*, for example, for the developer who wants to debug her servlet without modifying the *web.xml* file.

Finally, [Recipe 3.7](#), [Recipe 3.9](#), and [Recipe 3.10](#) show how to map all requests to one "controller" servlet ([Recipe 3.7](#)), restrict the requests for certain servlets to authenticated users ([Recipe 3.9](#)), and block all requests to certain servlets except those forwarded from the controller ([Recipe 3.10](#)).

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Recipe 3.1 Mapping a Servlet to a Name in web.xml

Problem

You want to create an alias, or servlet path, to your servlet.

Solution

Create `servlet` and `servlet-mapping` elements in *web.xml*.

Discussion

Creating an alias to the servlet takes place in the deployment descriptor's `servlet-mapping` element. All `servlet` elements must come before any of the `servlet-mapping` elements in the servlet 2.3 *web.xml*/deployment descriptor. The `servlet-mapping` element refers to the name of the servlet that appears in the `servlet-name` element, such as:

```
<servlet><servlet-name>myservlet</servlet-name></servlet>
```

This is referred to as the servlet's *registered name*. The `servlet-mapping` then provides the name, or *URL pattern*, which web application users can type into their browsers to access the servlet. [Example 3-1](#) shows a *web.xml*/file with a `servlet` and `servlet-mapping` element. The registered name in this case is "CookieServlet".

Example 3-1. servlet and servlet-mapping elements

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE web-app
    PUBLIC "-//Sun Microsystems, Inc.//DTD Web Application 2.3//EN"
        "http://java.sun.com/dtd/web-application_2_3.dtd"
>

<web-app>
  <servlet>
    <servlet-name>CookieServlet</servlet-name>
    <servlet-class>com.jspervletcookbook.CookieServlet</servlet-class>
  </servlet>

  <servlet-mapping>
    <servlet-name>CookieServlet</servlet-name>
    <url-pattern>/cookieservlet</url-pattern>
```



```
</servlet-mapping>
</web-app>
```

In this example, the `servlet` element registers the name "CookieServlet" by using the `servlet-name` element. The class name is specified by the `servlet-class` element. The actual location of this servlet class may be *WEB-INF/classes/com/jspServletcookbook/*, or inside a JAR file that resides in *WEB-INF/lib*. "CookieServlet" becomes the registered name by which the servlet `com.jspServletcookbook.CookieServlet` is referred to in the rest of the *web.xml*/file.

Now create the servlet path by which the *web application users* will access this servlet in their web browsers. This aliasing is accomplished with the `servlet-mapping` element. `servlet-name` identifies the registered name by which the servlet is referred to in *web.xml*, and the `url-pattern` element creates the URL that is used to access this servlet. The `/` character inside the */cookieservlet* pattern means "begin at the web-application root." For example, if the context path for the site *http://www.mysite.org* is "cookbook," then the complete address for accessing the `CookieServlet` servlet is *http://www.mysite.org/cookbook/cookieservlet*. The */cookbook* part of the URL is the context path for your web application. The servlet is then identified with the */cookieservlet* pattern within that context.

Looking at this more generally, you have the following URL for any given servlet:

```
http://<host>:<port>/<context path>/<servlet-path>
```

Most servlet containers allow for a *default context*, where the context path is `/`. In this case, the URL is in this form:

```
http://<host>:<port>/<servlet-path>
```

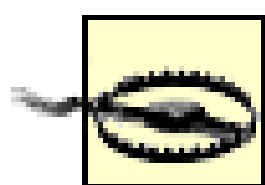
For example, if you are using Tomcat 4.1.x on your local machine and have created an application called "myapp" and a servlet URL pattern of */myservlet*, the entire web address for that servlet looks like *http://localhost:8080/myapp/myservlet*.

You can also access a servlet with a URL like this:

```
http://host:port/context path/servlet/registered-servlet-name
```

So if the registered servlet name was "MyServlet," then the request appears as *http://localhost:8080/myapp/servlet/MyServlet*.

Some servlet engines use a different servlet path than */servlet*, and others allow this path to be changed by an administrator. You should consult the documentation for your servlet container to ensure the correct path for your setup. What if the example `servlet-mapping` element appeared in the *web.xml*/file for the server's default web application, in which the context path is `/`? In this case, users would access the `CookieServlet` servlet by using the address *http://www.mysite.org/cookieservlet*.



The `url-pattern` that you create for a servlet inside of a `servlet-mapping` element is case-sensitive in Tomcat and WebLogic. According to Chapter SRV.11.1 of the servlet v2.3 specification and v2.4 proposed final draft, "The container must use case-sensitive string comparisons for matching." If the user requests `http://www.mysite.org/cookbook/cookieSERVLET` instead of `http://www.mysite.org/cookbook/cookieservlet`, then the request is not directed to the mapped servlet (`CookieServlet`). In Tomcat 4.1.x and WebLogic 7.0, the request returns an HTTP 404 error code, which is the "File not found" type error returned by a web server.

The `url-pattern` inside the `servlet-mapping` element can take on different forms, which are discussed in the upcoming recipes.

See Also

[Chapter 1](#) on *web.xml*, [Recipe 3.2](#)-[Recipe 3.8](#); Chapter 11 of the Servlet v2.3 and 2.4 specifications on mapping requests to servlets.

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Recipe 3.2 Creating More Than One Mapping to a Servlet

Problem

You want to create several names or URL patterns that web users can use to request a single servlet.

Solution

Associate the `servlet` element with more than one `servlet-mapping` element in the deployment descriptor.

Discussion

You can create a number of `servlet-mapping` elements for a single servlet, as shown in [Example 3-2](#). A user can access this servlet by using one of two addresses:

`http://www.mysite.org/cookbook/cookieservlet` or `http://www.mysite.org/cookbook/mycookie`.

Example 3-2. Two servlet-mapping tags

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE web-app
    PUBLIC "-//Sun Microsystems, Inc.//DTD Web Application 2.3//EN"
    "http://java.sun.com/dtd/web-application_2_3.dtd"
>

<web-app>
  <servlet>
    <servlet-name>CookieServlet</servlet-name>
    <servlet-class>com.parkerriver.cookbook.CookieServlet</servlet-class>
  </servlet>
  <servlet-mapping>
    <servlet-name>CookieServlet</servlet-name>
    <url-pattern>/cookieservlet</url-pattern>
  </servlet-mapping>
  <servlet-mapping>
    <servlet-name>CookieServlet</servlet-name>
    <url-pattern>/mycookie</url-pattern>
  </servlet-mapping>
</web-app>
```

Remember that the `servlet-mapping` elements have to appear after all of the `servlet` elements in

the servlet 2.3 deployment descriptor.



Only *exact* matches to the URL pattern will work. If a user requests `/cookieservlet/` (note the final forward slash) instead of `/cookieservlet`, she receives an HTTP error code instead of the servlet-generated page she was expecting.

You can use a wildcard character (*) to extend your mapping pattern. The mappings in [Example 3-3](#) invoke the `CookieServlet` for all of the URLs that begin with `/cookie/`, and then optionally include any names after the forward slash. For example, `CookieServlet` can be invoked with a URL of `http://www.mysite.org/cookbook/cookie/you` using this descriptor. This is because the `url-pattern` matches any HTTP requests ending with the `"/cookie/"` string.

Example 3-3. Using an asterisk in the URL pattern

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE web-app
    PUBLIC "-//Sun Microsystems, Inc.//DTD Web Application 2.3//EN"
    "http://java.sun.com/dtd/web-application_2_3.dtd"
>
<servlet>
    <servlet-name>CookieServlet</servlet-name>
    <servlet-class>com.jspervletcookbook.CookieServlet</servlet-class>
</servlet>

<servlet-mapping>
    <servlet-name>CookieServlet</servlet-name>
    <url-pattern>/cookie/*</url-pattern>
</servlet-mapping>
```

You cannot use the asterisk character as a wildcard symbol inside the `servlet-name` element. The asterisk can be used only as a wildcard symbol in the `url-pattern` element (as in `<url-pattern>/cookie/*</url-pattern>`), or in patterns that point to all files with a certain extension or suffix (as in `<url-pattern>*.jsp</url-pattern>`). The latter pattern is called an *extension mapping*.

See Also

[Chapter 1](#) on *web.xml*; [Recipe 3.1](#); [Recipe 3.3](#)-[Recipe 3.8](#); Chapter 11 of the Servlet v2.3 and 2.4 specifications on mapping requests to servlets.

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Recipe 3.3 Creating a JSP-Type URL for a Servlet

Problem

You want to link a URL pattern that looks like a JSP file request to a servlet.

Solution

Create a `servlet-mapping` element that includes a JSP-style URL pattern.

Discussion

I mentioned in the previous recipes that you have a lot of latitude when creating aliases that point to servlets. For instance, a request that appears to access a JSP file can easily be mapped to a servlet. The deployment descriptor in [Example 3-4](#) maps the URL pattern `/info.jsp` to the `JspInfo` servlet.

Example 3-4. Deployment descriptor example of mapping a JSP-style URL to a servlet

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE web-app
    PUBLIC "-//Sun Microsystems, Inc.//DTD Web Application 2.3//EN"
    "http://java.sun.com/dtd/web-application_2_3.dtd"
>
<web-app>
    <servlet>
        <servlet-name>JspInfo</servlet-name>
        <servlet-class>com.parkerriver.cookbook.JspInfo</servlet-class>
    </servlet>
    <servlet-mapping>
        <servlet-name>JspInfo</servlet-name>
        <url-pattern>/info.jsp</url-pattern>
    </servlet-mapping>
</web-app>
```

The forward slash that begins the URL pattern `/info.jsp` means "begin at the root of the web application that uses this deployment descriptor." So the entire URL for the `JspInfo` servlet looks like this for the cookbook web application: `http://www.mysite.org/cookbook/info.jsp`.

You can also map `a//` references to JSP pages to a single servlet, as shown in [Example 3-5](#), which uses a `web.xml` entry with an extension mapping.

Example 3-5. Mapping all JSP URLs to a single servlet

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE web-app
    PUBLIC "-//Sun Microsystems, Inc.//DTD Web Application 2.3//EN"
        "http://java.sun.com/dtd/web-application_2_3.dtd"
>

<web-app>
    <servlet>
        <servlet-name>JspInfo</servlet-name>
        <servlet-class>com.parkerriver.cookbook.JspInfo</servlet-class>
    </servlet>
    <servlet-mapping>
        <servlet-name>JspInfo</servlet-name>
        <url-pattern>*.jsp</url-pattern>
    </servlet-mapping>
</web-app>
```

Make sure to *exclude* the slash (/) in the URL pattern, as an extension mapping that uses a file extension suffix begins with an asterisk and ends with a period and the suffix itself, as in `<url-pattern>*.jsp</url-pattern>`. This type of mapping may be useful if you were migrating an application from one version that used a lot of JSP pages to a new version that relied entirely on servlets. This takes care of users who have bookmarked many URLs that involve JSP files.

Tomcat 4.1.x includes an implicit mapping to its own JSP page compiler and execution servlet for any request ending in *.jsp*. If you include a mapping such as the one in the previous `web-app` fragment, then your mapping will override Tomcat's implicit mapping.

See Also

[Chapter 1](#) on *web.xml*, [Recipe 3.1](#) and [Recipe 3.2](#); [Recipe 3.4](#)-[Recipe 3.8](#); Chapter 11 of the Servlet v2.3 and 2.4 specifications on mapping requests to servlets.

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Recipe 3.4 Mapping Static Content to a Servlet

Problem

You want requests for static content such as HTML-style URLs to request a servlet.

Solution

Use a `servlet-mapping` element in *web.xml* to map the servlet name to the static content.

Discussion

It often seems odd to the casual programmer, but you can have a servlet respond to a URL that appears to be static content, such as an HTML file. [Example 3-6](#) maps the servlet `HtmlServlet` to all URLs ending in the *.htm* suffix. Any request within the web application that contains this deployment descriptor and specifies a file ending with *.htm* is directed to `HtmlServlet`.

Example 3-6. Mapping static content to a servlet in web.xml

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE web-app
    PUBLIC "-//Sun Microsystems, Inc.//DTD Web Application 2.3//EN"
        "http://java.sun.com/dtd/web-application_2_3.dtd"
>

<web-app>
    <servlet>
        <servlet-name>HtmlServlet</servlet-name>
        <servlet-class>com.jspServletcookbook.HtmlServlet</servlet-class>
    </servlet>
    <servlet-mapping>
        <servlet-name>HtmlServlet</servlet-name>
        <url-pattern>*.html</url-pattern>
    </servlet-mapping>
</web-app>
```

The `servlet-mapping` element in this listing contains an extension-mapping URL pattern: it begins with an asterisk and ends with *.htm*. If you want to map the servlet to just one HTML file, use XML that looks like this:

```
<url-pattern>myfile.html</url-pattern>.
```

Using this pattern, only requests for the *myfile.htm*/file are directed to `HtmlServlet`.



Make sure that URL patterns never begin with a slash (/) when you are creating extension mappings.

See Also

[Chapter 1](#) on *web.xml*, [Recipe 3.3](#); [Recipe 3.5-Recipe 3.8](#); Chapter 11 of the Servlet v2.3 and 2.4 specifications on mapping requests to servlets.

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Recipe 3.5 Invoking a Servlet Without a web.xml Mapping

Problem

You want to request a servlet that does not have a `servlet-mapping` element in the *web.xml* deployment descriptor.

Solution

Use an invoker-style URL of the form

http://www.mysite.org/mywebapp/servlet/com.jspservletcookbook.MyServlet.

Discussion

Some servlets may not have a path mapping in the web application's deployment descriptor. So how can a user request this servlet? What name and URL do they use?

Tomcat and other servlet containers provide a method for invoking servlets that are not mapped in *web.xml*. You can use a URL of the following form:

```
http://www.mysite.org/mywebapp/servlet/<fully qualified class name of servlet>
```

A servlet with the class and package name of `jspservletcookbook.MyServlet` is invoked as *http://www.mysite.org/mywebapp/servlet/jspservletcookbook.MyServlet*. Ensure that the path segment following the name of your web application is */servlet/* and not */servlets/*. If the servlet is stored in the default web application (generally at the top level of the servlet container), the URL for invoking it is *http://www.mysite.org/servlet/jspservletcookbook.MyServlet*.

The *web.xml* file located in `<Tomcat_install_directory>/conf` includes this definition and mapping for the invoker servlet:

```
<servlet>
  <servlet-name>invoker</servlet-name>
  <servlet-class>org.apache.catalina.servlets.InvokerServlet</servlet-class>
  <init-param>
    <param-name>debug</param-name>
    <param-value>0</param-value>
  </init-param>
  <load-on-startup>2</load-on-startup>
</servlet>

<servlet-mapping>
```



```
<servlet-name>invoker</servlet-name>
<url-pattern>/servlet/*</url-pattern>
</servlet-mapping>
```

The invoker servlet can also be used to invoke the servlets that *are* registered in *web.xml*. These URLs look like *http://www.mysite.org/cookbook/servlet/<RegisteredServletName>*. For instance, imagine you have a servlet element like this:

```
<servlet>
  <servlet-name>myservlet</servlet-name>
  <servlet-class>jspServletcookbook.MyServlet</servlet-class>
</servlet>
```

Consider that the web application context path is */cookbook*. If the Tomcat invoker servlet is enabled in this application, then this servlet can be invoked with its registered name at *http://www.mysite.org/cookbook/servlet/myservlet*.



In Tomcat 4.1.x, the invoker servlet mapping may be commented out inside of the *<tomcat-installation-directory>/conf/web.xml* file. The purpose of thus disabling the invoker is to ensure that servlets can be invoked using only the paths specified by the *servlet-mapping* elements in *web.xml*.

If a servlet is requested using the form *http://www.mysite.org/myapp/servlet/<fully-qualified-classname>*, rather than using the servlet's registered name, any initialization parameters provided for that servlet in the *web.xml* file are *not* available. [Example 3-7](#) shows a registered servlet with init parameters.

Example 3-7. A registered servlet with init parameters

```
<servlet>
  <servlet-name>Weather</servlet-name>
  <servlet-class>home.Weather</servlet-class>
  <init-param>
    <param-name>region</param-name>
    <param-value>New England</param-value>
  </init-param>
</servlet>
```

Because it is the registered name of the servlet that has the region parameter assigned to it, only a request for that registered name (or a servlet path mapped to that name) triggers the *region* parameters. Accessing the servlet through its fully qualified name will *not* result in the region parameter being passed to the *Weather* servlet.

See Also

[Chapter 1](#) on *web.xml*, [Recipe 3.1-Recipe 3.4](#); [Recipe 3.6-Recipe 3.8](#); Chapter 11 of the Servlet v2.3 and 2.4 specifications on mapping requests to servlets.

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Recipe 3.6 Mapping All Requests Within a Web Application to a Servlet

Problem

You want to have all web application requests go to a single controller servlet.

Solution

Use a `servlet-mapping` element in your deployment descriptor, with a `url-pattern` element of `<url-pattern>/*</url-pattern>`.

Discussion

In some cases, you might want to have all requests related to the web application to go a single servlet. This servlet *controller* may log requests, implement security, or examine and optionally alter the request object before it forwards the request to another location (usually another servlet or JSP).

For the Sun Microsystems description of the Front Controller design pattern, which is a method for using a servlet as a central processing point, see the Core J2EE Blueprints page at <http://java.sun.com/blueprints/corej2eepatterns/Patterns/FrontController.html>.

Once again, *web.xml* is the place to configure a servlet to receive all web application requests. [Example 3-8](#) shows how to use a URL pattern to aim all requests at a controller servlet.

Example 3-8. Aiming all requests at a controller servlet

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE web-app
    PUBLIC "-//Sun Microsystems, Inc.//DTD Web Application 2.3//EN"
        "http://java.sun.com/dtd/web-application_2_3.dtd"
>
<web-app>

    <servlet>
        <servlet-name>Interceptor</servlet-name>
        <servlet-class>com.jspServletcookbook.Interceptor</servlet-class>
    </servlet>
```



```
<!-- The mappings for the Interceptor servlet -->
<servlet-mapping>
  <servlet-name>Interceptor</servlet-name>
  <url-pattern>/*</url-pattern>
</servlet-mapping>

<servlet-mapping>
  <servlet-name>Interceptor</servlet-name>
  <url-pattern>/servlet/*</url-pattern>
</servlet-mapping>

</web-app>
```

You may also have to override any default invoker servlet with your own mapping:

```
<url-pattern>/servlet/*</url-pattern>
```

Map the servlet that you want to receive all web application requests to this URL pattern as well. If you keep the invoker servlet the way it is, users could bypass the controller servlet by using a URL like *http://www.mysite.org/myapp/servlet/com.jspServletcookbook.CookieServlet*.

In Tomcat, you can also disable the invoker servlet in the top-level *web.xml* file (in *<Tomcat_install_directory>/conf*) by commenting out the `servlet-mapping` element. This affects all other web applications running under that Tomcat instance, however, so this decision should be made collectively among administrators who deploy applications on that server.

You must also remove, alter, or comment out other `servlet-mapping` elements that allow servlet requests to bypass the controller servlet. If a more specific mapping (such as the one in [Example 3-9](#)) is included in *web.xml*, requests for the `CookieServlet` will bypass the `Interceptor` servlet.

Example 3-9. Specific mappings override mappings using wildcard symbols

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE web-app
  PUBLIC "-//Sun Microsystems, Inc.//DTD Web Application 2.3//EN"
    "http://java.sun.com/dtd/web-application_2_3.dtd"
>

<web-app>

  <servlet>
    <servlet-name>Interceptor</servlet-name>
    <servlet-class>jspServletcookbook.Interceptor</servlet-class>
  </servlet>

  <servlet>
    <servlet-name>CookieServlet</servlet-name>
```

```
        <servlet-class>
            com.jspServletcookbook.CookieServlet
        </servlet-class>
    </servlet>

    <servlet-mapping>
        <servlet-name>Interceptor</servlet-name>
        <url-pattern>/*</url-pattern>
    </servlet-mapping>

    <servlet-mapping>
        <servlet-name>CookieServlet</servlet-name>
        <url-pattern>/CookieServlet</url-pattern>
    </servlet-mapping>

</web-app>
```

The `servlet-mapping` element for `CookieServlet` in this example would cause the servlet path of `/CookieServlet` to bypass the `Interceptor` servlet, because the servlet path of `/CookieServlet` (as part of a request that looks like *http://host:port/context-path/CookieServlet*) is a more exact match to the URL pattern of `/CookieServlet` than it is to `/*`.

The requests for static content such as welcome files (e.g., *index.html*) are also intercepted by the URL pattern `/*`. The requests for these static files will also go to the controller servlet.

See Also

[Chapter 1](#) on *web.xml*, [Recipe 3.1-Recipe 3.4](#); [Recipe 3.6-Recipe 3.8](#); Chapter 11 of the Servlet v2.3 and 2.4 specifications on mapping requests to servlets; the Core J2EE Blueprints page: <http://java.sun.com/blueprints/corej2eepatterns/Patterns/FrontController.html>.

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Recipe 3.7 Mapping Requests to a Controller and Preserving Servlet Mappings

Problem

You want to map all requests to a single controller servlet, while preserving the servlet mappings for other servlets in a secure manner.

Solution

Use `security-constraint` elements in *web.xml* to prevent web users from making requests to the noncontroller servlets.

Discussion

What if the controller servlet that receives all requests wants to conditionally forward the request along to another servlet for specialized processing? If all of the other servlet mappings are removed from *web.xml* and the invoker-style URL pattern (*/servlet/**) is mapped to the controller servlet itself, even the controller servlet is prevented from forwarding a request to another servlet! How can you get around these restrictions?

A solution is to retain the individual servlet mappings in *web.xml*. Then you can use `security-constraint` elements to prevent web users from making requests to these noncontroller servlets. When the controller servlet wants to forward a request to another servlet, it uses an object that implements the `javax.servlet.RequestDispatcher` interface. `RequestDispatchers` are not restricted from forwarding requests (using the `RequestDispatcher.forward(request, response)` method) to URL patterns that are specified by `security-constraint` elements. [Example 3-10](#) shows a servlet named `Controller` that uses a `RequestDispatcher` to forward a request to another servlet.

[Recipe 3.9](#) describes how to protect servlets from receiving any web-user requests with the `security-constraint` element, so I won't repeat that information here.

Example 3-10. Using RequestDispatcher to forward a request

```
import javax.servlet.*;
import javax.servlet.http.*;

public class Controller extends HttpServlet {

    public void doGet(HttpServletRequest request, HttpServletResponse response)
```



```

throws ServletException, java.io.IOException {

    RequestDispatcher dispatcher = null;
    String param = request.getParameter("go");

    if (param == null)
        throw new ServletException("Missing parameter in Controller.");
    else if (param.equals("weather"))
        dispatcher = request.getRequestDispatcher("/weather");
    else if (param.equals("maps"))
        dispatcher = request.getRequestDispatcher("/maps");
    else
        throw new ServletException(
            "Improper parameter passed to Controller.");

    //if we get this far, dispatch the request to the correct URL
    if (dispatcher != null)
        dispatcher.forward(request,response);
    else
        throw new ServletException(
            "Controller received a null dispatcher from request object.");
}
}

```

The servlet checks the `go` parameter for its value. A request to this servlet might look like:

```
http://localhost:8080/home?go=weather
```

In this example, the `Controller` servlet is mapped to receive all web requests to the "home" web application. In other words, the controller's `servlet-mapping` in *web.xml* has a `url-pattern` of `/*`.

Based on the `go` parameter value, `Controller` creates a `RequestDispatcher` object with a different specified URL for forwarding. The servlet gets a `RequestDispatcher` object first by calling the `request` object's `getRequestDispatcher(String path)` method. The `path` parameter can be relative to the context root of the web application, as it is here, but it cannot extend beyond the current servlet context. Suppose the URL pattern */weather* is mapped to the registered servlet name "Weather":

```

<servlet-mapping>
    <servlet-name>Weather</servlet-name>
    <url-pattern>/weather</url-pattern>
</servlet-mapping>

```

In this case, the path passed to the `getRequestDispatcher()` method looks like `getRequestDispatcher("/weather")`. If the `go` parameter is either wrong or missing, the `Controller` throws a `ServletException` with an appropriate message. The `Weather` servlet, though, cannot be accessed by web users directly because it is restricted by a `security-constraint` element-but the `RequestDispatcher.forward(request,response)` method is not limited by these constraints.

You can also use the `javax.servlet.ServletContext.getNamedDispatcher(String name)` method to get a `RequestDispatcher` object for forwarding. Using this method, you do not have to include any `servlet-mapping` elements for the target servlet. The `getNamedDispatcher()` method takes

as its parameter the registered name of the servlet in *web.xml*. [Example 3-11](#) shows the prior servlet example altered to use `getNamedDispatcher("Weather")`, using the weather servlet's registered name instead.

Example 3-11. Using `getNamedDispatcher()` to forward a request

```
import javax.servlet.*;
import javax.servlet.http.*;

public class Controller extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        RequestDispatcher dispatcher = null;
        String param = request.getParameter("go");

        if (param == null)
            throw new
                ServletException("Missing parameter in Controller.");
        else if (param.equals("weather"))
            dispatcher = getServletContext( ).
                getNamedDispatcher("Weather");
        else if (param.equals("maps"))
            dispatcher = getServletContext( ).
                getNamedDispatcher("Maps");
        else
            throw new ServletException(
                "Improper parameter passed to Controller.");

        /*check for a null dispatcher, then
        dispatch the request to the correct URL*/
        if (dispatcher != null)
            dispatcher.forward(request,response);
        else
            throw new ServletException(
                "Controller received a null dispatcher.");
    }
}
```

The `doGet()` method has been changed to use a `RequestDispatcher` received from the `ServletContext.getNamedDispatcher(String registered-servlet-name)` method. Instead of a servlet path, the `dispatcher` object uses that servlet's registered name ("Weather") from *web.xml*, as in:

```
<servlet>
    <servlet-name>Weather</servlet-name>
    <servlet-class>com.jspervletcookbook.Weather
</servlet-class>
</servlet>
```

If the `ServletContext` returns a null `dispatcher` because someone left out the necessary XML element in *web.xml*, then `doGet()` throws a `ServletException` explaining that the `dispatcher` object is `null`.



An alternate strategy is to use a listener to check the request before it finds its way to a servlet. [Chapter 19](#) describes how to use a listener to examine an HTTP request.

See Also

[Chapter 1](#) on *web.xml*, [Recipe 3.1-Recipe 3.5](#); [Recipe 3.8](#); [Chapter 19](#) on using a listener to examine the request; Chapter 11 of the Servlet v2.3 and 2.4 specifications on mapping requests to servlets; the Core J2EE Blueprints page:

<http://java.sun.com/blueprints/corej2eepatterns/Patterns/FrontController.html>

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Recipe 3.8 Creating Welcome Files for a Web Application

Problem

You want to configure one or more welcome files for a web application.

Solution

Use a `welcome-file-list` element in your deployment descriptor.

Discussion

A welcome file is a tradition as old as the hypertextual Internet. Many sites have homepages or other welcome files that are designed to be the entry page or front door for their web sites. These pages usually have names like *index.html*, *welcome.html*, or *default.html*. You can configure your web application to direct requests toward these pages by adding a `welcome-file-list` element to your web application's deployment descriptor. Set up a welcome file list in *web.xml* in the manner demonstrated by [Example 3-12](#). The `welcome-file-list` element must come after any `servlet` and `servlet-mapping` elements, and precede any `error-page` or `taglib` elements in the servlet 2.3 deployment descriptor.

Example 3-12. Setting up welcome files in web.xml

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE web-app
    PUBLIC "-//Sun Microsystems, Inc.//DTD Web Application 2.3//EN"
        "http://java.sun.com/dtd/web-application_2_3.dtd"
>

<web-app>

<!-- Define servlets and servlet-mappings here -->

    <welcome-file-list>
        <welcome-file>index.html</welcome-file>
        <welcome-file>default.jsp</welcome-file>
    </welcome-file-list>

</web-app>
```

Whenever the servlet container encounters a URL for a web application that specifies only a directory,

not a particular filename or servlet, then it looks for a `welcome-file-list` element in the application's deployment descriptor. The servlet v2.3 specification calls these kinds of URLs *valid partial requests*. The servlet container attaches any welcome filenames that it finds in *web.xml* to the request (in the order that they appear in *web.xml*) and returns those files to the client.

For example, let's say Tomcat receives a request for *http://www.mysite.org/cookbook/*. Also imagine that the *web.xml* file for the cookbook web application contains the `welcome-file-list` shown in [Example 3-12](#). Tomcat then returns *http://www.mysite.org/cookbook/index.html* if that file exists; if it does not, Tomcat looks for the *default.jsp* file in the *cookbook* directory and returns that file instead.

The servlet container initiates this search in response to any directory-style URL that it receives (such as *http://www.mysite.org/cookbook/bookinfo/*). In other words, as long as an *index.html* or *default.jsp* (or whichever filenames you choose) exists in a web application's root directory, and the web developer has properly configured the `welcome-file-list` element, then those files are invoked by default in response to directory-style requests.

See Also

[Chapter 1](#) on *web.xml*, [Recipe 3.1](#)-[Recipe 3.6](#); [Recipe 3.9](#); Chapter 11 of the Servlet v2.3 and 2.4 specifications on mapping requests to servlets.

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Recipe 3.9 Restricting Requests for Certain Servlets

Problem

You want to allow only authenticated users to request certain servlets.

Solution

Use the `security-constraint` element in the `web.xml`/deployment descriptor.

Discussion

Some web applications contain servlets that should not be invoked directly by web users, because they handle sensitive data and may have special jobs (such as administering the server or web application). For example, you could design a servlet that is accessed only by server administrators. How do you protect these servlets from being invoked improperly or by unauthorized users?

In the latter case, you can use *declarative security*, or *container-managed security*. This strategy involves configuring the `web.xml`/deployment descriptor with your application's security information, thereby decoupling security information from your servlet's code. Any security changes for a web application can then be made in the XML configuration files (or via the WebLogic Server 7.0 Administration Console) without messing with the servlet's source code. The security configuration is then loaded and implemented by the servlet container.

You can also use *programmatic security*, which involves including security-related code within servlets, such as checking the `HttpServletRequest` object to see if a user is authorized to use a certain web resource.

For Tomcat, using the `security-constraint` element in `web.xml`/requires creating a username and password in the XML file located at `<Tomcat-installation-directory>/conf/tomcat-users.xml`. This is an XML file in which you define internal users and passwords. It might look like [Example 3-13](#).

Example 3-13. A tomcat-users.xml file

```
<?xml version='1.0' encoding='utf-8'?>
<tomcat-users>
  <role rolename="manager"/>
  <role rolename="tomcat"/>
  <role rolename="developer"/>
  <user username="tomcat" password="tomcat" roles="tomcat,manager"/>
  <user username="bruce" password="bruce1957">
```



```

    roles="tomcat,manager,developer"/>
    <user username="stacy" password="stacy1986" roles="tomcat"/>
</tomcat-users>

```

This XML fragment includes a `tomcat-users` root element containing one or more `role` and `user` elements, depending on how many users are defined for the web applications handled by that instance of Tomcat. This `tomcat-users.xml` configuration file is accessible by all of the contained web applications.

You then create `security-constraint`, `login-config`, and `security-role` elements inside of the web application's deployment descriptor, or `web.xml`.



If you are not using the servlet v2.4 deployment descriptor, the security-related elements have to appear in this order and follow most of the other elements that can appear in `web.xml`, or your deployment descriptor will not be a valid XML file. Specifically, the only elements that can come *after* `security-role` are `env-entry`, `ejb-ref`, and `ejb-local-ref`.

The `security-constraint` element looks like [Example 3-14](#), given that the protected URL pattern in this case is `<url-pattern>/CookieServlet</url-pattern>`.

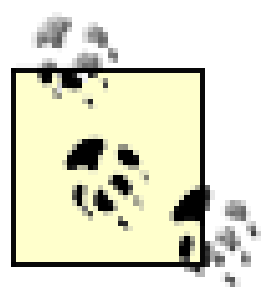
Example 3-14. The security-constraint element

```

<security-constraint>
  <web-resource-collection>
    <web-resource-name>CookieInfo</web-resource-name>
    <url-pattern>/CookieServlet</url-pattern>
    <http-method>GET</http-method>
    <http-method>POST</http-method>
  </web-resource-collection>
  <auth-constraint>
    <description>This applies only to the
                  "developer" security role</description>
    <role-name>developer</role-name>
  </auth-constraint>
  <user-data-constraint>
    <transport-guarantee>NONE</transport-guarantee>
  </user-data-constraint>
</security-constraint>

```

The `security-constraint` element must contain one or more `web-resource-collection` elements. The `web-resource-collection` element describes which web resources in the web application are protected by the specified security constraint. In other words, a request over the Internet for a web resource, such as a servlet, triggers any security constraint that has been mapped to the resource. In this example, the security constraint protects any request that fits the URL pattern, `<web-application-root-directory>/CookieServlet`. The `http-method` elements specify the HTTP methods that this security constraint covers. In the example, a `GET` or `POST` request for `/CookieServlet` triggers the configured security mechanism. If you do not include any `http-method` elements under the `security-constraint` element, the constraint will apply to any HTTP method (such as `PUT` or `DELETE`, in addition to `GET` and `POST`).



The objects that implement the `javax.servlet.RequestDispatcher` interface may forward HTTP requests from one servlet to a protected servlet without triggering these security constraints.

The `auth-constraint` element is designed to describe the security roles that permit access to the web component. A security role is a name that represents the security privileges a user or group of users have in relation to a particular resource, such as a servlet. Examples of security roles are *admin*, *manager*, or *developer*. In the case of the *tomcat-users.xml* file, users are assigned to roles. Within the `security-constraint` element example, only users that are mapped to the *developer* role in the *tomcat-users.xml* file have access to `CookieServlet`.

How does a web application authenticate a user in the first place? For instance, how can the web application find out the requester's username and password, and thereby determine if he can be given access to the servlet? In container-managed security, this is what the `login-config` element is used for. This element appears after the `security-constraint` element in the *web.xml* file. Both elements might look like [Example 3-15](#) in a web application's deployment descriptor.

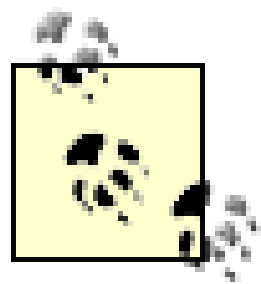
Example 3-15. Using login-config with a security-constraint element

```
<security-constraint>
  <web-resource-collection>
    <web-resource-name>CookieInfo</web-resource-name>
    <url-pattern>/CookieServlet</url-pattern>
    <http-method>GET</http-method>
    <http-method>POST</http-method>
  </web-resource-collection>
  <auth-constraint>
    <description>This applies only to the
      "developer" security role</description>
    <role-name>developer</role-name>
  </auth-constraint>
  <user-data-constraint>
    <transport-guarantee>NONE</transport-guarantee>
  </user-data-constraint>
</security-constraint>

<login-config>
  <auth-method>BASIC</auth-method>
</login-config>
<security-role>
  <role-name>developer</role-name>
</security-role>
```

The `login-config` element specifies the authentication method that is used to authenticate any user requests for protected web resources. Protected web resources are those specified by a `web-resource-collection` element, inside the `security-constraint` element. In the example, BASIC authentication is used for any requests that match the URL pattern */CookieServlet*. BASIC is a familiar form of web authentication in which the browser presents the user with a dialog window for entering the username and password. Tomcat compares the given name and password with the user

information configured in the *tomcat-users.xml* file, and then uses the web application's `security-constraint` configuration to determine whether the user can access the protected servlet.



The `auth-method` child element of `login-config` can also be given the values `FORM`, `CLIENT-CERT`, or `DIGEST`.

One more ingredient is necessary to complete this servlet security configuration: the `security-role` element. [Example 3-15](#) creates a security role named *developer*. The *developer* value also appears in the `security-constraint` child element `auth-constraint`. This means that only users who are mapped to the security role *developer* are able to access web resources which are protected by the security constraint (i.e., that are identified by a `web-resource-collection` child element of `security-constraint`). In other words, this authentication method is actually a two-step process:

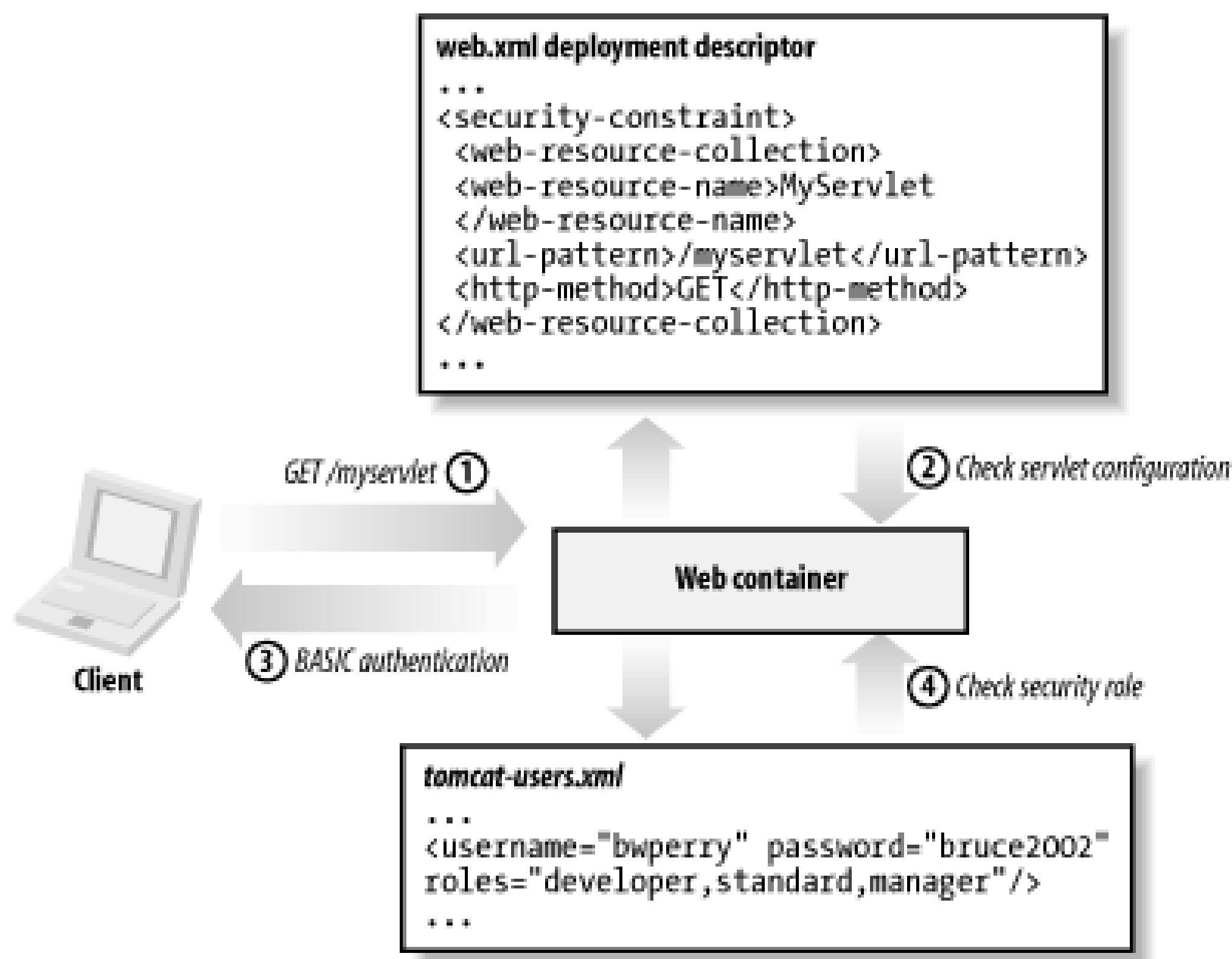
1. Check if the provided username and password are correct.
2. Determine if the user is mapped to the specified security role. For example, the user might provide a correct username and password, but she may not be mapped to the specified security role. In this case, she is prevented from accessing the specified web resource.

The users are mapped to security roles in Tomcat in the previously mentioned *tomcat-users.xml* file. Here is an example of what a `user` element might look like in the *tomcat-users.xml* file:

```
<username="bwperry" password="bruce2002"
  roles="developer,standard,manager" />
```

This user is assigned three different roles: *developer*, *standard*, and *manager*. The Tomcat servlet container uses these XML elements in the *tomcat-users.xml* file to determine whether certain username/password combinations have been assigned particular roles. [Figure 3-1](#) is designed to unravel these confusing cross-references. Just think of a security role as a way to further refine a group of application users, or group them in terms of their user privileges.

Figure 3-1. Using a security constraint element



The security configuration depicted by [Example 3-15](#)s XML text can be used with WebLogic 7.0, but the WebLogic-specific configuration file is called *weblogic.xml*.

The *weblogic.xml* file accompanies the *web.xml* deployment descriptor inside your web application's *WEB-INF* directory.

[Example 3-16](#) shows the XML within the *weblogic.xml* deployment descriptor.

Example 3-16. Security role in weblogic.xml

```
<!-- weblogic.xml security role mapping -->
<security-role-assignment>
  <role-name>developer</role-name>
  <principal-name>bwperry</principal-name>
</security-role-assignment>
```

In WebLogic 7.0, you can also establish users, groups, and security roles that are global to a particular WebLogic server through the Administrative Console.

This recipe described how to restrict the requests for certain servlets. The next recipe shows one way to prevent all requests except those forwarded from a controller servlet from reaching other servlets.

See Also

[Chapter 1](#) on *web.xml*, [Recipe 3.1](#)-[Recipe 3.8](#); Chapter 11 of the Servlet v2.3 and 2.4 specifications on mapping requests to servlets; the Core J2EE Blueprints page:

<http://java.sun.com/blueprints/corej2eepatterns/Patterns/FrontController.html>

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Recipe 3.10 Giving Only the Controller Access to Certain Servlets

Problem

You want to set up the web application so that only a controller servlet has access to certain servlets

Solution

Create a `security-role` that does not have any users mapped to it, then specify in the `security-constraint` element the servlets that you want to preserve for the controller.

Discussion

This recipe shows how you can create a `security-constraint` element that forbids any requests from reaching specified URL patterns.

The servlets mapped to those URL patterns are forwarded requests only from one or more controller servlets that use an object that implements the `javax.servlet.RequestDispatcher` interface.

[Recipe 3.7](#) includes an example controller servlet that forwards a request to another servlet using a `RequestDispatcher`. [Example 3-17](#) shows how you can set up the `security-constraint` element for an example servlet with the registered name "Weather".

Example 3-17. A security-constraint that allows only `RequestDispatcher.forward`-related requests

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE web-app
    PUBLIC "-//Sun Microsystems, Inc.//DTD Web Application 2.3//EN"
        "http://java.sun.com/dtd/web-application_2_3.dtd">
<web-app>
<!-- configure the Weather servlet;
    it receives requests from a
    controller servlet -->
<servlet>
    <servlet-name>Weather</servlet-name>
    <servlet-class>
        com.jspervletcookbook.Weather
    </servlet-class>
</servlet>
```



```

    <servlet-mapping>
      <servlet-name>Weather</servlet-name>
      <url-pattern>/weatherurl-pattern>
    </servlet-mapping>

<!-- this element prevents the Weather servlet
from directly receiving requests from users,
because no users are mapped to the 'nullrole' role-->
<security-constraint>
  <web-resource-collection>
    <web-resource-name>Weather
    </web-resource-name>
    <url-pattern>/weather</url-pattern>
    <http-method>GET</http-method>
    <http-method>POST</http-method>
  </web-resource-collection>
  <auth-constraint>
    <role-name>nullrole</role-name>
  </auth-constraint>
  <user-data-constraint>
    <transport-guarantee>NONE
    </transport-guarantee>
  </user-data-constraint>
</security-constraint>
<login-config>
  <auth-method>BASIC</auth-method>
</login-config>
<security-role>
  <role-name>nullrole</role-name>
</security-role>
</web-app>

```

The next step in protecting the Weather servlet is to make sure that the *tomcat-users.xml* file does not map any users to the "nullrole" security role. The `security-role` element looks like this:

```

<security-role>
  <role-name>nullrole</role-name>
</security-role>

```

Here is what a typical `<Tomcat-installation-directory>/conf/tomcat-users.xml` file looks like:

```

<?xml version='1.0' encoding='utf-8'?>
<tomcat-users>
  <role rolename="manager"/>
  <role rolename="tomcat"/>
  <role rolename="developer"/>
  <user username="tomcat" password="tomcat" roles="tomcat,manager"/>
  <user username="bruce" password="bruce1957"
    roles="tomcat,manager,developer"/>
</tomcat-users>

```

In web applications configured in the manner of [Example 3-17](#), any direct request to the URL pattern

/weather receives a response in the category of "HTTP Status 403-Access to the requested resource has been denied." However, a controller servlet can still use the `RequestDispatcher.forward(request,response)` method to forward a request to the */weather* URL for processing. [Recipe 3.7](#) and [Example 3-10](#) show a servlet that uses this forward method, so I won't repeat that code here.



Make sure to configure friendly error pages for the users who make requests to restricted servlets. [Chapter 9](#) describes how to designate error pages for certain HTTP response codes in the web application's deployment descriptor. You may want to provide automatic refreshes after a specified interval from the error page to the controller or any login pages.

See Also

[Chapter 1](#) on *web.xml*, [Recipe 3.1](#)-[Recipe 3.9](#); Chapter 11 of the Servlet v2.3 and 2.4 specifications on mapping requests to servlets; the Core J2EE Blueprints page: <http://java.sun.com/blueprints/corej2eepatterns/Patterns/FrontController.html>.

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Chapter 4. Using Apache Ant

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Introduction

Apache Ant (<http://ant.apache.org/>) is a Java- and XML-based automation tool that is available as open source software from the Apache Software Foundation. Ant began its life as part of the Tomcat code base. The tool's first official release as a standalone software product was in July 2000, according to the Ant FAQ (<http://ant.apache.org/faq.html>). The original creator of both Ant and Tomcat is James Duncan Davidson.

Ant has evolved into the build tool of choice for automating Java software projects, which means building these projects from beginning to end. This includes compiling Java classes, creating JAR or WAR files, and initiating filesystem-related tasks such as creating directories and moving or copying files. All of these tasks are controlled by the Ant build file for a specific project.

An Ant *build file* is an XML file that is launched from the command line and executes Java classes behind the scenes. Ant is also extensible; you can customize this tool to suit your own purposes. In addition, Ant is cross-platform and very portable, since it is based on XML and Java. Once web developers become familiar with this handy and powerful tool, they find that it greatly eases the task of compiling, packaging, and inevitably altering and redeploying their web applications.

This chapter first describes how to download Ant and set it up on your system, and then explains Ant targets and tasks for those who are new to Ant. The rest of you can merrily move on to other recipes describing how to create a classpath that includes the necessary Tomcat JAR files, create WAR and JAR files, and use Ant to execute Tomcat's Manager application.

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Recipe 4.1 Obtaining and Setting Up Ant

Problem

You want to download and set up Apache Ant on your computer.

Solution

Point your browser to <http://ant.apache.org/>, download the binary or source distribution of Ant, then follow the instructions given in this recipe and on the Ant support site.

Discussion

The binary distribution of Apache Ant can be downloaded from <http://ant.apache.org/bindownload.cgi>. You can also download the source distribution, which contains the Java source files for Ant, from <http://ant.apache.org/srcdownload.cgi>. You must have the Java Software Development Kit (SDK) installed.

Ant v1.5.3 will be the last release that supports JDK 1.1. Ant v1.5.1 can run with JDK 1.1, although some tasks work only on JDK 1.2.

To use Ant, you must have a Java API for XML Processing (JAXP)-compliant XML parser available on your classpath. The binary Ant distribution includes the ApacheXerces2 XML parser. If you opt for a different JAXP-compliant parser, you should remove *xercesImpl.jar* and *xmlParserAPIs.jar* from Ant's top-level */lib* directory (as in *jakarta-ant-1.5.1/lib*) and put the JAR file(s) for the alternative parser into Ant's */lib* directory. You can also add them directly to your user classpath.

The *user classpath* is the classpath represented by the `CLASSPATH` environment variable on your machine. This classpath overrides the default value for the user classpath (`.`, or the current directory). The `java` command-line tool's `-cp` or `-classpath` switches override the `CLASSPATH` environment variable. The user classpath can also be set by a JAR file specified by the `java` tool's `-jar` switch. This designation in turn overrides the other ways of specifying a classpath. The bottom line is that it is easier to place your parser of choice in the *jakarta-ant-1.5.1/lib* directory instead of fooling around with these classpath issues.

The complete installation directions for Ant and links to related Web pages are at <http://ant.apache.org/manual/index.html>.

Take the following steps to get Ant running on your machine:

1. Unpack the compressed file (in ZIP or TAR format) containing the Ant tool. With Ant v1.5.1, unpacking the distribution file creates a directory called *jakarta-ant-1.5.1*.
2. Set the `ANT_HOME` environment variable to the directory where you installed Ant. On Unix, this can be accomplished by typing a command-line phrase:

```
export ANT_HOME=/usr/local/jakarta-ant-1.5.1
```

On Windows type:

```
set ANT_HOME=h:\jakarta-ant-1.5.1
```

3. Add the `<Ant-installation-directory>/bin` directory to your `PATH` environment variable. This allows the developer to change to any working directory with a *build.xml* file and type `ant` to run this file (read the next recipe for a description of executing a *build.xml* file). The `<Ant-installation-directory>/bin` directory contains the scripts which launch the Java classes that form the basis of Ant.
4. Optionally, set the `JAVA_HOME` environment variable to the directory where your JDK is installed. You might as well set the `JAVA_HOME` environment variable, because the scripts that are provided with Ant in its `/bin` directory can then automatically add the required JDK-related classes when you want to use the `javac` or `rmic` tasks. *Tasks* are XML elements that do certain jobs in Ant files, such as `war` (to create Web Archive files) and `javac` (to compile Java classes with Ant).
5. Test your installation by typing `ant -version`. If everything goes well, this command produces a return value like this:

```
K:\>ant -version
Apache Ant version 1.5.1 compiled on October 2 2002
```

See Also

[Recipe 4.2](#) on using Ant targets; [Recipe 4.3](#) on including Tomcat JAR files in the Ant classpath; [Recipe 4.4](#) on compiling a servlet with Ant; [Recipe 4.5](#) on creating a WAR file with Ant; [Recipe 4.6](#) on using Ant to create JAR files; [Recipe 4.7](#) and [Recipe 4.8](#) on starting and stopping Tomcat with Ant; [Recipe 2.1](#) and [Recipe 2.6](#) on deploying web applications using Ant; the Apache Ant manual: <http://ant.apache.org/manual/index.html>; the Apache Ant Project: <http://ant.apache.org>.

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Recipe 4.2 Using Ant Targets

Problem

You want to create `target` elements for developing web applications with an Ant build file.

Solution

Create one or more `target` elements as child elements of a `project` element. Make sure the `targets` have the required `name` attribute and value.

Discussion

An Ant build file is an XML file—in other words, a plaintext file that includes elements and attributes. [Example 4-1](#) shows an Ant file that echoes a message to the console. As mentioned in the introduction, Ant files execute Java code behind the scenes. The way you control the desired actions of your build file is by arranging one or more `target` elements inside the `project` root element.

Example 4-1. An Ant build file that echoes a console message

```
<project name="Cookbook" default="echo-message" basedir=". ">
  <target name="echo-message"
    description="Echoing a message to the console">
    <echo message="Hello from the first Ant file"/>
  </target>
</project>
```

Ant files have one `project` root element, which must have a `default` attribute and value. The `default` attribute specifies the target that runs if no other targets are identified on the command line. The `name` and `basedir` attributes are optional. The `name` attribute, as you might have guessed, gives the `project` element a descriptive name. The `basedir` attribute specifies the directory by which paths that are referred to in the file are calculated. Its default value is the directory containing the build file.

What are targets? They are groups of tasks, represented in Ant by a `target` element. Targets group one or more tasks (which are in turn represented by a `task` element) into logical and named units of control, similar to Java methods.

Tasks include actions that compile Java files (the `javac` task), copy files from one location to another (`copy`), and create JAR or WAR files (aptly named `jar` and `war`). For instance, the `echo-message` target in [Example 4-1](#) calls the `echo` task.

The target's name in [Example 4-1](#) is `echo-message`, which is just a name that I created for it. A target's `description` attribute is optional, as are three other attributes: `depends`, `if`, and `unless`. I'll explain the purpose of `depends` shortly; the `if` and `unless` attributes allow the conditional execution of targets.

As long as Ant is properly set up on your computer, here is what the command-line sequence for executing this example *build.xml* file might look like:

```
H:\book\cookbook\sec1\sec1_3>ant
Buildfile: build.xml

echo-message:
    [echo] Hello from the first Ant file.
```

```
BUILD SUCCESSFUL
Total time: 3 seconds
```

First, the XML file with the `project` root element is saved with the filename *build.xml*. Then the user changes to the directory that contains this file and types `ant`, without any options. Ant then looks for a file called *build.xml* in the current directory and runs the project's default target (in [Example 4-1](#), the `echo-message` target).

You can give the build file a name other than *build.xml*, but then you need to run Ant with the `-buildfile` option:

```
ant -buildfile dev.xml
```

Most build files involve several targets that execute in a certain sequence to initiate Java development tasks. [Example 4-2](#) demonstrates the `depends` attribute. This example shows how to execute several targets in a specified sequence.

Example 4-2. Using the depends target attribute to launch a sequence of targets

```
<project name="Cookbook" default="echo-message" basedir=".">

    <target name="init">
        <property name="name" value="Bruce Perry"/>
    </target>

    <target name="show-props" depends="init">
        <echo message=
            "The 'name' property value is: ${name}"/>
        <echo message=
            "OS name and version is: ${os.name} ${os.version} "/>
        <echo message=
            "Your Java home is: ${java.home} "/>
    </target>

    <target name="echo-message" depends="show-props">
```

```

        <echo message=
            "Hello from the first Ant file in directory: ${basedir}"/>
    </target>

```

```
</project>
```

This time, instead of just one target, the `project` element has several nested targets. The `echo-message` target is still the default target, but its behavior has changed due to the value of its `depends` attribute. This optional attribute specifies the name of one or more Ant targets that must be executed prior to the current target. In other words, the `echo-message` target specifies, "I depend on the `show-props` target, so execute it before me." The `show-props` target, however, also has a `depends` attribute that indicates a reliance on the `init` target. As a result, this build file establishes a sequence for executing its targets: `init` `show-props` `echo-message`.

The result of running the prior build file at the command line is shown here:

```

H:\book\cookbook\sec1\sec1_3>ant
Buildfile: build.xml

init:

show-props:
    [echo] The 'name' property value is: Bruce Perry
    [echo] OS name and version is: Windows NT 4.0
    [echo] Your Java home is: h:\jdk1.3.1_02\jre

echo-message:
    [echo] Hello from the first Ant file in directory:
           H:\book\cookbook\sec1\sec1_3

BUILD SUCCESSFUL
Total time: 2 seconds

```

Here is what this build file accomplishes:

1. The `init` target first creates a `name` property that contains the value "Bruce Perry". The target uses the `property` task to accomplish this. Recall that tasks do the real work in Ant; targets are simply grouping elements that call one or more tasks.
2. The `show-props` target then echoes the values of the `name` property (created by the `init` target) and three built-in properties: `os.name`, `os.version`, and `java.home`.
3. The `echo-message` target issues its message to the console and returns the value of the `basedir` property. All of the targets use the `echo` task to deliver their messages.

Note that the `name` property would not be set if the `init` target was never executed. If the `show-props` target is defined as seen here, there will be problems:

```

<target name="show-props">
    . . . </target>

```

However, it is properly defined as follows:


```
<target name="show-props" depends="init">
    . . . </target>
```

Without the `depends` attribute, the `init` target would never be executed, because the build file's execution sequence would look like `show-props` `echo-message`. The `name` property would never be given a value.

Ant build files are usually much more complex than these examples, which is more of a testament to Ant's power than evidence of poor design. [Chapter 2](#) shows how to deploy individual servlets and web applications with more extensive Ant files.

See Also

[Recipe 4.1](#) on downloading and setting up Ant; [Recipe 4.3](#) on including Tomcat JAR files in the Ant classpath; [Recipe 4.4](#) on compiling a servlet with Ant; [Recipe 4.5](#) on creating a JAR file with Ant; [Recipe 4.7](#) and [Recipe 4.8](#) on starting and stopping Tomcat with Ant; [Recipe 2.1](#) and [Recipe 2.6](#) on deploying web applications using Ant; the Ant manual section on the `property` task: <http://ant.apache.org/manual/CoreTasks/property.html>; the Ant manual segment on `targets`: <http://ant.apache.org/manual/using.html#targets>; the Apache Ant manual index page: <http://ant.apache.org/manual/index.html>; the Apache Ant Project: <http://ant.apache.org> .

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Recipe 4.3 Including Tomcat JAR files in the Build File Classpath

Problem

You want to establish an Ant classpath that includes various Tomcat JAR files.

Solution

Use a path-like structure to define the classpath, then refer to this classpath whenever you need it. Specify the directories where the necessary JAR files are located with an external properties file.

Discussion

Before you can compile a servlet using Ant, you must ensure that the servlet API classes are available on the classpath that the Ant build file is using for compilation. For example, the *<Tomcat-installation-directory>/common/lib* directory contains *servlet.jar*, which includes the necessary classes for compiling a servlet. In addition, you might want to include the *mail.jar* component from the same directory to compile a servlet that uses the JavaMail API. A different directory- *<Tomcat-installation-directory>/common/endorsed* includes the *xmlParserAPIs.jar* file, which you might specify on the classpath to use the associated SAX and DOM XML programming classes.

[Example 4-3](#) defines a classpath using a `path` XML element. A `compile-servlet` target further down in the XML file then uses the defined classpath to compile a servlet.

Example 4-3. Defining a classpath including Tomcat JAR files

```
<project name="Cookbook" default="compile-servlet" basedir=".">

    <!-- include compiled-servlet and tomcat-dir properties -->
    <property file="global.properties" />

    <path id="servlet-classpath">
        <fileset dir="${tomcat.dir}/common/lib">
            <include name="*.jar" />
        </fileset>
        <fileset dir="${tomcat.dir}/common/endorsed">
            <include name="*.jar" />
        </fileset>
    </path>
```

```

<target name="compile-servlet">
    <echo message="Compiling the servlet...."/>
    <javac srcdir="${src}" destdir="${build}">
        <include name="${compiled.servlet}.java" />
        <classpath refid="servlet-classpath" />
    </javac>
</target>

</project>

```

Using the `path` element, the classpath can be defined similarly to an instance variable of a Java class and its value can then be used throughout the build file. The advantage of this approach is that the classpath may be very complex, but it has to be defined only once. Whenever there is a need for a classpath in an Ant file, the `classpath` element and its `refid` attribute can be used to pull in the defined classpath. In [Example 4-3](#), the path element is given a unique ID, "servlet-classpath." The developer creates this name to uniquely identify the path-like structure.

Another core type of Ant task is a `fileset`. `filesets` are elements that represent groups of files. The two nested `filesets` in the example have `dir` attributes that specify two directories under the Tomcat installation directory: `./common/lib` and `./common/endorsed`. These are directories that contain many important Java libraries, such as `servlet.jar` and `mail.jar`. A `fileset` element's nested `include` element creates a pattern (with the `name` attribute) that specifies the types of files to include in each `fileset`. The example includes all files in the specified directories ending in ".jar".

If you wanted to further refine the types of JAR files that are included in a fileset, you could use the `fileset`'s nested `exclude` element:

```

<fileset dir="${tomcat.dir}/common/lib">
    <include name="*.jar" />
    <exclude name="commons*.jar" />
</fileset>

```

The pattern "commons*.jar" excludes all the JAR files from the classpath that begin with the word "commons," followed by zero or more characters and a ".jar" suffix.

The `compile.servlet` target in [Example 4-3](#) echoes a message to the console, then uses the `javac` task to compile a servlet.

This code from [Example 4-3](#) makes two properties that are defined in another file available to the Ant build file:

```

<property file="global.properties" />

```

Here is what the *global.properties* file looks like:

```

tomcat.dir=k:/jakarta-tomcat-4.1.12
compiled.servlet=MyTask
src=.\src
build=.\build

```

The property `compiled.servlet` evaluates to the name of the Java source file that is being compiled. The *tomcat.dir* file is the file path to the Tomcat root directory.

In [Example 4-3](#), the `classpath` element is nested inside the `javac` task, as in:

```
<javac srcdir="${src}" destdir="${build}">
  <include name="${compiled.servlet}.java" />
  <classpath refid="servlet-classpath"/>
</javac>
```

The `classpath` element's `refid` attribute pulls in the classpath that was defined earlier in the build file (including all the Tomcat JARs in `./common/lib` and `./common/endorsed`). The value of the `refid` attribute is the `id` of the `path` element ("servlet-classpath"). In other words, the `path` element in [Example 4-3](#) represents a classpath; the element's `id` or name is "servlet-classpath."

If it is necessary to add more classes or JARs to the classpath that you are defining in an Ant file, then add another nested `fileset` to the `path` element. [Example 4-4](#) adds all of the contents of the `build` directory to the classpath defined by [Example 4-3](#) (along with the Tomcat-related JARs) by adding a third nested `fileset`.

Example 4-4. Nesting three filesets in a path structure

```
<path id="servlet-classpath">

  <fileset dir="${tomcat.dir}/common/lib">
    <include name="*.jar" />
  </fileset>

  <fileset dir="${tomcat.dir}/common/endorsed">
    <include name="*.jar" />
  </fileset>

  <fileset dir="./build"/>

</path>
```

An idiom that often appears in path-related patterns is `**`, which means zero or more directories. For example, the following `fileset` tag includes all of the files contained in any nested *images* folders (`src` is a property name pointing to the source directory of this `fileset`), no matter how deeply they are nested:

```
<fileset dir="${src}">
  <include name="**/images/*" />
</fileset>
```

See Also

[Recipe 4.1](#) on downloading and setting up Ant; [Recipe 4.2](#) on writing Ant targets; [Recipe 4.4](#) on compiling a servlet with Ant; [Recipe 4.5](#) on creating a WAR file with Ant; [Recipe 4.6](#) on using Ant to create JAR files; [Recipe 4.7](#) and [Recipe 4.8](#) on starting and stopping Tomcat with Ant; [Recipe 2.1](#) and [Recipe 2.6](#) on deploying web applications using Ant; the Ant manual section on the `property` task: <http://ant.apache.org/manual/CoreTasks/property.html>; the Ant manual segment on `targets`: <http://ant.apache.org/manual/using.html#targets>; the Apache Ant manual index page:

<http://ant.apache.org/manual/index.html>; the Apache Ant Project: <http://ant.apache.org>.

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Recipe 4.4 Compiling a Servlet with an Ant Build File

Problem

You want to set up a simple build file that you can use to compile individual servlets, without hardcoding servlet names.

Solution

Design a build file so that the name of the Java class to compile can be set from an external properties file or from the command line.

Discussion

If you are not using an IDE to develop and compile your servlets, an Ant build file can automate the compiling of your source files. In order to make this build file reusable, you should design it to get the name of the file from an external properties file or from the command line.

Ant's advantages come to the fore when it is used to automate all of the aspects of building, archiving, and deploying a web application. However, you can also use Ant as a kind of batch processor. In this recipe, I use Ant to dynamically choose a Java file to compile.

The *build.xml* file in [Example 4-5](#) imports a couple of properties from a *build.properties* file, including the name of the servlet to be compiled. One way to choose a different Java file to compile is to change the value of the `compiled.servlet` property in this file, without touching the build file:

```
tomcat.dir=/users/bruceper/java/jakarta-tomcat-4.1.12
compiled.servlet=MyServlet
```

To run [Example 4-5](#), change to the directory where the *build.xml* file is located and type `ant` without any options.

If you are running an Ant build file with a different name, then launch it with this command line:

```
ant -buildfile ant_compiler.xml
```

First, this file imports the `tomcat.dir` and `compiled.servlet` properties from a *build.properties* file. This file is located in the same directory as the build file. The `tomcat.dir` property is used to create a classpath composed of the JAR files in two directories that are a part of Tomcat's directory tree (see [Recipe 4.2](#)).

Example 4-5. Compiling a servlet with an Ant build file

```
<project name="servlet compiler" default="compile" basedir=".">

  <property file="build.properties" />

  <path id="servlet-classpath">

    <fileset dir="${tomcat.dir}/common/lib">
      <include name="*.jar" />
    </fileset>

    <fileset dir="${tomcat.dir}/common/endorsed">
      <include name="*.jar" />
    </fileset>

  </path>

  <target name="init"
    description="Initializes some properties.">
    <echo message="Initializing properties."/>
    <property name="build" value="./build" />
    <property name="src" value="./src" />
  </target>

  <target name="prepare" depends="init">
    <echo message="Cleaning up the build directory."/>
    <delete dir="${build}" />
    <mkdir dir="${build}" />
  </target>

  <target name="compile" depends="prepare"
    description="Compile the servlet">
    <echo message="Compiling the Java file "/>
    <echo message="${compiled.servlet}.java..." />
    <javac srcdir="${src}" destdir="${build}">
      <include name="${compiled.servlet}.java" />
      <classpath refid="servlet-classpath" />
    </javac>
  </target>
</project>
```

The `init` target creates two properties representing the source (`src`) and destination (`build`) directories of the target servlet. The Java file waiting to be compiled is located in an `src` directory. A typical build file also has an `init` target that initializes several more properties. Since the `compile` target has a `depends` attribute that specifies the `prepare` target, and the `prepare` target depends on `init`, then the build sequence looks like `init prepare compile`.

The `prepare` target just cleans up the *build* directory to ensure that the *build* directory contains the latest compiled classes.

The `compile` target uses the `javac` task to actually compile the Java file. `javac` has attributes that specify the source and destination directories of the Java file(s) that it will attempt to compile. [Example 4-5](#) uses the `src` and `build` properties to provide values for these attributes. Two nested elements of the `javac` task compile the specified servlet file and provide the classpath that the `javac` task uses (see [Recipe 4.2](#)).

Here is the console output after running this build file (with some editing for readability):

```
init:
    [echo] Initializing properties.

prepare:
    [echo] Cleaning up the build directory.
    [delete] Deleting directory
            /Users/bruceper/books/cookbook/sec1/sec1_3/build
    [mkdir] Created dir:
            /Users/bruceper/books/cookbook/sec1/sec1_3/build

compile:
    [echo] Compiling the Java file MyServlet.java...
    [javac] Compiling 1 source file to
            /Users/bruceper/books/cookbook/sec1/sec1_3/build

BUILD SUCCESSFUL
Total time: 6 seconds
```

Using the command line to declare the target servlet

What if you want to change the servlet that you are compiling, but are not inclined to type the new Java filename into the *build.properties* file? Running the *build.xml* Ant file from the command line in the following manner will override the imported `compiled.servlet` property:

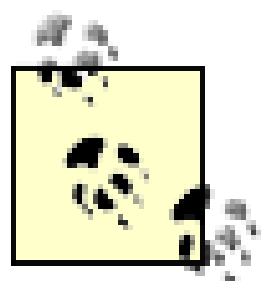
```
ant -Dcompiled.servlet=AnotherServlet
```

AnotherServlet.java is the filename in this example of the Java file that awaits compilation in the *src* directory. This fragment of output shows that any properties passed in from the command line override properties of the same name created within or imported into the build file:

```
compile:
    [echo] Compiling the Java file AnotherServlet.java...
    [javac] Compiling 1 source file to
            /Users/bruceper/books/cookbook/sec1/sec1_3/build
```

The `javac` task compiles only the java files in the *src* directory that do not have a corresponding class file, or in cases where the class file is older than its corresponding *.java* file. As always, check the Ant manual to find out about all the different variations and attributes of `javac`:

<http://ant.apache.org/manual/CoreTasks/javac.html>.



If you want to copy the compiled servlet class to a web application directory, you could add a `deploy-servlet` target that uses the `copy` Ant task:

```
<target name="deploy-servlet" depends="compile">
  <echo message=
    "Copying the servlet to Tomcat web app"/>
  <copy todir="${tomcat.webapps}/WEB-INF/classes">
    <fileset dir="${build}" />
  </copy>
</target>
```

The `copy` task takes its nested `fileset`, which represents the contents of the directory named by the `build` property value, and copies these class files to the *WEB-INF/classes* directory of Tomcat's default web application.

See Also

[Recipe 4.1](#) on downloading and setting up Ant; [Recipe 4.2](#) on writing Ant targets; [Recipe 4.3](#) on creating a classpath for an Ant file; [Recipe 4.5](#) on creating a WAR file with Ant; [Recipe 4.6](#) on using Ant to create JAR files; [Recipe 4.7](#) and [Recipe 4.8](#) on starting and stopping Tomcat with Ant; [Recipe 2.1](#) and [Recipe 2.6](#) on deploying web applications using Ant; the Ant manual section on the `property` task: <http://ant.apache.org/manual/CoreTasks/property.html>; the Ant manual segment on `targets`: <http://ant.apache.org/manual/using.html#targets>; the Apache Ant manual index page: <http://ant.apache.org/manual/index.html>; the Apache Ant Project, <http://ant.apache.org>.

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Recipe 4.5 Creating a WAR File with Ant

Problem

You want to use Ant to create a Web ARchive (WAR) file.

Solution

Use the Ant `war` task.

Discussion

A WAR file is a web application archive that contains servlet classes, JSP files, HTML files, image directories, JAR files, XML configuration files, and other resources that a web application depends on. The WAR is deployed on a web container like Tomcat in order to make the web application available to the container's users. Ant includes a `war` task that makes it easy to generate a WAR from a directory structure that contains the necessary web application files.

[Example 4-6](#) is a standalone build file that creates a WAR file. It could easily comprise one target in a complex build file that compiles Java files, creates the WAR, and deploys the application (see [Recipe 2.6](#)).

This example creates a build sequence of `init` `prepare` `create-war`. The `init` target creates several properties that refer to directories, such as the *build* directory containing the servlet class files. The `context-path` property provides the context path for the web application, and in this case, the name of the WAR file (*myapp.war*).

You execute this build file from a command prompt whose working directory is the web application's root or top-level directory.

Example 4-6. An Ant file using the war task

```
<project name="war-task" default="create-war" basedir=".">

  <target name="init"
    description="Initializes some properties.">

    <echo message="Initializing properties."/>

    <property name="build" value=".\\build" />
    <property name="src" value=".\\src" />
```

```

        <property name="dist" value=".\\dist" />
        <property name="lib" value=".\\lib" />
        <property name="web" value=".\\web" />
        <property name="meta" value=".\\meta" />
        <property name="context-path" value="myapp" />

</target>

<target name="prepare" depends="init">

    <echo message=
        "Cleaning up the build and dist directories."/>

    <delete dir="${build}" />
    <mkdir dir="${build}" />
    <delete dir="${dist}" />
    <mkdir dir="${dist}" />

</target>

<target name="create-war" description=
    "creates a web application archive file"
    depends="prepare">

    <war destfile="${dist}/${context-path}.war"
        webxml="${meta}/web.xml">

        <classes dir="${build}" />
        <lib dir="${lib}" />
        <fileset dir="${web}" />
    </war>
</target>

</project>

```

If the build file was called *war-task.xml*, then the Ant file is executed with this command line:

```
ant -buildfile war-task.xml
```

The `create-war` target calls the `war` task.

The `war` task's `destfile` attribute is required; it specifies the location of the resulting WAR file. [Example 4-6](#) creates the WAR in the *dist* directory. The `webxml` attribute specifies the location of the web application's deployment descriptor. This web application's *web.xml* file (in this example) is located in the *meta* directory.

The example `war` task has three nested elements: `classes`, `lib`, and `fileset`. The `dir` attribute of the `classes` element points to the directory that contains the Java classes that are located in the *WEB-INF/classes* directory. The `war` task automatically creates the *WEB-INF/classes* directory in the WAR file. This task also reproduces all the package-related directories in the *build* directory when it creates *WEB-INF/classes*. In other words, if the *build* directory includes a *com/jspServletcookbook* directory structure, then the WAR will have the same structure in *WEB-INF/classes*.

The `lib` element grabs and stores any JAR files that will be located in the WAR file's *WEB-INF/lib* directory. Finally, the `fileset` nested element, in this case, pulls in all the static files and any nested *image* directories that are contained in */web* and places them at the top level of the WAR's directory tree. Here is what the output of this build file looks like (with some editing for readability):

```
init:
    [echo] Initializing properties.

prepare:
    [echo] Cleaning up the build and dist directories.
    [delete] Deleting directory
        /Users/bruceper/books/cookbook/build
    [mkdir] Created dir:
        /Users/bruceper/books/cookbook/build
    [delete] Deleting directory
        /Users/bruceper/books/cookbook/dist
    [mkdir] Created dir:
        /Users/bruceper/books/cookbook/dist

create-war:
    [war] Building war:
        /Users/bruceper/books/cookbook/dist/myapp.war
```

The `war` task has numerous other optional attributes that are explained in the Ant manual at <http://ant.apache.org/manual/CoreTasks/war.html>.

See Also

[Recipe 4.1](#) on downloading and setting up Ant; [Recipe 4.2](#) on writing Ant targets; [Recipe 4.3](#) on creating a classpath for an Ant file; [Recipe 4.4](#) on compiling a servlet with Ant; [Recipe 4.6](#) on using Ant to create JAR files; [Recipe 4.7](#) and [Recipe 4.8](#) on starting and stopping Tomcat with Ant; [Recipe 2.1](#) and [Recipe 2.6](#) on deploying web applications using Ant; the Ant manual section on the `property` task: <http://ant.apache.org/manual/CoreTasks/property.html>; the Ant manual segment on `targets`: <http://ant.apache.org/manual/using.html#targets>; the Apache Ant manual index page: <http://ant.apache.org/manual/index.html>; the Apache Ant Project: <http://ant.apache.org>.

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Recipe 4.6 Creating a JAR File with Ant

Problem

You want to create a JAR file with Ant.

Solution

Use the built-in `jar` task.

Discussion

The `jar` task automates the creation of JAR files. Like the `war` task for WARs, the `jar` task allows you to automate the command-line phrases you would have to type in for creating JARs. In this way, build files using the `jar` task are somewhat like shell scripts or batch files for creating JARs. The Sun Microsystems JAR file specification can be found at <http://java.sun.com/j2se/1.4/docs/guide/jar/jar.html>.

In web applications, JAR files are used to contain separate code libraries that the web application depends on, such as a database driver. They are located in a web application's *WEB-INF/lib* directory. [Example 4-7](#) shows an Ant target that uses the `jar` task to create a JAR, and then copies the JAR file to the *lib* directory of a web application. These actions precede the archiving of the web application into a WAR file, which can be included in the same build file to automate everything at once (see [Recipe 4.5](#) on creating WAR files).

Example 4-7. Creating a JAR file with Ant

```
<project name="jar-task" default="create-jar" basedir=".">

    <target name="init"
        description="Initializes some properties.">

        <echo message="Initializing properties."/>

        <property name="dist" value="dist" />
        <property name="web" value="web" />
        <property name="meta" value="meta" />
        <property name="jar-name" value="myutils" />

    </target>
```

```

<target name="prepare" depends="init">

<echo message=
    "Cleaning up the build and dist directories."/>

<delete dir="${dist}"/>
<mkdir dir="${dist}"/>

</target>

<target name="create-jar"
    description="creates a JAR archive file"
    depends="prepare">

    <jar destfile="${dist}/${jar-name}.jar"
        basedir="../../"
        includes="**/*.class **/${web}/*.html">

        <fileset dir="../../images"/>

    </jar>

</target>

</project>

```

This build file contains three targets in the build sequence `init` `prepare` `create-jar`. These targets create some properties and clean up a directory called `dist` that contains the resultant JAR file. The `create-jar` target calls the `jar` task, which looks like:

```

<jar destfile="${dist}/${jar-name}.jar" basedir="../../"
    includes="**/*.class **/${web}/*.html">

    <fileset dir="../../images"/>

</jar>

```

The `destfile` attribute of the `jar` element specifies the location and name of the JAR file after it is created. I used a property called `jar-name` here, so that the user can run this Ant file from the command line and feed a new JAR filename into the build file if need be, as in:

```
ant -Djar-name=mynewjar.jar
```

Remember that any properties specified with the `-D` switch override the properties of the same name defined inside the build file.

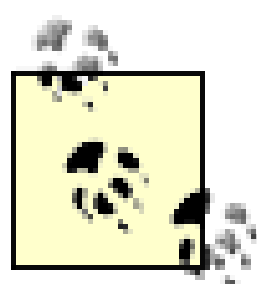
The `basedir` attribute of the `jar` task identifies the top-level directory of files that will be included in the JAR. In the example, the pattern `../../` means "go up two directories from the `basedir` of this project"; in other words, go up two directories from where the Ant build file is located.

The `includes` attribute has two space-separated patterns (you can also separate them with a comma). The patterns further refine the types of files that will be included in the JAR file. The first pattern specifies the inclusion of all the files ending with the `.class` suffix that are located in zero or more directories beneath the `basedir` location. This JAR, as a result, contains all of the Java class files in all directories nested beneath the base directory; the JAR reproduces any nested directories that it finds with the class files. The other pattern (`**/${web}/*.html`) takes all directories nested beneath the base directory called `web` and includes any files that end with `.html` in the JAR. Once again, the nested directories will be included with the JAR and the HTML files.

Finally, a `fileset` element nested within the `jar` task grabs all the contents of the `../..images` folder and includes them in the JAR, *but it does not include the images folder itself*. A way to include the `images` folder and its contents at the top level of the JAR is to change the `jar` task to:

```
<jar destfile="${dist}/${jar-name}.jar" basedir="../.."
    includes="**/*.class **/${web}/*.html **/images/*.gif" />
```

This task adds a third pattern to the `includes` attribute (`**/images/*.gif`), which grabs all the GIF files contained by any `images` directories that are nested in the base directory (the value of the `jar` element's `basedir` attribute). An `images` directory will be included in the JAR if one is found.



The `**` pattern is often used in Ant elements; it means "zero or more directories."

Manifest

The `jar` task creates a `META-INF/MANIFEST.MF` file for the JAR if the `jar` task's `manifest` attribute does not appear. The default manifest looks like this:

```
Manifest-Version: 1.0
Created-By: Apache Ant 1.5.1
```

If you want to specify the location of your own manifest file for reasons such as signing a JAR file or specifying the file that contains the `main()` method in an executable JAR, use the `jar` task's `manifest` attribute. This optional attribute can be either the file location of the manifest or the name of another JAR that has been added by using a nested `fileset` element. If it is a JAR, the task looks in that JAR for the `META-INF/MANIFEST.MF` manifest.

See Also

[Recipe 4.1](#) on downloading and setting up Ant; [Recipe 4.2](#) on writing Ant targets; [Recipe 4.3](#) on creating a classpath for an Ant file; [Recipe 4.4](#) on compiling a servlet with Ant; [Recipe 4.7](#) and [Recipe 4.8](#) on starting and stopping Tomcat with Ant; [Recipe 2.1](#) and [Recipe 2.6](#) on deploying web applications using Ant; the Ant manual section on the `property` task: <http://ant.apache.org/manual/CoreTasks/property.html>; the Ant manual segment on `targets`: <http://ant.apache.org/manual/using.html#targets>; the Apache Ant manual index page: <http://ant.apache.org/manual/index.html>; the Apache Ant Project: <http://ant.apache.org>.

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Recipe 4.7 Starting a Tomcat Application with Ant

Problem

You want to start a web application on Tomcat using an Ant file.

Solution

Use the Tomcat-supplied `StartTask` task so that Ant can manage Tomcat.

Discussion

The Tomcat servlet and JSP container includes a built-in web application called "Manager" that you can use to start, stop, deploy, and initiate other administrative tasks with web applications. Tomcat makes this application available from the `/manager` context path.

Tomcat Version 4 (and later) includes Java classes that allow developers to use the Manager application from their Ant build files. The advantage of using the Manager application from Ant is that you do not have to configure the `conf/server.xml` file to make the web application dynamically reloadable (see [Recipe 2.2](#)). In addition, you can start or stop a single web application without disrupting other Tomcat applications.

The Manager documentation is found online at
<http://jakarta.apache.org/tomcat/tomcat-4.1-doc/primer/manager-howto.html>

Take these steps to start Tomcat from Ant:

1. Make sure you have the necessary JAR file required to use the Ant `task` for starting Tomcat: `<Ant-installation-directory>/lib/catalina-ant.jar`. Copy this JAR from the `<Tomcat-installation-directory>/server/lib` directory to your `<Ant-installation-directory>/lib` directory (otherwise known as `ANT_HOME/lib`).
2. Make sure the Tomcat user database includes a username that is linked to the `manager` role. Only administrative users should be authorized to start and stop web applications using the Manager tool. The `conf/tomcat-users.xml` file maps users and passwords to roles. A user has to be mapped to the `manager` role to be able to use the Manager tool. Here is an example of one of these user mappings in `tomcat-users.xml`.

```
<user username="doug" password= "_1968dgw" roles="manager,dbadmin"/>
```

3. Use the `taskdef` element in the Ant file to define the custom task and give it a name. [Example 4-8](#) gives the task the name `start`, which is used by the target that is responsible for starting Tomcat.
4. Run the Ant file at the command line by changing to its directory and typing `ant`.

[Example 4-8](#) shows the `taskdef` element that defines the start task, followed by the target that starts the specified Tomcat application.

Example 4-8. Starting Tomcat using an Ant file

```
<project name="My Project" default="start-tomcat" basedir=".">

<taskdef name="start" classname="org.apache.catalina.ant.StartTask" />

<!-- import properties specifying username, password, url, and context-path -->
<property file="global.properties" />

<target name="start-tomcat"
  description="Starts the Web application">
  <echo message="Starting the default application ${ context-path}..." />

  <start
    url="${url}"
    username="${username}"
    password="${password}"
    path="/${context-path}" />
</target>

</project>
```

The `start` task has four attributes that [Example 4-8](#) sets using a *global.properties* file. This is a text file containing four name/value pairs, which are imported into the Ant file using the `property` task:

```
<property file="global.properties" />
```

The *global.properties* file is located in the same directory as the Ant build file. Here are the contents of the *global.properties* file:

```
url=http://localhost:8080/manager
username=bruce
password=bruce1957
context-path=home
```

The `url` property specifies the Tomcat Manager URL, the `username` and `password` identify the user who is mapped in the Tomcat user database to the *manager* role, the `context-path` property specifies the context path of the web application you are starting, and the Ant file itself specifies the opening slash (/) character for the context path.



Another way to pass properties to an Ant file is on the command line:

```
ant -Dusername=bruce -Dpassword=bruce1957
-Durl=http://localhost:8080/manager
-Dcontext-path=home
```

Properties added on the command line override those specified by the `property` task.

Launch this Ant file by changing to its directory at the command line and typing `ant` or `ant -buildfile buildfile-name`. Here is the command-line output:

```
H:\book\cookbook\code\chap4>ant -buildfile start.xml
Buildfile: start.xml
```

```
start-tomcat:
    [echo] Starting the default application home...
    [start] OK - Started application at context path /home
```

```
BUILD SUCCESSFUL
Total time: 4 seconds
```

If an application is stopped, it is unavailable to web users (see [Recipe 4.8](#)). When the application is started again, it can receive requests normally.

The Tomcat manager application can initiate many other common administrative tasks such as deploying applications (see [Recipe 2.6](#)).

See Also

The Tomcat Manager application description: <http://jakarta.apache.org/tomcat/tomcat-4.1-doc/manager-howto.html>; [Recipe 4.1](#) on downloading and setting up Ant; [Recipe 4.2](#) on writing Ant targets; [Recipe 4.3](#) on creating a classpath for an Ant file; [Recipe 4.4](#) on compiling a servlet with Ant; [Recipe 4.5](#) and [Recipe 4.6](#) on creating WAR and JAR files; [Recipe 4.8](#) on stopping Tomcat with Ant; [Recipe 2.1](#) and [Recipe 2.6](#) on deploying web applications using Ant; the Ant manual section on the `property` task: <http://ant.apache.org/manual/CoreTasks/property.html>; the Ant manual segment on targets: <http://ant.apache.org/manual/using.html#targets>; the Apache Ant manual index page: <http://ant.apache.org/manual/index.html>; the Apache Ant Project: <http://ant.apache.org>.

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Recipe 4.8 Stopping a Tomcat Application with Ant

Problem

You want to use Ant to stop a specific Tomcat web application.

Solution

Define a `task` in the Ant file using a `taskdef` element and the Java class `org.apache.catalina.ant.StopTask`.

Discussion

During development, you might need to stop a Tomcat web application so that you can add new servlets or deployment-descriptor entries, and then restart the application, allowing the changes to take effect. In the absence of a `conf/server.xml` configuration to make the application dynamically reloadable (see [Recipe 2.2](#)), you can use an Ant target to stop a particular web application without disrupting the other running web applications. This is the opposite of starting an application ([Recipe 4.7](#)); the application is taken out of service until you start it again.

The `org.apache.catalina.ant.StopTask` class provides a connection between Ant and the Tomcat Manager application. Manager is a built-in web application (at context path `/manager`) that you can use to administer other Tomcat web applications.

Implement the same four steps discussed in [Recipe 4.7](#) to use this `stop` task:

1. Make sure you have the necessary JAR file required to use the Ant task for stopping Tomcat: `<Ant-installation-directory>/lib/catalina-ant.jar`. Copy this JAR from the `<Tomcat-installation-directory>/server/lib` directory to your `<Ant-installation-directory>/lib` directory (otherwise known as `ANT_HOME/lib`).
2. Make sure the Tomcat user database includes a username that is linked to the `manager` role (see step 2 of [Recipe 4.7](#) if you need more details).
3. [Example 4-9](#) uses a `taskdef` element to give the task the name `stop`, which is used by the target that is responsible for stopping Tomcat.
4. Run the Ant file at the command line by changing to its directory and typing `ant` or `ant -buildfile buildfile-name`.

Example 4-9. Using Ant to stop a web application

```

<project name="My Project" default="stop-tomcat" basedir=".">

<taskdef name="stop" classname="org.apache.catalina.ant.StopTask" />

<!-- import properties specifying username, password, url, and context-path -->
<property file="global.properties" />

<target name="stop-tomcat"
    description="Stops the Web application">

    <echo message="Stopping the application ${context-path}..." />

    <stop
        url="${url}"
        username="${username}"
        password="${password}"
        path="/${context-path}" />

</target>

</project>

```

The `taskdef` defines a task for this build file called `stop`. The defined task is then used in the build file:

```

<stop url="${url}" username="${username}" password="${password}"
    path="/${context-path}" />

```

[Example 4-9](#) gets its property values from a `property` task that imports *global.properties* (the property file is located in the same directory as the Ant build file). The properties represent:

- The username and password of a user who is mapped to the *manager* role in *conf/tomcat-users.xml*
- The URL to the Manager application, as in *http://localhost:8080/manager*
- The context path for the web application that you are stopping

The Tomcat manager application can initiate many other common administrative tasks such as deploying applications (see [Recipe 2.6](#)).

See Also

The Tomcat Manager application description: <http://jakarta.apache.org/tomcat/tomcat-4.1-doc/manager-howto.html>; [Recipe 4.1](#) on downloading and setting up Ant; [Recipe 4.2](#) on writing Ant targets; [Recipe 4.3](#) on creating a classpath for an Ant file; [Recipe 4.4](#) on compiling a servlet with Ant; [Recipe 4.5](#) and [Recipe 4.6](#) on creating WAR and JAR files; [Recipe 4.7](#) on starting Tomcat with Ant;

[Recipe 2.1](#) and [Recipe 2.6](#) on deploying web applications using Ant; the Ant manual section on the [property](#) task: <http://ant.apache.org/manual/CoreTasks/property.html>; the Ant manual segment on [targets](#): <http://ant.apache.org/manual/using.html#targets>; the Apache Ant manual index page: <http://ant.apache.org/manual/index.html>; the Apache Ant Project: <http://ant.apache.org>.

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Chapter 5. Altering the Format of JSPs

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[Recipe 5.1. Precompiling a JSP in Tomcat](#)

[Recipe 5.2. Precompiling a JSP in WebLogic](#)

[Recipe 5.3. Precompiling JSPs with the Precompilation Protocol](#)

[Recipe 5.4. Mapping a JSP to Its Page Implementation Class](#)

[Recipe 5.5. Creating a JSP from Scratch as a JSP Document](#)

[Recipe 5.6. Generating an XML View from a JSP](#)

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Introduction

This chapter covers two means of working with JSPs that fall slightly outside the norm. The first method precompiles JSPs and turns them into servlet source code. The second develops JSPs as XML documents.

Precompiling JSPs

Precompiling a JSP involves using a server-provided command-line tool to convert the JSP page into a servlet class file. A JSP is converted into a servlet, often called a *JavaServer Page implementation class*, before it handles any HTTP requests. The JSP specification refers to the stage by which the JSP container converts JSP page syntax into a servlet as the *translation phase*. In Tomcat, if you want to examine what the JSP page implementation class looks like after this conversion, go to this directory:

Tomcat-install-directory/work/Standalone/name-of-host/name-of-web-app

name-of-host could be *localhost*, or any other hostname that refers to the server Tomcat is installed on. The name of the web application is also the name of the context; this is usually something like *examples*, *ROOT*, or *storefront*.

The indicated directory contains *.java* files, such as *default_jsp.java*. These are the Java source files that are compiled into class files, and then executed as servlets to respond to requests.

The reasons why a JSP developer may want to precompile a JSP page include:

1. Avoiding the perceptible delay caused when a JSP is first requested from the web container, during which the JSP compiler converts the JSP's source code into a servlet.
2. Allowing the developer to examine the Java source code for the JSP page implementation class, and optionally work on the code with their servlet IDE's sourcecode editor.

In both Tomcat and WebLogic, a command-line tool can be used to precompile a JSP. [Recipe 5.4](#) covers the mapping in *web.xml* of a JSP page to its servlet implementation class.

JSPs as XML Documents

The later recipes in this chapter describe creating JSPs as XML files. Both the JSP specifications v1.2 and 2.0 describe the generation and use of JSPs as pure XML documents. This means that rather than create JSPs in typical JSP page syntax, they are instead coded as well-formed XML documents. According to the JSP specification, a *JSP document* is a namespace-aware XML document. The JSP container differentiates JSP documents from traditional JSP pages in at least one of three ways.

1. A *jsp-property-group* element in *web.xml* specifies a JSP document with the *is-xml* child

element. (The `jsp-property-group` element is one of the JSP configuration elements that the JSP 2.0 specification has proposed adding to *web.xml*.)

2. The file has a `.jspx` extension.
3. The JSP page has a root element of `jsp:root`.

[Recipe 5.5](#) shows what these files look like.

The JSP specification describes an XML view as a description of a JSP page in XML form. An *XML view* is generated by the JSP container during the translation phase. A subclass of `javax.servlet.jsp.tagext.TagLibraryValidator` can use the XML view to parse a JSP in order to validate that custom tags have been used correctly, before the container finally converts the JSP into its page implementation class (a servlet). [Recipe 5.6](#) shows how to generate XML views for a JSP, and how to save the resulting XML files.

JSPs can be created as XML files for the following reasons, among others:

- Web containers can accept JSP documents in web applications, meaning that the web application can contain XML files instead of the pages in traditional JSP syntax. JSP documents can thus be integrated with other XML content, such as XHTML files, Scalable Vector Graphics (SVG), and the XML files that are part of web services transactions.
- You can use XML editors to work with JSP documents.
- You can use other XML technologies with JSP documents, such as XSLT, Simple Object Access Protocol (SOAP), SAX, and DOM.

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Recipe 5.1 Precompiling a JSP in Tomcat

Problem

You want to convert JSPs into servlets using Tomcat 4.1.x.

Solution

Use the *JspC* command-line tool found in *<Tomcat-installation>/bin*.

Discussion

Using the *JspC* command-line tool is the first step in precompiling Tomcat JSPs. This tool is offered in the form of a shell script-*jspc.sh* on Unix systems and *jspc.bat* on Windows-and creates the Java source files for the JSP page implementation classes with which it is supplied. The resultant *.java* files still have to be compiled into servlet class files, using *javac* or another Java compiler. Since precompiling JSPs is a two-step process, I recommend a batch file for convenience. However, let's first examine how to use the *JspC* utility.

The Windows shell script for running *JspC* (*<Tomcat-install-directory>/bin/jspc.bat*) requires that a **JASPER_HOME** environment variable be set to the Tomcat installation directory. Set this environment variable with the following command line:

```
set JASPER_HOME=k:\jakarta-tomcat-4.1.12
```

Run the *JspC* utility by changing to the *%JASPER_HOME%\bin* directory and typing the following command (specify your own directory paths and issue the command on one line):

```
jspc -d H:\book\cookbook -webinc H:\book\cookbook\map.xml
    -webapp h:\book\cookbook\dist
```

The **-d** switch specifies the directory where you would like the source files to be generated, and the **-webinc** switch specifies the name of an automatically generated file where *JspC* will create the **servlet** and **servlet-mapping** elements for the servlet files. If you compile a JSP page that is called *precomp.jsp*, the mappings would look like [Example 5-1](#).

Example 5-1. Servlet mapping for a precompiled JSP

```
<servlet>
    <servlet-name>org.apache.jsp.precomp_jsp</servlet-name>
    <servlet-class>org.apache.jsp.precomp_jsp</servlet-class>
</servlet>
```

```
<servlet-mapping>
  <servlet-name>org.apache.jsp.precomp_jsp</servlet-name>
  <url-pattern>/precomp.jsp</url-pattern>
</servlet-mapping>
```

You can then cut and paste these `servlet` and `servlet-mapping` elements into the *web.xml* deployment descriptor for your web application.

The `-webapp` switch specifies a web-application directory, which must in turn have a *WEB-INF* subdirectory containing your application's *web.xml* file. *JspC* finds all of the *.jsp* files at the top level of this web-application directory and translates them into servlet source files, along with any JSPs in nested subdirectories. The resulting *.java* files are placed in the directory specified with the `-d` switch. Unlike `-webinc`, the `-webxml` switch creates an entire *web.xml* file that includes the new servlets and servlet mappings. Several other *JspC* options are described here:

<http://cvs.apache.org/viewcvs/~checkout~/jakarta-tomcat-4.0/jasper/doc/jspc.html>.

You'll then need to compile the generated source files. I recommend using a batch file to take care of both steps at once. The Windows batch file in [Example 5-2](#) generates the source files and uses the *javac* tool to compile the servlets.

Example 5-2. Using a batch file to precompile JSPs with Tomcat

```
@echo off
jspc -d H:\book\cookbook\classes -webinc H:\book\cookbook\map.xml -webapp h:\book\
cookbook\dist
set PRECLASSPATH=%CATALINA_HOME%\common\lib\servlet.jar;
    %CATALINA_HOME%\common\lib\jasper-runtime.jar;%CLASSPATH%

javac -classpath %PRECLASSPATH% -d ./classes *.java
```

Save this file in a text file with a name like *precomp.bat*. Change to the directory containing the batch file and type `precomp`. This batch file runs the *JspC* command on all *.jsp* files existing beneath the *h:\book\cookbook\dist* web-application directory. Using the `-webinc` switch, the command creates an XML fragment of `servlet` and `servlet-mapping` elements as shown earlier in this recipe. If there are no problems, the compiled files will be stored in the *h:\book\cookbook\classes* directory.

The code then creates a `PRECLASSPATH` environment variable that includes the *servlet.jar* and *jasper-runtime.jar* components, along with any directories or JARs that are part of the existing `CLASSPATH` environment variable. The *servlet.jar* component is necessary to import these Java packages during compilation:

- `javax.servlet`
- `javax.servlet.http`
- `javax.servlet.jsp`

Adding the *jasper-runtime.jar* is necessary to import the `org.apache.jasper.runtime` package. On Windows, you may have to set a `JASPER_HOME` environment variable to the Tomcat installation directory before this batch file runs properly.

[Example 5-3](#) shows a Unix shell script that accomplishes the same task. This script executes the

jspc.sh file in Tomcat's */bin* directory, precompiling all of the JSP files that the *JspC* tool finds in the current working directory. The script stores the resulting *.java* files in the */classes* directory.

Example 5-3. A shell script for precompiling JSP files

```
#!/bin/sh
$CATALINA_HOME/bin/jspc.sh -d ./classes -webinc ./map.xml -webapp ./;
PRECLASSPATH=$CATALINA_HOME/common/lib/servlet.jar:$CATALINA_HOME/common/lib/jasper-
runtime.jar;
export PRECLASSPATH;
javac -classpath $PRECLASSPATH -d ./classes ./classes/*.java
```

See Also

[Recipe 5.3](#) on the precompilation protocol; [Recipe 5.4](#) on mapping the compiled JSP(s) in *web.xml*, the JSP precompilation section of *JavaServer Pages* by Hans Bergsten (O'Reilly); Chapter JSP.11.4 of the JSP 2.0 specification.

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Recipe 5.2 Precompiling a JSP in WebLogic

Problem

You want to precompile a JSP in WebLogic.

Solution

Use the *weblogic.jspc* Java utility that installs with WebLogic Server 7.0.

Discussion

WebLogic Server 7.0 installs with its own Java utility for precompiling JSPs: *weblogic.jspc*. This utility is part of the JAR file that can be found at this location: *<WebLogic-install-directory>/weblogic700/server/lib/weblogic.jar*. When you precompile JSPs using *weblogic.jspc*, it places the class files in the specified destination directory. Example 5-4 shows a simple batch file on Windows NT that precompiles an *example.jsp* JSP page into its servlet implementation class.

Example 5-4. Precompiling a JSP with weblogic.jspc

```
@echo off
set WLCLASSPATH=k:\bea\weblogic700\server\lib\weblogic.jar;%CLASSPATH%
java -cp %WLCLASSPATH% weblogic.jspc -d .\classes example.jsp
```

The second line of Example 5-4 sets an environment variable, *WLCLASSPATH*. This variable prepends a reference to *weblogic.jar* to the existing *CLASSPATH* variable. The next line of the example uses this combined classpath to run *weblogic.jspc*. The *-d* switch tells the program where to store the resulting class files, in this case, in the *classes* directory beneath the directory containing the batch file and *example.jsp*. This program generates a Java class file named *jsp_servlet_Example.class* (including the package name). If you do not specify a package for the compiled servlet, *jsp_servlet* is used as the default package name (see Example 5-6). Example 5-5 shows a shell script that is written on Mac OS X for precompiling a JSP with WebLogic.

Example 5-5. Precompiling JSPs with weblogic.jspc and a shell script

```
#!/bin/sh
WLCLASSPATH=/Users/bruceper/java/weblogic_jar/weblogic.jar:$CLASSPATH;
export WLCLASSPATH;
java -cp $WLCLASSPATH weblogic.jspc
    -d /Users/bruceper/books/cookbook/code/chap5/classes newfile.jsp
```



weblogic.jspc is different from Tomcat's *JspC* utility in that it compiles a file in JSP page syntax into the servlet class file in a single operation. Using Tomcat's *JspC* from the command line requires the use of a compiler, such as *javac*, to compile the *.java* files generated by *JspC* into class files. This second compilation step when using *JspC* is handled automatically when using *weblogic.jspc*.

The Windows batch file in Example 5-6 specifies a `jspServletcookbook` package for all the JSP pages found in the web application specified by the `-webapp` switch.

Example 5-6. Using weblogic.jspc to precompile all JSP pages in a web application

```
@echo off
set WLCLASSPATH=k:\bea\weblogic700\server\lib\weblogic.jar;%CLASSPATH%
java -cp %WLCLASSPATH% weblogic.jspc -d .\classes -package jspServletcookbook -compileAll
-webapp h:/home
```

Example 5-7 shows a Unix shell script that does the same thing.

Example 5-7. Precompiling all JSP pages in a web application with a shell script

```
#!/bin/sh
WLCLASSPATH=/Users/bruceper/java/weblogic_jar/weblogic.jar:$CLASSPATH;
export WLCLASSPATH;
java -cp $WLCLASSPATH weblogic.jspc -d /Users/bruceper/books/cookbook/code/chap5/classes
-package jspServletcookbook -compileAll -webapp /Users/bruceper/books/cookbook/code/cha
```

Note this portion of the instruction in the example:

```
-compileAll -webapp h:/home
```

The `-compileAll` switch, along with an argument to `-webapp`, tells *weblogic.jspc* to precompile all the JSP files found in the web application configured in the *h:/home* directory, including any JSP files nested in subdirectories. This web application is in exploded directory format (not archived into a WAR file). In Example 5-6, the compiled classes are stored in the `classes/jspServletcookbook` directory path.

See Also

Recipe 5.3 on the precompilation protocol; Recipe 5.4 on mapping the compiled JSP(s) in *web.xml*; the JSP precompilation section of *JavaServer Pages* by Hans Bergsten (O'Reilly); Chapter JSP.11.4 of the JSP 2.0 specification.

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Recipe 5.3 Precompiling JSPs with the Precompilation Protocol

Problem

You want to use the "precompilation protocol" that is part of the JSP specification to precompile one or more JSP files.

Solution

Send a request to the JSP container that includes a `jsp_precompile` parameter.

Discussion

The JSP 1.2 and 2.0 specifications require compliant JSP containers to support the use of the `jsp_precompile` request parameter. This parameter suggests that the container precompile the requested JSP. Here is how it works in Tomcat:

1. Request the JSP that you want precompiled with the `jsp_precompile` parameter added to the URL, as in *`http://localhost:8080/home/url_rewrite.jsp?jsp_precompile=true`*.

The JSP container is not supposed to execute the JSP page; it just precompiles it. The result of the request, if you were making it in a web browser, is a blank page.

2. If the JSP file in JSP page syntax has not yet been compiled, or if the JSP file has been changed and has a later modification date than any existing page implementation class, Tomcat creates a new Java source and class file for the JSP in the *`<Tomcat-install-directory>/work`* directory. If the JSP file is named *`url_rewrite.jsp`*, Tomcat calls the Java source and class files *`url_rewrite_jsp.java`* and *`url_rewrite_jsp.class`*.

Supplying the request parameter `jsp_precompile` (without the "`=true`" part) is the same as requesting `jsp_precompile =true` in the URL.

The precompilation protocol in Tomcat will both create the *`.java`* file and compile that file into the JSP page implementation class. Using the *`JspC`* tool as described in [Recipe 5.1](#) will generate only a *`.java`* file.

This protocol is best used with an automated tool that can make HTTP requests, such as the Jakarta

Commons `HttpClient` component. Using such a tool allows you to automate the precompilation of dozens of JSPs by sending several HTTP requests from a single Java program.

See Also

[Recipe 5.1](#) on using Tomcat's *JspC* utility; [Recipe 5.2](#) on precompiling with WebLogic Server; [Recipe 5.4](#) on mapping the compiled JSPs in *web.xml*; [Chapter 7](#) on sending HTTP requests from a servlet or a JSP; the Jakarta Commons `HttpClient` homepage at <http://jakarta.apache.org/commons/httpclient/>; The JSP precompilation section of *JavaServer Pages* by Hans Bergsten (O'Reilly); Chapter JSP.11.4 of the JSP 2.0 specification.

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Recipe 5.4 Mapping a JSP to Its Page Implementation Class

Problem

You have already precompiled a JSP and want to specify a mapping to the JSP page implementation class in your deployment descriptor.

Solution

Cut and paste the `servlet` and `servlet-mapping` elements generated automatically by *JspC* into *web.xml*. Create the proper package-related directories in the *WEB-INF/classes* directory of your web application, then place the precompiled JSPs into that directory.

Discussion

Precompiling JSPs allows you to remove the JSP page syntax files from your web application and just use the resulting servlet class files. You can then use the `servlet-mapping` element in *web.xml* to map a JSP-style URL (e.g., *default.jsp*) to the compiled servlet class. Here is how to accomplish this task:

1. Precompile the JSP(s) as described in [Recipe 5.1](#) or [Recipe 5.2](#), including the compilation of Java source files into class files using *javac* or another compiler tool.
2. Cut and paste the `servlet` and `servlet-mapping` elements generated automatically by *JspC* into your deployment descriptor (if you are using Tomcat), or add those elements manually to *web.xml* (if you are using WebLogic or another container).
3. Make sure the `servlet-mapping`'s `url-pattern` element points to a JSP-style filename, such as *default.jsp*, or an extension mapping such as **.jsp*.
4. Place the class or classes, including the package-related directories, in *WEB-INF/classes*, or inside of a JAR file that is stored in *WEB-INF/lib*.

When the web users request the URL specified by the `servlet-mapping` for that JSP page implementation class, the web container will now direct that request to the mapped servlet class.

[Example 5-8](#) shows a servlet configuration for a precompiled JSP.

Example 5-8. A web.xml entry for a precompiled JSP


```
<servlet>
  <servlet-name>org.apache.jsp.precomp_jsp</servlet-name>
  <servlet-class>org.apache.jsp.precomp_jsp</servlet-class>
</servlet>
<servlet-mapping>
  <servlet-name>org.apache.jsp.precomp_jsp</servlet-name>
  <url-pattern>/precomp.jsp</url-pattern>
</servlet-mapping>
```

The directory structure for this class in your web application should be something like: */WEB-INF/classes/org/apache/jsp/precomp_jsp.class*. If the context path for your web application is */home*, users can request this JSP's implementation class (a servlet, behind the scenes) with a URL similar to *http://localhost:8080/home/precomp.jsp*.

See Also

[Recipe 5.1](#)-[Recipe 5.3](#); Chapter JSP.11.4 of the JSP 2.0 specification.

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Recipe 5.5 Creating a JSP from Scratch as a JSP Document

Problem

You want to create a JSP document in an XML editor's tool.

Solution

Open up your XML editor of choice and create the JSP using only XML elements.

Discussion

A JSP document is a namespace-aware, well-formed XML file that contains JSP standardactions (such as `jsp:include` and `jsp:useBean`), custom actions (such as JSTL custom tags), and the XML equivalents of JSP directives. [Table 5-1](#) specifies the XML equivalents for common JSP directives. Write the JSP document in an XML editor, preferably one where you can check its well-formedness. The JSP document has to be a well-formed XML document to be eligible for placement into a JSP container and execution.

Table 5-1. XML equivalents for JSP directives

Directive	Example	JSP document equivalent
<code><page></code>	<code><%@ page import="java.util.Date" %></code>	<code><jsp:directive.page import="java.util.Date" /></code>
<code><include></code>	<code><%@ include file="footer.html" %></code>	<code><jsp:directive.include file="footer.html" /></code>
<code><taglib></code>	<code><%@ taglib uri="WEB- INF/tlds/xml_gen.tld" prefix="t" %></code>	<code><jsp:root jsp:id="0" xmlns:jsp="http://java.sun.com/JSP/Page" version="2.0" xmlns:t="urn:jsptld:/WEB- INF/tlds/xml_gen.tld"></code>



In JSP 1.2, the only way to identify a JSP page as XML is by having a `jsp:root` element as the root. However, JSP 2.0 offers several new options-the JSP 2.0 specification states that a JSP document can also be distinguished from a JSP in non-XML syntax by a `jsp-property-group` element in the deployment descriptor, a `.jspx` file extension, or a `jsp:root` root element.

This recipe shows a simple JSP page and its XML equivalent, then repeats the comparison with the addition of a custom tag and a runtime expression for a JSP element attribute. [Example 5-9](#) is a simple file in JSP page syntax showing the web server's local time.

Example 5-9. A simple JSP page-syntax file

```
<%@page contentType="text/html"%>
<%@page import="java.util.Date"%>
<html>
  <head><title>Welcome to the Web</title></head>
  <body>
    <h2>Welcome to the Web</h2>
    The server's local time is <%=new Date( ) %>.
  </body>
</html>
```

This JSP has two page directives and a JSP expression that displays a date and time string on the browser page. [Figure 5-1](#) shows the execution of this page in a browser.

Figure 5-1. Simple JSP before XML conversion

This page can be converted into a JSP document by cutting and pasting the code into an XML editor and replacing non-XML constructs with XML elements. [Example 5-10](#) is the JSP document equivalent of [Example 5-9](#).

Example 5-10. A simple JSP document as well-formed XML

```
<jsp:root xmlns:jsp="http://java.sun.com/JSP/Page" version="2.0">
  <jsp:directive.page contentType="text/html"/>
```



```

<jsp:directive.page import="java.util.Date"/>
<html>
  <head><title>Welcome to the Web</title></head>
  <body>
    <h2>Welcome to the Web</h2>
    The server's local time is <jsp:expression>new Date( )</jsp:expression>.
  </body>
</html>
</jsp:root>

```

[Example 5-10](#) has `jsp:directive.page` elements instead of traditional JSP directives, which are not valid XML elements because of the `<%@` syntax. Anything in a JSP page that uses `<%`-style delimiters cannot be used to distinguish JSP elements, because then the JSP document will not pass an XML well-formedness test.

[Example 5-11](#) is a more complex JSP page with a `taglib` directive that specifies the core tag library from JSTL 1.0; the page also uses Expression Language (EL) code. Further, the page has a `jsp:useBean` element that sets a `java.util.Date` variable `dateString` to page scope.

Example 5-11. A JSP page presenting a complex XML conversion

```

<%@page contentType="text/html"%>
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<html>
  <head><title>Welcome to the Web</title></head>
  <body>
    <h2>Welcome to the Web</h2>
    Hello, <c:out value="\${param.firstName} \${param.lastName}"/><br><br>
    <jsp:useBean id="dateString" class="java.util.Date"/>
    The time is <c:out value="\${dateString}"/>.<br><br>
    The value of 10 + 24 + 35 = <c:out value="\${10 + 24 + 35}"/>
  </body>
</html>

```

[Example 5-12](#) is the same JSP page converted to a JSP document.

Example 5-12. Referring to tag libraries (taglibs) in a JSP document

```

<jsp:root xmlns:jsp="http://java.sun.com/JSP/Page"
  xmlns:c="http://java.sun.com/jstl/core" version="2.0">
  <jsp:directive.page contentType="text/html"/>
  <html>
    <head><title>Welcome to the Web</title></head>
    <body>
      <h2>Welcome to the Web</h2>
      <jsp:text>Hello </jsp:text>
      <c:out value="\${param.firstName} \${param.lastName}"/><br></br><br></br>
      <jsp:useBean id="dateString" class="java.util.Date"/>
      <jsp:text>The time is </jsp:text><c:out value="\${dateString}"/>.<br></br><br></br>
      <jsp:text>The value of 10 + 24 + 35 = </jsp:text>
    </body>
  </html>

```

```
<c:out value="\${10 + 24 + 35}" />
</body>
</html>
</jsp:root>
```

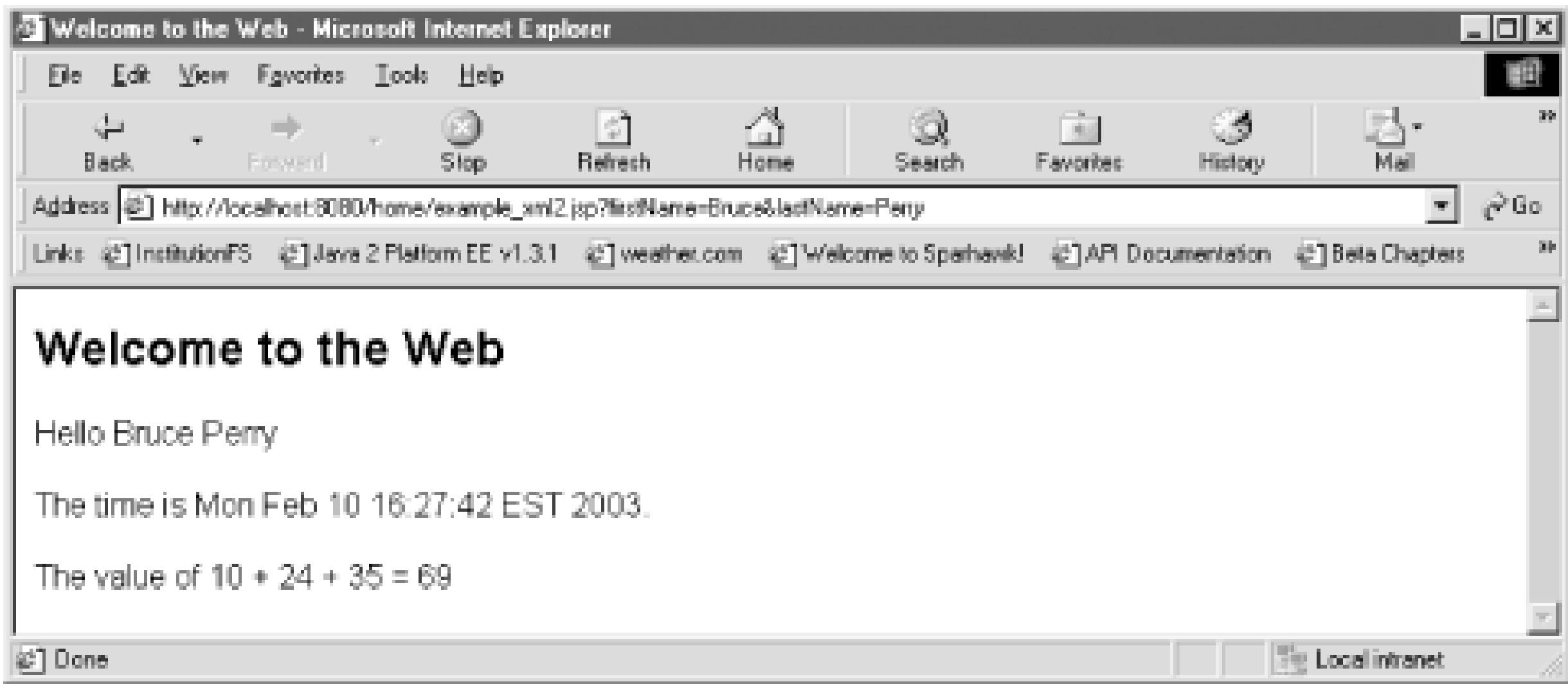
In a JSP document, any tag libraries can be included as namespace attributes, such as in the `jsp:root` element, as shown here:

```
<jsp:root xmlns:jsp="http://java.sun.com/JSP/Page"
          xmlns:c="http://java.sun.com/jstl/core" version="2.0">
```

The `jsp:text` element can be used to contain any template data in the JSP document. You can use the JSP standard actions such as `jsp:useBean` and custom tags like `c:out` with the same syntax used in a JSP page.

[Figure 5-2](#) shows the browser output of the JSP document in [Example 5-12](#). This page was requested by using this URL: *http://localhost:8080/home/example_xml2.jsp?firstName=Bruce&lastName=Perry*.

Figure 5-2. Output from [Example 5-11](#)



Here is what the HTML source code looks like, if you chose "View Source" from the browser menu (with some carriage returns added for readability):

```
<html><head><title>Welcome to the Web</title></head>
<body>
<h2>Welcome to the Web</h2>
Hello Bruce Perry<br/><br/>
The time is Mon Feb 10 16:20:05 EST 2003.<br/><br/>
The value of 10 + 24 + 35 = 69
</body></html>
```

See Also

[Recipe 5.6](#) on generating an XML view from a JSP; Chapter JSP.6 (JSP documents) of the JSP 2.0 specification; Chapter JSP.10 (XML views) of the JSP 2.0 specification.

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Recipe 5.6 Generating an XML View from a JSP

Problem

You want to automatically generate an XML view from a JSP page.

Solution

Create a custom tag and a `TagLibraryValidator` class, from which you can output the XML view of a JSP page to a file.

Discussion

An XML view is an XML form of a JSP page that the JSP container generates during the translation phase intermediary stage before the container converts the JSP to its page implementation class (a servlet). A `TagLibraryValidator` class can use the XML view to validate the use of custom tags in the JSP prior to JSP's conversion to a servlet. An XML view is very similar to a JSP document, which is an XML form of a page that JSP developers can write and add to their web applications. The differences between the two files according to the JSP specification v2.0 are:

- An XML view expands any `include` directives that a JSP document contains into their corresponding JSP fragments.
- An XML view provides each XML element with a `jsp:id` attribute.
- An XML view adds a `jsp:root` element as the root element of the document if the document does not already have a `jsp:root` element.
- An XML view adds a `jsp:directive.page` element and `pageEncoding` attribute if they do not already exist, and sets the value of `pageEncoding` to "UTF-8".
- An XML view adds a `jsp:directive.page` element and `contentType` attribute if they do not already exist, and sets the value of `contentType` according to Chapter JSP.4.2, "Response Character Encoding," of the JSP 2.0 specification (e.g., "text/xml" for a JSP document).

Java developers can add subclasses of `javax.servlet.jsp.tagext.TagLibraryValidator` to their web applications as tools for validating the application's use of custom tags. The JSP container (Jasper is the name of the Tomcat JSP container) makes available to the `TagLibraryValidator` an XML view of a JSP page for the purpose of parsing XML elements in the page and validating whether or not they have been used correctly.

It is useful to examine the XML view of a JSP page in order to debug a `TagLibraryValidator` class that you are using in a custom tag library, or to open up your JSP in an XML editor and evaluate its syntax from an XML perspective. Here is a nice way (okay, a bit of a hack!) to automatically generate a file representing the XML view of a JSP page. This recipe uses a `javax.servlet.jsp.tagext.PageData` object, which

automatically returns the XML view of a JSP page as a `java.io.InputStream`. Here is how it works:

1. Create a class that extends `javax.servlet.jsp.tagext.TagLibraryValidator`. These classes are used to validate the use of custom tags, and are explained in more detail in Chapter 23.
2. Override the `TagLibraryValidator.validate(String prefix, String uri, PageData page)` method to write the XML view information from the `PageData` parameter to a file.
3. Create a simple custom tag by extending `javax.servlet.jsp.tagext.TagSupport`. This tag marks a JSP page so that its XML view can be output to a file. The tag includes a "filename" attribute from which your validator class will get the filename for the XML view. The tag looks like this:

```
<t:toxml filename="myxml_view" />
```

4. Create a Tag Library Descriptor (TLD) file for this tag library, specifying the `TagLibraryValidator` class you created as the validator for this library:

```
<validator>
  <validator-class>
    com.jspserveletcookbook.ToXmlValidator
  </validator-class>
  <description>
    Saves XML views of JSP pages to the
    specified directory.
  </description>
</validator>
```

5. Place both the `TagLibraryValidator` and the `TagSupport` classes in the `WEB-INF/classes` directory of the web application, or inside a JAR file that is stored in `WEB-INF/lib` (the examples in this recipe assume this format, rather than placing the classes in a JAR).
6. Place the TLD file in the `WEB-INF/tlds` directory.
7. Add a `taglib` element referring to your tags and TLD to the `WEB-INF/web.xml` deployment descriptor.

The `taglib` element in `web.xml` is not needed with JSP Version 1.2 and 2.0, since the JSP container automatically searches `WEB-INF`, as well as the `META-INF` directory of your application's JAR files, for any file that ends with the extension `.tld`.

8. Create a properties file containing the directory path that you want to use for the automatically generated XML view. Store this properties file in `WEB-INF/classes` using the appropriate package names. This properties file is used to avoid the hardcoding of an absolute directory in the validator class's code.
9. Use the custom tag in the JSP file(s) for which you want the XML views generated as files.

First, Example 5-13 shows the XML view-related custom tag in a JSP file.

Example 5-13. Generating the XML view of a JSP page

```
<%@ taglib uri="/toxml_view" prefix="t" %>
<html>
<head>
    <title>Test tld</title>
</head>
<body bgcolor="#ffffff">

Hello, this page is using the toxml tag to look at its XML View.
<t:toxml filename="my_xmlview"/>

</body>
</html>
```

The `t:toxml` tag is an empty element that signals the validator class to generate a file containing an XML view. The file will be named *my_xmlview.xml* (the validator class adds the *.xml* extension). The tag otherwise has no effect on the appearance or behavior of this JSP. The following fragment of the deployment descriptor shows the `taglib` element specifying the URI that is used in Example 5-11's `tagl` directive. The `taglib` element in the deployment descriptor also specifies the location of the TLD file (*//INF/tlds/xml_gen.tld*):

```
<taglib>
    <taglib-uri>/toxml_view</taglib-uri>
    <taglib-location>/WEB-INF/tlds/xml_gen.tld</taglib-location>
</taglib>
```

Example 5-14 shows the TLD file for this tag library, which specifies the validator class and the simple custom tag (a marker) used in Example 5-11. I am not going to show the code for the `toxml` tag, since it does not contain any code of interest, beyond the fact that it has one `String` member variable called `filename`. The sole purpose of the tag's use is to put the validator class to work. The JSP container creates one validator instance for each tag library that includes a validator class.

Example 5-14. The TLD file for the XML view custom tag

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<!DOCTYPE taglib
    PUBLIC "-//Sun Microsystems, Inc.//DTD JSP Tag Library 1.2//EN"
    "http://java.sun.com/dtd/web-jsptaglibrary_1_2.dtd">

<taglib>

    <tlib-version>1.0</tlib-version>
    <jsp-version>1.2</jsp-version>
    <short-name>Validator test</short-name>
    <description>Validator test</description>

    <validator>
        <validator-class>
            com.jspServletcookbook.ToXmlValidator
        </validator-class>
```



```

        <description>
            Saves XML views of JSP pages to the specified
            directory.
        </description>
    </validator>

    <tag>
        <name>toxml</name>
        <tag-class>com.jspServletcookbook.ToXml</tag-class>
        <body-content>EMPTY</body-content>
        <description>
            This tag demonstrates the production of JSP XML view files.
        </description>
        <attribute>
            <name>filename</name>
            <required>true</required>
            <rtexprvalue>>false</rtexprvalue>
            <description>
                This attribute provides the filename.</description>
            </attribute>
        </tag>
    </taglib>

```

The `com.jspServletcookbook.ToXmlValidator` class, the library's validator, executes its `validate` method when a JSP page using the `toxml` tag is loaded. How does the validator class know where to save the files representing the JSP's XML view? The `com.jspServletcookbook.ToXmlValidator` class derives the directory path for saving its generated files from the properties file shown below. This allows any deployer of the custom tag to change the directory for the saved XML views, without touching the validator class's source code. The properties file is located in the same directory as the validator class. The path to this properties file is *WEB-INF/classes/com/jspServletcookbook/validator.properties*:

```
directory=h:/home/xmlviews
```

The filename is provided by the tag itself, as in:

```
<t:toxml filename="my_xmlview" />
```

The entire file path for the XML view looks like: *h:/home/xmlviews/my_xmlview.xml*.

The validator class adds the *.xml* extension when it creates the XML view file. The validator first extracts the filename from the `toxml` tag by using a SAX parser to parse the input stream from the `javax.servlet.jsp.tagext.PageData` object.

You now have all of the pieces together except for the all-important validator class, which is shown in Example 5-15. The `validate` method reads the `directory` property value using a `java.util.ResourceBundle` object. The `validate` method gets the filename by using the helper class that Example 5-16 shows. The `validate` method then generates the XML view of the JSP page by using the `java.io.InputStream` returned from `PageData.getInputStream()`.

Example 5-15. A validator class for generating XML view files

```
package com.jspServletcookbook;

import javax.servlet.jsp.tagext.TagLibraryValidator;
import javax.servlet.jsp.tagext.ValidationMessage;
import javax.servlet.jsp.tagext.PageData;
import java.io.*;
import java.util.ResourceBundle;
import java.util.MissingResourceException;
import java.util.Date;

public class ToXmlValidator extends TagLibraryValidator {

    /** Creates new ToXmlValidator */
    public ToXmlValidator( ) {
    }

    public ValidationMessage[] validate(java.lang.String prefix,
        java.lang.String uri,PageData page){

        ValidationMessage[] vam = null;
        try{

            ResourceBundle bundle =
                ResourceBundle.getBundle("com.jspServletcookbook.validator");
            String directory = bundle.getString("directory");
            String fileName = getFilename(page);

            //throw an Exception if the directory is invalid
            if (directory == null)
                throw new Exception(
                    "Received a null directory for the XML view file.");
            //throw an Exception if the filename is invalid
            if (fileName == null)
                throw new IOException(
                    "Received a null filename for the XML view file.");
            File file = new File(directory + "/" + fileName + ".xml");
            FileWriter writer = new FileWriter(file);
            BufferedReader in = new BufferedReader(
                new InputStreamReader(page.getInputStream( )));
            String line = "";
            //write the XML view to the specified file
            while ((line = in.readLine( )) != null ){
                writer.write(line);
            }

            in.close( );
            writer.close( );

        } catch (IOException io){

            //return a validation message
```

```

        ValidationMessage vmsg = new
            ValidationMessage(null,io.getMessage( ));
        vam = new ValidationMessage[1];
        vam[0] = vmsg;
        return vam;

    } catch (MissingResourceException mre){
        //return a validation message
        ValidationMessage vmsg = new
            ValidationMessage(null,mre.getMessage( ));
        vam = new ValidationMessage[1];
        vam[0] = vmsg;
        return vam;
    } catch (Exception e){
        //return a validation message
        ValidationMessage vmsg = new
            ValidationMessage(null,e.getMessage( ));
        vam = new ValidationMessage[1];
        vam[0] = vmsg;
        return vam;
    }

    //return empty array
    vam = new ValidationMessage[0];
    return vam;
}

private String getFilename(PageData page) throws Exception {
    try{
        ValidateHandler handler = new ValidateHandler( );
        return handler.getFilename(page);
    } catch (Exception e){
        throw e; }
    }
}

```

Example 5-16 shows the `ValidateHandler` helper class that our validator uses to get the filename from custom tag. The `ValidateHandler` makes a first pass through the XML view (before it is written to a file) to extract the filename that the user has added with the `toxml` element's `filename` attribute. The `ValidateHandler` does all the work behind the scenes to parse the XML so that the validator class can get the filename with a simple method call:

```

ValidateHandler handler = new ValidateHandler( );
return handler.getFilename(page);

```

The `ValidateHandler` uses the Java API for XML processing (JAXP) and the Simple API for XML (SAX) to parse the XML provided by `javax.servlet.jsp.tagext.PageData.getInputStream()`. You have to place the `ValidateHandler` class inside of the `WEB-INF/classes` directory (or inside of a JAR file in `WEB-INF/lib`) so that your web application (the `ToXmlValidator` class) can find it. You can use any component you want to provide the SAX functionality that a web application needs. If you choose to use JAXP, and your web container is not yet bundled with the necessary JAXP components, then add the following JAR files to your `WEB-INF/lib` directory for a complete JAXP installation: *jaxp-api.jar*, *dom.jar*, *sax.jar*, *xalan.jar*,

xerces/impl.jar, and *xs/ltc.jar*. You can download these components as part of the Java Web Services Developer Pack (<http://java.sun.com/webservices/webservicespack.html>), and the JAXP libraries are included as part of Java 1.4.x.

Example 5-16. A DefaultHandler that grabs the filename from the custom ta attribute

```
import org.xml.sax.Attributes;
import org.xml.sax.SAXParseException;
import org.xml.sax.SAXException;
import org.xml.sax.helpers.DefaultHandler;
import javax.xml.parsers.SAXParserFactory;
import javax.xml.parsers.FactoryConfigurationError;
import javax.xml.parsers.ParserConfigurationException;
import javax.xml.parsers.SAXParser;

import java.io.IOException;

import javax.servlet.jsp.tagext.PageData;

public class ValidateHandler extends DefaultHandler {

    private String fileName = "";

    public void startElement(String namespaceuri,
        String sname, String qname, Attributes attrs){

        for(int i=0; i<attrs.getLength( );i++)
            if("filename".equals(attrs.getLocalName(i)))
                this.fileName=attrs.getValue(i);
    }

    public String getFilename(PageData page)
        throws FactoryConfigurationError, ParserConfigurationException,
            SAXException, IOException {
        try{
            SAXParserFactory factory = SAXParserFactory.newInstance( );
            factory.setNamespaceAware(true);
            SAXParser saxparser = factory.newSAXParser( );
            saxparser.parse(page.getInputStream( ),this);
        } catch (FactoryConfigurationError fe){
            throw fe;
        } catch (ParserConfigurationException pce){
            throw pce;
        } catch( SAXException se){
            throw se;
        } catch( java.io.IOException io){
            throw io;
        } finally {
            return this.fileName; }
    }
}
```

```
public void error(SAXParseException e)
    throws SAXParseException
{
    throw e;
}
}
```

Example 5-17 shows the XML view generated from the JSP page of Example 5-13 (with some carriage returns added). It might be ugly, but now you know what an XML view looks like! The HTML code is all treated as template data, enclosed in a `jsp:text` element and `CDATA` sections. The two XML elements, `jsp:root` and `t:toxml`, are given sequential ID numbers as part of their `jsp:id` attributes in the XML view. The `TagLibraryValidator` class can use these IDs to provide finely grained XML-related message involving the validated JSP page.

Example 5-17. The XML view of Example 5-13

```
<jsp:root jsp:id="0" xmlns:jsp="http://java.sun.com/JSP/Page" version="1.2"
xmlns:t="/toxml_view">
    <jsp:text><![CDATA[ ]]></jsp:text>
    <jsp:text><![CDATA[<html>]]></jsp:text>
    <jsp:text><![CDATA[<head>    ]]></jsp:text>
    <jsp:text><![CDATA[<title>Test tld]]></jsp:text>
    <jsp:text><![CDATA[</title>]]></jsp:text>
    <jsp:text><![CDATA[</head>]]></jsp:text>
    <jsp:text><![CDATA[<body bgcolor="#ffffff">Hello, this page is using the toxml tag t
        look at its XML View.]]></jsp:text>
    <t:toxml jsp:id="1" filename="my_xmlview"/>
    <jsp:text><![CDATA[ ]]></jsp:text>
    <jsp:text><![CDATA[</body>]]></jsp:text>
    <jsp:text><![CDATA[</html>]]></jsp:text>
</jsp:root>
```

See Also

Recipe 5.5 on creating a JSP from scratch as a JSP document; Chapter JSP.6 (JSP documents) of the JSP 2.0 specification; Chapter JSP.10 (XML views) of the JSP 2.0 specification.

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Chapter 6. Dynamically Including Content in Servlets and JSPs

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Introduction

Servlets and JSPs often include fragments of information that are common to an organization, such as logos, copyrights, trademarks, or navigation bars. The web application uses the include mechanisms to import the information wherever it is needed, since it is easier to change content in one place than to maintain it in every piece of code where it is used. Some of this information is static and either never or rarely changes, such as an organization's logo. In other cases, the information is more dynamic and changes often and unpredictably, such as a textual greeting that must be localized for each user. In both cases, you want to ensure that the servlet or JSP can evolve independently of its included content, and that the implementation of the servlet or JSP properly updates its included content as necessary.

This chapter recommends recipes for including content in both servlets and JSPs under several conditions:

- When the included information is refreshed every time a user makes a request.
- When the included information involves two or more nested levels—for example, when an included file in turn includes another piece of information, and so on.
- When you want to use the deployment descriptor to update the item that a servlet includes, which is a handy, less error-prone way of including content when the content is configurable and changes rather often.
- When you want to import resources into a JSP from outside the web application.

[Recipe 6.1](#) describes how to import a resource each time the servlet handles a request.

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Recipe 6.1 Including a Resource Each Time a Servlet Handles a Request

Problem

You want to include information from an external file in a servlet each time the servlet handles a request.

Solution

Use the `javax.servlet.RequestDispatcher.include(request,response)` method in the `doGet()` method of the servlet that includes the external file.

Discussion

Including the content in the `javax.servlet.http.HttpServlet's doGet()` method initiates the include mechanism whenever the web container receives a `GET` request for the servlet.

When using this design, implement the servlet's `doPost()` method to call `doGet(request,response)`.

[Example 6-1](#) shows a servlet that imports a copyright template in the `doGet()` method using the `javax.servlet.RequestDispatcher.include()` method.

Example 6-1. Including content in the HttpServlet's `init()` method

```
package com.jspervletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

public class IncludeServlet extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {
```

```

        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );

        out.println("<html>");
        out.println("<head>");
        out.println("<title>Include Servlet</title>");
        out.println("</head>");
        out.println("<body>");
        out.println("<h1>Welcome To Our Universe</h1>");
        out.println("Imagine the rest of the page here.<br><br>");
        //Include the copyright information
        RequestDispatcher dispatcher = request.getRequestDispatcher(
            "/copyright");
        dispatcher.include(request, response);

        out.println("</body>");
        out.println("</html>");
    } //doGet
}

```

[Example 6-1](#) gets a `RequestDispatcher` object by calling the `javax.servlet.ServletRequest.getRequestDispatcher()` method . The parameter to the `getRequestDispatcher()` method in this case is the servlet path to the resource that the include servlet imports: */copyright*. This path is mapped in *web.xml* to the `Copyright` servlet, which is shown in [Example 6-2](#).

Example 6-2. The imported Copyright servlet

```

public class Copyright extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        java.io.PrintWriter out = response.getWriter( );
        out.println("Copyright&copy; 2003-2004 EmbraceAndExtend Corp.");

    }
}

```

The `Copyright` servlet outputs a line of text that includes the character entity code for the copyright symbol (`©`), so that the copyright symbol is displayed correctly in the resulting HTML. When the importing servlet calls the `include()` method, the copyright text is inserted in the method call's code location.

A servlet can import an HTML page, as well as the output of a JSP page or servlet. If you are importing HTML fragments in this manner, make sure that the imported text does not break your HTML page, such as by repeating HTML tags or failing to close certain tags.

[Figure 6-1](#) shows the page generated by the `IncludeServlet` in a browser.

Figure 6-1. The `IncludeServlet`'s page in a browser



[Recipe 6.2](#) describes how to configure the imported resource in an external configuration file, such as *web.xml*.

Jason Hunter, who provided a technical review of this book, points out that many people are using an offline build process to pregenerate static (e.g., HTML) files when a lot of the site's web content uses includes, such as importing headers and footers into most of the web site's pages. In most cases, the server can handle the requests for static files much more efficiently than requests for dynamic pages (such as a JSP that includes other resources). See [Chapter 3](#), *Servlet Best Practices*, in the book *Java Enterprise Best Practices* (O'Reilly).

See Also

[Recipe 6.2](#) and [Recipe 6.3](#) on including resources in servlets; [Recipe 6.4-Recipe 6.7](#) on using `jsp:include`, the `include` directive, as well as including resources into JSP documents or XML files; Chapter SRV.14.2.5 of the Servlet 2.4 specification; Chapter JSP.5.4 on of the JSP 2.0 specification on `jsp:include`; Chapter JSP.1.10.3 of the JSP 2.0 specification on the `include` directive.

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Recipe 6.2 Using an External Configuration to Include a Resource in a Servlet

Problem

You want to use an external configuration file (such as *web.xml*) to configure the resource that is included in a servlet.

Solution

Use init parameters with the including servlet to allow the external configuration of the include mechanism, then include the resource with the

`javax.servlet.RequestDispatcher.include(request, response)` method.

Discussion

You may want to periodically change the resource that a servlet includes, without changing and recompiling the servlet code. You can make these changes by altering the servlet's init parameters in *web.xml*. Using this strategy, either the included resource's file location itself or the method of retrieving the resource (such as from a database) can change. You can ensure that the servlet imports the correct resource by altering the content of the `param-value` element. Example 6-3 shows a servlet that is configured to include a file named *privacy.jspf*. This represents a standard privacy statement for the web application.

Example 6-3. Specifying an included resource by using the servlet's init-param element

```
<servlet>
  <servlet-name>PrivacyServlet</servlet-name>
  <servlet-class>com.jspServletcookbook.IncludeServlet</servlet-class>
  <init-param>
    <param-name>included-resource</param-name>
    <param-value>privacy.jspf</param-value>
  </init-param>
</servlet>
```

Example 6-4 shows the `doGet()` method of the `PrivacyServlet`. This method gets the value of the `included-resource` init parameter (*privacy.jspf*), then includes the JSP segment.

Example 6-4. Including a resource specified by an init parameter

```
public void doGet(HttpServletRequest request,
  HttpServletResponse response) throws ServletException,
```

```

java.io.IOException {

    response.setContentType("text/html");
    java.io.PrintWriter out = response.getWriter( );

    out.println("<html>");
    out.println("<head>");
    out.println("<title>Include Servlet</title>");
    out.println("</head>");
    out.println("<body>");
    out.println("<h1>Welcome To Our Universe</h1>");
    out.println("Imagine the rest of the page here.<br><br>");
    //Include the privacy information based on an init-param value
    String includeRes = (String) getInitParameter(
        "included-resource");
    //get a RequestDispatcher object based on the init-param value
    RequestDispatcher dispatcher = request.
        getRequestDispatcher(includeRes);
    dispatcher.include(request, response);
    out.println("</body>");
    out.println("</html>");

}

```

Example 6-4 gets a `RequestDispatcher` representing the configured `init-param` value with this code:

```

//the includeRes variable holds the init-param value "privacy.jspf"
RequestDispatcher dispatcher = request.getRequestDispatcher(includeRes);

```

Then the `dispatcher.include(request,response)` method is replaced by the output of the *privacy.jsp* file. Example 6-5 shows the JSP segment that the `PrivacyServlet` includes. The JSP's content has some HTML tags that fit into the HTML represented by the including page.

Example 6-5. A JSP segment included in a servlet with a RequestDispatcher

```

<%@page errorPage="/error.jsp"%>
<p><strong>Parker River Net Solutions Privacy Policy</strong></p>
<p>Any personal information you provide to us regarding Web- or software-development
services or shareware software, such as your name, address, telephone number, and e-mail
address, will not be released, sold, or rented to any entities or individuals outside
of Parker River Net Solutions.</p>

```

Included segments or pages cannot set or change response headers, so any attempts to set the content type in an included servlet or JSP as in:

```

<%@ page contentType="text/xml" %>

```

are ignored.

All the included JSP does is specify an error page composed of some formatting-related HTML tags and text. Figure 6-2 shows the browser page for the `PrivacyServlet` .

Figure 6-2. A web page with an included JSP segment



You may also want to augment Example 6-4 to provide a default resource for inclusion in the servlet, just in case the deployment descriptor (*web.xml*) mistakenly omits an init parameter for the servlet. The method `getInitParameter` returns `null` in the event of this omission. You could test for this `null` condition and then provide a default value for the included statement.

See Also

Recipe 6.3 on including resources that have nested includes; Recipe 6.4-Recipe 6.8 on including resources in JSPs; Chapter SRV.14.2.5 of the Servlet Recipe 2.4 specification; Chapter JSP.1.10.3 of the JSP 2.0 specification on including files in JSPs.

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Recipe 6.3 Including Resources Nested at Multiple Levels in a Servlet

Problem

You want to include resources in a servlet that already include servlets, JSPs, or HTML.

Solution

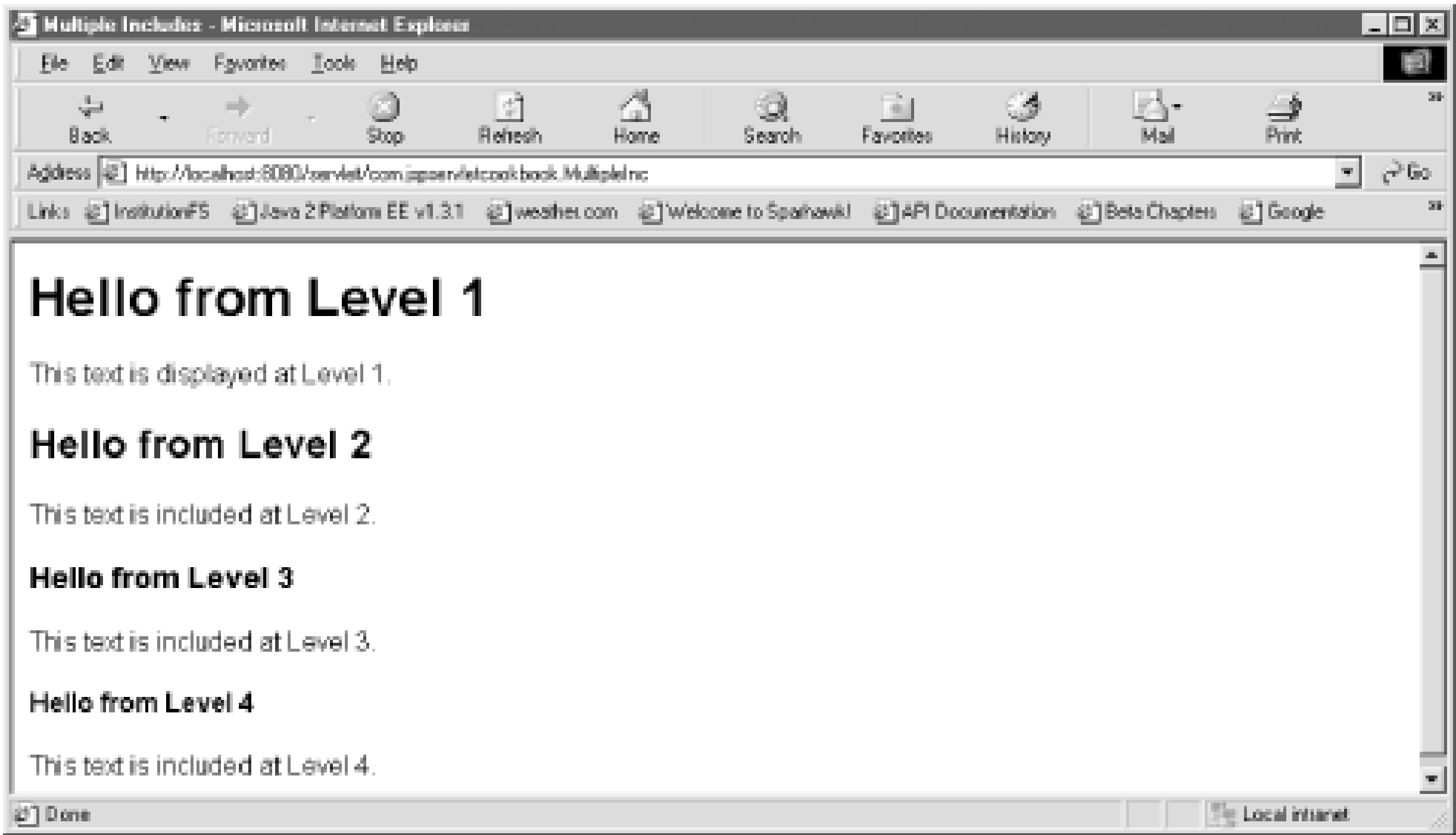
Use the `javax.servlet.RequestDispatcher.include(request,response)` method to include the top-level file. Make sure that error pages are properly configured in *web.xml*, just in case an exception is thrown in a deep-nested, imported file.

Discussion

Even though it does not represent the best architectural decision, it is possible for a servlet to include a resource that itself includes another resource, resulting in a number of inclusions taking place beneath the surface. Imagine the Russian dolls that fit inside each other. You unscrew the top half of the dolls, only to find smaller replicas of the dolls nested inside the outer ones. It is not outlandish to think of very complex web pages using HTML frame and table tags, containing headers and footers, with these segments of the page containing other specialized content using an include mechanism. One of the included files nested several levels deep could throw an exception or corrupt the chain of inclusions in some manner. Although there is no foolproof way to defend against this occurrence, for the purposes of debugging, make sure that the web application has an error page configured so that it can display information about the resource that ran into include problems.

This recipe provides an example of a servlet that has three levels of included resources. The outer servlet includes another servlet named `Level2`, which includes a JSP `level3.jsp`, which completes the picture by including the inner servlet, `Level4`. [Figure 6-3](#) shows the browser display when a user requests the `com.jspServletcookbook.MultipleInc` servlet.

Figure 6-3. Three included files in one web page



[Example 6-6](#) shows the servlet code. This servlet is responsible for the first level of text ("Hello from Level 1"), then each of the included resources contributes content to the response.

Example 6-6. The outer included servlet

```
package com.jsp.servletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

public class MultipleInc extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );

        out.println("<html>");
        out.println("<head>");
        out.println("<title>Multiple Includes</title>");
        out.println("</head>");
        out.println("<body>");
        out.println("<h1>Hello from Level 1</h1>");
        out.println("This text is displayed at Level 1.");
        RequestDispatcher dispatcher = request.
            getRequestDispatcher("/level2");
        dispatcher.include(request, response);
        out.println("</body>");
        out.println("</html>");

    }
}
```



```
}
```

The code:

```
RequestDispatcher dispatcher = request.getRequestDispatcher("/level2");
dispatcher.include(request, response);
```

includes the output of the servlet that is mapped to the servlet path */level2*, which [Example 6-7](#) shows (just the `doGet` method).

Example 6-7. The first inner included servlet

```
public void doGet(HttpServletRequest request, HttpServletResponse response) throws
ServletException, IOException {
```

```
    java.io.PrintWriter out = response.getWriter( );
    out.println("<h2>Hello from Level 2</h2>");
    out.println("This text is included at Level 2.");
    //Include the JSP file named "level3.jsp"
    try{

        RequestDispatcher dispatcher = request.getRequestDispatcher(
            "/level3.jsp");
        dispatcher.include(request, response);
    } catch (Exception se){

        String context_path = (String) request.getAttribute(
            "javax.servlet.include.context_path");

        String servlet_path = (String) request.getAttribute(
            "javax.servlet.include.servlet_path");

        String errorMessage = new StringBuffer(
            "Exception raised during Level2 servlet include:<br>").
            append("Context path: "+context_path+"<br>").
            append("Servlet path: "+servlet_path).toString( );
        throw new ServletException(errorMessage);
    }
}
```

[Example 6-7](#) writes more text to the response, then includes a */level3.jsp*, like the outer servlet, using a `javax.servlet.RequestDispatcher` object to initiate including the JSP. The `Level2` servlet does some other stuff with a `try/catch` block and `request` attributes, in order to demonstrate the handling of exceptions that may be thrown during include operations.

According to the JSP API specification, included resources have access to five request attributes:

- `javax.servlet.include.request_uri`
- `javax.servlet.include.context_path`

- `javax.servlet.include.servlet_path`
- `javax.servlet.include.path_info`
- `javax.servlet.include.query_string`

In the `catch` block, the `Level2` servlet gets the value of two of these request attributes with:

```
String context_path =
    (String) request.getAttribute("javax.servlet.include.context_path");
```

```
String servlet_path =
    (String) request.getAttribute("javax.servlet.include.servlet_path");
```

In the `catch` block, the `Level2` servlet then throws a new `ServletException` with the attribute values as part of the exception message. An error page configured for the web application displays information about the exception that was generated by the include operation.



The error-page configuration in *web.xml* looks like:

```
<error-page>
    <exception-type>
        javax.servlet.ServletException
    </exception-type>
    <location>/error</location>
</error-page>
```


where `"/error"` is mapped to a servlet that displays exception-related information.

In [Example 6-7](#), the context path was empty and the servlet path was `/level2`. [Figure 6-4](#) shows a browser displaying the error page. The servlet generating the exception is specified as the top-level servlet (`MultipleInc`) because this was the code that originated the include mechanism which resulted in the `ServletException`.

Figure 6-4. Displaying exception information caused during an include operation



[Example 6-8](#) shows the JSP file (*/eve/3.jsp*) that the first inner servlet imports. The */eve/3.jsp* file represents the second level of included content.



The included servlets do not call the `java.io.PrintWriter.close()` method, because that action would prevent the response that follows the outer servlet's include code from being sent to the client. The outer servlet (`MultipleInc` in [Example 6-6](#)) finally calls `PrintWriter.close()` when it is finished including the nested resources.

Example 6-8. The included level3.jsp JSP file

```
<%@page errorPage="/error"%>
<h3>Hello from Level 3</h3>
This text is included at Level 3.
<jsp:include page="/level4"/>
```

Finally, the JSP file uses the `jsp:include` standard action to import the text returned from a servlet that is mapped to the */level4* path. The `Level4` servlet does the same thing as the other of the recipe's servlets—it writes character data to the `PrintWriter` object—so I have not shown its source code. The reason I included it was to demonstrate how several different resource types can be nested in a chain of included files. The outer servlet includes servlet two, which includes a JSP file, which in turn includes the text returned from a third servlet. The first included servlet enclosed its own include code in a `try` block to catch any exceptions raised by including a JSP file.

See Also

[Recipe 6.1](#) on using the `RequestDispatcher` include mechanism; [Recipe 6.2](#) on determining an included resource with an configuration file; [Recipe 6.4](#)–[Recipe 6.8](#) on including resources in JSPs; Chapter SRV.14.2.5 of the Servlet [Recipe 2.4](#) proposed final specification; Chapter JSP.1.10.3 of the JSP 2.0 specification on including files in JSPs; [Chapter 9](#) on specifying errors pages in web applications.

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Recipe 6.4 Including a Resource that Seldom Changes into a JSP

Problem

You want to include a resource that does not change very much (such as a page fragment that represents a header or footer) in a JSP.

Solution

Use the `include` directive in the including JSP page, and give the included JSP segment a *.jspf* extension.

Discussion

JSP pages are often composites of page fragments that represent navigation bars, headers (page elements that appear at the top of a web page), footers (elements that appear at the bottom of a web page), and the main body content. Since pages in a web application or a site may all use the same navigation bar, this file is maintained in one place and used by all of the web components that require it. If you are going to import a JSP segment that is a static or unchanging resource, use the `include` directive in the JSP, as in:

```
<%@ include file="/WEB-INF/jspf/navbar.jspf" %>
```

If you are using a JSP document (see [Chapter 5](#)) or XML syntax for the JSP, use this form of the include directive:

```
<jsp:directive.include file="/WEB-INF/jspf/navbar.jspf" />
```

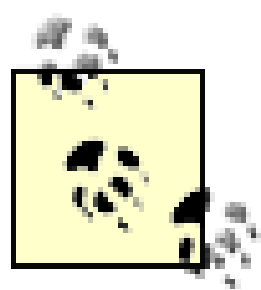
If the value of the `file` attribute begins with a `/` character, then it is a *context-relative* path, meaning that it is relative to the web application containing the JSP that uses this directive. If the JSP includes the latter directive, then this file path means "begin at the web application root and include the */WEB-INF/jspf/navbar.jspf* file."

A file attribute value in `include` that does not begin with a `/` character is a *page-relative* path, which is relative to the JSP page that is using the `include` directive. The following `include` directive attempts to include a file inside of the *segments* directory, which has the same parent directory as the including JSP:

```
<%@ include file="segments/navbar.jspf" %>
```

The `include` directive includes the text or code of the included segment during the *translation phase*,

when the JSP is converted into a servlet. The include mechanism is a more efficient way of importing the text or code that you would otherwise type into a JSP prior to its conversion to a servlet, such as HTML tags or `taglib` directives. [Example 6-9](#) shows how to use the `include` directive to import a segment of `taglib` directives into a JSP.



The difference between the `include` directive and the `jsp:include` standard action is that the `include` directive imports the actual text or bytes of the included segment, whereas the `jsp:include` standard action sends a request to the included page and then includes the dynamic response to that request. See [Recipe 6.5](#).

Example 6-9. Including a JSP segment into a JSP page at translation time

```
<%@page contentType="text/html"%>
<%@ include file="/WEB-INF/jspf/taglib-inc.jspf" %>
<html>
<head>
<title>Main Content</title>
</head>
<body>
<h1>Here is the main content</h1>
This web application is using the following Servlet API:
<c:out value="${pageContext.servletContext.majorVersion}"/>.<c:out value=
    "${pageContext.servletContext.minorVersion}"/><br><br>

    <jsp:useBean id="timeValues" class="java.util.Date"/>
    <c:set target="${timeValues}" value=
        "${pageContext.session.creationTime}" property="time"/>

    The session creation time:
    <fmt:formatDate value="${timeValues}" type="both" dateStyle=
        "medium" /><br><br>

    The toXml tag will create an XML view of this page.
    <t:toXml filename="include-xmlview"/>
</body>
</html>
```

The second line of [Example 6-9](#) includes a JSP segment named *taglib-inc.jspf*. This segment includes the `taglib` directives responsible for making available the JSTL and custom tag used in the page. [Example 6-10](#) shows the *taglib-inc.jspf* page.

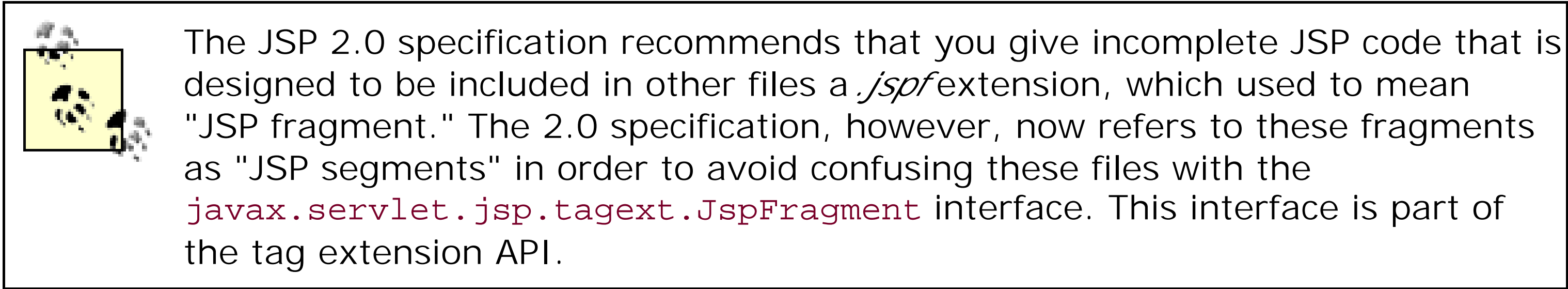
Example 6-10. A JSP segment containing taglib directives

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<%@ taglib uri="http://java.sun.com/jstl/fmt" prefix="fmt" %>
<%@ taglib uri="/toxml_view" prefix="t" %>
```

The `include` directive includes these three `taglib` directives just as if you had typed them in

yourself, then the JSP container converts the enclosing JSP into a servlet. The three `taglib` directives enable the use of the following tags in [Example 6-9](#):

- `c:out`
- `c:set`
- `fmt:formatDate`
- `t:toXml`



[Figure 6-5](#) shows what the JSP looks like in a browser window.

Figure 6-5. A JSP with an included JSP segment of taglib directives

This page displays the Servlet API used by the web container, the `javax.servlet.http.HttpSession` creation time (formatted using the `fmt:formatDate` JSTL tag), and the custom tag that is described in [Recipe 5.6](#). This tag generates an XML view of the containing page and saves a new XML file named according to its `filename` attribute. It was included to show a method of including a few different types of `taglibs`.

See Also

[Recipe 6.5](#) on using the `jsp:include` standard action; [Recipe 6.7](#) on including JSP segments in XML files; [Recipe 6.8](#) on including content from outside of a JSP's context; Chapter JSP.1.10.3 of the JSP 2.0 specification on including files in JSPs; [Chapter 23](#) on the JSTL tags.

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Recipe 6.5 Including Content in a JSP Each Time the JSP Handles a Request

Problem

You want to include content in a JSP each time it receives a request, rather than when the JSP is converted to a servlet.

Solution

Use the `jsp:include` standard action.

Discussion

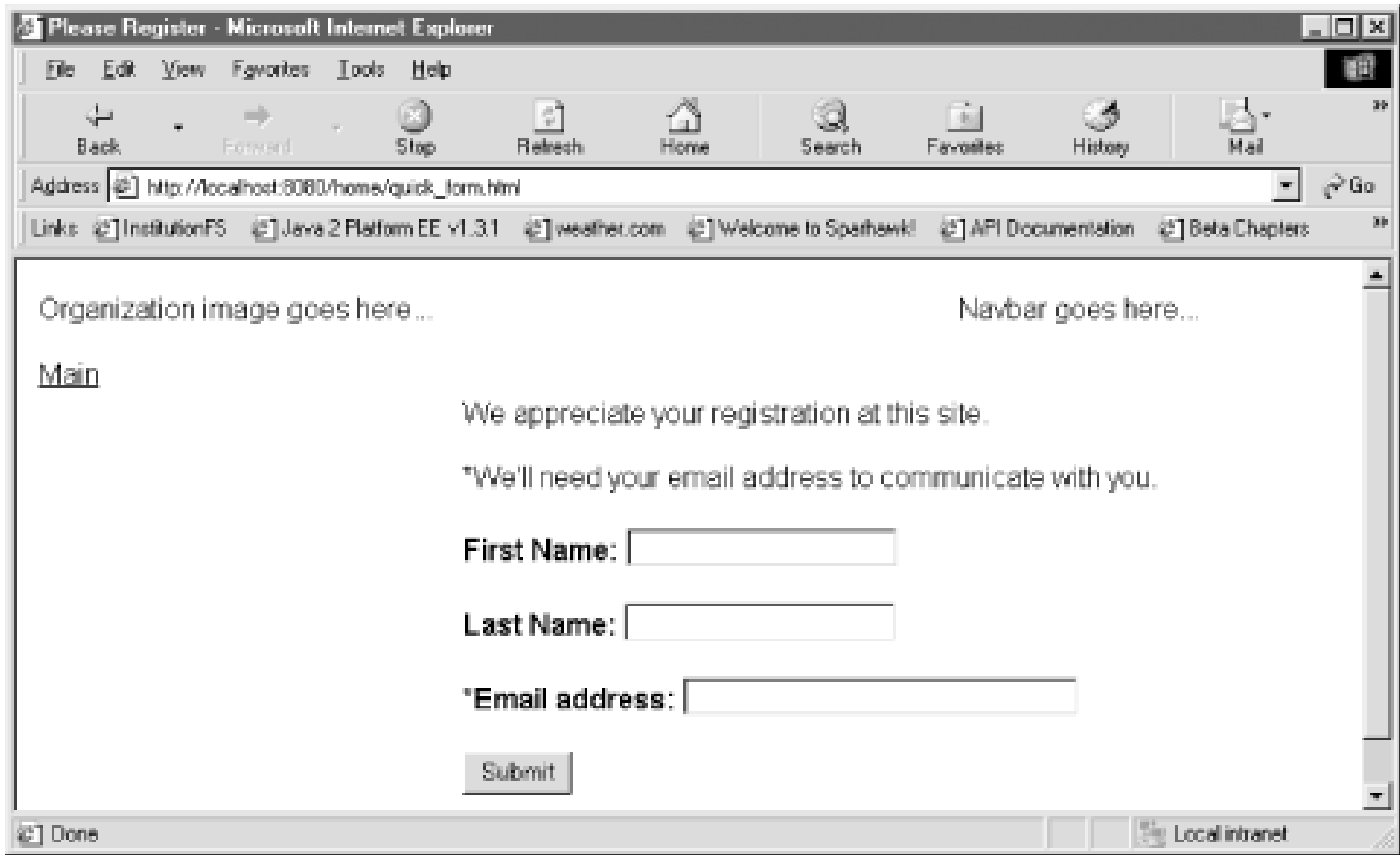
The `jsp:include` action includes a resource in a JSP each time it receives a request, which makes `jsp:include` more of a dynamic include mechanism than the `include` directive (see Recipe 6.4). Using `jsp:include` , the included JSP segments have access to the including page's `request` , `session` , and `application` implicit objects, and to any attributes these objects contain. Use the `jsp:include` action in each location of the file where you need to import resources such as JSP segments from the same web application.

The `import` custom action, which is part of the core JSTL, can import resources from other web applications or from other locations on the Internet. See Recipe 6.8 .

Example 6-10 shows a JSP page that receives submitted form information from another page in the web application. The receiving page uses `jsp:include` to include header and footer page segments at the top and bottom of the page.

Just to show that the included segments have access to the same request and session information as their parent page, the header segment displays the person's submitted name, which is stored in `fname` and `lname` request parameters, in the form of a greeting-related `title` HTML tag. The footer page element displays the session ID along with the user's submitted first and last name. First, Figure 6-6 shows an HTML page with a simple submission form for the user's first name, last name, and email address.

Figure 6-6. An HTML form



Assume that this form page includes embedded JavaScript to check the validity of the entered information. When the user clicks the Submit button, the form information is submitted with the following HTML tag to */solutions.jsp*:

```
<form method=post action="/solutions.jsp">
```

Example 6-11 shows the *solutions.jsp* page, which includes two JSP segments: *header.jspf* and *footer.jspf*. The *header.jspf* contains the contents of a `head` HTML tag, and places the user's submitted name in its nested `title` tag. The *footer.jspf* page-for the sake of demonstration-echoes the user's name and shows his session ID, which it obtains from the implicit `session` JSP object. The JSP 2.0 specification recommends that you keep these files in *WEB-INF/jspf*.

Example 6-11. Including two page segments and displaying submitted form values

```
<%@page contentType="text/html"%>
<html>

<jsp:include page="/WEB-INF/jspf/header.jspf" />

<body bgcolor="white">
<table width="660" border="0" summary="A two-column table in which resides a logo and
navigation bar">
  <tr><td valign="top">
    Organization image goes here...<p>
    <u>Main</u>
  </td>
  <td align="right" valign="top">
    Navbar goes here...
  </td></tr><tr><td valign="top" align="center" colspan="2">

  <table border="0" summary=
```

```
        "A nested table for aligning body content">
        <tr><td><h2>Thanks for registering at this site</h2></td></tr>
        <tr><td>Here is the info you submitted:</td></tr>

        <tr><td>Name:

            <%= request.getParameter("fname") %>
            <%= request.getParameter("lname") %></td></tr>

        <tr><td>Email:

            <%= request.getParameter("eaddress") %>

        </td></tr></table>

        </td></tr><tr><td></td></tr>
        </table>

<table width="660" border="0" summary=
    "A table containing a footer navigation bar.">

<tr><td valign="top" align="center">

<jsp:include page="/WEB-INF/jspf/footer.jsp" />

</td></tr>
</table>
</body>
</html>
```

Example 6-12 shows the *header.jsp* JSP segment.

Example 6-12. A JSP header segment included with jsp:include

```
<HEAD>
    <META name="author" content=
        "Bruce W. Perry, author@jspServletcookbook.com">
    <META name="keywords" content=
        "Java, JSP, servlets, databases, MySQL, Oracle, web development">
    <TITLE>Parker River: Thanks For Visiting
        <%= request.getParameter("fname") %>
        <%= request.getParameter("lname") %>
    </TITLE>
</HEAD>
```

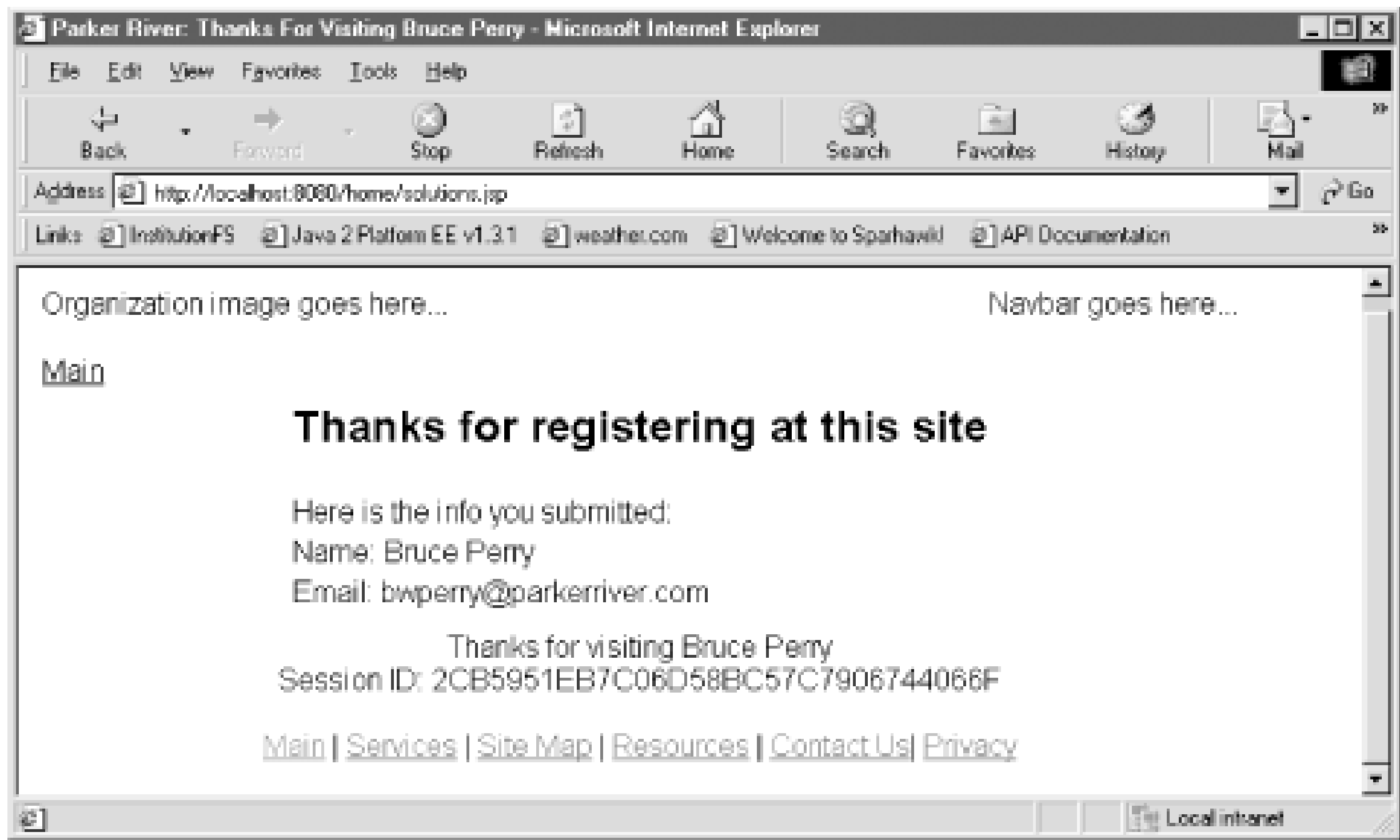
All this segment does is include the user's name in the `title` tag. Example 6-13 shows the imported *footer.jsp* segment. This segment also writes the user's name to the displayed output and adds the session ID, after checking whether the `javax.servlet.http.HttpSession` object is `null`, and before it calls the `HttpSession.getId()` method.

Example 6-13. A JSP footer segment included with jsp:include

```
Thanks for visiting
    <%= request.getParameter("fname") %>
    <%= request.getParameter("lname") %><br>
Session ID:
    <% if (request.getSession( ) != null) {%>
        <%= request.getSession( ).getId( ) %>
    <% } else {%>
        Unknown
    <% } %> <br><br>
<a href="/index.html">Main</a> | <a href="/service.html">Services</a> |
<a href="/sitemap.html">Site Map</a> |
<a href="/resources.html">Resources</a> |
<a href="/contacts.html">Contact Us</a>|
<a href="/prns_privacy.html">Privacy</a>
```

Figure 6-7 shows the *solutions.jsp* page in a web browser.

Figure 6-7. The included header and footer segments displayed in a web browser



Using `jsp:include` , changes to included files are reflected immediately in the including pages. On the other hand, if you make changes to a page that is included using the `include` directive, those changes are not reflected in the including page until you modify that page and force the JSP container to recompile it.

See Also

Recipe 6.4 on the `include` directive; Recipe 6.7 on including JSP segments in XML files; Recipe 6.8 on

including content from outside of a JSP's context; Chapter JSP.1.10.3 of the JSP 2.0 specification on including files in JSPs; Chapter 23 on the JSTL tags.

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Recipe 6.6 Using an External Configuration File to Include a Resource in a JSP

Problem

You want to include a file dynamically in a JSP, based on a value derived from a configuration file.

Solution

Use the `jsp:include` standard action. Provide the value in an external properties file or as a configuration parameter in the deployment descriptor.

Discussion

Using an external configuration to specify an include file for a JSP allows you to change the name and/or path to the included file without touching the JSP's code. In addition, when using `jsp:include` the JSP does not have to be recompiled to reflect any changes in the included file-the web resource is included by the JSP each time it handles a request. If you change the file pointed to by the configuration file, the response from the included resource is added to the including JSP's response during the next request.

The difference between a `jsp:include` standard action and `include` directive is that the `include` directive includes the bytes or contents of the imported file before the JSP is compiled (during the translation phase for the JSP). If the included segment changes, the updates will not be reflected in the JSP until the JSP itself is modified, which causes a JSP container (such as Tomcat's Jasper JSP container) to recompile the JSP.

Example 6-14 shows a JSP that uses an external properties file to specify the file to include.

Example 6-14. Using `java.util.ResourceBundle.getBundle()` to fetch an externally configured file

```
<%@page contentType="text/html"%>
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<html>


<% java.util.ResourceBundle bundle =
    java.util.ResourceBundle.getBundle("com.jspservletcookbook.include");
    String segment = bundle.getString("external-include");%>
```

```
<jsp:include page="<%=segment %>" />
```

```
<body>
<h2>Welcome to our Portal Home <c:out value="${param.fname}" /> <c:out value="${param.
lname}" /></h2>
<jsp:useBean id="dateString" class="java.util.Date"/>
The time is <c:out value="${dateString}" />.<br><br>
</body>
</html>
```

Example 6-14 includes a JSP segment that is found at the path specified by the `external-include` property. This property is written in a simple text file called *include.properties*, with content that looks like this:

```
external-include=WEB-INF/jspf/header_tag.jsp
```



The *include.properties* file is stored in *WEB-INF/classes/com/jspServletcookbook*. When your servlet or JSP attempts to access a list of property values by calling the static method

```
java.util.ResourceBundle.getBundle("com.jspServletcookbook.include") ,
```

`getBundle` automatically replaces the period "." characters with "/" and appends ".properties" to the end of the `String` (making the search look like "com/jspServletcookbook/include.properties" in our example).

The example code saves the property value in a `String` variable `segment` with the following code:

```
String segment = bundle.getString("external-include");
```

Then the value of the `segment` variable, which is a filepath, specifies the file for the JSP to include: *WEB-INF/jspf/header_tag.jsp*. This is accomplished with the JSP expression- `<%=segment %>` -in the `page` attribute value for `jsp:include`:

```
<jsp:include page="<%=segment %>" />
```

When the JSP page is executed, the included file's response is included in the part of the page where the `jsp:include` standard action occurs. Example 6-15 shows the content of the included file, *header_tag.jsp*.

Example 6-15. The content of the header_tag.jsp segment

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<HEAD>
  <META name="author" content=
    "Bruce W. Perry, author@jspServletcookbook.com">
  <META name="keywords" content=
    "Java, JSP, servlets, databases, MySQL, Oracle, web development">
  <TITLE>Parker River: Thanks For Visiting
    <c:out value="${param.fname}" />
    <c:out value="${param.lname}" />
  </TITLE>
```


</HEAD>

This is a complete **HEAD** HTML tag, including two nested **META** tags and a **TITLE** tag. If you requested the including JSP page at *http://localhost:8080/home/externalInclude.jsp?fname=Mister&lname=Bean*, the returned content from this JSP segment-the actual text that the JSP container substitutes for the **jsp:include** tag in the output-looks like Example 6-16.

Example 6-16. The output when jsp:include is used

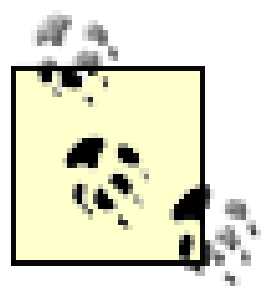
```
<HEAD>
  <META name="author" content=
    "Bruce W. Perry, author@jspServletcookbook.com">
  <META name="keywords" content=
    "Java, JSP, servlets, databases, MySQL, Oracle, web development">
  <TITLE>Parker River: Thanks For Visiting
    Mister
    Bean
  </TITLE>
</HEAD>
```

The included segment processes the request parameters **fname** and **lname** from the query string:

fname=Mister&lname=Bean

and includes their values in the **TITLE** tag. Figure 6-8 shows what the *externalInclude.jsp* page looks like in a browser.

Figure 6-8. Browser view of JSP that uses jsp:include to include another JSP segment



In this example, the included segment uses the proper `taglib` directive so that the `c:out` JSTL 1.0 tags can be used. If you are using JSTL 1.1, then the `uri` attribute value is `http://java.sun.com/jsp/jstl/core`:

```
<%@ taglib
    uri="http://java.sun.com/jstl/core"
    prefix="c" %>
```

You can also pass parameters for the included segment to process, in the manner of:

```
<jsp:include page="<%=segment %>">
    <jsp:param name="role" value="comedian"/>
</jsp:include>
```

If you want to use a context parameter in the web application's deployment descriptor instead to provide a path for the included file, add a `context-param` element to *web.xml* (as shown in Example 6-17).

Example 6-17. A context-param element provides an included file path

```
<context-param>
    <param-name>external-include</param-name>
    <param-value>WEB-INF/jspf/header_tag.jsp</param-value>
</context-param>
```

Then get the value of the context parameter in the including JSP:

```
<jsp:include page="<%=application.getInitParameter("external-include")%>" />
```

The JSP then inserts the file path *WEB-INF/jspf/header_tag.jsp* as the value for the `jsp:include page` attribute.

See Also

Recipe 6.4 on the `include` directive; Recipe 6.7 on including JSP segments in XML files; Recipe 6.8 on including content from outside of a JSP's context; Chapter JSP.1.10.3 of the JSP 2.0 specification on including files in JSPs; Chapter 23 on the JSTL tags; this web page for how the `getBundle` method returns certain types of `ResourceBundles`:

<http://java.sun.com/j2se/1.4.1/docs/api/java/util/ResourceBundle.html#getBundle> (*java.lang.String*, *java.util.Locale*, *java.lang.ClassLoader*).

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Recipe 6.7 Including an XML Fragment in a JSP Document

Problem

You want to include a fragment of an XML file inside of a JSP document, or include a JSP page in XML syntax.

Solution

Use the `jsp:include` standard action for the includes that you want to occur with each request of the JSP. Use the `jsp:directive.include` element if the include action should occur during the translation phase.

Discussion

Because a JSP document is a well-formed XML file, both of the mechanisms that you can use to include JSP segments are XML elements: `jsp:include` and `jsp:directive.include`. A JSP document is a JSP page in XML syntax, in which all of the code is well-formed XML; in other words, the entire page consists of XML elements, attributes, and the body content of some XML elements. You then take the JSP document and place it in the root of your web application (or wherever you make your JSP pages available; the root is the usual place), and the JSP container translates the XML file into a servlet. One reason for using JSP documents is to integrate the JSPs with other XML technologies, such as XHTML, SVG, or SOAP. [Recipe 5.5](#) describes JSP documents in more detail. [Example 6-18](#) shows a JSP document version of [Example 6-14](#), using `jsp:include` to include a file that is located at the path *WEB-INF/jspf/header_tag.jspf*.

Example 6-18. A JSP document using `jsp:include` to include a file

```
<jsp:root xmlns:jsp="http://java.sun.com/JSP/Page"
  xmlns:c="http://java.sun.com/jstl/core"
  xmlns="http://www.w3.org/1999/xhtml" version="2.0">

  <jsp:directive.page contentType="text/html"/>
  <html>

    <jsp:include page="WEB-INF/jspf/header_tag.jspf" />

    <body>
      <h2>Welcome to our Portal <c:out value="
```



```
        ${param.fname}" /><jsp:text> </jsp:text>
        <c:out value="${param.lname}" /></h2>
<jsp:useBean id="dateString" class="java.util.Date"/>
<jsp:text>The time is </jsp:text> <c:out value="${dateString}" />.
<br /><br />
</body>
</html>
</jsp:root>
```

In [Example 6-18](#), the JSP page includes the text that is returned by *header_tag.jspf*. Using `jsp:include`, the included file does not have to be well-formed XML *itself*, as long as it returns text that is well-formed XML and fits correctly into the JSP document.



The JSP 2.0 specification recommends that JSP segments that you include in JSP pages or JSP documents be given a *.jspf* extension. In addition, one way to differentiate JSP documents from conventional JSP pages is to give the JSP documents a *.jspx* extension (when using the Servlet 2.4 version of *web.xml*). Tomcat 4.1.x will compile and execute as JSP pages the files with these extensions if you add these `servlet-mapping` elements to *conf/web.xml*.

```
<servlet-mapping>
    <servlet-name>jsp</servlet-name>
    <url-pattern>*.jspf</url-pattern>
</servlet-mapping>
<servlet-mapping>
    <servlet-name>jsp</servlet-name>
    <url-pattern>*.jspx</url-pattern>
</servlet-mapping>
```

[Example 6-19](#) shows the included file *header_tag.jspf*. It has its own `taglib` directive so that the JSTL-related tags inside the `TITLE` tags produce the proper output from the request parameters `fname` and `lname`. The comment at the bottom of [Example 6-18](#) shows the text that is returned from this JSP segment, using `jsp:include`, when the enclosing JSP page is requested from *http://localhost:8080/home/x617jspx?fname=Bruce&lname=Perry*.

Example 6-19. The included file header_tag.jspf

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<HEAD>
    <META name="author" content=
        "Bruce W. Perry, author@jspServletcookbook.com"/>
    <META name="keywords" content=
        "Java, JSP, servlets, databases, MySQL, Oracle, web development"/>
    <TITLE>Parker River: Thanks For Visiting
        <c:out value="${param.fname}"/> <c:out value="${param.lname}"/>
    </TITLE>
</HEAD>
<!-- source text returned from header_tag.jspf

<HEAD>
```

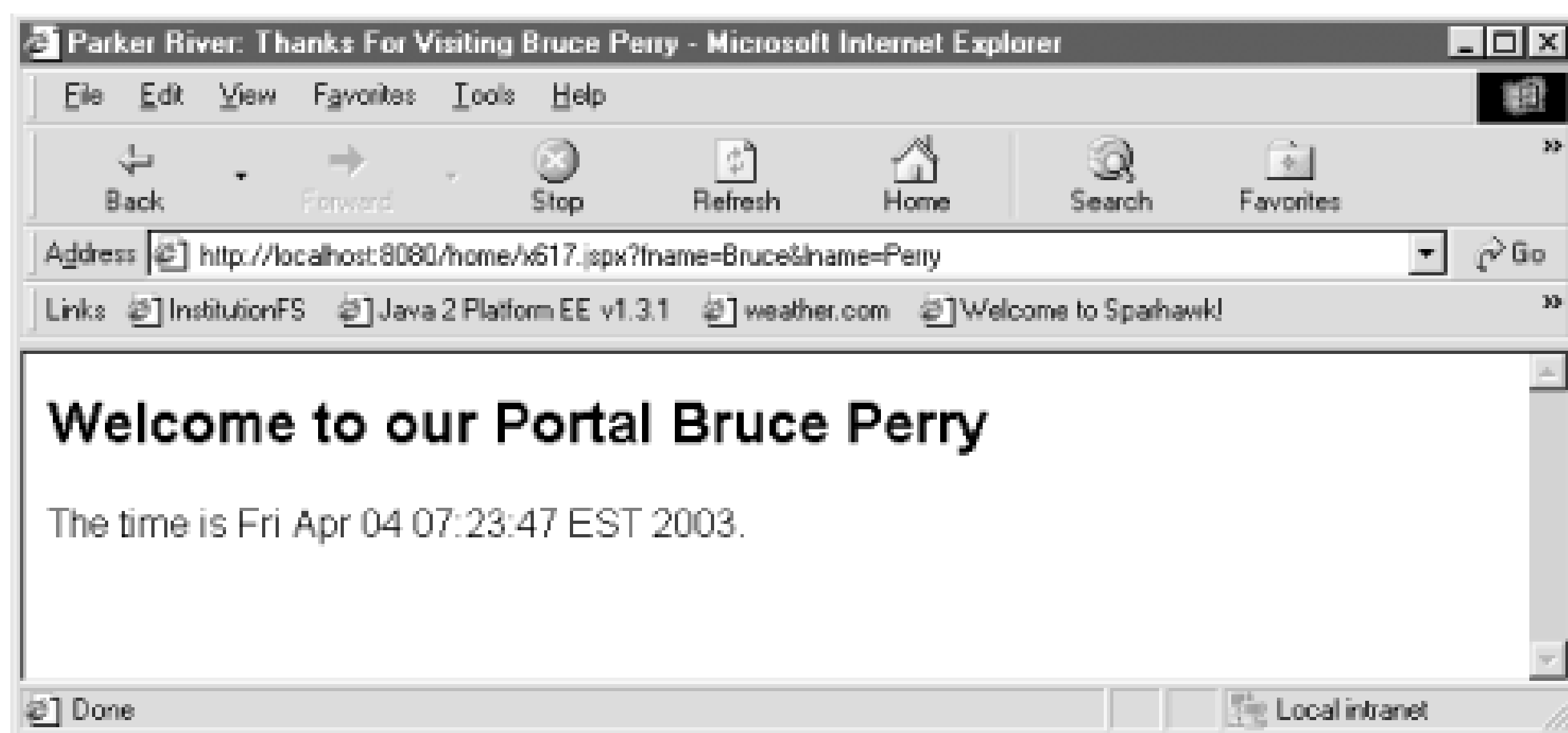
```

<META name="author" content=
    "Bruce W. Perry, author@jspervletcookbook.com"/>
<META name="keywords" content=
    "Java, JSP, servlets, databases, MySQL, Oracle, web development"/>
<TITLE>Parker River: Thanks For Visiting
    Bruce Perry
</TITLE>
</HEAD> -->

```

[Figure 6-9](#) shows what the complete document looks like in a browser.

Figure 6-9. A JSP document displayed in a browser



You can also use the `jsp:directive.include` element, which includes the content before the JSP document is converted into a servlet, rather than at runtime as with `jsp:include`. To convert [Example 6-17](#) to use an `include` directive, replace the `jsp:include` element with:

```
<jsp:directive.include file="WEB-INF/jspf/header_tag.jspf" />
```

The included content cannot have any non-XML syntax forms, such as a JSP `taglib` directive, because the included code is included verbatim into the JSP document when it is converted into a servlet.

An alternative approach is to use CDATA sections in the XML to attempt to preserve the words and symbols that would otherwise cause the XML file to fail the well-formed test. The CDATA sections look like `<![CDATA[...]]>`.

You would have to remove the `tag-lib` directive from the top of [Example 6-19](#) for the JSP to compile correctly using `jsp:directive.include`. In addition, the `c:out` tags inside of the included segment would then be dependent on the inclusion in the enclosing JSP document of an `xmlns` attribute to make the core JSTL elements available, as in the top of [Example 6-18](#).



A rule of thumb to use with the two include mechanisms is that if the included segment will change frequently and the enclosing JSP page must immediately reflect those changes, use `jsp:include` . If the included segment is relatively static and unchanging, use `jsp:directive.include`.

See Also

[Recipe 6.4](#) on the `include` directive; [Recipe 6.5](#) on the `jsp:include` standard action; [Recipe 6.8](#) on including content from outside of a JSP's context; Chapter JSP.1.10.3 of the JSP 2.0 specification on including files in JSPs; [Chapter 23](#) on the JSTL tags.

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Recipe 6.8 Including Content from Outside a Context in a JSP

Problem

You want to include a JSP segment from outside the including file's context.

Solution

Use the `c:import` JSTL core tag.

Discussion

The `c:import` tag gives JSP page authors much flexibility in pulling in resources from inside *and* outside their web application. The `c:import` tag allows a page to import web resources:

- From outside JSP's web container, using an absolute URL (such as *`http://java.sun.com/api`*).
- From another context in the same web container. For example, your domain may include a central repository of included content at *`http://www.mydomain.com/warehouse`*. A JSP page that is installed in a context named *`/customer`* could import a resource from the *`/warehouse`* context by using: `<c:import url="/catalog_header.jspf" context="/warehouse" />`
- From the same context, similar to using `jsp:include`.

This recipe includes examples of importing resources from outside the importing JSP's context. [Example 6-19](#) imports a JSP segment *`header_tag.jsp`* from the *`/dbproj`* context. The `url` attribute specifies the resource to include; the `context` attribute declares the context from which the JSP imports the resource. To use the `c:import` tag, the JSP has to include a `taglib` directive such as:

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
```

[Example 6-20](#) includes a group of `taglibs` by inserting the *`taglib-inc.jspf`* JSP segment in the second line.

Example 6-20. Using the `c:import` tag to import an external URL

```
<%@page contentType="text/html"%>
<%@ include file="/WEB-INF/jspf/taglib-inc.jspf" %>
<html>
```

```

<c:import url="/header_tag.jspf" context="/dbproj" />

<body>
<h2>Welcome to our Portal <c:out value=
    "${param.fname}" /> <c:out value="${param.lname}" />
</h2>
<jsp:useBean id="dateString" class="java.util.Date"/>
The time is <c:out value="${dateString}" />.
<br /><br />
</body>
</html>

```

The `c:import` tag inserts the text generated by `/dbproj/header_tag.jsp` in the part of the code where the `c:import` tag is located. The `/dbproj` context path represents a different web application or context than the importing JSP. The top of the importing page now looks like the following text, since this is the HTML that the imported file produces:

```

<html>
<HEAD>
    <META name="author" content=
        "Bruce W. Perry, author@jspServletcookbook.com"/>
    <META name="keywords" content=
        "Java, JSP, servlets, databases, MySQL, Oracle, web development"/>
    <TITLE>Parker River: Thanks For Visiting
        Mister Bean
    </TITLE>
</HEAD>
<body>
<!-- page continues from here... -->

```

Using Tomcat, the `context` element in `conf/server.xml` has to include this attribute/value pair or the JSP that uses `c:import` will raise an exception if it attempts to import resources from another context:

```
crossContext="true" <!--"false" by default-->
```

[Example 6-21](#) imports a description of the HTTP/1.1 protocol, Request For Comments (RFC) 2068.

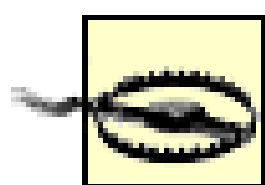
The example declares its content type as "text/plain," so that the browser does not try to display the text file as HTML, which can be unreadable with plaintext files. Then [Example 6-21](#) uses a `taglib` directive so that the JSP can use the `c:import` tag. The `c:import` tag specifies the location of the imported text file as an absolute URL: <http://www.ietf.org/rfc/rfc2068.txt>.

Example 6-21. Using `c:import` to import a text resource whose address is an absolute URL

```

<%@page contentType="text/plain"%>
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
    <c:import url="http://www.ietf.org/rfc/rfc2068.txt" />

```



If a JSP uses `c:import` to access a forbidden resource (which will cause the receiving server to respond with a HTTP status code 403), the `c:import` tag throw an exception and the JSP compilation will fail.

You can also include parameters with `c:import` using nested `c:param` tags. [Example 6-22](#) imports a file *header_tag.jspf*, and makes available two request parameters for that file to process: `fname` and `lname`. The `taglib` directive at the top of [Example 6-22](#) allows the use of the `c:import` and `c:param` tags later on in the code.

Example 6-22. Including parameter values using `c:param`

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<html>
<c:import url="WEB-INF/jspf/header_tag.jspf" >
    <c:param name="fname" value="Mister"/>
    <c:param name="lname" value="Bean"/>
</c:import>
<body>
<h2>The rest of the page goes here ...</h2>
</body>
</html>
```

The *header_tag.jspf* file takes the values of the two parameters and adds them to the `TITLE` tag's greeting. [Example 6-23](#) shows the HTML that results from this import action.

Example 6-23. Request parameter values are reflected in the HTML output

```
<html>
<HEAD>
    <META name="author" content=
        "Bruce W. Perry, author@jspServletcookbook.com"/>
    <META name="keywords" content=
        "Java, JSP, servlets, databases, MySQL, Oracle, web development"/>
    <TITLE>Parker River: Thanks For Visiting
        Mister Bean
    </TITLE>
</HEAD>
<body>
<h2>The rest of the page goes here ...</h2>
</body>
</html>
```

See Also

[Recipe 6.1](#)-[Recipe 6.3](#) on including resources in servlets; [Recipe 6.4](#)-[Recipe 6.7](#) on using `jsp:include`, the `include` directive, and including resources in JSP documents or XML files; [Chapter 23](#) on Using the JSTL 1.0; Chapter JSP.5.4 of the JSP 2.0 specification on `jsp:include`; Chapter

JSP.1.10.3 of the JSP 2.0 specification on the `include` directive.

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Chapter 7. Handling Web Form Data in Servlets and JSPs

[Introduction](#)

[Recipe 7.1. Handling a POST HTTP Request in a Servlet](#)

[Recipe 7.2. Handling a POST HTTP Request in a JSP](#)

[Recipe 7.3. Setting the Properties of a JavaBean in a JSP](#)

[Recipe 7.4. Setting a Scoped Attribute in a JSP to the Value of a Form Parameter](#)

[Recipe 7.5. Posting Data from a Servlet](#)

[Recipe 7.6. Posting Data from a JSP](#)

[Recipe 7.7. Using a Servlet to Add a Parameter to a Query String](#)

[Recipe 7.8. Using a JSP to Add a Parameter to a Query String](#)

[Recipe 7.9. Using a Filter to Read Parameter Values](#)

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Introduction

Every web developer is familiar with the scenario in which a client fills out anHTML form and then submits the inserted information to a server-side program for processing. Some of these programs use the HTTP request method **POST** to deliver the data to the server-side program. The **POST** method sends the data to the server in the body of the request, rather than as a query string appended to a URL (as in the **GET** method). For example, consider the HTML **form** tag in [Example 7-1](#).

Example 7-1. HTML form tag set up for posting data

```
<form method=POST action="/project/controller">

<b>User Name:</b> <input type="text" name="username"
size="20">  <br><br>

<b>Department:</b> <input type="text" name="department"
size="15"><br><br>

<b>Email:</b> <input type="text" name="email"
size="15"><br><br>

<input type="submit" value="Submit">

</form>
```

When the client submits this form information, the top of the client's request text looks like this:

```
POST /project/controller HTTP/1.1
Accept: image/gif, image/x-xbitmap, image/jpeg, image/pjpeg, application/msword,
application/vnd.ms-powerpoint, application/vnd.ms-excel, application/pdf, */*
Referer: http://localhost:8080/project/login.jsp
Accept-Language: en-us
Content-Type: application/x-www-form-urlencoded
```

Beneath this text, after a few more headers, the body of the request carries the submitted data:

```
username=Bruce+W+Perry&password=bw_p1968
```

JSPs and servlets make parsing the **POST** data quite transparent for the developer. This is the topic of the next few recipes. We then discuss how to use servlets and JSPs to post data so that they essentially play the role of client, instead of acting as a server-side program.

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Recipe 7.1 Handling a POST HTTP Request in a Servlet

Problem

You want to process data that is part of a `POST` request.

Solution

Use the `ServletRequest.getParameter(String name)`, `getParameterMap()`, `getParameterNames()`, or `getParameterValues(String name)` methods in the servlet's `doPost` method.

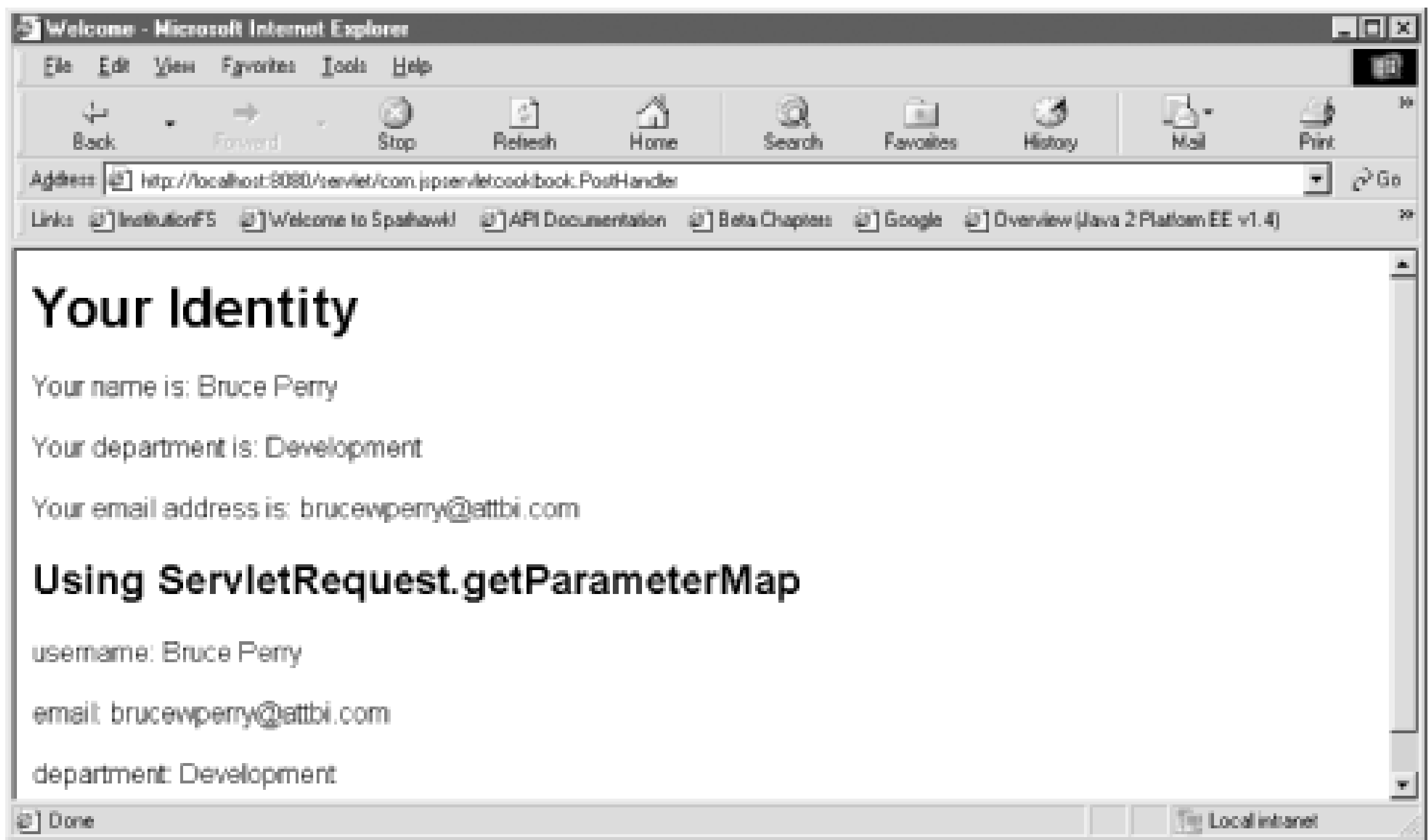
Discussion

The `service` method of a servlet calls the servlet's `doPost` method when a client sends a `POST` HTTP request. The servlet developer then has four different methods she can call to gain access to the posted data, which makes it pretty easy to process these requests. Just in case a client application uses a `GET` method to send the servlet its data as a query string, the servlet should also call:

```
doPost(request, response);
```

in the servlet's `doGet()` method. Example 7-2 demonstrates handling `POST` data with the oft-used `getParameter(String name)` method, as well as with the `getParameterMap()` method, which returns a `java.util.Map`. The map contains parameter keys and values. The `getParameterNames()` method returns a `java.util.Enumeration` of the parameter names. You can iterate through this `Enumeration` and pass the values to `getParameter(String name)`. Another `ServletRequest` method, `getParameterValues(String name)`, returns a `String` array of all the posted values for that parameter name (if there is only one value, the returned array contains one `String`). Figure 7-1 shows the browser display of the `PostHandler` servlet after a user has submitted the form in Example 7-1.

Figure 7-1. Servlet displays name/value pairs from posted form input



Example 7-2. Using the `ServletRequest.getParameter` and `getParameterMap` methods to handle posted data

```
import javax.servlet.*;
import javax.servlet.http.*;
import java.util.Map;
import java.util.Iterator;
import java.util.Map.Entry;

public class PostHandler extends HttpServlet {

    public void doPost(HttpServletRequest request, HttpServletResponse response) throws
ServletException, java.io.IOException {

    /* Use the ServletRequest.getParameter(String name), getParameterMap( ),
getParameterNames( ), or getParameterValues( ) methods in the servlet's doPost method*/

        String name = request.getParameter("username");
        String depart = request.getParameter("department");
        String email = request.getParameter("email");

        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );

        out.println("<html>");
        out.println("<head>");
        out.println("<title>Welcome</title>");
        out.println("</head>");
        out.println("<body>");
        out.println("<h1>Your Identity</h1>");

        out.println(
            "Your name is: " + ( (name == null || name.equals("")) ?
```

```

        "Unknown" : name));

out.println(" <br><br>");

out.println(
    "Your department is: " + ( (depart == null || depart.equals("")) ?
        "Unknown" : depart));

    out.println(" <br><br>");

out.println(
    "Your email address is: " + ( (email == null ||
        email.equals("")) ? "Unknown" : email));

out.println(" <h2>Using ServletRequest.getParameterMap</h2>");

Map param_map = request.getParameterMap( );

if (param_map == null)
    throw new ServletException(
        "getParameterMap returned null in: " +
        getClass( ).getName( ));

//iterate through the java.util.Map and display posted parameter
//values
//the keys of the Map.Entry objects are type String; the values are
//type String[],
//or String array

Iterator iterator = param_map.entrySet( ).iterator( );
while(iterator.hasNext( )){
    Map.Entry me = (Map.Entry)iterator.next( );
    out.println(me.getKey( ) + ": ");
    String[] arr = (String[]) me.getValue( );

    for(int i=0;i<arr.length;i++){
        out.println(arr[i]);
        //print commas after multiple values,
        //except for the last one
        if (i > 0 && i != arr.length-1)
            out.println(", ");
    }//end for

    out.println(" <br><br>");
} //end while

out.println("</body>");
out.println("</html>");

}

public void doGet(HttpServletRequest request, HttpServletResponse response)

```



```

        throws ServletException, java.io.IOException {

        doPost(request,response);
    }
}

```

Getting the value of a parameter is as simple as using `request.getParameter(parametername)`. Then you can test for the failure to return a valid value with code from Example 7-2:

```

out.println("Your name is: " +
    ( (name == null || name.equals("")) ? "Unknown" : name));

```

If the `name` variable is an empty `String` or `null`, then the servlet prints "Unknown"; otherwise, it prints the `name` value. There are several design patterns you can use for validating form input, including client-side JavaScript and special validation JavaBeans.

Handling the `java.util.Map` type is more involved and entails more code. The servlet gets the parameter map by calling the `ServletRequest` method:

```

Map param_map = request.getParameterMap( )

```

Then the code gets a `java.util.Iterator` from the `java.util.Set` returned from `Map.entrySet()`. The `Set` contains `Map.Entry` objects, which are key/value pairs representing the parameter name and value. The servlet uses the iterator to cycle through the parameter names and values:

```

Iterator iterator = param_map.entrySet( ).iterator( );

```

```

while(iterator.hasNext( )){

    Map.Entry me = (Map.Entry)iterator.next( );
    out.println(me.getKey( ) + ": ");

    // The returned value is a String array
    String[] arr = (String[]) me.getValue( );

    for(int i=0;i<arr.length;i++){

        out.println(arr[i]);

        //print commas after multiple values,
        //except for the last one
        if (i > 0 && i != arr.length-1)
            out.println(", ");

    } //end for

    out.println("<br><br>");
} //end while

```

If this looks too elaborate for processing posted data, then reserve `getParameterMap()` for applications that are designed to deal with them, such as a validator bean that takes a `Map` as a constructor or method parameter. In addition, Recipe 7.2 shows a JSP that uses JSTL to conveniently process a parameter map.

See Also

Recipe 7.2 on handling a `POST` request in a JSP; Recipe 7.5 on posting data from a servlet; Recipe 7.7 on using a servlet to add a parameter to a query string; the `ServletRequest` API docs at <http://java.sun.com/j2ee/1.4/docs/api/index.html> .

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Recipe 7.2 Handling a POST HTTP Request in a JSP

Problem

You want to have a JSP handle the data posted from a form or client application.

Solution

Use the JSTL `c:forEach` tag to iterate over the parameter names and values.

Discussion

The JSTL makes it very easy to process input data from a `POST` method. The JSP in [Example 7-3](#) uses only template text and JSTL tags to display posted information. The `c:forEach` tag iterates over the posted data using the implicit JSTL object `param`. The `param` object contains `java.util.Map.Entry` types, which each hold a key/value pair. The key and value correspond to the name of a submitted parameter and its value, such as "department=Development." Using the Expression Language (EL), the syntax "`${map_entry.key}`" or "`${map_entry.value}`" is the equivalent of calling the `Map.Entry.getKey()` and `getValue()` methods. The return values of these method calls are fed to the `c:out` JSTL tag for display in the HTML page. [Figure 7-2](#) shows what the browser page looks like if the form submitted to the JSP is the one detailed in [Example 7-1](#). With your `taglib`, use a `uri` value of `http://java.sun.com/jsp/jstl/core` for JSTL 1.1.

Example 7-3. Iterating posted data with the JSTL


```
<%@page contentType="text/html"%>
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<html>
<head><title>Post Data Viewer</title></head>
<body>
<h2>Here is your posted data</h2>

<c:forEach var="map_entry" items="${param}">
    <strong><c:out value="${map_entry.key}" /></strong>:
    <c:out value="${map_entry.value}" /><br><br>
</c:forEach>

</body>
</html>
```

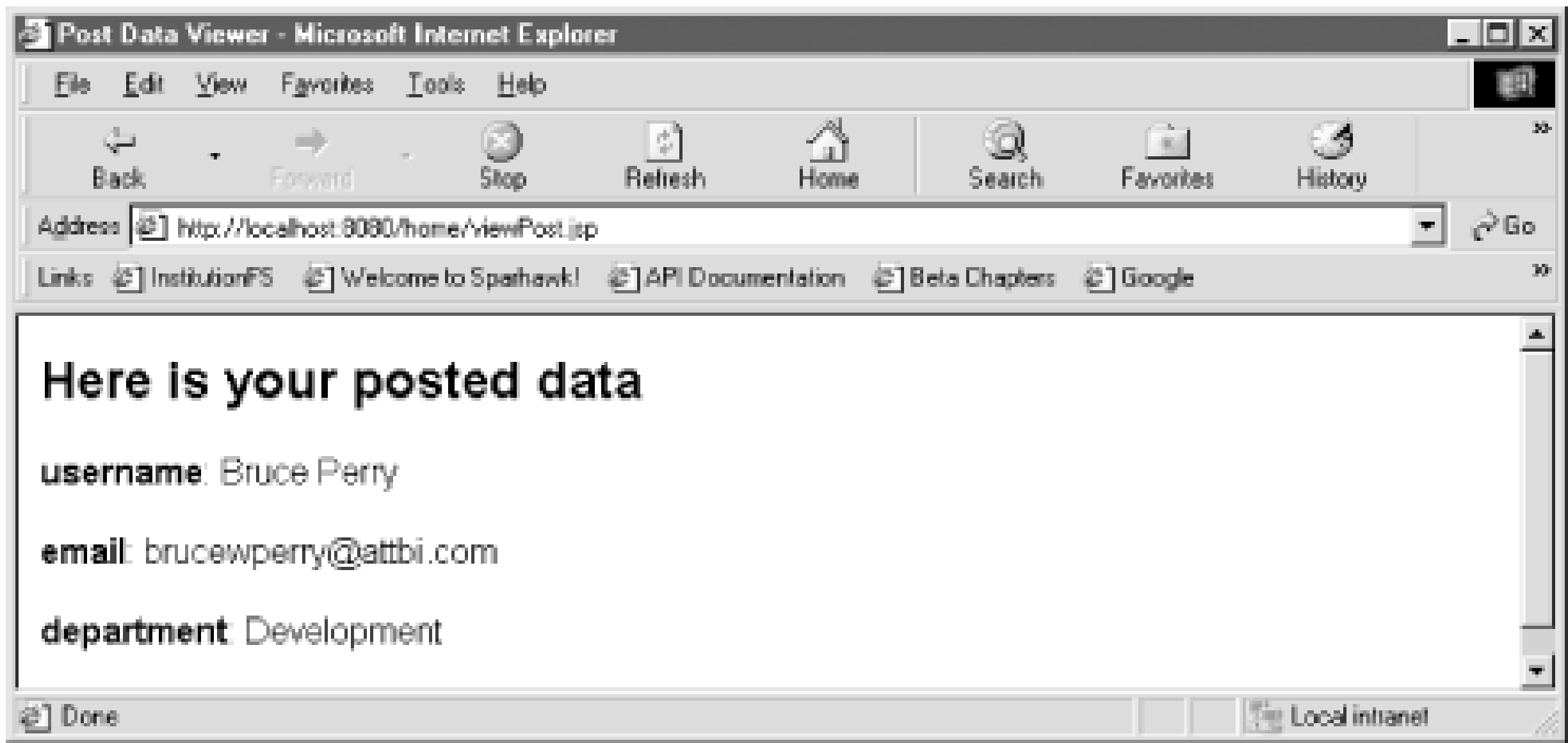
Make sure to include the `taglib` directive when you are using the JSTL tags. The `taglib` in [Example](#)

[7-3](#) takes care of any of the custom tags with the "c" prefix, as in `c:forEach`.



[Chapter 23](#) explains how to install the JSTL in your web application, make different custom tags, and use the EL.

Figure 7-2. A JSP displaying posted name/value pairs



If you want to get the values of parameters without using a `c:forEach` tag, then use the code fragment in [Example 7-4](#). This code displays the values of parameters when the parameter names are known by the developer (which is usually the case).

Example 7-4. Displaying individual parameter values using `c:out`

```
<h2>Here is your posted data</h2>
<strong>User name:</strong>: <c:out value="\${param.username}"/>

<br><br>
<strong>Department:</strong>: <c:out value="\${param.department}"/>
<strong>Email:</strong>: <c:out value="\${param.email}"/>
```

Substituting this code into the JSP produces the same results as those shown [Figure 7-2](#).

The JSP 2.0 specification is designed to allow the use of the EL in template text-in other words, without the `c:out` JSTL tag.

See Also

[Recipe 7.2](#) on handling a `POST` request in a JSP; [Recipe 7.3](#) on setting the properties of a JavaBean to form input; [Recipe 7.4](#) on setting a scoped attribute to the value of a parameter; [Recipe 7.6](#) on

posting data from a JSP; [Chapter 23](#) on using the JSTL.

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Recipe 7.3 Setting the Properties of a JavaBean in a JSP

Problem

You want to set a JavaBean's properties to the values entered in a form.

Solution

Use the `jsp:setProperty` standard action, with its `property` attribute set to "*" and its `class` attribute set to the fully qualified class name of the JavaBean.

Discussion

The `jsp:setProperty` standard action has a built-in method for automatically mapping the values submitted in a form to a JavaBean's fields or variables. The names of the submitted parameters have to correspond to the names of the JavaBean's setter methods. [Example 7-5](#) shows a *setBean.jsp* page that receives data from an HTML form:

```
<form method=post action="http://localhost:8080/home/setBean.jsp">
```

The JSP first instantiates an object of the type `com.jspServletcookbook.UserBean` using `jsp:useBean`. Then it sets the properties of the bean using `jsp:setProperty`. The `name` attribute of `jsp:setProperty` matches the `id` attribute of `jsp:useBean`. The `property` attribute of `jsp:setProperty` is simply set to "*".

Example 7-5. beanSet.jsp JSP that sets the UserBean's properties with form input

```
<%@page contentType="text/html"%>
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<jsp:useBean id="userB" class="com.jspServletcookbook.UserBean" >

<jsp:setProperty name="userB" property="*" />

</jsp:useBean>
<html>
<head><title>Post Data Viewer</title></head>
<body>
<h2>Here is your posted data</h2>
```



```
<strong>User name</strong>:
<c:out value="\${userB.username}" /><br><br>

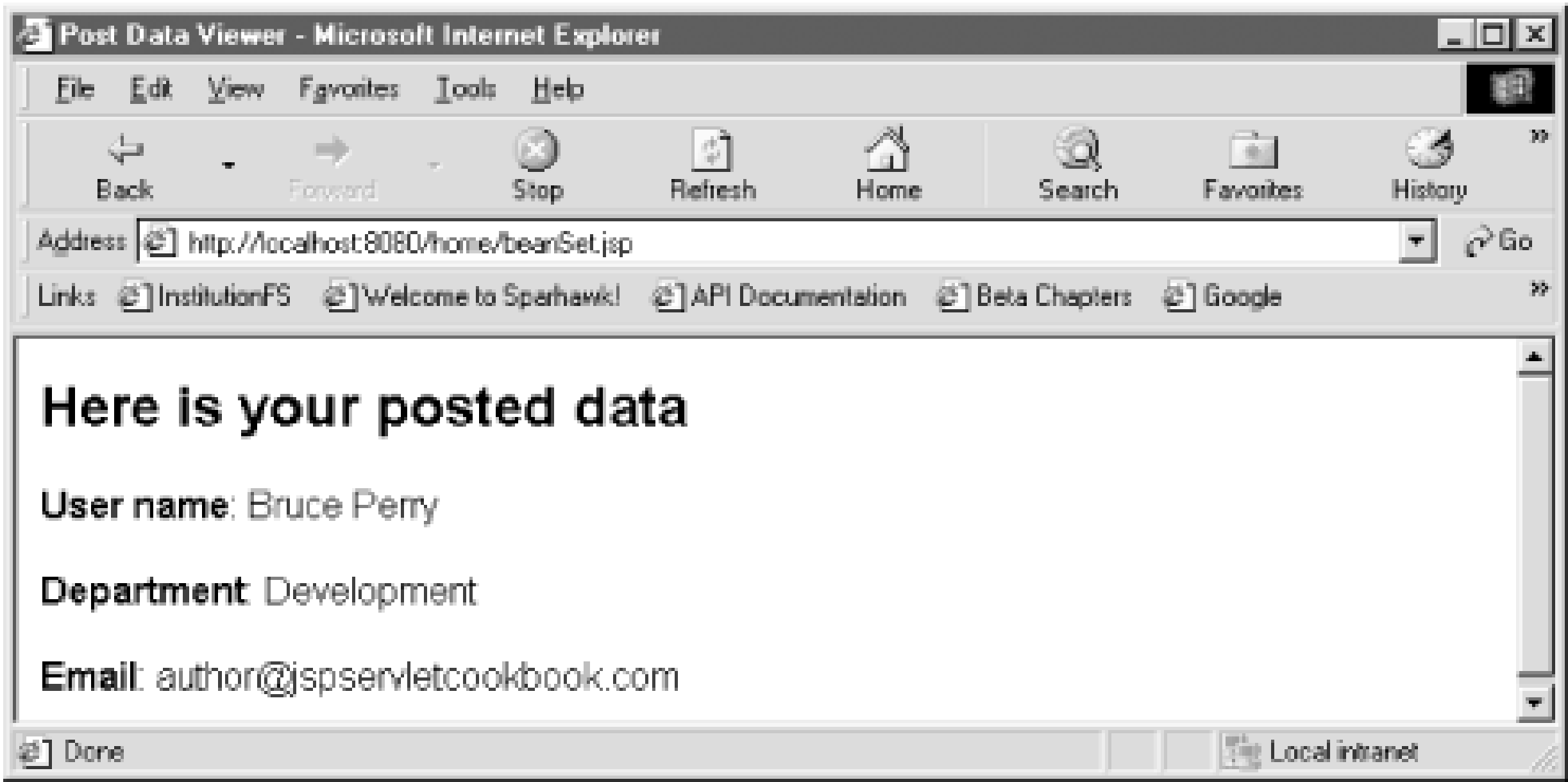
<strong>Department</strong>:
<c:out value="\${userB.department}" /><br><br>

<strong>Email</strong>:
<c:out value="\${userB.email}" />

</body>
</html>
```

[Example 7-5](#) uses the `c:out` element of the JSTL to display the bean's various values in a browser page. The `value` attribute of `c:out` uses the EL to acquire a property value, as in `"\${userB.email}"`. This syntax is the equivalent of calling the `UserBean`'s `getEmail()` method. [Example 7-6](#) shows the `UserBean`, which uses the JavaBean naming conventions to ensure that its properties can be properly set and accessed. [Figure 7-3](#) shows the browser display of the values.

Figure 7-3. Displaying form input via a JavaBean



The `jsp:setProperty` action, as used in this recipe, sets the JavaBean's properties by using introspection to line up parameter names with the bean's setter methods. If the bean has a field named "Username," then the parameter name must be exactly "Username" and the setter method must be exactly `setUsername(String name)` (if the bean's field is a `String`). Watch out, it's case-sensitive!

Example 7-6. Encapsulating the posted data in a JavaBean

```
package com.jspServletcookbook;

public class UserBean implements java.io.Serializable{
```

```
String username;
String email;
String department;

public UserBean( ){}

public void setUsername(String _username){

    if(_username != null && _username.length( ) > 0)
        username = _username;
    else
        username = "Unknown";
}

public String getUsername( ){

    if(username != null)
        return username;
    else
        return "Unknown";}

public void setEmail(String _email){

    if(_email != null && _email.length( ) > 0)
        email = _email;
    else
        email = "Unknown";
}

public String getEmail( ){

    if(_email != null)
        return email;
    else
        return "Unknown";}

public void setDepartment(String _department){

    if(_department != null && _department.length( ) > 0)
        department = _department;
    else
        department = "Unknown";
}

public String getDepartment( ){

    if(department != null)
        return department;
    else
        return "Unknown"; }

}
```

[Recipe 7.4](#) shows how to use a bean to validate form input, then set a scoped attribute to the input.

See Also

[Recipe 7.2](#) on handling a `POST` request in a JSP; [Recipe 7.4](#) on setting a scoped attribute to the value of a parameter; [Recipe 7.6](#) on posting data from a JSP; [Chapter 23](#) on using the JSTL.

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Recipe 7.4 Setting a Scoped Attribute in a JSP to the Value of a Form Parameter

Problem

You want to set a request-, session-, or application-scoped attribute to a value that a client has submitted as part of form input.

Solution

Use the `jsp:useBean` and `jsp:setProperty` standard actions to set a JavaBean's property to the submitted value. Then use the `c:set` JSTL custom tag to set the attribute to the validated value.

Discussion

Some web applications may validate form input such as an email/password combination, then set a request-, session-, or application-scoped attribute to the validated value. An efficient way to handle important data that a user submits is to use a JavaBean whose purpose is to validate the submission against some business rule or external resource, such as a database. If the submission is valid, then the application creates a session attribute, for instance, with the value. If the submission is invalid, then a `boolean` variable in the JavaBean is set to `false`. The JSP to which the form input is sent can check this value before it handles the data as valid.

[Example 7-7](#) shows a `ClientValidator` bean that has three fields: `email`, `password`, and `valid`. This bean is used by a JSP to validate form input before the JSP sets request-scoped attributes to the submitted values.

Example 7-7. The ClientValidator bean

```
package com.jspServletcookbook;

public class ClientValidator implements java.io.Serializable{

    String email;
    String password;
    boolean valid;

    public ClientValidator( ){

        this.valid=false;
    }
}
```

```

public boolean isValid( ){

    /* Use a Data Access Object to validate the email and password.
       If the validation does not fail, then set this.valid to true*/

    this.valid=true;
    return valid;

}

public void setEmail(String _email){

    if(_email != null && _email.length( ) > 0)
        email = _email;
    else
        email = "Unknown";
}

public String getEmail( ){

    return email;
}

public void setPassword(String _password){

    if(_password != null && _password.length( ) > 0)

        password = _password;

    else

        password = "Unknown";
}

public String getPassword( ){

    return password; }

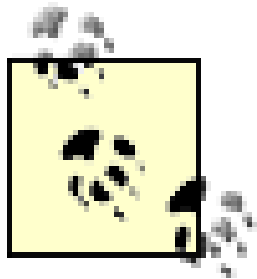
}

```

[Example 7-8](#) is the JSP that uses `ClientValidator`. The JSP first uses `jsp:useBean` to create an instance of the bean. Then it sets the fields or properties of the bean to the values that have been posted to the JSP, which are "email" and "password". If the `isValid` bean property is `true`, which is tested with this JSTL code:

```
<c:if test="${isValid}">
```

then the JSP sets two request-scoped attributes. The attributes are now available to a page that is forwarded this request. Session attributes are accessible from servlets and JSPs that are associated with the same session (see [Chapter 11](#)). The application scope encompasses the context or web application.



If you want to set session- or application-scoped attributes, change the code in [Example 7-8](#) to:

```
<c:set var="email" value="${chk.email}"
      scope="session" />
<c:set var="password" value="${chk.password}"
      scope="session" />
```

or:

```
<c:set var="email" value="${chk.email}"
      scope="application" />
<c:set var="password" value="${chk.password}"
      scope="application" />
```

Example 7-8. validChk.jsp page that uses a validator bean to check form input data

```
<%@page contentType="text/html"%>
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<jsp:useBean id="chk" class="com.jspServletcookbook.ClientValidator" >

<jsp:setProperty name="chk" property="*" />

</jsp:useBean>
<!-- get valid property from ClientValidator bean --%>

<c:set var="isValid" value="${chk.valid}" />

<c:if test="${isValid}">

    <c:set var="email" value="${chk.email}" scope="request" />
    <c:set var="password" value="${chk.password}" scope="request" />

</c:if>
<html>
<head><title>Client Checker</title></head>
<body>
<h2>Welcome</h2>

    <strong>Email</strong>:
    <c:out value="${email}" /><br><br>
    <strong>Password</strong>:
    <c:out value="${password}" />

</body>
</html>
```

See Also

[Recipe 7.2](#) on handling a `POST` request in a JSP; [Recipe 7.3](#) on setting the properties of a JavaBean to form input; [Recipe 7.6](#) on posting data from a JSP; [Chapter 23](#) on using the JSTL.

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Recipe 7.5 Posting Data from a Servlet

Problem

You want to send parameters and their values as a `POST` request from a servlet.

Solution

Use the Jakarta Commons `HttpClient` component and its `PostMethod` class to automate the posting of data to other programs.

Discussion

The Jakarta Commons `HttpClient` is a component that allows the developer to mimic the features of a web browser in his Java code, such as sending `GET` and `POST` HTTP requests, as well as using HTTPS for secure sockets. As the homepage describes this useful component, `HttpClient` "provides an efficient, up-to-date, and feature-rich package implementing the client side of the most recent HTTP standards and recommendations" (<http://jakarta.apache.org/commons/httpclient/>). `HttpClient` is offered under the Apache Software License.

This recipe describes using `HttpClient` to post data to another server-side program using the `POST` HTTP method. First, download the `HttpClient` distribution from the Jakarta site (<http://jakarta.apache.org/commons/httpclient/downloads.html>). Then unpack the distribution and place the JAR file that it contains in the `WEB-INF/lib` directory of your web application. At this writing, the JAR for Release 2.0 Alpha 3 was `commons-httpclient-2.0-alpha2.jar`. Once you have taken care of this installation, your servlets and beans can use the `HttpClient` classes.

Example 7-9 is a servlet that posts data to a JSP: `http://localhost:8080/home/viewPost.jsp`. Example 7-3 shows the `viewPost.jsp` file. Note the classes from the `org.apache.commons.httpclient` package that the servlet has to import at the top of the code.

Example 7-9. A servlet that posts data to a JSP using HttpClient

```
package com.jspervletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

import org.apache.commons.httpclient.HttpClient;
import org.apache.commons.httpclient.HttpStatus;
import org.apache.commons.httpclient.methods.PostMethod;
import org.apache.commons.httpclient.NameValuePair;

public class ClientPost extends HttpServlet {
```

```

public void doPost(HttpServletRequest request, HttpServletResponse response)
    throws ServletException, java.io.IOException {

    HttpClient httpClient = new HttpClient( );

    PostMethod postMethod = new PostMethod(
        "http://localhost:8080/home/viewPost.jsp");

    NameValuePair[] postData = {
        new NameValuePair("username", "devgal"),
        new NameValuePair("department", "development"),
        new NameValuePair("email", "devgal@yahoo.com")
    };

    //the 2.0 beta1 version has a
    //PostMethod.setRequestBody(NameValuePair[])
    //method, as addParameters is deprecated

    postMethod.addParameters(postData);

    httpClient.executeMethod(postMethod);

    //display the response to the POST method
    response.setContentType("text/html");
    java.io.PrintWriter out = response.getWriter( );
    //A "200 OK" HTTP Status Code

    if (postMethod.getStatusCode( ) == HttpStatus.SC_OK) {

        out.println(postMethod.getResponseBodyAsString( ));

    } else {

        out.println("The POST action raised an error: " + postMethod.getStatusLine( ));

    }

    //release the connection used by the method
    postMethod.releaseConnection( );
}

public void doGet(HttpServletRequest request, HttpServletResponse response)
    throws ServletException, java.io.IOException {

    doPost(request,response);
}
}

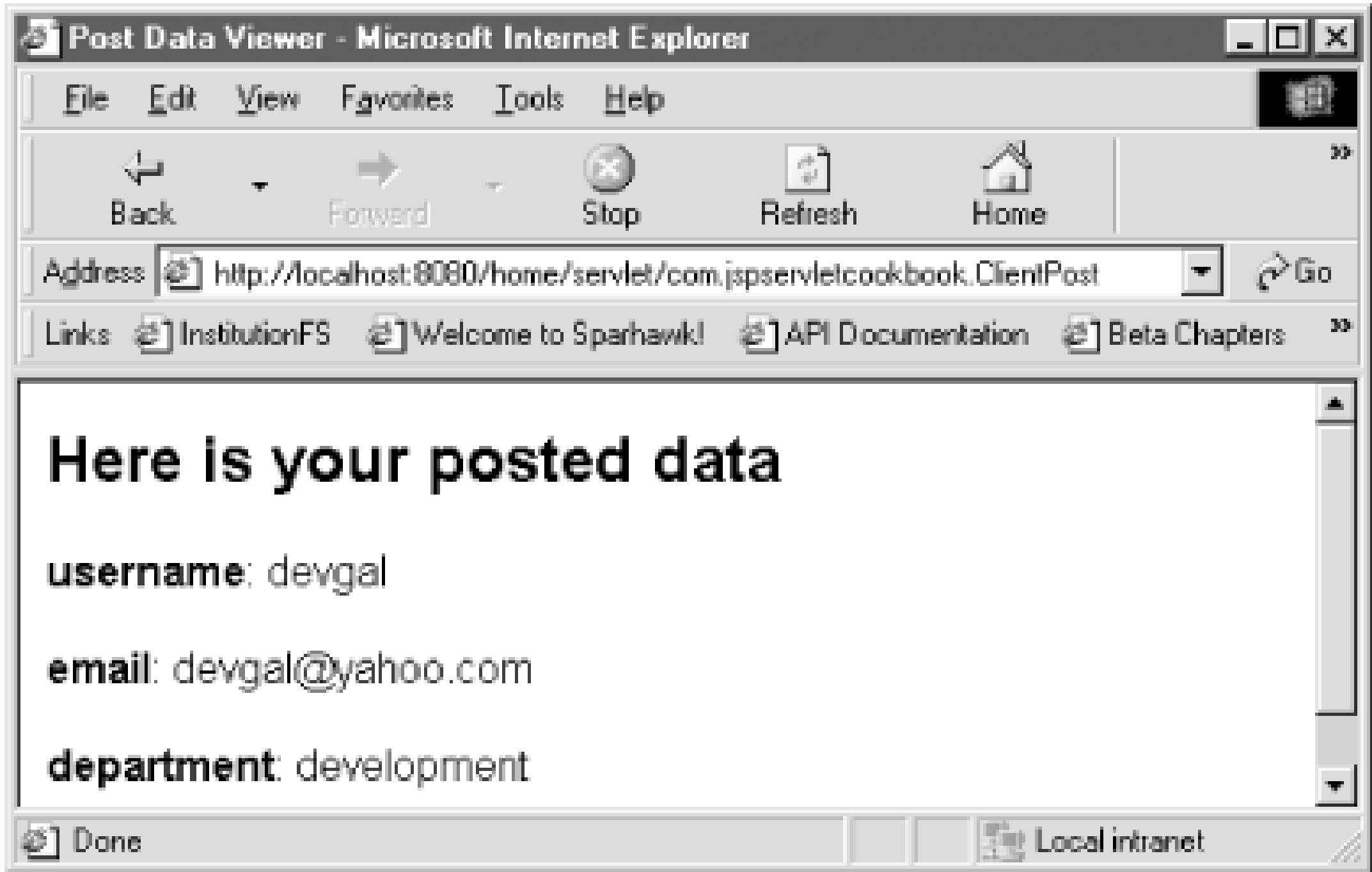
```

The code sends three name/value pairs to the JSP (named `username` , `department` , and `email`), which will handle the posted data. `HttpClient` handles the returned text from the `POST` method so that you can display it in the same servlet. If you expect to receive large amounts of text as return values from

the `POST` , then consider using the `HttpMethodBase.getResponseBodyAsStream()` method instead of `getResponseBodyAsString()` . The `getResponseBodyAsStream()` method returns a `java.io.InputStream` . Example 7-9 is derived from sample code provided at the `HttpClient` web site.

Figure 7-4 shows the web browser display after requesting the `ClientPost` servlet.

Figure 7-4. Displaying the returned text after posting data from a servlet



See Also

Recipe 7.1 on handling a `POST` request in a servlet; Recipe 7.7 on using a servlet to add a parameter to a query string; the Jakarta Commons `HttpClient` page: <http://jakarta.apache.org/commons/httpclient> .

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Recipe 7.6 Posting Data from a JSP

Problem

You want to send parameters and their values as an HTTP `POST` request from a JSP.

Solution

The easiest way to post data from a JSP is to do it the old fashioned way: use the HTML `form` tag and a Submit button. If you have to send the data dynamically (as in not relying on a user to press a form button), use a JavaBean that encapsulates the `HttpClient` code discussed in [Recipe 7.5](#).

Discussion

The simplest way to initiate a `POST` method in a JSP is to set up the HTML template text as shown in [Example 7-1](#): provide an HTML form tag that the user fills out and submits. Since [Example 7-1](#) already shows a typical HTML form, I'll use this space to show a JavaBean that allows a JSP to dynamically post data to another server-side process.

[Example 7-10](#) shows a *jspPost.jsp* page that uses a `PostBean` utility class to send a set of parameters/values to another JSP. The receiving JSP, *viewPost.jsp*, processes the parameters that the `PostBean` object sends it, then returns some text for the JSP in [Example 7-10](#) to display. The JSP passes the parameters that it wants to post as a `java.util.Map` to the `PostBean` class. The `PostBean url` property is the destination for the posted data (the address that you would otherwise place in the `action` attribute of a `form` HTML tag). The code:

```
<jsp:setProperty name="postBean" property="parameters" value="<%= request.
getParameterMap( )%>" />
```

gets a `Map` of the parameters that were passed to the *jspPost.jsp* page with the `HttpServletRequest.getParameterMap()` method, then passes that `Map` to the `PostBean` class to be reposted.

Example 7-10. A JSP that posts parameters and values dynamically

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<!-- create an instance of the PostBean class if once does not exist --%>
<jsp:useBean id="postBean" class="com.jspServletcookbook.PostBean" />

<!-- set the PostBean parameters property to a Map type --%>
<jsp:setProperty name="postBean" property="parameters" value="<%= request.
```

```
getParameterMap( )%>" />
```

```
<jsp:setProperty name="postBean" property="url" value="http://localhost:8080/home/
viewPost.jsp" />
```

```
<%-- Post the parameters and display the returned text --%>
<jsp:getProperty name="postBean" property="post"/>
```

[Example 7-11](#) shows the `PostBean` class that the JSP page uses to post data. This bean uses the Jakarta Commons `HttpClient` component to send an HTTP `POST` request. The sending action happens in the `PostBean.getPost()` method, which sends off the parameters and returns the text result from the receiving servlet (in this example, it's *viewPost.jsp*). Because the bean method is called `getPost()`, using the JavaBean naming conventions for methods that return property values, we can call the method in the JSP with:

```
<jsp:getProperty name="postBean" property="post"/>
```

The latter code is then replaced with the `String` return value.

Example 7-11. A data-posting JavaBean for use by a JSP or servlet

```
package com.jspServletcookbook;

import java.util.Map;
import java.util.Iterator;
import java.util.Map.Entry;

import org.apache.commons.httpclient.HttpClient;
import org.apache.commons.httpclient.HttpStatus;
import org.apache.commons.httpclient.methods.PostMethod;
import org.apache.commons.httpclient.NameValuePair;
import org.apache.commons.httpclient.HttpException;

public class PostBean implements java.io.Serializable {

    private Map parameters;
    private String url;

    public PostBean( ){

    }

    public void setParameters(Map param){

        if (param != null)
            parameters = param;
    }

    public Map getParameters( ){

        return parameters;
    }
}
```



```
public void setUrl(String url){

    if (url != null && !(url.equals(""))){
        this.url=url;
    }

public String getUrl( ){

    return url;
}

public String getPost( ) throws java.io.IOException,HttpException{

    if (url == null || url.equals("") || parameters == null)
        throw new IllegalStateException(
            "Invalid url or parameters in PostBean.getPost method.");

    String returnData = "";

    HttpClient httpClient = new HttpClient( );

    PostMethod postMethod = new PostMethod(url);

    //convert the Map passed into the bean to a NameValuePair[] type
    NameValuePair[] postData = getParams(parameters);

    //the 2.0 beta1 version has a
    //PostMethod.setRequestBody(NameValuePair[])
    //method, as addParameters is deprecated

    postMethod.addParameters(postData);

    httpClient.executeMethod(postMethod);

    //A "200 OK" HTTP Status Code
    if (postMethod.getStatusCode( ) == HttpStatus.SC_OK) {

        returnData= postMethod.getResponseBodyAsString( );

    } else {

        returnData= "The POST action raised an error: " +
            postMethod.getStatusLine( );
    }

    //release the connection used by the method
    postMethod.releaseConnection( );

    return returnData;

} //end getPost
```

```
private NameValuePair[] getParams(Map map){

    NameValuePair[] pairs = new NameValuePair[map.size( )];

    //Use an Iterator to put name/value pairs from the Map
    //into the array
    Iterator iter = map.entrySet( ).iterator( );

    int i = 0;

    while (iter.hasNext( )){

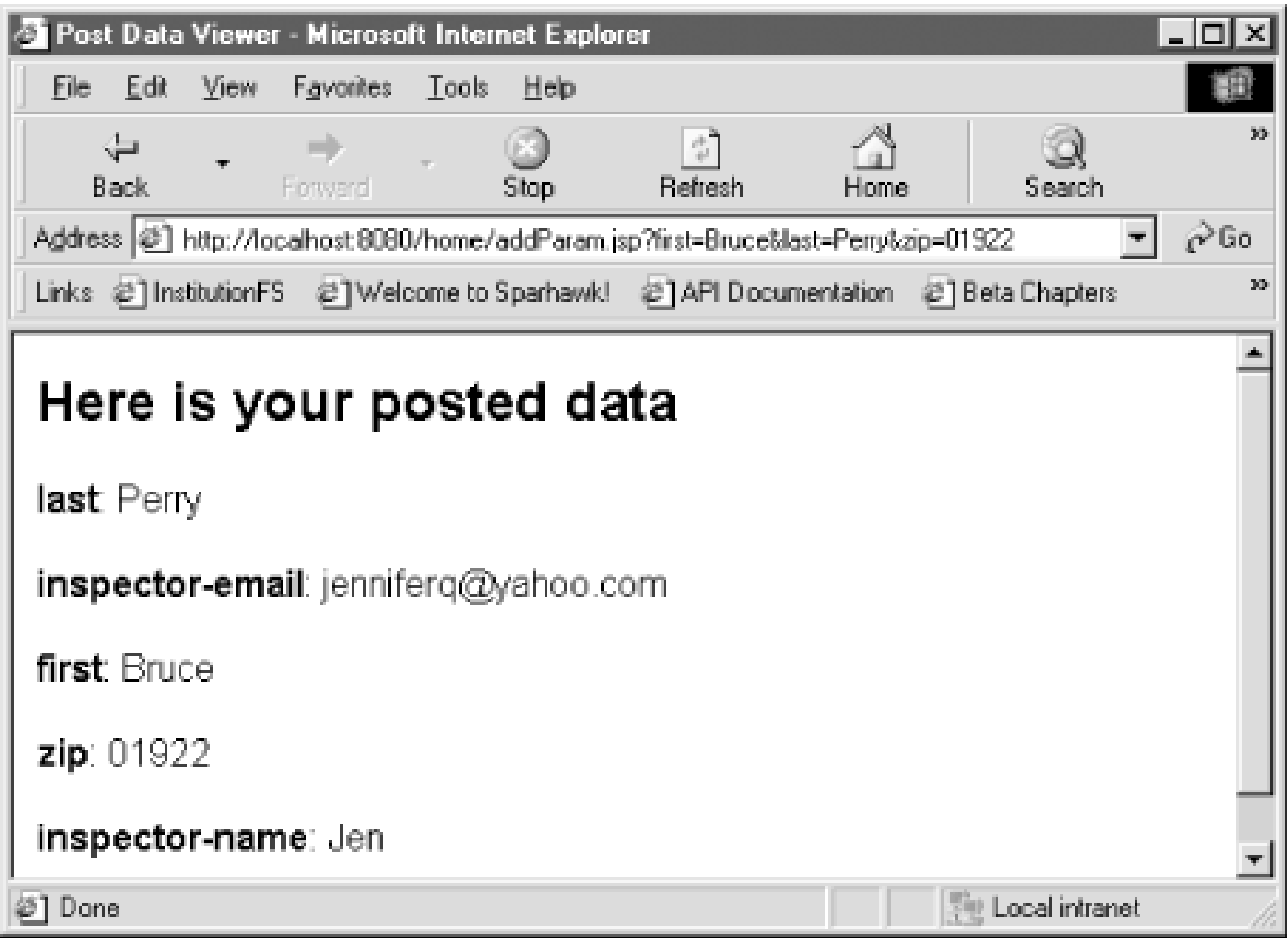
        Map.Entry me = (Map.Entry) iter.next( );

        //Map.Entry.getValue( ) returns a String[] array type
        pairs[i] = new NameValuePair(
            (String)me.getKey( ),((String[]) me.getValue( ))[0]);
        i++;
    }
    return pairs;
} //end getParams

}
```

The displayed results looks exactly like [Figure 7-5](#), which also uses *viewPost.jsp* to show the name/value pairs that were fed to the JSP. Again, if you have to use a JSP to dynamically mimic an HTML form, it is a good idea to delegate the mechanics of posting data to a JavaBean so that the JSP remains a presentation component and the bean can be reused elsewhere.

Figure 7-5. Displaying parameters added from a forwarding JSP



See Also

[Recipe 7.2](#) on handling a `POST` request in a JSP; [Recipe 7.3](#) on setting the properties of a JavaBean to form input; [Recipe 7.8](#) on using a JSP to add a parameter to a query string.

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Recipe 7.7 Using a Servlet to Add a Parameter to a Query String

Problem

You want to use a servlet to add one or more parameters to a query string, then forward the request to its final destination.

Solution

Use the `HttpServletRequest` API to get the existing query string. Then append any new parameters to the query string and use a `javax.servlet.RequestDispatcher` to forward the request.

Discussion

The servlet in [Example 7-12](#) simply takes any existing query string and appends the parameters that it has to add to this `String`. Then it sends the now extended (or new) query string on its merry way with a call to `RequestDispatcher.forward`.

Example 7-12. Adding a parameter to a query string with a servlet

```
package com.jspervletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

public class QueryModifier extends HttpServlet {

    public void doGet(HttpServletRequest request, HttpServletResponse response)
        throws ServletException, java.io.IOException {

        //returns null if the URL does not contain a query string
        String querystr = request.getQueryString( );

        if (querystr != null){

            querystr = querystr +
                "&inspector-name=Jen&inspector-email=Jenniferq@yahoo.com";

        } else {
```

```
        querystr = "inspector-name=Jen&inspector-email=Jenniferq@yahoo.com";}

        RequestDispatcher dispatcher =
            request.getRequestDispatcher("/viewPost.jsp?" + querystr);

        dispatcher.forward(request, response);
    }

    public void doPost(HttpServletRequest request, HttpServletResponse response)
        throws ServletException, java.io.IOException {

        doGet(request, response);

    }

}
```



The `HttpServletRequest.getQueryString()` method returns the query string without the opening "?", as in:

```
first=Bruce&last=Perry&zipcode=01922
```

If you want to get the request URL right up to the query string but not include the "?", use `HttpServletRequest.getRequestURL()`, which returns a `java.lang.StringBuffer` type.

See Also

[Recipe 7.1](#) on handling a `POST` request in a servlet; [Recipe 7.5](#) on posting data from a servlet.

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Recipe 7.8 Using a JSP to Add a Parameter to a Query String

Problem

You want to use a JSP to add one or more parameters to a query string, then forward the request to its destination.

Solution

Use the `jsp:forward` and `jsp:param` standard actions.

Discussion

Adding one or more parameters and forwarding to another component is as easy as four lines in a JSP. The `jsp:forward` action adds any `jsp:params` to existing parameters when it forwards this text to the processing component, as shown in [Example 7-13](#).

Example 7-13. Adding parameters and forwarding in a JSP

```
<jsp:forward page="/viewPost.jsp" >
    <jsp:param name="inspector-name" value="Jen"/>
<jsp:param name="inspector-email" value="jenniferq@yahoo.com"/>
</jsp:forward>
```

If this JSP is requested with the following URL:

```
http://localhost:8080/home/addParam.jsp?first=Bruce&last=Perry&zip=01922
```

then the three original parameters (`first`, `last`, and `zip`) are preserved when the `jsp:forward` action adds two additional parameters (`inspector-name`, `inspector-email`) and forwards the page. In the example, the page is processed by the *viewPost.jsp* page shown in [Example 7-3](#). Requesting *addParam.jsp* in a browser forwards the request, and a total of five parameters to the *viewPost.jsp* page. [Figure 7-5](#) shows the result in a browser.

See Also

[Recipe 7.2](#) on handling a `POST` request in a JSP; [Recipe 7.3](#) on setting the properties of a JavaBean to form input; [Recipe 7.6](#) on posting data from a JSP.

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Recipe 7.9 Using a Filter to Read Parameter Values

Problem

You want to use a filter to intercept form input and read it.

Solution

Use the various `getParameter` methods of the `ServletRequest` API to take a look at parameter values in a filter.

Discussion

When you develop a filter for a servlet, your filter class has to implement the `javax.servlet.Filter` interface. This means that your `Filter` class has to implement the `doFilter(request, response)` and `destroy()` methods of that interface. The `doFilter` method contains the hook to the filtered servlet's parameter values. The `doFilter`'s `ServletRequest` parameter has the `getParameter`, `getParameterMap`, `getParameterNames`, and `getParameterValues` methods which allow the filter to peek at a servlet's parameters and values.

First, you have to map the `Filter` you have designed to the servlet. This chunk of *web.xml* maps a `Filter` object to a servlet named `Viewer`.

```
<!-- any context-param elements go here -->
<filter>
    <filter-name>ParamSnoop</filter-name>
    <filter-class>com.jspervletcookbook.ParamSnoop</filter-class>
</filter>

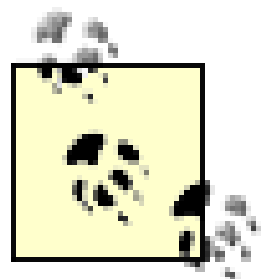
<filter-mapping>
    <filter-name>ParamSnoop</filter-name>
    <servlet-name>Viewer</servlet-name>
</filter-mapping>
<!-- web.xml continues -->
```

Place the filter class in the *WEB-INF/classes* directory of your web application, or inside a JAR file that is placed in *WEB-INF/lib*. The servlet container creates an instance when the container starts up of each filter that is declared in *web.xml*. The container then executes the filter (calls its `doFilter` method) when a user requests any of the servlets the filter is mapped to. So the `ParamSnoop` filter can inspect a request made to the `Viewer` servlet before the servlet processes the request.



"Only one instance per filter declaration in the deployment descriptor is instantiated per Java virtual machine of the container," according to the Servlet v2.4 specification, Chapter SRV.6.2.1.

[Example 7-14](#) gets access to the parameters in the intercepted request by calling `ServletRequest.getParameterMap()`. However, you are free to use other `ServletRequest` API methods to look at parameters, such as `getParameterStringName`. The `getParameterMap()` method returns a `java.util.Map` of parameter names and values, which you extract from the `Map` using a `java.util.Iterator` and its `next()` method.



The call `Map.entrySet()` returns a `java.util.Set`, from which you obtain an `Iterator` by calling `Set.iterator()`. The objects returned from the `Iterator.next()` method in this case are `Map.Entry` objects that hold key/value pairs, relating to the parameter names and values.

[Example 7-14](#) also shows how to pull the key/value pairs out of the map and log the values using the `ServletContext.log()` method.

Example 7-14. Snooping on parameter values with a servlet

```
package com.jspservletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

import java.util.Map;
import java.util.Iterator;
import java.util.Map.Entry;

public class ParamSnoop implements Filter {

    private FilterConfig config;

    /** Creates new ParamSnoop */
    public ParamSnoop( ) {

    }

    public void init(FilterConfig filterConfig) throws ServletException{

        this.config = filterConfig;
    }

    public void doFilter(
        ServletRequest request, ServletResponse response, FilterChain chain)
        throws java.io.IOException, ServletException {

        Map paramMap = request.getParameterMap( );
```



```

        ServletContext context = config.getServletContext( );

        /* use the ServletContext.log method to log
        param names/values */
        context.log("doFilter called in: " + config.getFilterName( ) +
            " on " + (new java.util.Date( )));

        context.log("Snooping the parameters in request: " +
            ((HttpServletRequest) request).getRequestURI( ));

        Iterator iter = paramMap.entrySet( ).iterator( );
        while (iter.hasNext( )){

            Map.Entry me = (Map.Entry) iter.next( );
            context.log((String)me.getKey( ) + ": " +
                ((String[]) me.getValue( ))[0]);
        }
        //continue the request, response to next filter or servlet
        //destination
        chain.doFilter(request,response);
    }

    public void destroy( ){
        /*called before the Filter instance is removed
        from service by the web container*/
    }
}

```

The only reason we used the `ServletContext.log()` method was to display the inspection of parameters by the filter. Here is an example of the Tomcat log in *<Tomcat-installation-directory>/logs* showing the two parameters that were stored in the servlet request (`last`, `first`). In other words, the web browser request was *http://localhost:8080/home/viewer?first=Bruce&last=Perry*.

```

2003-04-13 17:13:33 doFilter called in: ParamSnoop on Sun Apr 13 17:13:33 EDT 2003
2003-04-13 17:13:33 Snooping the parameters in request: /home/viewer
2003-04-13 17:13:33 last: Perry
2003-04-13 17:13:33 first: Bruce

```

See Also

[Recipe 7.1](#) on handling a `POST` request in a servlet; [Recipe 7.7](#) on using a servlet to add a parameter to a query string; [Chapter 19](#) on filtering requests and responses; Chapter SRV.6 on Filters in the Servlet 2.4 specification.

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Chapter 8. Uploading Files

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[Recipe 8.5. Renaming Files](#)

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Introduction

Web sites use the HTML `form` tag to allow users to submit files from their own filesystem for processing on the server. The `form` tag enables the uploading action with a nested `input` element that has a `type` attribute set to "file". The `form` and `input` tag is specified using the syntax described in [Recipe 8.1](#).

The HTTP request for file uploading uses a content type of "multipart/form-data". The HTTP message that the user sends to the server by clicking the web page's Submit button contains descriptive headers and the body of each uploaded file. Each of the uploaded files is separated by a specified boundary pattern (see the `Content-Type` header value in [Example 8-1](#)). [Example 8-1](#) shows an abbreviated view of a "multipart/form-data" type request including the uploading of three very small files. To make this example more compact, I have removed some of the values from the `Accept` request header.

Example 8-1. An HTTP request message with three uploaded files

```
POST /home/upload.jsp HTTP/1.1
Accept: image/gif, image/x-xbitmap, image/jpeg, image/pjpeg ...
Referer: http://localhost:8080/home/interact.html
Accept-Language: en-us
Content-Type: multipart/form-data; boundary=-----7d33c11c6018e
Accept-Encoding: gzip, deflate
User-Agent: Mozilla/4.0 (compatible; MSIE 5.5; Windows NT 4.0)
Host: localhost:9000
Content-Length: 541
Connection: Keep-Alive
Cache-Control: no-cache
Cookie: JSESSIONID=7F6154184FFF3D1AE345E1F2FFF1A22E

-----7d33c11c6018e
Content-Disposition: form-data; name="file1"; filename="H:\home\file1.txt"
Content-Type: text/plain

This is file 1.
-----7d33c11c6018e
Content-Disposition: form-data; name="file2"; filename="H:\home\file2.txt"
Content-Type: text/plain

This is file 2.
-----7d33c11c6018e
Content-Disposition: form-data; name="file3"; filename="H:\home\file3.txt"
Content-Type: text/plain

This is file 3.
-----7d33c11c6018e--
```


The HTTP request delineates each uploaded file with a boundary pattern:

-----7d33c11c6018e.

Each of the files has a `Content-Disposition` and `Content-Type` header. The simple text files that [Example 8-1](#) uploads to the server have only one line each to give you a clear snapshot of what this type of HTTP request looks like. For more details on the file-uploading mechanism itself, see RFC 1867: <http://www.ietf.org/rfc/rfc1867.txt>.

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Recipe 8.1 Preparing the HTML Page for File Uploads

Problem

You want to set up an HTML page to allow the user to specify a file from his filesystem to upload to the server.

Solution

Use the HTML `form` tag with its `enctype` attribute set to "multipart/form-data". Use an `input` tag nested in the `form` tag with a `type` attribute of "file".

Discussion

The HTML for file uploading involves a few "must haves." The `form` tag specifies the servlet (or other server-side component) that is handling the file upload in its `action` attribute. The `method` attribute must be `POST` (not `GET`) for the file upload action to work. The `form` tag's `enctype` attribute must be "multipart/form-data".

The widget with which the user enters the file to upload is an `input` tag with a `type` of "file", and looks like a text field. The `name` attribute uniquely names the particular `input` tag, which becomes important when the HTML specifies the uploading of more than one file (see the note at the end of this recipe). Without any additional intervention, the server saves the uploaded file with its original filename. The `accept` attribute is designed to limit the file types that the user can choose for uploading, such as to the "application/pdf" MIME type, but this attribute has poor support among browsers.

When displaying the HTML in [Example 8-2](#), browsers automatically show a Browse button. When the form client selects the button, the browser displays a typical filesystem navigation window with which the user can select the file.

Example 8-2. Simple HTML for file uploading

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<html>
<head>
    <title>Please Choose The File</title>
</head>
<body bgcolor="#ffffff">
<table border="0"><tr>
```

```
<form action="/home/servlet/com.jspServletcookbook.UploadServlet" method="post"
enctype="multipart/form-data">

<td valign="top"><strong>Please choose your document:</strong><br></td>

<td> <input type="file" name="file1">

<br><br>
</td></tr>

<tr><td><input type="submit" value="Upload File"></td></tr>
</form>

</table>
</body>
</html>
```

After selection, the text field displays the full path to the selected file.[Figure 8-1](#) shows this HTML page in a web browser.

Figure 8-1. HTML page for uploading a file to a servlet

[Figure 8-1](#) shows the input field after the user has already chosen the file. The browser then automatically fills in the text field with the complete file path.

To allow the uploading of multiple files, include more than one tag with different values for the `name` attribute. The browser associates a Browse button with each of them.

See Also

[Recipe 8.4](#) on using the `com.oreilly.servlet` library for file uploading; [Recipe 8.5](#) on handling a single file upload; [Recipe 8.6](#) on handling multiple file uploads; [Recipe 8.5](#) on controlling file naming; [Recipe 8.6](#) on using a JSP to handle file uploads; the homepage for `com.oreilly.servlet`:

<http://www.servlets.com/cos/index.html>; the RFC 1867 document on form-based file uploads:
<http://www.ietf.org/rfc/rfc1867.txt>.

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Recipe 8.2 Using the `com.oreilly.servlet` Library

Problem

You want to use the `com.oreilly.servlet` classes that O'Reilly author Jason Hunter has developed to handle file uploads.



Of course, this isn't much of a problem, as Jason's library takes most of the work out of uploading and accepting files. I use Jason's library here (with his permission, of course) because it handles file uploads nicely, and there's no good reason to reinvent a perfectly good wheel.

Solution

Download the distribution ZIP file from <http://www.servlets.com/cos/index.html>. Add the `cos.jar` file, which is part of the distribution to the `WEB-INF/lib` directory of your web application. Make sure that you adhere to the software license when using the library.

Discussion

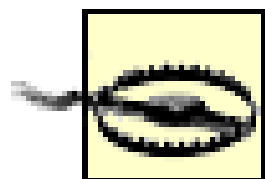
A JAR file named `cos.jar` includes the `com.oreilly.servlet` and `com.oreilly.servlet.multipart` packages. These packages include several classes, such as all of the Java classes that begin with "Multipart," which can be used to handle file uploading in a servlet.

The `cos.jar` archive also contains many other interesting and useful classes to use with servlets, but the following recipes focus on file uploads.

Download the latest ZIP file containing the distribution from <http://www.servlets.com/cos/index.html>. The contents of the ZIP file include `cos.jar`, which you need to add to the `WEB-INF/lib` directory of your web application. In your servlet, you then import the classes that you want to use:

```
import com.oreilly.servlet.MultipartRequest;  
import com.oreilly.servlet.multipart.FileRenamePolicy;
```

Before you have integrated these classes into your code, make sure that you have read the accompanying software license for this code: <http://www.servlets.com/cos/license.html>.



The rest of the recipes in this chapter assume that you have *cos.jar* and the classes it contains available in your web application. If you don't take steps to make these classes available, none of the examples in this chapter will function properly.

See Also

[Recipe 8.1](#) on preparing the HTML for a file upload; [Recipe 8.5](#) on handling a single file upload; [Recipe 8.6](#) on handling multiple file uploads in a servlet; [Recipe 8.5](#) on controlling file naming; [Recipe 8.6](#) on using a JSP to handle file uploads; the homepage for `com.oreilly.servlet`: <http://www.servlets.com/cos/index.html>; the RFC 1867 document on form-based file uploads: <http://www.ietf.org/rfc/rfc1867.txt>.

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Recipe 8.3 Uploading One File at a Time

Problem

You want to create a component that can receive a client file upload and store the file in a local directory.

Solution

Create a servlet that uses the `com.oreilly.servlet.MultipartRequest` class from Jason Hunter's *cos.jar* archive.

Discussion

The `MultipartRequest` class includes several overloaded constructors. The one used in [Example 8-3](#) takes the `javax.servlet.http.HttpServletRequest` object, the path to the directory where you want to save uploaded files, and the size limit for the file as parameters. In [Example 8-3](#), if the client uploads a file that exceeds 5 MB, then the `UploadServlet` throws a `java.io.IOException`. You can allow this exception to be managed by an `error-page` element in *web.xml* for `IOExceptions`, as [Example 8-3](#) does, or use a `try/catch` block in the upload servlet to deal with errors.

See [Chapter 9](#) for how to declare error pages for the web application.

With `MultipartRequest`, as soon as the code instantiates the object, the object is handling the file upload; in other words, you do not have to call a method to commence managing the upload.

The servlet in [Example 8-3](#) initiates the file upload and then displays the name of the uploaded file(s)

Example 8-3. A servlet that uses the `MultipartRequest` class

```
package com.jspervletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

import com.oreilly.servlet.MultipartRequest;
import java.util.Enumeration;
```

```

public class UploadServlet extends HttpServlet {

    private String webTempPath;

    public void init( )
    webTempPath = getServletContext( ).getRealPath("/") + "data";
    }

    public void doPost(HttpServletRequest request,
                        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        //file limit size of 5 MB
        MultipartRequest mpr = new MultipartRequest(
            request,webTempPath,5 * 1024 * 1024);
        Enumeration enum = mpr.getFileNames( );

        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );

        out.println("<html>");
        out.println("<head>");
        out.println("<title>Servlet upload</title>");
        out.println("</head>");
        out.println("<body>");

        for (int i = 1; enum.hasMoreElements( );i++)
            out.println("The name of uploaded file " + i +
                " is: " + mpr.getFilesystemName((String) enum.nextElement( ))
                + "<br><br>");

        out.println("</body>");
        out.println("</html>");

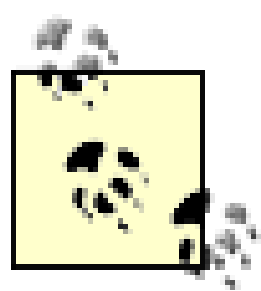
    }

    public void doGet(HttpServletRequest request,
                      HttpServletResponse response)
        throws ServletException, java.io.IOException {

        throw new ServletException("GET method used with " +
            getClass( ).getName( )+": POST method required.");
    }
}

```

The code generates the path to the save directory by calling `javax.servlet.ServletContext.getRealPath("/")` to get an absolute pathname to the root of the web application (as in *h: \home*). Then the code adds the name of the directory where the file will be saved (*data*).



This directory name could also be added using an external configuration such as a `context-param` element in *web.xml*. See [Recipe 8.6](#) for details.

The method `MultipartRequest.getFilesystemName(StringName)` returns the filename from the client's filesystem. The file can be saved on the server end with its original filename, or you can use a different `MultipartRequest` constructor that takes as a parameter a `FileRenamePolicy` object. This constructor looks like:

```
MultipartRequest(javax.servlet.http.HttpServletRequest request,  
                java.lang.String saveDirectory, int maxPostSize,  
                FileRenamePolicy policy)
```

There are a few versions of the `MultipartRequest` constructor with the `FileRenamePolicy` parameter, which is used to rename uploaded files (see [Recipe 8.5](#)). [Example 8-3](#) also throws a `ServletException` if the `UploadServlet` is requested with a `GET` method, which is not allowed with file uploads.

See Also

[Recipe 8.1](#) on preparing the HTML for a file upload; [Recipe 8.4](#) on downloading and using the `com.oreilly.servlet` library; [Recipe 8.6](#) on handling multiple file uploads in a servlet; [Recipe 8.5](#) on controlling file naming during file uploads; [Recipe 8.6](#) on using a JSP to handle file uploads; the homepage for `com.oreilly.servlet`: <http://www.servlets.com/cos/index.html>; the RFC 1867 document on form-based file uploads: <http://www.ietf.org/rfc/rfc1867.txt>.

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Recipe 8.4 Uploading Multiple Files

Problem

You want to upload more than one file at a time from a client, and handle each file as it is uploaded.

Solution

Use the `MultipartParser` from Jason Hunter's *cos.jar* archive.

Discussion

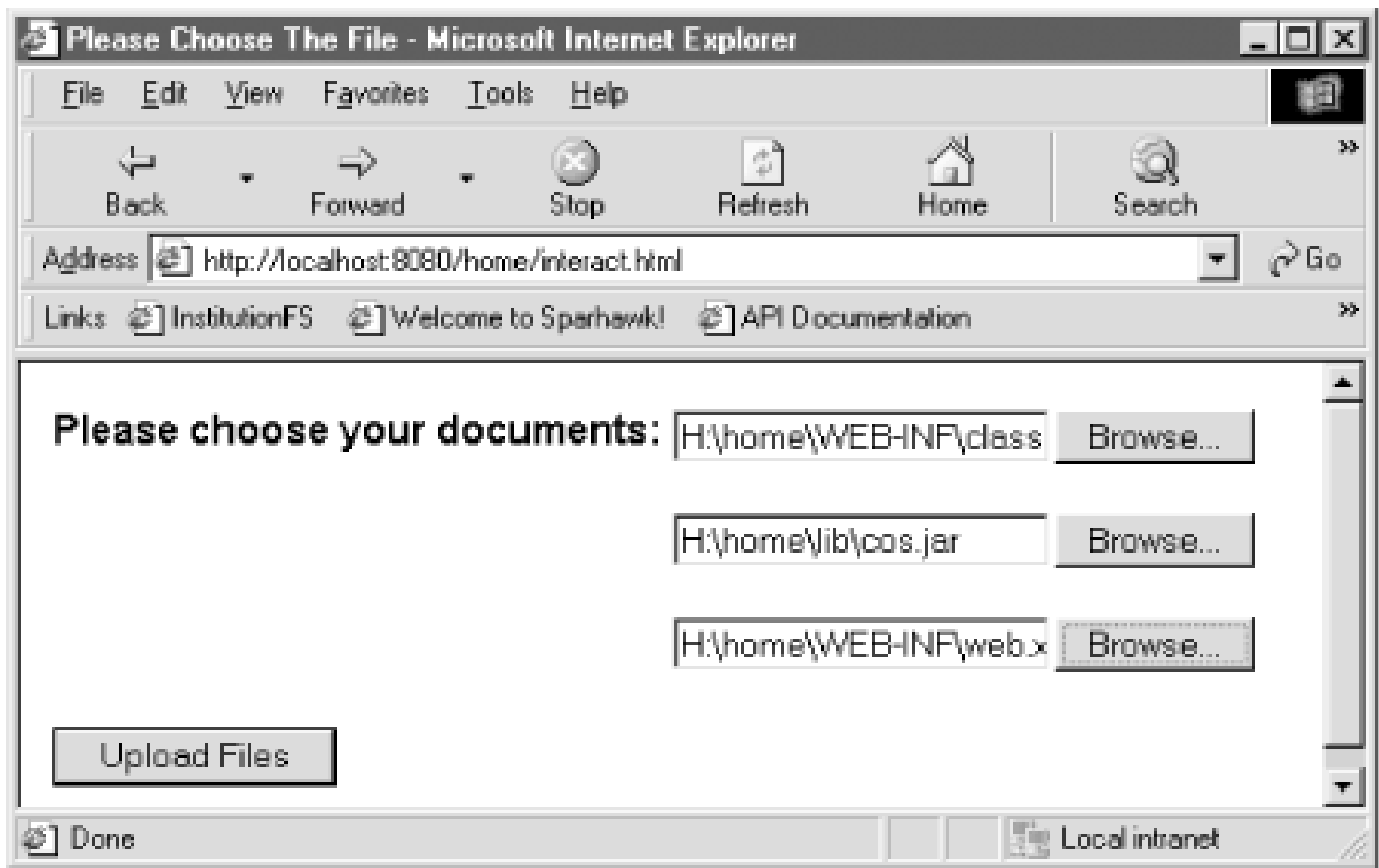
The `MultipartParser` class allows the servlet to handle each file part sequentially as the server receives a multipart HTTP request.

You can also use the `MultipartRequest` class to handle multiple files. However, the `MultipartParser` allows you to handle each part (such as by saving it to a database) during the parsing of a multiple-file upload.

In addition, the file's content type, size, and name can be read as the servlet handles the request. The servlet can also make basic checks using this class, such as counting how many files were uploaded and verifying whether the user uploaded a file for each of the available form `input` fields.

The HTML file from Recipe 8.5 has been altered to allow the upload of three different files from the user's filesystem, as shown in Figure 8-2.

Figure 8-2. An HTML form for uploading three files



This HTML form is created by including three input tags with `type="file"` , as in:

```
<input type="file" name="file1"><br><br>
<input type="file" name="file2"><br><br>
<input type="file" name="file3">
```

Example 8-4 handles the multiple file uploads by importing three classes from the *cos.jar* archive. The `MultipartParser` class restricts the size of file uploads to 5 MB in Example 8-4; however, you can set this constructor parameter to another value to allow smaller or larger file sizes, or leave the accepted file size at the 1 MB default.

You can view the Javadoc for this class at
<http://www.servlets.com/cos/javadoc/com/oreilly/servlet/multipart/MultipartParser.html> .

The `MultipartParser` object throws a `java.io.IOException` if any of the file uploads exceed the size limit. Calling the `MultipartParser.readNextPart()` method returns a `Part` type, or `null` if the incoming stream does not contain any more parts. A `Part` can be either a `FilePart` or a `ParamPart` , depending on the content it includes. The `ParamPart` covers the other parameters that an HTML form might include, such as "username". The `FilePart` has several methods that provide information about the uploaded file, such as its content type and the filename. The `FilePart.writeTo(java.io.File dir)` method saves the file to the specified directory and returns the file size as a `long` type. The `FilePart` can also write to an `OutputStream` , as in `writeTo(java.io.OutputStream out)` .

Example 8-4. A servlet handling multiple file uploads

```
package com.jspervletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;
```

```
import com.oreilly.servlet.multipart.MultipartParser;
import com.oreilly.servlet.multipart.Part;
import com.oreilly.servlet.multipart.FilePart;

public class ParserServlet extends HttpServlet {

    private String fileSavePath;

    public void init( ){

        // save uploaded files to a 'data' directory in the web app

        fileSavePath =    getServletContext( ).getRealPath("/") + "data";

    }
    public void doPost(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );

        out.println("<html>");
        out.println("<head>");
        out.println("<title>File uploads</title>");
        out.println("</head>");
        out.println("<body>");

        out.println("<h2>Here is information about any uploaded files</h2>");

        try{

            // file limit size of 5 MB
            MultipartParser parser = new MultipartParser(
                request,5 * 1024 * 1024);

            Part _part = null;

            while ((_part = parser.readNextPart( )) != null) {

                if (_part.isFile( )) {

                    // get some info about the file
                    FilePart fPart = (FilePart) _part;
                    String name = fPart.getFileName( );

                    if (name != null) {

                        long fileSize = fPart.writeTo(
                            new java.io.File(fileSavePath));
```



```

        out.println("The user's file path for the file: " +
            fPart.getFilePath( ) + "<br>");

        out.println("The content type of the file: " +
            fPart.getContentType( )+ "<br>");

        out.println("The file size: " +fileSize+ " bytes<br><br>");

        //commence with another file, if there is one

    } else {

        out.println(
            "The user did not upload a file for this part.");

    }

    }   else if (_part.isParam( )) {
        // do something else if it is a non-file-type parameter,
        //such as a username
    }

} // end while

    out.println("</body>");
    out.println("</html>");

} catch (java.io.IOException ioe){

    //an error-page in the deployment descriptor is
    //mapped to the java.io.IOException
    throw new java.io.IOException(
        "IOException occurred in: " + getClass( ).getName( ));
}
} //doPost

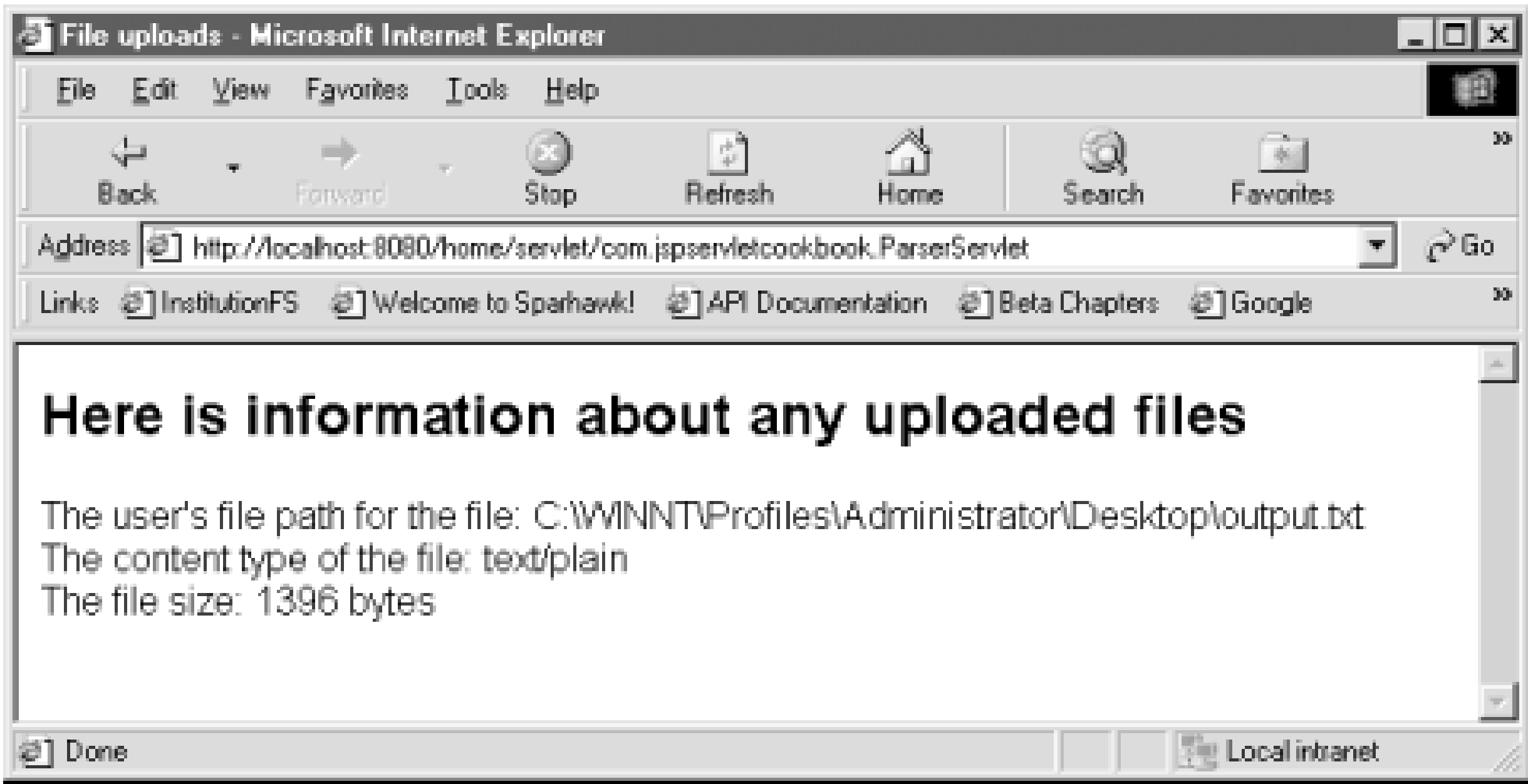
public void doGet(HttpServletRequest request,
    HttpServletResponse response) throws ServletException,
    java.io.IOException {

    throw new ServletException(
        "GET method used with " + getClass( ).getName( )+
        ": POST method required.");
}
}

```

Figure 8-3 shows the descriptive page that the servlet displays about each uploaded file.

Figure 8-3. A servlet displays information about uploaded files



See Also

Recipe 8.1 on preparing the HTML for a file upload; Recipe 8.4 on downloading and using the `com.oreilly.servlet` library; Recipe 8.5 on handling a single file upload in a servlet; Recipe 8.5 on controlling file naming; Recipe 8.6 on using a JSP to handle file uploads; the homepage for `com.oreilly.servlet` : <http://www.servlets.com/cos/index.html> ; the RFC 1867 document on form-based file uploads: <http://www.ietf.org/rfc/rfc1867.txt> .

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Recipe 8.5 Renaming Files

Problem

You want to rename the uploaded files according to a standard policy or to avoid conflicts with existing files that have the same name.

Solution

Create a class that implements the `com.oreilly.servlet.multipart.FileRenamePolicy` interface, or use the `DefaultFileRenamePolicy` class. Then use that class as a parameter in the constructor for the `com.oreilly.servlet.MultipartRequest` class.

Discussion

The `com.oreilly.servlet.multipart` package contains a `FileRenamePolicy` interface that can be used when you want to implement a particular file-renaming policy with file uploads.

The `DefaultFileRenamePolicy` class renames an uploaded file whose name conflicts with an existing file by adding a number to the uploaded filename. For example, if *index.txt* already exists, then the `DefaultFileRenamePolicy` class renames the uploaded file *index1.txt*, and if a second file is uploaded with the same name it will be renamed *index2.txt*, and so on.

If you want to implement your own renaming policy, then create your own class that implements the `FileRenamePolicy` interface, then implement the class's `rename(java.io.File file)` method to initiate the renaming action.

This code sample shows a `MultipartRequest` constructor from [Example 8-3](#). This time, the constructor adds a `DefaultFileRenamePolicy` object as a constructor parameter:

```
MultipartRequest mpr = new MultipartRequest(
    request,webTempPath,(5 * 1024 * 1024),new DefaultFileRenamePolicy( ));
```

Make sure to include the following import statements in the servlet class:

```
import com.oreilly.servlet.MultipartRequest;
import com.oreilly.servlet.multipart.DefaultFileRenamePolicy;
```

As mentioned before, you can implement the `FileRenamePolicy` interface yourself and create a custom file-renaming mechanism. [Example 8-5](#) shows a `MyFileRenamePolicy` class that renames each uploaded file by appending a timestamp to the end of its name. The simple timestamp is calculated as:


```
// seconds since Jan 1, 1970, 00:00:00
new java.util.Date( ).getTime( ) / 1000
```

The code renames the file by appending the `String` (representing a series of numbers) to the filename minus its extension, and then appending the extension at the end (if the filename originally had an extension).

Example 8-5. Renaming uploaded files with your own Java class

```
package com.jspServletcookbook;

import java.io.File;
import java.util.Date;

import com.oreilly.servlet.multipart.FileRenamePolicy;

public class MyFileRenamePolicy implements FileRenamePolicy {

    //implement the rename(File f) method to satisfy the
    // FileRenamePolicy interface contract
    public File rename(File f){

        //Get the parent directory path as in h:/home/user or /home/user
        String parentDir = f.getParent( );

        //Get filename without its path location, such as 'index.txt'
        String fname = f.getName( );

        //Get the extension if the file has one
        String fileExt = "";
        int i = -1;
        if(( i = fname.indexOf(".")) != -1){

            fileExt = fname.substring(i);
            fname = fname.substring(0,i);
        }

        //add the timestamp
        fname = fname + (""+( new Date( ).getTime( ) / 1000));

        //piece together the filename
        fname = parentDir + System.getProperty(
            "file.separator") + fname + fileExt;

        File temp = new File(fname);

        return temp;
    }
}
```

Given that your new class is called `com.jspServletcookbook.MyFileRenamePolicy` and implements

the `FileRenamePolicy` interface, the constructor for the `MultipartRequest` would now look like this:

```
MultipartRequest mpr = new MultipartRequest(
    request,webTempPath,(5 * 1024 * 1024),
    new com.jspservletcookbook.MyFileRenamePolicy( ));
```

Store your new class in the *WEB-INF/classes* directory of the web application using the same directory structure as the class's package name (as in *WEB-INF/classes/com/jspservletcookbook/MyFileRenamePolicy.class*).



In general, the `com.oreilly.servlet` package also includes the `MultipartFilter` class. According to an article that Jason has written (<http://www.servlets.com/soapbox/filters.html>), "The `MultipartFilter` works by watching incoming requests and when it detects a file upload request (with the content type `multipart/form-data`), the filter wraps the request object with a special request wrapper that knows how to parse the special content type format."

See Also

[Recipe 8.1](#) on preparing HTML for a file upload; [Recipe 8.4](#) on downloading and using the `com.oreilly.servlet` library; [Recipe 8.3](#) and [Recipe 8.6](#) on handling single- and multiple-file uploads in a servlet; [Recipe 8.6](#) on using a JSP to handle file uploads; the homepage for `com.oreilly.servlet`: <http://www.servlets.com/cos/index.html>; the RFC 1867 document on form-based file uploads: <http://www.ietf.org/rfc/rfc1867.txt>.

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Recipe 8.6 Using a JSP to Handle a File Upload

Problem

You want to use a JSP to handle a file upload.

Solution

Create a JavaBean that wraps the functionality of the `com.oreilly.servlet.MultipartRequest` class from Jason Hunter's *cos.jar* library. Then use the `jsp:useBean` standard action in a JSP to create an instance of this bean for handling the file uploads.

Discussion

This recipe describes a JavaBean that uses the `com.oreilly.servlet.MultipartRequest` class to manage file uploads. First, I'll show the bean that wraps the functionality of the `MultipartRequest` class, then the JSP that uses the bean to upload a file.

[Example 8-6](#) shows the `UploadBean` used by the JSP in [Example 8-7](#).

Example 8-6. A file-uploading JavaBean

```
package com.jspServletcookbook;

import java.util.Enumeration;

import javax.servlet.http.HttpServletRequest;
import javax.servlet.ServletRequest;

import com.oreilly.servlet.MultipartRequest;
import com.oreilly.servlet.multipart.DefaultFileRenamePolicy;

public class UploadBean {

    private String webTempPath;
    private HttpServletRequest req;
    private String dir;

    public UploadBean( ) {}

    public void setDir(String dirName) {
```



```

        if (dirName == null || dirName.equals(""))
            throw new IllegalArgumentException(
                "invalid value passed to " + getClass().getName() + ".setDir");

        webTempPath = dirName;
    }

    public void setReq(ServletRequest request) {

        if (request != null && request instanceof HttpServletRequest){

            req = (HttpServletRequest) request;

        } else {

            throw new IllegalArgumentException(
                "Invalid value passed to " + getClass().getName() + ".setReq");
        }

    }

    public String getUploadedFiles( ) throws java.io.IOException{

        //file limit size of 5 MB
        MultipartRequest mpr = new MultipartRequest(
            req,webTempPath,5 * 1024 * 1024,new DefaultFileRenamePolicy( ));

        Enumeration enum = mpr.getFileNames( );

        StringBuffer buff = new StringBuffer("");

        for (int i = 1; enum.hasMoreElements( );i++){

            buff.append("The name of uploaded file ").append(i).
                append(" is: ").
                append(mpr.getFilesystemName((String)enum.nextElement( ))).
                append("<br><br>");
        }//for

        //return the String
        return buff.toString( );

    } // getUploadedFiles

}

```

This code imports the classes it needs to handle the uploaded files with the `MultipartRequest` class. The `DefaultFileRenamePolicy` class is used in the `MultipartRequest` constructor to handle conflicts between the names of uploaded files and any existing files with the same name. When these naming conflicts occur, the `DefaultFileRenamePolicy` class automatically adds a number to the end of the uploaded file, as in *index1.txt* if the uploaded file was named *index.txt*.

[Example 8-6](#) uses the JavaBean naming conventions for its methods, as in `setDir()` and `getUploadedFiles()`, which allow the methods to be called using the `jsp:getProperty` and `jsp:setProperty` standard actions. [Example 8-7](#) shows the use of both of these actions and the JSP that handles the file upload and display information about the uploaded files.

The JSP uses the `UploadBean`, the class I just defined. The JSP instantiates the bean using the `jsp:useBean` standard action, sets the directory name where the uploaded file will be saved with `jsp:setProperty`, then uses `jsp:getProperty` to save the file(s) to the specified directory.

Example 8-7. A JSP that uploads files and displays information about them

```
<jsp:useBean id="uploader" class="com.jspservletcookbook.UploadBean" />

<jsp:setProperty name="uploader" property="dir"
    value="<%=application.getInitParameter(\"save-dir\")%>" />

<jsp:setProperty name="uploader" property="req" value="<%= request %>" />

<html>
<head><title>file uploads</title></head>
<body>
<h2>Here is information about the uploaded files</h2>

<jsp:getProperty name="uploader" property="uploadedFiles" />

</body>
</html>
```

The JSP in [Example 8-7](#) creates an instance of the `UploadBean` with this code:

```
<jsp:useBean id="uploader" class="com.jspservletcookbook.UploadBean" />
```

The `com.jspservletcookbook.UploadBean` class must be placed in the web application's *WEB-INF/classes* directory (inside of *WEB-INF/classes/com/jspservlet/cookbook*), or in a JAR file inside of *WEB-INF/lib*.

The JSP then passes the `HttpServletRequest` object to the bean with this code:

```
<jsp:setProperty name="uploader" property="req" value="<%= request %>" />
```

Under JSP 2.0, you can pass along the `request` value with this code:

```
<jsp:setProperty name="uploader" property="req" value="${pageContext.request}" />
```

The JSP 2.0 specification allows the use of EL syntax in the `jsp:setProperty` `value` attribute.

The bean needs the `request` object to pass into the `MultipartRequest` constructor, which does all the file-uploading work. The JSP also specifies the directory where uploaded files are saved:

```
<jsp:setProperty name="uploader" property="dir"
    value="<%=application.getInitParameter(\"save-dir\")%>" />
```

The expression `application.getInitParameter(\"save-dir\")` returns the value of the context parameter `save-dir`, which is the path to the directory where the uploaded files are saved. Here is what this *web.xml* element looks like:

```
<!-- beginning of deployment descriptor -->
<context-param>
    <param-name>save-dir</param-name>
    <param-value>h:\home\data</param-value>
</context-param>
<!-- deployment descriptor continues -->
```

The final step is to call the bean's `getUploadedFiles()` method. The JSP accomplishes this task using the `jsp:getProperty` standard action, as in:

```
<jsp:getProperty name="uploader" property="uploadedFiles" />
```

The JSP can call the bean's method in this manner, as though the JSP was fetching a bean property, because I named the method with the standard "get" prefix: `getUploadedFiles()`. Tricky!

[Figure 8-4](#) shows the resulting web page after the user has submitted the HTML form.

Figure 8-4. A JSP that handles file uploads

To use this JSP to handle a file upload, you have to specify it in an HTML`form` tag's `action` attribute, as in:

```
<form action="http://localhost:9000/home/upload.jsp" method="post"
enctype="multipart/form-data">
```

See Also

[Recipe 8.1](#) on preparing the HTML for a file upload; [Recipe 8.4](#) on downloading and using the `com.oreilly.servlet` library; [Recipe 8.3](#) and [Recipe 8.6](#) on handling single- and multiple-file uploads in a servlet; [Recipe 8.5](#) on controlling file renaming as files are uploaded; the homepage for `com.oreilly.servlet`: <http://www.servlets.com/cos/index.html>; the RFC 1867 document on form-based file uploads: <http://www.ietf.org/rfc/rfc1867.txt>.

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Chapter 9. Handling Exceptions in Web Applications

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Introduction

Web applications can sometimes show a number of errors that you don't want users to see. If a user who expects to be served an information-rich page is instead greeted with an ugly and incomprehensible announcement of an "HTTP Status 500" in her web browser, you can bet this visit to the site will be her last! All web sites handle unexpected HTTP status codes (such as the "404 Not Found" or "403 Forbidden") with a friendly and informative error message, but you'll want to hide these messages from your users. Tools to handle both Java runtime exceptions and these unanticipated HTTP status codes are available to developers, and the recipes in this chapter show you how to use them effectively.

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Recipe 9.1 Declaring Exception Handlers in web.xml

Problem

You want to display certain servlets or JSPs when a web component throws a Java exception or generates unexpected server response codes.

Solution

Use the `error-page` element in *web.xml* to specify the invocation of servlets or JSPs in response to certain exceptions or HTTP status codes.

Discussion

A Java web developer should handle these types of unexpected occurrences within his web application:

- The " 404 Not Found" server response code, which indicates that the user has made a mistake when typing in the URL, or requested a page that no longer exists.
- The " 500 Internal Server Error" that can be raised by a servlet when it calls `sendError(500)` on the `HttpServletResponse` object.
- Runtime exceptions that are thrown by the web application and not caught by the filter, servlet, or JSP.

You configure the handling of exceptions and server response codes with the `error-page` element in the deployment descriptor. The `error-page` element in *web.xml* comes after any `servlet`, `servlet-mapping`, `session-config`, `mime-mapping`, and `welcome-file-list` elements, as well as before any `taglib`, `resource-env-ref`, `resource-ref`, or `security-constraint` elements. The `error-page` element includes a mapping between the status code or exception type, as well as the path to a web resource. This resource, which should be a servlet, JSP, or HTML file, should inform the user about what happened and provide links to other parts of the web site, depending on the nature of the error.

Example 9-1 shows a deployment descriptor for servlet API 2.3 that configures error pages.

Example 9-1. Configuring error pages in web.xml

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE web-app
    PUBLIC "-//Sun Microsystems, Inc.//DTD Web Application 2.3//EN"
        "http://java.sun.com/dtd/web-application_2_3.dtd"
>
```

```
<web-app>
<!-- top of deployment descriptor, such as filter, servlet, servlet-mapping, session-
config, welcome-file elements -->

<servlet>
    <servlet-name>Error404</servlet-name>
    <servlet-class>com.jspervletcookbook.Error404</servlet-class>
</servlet>

<servlet>
    <servlet-name>Error403</servlet-name>
    <servlet-class>com.jspervletcookbook.Error403</servlet-class>
</servlet>

<servlet>
    <servlet-name>ErrorIo</servlet-name>
    <servlet-class>com.jspervletcookbook.ErrorIo</servlet-class>
</servlet>

<servlet>
    <servlet-name>ErrorServlet</servlet-name>
    <servlet-class>com.jspervletcookbook.ErrorServlet</servlet-class>
</servlet>

<servlet>
    <servlet-name>ErrorGen</servlet-name>
    <servlet-class>com.jspervletcookbook.ErrorGen</servlet-class>
</servlet>

<!-- servlet mappings -->

<servlet-mapping>
    <servlet-name>Error404</servlet-name>
    <url-pattern>/err404</url-pattern>
</servlet-mapping>

<servlet-mapping>
    <servlet-name>Error403</servlet-name>
    <url-pattern>/err403</url-pattern>
</servlet-mapping>

<servlet-mapping>
    <servlet-name>ErrorIo</servlet-name>
    <url-pattern>/errIo</url-pattern>
</servlet-mapping>

<servlet-mapping>
    <servlet-name>ErrorServlet</servlet-name>
    <url-pattern>/errServ</url-pattern>
</servlet-mapping>
```

```

<servlet-mapping>
    <servlet-name>ErrorGen</servlet-name>
    <url-pattern>/errGen</url-pattern>
</servlet-mapping>

<!-- error-code related error pages -->
<!-- Not Found -->
<error-page>
    <error-code>404</error-code>
    <location>/err404</location>
</error-page>
<!-- Forbidden -->
<error-page>
    <error-code>403</error-code>
    <location>/err403</location>
</error-page>

<!-- exception-type related error pages -->

<error-page>
    <exception-type>javax.servlet.ServletException</exception-type >
    <location>/errServ</location>
</error-page>

<error-page>
    <exception-type>java.io.IOException</exception-type >
    <location>/errIo</location>
</error-page>

<! -- all other types -->
<error-page>
    <exception-type>java.lang.Throwable</exception-type >
    <location>/errGen</location>
</error-page>

<!-- web.xml continues; tag-lib, resource-ref, security-constraint elements, etc. -->

</web-app>

```

When a servlet throws an exception, the web container searches the configurations in *web.xml* that use the `exception-type` element for a match with the thrown exception type. In Example 9-1, if the web application throws a `ServletException`, then the web container invokes the `/errServ` servlet. The web container invokes the closest match in the class hierarchy. For example, if a servlet throws an `IOException`, the container invokes the `/errIo` servlet that is mapped to the thrown exception type, not the component mapped to `java.lang.Throwable` -even though `IOException` is in the same class hierarchy as `Throwable`. If this application throws an `IllegalStateException`, the container invokes the `/errGen` servlet (which is mapped to `Throwable`), because there is no specific error page mapping for `IllegalStateException`.

In the event of an HTTP response code of 403 or 404, the container invokes the web components or HTML pages mapped with the `location` element to those exact numbers.



The web container must return a response code of 500 if an exception occurs that is not handled by this error-page mechanism, according to the servlet API specification.

See Also

Recipe 9.2 on creating a servlet error handler; Recipe 9.3 on sending an error from a servlet; Recipe 9.4 on sending an error from a JSP; Recipe 9.5 on using JSPs to handle errors; Recipe 9.6 on declaring in a JSP that another JSP will handle its exceptions; Chapter 1 on the deployment descriptor; the Java servlet specification, which covers error handling in Chapter SRV.9.9: <http://java.sun.com/products/servlet/index.html> .

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Recipe 9.2 Creating an Exception-Handling Servlet

Problem

You want to create a servlet that generates an error page.

Solution

Create a servlet that displays some information about the error, then map `exception` types and/or error codes to the servlet in the deployment descriptor.

Discussion

An error-handling servlet has access to several request attributes that it can use to describe the error. The error page also has access to the `request` and `response` objects associated with the page that generated the error. For example, the `java.lang.Throwable` object associated with any `exceptions` can be accessed with the following code:

```
Throwable throwable = (Throwable)
    request.getAttribute("javax.servlet.error.exception");
```

You can access the server response code with this code:

```
String status_code = ((Integer)
    request.getAttribute("javax.servlet.error.status_code")).toString( );
```

[Table 9-1](#) shows the request attributes that an error-handling servlet has access to.

Table 9-1. Request attributes available to servlet error pages

Request attribute	Java type
<code>javax.servlet.error.status_code</code>	<code>java.lang.Integer</code>
<code>javax.servlet.error.exception_type</code>	<code>java.lang.Class</code>
<code>javax.servlet.error.message</code>	<code>java.lang.String</code>
<code>javax.servlet.error.exception</code>	<code>java.lang.Throwable</code>
<code>javax.servlet.error.request_uri</code>	<code>java.lang.String</code>

Request attribute	Java type
<code>javax.servlet.error.servlet_name</code>	<code>java.lang.String</code>

[Example 9-2](#) shows the `ErrorGen` servlet. The web container invokes this servlet when another servlet or JSP throws an unhandled `Throwable`, according to the configuration in [Example 9-1](#).

Example 9-2. An error-handling servlet

```
package com.jspServletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

public class ErrorGen extends HttpServlet {

    public void doPost(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        //check the servlet exception
        Throwable throwable = (Throwable)
            request.getAttribute("javax.servlet.error.exception");

        String servletName = (String)
            request.getAttribute("javax.servlet.error.servlet_name");
        if (servletName == null)
            servletName = "Unknown";

        String requestUri = (String)
            request.getAttribute("javax.servlet.error.request_uri");
        if (requestUri == null)
            requestUri = "Unknown";

        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );
        out.println("<html>");
        out.println("<head>");
        out.println("<title>Error page</title>");
        out.println("</head>");
        out.println("<body>");

        if (throwable == null){
            out.println("<h2>The error information is not available</h2>");
            out.println("Please return to the <a href=\"\" +
                response.encodeURL("http://localhost:8080/home") +
                "\">home page</a>.");
        } else{
            out.println("<h2>Here is the error information</h2>");

            out.println(
```



```

        "The servlet name associated with throwing the exception: " +
        servletName + "<br><br>");

    out.println("The type of exception: " +
        throwable.getClass().getName() + "<br><br>");

    out.println("The request URI: " + requestUri + "<br><br>");
    out.println("The exception message: " + throwable.getMessage());
}
out.println("</body>");
out.println("</html>");

}

public void doGet(HttpServletRequest request,
    HttpServletResponse response)
    throws ServletException, java.io.IOException {

    doPost(request, response);
}
}

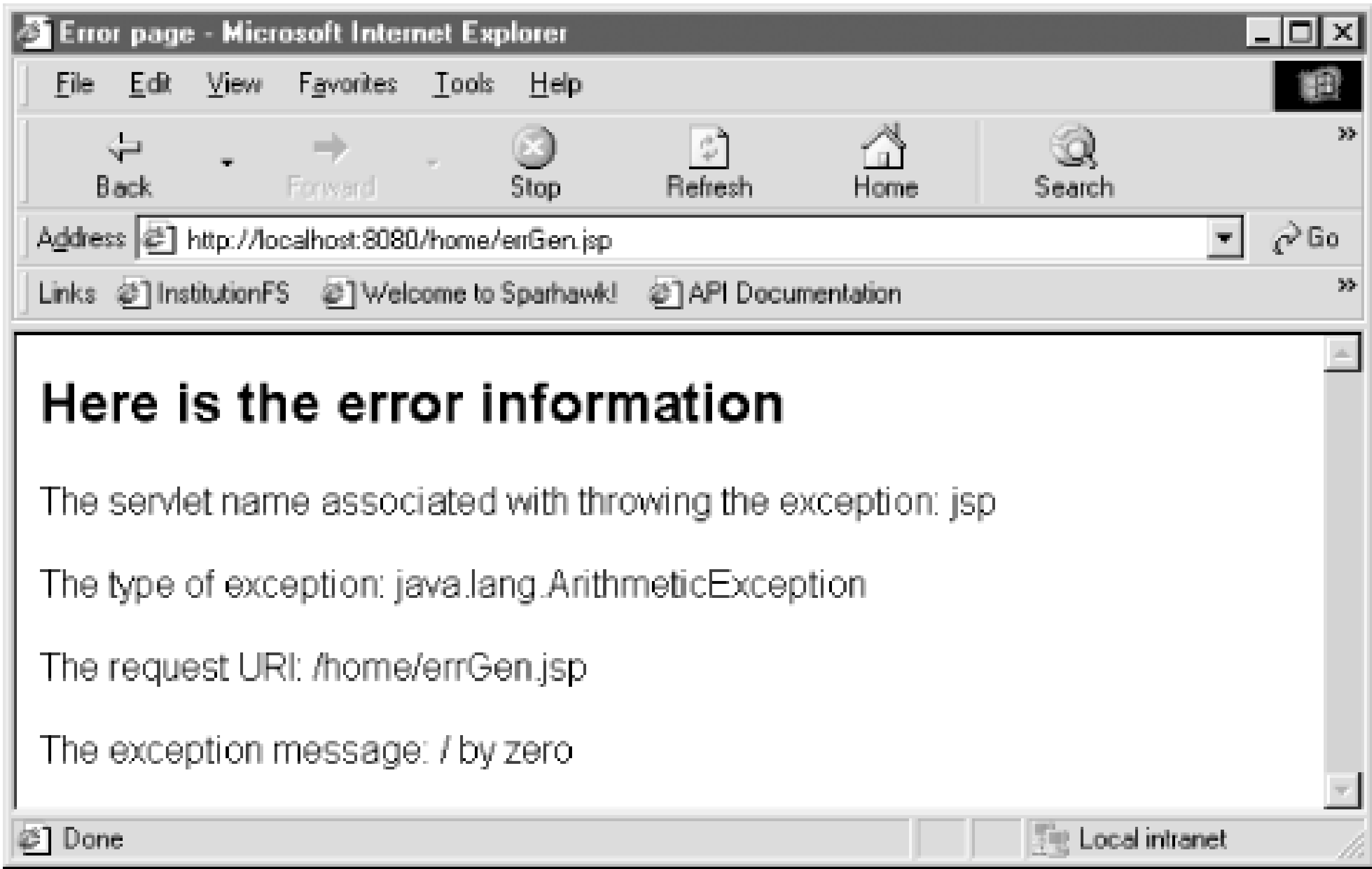
```

The servlet gets a reference to the thrown `exception`, then displays information such as the `exception`'s class name and the `exception` message. The request URI represents a partial path (such as `/home/errGen.jsp`) to the component that threw the `exception`, which can be very helpful for debugging and information purposes. [Figure 9-1](#) shows what the browser displays when a servlet throws an `exception` using Tomcat's web container.

Figure 9-1. Error page HTML displayed by an error-handling servlet

[Figure 9-2](#) shows the error page displayed by our example servlet when a JSP in the same web application throws a `java.lang.ArithmeticException`.

Figure 9-2. The error page displayed by [Example 9-1](#) when a JSP throws an exception



See Also

[Recipe 9.1](#) on declaring exception handlers in the deployment descriptor; [Recipe 9.3](#) on sending an error from a servlet; [Recipe 9.4](#) on sending an error from a JSP; [Recipe 9.5](#) on using JSPs to handle errors; [Recipe 9.6](#) on declaring in a JSP that another JSP will handle its exceptions; [Chapter 1](#) on the deployment descriptor; the Java servlet specification, which covers error handling in Chapter SRV.9.9: <http://java.sun.com/products/servlet/index.html>.

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Recipe 9.3 Sending an Error from a Servlet

Problem

You want to use a servlet to manually send a response error to the client.

Solution

Use the `javax.servlet.HttpServletResponse.sendError()` method.

Discussion

The `javax.servlet.http.HttpServletResponse` class has two versions of the `sendError()` method: one that takes an `int` parameter representing the HTTP response code (such as 500), and the other taking a `int` parameter and a `String` error message. The `String` parameter is used to display a message to the client if an error page is not configured for that particular response code. Example 9-3 shows the skeleton of a servlet whose commented sections describe various scenarios for sending response codes.

Use the two-parameter method version, so that a meaningful message is displayed in the event that the application has not configured an error page for a particular error code.

Example 9-3. Sending a response code from a servlet

```
package com.jspervletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

public class Sender extends HttpServlet {

    public void doPost(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        /* if the servlet tries to access a resource and finds out that the client is not
        authorized to access it - "401 Unauthorized" */

        //response.sendError(401,
        //    "You are not authorized to view the requested component");

        /* if the servlet tries to access a resource that is forbidden for this client and the
```



```

is no further information on it - "403 Forbidden" */
    //response.sendError(403,
    // "You are forbidden from viewing the requested component; no
    //further information");

/* if the servlet tries to access a resource that is not found given the client's provided
URL - "404 Not Found" */
    //response.sendError(404,
    //"The server could not find the requested component");
}

public void doGet(HttpServletRequest request, HttpServletResponse response)
    throws ServletException, java.io.IOException {

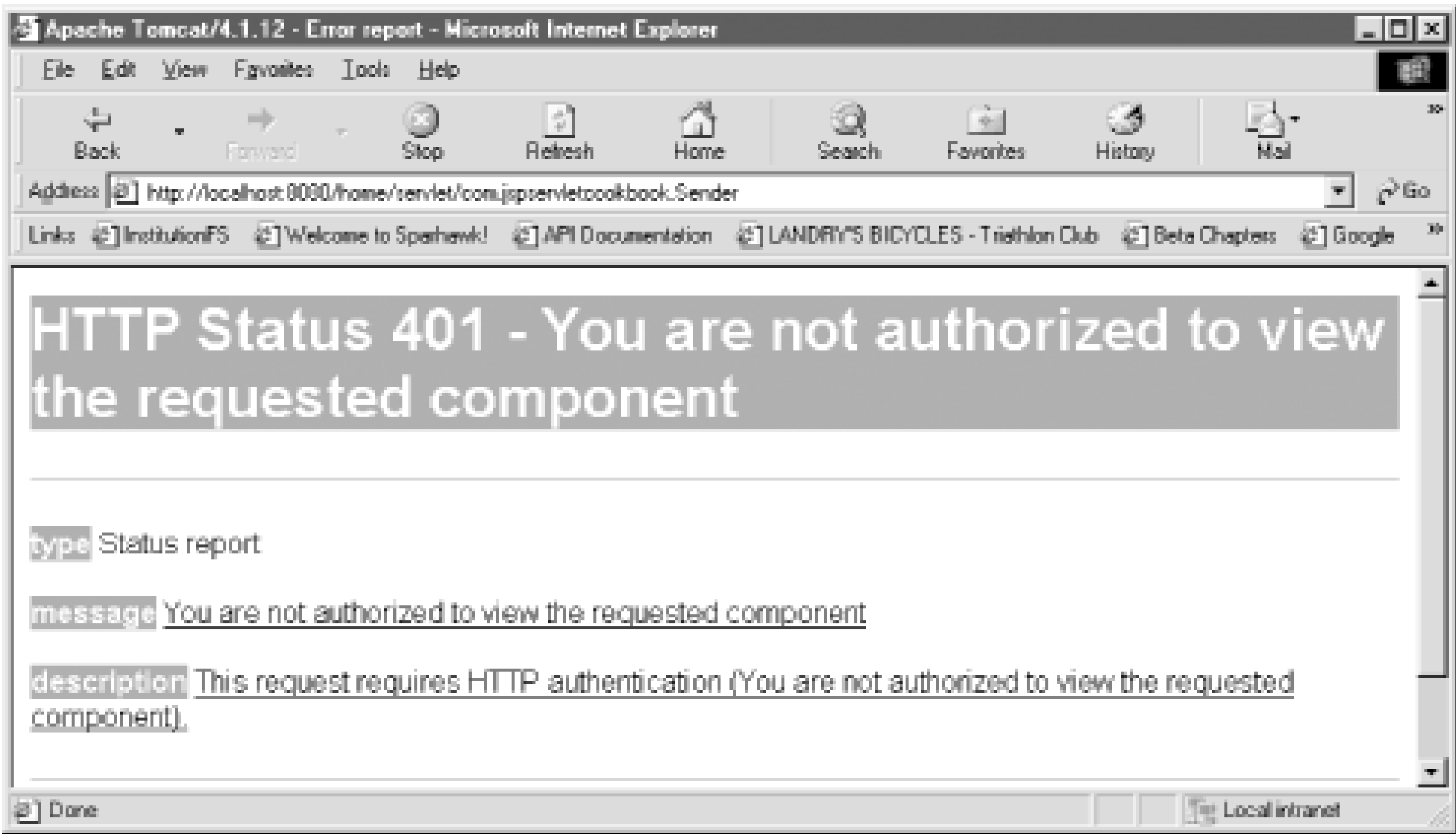
    doPost(request,response);
}
}

```

If an error page is configured for the error code that you specified in the `sendError()` method, the web container invokes the error page mapped to that error code. If the error code does not have an error page configured for it in *web.xml*, the web container generates a default HTML page containing the message included as the `String` parameter to the `sendError()` method, as in Figure 9-3 . The server leaves cookies and other response headers unmodified when it returns this HTML to the client.

If you call `sendError()` after already committing the response to the client (such as when the response buffer, a temporary storage location for the response data, is full and "auto-flushed"), `sendError()` throws a `java.lang.IllegalStateException` . You can set the buffer size with the `javax.servlet.ServletResponse.setBufferSize()` method.

Figure 9-3. Server response to `HttpServletResponse.sendError` when there no error page is configured for the error code



See Also

Recipe 9.1 on declaring exception handlers in the deployment descriptor; Recipe 9.2on developing a serv error handler; Recipe 9.4 on sending an error from a JSP; Recipe 9.5 on using JSPs to handle errors; Rec 9.6 on declaring in a JSP that another JSP will handle its exceptions; Chapter 1on the deployment descriptor; the Java servlet specification, which coverserror handling in Chapter SRV.9.9: <http://java.sun.com/products/servlet/index.html> .

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Recipe 9.4 Sending an Error from a JSP

Problem

You want to use a JSP to manually send a response error to a client.

Solution

Use the `response` implicit object and the `sendError` method inside a JSP scriptlet.

Discussion

If you want to send a response error from a JSP, then simply grab the `response` implicit object inside a scriptlet and call `sendError()` on it. Make sure not to call `sendError()` after already flushing or committing the response to the client, or the method will throw a `java.lang.IllegalStateException`. The JSP code in [Example 9-4](#), which could be a standalone JSP or a fragment of a larger page, results in the display of [Figure 9-3](#) when requested with the following query string: `"?client-unauthorized=true"`.

Example 9-4. Using the response implicit object to send a response error from a JSP

```
<%@ taglib uri=
    "http://java.sun.com/jstl/core" prefix="c" %>

<c:if test="{param.client-unauthorized}" >

    <% response.sendError(401,
        "You are not authorized to view the requested component");
    %>

</c:if>
```

See Also

[Recipe 9.1](#) on declaring exception handlers in the deployment descriptor; [Recipe 9.2](#) on developing a servlet error handler; [Recipe 9.3](#) on sending an error from a servlet; [Recipe 9.5](#) on using JSPs to handle errors; [Recipe 9.6](#) on declaring in a JSP that another JSP will handle its exceptions; [Chapter 1](#) on the deployment descriptor; the Java servlet specification, which covers error handling in Chapter SRV.9.9: <http://java.sun.com/products/servlet/index.html>.

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Recipe 9.5 Creating an Error-Handling JSP

Problem

You want to use a JSP as your error page for both servlets and JSPs.

Solution

Create a JSP that displays information about the `java.lang.Throwable` reported by using the specified `request` attributes, such as `javax.servlet.error.exception`. Use the `error-page` attribute in *web.xml* to map certain `exception` types to the JSP.

Discussion

A JSP can display error information in the same manner as the servlet used in [Recipe 9.2. Example 9-5](#) can be used as the error page for both JSPs and servlets. This sample JSP uses the JSTL and the EL to display the thrown exception's various characteristics, such as its fully qualified class name.

Example 9-5. Using a JSP as an error page

```
<%@page isErrorPage="true" %>
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<html>
<head><title>Sorry about the error</title></head>
<body>
<h2>Sorry, We Erred Handling Your Request</h2>

<strong>Here is information about the error:</strong> <br><br>
```

The servlet name associated with throwing the exception:

```
<c:out value="${requestScope['javax.servlet.error.servlet_name']}" />
<br><br>
```

The type of exception:

```
<c:out value=
    "${requestScope['javax.servlet.error.exception'].class.name}" />
<br><br>
```

The request URI:

```
<c:out value="${requestScope['javax.servlet.error.request_uri']}" />
<br><br>
```

The exception message:

```
<c:out value=
    "${requestScope["javax.servlet.error.exception"].message}" />
</body>
</html>
```

The error page grabs the request Uniform Resource Indicator (URI), which is the servlet path beginning with the context path and not including any query string, with this code:

```
<c:out value="${requestScope["javax.servlet.error.request_uri"]}" />
```

This passes the value of a request attribute named `javax.servlet.error.request_uri` to the `c:out` JSTL tag, which results in the attribute value displayed in the HTML. Make sure to escape the double quotes inside the EL phrase, as in:

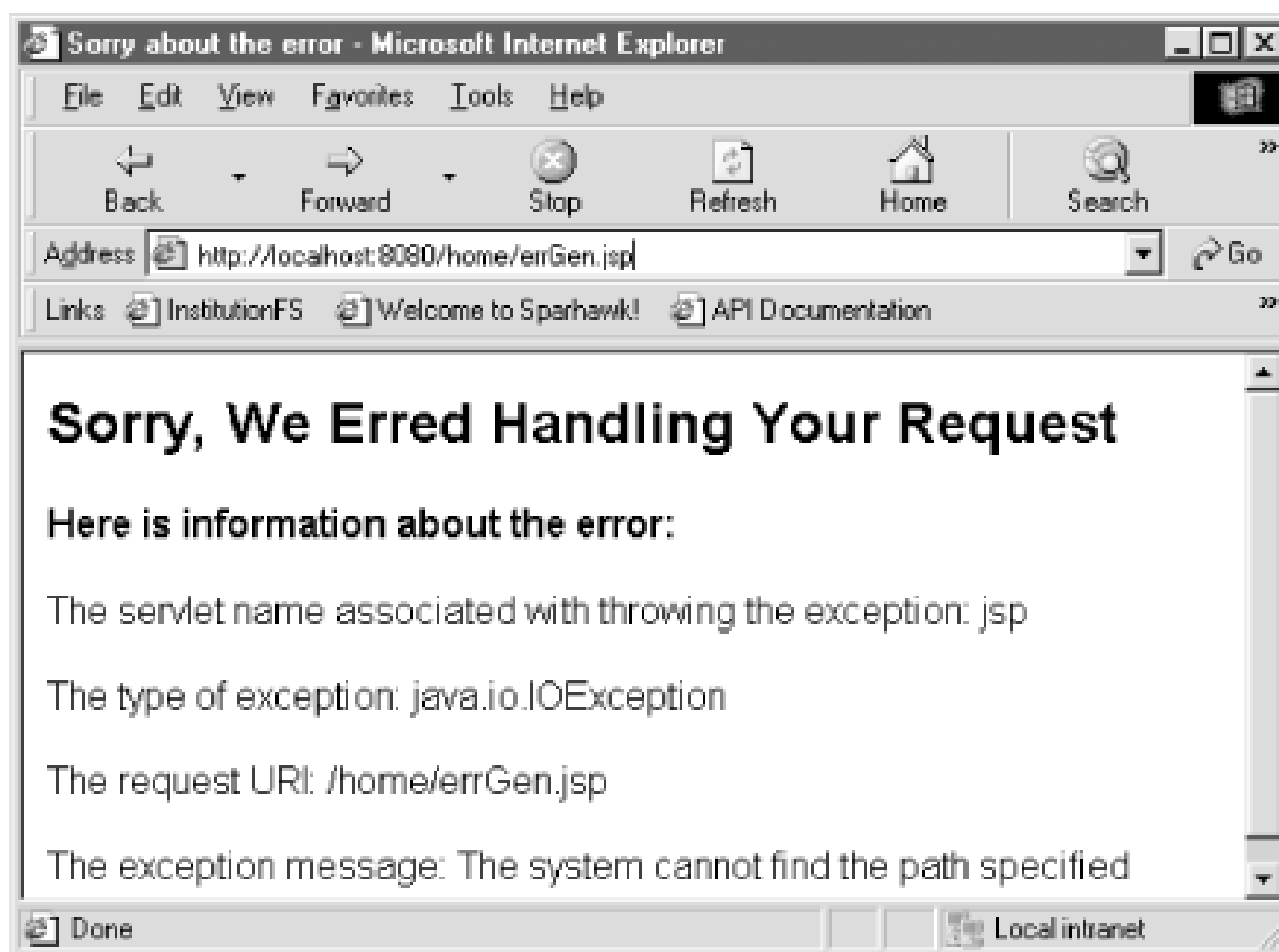
```
"${requestScope["javax.servlet.error.request_uri"]}"
```

The code gets information about the `exception` from the `request` attributes that are automatically created by the web container when the servlet or JSP throws an `exception`. For example, if you want to add the response status code to this information, then this number is available from the `request` attribute `javax.servlet.error.status_code`.

See [Table 9-1](#) for the complete list of these attributes.

In addition, the part of [Example 9-5](#) that gets the class name of the `exception` calls `getClass().getName()` on the `Throwable` object. [Figure 9-4](#) shows the browser display of this error page after a JSP named *errGen.jsp* generates an error.

Figure 9-4. A JSP error page displays information about a thrown exception



The *web.xml*/deployment descriptor uses the following element to specify that the error page of [Example 9-5](#) should handle any `java.io.IOException`s:

```
<error-page>
    <exception-type>java.io.IOException</exception-type >
    <location>/errHandler.jsp</location>
</error-page>
```

[Example 9-6](#) shows the JSP that throws the exception.

Example 9-6. A JSP that throws a `java.io.IOException`

```
<html>
<head><title>Exception Thrower</title></head>
<body>
<h2>Throw an IOException </h2>
<% java.io.File file = new java.io.File(
    "z:" + System.getProperty("file.separator") + "temp");
    file.createNewFile( );;%>
</body>
</html>
```

See Also

[Recipe 9.1](#) on declaring error pages in *web.xml*; [Recipe 9.2](#) on creating a special exception-handling servlet; [Recipe 9.3](#) on sending an error from a servlet; [Recipe 9.4](#) on sending an error from a JSP; [Recipe 9.6](#) on declaring in a JSP that another JSP will handle its exceptions; [Chapter 23](#) on using the JSTL; the JSP 2.0 specification and its Chapter JSP.1.4 on error handling: <http://java.sun.com/products/jsp/>.

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Recipe 9.6 Declaring a Special Exception-Handling JSP for Other JSPs

Problem

You want to declare inside of a JSP that another or external JSP will handle any thrown errors.

Solution

Set the `page` directive attribute `errorPage` to the special JSP error page's path in the web application. The JSP error page itself has its `page` directive attribute `isErrorPage` set to "true".

Discussion

The JSP specification allows a JSP author to declare at the top of the page that a special error-handling JSP will handle any exceptions thrown by the page that they are authoring. This design allows the encapsulation of error handling inside a specially designed JSP.

If you want to specifically target a JSP error page within JSP code, set the `page` directive's `errorPage` attribute to the target error page's location in the web application. [Example 9-7](#) shows a JSP with a `page` directive declaring *errHandler.jsp* as its error page.

This `page` directive declaration overrides any matching `error-page` configurations in *web.xml*. If this JSP throws an `java.io.IOException` and *web.xml* has an `exception-type` attribute for that exception, the web container invokes the error page specified by the `page` directive instead of any URI specified in the *web.xml*/configuration.

Example 9-7. A JSP that specifies another JSP as its error page

```
<%@page errorPage="/errHandler.jsp" %>
<html>
<head><title>Exception Thrower</title></head>
<body>
<h2>Throw an IOException </h2>
<%
    java.io.File file = new java.io.File("z:" + System.getProperty("file.separator") +
        "temp");
    file.createNewFile( ); %>
```

```
</body>
</html>
```

The error page has access to an `exception` implicit object that represents the `java.lang.Throwable` object associated with the error.

[Example 9-8](#) uses the JSTL and the EL to show information about the `exception`. See [Chapter 23](#) if you have not yet been introduced to the JSTL or the EL.

Example 9-8. A JSP error page named `errHandler.jsp`

```
<%@page isErrorPage="true" %>
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<html>
<head><title>Sorry about the error</title></head>
<body>
<h2>Sorry, We Erred Handling Your Request</h2>
<strong>Here is information about the error:</strong> <br><br>
```

The servlet name associated with throwing the exception:

```
<!-- JSP 2.0 usage only!
<:out value="${pageContext.errorData.servletName}" /> --%>
<br><br>
```

The type of exception:

```
<:out value="${pageContext.exception.class.name}" />
<br><br>
```

The request URI:

```
<!-- JSP 2.0 usage only!
<:out value="${pageContext.errorData.requestURI}" /> --%>
<br><br>
```

The exception message:

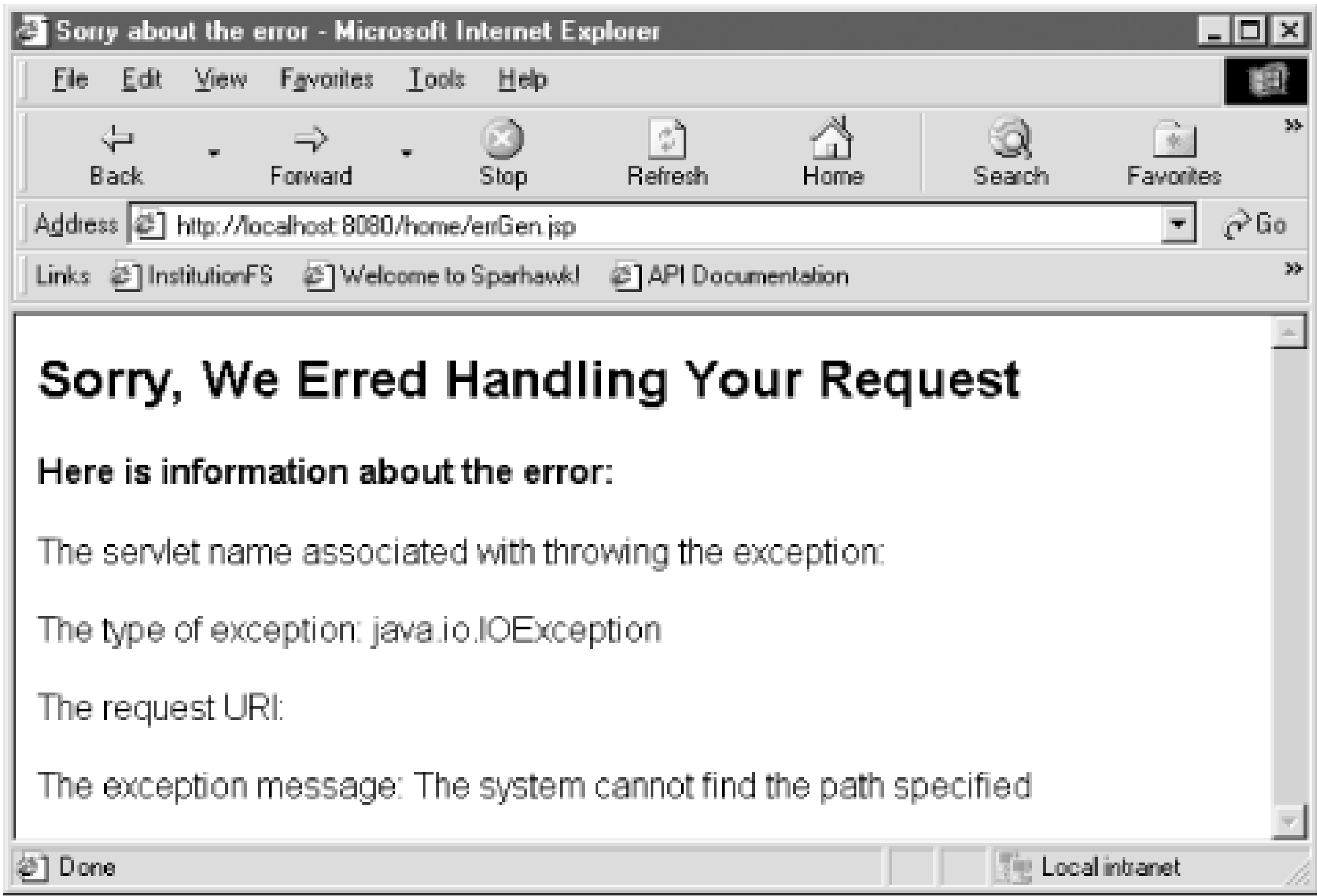
```
<:out value="${pageContext.exception.message}" />
</body>
</html>
```

[Figure 9-5](#) shows the `errHandler.jsp` page displayed in a browser, after the JSP in [Example 9-7](#) has thrown a `java.io.IOException` while trying to create a file on a phantom disk. The commented-out sections of [Example 9-8](#) show the use of the `javax.servlet.jsp.ErrorData` class, which allows you to use the EL to get more information about the error. For example, you can get the request URI (as in `/home/errGen.jsp`) of the offending JSP with this syntax:

```
${pageContext.errorData.requestURI}
```

However, this usage fails in a JSP 1.2 container such as Tomcat 4.1.12, because it was introduced in JSP 2.0. This is why there is an empty space in the browser page after "The request URI:."

Figure 9-5. A JSP error page using the page directive attributes `errorPage` and `isErrorPage`



You can also use this syntax to get access to the `java.lang.Throwable` object in the error page:

```
<c:out value="${requestScope[
  \"javax.servlet.jsp.jspException\"]}" />
```

See Also

[Recipe 9.1](#) on declaring error pages in *web.xml*; [Recipe 9.2](#) on creating a special exception-handling servlet; [Recipe 9.3](#) on sending an error from a servlet; [Recipe 9.4](#) on sending an error from a JSP; [Recipe 9.5](#) on using JSPs to handle errors; [Chapter 23](#) on using the JSTL; Chapter JSP.1.4 of the JSP 2.0 specification on error handling: <http://java.sun.com/products/jsp/>.

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Chapter 10. Reading and Setting Cookies

[Introduction](#)

[Recipe 10.1. Setting a Cookie with a Servlet](#)

[Recipe 10.2. Creating an Array from All of the Request's Cookies](#)

[Recipe 10.3. Setting a Cookie with a JSP](#)

[Recipe 10.4. Reading Cookie Values with a Servlet](#)

[Recipe 10.5. Reading Cookie Values with a JSP](#)

[Recipe 10.6. Altering or Removing a Cookie That Has Already Been Set](#)

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Introduction

In a typical visit to a web site, a user sends multiple requests for resources to a web server. If a web page contains many images (and most do!), then requesting the single web page involves one HTTP request for the HTML code and other template text (such as headlines and phrases), followed by separate requests for each image the web page contains. Future requests for the same page often return versions of these text and images that are cached on the client's computer for the sake of efficiency, depending on whether the fetched resources permit caching. At any rate, the server views each HTTP request for these web resources as separate and discrete from the other requests. Without the use of additional protocols, the server does not have a mechanism for managing *client state*, such as the progress of a web user through a questionnaire or storefront. Being able to logically relate one or more web requests as a single user session is where cookies come in.

A *cookie* is a small piece of information on a user's computer that a web server can use to identify that user the next time he visits the site. When a user initially visits the cookie-enabled site, the server responds with an extra response header that looks like:

```
Set-Cookie: mycookie=1051565332678; Domain=.myorg.com;
Expires=Tue, 29-Apr-2003 07:42:12 GMT
```

Consequently, when the user visits the same site, his browser sends an extra request header that contains the cookie associated with that web location. Here is what the request headers look like when the client returns to the site that previously set the cookie; since the servlet container is Tomcat 4.1.12, the Cookie request header also includes a name/value pair for the session-related cookie (JSESSIONID):

```
GET /home/cookie HTTP/1.1
Accept: image/gif, image/x-xbitmap, image/jpeg, image/pjpeg, application/msword,
application/vnd.ms-powerpoint, application/vnd.ms-excel, application/pdf, */*
Accept-Language: en-us
Accept-Encoding: gzip, deflate
User-Agent: Mozilla/4.0 (compatible; MSIE 5.5; Windows NT 4.0)
Host: localhost:9000
Connection: Keep-Alive
Cookie: JSESSIONID=F80F0F571FDE4873CFF3FF0B842D4938; mycookie=1051610231064
```

A cookie contains a name and a value; the cookie can also have several other optional attribute/value pairs, which are separated by semicolons:

Domain

Specifies the domain to which this cookie will be sent in future requests, as in *Domain=.jspServletcookbook.com*. The default value of this optional attribute is the hostname of the domain that has sent the *Set-Cookie* header.

Path

Further delineates the part of the web site that, when requested, is sent the cookie by the client. Most cookies give this attribute a value of `/`. For example, if only the *customer* context path should receive the cookie, then the `Set-Cookie` header would include the *path=/customer* attribute/value pair. The client would not send the cookie value when making any requests to the domain that do not include the */customer* context path.

Expires

Specifies the maximum amount of time the user's browser should keep the cookie. This attribute is a date string representing a future date. If `Expires` specifies a past date, then the cookie is deleted. The Java Cookie API manages this attribute by calling the `Cookie` object's `setMaxAge()` method (see [Recipe 10.1](#)).

Version

An optional value of `0` for Netscape's preliminary specification and `1` for the RFC 2109 document.

Secure

True if the cookie can be sent only over a secure connection such as HTTPS.

Comment

May have as a value a description of the cookie's purpose.

A browser is expected to support 20 cookies for each web server, 300 cookies total, and may limit cookie size to 4 KB each, according to the `javax.servlet.http.Cookie` API documentation. The cookie name and value combine to represent the 4-KB limit, according to the Netscape preliminary specification. A typical cookie is far less than 4 KB in size.

The user can also disable cookies, so that his browser does not save any of the cookies in a web-server response. For example, in Netscape 7.1, the menu combination Edit → Preferences Privacy & Security → Cookies allows you to prevent the acceptance of cookies by choosing the "Disable cookies" radio button. In this case, the web developer uses "URL rewriting" for any clients that have disabled cookies (see [Recipe 11.7](#) and [Recipe 11.8](#)).

The Java servlet API abstracts a cookie as an object of type `javax.servlet.http.Cookie`. The recipes in this chapter show how to create new cookies, as well as read or alter existing cookies, with

both servlets and JSPs.

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Recipe 10.1 Setting a Cookie with a Servlet

Problem

You want to set a cookie using a servlet.

Solution

Create the `javax.servlet.http.Cookie` object in a servlet, then set the cookie on a user's machine with the `javax.servlet.http.HttpServletResponse.addCookie(Cookie cookie)` method.

Discussion

Inside the servlet, create the `Cookie` by instantiating a new `Cookie` and calling its setter (or mutator) methods. The `Cookie` constructor includes the name and value for the cookie:

```
Cookie cookie = new Cookie("mycookie", "the1cookie");
```

[Example 10-1](#) creates a cookie and sets its `path` attribute (as in: `cookie.setPath(String path)`) to the name of the context path (as in `/home`). With this path setting, the client will not send the cookie to the server unless the client requests resources within the specified context path. The code uses `HttpServletRequest.getContextPath()` to provide the value for the cookie's path attribute.

Example 10-1. A servlet that sets a cookie and displays some cookie information

```
package com.jspervletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

public class CookieServlet extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        Cookie cookie = null;
        //Get an array of Cookies associated with this domain
        Cookie[] cookies = request.getCookies( );
        boolean newCookie = false;
```

```

//Get the 'mycookie' Cookie if it exists
if (cookies != null){
    for (int i = 0; i < cookies.length; i++){
        if (cookies[i].getName( ).equals("mycookie")){
            cookie = cookies[i];
        }
    } //end for
} //end if

if (cookie == null){
    newCookie=true;

    //Get the cookie's Max-Age from a context-param element
    //If the 'cookie-age' param is not set properly
    //then set the cookie to a default of -1, 'never expires'
    int maxAge;
    try{
        maxAge = new Integer(
            getServletContext( ).getInitParameter(
                "cookie-age")).intValue( );
    } catch (Exception e) {

        maxAge = -1;
    } //try

    //Create the Cookie object

    cookie = new Cookie("mycookie",""+getNextCookieValue( ));
    cookie.setPath(request.getContextPath( ));
    cookie.setMaxAge(maxAge);
    response.addCookie(cookie);

} //end if
// get some info about the cookie
response.setContentType("text/html");
java.io.PrintWriter out = response.getWriter( );

out.println("<html>");
out.println("<head>");
out.println("<title>Cookie info</title>");
out.println("</head>");
out.println("<body>");

out.println(
"<h2> Information about the cookie named \"mycookie\"</h2>");

out.println("Cookie value: "+cookie.getValue( )+"<br>");
if (newCookie){
    out.println("Cookie Max-Age: "+cookie.getMaxAge( )+"<br>");
    out.println("Cookie Path: "+cookie.getPath( )+"<br>");
}

```

```

        out.println("</body>");
        out.println("</html>");
    }
    private long getNextCookieValue( ){

        //returns the number of milleseconds since Jan 1, 1970
        return new java.util.Date( ).getTime( );

    }

    public void doPost(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        doGet(request,response);
    }
}

```

[Example 10-1](#) uses `Cookie.setMaxAge(int age)` to specify when the cookie will expire or be deleted by the browser. The method parameter represents the maximum number of seconds that the cookie will live on the user's machine after it is created. The example code gets the value for this method from a `context-param` element in *web.xml*, which allows a web developer to configure or optionally change this value in the deployment descriptor. Here is an example of a `context-param` element that provides a value for a cookie's age:

```

<context-param>
    <param-name>cookie-age</param-name>
    <param-value>31536000</param-value>
</context-param>

```

For example, if you wanted the cookie to linger for one year (365 x 24 x 60 x 60 seconds), you could use this code:

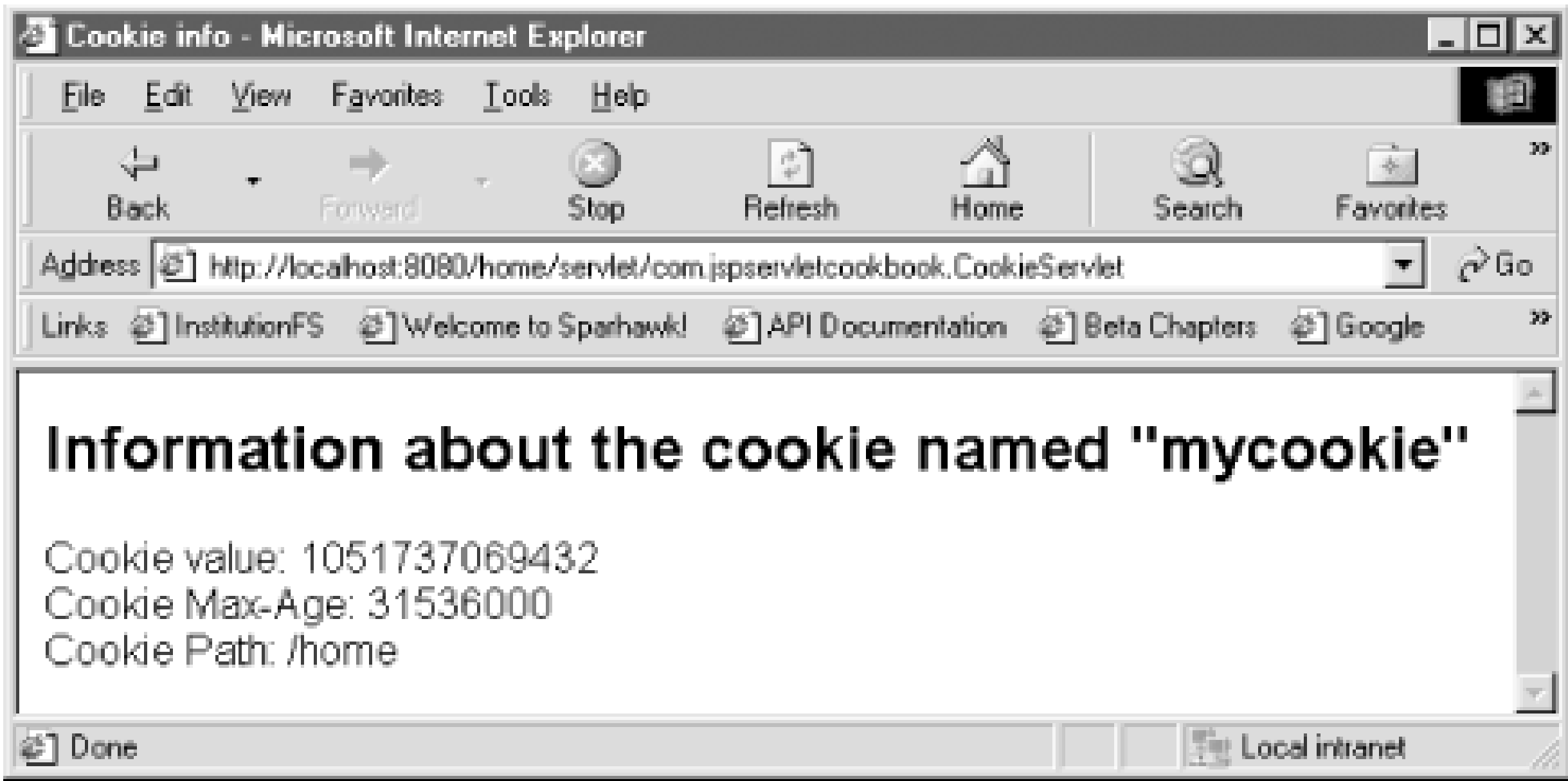
```
cookie.setMaxAge(31536000);
```

Users can delete a cookie from their machine, regardless of the maximum age that you have created for it. Some browsers provide a window into a user's cookies, with features that allow the user to remove one or more cookies. Don't assume that because you set a maximum age, the cookie will always be available on users' machines.

[Example 10-1](#) also checks for the existence of a cookie of the same name that the code plans to give the new cookie (*mycookie*). If the user has not already sent the *mycookie* cookie, then the servlet sets a new cookie and displays some of the cookie's values afterward.

[Figure 10-1](#) shows the servlet output.

Figure 10-1. A servlet shows information about a new cookie



The cookie value is arbitrarily set to a `String` showing a large number, just to demonstrate how to provide the value for a cookie. As many cookies need unique values, you could use a method whereby the user's email address or unique database ID is encoded and then used as the cookie value.

See Also

[Recipe 10.3](#) on setting a cookie with a JSP; [Recipe 10.4](#) on using a servlet to read cookies; [Recipe 10.5](#) on reading cookie values with a JSP; [Recipe 10.6](#) on altering or removing an existing cookie; the RFC 2109 document dealing with cookies: <ftp://ftp.rfc-editor.org/in-notes/rfc2109.txt>; Netscape's preliminary specification for cookies: http://wp.netscape.com/newsref/std/cookie_spec.html; the Java Cookie API: <http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/http/Cookie.html>.

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Recipe 10.2 Creating an Array from All of the Request's Cookies

Problem

You want to store all of the cookies contained by a client's request in a `Cookie` array.

Solution

Use the `HttpServletRequest.getCookies()` method, which returns an array of `javax.servlet.http.Cookie` objects.

Discussion

To create an array of `Cookies` representing all of the cookies included in a request, use the `HttpServletRequest.getCookies()` method. You can then access the name and value of a cookie by calling the `Cookie` class's `getName()` and `getValue()` methods.

The code for accessing an array of `Cookies` looks like [Example 10-2](#).

Example 10-2. Creating a Cookie array

```
//servlet's doGet method

public void doGet(HttpServletRequest request,
    HttpServletResponse response) throws ServletException,
    java.io.IOException {

    Cookie cookie = null;

    //Get an array of Cookies associated with this domain
    Cookie[] cookies = request.getCookies( );

    //Check for a null value, then do something with any Cookies
    if (cookies != null){ //read each Cookie value
    }
    //rest of the servlet
```

Once a cookie has already been created, the next time the user sends the cookie as a request header, the only information you can extract from the `Cookie` object is its name and value. You will not be able to derive the cookie's maximum age from the request header, because all the header will

contain is the `Cookie` object: header name, then the name and value of the cookie.

See Also

[Recipe 10.1](#) on setting a cookie with a servlet; [Recipe 10.3](#) on setting a cookie with a JSP; [Recipe 10.4](#) on using a servlet to read cookies; [Recipe 10.5](#) on reading cookie values with a JSP; [Recipe 10.6](#) on altering or removing an existing cookie; the RFC 2109 document dealing with cookies: <ftp://ftp.rfc-editor.org/in-notes/rfc2109.txt>; Netscape's preliminary specification for cookies: http://wp.netscape.com/newsref/std/cookie_spec.html; the Java Cookie API: <http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/http/Cookie.html>.

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Recipe 10.3 Setting a Cookie with a JSP

Problem

You want to use a JSP to set a cookie on a client.

Solution

Wrap a JavaBean around the servlet API for creating cookies. Then use the bean in the JSP with the `jsp:useBean` standard action.

Discussion

A JSP can use a JavaBean to create the cookie and set the cookie on the client. Example 10-3 creates an instance of a JavaBean of type `com.jspservletcookbook.CookieBean` using the `jsp:useBean` standard action. Then the JSP sets a few bean properties. The bean will pass through the property values to the cookie that it is generating for the JSP. The JSP uses `jsp:setProperty` to set the following cookie properties:

- The cookie name (*bakedcookie* in the code).
- The maximum number of seconds the browser will hold on to the cookie (roughly one year in Example 10-2). This number is converted to a readable future date for the cookie's `Expires` attribute.
- The path on the server associated with this cookie. Once the JSP has sent this cookie to the client, the client will return the associated cookie only in the request headers for requests that contain the specified context path (such as */home*). For example, if the cookie is set by the JSP file to */home/cookieSet.jsp* , only requests for resources in */home* will include a `Cookie` header.

Example 10-3. A JSP that sends a cookie to a client

```
<jsp:useBean id="cookieBean" class="com.jspservletcookbook.CookieBean" />
<jsp:setProperty name="cookieBean" property="name" value="bakedcookie" />
<!-- set 'Expires' attribute to about one year from now -->
<jsp:setProperty name="cookieBean" property="maxAge" value=
    "<%= (365*24*60*60) %>" />
<jsp:setProperty name="cookieBean" property="path" value="<%= request.getContextPath( )
%>" />
<jsp:setProperty name="cookieBean" property="cookieHeader" value="<%= response %>" />
<html>
<head><title>Cookie Maker</title></head>
<body>
<h2>Here is information about the new cookie</h2>
```



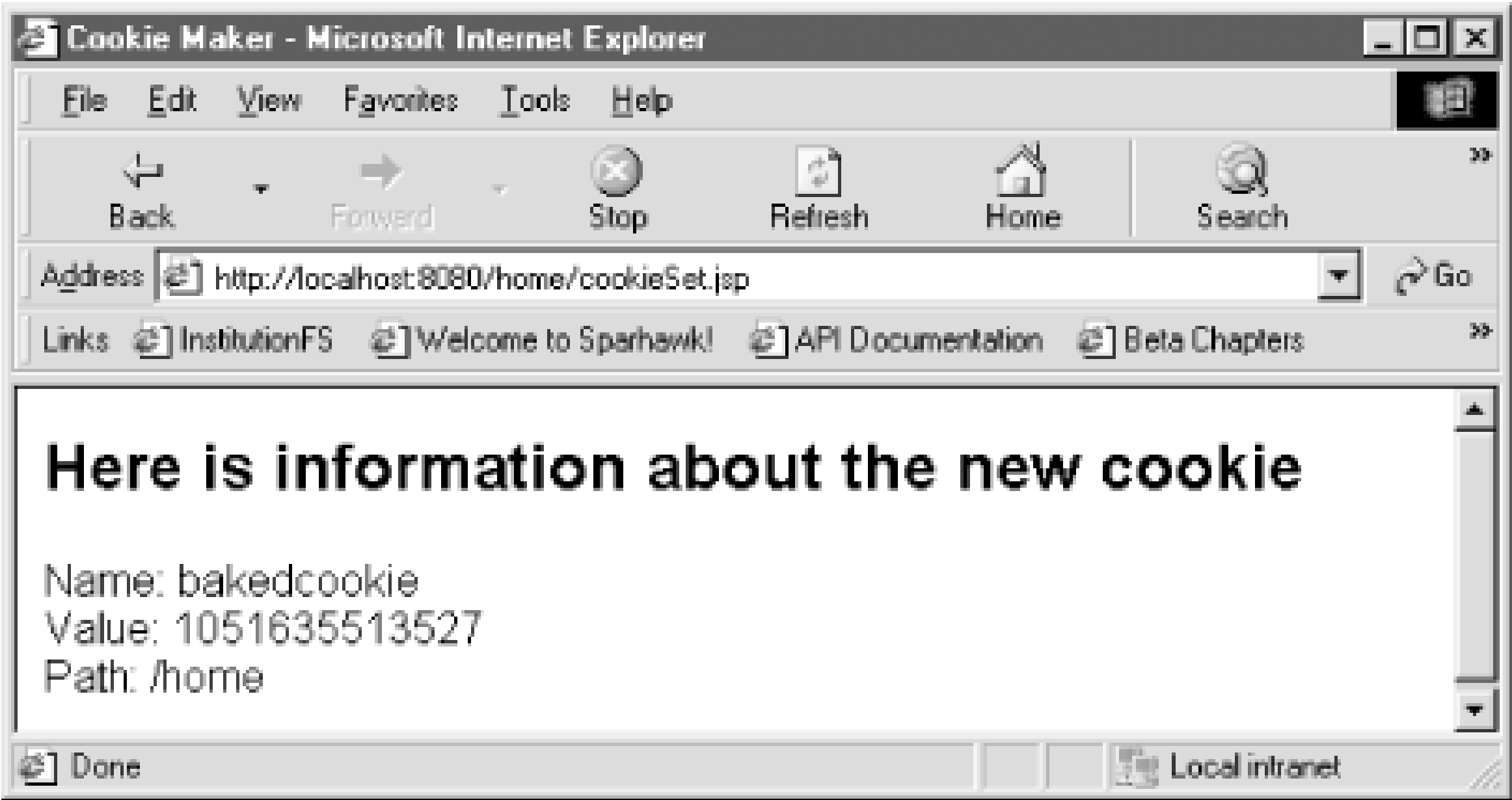
```
Name: <jsp:getProperty name="cookieBean" property="name" /><br>
Value: <jsp:getProperty name="cookieBean" property="value" /><br>
Path: <jsp:getProperty name="cookieBean" property="path" />
</body>
</html>
```

The JSP passes along the `HttpServletResponse` object to its wrapper bean, so that the bean can call `response.addCookie(Cookie cookie)` to send the client the new cookie. The `response` object is passed to the bean using this code (see the `setCookieHeader()` method in Example 10-4):

```
<jsp:setProperty name="cookieBean" property="cookieHeader" value=
    "<%= response %>" />
```

The bottom of the JSP displays some of the new cookie's values. Figure 10-2 shows the JSP's output in a web browser. Repeatedly requesting the JSP will overwrite the existing cookie with a new one.

Figure 10-2. A JSP shows information about a new cookie



Example 10-4 shows the code for the `CookieBean` itself, which is rather lengthy due to all the getter and setter methods.

This JavaBean class must be placed in the `WEB-INF/classes` directory of the web application (including a directory structure that matches the bean's package name) so that the web container can load the class. The bean could also be archived in a JAR file that is placed in `WEB-INF/lib`; however, the JAR would still have to contain a directory structure that matches the bean's package name.

You can set the cookie value in the JSP (which is not done in Example 10-3) by calling the bean's `setValue(String value)` method via `jsp:setProperty`:

```
<jsp:setProperty name="cookieBean" property="value" value="newvalue" />
```

The bean has to import the `Cookie` and `HttpServletResponse` classes, because it uses them to make the new cookie, then send the cookie to the client. Example 10-4 wraps its own methods around some of the

Cookie class methods, such as `setValue()` and `setMaxAge()`.

Example 10-4. A JavaBean for making cookies

```
package com.jspervletcookbook;

import javax.servlet.http.HttpServletResponse;
import javax.servlet.http.Cookie;

public class CookieBean {

    private Cookie cookie = null;

    public CookieBean( ){}

    //set the cookie name
    public void setName(String name){

        if (name == null || (name.equals(""))))
            throw new IllegalArgumentException(
                "Invalid cookie name set in: "+getClass().getName( ));

        cookie = new Cookie(name,""+new java.util.Date( ).getTime( ));
    }

    //set the cookie value
    public void setValue(String value){

        if (value == null || (value.equals(""))))
            throw new IllegalArgumentException(
                "Invalid cookie value set in: "+getClass().getName( ));

        if (cookie != null)
            cookie.setValue(value);
    }

    public void setMaxAge(int maxAge){

        if (cookie != null)
            cookie.setMaxAge(maxAge);
    }

    public void setPath(String path){

        if (path == null || (path.equals(""))))
            throw new IllegalArgumentException(
                "Invalid cookie path set in: "+getClass().getName( ));

        if (cookie != null)
            cookie.setPath(path);
    }
}
```

```

public void setCookieHeader(HttpServletResponse response){

    if (response == null )
        throw new IllegalArgumentException(
            "Invalid HttpServletResponse set in: "+getClass( ).getName( ));
    if (cookie != null)
        response.addCookie(cookie);
}

public String getName( ){

    if (cookie != null)
        return cookie.getName( );
    else
        return "unavailable";

}

public String getValue( ){

    if (cookie != null)
        return cookie.getValue( );
    else
        return "unavailable";

}

public String getPath( ){

    if (cookie != null)
        return cookie.getPath( );
    else
        return "unavailable";

}
}

```

If the JSP fails to use `jsp:setProperty` to call the bean's `setCookieHeader(HttpServletResponse response)` method, then the cookie is created but never included in the response headers sent to the client. In this design, you allow the user to set some optional cookie attributes (such as `Path`) before she explicitly sends the cookie as part of the response.

See Also

Recipe 10.1 on setting a cookie with a servlet; Recipe 10.2 on creating an `array` from all of the request's cookies; Recipe 10.4 on using a servlet to read cookies; Recipe 10.5 on reading cookie values with a JSP; Recipe 10.6 on altering or removing an existing cookie; the RFC 2109 document dealing with cookies: <http://ftp.rfc-editor.org/in-notes/rfc2109.txt> ; Netscape's preliminary specification for cookies: http://wp.netscape.com/newsref/std/cookie_spec.html ; the Java Cookie API: <http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/http/Cookie.html> .

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Recipe 10.4 Reading Cookie Values with a Servlet

Problem

You want to read cookie values from a client using a servlet.

Solution

Create a Java array of `javax.servlet.http.Cookie` objects by calling the `HttpServletRequest.getCookies()` method. Then cycle through the array, accessing each cookie and value as needed.

Discussion

The web user will send cookies to a web site only if the user originally received `Set-Cookie` headers from that domain. In addition, if the cookie was set with a `Path` attribute specifying a context path, then the servlet can access the cookie only if the servlet is also associated with the context path. As a result, always test the return value of the `request.getCookies()` method (which returns an array of `Cookie` objects) to see if it is `null`, indicating that the user has not sent any cookies, before operating upon it.

[Example 10-5](#) displays the value of any found cookies in a web browser. The `CookieReader` class uses the `javax.servlet.http.Cookie.getName()` and `getValue()` methods in order to display this information.

Example 10-5. A cookie-reading servlet

```
package com.jspervletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

public class CookieReader extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        Cookie cookie = null;
        //Get an array of Cookies associated with this domain
        Cookie[] cookies = request.getCookies( );
```



```

boolean hasCookies = false;

//if cookies contains an array and not a null value,
//then we can display information about the cookies.
    if (cookies != null)
        hasCookies = true;

// display the name/value of each cookie
response.setContentType("text/html");
java.io.PrintWriter out = response.getWriter( );

out.println("<html>");
out.println("<head>");
out.println("<title>Cookie information</title>");
out.println("</head>");
out.println("<body>");
if (hasCookies){
    out.println(
        "<h2> The name and value of each found cookie</h2>");

    for (int i = 0; i < cookies.length; i++){
        cookie = cookies[i];
        out.println(
            "Name of cookie #"+(i + 1)+"": "+cookie.getName( )+"<br>");
        out.println(
            "Value of cookie #"+(i + 1)+"": "+
            cookie.getValue( )+"<br><br>");
    }//for

} else {
    out.println(
        "<h2> This request did not include any cookies</h2>");
}
out.println("</body>");
out.println("</html>");}

public void doPost(HttpServletRequest request,
    HttpServletResponse response) throws ServletException,
    java.io.IOException {

    doGet(request,response);
}
}

```

The `javax.servlet.http.Cookie` class is an abstraction of a cookie that has getter and setter methods for a cookie's attributes, such as its name, value, path, and secure attributes. However, when you retrieve a cookie, you can only get its name and value, because this is the only information that the client includes in the request header. The `Cookie` request header looks like:

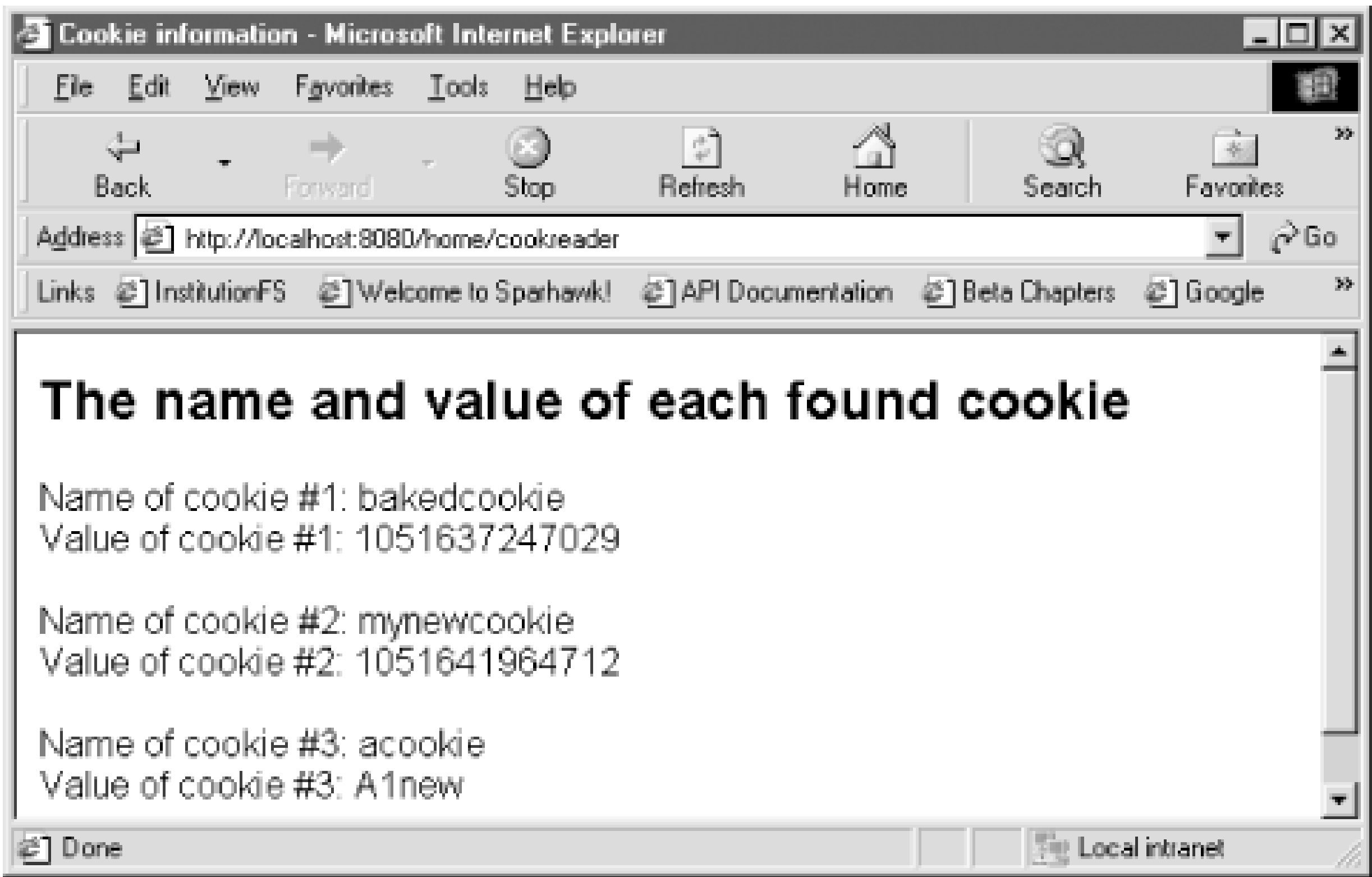
```
Cookie: JSESSIONID=F80F0F571FDE4873CFF3FF0B842D4938; mycookie=1051610231064
```

For example, calling `Cookie.getPath()` on a retrieved cookie will return `null`, even if the cookie

was originally set with a valid path attribute, such as */mypath*. You can only access these values in the servlet or JSP that creates the cookie object in the first place (see [Recipe 10.1](#) and [Recipe 10.3](#)).

[Figure 10-3](#) shows how a web browser displays this servlet's output.

Figure 10-3. A servlet displays cookie information



See Also

[Recipe 10.1](#) on setting a cookie with a servlet; [Recipe 10.2](#) on creating an `array` from all of the request's cookies; [Recipe 10.3](#) on setting a cookie with a JSP; [Recipe 10.5](#) on reading cookie values with a JSP; [Recipe 10.6](#) on altering or removing an existing cookie; the RFC 2109 document dealing with cookies: [ftp://ftp.rfc-editor.org/in-notes/rfc2109.txt](http://ftp.rfc-editor.org/in-notes/rfc2109.txt); Netscape's preliminary specification for cookies: http://wp.netscape.com/newsref/std/cookie_spec.html; the Java Cookie API: <http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/http/Cookie.html>.

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Recipe 10.5 Reading Cookie Values with a JSP

Problem

You want to read cookie values with a JSP.

Solution

Use the JSTL and its `cookie` implicit object to display the name and value of any cookies found in the request.

Discussion

The JSTL and its EL have a `cookie` implicit object (a variable that is automatically available to JSP or EL code) that you can use in JSPs to display any cookie names and values. For more information on the JSTL and EL, see [Chapter 23](#).

You can access the `cookie` implicit object in JSP code this way:

```
${cookie}
```

This implicit object evaluates to a `java.util.Map` type whose values you can iterate over with the `c:forEach` JSTL tag. Each iteration of `c:forEach` returns a `java.util.Map.Entry`, which encapsulates a key/value pair. The key is the name of the cookie; the value is a `javax.servlet.http.Cookie` object.

[Example 10-6](#) uses this code to retrieve a `Cookie` object from the `Map` of available cookies:

```
<c:forEach var="cookieVal" items="${cookie}">
```

The `var` attribute of `c:forEach` contains a `Map.Entry` object whose key is the cookie name; the value is the `Cookie` object. The code uses `c:out` tags to display the cookie names and values in the JSP. This odd syntax displays the value of each cookie:

```
<c:out value="${cookieVal.value.value}" />
```

The code `cookieVal.value` evaluates to the `javax.servlet.http.Cookie` object. The full phrase `${cookieVal.value.value}` is the equivalent of calling `Cookie.getValue()`.

Example 10-6. A JSP that reads cookie names and values

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
```

```
<html>
<body>
<%-- check whether the request contains any cookies --%>
<c:choose>
  <c:when test="{empty cookie}" >
    <h2>We did not find any cookies in the request</h2>
  </c:when>
<c:otherwise>

<h2>The name and value of each found cookie</h2>

<c:forEach var="cookieVal" items="{cookie}">
<strong>Cookie name:</strong> <c:out value="{cookieVal.key}" /><br>
<strong>Cookie value:</strong> <c:out value=
  "{cookieVal.value.value}" /><br><br>
</c:forEach>
</c:otherwise>
</c:choose>

</body>
</html>
```

[Figure 10-4](#) shows the JSP displaying the available cookie information.

Figure 10-4. Output of the cookieReader.jsp page



Make sure to include the `taglib` directive for the JSTL core library at the top of your JSP, so that you can use the JSTL tags to view any cookie values:

```
<%@ taglib uri=
"http://java.sun.com/jstl/core" prefix="c" %>
```

Use `uri=http://java.sun.com/jsp/jstl/core` when using JSTL 1.1

See Also

[Recipe 10.1](#) on setting a cookie with a servlet; [Recipe 10.2](#) on creating an `array` from all of the request's cookies; [Recipe 10.3](#) on setting a cookie with a JSP; [Recipe 10.4](#) on using a servlet to read cookies; [Recipe 10.6](#) on altering or removing an existing cookie; the RFC 2109 document dealing with cookies: [ftp://ftp.rfc-editor.org/in-notes/rfc2109.txt](http://ftp.rfc-editor.org/in-notes/rfc2109.txt); Netscape's preliminary specification for cookies: http://wp.netscape.com/newsref/std/cookie_spec.html; The Java Cookie API: <http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/http/Cookie.html>.

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Recipe 10.6 Altering or Removing a Cookie That Has Already Been Set

Problem

You want to overwrite or remove an existing cookie.

Solution

Send a cookie with the same name and path as an existing cookie to overwrite the existing cookie. To delete a cookie, send a cookie with the same name and path but set the `Expires` attribute to a date in the past.

Discussion

You can overwrite a cookie and optionally provide different values for its attributes (such as the cookie value) by including a cookie in a response header that has the same name and path as an existing cookie. For example, imagine a servlet has set a cookie on the client with the following response header:

```
Set-Cookie: newcookie=1051642031398; Expires=Wed, 28-Apr-2004 18:47:11 GMT; Path=/home
```

This cookie can be overwritten on the client by changing its cookie value, but not the name and path:

```
Set-Cookie: newcookie=Allnew; Expires=Wed, 28-Apr-2004 18:52:50 GMT; Path=/home
```

This response header will replace *newcookie* with a cookie of the same name. The new version has a new value (`Allnew`) and an `Expires` attribute value.

Deleting a Cookie

You can delete a cookie by sending a response header to the client with the same cookie name and `Path` value, but with an `Expires` attribute value that represents a date in the past. With Java's `Cookie` API, you simply call the `javax.servlet.http.Cookie.setMaxAge()` method with an argument value of `0`. Example 10-7 is the JSP of Recipe 10.2. This time the JSP is deleting *mycookie* by setting the `maxAge` property to `0` using `jsp:setProperty`.

Example 10-7. Deleting an existing cookie

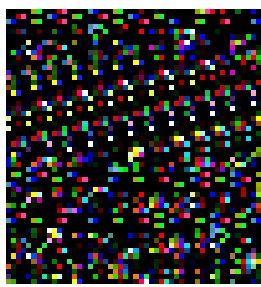
```
<jsp:useBean id="cookieBean" class="com.jspervletcookbook.CookieBean" />
<jsp:setProperty name="cookieBean" property="name" value="mycookie" />
<%-- delete the cookie by calling Cookie.setMaxAge(0) --%>
<jsp:setProperty name="cookieBean" property="maxAge" value="0" />
```

```
<jsp:setProperty name="cookieBean" property="value" value="finished" />
<jsp:setProperty name="cookieBean" property="path" value=
    "<%= request.getContextPath( ) %>" />
<jsp:setProperty name="cookieBean" property="cookieHeader" value=
    "<%= response %>" />
<%-- rest of JSP continues --%>
```

Cookies can be deleted only by a `Set-Cookie` response header emanating from the same domain that created the cookie, with the same cookie name and `Path` attribute. Here is what the response header from the deleting JSP looks like:

```
HTTP/1.1 200 OK
Content-Type: text/html; charset=ISO-8859-1
Set-Cookie: mycookie=finished; Expires=Thu, 01-Jan-1970 00:00:10 GMT; Path=/home
Transfer-Encoding: chunked
Date: Tue, 29 Apr 2003 19:18:59 GMT
Server: Apache Coyote/1.0
```

Note that the `Expires` attribute value is a date in the past. As a result, the client will no longer send the *mycookie* cookie in its request headers when it makes a request to the same domain at the */home* context path. However, it may send other cookies (with different names) that were created during prior visits to the same domain and context path.



The browser user can delete a cookie from his machine anytime he wants, so always plan accordingly.

See Also

Recipe 10.1 on setting a cookie with a servlet; Recipe 10.2 on creating an `array` from all of the request's cookies; Recipe 10.3 on setting a cookie with a JSP; Recipe 10.4 on using a servlet to read cookies; Recipe 10.5 on reading cookie values with a JSP; the RFC 2109 document dealing with cookies: <ftp://ftp.rfc-editor.org/in-notes/rfc2109.txt> ; Netscape's preliminary specification for cookies: http://wp.netscape.com/newsref/std/cookie_spec.html ; the Java Cookie API: <http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/http/Cookie.html> .

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Chapter 11. Session Tracking

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Introduction

This chapter describes how to monitor sessions in servlets and JSPs. A *session* represents an interaction between a web user and a web application. The Hypertext Transfer Protocol (HTTP) is a stateless protocol, meaning that it is not designed to maintain state, or the progress of a single user as she interacts with a web server by exchanging HTTP requests and responses. Each request for a JSP or servlet, at least from the HTTP server's point of view, is considered separate from other requests and not associated with the same user. Many web applications, however, need to follow a user's progress step by step throughout the application, to keep track of her purchased items and/or preferences.

For example, when a user buys books at Amazon.com, the web site monitors what is added to or removed from the customer's shopping cart and uses this information during the checkout and payment process. In addition, Amazon.com shows users which books they have looked at during their current session. Sequential visits by a single user to an e-commerce site like this are considered parts of one session.

Web applications commonly use cookies in order to implement sessions. All servlet containers have to support the use of cookies to track sessions, according to the Servlet v2.3 and 2.4 specifications. A *cookie* is a small piece of information that is stored by the client web browser in response to a response header issued by the web server. Cookies are described in more detail in [Chapter 10](#), but since they are central to the session concept, I include a brief overview of their use in session tracking here.

When a user requests a page from a web server, the server responds with a collection of name/value pairs called *response headers*, along with the HTML response. These headers may include one labeled *Set-Cookie*, which requests that the client store some state information locally. The only required element of the *Set-Cookie* HTTP response header is the cookie name and value. The cookie may include other pieces of information separated by semicolons. The cookie that Java web containers set in order to implement session tracking looks like `jsessionid=cookie-value`, where *cookie-value* is usually a long numeric string of bytes using hexadecimal notation. According to the servlet specification v2.3, this cookie's name must be `JSESSIONID`. Some web containers generate the name in lowercase, however, like Tomcat. A typical session-related cookie looks like the following:

```
jsessionid=3CAF7CD0A0BFF5076B390CCD24FD8F0D
```

The cookie value represents the session ID. This ID uniquely identifies the user for the period when he is making requests to the web server. For example, if 10 users are interacting with the web application at the same time, the web server assigns them 10 unique session IDs. Additionally, if a person sits down at his PC and connects with the web application using Internet Explorer, then move over to a connected laptop and opens up Safari to the same web application, those browsers will be associated with two different session IDs. The web server does not have any way of knowing that the same person is interacting with the web application from two different browsers at the same time, particularly if he is connecting from behind a proxy server. However, as long as the user works with a single browser and that user's session has not yet timed out, a web server can track that user's actions, and associate them as one session.

Disabled Cookies

What if the user blocks cookies? Web browsers typically allow the disabling of cookies in the user preferences. Servers may also use the Secure Sockets Layer (SSL), which has a built-in session-tracking mechanism. In addition, URL rewriting is a common fallback method of session tracking. URL rewriting involves adding the session ID as a path parameter to the URL when linking from one page to the next, so that the next page has access (without cookies) to the session ID. These URLs look like this:

```
/home/default.jsp;jsessionid=3CAF7CD0A0BFF5076B390CCD24FD8F0D
```

As most page requests in everyday web use are not made using SSL, you should code your session tracking-related web components to accommodate URL rewriting.

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Recipe 11.1 Setting the Session Timeout in web.xml

Problem

You want to configure a timeout period for the web application in the deployment descriptor.

Solution

Create a `session-config` element in *web.xml*.

Discussion

The length of time that a session lasts before the server invalidates the session and unbinds any of its objects is an important component of your web application. In Tomcat 4.1.x, the default timeout period for a session is 30 minutes. If any requests that are associated with the session have been inactive for that period, the session times out. If the user decides to return to the web application after 30 minutes, using the same browser, then a new session is created for him. Example 11-1 shows how to set your own timeout period for sessions.

Example 11-1. Configuring the session timeout

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE web-app
    PUBLIC "-//Sun Microsystems, Inc.//DTD Web Application 2.3//EN"
        "http://java.sun.com/dtd/web-application_2_3.dtd"
>

<web-app>

<!-- filter, listener, servlet, and servlet-mapping elements precede session-config -->

    <session-config>
        <session-timeout>15</session-timeout>
    </session-config>

</web-app>
```

Place one nested `session-timeout` element within the `session-config`. The timeout is expressed as minutes, and overrides the default timeout (which is 30 minutes in Tomcat, for example). However, the `HttpSession.getMaxInactiveInterval()` method in a servlet returns the timeout period for that session in *seconds*; if your session is configured in *web.xml* for 15 minutes, `getMaxInactiveInterval()` returns 900.

Another way to configure a timeout value for a servlet is to use the `init-param` element in *web.xml*, as

shown in Example 11-2 .

Example 11-2. Adding an init-param to a servlet to set a session timeout interval

```
<servlet>
  <servlet-name>Cart</servlet-name>
  <servlet-class>com.jspServletcookbook.TimeoutSession</servlet-class>
  <init-param>
    <param-name>timeout</param-name>
    <param-value>600</param-value>
  </init-param>
</servlet>
```

The `servlet` element in this web application's *web.xml*/file has a nested `init-param` , which creates a parameter called `timeout` . The `Cart` servlet takes the parameter value (600 seconds, equivalent to 10 minutes) and passes it to the `session.setMaxInactiveInterval(int seconds)` method. Example 11-3 shows the `doGet()` method of the servlet, which sets the session timeout variable to the configured parameter value.

Example 11-3. Using init parameters to set a servlet's session timeout

```
public void doGet(HttpServletRequest request,
    HttpServletResponse response)
    throws ServletException, java.io.IOException {

    response.setContentType("text/html");
    java.io.PrintWriter out = response.getWriter( );

    HttpSession session = request.getSession( );

    //initially set to default timeout interval
    int _default = session.getMaxInactiveInterval( );

    int timeout = _default;

    try{

        timeout = new Integer(getInitParameter("timeout")).intValue( );

    } catch(NumberFormatException nfe){

        //report any problems with the configured value in web.xml
        log("Problem with configuring session timeout in: " +
            getClass( ).getName( )) ;
    } //try

    //now set the session to the configured timeout period
    if(timeout != _default && timeout > -2)
        session.setMaxInactiveInterval(timeout);
```



```

        out.println("<html>");
        out.println("<head>");
        out.println("<title>Cart Servlet</title>");
        out.println("</head>");
        out.println("<body>");

        out.println("The timeout interval is: " +
            session.getMaxInactiveInterval( ));

        out.println("</body>");
        out.println("</html>");

    }

```

Figure 11-1 shows the result of running this servlet in a browser window.

Figure 11-1. Dynamically changing the session timeout



The session timeout is changed only if the configured value is different than the initial value, and if the value is greater than -2:

```

if(timeout != _default && timeout > -2)
    session.setMaxInactiveInterval(timeout);

```

A timeout interval can be set to `-1`, which is defined by the Servlet v2.4 specification as a session that never expires.

This behavior may not be implemented consistently from server to server.

As mentioned before, sessions are implemented the majority of the time as cookies. Chapter 10 includes recipes describing the handling of cookies in JSPs and servlets.

See Also

Recipe 11.2 and Recipe 11.3 on configuring the session timeout in Tomcat web applications; Chapter 1 on *web.xml*; Chapter 7 of the Servlet v2.3 and 2.4 specifications on sessions; the session-tracking sections of *Java Servlet Programming* by Jason Hunter (O'Reilly) and *Java Server Pages* by Hans Bergsten (O'Reilly).

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Recipe 11.2 Setting the Session Timeout in All Tomcat Web Applications

Problem

You want to configure a session timeout period for all of the web applications that are running within an instance of Tomcat.

Solution

Set the session timeout within the `session-config` element in `<Tomcat-installation-directory>/conf/web.xml`.

Discussion

You can set the session timeout for all web applications by configuring Tomcat's default `conf/web.xml` file. If the deployment descriptor for a particular web application does not have a `session-config` element, then the application uses the value set in `conf/web.xml` as the default session timeout. The content of the `session-timeout` element (nested within `session-config`) represents the time in minutes until an inactive session expires.

[Example 11-4](#) shows the `session-config` element in the default `web.xml` file for Tomcat 4.1.x, with the accompanying XML comment.

Example 11-4. The session-config element inside of the default Tomcat web.xml file

```
<!--===== Default Session Configuration =====-->
<!-- You can set the default session timeout (in minutes) for all newly-->
<!-- created sessions by modifying the value below.-->

    <session-config>
        <session-timeout>30</session-timeout>
    </session-config>
```

On application deployment, Tomcat processes its default `web.xml` file, followed by the deployment descriptors for each web application. Your own `session-config` element overrides the one specified in `conf/web.xml`. It is usually a better idea to configure sessions for each web application individually, particularly if they are designed to be portable.

See Also

[Recipe 11.1](#) on configuring the session timeout; [Recipe 11.3](#) on setting the session timeout programmatically; [Recipe 11.4](#) on checking the validity of a session; [Chapter 1](#) on *web.xml*, Chapter 7 of the Servlet v2.3 and 2.4 specifications on sessions; the session-tracking sections of *Java Servlet Programming* by Jason Hunter (O'Reilly) and *JavaServer Pages* by Hans Bergsten (O'Reilly).

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Recipe 11.3 Setting the Session Timeout Programmatically

Problem

You want to set a session timeout in your servlet code.

Solution

Use the `HttpServletRequest` object's `getSession()` method to get a reference to the `HttpSession` object. Then change the timeout period programmatically by using the `HttpSession.setMaxInactiveInterval(int seconds)` method.

Discussion

The `HttpSession.setMaxInactiveInterval(int seconds)` method sets the timeout for a session *individually*, so that only the particular session object being operated upon is affected. Other servlets that do session tracking in the web application still use the `session-timeout` value in `web.xml`/or, in the absence of this element, the server's default `session-timeout` value. [Example 11-5](#) checks the timeout period for a session, then resets that timeout period to 20 minutes.

Example 11-5. Resetting a default timeout period

```
package com.jspServletcookbook;

import java.util.Date;
import java.text.DateFormat;

import javax.servlet.*;
import javax.servlet.http.*;

public class SimpleSession extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );
```

```

        HttpSession session = request.getSession( );

        out.println("<html>");
        out.println("<head>");
        out.println("<title>Simple Session Tracker</title>");
        out.println("</head>");
        out.println("<body>");

        out.println("<h2>Session Info</h2>");

        out.println("session ID: " + session.getId( ) + "<br><br>");

        out.println( "The SESSION TIMEOUT period is " +
            session.getMaxInactiveInterval( ) + " seconds.<br><br>");

        out.println( "Now changing it to 20 minutes.<br><br>");

        session.setMaxInactiveInterval(20 * 60);

        out.println("The SESSION TIMEOUT period is now " +
            session.getMaxInactiveInterval( ) + " seconds.");

        out.println("</body>");
        out.println("</html>");
    }
}

```

[Figure 11-2](#) shows the result of requesting this servlet in a web browser.

Figure 11-2. Getting session-timeout info

This servlet gets the `HttpSession` object with the `HttpServletRequest` class's `getSession()` method.

Whatever the servlet's default timeout period is, say, 30 minutes, [Example 11-5](#) changes the accessed session's timeout to 20 minutes:

```
session.setMaxInactiveInterval(20 * 60);
```

Remember, this method alters the default session-timeout interval only for the session associated with the users who request this servlet. Why would some users get a different timeout interval than others? Perhaps web-user testing at your organization has indicated that a session timeout of five minutes is more appropriate for your shopping cart-related servlets, whereas some chart- or map-creation servlets require the default timeout of 30 minutes or more, since their users might linger over the complex images in their browsers for a long period.

In most web applications, the session timeout is set (or altered) in the deployment descriptor, and you will not have to dynamically change the timeout in the servlet code.

See Also

[Recipe 11.1](#) on configuring the session timeout; [Recipe 11.2](#) on setting the session timeout in all Tomcat applications; [Recipe 11.4](#) on checking the validity of a session; [Chapter 1](#) on *web.xml*, Chapter 7 of the Servlet v2.3 and v2.4 specifications on sessions; the session-tracking sections of *Java Servlet Programming* by Jason Hunter (O'Reilly) and *JavaServer Pages* by Hans Bergsten (O'Reilly).

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Recipe 11.4 Checking if a Session Exists in an `HttpServletRequest`

Problem

You want to check if a web application user has a valid session.

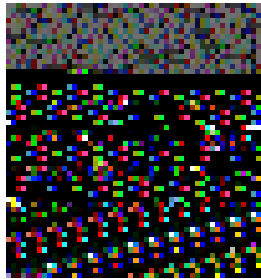
Solution

Use the `HttpServletRequest` object's `getSession(false)` method to find out whether the `HttpSession` object is `null`.

Discussion

Some web components are designed to monitor if a session is valid, then optionally redirect or forward the user to another web component based on the validity of the session. For example, imagine that a user makes a request to a component that expects to find a custom object stored in the session object, such as a "shopping cart." You want to check if the session is valid; however, you do not want to create a new session for the request if the session is not valid, because another web component farther back in the chain of application components is responsible for creating new sessions and populating them with shopping cart items. The user may have entered the web application at Step 3 instead of Step 1. In this case, if the session is invalid, the request is forwarded to another access point in the application (such as a login screen).

If you call the `HttpServletRequest` object's `getSession(false)` method and the method returns `false`, then the user does not have a valid session and the request object has not created a new session for her.



Either `HttpServletRequest.getSession(true)` or `getSession()` will attempt to create a new session.

[Example 11-6](#) is a servlet that checks a user's session, then redirects the user to another web component if the session object is `null`.

Example 11-6. Checking if a session is valid or not

```
import javax.servlet.*;
```



```

import javax.servlet.http.*;

public class SessionCheck extends HttpServlet {

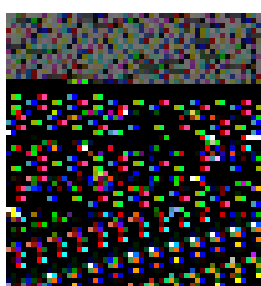
    public void doGet(HttpServletRequest request, HttpServletResponse response)
        throws ServletException, java.io.IOException {

        HttpSession session = request.getSession(false);

        if (session == null){
            response.sendRedirect("/myproj/login.jsp");
        } else {
            response.sendRedirect("/myproj/menu.jsp");
        }
    }
}

```

If the session in [Example 11-6](#) is `null`, the servlet redirects the request to the *login.jsp* page at the context path */myproj*. If the session object is valid, the request is redirected to the */myproj/menu.jsp* component.



The `HttpServletResponse.sendRedirect(String location)` method sends the client an HTTP response that looks like this:

```

HTTP/1.1 302 Moved Temporarily
Location:
http://localhost:9000/dbproj/login.jsp
Content-Type: text/html; charset=ISO-8859-1
...

```

The client then sends another request for the URL specified in the location header of the HTTP response.

See Also

[Recipe 11.1](#) and [Recipe 11.3](#) on configuring the session timeout; [Chapter 1](#) on *web.xml*; Chapter 7 of the Servlet v2.3 and 2.4 specifications on sessions; the session-tracking sections of *Java Servlet Programming* by Jason Hunter (O'Reilly) and *JavaServer Pages* by Hans Bergsten (O'Reilly).

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Recipe 11.5 Tracking Session Activity in Servlets

Problem

You want to use a servlet to track the creation time and last-accessed time for a session.

Solution

Use the `HttpServletRequest` object's `getSession()` method to get a reference to the `HttpSession` object. Then call the `HttpSession.getCreationTime()` and `HttpSession.getLastAccessedTime()` methods on that object.

Discussion

This recipe describes how to use the `HttpSession` API to find out the creation time and the last-accessed time for a session. How would a web application use this information? For one, you might want to monitor the pattern of request activity in a web application by comparing the session creation time, the last-accessed time, and the current time. For example, the difference between the creation time and the current time (measured in seconds) would indicate how long the web application had been tracking a particular user's session.

The method `HttpSession.getLastAccessedTime()` returns the time (as a `long` datatype) of the last time the user made a request associated with a particular session.

A servlet that calls `getLastAccessedTime()` represents the most current request associated with the session. In other words, the time at which the user requests the servlet that calls `getLastAccessedTime()` becomes the last accessed time.

[Example 11-7](#) displays the current time, as well as the session's creation and last- accessed times.

The `HttpServletRequest.getSession()` method associates a new session with the request if one does not already exist. The `HttpServletRequest.getSession(false)` method returns `null` if a session is not associated with the request and it will not create a new `HttpSession` for the user. See [Recipe 11.4](#).

Example 11-7. Calling HttpSession methods in a servlet

```
package com.jspServletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

import java.util.Date;
import java.text.DateFormat;
import java.util.Enumeraation;

public class SessionDisplay extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );

        HttpSession session = request.getSession( );

        Date creationTime = new Date(session.getCreationTime( ));

        Date lastAccessed = new Date(session.getLastAccessedTime( ));

        Date now = new Date( );

        DateFormat formatter =
            DateFormat.getDateInstance(DateFormat.MEDIUM,
                DateFormat.MEDIUM);

        out.println("<html>");
        out.println("<head>");

        out.println(
            "<title>Displaying the Session Creation and "+
            "Last-Accessed Time</title>");

        out.println("</head>");
        out.println("<body>");
        out.println("<h2>Session Creation and Last-Accessed Time</h2>");
        out.println(
            "The time and date now is: " + formatter.format(now) +
            "<br><br>");

        out.println("The session creation time: "+
            "HttpSession.getCreationTime( ): " +
            formatter.format(creationTime) + "<br><br>");

        out.println("The last time the session was accessed:  " +
            HttpSession.getLastAccessedTime( ): " +
            formatter.format(lastAccessed) );
```



```

        out.println("</body>");
        out.println("</html>");
    } //doGet

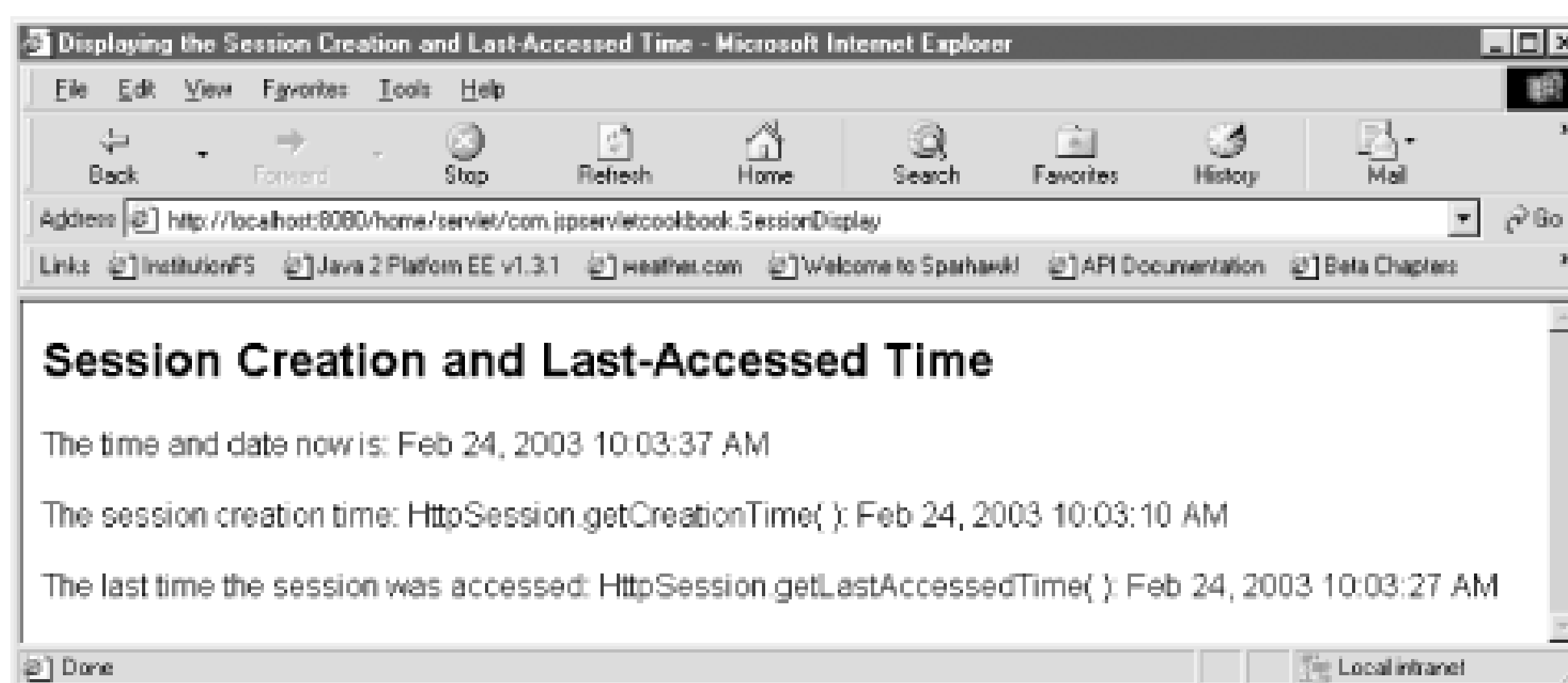
    public void doPost(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        doGet(request, response);
    } //doPost
}

```

An example of a browser display for this servlet is shown in [Figure 11-3](#).

Figure 11-3. Finding out a session's creation and last-accessed times



As in the prior recipe, this example uses a `java.text.DateFormat` object to format `Date` Strings for browser display. The date-related `HttpSession` methods `getCreationTime()` and `getLastAccessedTime()` return `long` datatypes, from which `java.util.Date` objects can be created:

```
Date creationTime = new Date( session.getCreationTime( ) );
```

The session's creation time can then be displayed using the `DateFormat`'s `format(Date _date)` method.

The next recipe shows how a JSP can track session activity.

See Also

[Recipe 11.5](#) and [Recipe 11.8](#); [Chapter 1](#) on *web.xml*; Chapter 7 of the Servlet v2.3 and 2.4 specifications on sessions; the `javax.servlet.http.HttpSession` API at http://java.sun.com/j2ee/sdk_1.3/techdocs/api/javax/servlet/http/HttpSession.html; the session-tracking sections of *Java Servlet Programming* by Jason Hunter (O'Reilly) and *JavaServer Pages* by Hans Bergsten (O'Reilly).

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Recipe 11.6 Tracking Session Activity in JSPs

Problem

You want to find out a session's creation time and last-accessed time using JSPs.

Solution

Use the JSTL to get access to the JSP's associated `HttpSession` object. Then call the `HttpSession.getCreationTime()` and `HttpSession.getLastAccessedTime()` methods on that object.

Discussion

It is very easy to keep track of session activity in a JSP; you just use slightly different methods and tools compared to those used with a servlet. [Example 11-8](#) uses the `out` custom action from the JSTL 1.0 to display information about the current session. [Chapter 24](#) describes the JSTL and its associated EL in more detail.

Example 11-8. Tracking sessions using the JSTL

```
<%@page contentType="text/html"%>

<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<html>
  <head><title>View Session JSP </title></head>
  <body>
    <h2>Session Info From A JSP</h2>

    The session id: <c:out value="${pageContext.session.id}"/><br><br>

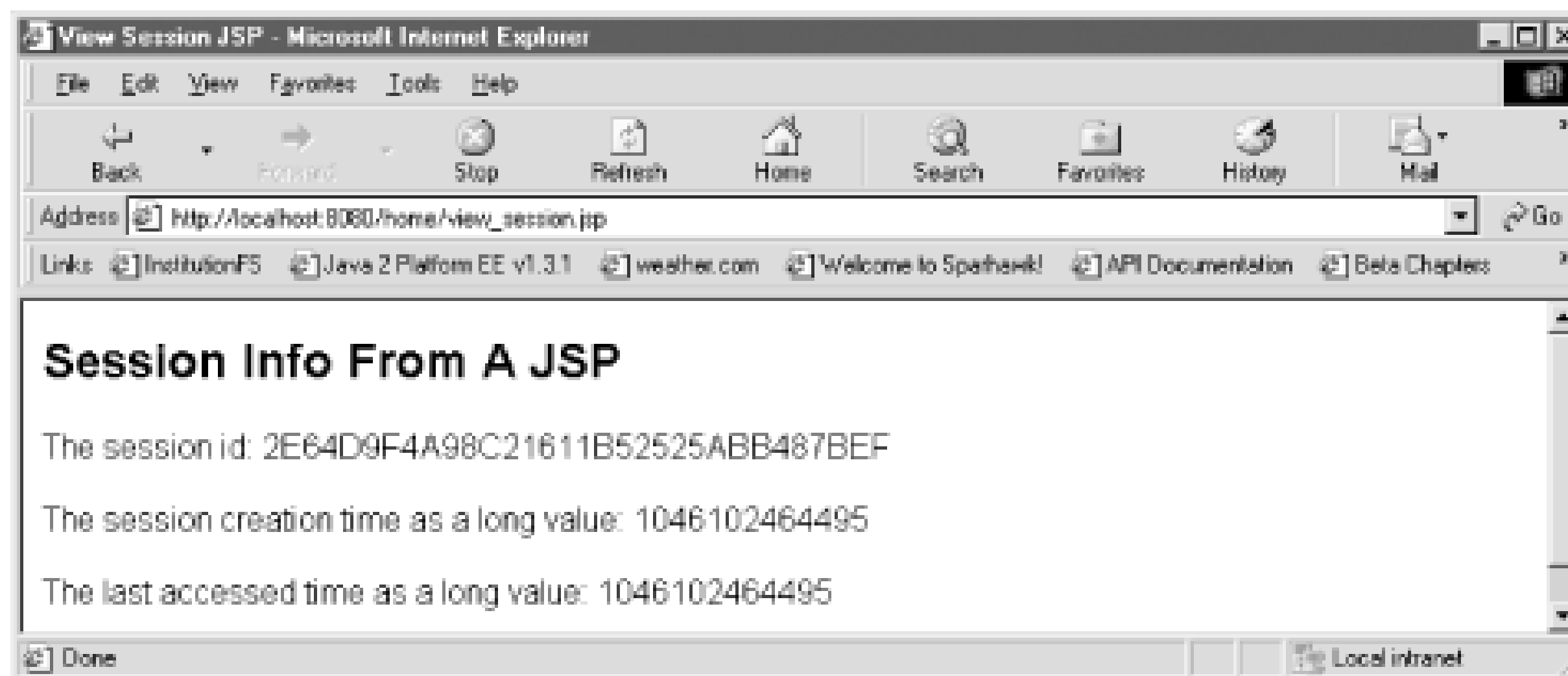
    The session creation time as a long value:
    <c:out value="${pageContext.session.creationTime}"/><br><br>

    The last accessed time as a long value:
    <c:out value="${pageContext.session.lastAccessedTime}"/><br><br>

  </body>
</html>
```

This JSP uses a `taglib` directive to make the custom actions that are part of the core tag library available. By convention, the `uri` attribute for the core tags is `http://java.sun.com/jstl/core`, and the prefix is `c` (you can create your own prefix in the `taglib` directive). With JSTL 1.1, the `uri` value is `http://java.sun.com/jsp/jstl/core`. The JSP then uses the `out` tag from the JSTL's core tag library to display the current session ID (the return value of `HttpSession.getId()`), the session's creation time as a `long` type, and the session's last-accessed time. [Figure 11-4](#) shows a browser display of these values.

Figure 11-4. Showing session info in a JSP



The `out` element writes the value of its `value` attribute to the JSP's response stream. However, it is the EL that does the fetching of the value. For example, the following EL expression gets the value of the session's creation time:

```
${pageContext.session.creationTime}
```

The `pageContext` reference is one of the implicit objects that can be accessed from the EL. This is equivalent to the implicit JSP scripting object of the same name.

The way the creation time is accessed is different than a method call; you use the dot (`.`) operator to get the `pageContext`'s `session` property, then in turn use the dot operator to access the `session` object's `creationTime` property. So the whole phrase looks like this:

```
pageContext.session.creationTime.
```

Finally, in the EL, all variable and property values are dereferenced (to get their values) by bracketing them in `${ }` characters.

The JSP gets the other session values in the same way. For example, the session's last-accessed time (the `long` type return value from the method `HttpSession.getLastAccessedTime()`) is returned using this syntax:

```
${pageContext.session.lastAccessedTime}
```

[Example 11-8](#) displays the last-accessed time for a session as a large, unfriendly number. Naturally,

this value is more understandable displayed as a date. [Example 11-9](#) shows how to use the JSTL's custom formatting actions to format a date string.

Example 11-9. Formatting the session creation time and last-accessed time with the JSTL

```
<%@page contentType="text/html"%>
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<%@ taglib uri="http://java.sun.com/jstl/fmt" prefix="fmt" %>

<html>
  <head><title>View Session JSP </title></head>
  <body>

    <h2>Session Info From A JSP</h2>

    The session ID: <c:out value="\${pageContext.session.id}"/>

    <h3>Session date values formatted as Dates</h3>

    <jsp:useBean id="timeValues" class="java.util.Date"/>

    <c:set target="\${timeValues}" value=
      "\${pageContext.session.creationTime}" property="time"/>

    The creation time: <fmt:formatDate value="\${timeValues}" type="both"
      dateStyle="medium" /><br><br>

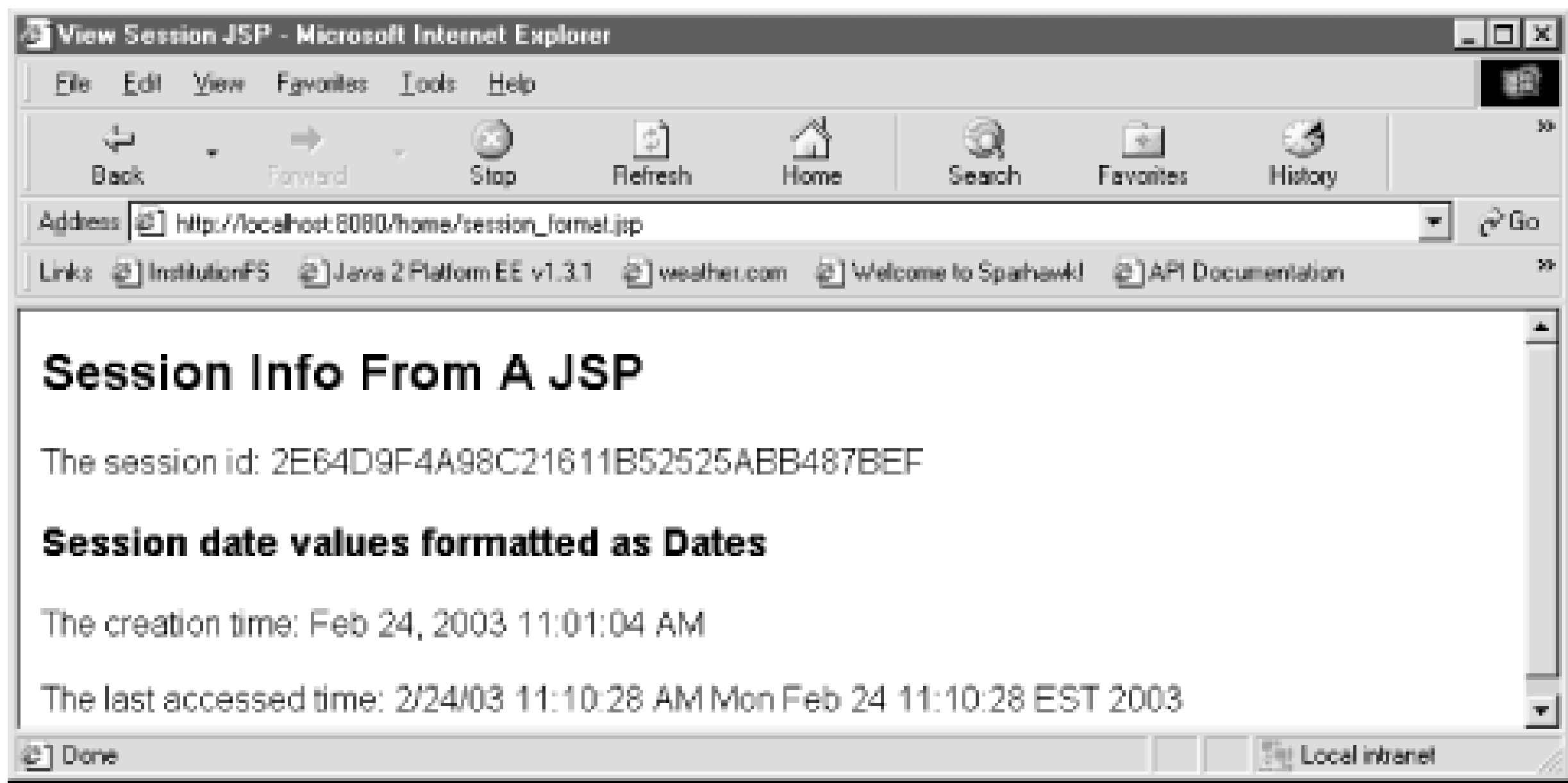
    <c:set target="\${timeValues}" value=
      "\${pageContext.session.lastAccessedTime}" property="time"/>

    The last accessed time: <fmt:formatDate value="\${timeValues}" type=
      "both" dateStyle="short" />

  </body>
</html>
```

[Figure 11-5](#) shows the browser display for this JSP.

Figure 11-5. Session date/times formatted using the JSTL



This JSP takes two date-related session values: the date/time when the session was created and the last date/time when a request associated with this session was made to the web application. It displays their values in the browser. As mentioned previously, these values are returned from the `HttpSession` object as `long` Java types. You have to create a `Date` object with its `time` property set to these `long` values. Then use the JSTL formatting custom actions to create readable `Strings` from the dates. First, make the formatting tag library available to the JSP with this `taglib` directive:

```
<%@ taglib uri="http://java.sun.com/jstl/fmt" prefix="fmt" %>
```

The `java.util.Date` object that will be used to create dates out of `long` values is generated using a JSP standard action called `jsp:useBean`. Here is the example's syntax:

```
<jsp:useBean id="timeValues" class="java.util.Date"/>
```

This line creates a new `Date` object and stores the object in a variable called `timeValues`, making it available through the EL with the syntax `${timeValues}`. The JSP then uses the `set` custom action to set a `time` property in the `Date` object:

```
<c:set target="${timeValues}" value="${pageContext.session.creationTime}"  
    property="time"/>
```

The value of `set`'s `target` attribute is the JavaBean whose property you are setting. The property name is specified by the `set` element's `property` attribute. The value this expression sets the `time` property to is the `long` type returned from this JSTL expression:

```
${pageContext.session.creationTime}
```

In other words, using the custom action this way is the equivalent of calling the `java.util.Date.setTime(long secs)` method on the `timeValues Date` object. This time value is actually set and displayed twice, to represent the creation time and last-accessed time of the session [Example 11-10](#) is the code chunk that does the setting and displaying, including the `fmt:formatDate` custom action.

Example 11-10. Displaying a session's creation time and last-accessed time

```
<c:set target="\${timeValues}" value="\${pageContext.session.creationTime}"
    property="time"/>
```

The creation time: <fmt:formatDate value="\\${timeValues}" type="both"
 dateStyle="medium" />


```
<c:set target="\${timeValues}" value=
    "\${pageContext.session.lastAccessedTime}" property="time"/>
```

The last accessed time: <fmt:formatDate value="\\${timeValues}" type="both"
 dateStyle="short" />

The `formatDate` element is one of the JSTL's formatting actions, which are described in [Chapter 24](#). The way the `formatDate` action works in this example is that the following code is replaced by the formatted date value, as in "Jan 21, 2003 1:57:39 PM":

```
<fmt:formatDate value="\${timeValues}" type="both" dateStyle="short" />
```

In order to display their differences, [Example 11-10](#) gives two different values (`medium` and `short`) for the `dateStyle` attribute.

See Also

[Recipe 11.4](#) on checking the validity of a session; [Chapter 1](#) on *web.xml*; Chapter 7 of the Servlet v2.3 and 2.4 specifications on sessions; the `javax.servlet.http.HttpSession` API at http://java.sun.com/j2ee/sdk_1.3/techdocs/api/javax/servlet/http/HttpSession.html; the session-tracking sections of *Java Servlet Programming* by Jason Hunter (O'Reilly) and *JavaServer Pages* by Hans Bergsten (O'Reilly).

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Recipe 11.7 Using URL Rewriting in a JSP

Problem

You want to make sure that URL rewriting is used in a JSP, in case any users disable cookies in their browsers.

Solution

Use the `url` custom action in the JSTL to create URLs that automatically include the session ID as a parameter.

Discussion

It is possible that some users of a web application will configure their browsers to disable cookies. Since cookies are the default basis for session tracking with JSPs, how will disabling cookies affect these users' experience with the web application? I recommend designing all session-tracking JSPs to accommodate URL rewriting, so that the cookie-averse users do not crash and burn in your web application.

One solution to this problem is to use the `url` custom action that is part of the JSTL.

The `url` element automatically inserts the session ID as a parameter with URLs that will be used in `href`, `form`, and `frameset` tags, for instance. This allows the pages that these links point to, such as servlets or JSPs, to track sessions without using cookies.

One of the nice things about using the `url` element like this is that it adds the session ID as a parameter to the URL when necessary, without the JSP author's intervention. [Example 11-11](#) shows how to use `url`.

Example 11-11. Using the url core tag to rewrite URLs

```
<%@page contentType="text/html"%>
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<html>
  <head><title>URL Rewriter</title></head>
  <body>
    <h1>This page will use URL rewriting if necessary</h2>

    <c:url value="/default.jsp" var="goToDefault" escapeXml="false"/>
```


Go to the default.jsp page `<a href="<c:out value="{goToDefault}" />">here.`

```
</body>
</html>
```

This example uses a `taglib` directive to make the JSTL's core tag library available. This directive looks like this:

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
```

The `url` element of this tag library creates a URL representing the web component *default.jsp* located on the top level of the web application. The URL is stored in a `goToDefault` variable using the `url` element's `var` attribute. The `escapeXml` attribute is set to `false` (it is `true` by default) to prevent characters such as ampersands and angle brackets from being converted to their character entity codes in the URL. The `url` element looks like this:

```
<c:url value="/default.jsp" var="goToDefault" escapeXml="false"/>
```

The URL created by the custom action is then used as the value for an `href` attribute in the following manner:

```
<a href="<c:out value="{goToDefault}" />">here</a>
```

This code uses the `out` custom action and an EL expression (`{goToDefault}`) to create the hyperlink. After the page is requested, the returned HTML looks like this if cookies are disabled in the browser:

```
<a href="/home/default.jsp;jsessionId=3CAF7CD0A0BFF5076B390CCD24FD8F0D">here</a>
```

You may notice two differences between the URL that was created here:

```
<c:url value="/default.jsp" var="goToDefault" escapeXml="false"/>
```

and the URL that was generated from the `out` custom action:

```
/home/default.jsp;jsessionId=3CAF7CD0A0BFF5076B390CCD24FD8F0D
```

First, the `url` custom action has automatically added the context path (*/home* in the example) as a prefix to */default.jsp*. Second, the session ID was added to the URL as a path parameter named `jsessionid`, so that the link destination can access the session ID associated with this user and undertake session tracking.

*A path parameter begins with a semicolon and a name/value pair, as in
;jsessionid=3CAF7CD0A0B.*

The URL that the JSP creates by using the `out` element may also have additional parameters. [Example 11-12](#) is the same as the first recipe example, except that parameters have been added to the URL inside the `url` custom action.

Example 11-12. Adding parameters using the url custom action


```
<%@page contentType="text/html"%>
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<html>
  <head><title>JSP Page</title></head>
  <body>
    <h1>This page will use URL rewriting if necessary</h2>

    <c:url value="/default.jsp?n=${param.first}&l=${param.last}"
          var="goToDefault" />

    Go to the default.jsp page <a href="<c:out value="${goToDefault}"
          escapeXml="false" />">here</a>.

  </body>
</html>
```

The URL now looks like this:

```
/default.jsp?n=${param.first}&l=${param.last}
```

This URL uses embedded EL syntax to access two request parameters, called `first` and `last`. If code uses the EL to access a parameter named `first`, for instance, then it uses the `param` EL implicit object, followed by the dot operator, and the name of the parameter, as in `${param.first}`. Suppose the example JSP is requested in the following manner:

```
http://localhost:8080/home/url_rewrite.jsp?first=Bruce&last=Perry
```

The `url` element's `value` attribute resolves to this code:

```
<c:url value="/default.jsp?n=Bruce&l=Perry" var="goToDefault" />
```

The `out` custom action further along in the example JSP has its `escapeXml` attribute set to `false`. If `escapeXml` is left with its default value (`true`) and the ampersand character (`&`) is replaced with its character entity code (`&`), the query string in the URL looks like this when the JSP is executed:

```
<a href="/home/default.jsp;jsessionid=D37AF592DACABD?n=Bruce&amp;l=Perry">
here</a>
```

To prevent this outcome when generating linked URLs with the `out` element, make sure to set `out`'s `escapeXml` attribute to `false`.

Table 11-1. Special characters and entity codes

Character	Entity code
<	<
>	>

Character	Entity code
&	& ;
'	' ;
"	" ;



Make sure to use relative URLs of the form */default.jsp* when using URL rewriting with the `url` element. URL rewriting will not take place if an absolute URL is used in `url`'s `value` attribute, as in *http://www.mysite.com/home/default.jsp*.

See Also

[Recipe 11.6](#) on tracking session activity in JSPs; [Recipe 11.8](#) on using URL rewriting in a servlet; the JSP Configuration section of the JSP v2.0 specification; [Chapter 23](#) on the JSTL; the session-tracking sections of *JavaServer Pages* by Hans Bergsten (O'Reilly).

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Recipe 11.8 Using URL Rewriting in a Servlet

Problem

You want to create a servlet that uses URL rewriting if the user has disabled cookies in his browser.

Solution

Use the `HttpServletResponse.encodeURL(String url)` method to encode all URLs that are used to link with other pages.

Discussion

The `javax.servlet.HttpServletResponse` class includes a nifty method that will encode a URL with the current session ID, in the event that the user making the servlet request has disabled cookies.

In fact, if you use the `HttpServletResponse.encodeURL(String url)` method to encode the URLs that are used in a servlet, this method takes care of URL rewriting if necessary, and you won't have to worry about whether cookies are enabled in users' browsers. You must conscientiously encode every URL link involved with the servlet when using this method. Example 11-13 is a servlet version of the example used in Recipe 11.6 .

Example 11-13. Using URL rewriting in a servlet

```
import javax.servlet.*;
import javax.servlet.http.*;

public class UrlRewrite extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );

        String contextPath = request.getContextPath( );

        String encodedUrl = response.encodeURL(contextPath +
            "/default.jsp");

        out.println("<html>");
        out.println("<head>");
        out.println("<title>URL Rewriter</title>");
```



```

        out.println("</head>");
        out.println("<body>");
        out.println(
            "<h1>This page will use URL rewriting if necessary</h2>");

        out.println("Go to the default.jsp page <a href=\"" + encodedUrl +
            "\">here</a>.");

        out.println("</body>");
        out.println("</html>");
    }

    public void doPost(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        doGet(request, response);
    }
}

```

In the page that is sent to the browser with cookies disabled, the URL looks like:

/home/default.jsp;jsessionid=3CAF7CD0A0BFF5076B390CCD24FD8F0D.

One of the differences between using `encodeURL` and the JSP solution in Recipe 11.7 (which used the `url` custom action from the JSTL) is that the custom action in JSTL 1.0 will automatically prepend the context path to the URL. If the context path was */home*, and the URL was */default.jsp*, then the rewritten URL would look like */home/default.jsp;jsessionid=3CAF7CD0A0BFF5076B390CCD24FD8F0D*. Automatically adding the context path in this manner to the URL is a separate operation compared with URL rewriting; it is not performed by the `encodeURL` method. If you want to duplicate this operation with a servlet, add the context path to the URL before calling the `encodeURL` method, as in:

```

String contextPath = request.getContextPath( );
String encodedUrl = response.encodeURL(contextPath + "/default.jsp")

```

You can also use the related `HttpServletResponse.encodeRedirectURL(String url)` method to initiate URL rewriting with calls to `HttpServletResponse.sendRedirect(String url)`. The servlet `doGet()` method in Example 11-14 uses `encodeRedirectURL` to ensure that the destination URLs have access to the session ID of the redirected user.

Example 11-14. Using `encodeRedirectURL` in a servlet `doGet` method

```

public void doGet(HttpServletRequest request, HttpServletResponse response) throws
    ServletException, java.io.IOException {

    //redirect the user depending on the value of the go param
    String destination = request.getParameter("go");
    String contextPath = request.getContextPath( );

```



```

        if(destination == null || destination.equals(""))
            throw new ServletException(
                "Missing or invalid 'go' parameter in " +
                getClass().getName());

        if(destination.equals("weather")){
            //ensure URL rewriting
            response.sendRedirect(
                response.encodeRedirectURL(
                    contextPath + "/weather") );}

        if(destination.equals("maps")){
            //ensure URL rewriting
            response.sendRedirect(
                response.encodeRedirectURL(
                    contextPath + "/maps") );}
    }

```

The `response.sendRedirect(String url)` method redirects the request to the destination represented by its `url` parameter. The server sends an HTTP status message to the client:

```
HTTP/1.1 302 Moved Temporarily
```

Additionally, a `Location` response header is sent along that provides the client with the new URL for the requested file. If necessary, the `response.encodeRedirectURL(String url)` method adds the session ID to the redirect destination of this URL. The example gets the name of a servlet from the value of the request's `go` parameter:

```
String destination = request.getParameter("go");
```

The servlet throws a `ServletException` if the parameter is either missing or is an empty `String`. If the `go` parameter is valid, the servlet redirects the request to one of two servlets, with paths of */weather* or */maps* (the context path in the example is */home*). If implemented properly on the server, the following code adds the session ID to the URL if the requester's cookies are disabled, so the destination servlet can initiate session tracking:

```
response.sendRedirect( response.encodeRedirectURL(contextPath + "/weather") );
```

See Also

Recipe 11.4 on checking the validity of a session; Recipe 11.7 on using URL rewriting in a JSP; Chapter 1 on *web.xml*; Chapter 7 of the Servlet v2.3 and 2.4 specifications on sessions; the `javax.servlet.http.HttpSession` API at http://java.sun.com/j2ee/sdk_1.3/techdocs/api/javax/servlet/http/HttpSession.html; the session-tracking sections of *Java Servlet Programming* by Jason Hunter (O'Reilly) and *JavaServer Pages* by Hans Bergsten (O'Reilly).

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Recipe 11.9 Using a Listener to Track the Session Lifecycle

Problem

You want an object that implements the `HttpSessionListener` interface to respond when a session is created or destroyed.

Solution

Create a listener class that implements the `HttpSessionListener` interface, and register the class in your deployment descriptor.

Discussion

The servlet API provides the `javax.servlet.http.HttpSessionListener` interface for use in responding to session creation or destruction. A class that implements this interface can perform custom behavior on either (or both) of these two events. Here is the process for creating and declaring a session listener for your web application:

1. Create a class that implements the `HttpSessionListener` interface. This interface defines two methods: `sessionCreated()` and `sessionDestroyed()`, each of which accept a single `HttpSessionEvent` parameter.
2. Make sure the implementing class has a zero-argument constructor.
3. Place the compiled class in the *WEB-INF/classes* directory of your web application (including any of its package-related directories); or store the class in a JAR located in the *WEB-INF/lib* directory.
4. Declare the listener in the *web.xml*/deployment descriptor.
5. Restart the web container (if necessary), which will instantiate your listener class and register it as a listener for all new sessions and session invalidations in the web application.



Objects that are bound to sessions should implement the `HttpSessionBindingListener` interface. This listener does not have to be configured in the deployment descriptor, but the bound objects must implement `HttpSessionBindingListener`, as well as the `valueBound()`, `valueUnbound()`, and `init()` methods. The `HttpSessionActivationListener` is designed for sessions that migrate between Java Virtual Machines (JVMs). Objects that are bound to these sessions must implement `HttpSessionActivationListener` and its two methods: `sessionDidActivate()` and `sessionWillActivate()`.

Here is the *web.xml* entry for our example listener class:

```
<listener>
  <listener-class>com.jspServletcookbook.SessionListen</listener-class>
</listener>
```

The `HttpSessionListener` class in [Example 11-15](#) keeps a count of live sessions in the web application and writes a message to the console whenever a session is created or destroyed. It would be better to log messages using a component such as log4j, which I'll discuss in [Chapter 14](#).

Example 11-15. Keeping track of session activity with a listener class

```
package com.jspServletcookbook;

import java.util.Date;
import javax.servlet.*;
import javax.servlet.http.*;

public class SessionListen implements HttpSessionListener {

    private int sessionCount;

    public SessionListen( ) {
        this.sessionCount = 0;
    }

    public void sessionCreated(HttpSessionEvent se){

        HttpSession session = se.getSession( );

        session.setMaxInactiveInterval(60);

        //increment the session count
        sessionCount++;

        String id = session.getId( );

        Date now = new Date( );
```



```

        String message = new StringBuffer(
            "New Session created on ").
            append(now.toString( )).append("\nID: ").
            append(id).append("\n").append("There are now ").
            append(""+sessionCount).append(
                " live sessions in the application."). toString( );

        System.out.println(message);
    }

    public void sessionDestroyed(HttpSessionEvent se){

        HttpSession session = se.getSession( );

        String id = session.getId( );

        --sessionCount;//decrement the session count variable

        String message = new StringBuffer("Session destroyed" +
            "\nValue of destroyed session ID is").
            append(""+id).append("\n").append(
                "There are now ").append(""+sessionCount).append(
                    " live sessions in the application.").toString( );

        System.out.println(message);
    }
}

```

Each listener must have a zero-argument constructor. The `SessionListen` class has one instance variable, an `int` that keeps track of the number of sessions. In the `sessionCreated()` method, the code gets access to the new session by calling the `HttpSessionEvent.getSession()` method. The session's timeout is then reset to 60 seconds, so the creating and destroying can be observed in the console without a lot of delay.

An `HttpSessionListener` class is notified only of requests to pages that create *new* sessions, such as with the `request.getSession()` method. This listener is also notified if a servlet or JSP invalidates an existing session, an event that will trigger the class's `sessionDestroyed()` method. If a servlet or JSP is accessed, but does not do session tracking, then the listener is *not* notified of those activities; the same is true when the session is further accessed through the web application after it is created, unless it is explicitly invalidated.

Similar messaging and access to the `HttpSession` object takes place in the `sessionDestroyed()` method. The resulting console in [Figure 11-6](#) shows that you can get information about the `HttpSession` object in both of the listener's methods.

Figure 11-6. Notifications of session creation and invalidation

A screenshot of a Tomcat console window. The window title is "Tomcat". The log messages show the startup sequence of the Tomcat server, including creating a Registry instance, initializing Coyote HTTP/1.1 on ports 8080 and 8443, starting the service Tomcat-Standalone, and the Jk2: ajp13 listener. It also shows session management: a session is destroyed, a new session is created on Tue Sep 23 13:38:18 EDT 2003, and then destroyed again.

```
INFO: Creating new Registry instance
Sep 23, 2003 12:55:45 PM org.apache.commons.modeler.Registry getServe
INFO: Creating MBeanServer
Sep 23, 2003 12:55:48 PM org.apache.coyote.http11.Http11Protocol init
INFO: Initializing Coyote HTTP/1.1 on port 8080
Sep 23, 2003 12:55:49 PM org.apache.coyote.http11.Http11Protocol init
INFO: Initializing Coyote HTTP/1.1 on port 8443
Starting service Tomcat-Standalone
Apache Tomcat/4.1.24
Sep 23, 2003 12:56:07 PM org.apache.coyote.http11.Http11Protocol star
INFO: Starting Coyote HTTP/1.1 on port 8080
Sep 23, 2003 12:56:07 PM org.apache.coyote.http11.Http11Protocol star
INFO: Starting Coyote HTTP/1.1 on port 8443
Sep 23, 2003 12:56:07 PM org.apache.jk.common.ChannelSocket init
INFO: JK2: ajp13 listening on /0.0.0.0:8009
Sep 23, 2003 12:56:07 PM org.apache.jk.server.JkMain start
INFO: Jk running ID=0 time=10/111 config=K:\Tomcat24\jakarta-tomcat-
Session destroyed
Value of destroyed session ID is87C2CD4E3125983D0702B84A35475A24
There are now 0 live sessions in the application.
New Session created on Tue Sep 23 13:38:18 EDT 2003
ID: 23C53BCD7C35D15834B417C41F86DE47
There are now 1 live sessions in the application.
Session destroyed
Value of destroyed session ID is23C53BCD7C35D15834B417C41F86DE47
There are now 0 live sessions in the application.
```

Using the `HttpSessionListener` interface, it is possible to create classes that monitor how many sessions are created during a certain period of time, and how long it takes before they are left idle and timeout.

See Also

[Chapter 14](#) on using listeners to log messages; [Recipe 11.4](#) on checking the validity of a session; [Chapter 1](#) on *web.xml*; Chapter 7 of the Servlet v2.3 and 2.4 specifications on sessions; the `javax.servlet.http.HttpSession` API at http://java.sun.com/j2ee/sdk_1.3/techdocs/api/javax/servlet/http/HttpSession.html.

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Recipe 11.10 Using a Listener to Monitor Session Attributes

Problem

You want a listener class to be notified when a session attribute is added, removed, or replaced.

Solution

Create a Java class that implements the `HttpSessionAttributeListener` interface. Register this class using the web application's deployment descriptor.

Discussion

The `HttpSessionAttributeListener` interface has three methods: `attributeAdded()`, `attributeRemoved()`, and `attributeReplaced()`; all have a parameter of the type `HttpSessionBindingEvent`. This listener is notified when the session sets, removes, or changes an attribute. Therefore, the method calls in the web application that cause an `HttpSessionAttributeListener` notification are:

- `HttpSession.setAttribute(String name, Object value)`.
- `HttpSession.removeAttribute(String name)`.
- A call to `HttpSession.setAttribute()` when an attribute of the same name is already bound to the session. The original attribute is replaced, triggering a call to the `attributeReplaced(HttpSessionBindingEvent event)` method.

[Example 11-16](#) displays a message to the console when a session object is bound, including the value of the object (which is a `String` in this simple example). Messages are also displayed when the attribute is removed or replaced. To make this listener available to the application:

1. Give the class a zero-argument constructor.
2. Add the class to the web application's *WEB-INF/classes* or *lib* directory (when it's in a JAR).
3. Declare the listener in the deployment descriptor.
4. Restart the web container (if necessary) so it can instantiate the listener.

Example 11-16. Listening for session object binding or unbinding

```
package com.jspServletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

public class SessionAttribListen implements HttpSessionAttributeListener {

    //Creates new SessionAttribListen
    public SessionAttribListen( ) {

        System.out.println(getClass().getName());
    }

    public void attributeAdded(HttpSessionBindingEvent se) {

        HttpSession session = se.getSession();

        String id = session.getId();

        String name = se.getName();

        String value = (String) se.getValue();

        String source = se.getSource().getClass().getName();

        String message = new StringBuffer(
            "Attribute bound to session in ").append(source).
            append("\nThe attribute name: ").append(name).
            append("\n").append("The attribute value:").
            append(value).append("\n").
            append("The session ID: ").
            append(id).toString();

        System.out.println(message);
    }

    public void attributeRemoved(HttpSessionBindingEvent se) {

        HttpSession session = se.getSession();

        String id = session.getId();

        String name = se.getName();

        if(name == null)
            name = "Unknown";

        String value = (String) se.getValue();
```



```

        String source = se.getSource( ).getClass( ).getName( );

        String message = new StringBuffer(
            "Attribute unbound from session in ").append(source).
            append("\nThe attribute name: ").append(name).
            append("\n").append("The attribute value: ").
            append(value).append("\n").append(
                "The session ID: ").append(id).toString( );

        System.out.println(message);
    }

    public void attributeReplaced(HttpSessionBindingEvent se) {

        String source = se.getSource( ).getClass( ).getName( );

        String message = new StringBuffer(
            "Attribute replaced in session ").
            append(source).toString( );

        System.out.println(message);
    }
}

```

When attributes are added, replaced, and removed from a session in the web application, this class prints information about the attribute and the session to the web container's console. The `HttpSession` type that binds the attribute can be accessed by calling the `HttpSessionBindingEvent` class's `getSession()` method. In all three of the listener's methods, you can get the ID of the session associated with the attribute, as well as the attribute's name and value. Inside the listener class's constructor is a line of code that prints the listener class name to the console when it is instantiated:

```
System.out.println(getClass( ).getName( ));
```

This message indicates to the developer that the listener is properly referenced in *web.xml*, and that the web container has created an instance of the listener. Finally, this listener class prints a message to the console about the session class that is the source of the event. The listener uses the `java.util.EventObject.getSource()` method (which is inherited by the `HttpSessionBindingEvent` object) to get a reference to the source of the session-binding event:

```
String source = se.getSource( ).getClass( ).getName( );
```

The `se` variable is the `HttpSessionBindingEvent` object. Here is the information that is printed to the Tomcat console:

```

Attribute bound to session in org.apache.catalina.session.StandardSession
The attribute name: session-attribute
The attribute value: Hello
The session ID: 9ED2C34964778265A34F7AB0DEA4B884
Attribute replaced in session  org.apache.catalina.session.StandardSession
Attribute unbound from session in org.apache.catalina.session.StandardSession
The attribute name: session-attribute
The attribute value: Hello there.

```


The session ID: 9ED2C34964778265A34F7AB0DEA4B884

The listener allows you to get the session ID, as well as the name and value of the session attribute, during the attribute's removal from the session. The `HttpSessionBindingEvent.getValue()` method returns the value of the attribute as a `java.lang.Object`. Therefore, if you want access to the attribute in the listener, then you would have to cast the `Object` type to its appropriate type during its addition, removal, or replacement. For example, imagine that you have stored a `java.util.Map` in a session. You want to check the `Map` contents in the listener's `attributeRemoved` method. If the variable `be` is of type `HttpSessionBindingEvent`, then this code checks the return type of `be.getValue()`:

```
java.util.Map map = null;

Object value = null;

if((value = be.getValue( )) instanceof java.util.Map){

    map = (java.util.Map) value;
    System.out.println("HashMap value: " + map.get("key"));

}
```

This method returns the value of the session-bound object that's being removed. If the return type is a `Map`, the local variable `value` is cast to a `java.util.Map`, then the `get()` method is called on that `Map` (given that the `Map` instance contains a key called "key").

See Also

[Chapter 14](#) on using listeners to log messages; [Recipe 11.4](#) on checking the validity of a session; [Recipe 11.9](#) on using a listener to track session lifecycle; [Chapter 1](#) on *web.xml*; Chapter 7 of the Servlet v2.3 and 2.4 specifications on sessions; the `javax.servlet.http.HttpSession` API at http://java.sun.com/j2ee/sdk_1.3/techdocs/api/javax/servlet/http/HttpSession.html.

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Recipe 11.11 Using a Filter to Monitor Session Attributes

Problem

You want to use a filter to check a session attribute prior to the request reaching a servlet.

Solution

Create a Java class that implements `javax.servlet.Filter`, write session-related code in the class's `doFilter()` method, then configure the filter in your deployment descriptor.

Discussion

Filters, as their name suggests, are semipermeable barriers through which requests to your web application must pass before they reach servlets, JSPs, or even static content. Filters are technically Java classes that implement the `javax.servlet.Filter` interface. A filter can have a look at the `ServletRequest` and `ServletResponse` objects before these objects find their way to a servlet's service methods (which include `service()`, `doGet()`, and `doPost()`). Filters can initiate authentication, logging, encryption, database actions, caching, and just about any other task that passes through request and response objects.

Filters are configured in *web.xml*. In Example 11-18, a filter checks a `logged-in HttpSession` attribute, and logs its activities by calling the `ServletContext` object's `log()` method. This filter is mapped to a servlet registered in *web.xml* as `MyServlet`. Any requests to the `MyServlet` servlet cause the `SessionFilter.doFilter()` method to be called. Example 11-17 shows the relevant entries in *web.xml*.

Example 11-17. Configuring a filter in web.xml

```
<!-- the beginning of web.xml goes here -->

<filter>
    <filter-name>SessionFilter</filter-name>
    <filter-class>com.jspervletcookbook.SessionFilter</filter-class>
</filter>

<filter-mapping>
    <filter-name>SessionFilter</filter-name>
    <servlet-name>MyServlet</servlet-name>
</filter-mapping>
<!-- more filters or listener classes added here -->

<servlet>
    <servlet-name>MyServlet</servlet-name>
```

```

        <servlet-class>com.jspServletcookbook.MyServlet</servlet-class>
    </servlet>

    <!-- deployment descriptor continues ...-->

```

The `filter` element specifies the filter's registered name and its fully qualified Java class. You package the filter class with the rest of the web application by placing the class in *WEB-INF/classes* or in a JAR file in *WEB-INF/lib*. The `filter-mapping` element maps the filter to the servlet registered in the deployment descriptor as `MyServlet`. Filters can also be mapped to URL patterns (Chapter 20 explains this syntax in detail). Example 11-18 is the source code for `com.jspServletcookbook.SessionFilter`.

Example 11-18. A filter that snoops on session information

```

package com.jspServletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

public class SessionFilter implements Filter {

    private FilterConfig config;

    //Creates new SessionFilter
    public SessionFilter( ) {}

    public void init(FilterConfig filterConfig) throws ServletException{

        System.out.println("Instance created of "+getClass().getName( ));
        this.config = filterConfig;
    }

    public void doFilter(ServletRequest request, ServletResponse response,
        FilterChain chain) throws java.io.IOException, ServletException {

        HttpSession session = ((HttpServletRequest) request).getSession( );

        ServletContext context = config.getServletContext( );

        /* use the ServletContext.log method to log
           filter messages */
        context.log("doFilter called in: " + config.getFilterName( ) +
            " on " + (new java.util.Date( )));

        // log the session ID
        context.log("session ID: " + session.getId( ));

        // Find out whether the logged-in session attribute is set
        String logged = (String) session.getAttribute("logged-in");
        if (logged == null)
            session.setAttribute("logged-in","no");
    }
}

```



```

        //log a message about the log-in status
        context.log("log-in status: "+
            (String)session.getAttribute("logged-in"));

        context.log("");

        chain.doFilter(request,response);
    }

    public void destroy( ){
        /*called before the Filter instance is removed
        from service by the web container*/
    }
}

```



Every filter has to have a zero-argument constructor, just like listener classes.

The `init()` method displays a console message when its instance is created by the web container. The `javax.servlet.FilterConfig` object is used to get the `ServletContext` object for this filter (by calling `FilterConfig.getServletContext()`). The `ServletContext.log()` method is used to log messages from the filter. These messages can then be read in the server logs. In Tomcat, look in the `<Tomcat-install-directory>/logs` directory for log files with names such as `localhost_home_log.2003-01-24.txt`. Here is an example of the log entries for this filter:

```

2003-01-24 11:56:09 doFilter called in: SessionFilter on Fri Jan 24 11:56:09 EST 2003
2003-01-24 11:56:09 session ID: E04DE93D9B88A974ED2350BCF7945F34
2003-01-24 11:56:09 log-in status: no

```

The filter gets access to the session with this code:

```
HttpSession session = ((HttpServletRequest) request).getSession( );
```

Since the `doFilter()` method has a `ServletRequest` parameter type, and not a `HttpServletRequest` type, the request parameter has to be cast to the latter type so that the code can call the `request.getSession()` method.

Beware of doing this blindly in environments where you are not *positive* that all servlets are `HttpServletRequest` s. If you aren't sure, a simple class check before casting can solve this problem.

Once the filter has access to the session object, it looks for a certain session attribute (`logged-in`). If `session.getAttribute("logged-in")` returns `null`, this attribute is added to the session with the value "no". The code then calls `chain.doFilter(request ,response)` inside of the filter's `doFilter()` method.

This method call on the `FilterChain` object ensures that the request and response are passed along

to the next filter on the chain, or, in the absence of any more mapped filters, to the targeted web resource. Example 11-19 shows the `doGet()` method of the `MyServlet` servlet that the filter in Example 11-18 is mapped to.

Example 11-19. `doGet` method of a servlet to which a filter is mapped

```
public void doGet(HttpServletRequest request,
    HttpServletResponse response)
    throws ServletException, java.io.IOException {

    response.setContentType("text/html");
    java.io.PrintWriter out = response.getWriter( );

    HttpSession session = request.getSession( );

    String logged = (String) session.getAttribute("logged-in");

    out.println("<html>");
    out.println("<head>");
    out.println("<title>Filter Servlet</title>");
    out.println("</head>");
    out.println("<body>");

    out.println("<h2>Session Logged in Info</h2>");

    out.println("logged in : " + logged+ "<br><br>");

    out.println("</body>");
    out.println("</html>");

}
```

This servlet checks the `logged-in` session attribute and displays its value, as shown in Figure 11-7.

A filter is mapped to a servlet's registered name like this:

```
<filter-mapping>
  <filter-name>SessionFilter</filter-name>
  <servlet-name>MyServlet</servlet-name>
</filter-mapping>
```

The requests for this servlet will not pass through the mapped filter first, however, if the servlet is requested with an "invoker"-style URL of the form *http://localhost:8080/servlet/com.jspservletcookbook.MyServlet*. If this causes problems for the web application, consider disabling or overriding the URL mapping of */servlet/** in your web application. Recipe 3.6 describes how to do this.

Figure 11-7. Checking a session object after a filter has altered it



A filter can take a number of actions with a session object before it reaches a servlet or JSP that does session tracking, such as add, remove, or change session attributes. It can also alter the session's timeout period (with the `HttpSession.setMaxInactiveInterval(int seconds)` method) based on an attribute of the session or request.

See Also

Chapter 19 on using filters; Recipe 11.4 on checking the validity of a session; Chapter 1 on *web.xml*; Chapter 7 of the Servlet v2.3 and 2.4 specifications on sessions; the `javax.servlet.http.HttpSession` API at http://java.sun.com/j2ee/sdk_1.3/techdocs/api/javax/servlet/http/HttpSession.html ; Chapter 1 on *web.xml*; Chapter 6 of the Servlet v 2.3 and 2.4 specifications on filtering.

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Chapter 12. Integrating JavaScript with Servlets and JSPs

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Introduction

JavaScript is a scripting system for web pages, standalone applications, and servers. Netscape Corporation invented JavaScript, which has become such a popular and useful programming tool that all major browsers now support it. Unlike the Java code shown in this book, JavaScript is mainly executed in the web browser as a client-side scripting system, rather than on the server.

Most busy web sites use JavaScript for dynamic behavior, such as validating form input or creating new browser windows (much to the chagrin of users, who are often overwhelmed by irresponsible and dynamically generated pop ups!). Just choose "View Source" from the browser menu bar for a typical web page, and often the first text items you'll see displayed are endless lines of JavaScript. JavaScript is used for advanced tasks such as controlling or animating browser shapes (dynamic HTML), creating flying objects, and initializing the behavior of embedded videos.

Developers converting static web pages to JSPs or servlets may have to integrate existing JavaScript code into their Java source code. This is what the upcoming recipes are all about.

JavaScript guides are available from <http://devedge.netscape.com/>.

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Recipe 12.1 Including JavaScript Modules in a Servlet

Problem

You want to import a module or file containing JavaScript code so that the JavaScript can be included in the servlet's HTML output.

Solution

Use the `javax.servlet.RequestDispatch.include()` method to import the needed JavaScript into your page.

Discussion

An efficient method for handling JavaScript throughout a web project is to store the JavaScript code in separate files or modules. Servlets that require the JavaScript functions can then import the JavaScript modules. You would not store your Java class files willy-nilly all over the computer's filesystem without an organization that mirrors the code's purpose. Nor should you organize your JavaScript in anything but well-defined modules.

The JavaScript is included in the servlet's HTML output with `<script>` tags and executed in the browser when needed. Example 12-1 shows a module of JavaScript code named *functions.js*. This module is stored in the web application's *WEB-INF/javascript* directory.

A sensible place to store JavaScript modules is in their own directory, so that they are easy to locate and do not clutter up the top-level directory of the web application. The JavaScript directory can be a sub-directory of *WEB-INF*, as in this recipe.

Example 12-1. A JavaScript module

```
<script language="JavaScript">

function CheckEmail(email)
{
    var firstchunk,indx,secondchunk

    if (email == ""){
        alert("Please make sure you have entered a valid " +
            "email before submitting the info.")

        return false
    }
}
```

```

    }

    //get the zero-based index of the "@" character
    indx = email.indexOf("@")

    //if the string does not contain an @, then return false
    if (indx == -1 ){

        alert("Please make sure you have entered a valid " +
            "email before submitting the info.")

        return false
    }

    //if the first part of email is < two chars and thye second part is < seven chars
    //(arbitrary but workable criteria), reject the input address

    firstchunk = email.substr(0,indx) //up to but not including the "@"

    //start at char following the "@" and include up to end of email addr
    secondchunk = email.substr(indx + 1)

    //if the part following the "@" does not include a period "." then
    //also return false

    if ((firstchunk.length < 2 ) || (secondchunk.length < 7) ||
        (secondchunk.indexOf(".") == -1)){

        alert("Please make sure you have entered a valid " +
            "email before submitting the info.")

        return false
    }

    //the email was okay; at least it had a @, more than one username chars,
    //more than six chars after the "@", and the substring after the "@"
    // contained a "." char

    return true

}

function CreateWindow(uri) {

    var newWin =
        window.open(uri, 'newwin1',
            'width=500,height=400,resizable,' +
            'scrollable,scrollbars=yes');
    newWin.focus( );

}

```

```
</script>
```

The module in Example 12-1 contains a `script` block with two JavaScript function definitions. The function `CheckEmail` ensures that the email address a user has typed into an HTML form contains at least an `@` character, two characters preceding the `@` and seven characters after that character, and that the characters after the `@` contain a period character (`.`). The `CreateWindow` function creates a new browser window with the supplied URI.

Example 12-2 shows a servlet that imports this JavaScript file using the `javax.servlet.RequestDispatcher.include()` method.

Example 12-2. A servlet includes a JavaScript file

```
package com.jspervletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

public class ModuleServlet extends HttpServlet {

    public void doGet(HttpServletRequest request, HttpServletResponse response) throws
        ServletException, java.io.IOException {

        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );
        out.println("<html><head>");

        RequestDispatcher dispatcher = request.getRequestDispatcher(
            "/WEB-INF/javascript/functions.js");

        dispatcher.include(request, response);

        out.println("<title>Client Forms</title></head><body>");
        out.println("<h2>Enter Your Name and Email</h2>");

        out.println("<form action="
            + "/home/displayHeaders.jsp" + " name=\"entryForm\" onSubmit="
            + " return CheckEmail(this.email.value)>");

        out.println("<table border=\"0\"><tr><td valign=\"top\">");
        out.println(
            "First and last name: </td> <td valign=\"top\"><input type="
            + "\"text\" name=\"name\" size=\"20\"></td></tr>");

        out.println("<tr><td valign=\"top\">");
        out.println("Email: </td>");
        out.println("<td valign=\"top\"><input type=\"text\" name="
            + "\"email\" size=\"20\"></td>");
        out.println("<tr><td valign=\"top\"><input type="
            + "\"submit\" value=\"Submit\" ></td>");
        out.println("</tr></table></form>");
```

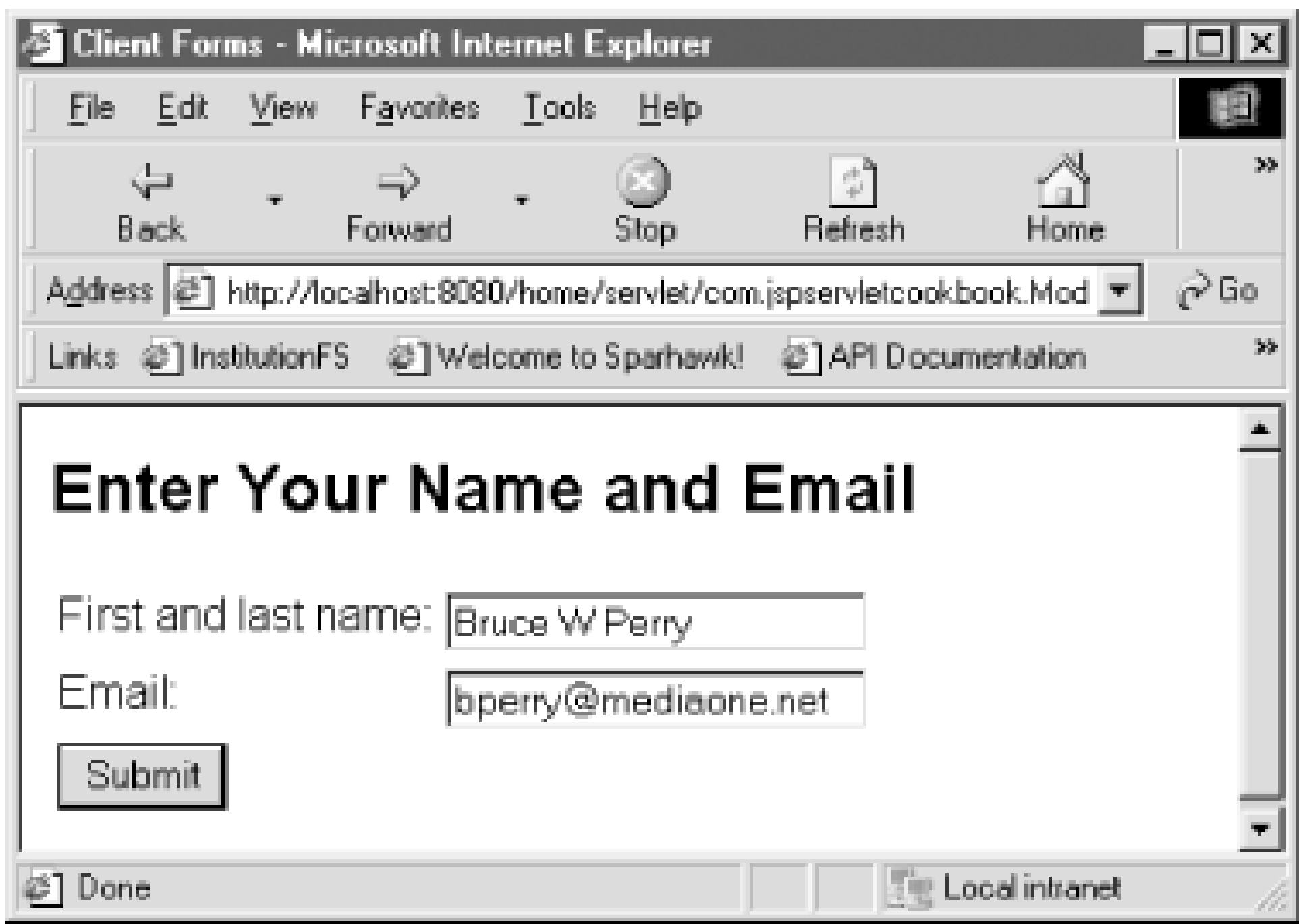


```
        out.println("</body></html>");  
  
    } //doGet  
}
```

The servlet in Example 12-2 uses a `RequestDispatcher` to include the code contained in *functions.js* within the HTML `head` tag generated by the servlet. The generated page includes an HTML `form` tag. When the page user clicks the Submit button, the `form` tag's `onSubmit` event handler checks the email address that the user typed into the form using the imported JavaScript `CheckEmail` function. This function returns `false`, which cancels the form submission if the email address does not meet the simple criteria specified by the function.

Figure 12-1 shows what the web page looks like when the user has entered an email address into the form.

Figure 12-1. A servlet generates a web page containing JavaScript



Users can also use the built-in `src` attribute of the HTML `script` tag to import a JavaScript module, as in:

```
<script src="functions.js">
```

See Also

The Netscape DevEdge site at <http://devedge.netscape.com/>; Recipe 12.2, Recipe 12.4, and Recipe 12.6 on using JavaScript with JSPs; Recipe 12.3 on using JavaScript with servlets for creating new browser windows; Recipe 12.5 on validating form values with a servlet and JavaScript; Recipe 18.3 on using a filter with HTTP requests.

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Recipe 12.2 Including JavaScript Modules in a JSP

Problem

You want to include a module or file containing JavaScript code within a JSP page's output.

Solution

Use the `c:import` JSTL core tag.

Discussion

The previous recipe described how to include a file containing JavaScript (Example 12-1) into a servlet's HTML input. It is very easy to accomplish the same task in a JSP, such as by using the *importMod.jsp* file shown in Example 12-3 . This JSP uses the JSTL core tag `c:import` to include a file named *functions.js* . The *functions.js* module contains a `script` tag with two JavaScript function definitions (Example 12-1 in Recipe 12.1). The HTML generated by the JSP shows that the `c:import` action positioned the `script` tag within the JSP's `head` tag. The JSP generates the HTML form shown previously in Figure 12-1 .

Example 12-3. Using the JSTL `c:import` tag to import JavaScript

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<html>
<head>

<c:import url="/WEB-INF/javascript/functions.js" />

<title>Client Forms</title></head><body>

<h2>Enter Your Name and Email</h2>

<form action="/home/displayHeaders.jsp" name="entryForm"
      onsubmit="return CheckEmail(this.email.value)">

<table border="0"><tr><td valign="top">

First and last name: </td>   <td valign="top"><input type="text" name="name" size="20"></
td></tr>

<tr><td valign="top">
Email: </td>   <td valign="top"><input type="text" name="email" size="20"></td></tr>

<tr><td valign="top"><input type="submit" value="Submit"></td>
</tr></table>
```

```
</form>
</body></html>
```

When the user submits the HTML form, her action is intercepted by the `form` tag's `onSubmit` event handler, which does a basic syntax check on the email address the user typed into the form. The form submit, targeted to a `/home/displayHeaders.jsp` page, is cancelled if the submitted email address has the wrong syntax.



The JavaScript code `this.email.value` returns the `String` that the user typed into the text field named `email`. The keyword `this` refers to the `form` object, which contains the event handler `onSubmit`. The JavaScript code is a parameter of this event handler.

See Also

The Netscape DevEdge site at <http://devedge.netscape.com/>; Recipe 12.4 on using JavaScript to create a new window in a JSP; Recipe 12.6 on using JavaScript to validate form input in a JSP; Recipe 12.3 on using JavaScript with servlets for creating new browser windows; Recipe 12.5 on validating form values with a servlet and JavaScript; Recipe 18.3 on using a filter with HTTP requests.

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Recipe 12.3 Creating a New Window with JavaScript in a Servlet

Problem

You want a servlet to contain JavaScript that can generate a new browser window.

Solution

Use a `javax.servlet.RequestDispatcher` to include the JavaScript function in the servlet. The JavaScript function calls the JavaScript window object's `open` method.

Discussion

This recipe uses the same imported module as the first two recipes, but this time the servlet uses the second function definition (`CreateWindow`) rather than the first. Example 12-4 generates an HTML button widget. When the user clicks the button, JavaScript generates a small window (sometimes referred to as a *windoid*, or pop up). The servlet dynamically retrieves the URL for loading into the new window from a servlet `init` parameter, which is something you cannot do with a static HTML page.

Example 12-4. A servlet that loads JavaScript for creating a window

```
package com.jspervletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

public class WindowServlet extends HttpServlet {

    public void doGet(HttpServletRequest request, HttpServletResponse response) throws
        ServletException, java.io.IOException {

        //URL for the pop-up window is configured
        String url = getInitParameter("popup-url");

        //just in case the initParameter is misconfigured

        if (url == null || url.equals(""))
            url = "/displayHeaders.jsp";

        //add the context path as a prefix to the URL, as in /home
        url = request.getContextPath( ) + url;
```



```

response.setContentType("text/html");
java.io.PrintWriter out = response.getWriter( );
out.println("<html><head>");

RequestDispatcher dispatcher = request.getRequestDispatcher(
    "/WEB-INF/javascript/functions.js");

dispatcher.include(request, response);

out.println("<title>Help Page</title></head><body>");
out.println("<h2>Cookie Info</h2>");

out.println("<form action =\"\" onSubmit=\" return false\">");
out.println("<table border=\"0\"><tr><td valign=\"top\">");

out.println(
    "Click on the button to get more info on cookies: </td>");

out.println("<td valign=\"top\">");

out.println("<input type=\"button\" name=\"button1\" " +
    "value=\"More Info\" onClick=\"CreateWindow('\" + url +
    "')\"></td></tr>");

out.println("</table></form>");

out.println("</body></html>");
} //end doGet
}

```

This servlet assumes some configuration steps have been taken in the application's deployment descriptor. This configuration includes an `init-param` that specifies the URL for loading into the new window. The `url` variable is the `CreateWindow` function's parameter (see Example 12-1 for a definition of the JavaScript functions). The servlet generates the HTML and dynamically provides the URL for loading into the new window. Here is the HTML button definition in the servlet's output:

```

<input type="button" name="button1" value="More Info"
    onClick="CreateWindow('home/cookieReader.jsp')">

```

If the application is dynamically reloadable (the web container monitors the deployment descriptor for any changes and reloads the context if the file is altered), then the developer can change the value of the servlet `init-param` in the deployment descriptor. The servlet pop-up window then loads the new URL without recompiling the servlet or stopping the server.

Here is the configuration for this servlet in *web.xml*:

```

<servlet>
    <servlet-name>>windowServlet</servlet-name>

```



```
<servlet-class>com.jspServletcookbook.WindowServlet</servlet-class>
<init-param>
  <param-name>popup-url</param-name>
  <param-value>/cookieReader.jsp</param-value>
</init-param>
</servlet>
```

The servlet loads the definition for the JavaScript function `CreateWindow` with this code:

```
RequestDispatcher dispatcher = request.getRequestDispatcher(
    "/WEB-INF/javascript/functions.js");
```

In the HTML code the servlet generates, the `script` tag containing the JavaScript code appears within the HTML `head` tag. When the user clicks the form button on the servlet-generated web page, a new window is created and the URL specified by the `init-param` element in *web.xml* (*cookieReader.jsp*) is loaded. Figure 12-2 shows the servlet output. Figure 12-3 shows the pop-up window.

Figure 12-2. A servlet that creates a pop-up window

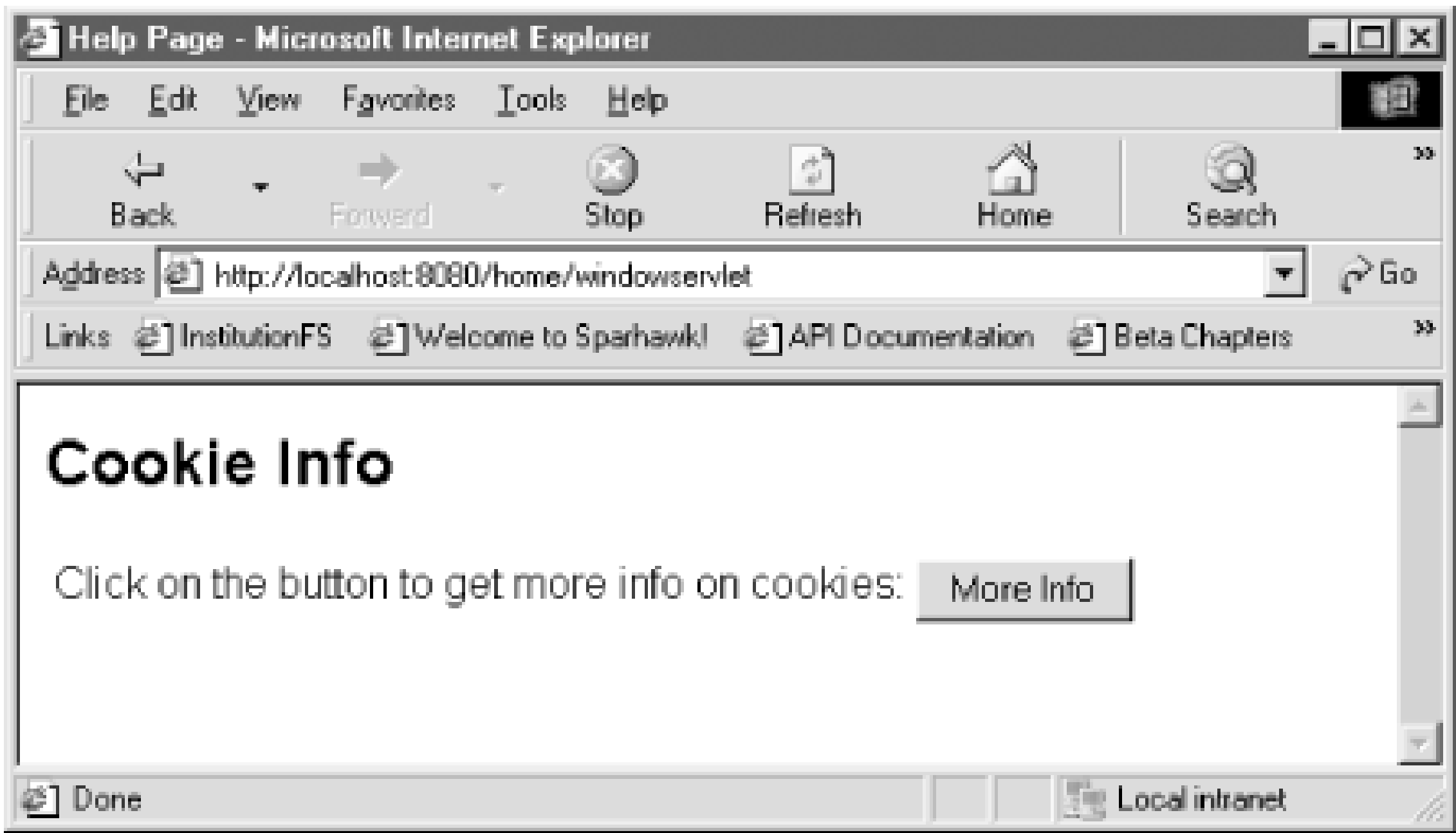


Figure 12-3. The new window loads a URL value from a servlet init-param

See Also

The Netscape DevEdge site at <http://devedge.netscape.com/>; Recipe 12.2 , Recipe 12.4 , and Recipe 12.6 on using JavaScript with JSPs; Recipe 12.5 on validating form values with a servlet and JavaScript; Recipe 18.3 on using a filter with HTTP requests.

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Recipe 12.4 Creating a New Window with JavaScript in a JSP

Problem

You want to use JavaScript in a JSP to create a new browser window.

Solution

Use the `c:import` JSTL tag to import the JavaScript code into the JSP. Then use the `initParam` JSTL implicit object to dynamically provide the URL for a JavaScript-generated window.

Discussion

The JSP in [Example 12-5](#) (*window.jsp*) uses the JSTL's `c:import` core tag to import the JavaScript function definition for creating a new window. The JSP then calls the JavaScript function (`CreateWindow`) in the `onClick` event handler for a web page button. The `CreateWindow` function loads the URL specified in its parameter into the new browser window. [Example 12-5](#) uses the `c:out` core tag and EL syntax to dynamically acquire the URL for the JavaScript window from a context parameter. The `c:out` tag looks like this:

```
<c:out value=
"${pageContext.request.contextPath}${initParam["jsp-url"]}" />
```

The `value` attribute specifies two EL expressions. The first one provides the JSP's context path, while the second gives the value of the `context-param` element `jsp-url`. The full URL specified by these concatenated EL expressions is */home/cookieReader.jsp*.

Example 12-5. Using the JSTL to import JavaScript into a JSP

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<html>
<head>

<c:import url="/WEB-INF/javascript/functions.js" />

<title>Help Page</title></head><body>
<h2>Cookie Info</h2>

<form action ="" onSubmit=" return false">
<table border="0"><tr><td valign="top">
```

```
Click on the button to get more info on cookies: </td>
<td valign="top">

<input type="button" name="button1" value=
    "More Info" onClick=
"CreateWindow('<c:out value=
    "${pageContext.request.contextPath}${initParam["jsp-url"]}'"/>')">

</td></tr>
</table></form>
</body></html>
```

This JSP uses the following `context-param` element in *web.xml*:

```
<context-param>
    <param-name>jsp-url</param-name>
    <param-value>/cookieReader.jsp</param-value>
</context-param>
```

The EL implicit object `initParam` evaluates to a `java.util.Map` containing the names and values of any `context-param` elements configured for the web application. An *implicit object* is a variable that the JSTL automatically makes available to your JSP code.

[Example 12-5](#) uses the EL syntax `initParam["jsp-url"]`, as opposed to `initParam.jsp-url`, in order to return the intended value in Tomcat 5 (alpha version as of this writing). The code's purpose is to escape the hyphen character (-) in "jsp-url."

See Also

The Netscape DevEdge site at <http://devedge.netscape.com/>; [Recipe 12.2](#) and [Recipe 12.6](#) on using JavaScript with JSPs to import JavaScript and validate form input; [Recipe 12.3](#) on creating new browser windows with servlets and JavaScript; [Recipe 12.5](#) on validating form values with a servlet and JavaScript; [Recipe 18.3](#) on using a filter with HTTP requests.

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Recipe 12.5 Using JavaScript to Validate Form Values in a Servlet

Problem

You want to validate form input values using JavaScript in a JSP.

Solution

Use a `javax.servlet.RequestDispatcher` to include the validating JavaScript in the servlet. Then call the validating JavaScript function in the form's `onSubmit` event handler.

Discussion

[Example 12-6](#) is a JavaScript module named *validate.js*. This file should be located in *WEB-INF/javascript/validate.js*. The file contains a `<script>` tag that contains one function definition: `validate`. This JavaScript function iterates through the form elements (such as `<input>` tags whose `type` attribute is `text`-in other words, text form fields) to determine if any of them have been left blank. The parameter for the `validate` function is a `form` object.

If the user has left the fields empty, this function displays an alert window and then cancels the form submit. A more realistic validation function might involve a greater degree of complex business logic, but I am keeping this example simple in order to demonstrate the mechanics of including the function in a servlet.

Example 12-6. A JavaScript module named `validate.js` for validating form input

```
<script language="JavaScript">
function validate(form1)
{
    for (i = 0; i < form1.length; i++){
        if( (form1.elements[i].value == "")){
            alert("You must provide a value for the field named: " +
                form1.elements[i].name)
            return false
        }
    }
    return true
}
```

```
}
</script>
```

The servlet in [Example 12-7](#) includes the *validate.js* file using a `RequestDispatcher`. The `RequestDispatcher` positions the JavaScript `script` tag within an HTML `head` tag in the servlet's output. The servlet page's `form` tag has an attribute that is composed of the context path (the return value of `request.getContextPath()`) concatenated with the */displayHeaders.jsp* JSP file. If the form fields are filled out properly, the browser submits the form to the JSP page (*/home/displayHeaders.jsp*).

Finally, the form's `onSubmit` event handler calls the included JavaScript function `validate`, passing in the `this` JavaScript keyword. The `this` parameter evaluates to the `form` object. If the user fails to fill out the `name` and `email` fields, the `validate` function cancels the browser's submission of the form by returning `false`.

Example 12-7. Importing JavaScript in a servlet to validate form values

```
package com.jspervletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

public class FormServlet extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );
        out.println("<html><head>");

        RequestDispatcher dispatcher = request.getRequestDispatcher(
            "/WEB-INF/javascript/validate.js");

        dispatcher.include(request, response);

        out.println("<title>Help Page</title></head><body>");
        out.println("<h2>Please submit your information</h2>");

        out.println(
            "<form action =\"" + request.getContextPath( ) +
                "/displayHeaders.jsp\" onSubmit=\" return validate(this)\">");

        out.println("<table border=\"0\"><tr><td valign=\"top\">");
        out.println("Your name: </td> <td valign=\"top\">");
        out.println("<input type=\"text\" name=\"username\" size=\"20\">");
        out.println("</td></tr><tr><td valign=\"top\">");
        out.println("Your email: </td> <td valign=\"top\">");
        out.println("<input type=\"text\" name=\"email\" size=\"20\">");
        out.println("</td></tr><tr><td valign=\"top\">");
```

```
out.println(
    "<input type=\"submit\" value=\"Submit Info\"></td></tr>");

out.println("</table></form>");
out.println("</body></html>");

} //doGet
}
```

[Figure 12-4](#) shows the browser page containing the form. [Figure 12-5](#) shows the alert window generated by the JavaScript function.

Figure 12-4. The servlet output for an HTML form

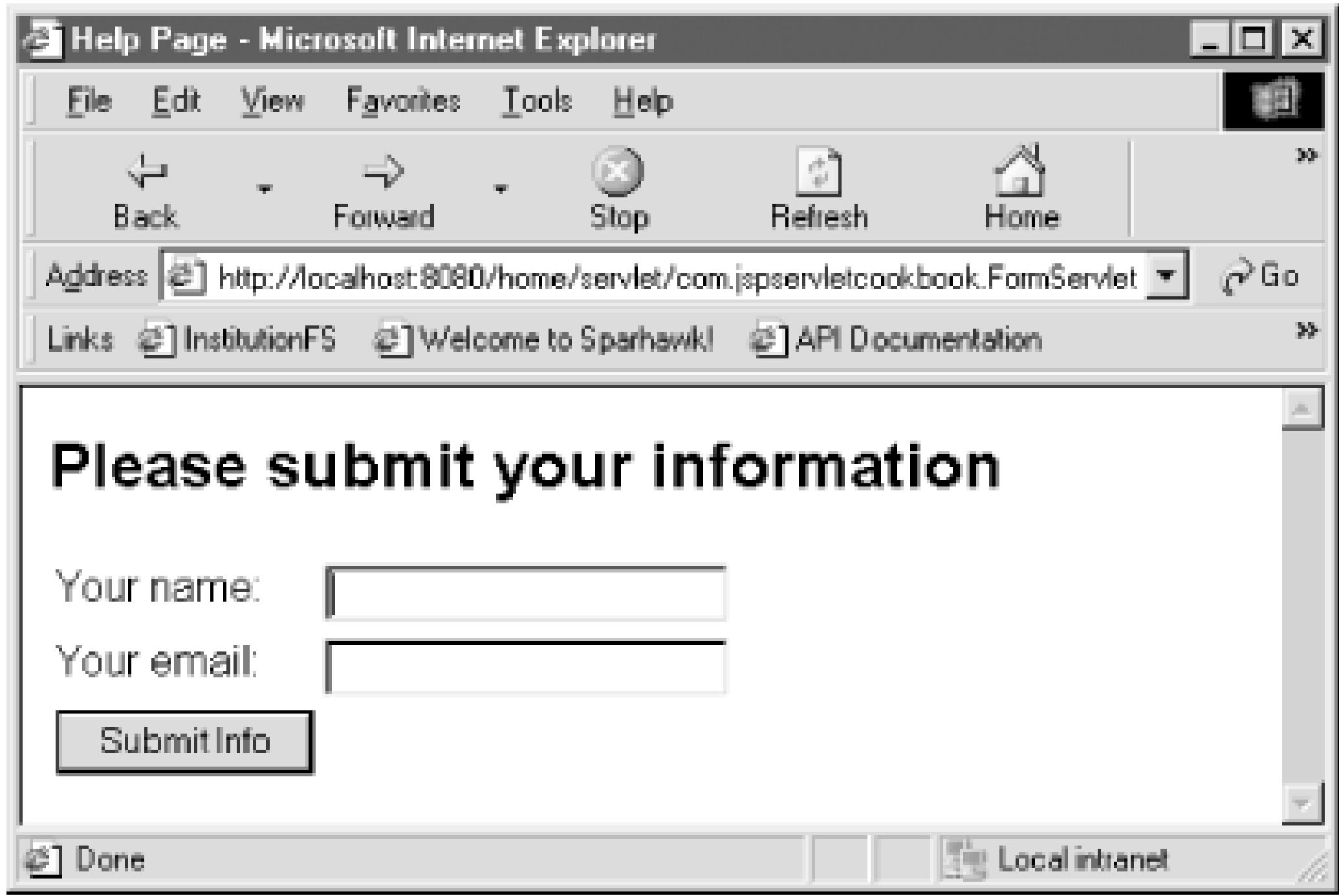


Figure 12-5. The included JavaScript validate function produces an alert window

Another option for validating form input is to use a filter to check parameter values, and then return the user to the form page or a new page if the input contains an error. Developers might prefer this option because a filter allows you to use Java code to parse the parameter values and gives you a great deal of control over the customization of the response page, in the case of a form input error. [Recipe 18.3](#) describes how to use a filter with a servlet to deal with client requests.

See Also

The Netscape DevEdge site at <http://devedge.netscape.com/>; [Recipe 12.2](#) and [Recipe 12.6](#) on using JavaScript with JSPs to import JavaScript and validate form input; [Recipe 12.3](#) on creating new browser windows with servlets and JavaScript; [Recipe 12.5](#) on validating form values with a servlet and JavaScript; [Recipe 18.3](#) on using a filter with HTTP requests.

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Recipe 12.6 Using JavaScript to Validate Form Values in a JSP

Problem

You want to import JavaScript into a JSP to validate HTML form values.

Solution

Use the `c:import` JSTL core tag to import the JavaScript function definitions. Then validate the HTML form input by using the `form` tag's `onSubmit` event handler.

Discussion

The JSP in [Example 12-8](#) uses the JSTL core tag `c:import` to include the contents of the `/WEB-INF/javascript/validate.js` file. See [Example 12-6](#) for the contents of `validate.js`, which is a definition for the function `validate`. This function determines whether the user has left any form fields blank.

The rest of the JSP is straightforward: the `onSubmit` event handler calls the `validate` function and passes in the `form` object (represented by the JavaScript keyword `this`) as a parameter. By returning `false`, the `validate` function cancels the form submit if it finds any blank fields.

Example 12-8. A JSP uses JavaScript to validate HTML form input

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<html>
<head>

<c:import url="/WEB-INF/javascript/validate.js" />

<title>Help Page</title></head><body>
<h2>Please submit your information</h2>

<form action ="/home/displayHeaders.jsp" onSubmit=" return validate(this)">

<table border="0"><tr><td valign="top">

Your name: </td> <td valign="top">
<input type="text" name="username" size="20">
```

```
</td></tr><tr><td valign="top">
Your email: </td> <td valign="top">
<input type="text" name="email" size="20">
</td></tr>

<tr><td valign="top">
<input type="submit" value="Submit Info"></td></tr>

</table></form>
</body></html>
```

[Figure 12-4](#) shows the web page containing the form. [Figure 12-5](#) depicts the alert window that would be displayed if the user leaves one or more text fields blank when submitting the form.

See Also

The Netscape DevEdge site at <http://devedge.netscape.com/>; [Recipe 12.2](#) and [Recipe 12.4](#) on using JavaScript with JSPs to import JavaScript function definitions and create new browser windows; [Recipe 12.3](#) on creating new browser windows with servlets and JavaScript; [Recipe 12.5](#) on validating form values with a servlet and JavaScript; [Recipe 18.3](#) on using a filter with HTTP requests.

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Chapter 13. Sending Non-HTML Content

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Introduction

Most web sites offer a smorgasbord of media types to their users. Typical web content these days includes Portable Document Format (PDF) files, word-processing documents, audio files, movies, and Extensible Markup Language (XML). In some cases, these alternative file types are stored in databases as *binary data*, or streams of unencoded bytes. Web developers cannot always provide their users with straightforward hyperlinks to these files for downloading. The user chooses a link or enters a URL in the browser's location field, and a servlet or some other web component downloads the binary data to the client. The client in most cases saves the data as a file, for use later in document viewers and other applications.

The following recipes describe how to initiate this download method. In a typical scenario, the servlet sets up a download whereby the browser prompts the user with a "Save As" dialog allowing him to save the files on his own filesystem. These strategies, however, do not guarantee 100-percent consistent behavior among web browsers. Some browsers allow the user to precisely configure how he wants to handle certain file types (such as a PDF document). For example, Opera 5 gives the user all kinds of options for dealing with downloads, such as opening up an external helper application, displaying a file using a plug-in, or immediately downloading a file to a specified folder without first opening up a "Save As" window.

Test how your web application works in various browsers, in response to different browser configurations, as well as on different platforms, so that you are aware of the different browser responses elicited by the servlet.

The alternative to these strategies is simply providing a link to a PDF file-for instance-if the data exists as a file. This method, however, also places a great deal of the responsibility on the client browser, and the user who configures the browser, for managing the media type. While advanced users may like this approach, it is rarely sufficient for less-experienced users.

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Recipe 13.1 Sending a PDF File

Problem

You want to send binary data representing a PDF file to a user.

Solution

Use a servlet and a `java.io.BufferedInputStream` to read the bytes from the file. Send the file content to the user with a `javax.servlet.ServletOutputStream` retrieved from the `javax.servlet.http.HttpServletResponse` object.

Discussion

PDF files are ubiquitous on the Web, as most users are equipped with the Adobe Reader application that reads them. [Example 13-1](#) takes a filename from a query string that is part of the request to the servlet, and responds with binary data that represents the PDF file. The servlet identifies the file that it sends to the client as the MIME type *application/pdf* by using the `Content-Type` response header.

Multipurpose Internet Mail Extensions (MIME) designate the media types of various data that are sent as email or as part of HTTP responses on the Web. A MIME type has a top-level type and a sub-type separated by a forward-slash character, as in *text/html*, *application/pdf*, or *audio/mpeg*. The `Content-Type` response header is the method the server response uses to convey the intended type and format of the data that the server sends to a network client such as a web browser. See the following Request For Comments (RFC) technical documents on MIME for more information: <http://ftp.rfc-editor.org/in-notes/rfc2045.txt> and <http://ftp.rfc-editor.org/in-notes/rfc2046.txt>.

[Table 13-1](#) shows several MIME types that web developers may encounter.

Table 13-1. Some common MIME types

File	MIME type	Extension
XML	<i>text/xml</i>	<i>.xml</i>

File	MIME type	Extension
HTML	<i>text/html</i>	<i>.html</i>
Plaintext file	<i>text/plain</i>	<i>.txt</i>
PDF	<i>application/pdf</i>	<i>.pdf</i>
Graphics Interchange Format (GIF) image	<i>image/gif</i>	<i>.gif</i>
JPEG image	<i>image/jpeg</i>	<i>.jpeg</i>
PNG image	<i>image/x-png</i>	<i>.png</i>
MP3 music file	<i>audio/mpeg</i>	<i>.mp3</i>
Shockwave Flash animation	<i>application/futuresplash</i> or <i>application/x-shockwave-flash</i>	<i>.swf</i>
Microsoft Word document	<i>application/msword</i>	<i>.doc</i>
Excel worksheet	<i>application/vnd.ms-excel</i>	<i>.xls</i>
PowerPoint document	<i>application/vnd.ms-powerpoint</i>	<i>.ppt</i>

The request to the servlet looks like this:

`http://localhost:8080/home/sendpdf?file=chapter5`

[Example 13-1](#) checks to see if the request parameter `file` is valid and then adds the file extension `.pdf` to the filename if it does not already have that suffix. This is the filename the HTTP response recommends to the browser (it will appear as the default filename in any displayed "Save As" windows).

Jason Hunter in *Java Enterprise Best Practices* (O'Reilly) points out that it is often useful to include the intended filename (for the "Save As" dialog box the browser produces) directly in the URL as extra path info. The browser detects that name as the requested resource and may specify the name in the "Save As" dialog window. An example URL in this case looks like:

`http://localhost:8080/home/chapter5.pdf?file=ch5`

Example 13-1. Sending a PDF file as binary data

```
package com.jspervletcookbook;

import java.io.FileInputStream;
import java.io.BufferedInputStream;
import java.io.File;
import java.io.IOException;

import javax.servlet.*;
import javax.servlet.http.*;
```

```
public class SendPdf extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        IOException {

        //get the filename from the "file" parameter
        String fileName = (String) request.getParameter("file");
        if (fileName == null || fileName.equals(""))
            throw new ServletException(
                "Invalid or non-existent file parameter in SendPdf servlet.");

        // add the .pdf suffix if it doesn't already exist
        if (fileName.indexOf(".pdf") == -1)
            fileName = fileName + ".pdf";

        //where are PDFs kept?
        String pdfDir = getServletContext( ).getInitParameter("pdf-dir");
        if (pdfDir == null || pdfDir.equals(""))
            throw new ServletException(
                "Invalid or non-existent 'pdfDir' context-param.");

        ServletOutputStream stream = null;
        BufferedInputStream buf = null;
        try{

            stream = response.getOutputStream( );
            File pdf = new File(pdfDir + "/" + fileName);

            //set response headers
            response.setContentType("application/pdf");

            response.addHeader(
                "Content-Disposition","attachment; filename="+fileName );

            response.setContentLength( (int) pdf.length( ) );

            FileInputStream input = new FileInputStream(pdf);
            buf = new BufferedInputStream(input);
            int readBytes = 0;

            //read from the file; write to the ServletOutputStream
            while((readBytes = buf.read( )) != -1)
                stream.write(readBytes);

        } catch (IOException ioe){

            throw new ServletException(ioe.getMessage( ));

        } finally {
```



```

        //close the input/output streams
        if (stream != null)
            stream.close( );
        if (buf != null)
            buf.close( );
    }

} //end doGet

public void doPost(HttpServletRequest request,
    HttpServletResponse response)
    throws ServletException, IOException {

    doGet(request,response);
}
}

```

[Example 13-1](#) gets the directory where the PDF files are stored from a `context-param` element in the deployment descriptor:

```

<context-param>
    <param-name>pdf-dir</param-name>
    <param-value>h:/book/distribute</param-value>
</context-param>

```

Remember that the `context-param` elements appear before the `filter`, `filter-mapping`, `listener`, and `servlet` elements in the *web.xml*/version for servlet API 2.3.

The code then gets the `ServletOutputStream` from the `HttpServletResponse` object. The binary data representing the PDF is written to this stream:

```
stream = response.getOutputStream( );
```

The servlet does not use a `java.io.PrintWriter` as in `response.getWriter()`, because a `PrintWriter` is designed for returning character data, such as HTML, that the browser displays on the computer screen. [Example 13-1](#) adds the response headers that help prevent the browsers from trying to display the bytes as content in the browser window:

```

response.setContentType("application/pdf");
response.addHeader(
    "Content-Disposition","attachment; filename="+fileName );
response.setContentLength( (int) pdf.length( ) );

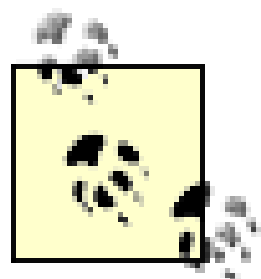
```

The `Content-Disposition` header field signals the client to treat the received content as an attachment, not as characters to be displayed in the browser. This optional response header also provides a recommended filename, which the browser may include as the default filename in any "Save As" windows.



See RFC 2183 at <ftp://ftp.rfc-editor.org/in-notes/rfc2183.txt> for background information on the `Content-Disposition` header.

The client browser can use the `Content-Length` header value (provided with `response.setContentLength()`) to indicate to the user the download progress with a widget that shows a horizontal bar steadily filling with color. The servlet also uses a `java.io.BufferedInputStream` to buffer the input from the file in a `byte[]` array, which speeds up the transfer of data from the server to the client.



See [Recipe 13.5](#) for an example of using a `java.net.URLConnection` (as opposed to a `FileInputStream`) to get an input stream associated with a web resource. A `URLConnection` is useful when you want to obtain binary data from a PDF file that is available only as a web address beginning with "http://".

The code closes the `ServletOutputStream` and the `BufferedInputStream` in a `finally` block to release any system resources used by these objects. The code within the `finally` block executes regardless of whether the code throws an exception.

Internet Explorer 5.5 usually raises an exception that is displayed in the Tomcat log file when a request is made to this recipe's servlet. The logged exception does not disrupt the application, nor does it appear when the servlet is requested by Opera 5, or by Internet Explorer 5.2 and the Safari Macintosh browsers. The exception message includes the text "Connection reset by peer: socket write error." This message has raised speculation on various servlet-related mailing lists that the IE client browser on Windows has caused the exception by severing the connection with Tomcat after the data transfer. Nobody has yet devised a definitive solution to this apparently harmless exception, beyond suggesting that the servlet container's logging mechanism be configured to ignore exceptions of this type.

See Also

[Recipe 13.2-Recipe 13.4](#) on sending Word, XML, and MP3 files as binary data; [Recipe 13.5](#) on getting an input stream representing a web resource such as *web.xml*; RFC technical documents on MIME: <ftp://ftp.rfc-editor.org/in-notes/rfc2045.txt> and <ftp://ftp.rfc-editor.org/in-notes/rfc2046.txt>; RFC 2183 at <ftp://ftp.rfc-editor.org/in-notes/rfc2183.txt> for background information on the `Content-Disposition` header; the Media Types section of the *HTTP Pocket Reference* by Clinton Long (O'Reilly).

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Recipe 13.2 Sending a Word Processing File

Problem

You want to send a Microsoft Word file as binary data.

Solution

Use the same servlet setup as described in [Recipe 13.1](#), but include a different file extension and a `Content-Type` of *application/msword*.

Discussion

You might have some Microsoft Word documents that you want to distribute as binary data from a servlet. [Example 13-2](#) uses the same basic structure as [Example 13-1](#), with a few changes to adapt the servlet for sending Microsoft Word documents. These include accessing a different `context-param` element (you *could* keep all files for download in the same directory, however), and using a different MIME type as the parameter for the `setContentType()` method, as in `response.setContentType("application/msword")`.

Example 13-2. Sending a Word file as binary data

```
package com.jspervletcookbook;

import java.io.FileInputStream;
import java.io.BufferedInputStream;
import java.io.File;
import java.io.IOException;

import javax.servlet.*;
import javax.servlet.http.*;

public class SendWord extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        IOException {

        //get the filename from the "file" parameter
        String fileName = (String) request.getParameter("file");
        if (fileName == null || fileName.equals(""))
```

```

        throw new ServletException(
            "Invalid or non-existent file parameter in SendWord.");

// add the .doc suffix if it doesn't already exist
if (fileName.indexOf(".doc") == -1)
    fileName = fileName + ".doc";

//where are Word files kept?
String wordDir = getServletContext( ).getInitParameter("word-dir");
if (wordDir == null || wordDir.equals(""))
    throw new ServletException(
        "Invalid or non-existent wordDir context-param.");

ServletOutputStream stream = null;
BufferedInputStream buf = null;
try{

    stream = response.getOutputStream( );
    File doc = new File(wordDir + "/" + fileName);

//set response headers
response.setContentType("application/msword");

response.addHeader(
    "Content-Disposition","attachment; filename="+fileName );

response.setContentLength( (int) doc.length( ) );

FileInputStream input = new FileInputStream(doc);
buf = new BufferedInputStream(input);
int readBytes = 0;

//read from the file; write to the ServletOutputStream
while((readBytes = buf.read( )) != -1)
    stream.write(readBytes);

} catch (IOException ioe){

    throw new ServletException(ioe.getMessage( ));

} finally {

    //close the input/output streams
    if(stream != null)
        stream.close( );
    if(buf != null)
        buf.close( );
}

} //end doGet

public void doPost(HttpServletRequest request,
```



```
        HttpServletResponse response) throws ServletException,  
        IOException {  
  
        doGet(request,response);  
    }  
}
```

The `ServletOutputStream` (the information sent as the servlet response) and the `BufferedInputStream` (from which the servlet gets the file to send) are both closed in the `finally` block to make sure any system resources they use are released. See the end of the discussion in [Recipe 13.1](#) for a further description of this code, including the warning at the end of that recipe about the Internet Explorer-related exception.

See Also

[Recipe 13.1](#) on sending a PDF file; [Recipe 13.3](#) and [Recipe 13.4](#) on sending XML and MP3 files as binary data; [Recipe 13.5](#) on getting an input stream representing a web resource such as *web.xml*, RFC technical documents on MIME: <ftp://ftp.rfc-editor.org/in-notes/rfc2045.txt> and <ftp://ftp.rfc-editor.org/in-notes/rfc2046.txt>; RFC 2183 at <ftp://ftp.rfc-editor.org/in-notes/rfc2183.txt> for background information on the `Content-Disposition` header; the Media Types section of the *HTTP Pocket Reference* by Clinton Wong (O'Reilly); [Chapter 1](#) introducing the development of a servlet.

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Recipe 13.3 Sending an XML file

Problem

You want to send an XML file as binary data from a servlet.

Solution

Use the `javax.servlet.ServletOutputStream` obtained from the `javax.servlet.http.HttpServletResponse` object to send the XML file as binary data to the client.

Discussion

This recipe describes how to send an XML file as binary data from a `ServletOutputStream`, so that the user can handle the file as downloaded XML. [Example 13-3](#) obtains the bytes that represent the XML as a `BufferedInputStream` wrapped around a `FileInputStream`. The code is very similar to [Example 13-1](#) in [Recipe 13.1](#), except that it uses a MIME type of *text/XML*.

In a popular form of converting XML into a readable format, you could convert the XML content to HTML or another form using Extensible Stylesheet Language Transformations (XSLT). If the intent is to use XSLT for generating the content in a browser, leave out the `Content-Disposition` response header, because this header is designed to handle the XML as a downloaded file that will be saved in the user's filesystem. See [Chapter 23](#) on using the `x:transform` JSTL tag.

Example 13-3. Sending an XML file with a servlet

```
package com.jspervletcookbook;

import java.io.FileInputStream;
import java.io.BufferedInputStream;
import java.io.File;
import java.io.IOException;

import javax.servlet.*;
import javax.servlet.http.*;

public class SendXml extends HttpServlet {
```

```

public void doGet(HttpServletRequest request,
    HttpServletResponse response) throws ServletException,
    IOException {

    //get the filename from the "file" parameter
    String fileName = (String) request.getParameter("file");
    if (fileName == null || fileName.equals(""))
        throw new ServletException(
            "Invalid or non-existent file parameter in SendXml servlet.");

    // add the .xml suffix if it doesn't already exist
    if (fileName.indexOf(".xml") == -1)
        fileName = fileName + ".xml";

    //where are XML files kept?
    String xmlDir = getServletContext( ).getInitParameter("xml-dir");
    if (xmlDir == null || xmlDir.equals(""))
        throw new ServletException(
            "Invalid or non-existent xmlDir context-param.");

    ServletOutputStream stream = null;
    BufferedInputStream buf = null;

    try{

        stream = response.getOutputStream( );
        File xml = new File(xmlDir + "/" + fileName);

        //set response headers
        response.setContentType("text/xml");

        response.addHeader(
            "Content-Disposition","attachment; filename="+fileName );

        response.setContentLength( (int) xml.length( ) );

        FileInputStream input = new FileInputStream(xml);
        buf = new BufferedInputStream(input);
        int readBytes = 0;

        //read from the file; write to the ServletOutputStream
        while((readBytes = buf.read( )) != -1)
            stream.write(readBytes);

    } catch (IOException ioe){

        throw new ServletException(ioe.getMessage( ));

    } finally {

        //close the input/output streams
        if(stream != null)

```

```

        stream.close( );

        if(buf != null)
            buf.close( );

    } //finally

} //end doGet

public void doPost(HttpServletRequest request,
    HttpServletResponse response)
    throws ServletException, IOException {

    doGet(request, response);
}
}

```

For the `context-param` to work correctly in this code, you have to include in *web.xml* an element that looks like:

```

<context-param>
    <param-name>xml-dir</param-name>
    <param-value>h:/home/xml</param-value>
</context-param>

```

See [Chapter 1](#) if you need an introduction or refresher for the deployment descriptor *web.xml*.

The discussion in [Recipe 13.1](#) describes the basic mechanics of this code, so I don't repeat that information here. See the note at the end of [Recipe 13.1](#) about the Internet Explorer-related exception that you may experience with servlets of this type.

See Also

[Recipe 13.1](#) on sending a PDF file; [Recipe 13.2](#) on sending a Microsoft Word file as binary data; [Recipe 13.4](#) on sending MP3 files as binary data; [Recipe 13.5](#) on getting an input stream representing a web resource such as *web.xml*; the RFC technical documents on MIME: [ftp://ftp.rfc-editor.org/in-notes/rfc2045.txt](http://ftp.rfc-editor.org/in-notes/rfc2045.txt) and [ftp://ftp.rfc-editor.org/in-notes/rfc2046.txt](http://ftp.rfc-editor.org/in-notes/rfc2046.txt); RFC 2183 at [ftp://ftp.rfc-editor.org/in-notes/rfc2183.txt](http://ftp.rfc-editor.org/in-notes/rfc2183.txt) for background information on the `Content-Disposition` header; the Media Types section of the *HTTP Pocket Reference* by Clinton Wong (O'Reilly); [Chapter 1](#) introducing the development of a servlet; a tutorial on *java.sun.com* on XSLT: <http://java.sun.com/webservices/docs/1.1/tutorial/doc/JAXPXSLT.html#wp68287>.

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Recipe 13.4 Sending an Audio File

Problem

You want to send an audio file such as an MPEG layer 3 (MP3) media type.

Solution

Use a `java.io.BufferedReader` to fetch the audio data, and the `javax.servlet.ServletOutputStream` from the `javax.servlet.http.HttpServletResponse` object to send the data to the client.

Discussion

The code in [Example 13-4](#) uses the same approach as the prior recipes, except for the MIME type, which is specified as *audio/mpeg*.

Web browsers associate a number of other MIME types for MP3 files, including *audio/x-mpeg*, *audio/mp3*, and *audio/x-mp3*.

The user requests a filename in the URL, as in:

```
http://localhost:8080/home/sendmp3?file=song_name
```

The deployment descriptor (*web.xml*) maps the servlet path */sendmp3* to the servlet class of [Example 13-4](#): `com.jspservletcookbook.SendMp3`. If the requested file does not already have the *.mp3* suffix, then the code adds that file extension. A `context-param` element in the deployment descriptor specifies the directory where the audio files are kept:

```
<context-param>
  <param-name>mp3-dir</param-name>
  <param-value>h:/home/mp3s</param-value>
</context-param>
```

[Example 13-4](#) uses this directory name, plus the filename, as the constructor parameter to create a new `java.io.File` object, which is the source for a `java.io.FileInputStream`. A `BufferedReader` buffers the bytes from the song file, which the `ServletOutputStream` response reads.

Example 13-4. Sending an MP3 file

```
package com.jspServletcookbook;

import java.io.FileInputStream;
import java.io.BufferedInputStream;
import java.io.File;
import java.io.IOException;

import javax.servlet.*;
import javax.servlet.http.*;

public class SendMp3 extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException, IOException {

        //get the filename from the "file" parameter
        String fileName = (String) request.getParameter("file");
        if (fileName == null || fileName.equals(""))
            throw new ServletException(
                "Invalid or non-existent file parameter in SendMp3 servlet.");

        // add the .mp3 suffix if it doesn't already exist
        if (fileName.indexOf(".mp3") == -1)
            fileName = fileName + ".mp3";

        //where are MP3 files kept?
        String mp3Dir = getServletContext( ).getInitParameter("mp3-dir");

        if (mp3Dir == null || mp3Dir.equals(""))
            throw new ServletException(
                "Invalid or non-existent mp3-Dir context-param.");

        ServletOutputStream stream = null;
        BufferedInputStream buf = null;
        try{

            stream = response.getOutputStream( );
            File mp3 = new File(mp3Dir + "/" + fileName);

            //set response headers
            response.setContentType("audio/mpeg");

            response.addHeader(
                "Content-Disposition","attachment; filename="+fileName );

            response.setContentLength( (int) mp3.length( ) );

            FileInputStream input = new FileInputStream(mp3);
            buf = new BufferedInputStream(input);
            int readBytes = 0;
```

```

        //read from the file; write to the ServletOutputStream
        while((readBytes = buf.read( )) != -1)
            stream.write(readBytes);

    } catch (IOException ioe){

        throw new ServletException(ioe.getMessage( ));

    } finally {

        //close the input/output streams
        if(stream != null)
            stream.close( );

        if(buf != null)
            buf.close( );

    }

} //doGet

public void doPost(HttpServletRequest request,
    HttpServletResponse response) throws ServletException, IOException {

    doGet(request,response);
}
}

```

Review [Recipe 13.1](#) for a further explanation of this code, including the warning at the end of the "Discussion" section about logged exceptions that may occur with Internet Explorer.

See Also

[Recipe 13.1](#) on MIME types and sending a PDF file as binary data; [Recipe 13.2](#) and [Recipe 13.3](#) on sending Word and XML files, respectively, as binary data; [Recipe 13.5](#) on receiving an input stream representing a web resource such as *web.xml*; the RFC technical documents on MIME: <ftp://ftp.rfc-editor.org/in-notes/rfc2045.txt> and <ftp://ftp.rfc-editor.org/in-notes/rfc2046.txt>; RFC 2183 at <ftp://ftp.rfc-editor.org/in-notes/rfc2183.txt> for background information on the **Content-Disposition** header; the Media Types section of the *HTTP Pocket Reference* by Clinton Wong (O'Reilly); [Chapter 1](#) introducing the development of a servlet.

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Recipe 13.5 Viewing Internal Resources in a Servlet

Problem

You want to use a servlet to fetch internal resources from a web application for viewing by authenticated users.

Solution

Use the `javax.servlet.ServletContext.getResource(String path)` method to generate the input stream from the web resource.

Discussion

A servlet could be used while a web application is in development to provide a view of the deployment descriptor. Web developers often have to double-check *web.xml* for the values of `context-param` elements, a servlet's registered name, and other information. Wouldn't it be nice to just request a servlet in the browser to view *web.xml*?

[Example 13-5](#) opens up *web.xml* using the `ServletContext.getResource()` method, which returns a `java.net.URL` object representing the deployment descriptor at the path *WEB-INF/web.xml*.

The code opens a connection to the XML file by calling the `URL` object's `openConnection()` method, which returns a `java.net.URLConnection` object. Then the code buffers the input stream to the resource by wrapping it in a `BufferedInputStream`:

```
buf = new BufferedInputStream(urlConn.getInputStream( ));
```

The `urlConn` variable refers to a `URLConnection`.

If the browser is not savvy about displaying XML files in a readable fashion (Netscape 7.1 and Internet Explorer can display these files properly), you can use XSLT to convert the XML into HTML before it is sent to the browser.

Example 13-5. Displaying the deployment descriptor via a servlet

```
package com.jspervletcookbook;  
  
import java.io.BufferedInputStream;
```

```
import java.io.PrintWriter;
import java.io.IOException;

import java.net.URL;
import java.net.URLConnection;
import java.net.MalformedURLException;

import javax.servlet.*;
import javax.servlet.http.*;

public class ResourceServlet extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        IOException {

        //get web.xml for display by a servlet
        String file = "/WEB-INF/web.xml";

        URL url = null;
        URLConnection urlConn = null;
        PrintWriter out = null;
        BufferedInputStream buf = null;

        try{

            out = response.getWriter( );

            //access a web resource within the same web application
            // as a URL object
            url = getServletContext( ).getResource(file);

            //set response header
            response.setContentType("text/xml");

            urlConn = url.openConnection( );

            //establish connection with URL representing web.xml
            urlConn.connect( );

            buf = new BufferedInputStream(urlConn.getInputStream( ));
            int readBytes = 0;

            //read from the file; write to the PrintWriter
            while((readBytes = buf.read( )) != -1)
                out.write(readBytes);

        } catch (MalformedURLException mue){

            throw new ServletException(mue.getMessage( ));

        } catch (IOException ioe){
```



```

        throw new ServletException(ioe.getMessage( ));
    } finally {

        //close the input/output streams
        if(out != null)
            out.close( );

        if(buf != null)
            buf.close( );

    }

} //doGet

public void doPost(HttpServletRequest request,
    HttpServletResponse response)
    throws ServletException, IOException {

    doGet(request,response);
}
}

```

This servlet is designed for developers; if just anyone has a chance to study the deployment descriptor, it will compromise the web application's security. Therefore, you should remove the servlet from production versions of the web application, or use authentication to allow only authorized users to view the servlet's output (see [Chapter 15](#) for details).

The code uses a `PrintWriter` to write the bytes received from the input stream, because the servlet intends to display the response as characters (instead of offering the response to the client as a downloaded resource). The `ServletContext.getResource(String path)` method takes a path that begins with the `/` character. The path is interpreted as beginning at the context root, or top-level directory, of the web application. Therefore, the servlet obtains *web.xml* with the following code:

```

String file = "/WEB-INF/web.xml";
...
url = getServletContext( ).getResource(file);

```

The `ServletContext.getResource()` method returns `null` if it is unable to return a valid resource representing the `path` parameter.

See Also

[Recipe 13.1](#)-[Recipe 13.4](#) on sending PDF, Word, XML, and audio files, respectively, as binary data;

the RFC technical documents on MIME: [ftp://ftp.rfc-editor.org/in-notes/rfc2045.txt](http://ftp.rfc-editor.org/in-notes/rfc2045.txt) and [ftp://ftp.rfc-editor.org/in-notes/rfc2046.txt](http://ftp.rfc-editor.org/in-notes/rfc2046.txt); RFC 2183 at [ftp://ftp.rfc-editor.org/in-notes/rfc2183.txt](http://ftp.rfc-editor.org/in-notes/rfc2183.txt) for background information on the `Content-Disposition` header; the Media Types section of the *HTTP Pocket Reference* by Clinton Wong (O'Reilly); [Chapter 1](#) introducing the development of a servlet.

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Chapter 14. Logging Messages from Servlets and JSPs

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Introduction

Logging involves sending messages from your application and displaying this information in a variety of ways for web developers and administrators. The messages can be delivered to a console, or they can be stored persistently in files or databases. Logging may be used only for sending debug-related information while a web application is being developed, or these messages may provide information from an application in production, including data about warnings and fatal errors.

This chapter describes a very powerful open source logging tool called *log4j*. This is a Java ARchive (JAR) file (*log4j-1.2.8.jar*) that you can add to your web application by placing it in your *WEB-INF/lib* directory. This makes it available for use in any servlets or beans that you want to send logging messages from. This section provides only a brief introduction to *log4j*, because its power does entail some complexity.

log4j involves three main concepts: *loggers*, *appenders*, and *layouts*. *log4j* uses an external configuration file, similar to a deployment descriptor, to configure these three logging elements. The upcoming recipes provide some examples of these configuration files, which are mostly simple text files involving a list of name/value pairs. The power of using external files is that you can change the properties in these text files to alter a logger (for instance, modify the format of its messages) instead of recompiling the servlet code.

For the changes to take effect, you may require a reload of the servlet or other component that initializes the logging system for the application.

Loggers

A logger is the entity that a servlet uses to log messages. To use one, import the *log4j* classes into the servlet, create an instance of a logger (specifically an `org.apache.log4j.Logger`), then call the logger's methods. The methods are named after the logging level of the message. For example, to log an informational message (an `INFO` level) you would call:

```
logger.info("HttpServlet init method called.");
```

log4j has five different levels of log categories: `DEBUG`, `INFO`, `WARN`, `ERROR`, and `FATAL`. The log categories are organized in ascending order beginning with `DEBUG`-a logger configured for `INFO`-level logging logs only `INFO`, `WARN`, `ERROR`, and `FATAL` messages (but not `DEBUG`-level messages, because in this hierarchy `DEBUG` is beneath `INFO` and the other levels). Here is a brief description of the purpose of each level:

- `DEBUG` involves logging messages while initially developing and debugging an application.
- `INFO` helps you monitor the progress of an application.

- **WARN** designates potentially harmful situations.
- **ERROR** represents an error that the application can likely recover from.
- **FATAL** suggests errors that will cause an application to abort.

Every logger is configured with a level (such as **DEBUG**) in the *log4j* properties or configuration file (see [Recipe 14.4](#)). *log4j* also associates the messages that you log with a specified level, which makes it easy to use because the method names are the same as the level names. The logger does not send these messages unless the logger's level is equal to or greater than the level represented by the method call (as in `logger.debug(Object message)`).

For example, let's say you configure the logger with a level of **DEBUG**, then develop a servlet with a number of `logger.debug(Object message)` calls.

Later, you can change the configuration file and give the logger an **INFO** level. Changing the configuration in this manner "turns off" **DEBUG**-level logging in that servlet, so that these logging messages no longer show up in the log files, database, or other logging repository. This is because **DEBUG** is not equal to or greater than **INFO** in the hierarchy of logging categories.

Similarly, you can turn back on **DEBUG**-level logging in the prior example by simply switching the logger's configuration back from **INFO** to **DEBUG**. As a result, the debug-level messages will no longer be filtered out.

Programmers writing software with several **DEBUG**-level method calls can easily switch into **WARN**- or **ERROR**-level debugging once the application moves into its next stage of development, or goes into production.

Appenders

log4j is also very powerful in terms of the different ways you can log messages. You can use *log4j* to log messages to a console, a file, a *rolling file* (which automatically creates a backup file when a log file reaches a specified size), a database, an email server, and several other types of log repositories. *log4j* calls each of these logging mechanisms an appender. [Recipe 14.4](#) introduces the configuration file in which you can describe appenders.

Layouts

What does the actual logged message look like? What information does it include? *log4j* shines in this area too. You can specify numerous different layouts for the messages using the *log4j* configuration file. *log4j* lets you specify very complex (or simple) layouts using *conversion patterns*, which are somewhat similar to regular expressions. To achieve the most basic layout, you can specify an `org.apache.log4j.SimpleLayout`. With this format, the log contains the level name, followed by a dash (-) and the actual message:

```
INFO - HttpServlet init method called.
```

Using an `org.apache.log4j.PatternLayout` is more powerful, and [Recipe 14.5](#) provides some examples of different layouts for logging messages.

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Recipe 14.1 Logging Without Log4j

Problem

You want to put a message in the server logs.

Solution

Call the `ServletContext.log()` method inside the servlet.

Discussion

If you just want to log a message in the servlet container's log file and do not need the power of *log4j*, use the `ServletContext.log()` method. [Example 14-1](#) shows the two versions of the `log()` method. One takes the `String` message as a parameter, and the other has two parameters: a `String` message and a `Throwable`. The servlet log will contain the stack trace of the `Throwable` if you use this `log()` form.

Example 14-1. A servlet uses the `ServletContext.log()` method

```
package com.jspervletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

public class ContextLog extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        String yourMessage = request.getParameter("mine");
        //Call the two ServletContext.log methods
        ServletContext context = getServletContext( );

        if (yourMessage == null || yourMessage.equals(""))
            //log version with Throwable parameter
            context.log("No message received:",
                new IllegalStateException("Missing parameter"));
        else
```

```
        context.log("Here is the visitor's message: " + yourMessage);

response.setContentType("text/html");
java.io.PrintWriter out = response.getWriter( );
//logging servlets probably want to display more HTML
out.println(
    "<html><head><title>ServletContext logging</title></head><body>");
out.println("<h2>Messages sent</h2>");
out.println("</body></html>");
} //doGet
}
```

The `ServletContext` logs its text messages to the servlet container's log file. With Tomcat these logs are found in `<Tomcat-installation-directory>/logs`. Below is the output of [Example 14-1](#) and the second form of `ServletContext.log()`, which prints the message and the `Throwable`'s stack trace (only the first two levels of the method stack are shown). You can see that the log includes the date and time of the logging activity, and the message text:

```
2003-05-08 14:42:43 No message received:
java.lang.IllegalStateException: Missing parameter
    at com.jspserveletcookbook.ContextLog.doGet(Unknown Source)
    at javax.servlet.http.HttpServlet.service(HttpServlet.java:740)
...
```

The single-parameter form of the `log()` method simply displays the date, time, and text of the message, as in the first line of the prior log sample. Each `log()` method call places the message on a new line in the server log file.

See Also

[Recipe 14.2](#)-[Recipe 14.8](#) on using *log4j* to design your own custom logging mechanism; Chapter SRV.3 of the servlet API on the servlet context; links to the latest servlet specification: <http://java.sun.com/products/servlet/index.html>.

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Recipe 14.2 Setting Up Log4j

Problem

You want to set up *log4j* for use in your web application.

Solution

Download the *log4j* distribution from the Apache Jakarta project and place the accompanying *log4j-1.2.8.jar* file (the name will be different for different *log4j* versions) in the *WEB-INF/lib* directory of your web application.

Discussion

The *log4j* package is available for use under the Apache Software License, which is included with the distribution. Here are the steps for setting up *log4j* for your web application:

1. Go to the *log4j* web site and download the distribution in ZIP (Windows) or gzipped (Unix-based systems) format: <http://jakarta.apache.org/log4j/docs/download.html>. The downloaded file will be named something like *jakarta-log4j-1.2.8.zip* or *jakarta-log4j-1.2.8.tar.gz*.
2. Unpack the distribution, which creates a directory *jakarta-log4j-1.2.8* (for Version 1.2.8 of *log4j*). Inside the *dist* directory of this top-level directory is the *log4j-1.2.8.jar* file. Copy this JAR file into the *WEB-INF/lib* directory of your web application(s).
3. Create a *log4j* properties file and place it in the web application's *WEB-INF/classes* directory. This is typically a text file with name/value pairs for configuring *log4j* elements such as loggers, appenders, and layouts. [Recipe 14.4](#) includes an example of this file.
4. In the servlets or beans where you will use a logger, include the proper `import` statements. [Example 14-2](#) is a skeletal servlet showing the classes that you might typically use.

Example 14-2. Importing log4j-related packages

```
import org.apache.log4j.Logger;
import org.apache.log4j.PropertyConfigurator;

import javax.servlet.*;
import javax.servlet.http.*;

public class LoggerSkel extends HttpServlet {
```

```
private Logger log;

public void init( ){

    //log4j will find the log4j.properties file
    //in WEB-INF/classes
    log = Logger.getLogger(LoggerSkel.class);

    //Just an example of using the logger
    log.debug("Instance created of: " + getClass( ).getName( ));

}

public void doGet(HttpServletRequest request,
    HttpServletResponse response) throws ServletException,
    java.io.IOException {

    //do logging here if necessary

} //doGet

}
```

As long as *log4j-1.2.8.jar* is located in *WEB-INF/lib*, your servlet can use the necessary classes from the `org.apache.log4j.*` packages.

See Also

[Recipe 14.3-Recipe 14.8](#) on using *log4j* to design your own custom logging mechanism; the *log4j* download site: <http://jakarta.apache.org/log4j/docs/download.html>; the *log4j* project documentation page: <http://jakarta.apache.org/log4j/docs/documentation.html>.

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Recipe 14.3 Using a Logger Without a Configuration File

Problem

You want to use a logger in a servlet without setting up your own configuration file.

Solution

Create the logger in the servlet and use the `org.apache.log4j.BasicConfigurator` class to configure the logger.

Discussion

log4j allows the configuration of a logger without a provided configuration or properties file. Example 14-3 is a servlet that instantiates a logger in its `init()` method, which the servlet container calls when the servlet instance is created. The static `BasicConfigurator.configure()` method creates a `ConsoleAppender`; in other words, the logger will log its messages to the console using a default format.

Example 14-3. A servlet uses BasicConfigurator to configure a logger

```
package com.jspservletcookbook;

import org.apache.log4j.Logger;
import org.apache.log4j.BasicConfigurator;

import javax.servlet.*;
import javax.servlet.http.*;

public class LoggerNconfig extends HttpServlet {

    private Logger log = null;

    public void init( ){

        //use the root logger
        log = Logger.getRootLogger( );

        //this logger will log to the console with a default message format
        BasicConfigurator.configure( );

    }

    public void doGet(HttpServletRequest request,
```



```

    HttpServletResponse response)
        throws ServletException, java.io.IOException {

        //display a DEBUG level message
        log.debug("Sending a DEBUG message");

        // display an INFO level message
        log.info("Sending an INFO message");

        //better display some HTML
        response.setContentType("text/html");

        java.io.PrintWriter out = response.getWriter( );
        out.println(
            "<html><head><title>Servlet logging</title></head><body>");
        out.println("<h2>Hello from a Logger with no Config file</h2>");

        //This logger's parent is the root logger
        out.println(
            "Your logger name is: " + log.getName( )+"<br>");
        out.println(
            "Your logger parent is: " + log.getParent( ).getName( )+"<br>");

        out.println("</body></html>");

    } //doGet

    public void doPost(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        doGet(request,response);
    }
}

```

Example 14-4 shows an example message from the servlet. The message is based on a default format that includes the thread name (Thread-5), the level name (**DEBUG**), the logger name (`com.jspervletcookbook.LoggerNconfig`), and the actual message ("Sending a DEBUG message"). Recipe 14.5 shows how to create a format pattern for logging messages, so that you can customize the type of information that the logger sends.

Example 14-4. Example of a logged message using BasicConfigurator

```

4061660 [Thread-5] DEBUG com.jspervletcookbook.LoggerNconfig - Sending a DEBUG message
4061660 [Thread-5] INFO com.jspervletcookbook.LoggerNconfig - Sending an INFO message

```

Here is the pattern used for the layout associated with `BasicConfigurator` :

```
%-4r [%t] %-5p %c %x - %m%n
```

See Recipe 14.5 for details on the `org.apache.log4j.PatternLayout` class.

See Also

Recipe 14.2 on downloading and setting up *log4j*; Recipe 14.4 -Recipe 14.8 on using *log4j* to design you own custom logging mechanism; the *log4j* download site: <http://jakarta.apache.org/log4j/docs/download.html> ; the *log4j* Javadoc page: <http://jakarta.apache.org/log4j/docs/api/index.html> ; the *log4j* project documentation page: <http://jakarta.apache.org/log4j/docs/documentation.html> .

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Recipe 14.4 Adding an Appender to the Root Logger

Problem

You want to configure an appender or logging destination for the root logger.

Solution

Create a configuration file called *log4j.properties* and place it in the *WEB-INF/classes* directory of your web application.

Discussion

Now our discussion moves on to the *log4j* configuration file, where developers can customize loggers, appenders, and layouts. Here are the steps for using this recipe's examples:

1. Create a properties file named *log4j.properties* (its contents look like [Example 14-5](#)).
2. Place the properties file in the *WEB-INF/classes* directory of the web application.
3. Import this class into your servlet: `org.apache.log4j.Logger`.
4. In the servlet, get a reference to the root logger with the static `Logger.getRootLogger()` method, and start logging.

[Example 14-5](#) configures the root logger, a kind of "super logger" for your application, with a `DEBUG` level. The root logger uses an appender named *cons*. This appender is of a type `org.apache.log4j.ConsoleAppender`, meaning that it sends its log messages to the console.

Example 14-5. The *log4j.properties* file for creating a root logger appender

```
log4j.rootLogger=DEBUG, cons
```

```
log4j.appender.cons=org.apache.log4j.ConsoleAppender
```

```
log4j.appender.cons.layout=org.apache.log4j.SimpleLayout
```

The third line of the *log4j.properties* file states that the logger will use a `SimpleLayout`, which logs the level name (`DEBUG`), a dash (-), and the message itself. [Example 14-6](#) shows the servlet that is using the logger. *log4j* will find the *log4j.properties* file automatically in *WEB-INF/classes* because the

servlet has not otherwise configured the logger with a call to `BasicConfigurator.configure()`, as shown in [Recipe 14.3](#).

Example 14-6. Using the root logger configured with the log4j.properties file

```
package com.jspervletcookbook;

import org.apache.log4j.Logger;

import javax.servlet.*;
import javax.servlet.http.*;

public class LoggerWconfig extends HttpServlet {

    private Logger log = null;

    public void init() {

        //The root logger will get its configuration from
        //WEB-INF/classes/log4j.properties
        log = Logger.getRootLogger();

        log.info("LoggerWconfig started.");
    }

    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        //display a DEBUG-level message
        log.debug("Sending a DEBUG message");

        // display an INFO-level message
        log.info("Sending an INFO message");

        //better display some HTML
        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter();
        out.println(
            "<html><head><title>Servlet logging</title></head><body>");

        out.println(
            "<h2>Hello from a Logger with a log4j.properties file</h2>");

        out.println("Your logger name is: " + log.getName() + "<br>");

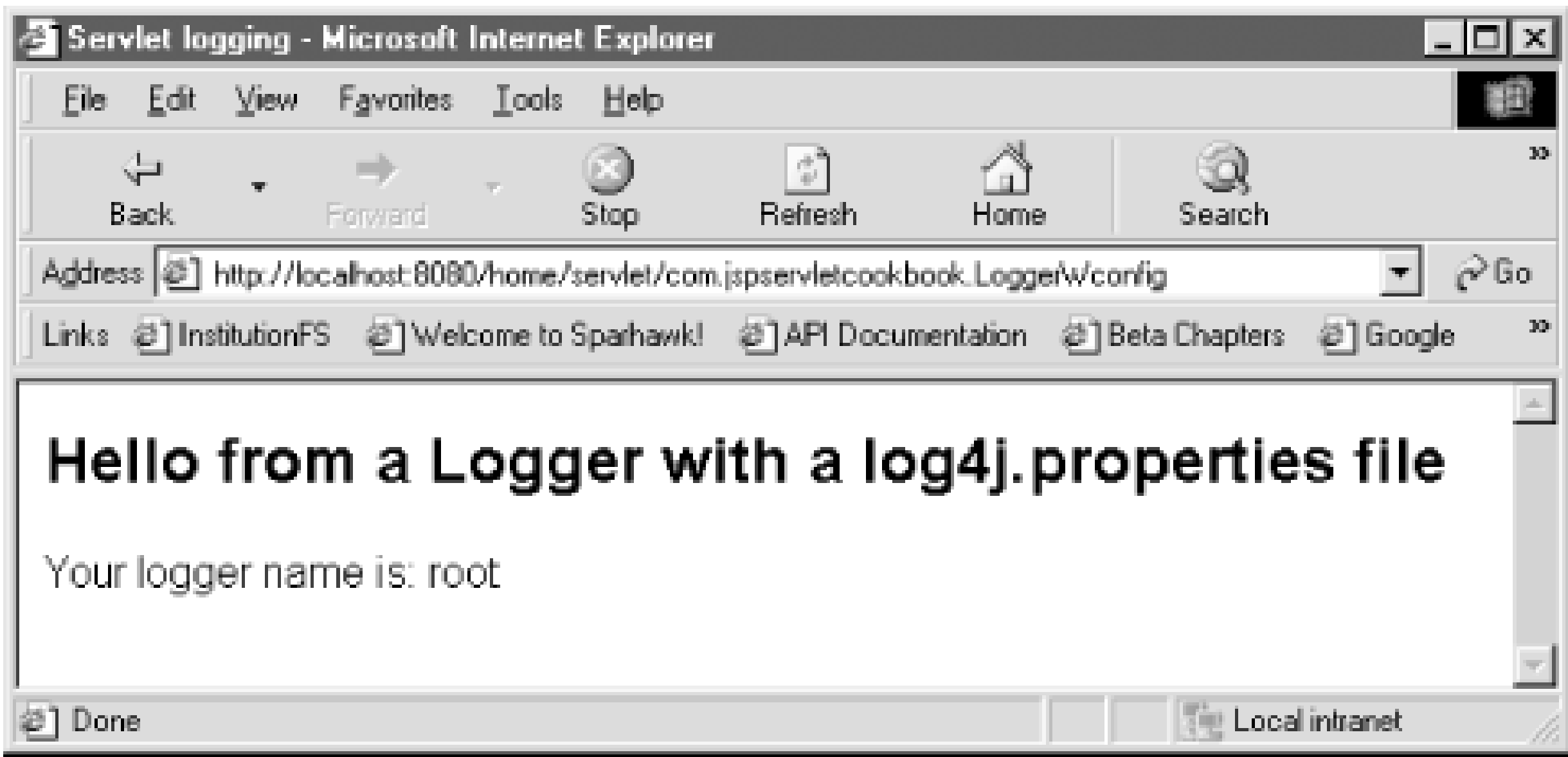
        out.println("</body></html>");
    } //end doGet
}
```

[Example 14-6](#) logs an `INFO` message in the servlet's `init()` method, then logs two messages in the servlet's `doGet()` service method. The logger logs all of these messages to the console because this is how the `log4j.properties` file configures the root logger's appender. This is what the console output looks like:

```
INFO - LoggerWconfig started.  
DEBUG - Sending a DEBUG message  
INFO - Sending an INFO message
```

[Figure 14-1](#) shows the servlet's output in a web browser.

Figure 14-1. The logger displays its name in a servlet



See Also

[Recipe 14.2](#) on downloading and setting up `log4j`; [Recipe 14.3](#) on using a `log4j` logger without a properties file; [Recipe 14.5-Recipe 14.8](#) on using `log4j` to design your own custom logging mechanism; the `log4j` download site: <http://jakarta.apache.org/log4j/docs/download.html>; the `log4j` Javadoc page: <http://jakarta.apache.org/log4j/docs/api/index.html>; the `log4j` project documentation page: <http://jakarta.apache.org/log4j/docs/documentation.html>.

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Recipe 14.5 Using a Pattern with a Logger's Appender

Problem

You want to create your own logger for a servlet and give the logger an appender.

Solution

Include the appender configuration in the *log4j.properties* file.

Discussion

This recipe creates a new logger, which brings us to the discussion of *log4j*'s inheritance structure. The root logger is the "super logger" that all logger's inherit from, similar to `java.lang.Object` in Java's object oriented programming setup. [Example 14-7](#) creates a new logger named `com.jspServletcookbook`, which inherits the root logger's level (`DEBUG`) and console appender (named `cons`). [Example 14-7](#) also creates an appender for the `com.jspServletcookbook` logger. Place this *log4j.properties* file in the *WEB-INF/classes* directory.

Example 14-7. The configuration for a logger named `com.jspServletcookbook`

```
log4j.rootLogger=DEBUG, cons
log4j.logger.com.jspServletcookbook=, myAppender

#the root logger's appender
log4j.appender.cons=org.apache.log4j.ConsoleAppender

#the com.jspServletcookbook logger's appender
log4j.appender.myAppender=org.apache.log4j.RollingFileAppender

log4j.appender.myAppender.File=h:/home/example.log

log4j.appender.myAppender.MaxBackupIndex=1

log4j.appender.myAppender.MaxFileSize=1MB

#the root logger's layout
log4j.appender.cons.layout=org.apache.log4j.SimpleLayout

#the com.jspServletcookbook logger's layout
```

```
log4j.appender.myAppender.layout=org.apache.log4j.PatternLayout
```

```
log4j.appender.myAppender.layout.ConversionPattern=%-5p Logger:%c{1}
Date: %d{ISO8601} - %m%n
```

You probably noticed the similarity between package names and the name of the new logger in [Example 14-7](#): `com.jspServletcookbook`. *log4j* uses a naming scheme based on Java's. Here's the basic rundown on this scheme:

- All loggers inherit from the root logger.
- All loggers whose name contains a prefix that matches a configured logger's name (such as `com.jspServletcookbook`) also inherit from that configured logger. Therefore, a logger named `com.jspServletcookbook.LoggerWconfig` derives its characteristics from the `com.jspServletcookbook` logger.

In [Example 14-7](#), the `com.jspServletcookbook` logger specifies that it will use an appender named `myAppender`. The `myAppender` appender is a *rolling file appender*, which is a log file that automatically creates a backup file when the original log reaches a certain size. The appender is based on the Java class `org.apache.log4j.RollingFileAppender`, which is among the set of classes that *log4j* uses.

If you look at the Javadoc for that class, then you see that it has a bunch of methods that look like `getXXX()`, where `XXX` is one of the logger's properties. You set these properties of the appender in the configuration file by giving each property a value. To set the `myAppender` appender's `File` property, the syntax is:

```
log4j.appender.myAppender.File=h:/home/example.log
```

This configuration element specifies the file location where the appender will log its messages. When this file reaches its `MaxFileSize` of 1 MB, *log4j* renames the file *example.log.1* and creates a new *example.log* to receive log messages. The `MaxBackupIndex` means that *log4j* will create only one backup file.

The Javadoc for `RollingFileAppender` can be found at:

<http://jakarta.apache.org/log4j/docs/api/org/apache/log4j/RollingFileAppender.html>.

[Example 14-7](#) also specifies a layout for the `com.jspServletcookbook` logger, and a rather elaborate one at that:

```
log4j.appender.myAppender.layout=org.apache.log4j.PatternLayout
```

```
log4j.appender.myAppender.layout.ConversionPattern=%-5p Logger:%c{1} Date:
%d{ISO8601} - %m%n
```

The first line specifies that the `myAppender` layout will use an `org.apache.log4j.PatternLayout`, which is based on the conversion pattern of the `printf` function in C, according to the `PatternLayout` Javadoc. This pattern language combines literal text and *conversion specifiers* to generate a formatted log message. The conversion specifiers are letters (like `c`) that have special meanings as placeholders. For example, the letters may represent dates or logger names.

The `%` character precedes the conversion pattern symbols. For example, consider the following pattern:

```
Logger:%c{1}
```

This translates to "the literal text ``Logger:`` followed by the logger's name." The number 1 in curly braces (`{1}`) following the `%c` characters is a precision specifier, which means "display just one segment of the name beginning from the righthand side." If the logger is `com.jspservletcookbook.LoggerServlet`, then the `%c{1}` pattern displays "LoggerServlet" in the log text. This is because the `c` conversion specifier is a placeholder for the logger name.

The letter `m` displays the log message itself, the letter `n` produces the platform-specific line separator, and the letter `d` represents the date. The entire string `%d{ISO8601}` is a *log4j* date formatter, which displays the date in detailed form. See

<http://jakarta.apache.org/log4j/docs/api/org/apache/log4j/helpers/ISO8601DateFormat.html>.

Example 14.8 shows a servlet that uses a logger that inherits its characteristics from two configured loggers: the root logger and the `com.jspservletcookbook` logger.

Example 14-8. A servlet uses a descendant logger

```
package com.jspservletcookbook;

import org.apache.log4j.Logger;

import javax.servlet.*;
import javax.servlet.http.*;

public class LoggerNewConfig extends HttpServlet {

    private Logger log = null;

    public void init( ){

        //the logger's name is the same as the class name:
        //com.jspservletcookbook.LoggerNewConfig
        log = Logger.getLogger(LoggerNewConfig.class);

        log.info("LoggerNewConfig started.");
    }

    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        //display a DEBUG-level message
        log.debug("Sending a DEBUG message");

        // display an INFO-level message
        log.info("Sending an INFO message");
    }
}
```

```

        //better display some HTML
        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );
        out.println(
            "<html><head><title>Servlet logging</title></head><body>");

        out.println(
            "<h2>Hello from a Logger with its own configuration in the "+
            log4j.properties file</h2>");

        out.println("Your logger name is: " + log.getName( )+"<br>");

        out.println(
            "Your logger parent is: " + log.getParent( ).getName( )+"<br>");

        out.println("</body></html>");
    } //end doGet
}

```

The static `org.apache.log4j.Logger.getLogger(Class className)` method creates a logger named after the class in Example 14.8 (`com.jspervletcookbook.LoggerNewConfig`). Therefore, this new logger inherits the appender that the properties file in [Example 14-7](#) set up for the logger `com.jspervletcookbook`, because the new logger's name has `com.jspervletcookbook` as a prefix. In fact, any other logger created in classes that are part of the `com.jspervletcookbook` package inherits these properties, as long as the developer keeps naming her loggers after the Java class in which they are created.

Here is an example of what the entire pattern the configuration file of [Example 14-7](#) created generates in the log file:

```

INFO  Logger:LoggerNewConfig Date: 2003-07-10 17:16:22,713 - LoggerNewConfig started
DEBUG Logger:LoggerNewConfig Date: 2003-07-10 17:16:34,530 - Sending a DEBUG message
INFO  Logger:LoggerNewConfig Date: 2003-07-10 17:16:34,530 - Sending an INFO message

```

Visit <http://jakarta.apache.org/log4j/docs/api/org/apache/log4j/PatternLayout.html> for more details on pattern layouts.

Because of the inheritance structure established by the log4j configuration file, the servlet in [Example 14-8](#) also logs its messages to the console.

See Also

[Recipe 14.2](#) on downloading and setting up *log4j*; [Recipe 14.3](#) on using a *log4j* logger without a properties file; [Recipe 14.4](#) on adding an appender to the root logger; [Recipe 14.6](#) on using loggers in JSPs; [Recipe 14.7](#) and [Recipe 14.8](#) on using *log4j* with application event listeners; the *log4j* download site: <http://jakarta.apache.org/log4j/docs/download.html>; the *log4j* Javadoc page: <http://jakarta.apache.org/log4j/docs/api/index.html>; the *log4j* project documentation page: <http://jakarta.apache.org/log4j/docs/documentation.html>.

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Recipe 14.6 Using log4j in a JSP

Problem

You want to include logging statements in a JSP.

Solution

Design a custom tag that uses *log4j* to initiate logging messages.

Discussion

A custom tag is an XML element that you invent or design for use in a JSP. In other words, the JSP container does not provide the custom actions; the web developer himself designs the Java classes that provide the tag functionality. A custom tag or action can be used to implement *log4j* logging functionality in JSPs.

In this recipe, I show:

- A Java class that provides the tag handler for a custom tag named `cbck:log`.
- A Tag Library Descriptor (TLD) that provides the web application with information about the tag.
- A JSP page that uses the `cbck:log` tag.

Example 14-9 shows the Java class `LoggerTag` on which the `cbck:log` tag is based. Each custom action is actually driven behind the scenes by one or more Java classes. In this case, `LoggerTag` is like a `JavaBean` that wraps the *log4j* classes, which we import at the top of the tag class.

Custom JSP actions are a complex topic, so I explain this tag by focusing mainly on its *log4j* features. See Chapter 22 to help fill in the missing spaces in your own knowledge about custom tag development.

Example 14-9. A custom tag that uses log4j

```
package com.jspServletcookbook;

import org.apache.log4j.Logger;
import org.apache.log4j.PropertyConfigurator;

import java.lang.reflect.Method;

import javax.servlet.jsp.*;
import javax.servlet.jsp.tagext.*;
```

```

public class LoggerTag extends BodyTagSupport {

    private Logger log = null;
    private String configFile = null;
    private String level = null;
    private static final String[] LEVELS =
        { "debug","info","warn","error","fatal"};

    public void setConfigFile(String fileName){

        this.configFile = fileName;

    }

    public void setLevel(String level){

        this.level = level;

    }

    public int doEndTag( ) throws JspException {

        String realPath = pageContext.getServletContext( ).getRealPath("/");
        String fileSep = System.getProperty("file.separator");

        if (realPath != null && (!realPath.endsWith(fileSep))){
            realPath = realPath + fileSep;}

        //configure the logger if the user provides this optional attribute
        if (configFile != null)
            PropertyConfigurator.configure(realPath +
                "WEB-INF/classes/" + configFile);

        //throw an exception if the tag user provides an invalid level,
        //something other than DEBUG, INFO, WARN, ERROR, or FATAL

        level = level.toLowerCase( );

        if (! contains(level))
            throw new JspException(
                "The value given for the level attribute is invalid.");

        //The logger has the same name as the class:
        //com.jspervletcookbook.LoggerTag. Therefore, it inherits its
        //appenders from a logger defined in the config file:
        //com.jspervletcookbook
        log = Logger.getLogger(LoggerTag.class);

        String message = getBodyContent( ).getString( ).trim( );
        Method method = null;

        try{

```

```

        method = log.getClass( ).
            getMethod(level,new Class[]{ Object.class });

        method.invoke(log,new String[]{message});

    } catch (Exception e){}

    return EVAL_PAGE;
} // doEndTag

public void release( ){

    //release resources used by instance variables
    log = null;
    configFile = null;
    level = null;

} // release

private boolean contains(String str){

    for (int i = 0; i < LEVELS.length; i++){

        if(LEVELS[i].equals(str))
            return true;
    }
    return false;
} // contains
}

```

The `LoggerTag` extends the `javax.servlet.jsp.tagext.BodyTagSupport` class , which is designed for custom actions that process body content, or the text that may appear between opening and closing tags.

The tag attributes, a required attribute named `level` and the `configFile` optional attribute, are handled like JavaBean properties: with "setter" methods (e.g., `public void setLevel(String level)`). The `doEndTag()` method does most of the important work for the tag:

1. It attempts to configure the logger if the user has provided a configuration filename in the `configFile` attribute.
2. It checks if the level is valid (one of `DEBUG` , `INFO` , `WARN` , `ERROR` , or `FATAL`).
3. It logs the message.

Example 14-10 shows the TLD, which conveys tag specifics to the JSP container, such as whether an attribute is required or optional. The tag library associated with this TLD describes only the `cbck:log` tag. The TLD files must be located in *WEB-INF* or a subdirectory thereof, or inside of the *META-INF* directory of a JAR that is placed in *WEB-INF/lib* .

Example 14-10. The TLD for the custom logger tag

```
<?xml version="1.0" encoding="ISO-8859-1" ?>

<!DOCTYPE taglib
    PUBLIC "-//Sun Microsystems, Inc.//DTD JSP Tag Library 1.2//EN"
    "http://java.sun.com/dtd/web-jsptaglibrary_1_2.dtd">
<taglib>

    <tlib-version>1.0</tlib-version>
    <jsp-version>1.2</jsp-version>
    <short-name>cbck</short-name>
    <uri>jspServletcookbook.com.tags</uri>
    <description>Cookbook custom tags</description>

    <tag>
        <name>log</name>
        <tag-class>com.jspServletcookbook.LoggerTag</tag-class>
        <body-content>JSP</body-content>
        <description>This tag uses log4j to log a message.</description>

        <attribute>
            <name>configFile</name>
            <required>false</required>
            <rtexprvalue>false</rtexprvalue>
            <description>
                This attribute provides any configuration filename for the
                logger. The file must be located in
                WEB-INF/classes.
            </description>
        </attribute>

        <attribute>
            <name>level</name>
            <required>true</required>
            <rtexprvalue>false</rtexprvalue>
            <description>This attribute provides the level for the log request.
            </description>
        </attribute>

    </tag>
</taglib>
```

Example 14-11 shows the *logger.jsp* page and how the custom action can be used.

Example 14-11. A JSP uses a log custom action to access log4j

```
<%@page contentType="text/html"%>
<%@ taglib uri="jspServletcookbook.com.tags" prefix="cbck" %>
<html>
<head><title>A logging JSP</title></head>
```

```

<body>
<h2>Here is the logging statement</h2>

<cbck:log level="debug">
Debug message from logger.jsp
</cbck:log>

Debug message from logger.jsp
</body>
</html>

```

First, the page uses the `taglib` directive to declare the tag library that contains our custom action. Example 14-10 shows the TLD file, an XML file that describes the properties of a tag library's various tags. Chapter 22 describes TLDs in more detail.

The `cbck:log` custom action allows a developer to log a message from the JSP by nesting the message text within the `cbck:log` tag (i.e., the body content of the tag is the log message). The `cbck` part of the tag is the prefix that the `taglib` directive declared. The `log` part is the name of the tag. The tag allows the developer to declare the logging level with the custom action's `level` attribute.



Typically, a component such as an initialization servlet initializes the *log4j* logging system when the web application starts up. The custom action described here does not have to initialize *log4j* itself. However, I've included an optional `configFile` attribute that permits me to specify the name of a *log4j* configuration file, which will configure the logger's level, appender(s), and layout.

For this tag, assume that you want to decide which logging level to use, and thus pass in a value for the `level` attribute. The tag class does not know whether the message will request a logging level of `DEBUG`, `INFO`, `WARN`, `ERROR`, or `FATAL`. Since the logger's methods in *log4j* use the same name as the levels, we can dynamically call the proper method based on the value of the `level` attribute. This is the purpose of the code:

```

method = log.getClass( ).
    getMethod(level,new Class[]{ Object.class });

method.invoke(log,new String[]{message});

```

We get a `java.lang.reflect.Method` object that is named either `DEBUG`, `INFO`, `WARN`, `ERROR`, or `FATAL`, and then invoke that method calling `method.invoke`, passing in the log message from the JSP page.

A configuration filename is not required for this tag, so how does *log4j* know how and where to log the message? This tag assumes that a servlet has already initialized the *log4j* system for the web application, which is typical for the use of *log4j* in a web environment. The configuration file is the one described by Recipe 14.4 and shown in Example 14-5.

You can also use a servlet as an *log4j*-initialization servlet, similar to Example 14-6.

That configuration file created a logging mechanism that sends messages to the console and a file, so that is where the custom tag's messages go. For example, running *logger.jsp* displays a message on the console:

```
DEBUG - Debug message from logger.jsp
```

The tag's logger writes the following message in the file *example.log*:

```
DEBUG Logger:LoggerTag Date: 2003-05-12 12:53:13,750 - Debug message from logger.jsp
```

If you want to include your own configuration file, you can include a `configFile` attribute when using the custom tag. The tag will configure the logger using that file instead of any previously initialized one:

```
if (configFile != null)
    PropertyConfigurator.configure(
        pageContext.getServletContext( ).getRealPath("/") +
        "WEB-INF/classes/" + configFile);
```



The `PropertyConfigurator.configure()` method allows you to specify the name of a *log4j* properties file when you initialize the logging system, if the filename is different than *log4j.properties*. The `PropertyConfigurator.configure()` method (in *log4j* Version 1.2.8) does not throw an exception that can be caught in the tag class. You could check for the existence of the `configFile` value (representing the path to a file in the web application) explicitly in the code using the `java.io` API, and then throw an exception if the `configFile` attribute declares an invalid filename.

See Also

Recipe 14.2 on downloading and setting up *log4j*; Recipe 14.3 on using a *log4j* logger without a properties file; Recipe 14.4 on adding an appender to the root logger; Recipe 14.5 on using a pattern layout with a logger's appender; Recipe 14.7 and Recipe 14.8 on using *log4j* with application event listeners; the *log4j* download site: <http://jakarta.apache.org/log4j/docs/download.html> ; the *log4j* Javadoc page: <http://jakarta.apache.org/log4j/docs/api/index.html> ; the *log4j* project documentation page: <http://jakarta.apache.org/log4j/docs/documentation.html> .

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Recipe 14.7 Logging Messages Using a Servlet Context Event Listener

Problem

You want to log messages using *log4j* when a servlet context is created and shut down.

Solution

Use *log4j* and a servlet context event listener.

Discussion

The servlet API includes a listener interface named `javax.servlet . ServletContextListener` that you can use to notify a specific Java class when a servlet context is created or shut down. This notified class may want to log the servlet context creation or shut down or store an object attribute in the servlet context, actions that the Java class (the listener) takes when it receives its notification.

The servlet context listener is an application event listener, a category that also includes session event listeners (see Chapter 11 or Recipe 14.8) and request event listeners. For example, the session event listener receives notifications when the servlet container creates new HTTP session objects in order to track a user's progress through a web application. The servlet container notifies the request event listener when a user makes a web application request, so that a listener can take some kind of action-such as logging the user's IP address.

A `javax.servlet.ServletContext` is used to store attributes or access context parameters that are common to a web application, get `RequestDispatcher` objects for forwarding or including files (see Chapter 6), or get information such as an absolute pathname associated with a web resource. Every web application has one associated servlet context.

There is one servlet context instance per web application (per Java Virtual Machine (JVM), in the case of distributed web applications) according to the `ServletContext` Javadoc:

<http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/ServletContext.html> .

log4j is a good choice for generating custom-designed log messages from a class that implements the `ServletContextListener` interface. Example 14-12 shows the `ContextLogger` class, which uses *log4j* to send messages in its two methods.

Example 14-12. A servlet context event listener that sends log messages

```
package com.jspervletcookbook;
```



```
import org.apache.log4j.Logger;
import org.apache.log4j.PropertyConfigurator;

import javax.servlet.*;
import javax.servlet.http.*;

public class ContextLogger implements ServletContextListener {

    private Logger log;

    public ContextLogger( ){}

    public void contextDestroyed(ServletContextEvent sce) {

        String name = sce.getServletContext( ).getServletContextName( );

        //log request of the INFO level
        log.info("ServletContext shut down: " + (name == null ? "" : name ));

        //do other necessary work, like clean up any left-over resources
        //used by the web app
    }

    public void contextInitialized(ServletContextEvent sce) {

        ServletContext context = sce.getServletContext( );

        String realPath = context.getRealPath("/");
        String fileSep = System.getProperty("file.separator");

        //Make sure the real path ends with a file separator character ('/')
        if (realPath != null && (! realPath.endsWith(fileSep))){
            realPath = realPath + fileSep;}

        //Initialize logger here; the log4j properties filename is specified
        //by a context parameter named "logger-config"

        PropertyConfigurator.configure(realPath +
            "WEB-INF/classes/" + context.getInitParameter("logger-config"));

        log = Logger.getLogger(ContextLogger.class);

        String name = context.getServletContextName( );

        //log request about servlet context being initialized
        log.info("ServletContext ready: " + (name == null ? "" : name ));

    }
}
```

Give this class a no-args constructor, place it in *WEB-INF/classes* or in a JAR located in *WEB-INF/lib*, and register it in *web.xml*:

```
<listener>
  <listener-class>
    com.jspServletcookbook.ContextLogger
  </listener-class>
</listener>
```

The `ServletContextListener` tracks the lifecycle of a servlet context with two methods: `contextInitialized()` and `contextDestroyed()`. The servlet container calls the first method when the servlet context is created and the web application is ready to receive its first request. The container notifies the listener class and calls the `contextDestroyed()` method when the servlet context is about to be shut down, such as when a web application is stopped prior to being reloaded.

Tomcat 4.1.24 initializes the servlet context listener prior to creating servlet instances, even if the application configures the servlet to be preloaded. Example 14-12 initializes the *log4j* system in the `contextInitialized()` method.



The deployment descriptor can instruct the servlet container to load a servlet instance and call its `init()` method at startup by including a `load-on-startup` element nested in the servlet element, as in:

```
<servlet>
  <servlet-name>logger</servlet-name>
  <servlet-class>
    com.jspServletcookbook.LoggerServlet
  </servlet-class>
  <load-on-startup>1</load-on-startup>
</servlet>
```

The value of `load-on-startup` is an integer indicating the order in which the container loads the servlet.

In the `contextInitialized()` method, the listener configures *log4j* using the file specified by a `context-param` element in *web.xml*:

```
<context-param>
  <param-name>logger-config</param-name>
  <param-value>servletLog.properties</param-value>
</context-param>
```

This *log4j* configuration file (*servletLog.properties*) is located in the *WEB-INF/classes* directory. The listener then logs its messages to the console and to a file when the web application starts up or is shut down. Example 14-13 shows the configuration file the listener uses for *log4j*.

Example 14-13. Log4j configuration file used by the servlet context listener

```
log4j.rootLogger=DEBUG, cons
log4j.logger.com.jspServletcookbook=, myAppender
```



```
log4j.appender.cons=org.apache.log4j.ConsoleAppender

#configure the 'myAppender' appender

log4j.appender.myAppender=org.apache.log4j.RollingFileAppender
log4j.appender.myAppender.File=h:/home/example.log
log4j.appender.myAppender.MaxBackupIndex=1
log4j.appender.myAppender.MaxFileSize=1MB

log4j.appender.cons.layout=org.apache.log4j.SimpleLayout
log4j.appender.myAppender.layout=org.apache.log4j.PatternLayout
log4j.appender.myAppender.layout.ConversionPattern=
%-5p Logger:%c{1} Date: %d{ISO8601} - %m%n
```

The listener gets a logger with this code:

```
log = Logger.getLogger(ContextLogger.class);
```

This names the logger after the class `com.jspServletcookbook.ContextLogger`. Therefore, in the *log4j* naming scheme, the listener's logger inherits the appender that Example 14-13 defines for the logger `com.jspServletcokbook`. This is because the configuration does not define a logger for `com.jspServletcookbook.ContextLogger`; consequently, the listener's logger inherits the next defined logger available: `com.jspServletcookbook`. The `com.jspServletcookbook` logger has a console appender and a file appender.

As a result, the servlet context listener sends its log messages to the console and the *h:/home/example.log* file. Example 14-13 has different layouts for the console and file appenders. The listener's console messages look like this:

```
INFO - ServletContext shut down: The home web application
INFO - ServletContext ready: The home web application
```

The log file messages have a different format:

```
INFO  Logger:ContextLogger Date: 2003-05-12 16:45:20,398 - ServletContext shut down:
The home web application
INFO  Logger:ContextLogger Date: 2003-05-12 16:45:20,999 - ServletContext ready: The
home web application
```

The format of these messages consists of the name of the logging level (e.g., `INFO`), the logger name, the date of the log request, and the message itself.

See Also

Recipe 14.2 on downloading and setting up *log4j*; Recipe 14.3 on using a *log4j* logger without a properties file; Recipe 14.4 on adding an appender to the root logger; Recipe 14.5 on using a pattern layout with a logger's appender; Recipe 14.6 on using a logger with a JSP; Recipe 14.8 on using *log4j* with session event listeners; the *log4j* download site: <http://jakarta.apache.org/log4j/docs/download.html>; the *log4j* Javadoc page: <http://jakarta.apache.org/log4j/docs/api/index.html>; the *log4j* project documentation page: <http://jakarta.apache.org/log4j/docs/documentation.html>.

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Recipe 14.8 Logging Messages Using a Session Event Listener

Problem

You want to log messages in a custom-designed manner from a session event listener.

Solution

Design a session event listener that uses a *log4j* logging mechanism.

Discussion

The servlet container notifies a session event listener class when it creates a new `HttpSession`, as well as when it is about to invalidate or expire a session. Web applications use sessions to track a user's progress through the web application, typically by identifying him with a cookie named `JSESSIONID`. See [Chapter 10](#) for more information on cookies, and [Chapter 11](#) for detailed coverage of sessions.

[Example 14-14](#) implements the `javax.servlet.http.HttpSessionListener` interface and the interface's two methods: `sessionCreated()` and `sessionDestroyed()`. The code logs messages relating to new sessions in `sessionCreated()` and relating to invalidated sessions in `sessionDestroyed()`.

Example 14-14. Using log4j in a session event listener

```
package com.jspervletcookbook;

import org.apache.log4j.Logger;
import org.apache.log4j.PropertyConfigurator;

import javax.servlet.*;
import javax.servlet.http.*;

public class SessionLogger implements HttpSessionListener
{
    private Logger log;

    public SessionLogger( ){
```

```

/*
The loggers are typically initialized by a special initialization
listener or servlet. If this is not the case, then initialize the
logger here:

java.util.ResourceBundle bundle =
    java.util.ResourceBundle.getBundle(
        "com.jspervletcookbook.global");

PropertyConfigurator.configure(bundle.getString(
    "log-configure-path"));
*/

log = Logger.getLogger(SessionLogger.class);

}

public void sessionCreated(HttpSessionEvent se) {

    //log request of the INFO level
    log.info("HttpSession created: " + se.getSession().getId());

}

public void sessionDestroyed(HttpSessionEvent se) {

    //log request about sessions that are invalidated
    log.info("HttpSession invalidated: " + se.getSession().getId());

}
}

```

Give this class a no-args constructor, place it in *WEB-INF/classes* or in a JAR located in *WEB-INF/lib*, and register it in *web.xml*.

```

<listener>
  <listener-class>
    com.jspervletcookbook.SessionLogger
  </listener-class>
</listener>

```

The `SessionLogger` class gets a logger in its constructor; it depends on the application already having initialized the *log4j* logging mechanism in a servlet or in the servlet context listener (as in [Recipe 14.4](#)).

A web application can configure its *log4j* mechanism using a special initialization servlet or listener, so the other classes or beans that do logging do not have to handle the *log4j* configuration stage. You can initialize the *log4j* logging mechanism using a servlet such as the one shown in [Recipe 14.6](#).

The commented-out code in the constructor shows another way that this listener class could configure its own logger in the event that the application has not yet configured the logging mechanism.

Here is the message logged to the Tomcat console after the first request to a servlet or JSP that participates in session tracking:

```
INFO - HttpSession created: A65481C53B92F869BD18961D635BBF52
```

When the session is invalidated, the console text is:

```
INFO - HttpSession invalidated: A65481C53B92F869BD18961D635BBF52
```

Like the listener described in [Recipe 14.7](#), the session listener's logger inherits the logging destinations or appenders from the `com.jspServletcookbook` logger. The configuration file of [Example 14-13](#) shows how this logger is set up to send messages to both the console and an *example.log* file. The log file's appender layout is specified using a `PatternLayout`, which is a different layout than the one used with the console appender. Here is example text from this log when the servlet container invalidates a session:

```
INFO  Logger:SessionLogger Date: 2003-05-12 20:41:05,367 - HttpSession invalidated:
A65481C53B92F869BD18961D635BBF52
```

See Also

[Recipe 14.2](#) on downloading and setting up *log4j*; [Recipe 14.3](#) on using a *log4j* logger without a properties file; [Recipe 14.4](#) on adding an appender to the root logger; [Recipe 14.5](#) on using a pattern layout with a logger's appender; [Recipe 14.6](#) on using a logger with a JSP; [Recipe 14.8](#) on using *log4j* with session event listeners; the *log4j* download site: <http://jakarta.apache.org/log4j/docs/download.html>; the *log4j* Javadoc page: <http://jakarta.apache.org/log4j/docs/api/index.html>; the *log4j* project documentation page: <http://jakarta.apache.org/log4j/docs/documentation.html>.

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Chapter 15. Authenticating Clients

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Introduction

Because of the increase in digital commerce and a corresponding rise in the need to transfer and store sensitive data (such as credit card numbers and financial accounts), security is of paramount importance to Java web applications.

This chapter's recipes cover tasks that involve authentication, which is designed to answer the question "are you who you say you are?" Authentication usually involves an interaction between a client or user and server-side code for the purpose of checking a username and password (and sometimes a digital certificate, biometric data, or other evidence) against stored information, such as a user database.

The recipes describe how to set up Secure Sockets Layer (SSL), as well as use BASIC- and form-based authentication with Apache Tomcat. The later recipes describe how to use a powerful security framework called Java Authentication and Authorization Service (JAAS) with servlets and JSPs.

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Recipe 15.1 Creating Users and Passwords with Tomcat

Problem

You want to create usernames and passwords for authenticating requests for certain web components.

Solution

Add the usernames, passwords, and roles to the *tomcat-users.xml* file.

Discussion

A very easy method of authenticating users with Tomcat involves creating usernames, passwords, and roles in the *tomcat-users.xml* file. This file is stored in *<Tomcat-installation-directory>/conf*.

Everyone is familiar with usernames and passwords, but what are roles? Roles are logical ways to describe groups of users who have similar responsibilities, such as *manager* or *databaseAdmin*. [Example 15-1](#) shows a *tomcat-users.xml* file that creates two roles and two users with two aptly named XML elements: `role` and `user`.

Example 15-1. The tomcat-users XML file

```
<?xml version='1.0' encoding='utf-8'?>

<tomcat-users>
  <role rolename="dbadmin"/>
  <role rolename="manager"/>
  <user username="BruceP" password="bwperry" roles="dbadmin,manager"/>
  <user username="JillH" password="jhayward" roles="manager"/>
</tomcat-users>
```

In [Example 15-1](#), the user `BruceP` is associated with two roles (*dbadmin* and *manager*), while user `JillH` is associated only with the *manager* role. Tomcat uses this file when authenticating users with BASIC and form-based authentication, as described in [Recipe 15.3](#) and [Recipe 15.4](#).

See Also

The Tomcat documentation and [Recipe 15.2](#) on setting up SSL for use with authentication: <http://jakarta.apache.org/tomcat/tomcat-4.1-doc/ssl-howto.html>; [Recipe 3.9](#) on restricting requests

for certain servlets; [Recipe 15.3](#) on using BASIC authentication; [Recipe 15.4](#) on using form-based authentication; [Recipe 15.5](#) on logging out a user; [Recipe 15.6](#)-[Recipe 15.9](#) on using JAAS.

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Recipe 15.2 Setting Up SSL on Tomcat

Problem

You want to set up SSL on Tomcat so that you can transmit usernames and passwords in encrypted form.

Solution

Create a digital certificate for the Tomcat server using the `$JAVA_HOME/bin/keytool` utility, then uncomment the SSL `Connector` element in `conf/server.xml`.

Discussion

When transferring usernames and passwords over HTTP, you should set up SSL on Tomcat or whichever application server you are using. This protocol ensures that the names and passwords are in encrypted form as they travel across the network, and thus protected from theft and malicious use by hackers and other intruders.

Setting up SSL on Tomcat 4 is a two-step process:

1. Use the `keytool` utility to create a *keystore* file encapsulating a digital certificate used by the server for secure connections.
2. Uncomment the SSL `Connector` element in Tomcat's `conf/server.xml` file, and alter its attributes if necessary.

The `keytool` utility is located in the *bin* subdirectory of the directory where you have installed the JSDK. The following command line creates a single self-signed digital certificate for the Tomcat server within a *keystore* file named *.keystore*. This file is created in the home directory of the user running the command.

```
%JAVA_HOME%\bin\keytool -genkey -alias tomcat -keyalg RSA
```

The Unix version of this command is:

```
$JAVA_HOME/bin/keytool -genkey -alias tomcat -keyalg RSA
```

For this command to succeed, the `JAVA_HOME` environment variable must be set to the directory where the Java 2 SDK is installed, such as *h:\j2sdk1.4.1_01*.

[Example 15-2](#) shows the console output resulting from executing the `keytool` command. The `keytool` will request some information about you and your organization, but you can accept the default values by pressing Enter. This information is incorporated into the server's certificate and presented to the user (via her web browser) when she requests any components with a URL that starts with `https://`.

In setting up SSL for Tomcat, you must use the same password for both the *keystore* and the certificate that is stored in the *keystore*.



The default password used in Tomcat is "changeit":
<http://jakarta.apache.org/tomcat/tomcat-4.1-doc/ssl-howto.html>.

Example 15-2. The console output resulting from using the keytool utility

```
Enter keystore password:  changeit
What is your first and last name?
  [Unknown]:  Bruce Perry
What is the name of your organizational unit?
  [Unknown]:
What is the name of your organization?
  [Unknown]:
What is the name of your City or Locality?
  [Unknown]:
What is the name of your State or Province?
  [Unknown]:
What is the two-letter country code for this unit?
  [Unknown]:
Is CN=Bruce Perry, OU=Unknown, O=Unknown, L=Unknown, ST=Unknown, C=Unknown correct?
  [no]:  yes

Enter key password for <tomcat>
      (RETURN if same as keystore password):
```

Finally, uncomment the SSL `Connector` element in the `conf/server.xml` file (shown in [Figure 15-3](#)) by removing the comment characters around it (`<!-- -->`). Then restart Tomcat.

Example 15-3. The Connector element inside server.xml

```
<!-- Define a SSL Coyote HTTP/1.1 Connector on port 8443 -->

<Connector className=
  "org.apache.coyote.tomcat4.CoyoteConnector" port=
  "8443" minProcessors="5" maxProcessors="75" enableLookups=
  "true" acceptCount="100" debug="0" scheme="https" secure="true"
  useURISValidationHack="false" disableUploadTimeout="true">
```

```
<Factory className=  
"org.apache.coyote.tomcat4.CoyoteServerSocketFactory" clientAuth=  
"false" protocol="TLS" />
```

```
</Connector>
```

The `Connector` uses a different port number (8443) than that used by insecure HTTP connections (in Tomcat, it's usually 8080). After you have restarted Tomcat, you can now make a secure connection to a web component in the *home* application with a URL that looks like this:

`https://localhost:8443/home/sqlJsp.jsp`



Don't forget the `https` (as opposed to `http`) part in setting up these web links!

See Also

The Tomcat documentation on setting up SSL for use with authentication:

<http://jakarta.apache.org/tomcat/tomcat-4.1-doc/ssl-howto.html>; [Recipe 15.1](#) on creating usernames and passwords in Tomcat; [Recipe 15.3](#) on using BASIC authentication; [Recipe 15.4](#) on using form-based authentication; [Recipe 15.5](#) on logging out a user; [Recipe 15.6](#)-[Recipe 15.9](#) on using the JAAS.

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Recipe 15.3 Using BASIC Authentication

Problem

You want to use BASIC authentication with web components in a Tomcat web application.

Solution

Use the `security-constraint`, `login-config`, and `security-role` elements in the deployment descriptor to protect one or more URLs.

Discussion

BASIC authentication is a security method that has been used with web resources for several years, and all popular browsers support it. This method of authentication involves the transfer of usernames and passwords over a network encoded with the Base64 content-encoding mechanism. Base64 is easy to decode and therefore not very secure. The solution is to combine BASIC authentication with SSL, which will further encrypt the data as it is transferred across the network (see [Recipe 15.2](#)).

Here is how setting up BASIC authentication works with web applications that you have installed on Tomcat:

1. Set up usernames, passwords, and roles in the `conf/tomcat-users.xml` file described in [Recipe 15.1](#).
2. Create a `security-constraint` element in the deployment descriptor (`web.xml`), specifying the web resources for which you are requiring authentication.
3. Include a `login-config` in `web.xml`; this element has a nested `auth-method` element that contains the text "BASIC".

When the user requests any of the protected resources, the server sends along a response header that looks like this:

```
WWW-Authenticate: BASIC Realm="MyRealm"
```

You are probably familiar with what happens next: the browser displays a standard dialog window requesting the client to provide a username and password ([Figure 15-1](#)). If the username and password are incorrect, the browser will either give the user another chance to log in by redisplaying the dialog window, or simply send back a server status code "401: Unauthorized" type of response.



The usernames and passwords in the *conf/tomcat-users.xml* file are case-sensitive. The user has to type them into the dialog window using upper- and lowercase letters exactly as they appear in *conf/tomcat-users.xml*.

[Example 15-4](#) shows the *web.xml* elements that are designed to initiate BASIC authentication for the URL pattern */sqlJsp.jsp*.

Example 15-4. A security-constraint initiates authentication with a JSP file

```
<!-- Beginning of web.xml deployment descriptor -->

<security-constraint>

    <web-resource-collection>

        <web-resource-name>JSP database component</web-resource-name>

        <url-pattern>/sqlJsp.jsp</url-pattern>

        <http-method>GET</http-method>
        <http-method>POST</http-method>

    </web-resource-collection>

    <auth-constraint>
        <role-name>dbadmin</role-name>
    </auth-constraint>

    <user-data-constraint>
        <transport-guarantee>CONFIDENTIAL</transport-guarantee>
    </user-data-constraint>

</security-constraint>

<login-config>
    <auth-method>BASIC</auth-method>
</login-config>

<security-role>
    <role-name>dbadmin</role-name>
</security-role>

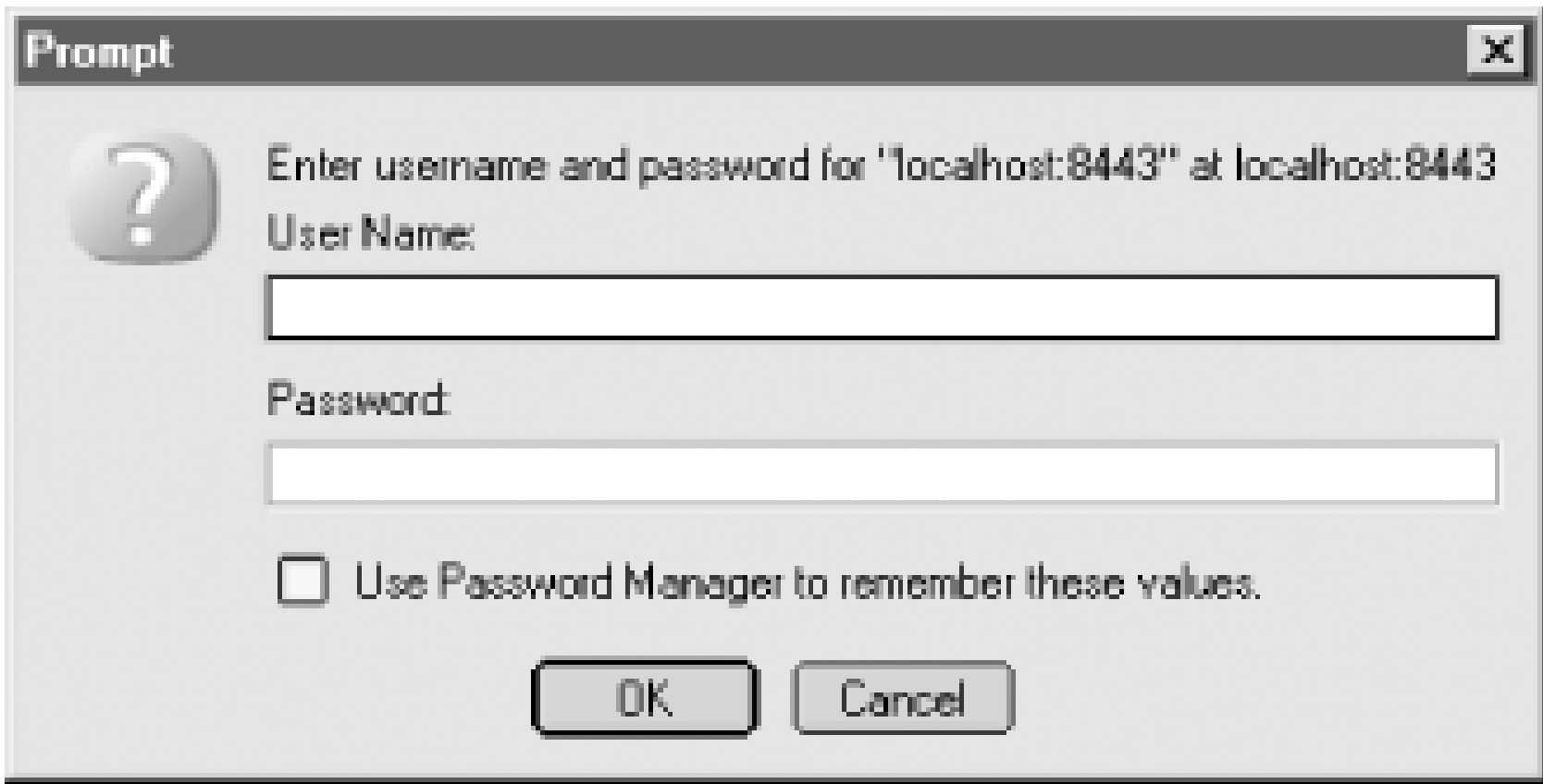
<!-- Rest of web.xml deployment descriptor -->
```

The `security-constraint` element in [Example 15-4](#) contains a `web-resource-collection` element. This element specifies the following constraints that apply to any requests for */sqlJsp.jsp*.

- The constraints apply to any GET or POST requests (as specified by the `http-method` elements).
- The `auth-constraint` element nested inside `security-constraint` contains the `role-name` `dbadmin`. Therefore, the requestor must enter the proper username and password (as specified in the `tomcat-users.xml` file) and be associated with the `dbadmin` role. Only those who have the `dbadmin` role can gain access to the protected web resource, even if they enter a proper username and password.

Figure 15-1 shows the dialog box that Netscape 7.1 produces when Tomcat is using BASIC authentication. The URL is used is `https://localhost:8443/home/sqlJsp.jsp`.

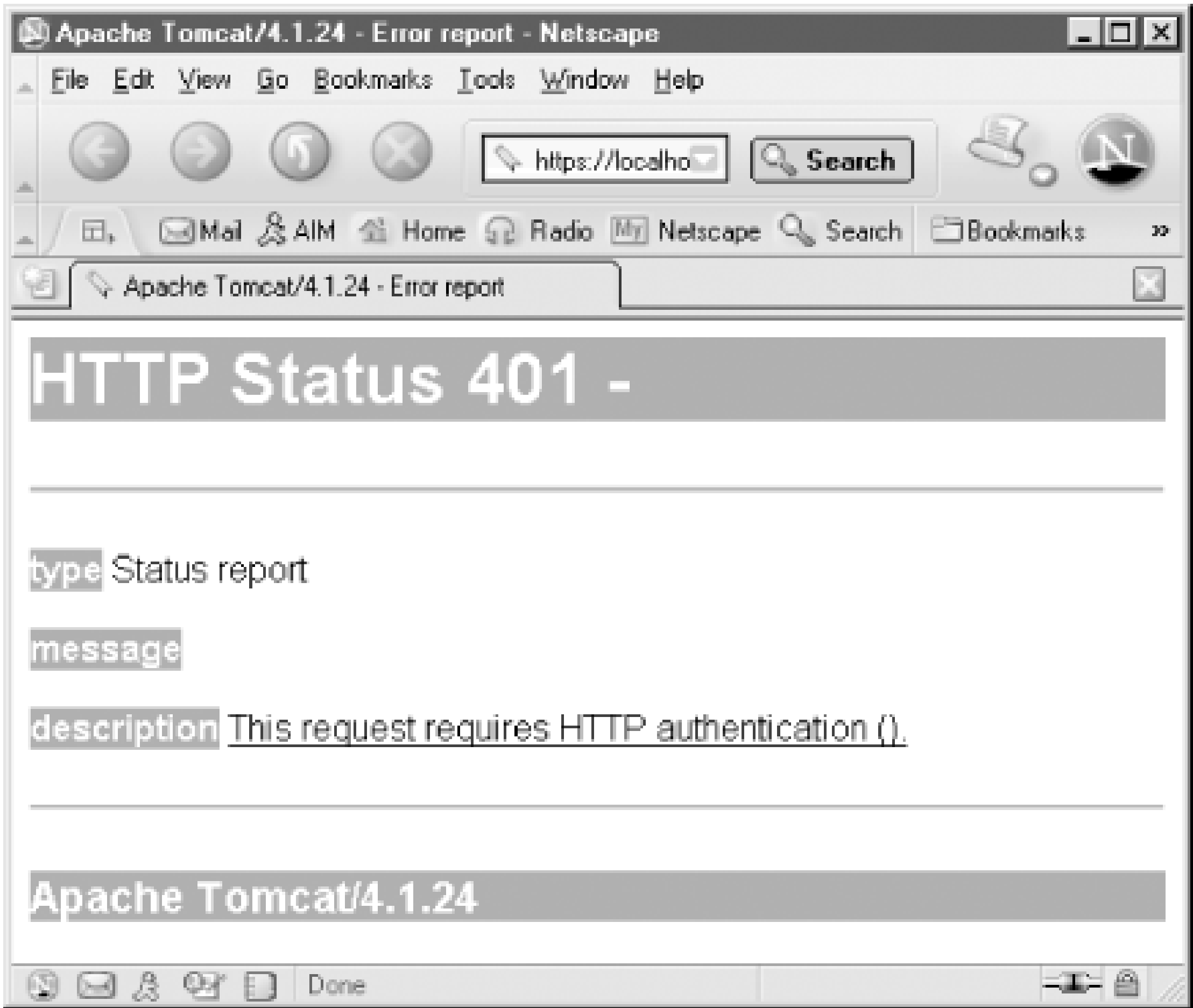
Figure 15-1. A browser dialog window requests a name and password



Notice that the URL uses a secure connection to request the JSP: an HTTPS protocol and port 8443 on Tomcat.

Figure 15-2 shows a browser window after a client has failed authentication.

Figure 15-2. A server status code 401 page as viewed in the web browser



See Also

The Tomcat documentation and [Recipe 15.2](#) on setting up SSL for use with authentication: <http://jakarta.apache.org/tomcat/tomcat-4.1-doc/ssl-howto.html>; [Recipe 3.9](#) on restricting requests for certain servlets; [Recipe 15.5](#) on logging out a user; [Recipe 15.6-Recipe 15.9](#) on using JAAS.

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Recipe 15.4 Using Form-Based Authentication

Problem

You want to design your own form to receive the user's name and password during BASIC authentication

Solution

Use the `login-config` element in the deployment descriptor and give its nested `auth-method` element a value of "FORM".

Discussion

The servlet API offers an alternative to using plain-vanilla BASIC authentication: *form-based authentication*. This method allows you to design your own form for receiving the user's name and password, as well as specifying the informative page that the servers send to the client if the user's authentication fails. This gives you the ability to provide a much more friendly and customized user interface for applications involving BASIC authentication.

The form-based method should still be combined with SSL and the HTTPS protocol so that the names and passwords are encrypted as they travel through the network.

Example 15-5 shows the form-based setup for the web application's deployment descriptor. It differs from Recipe 15.3's setup in one area: the `login-config` element, which is emphasized in the following code sample.

Example 15-5. The web.xml elements designed for form-based authentication

```
<!-- Beginning of web.xml deployment descriptor -->

<security-constraint>
  <web-resource-collection>
    <web-resource-name>JSP database component</web-resource-name>
    <url-pattern>/sqlJsp.jsp</url-pattern>
    <http-method>GET</http-method>
    <http-method>POST</http-method>
  </web-resource-collection>

  <auth-constraint>
    <role-name>dbadmin</role-name>
  </auth-constraint>
```

```
<user-data-constraint>
  <transport-guarantee>CONFIDENTIAL</transport-guarantee>
</user-data-constraint>

</security-constraint>

<login-config>

  <auth-method>FORM</auth-method>

  <form-login-config>

    <form-login-page>/login.html</form-login-page>
    <form-error-page>/loginError.jsp</form-error-page>

  </form-login-config>

</login-config>

<security-role>
  <role-name>dbadmin</role-name>
</security-role>

<!-- Rest of web.xml deployment descriptor -->
```

The `auth-method` element includes the text "FORM". The `form-login-config` element specifies the login (*/login.html*) and authentication failure page (*/loginError.html*) that your application uses. The forward slash (/) preceding the filenames means to navigate to the page from the web application's root directory.

Almost by magic, if a user requests a protected resource in your application, the server sends him the */login.html* page (in this example) instead of initiating the typical behavior in which the browser displays its own dialog window. If the name and password the user enters turns out to be incorrect, the server routes his request to the */loginError.html* page.

Example 15-6 shows the */login.html* page, for reference.

Example 15-6. The login form

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">

<html>
<head>
  <title>Welcome</title>
</head>

<body bgcolor="#ffffff">
<h2>Please Login to the Application</h2>

<form method="POST" action="j_security_check">

<table border="0"><tr>
```



```
<td>Enter the username: </td><td>  
  
<input type="text" name="j_username" size="15">  
  
</td>  
</tr>  
<tr>  
<td>Enter the password: </td><td>  
  
<input type="password" name="j_password" size="15">  
  
</td>  
</tr>  
<tr>  
<td> <input type="submit" value="Submit"> </td>  
</tr>  
</table>  
  
</form>  
  
</body>  
</html>
```

Figure 15-3 shows what this form looks like in a web browser.

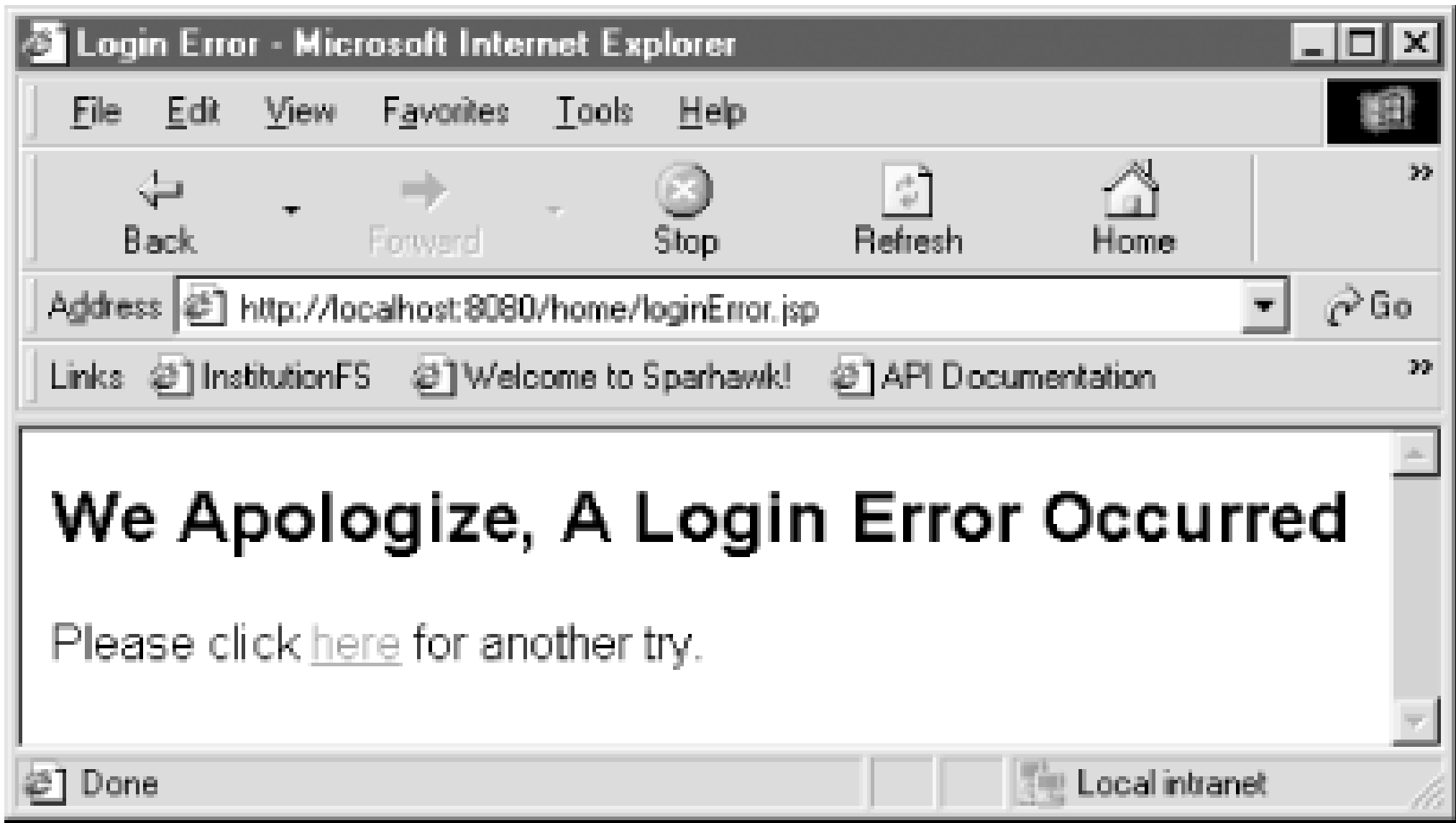
Figure 15-3. A form for use with form-based authentication

With form-based authentication, the `form` tag's `action` attribute must have the value "j_security_check". The input elements for the username and password must specify the values "j_user_name" and "j_password", respectively, for their `name` attributes.

Figure 15-4 shows the HTML page that the server sends the user if her authentication fails.

Figure 15-4. Form-based authentication allows the inclusion of your own

login-failure page



Example 15-7 shows the source for this page. The form-based approach is more predictable and friendly than the various browsers' methods for dealing with BASIC authentication.

Example 15-7. The server displays the loginError.jsp page when authentication fails

```
<html>
<head>
  <title>Login Error</title>
</head>
<body bgcolor="#ffffff">
<h2>We Apologize, A Login Error Occurred</h2>
Please click <a href="http://localhost:8080/home/sqlJsp.jsp">here</a> for another try.
<!-- Or, dynamically list hyperlinks to your protected resources here, perhaps by getting
them from a database or configuration file, instead of hard-coding a link into the error
page. --%>

</body>
</html>
```

See Also

The Tomcat documentation and Recipe 15.2 on setting up SSL for use with authentication:
http://jakarta.apache.org/tomcat/tomcat-4.1-doc/ssl-howto.html ; Recipe 3.9 on restricting requests for certain servlets; Recipe 15.5 on logging out a user; Recipe 15.6 -Recipe 15.9 on using JAAS.

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Recipe 15.5 Logging Out a User

Problem

You want to log out a user in a system that uses form-based authentication.

Solution

Call `invalidate()` on the user's `HttpSession` object.

Discussion

Invalidating a user's `HttpSession` object will log the user out in an application that uses form-based authentication. Naturally, this code involves calling `HttpSession.invalidate()`. [Example 15-8](#) displays some information about a logged-in user, then logs him out by invalidating his session. The next time this user requests a protected resource, the web application will send him to the configured login page, because he has been logged out of the application.

Example 15-8. Logging out a user

```
package com.jspservletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

public class LogoutServlet extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response)throws ServletException,
        java.io.IOException {

        HttpSession session = request.getSession( );
        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );
        out.println(
            "<html><head><title>Authenticated User Info</title></head><body>");
            out.println("<h2>Logging out a user</h2>");
        out.println("request.getRemoteUser( ) returns: ");
        //get the logged-in user's name
        String remUser = request.getRemoteUser( );
        //Is the request.getRemoteUser( ) return value null? If
```

```

        //so, then the user is not authenticated
        out.println(remUser == null ? "Not authenticated." : remUser );
        out.println("<br>");
        out.println("request.isUserInRole(\"dbadmin\") returns: ");
        //Find out whether the user is in the dbadmin role
        boolean isInRole = request.isUserInRole("dbadmin");
        out.println(isInRole);
        out.println("<br>");
        //log out the user by invalidating the HttpSession
        session.invalidate( );
        out.println("</body></html>");

    } //doGet

    public void doPost(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        doGet(request,response);

    } //doPost

} //LogoutServlet

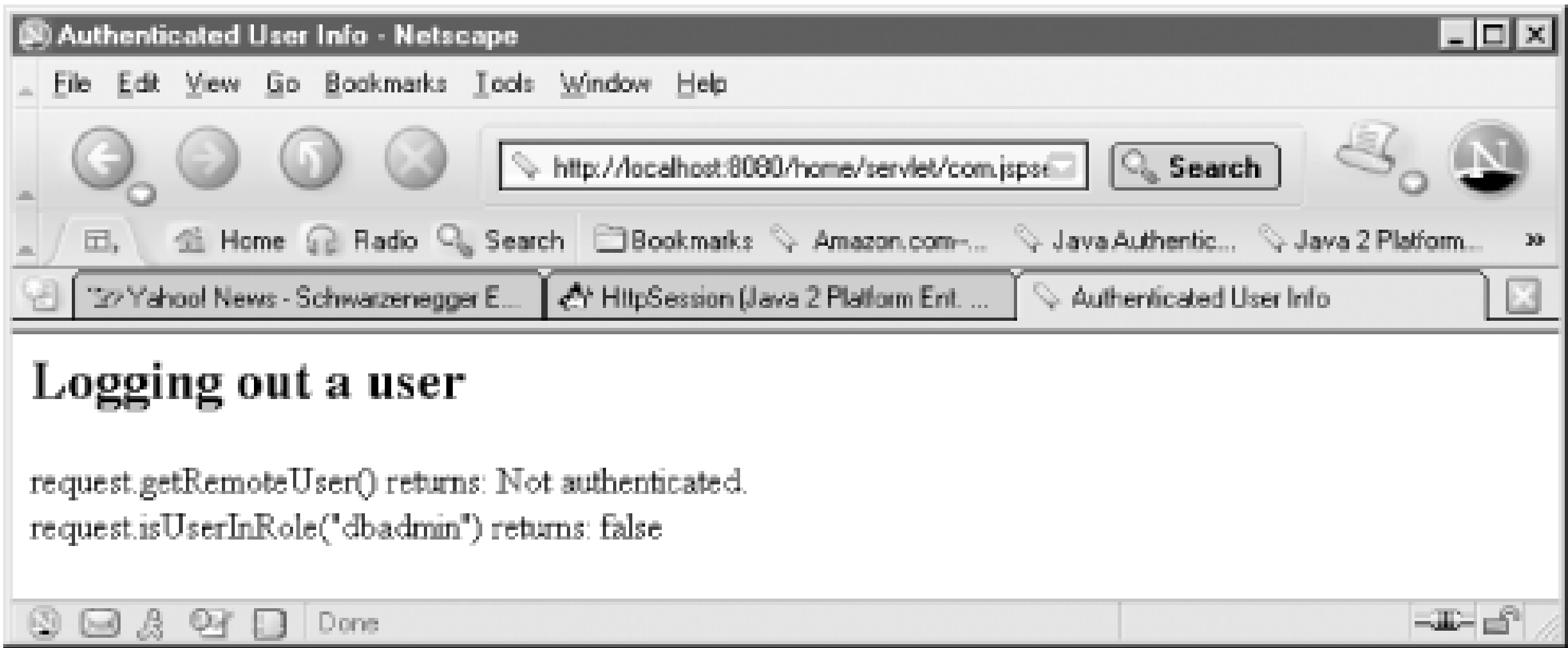
```

A logged-in user who requests this servlet sees the output in [Figure 15-5](#). The servlet displays the return values of `HttpServletRequest.getRemoteUser()` (the username) and `HttpServletRequest.isUserInRole()`. The latter method returns a `boolean` value indicating whether the user is associated with the role specified by the method's `String` parameter.

Figure 15-5. A servlet shows some user-related information before logging out the user

The servlet then invalidates the user's session to log her out. Rerequesting the servlet produces the output shown in [Figure 15-6](#).

Figure 15-6. The servlet's output indicates a logged-out user



See Also

The Tomcat documentation and [Recipe 15.2](#) on setting up SSL for use with authentication: <http://jakarta.apache.org/tomcat/tomcat-4.1-doc/ssl-howto.html>; [Recipe 3.9](#) on restricting requests for certain servlets; [Recipe 15.6](#)-[Recipe 15.9](#) on using JAAS.

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Recipe 15.6 Using JAAS to Create a LoginModule

Problem

You want to use the Java Authentication and Authorization Service (JAAS) to create an authentication module that a servlet or JSP can use.

Solution

Create a `javax.security.auth.spi.LoginModule` class for your application, then store the class under *WEB-INF/classes* or *WEB-INF/lib* (in a JAR file).

Discussion

The JAAS is a security API that can be used to create standalone, pluggable authentication or authorization tools for Java applications. *Pluggable* means that the JAAS security code is not bound to a particular application; it is stored in a JAR file and can be dropped or plugged into web applications and other types of Java programs.

JAAS is a Java version of a framework named Pluggable Authentication Module (PAM). Here's a link to a paper on that very topic:
<http://java.sun.com/security/jaas/doc/pam.html>.

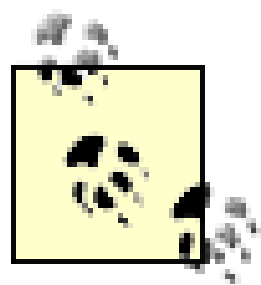
For the sake of clarity, [Recipe 15.5](#)-[Recipe 15.7](#) describe a simple example of JAAS authentication that requires two classes, and one servlet that uses the JAAS API. In our examples, these classes are stored in *WEB-INF/classes*. However, many organizations have a complex security architecture that calls for a more extensive authentication and authorization model, and thus more Java code and objects. In these cases, you'll want to create a separate package name for your JAAS code, archive it in a JAR file, and place it in *WEB-INF/lib* for web applications to use.

Take the following steps to use JAAS for authenticating web clients:

1. Make sure you have installed the JAAS packages for use with a web application. JAAS has been integrated into the Java 2 1.4 SDK, so you can use JAAS if Tomcat or your application server is using this version of Java. See the following web site if you are using Java 1.3, which requires you to download and install JAAS as a Java extension:
<http://java.sun.com/products/jaas/index-10.html>.
2. Create a `LoginModule` class to handle the authentication. This class must be stored in *WEB-*

INF/classes or in a JAR file placed in *WEB-INF/lib*.

3. Create a `CallbackHandler` class that deals with interaction with the client to get its username and password. Store this class with your `LoginModule`.
4. Create a JAAS configuration file that specifies which `LoginModule(s)` you are using for authentication. Place the configuration file in a location where the JAAS-related code can read it (see the description of the configuration file in [Recipe 15.7](#)).
5. Include a `LoginContext` object in servlet code and call its `login()` method.



Authentication checks whether a user or client has a particular identity, which is typically one of a set of usernames and passwords. JAAS can also be used for *authorization*, which specifies the extent of access to data a user has once she is successfully authenticated. This recipe focuses solely on authentication.

In order to make clearer a rather complex matter, I have broken these steps up into three recipes:

- This recipe describes steps 1-3.
- [Recipe 15.6](#) shows how to create the JAAS configuration file.
- [Recipe 15.7](#) uses the JAAS authentication classes in a servlet.

[Example 15-9](#) shows a class that implements the `javax.security.auth.spi.LoginModule` interface. It performs most of the work in identifying clients, and uses packages that are part of the JAAS API (emphasized with bold in the code sample). You have to make this class available to the servlet engine by placing it in *WEB-INF/classes* or in a JAR file stored in *WEB-INF/lib*.

Example 15-9. The LoginModule for web authentication

```
package com.jspervletcookbook;

import java.util.Map;
import java.sql.*;

import javax.naming.Context;
import javax.naming.InitialContext;
import javax.naming.NamingException;

import javax.security.auth.spi.LoginModule;
import javax.security.auth.*;
import javax.security.auth.callback.*;
import javax.security.auth.login.*;

import javax.sql.*;

public class DataSourceLoginModule implements LoginModule {

    //These instance variables will be initialized by the
```

```
//initialize( ) method
CallbackHandler handler;
Subject    subject;
Map        sharedState;
Map        options;

private boolean loginPassed = false;

public DataSourceLoginModule( ){//no-arguments constructor

public void initialize(Subject subject, CallbackHandler handler,
    Map sharedState, Map options){

    this.subject = subject;
    this.handler = handler;
    this.sharedState = sharedState;
    this.options = options;

}

public boolean login( ) throws LoginException {

    String name = "";
    String pass = "";

    Context env = null;
    Connection conn = null;
    Statement stmt = null;
    ResultSet rs = null;
    DataSource pool = null;

    boolean passed = false;

    try{

        //Create the CallBack array to pass to the
        //CallbackHandler.handle( ) method
        Callback[] callbacks = new Callback[2];

        //Don't use null arguments with the NameCallback constructor!
        callbacks[0] = new NameCallback("Username:");

        //Don't use null arguments with PasswordCallback!
        callbacks[1] = new PasswordCallback("Password:", false);

        handler.handle(callbacks);

        //Get the username and password from the CallBacks
        NameCallback nameCall = (NameCallback) callbacks[0];

        name = nameCall.getName( );
```



```
PasswordCallback passCall = (PasswordCallback) callbacks[1];

pass = new String ( passCall.getPassword( ) );

//Look up our DataSource so that we can check the username and
//password
env = (Context) new InitialContext( ).lookup("java:comp/env");

pool = (DataSource) env.lookup("jdbc/oracle-8i-athletes");

if (pool == null)
    throw new LoginException(
        "Initializing the DataSource failed.");

//The SQL for checking a name and password in a table named
//athlete
String sql = "select * from athlete where name='"+name+"'";

String sqlpass = "select * from athlete where passwrд='"+pass+"'";

//Get a Connection from the connection pool
conn = pool.getConnection( );

stmt = conn.createStatement( );

    //Check the username
    rs = stmt.executeQuery(sql);

    //If the ResultSet has rows, then the username was
    //correct and next( ) returns true
    passed = rs.next( );

    rs.close( );

    if (! passed){

        loginPassed = false;
        throw new FailedLoginException(
            "The username was not successfully authenticated");

    }

    //Check the password
    rs = stmt.executeQuery(sqlpass);

    passed = rs.next( );

    if (! passed){

        loginPassed = false;
        throw new FailedLoginException(
            "The password was not successfully authenticated");
```

```
        } else {

            loginPassed = true;
            return true;

        }

    } catch (Exception e){

        throw new LoginException(e.getMessage( ));

    } finally {

        try{

            //close the Statement
            stmt.close( );

            //Return the Connection to the pool
            conn.close( );

        } catch (SQLException sqle){ }

    } //finally

} //login

public boolean commit( ) throws LoginException {

    //We're not doing anything special here, since this class
    //represents a simple example of login authentication with JAAS.
    //Just return what login( ) returned.
    return loginPassed;
}

public boolean abort( ) throws LoginException {

    //Reset state
    boolean bool = loginPassed;
    loginPassed = false;

    return bool;
}

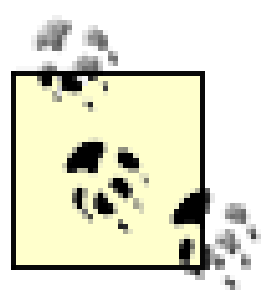
public boolean logout( ) throws LoginException {

    //Reset state
    loginPassed = false;
    return true;

} //logout
```

```
} //DataSourceLoginModule
```

A class that implements `LoginModule` has to implement the interface's five declared methods: `initialize()`, `login()`, `commit()`, `abort()`, and `logout()`. `login()` initiates the main task of checking the username and password and determining whether to successfully authenticate the client. Since this is a simple example, the `DataSourceLoginModule` focuses on the `login()` method. The other methods in [Example 15-9](#) simply reset the object's state so that it can perform another authentication, although a more complex login process involves other tasks, such as setting up authorization-related objects for the authenticated user.



JAAS is a quite comprehensive framework. Refer to Sun Microsystems' documentation (<http://java.sun.com/products/jaas/>) for guidance in developing more advanced JAAS programs than those described in this recipe.

JAAS separates the responsibility for interacting with the client (such as getting the username and password) and performing authentication into `CallbackHandlers` and `LoginModules`, respectively. The `LoginModule` in [Example 15-9](#) uses a `CallbackHandler` to get the username and password, then checks this information by accessing a table from an Oracle 8 database. The module uses a JNDI lookup to get access to the database, which [Chapter 21](#) explains in detail.

Basically, the `LoginModule` borrows a `Connection` from a database-connection pool, uses SQL `SELECT` statements to check the client's name and password, then returns the `Connection` to the shared pool by closing it.

The `CallbackHandler` in [Example 15-10](#) gets the client's username and password from HTTP request parameters. The class's constructor includes a `ServletRequest` argument, from which the class can derive request parameters by calling `ServletRequest`'s `getParameter()` method. This process will become much clearer when you see how the servlet (see [Example 15-11](#) in [Recipe 15.7](#)) uses these classes to perform the authentication.

Example 15-10. A CallbackHandler for use in web authentication

```
package com.jspervletcookbook;

import javax.security.auth.callback.*;
import javax.servlet.ServletRequest;

public class WebCallbackHandler implements CallbackHandler {

    private String userName;
    private String password;

    public WebCallbackHandler(ServletRequest request){

        userName = request.getParameter("userName");
        password = request.getParameter("password");

    }
}
```



```

public void handle(Callback[] callbacks) throws java.io.IOException,
    UnsupportedCallbackException {

    //Add the username and password from the request parameters to
    //the Callbacks
    for (int i = 0; i < callbacks.length; i++){

        if (callbacks[i] instanceof NameCallback){

            NameCallback nameCall = (NameCallback) callbacks[i];

            nameCall.setName(userName);

        } else if (callbacks[i] instanceof PasswordCallback){

            PasswordCallback passCall = (PasswordCallback) callbacks[i];

            passCall.setPassword(password.toCharArray( ));

        } else{

            throw new UnsupportedCallbackException (callbacks[i],
                "The CallBacks are unrecognized in class: "+getClass( ).
                getName( ));

        }

    } //for
} //handle
}

```

Just to summarize how the `LoginModule` and `CallbackHandler` fit together before you move on to the next two recipes, one of the `LoginContext`'s constructors takes a `CallbackHandler` as its second parameter, as in the following code:

```

WebCallbackHandler webcallback = new WebCallbackHandler(request);
LoginContext lcontext = null;

try{

    lcontext = new LoginContext( "WebLogin",webcallback );
} catch (LoginException le) { //respond to exception...}

```

[Recipe 15.7](#) shows how to create a JAAS configuration file, which specifies the `LoginModule`(s) that certain applications will use during authentication.

See Also

Sun Microsystems' JAAS developer's guide:

<http://java.sun.com/j2se/1.4.2/docs/guide/security/jaas/JAASLMDevGuide.html>; a list of JAAS

tutorials and sample programs:
<http://java.sun.com/j2se/1.4.2/docs/guide/security/jaas/JAASRefGuide.html>; the Javadoc relating to JAAS configuration files:
<http://java.sun.com/j2se/1.4.1/docs/api/javax/security/auth/login/Configuration.html>; [Recipe 15.9](#) on using JAAS with a JSP.

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Recipe 15.7 Creating the JAAS Configuration File

Problem

You want to create the JAAS configuration file.

Solution

Create the configuration file, then specify the configuration's location on your filesystem in the *`${java.home}/jre/lib/security/java.security`* file.

Discussion

Using JAAS also involves writing a configuration file to identify the `LoginModule`(s) that a particular application will use. The configuration file in [Example 15-11](#) specifies an application named "WebLogin."

Example 15-11. A JAAS configuration file

```
WebLogin {  
    com.jspServletcookbook.DataSourceLoginModule requisite;  
};
```

Although only one module is specified in this recipe, one of the powerful features of the JAAS security design is to use multiple `LoginModules` or layers in order to authenticate users. A user might have to be authenticated in several ways before she gains access to web components and data (e.g., first her irises are scanned, then she must specify a username and password).

The configuration file specifies:

- The fully qualified class name of the `LoginModule`(s).
- A "Flag" value, which is just a constant expression such as "required" or "requisite." The example uses "requisite." [Table 15-1](#) describes the different Flag values.
- One or more "options" ([Example 15-11](#) does not identify any options). The options represent a space-separated list of name/value pairs, such as `debug="true"` (you can use any name/value pairing you want). The options allow the configuration file to pass properties and values to the underlying `LoginModule`.

Table 15-1. Flag values for JAAS configuration files

Flag name	Description
Required	The <code>LoginModule</code> is required to succeed, and overall authentication fails if a <code>LoginModule</code> marked "required" fails. However, if a failure occurs, authentication still continues down the <code>LoginModule</code> list.
Requisite	The <code>LoginModule</code> is required to succeed, and runtime control returns to the application (rather than continuing with any other listed <code>LoginModules</code>) if authentication failure occurs.
Sufficient	If the <code>LoginModule</code> succeeds, control returns to the application and does <i>not</i> continue with any other listed <code>LoginModules</code> . If an authentication failure occurs, authentication continues with any other <code>LoginModule</code> . In other words, the failure of this <code>LoginModule</code> does not automatically lead to the failure of overall authentication, as in "required" or "requisite."
Optional	Success is not required with this <code>LoginModule</code> . If authentication success or failure occurs, authentication continues with any other listed <code>LoginModules</code> .

The basic structure of the configuration file looks like this:

```
ApplicationName{  
  
    ModuleName Flag Options;  
    ModuleName Flag Options;  
    ModuleName Flag Options;  
};  
  
AnotherApplication{  
  
    ModuleName Flag Options;  
    ModuleName Flag Options;  
};
```

Again, you do not have to use multiple `LoginModules`.

See this Javadoc page for more details on configuration:
<http://java.sun.com/j2se/1.4.1/docs/api/javax/security/auth/login/Configuration.html>.

How does the JAAS implementation find the configuration file? The directory `${java.home}/jre/lib/security` contains a file named `java.security`. This is a "properties" or "policy" file in Java security parlance—a text file containing name/value pairs. The following line of text provides the location of the JAAS configuration file for the authentication servlet of [Example 15-11](#):

```
login.config.url.1=file:h:/home/.java.login.config
```

If you have other JAAS configuration files that you want to combine with this one, use syntax similar to `login.config.url.2=file:h:/home/.my.config` (note the incremented number `2`), placed within the *java.security* file.



You can use any filenaming convention; the configuration filename does not have to begin with a period.

A single JAAS configuration file can specify the `LoginModule`(s) for multiple application names. [Recipe 15.8](#) shows a servlet that uses the `LoginModule` described in [Recipe 15.5](#).

See Also

Sun Microsystems' JAAS developer's guide:

<http://java.sun.com/j2se/1.4.2/docs/guide/security/jaas/JAASLMDevGuide.html>; a list of JAAS tutorials and sample programs:

<http://java.sun.com/j2se/1.4.2/docs/guide/security/jaas/JAASRefGuide.html>; the Javadoc relating to JAAS configuration files:

<http://java.sun.com/j2se/1.4.1/docs/api/javax/security/auth/login/Configuration.html>; [Recipe 15.8](#) on using JAAS with a servlet; [Recipe 15.9](#) on using JAAS with a JSP.

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Recipe 15.8 Using JAAS in a Servlet

Problem

You want to authenticate servlet clients with JAAS.

Solution

Create a JavaBean that wraps the functionality of the JAAS API classes that you have included in your web application.

Discussion

Using JAAS in a servlet requires that you have a `LoginModule` installed in your web application, either in *WEB-INF/classes* or stored in a JAR file in *WEB-INF/lib*.

[Example 15-12](#) shows a servlet named `LoginServlet` that implements JAAS authentication. This servlet uses the `CallbackHandler` described in [Recipe 15.5](#). This `CallbackHandler` must also be placed in *WEB-INF/classes* or included in a JAR stored in *WEB-INF/lib*. A browser request for this servlet looks like:

```
http://localhost:8080/home/servlet/com.jspervletcookbookLoginServlet?
userName=Bruce%20W%20Perry&password=bwp1968
```

Use a `POST` request from an HTML form in conjunction with SSL ([Recipe 15.2](#)) if you want to use the much more secure strategy of keeping usernames and passwords out of visible URLs.

Example 15-12. A servlet for authenticating and logging in clients

```
package com.jspervletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

import javax.security.auth.login.LoginContext;
import javax.security.auth.login.LoginException;
import javax.security.auth.callback.CallbackHandler;

public class LoginServlet extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
```

```

throws ServletException, java.io.IOException {

//The CallbackHandler gets the username and password from
//request parameters in the URL; therefore, the ServletRequest is
//passed to the CallbackHandler constructor
WebCallbackHandler webcallback = new WebCallbackHandler(request);

LoginContext lcontext = null;

boolean loginSuccess = true;

try{

    lcontext = new LoginContext( "WebLogin",webcallback );

    //this method throws a LoginException
    //if authentication is unsuccessful
    lcontext.login( );

} catch (LoginException lge){

    loginSuccess = false;

}

response.setContentType("text/html");

java.io.PrintWriter out = response.getWriter( );

out.println(
"<html><head><title>Thanks for logging in</title>"+
"</head><body>");

out.println("<h2>Your logged in status</h2>");

out.println(""+ ( loginSuccess ? "Logged in" :
    "Failed Login" ));

out.println("</body></html>");

} //doGet

public void doPost(HttpServletRequest request,
    HttpServletResponse response) throws ServletException,
    java.io.IOException {

    doGet(request,response);

} //doPost

} //LoginServlet

```

This servlet:

1. Creates a `WebCallbackHandler` ([Example 15-10](#)) and passes the `ServletRequest` into the constructor (from where the `CallbackHandler` gets the client's name and password).
2. Creates a `LoginContext` object with two constructor parameters: the name of the login application (from our configuration file in [Recipe 15.6](#), "WebLogin") and the `WebCallbackHandler` object.
3. Calls the `LoginContext`'s `login()` method, which beneath the surface calls the `DataSourceLoginModule`'s `login()` method (from [Example 15-9](#)), in order to perform authentication.

[Figure 15-7](#) shows the web browser output when an attempted login using this servlet succeeds.

Figure 15-7. The LoginServlet signals success



See Also

[Recipe 15.6](#) on creating a JAAS `LoginModule`; [Recipe 15.7](#) on creating the JAAS configuration file; [Chapter 21](#) on accessing databases with servlets; Sun Microsystems' JAAS developer's guide: <http://java.sun.com/j2se/1.4.2/docs/guide/security/jaas/JAASLMDevGuide.html>; a list of JAAS tutorials and sample programs: <http://java.sun.com/j2se/1.4.2/docs/guide/security/jaas/JAASRefGuide.html>; the Javadoc relating to JAAS configuration files: <http://java.sun.com/j2se/1.4.1/docs/api/javax/security/auth/login/Configuration.html>; [Recipe 15.9](#) on using JAAS with a JSP.

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Recipe 15.9 Using JAAS in a JSP

Problem

You want to use a JSP and JAAS to authenticate clients.

Solution

Create a JavaBean that wraps the functionality of the JAAS API classes that you have included in your web application.

Discussion

Recipe 15.5 -Recipe 15.7 cover the JAAS basics, so this recipe focuses on adapting a JSP to the JAAS security API.

The JSP in this recipe uses a JavaBean to perform the login.

The JavaBean in Example 15-13 has two properties (in the form of instance variables): a `ServletRequest` and a `boolean` value indicating whether the name and password have passed the login test. The bean passes the `ServletRequest` to the `WebCallbackHandler` constructor; the `WebCallbackHandler` ultimately extracts the username and password from request parameters.

Example 15-13. A JavaBean uses the JAAS API to perform authentication

```
package com.jspervletcookbook;

import javax.servlet.ServletRequest;

import javax.security.auth.login.LoginContext;
import javax.security.auth.login.LoginException;

public class LoginBean {

    //private bean instance variables or properties
    private ServletRequest req;
    boolean loginSuccess;

    public LoginBean( ){ } //bean's no-args constructor

    public boolean getLoginSuccess( ) throws LoginException {

        //the ServletRequest property has to be set before this
```



```

//method is called, because that's where we get the
//username and password from

if (req == null)
    throw new IllegalStateException(
        "The ServletRequest cannot be null in getLogin( )");

WebCallbackHandler webcallback = new WebCallbackHandler(req);

try{

    LoginContext lcontext = new LoginContext(
        "WebLogin",webcallback);

    //Call the LoginContext's login( ) method; if it doesn't
    //throw an exception, the method returns true
    lcontext.login( );

    return true;

} catch (LoginException lge){

    //login failed because the LoginContext.login( ) method
    //threw a LoginException
    return false;

}

} //getLoginSuccess

public void setReq(ServletRequest request) {

    if (request == null)
        throw new IllegalArgumentException(
            "ServletRequest argument was null in: "+
            getClass( ).getName( ));

    this.req = request;

} //setReq

} // LoginBean

```

The bean depends on its `ServletRequest` property being set properly before the `getLoginSuccess()` method is called. This method performs the login by using the familiar `LoginContext` class and its `login()` method (that is, familiar if you read Recipe 15.5!).

The Java object using the bean knows that the login succeeded or failed based on the `boolean` return value of the `getLoginSuccess()` method. The object using the bean in this case is a servlet instance originating from the JSP in Example 15-14 .

The JSP includes the `jsp:useBean` standard action to create an instance of the `LoginBean` (in a

variable named `jaasBean`). Then the code uses JSTL tags to:

1. Set the bean's `ServletRequest` property (named `req`) to the current request (using `c:set`).
2. Find out whether the login succeeded by using the EL syntax to call the bean's `getLoginSuccess()` method.



This recipe combines many Java-related technologies. See Chapter 23 for a description of the JSTL and its associated EL syntax.

Example 15-14. A JSP that logs in users using the JAAS API and a JavaBean

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<html>
<head><title>Authenticating JSP</title></head>
<body>
<h2>Here is your login status...</h2>

<jsp:useBean id="jaasBean" class="com.jspervletcookbook.LoginBean" />

<!-- The bean's 'req' property is set using the 'request' property of the Expression
Language's pageContext implicit object -->

<c:set target="${jaasBean}" value="${pageContext.request}"
property="req"/>

<c:choose>

    <c:when test="${jaasBean.loginSuccess}">
        Logged in successfully.
    </c:when>

    <c:otherwise>
        Login failed.
    </c:otherwise>

</c:choose>

</body>
</html>
```

The `LoginBean` has a `getLoginSuccess()` method that returns `false` if the login fails, and `true` if it succeeds. With the EL, you can call any of a bean's accessor methods with the terminology:

bean name.bean property name

The *bean property name* part represents the actual property name, not the name of the method, even though the end result of using this syntax is that the accessor method associated with that property gets called. Therefore, Example 15-14 gets the return value of the `getLoginSuccess()` method by using:

```
${jaasBean.loginSuccess}
```

If this expression returns `true` , the JSP displays the text "Logged in successfully." Otherwise, it shows "Login failed."

Figure 15-8 shows the JSP's browser display when a login fails.

Figure 15-8. A JSP signals a login failure



See Also

Recipe 15.6 on creating a JAAS `LoginModule` ; Recipe 15.7 on creating the JAAS configuration file; Recipe 15.8 on using JAAS with a servlet; Chapter 23 on the JSTL; Sun Microsystems' JAAS developer's guide: <http://java.sun.com/j2se/1.4.2/docs/guide/security/jaas/JAASLMDevGuide.html> ; a list of JAAS tutorials and sample programs: <http://java.sun.com/j2se/1.4.2/docs/guide/security/jaas/JAASRefGuide.html> ; the Javadoc relating to JAAS configuration files: <http://java.sun.com/j2se/1.4.1/docs/api/javax/security/auth/login/Configuration.html> .

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Chapter 16. Binding, Accessing, and Removing Attributes in Web Applications

[Introduction](#)

[Recipe 16.1. Setting ServletContext Attributes in Servlets](#)

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[Recipe 16.4. Accessing or Removing ServletContext Attributes in JSPs](#)

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[Recipe 16.7. Accessing or Removing Session Attributes in Servlets](#)

[Recipe 16.8. Accessing or Removing Session Attributes in JSPs](#)

[Recipe 16.9. Setting Request Attributes in Servlets](#)

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[Recipe 16.12. Accessing or Removing Request Attributes in JSPs](#)

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Introduction

An *attribute* is a Java object that servlet code can *bind*, or store, in a certain scope, such as a `ServletContext`, a session, or a request. The object can temporarily store and share a small piece of data in a way that is not otherwise available to servlet developers. Then, when the application no longer has use for the object, your code can remove, or *unbind* it, and the web container makes the object available for garbage collection.

This chapter describes how to work with attributes in all three scopes: `ServletContext`, session, and request. If you need to make an object available to all of the servlets and JSPs in a context, then you can bind the object to a `ServletContext`. If the application calls for an object such as a "shopping cart" to be bound to a session (see [Chapter 11](#)), you can set the object as a session attribute. Finally if the application requires two servlets that communicate via a `RequestDispatcher` to share an object, then the servlets can use an object attribute bound to a request scope.



Since sessions and requests are associated with numerous users in a busy web application, developers have to pay attention to the size and resource use of any objects that are bound as attributes to requests or sessions.

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Recipe 16.1 Setting ServletContext Attributes in Servlets

Problem

You want to make an object available to all servlets in a context or web application.

Solution

Bind an object to the `ServletContext` using the `javax.servlet.ServletContext.setAttribute()` method.

Discussion

A `ServletContext` attribute is available to all servlets and JSPs in a context or web application. Here are the steps to bind an object to a `ServletContext` :

1. Create the Java class that you want to bind to a `ServletContext` .
2. Place the class in the *WEB-INF/classes* directory, including the necessary package-related directories. You can also store the class in a JAR file in *WEB-INF/lib* .
3. Create a servlet that binds the object to the `ServletContext` using the `javax.servlet.ServletContext.setAttribute()` method.
4. Access the object using `ServletContext.getAttribute()` in (other) servlets whenever it is needed.

I'll first show the object that this recipe binds to the `ServletContext` . The recipe then demonstrates a servlet that stores the object attribute in the `ServletContext` . Example 16-1 shows a simple object wrapped around a `java.util.Map` type. Use the `Map` to store a characteristic of each request made to the web application. In this example, each `Map` key is the IP address of the client making the request. Each `Map` value is the date it requested the servlet.

Example 16-1. The object that a servlet binds to the `ServletContext`

```
package com.jspservletcookbook;

import java.util.Collections;
import java.util.HashMap;
import java.util.Iterator;
import java.util.Map;
import java.util.Set;

public class ContextObject {
```

```

    private Map map;

    public ContextObject( ){

        map = Collections.synchronizedMap(new HashMap( ));
    }

    public void put(Object key, Object value){

        if (key == null || value == null)
            throw new IllegalArgumentException(
                "Invalid parameters passed to ContextObject.put");

        map.put(key,value);
    }

    public String getValues( ){

        StringBuffer buf = new StringBuffer("");
        Set set = map.keySet( );

        //you have to explicitly synchronize when an Iterator is used
        synchronized(map) {

            Iterator i = set.iterator( );

            while (i.hasNext( ))
                buf.append((String) i.next( ) + "<br>");
        }//synchronized

        return buf.toString( );
    }

    public String toString( ){

        return getClass( ).getName( ) + "[ " +map+ " ]";

    }//toString
}

```

The `ContextObject` class has methods to add keys and values to the `Map` (`put(Object key , Object value)`) as well as to output the `Map`'s current key values (`getValues()`). The `Map` is synchronized, which is essentially thread-safe; it is created in the `ContextObject`'s constructor in the following manner:

```
map = Collections.synchronizedMap(new HashMap( ));
```




When you generate a `Map` using the static `java.util.Collections.synchronizedMap()` method, only one thread at a time can call the `Map`'s methods. This is important with `ServletContext` attributes that may be accessed by several servlets and/or multiple threads at the same time.

Example 16-2 shows the skeleton of the `ContextBinder` servlet that binds an instance of the `ContextObject` class in Example 16-1 to the `ServletContext`.

Example 16-2. A servlet binds an object to the ServletContext

```
package com.jspervletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

public class ContextBinder extends HttpServlet {

    public void doGet(HttpServletRequest request, HttpServletResponse response) throws
        ServletException, java.io.IOException {

        //bind an object to the ServletContext
        getServletContext().setAttribute(
            "com.jspervletcookbook.ContextObject", new ContextObject( ));

        //display some HTML
        ...
    } //end doGet
}
```

The servlet method `getServletContext()` returns a `javax.servlet.ServletContext` instance. You then call that instance's `setAttribute()` method with the `String` attribute name and the bound object as parameters. As a convention, you should consider naming attributes after their fully qualified class name-in this case, "com.jspervletcookbook.ContextObject."

See Also

Recipe 16.2 on setting `ServletContext` attributes in JSPs; Recipe 16.3 on accessing or removing a `ServletContext` attribute; Recipe 16.5 -Recipe 16.8 on handling session attributes in servlets and JSPs; Recipe 16.9 -Recipe 16.12 on handling request attributes in servlets and JSPs; Recipe 14.5 on using a `ServletContext` event listener; the Javadoc for `javax.servlet.ServletContextAttributeListener` : <http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/ServletContextAttributeListener.html> .

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Recipe 16.2 Setting ServletContext Attributes in JSPs

Problem

You want to store an object attribute in the `ServletContext` using a JSP.

Solution

Use the JSTL `c:set` tag to bind an object to `application` scope. The JSTL uses the `application` implicit object to represent the `ServletContext`, which is also the scope used for the object attributes discussed in the previous recipe.

Discussion

JSP developers can use the JSTL core tags and the `jsp:useBean` standard action to implement the same functionality as the servlet in [Recipe 16.1](#). Like the program in that recipe, the upcoming JSP stores in the `ServletContext` an object attribute that contains a `java.util.Map` type. The `Map` stores key/value pairs that are accessed by other servlets or JSPs in the same context.

Here are the steps to bind an attribute to the `ServletContext` using a JSP:

1. Create the Java class that you will instantiate and bind to the `ServletContext`.
2. Place the Java class in the `WEB-INF/classes` directory, including any package-related directories (if the class is named `com.jspservletcookbook.ContextObject` then place the class in `WEB-INF/classes/com/jpservletcookbook`), or in `WEB-INF/lib` if the class is stored in a JAR file.
3. Create the JSP that will bind the object attribute to the `ServletContext`. Store the JSP in the web application's top-level directory.
4. If the web container does not already provide the JSTL-related components, include them in `WEB-INF/lib` (see [Chapter 23](#)) so that the JSP can use these tag libraries.

First I show the object attribute that the JSP binds to the `ServletContext`. [Example 16-3](#) is the same Java class as [Example 16-1](#), except for the `getMap()` method, which returns the `Map` type that this object uses to store information. I added this method to make the `Map` available to the `c:set` core tag (see [Example 16-4](#)). Because the two code samples are exactly the same except for the `getMap()` method, [Example 16-3](#) has been abbreviated to show just the creation of the synchronized map and its getter method (see [Example 16-1](#) for the other parts of the class).

Example 16-3. The object attribute bound to the `ServletContext` by a JSP

```

package com.jspServletcookbook;

import java.util.Collections;
import java.util.HashMap;
import java.util.Iterator;
import java.util.Map;
import java.util.Set;

public class ContextObject {

    private Map map;

    public ContextObject( ){

        map = Collections.synchronizedMap(new HashMap( ));
    }

    public Map getMap( ){

        return map;

    }
// see Example 16-1 for the other parts of the class
}

```

[Example 16-4](#) does the work of creating an instance of the object attribute and then binding the attribute to the `ServletContext`. The code creates the `ContextObj` instance (which is stored in the `ServletContext`) with the `jsp:useBean` standard action. Then the `c:set` JSTL core tag stores this object in `application` scope, which is an alias for the `ServletContext`. The `ContextObj` class stores information with a `Map` type that it contains. This code in [Example 16-4](#) stores data in the `ServletContext` attribute:

```

<c:set target=
    "${applicationScope["com.jspServletcookbook.ContextObject"].map}"
    value="${date}" property="${pageContext.request.remoteAddr}"/>

```

The value of the `target` attribute has the effect of calling `getMap()` on the `ContextObj` object. The code then creates a new key-value pair in the `Map`, consisting of the remote IP address of the client making the request (the key) and the current date (the value). I chose this information at random to demonstrate how to store pieces of data in a `ServletContext` attribute using the JSTL and JSPs. Your own code may store data of practical value to your application such as a customer's unique ID and the item that he is purchasing.

Example 16-4. The contextBind.jsp file

```

<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<html>
<head><title>Context binding JSP</title></head>
<body>

```



```
<h2>Here is the bound ContextObject</h2>
```

```
//create an instance of ContextObject; store it as a Page scoped attribute
<jsp:useBean id="contextObj" class=
    "com.jspServletcookbook.ContextObject" />

//create an instance of Date; store it as a Page scoped attribute
<jsp:useBean id="date" class="java.util.Date" />

//bind the object to the ServletContext represented by the
//'application' implicit object
<c:set var=
    "com.jspServletcookbook.ContextObject" value="${contextObj}" scope=
    "application" />

//create a new key/value pair in the bound object's Map
<c:set target=
    "${applicationScope["com.jspServletcookbook.ContextObject"].map}"
    value="${date}" property="${pageContext.request.remoteAddr}" />

</body>
</html>
```

After looking at this code, you may wonder why the `ContextObject` variable is effectively named twice, once by `jsp:useBean` when it creates the object (giving the object an `id` or name `contextObj`) and again by `c:set` when it binds the object to the `ServletContext` (and creating the name `com.jspServletcookbook.ContextObject`).

By convention, you should name the attribute after its fully qualified class name. However, you cannot use this format with `jsp:useBean`, because this action creates a Java variable in the underlying servlet. The Java variable is named `contextObj`.

The JSP container creates a servlet behind the scenes to implement each JSP page.

You cannot include period (.) characters when naming Java variables, so the code renames the object in `c:set`'s `var` attribute when the object is bound to the `ServletContext`.

See Also

[Chapter 23](#) on using the JSTL; [Recipe 16.1](#) on setting `ServletContext` attributes in servlets; [Recipe 16.4](#) on accessing or removing a `ServletContext` attribute in a JSP; [Recipe 16.5-Recipe 16.8](#) on handling session attributes in servlets and JSPs; [Recipe 16.9-Recipe 16.12](#) on handling request attributes in servlets and JSPs; [Recipe 14.5](#) on using a `ServletContext` event listener; the Javadoc for `javax.servlet.ServletContextAttributeListener`: <http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/ServletContextAttributeListener.html>.

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Recipe 16.3 Accessing or Removing ServletContext Attributes in Servlets

Problem

You want to access a `ServletContext` attribute to work with it in code, or completely remove it.

Solution

Use the `ServletContext.getAttribute(String attributeName)` method to access the attribute. Use the `ServletContext.removeAttribute(String attributeName)` method to remove the attribute from the `ServletContext`.

Discussion

The code in [Example 16-5](#) gets the `ServletContext` attribute and stores it in a local variable. Then the code adds a new key/value to the attribute (which contains a `java.util.Map` type for storing the keys and values). Later, the servlet prints out a list of the attribute's keys, which are IP addresses associated with requests to the servlet.

Example 16-5. Accessing a ServletContext attribute in a servlet

```
package com.jspervletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

public class ContextAccessor extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        //get a ServletContext attribute
        ContextObject contextObj = (ContextObject)
            getServletContext( ).getAttribute(
                "com.jspervletcookbook.ContextObject");

        if (contextObj != null)
            contextObj.put(request.getRemoteAddr( ), ""+
```

```

        new java.util.Date( ));

//display the context attribute values
response.setContentType("text/html");
java.io.PrintWriter out = response.getWriter( );
out.println(
    "<html><head><title>Context Attribute</title></head><body>");

    if (contextObj != null){
        out.println("<h2>ServletContext Attribute Values</h2>");
        out.println(contextObj.getValues( ));
    } else {
        out.println("<h2>ServletContext Attribute is Null</h2>");
    }
    out.println("</body></html>");
} //end doGet
}

```

[Example 16-1](#) in [Recipe 16.1](#) shows the `ContextObject` source code. Here, the `ContextObject put()` method passes its key and value parameters to the `Map` method of the same name, except that the `ContextObject put()` method does not allow `null` values for either its keys or values.

If you want to remove the same attribute that was bound by this recipe, call the `ServletContext.removeAttribute()` method with the attribute name as a parameter:

```

getServletContext( ).removeAttribute(
    "com.jspservletcookbook.ContextObject");

```

After the attribute removal code executes, any further calls to `ServletContext.getAttribute()` using the same attribute name will return `null`.

See Also

[Recipe 16.1](#) and [Recipe 16.2](#) on setting `ServletContext` attributes in servlets and JSPs; [Recipe 16.5-Recipe 16.8](#) on handling session attributes in servlets and JSPs; [Recipe 16.9-Recipe 16.12](#) on handling request attributes in servlets and JSPs; [Recipe 14.5](#) on using a `ServletContext` event listener; the Javadoc for `javax.servlet.ServletContextAttributeListener`: <http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/ServletContextAttributeListener.html>.

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Recipe 16.4 Accessing or Removing ServletContext Attributes in JSPs

Problem

You want to access or remove a `ServletContext` attribute in a JSP.

Solution

Use the `c:out` JSTL core tag to display the value of an attribute and the `c:remove` tag to remove the attribute from the `ServletContext`.

Discussion

By now you are probably familiar with the object attribute that the previous recipes stored in the `ServletContext` under the name `com.jspserveletcookbook.ContextObject`. If you are not, [Recipe 16.1](#) and [Recipe 16.2](#) show the source code for this class and how it is bound as an attribute to a servlet and a JSP. This recipe shows the JSTL tags that you can use in JSP code to access this attribute and optionally remove or unbind it.

[Example 16-6](#) includes the `taglib` directive that is required for using JSTL 1.0 tags in a JSP. The `c:out` tag then accesses the `ServletContext` attribute in the tag's `value` attribute. The tag gets the value of the `ServletContext` attribute by using the `applicationScope` JSTL implicit object, which is a `java.util.Map` type.

Example 16-6. Accessing an application attribute in a JSP

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
//HTML or other presentation code here...
<c:out value=
    "${applicationScope["com.jspserveletcookbook.ContextObject"].values}"
    escapeXml="false" />
```

An implicit object is an object that the JSTL automatically makes available to the developer. You use the term `applicationScope` within `${...}` characters, and this term evaluates to a `java.util.Map` of any object attributes that are bound to the `ServletContext`.

The code:


```
${applicationScope["com.jspserveletcookbook.ContextObject"].values}
```

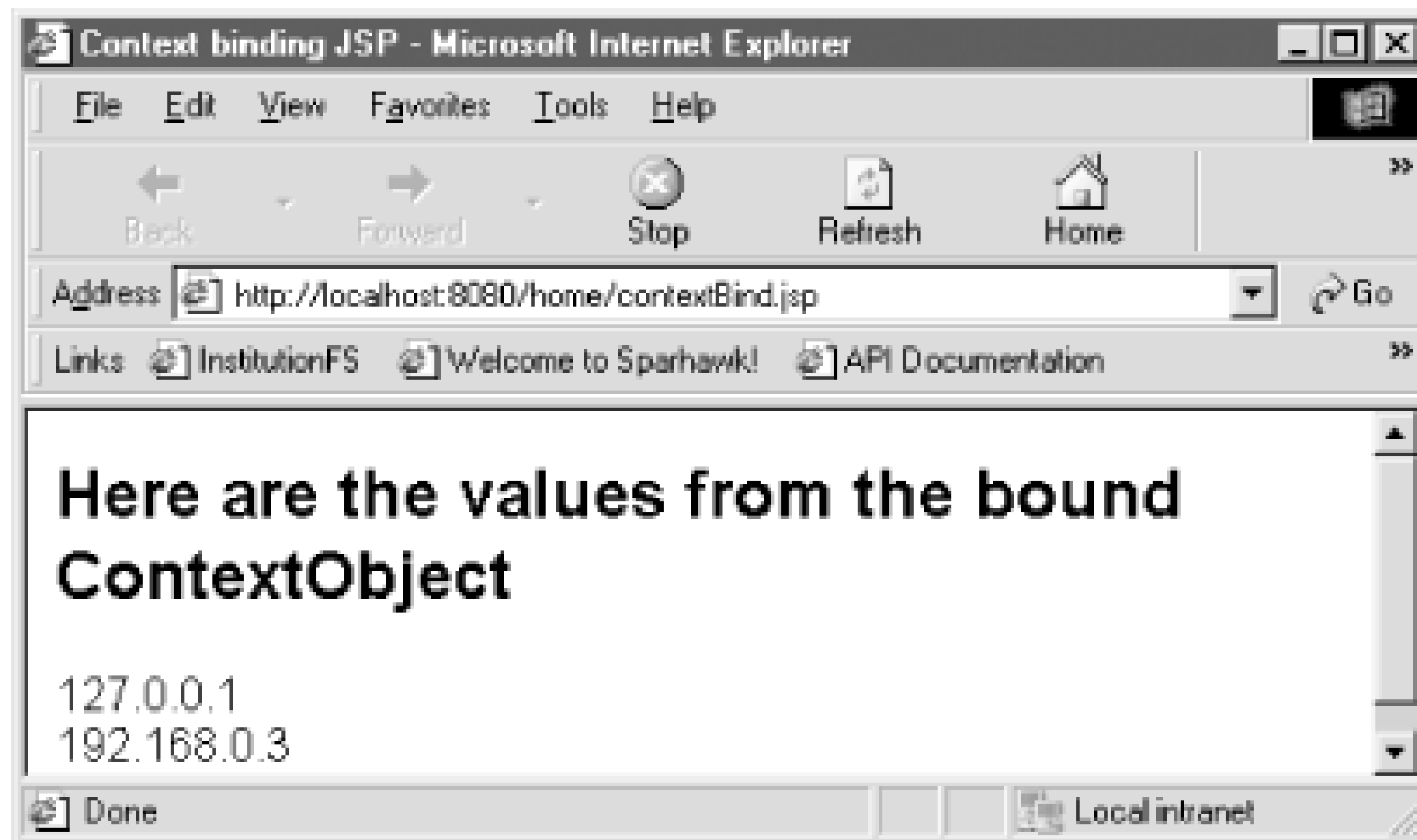
uses EL syntax to access the `ServletContext` attribute named `com.jspserveletcookbook.ContextObject` and get its `values` property, which effectively calls the `getValues()` method on the `ContextObject` object. This method displays all the keys of the `Map` contained by `ContextObject`, separated by an HTML line break (`
`). The attribute `escapeXml="false"` prevents the `<` and `>` characters in `
` from being escaped (and being replaced by `<` and `>`, respectively), which would prevent its proper display in a web browser.



If I wanted to make the `ContextObject` more universal, I could include a JavaBean property allowing the user of the class to set the line separator, so that the output of the `getValues()` method could be used in different contexts, not just HTML.

[Figure 16-1](#) shows the result of accessing a JSP that uses this code in a browser.

Figure 16-1. Accessing a ServletContext bound attribute in a JSP



To remove the attribute from the `ServletContext`, use the `c:remove` JSTL tag. This tag removes the named variable from the specified scope:

```
<c:remove var=
    "com.jspserveletcookbook.ContextObject" scope="application" />
```

`application` is an alias for the `ServletContext`. After a JSP that contains this tag is executed, any further attempts to access a `ServletContext` attribute of the same name will return `null`.

See Also

[Chapter 23](#) on using the JSTL; [Recipe 16.1](#) and [Recipe 16.2](#) on setting `ServletContext` attributes in servlets and JSPs; [Recipe 16.3](#) on accessing or removing `ServletContext` attributes in servlets; [Recipe 16.5-Recipe 16.8](#) on handling session attributes in servlets and JSPs; [Recipe 16.9-Recipe](#)

[16.12](#) on handling request attributes in servlets and JSPs; [Recipe 14.5](#) on using a `ServletContext` event listener; the Javadoc for `javax.servlet.ServletContextAttributeListener`:
<http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/ServletContextAttributeListener.html>.

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Recipe 16.5 Setting Session Attributes in Servlets

Problem

You want to store an object attribute in a session.

Solution

Use the `javax.servlet.http.HttpSession` class's `setAttribute()` method.

Discussion

The mechanism for placing object attributes in sessions is very similar to storing objects in the `ServletContext`, which Recipe 16.1 described. The difference lies in the scope of the objects; in other words, which users and how many concurrent users can access the bound objects.

A *session* represents the interaction of a user with a web site. The sequence of web pages or component that a single user requests from a web site represents a single session (detailed in Chapter 11). Therefore, when you store an object instance in a session attribute, every user who participates in sessions interacts with his own instance of that object attribute. With `ServletContext` attributes, however, all of the application's users interact with the same attribute instance, since each web application has only one `ServletContext` and each context is associated with one attribute instance.

A distributed web application has one `ServletContext` instance per Java virtual machine (JVM). Instead of using the `ServletContext` to store information globally for the application, the `ServletContext` Javadoc makes brief mention of using a database instead, to ensure that servlets in a distributed application are accessing the same data. See the `ServletContext` Javadoc at:
<http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/ServletContext.html>.

A shopping cart storing a user's item choices is an example of an object that web developers typically store as a session attribute. Example 16-7 shows a fragment of servlet code for storing an object in a session.

Example 16-7. Storing an object attribute in a session

```
<!-- this code appears in the servlet's doGet or doPost method, whichever is appropriate -->

//Create a session if one does not exist yet
HttpSession session = request.getSession( );

//bind an object attribute in the session
```

```
if (session != null)
    session.setAttribute(
        "com.jspServletcookbook.ContextObject", new ContextObject( ));
```

Gain access to a session in a servlet by using the `javax.servlet.http.HttpServletRequest` object's `getSession()` method. Then call `HttpSession.setAttribute()`, passing in the name of the attribute and an instance of the object attribute. The code in Example 16-7 uses the same `ContextObject` that Example 16-1 showed (Recipe 16.1). The `ContextObject` uses a synchronized `java.util.Map` type to handle multiple threads that might be using the attribute concurrently.



Pay attention to the possibility of multiple threads accessing a session object attribute. According to the servlet specification v2.4 (Chapter SRV.7.7.1), "Multiple servlets executing request threads may have active access to a single session object at the same time. The developer has the responsibility for synchronizing access to session resources as appropriate."

See Also

Recipe 16.1 -Recipe 16.4 on handling `ServletContext` attributes in servlets and JSPs; Recipe 16.7 on accessing or removing session attributes in servlets; Recipe 16.6 and Recipe 16.8 on handling session attributes in JSPs; Recipe 16.9 -Recipe 16.12 on handling request attributes in servlets and JSPs; Recipe 14.6 on using a session event listener; the Javadoc for `javax.servlet.http.HttpSessionAttributeListener` : <http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/http/HttpSessionAttributeListener.html> .

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Recipe 16.6 Setting Session Attributes in JSPs

Problem

You want to bind an object to a session in a JSP.

Solution

Use the `jsp:useBean` and `c:set` tags to create an instance of an object and assign it as an attribute to the session.

Discussion

The JSTL core tags and the `jsp:useBean` standard action can be used to manage session attributes in JSPs. [Example 16-8](#) binds an object attribute to a session, displays a value from the object, and then shows the session ID of the client who requested the JSP. The bound object is the `ContextObject` that I have used throughout this chapter as the stored attribute. It contains a `java.util.Map` type for storing the IP addresses of users who request the JSP (see [Example 16-1](#) and the accompanying description of the code).

Example 16-8. Setting a session attribute in a JSP

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<html>
<head><title>Context binding JSP</title></head>
<body>
<h2>Here are the values from the bound ContextObject</h2>
<!-- Create instances of the ContextObject and Date classes --%>
<jsp:useBean id="contextObj" class=
    "com.jspServletcookbook.ContextObject" />

<jsp:useBean id="date" class="java.util.Date" />

<!-- Bind the object attribute to the session scope--%>
<c:set var=
    "com.jspServletcookbook.ContextObject" value="{contextObj}" scope=
    "session" />

<!-- Put a value in the object, then display the value--%>
<c:set target=
    "${sessionScope["com.jspServletcookbook.ContextObject"].map}" value=
```



```

        "${date}" property="${pageContext.request.remoteAddr}"/>

<c:out value="${sessionScope[\"com.jspServletcookbook.ContextObject\"].
    values}" escapeXml="false" />

<h2>Here is the session ID</h2>
<c:out value="${pageContext.session.id}" />
</body>
</html>

```

This code from [Example 16-8](#) binds the object to the session:

```

<c:set var=
    "com.jspServletcookbook.ContextObject" value="${contextObj}" scope=
    "session" />

```

The only difference between [Example 16-8](#) and the JSP of [Recipe 16.2](#), which binds the object to the `ServletContext`, is the value of the `scope` attribute in the `c:set` tag (`session` in this case). In similar fashion, the `c:set` tag sets a value in the session attribute by referring to the `sessionScope` implicit variable:

```

<c:set target=
    "${sessionScope[\"com.jspServletcookbook.ContextObject\"].map}" value=
    "${date}" property="${pageContext.request.remoteAddr}"/>

```

The EL mechanism automatically makes available the `sessionScope` implicit variable, which represents a `java.util.Map` type that stores any object variables in session scope.

If you have an attribute name that does not include period characters in it, you can provide the attribute name without any further context, and the EL will search the `page`, `request`, `session`, and `application` scopes for an attribute of that name. For example, the following EL syntax returns a session object attribute named `contextObj` without using an implicit variable (or `null` if that session attribute does not exist) to further qualify the name:

```

${contextObj}

```

See Also

[Chapter 23](#) on using the JSTL; [Recipe 16.1-Recipe 16.4](#) on handling `ServletContext` attributes in servlets and JSPs; [Recipe 16.7](#) on accessing or removing session attributes in servlets; [Recipe 16.8](#) on accessing or removing session attributes in JSPs; [Recipe 16.9-Recipe 16.12](#) on handling request attributes in servlets and JSPs; [Recipe 14.6](#) on using a session event listener; the Javadoc for `javax.servlet.http.HttpSessionAttributeListener`: <http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/http/HttpSessionAttributeListener.html>.

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Recipe 16.7 Accessing or Removing Session Attributes in Servlets

Problem

You want to access or remove a session attribute in a servlet.

Solution

Use the `javax.servlet.http.HttpSession.getAttribute(String attributeName)` method to access the attribute. Use the `removeAttribute(String attributeName)` method to remove the attribute from the session.

Discussion

To access a session attribute, you must first bind the attribute to a session, as in Recipe 16.5. The object attribute is now available to the user associated with that session. Example 16-9 accesses an attribute named `com.jspservletcookbook.ContextObject`. The example just shows the code relating to access an attribute from the session. Example 16-5 in Recipe 16.3 shows the entire servlet and `doGet()` method for accessing an object attribute.

The `HttpSession.getAttribute()` method returns an `Object` type, so the return value has to be cast to the appropriate type before calling any methods on it.

Example 16-9. Gaining access to the session attribute in a servlet

```
package com.jspservletcookbook;

...
<!-- this code appears in the servlet's doGet or doPost method, whichever is appropriate
The ContextObject class is stored in WEB-INF/classes/com/jspservletcookbook/ -->

//Create a session if one does not exist yet
HttpSession session = request.getSession( );

//This local variable will hold the object attribute
ContextObject contextObj = null;

//get access to an object attribute in the session
if (session != null)
    contextObj = (ContextObject) session.getAttribute(
```

```

        "com.jspservletcookbook.ContextObject");

//ensure the contextObj is not null before calling any methods
if (contextObj != null)
    out.println( contextObj.getValues( ) );

<!-- rest of servlet class and doGet or doPost method goes here -->

```

You must take these steps before accessing a session attribute:

1. Compile the class of the object that will be stored in the session.
2. Place this class in *WEB-INF/classes* or in *WEB-INF/lib* if it's stored in a JAR file.
3. Make sure a servlet, JSP, or other web component sets the attribute to the session with the `HttpSession.setAttribute()` method.

Removing the session attribute from a servlet

To remove an attribute, call `HttpSession.removeAttribute()` with the name of the attribute. Use the following code in a servlet to remove the attribute this chapter has been working with:

```

HttpSession session = request.getSession( );
<!-- HttpSession.removeAttribute will have no effect if an attribute of that name
does not exist -->

if (session != null)
    session.removeAttribute("com.jspservletcookbook.ContextObject");

```

Now the attribute is no longer available in the session associated with the user that requested the service. The session attribute is still available in other sessions where it may be stored (albeit in the form of a different instance). Each user is associated with a specific session, and each session can carry its own instance of the object attribute.

When you remove the attribute from the `ServletContext`, on the other hand, it is no longer available to any users, because there is only one `ServletContext` for each nondistributed web application.

See Also

Recipe 16.1 -Recipe 16.4 on handling `ServletContext` attributes in servlets and JSPs; Recipe 16.5 on setting session attributes in servlets; Recipe 16.6 on setting session attributes in JSPs; Recipe 16.8 on accessing or removing session attributes in JSPs; Recipe 16.9-Recipe 16.12 on handling request attributes in servlets and JSPs; Recipe 14.6 on using a session event listener; the Javadoc for `javax.servlet.http.HttpSessionAttributeListener` : <http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/http/HttpSessionAttributeListener.html> .

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Recipe 16.8 Accessing or Removing Session Attributes in JSPs

Problem

You want to access or remove a session attribute in a JSP.

Solution

Use the `c:out` JSTL core tag to display the value of an attribute and the `c:remove` tag to remove the attribute from the session.

Discussion

Here are the steps to access or remove a session-scoped variable with the JSTL and a JSP:

1. Make sure that your web application is able to use the JSTL (i.e., you have the proper JAR files such as *jstl.jar* and *standard.jar* in your *WEB-INF/lib* directory; see [Chapter 23](#) for instructions).
2. Include the `taglib` directive, which makes the JSTL core tags available to the JSP (see the upcoming code).
3. Make sure the object attribute is bound to the session in the first place, either by the same JSP that accesses the attribute, or by another web component (such as a servlet).

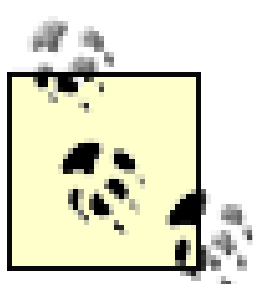
The code in this recipe shows how to reference a session-scoped variable, as opposed to a `ServletContext` attribute (shown in [Recipe 16.4](#)). This code uses the `sessionScope` implicit object of the EL, which is an automatically available variable in EL format that contains any session-scoped object attributes. This code represents a portion of a JSP that displays the values contained in an attribute named `com.jspservletcookbook.ContextObject`.

[Example 16-4](#) in [Recipe 16.2](#) shows a complete JSP that accesses object attributes. [Recipe 16.2](#) accesses a `ServletContext` attribute in a JSP, rather than a session-scoped attribute.

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
//HTML or other presentation code here...
<c:out value=
    "${sessionScope["com.jspservletcookbook.ContextObject"].values} "
```



```
escapeXml="false" />
```



The `escapeXml="false"` part of the `c:out` tag tells the tag to leave characters that are part of the tag's output such as `<` and `>` unescaped (in other words, do not convert them to character entities such as `<` and `>`).

This JSP code removes a session-scoped variable using the `c:remove` core tag:

```
<c:remove var=
    "com.jspservletcookbook.ContextObject" scope="session" />
```

The object attribute is no longer available for the individual session associated with the user that requested this JSP. In other words, the `c:remove` tag does not remove all session attributes of the specified name, just the session attribute(s) associated with any user who requests the JSP containing the `c:remove` tag.

See Also

[Chapter 23](#) on using the JSTL; [Recipe 16.1-Recipe 16.4](#) on handling `ServletContext` attributes in servlets and JSPs; [Recipe 16.5](#) on setting session attributes in servlets; [Recipe 16.6](#) on setting session attributes in JSPs; [Recipe 16.7](#) on accessing or removing session attributes in servlets; [Recipe 16.9-Recipe 16.12](#) on handling request attributes in servlets and JSPs; [Recipe 14.6](#) on using a session event listener; the Javadoc for `javax.servlet.http.HttpSessionAttributeListener`: <http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/http/HttpSessionAttributeListener.html>.

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Recipe 16.9 Setting Request Attributes in Servlets

Problem

You want to use a servlet to store an attribute in a request.

Solution

Use the `javax.servlet.ServletRequest.setAttribute()` method.

Discussion

The `ServletRequest.setAttribute()` method is often used in code that dynamically forwards requests or includes content with a `javax.servlet.RequestDispatcher`.

Web applications that use `RequestDispatchers` to share requests between web components can communicate between these components using request attributes. Both the recipient of the `RequestDispatcher.forward()` method and the included file or page involved with the `RequestDispatcher.include()` method have access to the original or enclosing request. Therefore, these web components can also access any object attributes that are stored in those requests.

The servlet in [Example 16-10](#) creates an instance of a `ContextObject`, stores some information in the object by calling its `put()` method, and then places the object in the `HttpServletRequest` under the name "com.jspservletcookbook.ContextObject." The servlet then uses a `RequestDispatcher` to forward the request (including the attribute) and response to the servlet path `/displayAttr`. The web component mapped to that servlet path now has access to the previously created request attribute.

Example 16-10. Binding an object to a request

```
package com.jspservletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

public class RequestBinder extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {
```

```

        //bind an object to the request
        ContextObject contextObj = new ContextObject( );

        contextObj.put( request.getRemoteAddr( ), ""+new java.util.Date( ));

        request.setAttribute(
            "com.jspservletcookbook.ContextObject",contextObj );

        //use RequestDispatcher to forward request to another servlet
        // mapped to the servlet path '/displayAttr'
        RequestDispatcher dispatcher = request.getRequestDispatcher(
            "/displayAttr");

        dispatcher.forward(request,response);

    } //doGet

}

```

[Example 16-11](#) shows the servlet that receives the forwarded request. The `RequestDisplay` servlet is mapped in *web.xml* to the */displayAttr* servlet path. This servlet gets the request attribute from the `HttpServletRequest` object by calling `getAttribute()` with the attribute name: `com.jspservletcookbook.ContextObject`. Since the return value of `getAttribute()` is typed to `Object`, the code must cast the result to `ContextObject`.

Example 16-11. The target of `RequestDispatcher.forward` has access to the request attribute

```

package com.jspservletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

public class RequestDisplay extends HttpServlet {

    public void doGet(HttpServletRequest request, HttpServletResponse response) throws
        ServletException, java.io.IOException {

        ContextObject obj = (ContextObject) request.getAttribute(
            "com.jspservletcookbook.RequestObject");

        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );
        out.println(
            "<html><head><title>Request Attribute</title></head><body>");
        out.println("<h2>Request attribute values</h2>");

        //display the keys of the java.util.Map stored in the request object
        //attribute
        if (obj != null)

```



```
        out.println( obj.getValues( ) );

    out.println( "</body></html>" );

} //end doGet

}
```

Make sure to check whether the `ServletRequest.getAttribute()` return value is `null` before calling any of the object attribute's methods. The `getAttribute()` method returns `null` if the request does not contain an attribute of the specified name.

See Also

[Recipe 16.1](#)-[Recipe 16.4](#) on handling `ServletContext` attributes in servlets and JSPs; [Recipe 16.5](#)-[Recipe 16.8](#) on handling session attributes in servlets and JSPs; [Recipe 16.10](#) on setting request attributes in JSPs; [Recipe 16.11](#) and [Recipe 16.12](#) on accessing or removing request attributes in servlets and JSPs; the Javadoc for `javax.servlet. ServletRequestAttributeListener`: <http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/ServletRequestAttributeListener.html>.

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Recipe 16.10 Setting Request Attributes in JSPs

Problem

You want to set a request attribute using a JSP.

Solution

Use the JSTL core tags and the `jsp:useBean` standard action to create an instance of an object and bind it to the request.

Discussion

The JSP in [Example 16-12](#) stores a `com.jspServletcookbook.ContextObject` in the request scope by first creating an instance of that object with `jsp:useBean`. As in [Recipe 16.2](#) and [Recipe 16.6](#), the code uses the `c:set` tag to bind the object to the request, but this time gives its `scope` attribute a value of `request`.

You should store the classes for the objects that JSPs use as request attributes in *WEB-INF/classes*, or in *WEB-INF/lib* if the class is part of a JAR file.

The JSP in [Example 16-12](#) is exactly like the JSP code shown in [Recipe 16.2](#) and [Recipe 16.6](#), except this time the code uses the `requestScope` implicit object to fetch the request attribute and give it a new property and value. The `requestScope` is used in EL syntax (see [Chapter 23](#)) to access request attributes.

Example 16-12. Setting a request attribute and forwarding the request in a JSP

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<jsp:useBean id="contextObj" class=
    "com.jspServletcookbook.ContextObject" />

<jsp:useBean id="date" class="java.util.Date" />
<c:set var="com.jspServletcookbook.ContextObject" value=
    "${contextObj}" scope="request" />
```

```
<c:set target=
    "${requestScope["com.jspservletcookbook.ContextObject"].map}" value=
        "${date}" property="${pageContext.request.remoteAddr}"/>

<jsp:forward page="/displayAttr" />
```

After setting the request attribute and giving it some values, the JSP forwards the request to the servlet path */displayAttr*. The servlet or JSP mapped to that path has access to the new request attribute.

See Also

[Chapter 23](#) on using the JSTL; [Recipe 16.1-Recipe 16.4](#) on handling `ServletContext` attributes in servlets and JSPs; [Recipe 16.5-Recipe 16.8](#) on handling session attributes in servlets and JSPs; [Recipe 16.11](#) and [Recipe 16.12](#) on accessing or removing request attributes in servlets and JSPs; the Javadoc for `javax.servlet.ServletRequestAttributeListener`: <http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/ServletRequestAttributeListener.html>.

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Recipe 16.11 Accessing or Removing Request Attributes in Servlets

Problem

You want a servlet to access or remove a request attribute.

Solution

Use the `javax.servlet.ServletRequest.getAttribute()` and `javax.servlet.ServletRequest.removeAttribute()` methods, including the name of the attribute as the method parameter.

Discussion

[Example 16-13](#) is derived from the `doGet()` method of [Example 16-11](#) in [Recipe 16.9](#) (refer to that class if you need to review the complete code of a servlet handling request attributes). [Example 16-13](#) gets an object attribute from the `HttpServletRequest` object, which is the `doGet()` method's first parameter.

The servlet container creates an `HttpServletRequest` object and passes it as the first parameter to all of the `HttpServlet`'s service methods, including `doGet()` and `doPost()`.

[Example 16-13](#) calls one of the attribute's methods, then removes the request attribute.

Example 16-13. A servlet accesses and removes a request attribute

```
public void doGet(HttpServletRequest request, HttpServletResponse response)
    throws ServletException, java.io.IOException {

    ContextObject obj = (ContextObject) request.getAttribute(
        "com.jspservletcookbook.ContextObject");

    response.setContentType("text/html");
    java.io.PrintWriter out = response.getWriter( );
    out.println(
        "<html><head><title>Request Attribute</title></head><body>");
```

```
//display the attribute's Map keys
out.println("<h2>Request attribute values</h2>");

if (obj != null)
    out.println( obj.getValues( ) );

//This method call may not be necessary as request attributes
//persist only as long as the request is being handled,
//according to the ServletRequest API documentation.
request.removeAttribute("com.jspervletcookbook.ContextObject");

out.println("</body></html>");

} //doGet
```

If the attribute does not exist in the request (because it was not bound to the request in the first place), `ServletRequest.getAttribute()` returns `null`. Make sure the servlet code checks for a `null` value before it calls the object's methods. In addition, the `ServletRequest.getAttribute()` method returns an `Object` type, so ensure that the servlet code casts the return value to the proper type before calling the expected type's methods.

See Also

[Recipe 16.1](#)-[Recipe 16.4](#) on handling `ServletContext` attributes in servlets and JSPs; [Recipe 16.5](#)-[Recipe 16.8](#) on handling session attributes in servlets and JSPs; [Recipe 16.12](#) on accessing or removing request attributes in JSPs; [Chapter 6](#) on including content in servlets and JSPs; the Javadoc for `javax.servlet. ServletRequestAttributeListener`: <http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/ServletRequestAttributeListener.html>.

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Recipe 16.12 Accessing or Removing Request Attributes in JSPs

Problem

You want to use a JSP to access or remove a request attribute.

Solution

Use the JSTL core tags `c:out` and `c:remove` to access and optionally remove the attribute.

Discussion

Example 16-14 accesses an object attribute that is bound to the `HttpServletRequest`. The JSP accesses this attribute by using EL syntax inside the `c:out` JSTL tag.

Example 16-12 in Recipe 16.10 forwards a request attribute to a servlet using the `jsp:forward` standard action. The JSP in that example can forward its request attribute to the JSP in Example 16-14 by using the code:

```
<jsp:forward page="/requestDisplay.jsp" />
```

The code:

```
"${requestScope["com.jspservletcookbook.ContextObject"].
    values}"
```

uses the `requestScope` JSTL implicit object. This variable, which the JSTL automatically makes available to EL-related code, is a `java.util.Map` type containing any attributes bound to the request scope. The code then displays the values the attribute contains by accessing the object attribute's `values` property (see Recipe 16.1 for a discussion of the object used for storing an attribute in various scopes throughout this chapter).

Example 16-14. Accessing and removing a request attribute with the JSTL

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<html>
<head><title>Request reading JSP</title></head>
<body>
<h2>Here are the values from the bound RequestObject</h2>

<c:out value=
```

```
"${requestScope["com.jspserveletcookbook.ContextObject"].
  values}" escapeXml="false" />
```

```
<!-- c:remove may not be necessary as request attributes persist only as long as the
request is being handled -->
```

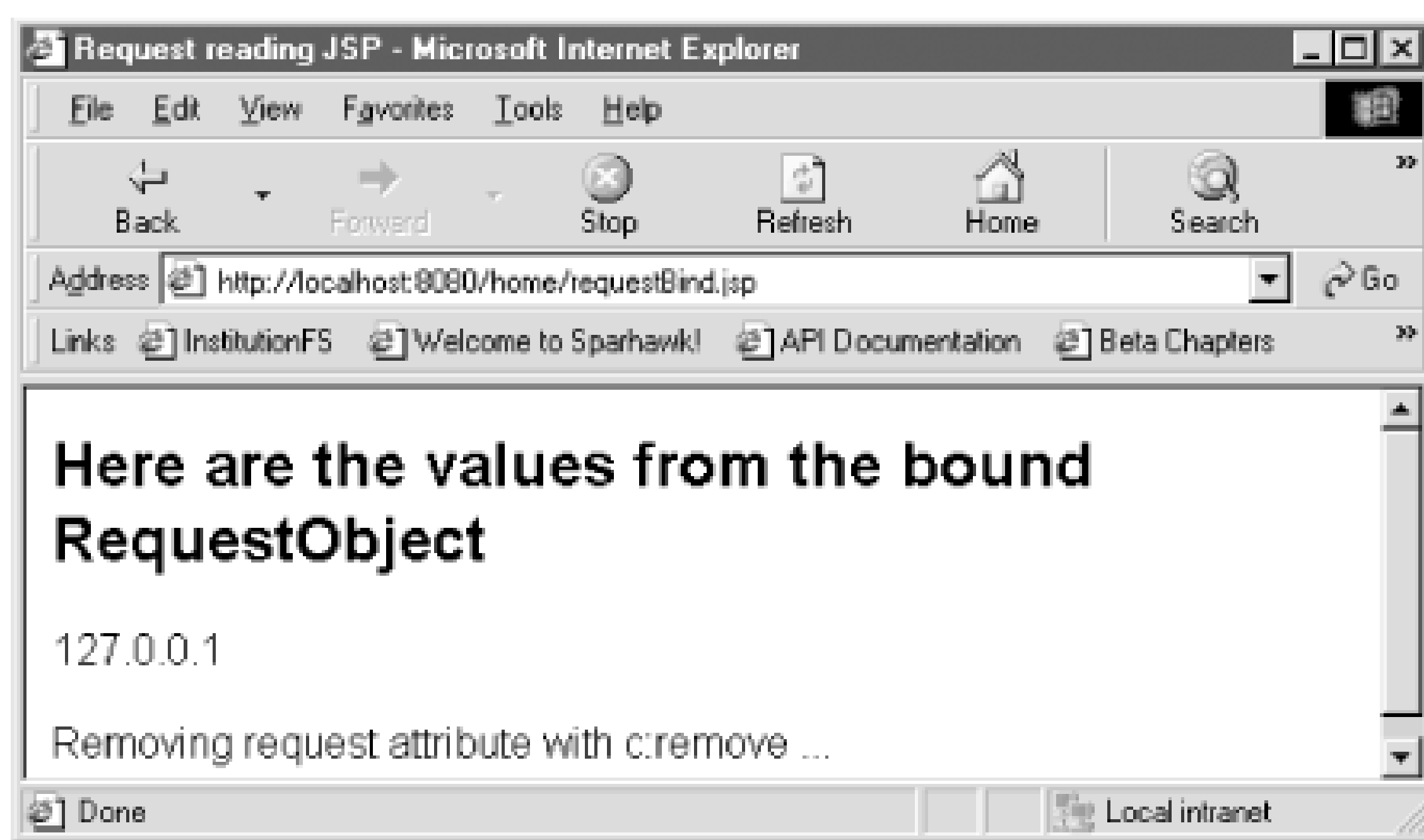
```
<br>Removing request attribute with c:remove ... <c:remove var=
  "com.jspserveletcookbook.ContextObject" scope="request" />
```

```
</body>
```

```
</html>
```

The `c:remove` tag removes the attribute named in its `var` attribute from the specified scope. Use `scope="request"` because you are removing this attribute from the JSP's request scope. Figure 16-2 shows the output of the *displayRequest.jsp* page in a web browser.

Figure 16-2. The browser display after accessing and removing a request attribute in a JSP



The JSP that appears in the browser's address field, *requestBind.jsp*, actually set the attribute and forwarded the request (see Recipe 16.10). When code uses `jsp:forward`, the original JSP remains in the browser's address field, even though the browser displays the output of the JSP targeted by the forward action.

See Also

Chapter 23 on using the JSTL; Recipe 16.1 -Recipe 16.4 on handling `ServletContext` attributes in servlets and JSPs; Recipe 16.5 -Recipe 16.8 on handling session attributes in servlets and JSPs; Recipe 16.11 on accessing or removing request attributes in servlets; the Javadoc for `javax.servlet.ServletRequestAttributeListener` :

<http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/ServletRequestAttributeListener.html> .

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Chapter 17. Embedding Multimedia in JSPs

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Introduction

Most web sites include some type of multimedia and interactive programs, such as digital videos, digital audio files, Macromedia Flash movies, and Java applets. Therefore, Java web sites often integrate this type of content with servlets and JavaServer Pages (JSPs). This chapter explains the basics of embedding multimedia in Java web components. This process involves including the `object` and `embed` tags in your component's HTML output.

A JSP is the preferred choice for combining multimedia with dynamic content, because you can make the tags that you use to embed the multimedia a part of the JSP's HTML template text. However, [Recipe 17.5](#) also shows how to include multimedia as part of a servlet's output.



If the page containing the multimedia content does not have to include any other type of dynamic output, just use a static HTML page instead of executing JSPs and servlets. A static page typically requires fewer server resources to respond to HTML page requests.

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Recipe 17.1 Embedding an Applet in a JSP Using `jsp:plugin`

Problem

You want to use the `jsp:plugin` standard action to execute a Java applet with the Java Plug-in software.

Solution

Use the `jsp:plugin` action positioned in the area of a JSP where you want the applet to appear.

Discussion

The JSP specification provides a standard action, `jsp:plugin`, which produces the `object` and `embed` tags that are designed to allow browsers to load a Java applet. The action will run the applet using Sun Microsystems's Java Plug-in or initiate the download of the Plug-in if the user has not yet installed the Plug-in.

The Java Plug-in is designed to execute an applet using Sun Microsystems's Java 2 Runtime Environment, rather than any Java runtime provided by the browser. The installation of the Java JRE or Software Development Kit automatically installs the Java Plug-in.

Use nested `jsp:param` elements to provide the applet with any necessary parameter and value pairs. The `jsp:param` elements must be nested within a single `jsp:params` element.

[Example 17-1](#) shows a JSP file that uses `jsp:plugin` to embed an applet named *Clock.class*. In this case, the *Clock.class* file is located in the same directory as the JSP in [Example 17-1](#).

This applet originates from Sun Microsystems's sample applets:
<http://java.sun.com/products/plugin/1.4.1/demos/plugin/applets/Clock/example1.html>

Example 17-1. Embedding a Java applet with `jsp:plugin`

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<jsp:useBean id="date" class="java.util.Date" />

<html>
<head><title>A Clock in a JSP</title></head>
<body>
<h2>The time...</h2>

<jsp:plugin type="applet" code="Clock.class" codebase=
    "http://localhost:8080/home/applets" jreversion="1.4.1">

<jsp:params>
    <jsp:param name="scriptable" value="false"/>
</jsp:params>

<jsp:fallback>
    Sorry, we are unable to start the Java plugin <br />
</jsp:fallback>

</jsp:plugin>

<br /><c:out value="\${date}" />
</body>
</html>
```

Users who have installed Internet Explorer for Windows depend on an HTML `object` tag to provide the direction for loading the applet. In browsers that support the Netscape-style plug-in, the HTML uses its `embed` tag. The `jsp:plugin` standard action generates HTML that should work with both browser types (but you still should test the resulting JSP, of course).

[Example 17-2](#) shows the HTML tags generated by the `jsp:plugin` action when the Internet Explorer 5.5 and the Netscape browsers request the JSP in [Example 17-1](#).

Example 17-2. HTML tags generated by the `jsp:plugin` action for loading a Java applet

```
<OBJECT classid=
    clsid:8AD9C840-044E-11D1-B3E9-00805F499D93 codebase=
    "http://java.sun.com/products/plugin/1.2.2/jinstall-1_2_2-win.cab#
    Version=1,2,2,0">

<PARAM name="java_code" value="Clock.class">

<PARAM name="java_codebase" value="http://localhost:8080/home/applets">

<PARAM name="type" value="application/x-java-applet;version=1.4.1">

<PARAM name="scriptable" value="false">

<COMMENT>
```

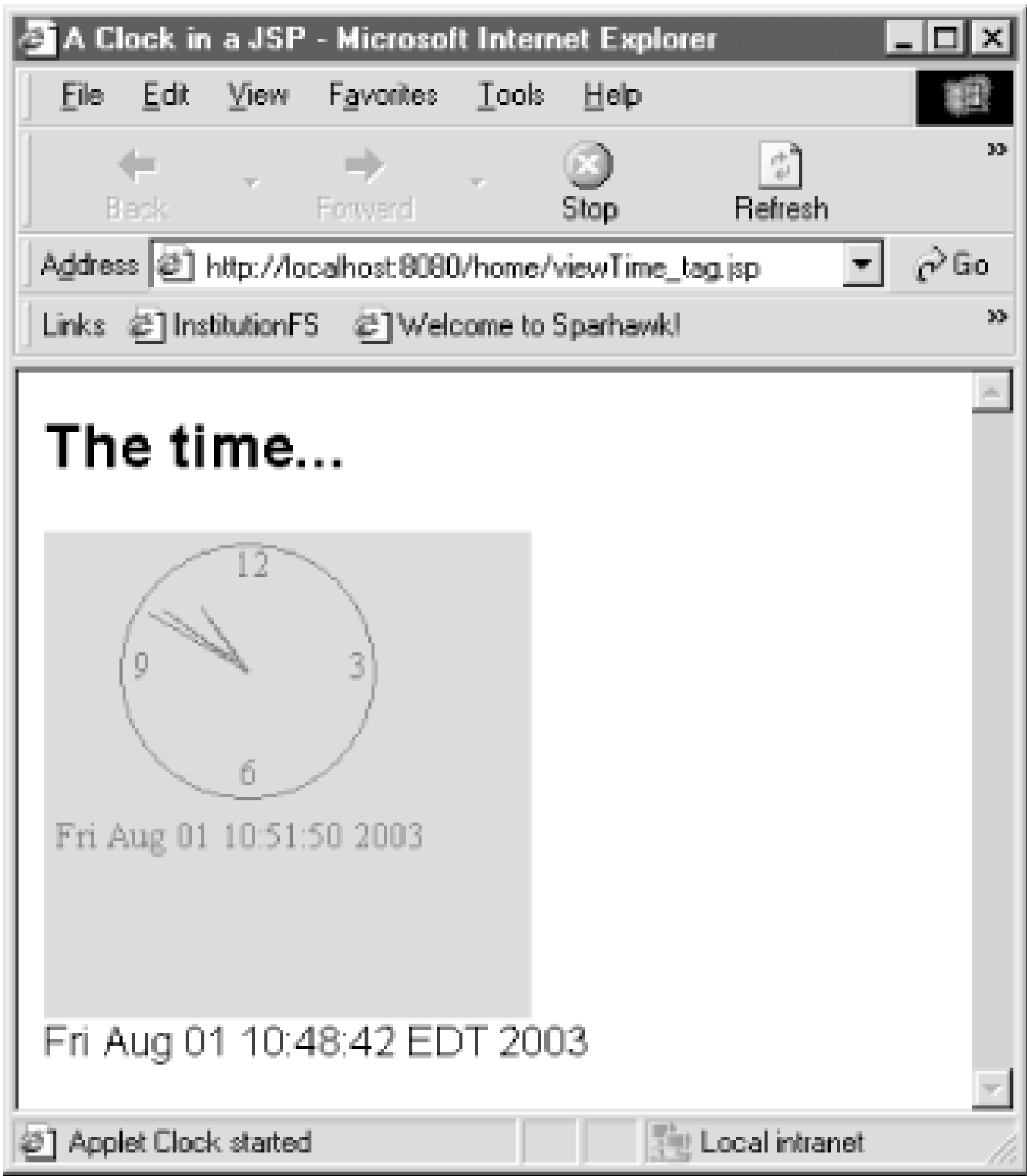
```
<EMBED type="application/x-java-applet;version=1.4.1" pluginspage=
    "http://java.sun.com/products/plugin/" java_code=
    "Clock.class" java_codebase=
    "http://localhost:8080/home/applets" scriptable="false"/>

<NOEMBED>
Sorry, we are unable to start the Java plugin <br />
</NOEMBED>

</COMMENT>
</OBJECT>
```

[Figure 17-1](#) shows the JSP with the embedded applet.

Figure 17-1. A JSP with an embedded applet



See Also

The Java Plug-in technology page: <http://java.sun.com/products/plugin/>; [Recipe 17.2](#) on embedding an applet using the Sun Microsystems HTML Converter.

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Recipe 17.2 Embedding an Applet in a JSP Using the HTML Converter

Problem

You want to use the Java Plug-in HTML Converter tool to generate the tags for embedding an applet.

Solution

Use the HTML Converter tool within *htmlconverter.jar*, which is located in the *lib* directory of the directory where you have the Java SDK installed.

Discussion

A busy developer can let the Java Plug-in HTML Converter tool produce the HTML tags that are responsible for loading Java applets. The Java Plug-in is a Java-based tool that allows applets to be run in the Sun Microsystems Java 2 runtime environment, rather than within the web browser's Java runtime environment. The Java Plug-in is installed on your machine when you install the JRE, including the installation of the SDK.

The HTML Converter tool will convert a specified JSP file that contains an `applet` HTML tag, replacing the `applet` tag with a more complex tag collection that allows most browsers to load the Java applet. The Converter leaves the rest of your JSP code untouched; it only replaces the JSP's `applet` tag.

Here is how to use the HTML Converter tool:

1. Write the JSP file, adding an `applet` tag. [Example 17-3](#) shows a JSP that embeds a *Clock.class* applet reference. This JSP, rather redundantly, dynamically writes a time string beneath the applet. I included this code to show that the Converter does not change the JSP code; it just alters the `applet` tag template text included with the JSP.

Example 17-3. A JSP with an applet tag

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<jsp:useBean id="date" class="java.util.Date" />

<html>
<head><title>A Clock in a JSP</title></head>
```

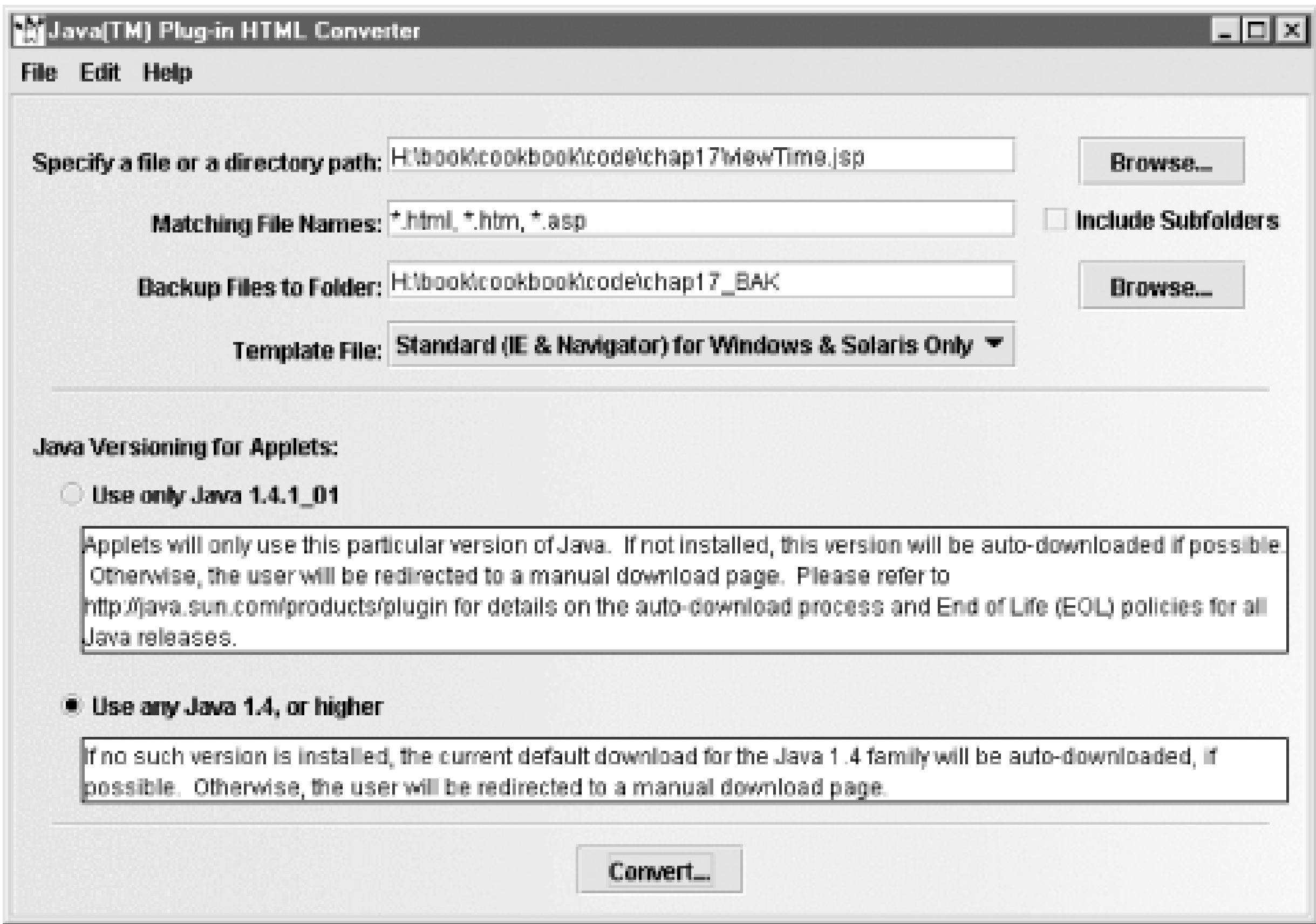
```
<body>
<h2>The time...</h2>
<applet code="Clock.class" codebase="http://localhost:8080/home/applets">
</applet>

<br /><c:out value="\${date}" />

</body>
</html>
```

2. Open a command-line window to the `lib` directory of your SDK installation, such as `H:\j2sdk1.4.1_01\lib`.
3. Type `java -jar htmlconverter.jar -gui`. This command launches the Swing version of the HTML Converter tool. [Figure 17-2](#) shows what the tool looks like.

Figure 17-2. The HTML Converter (GUI version)



The HTML Converter can also be run from the command line. See the Java Plug-in Developer Guide for supported options:
<http://java.sun.com/j2se/1.4.1/docs/guide/plugin/>.

4. If you want to choose a back-up folder where the tool saves the old JSP file (with the `applet` tag), use the HTML Converter GUI window to choose this folder.
5. Click the "Convert . . ." button with the JSP file specified in the top text field, and the Converter

will overwrite the original file with additional `object` and `embed` tags.

[Example 17-4](#) shows the code that replaced the `applet` tag in [Example 17-3](#) (in bold font), as well as the code that the converter tool did not modify.

Example 17-4. The object and embed tags produced by the HTML Converter

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<jsp:useBean id="date" class="java.util.Date" />

<html>
<head><title>A Clock in a JSP</title></head>
<body>
<h2>The time...</h2>

<!--"CONVERTED_APPLET"-->
<!-- HTML CONVERTER -->
<OBJECT
    classid =
        "clsid:8AD9C840-044E-11D1-B3E9-00805F499D93"

    codebase =
        "http://java.sun.com/products/plugin/autodl/jinstall-1_4-windows-
        i586.cab#Version=1,4,0,0"
    >

    <PARAM NAME = CODE VALUE = "Clock.class" >
    <PARAM NAME = CODEBASE VALUE = "http://localhost:8080/home/applets" >
    <PARAM NAME = "type" VALUE = "application/x-java-applet;version=1.4">
    <PARAM NAME = "scriptable" VALUE = "false">

    <COMMENT>
        <EMBED
            type = "application/x-java-applet;version=1.4"
            CODE = "Clock.class"
            JAVA_CODEBASE = "http://localhost:8080/home/applets"
            scriptable = false
            pluginspage =
                "http://java.sun.com/products/plugin/index.html#download">
            <NOEMBED>

        </NOEMBED>
        </EMBED>
    </COMMENT>
</OBJECT>

<!--
<APPLET CODE = "Clock.class" JAVA_CODEBASE =
    "http://localhost:8080/home/applets">
```

```
</APPLET>
-->

<!--"END_CONVERTED_APPLET"-->

<br /><c:out value="\${date}"/>

</body>
</html>
```



Users may have trouble loading the applet in their browsers if they have several installed versions of the Java Plug-in. This occurs when users steadily upgrade their JRE or Java SDK versions, which install the corresponding version of the Java Plug-in. The simplest solution in these cases is to uninstall the old Java Plug-ins.

See Also

The Java Plug-in technology page: <http://java.sun.com/products/plugin/>; [Recipe 17.1](#) on embedding a Java applet using the `jsp:plugin` standard JSP action.

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Recipe 17.3 Automatically Creating HTML Template for Including Flash Files

Problem

You want to automatically generate the required HTML for embedding a Flash file in a web component.

Solution

From within Macromedia Flash 6, use the "File Publish" menu command to output an HTML file that includes the `object` and `embed` tags.

Discussion

With an *.swf* file open in Macromedia Flash 6, use the "File Publish" menu command to create an HTML file. This file includes the necessary tags to embed the Flash movie you are working on in a web component. Then cut and paste these tags and attributes into your JSP. [Example 17-5](#) shows the output from using this menu command with an *.swf* file named *example.swf*.

Example 17-5. Automatically generated template text from within the Flash application

```
<HTML>
<HEAD>
<meta http-equiv=Content-Type content="text/html; charset=ISO-8859-1">
<TITLE>example</TITLE>
</HEAD>
<BODY bgcolor="#FFFFFF">

<!-- URL's used in the movie-->
<!-- text used in the movie-->
<!--DeductionsPaycheckSDIAnnual SalaryMedicareSocial
securityESPP401k$#FederalStateMarriedSingleactions-->

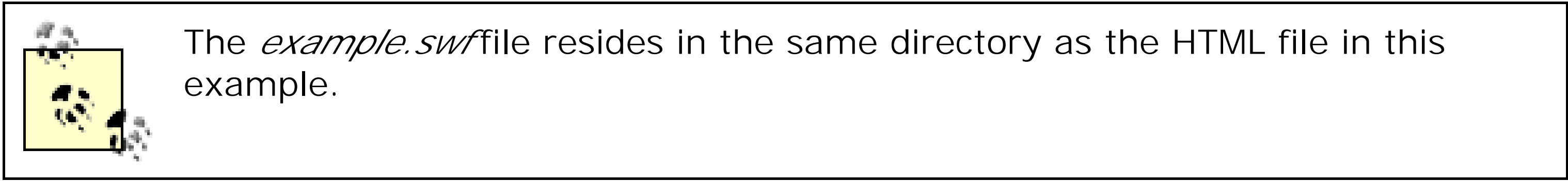
<OBJECT classid="clsid:D27CDB6E-AE6D-11cf-96B8-444553540000"
codebase=
"http://download.macromedia.com/pub/shockwave/cabs/flash/swflash.
cab#version=6,0,0,0"WIDTH="550" HEIGHT="400" id="example" ALIGN=""
>
```

```
<PARAM NAME=movie VALUE="example.swf">
<PARAM NAME=quality VALUE=high> <PARAM NAME=bgcolor VALUE=#FFFFFF>

<EMBED src="example.swf" quality=high bgcolor=#FFFFFF WIDTH="550" HEIGHT=
  "400" NAME="example" ALIGN=""
  TYPE="application/x-shockwave-flash" PLUGINSPAGE=
  "http://www.macromedia.com/go/getflashplayer">
</EMBED>
</OBJECT>

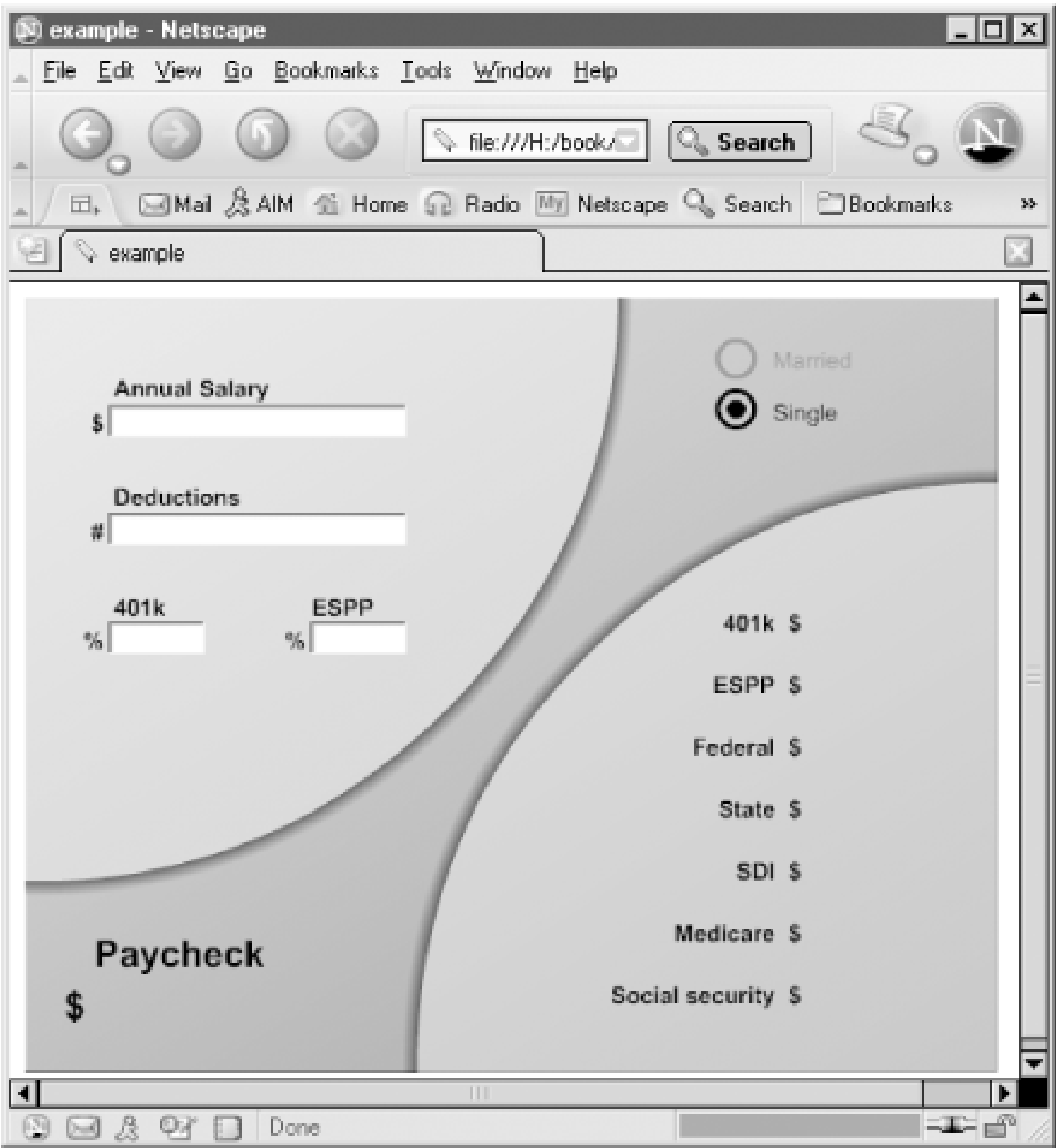
</BODY>
</HTML>
```

Your JSP probably already includes the boilerplate HTML such as the `body` tag; therefore, you only have to cut and paste the noncommented, emphasized code in [Example 17-5](#).



[Example 17-6](#) in the next recipe shows a JSP file with the same type of Flash-related object and embed tags as those illustrated in this recipe. [Figure 17-3](#) shows the automatically generated HTML file from [Example 17-5](#).

Figure 17-3. HTML template text with an embedded Flash file



The displayed Flash movie is derived from one of the Flash samples that accompanies the Flash 6 application: *Paycheck_calculator.swf*.

See Also

Macromedia technical notes page: <http://www.macromedia.com/support/flash/technotes.html>; an article about alternative techniques to using the `embed` tag: http://www.macromedia.com/devnet/mx/dreamweaver/articles/flash_satay.html.

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Recipe 17.4 Writing HTML Template to Embed a Flash File

Problem

You want to write the HTML template text to embed a Flash file in your JSP.

Solution

Use the `object` and `embed` tags so that the HTML is read correctly by the browsers that support either of these tags.

Discussion

You may not have the Macromedia Flash application that can automatically generate the HTML which is necessary to embed a Flash file ([Recipe 17.4](#)). In this case, write the required HTML template text for embedding a Flash movie inside a JSP.

[Example 17-6](#) shows a JSP with an embedded Flash file (the embedded file has a `.swf` extension). The same concept applies to this example as to the other recipes: the `object` tag is for the Internet Explorer Windows browser, which embeds the media file as an ActiveX control, not a Netscape-style plug-in. The `embed` tag, nested inside the `object` tag, is designed to embed the Flash file in Netscape and other browsers that support Netscape-style plug-ins.

[Example 17-6](#) is derived from a technical note at <http://www.macromedia.com/support/flash/technotes.html>.

Example 17-6. A JSP contains an embedded file

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<jsp:useBean id="date" class="java.util.Date" />

<html>
<head><title>Flash in a JSP</title></head>
<body>
<h2>Enjoy the Flash Movie</h2>

<OBJECT CLASSID=
    "clsid:D27CDB6E-AE6D-11cf-96B8-444553540000" CODEBASE=
    "http://download.macromedia.com/pub/shockwave/cabs/flash/swflash.cab#
    version=6,040,0" width="293" height="423"
```



```
>

<PARAM name="movie"  VALUE="coolFlashMov.swf">

<PARAM name="quality"  VALUE="high">

<PARAM name="bgcolor"  VALUE="#FFFFFF">

<EMBED SRC=
    "coolFlashMov.swf"  quality="high"  width="293"  height="423"
    bgcolor="#FFFFFF"  type="application/x-shockwave-flash"  PLUGINSOURCE=
    "http://www.macromedia.com/go/getflashplayer"
>

</EMBED>

</OBJECT>

<br /><c:out value="{date}" />

</body>
</html>
```

Both the `embed` and `object` tags are designed to prompt the end user to download the required version of the Flash plug-in or ActiveX control if they do not already have it installed.

See Also

Macromedia technical notes page: <http://www.macromedia.com/support/flash/technotes.html>; an article about alternative techniques to using the `embed` tag: http://www.macromedia.com/devnet/mx/dreamweaver/articles/flash_satay.html.

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Recipe 17.5 Embedding Flash in a Servlet

Problem

You want to embed a Flash file in a servlet's output.

Solution

Use the `javax.servlet.RequestDispatcher.include(request,response)` method in the `doGet()` method of the servlet that includes the necessary HTML template text.

Discussion

The servlet can include the HTML fragment that loads the Flash movie into the page by using a `RequestDispatcher`. This process is similar to server-side includes in traditional Common Gateway Interface (CGI) programs. When the servlet receives a request, it includes the text fragment containing the Flash-related tags in its HTML output. This design separates the servlet itself from the tags and parameters that load the Flash movie, so that each of these entities evolves independently. For example, you can change the filename of the Flash movie or some of the `object` or `embed` parameters without recompiling the servlet code.

[Example 17-7](#) is a servlet that uses a `RequestDispatcher` to include the text shown in [Example 17-8](#). The text appears in a *flash.txt* file that is stored at the top level of the web application.

`RequestDispatchers` typically include the output of servlets and JSPs, not just text fragments. See [Chapter 6](#) for more detailed `RequestDispatcher`-related recipes.

Example 17-7. A servlet uses a `RequestDispatcher` to include `object` and `embed` tags

```
package com.jspServletcookbook;
import javax.servlet.*;
import javax.servlet.http.*;

public class FlashServlet extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
```

```
java.io.IOException {

    response.setContentType("text/html");
    java.io.PrintWriter out = response.getWriter( );
    out.println(
        "<html><head><title>Embedded Flash content</title></head><body>");

    RequestDispatcher dispatcher = request.getRequestDispatcher(
        "/flash.txt");

    dispatcher.include(request, response);

    out.println("</body></html>");
} //doGet

public void doPost(HttpServletRequest request,
    HttpServletResponse response) throws ServletException,
    java.io.IOException {

    doGet(request, response);

} //doPost
}
```

[Example 17-8](#) shows the text fragment included by the servlet in [Example 17-7](#).

Example 17-8. An included text fragment (flash.txt) that a servlet uses to embed Flash

```
<OBJECT classid="clsid:D27CDB6E-AE6D-11cf-96B8-444553540000" codebase=
    "http://download.macromedia.com/pub/shockwave/cabs/flash/swflash.cab#
    version=6,0,0,0" WIDTH="550" HEIGHT="400" id="example" ALIGN=""
>

<PARAM NAME=movie VALUE="/home/example.swf">
<PARAM NAME=quality VALUE=high>
<PARAM NAME=bgcolor VALUE=#FFFFFF>

<EMBED src="/home/example.swf" quality=high bgcolor=#FFFFFF WIDTH=
    "550" HEIGHT="400" NAME="example" ALIGN="" TYPE=
    "application/x-shockwave-flash" PLUGINSOURCE=
    "http://www.macromedia.com/go/getflashplayer">
</EMBED>

</OBJECT>
```

The result in a web browser looks exactly like [Figure 17-3](#).

See Also

[Chapter 6](#) on dynamically including content into servlets; Macromedia technical notes page: <http://www.macromedia.com/support/flash/technotes.html>; an article about alternative techniques to using the `embed` tag: http://www.macromedia.com/devnet/mx/dreamweaver/articles/flash_satay.html.

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Recipe 17.6 Embedding a QuickTime Movie in a JSP

Problem

You want to embed a QuickTime movie in your JSP.

Solution

Use the `embed` tag nested inside the `object` tag. The `object` tag has to contain the `CLASSID` attribute with the proper value.

Discussion

Similar to using the Java Plug-in, a JSP uses the `embed` tag inside of an HTML `object` tag to properly load one of Apple Computer's QuickTime movies. You must include the `CLASSID` attribute value exactly as [Example 17-9](#) specifies. You also must include the same `CODEBASE` attribute value. If the user has an Internet Explorer Windows browser, but has not yet installed the QuickTime ActiveX control, the `CODEBASE` attribute value specifies where the user can download it.

Example 17-9. Embedding a QuickTime movie in a JSP

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<jsp:useBean id="date" class="java.util.Date" />

<html>
<head><title>QuickTime in a JSP</title></head>
<body>
<h2>Ladies and Gentlemen, The Who</h2>

<OBJECT CLASSID=
    "clsid:02BF25D5-8C17-4B23-BC80-D3488ABDDC6B" WIDTH="320"
    HEIGHT="256" CODEBASE="http://www.apple.com/qtactivex/qtplugin.cab">

<PARAM name="SRC" VALUE="http://www.parkerriver.com/films/who_bene2.mov">

<PARAM name="AUTOPLAY" VALUE="true">

<PARAM name="CONTROLLER" VALUE="true">

<EMBED SRC=
```

```
"http://www.parkerriver.com/films/who_bene2.mov"
WIDTH="240" HEIGHT="196"
AUTOPLAY="true" CONTROLLER=
"true" PLUGINSOURCE="http://www.apple.com/quicktime/download/">

</EMBED>

</OBJECT>

<br /><c:out value="\${date}" />

</body>
</html>
```

If the browser uses Netscape-style plug-ins, then the `embed` tag will initiate the loading of the QuickTime movie. The JSP in [Example 17-6](#) properly loaded the movie into the Safari web browser on my Macintosh laptop, for instance. One of the advantages of the `embed` tag is that you can use a number of proprietary attributes that the embedded object, such as QuickTime, understands. [Example 17-9](#) specifies that the movie should start playing as soon as the browser has loaded enough data (`AUTOPLAY="true"`) as well as that the browser should show the movie controls, which lets the user stop or start the movie (`CONTROLLER="true"`).

[Figure 17-4](#) shows the QuickTime movie embedded in the JSP of [Example 17-9](#).

Figure 17-4. A QuickTime movie embedded in a JSP



See Also

Apple Computer's guide on embedding QuickTime in Web pages:
<http://www.apple.com/quicktime/authoring/embed.html>; [Recipe 17.3](#)-[Recipe 17.5](#) on embedding a Flash file; [Recipe 17.7](#) on embedding an SVG file in a JSP; [Recipe 17.8](#) on embedding a background soundtrack.

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Recipe 17.7 Embedding an SVG File in a JSP

Problem

You want to display a Scalable Vector Graphics (SVG) image inside a JSP.

Solution

Use the `embed` HTML element to position the SVG in the JSP.

Discussion

Developers typically use the `embed` tag to place an SVG file in an HTML file or JSP. SVG is an XML-based graphics technology that provides developers and designers leverage in producing and displaying interactive graphics.

Browsers use special SVG viewer applications to handle the embedded SVG files. Adobe System's SVG Viewer application can be downloaded from <http://www.adobe.com/svg/viewer/install/>. Corel's SVG Viewer can be downloaded from <http://www.corel.com/svgviewer/>.

[Example 17-10](#) embeds an SVG file named *testLogo.svg* and points the user to the Adobe SVG Viewer download site if they have not installed an SVG Viewer application.

SVG files have extensions of either *.svg* or (in compressed form) *.svgz*, even though they are XML files.

Example 17-10. An SVG graphics file embedded in a JSP

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<jsp:useBean id="date" class="java.util.Date" />

<html>
<head><title>SVG in a JSP</title></head>
<body>
<h2>A Scalable Vector Graphics example</h2>
```



```
<embed src=
  '<c:out value="{param.svg_source}"/>.svg' width=
  "200" height="200" type="image/svg+xml" pluginspage=
  "http://www.adobe.com/svg/viewer/install/"
>

<br /><c:out value="{date}"/>

</body>
</html>
```

[Example 17-10](#) shows how to place an SVG within other JSP code elements, such as the `taglib` directive and the `jsp:useBean` standard action. [Example 17-10](#) also dynamically loads an SVG based on the request parameter named `svg_source`. The code uses the JSTL `c:out` tag and the EL's `param` implicit object to output the parameter value (see [Chapter 23](#) on the JSTL).

[Figure 17-5](#) shows the result of requesting the JSP in [Example 17-10](#), including the name of the SVG file as a request parameter. The request URL looks like:

```
http://localhost:8080/home/svg.jsp?svg_source=testLogo
```

Figure 17-5. A JSP page shows an SVG graphics file

The SVG shown in [Figure 17-5](#) is derived from Adobe Systems Inc., which creates the Adobe SVG Viewer and an SVG-enabled graphics application, Adobe Illustrator.

See Also

SVG specifications at the W3 Consortium: <http://www.w3.org/Graphics/SVG/Overview.htm8>;
Adobe's SVG Viewer install page: <http://www.adobe.com/svg/viewer/install/>; Recipes 17-3-5 on
embedding a Flash file in servlets and JSPs; [Recipe 17.6](#) on embedding a QuickTime movie in a JSP.

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Recipe 17.8 Embedding a Background Soundtrack in a JSP

Problem

You want to embed an audio file in your JSP.

Solution

Use the `embed` tag in the JSP. Use the `hidden` attribute if you want to hide the audio controls; otherwise, specify a `width` and `height` attribute for showing the audio controls.

Discussion

The `embed` tag is used to include an audio file with a JSP, so that when a user requests the JSP, the browser plays music. Specifically, the browser is designed to detect the MIME type of the embedded file, then activate a helper application such as QuickTime or RealAudio to handle the embedded file and play the music.

[Example 17-11](#) shows a JSP that embeds an MPEG, audio layer 3 (MP3) file. The JSP displays some information about the artist based on a request parameter; this random information is included to show how to combine JSP code with the `embed` tag. The `embed` tag includes width and height attributes to show the audio controls in the web page. The controls allow the user to turn the volume off or down if they do not want to be serenaded while surfing.

Example 17-11. A JSP with an embedded audio file

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<c:set var="artist" value="${param.artist}" />

<html>
<head><title>Choose Your Tunes</title></head>
<body>

<h2>You chose music from the artist <c:out value="${artist}" /></h2>

<embed src="ConstantCraving.mp3" width="240" height="160">
</embed>
```

```
</body>
</html>
```

Figure 17-6 shows the output from the JSP in [Example 17-11](#).

Figure 17-6. Embedded song file controls in a JSP



See Also

[Recipe 17.1](#) and [Recipe 17.2](#) on embedding a Java applet in a JSP; [Recipe 17.3](#)-[Recipe 17.5](#) on embedding a Flash file in a JSP; [Recipe 17.6](#) on embedding a QuickTime movie; [Recipe 17.7](#) on embedding an SVG file.

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Chapter 18. Working With the Client Request

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Introduction

A number of web applications must examine the client request before sending a response. An example is a servlet that has to read (or *sniff*) the browser type (often through the `User-Agent` header). Servlets or other web components read information about the request by examining HTTP *request headers*. These headers are composed of header names followed by colon characters and their values, such as `Accept-Language: en`. The headers precede any message body that the client is sending to the server, such as text that has been posted from an HTML form.

Here is an example of a group of request headers sent with a request for a JSP named *contextBind.jsp*.

```
GET /home/contextBind.jsp HTTP/1.1
User-Agent: Opera/5.02 (Windows NT 4.0; U) [en]
Host: localhost:9000
Accept: text/html, image/png, image/jpeg, image/gif, image/x-xbitmap, */*
Accept-Language: en
Accept-Encoding: deflate, gzip, x-gzip, identity, *;q=0
Cookie: mycookie=1051567248639; JSESSIONID=1D51575F3F0B17D26537338B5A29DB1D
Connection: Keep-Alive
```

The recipes in this chapter show how to examine request headers with servlet and JSPs, use filters to alter requests, automatically refresh servlets and JSPs, and count the number of application requests

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Recipe 18.1 Examining HTTP Request Headers in a Servlet

Problem

You want to examine the HTTP request headers in a servlet.

Solution

Use the `javax.servlet.http.HttpServletRequest.getHeaderNames()` and `getHeader()` methods to access the names and values of various request headers.

Discussion

The `HttpServletRequest.getHeaderNames()` method returns all of the request header names for an incoming request. You can then obtain the value of a specific header by providing the header name to the method `HttpServletRequest.getHeader()` method. [Example 18-1](#) gets an `Enumeration` of header names in the servlet's `doGet()` method, and then displays each header and value on its own line in the resulting HTML page.

Example 18-1. A servlet displays request headers and values

```
package com.jspervletcookbook;

import java.util.Enumeration;

import javax.servlet.*;
import javax.servlet.http.*;

public class RequestHeaderView extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        //get an Enumeration of all the request header names
        Enumeration enum = request.getHeaderNames( );

        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );
```

```
out.println(
    "<html><head><title>Request Header View</title></head><body>");
out.println("<h2>Request Headers</h2>");

String header = null;

//display each request header name and value
while (enum.hasMoreElements( )){
    header = (String) enum.nextElement( );

    //getHeader returns null if a request header of that name does not
    //exist in the request
    out.println("<strong>" + header + "</strong>" + ": " +
        request.getHeader(header) + "<br>" );
}

out.println("</body></html>");
} //doGet
}
```

[Figure 18-1](#) shows the `RequestHeaderView` servlet's output.

Figure 18-1. A servlet shows the request header names and values

See Also

[Recipe 18.2](#) on examining request headers in a JSP; [Recipe 18.3](#) on using a filter to wrap the request and forward it along the filter chain; [Recipe 18.6](#) on using a listener to track requests; [Chapter 7](#) on handling request parameters and JavaBean properties with servlets, JSPs, and filters.

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Recipe 18.2 Examining HTTP Request Headers in a JSP

Problem

You want to use a JSP to display the request headers and values.

Solution

Use the `c:forEach` and `c:out` JSTL tags to view the header names and values.

Discussion

The JSTL v1.0 makes all existing request headers available via the `header` implicit object. The JSTL automatically makes this variable available to JSPs; the `header` object evaluates to a `java.util.Map` type.

In [Example 18-2](#), the `c:forEach` tag iterates over this `Map` and stores each header name and value in the loop variable named by `c:forEach`'s `var` attribute (in [Example 18-2](#) it's called `req`). The `c:forEach var` attribute is implemented as a `java.util.Map.Entry` type, which is a data type that stores keys and their values. The `c:out` tag displays each header name by using EL format: `${req.key}`. Consequently `c:out` displays the value with `${req.value}`.

Example 18-2. Viewing the request header names and values in a JSP

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<html>
<head><title>Request Headers</title></head>
<body>
<h2>Here are the Request Header names and values</h2>

<c:forEach var="req" items="${header}">

    <strong><c:out value=
        "${req.key}"/></strong>: <c:out value="${req.value}"/><br>

</c:forEach>

</body>
</html>
```

[Figure 18-2](#) shows the result in a browser of requesting the *displayHeaders.jsp* page.

Figure 18-2. A JSP page shows request headers using JSTL tags



See Also

[Chapter 23](#) on using the JSTL; [Recipe 18.2](#) on examining request headers in a servlet; [Recipe 18.3](#) on using a filter to wrap the request and forward it along the filter chain; [Recipe 18.6](#) on using a listener to track requests; [Chapter 7](#) on handling request parameters and JavaBean properties with servlets, JSPs, and filters.

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Recipe 18.3 Using a Filter to Alter Request Headers

Problem

You want to use a filter to change the request headers before a servlet or JSP receives the request.

Solution

Wrap the request in your own custom request class. Pass the request wrapper or decorator class to the `FilterChain.doFilter()` method, instead of the original request destination.

Discussion

The `javax.servlet.http.HttpServletRequestWrapper` is a convenience class that you can extend to provide additional functionality for an HTTP request. Here is how to alter and forward a request using a filter:

1. Create a class that extends `HttpServletRequestWrapper`.
2. Place this class in the web application's *WEB-INF/classes* (including package-related directories) directory or *WEB-INF/lib* if the class is part of a JAR file.
3. Create a class that implements `javax.servlet.Filter`, such as [Example 18-3](#). This class uses your custom request wrapper class to enclose the `ServletRequest` parameter of the `Filter.doFilter()` method.
4. Store the filter class in *WEB-INF/classes* or *WEB-INF/lib* (if it's in a JAR).
5. Register the filter in *web.xml*. In this recipe, the filter is mapped to all of the requests in the web application with the URL mapping `/*`.

[Example 18-3](#) shows the filter class that passes the request-wrapper class along the filter chain. The file is named `RequestFilter`; the wrapper class is named `ReqWrapper`.

Example 18-3. A filter that wraps the `HttpServletRequest`

```
package com.jspervletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;
```



```

public class RequestFilter implements Filter {

    private FilterConfig config;

    /** Creates new RequestFilter */
    public RequestFilter( ) {}

    public void  init(FilterConfig filterConfig)  throws ServletException{

        this.config = filterConfig;
    }

    public void  doFilter(ServletRequest request,
        ServletResponse response, FilterChain chain) throws java.io.IOException,
        ServletException {

        ReqWrapper wrapper = null;
        ServletContext context = null;

        //create the request wrapper object, an instance of the
        //ReqWrapper class. The client request is passed into
        //ReqWrapper's constructor

        if (request instanceof HttpServletRequest)
            wrapper = new ReqWrapper((HttpServletRequest)request);

        //use the ServletContext.log method to log param names/values

        if (wrapper != null){
            context = config.getServletContext( );

            context.log("Query: " + wrapper.getQueryString( ));}

        //continue the request, response to next filter or servlet
        //destination

        if (wrapper != null)
            chain.doFilter(wrapper,response);
        else
            chain.doFilter(request,response);

    } //doFilter

    public void destroy( ){

        /*called before the Filter instance is removed
        from service by the web container*/
    } //destroy
}

```

[Example 18-3](#) uses the servlet context to log the `ReqWrapper`'s query string. The `ReqWrapper` class

adds a parameter to the query string, but you could make this class implement whatever behavior you need in your own application. [Example 18-4](#) shows the filter-mapping entries in the deployment descriptor (*web.xml*), which ensures that every application request passes through this filter.

Example 18-4. The filter mapping in web.xml

```
<filter>

    <filter-name>RequestFilter</filter-name>
    <filter-class>com.jspServletcookbook.RequestFilter</filter-class>

</filter>

<filter-mapping>

    <filter-name>RequestFilter</filter-name>
    <url-pattern>/*</url-pattern>

</filter-mapping>
```

The `ReqWrapper` is a simple example of an `HttpServletRequestWrapper` subclass that encapsulates the original request. This class overrides the `getQueryString()` method in order to add a parameter to the request's query string.

To access the new `filter` parameter, you must call `getQueryString()` on the request once it reaches its destination servlet, then parse the `getQueryString()` return value for individual parameters. Using the EL will not work with request wrappers that override `getQueryString()`:

```
//does not return the new parameter value
//added by the overridden getQueryString
//method
${param.filter}
```

The request that passes through the filter is the parameter to `ReqWrapper`'s constructor, so the filter (in [Example 18-3](#)) wraps the request with this code:

```
wrapper = new ReqWrapper((HttpServletRequest)request);
```

A URL sent to the application containing the query string `name=Bruce` displays the following text in the server log (as a result of the `ServletContext.log` method):

```
Query: name=Bruce&filter=com.jspServletcookbook.ReqWrapper.
```

[Example 18-5](#) is the code for the `ReqWrapper` object.

Example 18-5. The ReqWrapper class for encapsulating the HttpServletRequest

```
package com.jspServletcookbook;
```

```

import javax.servlet.*;
import javax.servlet.http.HttpServletRequestWrapper;
import javax.servlet.http.HttpServletRequest;

public class ReqWrapper extends HttpServletRequestWrapper{

    private static final String AMP = "&";

    public ReqWrapper(HttpServletRequest request){

        super(request);
    }

    public String getQueryString( ){

        String query = null;

        //get the query string from the wrapped request object
        query = ((HttpServletRequest)getRequest( )).getQueryString( );

        //add a 'filter' parameter to this query string with the class
        //name as the value
        if (query != null)
            return query +AMP+"filter="+getClass( ).getName( );
        else
            return "filter="+getClass( ).getName( );

    } //getQueryString
}

```

The method call `chain.doFilter(wrapper, response)` at the end of [Example 18-3](#) passes the request (wrapped in our own custom class) and response to the next filter, or to the destination servlet or JSP if no other filters are registered.

See Also

[Recipe 18.1](#) and [Recipe 18.2](#) on examining request headers in a servlet and a JSP respectively; [Recipe 18.3](#) on using a filter to wrap the request and forward it along the filter chain; [Recipe 18.6](#) on using a listener to track requests; [Chapter 7](#) on handling request parameters and JavaBean properties with servlets, JSPs, and filters.

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Recipe 18.4 Automatically Refreshing a Servlet

Problem

You want to automatically refresh a servlet-generated page at a specified interval.

Solution

Add a `Refresh` response header, using the `javax.servlet.http.HttpServletResponse` object.

Discussion

Suppose that your servlet is monitoring a Red Sox versus Yankees baseball game. You want to be able to allow a user to follow the game almost pitch by pitch, and have your web application constantly update the status of the game. If you add a `Refresh` response header to your client response, the browser will continually refresh the page according to the specified interval.

[Example 18-6](#) adds a response header that the web container will send to the client in the format `Refresh: 60`, which means "request this page again in 60 seconds."

Example 18-6. Refreshing a servlet every 60 seconds

```
package com.jspervletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

public class AutoServlet extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        //client browser will request the page every 60 seconds
        response.addHeader("Refresh","60");

        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );
        out.println(
            "<html><head><title>Client Refresh</title></head><body>");
```



```

        out.println("<h2>Welcome to the Red Sox - Yankees series...</h2>");

        //More HTML or dynamic content
        out.println("</body></html>");

    } //doGet
}

```

There are some caveats to this approach-if the end user walks away from her desk, her browser will blithely continue to request the page. If your servlet doesn't impose some control over this, you could add a lot of unnecessary load to your application. One example of a solution to this problem is to keep track of how many times the servlet has been refreshed with a session attribute (detailed in [Chapter 16](#)). If the number of times exceeds a certain limit, you could stop adding the header to the response. [Example 18-7](#) shows part of a `doPost()` method body for keeping track of a user's refresh count.

Example 18-7. Tracking a user's refresh count

```

//inside doPost (or doGet) method
HttpSession session = request.getSession( );

Long times = (Long) session.getAttribute("times");

//create session attribute if it doesn't exist
if (times == null)
    session.setAttribute("times",new Long(0));

//local variable 'temp' will hold the session attribute value
long temp = 1;

//increment the attribute value to account for this request
if (times != null)
    temp = times.longValue( ) + 1;

if (temp < 60) //only allow 60 refreshes; about an hour's worth
    response.addHeader("Refresh","60");

//update the session attribute value
session.setAttribute("times",new Long(temp));

```

This code works equally well inside of a `doGet()` method.

See Also

[Recipe 18.5](#) on automatically refreshing a JSP; [Recipe 18.1](#) and [Recipe 18.2](#) on examining request headers in a servlet and a JSP; [Recipe 18.3](#) on using a filter to wrap the request and forward it along

the filter chain; [Recipe 18.6](#) on using a listener to track requests.

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Recipe 18.5 Automatically Refreshing a JSP

Problem

You want to refresh a JSP request at a specified interval.

Solution

Use a JSP scriptlet that adds a `Refresh` response header to the response.

Discussion

The following scriptlet code adds a `Refresh` header that specifies a 60-second interval for refreshing the JSP. Place this code at the top of the JSP before any content appears:

```
<% response.setHeader("Refresh","60"); %>
```

If you want to refresh the JSP to another web component or page, use this syntax:

```
<% response.setHeader("Refresh","10;  
http://localhost:8080/home/thanks.jsp"); %>
```

See Also

[Example 18-6](#) in [Recipe 18.4](#) on refreshing a servlet; [Example 18-7](#) in [Recipe 18.4](#) on limiting the number of automatic refreshes of a servlet; [Recipe 18.1](#) and [Recipe 18.2](#) on examining request headers in a servlet and a JSP, respectively; [Recipe 18.3](#) on using a filter to wrap the request and forward it along the filter chain; [Recipe 18.6](#) on using a listener to track requests.

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Recipe 18.6 Counting the Number of Web Application Requests

Problem

You want to count the number of requests handled by a web application.

Solution

Use a `javax.servlet.ServletRequestListener` to be notified whenever an HTTP request is initialized.

Discussion

A request listener is a good candidate for tracking requests, because the web container notifies the listener of new requests by calling its `requestInitialized()` method. Example 18-8 keeps track of the request count with a static class variable named `reqCount`. The program increments this variable in a synchronized block within the `requestInitialized()` method.

The `ServletContext` is used to log a message about the request so that you can observe the listener behavior. However, a busy production application that logs information about every request typically represents an inefficient use of web container resources. This type of logging activity should be reserved for development applications.

Example 18-8. A request listener class for counting application requests

```
package com.jspServletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

public class ReqListener implements ServletRequestListener {

    private static long reqCount;

    public void requestInitialized(ServletRequestEvent sre){

        //used for logging purposes
        ServletContext context = sre.getServletContext( );

        //Used to get information about a new request
        ServletRequest request = sre.getServletRequest( );
```



```

//The static class variable reqCount is incremented in this block;
//the incrementing of the variable is synchronized so that one
// thread is not reading the variable while another increments it

synchronized (context){

    context.log(
        "Request for "+
        (request instanceof HttpServletRequest ?
        ((HttpServletRequest) request).getRequestURI( ) :
        "Unknown")+ "; Count="+ ++reqCount);

}

}

public void requestDestroyed(ServletRequestEvent sre){

    //Called when the servlet request is going out of scope.

}

}

```

You can access the new `ServletRequest` in the two `ServletRequestListener` methods by calling `ServletRequestEvent.getServletRequest()`. You must cast the `ServletRequest` return value to an `HttpServletRequest` to call the latter class's methods. Example 18-8 accesses the new `HttpServletRequest` in order to call those object's `getRequestURI()` method, which provides part of the information the code includes in a logging message.

You must register the `ServletRequestListener` in *web.xml*:

```

<listener>
    <listener-class>com.jspServletcookbook.RegListener</listener-class>
</listener>

```

The web container then creates an instance of the listener when it starts up. Here is an example of a server-log entry when a request is made to the application within which the request listener is registered:

```

2003-05-30 07:22:21 Request for /home/servlet/com.jspServletcookbook.SessionDisplay;
Count=2

```

For Tomcat, this line would be displayed in the log file found in *<Tomcat-installation-directory>/logs*.

See Also

Recipe 18.1 and Recipe 18.2 on examining request headers in a servlet and a JSP; Recipe 18.3 on using a filter to wrap the request and forward it along the filter chain; Chapter 7 on handling request parameters and JavaBean properties with servlets, JSPs, and filters.

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Chapter 19. Filtering Requests and Responses

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Introduction

Servlet filtering was introduced with the servlet API v2.3 in 2001. Filtering is a powerful technology for servlet developers, who can use it to generate chains of Java classes that execute in sequence in response to client requests.

Developers begin by creating one or more Java classes that implement the `javax.servlet.Filter` interface. These classes can undertake a number of actions prior to a servlet's request handling, creating a chain of actions before the request is delivered to its destination (including blocking the request altogether). These actions include, according to the `Filter` API documentation:

- Authentication of requests
- Data encryption
- Data compression
- Logging
- Extensible Stylesheet Language Transformation (XSLT) filtering
- Image conversion

Access the Javadoc for the `Filter` interface at:

<http://java.sun.com/j2ee/1.4/docs/api/javax/servlet/Filter.html>.

Register a filter in the deployment descriptor, and then map the registered filter to either servlet names or URL patterns in your application's deployment descriptor. When the web container starts up your web application, it creates an instance of each filter that you have declared in the deployment descriptor. The filters execute in the order that they are declared in the deployment descriptor.

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Recipe 19.1 Mapping a Filter to a Servlet

Problem

You want to map or apply a filter to an individual servlet.

Solution

Use the `filter` and `filter-mapping` elements in *web.xml* to associate the filter with the servlet.

Discussion

The web container finds out about the filters that you want to apply to a servlet by using information in the deployment descriptor. The `filter` element associates a filter name with a Java class that implements the `javax.servlet.Filter` interface. The `filter-mapping` element then associates individual filters with URL mappings or paths, similar to the `servlet-mapping` element that you have probably used before in *web.xml*. Example 19-1 shows a deployment descriptor from the servlet API v2.3 that includes the mapping of a filter named `LogFilter` to the servlet path */requestheaders*.

Example 19-1. Mapping a filter to a servlet

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE web-app
    PUBLIC "-//Sun Microsystems, Inc.//DTD Web Application 2.3//EN"
        "http://java.sun.com/dtd/web-application_2_3.dtd"
>

<web-app>

<!-- register the filter -->

<filter>
    <filter-name>LogFilter</filter-name>
    <filter-class>com.jspServletcookbook.LogFilter</filter-class>
</filter>

<filter-mapping>
    <filter-name>LogFilter</filter-name>
    <url-pattern>/requestheaders</url-pattern>
</filter-mapping>

<!-- register the servlet to which the filter is mapped -->

<servlet>
```

```
<servlet-name>requestheaders</servlet-name>
<servlet-class>com.jspServletcookbook.RequestHeaderView</servlet-class>
</servlet>

<!-- Here is the URL mapping for the requestheaders servlet -->

<servlet-mapping>
  <servlet-name>requestheaders</servlet-name>
  <url-pattern>/requestheaders</url-pattern>
</servlet-mapping>

</web-app>
```

When a client sends a request to the servlet path */requestheaders*, the web container applies the `LogFilter` filter to the request. This servlet path, as in:

`http://localhost:8080/home/requestheaders`

is the only servlet path to which this filter is applied. As you might have guessed, the `LogFilter` logs some information about the request before the request continues along to its servlet destination. Example 19-2 shows the filter class for the `LogFilter` in Example 19-1.

This filter class provides the additional benefit of showing you how to log a message inside of a filter!

Make sure to:

- Create the filter with a constructor that does not take any parameters
- Give the filter class a package name
- Store the filter in the *WEB-INF/classes* directory of the web application, including its package-related directories
- Map the filter to the servlet in *web.xml*, as in Example 19-1

Example 19-2. A filter that logs some information

```
package com.jspServletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

import org.apache.log4j.Logger;
import org.apache.log4j.PropertyConfigurator;

public class LogFilter implements Filter {
```

```

    private FilterConfig config;
    private Logger log;

    // Creates new LogFilter
    public LogFilter( ) {}

    public void  init(FilterConfig filterConfig) throws ServletException{

        this.config = filterConfig;

        //load the configuration for this application's loggers using the
        // servletLog.properties file
        PropertyConfigurator.configure(config.getServletContext( ).
            getRealPath("/") +
                "WEB-INF/classes/servletLog.properties");

        log = Logger.getLogger(LogFilter.class);

        log.info("Logger instantiated in " + getClass( ).getName( ));
    } //init

    public void  doFilter(ServletRequest request, ServletResponse response,
        FilterChain chain) throws java.io.IOException, ServletException {

        HttpServletRequest req = null;

        if (log != null && (request instanceof HttpServletRequest)){

            req = (HttpServletRequest) request;
            log.info(
                "Request received from: " + req.getRemoteHost( ) + " for: " +
                req.getRequestURL( )); }

        //pass request back down the filter chain
        chain.doFilter(request,response);
    } // doFilter

    public void destroy( ){

        /*called before the Filter instance is removed
        from service by the web container*/
        log = null;
    }
}

```

This filter logs the remote host of the client request and the URL that the client requested. Here is an example of the logged information:

```
INFO - Request received from: localhost for: http://localhost:8080/home/requestheaders
```

The filter uses the *log4j* library (see Chapter 14) from the Apache Software Foundation.



Since the first parameter to the filter's `doFilter()` method is a `javax.servlet.ServletRequest` type, this parameter must be cast to an `HttpServletRequest` to call methods such as `HttpServletRequest.getRemoteHost()`.

See Also

Recipe 7.9 on using a filter to read request parameter values; Recipe 11.11 on using a filter to monitor session attributes; Recipe 18.3 on using a filter to alter the request; Recipe 19.2-Recipe 19.4 on mapping filters to web components; Recipe 19.5 on configuring filter initialization parameters; Recipe 19.6 on blocking requests; Recipe 19.7 on filtering the `HttpServletResponse`; Recipe 19.8 on using filters with `RequestDispatchers`; Recipe 19.9 on using filters to check request parameters; Recipe 19.10 on using filters to disallow requests from certain IP addresses.

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Recipe 19.2 Mapping a Filter to a JSP

Problem

You want to have the web container apply a filter to requests for a certain JSP page.

Solution

Use the `url-pattern` child element of the `filter-mapping` element in the deployment descriptor to map the filter to the JSP.

Discussion

Map a filter to a JSP by specifying the path to the JSP page using the `filter-mapping` element's `url-pattern` subelement. [Example 19-3](#) shows a *web.xml*/configuration that maps the filter in [Example 19-2](#) to the *requestHeaders.jsp*.

Example 19-3. Mapping a filter to a JSP

```
<!-- top of web.xml deployment descriptor -->

<filter>
  <filter-name>LogFilter</filter-name>
  <filter-class>com.jspServletcookbook.LogFilter</filter-class>
</filter>

<filter-mapping>
  <filter-name>LogFilter</filter-name>
  <url-pattern>/displayHeaders.jsp</url-pattern>
</filter-mapping>

<!-- rest of deployment descriptor -->
```

You can create a number of filter mappings for a single filter, each with their own type of URL pattern.

With the configuration of [Example 19-3](#), any requests for */displayHeaders.jsp* will pass through the filter named `LogFilter`. [Example 19-2](#) shows the source code for the `LogFilter` class. The code logs

a message about the request, before the request is passed along the filter chain to the JSP. The logged message looks like:

```
INFO - Request received from: localhost for: http://localhost:8080/home/
displayHeaders.jsp
```

The JSP itself does not have to be configured in a special way for the filter to be applied to it. You can apply the filter to all JSPs with this configuration:

```
<filter-mapping>
  <filter-name>LogFilter</filter-name>
  <url-pattern>*.jsp</url-pattern>
</filter-mapping>
```

The URL pattern `*.jsp` is an extension mapping that associates the `LogFilter` with any of the web application's components that end with `.jsp`.

See Also

[Recipe 7.9](#) on using a filter to read request parameter values; [Recipe 11.11](#) on using a filter to monitor session attributes; [Recipe 18.3](#) on using a filter to alter then forward the request; [Recipe 19.3](#) on mapping more than one filter to a servlet; [Recipe 19.4](#) on changing the order filters are applied to a servlet; [Recipe 19.5](#) on configuring filter initialization parameters; [Recipe 19.6](#) on blocking requests; [Recipe 19.7](#) on filtering the `HttpServletResponse`; [Recipe 19.8](#) on using filters with `RequestDispatchers`; [Recipe 19.9](#) on using filters to check request parameters; [Recipe 19.10](#) on using filters to disallow requests from certain IP addresses.

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Recipe 19.3 Mapping More Than One Filter to a Servlet

Problem

You want requests for a servlet or JSP to pass through more than one filter.

Solution

Map each filter to the servlet or JSP using `filter-mapping` elements in the deployment descriptor. The filters are applied to the servlet in the order they appear in the deployment descriptor.

Discussion

Your web application may define several different filters with a specific purpose. For instance, one filter might log messages, while another filter authenticates users. It is straightforward to create a filter chain that applies each filter in a specified order to a servlet. You use the `filter-mapping` element to map each filter to the target servlet (or JSP). The web container then applies the filters to the target in the order that the `filter-mapping` elements are defined in the deployment descriptor.

[Example 19-4](#) configures two filters: `AuthenFilter` and `LogFilter`. The `filter-mapping` elements for these filters then map the servlet name `requestheaders` to each of these filters. The order of the `filter-mapping` elements in [Example 19-4](#) specifies that the authentication filter (`AuthenFilter`) must be applied to the servlet named `requestheaders` first, followed by the `LogFilter`.

To map a filter to a servlet name, the servlet has to be registered in *web.xml*. [Example 19-4](#) registers the `requestheaders` servlet beneath the `filter` and `filter-mapping` elements.

Example 19-4. Mapping more than one filter to a servlet

```
<!-- top of web.xml deployment descriptor -->

<filter>
    <filter-name>AuthenFilter</filter-name>
    <filter-class>com.jspervletcookbook.AuthenticateFilter</filter-class>
</filter>

<filter>
    <filter-name>LogFilter</filter-name>
    <filter-class>com.jspervletcookbook.LogFilter</filter-class>
</filter>
```



```
<filter-mapping>
  <filter-name>AuthenFilter</filter-name>
  <servlet-name>requestheaders</servlet-name>
</filter-mapping>

<filter-mapping>
  <filter-name>LogFilter</filter-name>
  <servlet-name>requestheaders</servlet-name>
</filter-mapping>

<!-- servlet definitions -->

<servlet>
  <servlet-name>requestheaders</servlet-name>
  <servlet-class>com.jspServletcookbook.RequestHeaderView</servlet-class>
</servlet>

<!-- servlet-mapping section of web.xml -->

<servlet-mapping>
  <servlet-name>requestheaders</servlet-name>
  <url-pattern>/requestheaders</url-pattern>
</servlet-mapping>

<!-- rest of deployment descriptor -->
```

When a user requests the `requestheaders` servlet using the servlet path */requestheaders*, as specified in the `servlet-mapping` element, the request passes through the `AuthenFilter` and `LogFilter` before it reaches its servlet destination.

The same process applies to a `filter-mapping` that uses a `url-pattern` element instead of a `servlet-name` element. The order of the `filter-mapping` elements in the deployment descriptor determines the order of the filters applied to the web components that match the `url-pattern`.

See Also

[Recipe 7.9](#) on using a filter to read request parameter values; [Recipe 11.11](#) on using a filter to monitor session attributes; [Recipe 18.3](#) on using a filter to alter then forward the request; [Recipe 19.4](#) on changing the order filters are applied to a servlet; [Recipe 19.5](#) on configuring filter init parameters; [Recipe 19.6](#) on blocking requests; [Recipe 19.7](#) on filtering the `HttpServletResponse`; [Recipe 19.8](#) on using filters with `RequestDispatchers`; [Recipe 19.9](#) on using filters to check request parameters; [Recipe 19.10](#) on using filters to disallow requests from certain IP addresses.

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Recipe 19.4 Changing the Order in Which Filters are Applied to Servlets

Problem

You want to change the order in which filters are applied to web components.

Solution

Change the order of `filter-mapping` elements in the deployment descriptor.

Discussion

The order of `filter-mapping` elements in *web.xml* determines the order in which the web container applies the filter to the servlet. [Example 19-5](#) reverses the order of the `filter-mapping` elements that map two filters to the servlet named *requestheaders*, compared with [Recipe 19.3](#). The `LogFilter` is thus applied to the servlet before the `AuthenFilter`. Any requests for the servlet pass through a chain: `LogFilter` `AuthenFilter` *requestheaders* servlet.

Example 19-5. Reversing the order of filter-mapping elements

```
<!-- LogFilter applies to the requestheaders servlet  
before AuthenFilter -->
```

```
<filter-mapping>  
  <filter-name>LogFilter</filter-name>  
  <servlet-name>requestheaders</servlet-name>  
</filter-mapping>
```

```
<filter-mapping>  
  <filter-name>AuthenFilter</filter-name>  
  <servlet-name>requestheaders</servlet-name>  
</filter-mapping>
```

See Also

[Recipe 7.9](#) on using a filter to read request parameter values; [Recipe 11.11](#) on using a filter to monitor session attributes; [Recipe 18.3](#) on using a filter to alter then forward the request; [Recipe 19.1](#) - [Recipe 19.3](#) on mapping filters to web components; [Recipe 19.5](#) on configuring filter init

parameters; [Recipe 19.6](#) on blocking requests; [Recipe 19.7](#) on filtering the `HttpServletResponse`; [Recipe 19.8](#) on using filters with `RequestDispatchers`; [Recipe 19.9](#) on using filters to check request parameters; [Recipe 19.10](#) on using filters to disallow requests from certain IP addresses.

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Recipe 19.5 Configuring Initialization Parameters for a Filter

Problem

You want to make an initialization (init) parameter available to a filter .

Solution

Use the `init-param` child element of the `filter` element to declare the initialization parameter and its value. Inside the filter, access the init parameter by calling the `FilterConfig` object's `getInitParameter` method.

Discussion

[Example 19-6](#) shows a filter declared in the deployment descriptor. The filter includes an init parameter named `log-id`.

Example 19-6. A filter declared in the deployment descriptor with an init parameter

```
<filter>
  <filter-name>LogFilter</filter-name>
  <filter-class>com.jspServletcookbook.LogFilter</filter-class>
  <init-param>
    <param-name>log-id</param-name>
    <param-value>A102003</param-value>
  </init-param>
</filter>
```

[Example 19-7](#) shows the code you would use inside the filter to access the init parameter and its value. The code initializes the `FilterConfig` object in its `init` method, which is called once when the web container creates an instance of the filter. The code then gets the value of the filter's init parameter by calling:

```
String id = config.getInitParameter("log-id");
```

Make sure that the code checks whether the return value from `getInitParameter` is `null` before the code does something with that object.

Example 19-7. Accessing an init param value in a filter

```
package com.jspServletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;

import org.apache.log4j.Logger;
import org.apache.log4j.PropertyConfigurator;

public class LogFilter implements Filter {

    private FilterConfig config;
    private Logger log;

    // Creates new LogFilter
    public LogFilter( ) {}

    public void init(FilterConfig filterConfig) throws ServletException{

        this.config = filterConfig;

        //load the configuration for this application's loggers
        //using the servletLog.properties file
        PropertyConfigurator.configure(config.getServletContext( ).
            getRealPath("/") +
                "WEB-INF/classes/servletLog.properties");

        log = Logger.getLogger(LogFilter.class);

        log.info("Logger instantiated in "+ getClass( ).getName( ));
    }

    public void doFilter(ServletRequest request, ServletResponse response,
        FilterChain chain) throws java.io.IOException, ServletException {

        HttpServletRequest req = null;

        String id = config.getInitParameter("log-id");

        if (id == null)
            id = "unknown";

        if (log != null && (request instanceof HttpServletRequest)){

            req = (HttpServletRequest) request;
            log.info("Log id:" + id + ": Request received from: " +
                req.getRemoteHost( ) + " for " + req.getRequestURL( )); }

        chain.doFilter(request,response);

    } // doFilter
}
```



```
public void destroy( ){
    /*called before the Filter instance is removed
    from service by the web container*/
    log = null;
}
}
```

Here is how the log output appears:

INFO - Log id:A102003: Request received from: localhost for http://localhost:8080/home/requestheaders



You can also use the `FilterConfig` object's `getInitParameterNames` method to get all of the init parameter names in a `java.util.Enumeration` object.

See Also

[Recipe 7.9](#) on using a filter to read request parameter values; [Recipe 11.11](#) on using a filter to monitor session attributes; [Recipe 18.3](#) on using a filter to alter then forward the request; [Recipe 19.1](#)-[Recipe 19.4](#) on mapping filters to web components; [Recipe 19.6](#) on blocking a request; [Recipe 19.7](#) on filtering the `HttpServletResponse`; [Recipe 19.8](#) on using filters with `RequestDispatchers`; [Recipe 19.9](#) on using filters to check request parameters; [Recipe 19.10](#) on using filters to disallow requests from certain IP addresses.

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Recipe 19.6 Optionally Blocking a Request with a Filter

Problem

You want the option to block a request with a filter.

Solution

Do not call the `FilterChain` object's `doFilter()` method inside of the filter. Output the response to the client inside of the filter's `doFilter()` method instead.

Discussion

A filter blocks a request from getting to a web component, such as a servlet, JSP, or HTML page, by never calling `FilterChain.doFilter()` inside the filter's own `doFilter()` method.

The `BlockFilter` class in [Example 19-8](#) attempts to authenticate the user based on a request parameter. If the authentication fails, the filter uses the response object to output a response to the client, and the request is effectively blocked from reaching the requested servlet. A filter can output the final response to the client, not just initiate its filtering tasks.

Example 19-8. A filter optionally blocks the request and issues a response itself

```
package com.jspervletcookbook;

import java.io.PrintWriter;
import java.io.IOException;

import javax.servlet.*;
import javax.servlet.http.*;

public class BlockFilter implements Filter {

    private FilterConfig config;

    /** Creates new BlockFilter */
    public BlockFilter( ) {}

    public void init(FilterConfig filterConfig) throws ServletException{
```

```

        this.config = filterConfig;
    }

    public void doFilter(ServletRequest request, ServletResponse response,
        FilterChain chain) throws IOException, ServletException {

        HttpServletRequest req = null;
        boolean authenticated = false;
        PrintWriter out = null;

        if (request instanceof HttpServletRequest){

            req = (HttpServletRequest) request;

            String user = req.getParameter("user");//get the user name

            authenticated = authenticateUser(user);//authenticate the user
        }

        if (authenticated){

            //they are authenticated, so pass along the request

            chain.doFilter(request,response);

            else {
                //have the filter send back the response

                response.setContentType("text/html");

                out = response.getWriter( );

                out.println(
                    "<html><head><title>Authentication Response</title>");
                out.println("</head><body>");
                out.println("<h2>Sorry your authentication attempt failed</h2>");

                out.println("</body></html>");
            }
        } // doFilter

        public void destroy( ){
            /*called before the Filter instance is removed
            from service by the web container*/
        }

        private boolean authenticateUser(String userName){

            //authenticate the user using JNDI and a database, for instance
            //return false for demonstration purposes
            return false;
        }
    }

```

```

    } // authenticateUser
}

```

The code authenticates the user by getting the hypothetical username as a request parameter. The name is the parameter for the filter's `authenticateUser()` method, which returns `false` to demonstrate the filter's response to the client. The filter uses the `PrintWriter` from the `javax.servlet.ServletResponse` object, which is a parameter to the `doFilter()` method. The `PrintWriter` sends HTML back to the client. [Figure 19-1](#) shows the response output in a web browser.

Figure 19-1. The HTML page returned by a blocking filter



If you regularly use filters to send responses to a client, consider creating a JavaBean to customize the response. Store the bean class in its package beneath *WEB-INF/classes*, and use the bean inside the filter.

See Also

[Recipe 7.9](#) on using a filter to read request parameter values; [Recipe 11.11](#) on using a filter to monitor session attributes; [Recipe 18.3](#) on using a filter to alter then forward the request; [Recipe 19.1-Recipe 19.4](#) on mapping filters to web components; [Recipe 19.5](#) on configuring init parameters for a filter; [Recipe 19.7](#) on filtering the HTTP response; [Recipe 19.8](#) on using filters with `RequestDispatchers`; [Recipe 19.9](#) on using filters to check request parameters; [Recipe 19.10](#) on using filters to disallow requests from certain IP addresses.

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Recipe 19.7 Filtering the HTTP Response

Problem

You want to change the response with a filter while the client request is en route to the servlet.

Solution

Change the `javax.servlet.ServletResponse` inside the filter's `doFilter()` method by wrapping the response with your own object. Then pass the wrapped response as a parameter into the `FilterChain.doFilter()` method.

Discussion

Here are the steps for changing a response with a filter and a wrapper class:

1. Create a Java class that extends `javax.servlet.http.HttpServletResponseWrapper`.
2. Place this class, including its package-related directories, in *WEB-INF/classes*.
3. Use the wrapper class in the filter to wrap the response object, which is a parameter to the filter's `doFilter()` method.
4. Call the `chain.doFilter()` method with the wrapped response as a parameter.

[Example 19-9](#) shows the Java class that we will use to wrap the response object.



If you are just making a simple response change, you do not *have* to go to the trouble of using an `HttpServletResponseWrapper` class. This code inside of a filter's method adds a header to the response, then calls the `chain.doFilter()` method with the altered response:

```
if(response instanceof HttpServletResponse){
    //cast to HttpServletResponse to call
    //addHeader
    myHttpResponse =
        ((HttpServletResponse)response);

    myHttpResponse.addHeader("WWW-Authenticate",
        "BASIC realm=\"Admin\"");

    chain.doFilter(request,response); }
```

The `ResponseWrapper` class contains the skeleton of a new method named `getWebResource`. I want to show the mechanics of wrapping the response in a filter, so have kept this wrapper class very simple.

All the other `HttpServletResponse`-derived method calls are delegated to the wrapped response object, which is the convenience of extending `HttpServletResponseWrapper`.

Example 19-9. An `HttpServletResponseWrapper` class for use in a filter

```
package com.jspervletcookbook;

import javax.servlet.*;
import javax.servlet.http.HttpServletResponseWrapper;
import javax.servlet.http.HttpServletResponse;

public class ResponseWrapper extends HttpServletResponseWrapper{

    public ResponseWrapper(HttpServletResponse response){

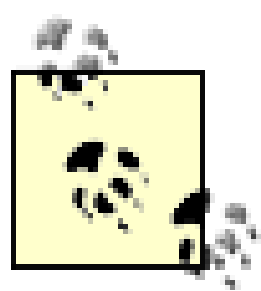
        super(response);
    }

    public String getWebResource(String resourceName){

        //Implement a method to return a String representing
        //the output of a web resource
        //See Recipe 13.5
        return "resource"; //for the compiler...

    } // getWebResource
}
```

[Example 19-10](#) shows the `doFilter()` method inside the filter that uses this `ResponseWrapper` class.



The class extending `HttpServletResponseWrapper` must be placed beneath *WEB-INF/classes*, with a directory structure that matches its package name.

Example 19-10. The `doFilter()` method of a filter that uses a `HttpServletResponseWrapper` class

```
public void doFilter(ServletRequest request, ServletResponse response,
    FilterChain chain) throws java.io.IOException, ServletException {

    if(response instanceof HttpServletResponse){

        chain.doFilter(request,
            new ResponseWrapper((HttpServletResponse)response));

    } else {

        chain.doFilter(request,response);

    }
} //doFilter
```

The code calls the `chain.doFilter()` method and passes in the wrapped response as a parameter. The web resource at the end of the chain has access to the customized response object and can call the additional method the response wrapper class has defined. All the other method calls on the `HttpServletResponse` object, such as `getWriter()` or `getOutputStream()`, are passed through to the wrapped response object.

See Also

[Recipe 7.9](#) on using a filter to read request parameter values; [Recipe 11.11](#) on using a filter to monitor session attributes; [Recipe 18.3](#) on using a filter to alter the request; [Recipe 19.1-Recipe 19.4](#) on mapping filters to web components; [Recipe 19.5](#) on configuring init parameters for a filter; [Recipe 19.6](#) on blocking a request; [Recipe 19.8](#) on using filters with `RequestDispatchers`; [Recipe 19.9](#) on using filters to check request parameters; [Recipe 19.10](#) on using filters to disallow requests from certain IP addresses.

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Recipe 19.8 Using Filters with RequestDispatcher Objects

Problem

You want to apply a filter to a servlet whose output is included in another servlet.

Solution

Use the `javax.servlet.RequestDispatcher` object to include the servlet's output. Configure the filter in *web.xml* with a `dispatcher` element containing the content "INCLUDE" (servlet API v2.4 and above only!).

Discussion

The servlet API v2.4 introduced a new twist for working with `RequestDispatchers`. Using the `filter-mapping` element in the deployment descriptor, you can specify that the filter applies to a servlet that is part of a `RequestDispatcher` include or forward action.

[Example 19-11](#) shows a *web.xml* configuration for a filter.

Example 19-11. Applying a filter to a servlet using a RequestDispatcher

```
<?xml version="1.0" encoding="ISO-8859-1"?>

<web-app xmlns="http://java.sun.com/xml/ns/j2ee"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation=
    "http://java.sun.com/xml/ns/j2ee
    http://java.sun.com/xml/ns/j2ee/web-app_2_4.xsd" version="2.4">

  <filter>
    <filter-name>LogFilter</filter-name>
    <filter-class>com.jspervletcookbook.LogFilter</filter-class>
  </filter>

  <filter-mapping>
    <filter-name>LogFilter</filter-name>
    <url-pattern>/requestheaders</url-pattern>
    <dispatcher>REQUEST</dispatcher>
    <dispatcher>INCLUDE</dispatcher>
  </filter-mapping>
```


The `dispatcher` elements in the example configuration specify that the `LogFilter` applies to requests for the servlet path `/requestheaders`, as well as to any `RequestDispatchers` that include the output of the servlet path `/requestheaders`.



Similarly, if you want to initiate a filter when you are using a `RequestDispatcher` to *forward* a request to another component, use the `FORWARD` value with the `dispatcher` element, as in:

```
<filter-mapping>
  <filter-name>LogFilter</filter-name>
  <url-pattern>/requestheaders</url-pattern>
  <dispatcher>REQUEST</dispatcher>
  <dispatcher>FORWARD</dispatcher>
</filter-mapping>
```

[Example 19-12](#) shows a servlet's `doGet` method that creates a `RequestDispatcher` specifying the path `/requestheaders`. This code includes the servlet output represented by that path. Because of [Example 19-11](#)'s configuration in `web.xml`, however, the web container applies the `LogFilter` before the servlet mapped to the `/requestheaders` path is executed.

Example 19-12. A servlet includes another servlet's output, triggering a filter

```
public void doGet(HttpServletRequest request, HttpServletResponse response)
    throws ServletException, java.io.IOException {

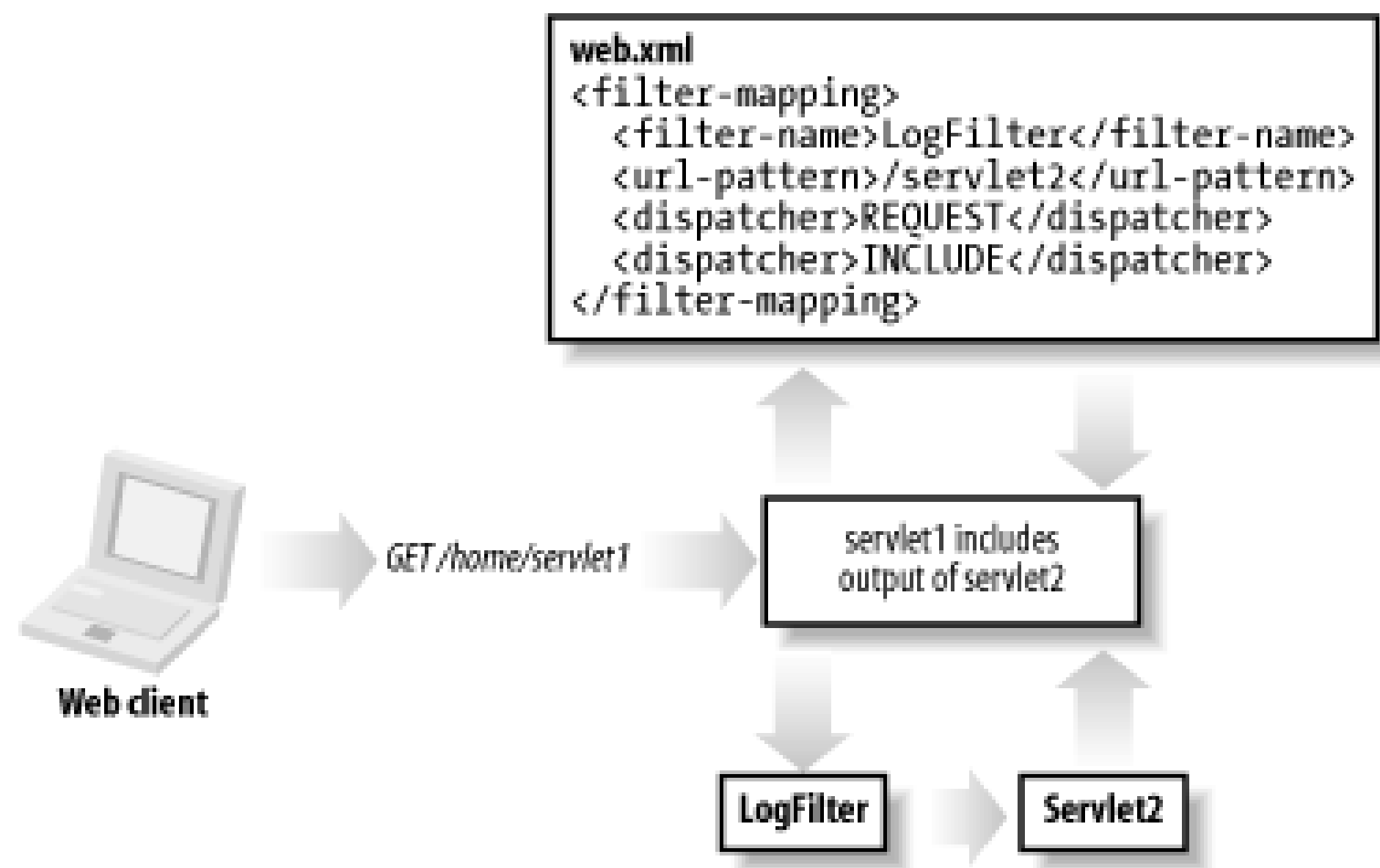
    /* The output of the servlet at path "/requestheaders" will
       be included in this servlet's output, but first the request
       will pass through the LogFilter before it is sent to the
       "/requestheaders" servlet */
    RequestDispatcher dispatch = request.getRequestDispatcher(
        "/requestheaders");

    dispatch.include(request, response);

}
```

[Figure 19-2](#) illustrates the process of filters and `RequestDispatchers`.

Figure 19-2. A log filter intervenes between a servlet, including another servlet's output



In [Figure 19-2](#), a web client requests the servlet at path `/home/servlet1`, with `/home` representing the context path. The `servlet1` component uses a `RequestDispatcher` to include the output of `servlet2`. Based on a `filter-mapping` element in `web.xml`, any requests for `servlet2` involving a `RequestDispatcher` include action must first pass through the log filter. This filter is configured with a `filter` element in `web.xml` with the name "LogFilter" ([Figure 19-2](#) does not show this configuration; see [Example 19-11](#)).

This type of `RequestDispatcher` set-up is only supported by Servlet API v2.4 and above.

See Also

[Chapter 6](#) on including content using `RequestDispatchers`; [Recipe 7.9](#) on using a filter to read request parameter values; [Recipe 11.11](#) on using a filter to monitor session attributes; [Recipe 18.3](#) on using a filter to alter then forward the request; [Recipe 19.1-Recipe 19.4](#) on mapping filters to web components; [Recipe 19.5](#) on configuring init parameters for a filter; [Recipe 19.6](#) on blocking a request; [Recipe 19.7](#) on filtering the HTTP response; [Recipe 19.9](#) on using filters to check request parameters; [Recipe 19.10](#) on using filters to disallow requests from certain IP addresses.

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Recipe 19.9 Checking Form Parameters with a Filter

Problem

You want to use a filter to check the values that a user has entered into a form.

Solution

Use the deployment descriptor to map the filter to the servlet or JSP that is the target of the form.

Discussion

Filters offer an alternative to JavaScript and other server-side languages for checking whether the user has entered valid values into HTML form fields. The filter in this recipe initiates a basic check of the request parameters to determine if they are `null` or the empty `String`.

[Example 19-13](#) is a JSP that contains an HTML form. The JSP includes some embedded JSTL tags that fill in the text fields with any correct values if the form is returned to the user for corrections. In most cases, a user fills in the vast majority of the fields correctly, but might make a mistake in one or two of them. You do not want to make him fill out all of the fields again.

Example 19-13. A JSP containing a form for users to fill out

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<html>
<head>
    <title>Personal Information</title>
</head>
<body bgcolor="#ffffff">

    <c:if test="${! (empty errorMsg)}">

        <font color="red"> <c:out value="${errorMsg}"/> </font>

    </c:if>

    <h2>Please enter your name and email address</h2>
    <table>
```

```
<form action="/home/thanks.jsp">

<tr><td valign="top">First name: </td>
<td valign="top">

    <input type="text" name="first" size="15" value=
        '<c:out value="\${first}" />'>

</td>
<td valign="top">Middle initial: </td>
<td valign="top">

    <input type="text" name="middle" size="2" value=
        '<c:out value="\${middle}" />'>

</td>
</tr>
<tr>
<td valign="top">Last name: </td>
<td valign="top">

    <input type="text" name="last" size="20" value=
        '<c:out value="\${last}" />'>

</td></tr>
<tr>
<td valign="top">Your email: </td>
<td valign="top">

    <input type="text" name="email" size="20" value=
        '<c:out value="\${email}" />'>

</td></tr>

<tr><td valign="top"><input type="submit" value="Submit"> </td>
<td></td></tr>
</form>
</table>

</body>
</html>
```

When the user submits [Example 19-13](#), the browser sends the form information to the URL specified in the `form` tag's `action` attribute: a JSP page named *thanks.jsp*. The deployment descriptor maps the filter in [Example 19-14](#) to the URL *thanks.jsp*. The filter is designed to check the fields' values to determine if the user left any of them blank and, if so, return the user to the form (named *form.jsp*).

Make sure to develop all filters with a constructor that does not take any arguments.

Example 19-14. The filter that checks parameters values

```
package com.jspServletcookbook;

import java.io.IOException;
import java.util.Enumeration;

import javax.servlet.*;
import javax.servlet.http.*;

public class CheckFilter implements Filter {

    private FilterConfig config;

    public CheckFilter( ) {}

    public void init(FilterConfig filterConfig) throws ServletException {

        this.config = filterConfig;

    }

    public void doFilter(ServletRequest request, ServletResponse response,
        FilterChain chain) throws IOException, ServletException {

        //Get all the parameter names associated with the form fields
        Enumeration params = request.getParameterNames( );
        boolean rejected = false;

        //Cycle through each one of the parameters; if any of them
        //are empty, call the 'reject' method
        while (params.hasMoreElements( )){

            if (isEmpty( request.getParameter( (String) params.
                nextElement( )) ) ){

                rejected = true;

                reject(request,response);

            }//if

        }//while

        //Pass the request to its intended destination, if everything
        //is okay
        if (! rejected)
            chain.doFilter(request,response);

    }// doFilter
```

```

private boolean isEmpty(String param){

    if (param == null || param.length( ) < 1){
        return true;
    }

    return false;
}

private void reject(ServletRequest request, ServletResponse response)
    throws IOException, ServletException {

    //Create an error message; store it in a request attribute
    request.setAttribute("errorMsg",
        "Please make sure to provide a valid value for all of the text "+
        "fields.");

    Enumeration params = request.getParameterNames( );

    String paramN = null;

    //Create request attributes that the form-related JSP will
    //use to fill in the form fields that have already been
    //filled out correctly. Then the user does not have to fill
    //in the entire form all over again.
    while (params.hasMoreElements( )){

        paramN = (String) params.nextElement( );

        request.setAttribute(
            paramN, request.getParameter(paramN));

    }

    //Use a RequestDispatcher to return the user to the form in
    //order to fill in the missing values

    RequestDispatcher dispatcher = request.
        getRequestDispatcher("/form.jsp");

    dispatcher.forward(request,response);

} //reject

public void destroy( ){
    /*called before the Filter instance is removed
    from service by the web container*/
}

}

```

The Java comments in [Example 19-14](#) explain what is going on in this filter. Basically, the user is

returned to the form, which displays an error message if any of the request parameters are empty. [Example 19-15](#) shows how the `CheckFilter` is mapped in *web.xml*. If the user fills in the form correctly, his request is sent to the *thanks.jsp* page without interruption by the filter.

Example 19-15. The `CheckFilter` is registered and mapped in *web.xml*

```
<!-- start of web.xml... -->

<filter>
    <filter-name>CheckFilter</filter-name>
    <filter-class>com.jspServletcookbook.CheckFilter</filter-class>
</filter>

<filter-mapping>
    <filter-name>CheckFilter</filter-name>
    <url-pattern>/thanks.jsp</url-pattern>
</filter-mapping>

<!-- rest of web.xml... -->
```

[Figure 19-3](#) shows an HTML form that was partially filled out and submitted. The filter sent the form back to the user with a message (in a red font).

Figure 19-3. A filter forwards an error message to a JSP

See Also

[Chapter 6](#) on including content using `RequestDispatchers`; [Recipe 19.8](#) on using filters with `RequestDispatchers`; [Recipe 7.9](#) on using a filter to read request parameter values; [Recipe 18.3](#) on using a filter to alter then forward the request; [Recipe 19.1-Recipe 19.4](#) on mapping filters to web

components; [Recipe 19.5](#) on configuring init parameters for a filter; [Recipe 19.6](#) on blocking a request; [Recipe 19.7](#) on filtering the HTTP response.

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Recipe 19.10 Blocking IP Addresses with a Filter

Problem

You want to use a filter that checks the IP address associated with the request.

Solution

Use a filter that calls the `HttpServletRequest` 's `getRemoteAddr()` method inside the `doFilter()` method and blocks the request by *not* calling `chain.doFilter()`.

Discussion

A typical use of a filter in a web application is to check the request to make sure it's acceptable. Let's say your security division has discovered that a certain range of IP addresses represent nasty clients-you want to rebuff those folks with a "403 Forbidden" HTTP response.

[Example 19-16](#) blocks any client IP address beginning with "192.168."

Example 19-16. A filter for blocking a certain range of IP addresses

```
package com.jspServletcookbook;

import java.io.IOException;
import java.util.StringTokenizer;

import javax.servlet.*;
import javax.servlet.http.*;

public class IPFilter implements Filter {

    private FilterConfig config;
    public final static String IP_RANGE = "192.168";

    public IPFilter( ) {}

    public void init(FilterConfig filterConfig) throws ServletException {

        this.config = filterConfig;

    }
}
```

```
public void doFilter(ServletRequest request,
    ServletResponse response,
    FilterChain chain) throws IOException, ServletException {

    String ip = request.getRemoteAddr( );

    HttpServletResponse httpResp = null;

    if (response instanceof HttpServletResponse)
        httpResp = (HttpServletResponse) response;

    //Break up the IP address into chunks representing each byte
    StringTokenizer token = new StringTokenizer(ip, ".");

    int dots = 0;

    String byte1 = "";

    String byte2 = "";

    String client = "";

    //
    while (token.hasMoreTokens( )){

        ++dots;

        //This token is the first number series or byte
        if (dots == 1){

            byte1 = token.nextToken( );

        } else {

            //This token is the second number series or byte
            byte2 = token.nextToken( );

            break;//only interested in first two bytes
        }
    }//while

    //Piece together half of the client IP address so it can be
    // compared with the forbidden range represented by
    //IPFilter.IP_RANGE

    client = byte1+"."+byte2;

    //if the client IP fits the forbidden range...
    if (IP_RANGE.equals(client)){
```

```

        httpResp.sendError(HttpServletResponse.SC_FORBIDDEN,
                           "That means goodbye forever!" );

    } else {

        //Client is okay; send them on their merry way
        chain.doFilter(request,response);
    }

} // doFilter

public void destroy( ){
    /*called before the Filter instance is removed
    from service by the web container*/
}

}

```

The filter obtains the client's IP address with the `ServletRequest`'s `getRemoteAddr()` method. The filter then parses the return value to determine if the IP address falls into the "192.168" range. If the IP address does fall into this range, then the code calls the `HttpServletResponse sendError()` method with the "403 Forbidden" type HTTP status code, as in:

```

httpResp.sendError(HttpServletResponse.SC_FORBIDDEN,
    "That means goodbye forever!" );

```

This method call effectively short circuits the request by preventing the user from reaching their original destination. If the IP address is acceptable, the code calls `chain.doFilter()`, which passes the request and response objects along the filter chain. In this case, the application does not map any other filters to *thanks.jsp*, so the web container invokes that JSP page.

[Example 19-17](#) shows the mapping for this filter in *web.xml*. The filter is mapped to *all* requests with the URL mapping */**.

Example 19-17. The mapping of the IP-blocking filter

```

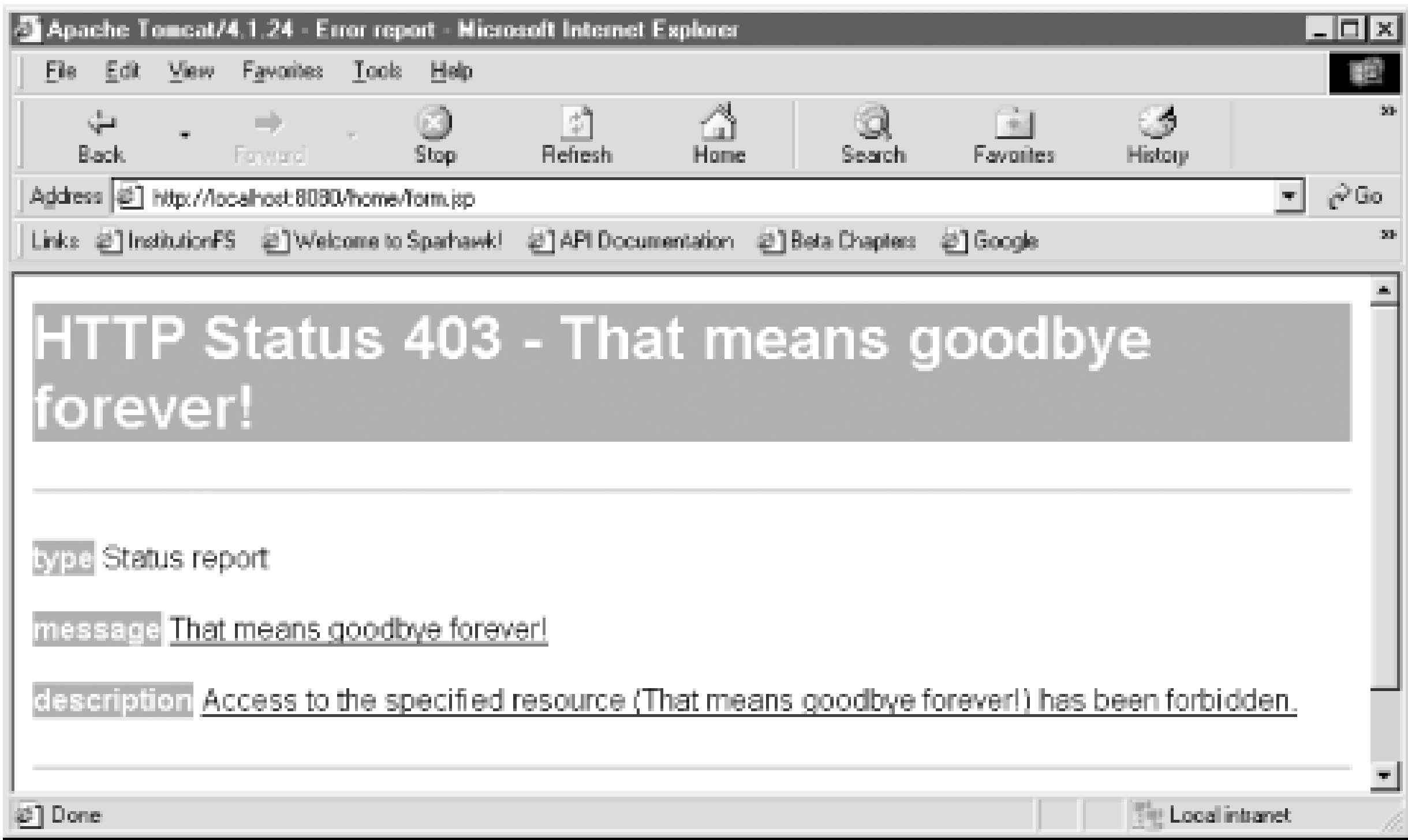
<filter>
    <filter-name>IPFilter</filter-name>
    <filter-class>com.jspServletcookbook.IPFilter</filter-class>
</filter>

<filter-mapping>
    <filter-name>IPFilter</filter-name>
    <url-pattern>/*</url-pattern>
</filter-mapping>

```

[Figure 19-4](#) shows the page the web browser will display if the client IP address is blocked.

Figure 19-4. A filtered out IP address receives an HTTP Status 403 message



See Also

[Chapter 9](#) on handling errors in web applications; [Recipe 19.8](#) on using filters with `RequestDispatchers`; [Recipe 18.3](#) on using a filter to alter then forward the request; [Recipe 19.1](#)-[Recipe 19.4](#) on mapping filters to web components; [Recipe 19.5](#) on configuring `init` parameters for a filter; [Recipe 19.7](#) on filtering the HTTP response; [Recipe 19.9](#) on checking form parameters with a filter.

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Chapter 20. Managing Email in Servlets and JSPs

[Introduction](#)

[Recipe 20.1. Placing the Email-Related Classes on your Classpath](#)

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[Recipe 20.4. Accessing Email from a Servlet](#)

[Recipe 20.5. Accessing Email from a Servlet Using a JavaBean](#)

[Recipe 20.6. Handling Attachments from an Email Received in a Servlet](#)

[Recipe 20.7. Adding Attachments to an Email in a Servlet](#)

[Recipe 20.8. Reading a Received Email's Headers from a Servlet](#)

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Introduction

This chapter describes how to manage email in your servlets using the JavaMail and JavaBeans Activation Framework (JAF) APIs. JavaMail provides Java classes for dealing with most aspects of creating, sending, and accessing email. The JAF is a separate API for handling the datatypes and Multipurpose Internet Mail Extension (MIME) types you may encounter when generating email, such as the many different kinds of file attachments. Both of these APIs are a part of the Java 2 Enterprise Edition (J2EE) platform.

JavaMail models an email system with classes that represent mail sessions (the `javax.mail.Session` class), message stores (the `javax.mail.Store` class), folders (the `javax.mail.Folder` class, such as the INBOX folder), email messages (`javax.mail.Message`), and email addresses (the `javax.mail.internet.InternetAddress` class) . For example, an email message is similar to a JavaBean, with setter methods to build the various message components (e.g., `setFrom()`, `setRecipients()`, `setSubject()`, etc.).

The following recipes show how to manage basic email messaging using a single servlet, as well as methods for separating the responsibility for emailing and handling HTTP requests into JavaBeans and servlets.

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Recipe 20.1 Placing the Email-Related Classes on your Classpath

Problem

You want to use the `javax.mail` and related Java packages to handle email in a servlet.

Solution

Download the ZIP files containing the *mail.jar* and *activation.jar* archives. Add these JAR files to a shared directory for JAR files whose contents are loaded by the web container. If this directory type is not available, add the *mail.jar* and *activation.jar* files to the *WEB-INF/lib* directory of your web application.

Discussion

If your classpath for compiling servlets already includes the JAR files made available by your web container (such as the JAR files in Tomcat's *common/lib* directory), test if an email-related servlet such as [Example 20-1](#) compiles successfully. If the compiler reports that the packages `javax.mail` and `javax.mail.internet` do not exist, you must add the proper JAR files to your classpath.

See [Recipe 4.3](#) on using Ant to include Tomcat's JAR files in your classpath.

Download the *mail.jar* component from <http://java.sun.com/products/javamail/>. The downloaded file is a ZIP archive containing the *mail.jar* archive. This file includes the required packages for handling email in a servlet, such as `javax.mail` and `javax.mail.internet`.

Then download the JAF from <http://java.sun.com/products/javabeans/glasgow/jaf.html>. Servlets can use these classes, as part of the *javax.activation* package, to handle the different data types that can be transferred with email messages, such as file attachments.

You can handle basic file attachments using the JavaMail API alone (without JAF), as in [Recipe 20.5](#) and [Recipe 20.6](#). See [Recipe 20.7](#) for examples of how to use some of the `javax.activation` classes to add file attachments to emails.

Add the *mail.jar* and *activation.jar* archives to the *WEB-INF/lib* directory of your web application to make the JavaMail and JAF packages available to a servlet.

See Also

The Sun Microsystems JavaMail API page: <http://java.sun.com/products/javamail/>; the JAF web page: <http://java.sun.com/products/javabeans/glasgow/jaf.html>; [Recipe 20.2](#) on sending email from a servlet; [Recipe 20.3](#) on sending email using a JavaBean; [Recipe 20.4](#) covering how to access email in a servlet; [Recipe 20.5](#) on accessing email with a JavaBean; [Recipe 20.6](#) on handling attachments in a servlet; [Recipe 20.7](#) on adding attachments to an email message; [Recipe 20.8](#) on reading an email's headers.

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Recipe 20.2 Sending Email from a Servlet

Problem

You want to send emails from a servlet.

Solution

Import the `javax.mail` and `javax.mail.internet` packages at the top of the servlet source code. Create a `sendMessage()` method (or a method with a different name) that can be called from the servlet methods `doGet()` or `doPost()`.

Discussion

The `sendMessage()` method in [Example 20-1](#) uses the JavaMail API to connect with a mail server, construct an email message, and then send that message to one or more recipients. The servlet obtains the various components of an email-the target email address, the sender's address, the subject field, and the email's body content-from request parameters. The servlet can handle a form submitted by a client using a web browser.

The form tag might look like this:

```
<form method="POST" action=
"/home/servlet/com.jspServletcookbook.EmailServlet">
```

[Example 20-1](#) calls the `sendMessage()` method from the service method `doPost()`. The `sendMessage()` method parameters comprise the parts of an email: the SMTP server, the recipient of the email (the variable `to`), the "from" address of the sender, the email subject, and the email's content.

Example 20-1. A servlet sends email based on request parameter values

```
package com.jspServletcookbook;

import java.io.IOException;
import java.io.PrintWriter;
import java.util.Properties;

import javax.mail.*;
import javax.mail.internet.*;
```

```
import javax.servlet.*;
import javax.servlet.http.*;

public class EmailServlet extends HttpServlet {

    //default value for mail server address, in case the user
    //doesn't provide one
    private final static String DEFAULT_SERVER = "mail.attbi.com";

    public void doPost(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        //obtain the values for email components from
        //request parameters
        String smtpServ = request.getParameter("smtp");
        if (smtpServ == null || smtpServ.equals(""))
            smtpServ = DEFAULT_SERVER;

        String from = request.getParameter("from");
        String to = request.getParameter("to");
        String subject = request.getParameter("subject");
        String emailContent = request.getParameter("emailContent");

        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );

        out.println(
            "<html><head><title>Email message sender</title></head><body>");

        try {

            sendMessage(smtpServ, to, from, subject, emailContent);

        } catch (Exception e) {

            throw new ServletException(e.getMessage( ));

        }

        out.println(
            "<h2>The message was sent successfully</h2>");

        out.println("</body></html>");

    } //doPost

    private void sendMessage(String smtpServer, String to, String from,
        String subject,String emailContent) throws Exception {

        Properties properties = System.getProperties( );
```

```
//populate the 'Properties' object with the mail
//server address, so that the default 'Session'
//instance can use it.
properties.put("mail.smtp.host", smtpServer);

Session session = Session.getDefaultInstance(properties);
Message mailMsg = new MimeMessage(session);//a new email message
InternetAddress[] addresses = null;

try {

    if (to != null) {

        //throws 'AddressException' if the 'to' email address
        //violates RFC822 syntax
        addresses = InternetAddress.parse(to, false);
        mailMsg.setRecipients(Message.RecipientType.TO, addresses);

    } else {

        throw new MessagingException(
            "The mail message requires a 'To' address.");

    }

    if (from != null) {

        mailMsg.setFrom(new InternetAddress(from));

    } else {

        throw new MessagingException(
            "The mail message requires a valid 'From' address.");

    }

    if (subject != null)
        mailMsg.setSubject(subject);

    if (emailContent != null)
        mailMsg.setText(emailContent);

    //Finally, send the mail message; throws a 'SendFailedException'
    //if any of the message's recipients have an invalid address
    Transport.send(mailMsg);

} catch (Exception exc) {

    throw exc;

}
```

```
//sendMessage

public void doGet(HttpServletRequest request,
    HttpServletResponse response) throws ServletException,
    java.io.IOException {

    //doGet( ) calls doPost( )...
    doPost(request, response);

} //doGet

} //EmailServlet
```

The servlet interacts with a mail server in the following manner:

1. The code creates a `javax.mail.Session` object, which contains various defaults and property values (such as `mail.smtp.host`) that the other JavaMail objects will use. You can share a single `Session` object in an application.
2. The code creates a `MimeMessage` object (passing in the `Session` as a constructor parameter).
3. The servlet then populates the `MimeMessage` with an email's various components, such as the "to" and "from" email addresses, the email subject, as well as the message content.
4. The code sends the email using the `javax.mail.Transport` static `send()` method.

See Also

The Sun Microsystems JavaMail API page: <http://java.sun.com/products/javamail/>; [Recipe 20.1](#) on adding JavaMail-related JARs to your web application; [Recipe 20.3](#) on sending email using a JavaBean; [Recipe 20.4](#) covering how to access email in a servlet; [Recipe 20.5](#) on accessing email with a JavaBean; [Recipe 20.6](#) on handling attachments in a servlet; [Recipe 20.7](#) on adding attachments to an email message; [Recipe 20.8](#) on reading an email's headers.

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Recipe 20.3 Sending Email from a Servlet Using a JavaBean

Problem

You want to use a JavaBean or helper class to send email from a servlet.

Solution

Develop a Java class that implements a `sendMessage()` method (just a name I gave it) to construct an email and send it. Store the new class in the *WEB-INF/classes* folder of the web application, including the class's package-related folders.

Discussion

You may choose to separate the responsibilities of handling HTTP requests and managing email by encapsulating these tasks in separate classes. A JavaBean that provides the essential function of sending email fits the bill here.

Recipe 20.5 and Recipe 20.6 show JavaBeans that are used to *access* email and handle attachments. A bean that does *everything* email-related grows fairly large in size, so developers must make a design decision about whether to separate these tasks into different JavaBeans (or utility classes) that can be used from servlets.

Create the bean and store it in the *WEB-INF/classes* folder. Example 20-3 shows the `doGet()` method of an `HttpServlet` using a JavaBean to send an email. Example 20-2 shows the bean class itself. The difference between the `sendMessage()` method of Example 20-1 and the one in Example 20-2 is in the way the bean receives the various email parts, such as the recipient's email address. The bean stores these parts as properties and uses setter methods to provide the property values.

On the other hand, Example 20-1 uses request parameters and method arguments to provide these values.

Example 20-2. A JavaBean used to send email

```
package com.jspervletcookbook;

import java.io.IOException;
import java.io.PrintWriter;
```

```
import java.util.Properties;

import javax.mail.*;
import javax.mail.internet.*;

public class EmailBean {

    public EmailBean( ){

        //set defaults
        private final static String DEFAULT_CONTENT = "Unknown content";
        private final static String DEFAULT_SUBJECT= "Unknown subject";
        private static String DEFAULT_SERVER = null;
        private static String DEFAULT_TO = null;
        private static String DEFAULT_FROM = null;
        static{
            //set Mail defaults based on a properties file
            java.util.ResourceBundle bundle =
                java.util.ResourceBundle.
                    getBundle("com.jspervletcookbook.mailDefaults");

            DEFAULT_SERVER = bundle.getString("DEFAULT_SERVER");
            DEFAULT_TO = bundle.getString("DEFAULT_TO");
            DEFAULT_FROM = bundle.getString("DEFAULT_FROM");

        }//static


        //JavaBean properties
        private String smtpHost;
        private String to;
        private String from;
        private String content;
        private String subject;

    public void sendMessage( ) throws Exception {

        Properties properties = System.getProperties( );

        //populate the 'Properties' object with the mail
        //server address, so that the default 'Session'
        //instance can use it.
        properties.put("mail.smtp.host", smtpHost);
        Session session = Session.getDefaultInstance(properties);
        Message mailMsg = new MimeMessage(session);//a new email message
        InternetAddress[] addresses = null;

        try {

            if (to != null) {
```

```
        //throws 'AddressException' if the 'to' email address
        //violates RFC822 syntax
        addresses = InternetAddress.parse(to, false);
        mailMsg.setRecipients(Message.RecipientType.TO, addresses);

    } else {

        throw new MessagingException(
            "The mail message requires a 'To' address.");

    }

    if (from != null) {

        mailMsg.setFrom(new InternetAddress(from));

    } else {

        throw new MessagingException(
            "The mail message requires a valid 'From' address.");

    }

    if (subject != null)
        mailMsg.setSubject(subject);

    if (content != null)
        mailMsg.setText(content);

    //Finally, send the mail message; throws a 'SendFailedException'
    //if any of the message's recipients have an invalid address
    Transport.send(mailMsg);

    } catch (Exception exc) {

        throw exc;

    }

} //sendMessage

//The setter methods are all the same structure,
//so we're just showing two

public void setSmtpHost(String host){

    if (check(host)){
        this.smtpHost = host;
    } else {
        this.smtpHost = DEFAULT_SERVER;
    }
}
```

```

    } // setSmtpHost

    public void setTo(String to) {

        if (check(to)) {
            this.to = to;
        } else {
            this.to = DEFAULT_TO;
        }

    } // setTo

    /* -- Not shown: 'setter' methods continue with exactly the same structure for
    'from', 'subject', and 'content' -- */

    private boolean check(String value) {

        if (value == null || value.equals(""))
            return false;

        return true;
    } // check
}

```

Example 20-3 uses the `java.util.ResourceBundle` class to set default property values for variables such as the name of the server. The *mailDefaults.properties* file is stored in *WEB-INF/classes/com/jspServletcookbook*. Here is an example of the properties file's contents:

```

DEFAULT_SERVER=smtp.comcast.net
DEFAULT_TO=author@jspServletcookbook.com
DEFAULT_FROM=author@jspServletcookbook.com

```

The bean allows the setting of the various email parts with the following methods (Example 20-3 does not show all of them): `setSmtpHost()`, `setTo()`, `setFrom()`, `setSubject()`, and `setContent()`.

The servlet in Example 20-3 creates an instance of an `EmailBean`, sets the various parts of the email message, then calls the `sendMessage()` method. Example 20-3 shows only the `doGet()` method. The servlet's `doPost()` method could call `doGet()` as in: `doGet(request, response)`.

Example 20-3. A servlet uses the JavaBean to send email

```

public void doGet(HttpServletRequest request,
    HttpServletResponse response)
    throws ServletException, java.io.IOException {

    response.setContentType("text/html");
    java.io.PrintWriter out = response.getWriter( );
    out.println(
        "<html><head><title>Email message sender</title></head><body>");
}

```



```
        EmailBean emailer = new EmailBean( );
        emailer.setSmtpHost("mail.attbi.com");
        emailer.setTo("myfriend@yahoo.com");
        emailer.setFrom("author@jspServletcookbook.com");
        emailer.setSubject("This is not spam!");
        emailer.setContent("Please call ASAP.");

        try{
            emailer.sendMessage( );
        } catch (Exception e) {throw new ServletException(e);}

        out.println("</body></html>");

    } //doGet
```

The bean itself throws `MessagingExceptions` if, for instance, the "to" email address that the user provides is in an invalid format. The bean rethrows any exceptions that it catches while building and sending the email.

See Also

Recipe 20.4 covering how to access email in a servlet; Recipe 20.5 on accessing email with a JavaBean; Recipe 20.6 on handling attachments in a servlet; Recipe 20.7 on adding attachments to an email message; Recipe 20.8 on reading an email's headers.

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Recipe 20.4 Accessing Email from a Servlet

Problem

You want to access and display the content of email in a servlet.

Solution

Use the JavaMail API and a method inside the servlet to handle and display the values of email messages.

Discussion

Fetching email messages using JavaMail and a servlet is a straightforward process:

1. Import the `javax.mail` and `javax.mail.internet` packages at the top of the servlet source code.
2. Inside the servlet's mail-fetching method, create a `javax.mail.Session` object to handle this mail session.
3. Get a message store object (a `javax.mail.Store`) from the session to represent the POP3 mail account.
4. Connect to the `Store` using the `connect(String host, String user, String password)` method of the `Store` object (there are overloaded versions of this method). The `Store` is designed to authenticate a user and connect with a mail server.
5. Access the INBOX folder from the message store.
6. Obtain any messages that folder contains as a `Message[]` type, then do whatever you want with each message, iterating through the `array`.

[Example 20-4](#) fetches email messages by calling its `handleMessages()` method in the `doGet()` service method.

Example 20-4. A servlet that fetches email messages

```
package com.jspervletcookbook;  
  
import java.io.IOException;
```

```
import java.io.PrintWriter;

import java.util.Properties;

import javax.mail.*;
import javax.mail.internet.*;
import javax.servlet.*;
import javax.servlet.http.*;

public class MailAccessor extends HttpServlet {

    private final static String DEFAULT_SERVER = "mail.attbi.com";

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );
        out.println("<html><head><title>Email Reader</title></head><body>");

        //This method accesses any email and displays the contents
        handleMessages(request, out);

        out.println("</body></html>");

    } //doGet

    private void handleMessages(HttpServletRequest request,
        PrintWriter out) throws IOException, ServletException {

        //Obtain user authentication information for a POP server,
        //used to access email. This information is stored in a
        //HttpSession object
        HttpSession httpSession = request.getSession( );
        String user = (String) httpSession.getAttribute("user");
        String password = (String) httpSession.getAttribute("pass");
        String popAddr = (String) httpSession.getAttribute("pop");

        Store popStore = null;
        Folder folder = null;

        if (! check(popAddr))
            popAddr = MailAccessor.DEFAULT_SERVER;

        try {

            //basic check for null or empty user and password
            if ((! check(user)) || (! check(password)))
                throw new ServletException(
                    "A valid username and password is required.");

        }
```

```

Properties properties = System.getProperties( );
//Obtain default 'Session' for this interaction with
//a mail server
Session session = Session.getDefaultInstance(properties);
//Obtain a message store (i.e., a POP3 email account, from
//the Session object
popStore = session.getStore("pop3");

//connect to the store with authentication information
popStore.connect(popAddr, user, password);
//Get the INBOX folder, open it, and retrieve any emails
folder = popStore.getFolder("INBOX");

if (! folder.exists( ))
    throw new ServletException(
        "An 'INBOX' folder does not exist for the user.");

folder.open(Folder.READ_ONLY);
Message[] messages = folder.getMessages( );
int msgLen = messages.length;

if (msgLen == 0){
    out.println(
        "<h2>The INBOX folder doesn't contain any email "+
        "messages.</h2>");}

//for each retrieved message, use displayMessage method to
//display the mail message
for (int i = 0; i < msgLen; i++){

    displayMessage(messages[i], out);

    out.println("<br /><br />");
}

} catch (Exception exc) {

    out.println(
        "<h2>Sorry, an error occurred while accessing the email" +
        " messages.</h2>");

    out.println(exc.toString( ));

} finally {

    try{

        //close the folder and the store in the finally block
        //if 'true' parameter, any deleted messages will be expunged
        //from the Folder
        if (folder != null)
            folder.close(false);
    }
}

```



```

        if (popStore != null)
            popStore.close( );

        } catch (Exception e) { }
    }
} // printMessages

private void displayMessage(Message msg, PrintWriter out)
    throws MessagingException, IOException{

    if (msg != null && msg.getContent( ) instanceof String){
        if (msg.getFrom( )[0] instanceof InternetAddress){
            out.println(
                "Message received from: " +
                ((InternetAddress)msg.getFrom( )[0]).getAddress( ) +
                "<br />");
        }

        out.println("Message content type: " + msg.getContentType( ) +
            "<br />");
        out.println("Message body content: " +
            (String) msg.getContent( ));

    } else{

        out.println(
            "<h2>The received email message was not of a text " +
            "content type.</h2>");

    } // outer if

} // displayMessage

private boolean check(String value){

    if(value == null || value.equals(""))
        return false;

    return true;

} // check

}

```

The `displayMessage()` method displays each message's "from" address, the message's content type (i.e., the MIME type as in *text/plain*), and the email's content. You can get the `String` from a typical email message that contains just headers and the text message by calling `Message.getContent()`. Getting the "from" address is a little trickier:

```

out.println("Message received from: " +
    ((InternetAddress)msg.getFrom( )[0]).getAddress( ) + "<br />");

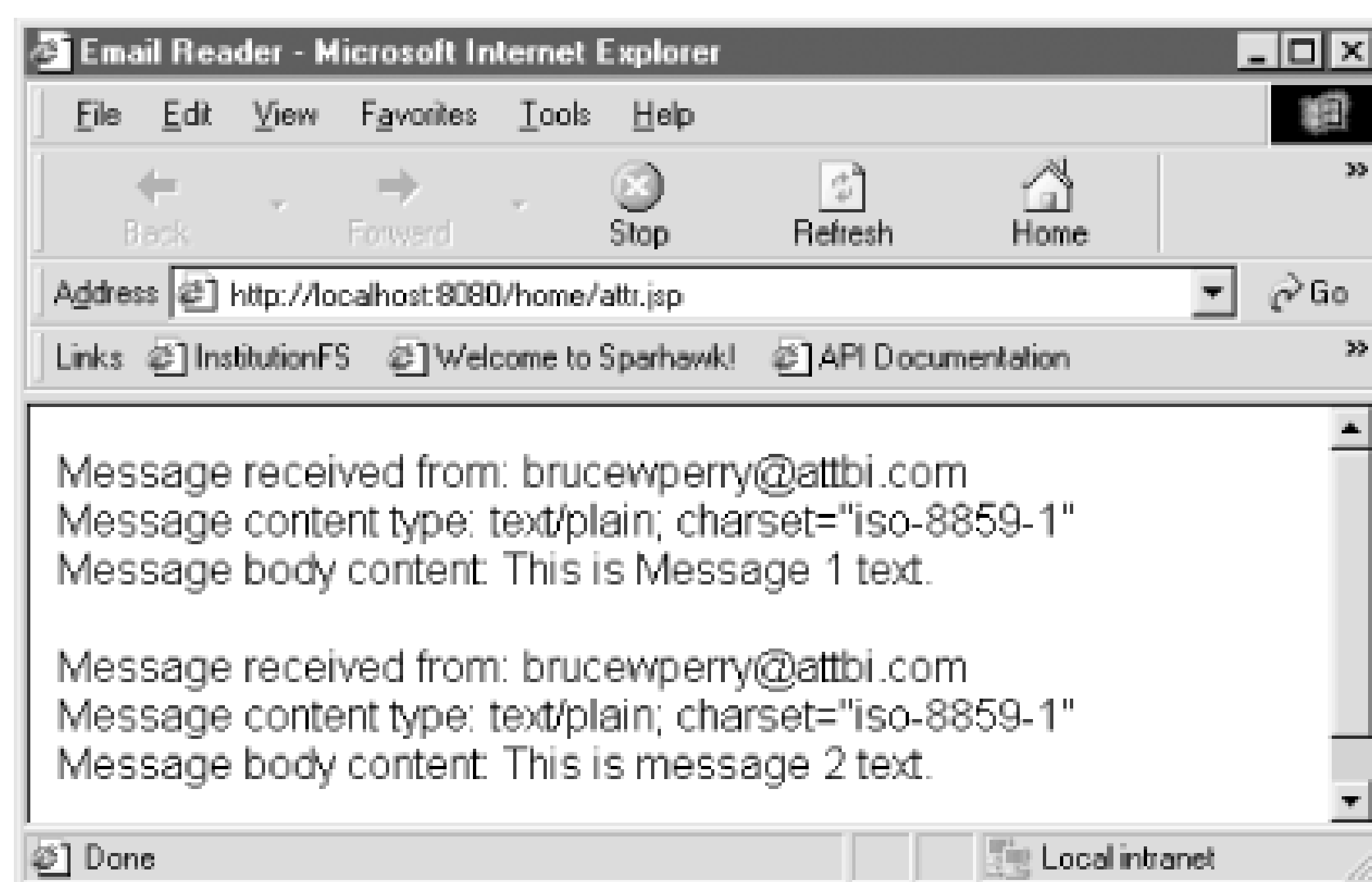
```

The `Message.getFrom()` method returns an array of `javax.mail.Address` objects. This code is designed to access the first email address, since an email is typically sent by one party to its recipient (not including those malicious spammers, of course).

The code accesses the first array member, casts the return value to a `javax.mail.InternetAddress`, then calls `getAddress()` on that object, which returns the `String` email address.

[Figure 20-1](#) shows the servlet's return value in a browser window. Since the servlet receives its email authentication information from session attributes, the first request targets a JSP, which sets the session attributes. Then the JSP forwards the request to the `MailAccessor` servlet. The servlet displays each received email separated by two line breaks. In other words, the information the servlet displays about each email includes who sent the email, the mail's content type, and the content of the message itself.

Figure 20-1. A servlet fetches and displays two email messages



See Also

[Chapter 16](#) on setting session attributes; [Chapter 25](#) on accessing a `javax.mail.Session` JNDI object on BEA WebLogic; Sun Microsystems's JavaMail API page: <http://java.sun.com/products/javamail/>; [Recipe 20.1](#) on adding JavaMail-related JARs to your web application; [Recipe 20.2](#) on sending email using a servlet; [Recipe 20.3](#) on sending email using a JavaBean; [Recipe 20.5](#) on accessing email with a JavaBean; [Recipe 20.6](#) on handling attachments in a servlet; [Recipe 20.7](#) on adding attachments to an email message; [Recipe 20.8](#) on reading an email's headers.

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Recipe 20.5 Accessing Email from a Servlet Using a JavaBean

Problem

You want to use a JavaBean or helper class to access and display email messages.

Solution

Add the `handleMessages()` and `displayMessage()` methods from [Example 20-4](#) to the JavaBean class defined in [Example 20-2](#). Then use the JavaBean from a servlet's `doGet()` or `doPost()` method.

Discussion

When we last encountered the `EmailBean` in [Example 20-2](#) it contained a `sendMessage()` method, along with several property "setter" methods (such as `setSmtphost(String host)`). If you add the `handleMessages()` and `displayMessage()` methods from [Example 20-4](#) to this same class, you can use the JavaBean to both send and access email.

This code in `handleMessages()` from [Example 20-4](#) needs to be changed to include the `EmailBean` class name:

```
//static reference to a constant value
if (! check(popAddr))
    popAddr = EmailBean.DEFAULT_SERVER;
```

However, the `EmailBean` class will have grown quite large as a result of adding the two methods, so you might create two JavaBeans—one for sending mail and another for accessing it. [Example 20-5](#) creates and uses an instance of a special email JavaBean. You must store the bean class in the *WEB-INF/classes* directory or in a JAR file in *WEB-INF/lib*.

[Example 20-6](#) also shows a JavaBean that defines `handleMessages()` and `displayMessage()` for dealing with email attachments.

Example 20-5. A servlet uses a JavaBean to access email messages

```
public void doGet(HttpServletRequest request, HttpServletResponse response)
    throws ServletException, java.io.IOException {

    response.setContentType("text/html");
    java.io.PrintWriter out = response.getWriter( );

    out.println(
        "<html><head><title>Email message sender</title></head><body>");

    EmailBean emailer = new EmailBean( );
    emailer.setSmtphost("mail.attbi.com");
    emailer.handleMessages(request,out);

    out.println("</body></html>");

} //doGet
```

See Also

Sun Microsystem's JavaMail API page: <http://java.sun.com/products/javamail/>; [Recipe 20.1](#) on adding JavaMail-related JARs to your web application; [Recipe 20.2](#) on sending email from a servlet; [Recipe 20.3](#) on sending email using a JavaBean; [Recipe 20.4](#) covering how to access email in a servlet; [Recipe 20.6](#) on handling attachments in a servlet; [Recipe 20.7](#) on adding attachments to an email message; [Recipe 20.8](#) on reading an email's headers.

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Recipe 20.6 Handling Attachments from an Email Received in a Servlet

Problem

You want to read an email message and save any attachments from a servlet.

Solution

Use the JavaMail API and a special JavaBean to save the `InputStream`s from attached files to a specified folder.

Discussion

Accessing email usually involves authenticating a user with a POP account, then connecting with the mail server and downloading any email messages. Example 20-6 uses the `Session`, `Store`, `Folder`, and `Message` classes from the JavaMail API to download an array of `Messages` from a particular user's email account. However, the servlet in Recipe 20.4 was designed to deal only with `Messages` whose content was of type `String` (the return value of the `Message.getContent()` method).

If the `Message`'s content is of type `Multipart`, then the process of handling attachments mirrors the peeling of an onion—more code is involved. Example 20-6 separates the email-related code into a JavaBean that can be used from a servlet. The bean's `displayMessage()` method tests the content of each `Message`. If the content is of type `Multipart`, then the code examines each contained `BodyPart`.

Picture a `Multipart` message type as a container. The container's headers are like any other email message's headers (but with different values). The container encloses `BodyPart`s, which are like messages inside of messages. Some `BodyPart`s represent the text message accompanying a `Multipart` email message. Other `BodyPart`s represent the attached files, such as a Microsoft Word file or JPEG image.

If the `BodyPart`'s content is a `String`, then the bean displays the text message. Otherwise, the bean assumes the `BodyPart` is an attached file; it saves the file to a special *attachments* folder. You're probably already familiar with the `handleMessages()` code, so you can skip to the `displayMessage()` method, which deals with saving any file attachments.

Example 20-6. A JavaBean that handles attachments and delivers a browser message

```
package com.jspServletcookbook;

import java.io.*;
import java.util.Properties;

import javax.mail.*;
import javax.mail.internet.*;
import javax.servlet.*;
import javax.servlet.http.*;

public class AttachBean {

    /* NOT SHOWN: private bean fields (or, properties); default variables;
       and the sendMessage method
       See Example 20-2 */

    public AttachBean( ){}

    private void handleMessages(HttpServletRequest request,
                               PrintWriter out) throws IOException, ServletException {

        /* get the user and password information for a POP
           account from an HttpSession object */

        HttpSession httpSession = request.getSession( );
        String user = (String) httpSession.getAttribute("user");
        String password = (String) httpSession.getAttribute("pass");
        String popAddr = (String) httpSession.getAttribute("pop");

        Store popStore = null;
        Folder folder = null;

        if (! check(popAddr))
            popAddr = AttachBean.DEFAULT_SERVER;

        try {

            if ((! check(user)) || (! check(password)))
                throw new ServletException(
                    "A valid username and password is required to check email.");

            Properties properties = System.getProperties( );
            Session session = Session.getDefaultInstance(properties);
            popStore = session.getStore("pop3");
            popStore.connect(popAddr, user, password);
            folder = popStore.getFolder("INBOX");
            if (! folder.exists( ))
                throw new ServletException(
                    "An 'INBOX' folder does not exist for the user.");

            folder.open(Folder.READ_ONLY);
            Message[] messages = folder.getMessages( );
```

```

        int msgLen = messages.length;
        if (msgLen == 0)
            out.println(
                "<h2>The INBOX folder does not yet contain any " +
                " email messages.</h2>");

        for (int i = 0; i < msgLen; i++){

            displayMessage(messages[i], out);
            out.println("<br /><br />");

        }//for

    } catch (Exception exc) {

        out.println(
            "<h2>Sorry, an error occurred while accessing " +
            "the email messages.</h2>");

        out.println(exc.toString( ));

    } finally {

        try{

            if (folder != null)
                folder.close(false);

            if (popStore != null)
                popStore.close( );

        } catch (Exception e) { }

    }
} //handleMessages

private void displayMessage(Message msg, PrintWriter out)
throws MessagingException, IOException{

    if (msg != null){

        /* get the content of the message; the message could
        be an email without attachments, or an email
        with attachments. The method getContent( ) will return an
        instance of 'Multipart' if the msg has attachments */

        Object o = msg.getContent( );

        if ( o instanceof String){

            //just display some info about the message content
            handleStringMessage(msg,(String) o, out);

```



```

    } else if ( o instanceof Multipart ) {

        //save the attachment(s) to a folder
        Multipart mpart = (Multipart) o;
        Part part = null;
        File file = null;
        FileOutputStream stream = null;
        InputStream input = null;
        String fileName = "";

        //each Multipart is made up of 'BodyParts' that
        //are of type 'Part'
        for (int i = 0; i < mpart.getCount( ); i++){

            part = mpart.getBodyPart(i);
            Object partContent = part.getContent( );

            if (partContent instanceof String){
                handleStringMessage(msg,(String) partContent,
                    out);
            } else { //handle as a file attachment

                fileName = part.getFileName( );

                if (! check(fileName)){ //default file name
                    fileName = "file"+
                        new java.util.Date( ).getTime( );
                }

                //write the attachment's InputStream to a file
                file = new File( attachFolder +
                    System.getProperty("file.separator") + fileName);
                stream = new FileOutputStream(file);
                input = part.getInputStream( );
                int ch;

                while ( (ch = input.read( )) != -1){
                    stream.write(ch);
                }

                input.close( );
                out.println(
                    "Handled attachment named: "+
                    fileName+"<br /><br />");
            } // if
        } //for

        //else if instanceof multipart

    } else{

        out.println(

```



```

        "<h2>The received email message returned null.</h2>");

    } // if msg != null

} // displayMessage

private void handleStringMessage(Part part, String emailContent,
    PrintWriter out) throws MessagingException {

    if (part instanceof Message) {
        Message msg = (Message) part;
        if (msg.getFrom()[0] instanceof InternetAddress) {

            out.println("Message received from: " +
                ((InternetAddress) msg.getFrom()[0]).getAddress() +
                "<br />");

            out.println(
                "Message content type: " + msg.getContentType() +
                "<br />");
            out.println("Message content: " + emailContent + "<br />");
        }
    }

    private boolean check(String value) {

        if (value == null || value.equals(""))
            return false;

        return true;

    } // check

    /* NOT SHOWN: various 'setter' methods for the bean's properties
       See Example 20-2 */

} // AttachBean

```

Once the `displayMessage()` code identifies a `BodyPart` as an attached file, it receives the bytes that represent the file as an `InputStream`. A `BodyPart` implements the `Part` interface, which defines the method `getInputStream()`. The code saves the file using the `InputStream` and the `java.io.FileOutputStream` class.

Example 20-7 shows the `doGet()` method of a servlet using `com.jspServletcookbook.AttachBean`.

Example 20-7. A servlet's `doGet()` method uses a JavaBean to deal with email attachments

```

public void doGet(HttpServletRequest request,
    HttpServletResponse response)
    throws ServletException, java.io.IOException {

    response.setContentType("text/html");
    java.io.PrintWriter out = response.getWriter( );

    out.println(
        "<html><head><title>Email message sender</title></head><body>");

    AttachBean emailer = new AttachBean( );
    emailer.setSmtpHost("mail.attbi.com");
    emailer.setAttachFolder(getServletContext( ).getRealPath("/") + "attachments");
    emailer.handleMessages(request,out);

    out.println("</body></html>");

} //doGet

```

Figure 20-2 shows the messages that the servlet (using the JavaBean) displays in a browser. The first email is a simple text message without attachments. The second email contains two attachments; its MIME type is *multipart/mixed*.

Figure 20-2. A servlet displays information about received attachments and messages

See Also

Sun Microsystem's JavaMail API page: <http://java.sun.com/products/javamail/>; Recipe 20.1 on adding JavaMail-related JARs to your web application; Recipe 20.2 on sending email from a servlet; Recipe 20.3 on sending email using a JavaBean; Recipe 20.4 covering how to access email in a servlet; Recipe 20.5 on accessing email with a JavaBean; Recipe 20.7 on adding attachments to an email message; Recipe 20.8 on reading an email's headers.

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Recipe 20.7 Adding Attachments to an Email in a Servlet

Problem

You want to build an email message with attachments in a servlet.

Solution

Use the JavaMail API for basic email messaging, and the the JavaBeans Activation Framework (JAF) to generate the file attachments.

Discussion

The JAF classes provide fine-grained control over setting up a file attachment for an email message.

If you are using both the JavaMail API and the JAF, make sure to import the packages in your servlet class:

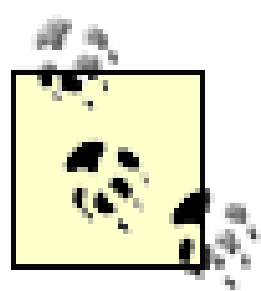
```
import javax.activation.*;
import javax.mail.*;
import javax.mail.internet.*;

//class definition continues
```

The `sendMessage()` method in [Example 20-8](#) creates a new email message (specifically, a new `javax.mail.internet.MimeMessage`), adds its text message, and inserts a file attachment inside the message. The method then sends the message using the code you may have seen in [Recipe 20.2](#) and [Recipe 20.3](#):

```
Transport.send(mailMsg);
```

To accomplish this, the code creates a container (a `javax.mail.Multipart` object) and two `javax.mail.BodyParts` that make up the the container. The first `BodyPart` is a text message (used usually to describe the file attachment to the user), while the second `BodyPart` is the file attachment (in this case, a Microsoft Word file). Then the code sets the content of the `MimeMessage` to the `Multipart`. In a nutshell, the `MimeMessage` (an email message) contains a `Multipart`, which itself is composed of two `BodyParts`: the email's text message and an attached file.



If you want to look at the headers of a `MimeMessage` that contains attachments, call the `getAllHeaders()` method on the `MimeMessage`. See [Recipe 20.8](#) for details.

Example 20-8. Making email attachment in a servlets

```
package com.jspervletcookbook;

import java.io.*;
import java.util.Properties;

import javax.activation.*;
import javax.mail.*;
import javax.mail.internet.*;

import javax.servlet.*;
import javax.servlet.http.*;

public class EmailAttachServlet extends HttpServlet {

    //default value for mail server address, in case the user
    //doesn't provide one
    private final static String DEFAULT_SERVER = "mail.attbi.com";

    public void doPost(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );
        out.println(
            "<html><head><title>Email message sender</title></head><body>");

        String smtpServ = request.getParameter("smtp");
        if (smtpServ == null || smtpServ.equals(""))
            smtpServ = DEFAULT_SERVER;
        String from = request.getParameter("from");
        String to = request.getParameter("to");
        String subject = request.getParameter("subject");

        try {
            sendMessage(smtpServ, to, from, subject);
        } catch (Exception e) {
            throw new ServletException(e.getMessage( ));
        }
        out.println(
            "<H2>Your attachment has been sent.</H2>");
        out.println("</body></html>");
    }
}
```



```
//doPost

public void doGet(HttpServletRequest request,
    HttpServletResponse response) throws ServletException,
    java.io.IOException {

    doPost(request,response);

}//doGet

private void sendMessage(String smtpServ, String to, String from,
    String subject) throws Exception {

    Multipart multipart = null;
    BodyPart bpart1 = null;
    BodyPart bpart2 = null;

    Properties properties = System.getProperties( );

    //populate the 'Properties' object with the mail
    //server address, so that the default 'Session'
    //instance can use it.
    properties.put("mail.smtp.host", smtpServ);

    Session session = Session.getDefaultInstance(properties);
    Message mailMsg = new MimeMessage(session);//a new email message
    InternetAddress[] addresses = null;

    try {

        if (to != null) {

            //throws 'AddressException' if the 'to' email address
            //violates RFC822 syntax
            addresses = InternetAddress.parse(to, false);

            mailMsg.setRecipients(Message.RecipientType.TO, addresses);

        } else {

            throw new MessagingException(
                "The mail message requires a 'To' address.");

        }

        if (from != null) {

            mailMsg.setFrom(new InternetAddress(from));

        } else {

            throw new MessagingException(
                "The mail message requires a valid 'From' address.");

        }

        if (subject != null)
```

```
mailMsg.setSubject(subject);

//This email message's content is a 'Multipart' type
//The MIME type for the message's content is 'multipart/mixed'
multipart = new MimeMultipart( );

//The text part of this multipart email message
bpart1 = new MimeBodyPart( );

String textPart =
"Hello, just thought you'd be interested in this Word file.";

// create the DataHandler object for the text part
DataHandler data = new DataHandler(textPart, "text/plain");

//set the text BodyPart's DataHandler
bpart1.setDataHandler(data);

//add the text BodyPart to the Multipart container
multipart.addBodyPart( bpart1);

//create the BodyPart that represents the attached Word file
bpart2 = new MimeBodyPart( );

//create the DataHandler that points to a File
FileDataSource fds = new FileDataSource( new File(
"h:/book/chapters/chap1/chap1.doc") );

//Make sure that the attached file is handled as
//the appropriate MIME type: application/msword here
MimetypesFileTypeMap ftm = new MimetypesFileTypeMap( );

//the syntax here is the MIME type followed by
//space separated extensions
ftm.addMimeTypes("application/msword doc DOC" );

fds.setFileTypeMap(ftm);
//The DataHandler is instantiated with the
//FileDataSource we just created
DataHandler fileData = new DataHandler( fds );

//the BodyPart will contain the word processing file
bpart2.setDataHandler(fileData);

//add the second BodyPart, the one containing the attachment, to
//the Multipart object
multipart.addBodyPart( bpart2 );

//finally, set the content of the MimeMessage to the
//Multipart object
mailMsg.setContent( multipart );
```

```

        // send the mail message; throws a 'SendFailedException'
        //if any of the message's recipients have an invalid adress
        Transport.send(mailMsg);

    } catch (Exception exc) {

        throw exc;

    } //try

} //sendMessage

} //EmailAttachServlet

```

The comments in [Example 20-8](#) explain what happens when you use the `javax.activation` classes to create a file attachment of the intended MIME type. The most confusing part is creating a `javax.activation.FileDataSource` that points to the file that you want to attach to the email message. The code uses the `FileDataSource` to instantiate the `javax.activation.DataHandler`, which is responsible for the content of the file attachment.

```

//create the DataHandler that points to a File
FileDataSource fds = new FileDataSource( new File(
    "h:/book/chapters/chap1/chap1.doc" ) );

```

Make sure that the `MimeMessage` identifies the attached file as a MIME type of *application/msword*, so that the user's email application can try to handle the attachment as a Microsoft Word file. Set the `FileTypeMap` of the `FileDataSource` with the following code:

```

//Make sure that the attached file is handled as
//the appropriate MIME type: application/msword here
MimetypesFileTypeMap ftm = new MimetypesFileTypeMap( );

//the syntax here is the MIME type followed by
//space separated extensions
ftm.addMimeTypes("application/msword doc DOC" );

fds.setFileTypeMap(ftm);

```

A `MimetypesFileTypeMap` is a class that associates MIME types (like *application/msword*) with file extensions such as *.doc*.

Make sure you associate the correct MIME type with the file that you are sending as an attachment, since you explicitly make this association in the code. See <http://java.sun.com/j2ee/1.4/docs/api/javax/activation/MimetypesFileTypeMap.html> for further details.

Then the code performs the following steps:

1. Creates a `DataHandler` by passing this `FileDataSource` in as a constructor parameter.

2. Sets the content of the `BodyPart` with that `DataHandler`.
3. Adds the `BodyPart` to the `Multipart` object (which in turn represents the content of the email message).

See Also

Sun Microsystem's JavaMail API page: <http://java.sun.com/products/javamail/>; the JAF web page: <http://java.sun.com/products/javabeans/glasgow/jaf.html>; [Recipe 20.1](#) on adding JavaMail-related JARs to your web application; [Recipe 20.2](#) on sending email from a servlet; [Recipe 20.3](#) on sending email using a JavaBean; [Recipe 20.4](#) covering how to access email in a servlet; [Recipe 20.5](#) on accessing email with a JavaBean; [Recipe 20.6](#) on handling attachments in a servlet; [Recipe 20.8](#) on reading an email's headers.

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Recipe 20.8 Reading a Received Email's Headers from a Servlet

Problem

You want to read the headers from an email in a servlet.

Solution

Use the JavaMail API to access each email message. Call the `getAllHeaders()` method of the `Part` interface, then iterate through the `Enumeration` return value to get the name and value of each header.

Discussion

An advanced email program, such as a spam filter, is designed to examine an email's headers, not just its message and file attachments.

A header is composed of a name, a colon character (:), and a value. The headers provide details about the email message, such as who sent the message and the mail server(s) that handled the message during its network travels. An example header is:

```
To: <bwperry@parkerriver.com>
```

The JavaMail API makes it easy to list an email's headers. The `Message` object has a `getAllHeaders()` method (via the `Part` interface that the `Message` class implements). This method returns a `java.util.Enumeration`, holding a collection of `javax.mail.Header` objects. To get the header name and value from these `Header` objects, just call their `getName()` and `getValue()` methods.

The `Part` interface also has a `getHeader(String headerName)` method that you can use to obtain the value for a particular header. This method returns a `String` array containing the value(s) for the header of that name.

[Example 20-9](#) shows the same servlet from [Recipe 20.4](#), revised to list both the message contents and the header values. The header-related code appears in the `displayMessage()` method.

Example 20-9. A servlet displays email header names and values

```
package com.jspervletcookbook;

import java.io.IOException;
import java.io.PrintWriter;

import java.util.Properties;
import java.util.Enumeration;

import javax.mail.*;
import javax.mail.internet.*;
import javax.servlet.*;
import javax.servlet.http.*;

public class HeaderAccessor extends HttpServlet {

    private final static String DEFAULT_SERVER = "mail.attbi.com";

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );
        out.println("<html><head><title>Email Reader</title></head><body>");

        handleMessages(request, out);

        out.println("</body></html>");
    } //doGet

    private void handleMessages(HttpServletRequest request,
        PrintWriter out) throws IOException, ServletException {

        HttpSession httpSession = request.getSession( );
        String user = (String) httpSession.getAttribute("user");
        String password = (String) httpSession.getAttribute("pass");
        String popAddr = (String) httpSession.getAttribute("pop");
        Store popStore = null;
        Folder folder = null;

        if (! check(popAddr))
            popAddr = HeaderAccessor.DEFAULT_SERVER;

        try {

            if ((! check(user)) || (! check(password)))
                throw new ServletException(
                    "A valid username and password is required to check email.");

            Properties properties = System.getProperties( );
```

```

        Session session = Session.getDefaultInstance(properties);
        popStore = session.getStore("pop3");
        popStore.connect(popAddr, user, password);
        folder = popStore.getFolder("INBOX");
        if (! folder.exists( ))
            throw new ServletException(
                "An 'INBOX' folder does not exist for the user.");

        folder.open(Folder.READ_ONLY);
        Message[] messages = folder.getMessages( );
        int msgLen = messages.length;

        if (msgLen == 0)
            out.println(
                "<h2>The INBOX folder does not yet contain any " +
                "email messages.</h2>");

        for (int i = 0; i < msgLen; i++){

            displayMessage(messages[i], out);
            out.println("<br /><br />");

        }//for
    } catch (Exception exc) {

        out.println(
            "<h2>Sorry, an error occurred while accessing the " +
            "email messages.</h2>");
        out.println(exc.toString( ));

    } finally {

        try{

            if (folder != null)
                folder.close(false);

            if (popStore != null)
                popStore.close( );

        } catch (Exception e) { }
    }
} //handleMessages

private void displayMessage(Message msg, PrintWriter out)
throws MessagingException, IOException{

    if (msg != null && msg.getContent( ) instanceof String){

        if (msg.getFrom( )[0] instanceof InternetAddress){

```

```

        out.println(
            "Message received from: " +
            ((InternetAddress)msg.getFrom( )[0]).getAddress( ) + "<br />");
    }
    out.println("Message content type: " + msg.getContentType( ) +
        "<br />");
    out.println(
        "Message body content: " + (String) msg.getContent( ));

    //List each of the email headers using a ul tag
    out.println("<ul>");
    Header head = null;
    Enumeration headers = msg.getAllHeaders( );

    while ( headers.hasMoreElements( ) ){
        head = (Header) headers.nextElement( );
        out.println(
            "<li>" + head.getName( ) + ": " + head.getValue( )+ "</li>");
    }//while

    out.println("</ul>");

} else{

    out.println(
        "<h2>The received email message was not " +
        "a text content type.</h2>");
}

} //displayMessage

private boolean check(String value){

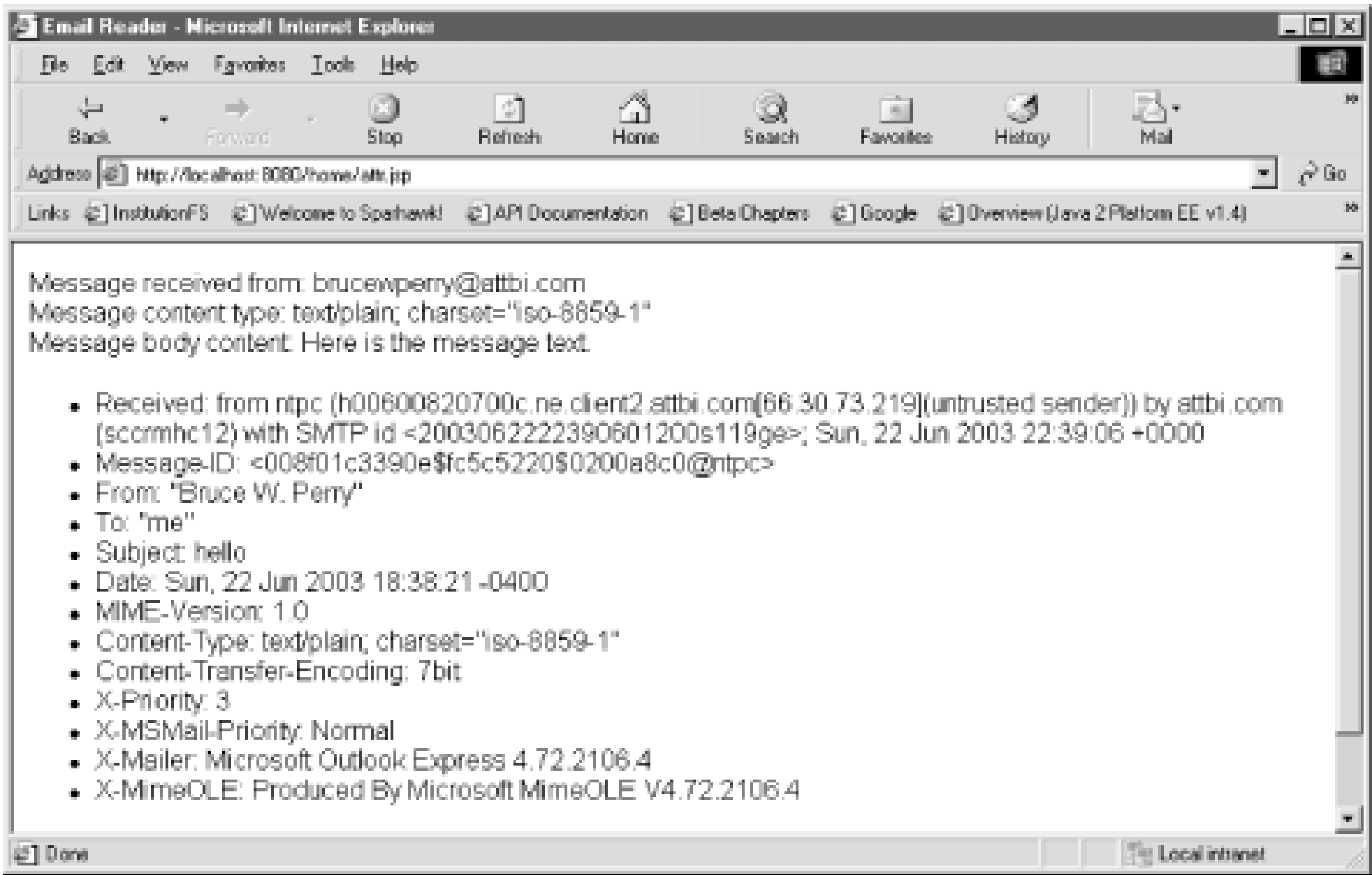
    if(value == null || value.equals(""))
        return false;

    return true;
}
}

```

[Figure 20-3](#) shows the browser display of the servlet in [Example 20-9](#). Each of the headers is preceded by a bullet character, followed by the header name, a colon, and the header value.

Figure 20-3. A servlet accesses an email and displays its header s



See Also

Sun Microsystem's JavaMail API page: <http://java.sun.com/products/javamail/>; [Recipe 20.1](#) on adding JavaMail-related JARs to your web application; [Recipe 20.2](#) on sending email from a servlet; [Recipe 20.3](#) on sending email using a JavaBean; [Recipe 20.4](#) covering how to access email in a servlet; [Recipe 20.5](#) on accessing email with a JavaBean; [Recipe 20.6](#) on handling attachments in a servlet; [Recipe 20.7](#) on adding attachments to an email message.

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Chapter 21. Accessing Databases

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Introduction

If you are a Java web developer who has never written database-related code, I have some advice for you: don't hold your breath until you receive this type of assignment!

These recipes show you how to access a database resource by using aJava Naming and Directory Interface (JNDI) lookup, which is the most efficient (and probably the most common) method of accessing database resources in a portable manner. JNDI is a Java API that is designed to store objects in a hierarchical tree structure, similar to a filesystem composed of directories, subdirectories and files. Servlets and JSPs can then use the methods of the JNDI API (shown by several examples in this chapter) to obtain references from Java objects, such as JavaBeans, and use them in their programs.

For database code, this usually means `javax.sql.DataSource` objects, which are factories for database connections. The `DataSource`s provide "connection pools," another very important web database tool. Connection pools are groups of database connections shared by servlets, JSPs, and other classes. Application servers such as WebLogic usually allow you to determine how many connections are stored in the pool, which database table can be used by the server to automatically test a connection to determine if it is fit to be returned to the shared pool, and other pool properties.

These recipes explain the basics of setting up a connection pool on both Tomcat and WebLogic.

The recipes also cover some other practical database topics, such as how to call stored procedures in servlets and JSPs, as well as how to include more than one Structured Query Language (SQL) statement in a transaction.

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Recipe 21.1 Accessing a Database from a Servlet Without DataSource

Problem

You want to access a database from a servlet without a `DataSource` configuration for the database.

Solution

Use the Java Database Connectivity (JDBC) API to access a `java.sql.Connection` object that connects the servlet with the database.

Discussion

On occasion, developers require a quick, less elegant solution to accessing a database. This recipe explains how to use the `java.sql.DriverManager` class to obtain a connection to a datasource in a servlet. The `DriverManager` class communicates with a database driver, which is software that allows Java code to interact with a particular database, such as MySQL or Oracle.

The preferred design is to use a `javax.sql.DataSource` to get a database connection from a connection pool, as described in [Recipe 21.2-Recipe 21.6](#).

[Example 21-1](#) accomplishes this task in its `doGet()` service method.

Example 21-1. A servlet accesses a database using the JDBC API

```
package com.jspervletcookbook;

import java.sql.*;

import javax.servlet.*;
import javax.servlet.http.*;

public class DatabaseServlet extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
```



```
java.io.IOException {

    String sql = "select * from athlete";

    Connection conn = null;

    Statement stmt = null;

    ResultSet rs = null;

    ResultSetMetaData rsm = null;

    response.setContentType("text/html");
    java.io.PrintWriter out = response.getWriter( );

    out.println(
        "<html><head><title>Servlet Database Access</title></head><body>");

    out.println("<h2>Database info</h2>");
    out.println("<table border='1'><tr>");

    try{

        //load the database driver
        Class.forName ("oracle.jdbc.driver.OracleDriver");

        //The JDBC URL for this Oracle database
        String url = "jdbc:oracle:thin:@192.168.0.2:1521:ORCL";

        //Create the java.sql.Connection to the database, using the
        //correct username and password
        conn = DriverManager.getConnection(url,"scott", "tiger");

        //Create a statement for executing some SQL
        stmt = conn.createStatement( );

        //Execute the SQL statement
        rs = stmt.executeQuery(sql);

        //Get info about the return value in the form of
        //a ResultSetMetaData object
        rsm = rs.getMetaData( );

        int colCount =  rsm.getColumnCount( );

        //print column names in table header cells
        for (int i = 1; i <=colCount; ++i){

            out.println("<th>" + rsm洗getColumnName(i) + "</th>");

        }

    }
```

```

        out.println("</tr>");

        while( rs.next( )){

            out.println("<tr>");

            //print the values for each column
            for (int i = 1; i <=colCount; ++i)
                out.println("<td>" + rs.getString(i) + "</td>");

            out.println("</tr>");

        }

    } catch (Exception e){

        throw new ServletException(e.getMessage( ));

    } finally {

        try{

            //this will close any associated ResultSets
            if(stmt != null)
                stmt.close( );

            if (conn != null)
                conn.close( );

        } catch (SQLException sqle){ }

    } //finally

    out.println("</table><br><br>");


    out.println("</body>");
    out.println("</html>");

} //doGet
}

```

Here are the steps needed to run a servlet, as shown in [Example 21-1](#):

1. Take the JAR file that contains your database driver, and store it either in a common server directory, such as Tomcat's *<Tomcat-root>/common/lib* directory or in the *WEB-INF/lib* directory of your web application.



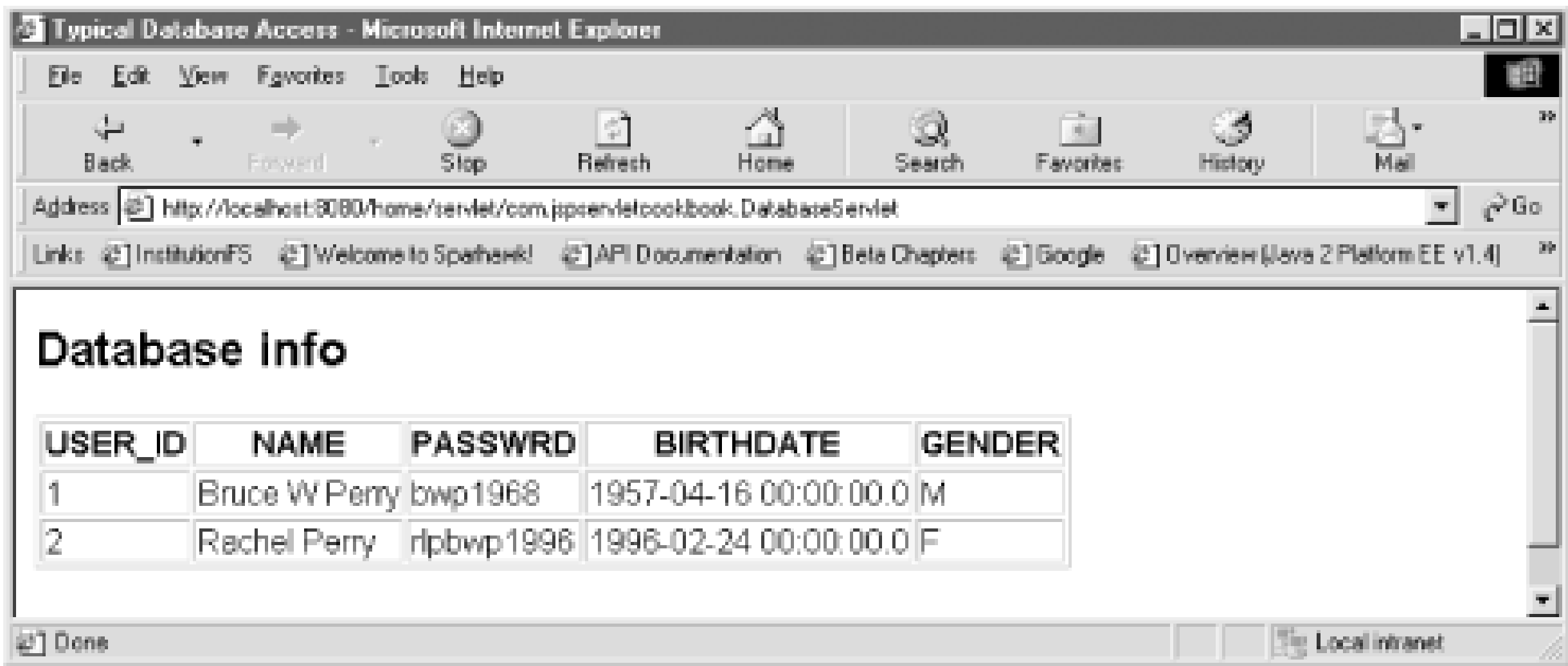
Change the extension of the Oracle JDBC driver (such as *classes12.zip*) to *.jar*, so that the Java classes that it contains can be loaded properly into the JVM.

- 2. Derive the database URL from vendor literature, and the username and password for the database from a database administrator (that might be you!) or other appropriate means. The code will not be able to access the database without a valid username and password.

The downside of this approach is that you are mixing up sensitive database security information with servlet code. It makes more sense to adopt the strategies that the upcoming five recipes describe, beginning with [Recipe 21.2](#), "Configuring a DataSource in Tomcat."

[Figure 21-1](#) shows the result of running this servlet.

Figure 21-1. A servlet that displays some database information



[Chapter 23](#) on the JSTL shows how to use a JSP to access a database without a `DataSource` configuration.

See Also

The JDBC specification: <http://java.sun.com/products/jdbc/download.html>; [Recipe 21.2](#)-[Recipe 21.6](#) on configuring and using `DataSources` on Tomcat and WebLogic; [Recipe 21.7](#) and [Recipe 21.8](#) on calling stored procedures from servlets and JSPs; [Recipe 21.9](#) on converting a `java.sql.ResultSet` object to a `javax.servlet.jsp.jstl.sql.Result`; [Recipe 21.10](#) and [Recipe 21.11](#) on using transactions in servlets and JSPs; [Recipe 21.12](#) on finding out information about a `ResultSet`.

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Recipe 21.2 Configuring a DataSource in Tomcat

Problem

You want to configure a `javax.sql.DataSource` for use in a servlet with the Tomcat web container.

Solution

Create a `resource` element in Tomcat's `server.xml` file and an associated `resource-ref` element in the `web.xml` deployment descriptor.

Discussion

Tomcat makes it easy to set up a connection pool so that servlets and JSPs can efficiently share database connections. In web sites that have many simultaneous users, a connection pool improves efficiency by sharing existing database connections, rather than creating a new connection and tearing it down every time an application has to use the database.

Another benefit of configuring a connection pool is that you can change the database system that a servlet or JSP is using without touching the Java code, because the database resource is configured outside of the servlet or JSP.

Here are the steps for configuring a `DataSource` with Tomcat:

1. Create a `Resource` and a `ResourceParams` element in `server.xml`, or in the XML file that you have placed in Tomcat's `webapps` directory. These elements describe the JNDI object you are creating in order to provide your servlets or JSPs with a `DataSource`.
2. Add a `resource-ref` element to `web.xml`, which allows the components in the associated web application to access the configured `DataSource`.

[Example 21-2](#) shows the `Resource` and a `ResourceParams` elements in `server.xml`. This example describes a `DataSource` that connects with an Oracle 8i database.

Example 21-2. The resource element in server.xml

```
<Resource name="jdbc/oracle-8i-athletes" scope=
  "Shareable" type="javax.sql.DataSource" auth=
    "Container" description="Home Oracle 8i Personal Edition"/>

  <ResourceParams name="jdbc/oracle-8i-athletes">
```



```
<parameter>
  <name>driverClassName</name>
  <value>oracle.jdbc.driver.OracleDriver</value>
</parameter>

<parameter>
  <name>url</name>
  <value>jdbc:oracle:thin:@192.168.0.2:1521:ORCL</value>
</parameter>

  <parameter>
    <name>username</name>
    <value>scott</value>
  </parameter>

  <parameter>
    <name>password</name>
    <value>tiger</value>
  </parameter>

</ResourceParams>
```

Create a `Resource` and `ResourceParams` element for each database that your application uses. [Example 21-3](#) shows the `resource-ref` element associated with the `Resource` specified by [Example 21-2](#).

Example 21-3. A resource-ref element specifies a DataSource in web.xml

```
<!-- top of web.xml file -->
<resource-ref>

  <res-ref-name>jdbc/oracle-8i-athletes</res-ref-name>

  <res-type>javax.sql.DataSource</res-type>

  <res-auth>Container</res-auth>

</resource-ref>
<!-- rest of web.xml file -->
```

The JNDI path to this `DataSource`, which you use in a JNDI lookup (see the next recipe), is *jdbc/oracle-8i-athletes*.

The servlet 2.4 API does not require the *web.xml* elements such as `resource-ref` to appear in a specific order. The servlet 2.3 API specifies the order these elements must appear in with a Document Type Definition (DTD). See [Chapter 1](#).

See Also

The JDBC specification: <http://java.sun.com/products/jdbc/download.html>; [Recipe 21.3](#) on using a `DataSource` in a servlet with Tomcat; [Recipe 21.4-Recipe 21.6](#) on configuring and using `DataSources` with servlets and JSPs on WebLogic; [Recipe 21.7](#) and [Recipe 21.8](#) on calling stored procedures from servlets and JSPs; [Recipe 21.9](#) on converting a `java.sql.ResultSet` object to a `javax.servlet.jsp.jstl.sql Result`; [Recipe 21.10](#) and [Recipe 21.11](#) on using transactions in servlets and JSPs; [Recipe 21.12](#) on finding out information about a `ResultSet`.

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Recipe 21.3 Using a DataSource in a Servlet with Tomcat

Problem

You want to use a `DataSource` that you have configured with Tomcat.

Solution

Use the JNDI API classes to obtain the `DataSource`, then access a database connection from that `DataSource`.

Discussion

Use classes from the `javax.naming` package to access the configured `DataSource`. For example, use a `javax.naming.InitialContext` object to look up a `DataSource` that has been bound as a JNDI object.

The `javax.naming` package is a part of the Java Platform Standard Edition 1.3 and 1.4.

[Example 21-4](#) instantiates a `javax.sql.DataSource` instance variable in its `init()` method, which the servlet container calls when it creates a servlet instance. In Tomcat, JNDI objects are stored under the root level specified by the "java:comp/env" string.

Example 21-4. Using a DataSource in a servlet

```
package com.jspervletcookbook;

import java.sql.*;

import javax.naming.Context;
import javax.naming.InitialContext;
import javax.naming.NamingException;
import javax.sql.*;

import javax.servlet.*;
import javax.servlet.http.*;
```

```
public class DbServlet extends HttpServlet {

    DataSource pool;

    public void init( ) throws ServletException {

        Context env = null;

        try{

            env = (Context) new InitialContext( ).lookup("java:comp/env");

            //Look up a DataSource, which represents a connection pool
            pool = (DataSource) env.lookup("jdbc/oracle-8i-athletes");

            if (pool == null)
                throw new ServletException(
                    "'oracle-8i-athletes' is an unknown DataSource");

        } catch (NamingException ne) {

            throw new ServletException(ne.getMessage( ));

        }

    }

    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        String sql = "select * from athlete";

        Connection conn = null;

        Statement stmt = null;

        ResultSet rs = null;

        ResultSetMetaData rsm = null;

        //Start building the HTML page
        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );
        out.println(
            "<html><head><title>Typical Database Access</title></head><body>");

        out.println("<h2>Database info</h2>");
        out.println("<table border='1'><tr>");
```



```
try{

    //Get a Connection from the connection pool
    conn = pool.getConnection( );

    //Create a Statement object that can be used to execute
    //a SQL query
    stmt = conn.createStatement( );

    //execute a simple SELECT query
    rs = stmt.executeQuery(sql);

    //Get the ResultSetMetaData object so we can dynamically
    //display the column names in the ResultSet
    rsm = rs.getMetaData( );

    int colCount = rsm.getColumnCount( );

    //print column names in table header cells
    for (int i = 1; i <=colCount; ++i){

        out.println("<th>" + rsm.getColumnName(i) + "</th>");
    }

    out.println("</tr>");

    //while the ResultSet has more rows...

    while( rs.next( )){

        out.println("<tr>");

        //Print each column value for each row with the
        //ResultSet.getString( ) method
        for (int i = 1; i <=colCount; ++i)
            out.println("<td>" + rs.getString(i) + "</td>");

        out.println("</tr>");

    }//while
} catch (Exception e){

    throw new ServletException(e.getMessage( ));

} finally {

    try{

        //When a Statement object is closed, any associated
        //ResultSet is closed
        if (stmt != null)
```

```

        stmt.close( );

        //VERY IMPORTANT! This code returns the Connection to the
        //pool
        if (conn != null)
            conn.close( );

    } catch (SQLException sqle){ }

}

    out.println("</table></body></html>");

} //doGet
}

```

[Example 21-4](#) gets a `DataSource` by using the address configured in Tomcat ([Recipe 21.2](#); *jdbc/oracle-8i-athletes*) in a JNDI lookup. This code looks like this:

```

env = (Context) new InitialContext( ).lookup("java:comp/env");

//Look up a DataSource, which represents a connection pool
pool = (DataSource) env.lookup("jdbc/oracle-8i-athletes");

```

The code then obtains a database connection from the connection pool by calling the `DataSource` object's `getConnection()` method. It is very important to call the `Connection` object's `close()` method when the servlet is finished with it, because this method call returns the shared `Connection` to the pool.

Requesting the servlet of [Example 21-4](#) in a browser creates output that looks just like [Figure 21-1](#).

[Chapter 23](#) on the JSTL shows how to use a JSP to access a database with a `DataSource` configuration.

See Also

The JDBC specification: <http://java.sun.com/products/jdbc/download.html>; [Recipe 21.1](#) on accessing a database from a servlet without a connection pool; [Recipe 21.2](#) on configuring a `DataSource` on Tomcat; [Recipe 21.4-Recipe 21.6](#) on configuring and using `DataSource` with servlets and JSPs on WebLogic; [Recipe 21.7](#) and [Recipe 21.8](#) on calling stored procedures from servlets and JSPs; [Recipe 21.9](#) on converting a `java.sql.ResultSet` object to a `javax.servlet.jsp.jstl.sql.Result`; [Recipe 21.10](#) and [Recipe 21.11](#) on using transactions in servlets and JSPs; [Recipe 21.12](#) on finding out information about a `ResultSet`.

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Recipe 21.4 Creating a DataSource on WebLogic

Problem

You want to create a `javax.sql.DataSource` on BEA WebLogic for use in your servlets.

Solution

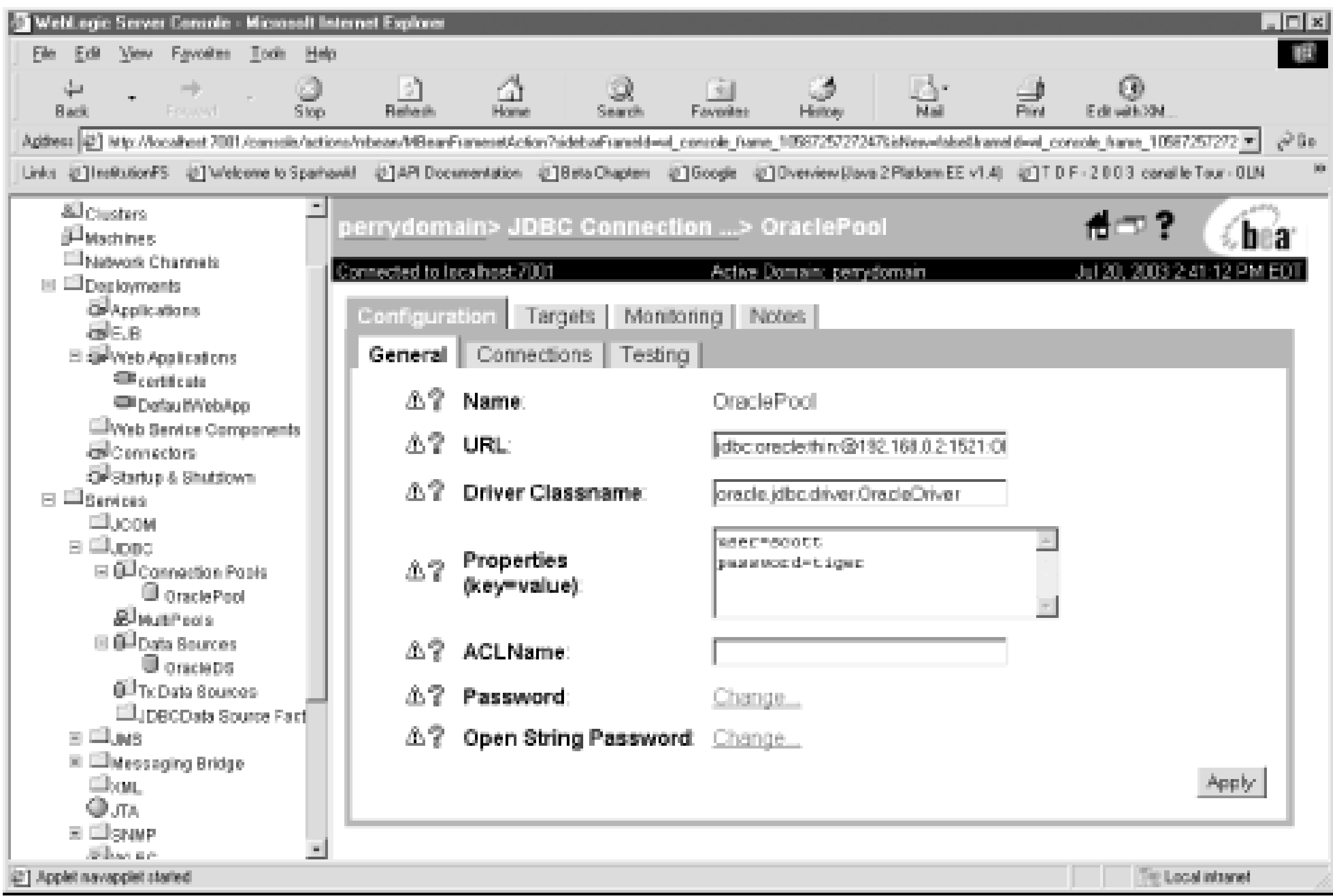
Use the WebLogic console to configure a new connection pool, then configure a new `DataSource` associated with that pool.

Discussion

Configuring a WebLogic `DataSource` involves the following steps:

1. Login to the WebLogic console, which allows you to manage the WebLogic server from a browser. The URL for the console is typically *http://<localhost:7001>/console* (substitute your host name for "localhost" and the port number that matches your own WebLogic configuration).
2. Click on *Your-domain-name* Services JDBC Connnection Pools on the menu tree in the console's lefthand column. Then click on "Configure a new JDBC Connection Pool . . .".
3. In the resulting window, enter a name for the connection pool, the JDBC URL (e.g., *jdbc:oracle:thin:@192.168.0.2:1521:ORCL*), the `Driver` class name (e.g., `oracle.jdbc.driver.OracleDriver`), as well as the username and password in the "Properties" text field. [Figure 21-2](#) shows a configured connection pool named "OraclePool." Remember this name-you'll need it to configure a `DataSource` further along in the process.

Figure 21-2. Creating a connection pool with the WebLogic console application



- Click on the "Create" button in this window to create the connection pool, then choose the "Targets" tab. The resulting screen allows you to choose a server to which the connection pool will apply. After you have chosen the server, click on the "Apply" button in the Targets screen. The name of the new pool should appear in the lefthand menu frame.
- Click on *Your-domain-name* Services JDBC Data Sources and click on the URL "Configure a New JDBC Data Source . . . ". [Figure 21-3](#) shows a *DataSource* configuration window that includes the *DataSource* name ("oracle-8i-athletes") under which WebLogic will bind the *DataSource* as a JNDI object. The window also has a text field where you must enter the name of the connection pool that you just configured: "OraclePool." Click the "Create" button to create the new DataSource. [Figure 21-3](#) shows the JDBC Data Sources window.
- Take the same steps as in step 4 with the "Targets" screen to apply this *DataSource* to the appropriate server. Painless, right?

Figure 21-3. Creating a DataSource with the WebLogic console application

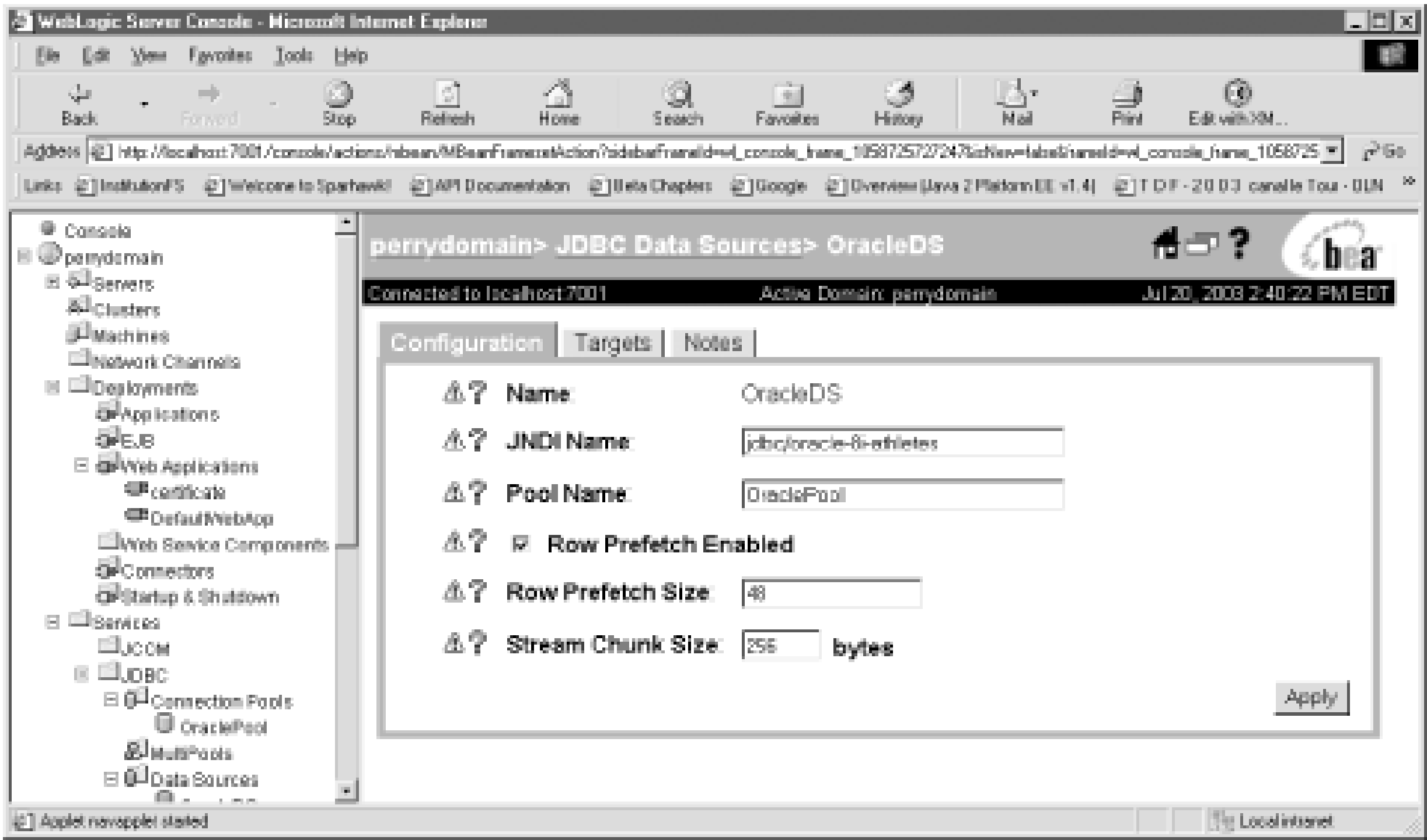


Figure 21-4 shows the WebLogic JNDI tree where the DataSource that you have just created is bound.

Figure 21-4. A view of the WebLogic JNDI tree containing the DataSource

See Also

The JDBC specification: <http://java.sun.com/products/jdbc/download.html>; Chapter 2 on deploying servlets and JSPs on WebLogic; Recipe 21.2 and Recipe 21.3 on using a DataSource on Tomcat; Recipe 21.5 and Recipe 21.6 on using DataSources with servlets and JSPs on WebLogic.

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Recipe 21.5 Using a JNDI Lookup to get a DataSource from WebLogic

Problem

You want to use a JNDI lookup to access a WebLogic `DataSource`.

Solution

Use the JNDI API and the classes in the `javax.naming` package to get the JNDI object that you have bound on WebLogic.

Discussion

Accessing a `Connection` from a WebLogic `DataSource` and connection pool uses similar Java code compared with Tomcat.

1. Set up the connection pool and `DataSource` by following [Recipe 21.4](#)s instructions.
2. In the servlet code, get the `DataSource` by using a JNDI lookup. This involves creating an instance of a `javax.naming.InitialContext` and then calling its `lookup()` method with the name that you gave your `DataSource` ([Recipe 21.4](#)).
3. Get a `Connection` from the `DataSource` by calling the `DataSource`'s `getConnection()` method.

[Example 21-5](#) creates an instance of an `InitialContext` by passing in a `Hashtable` that contains some property values.

Example 21-5. A servlet that uses a WebLogic connection pool

```
package com.jspervletcookbook;

import java.util.Hashtable;

import java.sql.*;

import javax.naming.Context;
import javax.naming.InitialContext;
import javax.naming.NamingException;
```

```
import javax.sql.*;

import javax.servlet.*;
import javax.servlet.http.*;

public class WeblogicDbServlet extends HttpServlet {

    DataSource pool;

    public void init( ) throws ServletException {

        Context env = null;

        Hashtable ht = new Hashtable( );

        //Create property names/values that will be passed to
        //the InitialContext constructor

        ht.put(Context.INITIAL_CONTEXT_FACTORY,
            "weblogic.jndi.WLInitialContextFactory");

        // t3://localhost:7001 is the default value
        //Add your own value if necessary:
        // ht.put(Context.PROVIDER_URL,"t3://localhost:7001");

        try {

            env = new InitialContext(ht);

            pool = (javax.sql.DataSource) env.lookup (
                "oracle-8i-athletes");

            if (pool == null)
                throw new ServletException(
                    "'oracle-8i-athletes' is an unknown DataSource");

        } catch (NamingException ne) {

            throw new ServletException(ne);

        }

    }

    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        String sql = "select * from athlete";

        Connection conn = null;
```

```
Statement stmt = null;
ResultSet rs = null;
ResultSetMetaData rsm = null;

response.setContentType("text/html");

java.io.PrintWriter out = response.getWriter( );

out.println(
"<html><head><title>Weblogic Database Access</title></head><body>");

out.println("<h2>Database info</h2>");
out.println("<table border='1'><tr>");

try{

    conn = pool.getConnection( );

    stmt = conn.createStatement( );

    rs = stmt.executeQuery(sql);

    rsm = rs.getMetaData( );

    int colCount = rsm.getColumnCount( );

    //print column names
    for (int i = 1; i <=colCount; ++i){

        out.println("<th>" + rsm.getColumnName(i) + "</th>");
    }

    out.println("</tr>");

    while( rs.next( )){

        out.println("<tr>");

        for (int i = 1; i <=colCount; ++i)
            out.println("<td>" + rs.getString(i) + "</td>");

        out.println("</tr>");
    }
} catch (Exception e){

    throw new ServletException(e.getMessage( ));

} finally {

    try{
```



```

        if (stmt != null)
            stmt.close( );

        //RETURN THE CONNECTION TO THE POOL!
        if (conn != null)
            conn.close( );

    } catch (SQLException sqle){ }

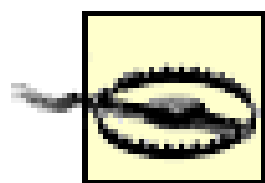
    }
    out.println("</table></body></html>");

} //doGet

}

```

Once you have accessed a `Connection` from the WebLogic connection pool, the code can execute various SQL statements in order to interact with the associated database. Always call the `Connection`'s `close()` method when you are finished with the `Connection`, because this method call returns the shared `Connection` to the pool.



[Example 21-5](#) cannot work without a properly configured connection pool and `DataSource`, which is very easy to do with the WebLogic console (as explained in [Recipe 21.4](#)).

The servlet output looks just like [Figure 21-1](#), except for the different URL in the web browser's address field (*`http://localhost:7001/dbServlet`*).

See Also

The JDBC specification: <http://java.sun.com/products/jdbc/download.html>; [Recipe 21.1](#) on accessing a database from a servlet without a connection pool; [Recipe 21.2](#) and [Recipe 21.3](#) on using a `DataSource` on Tomcat; [Recipe 21.6](#) on using a `DataSource` with a JSP on WebLogic; [Recipe 21.7](#) and [Recipe 21.8](#) on calling stored procedures from servlets and JSPs; [Recipe 21.9](#) on converting a `java.sql.ResultSet` object to a `javax.servlet.jsp.jstl.sql.Result`; [Recipe 21.10](#) and [Recipe 21.11](#) on using transactions in servlets and JSPs; [Recipe 21.12](#) on finding out information about a `ResultSet`.

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Recipe 21.6 Using a DataSource from WebLogic in a JSP

Problem

You want to use the `javax.sql.DataSource` that you set up on WebLogic in a JSP.

Solution

Use JSP scriptlets to access the `DataSource` with a JNDI lookup, then use the JDBC API in the scriptlets to access the database.

Discussion

The JSP in [Example 21-6](#) transplants code from a servlet inside of HTML template text. The JSP uses *scriptlets*, which contain Java code within "<% %>" characters.

JSTL SQL tags are preferable to scriptlets in a JSP; however, the JSTL implementation I use for this book's examples cannot access a `DataSource` from WebLogic's JNDI implementation. See [Recipe 23.6](#) for an example that uses the JSTL SQL tags with a Tomcat `DataSource`.

[Example 21-6](#) imports the necessary classes at the top of the code using the `page` directive and its `import` attribute. Otherwise, this JSP accomplishes everything that the servlet of the prior recipe does, including the display of nearly identical output in the web browser (see [Figure 21-1](#) in [Recipe 21.1](#)).

Example 21-6. Using a JSP scriptlet to access a WebLogic DataSource

```
<%@ page import="java.util.Hashtable,java.sql.*,javax.naming.*,javax.sql.*" %>

<html>
<head><title>Database Query in WebLogic</title></head>
<body>
<h2>Querying a database with a JSP in WebLogic</h2>

<%
    Context env = null;

    DataSource pool = null;
```

```
Hashtable ht = new Hashtable( );

ht.put(Context.INITIAL_CONTEXT_FACTORY,
    "weblogic.jndi.WLInitialContextFactory");

ht.put(Context.PROVIDER_URL,"t3://localhost:7001");

env = new InitialContext(ht);

//Lookup this DataSouce at the top level of the WebLogic JNDI tree
pool = (DataSource) env.lookup ("oracle-8i-athletes");

String sql = "select * from athlete";

Connection conn = null;
Statement stmt = null;
ResultSet rs = null;
ResultSetMetaData rsm = null; %>

<table border='1'><tr>

<%
    try{
        //get a java.sql.Connection from the pool
        conn = pool.getConnection( );

        stmt = conn.createStatement( );//create a java.sql.Statement

        //execute a SQL statement,generating a ResultSet
        rs = stmt.executeQuery(sql);

        rsm = rs.getMetaData( );

        int colCount =  rsm.getColumnCount( );

        //print column names
        for (int i = 1; i <=colCount; ++i) { %>

            <th><%=rsm洗getColumn洗Name(i)%> </th>

<%    } %>

</tr>

<% while( rs.next( )){ %>

    <tr>

<%        for (int i = 1; i <=colCount; ++i) { %>
        <td>        <%= rs.getString(i) %> </td>
<%}//for %>
```

```
                </tr>
            <%} //while

        } catch (Exception e) {

            throw new JspException(e.getMessage( ));

        } finally {

            try{

                stmt.close( );
                conn.close( );

            } catch (SQLException sqle){ }

        }

    %>

</body>
</html>
```

After making sure that you have properly configured the connection pool and `DataSource` in the WebLogic console, view this JSP's output by copying it to WebLogic's default web application, then request a URL in your browser that looks like this one: *http://localhost:7001/sqlWeblogic.jsp*.

See Also

The JDBC specification: <http://java.sun.com/products/jdbc/download.html>; [Chapter 2](#) on deploying servlets and JSPs on WebLogic; [Recipe 21.1](#) on accessing a database from a servlet without a connection pool; [Recipe 21.2](#) and [Recipe 21.3](#) on using a `DataSource` on Tomcat; [Recipe 21.4](#) and [Recipe 21.5](#) on using `DataSources` with servlets on WebLogic; [Recipe 21.7](#) and [Recipe 21.8](#) on calling stored procedures from servlets and JSPs; [Recipe 21.9](#) on converting a `java.sql.ResultSet` object to a `javax.servlet.jsp.jstl.sql Result`; [Recipe 21.10](#) and [Recipe 21.11](#) on using transactions in servlets and JSPs; [Recipe 21.12](#) on finding out information about a `ResultSet`.

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Recipe 21.7 Calling a Stored Procedure from a Servlet

Problem

You want to call a stored procedure from a servlet.

Solution

Use the `java.sql.CallableStatement` class inside a servlet service method, such as `doGet()` or `doPost()`.

Discussion

Database developers create stored procedures typically for SQL code that they want to execute on a regular basis, similar to a Java developer's reason for creating a method. A stored procedure is a piece of SQL that the database system pre-compiles under a specific name. The stored procedure that I use in this recipe is named `addEvent`.

Naturally, a web developer who is using a database will want to call these stored procedures. The `java.sql.CallableStatement` class encapsulates a particular stored procedure, so that you can use these tools within JDBC code.

[Table 21-1](#) shows the table schema for the table that `addEvent` uses. The table has four columns: `EVENT_ID`, `NAME`, `LOCATION`, and `RACEDATE`.

Table 21-1. The RACEEVENT database table schema

Name	Null?	Type
EVENT_ID	NOT NULL	NUMBER
NAME	NOT NULL	VARCHAR2(30)
LOCATION	NOT NULL	VARCHAR2(30)
RACEDATE		DATE

[Example 21-7](#) shows the `addEvent` definition using Oracle 8/s syntax. This stored procedure takes an event name, location, and date as arguments. It then inserts these values into a new row in the RACEEVENT table.



A piece of code called a *sequence* named `log_seq` provides the value for the new row's `EVENT_ID` column. In Oracle's database system, a sequence can keep track of a long sequence of numbers. The database developer creates the sequence, just as they would create a stored procedure.

Example 21-7. A SQL stored procedure designed to add a row to the `EVENT` table

```
create or replace procedure addEvent(eventname in varchar2,
    location_ in varchar2,date_ in date)

as -- need to do inserts in raceevent

begin
    insert into raceevent values(log_seq.nextval,
        eventname,location_,date_);
end;
/
```

If you're using a database tool such as SQL PLUS from the command line, call the `addEvent` procedure in the following manner:

```
exec addEvent('Falmouth Triathlon','Falmouth MA','26-Jul-2003');
```

[Example 21-8](#) shows how you can call `addEvent` in a servlet. The following servlet calls the stored procedure from `doGet()` in its own `addRaceEvent` method. This method has a `java.util.List` as an argument. The List contains the values that the code uses as arguments to call the `addEvent` stored procedure.

Example 21-8. A servlet uses `CallableStatement` to call the stored procedure

```
package com.jspervletcookbook;

import java.sql.*;
import java.util.ArrayList;
import java.util.List;
import java.util.Iterator;

import javax.naming.Context;
import javax.naming.InitialContext;
import javax.naming.NamingException;
import javax.sql.*;

import javax.servlet.*;
import javax.servlet.http.*;

public class StoredProcServlet extends HttpServlet {
```

```
DataSource pool;

public void init( ) throws ServletException {

    Context env = null;

    try{

        env = (Context) new InitialContext( ).lookup("java:comp/env");

        pool  = (DataSource) env.lookup("jdbc/oracle-8i-athletes");

        if (pool == null)
            throw new ServletException(
                "'oracle-8i-athletes' is an unknown DataSource");

    } catch (NamingException ne) {

        throw new ServletException(ne);

    }

}

public void doGet(HttpServletRequest request,
    HttpServletResponse response)
    throws ServletException, java.io.IOException {

    String eventName = request.getParameter("eName");
    String location = request.getParameter("eLocation");
    String date = request.getParameter("eDate");

    List paramList = new ArrayList( );
    paramList.add(eventName);
    paramList.add(location);
    paramList.add(date);

    try{

        addRaceEvent(paramList);

    } catch (SQLException sqle){

        throw new ServletException(sqle.getMessage( ));

    }//try

    response.setContentType("text/html");
    java.io.PrintWriter out = response.getWriter( );
    out.println("<html><head><title>Add an Event</title></head><body>");

    out.println(
```

```
        "<h2>The Event named "+ eventName +
        " has been added to the database</h2>");

    out.println("</body>");
    out.println("</html>");

} //doGet

public Connection getConnection( ){

    Connection conn = null;

    try{

        conn = pool.getConnection( );

    } catch (SQLException sqle){

        throw new ServletException(sqle.getMessage( ));

    } finally {

        return conn;

    }

}

public void addRaceEvent(List values) throws SQLException{

    if (values == null)
        throw new SQLException(
            "Invalid parameter in addRaceEvent method.");

    Connection conn = null;

    conn = getConnection( );

    if (conn == null )
        throw new SQLException(
            "Invalid Connection in addRaceEvent method");

    Iterator it = values.iterator( );

    CallableStatement cs = null;

    //Create an instance of the CallableStatement
    cs = conn.prepareCall( "{call addEvent (?,?,?)}" );

    for (int i = 1; i <= values.size( ); i++)
        cs.setString(i,(String) it.next( ));

}
```



```
//Call the inherited PreparedStatement.executeUpdate( ) method
cs.executeUpdate( );

// return the connection to the pool
conn.close( );

} //addRaceEvent
}
```

[Example 21-8](#) gets a `Connection` from a connection pool using the techniques explained in the prior recipes. The code uses the `Connection` to create a `CallableStatement` that the example can use to call the underlying stored procedure:

```
cs = conn.prepareCall( "{call addEvent (?, ?, ?)}" );
```

The `String` argument to the `Connection`'s `prepareCall` method contains question marks (?) as placeholders for the stored procedure's parameters. The code then calls the `CallableStatement`'s `setString()` method to give these placeholders values. Finally, the code calls the `CallableStatement`'s `executeUpdate()` method to execute `addEvent`.



If calling the stored procedure causes a database error, the `addRaceEvent` method throws a `SQLException`.

The servlet receives values for the new row from request parameters. The following URL calls the servlet with three parameters: `eName`, `eLocation`, and `eDate`:

```
http://localhost:8080/home/servlet/com.jspServletcookbook.
StoredProcServlet?eName=
Falmouth%20Triathlon&eLocation=Falmouth%20MA&eDate=26-July-2003
```

[Figure 21-5](#) shows the servlet's output in a web browser.

Figure 21-5. The browser output of the `StoredProcServlet`

See Also

The JDBC specification: <http://java.sun.com/products/jdbc/download.html>; [Recipe 21.1](#) on accessing a database from a servlet without a connection pool; [Recipe 21.2](#) and [Recipe 21.3](#) on using a `DataSource` on Tomcat; [Recipe 21.4](#)-[Recipe 21.6](#) on using `DataSources` with servlets and JSPs on WebLogic; [Recipe 21.8](#) on calling a stored procedure from a JSP; [Recipe 21.9](#) on converting a `java.sql.ResultSet` object to a `javax.servlet.jsp.jstl.sql Result`; [Recipe 21.10](#) and [Recipe 21.11](#) on using transactions in servlets and JSPs; [Recipe 21.12](#) on finding out information about a `ResultSet`.

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Recipe 21.8 Calling a Stored Procedure from a JSP

Problem

You want to call a stored procedure from a JSP.

Solution

Using a JSP 2.0 container, develop an Expression Language (EL) function that will call the stored procedure for you.

Discussion

JSP 2.0 introduced *functions*, which are static methods that you can call inside EL statements.

See [Chapter 23](#) if you need to familiarize yourself with the EL.

This recipe explains the steps for developing a function that calls a stored procedure:

1. Create the stored procedure in your database system.
2. Write the Java class that implements the function as a `static` or class method.
3. Define the function in a Tag Library Descriptor (TLD), which is an XML configuration file that you include with the web application.
4. In the JSP itself, use the `taglib` directive to declare the tag library that contains the function.
5. Call the function in the JSP, using the proper prefix for your tag library. The function I use in this recipe looks like this:

```
<cbck:addRaceEvent("My Race", "Anytown USA", "11-Dec-2003") />
```

[Example 21-9](#) shows the Java class that implements this function.

Example 21-9. The Java class that implements an EL function

```

package com.jspServletcookbook;

import java.sql.*;

import javax.naming.Context;
import javax.naming.InitialContext;
import javax.naming.NamingException;
import javax.sql.*;

public class StoredProcUtil {

    private static DataSource pool;
    private static Context env;

    static { //static initialization of the Context and DataSource

        try{

            env = (Context) new InitialContext( ).lookup("java:comp/env");

            pool  = (DataSource) env.lookup("jdbc/oracle-8i-athletes");

            if (pool == null)
                throw new Exception(
                    "'oracle-8i-athletes' is an unknown DataSource");

        } catch (Exception e) {

            System.out.println(e);

        }

    }

}

//static

/* This static method will be configured in a TLD file and provide the
implementation for an EL function. An example use of the function is:
<cbck:addRaceEvent("My Race","Anytown USA","11-Dec-2003") /> */

public static void addRaceEvent(String name,String location,String date) {

    if( (! check(name)) || (! check(location)) || (! check(date)))
        throw new IllegalArgumentException(
            "Invalid param values passed to addRaceEvent( )");

    Connection conn = null;

    try{

        conn = pool.getConnection( );

        if (conn == null )

```



```

        throw new SQLException(
            "Invalid Connection in addRaceEvent method");

    CallableStatement cs = null;

    //Create an instance of the CallableStatement
    cs = conn.prepareCall( "{call addEvent (?,?,?)}" );

    cs.setString(1,name);
    cs.setString(2,location);
    cs.setString(3,date);

    //Call the inherited PreparedStatement.executeUpdate( ) method
    cs.executeUpdate( );

    // return the connection to the pool
    conn.close( );

} catch (SQLException sqle) { }

} //addRaceEvent

private static boolean check(String value){

    if(value == null || value.equals(""))
        return false;

    return true;
}
}

```

The `addRaceEvent()` method creates a `java.sql.CallableStatement`, which calls the underlying stored procedure (`addEvent`). [Recipe 21.7](#) explains this process.

The Java method that implements the function for a JSP must be defined as `static`.

This Java class must be stored in your web application beneath the *WEB-INF/classes* directory (with a subdirectory structure matching its package name) or in a JAR file stored in *WEB-INF/lib*. For example, the Java class of [Example 21-9](#) should be stored in *WEB-INF/classes/com/jspServletcookbook/StoredProcUtil.class*.

[Example 21-10](#) shows the TLD file that defines the EL function.

The TLD file has a *.tld* extension and lives in a *WEB-INF* subdirectory of your web application, such as *WEB-INF/tlds*.

Example 21-10. The TLD file for configuring the EL function

```
<taglib xmlns="http://java.sun.com/xml/ns/j2ee" xmlns:xsi=
  "http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation=
  "http://java.sun.com/xml/ns/j2ee http://java.sun.com/xml/ns/j2ee/
  web-jsp-taglibrary_2_0.xsd"
  version="2.0"
>

  <tlib-version>1.0</tlib-version>
  <jsp-version>2.0</jsp-version>
  <short-name>cbck</short-name>
  <uri>jspServletcookbook.com.tags</uri>
  <description>Cookbook custom tags</description>

  <function>

    <name>addRaceEvent</name>

    <function-class>
      com.jspServletcookbook.StoredProcUtil
    </function-class>

    <function-signature>
      void addRaceEvent(java.lang.String,
        java.lang.String, java.lang.String)
    </function-signature>

  </function>

  <tag>
    <!-- define a custom tag here if you have to -->
  </tag>

</taglib>
```

[Example 21-10](#) defines the function with the function tag and its `name`, `function-class`, and `function-signature` attributes. Make sure to include the fully qualified class name under `function-class`. The JSP container knows how to call the function by inspecting the `function-signature`. This signature includes the return type ("void" in this case), the function name, and all of its parameters specified by their fully qualified class names.

[Example 21-11](#) is a JSP that calls our defined function. First, the `taglib` directive declares the tag library and prefix ("cbck") that the function uses.

Example 21-11. A JSP uses an EL function to call a stored procedure

```
<%@ taglib uri="jspServletcookbook.com.tags" prefix="cbck" %>
```

```
<html>
<head><title>Calling a Stored procedure</title></head>
<body>
<h2>This JSP calls a stored procedure with a JSP 2.0 function</h2>

${cbck:addRaceEvent("Falmouth Triathlon","Falmouth MA","26-Jul-2003")}

</body>
</html>
```

Since this is a feature of the EL, the syntax encapsulates the function call within the `${ }` character string. Next comes the prefix (cbck), a colon, and the function call itself:

```
${cbck:addRaceEvent("Falmouth Triathlon","Falmouth MA","26-Jul-2003")}
```

This process appears complicated the first time around, but once you create your first JSP 2.0 function, the rest of them will be much easier! This feature does not involve much more than creating a `static` Java method, configuring the function with the proper values in an XML file, then calling the function in a JSP. This is a nifty way to call stored procedures!

See Also

The JDBC specification: <http://java.sun.com/products/jdbc/download.html>; [Chapter 23](#) on the JSTL; [Chapter 22](#) on creating custom tag libraries; [Recipe 21.1](#) on accessing a database from a servlet without a connection pool; [Recipe 21.2](#) and [Recipe 21.3](#) on using a `DataSource` on Tomcat; [Recipe 21.5](#) and [Recipe 21.6](#) on using `DataSources` with servlets and JSPs on WebLogic; [Recipe 21.7](#) on calling a stored procedure from a servlet; [Recipe 21.9](#) on converting a `java.sql.ResultSet` object to a `javax.servlet.jsp.jstl.sql.Result`; [Recipe 21.10](#) and [Recipe 21.11](#) on using transactions in servlets and JSPs; [Recipe 21.12](#) on finding out information about a `ResultSet`.

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Recipe 21.9 Converting a ResultSet to a Result Object

Problem

You want to convert a `java.sql.ResultSet` to a `javax.servlet.jsp.jstl.sql.Result` object so that the object can be used with the JSTL.

Solution

Use the `javax.servlet.jsp.jstl.sql.ResultSupport.toResult()` method.

Discussion

The `Result` interface allows code to work with `ResultSets` in the form of Java `arrays` or `java.util.Maps`. The JSTL tags often use `arrays` or `Maps` to iterate through values (which is why they included the `Result` interface in the JSTL specification). Therefore, you might want to convert a `ResultSet` to a `Result`, then hand the `Result` to a JSP that uses the JSTL tags.

Example 21-12 is a servlet that:

1. Creates a `ResultSet` by querying a database.
2. Converts the `ResultSet` to a `Result`.
3. Forwards the `Result` to a JSP by storing the `Result` as a `session` attribute.

Example 21-12. A servlet converts a `ResultSet` to a `Result`

```
package com.jspservletcookbook;

import java.sql.*;

import javax.naming.Context;
import javax.naming.InitialContext;
import javax.naming.NamingException;
import javax.sql.*;

import javax.servlet.jsp.jstl.sql.Result;
import javax.servlet.jsp.jstl.sql.ResultSupport;

import javax.servlet.*;
import javax.servlet.http.*;

public class DbServletResult extends HttpServlet {
```



```
DataSource pool;

public void init( ) throws ServletException {

    Context env = null;

    try{

        env = (Context) new InitialContext( ).lookup("java:comp/env");

        pool  = (DataSource) env.lookup("jdbc/oracle-8i-athletes");

        if (pool == null)
            throw new ServletException(
                "'oracle-8i-athletes' is an unknown DataSource");

    } catch (NamingException ne) {

        throw new ServletException(ne);

    }

}

}

//init

public void doGet(HttpServletRequest request,
    HttpServletResponse response) throws ServletException,
    java.io.IOException {

    String sql = "select * from athlete";

    try{

        //Get a Result object that represents the return value of the SQL
        //statement 'select * from athlete'
        Result jspResult = select(sql);

        HttpSession session = request.getSession( );

        //store the Result in a session attribute,
        //where it can be passed to
        //a JSP and used with the JSTL tags
        session.setAttribute(
            "javax.servlet.jsp.jstl.sql.Result",jspResult);

        RequestDispatcher dispatcher = request.getRequestDispatcher(
            "/useResult.jsp");

        dispatcher.forward(request,response);

    } catch (SQLException sqle){
```

```

        throw new ServletException(sql.getMessage( ));}

    } //doGet

    private Result select(String sql) throws SQLException{

        if (sql == null || sql.equals(""))
            throw new SQLException("Invalid parameter in select method");

        ResultSet rs = null;

        Connection conn = null;

        Result res = null;

        //Get a Connection from the pool
        conn = pool.getConnection( );

        if (conn == null )
            throw new SQLException("Invalid Connection in select method");

        PreparedStatement stmt = conn.prepareStatement(sql);

        //Create the ResultSet
        rs = stmt.executeQuery( );

        //Convert the ResultSet to a
        //Result object that can be used with JSTL tags
        res=ResultSupport.toResult(rs);

        stmt.close( );//this will close any associated ResultSets

        conn.close( );//return Connection to pool

        return res;//return Result object

    } //select
}

```

Example 21-12 imports the necessary Java classes including the `Result` and `ResultSupport` classes:

```

import javax.servlet.jsp.jstl.sql.Result;
import javax.servlet.jsp.jstl.sql.ResultSupport;

```

The `select()` method does the important work: creating the `ResultSet` , converting this object to a `Result` , and returning the `Result` . Here is the code that performs the conversion:

```


res=ResultSupport.toResult(rs);

```

The `ResultSupport` class's static `toResult()` method takes a `ResultSet` as an argument and returns a `Result` .

The servlet's `doGet()` method then creates a `session` attribute from the `Result` and uses a

`RequestDispatcher` to forward the request to a JSP. The JSP is named *useResult.jsp*.



The user initially requests the servlet in his browser, and the servlet passes the request to the JSP. The user then sees the JSP's output in their browser.

The `RequestDispatcher` code looks like this:

```
RequestDispatcher dispatcher = request.getRequestDispatcher(
    "/useResult.jsp");
dispatcher.forward(request, response);
```

Example 21-13 uses the JSTL core tags (with the "c" prefix). The `c:set` tag gains access to the session attribute and stores the attribute's value in a `resultObj` variable. The `c:forEach` and `c:out` tags then display the database values in the JSP.

Example 21-13. The JSP that uses a Result object stored as a session attribute

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<%@ taglib uri="http://java.sun.com/jstl/sql" prefix="sql" %>

<html>
<HEAD>
    <TITLE>Using a Result object</TITLE>
</HEAD>
<body bgcolor="white">
<h2>View Database Data</h2>


<!--store a session attribute (the Result object) in a variable named 'resultObj'-->
<c:set var="resultObj" value=
    "${sessionScope["javax.servlet.jsp.jstl.sql.Result"]}" />

<table border="1" cellspacing="2">
<!-- for every row in the Result ...-->
<c:forEach items="${resultObj.rows}" var="row">

    <!-- for every column in the row ...-->
    <c:forEach items="${row}" var="column">

        <tr>
            <td align="right">
                <b> <c:out value="${column.key}" /> </b>
            </td>
            <td>
                <c:out value="${column.value}" />
            </td></tr>
        </c:forEach>
    </c:forEach>
```

```
</c:forEach>
    </table>
</body>
</html>
```

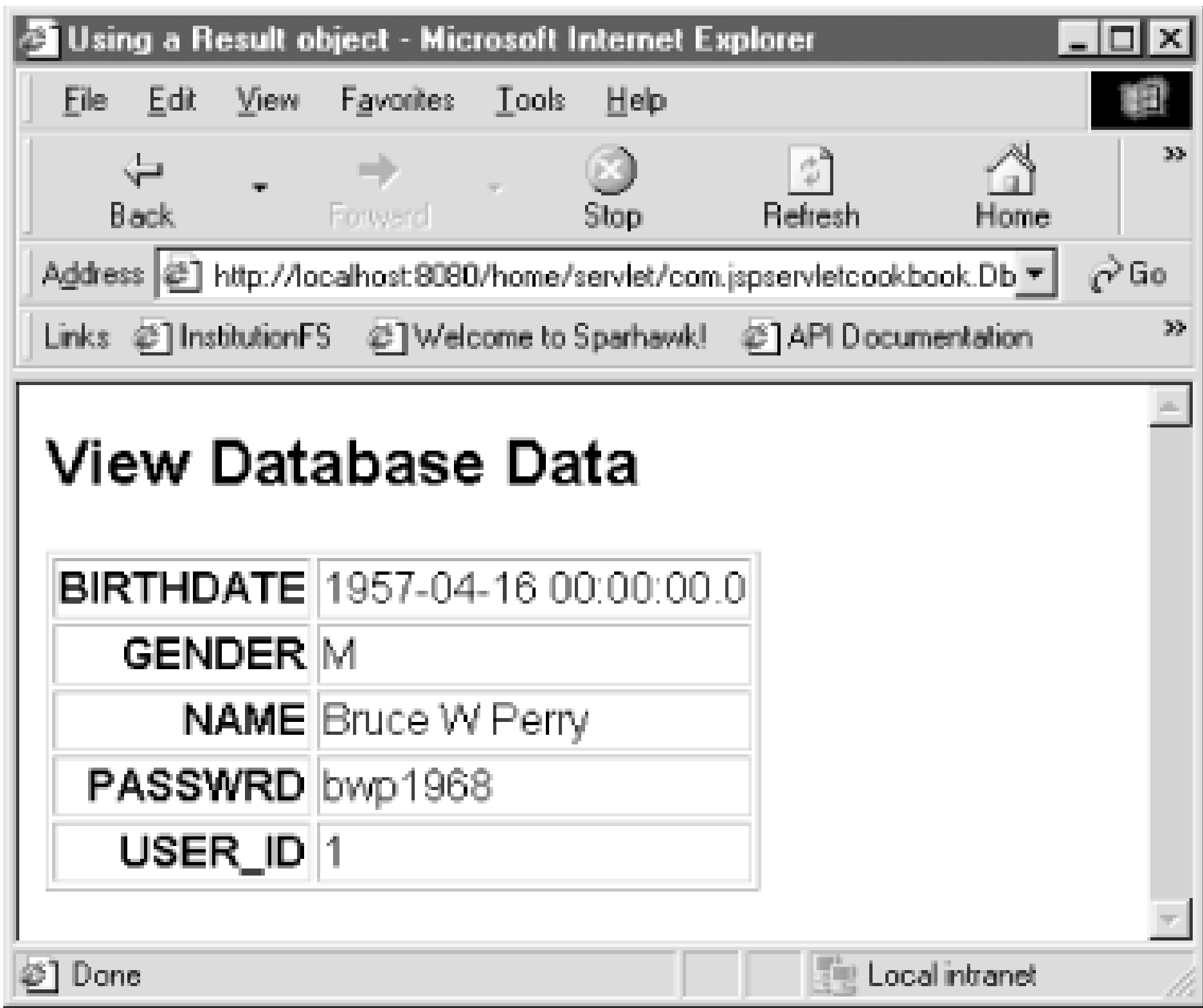


The syntax "`${sessionScope[\"javax.servlet.jsp.jstl.sql.Result\"]}`" is necessary, because the session attribute name contains periods (.). Otherwise, theEL can access a scoped attribute, if the attribute is named `myAttribute` , using this simpler syntax:

```
${myAttribute}
```

Figure 21-6 shows how a web browser displays the JSP's output.

Figure 21-6. The JSP page output in a web browser



See Also

The JDBC specification: <http://java.sun.com/products/jdbc/download.html> ; Chapter 23 on the JSTL; Chapter 16 on using session attributes; Recipe 21.1 on accessing a database from a servlet without a connection pool; Recipe 21.2 and Recipe 21.3 on using a `DataSource` on Tomcat; Recipe 21.5 and Recipe 21.6 on using `DataSources` with servlets and JSPs on WebLogic; Recipe 21.7 and Recipe 21.8 on calling stored procedures from servlets and JSPs; Recipe 21.10 and Recipe 21.11 on using transactions in servlets and JSPs; Recipe 21.12 on finding out information about a `ResultSet` .

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Recipe 21.10 Executing Several SQL Statements Within a Single Transaction

Problem

You want to execute more than one SQL statement within a single transaction.

Solution

Use the `java.sql.Connection` API and the `setAutoCommit()`, `commit()`, and `rollback()` methods to create a transaction.

Discussion

Some SQL statements, such as those that update customer information in two different database tables, are meant to be executed only as a group. If one of them does not succeed, the database is returned to its previous state. This is the purpose of using a transaction in your Java code. A transaction is a logical unit of database operations that can be "rolled back" or canceled as a group if something goes wrong with one of the operations.

Once you have a database connection (an instance of `java.sql.Connection`), you can call various `Connection` methods to create a transaction. Here are the steps for executing a transaction:

1. Call the `Connection` object's `setAutoCommit()` method with `false` as the parameter. This turns off the default behavior for JDBC code, which is to commit each separate SQL statement instead of automatically grouping sequential statements as a single transaction.
2. Follow the `setAutoCommit()` method call with the database code that you want to treat as a single transaction.
3. Call the `Connection`'s `commit()` method to commit the SQL statements, which writes any database changes associated with the SQL (such as a DELETE or UPDATE statement) to the underlying database file.
4. In the area of Java code reserved for dealing with errors or unexpected conditions, such as a catch block, call the `Connection`'s `rollback()` method, which rolls back the SQL that was included in the transaction.

[Example 21-14](#) is a servlet that illustrates this process.

Example 21-14. A servlet that uses a SQL transaction

```
package com.jspServletcookbook;

import java.sql.*;

import javax.naming.Context;
import javax.naming.InitialContext;
import javax.naming.NamingException;
import javax.sql.*;

import javax.servlet.*;
import javax.servlet.http.*;

public class DbServletTrans extends HttpServlet {

    DataSource pool;

    /*Initialize the DataSource in the servlet's init( ) method  
which the servlet container calls once when it creates an instance of  
the servlet */
    public void init( ) throws ServletException {

        Context env = null;

        try{

            env = (Context) new InitialContext( ).lookup("java:comp/env");

            pool = (DataSource) env.lookup("jdbc/oracle-8i-athletes");

            if (pool == null)
                throw new ServletException(
                    "'oracle-8i-athletes' is an unknown DataSource");

        } catch (NamingException ne) {

            throw new ServletException(ne);

        }

    } //init

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        Connection conn = null;

        Statement stmt = null;

        response.setContentType("text/html");
```

```
java.io.PrintWriter out = response.getWriter( );

out.println(
"<html><head><title>Using transactions</title></head><body>");

out.println(
"<h2>These SQL statements are part of a transaction</h2>");

out.println("CallableStatement.executeUpdate( )");
out.println("<br><br>");
out.println("Statement.executeUpdate( )");
out.println("<br><br>");

try{

    //Get a connection from the pool
    conn = pool.getConnection( );

    //Display the default values for setAutoCommit( )
    //and the isolation level

    out.println("AutoCommit before setAutoCommit( ): " +
        conn.getAutoCommit( ) + "<br><br>");

    out.println("Transaction isolation level: ");

    //just out of curiosity, display the existing transaction
    // isolation level
    witch(conn.getTransactionIsolation( )){

        case 0 : out.println("TRANSACTION_NONE<br><br>"); break;

        case 1 : out.println(
            "TRANSACTION_READ_UNCOMMITTED<br><br>"); break;

        case 2 : out.println(
            "TRANSACTION_READ_COMMITTED<br><br>"); break;

        case 4 : out.println(
            "TRANSACTION_REPEATABLE_READ<br><br>"); break;

        case 8 : out.println(
            "TRANSACTION_SERIALIZABLE<br><br>"); break;

        default: out.println("UNKNOWN<br><br>");

    }//switch

    //set Autocommit to false so that individual SQL statements will
    //not be committed until Connection.commit( ) is called
    conn.setAutoCommit(false);
```

```

        //Transaction-related SQL begins...
        CallableStatement cs = null;

        //Create an instance of the CallableStatement
        cs = conn.prepareCall( "{call addEvent (?,?,?)}" );

        cs.setString(1,"Salisbury Beach 5-Miler");
        cs.setString(2,"Salisbury MA");
        cs.setString(3,"14-Aug-2003");

        //Call the inherited PreparedStatement.executeUpdate( ) method
        cs.executeUpdate( );

        String sql = "update raceevent set racedate='13-Aug-2003' "+
            "where name='Salisbury Beach 5-Miler'";

        int res = 0;

        stmt = conn.createStatement( );

        res = stmt.executeUpdate(sql);

        //commit the two SQL statements
        conn.commit( );

    } catch (Exception e){

        try{

            //rollback the transaction in case of a problem
            conn.rollback( );

        } catch (SQLException sqle){ }

        throw new ServletException(e.getMessage( ));

    } finally {

        try{

            if (stmt != null)
                stmt.close( );

            if (conn != null)
                conn.close( );

        } catch (SQLException sqle){ }

    }

    out.println("</table></body></html>");

} //doGet

```


}

The `doGet()` method in [Example 21-14](#) displays the default values for "auto committing" SQL statements and the transaction isolation level (the level of database-locking that occurs as the transactions within your Java code are initiated). For example, if your SQL statements include the updating of database fields, can other users of the database view the new column values before your transaction is committed? If allowed, this type of behavior is called a *dirty read*.

[Table 21-2](#) shows the different types of transaction isolation levels, from the least to most restrictive level. Two other terms need addressing before you inspect this table:

- A *non-repeatable read* occurs when one transaction reads a row, another transaction changes the same row, and the first transaction reads the same row and receives the different value.
- A *phantom read* happens when one transaction obtains a result set based on a WHERE condition and a second transaction inserts a new row that satisfies this WHERE condition. The first transaction then evaluates the same database table again with the same WHERE condition and retrieves the new "phantom" row.

Table 21-2. Transaction isolation levels

Transaction isolation level	Return value of java.sql.Connection.getTransactionIsolation()	Definition
TRANSACTION_NONE	0	The database driver does not support transactions.
TRANSACTION_READ_UNCOMMITTED	1	Another transaction can see uncommitted changes; "dirty reads" are allowed.
TRANSACTION_READ_COMMITTED	2	Uncommitted changes are not visible to other transactions.
TRANSACTION_REPEATABLE_READ	4	Uncommitted changes are not visible to other transactions; nonrepeatable reads are also disallowed.
TRANSACTION_SERIALIZABLE	8	Uncommitted changes are not visible to other transactions; nonrepeatable reads and phantom reads are also disallowed.

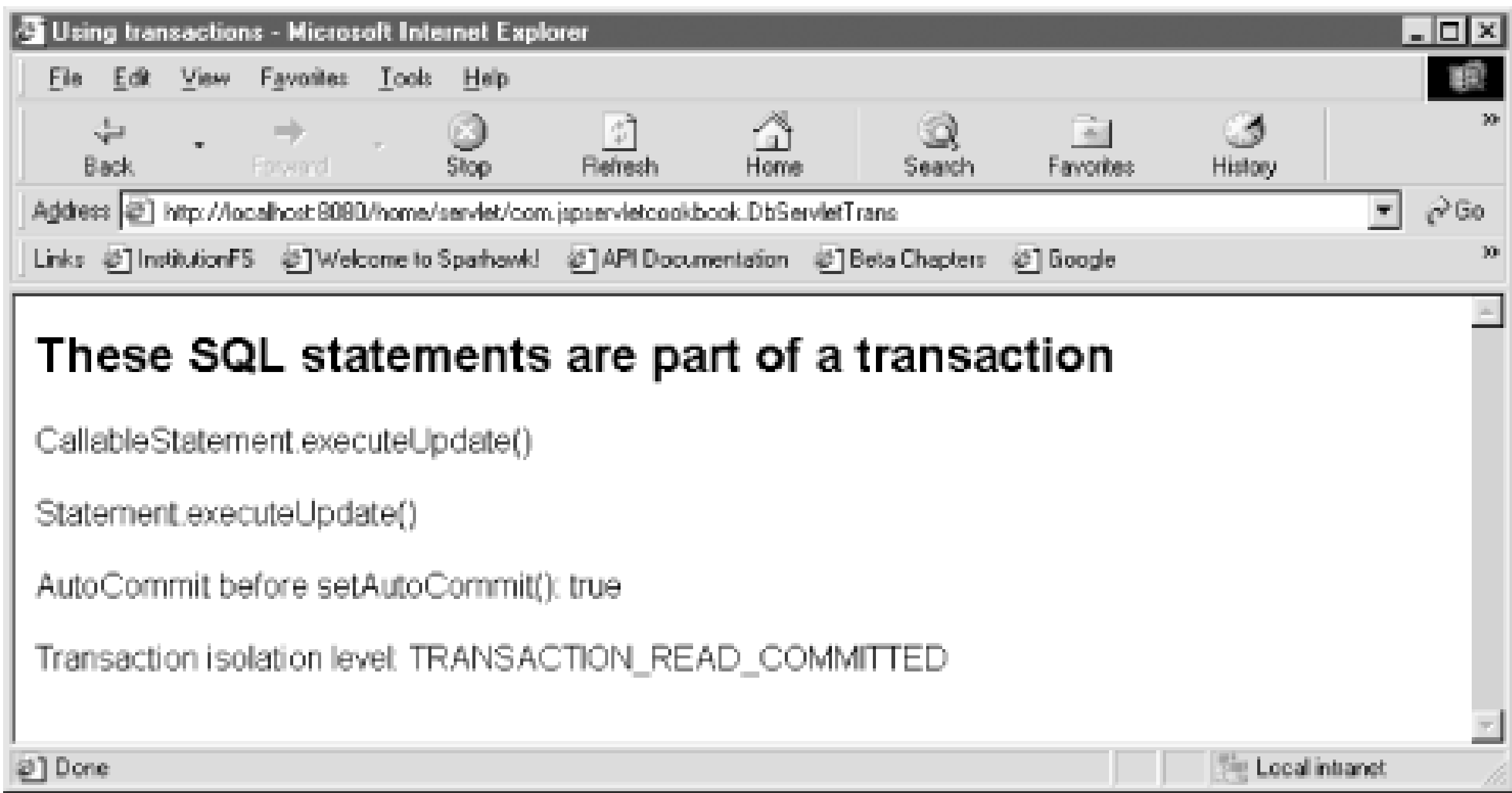


Check your database vendor's specifications or literature for how the database system you use handles transaction isolation. Use the `Connection` object's `getTransactionIsolation()` method to find out the value associated with a particular database driver that JDBC-related code is using. This method returns an `int`. For example, a "2" return value means that the `Connection` is associated with a `TRANSACTION_READ_COMMITTED` transaction isolation level.

[Example 21-14](#) runs two SQL statements within a transaction: it executes a stored procedure and initiates an `UPDATE` statement. Then the code calls `commit()` on the `Connection` object to commit any database changes to the underlying data store. If this SQL code throws an exception, the transaction is rolled back with a call to `Connection`'s `rollback()` method. This method call prevents the prior SQL statements from having any effect on the underlying database.

[Figure 21-7](#) shows the output of the servlet in [Example 21-14](#), as it would appear in a web browser.

Figure 21-7. A servlet with a database transaction provides browser output



See Also

The JDBC specification: <http://java.sun.com/products/jdbc/download.html>; [Recipe 21.1](#) on accessing a database from a servlet without a connection pool; [Recipe 21.2](#) and [Recipe 21.3](#) on using a `DataSource` on Tomcat; [Recipe 21.4-Recipe 21.6](#) on using `DataSources` with servlets and JSPs on WebLogic; [Recipe 21.7](#) and [Recipe 21.8](#) on calling stored procedures from servlets and JSPs; [Recipe 21.11](#) on using transactions in JSPs; [Recipe 21.12](#) on finding out information about a `ResultSet`.

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Recipe 21.11 Using Transactions with JSPs

Problem

You want to run SQL statements within a transaction in a JSP.

Solution

Use the `sql:transaction` JSTL tag.

Discussion

The JSTL has a `sql:transaction` tag that executes any nested SQL actions (such as `sql:update`) in a transaction.

The `sql:transaction` tag uses the same `java.sql.Connection` methods that you would use in a transaction-related servlet ([Recipe 21.10](#)): `setAutoCommit(false)`, `commit()`, and `rollback()`.

[Example 21-15](#) uses a `DataSource` that is configured in *web.xml*, so that none of the database-related information appears in the JSP. See [Recipe 23.6](#) for how to configure a `DataSource` in the deployment descriptor. The INSERT and SELECT SQL statements that are nested inside the `sql:transaction` tag will both be rolled back if any problems arise within the transaction.

Example 21-15. A JSP executes INSERT and SELECT SQL statements in a transaction

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<%@ taglib uri="http://java.sun.com/jstl/sql" prefix="sql" %>
<html>
<HEAD>
    <TITLE>Using a Transaction with a JSP</TITLE>
</HEAD>
<body bgcolor="white">
    <h2>View Athlete Data</h2>

    <sql:transaction>

        <sql:update>
```



```
        insert into athlete values(2, 'Rachel Perry','rlpbwp1996',
        '24-Feb-1996','F')
    </sql:update>

    <sql:query var="resultObj">
        select * from athlete
    </sql:query>

</sql:transaction>

<table>
<c:forEach items="${resultObj.rows}" var="row">
    <c:forEach items="${row}" var="column">
        <tr>
            <td align="right">
                <b><c:out value="${column.key}" /></b>
            </td>
            <td>
                <c:out value="${column.value}" />
            </td></tr>
        </c:forEach>
    </c:forEach>
</table>
</body>
</html>
```

After executing SQL within a transaction, the JSP displays the database table's updated values. The content of the `sql:update` and `sql:query` tags are traditional SQL statements.

Make sure to include the proper taglib directive to use the JSTL 1.0 sql tag library:

```
<%@ taglib uri=
"http://java.sun.com/jstl/sql" prefix="sql" %>
```

The `sql:transaction` tag also has an `isolation` attribute in which you can specify an isolation level for the transaction (see [Recipe 21.10](#)). Here is an example:

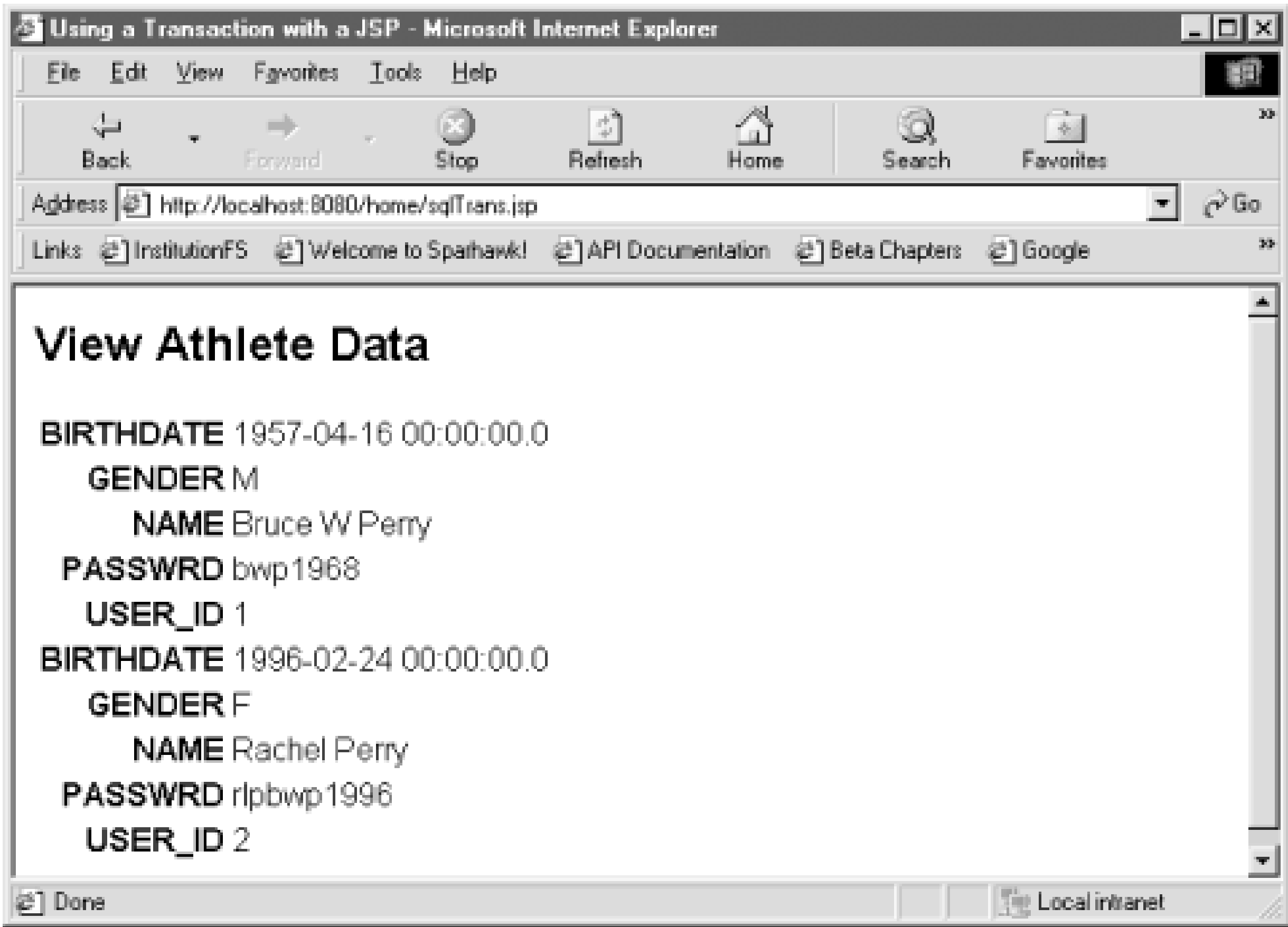
```
<sql:transaction isolation="TRANSACTION_READ_COMMITTED">

<%-- SQL statements and tags here... --%>

</sql:transaction>
```

[Figure 21-8](#) shows the output of the *sqlTrans.jsp* file.

Figure 21-8. A JSP displays an updated database table



See Also

The JDBC specification: <http://java.sun.com/products/jdbc/download.html>; [Chapter 23](#) on the JSTL and its `sql` tag library; [Recipe 21.1](#) on accessing a database from a servlet without a connection pool; [Recipe 21.2](#) and [Recipe 21.3](#) on using a `DataSource` on Tomcat; [Recipe 21.4-Recipe 21.6](#) on using `DataSources` with servlets and JSPs on WebLogic; [Recipe 21.7](#) and [Recipe 21.8](#) on calling stored procedures from servlets and JSPs; [Recipe 21.10](#) on using transactions in servlets; [Recipe 21.12](#) on finding out information about a `ResultSet`.

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Recipe 21.12 Finding Information about a ResultSet

Problem

You want to dynamically discover details about the rows and columns in a `java.sql.ResultSet`.

Solution

Use the `ResultSetMetaData` class obtained by calling the `java.sql.ResultSet`'s `getMetaData()` method.

Discussion

Web developers sometimes need to work with database tables that have unknown column names and types. The `java.sql` package contains a very useful `ResultSetMetaData` interface that defines methods designed to provide information about a `java.sql.ResultSet`. A `ResultSet` encapsulates the rows returned by a SELECT SQL statement.

[Example 21-16](#) shows a servlet that queries an Oracle 8i database for a `ResultSet`, then displays the column names, the column index, the SQL type of the column, and the number of characters the column requires to display its values.

Example 21-16. A servlet uses the `ResultSetMetaData` class

```
package com.jspservletcookbook;

import java.sql.*;

import javax.naming.Context;
import javax.naming.InitialContext;
import javax.naming.NamingException;
import javax.sql.*;

import javax.servlet.*;
import javax.servlet.http.*;

public class DbMetaServlet extends HttpServlet {

    DataSource pool;
```

```
/*Initialize the DataSource in the servlet's init( ) method
which the servlet container calls once when it creates an instance of
the servlet */
public void init( ) throws ServletException {

    Context env = null;

    try{

        env = (Context) new InitialContext( ).lookup("java:comp/env");

        pool  = (DataSource) env.lookup("jdbc/oracle-8i-athletes");

        if (pool == null)
            throw new ServletException(
                "'oracle-8i-athletes' is an unknown DataSource");

    } catch (NamingException ne) {

        throw new ServletException(ne);

    }

}

} //init

public void doGet(HttpServletRequest request,
    HttpServletResponse response)
    throws ServletException, java.io.IOException {

    String sql = "select * from athlete";
    Connection conn = null;
    Statement stmt = null;
    ResultSet rs = null;
    ResultSetMetaData rsm = null;

    response.setContentType("text/html");
    java.io.PrintWriter out = response.getWriter( );

    out.println(
        "<html><head><title>Discover a ResultSet</title></head><body>");

    out.println("<h2>Here is Info about the returned ResultSet</h2>");
    out.println("<table border='1'><tr>");

    try{

        //Get a connection from the pool
        conn = pool.getConnection( );

        //Create a Statement with which to run some SQL
        stmt = conn.createStatement( );
```

```

        //Execute the SQL
        rs = stmt.executeQuery(sql);

        //Get a ResultSetMetaData object from the ResultSet
        rsm = rs.getMetaData( );

        int colCount = rsm.getColumnCount( );

        //print column names
        printMeta(rsm,"name",out,colCount);

        //print column index
        printMeta(rsm,"index",out,colCount);

        //print column type
        printMeta(rsm,"column type",out,colCount);

        //print column display size
        printMeta(rsm,"column display",out,colCount);

    } catch (Exception e){

        throw new ServletException(e.getMessage( ));

    } finally {

        try{

            stmt.close( );
            conn.close( );

        } catch (SQLException sqle){ }

    }

    out.println("</table></body></html>");

} //doGet

private void printMeta(ResultSetMetaData metaData, String type,
    java.io.PrintWriter out, int colCount) throws SQLException {

    if (metaData == null || type == null || out == null)
        throw new IllegalArgumentException(
            "Illegal args passed to printMeta( )");

    out.println("<tr>");

    if (type.equals("table")){

```



```
        out.println("<td><strong>Table name</strong></td>");

        for (int i = 1; i <= colCount; ++i){

            out.println("<td>" + metaData.getTableName(i) + "</td>");
        }

    } else if (type.equals("name")){

        out.println("<td><strong>Column name</strong></td>");

        for (int i = 1; i <= colCount; ++i){

            out.println("<td>" + metaData.getColumnName(i) + "</td>");
        }

    } else if (type.equals("index")){

        out.println("<td><strong>Column index</strong></td>");

        for (int i = 1; i <= colCount; ++i){

            out.println("<td>" + i + "</td>");
        }

    } else if (type.equals("column type")){

        out.println("<td><strong>Column type</strong></td>");

        for (int i = 1; i <= colCount; ++i){

            out.println("<td>" + metaData.getColumnTypeName(i) +
                "</td>");
        }

    } else if (type.equals("column display")){

        out.println("<td><strong>Column display size</strong></td>");

        for (int i = 1; i <= colCount; ++i){

            out.println("<td>" + metaData.getColumnDisplaySize(i) +
                "</td>");
        }

    }

    out.println("</tr>");

} //printMeta
```

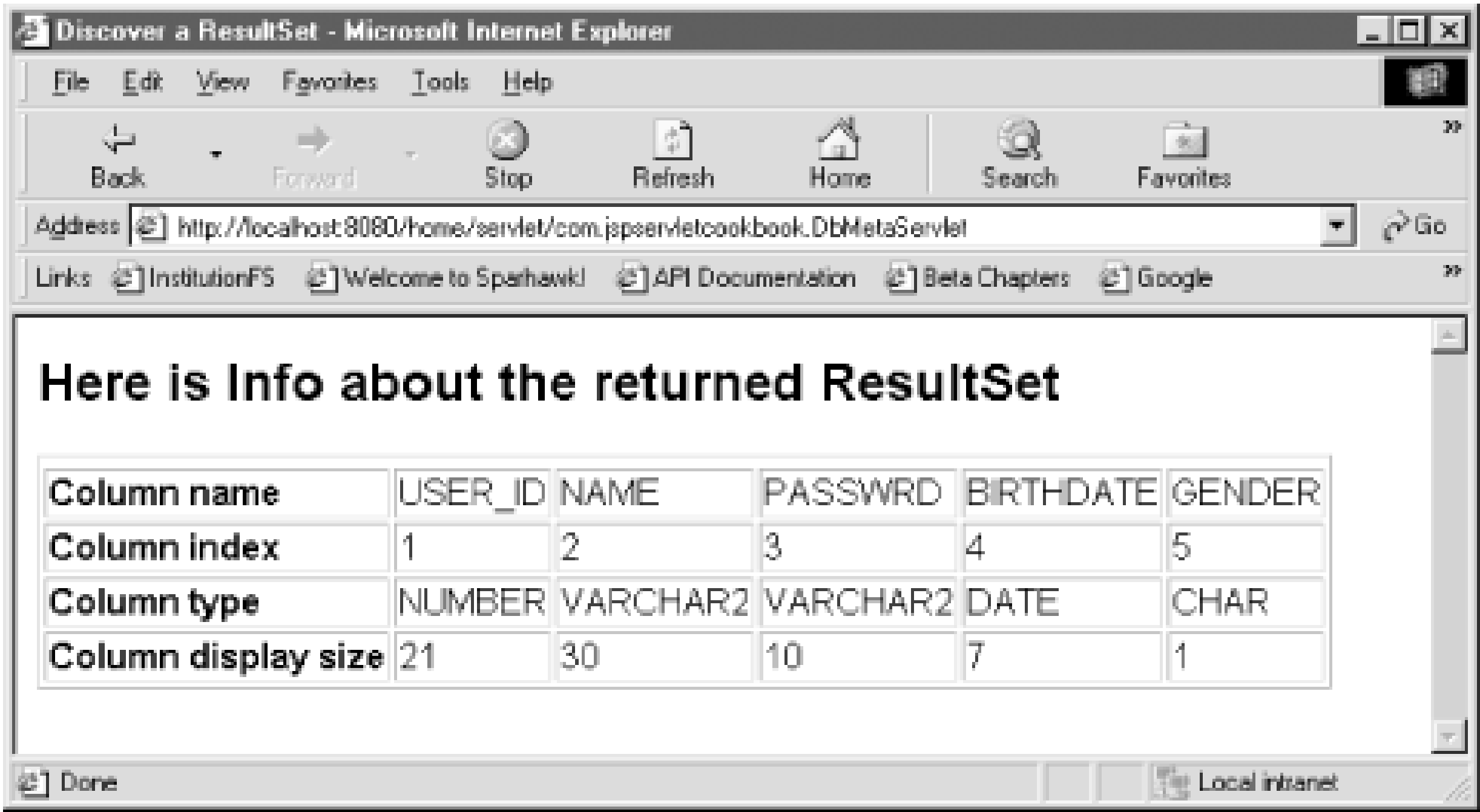
```
}
```

[Example 21-16](#) uses `ResultSetMetaData` methods to obtain information about each of the columns in the `ResultSet`. The code calls these methods inside its `printMeta()` method. For example, the code:

```
metaData.getColumnNames(1)
```

returns the name of the first column the table schema specifies, such as "USER_ID." [Figure 21-9](#) shows the servlet's HTML output in a web browser.

Figure 21-9. A servlet displays meta information about a `ResultSet`



Use the `java.sql.DatabaseMetaData` interface to get a large amount of information about the database system associated with the `java.sql.Connection` the code is using. The `Connection` method `getMetaData()` returns an object that implements the `DatabaseMetaData` interface.

See Also

The JDBC specification: <http://java.sun.com/products/jdbc/download.html>; The `ResultSetMetaData` class: <http://java.sun.com/j2se/1.4.1/docs/api/java/sql/ResultSetMetaData.html>; [Recipe 21.1](#) on accessing a database from a servlet without a connection pool; [Recipe 21.2](#) and [Recipe 21.3](#) on using a `DataSource` on Tomcat; [Recipe 21.4-Recipe 21.6](#) on using `DataSources` with servlets and JSPs on WebLogic; [Recipe 21.7](#) and [Recipe 21.8](#) on calling stored procedures from servlets and JSPs; [Recipe 21.10](#) and [Recipe 21.11](#) on using transactions in servlets and JSPs.

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Chapter 22. Using Custom Tag Libraries

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Introduction

A very powerful feature of JavaServer Pages technology is the ability to create your own XML tags for use in JSPs. Custom tags have been a part of the JSP specification since Version 1.1. JSP 2.0 is dedicated to making custom tag development less complex than prior versions. JSP 2.0's introduction of simple tag handlers and *tag files*, which we cover in [Recipe 22.8-Recipe 22.14](#), are a big part of this strategy.

Let's familiarize ourselves with a few terms before we move on to custom tag recipes. A *tag* is an instance of an XML element and a member of a specified namespace. For example, the prefix for all tags associated with this cookbook is `cbck`. The JSP refers to an individual tag associated with the `cbck` namespace (say, the `myTag` tag) as follows:

```
<cbck:myTag>whatever this tag does...</cbck:myTag>
```

Tags are XML elements; therefore, their names and attributes are case sensitive. A collection of tags that provide similar functionality or that logically collaborate with each other is called a *tag library*. Developers can install one or more tag libraries in a web application.

A Java class called the *tag handler* provides the tag's functionality in a JSP. A *custom action* is a tag that you invent for use in JSPs and that is powered behind the scenes by a tag-handler object that the web container keeps in memory.

A *classic tag handler* uses the tag extension API that evolved from JSP v1.1 to 1.2. A *simple tag handler* is a Java class that implements the `SimpleTag` interface, which JSP 2.0 introduced.

A *tag file* defines a custom tag in JSP syntax. It is designed to make life easier for tag developers. The web container generates from the tag file a Java class that implements the `SimpleTag` interface, and then creates an object from that class to interpret the tag's use in JSPs.

Finally, a *tag library descriptor* (TLD) is an XML file that provides a mapping between references to tag libraries in JSPs (with the `taglib` directive) and the tag-library classes that you install in the web application. A TLD is a configuration file, similar to a web application's deployment descriptor. The recipes in this chapter provide examples of how to create classic tag handlers, simple tag handlers, and tag files. The recipes also show how to package these components in web applications.

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Recipe 22.1 Creating a Classic Tag Handler

Problem

You want to create a classic JSP 1.2-style tag handler for a custom action.

Solution

Create a Java class that extends one of the `Tag` support classes in the `javax.servlet.jsp.tagext` package, such as `BodyTagSupport`.

Discussion

There are numerous types of custom tags you can create for JSPs, such as actions that ignore their body (empty tags), actions that are nested within other custom actions, and custom tags that use their body content. In fact, entire books have been dedicated solely to JSP custom tag development! Instead of being exhaustive in this book, I show how to create a fairly simple classic tag that adds an image logo to a JSP page with a text message. You can then infer details for your own programming tasks from this example.

The sample tag is designed to allow a page designer to specify an image, its width and height, and a text message to sit alongside the image.

Example 22-1 shows the classic tag handler for this custom action. This Java class extends `BodyTagSupport`, since it uses the tag's nested content for the image's text message.

Example 22-1. A classic tag handler for inserting an image and markup

```
package com.jspServletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;
import javax.servlet.jsp.*;
import javax.servlet.jsp.tagext.*;

/** This tag generates a thumbnail image using the HTML img tag, next to a text message.
    The user specifies the content of the message and the Heading level (i.e., <H1>-<H6>) */

public class LogoTag extends BodyTagSupport {

    //These variable represent the custom tag's attributes
    private String heading = null;
    private String image =null;
    private String width =null;
    private String height =null;
```

```

//this method assumes that attribute properties have been set.
public int doStartTag( ) throws JspException{

    try {

        int h = new Integer(heading).intValue( );

        if(! (h > 0 && h < 7))
            throw new JspException(
                "The 'heading' attribute value must between 1 and 6 inclusive.");

    } catch (Exception e) { throw new JspException(e.getMessage( )); }

    return EVAL_BODY_BUFFERED;

}

public int doEndTag( ) throws JspException {

    JspWriter out = pageContext.getOut( );

    //the 'images' directory is located in the web app's
    //root directory
    String imgDir = ((HttpServletRequest) pageContext.
        getRequest( )).getContextPath( ) + "/images/";

    //get the text provided between the custom action's
    // start and end tags
    String message = getBodyContent( ).getString( ).trim( );

    try{

        //build the HTML img tag
        out.println("<img src=\"" + imgDir + image + "\"" width=\"" + width +
            "\"" height=\"" + height + "\"" align=\"left\">" + "<H" + heading + ">" +
            message + "</H" + heading+ ">");

    } catch (java.io.IOException io) {}

    return EVAL_PAGE;

} //doEndTag

//methods designed to set attribute values
public void setHeading(String level){

    this.heading= level;

}

public void setImage(String name){

```

```

        this.image = name;
    }

    public void setWidth(String width){

        this.width = width;
    }

    public void setHeight(String height){

        this.height = height;
    }

    //the JSP container may cache and reuse tag handler objects.
    //this method releases instance variables so that the tag handler
    //can be reused afresh
    public void release( ){

        heading = null;
        image =null;
        width =null;
        height =null;

    }// release
}

```

Classic tag handlers are like JavaBeans. You declare the custom tag's attributes as instance variables, or *properties*, and define setter methods for each attribute. If you just want to manipulate the custom tag body, define the `doEndTag()` method. When the JSP container invokes `doEndTag()`, developers can use this method to evaluate the body content that the tag user has placed between the action's start and end tags. Example 22-1 also defines the `doStartTag()` method to check that the tag user has included a valid value for the `header` attribute (a number between one and six, inclusive, for this example code).

When the `doStartTag()` method is invoked, any attribute values that the user has set are available, but the tag's body content is not.

The `doEndTag()` method uses the various tag attribute values to build an `img` and `H` tag that results in the display of a simple logo in the JSP page where the tag is used. Here's an example of how a JSP would use the action defined by this tag handler:

```

<!-- import the tag library with 'taglib' directive --%>
<%@ taglib uri="jspServletcookbook.com.tags" prefix="cbck" %>

<!-- JSP page continues... --%>

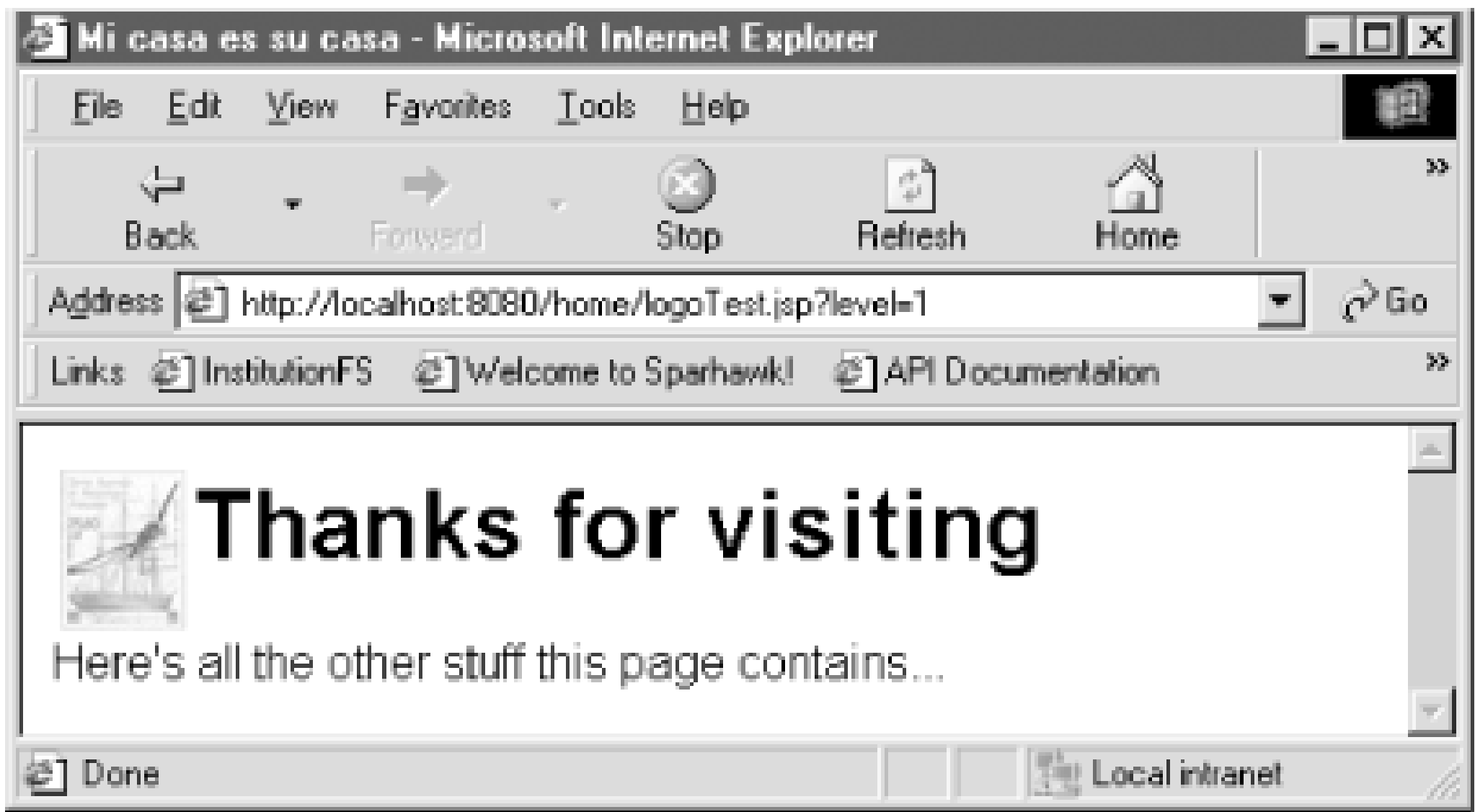
```



```
<%-- Use the 'logo' tag --%>
<cbck:logo heading="1" image="stamp.gif" width="42" height="54">Thanks for visiting</
cbck:logo>
```

Figure 22-1 shows a JSP that uses the tag defined by Example 22-1 .

Figure 22-1. A JSP page uses a custom tag that displays an image and a heading



The JSP using this tag outputs HTML that looks like this:

```

<H1> Thanks for visiting</H1>
```

You might respond by exclaiming, "The designer can just enter these HTML tags manually, and they don't have to deal with the custom tag's syntax!" This is absolutely true; however, the tag takes care of the default location for the images directory, positions and aligns the image, and checks whether the attribute level is correct. In other words, it performs a lot of routine work and removes the possibility of silly typographical mistakes.

Also consider that this is a simple example; what if the image was a Flash file instead? A custom tag could take care of all of the complex details for embedding the Flash in the HTML page and generating proper attribute values, leaving the graphical positioning of the media file up to the tag user.

A nice rule of thumb with custom tags is this: leave automated, complex, or tedious work to the tag handler, and reserve configurable details for the tag's attributes.

See Also

The JSP 2.0 specification web page: <http://jcp.org/en/jsr/detail?id=152>; Recipe 22.2 and Recipe 22.3 on creating TLD files for tag libraries; Recipe 22.4 and Recipe 22.5 on packaging tag libraries in a web application; Recipe 22.6 on using the custom tag in a JSP; Recipe 22.7 on handling exceptions in tags; Recipe 22.8 and Recipe 22.9 on creating a simple tag handler; Recipe 22.10 on using the simple tag handler in a JSP; Recipe 22.11 -Recipe 22.14 on using a JSP tag file; Recipe 22.15 on adding a listener class to a tag library; the custom-tag sections of Hans Bergsten's *JavaServer Pages*, Third Edition (O'Reilly).

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Recipe 22.2 Creating a JSP 1.2 TLD for a Classic Tag Handler

Problem

You want to create a JSP 1.2 TLD file for one or more custom tags.

Solution

Create the XML file using the proper **DOCTYPE** declaration for a JSP 1.2 TLD.

Discussion

A TLD is an XML file that describes your custom tags, the tag's attributes (if any), as well as the Java classes that provide the tag's functionality. The JSP container uses this configuration file when it interprets custom tags that appear in JSP pages. If you are using a JSP v1.2 container, your tag library's TLD has the **DOCTYPE** declaration shown in [Example 22-2](#). This TLD describes the tag handler of the previous recipe.

Example 22-2. The TLD file for a classic JSP 1.2 tag handler

```
<?xml version="1.0" encoding="ISO-8859-1" ?>

<!DOCTYPE taglib
    PUBLIC "-//Sun Microsystems, Inc.//DTD JSP Tag Library 1.2//EN"
    "http://java.sun.com/dtd/web-jsptaglibrary_1_2.dtd">

<taglib>

    <tlib-version>1.0</tlib-version>
    <jsp-version>1.2</jsp-version>
    <short-name>cbck</short-name>

    <!-- Here is the URI you use with the 'taglib' directive in the JSP -->
    <uri>com.jspserveletcookbook.tags</uri>

    <description>Cookbook custom tags</description>

    <tag>
```

```
<name>logo</name>

<!-- make sure to use the fully qualifed class name -->
<tag-class>com.jspervletcookbook.LogoTag</tag-class>

<body-content>JSP</body-content>

<description>This tag writes a logo inside the JSP.</description>

<attribute>
  <name>heading</name>
  <!-- The logo tag requires this attribute -->
  <required>true</required>
  <!-- The attribute can take a JSP expression as a value -->
  <rtexprvalue>true</rtexprvalue>
  <description>The heading level for the logo; 1 through 6.
  </description>
</attribute>

<attribute>
  <name>image</name>
  <required>true</required>
  <rtexprvalue>true</rtexprvalue>
  <description>The image name for the logo.</description>
</attribute>

  <attribute>
    <name>width</name>
    <required>true</required>
    <rtexprvalue>true</rtexprvalue>
    <description>The image width for the logo.</description>
  </attribute>

    <attribute>
      <name>height</name>
      <required>true</required>
      <rtexprvalue>true</rtexprvalue>
      <description>The image height for the logo.</description>
    </attribute>

</tag>

</taglib>
```

In JSP 1.2 and 2.0, a JSP container automatically searches *WEB-INF*, as well as the *META-INF* directory of your application's JAR files, for any file that ends with the extension *.tld*.

Because *.tld* is a fixed extension, it is mandatory to give your tag library descriptor filenames that end in *.tld*.

The container then uses the information it finds in the TLD to interpret custom tags that the web application may use. For example, the container maps the `uri` elements it finds in the TLD to the URIs specified by any `taglib` directives in JSP files. [Example 22-2](#) specifies a `uri` of *com.jspServletcookbook.tags* for the tag library that contains the `logo` tag. A `taglib` directive that uses this tag library in a JSP looks like this:

```
<%@ taglib uri="com.jspServletcookbook.tags" prefix="cbck" %>
```

When the `logo` tag appears later on in the JSP, the JSP container knows that the tag belongs in the tag library with the *com.jspServletcookbook.tags* `uri` value, and the container can evaluate the JSP's tag use based on the TLD's specification of the tag class and the tag's various attributes. Based on the TLD, the JSP container knows that the `logo` tag's attributes are all required, so a JSP that uses the `logo` tag and omits an attribute fails to compile.

See Also

The JSP 2.0 specification web page: <http://jcp.org/en/jsr/detail?id=152>; [Recipe 22.3](#) on creating a JSP 2.0 TLD file for tag libraries; [Recipe 22.4](#) and [Recipe 22.5](#) on packaging tag libraries in a web application; [Recipe 22.6](#) on using the custom tag in a JSP; [Recipe 22.7](#) on handling exceptions in tags; [Recipe 22.8](#) and [Recipe 22.9](#) on creating a simple tag handler; [Recipe 22.10](#) on using the simple tag handler in a JSP; [Recipe 22.11-Recipe 22.14](#) on using a JSP tag file; [Recipe 22.15](#) on adding a listener class to a tag library; the custom tag sections of HansBergsten's *JavaServer Pages*, Third Edition (O'Reilly).

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Recipe 22.3 Creating a JSP 2.0 TLD for a Classic Tag Handle

Problem

You want to create a JSP 2.0 TLD file for a tag library.

Solution

Create a tag library descriptor with the proper `taglib` root element, including the `taglib`'s various `xmlr` attributes and values.

Discussion

If you are using any JSP 2.0 features with your tag library and TLD, such as a `function` or `tag-file` element, then you must use the JSP 2.0-style TLD, as shown in Example 22-3.

The JSP 2.0 TLD is backward compatible with elements defined in the JSP 1.2DTD. Therefore you can use the `taglib` and `tag` elements as they are specified in any existing JSP 1.2 TLDs when you upgrade your TLD file to JSP 2.0. For example, the only difference between the TLD in Example 22-3 and the JSP 1.2 T in Example 22-2 is the `taglib` start tag, which must have exactly the same content as shown here.

Example 22-3. The JSP 2.0 TLD file for our classic tag handler

```
<taglib xmlns="http://java.sun.com/xml/ns/j2ee"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation=
    "http://java.sun.com/xml/ns/j2ee
    http://java.sun.com/xml/ns/j2ee/web-jsptaglibrary_2_0.xsd"
  version="2.0"
>

<!-- THE REST OF THE XML CONTENT IS ALMOST EXACTLY THE SAME AS THE JSP 1.2 TLD VERSION
EXCEPT FOR <jsp-version>2.0</jsp-version> AND <body-content>scriptless</body-content>. The
"scriptless" value means that the content of the tag can only be template text (such as
HTML content), Expression Language code, or JSP action elements, but not "scripting"
elements such as the JSP code delineated by <% %> -->

  <tlib-version>1.0</tlib-version>
  <jsp-version>2.0</jsp-version>
  <short-name>cbck</short-name>
  <uri>com.jspservletcookbook.tags</uri>
  <description>Cookbook custom tags</description>

  <tag>
```



```
<name>logo</name>

<tag-class>com.jspServletcookbook.LogoTag</tag-class>

<body-content>scriptless</body-content>

<description>This tag writes a logo inside the JSP.</description>

<attribute>
  <name>heading</name>
  <required>true</required>
  <rtexprvalue>true</rtexprvalue>
  <description>
    The heading level for the logo; 1 through 6.
  </description>
</attribute>

<attribute>
  <name>image</name>
  <required>true</required>
  <rtexprvalue>true</rtexprvalue>
  <description>The image name for the logo.</description>
</attribute>

<attribute>
  <name>width</name>
  <required>true</required>
  <rtexprvalue>true</rtexprvalue>
  <description>The image width for the logo.</description>
</attribute>

<attribute>
  <name>height</name>
  <required>true</required>
  <rtexprvalue>true</rtexprvalue>
  <description>The image height for the logo.</description>
</attribute>

</tag>

</taglib>
```

The JSP 2.0 TLD is based on an XML Schema file, rather than a DTD (the XML Schema file: http://java.sun.com/xml/ns/j2ee/web-jsptaglibrary_2_0.xsd).

XML Schemas allow the definers of XML documents to create more complex elements and attributes than those allowed in DTDs. XML Schemas are also designed to be valid XML documents themselves, which makes it easier to integrate them with XML-based applications.

The `taglib` element in Example 22-3 has four attributes. The `xmlns` attribute specifies that the TLD has same default namespace as all J2EE deployment descriptors: `http://java.sun.com/xml/ns/j2ee`.



A namespace is a unique identifier that helps avoid the collision of two XML elements of the same name. For example, the `taglib` element that is part of the `http://java.sun.com/xml/ns/j2ee` namespace is different from a `taglib` element that might be defined as part of the `http://acme.com` namespace. A namespace has to be unique only within its domain (such as an Internet URL); it does not necessarily represent an actual web document.

The `xmlns:xsi` attribute specifies the namespace for a set of XML elements related to XML Schema *instances*. The `xsi:schemaLocation` attribute specifies the location of the XML Schema on which the current XML document is based.



An XML Schema describes a related set of elements and attributes. An XML Schema *instance* is an XML document that uses the previously defined XML elements and attributes. This concept is similar to a Java class and its object instances.

Finally, the `taglib` element's `version` attribute specifies the JSP-specification version on which the tag library is based, as in JSP 2.0.

See Also

The XML schema file for the JSP 2.0 TLD: `http://java.sun.com/xml/ns/j2ee/web-jsptaglibrary_2_0.xsd`; Recipe 22.2 on creating a JSP 1.2 TLD file for tag libraries; Recipe 22.4 and Recipe 22.5 on packaging tag libraries in a web application; Recipe 22.6 on using the custom tag in a JSP; Recipe 22.7 on handling exceptions in tags; Recipe 22.8 and Recipe 22.9 on creating a simple tag handler; Recipe 22.10 on using the simple tag handler in a JSP; Recipe 22.11 - Recipe 22.14 on using a JSP *tag file*; Recipe 22.15 on adding a listener class to a tag library; the custom tag sections of Hans Bergsten's *JavaServer Pages*, Third Edition (O'Reilly).

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Recipe 22.4 Packaging a Tag Library in a Web Application

Problem

You want to make your tag library available in a web application.

Solution

Place your TLD file in *WEB-INF* or a *WEB-INF* subdirectory (with the exception of *WEB-INF/lib* and *WEB-INF/classes*). Place the tag handler class or classes in *WEB-INF/classes*.

Discussion

Packaging your tag library outside of a JAR file is typically a two-step process:

1. Store the TLD file in the *WEB-INF* directory or a *WEB-INF* subdirectory, and a JSP container (compliant with Versions 1.2 and 2.0) automatically configures your tag library. The TLD file must have a *.tld* extension. For example, if you store a *mytags.tld* in *WEB-INF/tlds*, then the JSP container automatically finds your TLD file and configure your tag library.

The JSP 2.0 specification states that TLDs should not be placed in *WEB-INF/lib* or *WEB-INF/classes*. The JSP container will *not* look for the TLDs in these locations.

2. Make sure the tag handler classes for your tag library have a package name (such as `com.jspservletcookbook`) and are stored in *WEB-INF/classes* or in a JAR file in *WEB-INF/lib*.

The next recipe shows how to package your tag library, including the TLD, in a JAR file.

See Also

The XML schema file for the JSP 2.0 TLD: http://java.sun.com/xml/ns/j2ee/web-jsptaglibrary_2_0.xsd; [Recipe 22.2](#) and [Recipe 22.3](#) on creating TLD files for tag libraries; [Recipe 22.5](#) on packaging tag libraries in a JAR file; [Recipe 22.6](#) on using the custom tag in a JSP; [Recipe 22.7](#) on handling exceptions in tags; [Recipe 22.8](#) and [Recipe 22.9](#) on creating a simple tag handler; [Recipe 22.10](#) on using the simple tag handler in a JSP; [Recipe 22.11](#)-[Recipe 22.14](#) on using a JSP *tag file*; [Recipe 22.15](#) on adding a listener class to a tag library; the custom-tag sections of Hans

Bergsten's *JavaServer Pages*, Third Edition (O'Reilly).

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Recipe 22.5 Packaging the Tag Library in a JAR File

Problem

You want to make your tag library available in a JAR file.

Solution

Create a JAR file that contains your tag handler class or classes in the correct directory structure (with subdirectory names matching the package names). Place the tag library descriptor file in the JAR's *META-INF* directory. Then put the JAR in the *WEB-INF/lib* directory of your web application.

Discussion

To make your tag library portable, store all of your tag handler classes and tag files in a JAR file.

In a JAR, store any tag files in *META-INF/tags* or a subdirectory of *META-INF/tags*. If you don't, the JSP container will not recognize them as legitimate tag files. See [Recipe 22.11](#) for details.

You can generate this JAR file from a directory that contains your tag library classes, including their package-related subdirectories. For example, the `logo` tag I developed in this chapter has a package name of `com.jspservletcookbook`, so the relative path to this file is `com/jspservletcookbook/LogoTag.class`. Include a *META-INF* directory at the top level of the directory where the classes are stored (e.g., in the same directory as the one containing *com*). Place your tag library descriptor file in the *META-INF* directory or a *META-INF* subdirectory.

If your library includes any tag files, place them in *META-INF/tags* or a subdirectory of *META-INF/tags*. Change to the directory containing all these subdirectories and type the following command line, substituting your own JAR filename for `cookbooktags.jar`:

```
jar cvf cookbooktags.jar .
```

Don't forget that period (.) character at the end. This tells the `jar` tool to include all of the files and directories that the current directory contains in the archive.

Make sure your computer's `PATH` environment variable includes the path to the *bin* directory of your Java SDK installation, as in `h:\j2sdk1.4.1_01\bin`. This allows you to type `jar` at the command line to launch the Java `jar` tool.

To install the tag library, just take the resulting JAR file and move it into your web application's *WEB-INF/lib* directory.

The JSP container (in JSP 1.2 and 2.0) automatically looks in the JAR's *META-INF* directory for the TLD file-you do not have to include a `taglib` element in the *web.xml*/deployment descriptor.

See Also

The JSP 2.0 specification web page: <http://jcp.org/en/jsr/detail?id=152>; [Recipe 22.2](#) and [Recipe 22.3](#) on creating TLD files for tag libraries; [Recipe 22.4](#) on packaging a tag library in a web application without using a JAR file; [Recipe 22.6](#) on using the custom tag in a JSP; [Recipe 22.7](#) on handling exceptions in tags; [Recipe 22.8](#) and [Recipe 22.9](#) on creating a simple tag handler; [Recipe 22.10](#) on using the simple tag handler in a JSP; [Recipe 22.11](#) and [Recipe 22.14](#) on using a JSP tag file; [Recipe 22.15](#) on adding a listener class to a tag library; the custom tag sections of Hans Bergsten's *JavaServer Pages*, Third Edition (O'Reilly).

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Recipe 22.6 Using the Custom Tag in a JSP

Problem

You want to use a custom tag that you have developed and installed.

Solution

Include a `taglib` directive at the top of the JSP. The `taglib` directive must identify the `uri` for your tag library, as that `uri` is specified in your TLD file.

Discussion

To use the custom tags from your tag library, the JSP has to have a `taglib` directive, as in Example 22-4 . The `uri` attribute matches the `uri` your TLD file specifies (see Recipe 22.5). The `prefix` attribute specifies the namespace for your tags. Example 22-4 specifies the prefix `cbck` ; therefore, the JSP uses the `logo` tag from that tag library in the manner of `<cbck:logo>...</cbck:logo>` .

If the tag encloses body content (it's not an *empty* tag), make sure to close the tag properly, as in `</cbck:logo>` as opposed to `</logo>` .

If the JSP does not use the tag as specified in the TLD (for example, if it leaves out a mandatory attribute), the JSP will fail to compile the first time it is requested.

Example 22-4. The Logo tag used in a JSP

```
<%@ taglib uri="jspServletcookbook.com.tags" prefix="cbck" %>

<html>
<head><title>Mi casa es su casa</title></head>
<body>

<cbck:logo heading="<%=request.getParameter("level") %>" image="stamp.gif" width="42"
height="54">Thanks for visiting</cbck:logo>

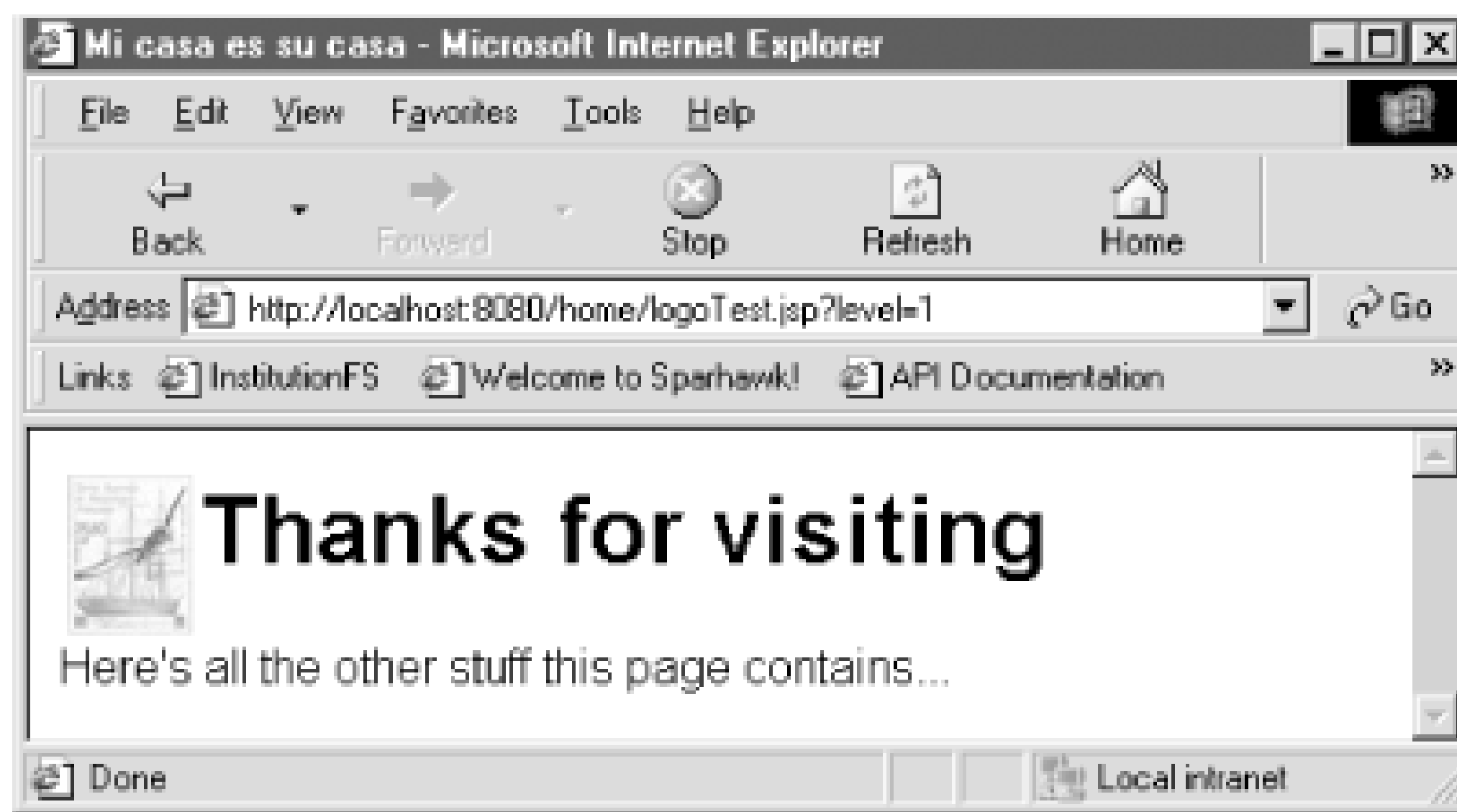
Here's all the other stuff this page contains...
</body>
</html>
```

In Example 22-4 , the `logo` tag's `heading` attribute takes a runtime expression value so that the user can dynamically set the attribute value, as in the following URL:

`http://localhost:8080/home/logoTest.jsp?level=1`.

Figure 22-2 shows the web browser display for this JSP.

Figure 22-2. The web browser display of a custom tag output



See Also

The JSP 2.0 specification web page: <http://jcp.org/en/jsr/detail?id=152>; Recipe 22.2 and Recipe 22.3 on creating TLD files for tag libraries; Recipe 22.4 and Recipe 22.5 on packaging a tag library in a web application; Recipe 22.7 on handling exceptions in tags; Recipe 22.8 and Recipe 22.9 on creating a simple tag handler; Recipe 22.10 on using the simple tag handler in a JSP; Recipe 22.11-Recipe 22.14 on using a JSP *tag file*; Recipe 22.15 on adding a listener class to a tag library; the custom tag sections of Hans Bergsten's *JavaServer Pages*, Third Edition (O'Reilly).

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Recipe 22.7 Handling Exceptions in a Custom Tag Class

Problem

You want your custom tag handler to deal with any exceptions thrown inside the tag.

Solution

Implement the `TryCatchFinally` interface in your tag handler.

Discussion

The tag extension API provides the `TryCatchFinally` interface, which you can implement in your tag handler class to write code dealing with any exceptions the tag handler might throw. If the class implements `TryCatchFinally`, it must include the methods `doCatch()` and `doFinally()`. In `doCatch()`, the class has access to any `Throwable` object thrown by `doStartTag()` or `doEndTag()`, for instance. In `doFinally()`, the code closes any resources the tag uses, such as a database connection.

In general, this interface allows the tag handler itself to catch and handle any exceptions that do not affect the output of the JSP enclosing the tag. Example 22-5 uses the same code as Example 22-1, but additional methods are added by implementing the `TryCatchFinally` interface.

Example 22-5. A logo tag handler that catches any exceptions

```
package com.jspservletcookbook;

import javax.servlet.*;
import javax.servlet.http.*;
import javax.servlet.jsp.*;
import javax.servlet.jsp.tagext.*;

/** This tag generates a thumbnail image using the HTML img tag, next to a text message.
The user specifies the content of the message and the Heading level (i.e., <H1>-<H6>) */

public class LogoTag extends BodyTagSupport implements TryCatchFinally{

    private String heading = null;
    private String image =null;
    private String width =null;
    private String height =null;

    //this method assumes that attribute properties have been set.
    public int doStartTag() throws JspException{
```

```

        try {

            int h = new Integer(heading).intValue( );

            if(! (h > 0 && h < 7))

                throw new JspException(
                    "The 'heading' attribute value must between 1 and 6"+
                    " inclusive.");

        } catch (Exception e) {
            throw new JspException(e.getMessage( ));
        }

        return EVAL_BODY_BUFFERED;

    }

    public int doEndTag( ) throws JspException {

        JspWriter out = pageContext.getOut( );

        String imgDir = ((HttpServletRequest) pageContext.getRequest( )).
            getContextPath( ) + "/images/";

        String message = getBodyContent( ).getString( ).trim( );

        try{

            out.println("<img src=\""+ imgDir + image + "\"" width=\""+
                width + "\"" height=\""+ height + "\"" align=\"left\">" + "<H" +
                heading + ">" + message + "</H" + heading+ ">");

        } catch (java.io.IOException io) {}

        return EVAL_PAGE;

    } //doEndTag

    /* The next two methods have to be implemented in this class since the class implement
    TryCatchFinally */

    public void doCatch(Throwable t){

        try{

            //print the exception message inside the JSP where the tag
            //appears
            pageContext.getOut( ).println(t.getMessage( )+"<br />");

        } catch (java.io.IOException io) {}

    }

```

```
}

public void doFinally( ){

    //do nothing here, since we don't have any resources open
    //like database connections

}

public void setHeading(String level){

    this.heading= level;

}

/* THE REST OF THE SOURCE CODE FROM EXAMPLE 22-1 CONTINUES... */
}
```

If the tag throws an exception, then the web container invokes the `doCatch()` method and the tag handler prints the exception message where the JSP would otherwise output the image produced by the tag. Our `doFinally()` method does not do anything, because this code does not have any open resources such as a `FileInputStream`.

See Also

The JSP 2.0 specification web page: <http://jcp.org/en/jsr/detail?id=152>; Recipe 22.2 and Recipe 22.3 on creating TLD files for tag libraries; Recipe 22.4 and Recipe 22.5 on packaging a tag library in a web application; Recipe 22.6 on using the custom tag in a JSP; Recipe 22.8 and Recipe 22.9 on creating a simple tag handler; Recipe 22.10 on using the simple tag handler in a JSP; Recipe 22.11-Recipe 22.14 on using JSP *tag file*; Recipe 22.15 on adding a listener class to a tag library; the custom tag sections of Hans Bergsten's *JavaServer Pages*, Third Edition (O'Reilly).

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Recipe 22.8 Creating a Simple Tag Handler

Problem

You want to create a JSP 2.0 simple tag handler.

Solution

Create a Java class that either implements the `SimpleTag` interface or extends the `SimpleTagSupport` class.

Discussion

In an effort to simplify custom tag development, the JSP 2.0 specification added the `javax.servlet.jsp.tagext.SimpleTag` interface and the `SimpleTagSupport` class. The `SimpleTagSupport` class is designed to be the base class for tag handlers that implement `SimpleTag`. These tag handlers have to implement just one method, `doTag()`.

The JSP 2.0 specification states that vendors should not cache simple tag handlers, so developers do not have to worry about the reuse of tag handler objects and releasing object state in their code.

Example 22-6 mimics the `logo` tag handler created in earlier recipes, but uses the `SimpleTagSupport` class from the JSP 2.0 API instead.

Example 22-6. A simple tag handler displaying a logo

```
package com.jspServletcookbook;

import java.io.IOException;

import javax.servlet.*;
import javax.servlet.http.*;
import javax.servlet.jsp.*;
import javax.servlet.jsp.tagext.*;

/** This tag generates a thumbnail image using an HTML img tag, aligned next to a text
    message. The user specifies the content of the message and the Heading level (i.e., <H1>
    <H6>) */

public class SimpleLogoTag extends SimpleTagSupport{
```



```

private String heading = null;
private String image =null;
private String width =null;
private String height =null;

public void doTag( ) throws JspException, IOException{

    //JspContext provides access to the JspWriter for generating
    //text from the tag. You can also get any stored attribute values
    //using JspContext
    JspContext jspContext = getJspContext( );

    //this method assumes that attribute properties have been set.
    try {

        int h = new Integer(heading).intValue( );

        if(! (h > 0 && h < 7))
            throw new JspException(
                "The 'heading' attribute value must between 1 and 6"+
                " inclusive.");

    } catch (Exception e) { throw new JspException(e.getMessage( )); }

    //Get a JspWriter to produce the tag's output
    JspWriter out = jspContext.getOut( );

    //the value of the 'imgDir' attribute is the web app's /images
    //directory; the directory path is stored in a session attribute
    String imgDir = (String) jspContext.findAttribute("imgDir");

    if (imgDir == null || "".equals(imgDir))
        throw new JspException(
            "No attribute provided specifying the application's " +
            "image directory.");

    //display the img and H HTML tags
    out.println(new StringBuffer("<img src=\"").append(imgDir).
        append(image).append("\" width=\"").append(width).
        append("\" height=\"").append(height).append("\" align=\"left\">").
        append("<H").append(heading).append(">").toString( ));

    // getJspBody( ) returns a 'JspFragment' object; calling 'invoke( )'
    //on this object with a 'null' parameter will use the JSP page's
    //JspWriter to output the tag's nested content in the JSP
    getJspBody( ).invoke(null);

    out.println(new StringBuffer("</H").append(heading).
        append(">").toString( ));

} //doTag

```

```

//Attribute-related setter methods

public void setHeading(String level){

    this.heading= level;

}

public void setImage(String name){

    this.image = name;

}

public void setWidth(String width){

    this.width = width;

}

public void setHeight(String height){

    this.height = height;

}

} // SimpleLogoTag

```

This simple tag handler accesses a `JspContext` object by calling the `SimpleTagSupport`'s `getJspContext()` method. The code uses the `JspContext` to obtain the value of an attribute stored in the session, as well as to access a `JspWriter` to generate the tag's output:

```

JspContext jspContext = getJspContext( );

//further along in the code...

JspWriter out = jspContext.getOut( );

//the value of the 'imgDir' attribute is the web app's images
//directory; it is stored in a session attribute
String imgDir = (String) jspContext.findAttribute("imgDir");
//code continues...

```

Calling the `SimpleTagSupport`'s `getJspBody()` method returns a `JspFragment` object, which represents a chunk of JSP code as an object. Calling this object's `invoke()` method with `null` as the parameter directs the output of the fragment to the `JspWriter` available to the tag handler:

```

//Get the tag's body content and output it using the JspWriter
//that is available by calling JspContext.getOut( )
getJspBody( ).invoke(null);

```

This code displays the content or text that the JSP developer included within the custom action's start and

end tags. The tag handler uses the tag's body content as the textual logo message. Figure 22-1 in Recipe 22.1 shows what the JSP page looks like in a web browser.

See Also

The JSP 2.0 specification web page: <http://jcp.org/en/jsr/detail?id=152>; Recipe 22.2 and Recipe 22.3 on creating TLD files for tag libraries; Recipe 22.4 and Recipe 22.5 on packaging a tag library in a web application; Recipe 22.6 on using the custom tag in a JSP; Recipe 22.7 on handling exceptions in tags; Recipe 22.9 on creating a TLD for a simple tag handler; Recipe 22.10 on using the simple tag handler in JSP; Recipe 22.11 -Recipe 22.14 on using a JSP *tag file*; Recipe 22.15 on adding a listener class to a tag library; the custom tag sections of Hans Bergsten's *JavaServer Pages*, Third Edition (O'Reilly).

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Recipe 22.9 Creating a TLD for a Simple Tag Handler

Problem

You want to create a TLD for a simple tag handler.

Solution

Use the JSP 2.0-style TLD for the simple tag handler.

Discussion

The simple tag handler derives from the JSP 2.0 API, so you can use the TLD version from JSP 2.0 as well. Example 22-7 shows the `taglib` start tag and the various `xmlns` attributes that your TLD must reproduce exactly. Then, unless you are using JSP 2.0 TLD features such as the `tag-file` element, you can specify the `tag` element and its nested elements with the same XML syntax that you used for the prior TLD version.

Example 22-7. A JSP 2.0 TLD file for a simple tag handler

```
<taglib xmlns="http://java.sun.com/xml/ns/j2ee"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation=
    "http://java.sun.com/xml/ns/j2ee
    http://java.sun.com/xml/ns/j2ee/web-jsptaglibrary_2_0.xsd"
  version="2.0"
>

<!-- THE REST OF THE XML CONTENT IS THE SAME AS THE JSP 1.2 TLD VERSION EXCEPT FOR <jsp-
version>2.0</jsp-version> -->

  <tlib-version>1.0</tlib-version>
  <jsp-version>2.0</jsp-version>
  <short-name>cbck</short-name>
  <uri>com.jspServletcookbook.tags</uri>
  <description>Cookbook custom tags</description>

  <tag>

    <name>simplelogo</name>

    <tag-class>com.jspServletcookbook.SimpleLogoTag</tag-class>

    <body-content>JSP</body-content>
```



```
<description>This tag writes a logo inside the JSP.</description>

<attribute>
  <name>heading</name>
  <required>true</required>
  <rtexprvalue>true</rtexprvalue>
  <description>
    The heading level for the logo; 1 through 6.
  </description>
</attribute>

<attribute>
  <name>image</name>
  <required>true</required>
  <rtexprvalue>true</rtexprvalue>
  <description>The image name for the logo.</description>
</attribute>

<attribute>
  <name>width</name>
  <required>true</required>
  <rtexprvalue>true</rtexprvalue>
  <description>The image width for the logo.</description>
</attribute>

<attribute>
  <name>height</name>
  <required>true</required>
  <rtexprvalue>true</rtexprvalue>
  <description>The image height for the logo.</description>
</attribute>

</tag>

</taglib>
```

To use the simple tag handler in a web application, place the TLD in a subdirectory of *WEB-INF* like *WEB-INF/tlds*. Or, store the TLD in a JAR file's *META-INF* directory or a subdirectory thereof. Then put the JAR in the *WEB-INF/lib* directory.

See Also

The JSP 2.0 specification web page: <http://jcp.org/en/jsr/detail?id=152>; Recipe 22.2 -Recipe 22.3 on creating TLD files for tag libraries; Recipe 22.4 -Recipe 22.5 on packaging a tag library in a web application; Recipe 22.6 on using the custom tag in a JSP; Recipe 22.7 on handling exceptions in tags; Recipe 22.8 on creating a simple tag handler; Recipe 22.10 on using the simple tag handler in a JSP; Recipe 22.11 -Recipe 22.14 on using a JSP *tag file*; Recipe 22.15 on adding a listener class to a tag library; the custom tag sections of Hans Bergsten's *JavaServer Pages*, Third Edition (O'Reilly).

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Recipe 22.10 Using a Simple Tag Handler in a JSP

Problem

You want to use a custom tag based on a simple tag handler.

Solution

Use the `taglib` directive in the JSP, specifying the proper `uri` attribute for the tag library.

Discussion

Make sure to package the tag library, the simple tag handler, and its associated TLD, as described by [Recipe 22.4](#) and [Recipe 22.5](#) and the note in [Recipe 22.9](#). [Example 22-8](#) shows the rest of the setup needed to use the tag in a JSP.

Simple tag handlers are designed to be easier to develop (by having only one method that you need to implement: `void doTag()`). Use the associated tags in a JSP the same way you use the tags associated with classic tag handlers.

Example 22-8. A JSP uses a tag defined by a simple tag handler

```
<%@ taglib uri="jspServletcookbook.com.tags" prefix="cbck" %>
<html>
<head><title>Me Casa Su Casa</title></head>
<body>

<% session.setAttribute("imgDir",(request.getContextPath( ) +
"/images/")); %>

<cbck:simplelogo heading=
  "<%=request.getParameter(\"level\") %>" image=
  "stamp.gif" width="42" height="54">
  Thanks for visiting here</cbck:simplelogo>

Here's all the other stuff this page contains...
</body>
</html>
```

The JSP in [Example 22-8](#) obtains the value for the `logo` tag's `heading` attribute with a JSP expression. The JSP page user provides the value in the URL as in:

```
http://localhost:8080/home/logoTest.jsp?level=1
```

The JSP's output looks the same as the output shown in [Figure 22-1](#) of [Recipe 22.1](#).

See Also

The JSP 2.0 specification web page: <http://jcp.org/en/jsr/detail?id=152>; [Recipe 22.2](#) and [Recipe 22.3](#) on creating TLD files for tag libraries; [Recipe 22.4](#) and [Recipe 22.5](#) on packaging a tag library in a web application; [Recipe 22.6](#) on using the custom tag in a JSP; [Recipe 22.7](#) on handling exceptions in tags; [Recipe 22.8](#) and [Recipe 22.9](#) on creating a simple tag handler; [Recipe 22.11-Recipe 22.14](#) on using a JSP *tag file*; [Recipe 22.15](#) on adding a listener class to a tag library; the customtag sections of Hans Bergsten's *JavaServer Pages*, Third Edition (O'Reilly).

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Recipe 22.11 Creating a JSP Tag File

Problem

You want to create a custom tag in the form of a tag file.

Solution

Create the tag file using JSP syntax and with an extension of *.tag* or *.tagx*. Place the tag file in *WEB-INF/tags* or in *META-INF/tags* inside a JAR file, or in a subdirectory of either of these directories.

Discussion

JSP 2.0 introduced tag files, which are custom tags that you write using JSP syntax. Tag files are designed to allow developers with little or no Java experience to create simple tags using only JSP and XML elements. In addition, tag files do not require a TLD, although you can describe a tag file in a TLD (see Recipe 22.12). When you create the tag file, then drop it in the *WEB-INF/tags* directory, the JSP container compiles the file into a tag handler class the first time its associated tag is used in a JSP.

The JSP container converts the tag file into a class that extends `javax.servlet.jsp.tagext.SimpleTagSupport`. See Recipe 22.8 for more details on that class.

Tag files have introduced a few more directives and standard actions, such as the `tag` and `attribute` directives, as well as the `jsp:doBody` action. Example 22-9 shows these new syntax elements. The example creates the same `logo` tag we have worked on throughout this chapter, but uses tag file format.

Recipe 22.14 shows how the resulting custom tag can be used in a JSP.

Example 22-9 uses a `tag` directive to specify that the tag's body content (the text that appears between start and end tags) is *scriptless*. This means that the body content contains only template text, EL code, or JSP action elements.

If you are defining an empty tag, the `body-content` value is "empty." If the tag accepts JSP code in its body, use "JSP" for this value. The fourth `body-content` option is "tagdependent," meaning that the tag itself interprets the code in its body (such as SQL statements).

Since a tag *file* can use normal JSP syntax, Example 22-9 uses a `taglib` directive to use the JSTL (see Chapter 23). Then the example defines each one of the tag's attributes.



Remember that `tag` and `attribute` are *directives*, so their code starts with "`<%@.`"

Example 22-9. A tag file generates a custom tag that inserts a logo in a JSP

```
<%@ tag body-content="scriptless" description="Writes the HTML code for inserting a logo" %>

<%@ taglib prefix="c" uri="http://java.sun.com/jstl/core" %>

<%@ attribute name="heading" required="true" rtexprvalue="true" description="The heading level for the logo." %>

<%@ attribute name="image" required="true" rtexprvalue="true" description="The image name for the logo." %>

<%@ attribute name="width" required="true" rtexprvalue="true" description="The image width for the logo." %>

<%@ attribute name="height" required="true" rtexprvalue="true" description="The image height for the logo." %>

" width="
  "<c:out value="\${width}"/>" height="<c:out value="
    "\${height}"/>" align="left">

<H<c:out value="\${heading}"/>><jsp:doBody/></H<c:out value="\${heading}"/>>
```

The attributes for the `attribute` directive are the same as the attributes that you use for a JSP 1.2-style TLD file (see Recipe 22.2). Since a tag file accepts plain template text, this is how we have set up the HTML `img` tag that the tag file is designed to generate.

The `img` tag gets the values for its own attributes using the `c:out` JSTL tag and the EL (see Chapter 23). For example, the expression "`\${imgDir}`" returns the value for a stored object attribute of the same name, and `\${image}` specifies a directory that contains the image used in the logo. The expression "`\${image}`" returns the value of the tag's `image` attribute which, by this line of the code, has already been set by the user.

The `jsp:doBody` standard action is a nifty way to output the text between the custom action's start tag and end tag.

The `jsp:doBody` action, as well as the `tag`, `attribute`, and `variable` (not shown in this recipe) directives, can be used only in *tag files*.

See Also

The JSP 2.0 specification web page: <http://jcp.org/en/jsr/detail?id=152>; Recipe 22.2 and Recipe 22.3 on creating TLD files for tag libraries; Recipe 22.4 and Recipe 22.5 on packaging a tag library in a web application; Recipe 22.6 on using the custom tag in a JSP; Recipe 22.7 on handling exceptions in tags; Recipe 22.8 and Recipe 22.9 on creating a simple tag handler; Recipe 22.10 on using the simple tag handler in a JSP; Recipe 22.12 -Recipe 22.14 on using a JSP *tag file*; Recipe 22.15 on adding a listener class to a tag library; the custom tag sections of Hans Bergsten's *JavaServer Pages*, Third Edition (O'Reilly).

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Recipe 22.12 Packaging the JSP Tag File in a Web Application

Problem

You want to store the tag file for use in a web application.

Solution

Place the tag file in *WEB-INF/tags* or in *META-INF/tags* inside a JAR file or in a subdirectory of either of these directories. If you do this you do not need to describe the tag in a TLD file.

Discussion

The JSP container finds the tag file by using the `tagDir` attribute of the `taglib` directive. In other words, the `tagDir` attribute provides the path to the web application directory where you stored the tag file. Here's an example:

```
<%@ taglib prefix="cbck" tagdir="/WEB-INF/tags" %>
```

As long as you place the tag file, which has a *.tag* extension (or *.tagx* extension if the tag file is in XML syntax) in */WEB-INF/tags*, JSPs can use the tag associated with the tag file.

The JSP has to position the `taglib` directive in the code before the JSP uses the associated custom tag.

The JSP 2.0 TLD can also specify the tag file in the following manner:

```
<tag-file>
  <name>dbSelect</name>
  <path>/WEB-INF/tags/dbtags</path>
</tag-file>
```

This TLD entry specifies a tag file named *dbSelect.tag*, which resides in the */WEB-INF/tags/dbtags* directory. The `path` attribute must begin with *"/META-INF/tags"* if the *tag file* resides in a JAR, and *"/WEB-INF/tags"* if the tag file is located in a Web Archive (WAR) file or in a nonarchived web application.

See Also

The JSP 2.0 specification web page: <http://jcp.org/en/jsr/detail?id=152>; [Recipe 22.2](#) and [Recipe 22.3](#) on creating TLD files for tag libraries; [Recipe 22.4](#) and [Recipe 22.5](#) on packaging a tag library in a web application; [Recipe 22.6](#) on using the custom tag in a JSP; [Recipe 22.7](#) on handling exceptions in tags; [Recipe 22.8](#) and [Recipe 22.9](#) on creating a simple tag handler; [Recipe 22.10](#) on using the simple tag handler in a JSP; [Recipe 22.13](#) and [Recipe 22.14](#) on packaging a *tag file* and using it in a JSP; [Recipe 22.15](#) on adding a listener class to a tag library; the custom tag sections of Hans Bergsten's *JavaServer Pages*, Third Edition (O'Reilly).

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Recipe 22.13 Packaging the JSP Tag File in a JAR

Problem

You want to store the tag file in a JAR file.

Solution

Place the tag file in the JAR's *META-INF/tags* directory or a subdirectory thereof.

Discussion

Developers commonly distribute tag libraries as JAR files, particularly if they have designed the tag library to be portable. For JSP 2.0-style tag libraries that are using tag files, place the tag file in *META-INF/tags* or a subdirectory of *META-INF/tags*. The tag file must have a *.tag* extension, or a *.tagx* extension if it's a tag file in XML syntax.

Then place the JAR file in *WEB-INF/lib* of any web application containing JSPs that will use the tag.

See Also

The JSP 2.0 specification web page: <http://jcp.org/en/jsr/detail?id=152>; [Recipe 22.2](#) and [Recipe 22.3](#) on creating TLD files for tag libraries; [Recipe 22.4](#) and [Recipe 22.5](#) on packaging a tag library in a web application; [Recipe 22.6](#) on using the custom tag in a JSP; [Recipe 22.7](#) on handling exceptions in tags; [Recipe 22.8](#) and [Recipe 22.9](#) on creating a simple tag handler; [Recipe 22.10](#) on using the simple tag handler in a JSP; [Recipe 22.14](#) on using a tag tag file based on a tag file; [Recipe 22.15](#) on adding a listener class to a tag library; the custom tag sections of Hans Bergsten's *JavaServer Pages*, Third Edition (O'Reilly).

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Recipe 22.14 Using a Custom Tag Associated with a Tag File

Problem

You want to use a custom tag associated with a tag file.

Solution

Use the `taglib` directive in the JSP, before the code that uses the tag file related tag.

Discussion

The `taglib` directive identifies the tag with its `tagdir` attribute, which is the web application path to the `tags` directory. [Example 22-10](#) uses the tag from a tag file stored at `/WEB-INF/tags/logo.tag`.

The tag name in the JSP is the same as the tag filename, without the `.tag` extension. The `prefix` attribute represents the custom tag's namespace, so the entire tag is used in the JSP as "`<cbck:logo heading=...> ...tag content...</cbck:logo>`."

Example 22-10. A JSP uses a tag defined in a tag file

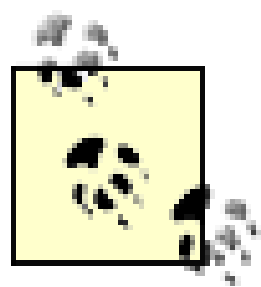
```
<%@ taglib prefix="cbck" tagdir="/WEB-INF/tags" %>

<html>
<head><title>Me Casa Su Casa</title></head>
<body>

<% session.setAttribute("imgDir",(request.getContextPath( ) + "/images/")); %>

<cbck:logo heading="<%=request.getParameter(\"level\") %>" image=
    "stamp.gif" width="42" height="54">
Thanks for visiting here ...
</cbck:logo>

Here's all the other stuff this page contains...
</body>
</html>
```



I use the same basic `<logo>` tag throughout this chapter to illustrate the various custom-tag syntax differences. See [Recipe 22.2](#) for details on the `<logo>` tag itself.

See Also

The JSP 2.0 specification web page: <http://jcp.org/en/jsr/detail?id=152>; [Recipe 22.2](#) and [Recipe 22.3](#) on creating TLD files for tag libraries; [Recipe 22.4](#) and [Recipe 22.5](#) on packaging a tag library in a web application; [Recipe 22.6](#) on using the custom tag in a JSP; [Recipe 22.7](#) on handling exceptions in tags; [Recipe 22.8](#) and [Recipe 22.9](#) on creating a simple tag handler; [Recipe 22.10](#) on using the simple tag handler in a JSP; [Recipe 22.11-Recipe 22.13](#) on setting up a JSP tag file; [Recipe 22.15](#) on adding a listener class to a tag library; the custom tag sections of Hans Bergsten's *JavaServer Pages*, Third Edition (O'Reilly).

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Recipe 22.15 Adding a Listener Class to a Tag Library

Problem

You want to include a listener class with your tag library.

Solution

Add a `listener` element to your TLD file.

Discussion

The servlet API includes "application event listeners," which are special Java classes that are notified by the web container when certain events occur, such as the creation of a new user session (see Chapter 1). You can include `listener` classes with your tag libraries. For example, you might have a session-relat tag that needs to know when sessions are created or destroyed.

The `listener` element has exactly the same syntax as it may appear in the *web.xml*/deployment descriptor. Example 22-11 shows a `listener` element included in a JSP Version 2.0 TLD.

Example 22-11. Adding a listener element to a JSP 2.0 TLD

`<!-- beginning of the TLD file. The listener element is nested in the taglib element. SEE CHAPTER 11 OR 14 FOR LISTENER CODE EXAMPLES -->`

```
<taglib xmlns="http://java.sun.com/xml/ns/j2ee"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation=
    "http://java.sun.com/xml/ns/j2ee
    http://java.sun.com/xml/ns/j2ee/web-jsptaglibrary_2_0.xsd"
  version="2.0"
>

  <tlib-version>1.0</tlib-version>
  <jsp-version>2.0</jsp-version>
  <short-name>cbck</short-name>
  <uri>com.jspServletcookbook.tags</uri>
  <description>Cookbook custom tags</description>

  <listener>
    <listener-class>
      com.jspServletcookbook.RegListener
    </listener-class>
  </listener>
```

```
<tag>

<!-- declare a tag here. See Example 22-2 (Recipe 22.2), Example 22-3 (recipe
22.3), or 22-7 (Recipe 22.9) -->

</tag>

</taglib>
```

The JSP specification requires the JSP container to automatically instantiate and register the listeners that are associated with tag libraries. A listener can be used with a tag library to track the number of requests the web application is receiving, as shown in the `ServletRequestListener` in Example 18-8 (Recipe 18.6).



JSP 1.2's TLD file uses an XML DTD. Therefore, the TLD elements must appear in a specific sequence. The `listener` element is nested inside the `taglib` element; `listener` appears after all of the other nested elements except for `tag`. You can precede your `tag` elements with the `listener` element. In the JSP 2.0 TLD, on the other hand, you can position the `listener` right after the `taglib` root element.

Store any listener classes in the same JAR file as the one containing any tag handler classes.

Make sure to specify the listener class in the `listener-class` element as a fully qualified class name, or the JSP container will probably have trouble finding the class.

See Also

Example 18-8 in Recipe 18.6 for an example of a class that implements the `javax.servlet.ServletRequestListener`; Chapter 11 and Chapter 14 for several listener-related recipes; Recipe 22.2 on creating a JSP 1.2 TLD file; Recipe 22.3 on creating a JSP 2.0 TLD; Recipe 22.9 on creating a TLD for a simple tag handler; the custom tag sections of Hans Bergsten's *JavaServer Pages*, Third Edition (O'Reilly).

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Chapter 23. Using the JSTL

[Introduction](#)

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Introduction

JavaServer Page's custom tags and tag handlers are designed to help you invent your own tags. While this is a powerful tool for Java web developers, developing custom tags entails a steep learning curve and can be time consuming. Luckily, some hard-working volunteer software developers have developed a bunch of highly useful tags for you. This tag collection is called the JavaServer Pages Standard Tag Library (JSTL). The JSTL specification arises from the Java Community Process (JSR-052) and the Apache Jakarta Project has developed a JSTL implementation, the Standard 1.0 taglib.

The JSTL has very broad functionality. It includes tags that:

1. Set object attributes for web applications (`c:set`).
2. Output text to web pages (`c:out` and `x:out`).
3. Iterate over collections of data (`c:forEach` and `x:forEach`).
4. Format numbers, dates, and currencies using different international styles (e.g., `fmt:formatDate`, `fmt:formatNumber`).
5. Transform XML (`x:transform`).
6. Interact with databases using SQL (e.g., `sql:query`, `sql:update`).
7. Allow you to embed function calls in JSP code and template text (e.g., `fn:substring()`). This functionality is available only with JSP 2.0 and JSTL 1.1 (see [Recipe 23.14](#)).

The JSTL originated a very important new JSP technology, the Expression Language (EL). This is a scripting language based generally on JavaScript and other scripting tools that, with JSP 2.0, can be embedded in HTML template text.

The EL was once part of JSTL 1.0 but has now migrated to the JSP specification. The EL must be implemented with JSP 2.0 containers such as Tomcat 5.

This chapter is designed to start you quickly with the JSTL, which commonly has to be downloaded and installed in a web application. Many web containers eventually integrate or have already integrated a JSTL implementation with their servlet and JSP engines.

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Recipe 23.1 Downloading the JSTL 1.0 and Using the JSTL Tags in JSPs

Problem

You want to download and use the JSTL.

Solution

Download the JSTL distribution, in a ZIP or TAR file, from the Apache Jakarta Project.

Discussion

The Apache Jakarta Project hosts the reference implementation (RI) for the JSTL. An RI is software that is designed to implement a particular Java technology specification in order to demonstrate how the software is intended to function. RIs are freely available for use by software vendors and developers. You can download the binary or source distribution of the JSTL from <http://jakarta.apache.org/taglibs/doc/standard-doc/intro.html>.

Unpack the ZIP or TAR file into the directory of your choice. This creates a *jakarta-taglibs* directory.

This recipe uses the Standard Taglib Version 1.0.3, an implementation of the JSTL 1.0. However, by the time you read this, the Jakarta Taglibs site will have introduced Standard Taglib Version 1.1, which is an implementation of the JSTL 1.1. The new version includes some new features such as functions, which are described in [Recipe 23.14](#).

Inside the *standard-1.0.3* directory is a *lib* subdirectory. This directory contains a number of JAR files, including *jstl.jar* and *standard.jar*. The *jstl.jar* contains the JSTL 1.0 API classes; *standard.jar* is a collection of JSTL 1.0 implementation classes. Add *all* of the JAR files found in your JSTL distribution's *lib* directory (*jakarta-taglibs/standard-1.0.3/lib* in the example) to *WEB-INF/lib*.

JSTL 1.1 only requires the installation of *jstl.jar* and *standard.jar* in *WEB-INF/lib* if you are using J2SE 1.4.2 or higher (as well as Servlet 2.4 and JSP 2.0).

[Table 23-1](#) describes each of the JAR files found in the distribution's *lib* directory (courtesy of the

Standard Taglib 1.0 documentation).

Table 23-1. Contents of the JSTL 1.0 reference implementation lib directory

File name	Purpose
<i>jstl.jar</i>	JSTL1.0 API classes
<i>standard.jar</i>	JSTL1.0 implementation classes
<i>jaxen_full.jar</i>	Xpath engine classes
<i>jdbc2_0-stdext.jar</i>	Java Database Connectivity (JDBC) implementation classes (also included with J2SE 1.4)
<i>saxpath.jar</i>	Simple API for Xpath parsing
<i>xalan.jar</i>	Apache Xalan Extensible StyleSheet Transformations (XSLT) processor
<i>dom.jar, jaxp-api.jar, sax.jar, xercesImpl.jar</i>	Java API for XML Processing (JAXP) 1.2 API libraries

In the JSP where you want to use the JSTL tags, use the proper `taglib` directive shown in [Table 23-2](#). For example, if you use all of the different JSTL functions (core, XML, formatting, and SQL), your JSP contains *all* of the following `taglib` directives, preferably at the top of the JSP page (they must appear before the tags are used).

Table 23-2. The taglib directives for different JSTL functions, version 1.0

JSTL library	taglib directive
Core	<code><%@ taglib uri="java.sun.com/jstl/core" prefix="c" %></code>
XML processing	<code><%@ taglib uri="java.sun.com/jstl/xml" prefix="x" %></code>
Formatting data (such as dates and currencies) for international users	<code><%@ taglib uri="java.sun.com/jstl/fmt" prefix="fmt" %></code>
SQL and Database access	<code><%@ taglib uri="java.sun.com/jstl/sql" prefix="sql" %></code>



The Java community is now working on the JSTL Version 1.1, which will require a JSP-2.0 compatible JSP container. JSTL 1.1 will use these different `uri` values in the `taglib` directive:

- *`http://java.sun.com/jsp/jstl/core`*, so the entire `taglib` directive would look like: `<%@ taglib uri="java.sun.com/jsp/jstl/core" prefix="c" %>`
- *`http://java.sun.com/jsp/jstl/xml`*, creating a `taglib` directive of: `<%@ taglib uri="java.sun.com/jsp/jstl/xml" prefix="x" %>`
- *`http://java.sun.com/jsp/jstl/fmt`*, as used in the `taglib` directive: `<%@ taglib uri="java.sun.com/jsp/jstl/fmt" prefix="fmt" %>`
- *`http://java.sun.com/jsp/jstl/sql`*, creating a `taglib` directive of: `<%@ taglib uri="java.sun.com/jsp/jstl/sql" prefix="sql" %>`

See Also

The Jakarta Project's Taglibs site: <http://jakarta.apache.org/taglibs/index.html>; Sun Microsystem's JSTL information page: <http://java.sun.com/products/jsp/jstl/>; [Recipe 23.3](#) on using the core tags; [Recipe 23.4](#) and [Recipe 23.5](#) on using XML-related tags; [Recipe 23.6](#) on using the formatting tags; [Recipe 23.7](#) and [Recipe 23.8](#) on the JSTL's SQL features; [Recipe 23.9-Recipe 23.14](#) on using the EL to access scoped variables, cookies, and JavaBean properties.

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Recipe 23.2 Downloading the Java Web Services Developer Pack

Problem

You want to download the Java Web Services Developer Pack (WSDP) so that you can use a JSTL 1.1 reference implementation.

Solution

Visit the Sun Microsystems Java WSDP download site at <http://java.sun.com/webservices/jwsdp>.

Discussion

The Java WSDP Version 1.2 contains reference implementations of the JSTL 1.1, as well as several other web tier technologies, including the Servlet API 2.4 and JSP 2.0. The WSDP is bundled with Tomcat 5, so once you install the WSDP you can experiment with the various technologies, including JavaServer Faces, Java Architecture for XML Binding (JAXB), Java API for XML Processing, and Java API for XML-based RPC (Jax-RPC).

The Java WSDP 1.2 installs on both Windows and various Unix systems, such as Solaris and Linux. [Recipe 23.15](#) shows how to use JSTL 1.1 functions; I use the WSDP for this recipe.

Using Tomcat 5 and the new JSTL 1.1 features such as functions and the embedding of EL code in template text requires you to use the servlet API 2.4 version of *web.xml*. See [Recipe 23.15](#) for more details on this issue.

See Also

The Sun Microsystems Java WSDP download site at: <http://java.sun.com/webservices/jwsdp>; [Recipe 23.15](#) on using JSTL 1.1 *functions*; Sun's JSTL information page: <http://java.sun.com/products/jsp/jstl/>; [Recipe 23.3](#) on using the core tags; [Recipe 23.4](#) and [Recipe 23.5](#) on using XML-related tags; [Recipe 23.6](#) on using the formatting tags; [Recipe 23.7](#) and [Recipe 23.8](#) on the JSTL's SQL features; [Recipe 23.9](#)-[Recipe 23.14](#) on using the EL to access scoped variables, cookies, and JavaBean properties.

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Recipe 23.3 Using the Core JSTL Tags

Problem

You want to use the core JSTL tags in a JSP.

Solution

Use the `taglib` directive with the core `uri` attribute value to make the tags available in the JSP.

Discussion

This recipe demonstrates several JSTL tags that you use all the time: `c:set` , `c:out` , `c:forEach` , and `c:if` . Here are the tag summaries:

- The `c:set` tag sets object attributes to `page` , `request` , `session` , or `application` scopes.
- The `c:out` tag displays text literals or the values of variables or bean properties in your JSPs.
- The `c:forEach` tag iterates over `Maps` , `Collections` , and `arrays` .
- The `c:if` tag tests expressions for `true` or `false` values, then conditionally executes the code nested in the `c:if` body.

Remember to use the prefix for the certain functional area of the JSTL, such as `c`, followed by a colon, and the tag name, as in "c:forEach."

Example 23-1 is a helper class that I find necessary to properly return a `String array` of `TimeZone` IDs to the JSP in Example 23-2 .

Example 23-1. A helper class to help display `TimeZone` IDs

```
package com.jspServletcookbook;

import java.util.TimeZone;

public class ZoneWrapper {

    public ZoneWrapper( ){}

    public String[] getAvailableIDs( ){
```

```
        return TimeZone.getAvailableIDs( );
    }
}
```

Example 23-2 shows how to use a number of the core JSTL tags. The code uses the `jsp:useBean` standard action to create `ZoneWrapper` (Example 23-1) and `java.util.Date` objects for use by the tags.

Example 23-2. Using core JSTL 1.0 tags in a JSP

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<jsp:useBean id="zone" class="com.jspServletcookbook.ZoneWrapper" />

<jsp:useBean id="date" class="java.util.Date" />

<html>
<head><title>Using the Core JSTL tags</title></head>
<body>
<h2>Here are the available Time Zone IDs on your system</h2>

<c:if test="${date.time != 0}" >

    <c:out value=
        "Phew, time has not stopped yet...<br /><br />" escapeXml="false"/>

</c:if>

<!-- The variable 'zones' contains a String array of TimeZone IDs; it is stored as a
'session' object attribute. The '${zone.availableIDs}' expression is the equivalent of
calling the ZoneWrapper.getAvailableIDs( ) method --%>

<c:set var="zones" value="${zone.availableIDs}" scope="session" />

<c:forEach var="id" items="${zones}">

    <c:out value="${id}<br />" escapeXml="false" />

</c:forEach>

</body>
</html>
```

The `c:if` tag uses an EL phrase to test whether the `Date` object's `getTime()` method returns a value that is not zero (of course it does! I'm just demonstrating how to use the `c:if` tag).

```
${date.time != 0}
```

The prior code represents a `boolean` expression that returns `true` if `Date.getTime()` is greater than zero. If `true` , then the code executes the nested `c:out` tag, which writes a message that the client's browser displays.



The `escapeXml="false"` code displays the characters `

` correctly in the HTML output by the `c:out` tag. See Table 23-3 .

Example 23-2 sets an object attribute to `session` scope. This object is a `String[]` type containing time zone IDs, such as "Pacific/Tahiti." The `c:forEach` tag then iterates over all of these `array` members, displaying each ID with the `c:out` tag:

```
<c:forEach var="id" items="${zones}">
  <c:out value="${id}<br />" escapeXml="false" />
</c:forEach>
```

The `var` attribute of the `c:forEach` tag stores the current `array` member as `c:forEach` cycles over the collection. The `c:out` tag uses an EL expression to access the value of the current `array` member:

```
<c:out value="${id}<br />" escapeXml="false" />
```

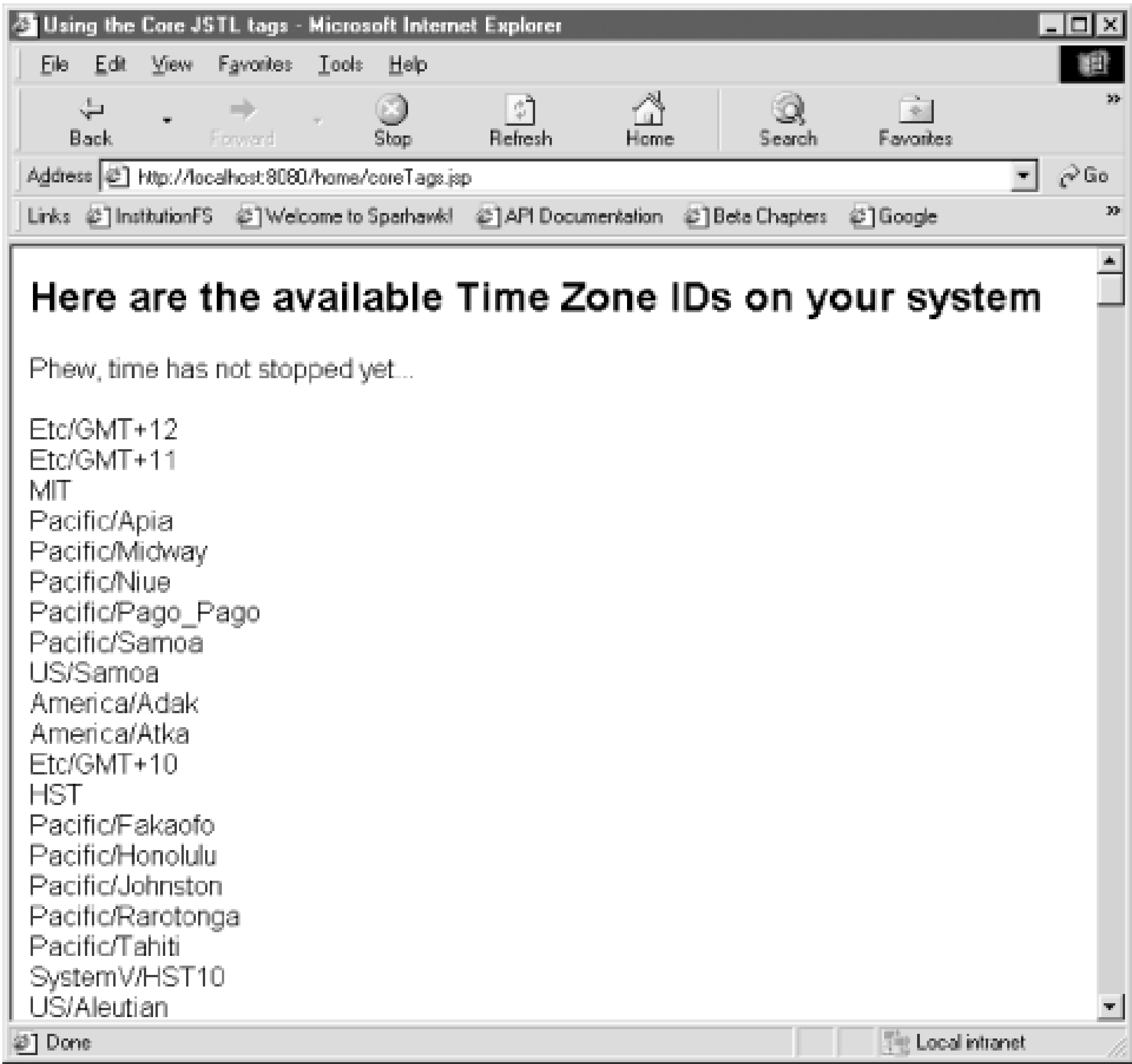
If you do not give the `escapeXml` attribute a `false` value when using `c:out` , the character entity codes shown in Table 23-3 will display instead of the escaped characters.

Table 23-3. The `c:out` tag's escaped characters

c:out value attribute character	Character entity code
<	<
>	>
&	&
`	'
"	"

Figure 23-1 shows a part of the JSP using the code in Example 23-2.

Figure 23-1. A JSP using the various core tags to display time zone IDs



See Also

Recipe 6.8 on including content in a JSP with the `c:url` tag; the Jakarta Project's Taglibs site: <http://jakarta.apache.org/taglibs/index.html> ; the Sun Microsystems JSTL information page: <http://java.sun.com/products/jsp/jstl/> ; Recipe 23.4 and Recipe 23.5 on using XML-related tags; Recipe 23.6 on using the formatting tags; Recipe 23.7 and Recipe 23.8 on the JSTL's SQL features; Recipe 23.9 -Recipe 23.14 on using the EL to access scoped variables, cookies, and JavaBean properties.

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Recipe 23.4 Using the XML Core JSTL Tags

Problem

You want to use the JSTL's XML tags in a JSP.

Solution

Use the various XML tags after declaring the tag library with the `xmlns:taglib` directive (`uri` attribute of `http://java.sun.com/jstl/xml` for JSTL 1.0 or `http://java.sun.com/jsp/jstl/xml` for JSTL 1.1).

Discussion

Many web developers have to write programs that parse or read XML to find information, or they have to write code that displays the encapsulated XML information in a readable format. The JSTL XML tags are a nice tool for these tasks. Example 23-3 displays some information from an Ant *build.xml* file. (See Chapter 4 on the Ant tool if you are new to Ant.) I'm using this XML file just for an example of how to use the XML-related JSTL tags. Notice that the `xmlns:taglib` directives at the top of the page allow the use of the XML and core JSTL tags further along in the code.

Example 23-3. A JSP parses an ant build file

```
<%@ taglib uri="http://java.sun.com/jstl/xml" prefix="x" %>
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<html>
<head><title>Using the Core XML tags</title></head>
<body>
<h2>Here are the target and property values from the XML file</h2>

<c:import url="http://localhost:8080/home/build.xml" var="buildXml" />

<x:parse xml="${buildXml}" var="antDoc" />

<h3>First the target names...</h3>

<x:forEach select="$antDoc/project/target" >

    <x:out select="@name"/>
    <x:if select="@depends" > : depends=<x:out select="@depends"/></x:if><br />

</x:forEach>

<h3>Then property names and values...</h3>
```

```

<x:forEach select="$antDoc/project/target/property" >

    <x:out select="@name"/>: value= <x:out select="@value"/><br />

</x:forEach>

</body>
</html>

```

Example 23-3 uses the `c:import` tag to import a build file and store it in a variable called `buildXml`. The `x:parse` tag then parses the imported document into a form or object that the other XML tags can work with. The code stores the parsing result in another variable named `antDoc`.

The XML JSTL tags use some of the same tag names as the core library, but a different prefix ("x"). The `x:forEach` tag in Example 23-3 uses an XPath expression as the value of the `x:forEach select` attribute.



XPath is an XML technology that is designed to search for and select portions or "node sets" of the hierarchical tree represented by an XML document. While an XPath tutorial is well beyond the scope of this recipe (it is like a little programming language in itself), there are plenty of online tutorials and books on the subject. You can start at the Sun Microsystems web services tutorial, which includes a discussion of XPath:
<http://java.sun.com/webservices/docs/1.3/tutorial/doc/> .

The `x:forEach` tag makes nested elements such as `x:out` available to any nodes grabbed by the XPath expression. The code in Example 23-3 displays the name of each Ant target in the *build.xml* file by first collecting a set of all of the `target` elements with this expression:

```

<!-- this XPath expression is the equivalent of "begin at the root 'project' element
and get all of its nested 'target' elements" -->

<x:forEach select="$antDoc/project/target" >

```

Example 23-3 outputs the name of each `target` with this code:

```

<x:out select="@name"/>

```

The enclosing `x:forEach` tag establishes the context of the XPath expression in this `x:out` tag.

The following code states "return `true` if the current node has a valid `depends` attribute."

```

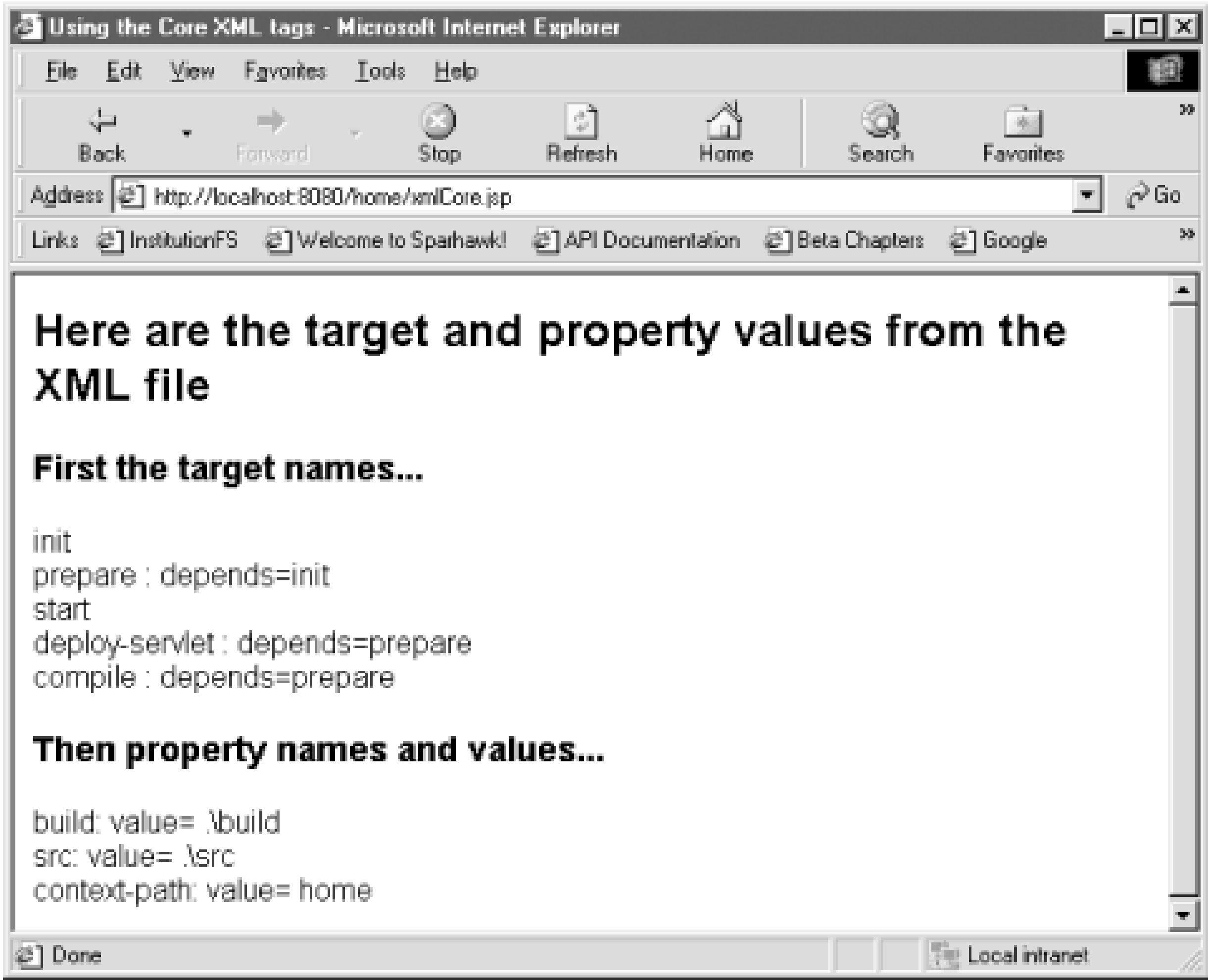
<x:if select="@depends">

```

If that expression returns `true`, the nested `x:out` tag outputs the value of the `depends` attribute. Figure 23-2 shows the result of requesting the JSP of Example 23-3 in a browser. I've converted the

XML information into a more readable format for a browser. XML mavens (meaning those who can sif through all of these crazy acronyms!) declare that you can also use Extensible Stylesheet Language Transformations (XSLT) for converting XML information to HTML or other readable forms. This is the next recipe's topic.

Figure 23-2. A JSP shows the output of a parsed XML file



See Also

The Jakarta Project's Taglibs site: <http://jakarta.apache.org/taglibs/index.html>; Sun Microsystem's JSTL information page: <http://java.sun.com/products/jsp/jstl/> ; Recipe 23.3 on using the core tags; Recipe 23.5 on using the XML Transform tags; Recipe 23.6 on using the formatting tags; Recipe 23.7 and Recipe 23.8 on the JSTL's SQL features; Recipe 23.9 -Recipe 23.14 on using the EL to access scoped variables, cookies, and JavaBean properties.

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Recipe 23.5 Using the XML Transform Tags

Problem

You want to use the JSTL's XML and XSLT-related tags

Solution

Use the various XML tags after declaring the tag library with the proper `taglib` directive (`uri` attribute of `http://java.sun.com/jstl/xml` for JSTL 1.0 or `http://java.sun.com/jsp/jstl/xml` for JSTL 1.1).

Discussion

A number of web site teams may already have devised stylesheets for transforming XML into HTML. In addition, you may want to separate most of the XML transformation responsibilities from JSPs, so that JSPs focus only on presenting the transformed information. The JSTL provides XML-related tags to easily integrate stylesheets into JSPs. [Example 23-4](#) is an Extensible Stylesheet Language (XSL) document that converts an XML file into HTML. The stylesheet provides a conversion of an Antbuild file similar to the one described in [Recipe 23.3](#).

Example 23-4. The stylesheet for transforming an XML file

```
<?xml version="1.0" encoding="ISO-8859-1"?>

<xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform" version="1.0">

  <xsl:output method="html"/>

  <xsl:template match="/">

    <html><head><title>List of build.xml targets
    </title></head><body bgcolor="white"><h2>Build.xml targets</h2>

    <xsl:apply-templates />

  </body></html>

</xsl:template>

<xsl:template match="/project">
```



```

<dl>
  <xsl:for-each select="./target">

    <dt><b>
      <xsl:value-of select="@name" /></b>&#xA0;</dt>

    <xsl:if test="@depends">
      <dd>depends=<xsl:value-of select="@depends" />&#xA0;</dd>

    </xsl:if>

  </xsl:for-each><!--end for-each -->
</dl>

</xsl:template>

<xsl:template match="text( )">
  <xsl:value-of select="normalize-space( )" />
</xsl:template>

</xsl:stylesheet>

```

How do you apply this XSL file to the *build.xml* file to produce a readable format? [Example 23-5](#) uses the `x:transform` tag to associate a stylesheet with an XML file. First, the JSP has to import both the stylesheet of the prior example and the XML file this stylesheet transforms by using the `c:import` tag. The `c:import` tag imports the resource specified by its `url` attribute and stores it in a variable (e.g., `buildXml`) that the `x:transform` tag can access.

Example 23-5. A JSP displays the result of an XSL transformation

```

<%@ taglib uri="http://java.sun.com/jstl/xml" prefix="x" %>
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<c:import url="http://localhost:8080/home/build.xml" var="buildXml" />

<c:import url="/WEB-INF/xslt/chap23.xsl" var="xslt" />

<x:transform xml="${buildXml}" xslt="${xslt}" />

```

The `x:transform` tag makes the transformation process very easy, once you've put together a valid stylesheet file. The `x:transform` tag's `xml` attribute specifies the XML file that the `x:transform` tag handler transforms by applying a stylesheet. The code specifies the stylesheet to use in the transformation with the `x:transform` tag's `xslt` attribute.

The `xml` and `xslt` attributes of `x:transform` resolve the variables that represent the stylesheet and the XML file by using the EL, as in:

```

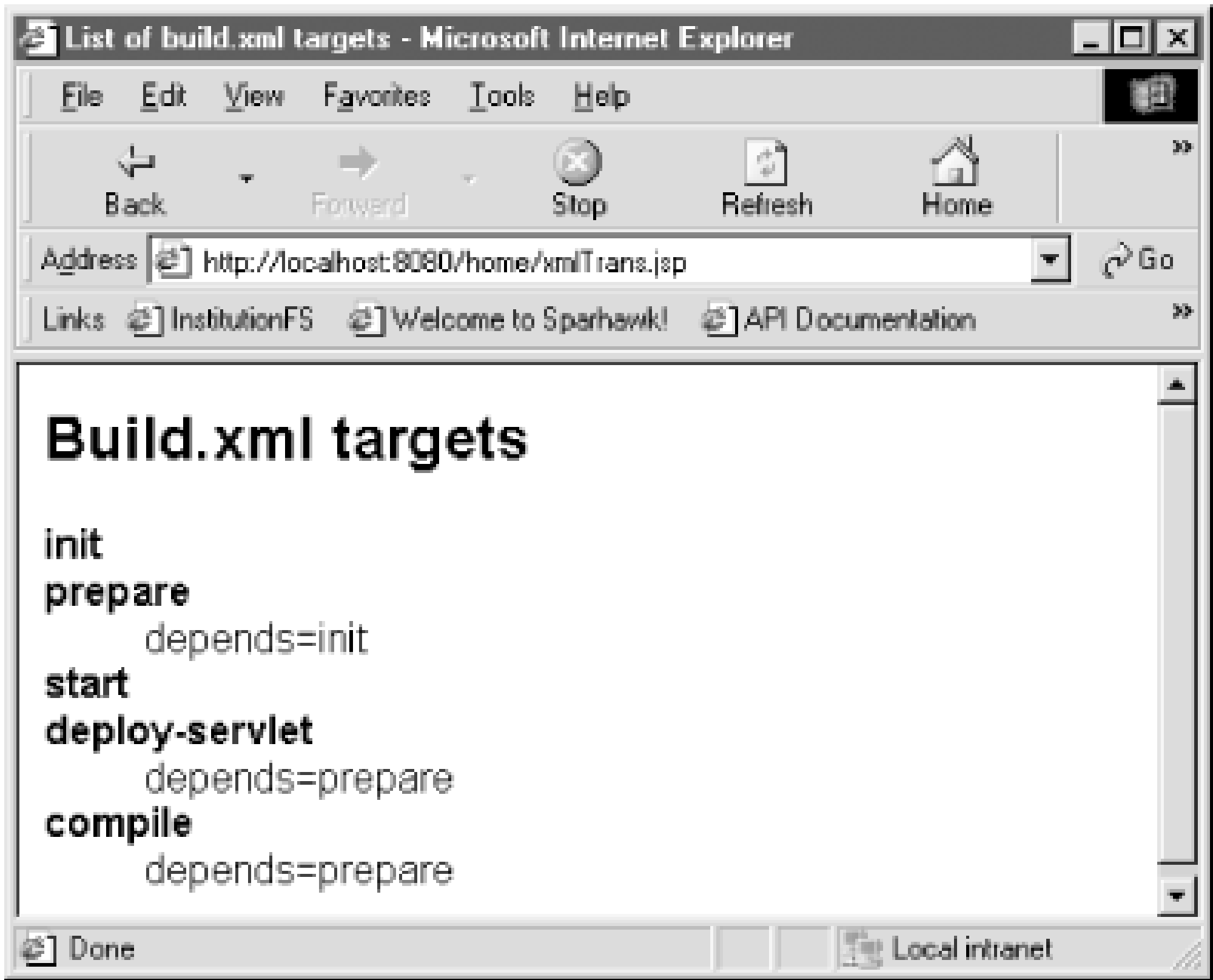
${buildXml}

```

[Figure 23-3](#) shows the result of running the JSP of [Example 23-5](#). In short, `x:transform` provides

your very own XSLT processor for use in the JSP.

Figure 23-3. A JSP shows transformed XML content



See Also

The Jakarta Project's Taglibs site: <http://jakarta.apache.org/taglibs/index.html>; the Sun Microsystems JSTL information page: <http://java.sun.com/products/jsp/jstl/>; [Recipe 23.2](#) on using the core tags; [Recipe 23.3](#) on using the various XML-related tags; [Recipe 23.5](#) on using the formatting tags; [Recipe 23.6](#) and [Recipe 23.7](#) on the JSTL's SQL features; [Recipe 23.9-Recipe 23.14](#) on using the EL to access scoped variables, request headers and parameters, cookies, and JavaBean properties.

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Recipe 23.6 Using the Formatting JSTL Tags

Problem

You want to format a date or a number using the JSTL.

Solution

Use the `fmt:formatDate` and `fmt:formatNumber` actions.

Discussion

Internationalization or "i18n" is the process by which web developers design their web sites to accommodate visitors who use different languages.

The term "i18n" means internationalization begins with "i," is followed by 18 letters, and ends with "n." It is designed to relieve the tedium of spelling out the word several times.

Localization means adding specific resources to a web site to enable messages such as web page greetings to be translated into the visitor's language. For example, you might localize a site for Japanese visitors by adding resources that contain Japanese translations of text that appears on web pages (I cover more i18n related Java code in Chapter 24). Example 23-6 uses the JSTL formatting tag library to display the current date and a large number in Swiss and U.S. styles.

Example 23-6. showing a date and a number for U.S. and Swiss audiences

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<!--include this taglib for i18n related actions --%>
<%@ taglib uri="http://java.sun.com/jstl/fmt" prefix="fmt" %>

<html>
<head><title>Formatting numbers and dates</title></head>
<body>
<h2>Dates and numbers in Swiss and US style formats</h2>

<!-- create an object representing the current date --%>
<jsp:useBean id="now" class="java.util.Date"/>

<!-- set the locale to German language, Swiss country code --%>
<fmt:setLocale value="de_CH"/>
```



```
<strong>Swiss-style date:</strong>

<!-- output the date --%>
<fmt:formatDate type=
  "both" value="{now}" dateStyle="full" timeStyle="short" />

<br />

<strong>Swiss-style number:</strong>

<!-- output the equivalent of java.util.Date.getTime( ) to show how numbers are formatted --%>
<fmt:formatNumber value="{now.time}" />

<br /><br />

<!-- reset the locale to English language, US country code --%>
<fmt:setLocale value="en_US"/>

<strong>US-style date:</strong>

<!-- output the date --%>
<fmt:formatDate type="both" value="{now}" dateStyle=
  "full" timeStyle="short" />

<br />

<strong>US-style number:</strong>

<fmt:formatNumber value="{now.time}" />

<br /><br />

</body>
</html>
```

Example 23-6 uses `fmt:setLocale` to set the context for formatting dates and numbers first to Swiss-German ("de_CH"), then back to U.S. English ("en_US").

A "locale" represents a particular cultural, geographic, or political region. Locales are typically specified by a `String` showing a language code followed by an underscore "_" and the country code. See Chapter 24 for an expanded discussion of i18n topics.

Both `fmt:formatDate` and `fmt:formatNumber` use the current locale to format their information. The `fmt:formatDate` tag has several attributes that are designed to configure the date format. The `both` attribute specifies whether to output only the date, the time, or both the date and time, as in Example 23-6. The `dateStyle` and `timeStyle` attributes have settings that derive from the `java.text.DateFormat` class. Example 23-6 specifies a "full" date display that includes the day of week, the month, and the year. The code also specifies a "short" time display (such as "8:07").

Figure 23-4 shows the JSP that formats dates and numbers for Swiss-German and U.S. English speakers. There are several other formatting related JSTL tags, which the recipes of Chapter 24 cover in more detail.

Figure 23-4. The `fmt:formatDate` and `fmt:formatNumber` tags perform translation magic in a JSP



See Also

Chapter 24 on using the JSTL's several `fmt`-related tags; the Jakarta Project's Taglibs site: <http://jakarta.apache.org/taglibs/index.html> ; the Sun Microsystems JSTL information page: <http://java.sun.com/products/jsp/jstl/> ; Recipe 23.3 on using the core tags; Recipe 23.5 on using the XML Transform tags; Recipe 23.7 and Recipe 23.8 on the JSTL's SQL features; Recipe 23.9 -Recipe 23.14 on using the EL to access scoped variables, cookies, and JavaBean properties.

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Recipe 23.7 Using A SQL JSTL Tag with a DataSource Configuration

Problem

You want to interact with a relational database by configuring the `javax.sql.DataSource` in the deployment descriptor.

Solution

Add a `context-param` element to *web.xml*, creating a parameter named `javax.servlet.jsp.jstl.sql.dataSource` that connects with a particular database.

Discussion

The JSTL SQL tag library allows a JSP to interact with a database using custom tags. Java Database Connectivity (JDBC) and the classes in the `javax.sql` package allow this technology to work. The first step in this recipe is to configure the `DataSource` that the tags will use to connect with a database.

A `DataSource` is a factory for `java.sql.Connection` objects, which represent a socket connection with a particular database server such as MySQL or Oracle.

[Example 23-7](#) creates a `context-param` element in *web.xml*. For the JSTL's SQL tags to automatically receive their `Connections` from this setting, the param name must be `javax.servlet.jsp.jstl.sql.dataSource`. The param value comprises comma-separated phrases:

```
[JDBC URL],[Driver name],[user],[password]
```

Developers commonly derive the JDBC URL and driver name from database vendor documentation (and often from mailing lists, because debugging backend database connections with JDBC can be tricky!). The code I show here contains an example of a JDBC URL for Oracle8 Personal Edition.

Example 23-7. An example web.xml configuration for a javax.sql.Datasource

```
<!-- top of web.xml file -->
```

```
<context-param>

    <param-name>javax.servlet.jsp.jstl.sql.dataSource</param-name>

    <param-value>jdbc:oracle:thin:@192.168.0.2:1521:ORCL,
oracle.jdbc.driver.OracleDriver,scott,tiger</param-value>

</context-param>

<!-- rest of web.xml file -->
```

The JSTL software uses these values to generate a `DataSource` for its SQL tags. The advantage of using an external setting for the `DataSource` is that to switch databases, you can change the value of the `context-param` to the configuration representing the new database without touching the JSP code. The JSP deals transparently with the SQL tags and `DataSource` object.

Now on to the JSP. Remember that the SQL tags (the ones using the "sql" prefix) use the `DataSource` that we just set with the `context-param` element in *web.xml*.



Web applications always have a *web.xml* file in the *WEB-INF* directory. See [Chapter 1](#) if you need a further explanation.

The `taglib` directives at the top of [Example 23-8](#) are required if you want to use the JSTL 1.0 core and SQL libraries.

Example 23-8. A JSP uses JSTL sql tags to display database information

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<%@ taglib uri="http://java.sun.com/jstl/sql" prefix="sql" %>

<html>
<head><title>Database Query</title></head>
<body>
<h2>Querying a database from a JSTL tag</h2>

<sql:query var="athletes">
SELECT * FROM athlete
</sql:query>

<table border="1">

<c:forEach var="row" items="{athletes.rows}">

<tr>
<th>user_id</th>
<th>name</th>
<th>birthdate</th>
<th>passwr</th>
```

```
<th>gender</th></tr>

<tr>
<td><c:out value="\${row.user_id}"/></td>
<td><c:out value="\${row.name}"/></td>
<td><c:out value="\${row.birthdate}"/></td>
<td><c:out value="\${row.passwr}"/></td>
<td><c:out value="\${row.gender}"/></td>
</tr>

</c:forEach>
</table>

</body>
</html>
```

The `sql:query` tag uses its nested content to send the SQL SELECT statement "select * from athlete" to a database. The database connection derives from the `DataSource` you have already configured. The statement is designed to "select all rows from the table named `athlete`." The `sql:query` tag saves the result set in a `javax.servlet.jsp.jstl.sql.Result` object, in a variable named `athletes`.

`Result` objects are converted from `java.sql.ResultSet` objects. `Result` objects have methods (such as `getRows()`) that are designed to interact with the JSTL SQL tags.

The code:

```
\${athletes.rows}
```

is an EL phrase that calls the `Result` object's `getRows()` method. This method returns a `java.util.SortedMap[]` type or an array of `SortedMaps`. [Example 23-8](#) uses the `c:forEach` tag to iterate over this `array` and create an HTML table row out of each of the returned database rows.


You can use this form of code to display the *column names* of a result set (``athletes`` is the variable storing the result set):

```
<c:forEach var="col" items=
    "\${athletes.columnNames}">

    <c:out value="\${col}"/>

</c:forEach>
```

The next recipe shows how a JSP accomplishes this same task without a `context-param` configuring the `DataSource`.



Try to stick with the strategy of setting the `DataSource` in `web.xml`, because it represents a better software design than cluttering up a JSP with a `DataSource` configuration.

[Figure 23-5](#) shows the JSP displaying the database row information in a web browser.

Figure 23-5. Displaying database information in a JSP



See Also

[Chapter 21](#) on working with databases; the Jakarta Project's Taglibs site: <http://jakarta.apache.org/taglibs/index.html>; the Sun Microsystems JSTL information page: <http://java.sun.com/products/jsp/jstl/>; [Recipe 23.3](#) on using the core tags; [Recipe 23.5](#) on using the XML Transform tags; [Recipe 23.6](#) on using the formatting tags; [Recipe 23.8](#) on using a SQL JSTL tag without a `DataSource` configuration; [Recipe 23.9-Recipe 23.14](#) on using the EL to access scoped variables, cookies, and JavaBean properties.

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Recipe 23.8 Using A SQL JSTL Tag Without a DataSource Configuration

Problem

You want to specify the `DataSource` for the JSTL SQL tags inside a JSP.

Solution

Use the `sql:setDataSource` tag to establish a `DataSource` for the other SQL tags, such as `sql:query`.

Discussion

You can explicitly set the `DataSource` for the JSTL SQL tags in a JSP using `sql:setDataSource` and its `dataSource` attribute. Example 23-9 creates the same `DataSource` as Recipe 23.6 and stores it in a variable named `dSource`. The `sql:query` tag then specifies this `DataSource` with its own `dataSource` attribute. The code otherwise accomplishes the same task as Example 23-8: the JSP sends a SELECT SQL statement to the database system, then displays the results.

Example 23-9. Using the sql:setDataSource tag

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<%@ taglib uri="http://java.sun.com/jstl/sql" prefix="sql" %>

<html>
<head><title>Database Query</title></head>
<body>
<h2>Querying a database from a JSTL tag</h2>

<sql:setDataSource dataSource=
"jdbc:oracle:thin:@192.168.0.2:1521:ORCL,oracle.jdbc.driver.OracleDriver,scott,tiger"
var="dSource" scope="application"/>

<sql:query var="athletes" dataSource="dSource">
SELECT * FROM athlete
</sql:query>

<table border="1">

<c:forEach var="row" items="${athletes.rows}">

<tr>
```

```
<th>user_id</th>
<th>name</th>
<th>birthdate</th>
<th>passwr</th>
<th>gender</th></tr>

<tr>
<td><c:out value="\${row.user_id}"/></td>
<td><c:out value="\${row.name}"/></td>
<td><c:out value="\${row.birthdate}"/></td>
<td><c:out value="\${row.passwr}"/></td>
<td><c:out value="\${row.gender}"/></td>
</tr>

</c:forEach>
</table>

</body>
</html>
```

The code stores the `DataSource` in an application-scoped variable, so that another JSP can access the `DataSource` this way:

```
<sql:query var="athletes" dataSource="\${dSource}">
SELECT * FROM athlete
</sql:query>
```

The only difference between this `sql:query` usage and Example 23-9 is that the value of the `dataSource` attribute has to be resolved using the EL; the tag has to find and get the value of an application-scoped variable (a servlet context attribute) named "dSource."

You can also specify a `DataSource` in the JSTL SQL tags as a Java Naming and Directory Interface (JNDI) string, but we will reserve discussion of that topic for Chapter 21 , which covers using databases with servlets and JSPs.

See Also

Chapter 21 on working with databases; the Jakarta Project's Taglibs site: <http://jakarta.apache.org/taglibs/index.html> ; the Sun Microsystems JSTL information page: <http://java.sun.com/products/jsp/jstl/> ; Recipe 23.3 on using the core tags; Recipe 23.4 and Recipe 23.5 on using the XML tags; Recipe 23.6 on using the formatting tags; Recipe 23.7 and Recipe 23.8 on using the SQL JSTL tags; Recipe 23.9 -Recipe 23.14 on using the EL to access scoped variables, cookies, and JavaBean properties.

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Recipe 23.9 Accessing Scoped Variables with the EL

Problem

You want to grab and display the value of an object attribute using a JSTL custom tag.

Solution

Use the EL and the `c:out` tag to get the value of an attribute that has been stored in a certain scope.

Discussion

An object such as a `java.util.Date`, a `java.lang.Integer`, or an object that you design, can be stored in four different scopes:

- `page`, so that it's only available in the servlet or JSP where it is created
- `request` scope, which makes the object available to any pages that interact with the JSP using a `RequestDispatcher`, such as a request that is forwarded from one JSP to another
- `session` scope stores object attributes for any servlets or JSPs that participate in the same session (see [Chapter 11](#))
- `application` scope, which represents the entire servlet context for one web application

[Example 23-10](#) uses the `c:set` JSTL tag to set a variable named `com.jspserveletcookbook.SessionObject` to session scope. Then `c:out` accesses and displays the value of the variable.

Example 23-10. Accessing the value of an object stored in session scope

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<html>
<head><title>Accessing a Scoped Value</title></head>
<body>
<h2>Here is the value of the Session-Scoped Attribute</h2>

<c:set var=
  "com.jspserveletcookbook.SessionObject" value=
    "My object attribute.<br />" scope="session" />
```



```
<c:out value=
    "${sessionScope[\"com.jspServletcookbook.SessionObject\"]}" escapeXml="false" />

</body>
</html>
```

By convention, object attributes are named after fully qualified Java classes (usually, after the Java type of the stored object). Therefore, the attribute name has period characters (.) in it. This is the purpose of the syntax `${sessionScope[\"com.jspServletcookbook.SessionObject\"]}`. If the attribute name does not contain periods, then you can use an EL expression consisting of just the variable name, without the `sessionScope` JSTL implicit object, in order to access the object attribute:

```
<c:out value=
    "${SessionObject}" escapeXml="false" />
```



If you just include the scoped object's name, as in the prior code fragment, then the JSTL will search the `page`, `request`, `session`, and `application` scopes for an attribute of that name, returning `null` if the JSTL does not find one.

You must use the required characters of an EL expression (the dollar sign and curly braces surrounding the expression: `"${ ... }"`). Otherwise the `c:out` tag will just output a `String` literal such as "SessionObject."

See Also

The Jakarta Project's Taglibs site: <http://jakarta.apache.org/taglibs/index.html>; Sun Microsystem's JSTL information page: <http://java.sun.com/products/jsp/jstl/>; [Recipe 23.3](#) on using the core tags; [Recipe 23.4](#) and [Recipe 23.5](#) on using the XML tags; [Recipe 23.6](#) on using the formatting tags; [Recipe 23.7](#) and [Recipe 23.8](#) on using the SQL JSTL tags; [Recipe 23.10-Recipe 23.14](#) on using the EL to access request parameters, cookies, and JavaBean properties.

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Recipe 23.10 Accessing Request Parameters with the EL

Problem

You want to access a request parameter using the EL in a JSP.

Solution

Use the `param` implicit object in your JSP code.

Discussion

The JSTL provides an implicit object named `param` that you can use to get a request parameter. Simply follow the term "param" with a period and the parameter name. Use this terminology with the EL to output the value of a request parameter with the `c:out` tag. [Example 23-11](#) displays a greeting with the visitor's name. The request might look like:

```
http://localhost:8080/home/welcome.jsp?name=Bruce%20Perry
```

If the URL does not include the "name" parameter, the JSP displays the message "Hello Esteemed Visitor."

Example 23-11. Using the JSTL in a JSP to display the result of a request parameter

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<html>
<head><title>Accessing a Scoped Value</title></head>
<body>
<h2>Hello

<c:choose>

<c:when test="${empty param.name}">
  Esteemed Visitor
</c:when>

<c:otherwise>

<c:out value="${param.name}" />
```

```
</c:otherwise>

</c:choose>

</h2>

</body>
</html>
```

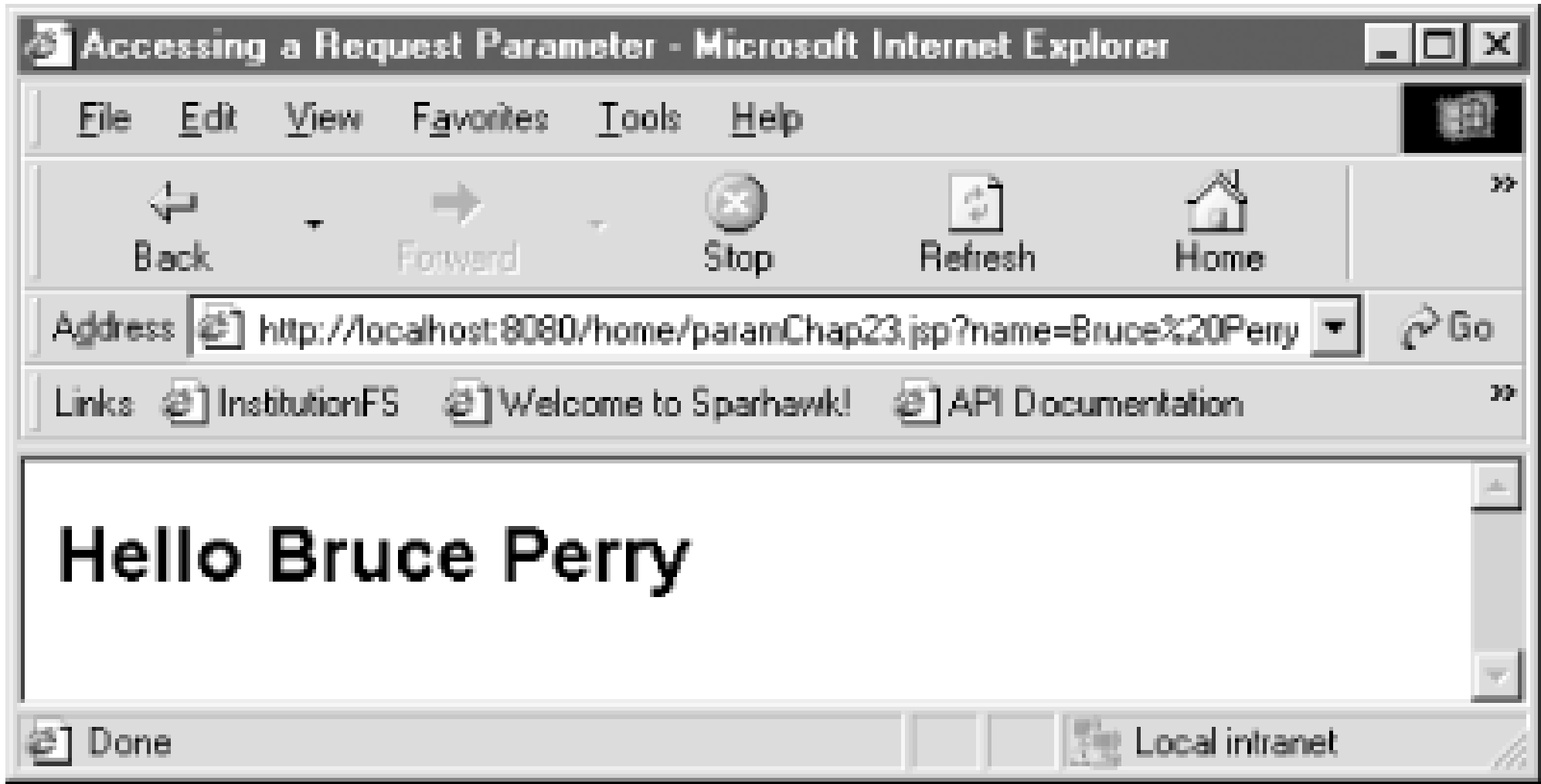
The code tests whether the request contains a value for `name` by using the `empty` EL keyword:

```
<c:when test="${empty param.name}">
```

The `c:choose`, `c:when`, and `c:otherwise` tags are like `if/then/else` statements in Java code. If the request parameter `name` does not have a value, the browser will display "Esteemed Visitor". Otherwise, it displays the value of `name`.

[Figure 23-6](#) shows a JSP displaying the message, including the parameter value.

Figure 23-6. Humble output of a JSP using the param JSTL implicit object



See Also

[Chapter 18](#) on working with the client request; the Jakarta Project's Taglibs site: <http://jakarta.apache.org/taglibs/index.html>; Sun Microsystem's JSTL information page: <http://java.sun.com/products/jsp/jstl/>; [Recipe 23.3](#) on using the core tags; [Recipe 23.4](#) and [Recipe 23.5](#) on using the XML tags; [Recipe 23.6](#) on using the formatting tags; [Recipe 23.7](#) and [Recipe 23.8](#) on using the SQL JSTL tags; [Recipe 23.11-Recipe 23.14](#) on using the EL to access request headers, cookies, and JavaBean properties.

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Recipe 23.11 Using the EL to Access Request Headers

Problem

You want to use the EL to access the value of various HTTP request headers.

Solution

Use the `header` implicit object that the EL makes available for custom tags.

Discussion

The `header` implicit object is a `java.util.Map` type that contains a request header value mapped to each header key (which is the header name, such as "accept" or "user-agent"). Web clients (usually browsers) send these headers or name/value pairs along with the web address of the page they are interested in.

Example 23-12 uses the `c:forEach` iteration tag to cycle through each of the `Map`'s stored request headers. The variable `reqHead` stores the current header/value pair. The code uses the EL to display the header name ("`${reqHead.key}`") and header value ("`${reqHead.value}`").

Example 23-12. Using the JSTL to display request headers

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<html>
<head><title>Request header display</title></head>
<body>
<h2>Here are all the Request Headers</h2>

<%-- 'header' represents a java.util.Map type holding request-header names and values -->
<c:forEach var="reqHead" items="${header}">

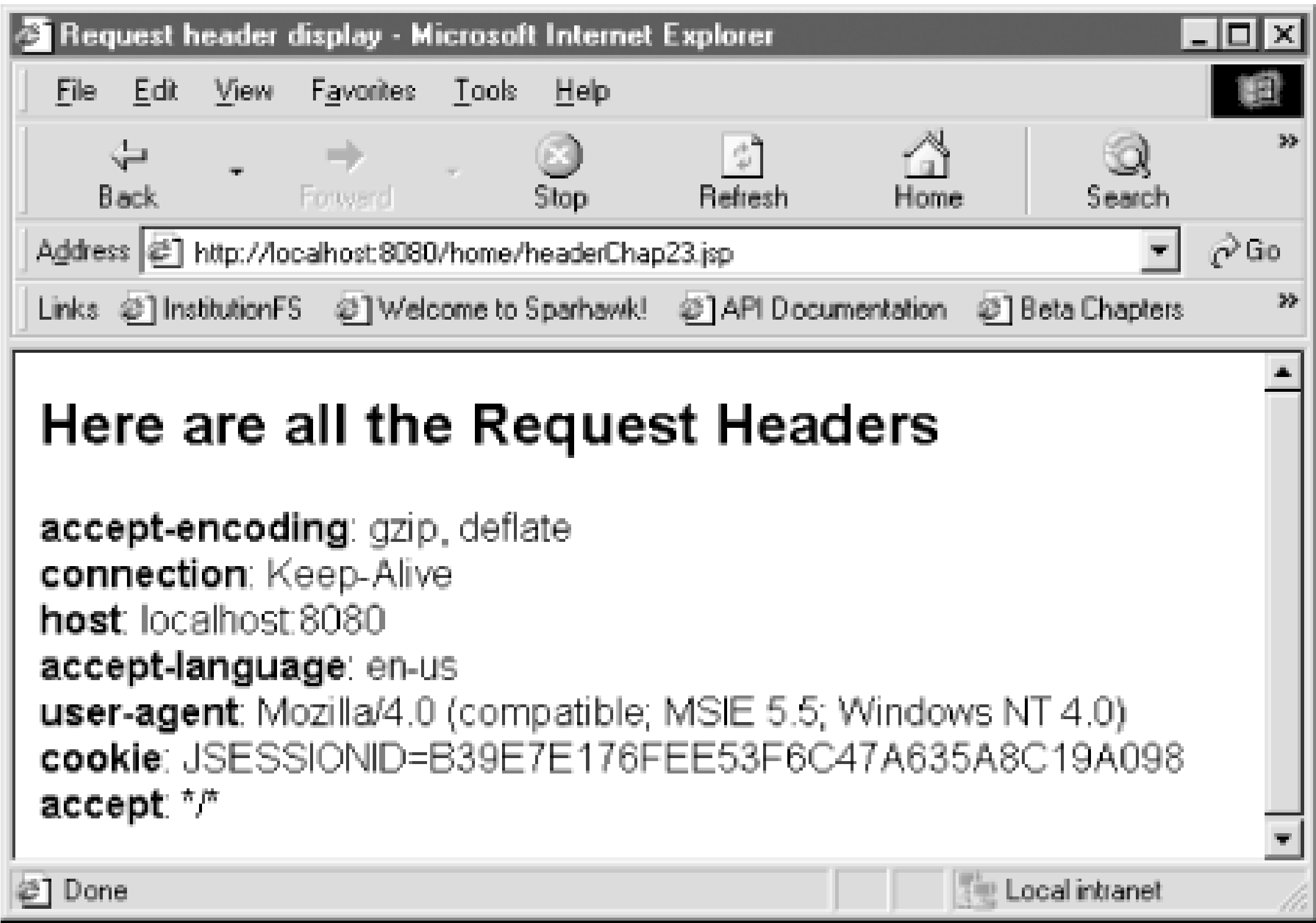
    <strong><c:out value=
        "${reqHead.key}"/></strong>: <c:out value="${reqHead.value}"/><br />

</c:forEach>

</body>
</html>
```

Figure 23-7 shows the result of requesting this JSP in a web browser.

Figure 23-7. Displaying request headers in a JSP



See Also

Chapter 18 on working with the client request; the Jakarta Project's Taglibs site: <http://jakarta.apache.org/taglibs/index.html> ; Sun Microsystem's JSTL information page: <http://java.sun.com/products/jsp/jstl/> ; Recipe 23.3 on using the core tags; Recipe 23.4 and Recipe 23.5 using the XML tags; Recipe 23.6 on using the formatting tags; Recipe 23.4 and Recipe 23.5 on using the SQL JSTL tags; Recipe 23.12 -Recipe 23.14 on using the EL to access one request header, cookies, and JavaBean properties.

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Recipe 23.12 Using the EL to Access One Request Header

Problem

You want to use the EL to access the value of one particular HTTPrequest header.

Solution

Use the `headerValues` implicit object that the EL makes available for custom tags.

Discussion

The `headerValues` implicit object is a `java.util.Map` type that contains a `String` array (a `String[]` type) for every header name. Example 23-13 displays only the value of the "user-agent" request header, which identifies the type of browser the client is using.

Example 23-13. Using the JSTL to display request headers

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<html>
<head><title>User Agent</title></head>
<body>
<h2>Here is your user agent</h2>

<!-- 'headerValues' represents a java.util.Map type holding a String[] type for every
request header-->

    <strong><c:out value=
        "${headerValues["user-agent"][0]}" /> </strong>

</body>
</html>
```

The code accesses only the first member of the `String` array (it is highly likely that the user-agent request header only involves one value). The expression:

```
${headerValues["user-agent"]}
```

returns the `array`, and the entire expression, including the `"[0]"` `array` operator, which returns the name of the user agent, such as "Mozilla/4.0 (compatible; MSIE 5.5; Windows NT 4.0)."

See Also

Chapter 18 on working with the client request; Recipe 23.11 on how to use the EL to access all the available request headers; the Jakarta Project's Taglibs site: <http://jakarta.apache.org/taglibs/index.html> ; the Sun Microsystems JSTL information page: <http://java.sun.com/products/jsp/jstl/> ; Recipe 23.3 on using the core tags; Recipe 23.4 and Recipe 23.5 on using the XML tags; Recipe 23.6 on using the formatting tags; Recipe 23.7 and Recipe 23.8 on using the SQL JSTL tags; Recipe 23.10 on using the EL to access request parameters; Recipe 23.13 and Recipe 23.14 on using the EL to access cookies and JavaBean properties.

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Recipe 23.13 Accessing Cookies with the EL

Problem

You want to take a look at all of the cookie names and values using EL code.

Solution

Use the `cookie` EL implicit object in the JSP to display any cookie names and values.

Discussion

The `cookie` EL implicit object is a `java.util.Map` type that maps cookie names (like "JSESSIONID") to `javax.servlet.Cookie` objects. Since the cookies are stored in a `Map`, you can use the `c:forEach` tag to cycle through the map and display each cookie name and value using `c:out` (see Example 23-14).

Make sure to include the `taglib` directive at the top of the JSP so the page can use the core JSTL tags.

Example 23-14. using the EL to display each cookie name and value in a JSP

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<html>
<head><title>Cookie display</title></head>
<body>
<h2>Here are all the Available Cookies</h2>

<!-- ${cookies.key>equals the cookie name; ${cookies.value} equals the Cookie object;
${cookies.value.value} returns the cookie value --%>

<c:forEach var="cookies" items="${cookie}">

    <strong>
    <c:out value="${cookies.key}"/>
    </strong>: Object=
    <c:out value="${cookies.value}"/>, value=
    <c:out value="${cookies.value.value}"/><br />

</c:forEach>
```



```
</body>  
</html>
```

The `c:forEach` tag stores the entry in the `Map` for each cookie in a variable named `cookies` . The code uses the EL phrase "`${cookies.key}`" to access the name of each cookie. You would think "`${cookies.value}`" returns the value for each cookie; however, this syntax returns the `Cookie` object itself. The weird syntax "`${cookies.value.value}`" returns the value of the cookie. Figure 23-8 shows how the JSP displays this information.

Figure 23-8. Displaying a cookie object and value with the JSTL



See Also

Chapter 10 on reading and setting cookies; the Jakarta Project's Taglibs site: <http://jakarta.apache.org/taglibs/index.html> ; the Sun Microsystems JSTL information page: <http://java.sun.com/products/jsp/jstl/> ; Recipe 23.3 on using the core tags; Recipe 23.4 and Recipe 23.5 on using the XML tags; Recipe 23.6 on using the formatting tags; Recipe 23.7 and Recipe 23.8 on using the SQL JSTL tags; Recipe 23.9 -Recipe 23.12 on using the EL to access scoped variables, request parameters, and request headers; Recipe 23.14 on using the EL to access JavaBean properties.

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Recipe 23.14 Using the EL to Access JavaBean Properties

Problem

You want to use the EL to access the properties of a JavaBean in a JSP.

Solution

Use the `jsp:useBean` standard action to create or access an instance of the bean, then use the EL to access the bean properties.

Discussion

You can use the `c:out` JSTL core tag and the EL to display the values of JavaBean properties in a JSP. [Example 23-15](#) shows the skeleton of a JavaBean that is designed to handle email. I used this bean in [Chapter 20](#), which contains details about all of its email-sending and -accessing methods.

Example 23-15. A JavaBean that a JSP will instantiate and access

```
package com.jspServletcookbook;

import java.io.IOException;
import java.io.PrintWriter;
import java.util.Properties;

import javax.mail.*;
import javax.mail.internet.*;
import javax.servlet.*;
import javax.servlet.http.*;

public class EmailBean {

    //defaults
    private final static String DEFAULT_SERVER = "smtp.comcast.net";
    private final static String DEFAULT_TO =
        "author@jspServletcookbook.com";

    private final static String DEFAULT_FROM =
        "author@jspServletcookbook.com";

    private final static String DEFAULT_CONTENT = "Unknown content";
```

```

private final static String DEFAULT_SUBJECT= "Unknown subject";

//JavaBean properties
    private String smtpHost;
    private String to;
    private String from;
    private String content;
    private String subject;

//no-args constructor for the bean
    public EmailBean( ){

//configure an email message with request params and send the email
public void sendMessage(HttpServletRequest request,
    PrintWriter out) throws IOException {

    //SEE RECIPE 20.3 AND 20.6 FOR MORE DETAILS ON THIS EMAIL BEAN
    //METHOD

}

//sendMessage

//get email messages using a POP account
    private void handleMessages(HttpServletRequest request,
    PrintWriter out) throws IOException, ServletException {

    //SEE RECIPE 20.3 AND 20.6 FOR MORE DETAILS ON THIS EMAIL BEAN
    //METHOD

}

//handleMessages

//display info about received email messages
private void displayMessage(Message msg, PrintWriter out)
    throws MessagingException, IOException{

//SEE RECIPE 20.3 AND 20.6 FOR MORE DETAILS ON THIS EMAIL BEAN

}

//displayMessage

//getter or accessor methods

public String getSmtpHost( ){

    return (smtpHost == null || smtpHost.equals("")) ?
        EmailBean.DEFAULT_SERVER : smtpHost;

}

//getSmtpHost

public String getTo( ){

    return to;

```

```
//getTo

public String getFrom( ){

    return from;

} //getFrom

public String getContent( ){

    return content;

} //getContent

public String getSubject( ){

    return subject;

} //getSubject

//setter or mutator methods

public void setSmtphost(String host){
    if (check(host)){
        this.smtphost = host;
    } else {
this.smtphost = EmailBean.DEFAULT_SERVER;
    }
} //setSmtphost

public void setTo(String to){
    if (check(to)){
        this.to = to;
    } else {
this.to = EmailBean.DEFAULT_TO;
    }
} //setTo

public void setFrom(String from){
    if (check(from)){
        this.from = from;
    } else {
this.from = EmailBean.DEFAULT_FROM;
    }
} //setFrom

public void setContent(String content){
    if (check(content)){
        this.content = content;
    } else {
this.content = EmailBean.DEFAULT_CONTENT;
    }
}
```



```

        } //setContent

    public void setSubject(String subject){
        if (check(subject)){
            this.subject = subject;
        } else {
            this.subject = EmailBean.DEFAULT_SUBJECT;
        }
    } //setSubject

    private boolean check(String value){

        if(value == null || value.equals(""))
            return false;

        return true;
    }
}

```

[Example 23-16](#) shows the JSP that creates an instance of this bean using the `jsp:useBean` standard action. The `id` attribute of `jsp:useBean` specifies "emailer" as the bean name. This is the name the code uses to access the bean instance's property values using the EL.

Example 23-16. Creating a JavaBean and using the JSTL to display its property values

```

<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<jsp:useBean id="emailer" class="com.jspervletcookbook.EmailBean"/>

<jsp:setProperty name="emailer" property="*" />

<html>
<head><title>Bean property display</title></head>
<body>
<h2>Here are the EmailBean properties</h2>

<strong>SMTP host: </strong> <c:out value="${emailer.smtpHost}" /><br />

<strong>Email recipient: </strong> <c:out value="${emailer.to}" /><br />

<strong>Email sender: </strong> <c:out value="${emailer.from}" /><br />

<strong>Email subject: </strong> <c:out value="${emailer.subject}" /><br />

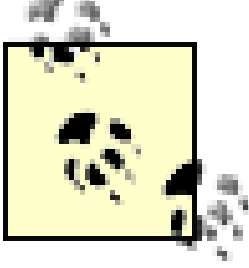
<strong>Email content: </strong> <c:out value="${emailer.content}" /><br />

</body>
</html>

```

When the code uses an expression such as `"${emailer.smtpHost}"`, it calls the `getSmtphost()`

method of the `EmailBean` (the SMTP server from which you receive email, such as "smtp.comcast.net"). The variable `emailer` refers to the instance of the `EmailBean`.

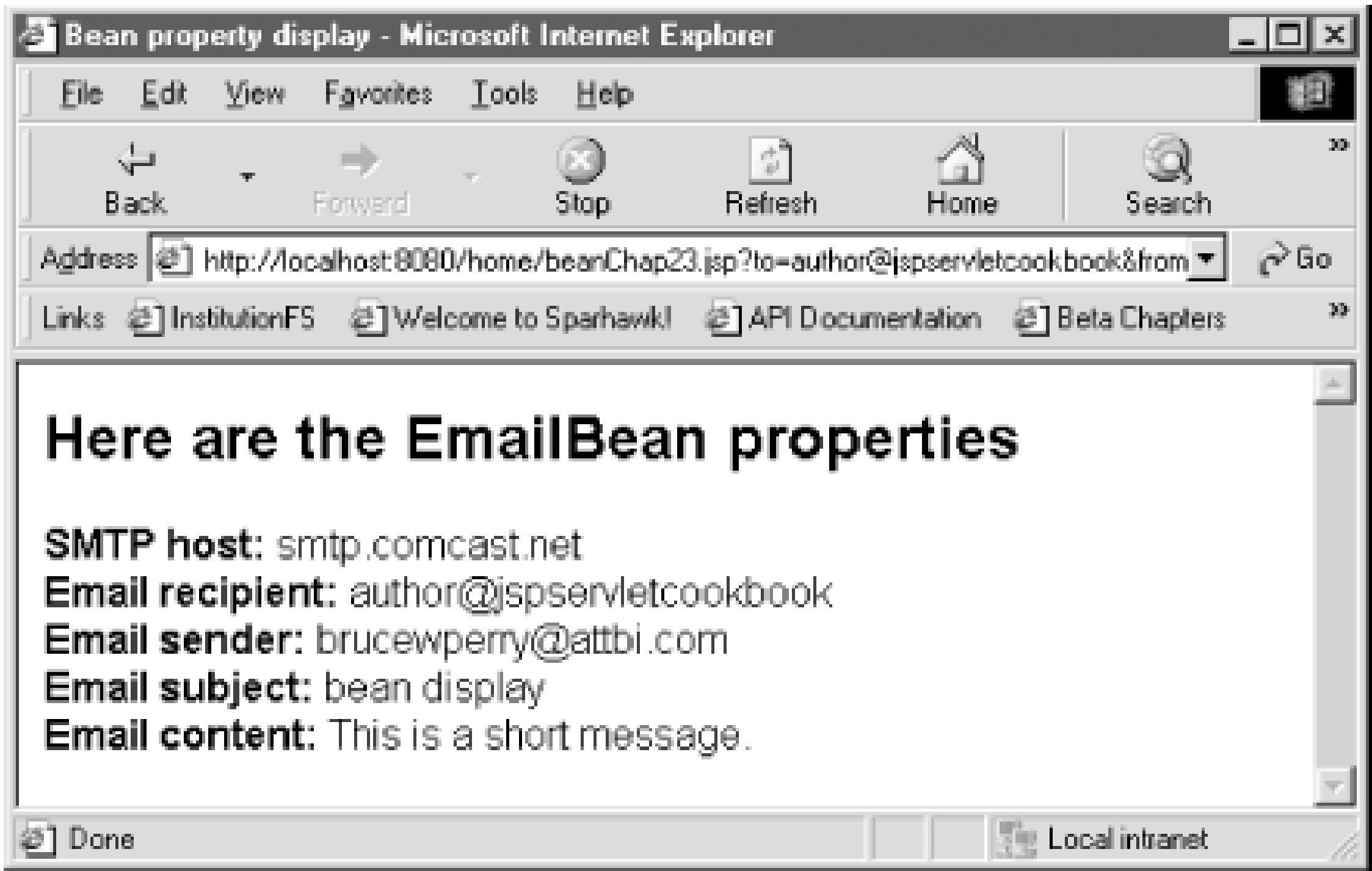


[Example 23-16](#) set all of the `EmailBean`'s settable properties from request parameters of the same name. This is the purpose of the code:

```
<jsp:setProperty name=  
    "emailer" property="*" />
```

Providing the `c:out value` attribute with this expression outputs the value of the bean's property. [Figure 23-9](#) shows the JSP of [Example 23-16](#) in a web browser.

Figure 23-9. Displaying a JavaBean's properties using JSTL `c:out` tags



See Also

[Chapter 20](#) on using JavaBeans to handle email; the Jakarta Project's Taglibs site: <http://jakarta.apache.org/taglibs/index.html>; the Sun Microsystems JSTL information page: <http://java.sun.com/products/jsp/jstl/>; [Recipe 23.3](#) on using the core tags; [Recipe 23.4](#) and [Recipe 23.5](#) on using the XML tags; [Recipe 23.6](#) on using the formatting tags; [Recipe 23.7](#) and [Recipe 23.8](#) on using the SQL JSTL tags; [Recipe 23.9-Recipe 23.13](#) on using the EL to access scoped variables, request parameters, request headers, and cookies.

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Recipe 23.15 Using JSTL Functions

Problem

You want to use the built-in functions included with JSTL 1.1.

Solution

Use the proper `taglib` directive (with the `uri` value of "http://java.sun.com/jsp/jstl/functions") and prefix (e.g., the `fn` : in `fn:contains`) in your JSP.

Discussion

The JSTL 1.1 and its EL includes a nifty new *functions* library. These tags allow JSP developers to call built-in functions to handle and return values from `Strings` , `arrays` , `Maps` , and `Collections` . The nature of these functions will be familiar to anyone who has worked with `java.lang.String` and its numerous methods (see Table 23-4). Functions represent an evolution of JSTL from involving a collection of custom tags to giving you the ability to make function calls embedded inside template text.

Here is the setup that you need to use JSTL functions in your JSPs:

1. A JSP 2.0 JSP container
2. An implementation of JSTL 1.1 (I use the Java Web Services Developer Pack 1.2 in this recipe)
3. A conversion of your *web.xml*/file to the servlet API Version 2.4 (see later on in this recipe)

Example 23-17 shows the new `taglib uri` and `prefix` values to use with the *functions* library. This JSP uses the String "I am a test String" as input to four of the available functions: `fn:length()` , `fn:contains()` , `fn:toUpperCase()` , and `fn:split()` .

Example 23-17. A JSP that uses JSTL 1.1 functions

```
<%@ taglib uri="http://java.sun.com/jsp/jstl/functions" prefix="fn" %>

<%@ taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c" %>

<html>
<head><title>Using the JSTL functions</title></head>
<body>
<h2>Using various JSTL 1.1 functions</h2>

<c:set var="tempStr" value="I am a test String"/>
```



```
The length of the test String: ${fn:length(tempStr)}<br />
```

```
Does the test String contain "test"? ${fn:contains(tempStr,"test")}<br />
```

```
Putting the String into upper case using fn:toUpperCase( ): ${fn:toUpperCase(tempStr)}<br />
```

```
Splitting the String into a String array using fn:split( ), and returning the array  
length: ${fn:length(fn:split(tempStr," "))}
```

```
</body>  
</html>
```

JSTL 1.1 function calls can be intermingled with template text, as in Example 23-17. Surround the function calls with the EL delimiters ("\${...}"), and make sure to use the `fn:` prefix, as in `${fn:toUpperCase(tempStr)}`.

Example 23-18 shows how you can change *web.xml* to the servlet API 2.4 version, so that the JSP 2.0 container interprets the EL functions in your code.



The major difference between JSTL 1.0 and 1.1 is that the JSP 2.0 specification has taken over the EL responsibility. Therefore, the JSP 2.0 container, not the JSTL libraries, now evaluates the EL syntax.

If you stick with the servlet API 2.3 deployment descriptor, then the JSP 2.0 container will not evaluate EL expressions and function calls. Using the old servlet 2.3 deployment descriptor "turns off" EL evaluation by the JSP container; consequently, you cannot use the functions library or include EL syntax in template text. This automatic disabling of EL expressions by the JSP container is designed as a way of easing the migration of existing JSP pages to JSP 2.0. In short, a JSP that includes the JSTL 1.0 usages and is associated with a servlet 2.3 deployment descriptor works the same under a JSP 2.0 container.

However, you may want to use the new functions! Therefore, Example 23-18 shows how to migrate to the servlet 2.4 version of *web.xml*.

Example 23-18. Change web.xml to servlet API 2.4 to use JSTL 1.1 features

```
<?xml version="1.0" encoding="ISO-8859-1"?>  
  
<web-app xmlns="http://java.sun.com/xml/ns/j2ee"  
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"  
  xsi:schemaLocation=  
    "http://java.sun.com/xml/ns/j2ee  
    http://java.sun.com/xml/ns/j2ee/web-app_2_4.xsd"  
  version="2.4"  
>  
  
<!-- REST OF DEPLOYMENT DESCRIPTOR ELEMENTS -->  
  
</web-app>
```


Example 23-18 alters the `web-app` element to include the required attributes of the servlet 2.4 deployment descriptor (See Chapter 1). The rest of `web.xml` can remain as it appeared using the servlet 2.3 DTD.

Table 23-4 describes the purpose of each *function* that the JSTL 1.1 includes in its *function* library.

Table 23-4. JSTL 1.1 functions

Function name	Arguments	Return type	Purpose
<code>fn:contains</code>	<code>String, String</code>	<code>boolean</code>	Finds out whether a <code>String</code> (first argument) contains a certain substring (second argument)
<code>fn:containsIgnoreCase</code>	<code>String, String</code>	<code>boolean</code>	Finds out whether a <code>String</code> contains a substring (second argument) in a case insensitive manner
<code>fn:endsWith</code>	<code>String, String</code>	<code>boolean</code>	Finds out whether a <code>String</code> (first argument) ends with another <code>String</code> (second argument)
<code>fn:escapeXML</code>	<code>String</code>	<code>String</code>	Escapes characters that could be interpreted as XML markup, such as "
<code>fn:indexOf</code>	<code>String, String</code>	<code>int</code>	Returns the index or position of one <code>String</code> (second argument) inside another (first argument)
<code>fn:join</code>	<code>String[], String</code>	<code>String</code>	Joins all <code>String[] array</code> elements into a <code>String</code> , using the specified separator (second argument) as the character between each <code>array</code> element.
<code>fn:length</code>	<code>Map, array, Collection, Iterator, Enumeration, or String</code>	<code>int</code>	Finds out the length of the <code>array</code> , collection, or <code>String</code> .
<code>fn:replace</code>	<code>String, String, String</code>	<code>String</code>	Replaces all instances of a <code>String</code> (second argument) in an input <code>String</code> (first argument) with another <code>String</code> (third)
<code>fn:split</code>	<code>String, String</code>	<code>String[]</code>	Splits a <code>String</code> into an array, using the specified delimiter(s) (second argument)
<code>fn:startsWith</code>	<code>String, String</code>	<code>boolean</code>	Finds out whether a <code>String</code> (first argument) starts with another <code>String</code>

Function name	Arguments	Return type	Purpose
<code>fn:substring</code>	<code>String, int, int</code>	<code>String</code>	Returns a substring from the input <code>String</code> (first argument), from the index of the second argument (inclusive) to the index of the third argument (exclusive)
<code>fn:substringAfter</code>	<code>String, String</code>	<code>String</code>	Returns the part of the <code>String</code> <i>after</i> the specified substring (second argument)
<code>fn:substringBefore</code>	<code>String, String</code>	<code>String</code>	Returns the part of the <code>String</code> <i>before</i> the specified substring (second argument), beginning with the first character of the first <code>String</code> argument
<code>fn:toLowerCase</code>	<code>String</code>	<code>String</code>	Returns the specified <code>String</code> in all lower case.
<code>fn:toUpperCase</code>	<code>String</code>	<code>String</code>	Returns the specified <code>String</code> in all upper case.
<code>fn:trim</code>	<code>String</code>	<code>String</code>	Removes white space from each end of the specified <code>String</code> .

Figure 23-10 shows the web browser output of a JSP that uses various members of the JSTL 1.1 function library.

Figure 23-10. A JSP displays the results of using some JSTL 1.1 functions

See Also

Sun Microsystems's JSTL information page: <http://java.sun.com/products/jsp/jstl/>; Recipe 23.2 on using the core tags; Recipe 23.3 and Recipe 23.4 on using XML-related tags; Recipe 23.5 on formatting dates and numbers; Recipe 23.6 and Recipe 23.7 on the JSTL's SQL features; Recipe 23.8 on accessing scoped variables; Recipe 23.9 on using the EL with request parameters; Recipe 23.10 and Recipe 23.11 on using

the EL with request headers; Recipe 23.12 on finding out information about cookies; Recipe 23.13 on using the EL to access JavaBean properties.

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Chapter 24. Internationalization

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Introduction

The audience for almost all web sites is global. Many sites have at least a subset of content that must be adapted to the language and nationality of their visitors, so that the visitor's browser formats numbers and dates properly and translates text into the proper language. An obvious example is a product documentation or help web site. What if most of your customers or viewers for this product speak a language other than English? Java provides tools that allow web developers to internationalize their sites.

Before I show these tools, let's first explain a few terms that always appear in discussions of web site translation.

1. Internationalization, or *i18n* in its abbreviated version, means enabling a web site or other Java program to provide different versions of content translated into the visitor's language or nationality. This term basically means making your site global.
2. Localization, or *l10n*, means adding resources to a web site to adapt it to a particular geographical or cultural region. An example of l10n is adding Korean language translations to a web site. The web developers who have this responsibility are often referred to as *localizers*.
3. A *locale* is a particular cultural or geographical region. It is usually referred to as a language symbol followed by a country symbol (separated by an underscore character), as in "en_US" for the English locale, "de_DE" for German speakers in Germany, or "de_CH" for Swiss-German speakers, or "fr_CH" for people in Switzerland who speak French. A locale can also represent just the language, as in "ja" for Japanese or "it" for Italian. Finally, locales can have a third segment or "variant" that reflects a certain browser-type or vendor, such as "MAC" for Macintosh. An example of a locale for English with a Windows variant is "en_US_WIN."

The language element is represented by an International Standards Organization (ISO) language code (<http://www.ics.uci.edu/pub/ietf/http/related/iso639.txt>); the country is encoded under ISO-3166 (http://www.chemie.fu-berlin.de/diverse/doc/ISO_3166.html).

So how do you internationalize or localize a Java web site? This is a big subject and the topic of several books. The following recipes provide the basics of how to create properties files (called *ResourceBundles*). These files (they can also be implemented as Java classes) provide language translations for phrases that your web pages use. A servlet can then access these resources and provide different text versions according to the requester's locale.

The recipes in this chapter also cover how to adapt JSP pages to visitors who speak different languages by using the JSTL tags. I begin by describing how to detect the locale of a request using a servlet or JSP.

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Recipe 24.1 Detecting the Client Locale in a Servlet

Problem

You want to detect the client locale in a servlet.

Solution

Use the `ServletRequest.getLocale()` method.

Discussion

The locale is represented by a class in Java: `java.util.Locale`. The `ServletRequest` object can access the client's "preferred" locale with its `getLocale()` method, which returns a `Locale` object.

The preferred locale is the user's top preference. For example, a user may configure their browser with a Spanish language locale ("es_ES") as the preferred one.

Java code can access the list of locales that a user configures a browser with by calling `ServletRequest's getLocales()` method, which returns an `Enumeration` object. This object contains the preferred and less-preferred locales.

To set the language preference(s) in Netscape 7.1, go to "Edit Preferences
Netscape Languages." In the Macintosh Safari browser, open System Preferences and drag your language preference(s) to the top of the list (then restart Safari). In Internet Explorer 5.5, go to "Tools Internet Options Languages."

[Example 24-1](#) accesses the client's preferred locale by calling `request.getLocale()`. The servlet then displays information about the locale by calling some `Locale` methods. [Example 24-1](#) also displays information about the less-preferred locales by using the method `request.getLocales()`.

Example 24-1. Accessing the Locale object in a servlet

```
package com.jspervletcookbook;
```

```

import java.util.Enumeration;
import java.util.Locale;

import javax.servlet.*;
import javax.servlet.http.*;

public class LocaleDisplay extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        //Get the client's Locales
        Enumeration enum = request.getLocales( );
        //Get the preferred Locale
        Locale preferred = request.getLocale( );
        String prefDisplay = "";
        if (preferred != null)
            prefDisplay = preferred.getDisplayName( );

        //Display the preferred and any other locales
        response.setContentType("text/html");
        java.io.PrintWriter out = response.getWriter( );
        out.println(
            "<html><head><title>Locale Display</title></head><body>");

        out.println("<h2>Here is your Locale info...</h2>");
        out.println("<b>Preferred Locale:</b> ");
        out.println( prefDisplay );
        out.println("<br />");
        out.println("Locale country: ");
        if (preferred != null)
            out.println( preferred.getDisplayCountry( ) );

        out.println("<br />");
        out.println("Locale language: ");
        if (preferred != null)
            out.println( preferred.getDisplayLanguage( ) );
        out.println("<br /><br />");
        out.println("<h3>Lower priority Locales...</h3>");
        Locale loc = null;
        while (enum.hasMoreElements( )){
            loc = (Locale)enum.nextElement( );
            if (! (loc.getDisplayName( ).equals( prefDisplay ))){
                out.println("Locale: ");
                out.println( loc.getDisplayName( ) );
                out.println("<br />");
                out.println("Locale country: ");
                out.println( loc.getDisplayCountry( ) );
                out.println("<br />");
                out.println("Locale language: ");
                out.println( loc.getDisplayLanguage( ) );
            }
        }
    }
}

```



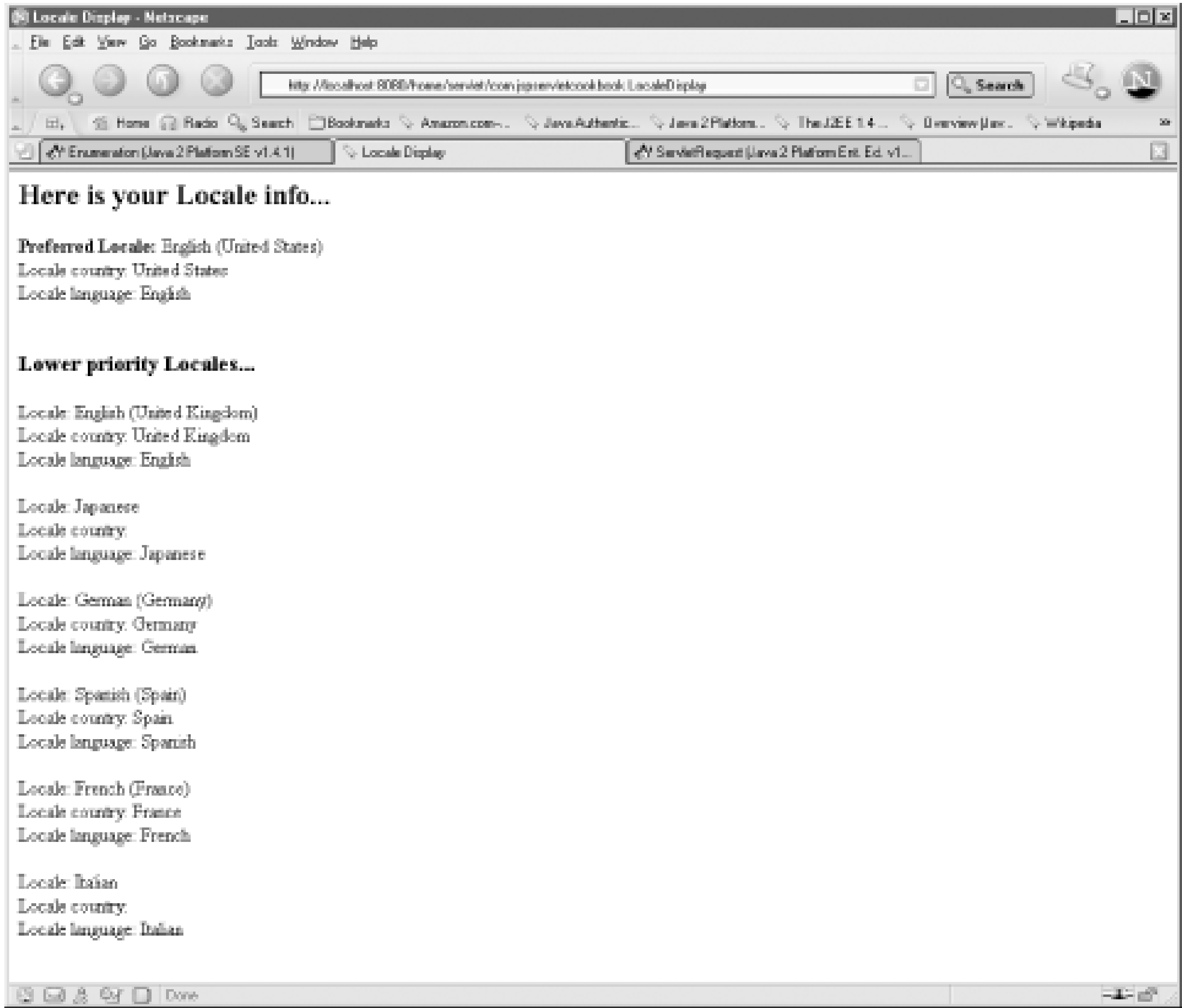
```
        out.println("<br /><br />");
    } //if
} //while
out.println( "</body></html>" );

} //doGet

}
```

Figure 24-1 shows the web browser output when a visitor with a preferred locale of "en_US" requests the servlet.

Figure 24-1. The servlet displays the preferred and less-preferred locales



This user has configured their browser with several other locales. As you can see, the method `locale.getDisplayName()` is designed to return a more readable name (compared with "de_CH") for the locale.



The `com.oreilly.servlet` library includes the `LocaleNegotiator` class, which uses the client request to figure out the best charset, locale, and resource bundle to use with the response. See [Recipe 8.4](#) for tips on using the `com.oreilly.servlet` library. I don't cover `LocaleNegotiator` in particular here, but the Javadoc explains this class. See <http://www.servlets.com/cos/javadoc/com/oreilly/servlet/LocaleNegotiator.html>.

See Also

The Javadoc describing the `Locale` class:
<http://java.sun.com/j2se/1.4.1/docs/api/java/util/Locale.html>; [Recipe 24.2](#) on detecting the locale using a JSP.

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Recipe 24.2 Detecting the Client's Locales in a JSP

Problem

You want to find out what the request's preferred locale and less-preferred locales are and display this information in a JSP.

Solution

Grab the preferred locale with the expression "`${pageContext.request.locale}`". Get access to all of the locales with the expression "`${pageContext.request.locales}`".

Discussion

The JSTL tags make it easy to adapt a JSP for visitors who speak different languages. [Example 24-2](#) uses the EL to create a variable named `clientLocale` that represents the request's preferred locale. Then the JSP displays the locale's name, language, and country. [Example 24-2](#) also displays any information about the client's less-preferred locales.

Example 24-2. Accessing the request's locale in a JSP

```
<%@ taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c" %>

<html>
<head><title>Locale Display</title></head>
<body>
<h2>Here is your preferred locale info...</h2>

<c:set var="clientLocale" value="${pageContext.request.locale}" />
<c:set var="clientLocales" value="${pageContext.request.locales}" />

Preferred locale: ${clientLocale.displayName}
<br />
Preferred locale country: ${clientLocale.displayCountry}
<br />
Preferred locale language: ${clientLocale.displayLanguage}
<h3>Lower priority locales...</h3>
<c:forEach var="loc" items="${clientLocales}" begin="1">
    Locale: ${loc.displayName}
    <br />
    Locale country: ${loc.displayCountry}
```

```
        <br />
        Locale language: ${loc.displayName}
        <br /><br />
</c:forEach>

</body>
</html>
```

The expression "`${pageContext.request.locale}`" gets the `request` object from the `pageContext` implicit object, then accesses the `Locale` object, representing the client's preferred locale, from the request. Fairly efficient, huh? Then an expression such as "`${clientLocale.displayName}`" represents the equivalent of calling the `Locale` object's `getDisplayName()` method.

The EL phrase "`${pageContext.request.locales}`" represents the equivalent of calling the `ServletRequest` object's `getLocales()` method, which returns a `java.util.Enumeration` type. The `Enumeration` contains all of the client's configured locales, beginning with their preferred locale.



[Example 24-2](#) uses an implementation of JSTL 1.1 and JSP 2.0. Make sure to include the proper `taglib` directive at the top of the JSP file, so that the JSP can use the EL and core tags. If all this terminology is new and strange to you, read [Chapter 23](#) on the JSTL.

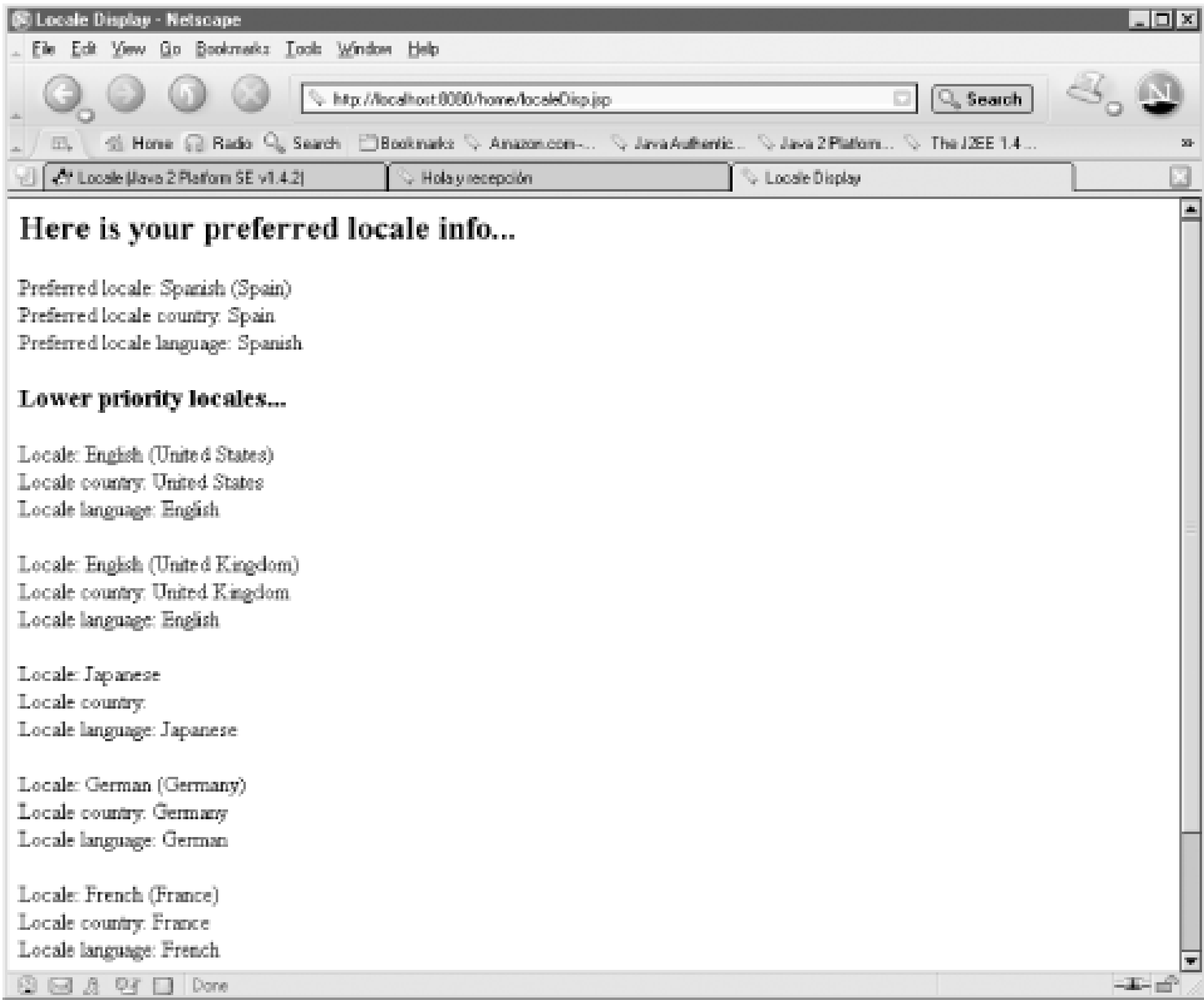
[Example 24-2](#) iterates through each of the locales using the `c:forEach` tag, as in:

```
<c:forEach var="loc" items="${clientLocales}" begin="1">
```

The `begin="1"` attribute begins the `c:forEach` iteration with the second locale object, since the first locale is the client's preferred one, and the JSP has already displayed information on that one. The `begin` attribute uses "0" as the index for the first item in the `Enumeration`.

[Figure 24-2](#) shows the JSP's web browser output. This output results from a visitor whose browser specifies the locale "es_ES" as preferred.

Figure 24-2. A browser requests a locale-sensitive JSP



See Also

[Chapter 23](#) on the JSTL; the Javadoc describing the `Locale` class:
<http://java.sun.com/j2se/1.4.1/docs/api/java/util/Locale.html>.

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Recipe 24.3 Creating a ResourceBundle as a Properties File

Problem

You want to store your i18n resources in your web application.

Solution

Create a text file with name/value pairs representing your i18n resources. Name the file with your global resource name and store it beneath *WEB-INF*.

Discussion

Adding i18n-related resources to your web application involves creating properties files or `ResourceBundle` classes ([Recipe 24.4](#)). A `ResourceBundle` that takes the form of a properties file is simply a list of keys and values, produced in any text editor. The keys represents the words that you want to be translated, and the values are the translations. These files are the resources that the web application uses to dynamically translate text into the appropriate language.

Imagine that you are creating some resources with a global name, or basename, of "WelcomeBundle." [Example 24-3](#) shows the subclass of this resource for the visitors from the locale "es_ES," or people from Spain who speak Spanish.

For example, the key "Welcome" is associated with its Spanish equivalent "Hola y recepción." [Recipe 24.5](#) shows how a servlet would use a `ResourceBundle` like this to dynamically translate "Welcome" to the visitor's language.

Example 24-3. The contents of a ResourceBundle file named WelcomeBundle_es_ES.properties

```
#Spanish language resources
Welcome = Hola y recepción
```

These are just keys and values separated by newline characters. Comments are delineated by a hash (#) character.

This text file has to be stored in a place where other web components can find it, similar to installing a Java class in your web application. This is the path to the properties file, which has a fully qualified name of *i18n.WelcomeBundle_es_ES.properties*. The *.properties* extension is an essential detail!

`WEB-INF/i18n/WelcomeBundle_es_ES.properties`



Centralizing the i18n resources in their own *WEB-INF* subdirectory in a web application is a sensible way to organize this information and avoid clutter.

See Also

[Recipe 24.4](#) on creating `ResourceBundle` as a Java class; the `PropertyResourceBundle` Javadoc: <http://java.sun.com/j2se/1.4.1/docs/api/java/util/PropertyResourceBundle.html>.

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Recipe 24.4 Creating a ResourceBundle as a Java Class

Problem

You want to create a `ResourceBundle` as a Java class.

Solution

Create a class that extends `java.util.ListResourceBundle`.

Discussion

If your application requires more functionality than a static properties file can provide ([Recipe 24.3](#)), you can create your `ResourceBundles` as Java classes: `java.util.ListResourceBundle` types. For instance, a particular resource might need to select its translation information from a database.

[Example 24-4](#) includes the same information as the properties file in the prior recipe. However, its key/value pairs are stored in the form of a two-dimensional `Object` array. This class is stored in the same place as the `.properties` files in `WEB-INF/i18n`.

Example 24-4. Storing language information in a ListResourceBundle

```
package com.jspServletcookbook;

import java.util.ListResourceBundle;

public class WelcomeBundle_es_ES extends ListResourceBundle {

    static final Object[][] contents = {

        {"Welcome", "Hola y recepción"}
    };

    public Object[][] getContents( ) {
        return contents;
    }

}
```

This code snippet from a servlet shows how you could use this class.

Example 24-5. Calling a ListResourceBundle method from a ResourceBundle created as a Java class

```
<!-- inside servlet doGet( ) or doPost( ) method, for instance -->

ResourceBundle bundle = ResourceBundle.getBundle(
    "i18n.WelcomeBundle_es_ES");

//Call inherited ListResourceBundle getKeys( ) method
java.util.Enumeration enum = bundle.getKeys( );

while (enum.hasMoreElements( )){

    //Prints out key: "Welcome"
    out.println((String) enum.nextElement( ));
    out.println("<br /><br />");

} //while
```



The `ResourceBundle.getBundle()` static method tries to find a Java class with the fully qualified name "i18n.WelcomeBundle_es_ES" (in this example). Failing that, it looks for a properties file of the same name (minus the *.properties* extension): *i18n.WelcomeBundle_es_ES.properties*.

See Also

The Javadoc for `ListResourceBundle`:
<http://java.sun.com/j2se/1.4.1/docs/api/java/util/ListResourceBundle.html>; [Recipe 24.3](#) on creating a `ResourceBundle` as a properties file.

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Recipe 24.5 Using the ResourceBundle in a Servlet

Problem

You want a servlet to dynamically display a "Welcome" message to visitors depending on their locale.

Solution

Use the servlet to access the translated text dynamically from a `ResourceBundle`.

Discussion

Once you have added `ResourceBundles` to the web application, then servlets can use them to dynamically display text based on the user's locale.

Remember, the web application stores `ResourceBundles` as *.properties* files (text) or Java classes.

[Example 24-6](#) uses a `ResourceBundle` with a basename of "WelcomeBundle." It is stored in *WEB-INF/i18n*, so its fully qualified name is *i18n.WelcomeBundle*.

Example 24-6. A servlet uses a to dynamically display translated text

```
package com.jspservletcookbook;

import java.util.Locale;
import java.util.ResourceBundle;

import javax.servlet.*;
import javax.servlet.http.*;

public class WelcomeServlet extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        //Get the client's Locale
```

```

    Locale locale = request.getLocale( );

    ResourceBundle bundle = ResourceBundle.getBundle(
        "i18n.WelcomeBundle",locale);

    String welcome = bundle.getString("Welcome");

    //Display the locale
    response.setContentType("text/html");
    java.io.PrintWriter out = response.getWriter( );

    out.println("<html><head><title>"+welcome+"</title></head><body>");

    out.println("<h2>"+welcome+"</h2>");

    out.println("Locale: ");
    out.println( locale.getLanguage( )+"_"+locale.getCountry( ) );

    out.println("</body></html>");

} //end doGet

// doPost method ...

} //WelcomeServlet

```

Here is how the application uses this resource in response to a visitor from a Spanish locale ("es_ES"):

1. The servlet accesses the locale as a `java.util.Locale` object.
2. It passes the locale into the `ResourceBundle.getBundle()` method, which uses the locale to search for a `ResourceBundle` named *i18n.WelcomeBundle_es_ES*. The method forms this search term by attaching the current request's locale name to the end of the `ResourceBundle` basename. In this case, the bundle is stored as a Java class (Recipe 24.4).
3. The bundle then displays the message by accessing the "Welcome" key, which is specified by the `ResourceBundle` ([Example 24-4](#) or [Example 24-5](#)).

Sometimes the browser sends the locale information as a language code only, as in "es" for Spanish (instead of "es_ES" with language code *and* country code). If the application has only installed a resource named *WelcomeBundle_es_ES*, but not *WelcomeBundle_es*, then the `getBundle()` method defaults to a resource named *WelcomeBundle* (which might not be the optimal outcome), and therefore may not display the translated text. Make sure to include a *WelcomeBundle_es* resource to cover these cases.

[Figure 24-3](#) shows the servlet's output in response to a request from a Spanish locale.

Figure 24-3. A Spanish client requests the LocaleServlet



[Figure 24-4](#) shows the servlet's response when it deals with a locale for which the application has not provided a resource. In this case, the browser is set for the Japanese language, but the application has not yet provided a resource for this locale.

Figure 24-4. A browser set for Japanese visits receives the default message

The text that the browser displays derives from the default properties file: *WelcomeBundle.properties* (notice the absence of any locale-related suffix in the filename).

See Also

[Recipe 24.6](#) on using the `ResourceBundle` in a JSP; The Javadoc for `ResourceBundle`: <http://java.sun.com/j2se/1.4.1/docs/api/java/util/ResourceBundle.html>.

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Recipe 24.6 Using the ResourceBundle in a JSP

Problem

You want to dynamically display text in the JSP according to the locale of the request.

Solution

Use the JSTL tags from the formatting library.

Discussion

The JSTL's formatting tags make it easy to dynamically display text based on the browser's language setting. [Example 24-7](#) makes available the formatting and core JSTL tags with the `taglib` directive. Then it uses the `fmt:setBundle` tag to specify the i18n resources that will be used by the page (the localization context).

Example 24-7. Using the formatting tags to display a locale-sensitive message in a JSP

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<%@ taglib uri="http://java.sun.com/jstl/fmt" prefix="fmt" %>

<fmt:setBundle basename="i18n.WelcomeBundle" />

<html>
<head><title> <fmt:message key="Welcome" /></title></head>
<body>

<h2><fmt:message key="Welcome" /></h2>

Locale: <c:out value=
    "${pageContext.request.locale.language}" />_<c:out value=
    "${pageContext.request.locale.country}" />

</body>
</html>
```

Just like the servlet code in the prior recipe, the tag dynamically uses the `WelcomeBundle` resource based on the request's locale. In other words, if the browser's locale is "es_ES," a Spanish locale, then the `fmt:message` tags uses the keys and values from the `WelcomeBundle_es_ES` properties file

or Java class (however it is implemented).



If you set the localization context as a `context-param` element in the deployment descriptor, the JSP does not have to use the `fmt:setBundle` tag. See [Recipe 24.13](#).

In the JSP, the code:

```
<fmt:message key="Welcome" />
```

is replaced by the value of the "Welcome" key in the chosen `ResourceBundle` file ("Hola y recepción"). The result of requesting this JSP looks just like [Figure 24-3](#) in [Recipe 24.5](#).

See Also

[Recipe 24.5](#) on using the `ResourceBundle` in a servlet; [Chapter 23](#) on the JSTL; the Javadoc for `ResourceBundle`: <http://java.sun.com/j2se/1.4.1/docs/api/java/util/ResourceBundle.html>.

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Recipe 24.7 Formatting Dates in a Servlet

Problem

You want to format a date for display in a servlet based on the request's locale.

Solution

Use the `java.text.DateFormat` class.

Discussion

Different countries have their own ways of displaying the date and time. The `DateFormat` class, like many of the classes in the `java.text` package, is "locale sensitive." Your code displays the date depending on the browser's language setting. All you have to do is pass the `Locale` object to the static `DateFormat.getDateTimeInstance()` method, as in the servlet of [Example 24-8](#).

Example 24-8. Displaying a date String in a locale-sensitive manner

```
package com.jspervletcookbook;

import java.text.DateFormat;

import java.util.Date;
import java.util.Locale;
import java.util.ResourceBundle;

import javax.servlet.*;
import javax.servlet.http.*;

public class DateLocaleServlet extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response) throws ServletException,
        java.io.IOException {

        //Get the client's Locale
        Locale locale = request.getLocale( );

        ResourceBundle bundle = ResourceBundle.getBundle(
            "i18n.WelcomeBundle", locale);
```

```

String welcome = bundle.getString("Welcome");

String date = DateFormat.getDateInstance(DateFormat.FULL,
    DateFormat.SHORT, locale).format(new Date( ));

//Display the locale
response.setContentType("text/html");
java.io.PrintWriter out = response.getWriter( );

out.println("<html><head><title>"+welcome+"</title></head><body>");

out.println("<h2>"+bundle.getString("Hello") + " " +
    bundle.getString("and") + " " +
    welcome+"</h2>");

out.println(date+ " <br /><br />");

out.println("Locale: ");
out.println( locale.getLanguage( )+"_"+locale.getCountry( ) );

out.println("</body></html>");

} //doGet

//implement doPost and call doGet(request, response);

}

```

The `DateFormat.getDateInstance()` method includes parameters in the form of constants (e.g., `DateFormat.FULL`) that allow your code to customize the date format. [Example 24-8](#) displays the date in a way that includes the name of the day of the week and a short form for the time. You can experiment with these constants in order to determine how browsers display the servlet's output. [Figure 24-5](#) shows how the date is displayed in response to a German-language locale of "de_DE."

Figure 24-5. Displaying the date in a servlet according to the request's locale



See Also

The Javadoc for the `DateFormat` class:
<http://java.sun.com/j2se/1.4.1/docs/api/java/text/DateFormat.html>; [Recipe 24.8](#) on formatting dates in a JSP.

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Recipe 24.8 Formatting Dates in a JSP

Problem

You want to display a date in a JSP that is customized for the user's locale.

Solution

Use the `fmt:formatDate` JSTL tag.

Discussion

The JSTL includes the "formatting" library, which allows JSP code to display dates in a locale-sensitive manner. [Example 24-9](#) uses the `fmt:formatDate` tag. The code uses the standard action `jsp:useBean` to create a `java.util.Date` object representing the current date and time. The code passes the date object to `fmt:formatDate`'s `value` attribute. When a user requests the JSP, the `fmt:formatDate` tag is replaced by text displaying the formatted date.

Example 24-9. Formatting a date using `fmt:formatDate`

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<%@ taglib uri="http://java.sun.com/jstl/fmt" prefix="fmt" %>

<jsp:useBean id="date" class="java.util.Date" />

<html>
<head><title> <fmt:message key="Welcome" /> </title></head>
<body>

<h2> <fmt:message key="Hello" /> <fmt:message key="and" />
    <fmt:message key="Welcome" /> </h2>

<fmt:formatDate value="${date}" type="both" dateStyle=
    "full" timeStyle="short" /> <br />

Locale: <c:out value=
    "${pageContext.request.locale.language}" />_<c:out value=
    "${pageContext.request.locale.country}" />

</body>
</html>
```



The `fmt:message` tags here depend on a configuration parameter, or `context-param` element, in the deployment descriptor. The `context-param` element specifies the i18n-related resources . See [Recipe 24.13](#).

The element has attributes named `dateStyle` and `timeStyle` that allow the code to customize the format of the date and time `Strings`.



See the Javadoc for the `DateFormat` class for more details:
<http://java.sun.com/j2se/1.4.1/docs/api/java/text/DateFormat.html>.

The output of the JSP in [Example 24-9](#) looks just like [Figure 24-5](#) in the prior recipe.

See Also

The Javadoc for the `DateFormat` class:
<http://java.sun.com/j2se/1.4.1/docs/api/java/text/DateFormat.html>; [Chapter 23](#) on the JSTL; [Recipe 24.7](#) on formatting dates in a servlet.

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Recipe 24.9 Formatting Currencies in a Servlet

Problem

You want to format a currency value according to the request's locale.

Solution

Use the `java.text.NumberFormat` class.

Discussion

The `NumberFormat` class can format a number, such as a `long` or `double` type, as a percentage. This class has a `static getCurrencyInstance()` method. This method can take a `java.util.Locale` object as a parameter, to display the currency according to the user's language setting.

[Example 24-10](#) is a servlet that demonstrates the locale-sensitive display of a currency, by showing both the currency amount and the locale language and country code.

Example 24-10. Formatting a number as a percentage in a servlet

```
package com.jspervletcookbook;

import java.text.NumberFormat;

import java.util.Locale;
import java.util.ResourceBundle;

import javax.servlet.*;
import javax.servlet.http.*;

public class CurrLocaleServlet extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        //Get the client's Locale
        Locale locale = request.getLocale( );

        ResourceBundle bundle = ResourceBundle.getBundle(
```

```

        "i18n.WelcomeBundle", locale);

String welcome = bundle.getString("Welcome");

NumberFormat nft = NumberFormat.getCurrencyInstance(locale);

String formattedCurr = nft.format(1000000);

//Display the locale
response.setContentType("text/html");
java.io.PrintWriter out = response.getWriter( );
out.println("<html><head><title>"+welcome+"</title></head><body>");

out.println("<h2>"+bundle.getString("Hello") + " " +
    bundle.getString("and") + " " +
    welcome+"</h2>");

out.println("Locale: ");
out.println( locale.getLanguage( )+"_"+locale.getCountry( ) );

out.println("<br /><br />");

out.println(formattedCurr);

out.println("</body></html>");

} //doGet

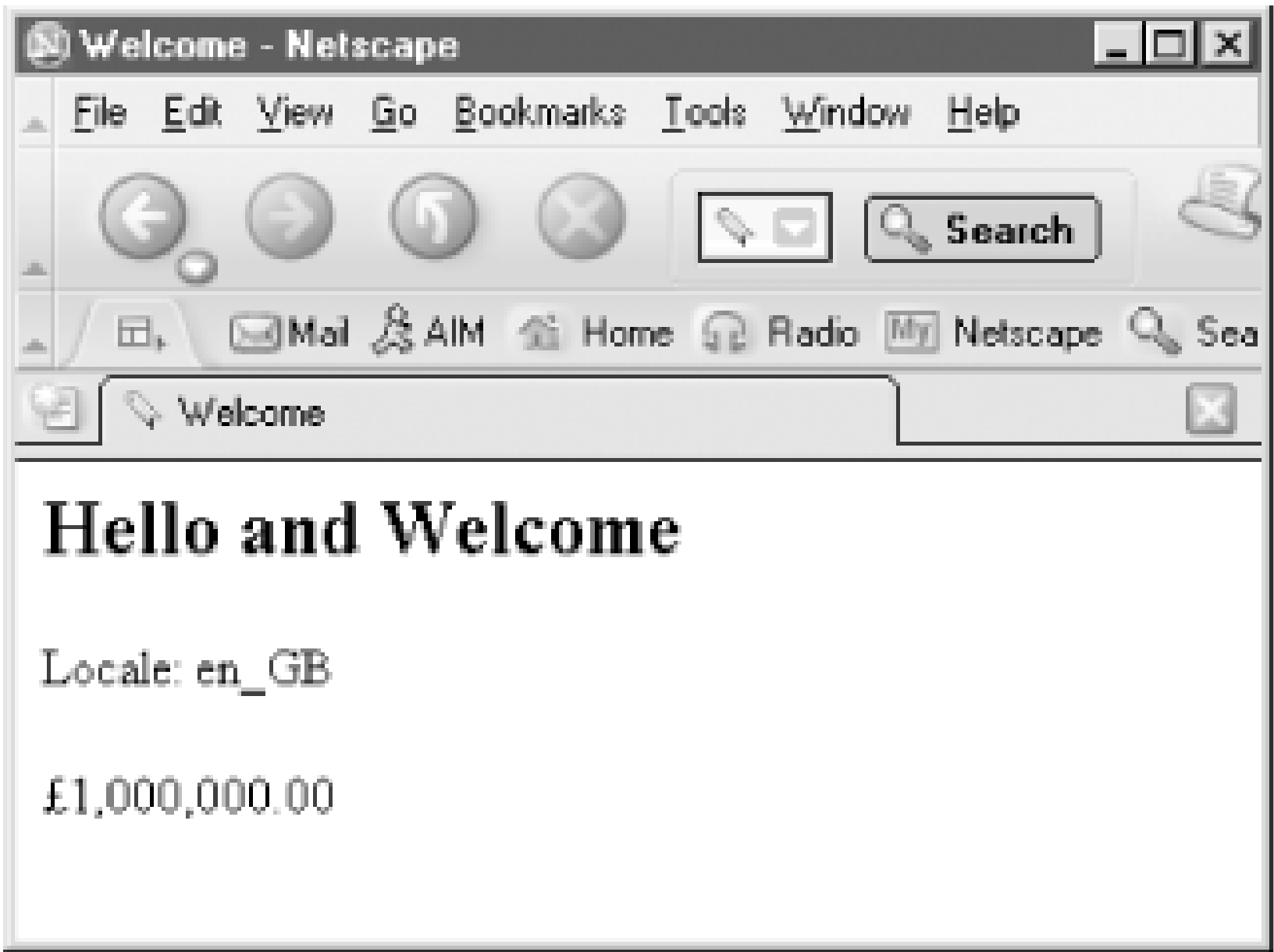
//implement doPost( ) to call doGet( )...

}

```

The `NumberFormat` class' `format()` method returns a `String` that represents the formatted currency. [Figure 24-6](#) shows the servlet's output when requested by a browser where the user has set the language setting to the locale "en_GB" (English language, Great Britain).

Figure 24-6. A British visitor sees the formatted currency display of one million pounds



See Also

The Javadoc for the `NumberFormat` class:
<http://java.sun.com/j2se/1.4.1/docs/api/java/text/NumberFormat.html>; [Recipe 24.10](#) on formatting currencies in a JSP.

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Recipe 24.10 Formatting Currencies in a JSP

Problem

You want to format currency values in a JSP.

Solution

Use the JSTL tag `fmt:formatNumber`.

Discussion

The `fmt:formatNumber` tag is designed to display a currency value based on the visitor's locale. Example 24-11 first uses the `taglib` directive to make the JSTL 1.0 formatting library available to the JSP.

Example 24-11. formatting a number using the JSTL 1.0 tags

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<%-- the formatting library includes fmt:formatNumber --%>
<%@ taglib uri="http://java.sun.com/jstl/fmt" prefix="fmt" %>

<html>
<head><title> <fmt:message key="Welcome" /></title></head>
<body>
<h2> <fmt:message key="Hello" /> <fmt:message key="and" /> <fmt:message key="Welcome" />
h2>

Locale: <c:out value="\${pageContext.request.locale.language}" />_<c:out
value="\${pageContext.request.locale.country}" />

<br /><br />

<fmt:formatNumber value="1000000" type="currency" />

</body>
</html>
```

The `fmt:formatNumber` tag is quite straightforward. The `value` attribute takes the number you want to format as a currency, and the value of the `type` attribute must be "currency." The text representing the formatted number then replaces the tag when a browser displays the JSP's output. The JSP in Example : 11 displays the same browser information as shown in Figure 24-6of the prior recipe.

See Also

Chapter 23 on the JSTL; the Javadoc for the `NumberFormat` class:
<http://java.sun.com/j2se/1.4.1/docs/api/java/text/NumberFormat.html> ; Recipe 24.9 on formatting currencies in a servlet.

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Recipe 24.11 Formatting Percentages in a Servlet

Problem

You want to format numbers as percentages and display them in a servlet.

Solution

Use the `java.text.NumberFormat` class and its `static getPercentInstance()` method.

Discussion

[Example 24-12](#) uses the `NumberFormat.getPercentInstance()` method, with the user's locale as an argument, to get a `NumberFormat` type for displaying a number as a percentage. The code in [Example 24-12](#) calls the `NumberFormat`'s `format()` method, with a number as an argument.

The `format()` method displays the number 51 as "5100%"; a `double` type including the decimal point, such as 0.51 produces the intended result (51%).

Example 24-12. Using `NumberFormat` to display a percentage in a servlet

```
package com.jspservletcookbook;

import java.text.NumberFormat;

import java.util.Locale;
import java.util.ResourceBundle;

import javax.servlet.*;
import javax.servlet.http.*;

public class PerLocaleServlet extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        //Get the client's Locale
        Locale locale = request.getLocale( );
```



```
ResourceBundle bundle = ResourceBundle.getBundle(
    "i18n.WelcomeBundle", locale);

String welcome = bundle.getString("Welcome");

NumberFormat nft = NumberFormat.getPercentInstance(locale);

String formatted = nft.format(0.51);

//Display the locale
response.setContentType("text/html");
java.io.PrintWriter out = response.getWriter( );

out.println("<html><head><title>"+welcome+"</title></head><body>");

out.println("<h2>"+bundle.getString("Hello") + " " +
    bundle.getString("and") + " " +
    welcome+"</h2>");

out.println("Locale: ");
out.println( locale.getLanguage( )+"_"+locale.getCountry( ) );

out.println("<br /><br />");

out.println("NumberFormat.getPercentInstance( ): "+formatted);

out.println("</body></html>");

} //doGet

//implement doPost( ) to call doGet( )...

}
```

[Figure 24-7](#) shows the servlet's output in a browser.

Figure 24-7. The browser displays a percentage for a certain locale

See Also

The Javadoc for the `NumberFormat` class:
<http://java.sun.com/j2se/1.4.1/docs/api/java/text/NumberFormat.html>; [Recipe 24.12](#) on formatting percentages in a JSP.

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Recipe 24.12 Formatting Percentages in a JSP

Problem

You want to display a number as a percentage in a JSP.

Solution

Use the `fmt:formatNumber` tag.

Discussion

The JSTL's `fmt:formatNumber` tag can display a number the code provides in the tag's `value` attribute as a percentage. The value of the `type` attribute must be "percent" (not "percentage"). Example 24-13 pass the `String` ".51" to the `value` attribute. This code displays the text "51%" in the browser.

Example 24-13. Using the `fmt:formatNumber` tag in a JSP to display a percentage

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>
<%@ taglib uri="http://java.sun.com/jstl/fmt" prefix="fmt" %>

<html>
<head><title><fmt:message key="Welcome" /></title></head>
<body>
<h2><fmt:message key="Hello" /> <fmt:message key="and" /> <fmt:message key="Welcome" /><
h2>

Locale: <c:out value="\${pageContext.request.locale.language}" />_<c:out
value="\${pageContext.request.locale.country}" />

<br /><br />

<fmt:formatNumber value=".51" type="percent" />

</body>
</html>
```

Figure 24-8 shows the JSP's output.

Figure 24-8. A JSP displays a number formatted as a percentage



See Also

The Javadoc for the `NumberFormat` class:
<http://java.sun.com/j2se/1.4.1/docs/api/java/text/NumberFormat.html> ; Chapter 23 on the JSTL; Recip 24.12 on formatting percentages in a servlet.

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Recipe 24.13 Setting the Localization Context in the Deployment Descriptor

Problem

You want to configure the localization context for the JSTL tags used by a web application.

Solution

Use a `context-param` element in the application's deployment descriptor.

Discussion

A localization context is a set of resources such as `ResourceBundles` that your web application's use to provide locale information for a JSP. If the JSP is displaying translated text, it can use JSTL tags (such as `fmt:fmtMessage`) that detect the user's locale, and then searches within the localization context for the proper text to display.

Set the localization context with a `context-param` element in *web.xml*. The parameter name must be `javax.servlet.jsp.jstl.fmt.localizationContext`. Its value is the fully qualified basename of the `ResourceBundle` that you have installed in the web application. [Example 24-14](#) shows a `context-param` element that points to the `ResourceBundle` we have used throughout this chapter.

Add this type of element to your deployment descriptor as an alternative to using the JSTL tag `fmt:setBundle` inside JSPs to specify a `ResourceBundle`.

Example 24-14. Setting the localization context for JSTL tags

```
<!-- Beginning of web.xml -->

<context-param>

    <param-name>
        javax.servlet.jsp.jstl.fmt.localizationContext
    </param-name>

    <param-value>i18n.WelcomeBundle</param-value>

</context-param>

<!-- Rest of web.xml -->
```

See Also

[Chapter 23](#) on the JSTL; [Recipe 24.2](#) on detecting the client locale in a JSP; [Recipe 24.6](#) on using a `ResourceBundle` in a JSP; [Recipe 24.8](#) on formatting dates; [Recipe 24.10](#) on formatting currencies; [Recipe 24.12](#) on formatting percentages.

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Chapter 25. Using JNDI and Enterprise JavaBeans

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Introduction

The Java Naming and Directory Interface (JNDI) is an API that Java developers use to access naming and directory services. These services are technologies that Java programs use to store or *bind* objects for later use, as well as search for or "look up" object references. The purpose of JNDI is to separate the responsibility of maintaining a repository of commonly used objects from the wide variety of Java classes that use those objects, including servlets and JSPs.

Examples of JNDI services are the Remote Method Invocation registry and the Lightweight Directory Access Protocol (LDAP). The JNDI API, represented by the `javax.naming` package, provides a common implementation for accessing objects that are bound to these services.



The `javax.naming` package is part of the Java 2 1.3 and 1.4 Software Development Kits (SDKs).

Each of these technologies has a naming scheme with which "JNDI objects" can be found. The structure of these schemes is often hierarchical; you start at the top of the JNDI tree, then work your way down to each of the branches to find what you are looking for. Using JNDI, Java programs begin with an "initial context," similar to the forward slash (/) from which Unix begins to describe the location of a file. The / represents the root of a storage medium or hard disk; you can find the *Users* folder at the top level of the disk by entering */Users*.

In Tomcat, the initial context of its built-in JNDI implementation is the address `java:comp/env`—all lookups start from there. [Chapter 21](#) describes how to access a `javax.sql.DataSource` from a JNDI implementation by starting at the initial context `java:comp/env`, and then looking up the `DataSource` at the address `jdbc/MyDataSource`. All `DataSources` are stored under `jdbc`, so this is how Java code accesses a `DataSource` named "MyDataSource." Using a filesystem analogy, the "root" folder in Tomcat's JNDI structure is "java:comp/env" and specific `DataSources` are stored under the `jdbc` subdirectory.

You can use JNDI to get access to any Java object, not just `DataSources`. This chapter describes how to store a JavaBean using Tomcat's JNDI implementation, and then look up the bean using a servlet or JSP. The chapter also describes how to configure a mail session (with a `javax.mail.Session` object) using BEA WebLogic's JNDI implementation, and then to gain access to that mail session by enabling a servlet or JSP to send email.

A servlet can also access Enterprise JavaBeans (EJBs) using JNDI.

An EJB is a Java class that resides in the "business tier" of the Java 2 Enterprise Edition (J2EE) multi-tier architecture. The J2EE includes a web tier containing our familiar servlets and JSPs, and an Enterprise Information System (EIS) tier involving database systems. See the "See Also" section of [Recipe 25.8](#).

The servlets or JSPs may represent the presentation logic of a system that uses EJBs to access databases and implement tasks that are specific to a business or organization. The last recipe shows how to access an EJB from a servlet using BEA WebLogic as the application server.

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Recipe 25.1 Configuring a JNDI Object in Tomcat

Problem

You want to configure a JavaBean as a JNDI object using Tomcat 4.

Solution

Create `Resource` and `ResourceParam` elements in *server.xml* or in the XML file that represents your web application (located in Tomcat's *webapps* folder). Then add a `resource-env-ref` element to *web.xml*.

Discussion

The JNDI object for Tomcat is set up in *conf/server.xml*. If you have configured a web application as a separate XML file in Tomcat's *webapps* folder, then configure the JNDI resource in this XML file instead. [Example 25-1](#) shows the set up for binding a JavaBean as a JNDI object. The bean is named `com.jspserveletcookbook.StockPriceBean`.

Example 25-1. The *server.xml* element for configuring a JNDI object

```
<Resource name="bean/pricebean" type=
  "com.jspserveletcookbook.StockPriceBean" auth="Container" description=
  "A web harvesting bean"/>

<ResourceParams name="bean/pricebean">

  <parameter>
    <name>factory</name>
    <value>org.apache.naming.factory.BeanFactory</value>
  </parameter>

</ResourceParams>
```

[Example 25-1](#) includes a `Resource` element and a `ResourceParams` element that references the `Resource` by name ("bean/pricebean"). This name is the address by which Java code accesses a bean instance using the JNDI API.

[Example 25-2](#) shows the `resource-env-ref` element that must appear in the deployment descriptor (*web.xml*) in order for web application code to access the JNDI object. Store the `com.jspserveletcookbook.StockPriceBean` class in *WEB-INF/classes* or in a JAR file placed in *WEB-*

/NF/lib.

Example 25-2. Place this element in the deployment descriptor web.xml

```
<!-- start of deployment descriptor -->

<resource-env-ref>

    <description>
        A factory for StockPriceBean
    </description>

    <resource-env-ref-name>
        bean/pricebean
    </resource-env-ref-name>

    <resource-env-ref-type>
        com.jspervletcookbook.StockPriceBean
    </resource-env-ref-type>

</resource-env-ref>

<!-- rest of deployment descriptor -->
```

[Example 25-3](#) shows a snippet of code that uses the JNDI API, just to start you on how the configuration fits in with JNDI-related code.

Example 25-3. Code snippet for accessing a Tomcat JNDI resource

```
import javax.naming.Context;
import javax.naming.InitialContext;
import javax.naming.NamingException;

//This code may appear in a servlet's init( ) method or perhaps
//in doGet( ) or doPost( )

Context env = null;

StockPriceBean spbean = null;

try{

    env = (Context) new InitialContext( ).lookup("java:comp/env");

    spbean = (StockPriceBean) env.lookup("bean/pricebean");

    if (spbean == null)
        throw new ServletException(
            "bean/pricebean is an unknown JNDI object");

    //close the InitialContext
```

```
        env.close( );

    } catch (NamingException ne) {

        //close the Context if you're not using it again
        try{ env.close( ); } catch(NamingException nex) {}

        throw new ServletException(ne);
    }
}
```

[Example 25-3](#) imports the necessary classes from the `javax.naming` package. Then two lookups take place to get a reference to a JavaBean that has been bound to a JNDI implementation. The first lookup provides the initial context:

```
env = (Context) new InitialContext( ).lookup("java:comp/env");
```

The second lookup attempts to return a `StockPriceBean` object:

```
spbean = (StockPriceBean) env.lookup("bean/pricebean");
```

The code closes the `InitialContext` to release the object's resources, if the code is not going to use the context again for another lookup. The next recipe uses code like this from servlets and JSPs.

See Also

[Recipe 25.2](#) on accessing the Tomcat JNDI object from a servlet; [Recipe 25.3](#) on accessing the Tomcat JNDI object from a JSP; [Chapter 21](#) on accessing `DataSources` with JNDI.

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Recipe 25.2 Accessing the Tomcat JNDI Resource from a Servlet

Problem

You want to access a JNDI object with a servlet using Tomcat's JNDI implementation.

Solution

Use the `javax.naming` classes in the servlet's `init()` method to look up a JNDI object. Then use the object in a service method like `doGet()`.

Discussion

A servlet can access a JavaBean as a JNDI registered resource after you have:

1. Developed the JavaBean class and stored it in *WEB-INF/classes* or in a JAR in *WEB-INF/lib*.
2. Changed the server configuration file and *web.xml* as described in [Recipe 25.1](#), in order to bind the object to the Tomcat JNDI tree.

[Example 25-4](#) creates a `javax.naming.InitialContext` in its `init()` method, then looks up a JavaBean: `com.jspservletcookbook.StockPriceBean`. This bean is bound to the JNDI implementation under the name "bean/pricebean." The `init()` method is called only when the servlet container creates a servlet instance, so the servlet has access to one instance of `StockPriceBean`.

Example 25-4. Using a Tomcat JNDI object from a servlet

```
package com.jspservletcookbook;

import java.io.IOException;
import java.io.PrintWriter;

import javax.naming.Context;
import javax.naming.InitialContext;
import javax.naming.NamingException;

import javax.servlet.*;
import javax.servlet.http.*;
```

```
public class BeanServlet extends HttpServlet {

    private StockPriceBean spbean;

    public void init( ) throws ServletException {

        Context env = null;

        try{

            env = (Context) new InitialContext( ).lookup("java:comp/env");

            spbean = (StockPriceBean) env.lookup("bean/pricebean");

            //close the InitialContext, unless the code will use it for
            //another look up
            env.close( );

            if (spbean == null)
                throw new ServletException(
                    "bean/pricebean is an unknown JNDI object");

        } catch (NamingException ne) {

            try{ env.close( ); } catch (NamingException nex) { }

            throw new ServletException(ne);

        } //try

    } //init

    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        //set the MIME type of the response, "text/html"
        response.setContentType("text/html");

        //use a PrintWriter to send text data to the client
        java.io.PrintWriter out = response.getWriter( );

        //Begin assembling the HTML content
        out.println("<html><head>");

        out.println("<title>Stock Price Fetcher</title></head><body>");
        out.println("<h2>Please submit a valid stock symbol</h2>");

        //make sure method="POST" so that the servlet service method
        //calls doPost in the response to this form submit
    }
}
```

```

        out.println(
            "<form method=\"POST\" action =\"" + request.getContextPath( ) +
                "/namingbean\" >");

        out.println("<table border=\"0\"><tr><td valign=\"top\">");
        out.println("Stock symbol: </td> <td valign=\"top\">");
        out.println("<input type=\"text\" name=\"symbol\" size=\"10\">");
        out.println("</td></tr><tr><td valign=\"top\">");

        out.println(
            "<input type=\"submit\" value=\"Submit Info\"></td></tr>");

        out.println("</table></form>");
        out.println("</body></html>");

    } //doGet

    public void doPost(HttpServletRequest request,
        HttpServletResponse response)
        throws java.io.IOException{

        String symbol;//this will hold the stock symbol

        float price = 0f;

        symbol = request.getParameter("symbol");

        boolean isValid = (symbol == null || symbol.length( ) < 1) ?
            false : true;

        //set the MIME type of the response, "text/html"
        response.setContentType("text/html");

        //use a PrintWriter send text data to the client
        java.io.PrintWriter out = response.getWriter( );

        //Begin assembling the HTML content
        out.println("<html><head>");
        out.println("<title>Latest stock value</title></head><body>");

        if ((! isValid) || spbean == null){
            out.println(
                "<h2>Sorry, the stock symbol parameter was either "+
                "empty or null</h2>");

        } else {

            out.println("<h2>Here is the latest value of "+ symbol +"</h2>");
            spbean.setSymbol(symbol);
            price = spbean.getLatestPrice( );
            out.println( (price==0?
                "The symbol is probably invalid." : ""+price) );
        }
    }
}

```



```

        }
        out.println("</body></html>");
    } //doPost
} //BeanServlet

```

[Example 25-4](#) calls `close()` on the `InitialContext` to free up any resources this object is using, since the code does not use it again to initiate a lookup. Then the servlet uses the bean object to access a live stock quote in its `doGet()` method. The servlet first calls the bean's setter method `setSymbol()` to notify the bean about which stock symbol it is looking up.

[Example 25-5](#) shows the bean that Tomcat has stored as a JNDI object (it's the same bean used in [Example 25-4](#)). [Chapter 26](#) explains this bean, which "scrapes" a stock price off of a web page. [Chapter 26](#) covers the bean's details; the methods this chapter's servlet uses are `setSymbol()` and `getLatestPrice()`. The bean handles all the details of downloading the stock price.

Example 25-5. The bean that is stored as a JNDI object

```

package com.jspervletcookbook;

import java.io.BufferedReader;
import java.io.IOException;
import java.io.InputStreamReader;
import java.net.URL;
import java.net.MalformedURLException;

import javax.swing.text.html.HTMLEditorKit.ParserCallback;
import javax.swing.text.MutableAttributeSet;
import javax.swing.text.html.parser.ParserDelegator;

public class StockPriceBean {

    private static final String urlBase =
        "http://finance.yahoo.com/q?d=t&s=";
    private BufferedReader webPageStream = null;
    private URL stockSite = null;
    private ParserDelegator htmlParser = null;
    private MyParserCallback callback = null;
    private String htmlText = "";
    private String symbol = "";
    private float stockVal = 0f;

    public StockPriceBean( ) {} //no-arguments constructor for the bean

    public void setSymbol(String symbol){
        this.symbol = symbol;
    }

    public String getSymbol( ){
        return symbol;
    }

    //Inner class provides the callback

```



```

class MyParserCallback extends ParserCallback {

    private boolean lastTradeFlag = false;
    private boolean boldFlag = false;
    public MyParserCallback( ){
        if (stockVal != 0)
            stockVal = 0f;
    }

    public void handleStartTag(javax.swing.text.html.HTML.Tag t,
        MutableAttributeSet a,int pos) {
        if (lastTradeFlag && (t == javax.swing.text.html.HTML.Tag.B )){
            boldFlag = true;
        }
    } //handleStartTag

    public void handleText(char[] data,int pos){
        htmlText = new String(data);
        if (htmlText.indexOf("No such ticker symbol.") != -1){
            throw new IllegalStateException(
                "Invalid ticker symbol in handleText( ) method.");
        } else if (htmlText.equals("Last Trade:")){
            lastTradeFlag = true;
        } else if (boldFlag){

            try{
                stockVal = new Float(htmlText).floatValue( );
            } catch (NumberFormatException ne) {

                try{
                    //tease out any commas in the number using NumberFormat
                    java.text.NumberFormat nf = java.text.NumberFormat.
                        getInstance( );
                    Double f = (Double) nf.parse(htmlText);
                    stockVal = (float) f.doubleValue( );
                } catch (java.text.ParseException pe){
                    throw new IllegalStateException(
                        "The extracted text " + htmlText +
                        " cannot be parsed as a number!");
                } //inner try

            } //outer try
            lastTradeFlag = false;
            boldFlag = false;

        } //if
    } //handleText
} //MyParserCallback

    public float getLatestPrice( ) throws IOException,MalformedURLException {

        stockSite = new URL(urlBase + symbol);
    }
}

```

```
webPageStream = new BufferedReader(new InputStreamReader(stockSite.  
    openStream( )));  
htmlParser = new ParserDelegator( );  
callback = new MyParserCallback( );//ParserCallback  
  
synchronized(htmlParser){  
    htmlParser.parse(webPageStream,callback,true);  
}//synchronized  
  
//reset symbol  
setSymbol("");  
return stockVal;  
  
}//getLatestPrice  
}//StockPriceBean
```



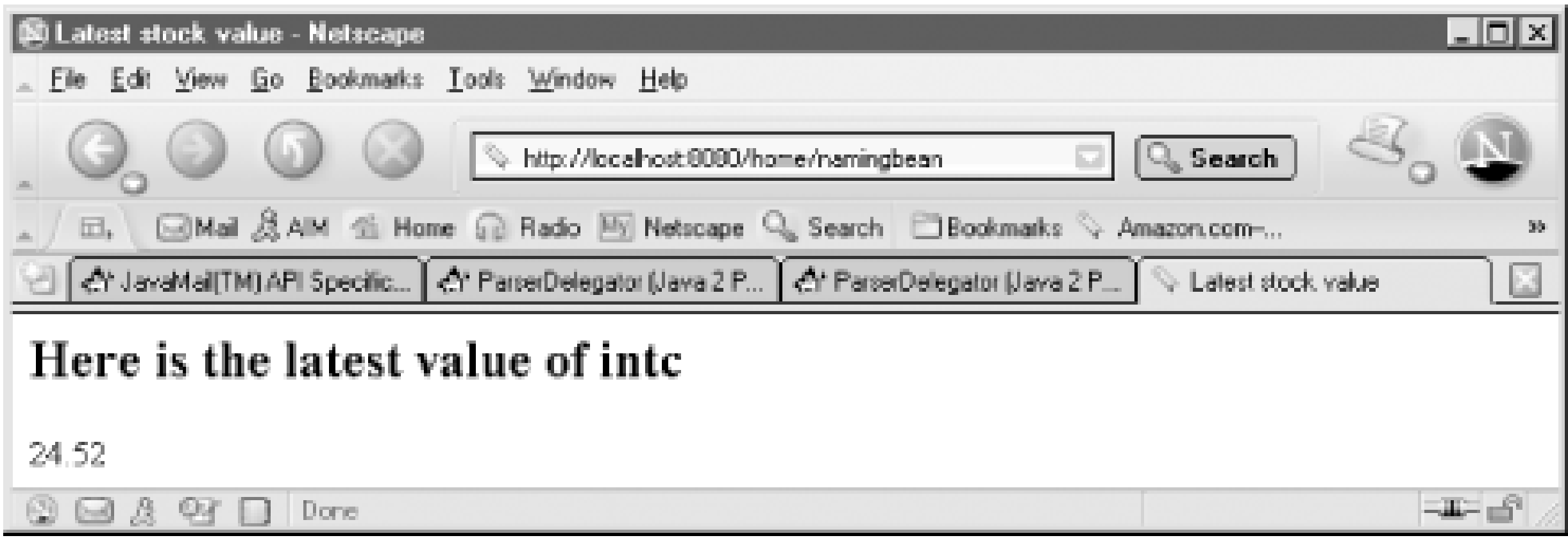
The `ParserDelegator.parse()` method is synchronized and therefore designed to only allow one thread at a time to parse the web page and pull out the stock quote.

[Figure 25-1](#) shows the web page form generated by the servlet's `doGet()` method. The user enters a stock symbol into this form, then submits the form to the servlet's `doPost()` method.

Figure 25-1. Enter a stock symbol for a live stock price

[Figure 25-2](#) shows the stock information that the JNDI object found for the servlet.

Figure 25-2. The servlet's `doPost()` method generates a live stock quote using a JNDI object



See Also

[Recipe 25.1](#) on configuring a JNDI object with Tomcat; [Recipe 25.3](#) on accessing the Tomcat JNDI object from a JSP; [Chapter 21](#) on accessing `DataSource`s with JNDI; [Chapter 26](#) on harvesting web information.

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Recipe 25.3 Accessing the Tomcat JNDI Resource from a JSP

Problem

You want to access a JNDI resource from a JSP.

Solution

Use a filter to place the object in request or session scope. Access the object in the JSP with the `c:set` and `c:out` JSTL tags.

Discussion

A nice job for a filter is accessing a JNDI object, then placing a reference to that object in a session for a JSP to use. See [Chapter 19](#) for more information on filters.

Here are the steps needed to use a filter with JNDI and a JSP:

1. Develop and compile the filter, including a no-arguments constructor.
2. Use the JNDI API and `javax.naming` package in the filter to set a session attribute using the JNDI object.
3. Place the filter in *WEB-INF/classes* or in a JAR in *WEB-INF/lib*.
4. Add `filter` and `filter-mapping` elements to *web.xml*, map the filter to the JSP that will use the JNDI object ([Example 25-7](#)).
5. Create a JSP that uses the session attribute.

[Example 25-6](#) shows the filter. The filter initializes a `javax.naming.Context` type in its `init()` method (when the servlet container creates the filter instance). The `doFilter()` method grabs a JNDI object and stores the object as a session attribute. The filter chain ends at the JSP to which the filter is mapped; therefore, the JSP has access to the session attribute (i.e., the JNDI object).

Example 25-6. A Filter accesses a JNDI object and sets the object as a session attribute

```
package com.jspervletcookbook;
```



```
import java.io.IOException;

import javax.naming.Context;
import javax.naming.InitialContext;
import javax.naming.NamingException;

import javax.servlet.*;
import javax.servlet.http.*;

public class JndiTFilter implements Filter {

    private FilterConfig config;
    private Context env;

    //No-arguments constructor required for a filter; we've made it
    //explicit here, even though the compiler would have created one
    //in the absence of this or any other constructor
    public JndiTFilter( ) {}

    public void init(FilterConfig filterConfig) throws ServletException {

        this.config = filterConfig;
        try {
            env = (Context) new InitialContext( ).lookup("java:comp/env");
            env.close( );
        } catch (NamingException ne) {
            try{ env.close( ); } catch (NamingException nex) {}
            throw new ServletException(ne);
        }
    }

    public void doFilter(ServletRequest request,
        ServletResponse response, FilterChain chain) throws IOException,
        ServletException {

        StockPriceBean spbean = null;

        try {
            spbean = (StockPriceBean) env.lookup("bean/pricebean");
        } catch (NamingException ne) { }

        HttpServletRequest hRequest = null;
        if (request instanceof HttpServletRequest)
            hRequest = (HttpServletRequest) request;

        HttpSession hSession = hRequest.getSession( );
        if (hSession != null)
            hSession.setAttribute("MyBean", spbean);

        chain.doFilter(request, response);
    }
}
```

```

    }// doFilter

    public void destroy( ){
        /*called before the Filter instance is removed
        from service by the web container*/
    }
} //Filter

```

The filter's `doFilter()` method is called each time a client requests the JSP, so each client is associated with a different bean instance. In other words, each session stores its own bean instance.



The JSP could then remove the session attribute (if it was not going to be used again) to conserve server resources. See [Chapter 16](#) for recipes on setting and removing session attributes.

[Example 25-7](#) shows the `filter` and `filter-mapping` elements that you can add to the deployment descriptor. This causes the servlet container to create an instance of the filter (calling the filter's `init()` method). Then the container calls the filter's `doFilter()` method whenever it receives a request matching the URL(s) associated with the `filter-mapping` element.

Example 25-7. The filter and elements for a JNDI -related filter

```

<!-- start of web.xml -->

<filter>

    <filter-name>JndiTFilter</filter-name>
    <filter-class>com.jspervletcookbook.JndiTFilter</filter-class>

</filter>

<filter-mapping>

    <filter-name>JndiTFilter</filter-name>
    <url-pattern>/jndiJsp.jsp</url-pattern>

</filter-mapping>

<!-- rest of web.xml -->

```

[Example 25-7](#) maps the `JndiTFilter` to the web component at the URL `/jndiJsp.jsp`. [Example 25-8](#) shows the JSP that uses the session attribute, called "MyBean" to display a stock quote.

Example 25-8. A JSP uses a session attribute originating as a JNDI object

```

<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<html>
<head><title>Jndi Bean</title></head>

```

```
<body>
<h2>Getting a StockPriceBean object via JNDI...</h2>

<c:set var="priceBean" value="${MyBean}"/>

<%-- set the 'symbol' property to the stock symbol --%>
<c:set target="${priceBean}" property="symbol" value="${param.symbol}"/>

<%-- get the latest price by calling getLatestPrice( ) on the bean object --%>
The latest price: <c:out value="${priceBean.latestPrice}" />

</body>
</html>
```

Figure 25-3 shows this JSP's output. [Example 25-5](#) in [Recipe 25.2](#) shows the code for the JavaBean that this JSP uses.

Figure 25-3. A JSP uses a session attribute via JNDI to display a stock price



See Also

[Recipe 25.1](#) on configuring a JNDI object with Tomcat; [Recipe 25.2](#) on accessing the Tomcat JNDI object from a servlet; [Chapter 21](#) on accessing `DataSources` with JNDI.

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Recipe 25.4 Configuring a JNDI Resource in WebLogic

Problem

You want to bind an object to BEA WebLogic's JNDI implementation.

Solution

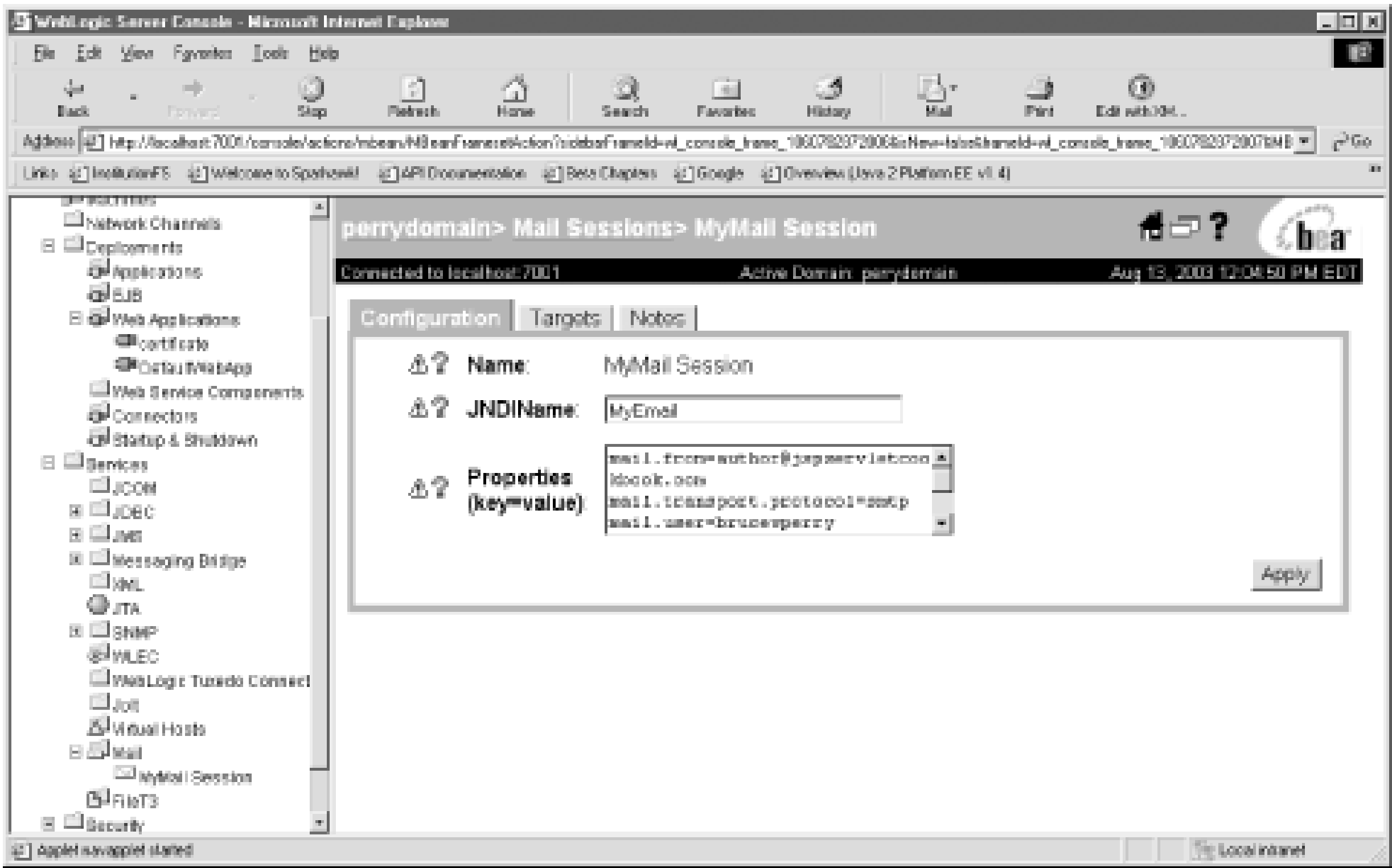
Use the WebLogic Administration console.

Discussion

Here are the steps needed to bind a `javax.mail.Session` object (which I use as an example for this recipe) to WebLogic's JNDI implementation. The advantage of this approach is that the available `Session` is already configured with elements such as its SMTP host (see [Table 25-1](#)). The `Session` is "ready to go" for the code that will eventually look up and use the object.

1. Log in to the WebLogic Administration console, which involves using a browser URL such as *`http://localhost:7001/console`*.
2. Go to *`Your-domain-name`* Services Mail in the lefthand column menu.
3. Click on "Configure a new Mail Session . . ." This produces the window shown in [Figure 25-4](#).

Figure 25-4. Configuring a `javax.mail.Session` type as a JNDI object using the WebLogic Administration console



- 4. Fill in the text fields in the resulting window. Give theSession object a JNDI name (under "JndiName"), which is the name that the code uses to look up the object.
- 5. Enter any properties for the Session by typing in the property name, an equals sign (=), and the property value. See Table 25-1.
- 6. Click the "Apply" button, then choose the "Targets" tab. The resulting screen allows you to associate the JNDI object with one or more servers.

Now the JNDI object is available to Java programs using the JNDI API and the name you bound the object under. Recipe 25.5 shows how to view the JNDI tree graphically to verify that the object has been bound properly.

Table 25-1. JavaMail properties set for this recipe's Session JNDI object

Property name	Description	Example
mail.host	The default mail server	mail.comcast.net
mail.smtp.host	Protocol-specific mail host; defaults to mail.host value	mail.comcast.net
mail.user	The username for connecting to the mail server	bruceperry
mail.from	The return address to use when sending mail.	author@jspServletCookbook.com

See Also

[Recipe 25.6](#) on accessing a JNDI object with a servlet on WebLogic; [Recipe 25.7](#) on accessing a JNDI object with a JSP on WebLogic; [Chapter 2](#) on on accessing a JNDI object with a JSP on WebLogic; [Chapter 2](#) on deploying web components with WebLogic.

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Recipe 25.5 Viewing the JNDI Tree in WebLogic

Problem

You want to view the WebLogic JNDI tree in graphical form.

Solution

Right click on the server name in the WebLogicAdministration console and choose "View JNDI Tree."

Discussion

After you have bound an object to JNDI using the Administration console, you can then view the JNDI tree to see if WebLogic has bound your object as intended. Right-click on *My-domain-name* Servers *Server-name* in the lefthand menu and choose "View JNDI Tree." This generates a new browser window that looks like the one in [Figure 25-5](#).

The new object ("MyEmail") is represented at the top of the tree as a purple dot. This is a nice graphical way of viewing the hierarchical structure of the JNDI tree, including its subdirectories and various objects, that are available to a WebLogic server.

[Figure 25-5](#) shows the "MyEmail" bound object selected in the JNDI tree. Information about the object is displayed in the righthand frame of the browser window.

Figure 25-5. A graphical display of the WebLogic JNDI tree

See Also

[Recipe 25.4](#) on configuring a JNDI object on WebLogic; [Recipe 25.6](#) on accessing a JNDI object with a servlet on WebLogic; [Recipe 25.7](#) on accessing a JNDI object with a JSP on WebLogic; [Chapter 2](#) on deploying web components with WebLogic.

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Recipe 25.6 Accessing the WebLogic JNDI Resource from a Servlet

Problem

You want to access the JNDI object created and bound on WebLogic.

Solution

Use the JNDI API in the servlet to access a reference to the bound object.

Discussion

[Example 25-9](#) is an `HttpServlet` that obtains a `javax.mail.Session` object from WebLogic's JNDI implementation. The servlet uses this object to build an email message. The servlet initiates the JNDI lookup in its `init()` method for an object bound under the name "MyEmail" (Recipe 25.4). The servlet container calls the `init()` once when the container creates the servlet instance.

Example 25-9. Servlet to obtain a `javax.mail.Session` object from WebLogic's JNDI implementation and build an email message

```
package com.jspServletcookbook;

import java.io.IOException;
import java.io.PrintWriter;

import javax.naming.Context;
import javax.naming.InitialContext;
import javax.naming.NamingException;
import javax.mail.*;
import javax.mail.internet.*;
import javax.servlet.*;
import javax.servlet.http.*;

public class EmailJndiServlet extends HttpServlet {

    private Session mailSession;

    public void init( ) throws ServletException {
```

```

Context env = null;

try{

    env = (Context) new InitialContext( );
    mailSession = (Session) env.lookup("MyEmail");
    if (mailSession == null)
        throw new ServletException(
            "MyEmail is an unknown JNDI object");

    //close the InitialContext
    env.close( );

} catch (NamingException ne) {
    try{ env.close( );} catch (NamingException nex) { }
    throw new ServletException(ne);
}
} //init

public void doPost(HttpServletRequest request,
    HttpServletResponse response) throws ServletException,
    java.io.IOException {

    response.setContentType("text/html");
    java.io.PrintWriter out = response.getWriter( );

    out.println(
        "<html><head><title>Email message sender</title></head><body>");

    String to = request.getParameter("to");
    String from = request.getParameter("from");
    String subject = request.getParameter("subject");
    String emailContent = request.getParameter("emailContent");
    try{
        sendMessage(to,from,subject,emailContent);
    } catch(Exception exc){
        throw new ServletException(exc.getMessage( ));
    }

    out.println(
        "<h2>The message was sent successfully</h2></body></html>");

    out.println("</body></html>");

} //doPost

public void doGet(HttpServletRequest request,
    HttpServletResponse response) throws ServletException,
    java.io.IOException {

    //doGet( ) calls doPost( )

```

```

        doPost(request,response);
    }

    private void sendMessage(String to, String from, String subject,
        String bodyContent) throws Exception {

        Message mailMsg = null;

        mailMsg = new MimeMessage(mailSession);//a new email message
        InternetAddress[] addresses = null;

        try {
            if (to != null) {

                //throws 'AddressException' if the 'to' email address
                //violates RFC822 syntax
                addresses = InternetAddress.parse(to, false);
                mailMsg.setRecipients(Message.RecipientType.TO, addresses);

            } else {
                throw new MessagingException(
                    "The mail message requires a 'To' address.");
            }

            if (from != null)
                mailMsg.setFrom(from);

            if (subject != null)
                mailMsg.setSubject(subject);

            if (bodyContent != null)
                mailMsg.setText(bodyContent);

            //Finally, send the mail message; throws a 'SendFailedException'
            //if any of the message's recipients have an invalid address
            Transport.send(mailMsg);

        } catch (Exception exc) {
            throw exc;
        }

    } //sendMessage
} //EmailJndiServlet

```

The `doPost()` method calls the servlet's `sendMessage()` method, passing in the email message parts such as the recipient and the email's content. The servlet derives this information from request parameters that the user submits. A typical request for the servlet looks like:

```

http://localhost:7001/email?to=author@jspServletcookbook.com&
from=bwperry@parkerriver.com&subject=hello&
emailContent=A web message

```

A user can also `POST` information to the servlet with an HTML form.

The servlet's `sendMessage()` method uses the JNDI object in the `javax.mail.internet.MimeMessage` constructor when the method creates a new email message.

[Figure 25-6](#) shows the servlet's simple return message in a browser window.

Figure 25-6. The servlet sends the email successfully



See Also

[Recipe 25.4](#) on configuring a JNDI object on WebLogic; [Recipe 25.5](#) on viewing the WebLogic JNDI tree with the Administration console; [Recipe 25.7](#) on accessing a JNDI object with a JSP on WebLogic; [Chapter 2](#) on deploying web components with WebLogic.

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Recipe 25.7 Accessing the WebLogic JNDI Resource from a JSP

Problem

You want to use a WebLogic JNDI object in a JSP.

Solution

Create a filter that accesses the JNDI object and sets the object as a session attribute.

Discussion

Any sense of déjà vu comes from a few recipes ago, when you used a filter to pass a JNDI object to a JSP on Tomcat. The only difference in this recipe is that the application server used is WebLogic and the JNDI object is a JavaMail `Session`, not a `JavaBean`.

The filter accesses the object using the JNDI API on WebLogic. Then the filter sets the object as a session attribute, so that the JSP can access the `javax.mail.Session`. [Example 25-10](#) shows the code for the filter that recipe uses on the WebLogic server.

Example 25-10. A filter stores a WebLogic JNDI object in a session attribute

```
package com.jspServletcookbook;

import java.io.IOException;

import javax.naming.Context;
import javax.naming.InitialContext;
import javax.naming.NamingException;

import javax.servlet.*;
import javax.servlet.http.*;

public class JndiFilter implements Filter {

    private FilterConfig config;
    private Context env;
```

```

public JndiFilter( ) {}

public void  init(FilterConfig filterConfig)  throws ServletException {
    this.config = filterConfig;
    try {
        env = (Context) new InitialContext( );
    } catch (NamingException ne) {
        throw new ServletException(ne);
    }
} //init

public void  doFilter(ServletRequest request, ServletResponse response,
    FilterChain chain) throws IOException, ServletException {

    javax.mail.Session mailSession = null;
    try {
        mailSession = (javax.mail.Session) env.lookup("MyEmail");
    } catch (NamingException ne) { }

    HttpServletRequest hRequest = null;
    if (request instanceof HttpServletRequest){
        hRequest = (HttpServletRequest) request;
        HttpSession hSession = hRequest.getSession( );
        if (hSession != null)
            hSession.setAttribute("MyEmail",mailSession);

    } //if
    chain.doFilter(request,response);

} // doFilter

public void destroy( ){
    /*called before the Filter instance is removed
    from service by the web container*/
}
}

```

[Example 25-11](#) shows the filter configuration inside the deployment descriptor. This deployment descriptor must accompany a web application that you or another deployer has installed on WebLogic server.

Example 25-11. A filter that accesses a JNDI object on Weblogic

```

<!-- start of web.xml -->

<filter>

    <filter-name>JndiFilter</filter-name>
    <filter-class>com.jspervletcookbook.JndiFilter</filter-class>

</filter>

```

```

<filter-mapping>

    <filter-name>JndiFilter</filter-name>
    <url-pattern>/jndiJsp.jsp</url-pattern>

</filter-mapping>

<!-- rest of web.xml -->

```

[Example 25-12](#) shows a JSP that accesses the JNDI object. This code displays the class name of the object, a `javax.mail.Session` type that [Recipe 25.4](#) bound as a JNDI object on WebLogic. The filter in [Example 25-11](#) then set the object as a session attribute (not to be confused with the `Session` type of the object). This attribute is available to all web components that participate in the same session. Therefore, the `c:set` tag in this JSP uses the following EL code to get access to the attribute

```

${MyEmail}

```

Then the `c:out` tag displays the class name of the session attribute, in order to verify that the object is a `javax.mail.Session`. [Recipe 25.6](#) gives the complete JavaMail code for sending an email.

Example 25-12. The JSP accesses the JavaMail object as a session attribute

```

<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<html>
<head><title>Jndi Email</title></head>
<body>
<h2>Getting a javax.mail.Session object via JNDI...</h2>

<c:set var="mSession" value="${MyEmail}" />

<c:out value="${mSession.class.name}" />

</body>
</html>

```

[Figure 25-7](#) shows a web browser window after a user has requested the JSP.

Figure 25-7. A JSP accesses a JNDI object via a servlet filter



See Also

[Chapter 19](#) on filters; [Chapter 23](#) on the JSTL; [Recipe 25.4](#) on configuring a JNDI object with WebLogic; [Recipe 25.6](#) on accessing a JNDI object with a servlet on WebLogic; [Chapter 2](#) on deploying web components with WebLogic.

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Recipe 25.8 Accessing an EJB Using the WebLogic JNDI Tree

Problem

You want to access an Enterprise JavaBean (EJB) from a servlet on WebLogic.

Solution

Find out the EJB's JNDI name and use the `javax.naming` package to get a reference to the `EJBObject` or remote interface so that you can call the EJB's methods.

Discussion

A servlet accesses an EJB by using a specified JNDI name. The process is therefore transparent to the servlet developer. Any EJBs an application uses comprise the *business tier* of an application. The servlets and JSPs represent the *web tier* within the multi-tiered distributed architecture of a typical Java 2 Enterprise Edition (J2EE) application. All you need to know is the JNDI name associated with the EJB in order to use the EJB in your programs.

Enterprise JavaBeans is a comprehensive topic; however, this recipe is devoted to showing how a servlet can connect to an EJB. The "See Also" segment of this recipe includes several links to EJB and J2EE information and books.

You should be aware of the EJB's business methods, but do not have to be an expert on the `javax.ejb` package to use the EJB. [Example 25-13](#) shows the source code for a stateless session EJB that is managed by BEA WebLogic 7.0 application server.

A certain type of EJB, a stateless session bean encapsulates business logic that does not require persistence or the saving of the object's state between method calls. On the other hand, a *stateful* session bean (such as a shopping cart object), must remember the object's state (such as the value of various instance variables) between method calls, as part of a conversation with the EJB client.

[Example 25-13](#) provides a `java.util.Map` that links U.S. state names with their postal abbreviations. The session bean includes one business method, `getAbbreviation()`, which receives

a state name as a parameter and returns its postal abbreviation.

Example 25-13. The stateless session EJB

```
package com.jspServletcookbook;

import javax.ejb.*;

import java.util.Map;
import java.util.HashMap;

public class AbbrevBean implements SessionBean{

    private SessionContext context;
    private Map abbrevMap;

    public AbbrevBean( ){ //the bean's no-arguments constructor

        //A Map containing the names of states and abbreviations
        abbrevMap = new HashMap( );

        abbrevMap.put( "ALABAMA", "AL" );
        abbrevMap.put( "ALASKA", "AK" );
        abbrevMap.put( "AMERICAN SAMOA", "AS" );
        abbrevMap.put( "ARIZONA", "AZ" );
        abbrevMap.put( "ARKANSAS", "AR" );
        abbrevMap.put( "CALIFORNIA", "CA" );
        abbrevMap.put( "COLORADO", "CO" );
        abbrevMap.put( "CONNECTICUTT", "CT" );

        abbrevMap.put( "DELAWARE", "DE" );
        abbrevMap.put( "DISTRICT OF COLUMBIA", "DC" );
        abbrevMap.put( "FEDERATED STATES OF MICRONESIA", "FM" );
        abbrevMap.put( "FLORIDA", "FL" );
        abbrevMap.put( "GEORGIA", "GA" );
        abbrevMap.put( "GUAM", "GU" );
        abbrevMap.put( "HAWAII", "HI" );
        abbrevMap.put( "IDAHO", "ID" );

        abbrevMap.put( "ILLINOIS", "IL" );
        abbrevMap.put( "INDIANA", "IN" );
        abbrevMap.put( "IOWA", "IA" );
        abbrevMap.put( "KANSAS", "KS" );
        abbrevMap.put( "KENTUCKY", "KY" );
        abbrevMap.put( "LOUISIANA", "LA" );

        abbrevMap.put( "MAINE", "ME" );
        abbrevMap.put( "MARSHALL ISLANDS", "MH" );
        abbrevMap.put( "MARYLAND", "MD" );
        abbrevMap.put( "MASSACHUSETTS", "MA" );
```

```
abbrevMap.put ( "MICHIGAN" , "MI" ) ;
abbrevMap.put ( "MINNESOTA" , "MN" ) ;

abbrevMap.put ( "MISSISSIPPI" , "MS" ) ;
abbrevMap.put ( "MISSOURI" , "MO" ) ;
abbrevMap.put ( "MONTANA" , "MT" ) ;
abbrevMap.put ( "NEBRASKA" , "NE" ) ;
abbrevMap.put ( "NEVADA" , "NV" ) ;
abbrevMap.put ( "NEW HAMPSHIRE" , "NH" ) ;

abbrevMap.put ( "NEW JERSEY" , "NJ" ) ;
abbrevMap.put ( "NEW MEXICO" , "NM" ) ;
abbrevMap.put ( "NEW YORK" , "NY" ) ;
abbrevMap.put ( "NORTH CAROLINA" , "NC" ) ;
abbrevMap.put ( "NORTH DAKOTA" , "ND" ) ;
abbrevMap.put ( "NORTHERN MARIANA ISLANDS" , "MP" ) ;

abbrevMap.put ( "OKLAHOMA" , "OK" ) ;
abbrevMap.put ( "OREGON" , "OR" ) ;
abbrevMap.put ( "PALAU" , "PW" ) ;
abbrevMap.put ( "PENNSYLVANIA" , "PA" ) ;
abbrevMap.put ( "PUERTO RICO" , "PR" ) ;
abbrevMap.put ( "RHODE ISLAND" , "RI" ) ;
abbrevMap.put ( "SOUTH CAROLINA" , "SC" ) ;
abbrevMap.put ( "SOUTH DAKOTA" , "SD" ) ;

abbrevMap.put ( "TENNESSEE" , "TN" ) ;
abbrevMap.put ( "TEXAS" , "TX" ) ;
abbrevMap.put ( "UTAH" , "UT" ) ;
abbrevMap.put ( "VERMONT" , "VT" ) ;
abbrevMap.put ( "VIRGIN ISLANDS" , "VI" ) ;
abbrevMap.put ( "VIRGINIA" , "VA" ) ;
abbrevMap.put ( "WASHINGTON" , "WA" ) ;
abbrevMap.put ( "WEST VIRGINIA" , "WV" ) ;
abbrevMap.put ( "WISCONSIN" , "WI" ) ;
abbrevMap.put ( "WYOMING" , "WY" ) ;

} //constructor

public void setSessionContext(SessionContext ctx) throws
    EJBException {
    context = ctx;
} //setSessionContext

public Map getAbbrevMap( ){
    return abbrevMap;
}

//The bean's business method
public String getAbbreviation(String state){
    return (String) abbrevMap.get(state);
}
```



```

//javax.ejb.SessionBean method; it has to be implemented in a session
//bean, but is not relevant to Stateless session beans.
public void ejbActivate( ){}

//javax.ejb.SessionBean method; it has to be implemented in a Session
//bean, but is not relevant to stateless session beans.
public void ejbPassivate( ){}

//javax.ejb.SessionBean method;
public void ejbRemove( ) {}

}

```

[Example 25-13](#) could easily be implemented as an ordinary Java helper or utility class. However, I show a simple example of an EJB so that the recipe can focus on how a servlet connects to these objects.

EJBs have a deployment descriptor, similar to the *web.xml*/file that web applications use. The EJB deployment descriptor must be named *ejb-jar.xml*. When you package the EJB(s) before they are deployed on an application server, include this deployment descriptor as part of the archive. The *ejb-jar.xml*/file describes the related EJB component(s); the application server uses this descriptive information in order to properly deploy the EJB.

For example, the *ejb-jar.xml*/file in [Example 25-14](#) specifies the type of EJB (e.g., stateless session bean) and the fully qualified class names of its related Java classes, such as its remote interface.

Example 25-14. The ejb-jar.xml file

```

<?xml version="1.0"?>

<!DOCTYPE ejb-jar PUBLIC "-//Sun Microsystems, Inc.
//DTD Enterprise JavaBeans 2.0//EN"
"http://java.sun.com/dtd/ejb-jar_2_0.dtd"
>

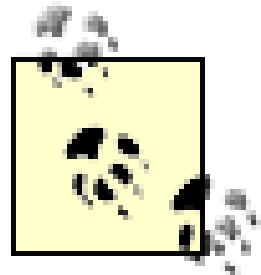
<ejb-jar>
  <enterprise-beans>
    <session>
      <ejb-name>AbbreviationEjb</ejb-name>
      <home>com.jspervletcookbook.AbbrevHome</home>
      <remote>com.jspervletcookbook.Abbrev</remote>
      <local-home>com.jspervletcookbook.AbbrevLocalHome</local-home>
      <local>com.jspervletcookbook.AbbrevLocal</local>
      <ejb-class>com.jspervletcookbook.AbbrevBean</ejb-class>
      <session-type>Stateless</session-type>
      <transaction-type>Container</transaction-type>
    </session>
  </enterprise-beans>
</ejb-jar>

```

The package that contains this EJB, and with which the EJB is deployed on the application server, is a

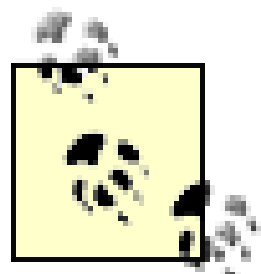
JAR file named *myejb.jar* (just a name I concocted; you do not have to use the same name).

Since this stateless session bean is deployed on BEA WebLogic Server, the JAR file must include a vendor-specific deployment descriptor named *weblogic-ejb-jar.xml*. This deployment descriptor gives the deployer the opportunity to configure several aspects of how the EJB is deployed on WebLogic, such as the JNDI names of its home and local home interfaces.



The "home" object is an implementation of the "home" interface, and the "local home" object is an implementation of the local home interface. These objects are "factories" for EJB objects, which delegate the business-method calls to the EJB deployed in the server. A factory is a Java class that generates objects of a different kind of Java class. In this recipe's case, the client uses JNDI to get a reference to the home object, which creates an EJB object. The servlet (client) then calls the *EJB object's* `getAbbreviation()` method; the EJB object is a remote object or "stub" that delegates this method call to the original EJB stored on the server.

You will encounter the home object's JNDI name in the servlet depicted later on in this recipe.



When you deploy an EJB on WebLogic using the Administration Console, WebLogic automatically binds the home and local home objects within the WebLogic JNDI tree, using the names specified by the *weblogic-ejb-jar.xml* deployment descriptor.

[Example 25-15](#) shows the *weblogic-ejb-jar.xml* deployment descriptor for our stateless session bean.

Example 25-15. The weblogic-ejb-jar.xml file

```
<!DOCTYPE weblogic-ejb-jar PUBLIC
'-//BEA Systems, Inc.//DTD WebLogic 7.0.0 EJB//EN'
'http://www.bea.com/servers/wls700/dtd/weblogic-ejb-jar.dtd'>

<weblogic-ejb-jar>
  <weblogic-enterprise-bean>
    <ejb-name>AbbreviationEjb</ejb-name>
    <stateless-session-descriptor>
      <pool>
        <initial-beans-in-free-pool>1</initial-beans-in-free-pool>
      </pool>
    </stateless-session-descriptor>
    <jndi-name>AbbrevHome</jndi-name>
    <local-jndi-name>AbbrevLocalHome</local-jndi-name>
  </weblogic-enterprise-bean>
</weblogic-ejb-jar>
```

An EJB module is a complicated package that includes bean classes, remote interfaces, and two different deployment descriptors. [Example 25-16](#) shows the contents of the *myejb.jar* file. I use the `jar tvf myejb.jar` command in a command-line window to display the contents of the specified

JAR file (it works in both Unix and Windows).

Example 25-16. The contents of the ejb-jar.xml file

```
H:\book\cookbook\code\chap27\src\ejbs\ejbjar>jar tvf myejb.jar
```

```
META-INF/
META-INF/MANIFEST.MF
com/
com/jspServletcookbook/
com/jspServletcookbook/Abbrev.class
com/jspServletcookbook/AbbrevBean.class
com/jspServletcookbook/AbbrevHome.class
com/jspServletcookbook/AbbrevLocal.class
com/jspServletcookbook/AbbrevLocalHome.class
```

```
META-INF/ejb-jar.xml
META-INF/weblogic-ejb-jar.xml
```

In [Example 25-16](#), the session bean is *AbbrevBean.class*, the remote interface is *Abbrev.class*, and the home object (the factory for EJB objects that implement the `Abbrev` interface) is *AbbrevHome.class*.

Finally, [Example 25-17](#) shows the servlet that uses the session bean from [Example 25-13](#). The code is self-explanatory. The important thing to remember is that the servlet receives a reference to the `AbbrevHome` object from the WebLogic JNDI tree. Then the servlet, in its `doGet()` method, calls the `AbbrevHome` object's `create()` method to get an instance of the session bean's remote interface (in this example, it's an `Abbrev` type).

Example 25-17. A servlet that accesses the EJB on WebLogic using JNDI

```
package com.jspServletcookbook;

import java.io.IOException;
import java.io.PrintWriter;

import javax.naming.Context;
import javax.naming.InitialContext;
import javax.naming.NamingException;

import javax.rmi.PortableRemoteObject;

import javax.servlet.*;
import javax.servlet.http.*;

public class WebJndiServlet extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {
```

```

//The request parameter looks like 'state=Massachusetts'
String state = request.getParameter("state");
Context env = null;
Abbrev abbrev = null;
AbbrevHome home = null;

try{

    env = (Context) new InitialContext( );

    //Look up the home or factory object on the WebLogic JNDI tree
    Object localH  = env.lookup("AbbrevHome");

    //This method call is necessary for EJB code that uses a
    //technology called RMI-IIOP
    home = (AbbrevHome) PortableRemoteObject.narrow(localH,
        AbbrevHome.class);

    //close the InitialContext
    env.close( );

    if (home == null)
        throw new ServletException(
            "AbbrevHome is an unknown JNDI object");

    //Get the remote interface by calling the home object's create( )
    //method
    abbrev = (Abbrev) PortableRemoteObject.narrow(home.create( ),
        Abbrev.class);

} catch (NamingException ne) {
    try{ env.close( );} catch (NamingException nex) { }
    throw new ServletException(ne);
} catch (javax.ejb.CreateException ce) {
    throw new ServletException(ce);
}

//set the MIME type of the response, "text/html"
response.setContentType("text/html");

java.io.PrintWriter out = response.getWriter( );

out.println("<html><head>");

out.println("<title>State abbreviations</title></head><body>");
out.println("<h2>Here is the state's abbreviation</h2>");

//Call the EJBObject's getAbbreviation( ) method; the EJBObject
//delegates this method call to the session bean. Put the request
//parameter in all upper-case, because this is how the session bean's
//java.util.Map stores the state names, which are the Map's keys

```



```

        if (state != null)
            out.println( abbrev.getAbbreviation(state.toUpperCase( )) );

        try{
            //The servlet is through with the EJBObject; call its remove( )
            //method
            abbrev.remove( );
        } catch (javax.ejb.RemoveException re){}

        out.println("</body></html>");

    } //doGet

    public void doPost(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        doGet(request, response);

    } //doPost

} //WebJndiServlet

```

The value of the abbreviation for a state such as "Oregon" is ultimately retrieved on the server side by calling the session bean's `getAbbreviation()` method. [Figure 25-8](#) shows a web browser window after a user has requested the servlet. The URL looks something like *http://localhost:7001/webjndi?state=Oregon*. The URL pattern */webjndi* is mapped in *web.xml* to the servlet of [Example 25-17](#).

Figure 25-8. An EJB-accessing servlet's web browser display

See Also

[Recipe 25.4](#) on configuring a JNDI object with WebLogic; [Recipe 25.6](#) on accessing a JNDI object with

a servlet on WebLogic; [Chapter 2](#) on deploying web components with WebLogic; a web link for the `javax.ejb` API: <http://java.sun.com/j2ee/1.4/docs/api/javax/ejb/package-summary.html>; the documentation page for WebLogic Server 7.0: <http://edocs.bea.com/wls/docs70/index.html>; a link to J2EE tutorials, including an Enterprise JavaBean tutorial: <http://java.sun.com/j2ee/tutorial/index.html>; *Enterprise JavaBeans*, Third Edition (O'Reilly); *J2EE Design Patterns* (O'Reilly).

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Chapter 26. Harvesting Web Information

[Introduction](#)

[Recipe 26.1. Parsing an HTML Page Using the `javax.swing.text` Subpackages](#)

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Introduction

The Web contains information galore. Much of this information is freely available by simply surfing over to an organization's web site and reading their pages or search results. However, it can be difficult separating the dross from the gems. The vast majority of a web page's visual components are typically dedicated to menus, logos, advertising banners, and fancy applets or Flash movies. What if all you are interested in is a tiny nugget of data awash in an ocean of HTML?

The answer lies in using Java to parse a web page to extract only certain pieces of information from it. The web terms for this task are *harvesting* or *scraping* information from a web page. Perhaps web services ([Chapter 27](#)) will eventually replace the need to harvest web data. But until most major sites have their web services APIs up and running, you can use Java and certain `javax.swing.text` subpackages to pull specified text from web pages.

How does it work? Basically, your Java program uses HTTP to connect with a web page and pull in its HTML text.

Parsing the HTML from web sites still involves transferring the entire web page over the network, even if you are only interested in a fraction of its information. This is why using web services is a much more efficient manner of sharing specific data from a web site.

Then use Java code to parse the HTML page in order to pull from it only the piece of data you are interested in, such as weather data or a stock quote. The following recipes show the Java classes that you can use to harvest web information. Then the recipes show a servlet and a JSP using a `JavaBean` to grab and display, as an example, a live stock quote.

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Recipe 26.1 Parsing an HTML Page Using the `javax.swing.text` Subpackages

Problem

You want to use the classes the Java 2 Standard Edition (J2SE) makes available for parsing HTML.

Solution

Use the various subpackages of the `javax.swing.text` package to create a parser for HTML.

Discussion

The J2SE 1.3 and 1.4 versions include the necessary classes for sifting through web pages in search of information. The Java programs these recipes use import the following classes:

```
javax.swing.text.html.  
HTMLToolkit.ParserCallback;  
javax.swing.text.MutableAttributeSet;  
javax.swing.text.html.parser.ParserDelegator;
```

The design pattern that these classes use to read web pages involves three main elements:

1. A `java.net.URL` object that opens up a socket or `InputStream` to the web page using HTTP. The code then uses this object to read the web page.
2. A `ParserDelegator` object with which the code sifts through the web page by calling this object's `parse()` method.
3. A `ParserCallback` object that the `ParserDelegator` uses to take certain actions while it is parsing the web page's HTML text. A *callback* in general is an object that Java code typically passes into another object's constructor. The enclosing object then *drives* the callback by invoking the callback's methods, which the Java programmer implements according to what they want to accomplish by parsing the HTML. The role of the callback will become clearer as you read through these recipes.

The servlet and JavaBean defined in this chapter use an inner class to implement the callback.

[Example 26-1](#) shows the callback that extends

```
javax.swing.text.html.HTMLToolkit.ParserCallback.
```


Example 26-1. A callback class for sifting through web pages

```

class MyParserCallback extends ParserCallback {

    //bread crumbs that lead us to the stock price
    private boolean lastTradeFlag = false;
    private boolean boldFlag = false;

    public MyParserCallback( ){
        //Reset the enclosing class' stock-price instance variable
        if (stockVal != 0)
            stockVal = 0f;
    }

    //A method that the parser calls each time it confronts a start tag
    public void handleStartTag(javax.swing.text.html.HTML.Tag t,
        MutableAttributeSet a,int pos) {
        if (lastTradeFlag && (t == javax.swing.text.html.HTML.Tag.B )){
            boldFlag = true;
        }

    }//handleStartTag

    //A method that the parser calls each time it reaches nested text content
    public void handleText(char[] data,int pos){

        htmlText = new String(data);
        if (htmlText.indexOf("No such ticker symbol.") != -1){
            throw new IllegalStateException(
                "Invalid ticker symbol in handleText( ) method.");

        } else if (htmlText.equals("Last Trade:")){
            lastTradeFlag = true;
        } else if (boldFlag){
            try{
                stockVal = new Float(htmlText).floatValue( );
            } catch (NumberFormatException ne) {
                try{
                    // tease out any commas in the number using NumberFormat
                    java.text.NumberFormat nf = java.text.NumberFormat.
                        getInstance( );
                    Double f = (Double) nf.parse(htmlText);
                    stockVal = (float) f.doubleValue( );
                } catch (java.text.ParseException pe){
                    throw new IllegalStateException(
                        "The extracted text " + htmlText +
                        " cannot be parsed as a number!");
                }
            }//try
        }//try

        //Reset the inner class's instance variables
    }
}

```

```

        lastTradeFlag = false;
        boldFlag = false;
    } //if

    } //handleText
} //MyParserCallback

```

A callback includes methods that represent the attainment of a certain element of a web page during the parsing process. For example, the parser (the object that encloses the callback object) calls `handleStartTag()` whenever it runs into an opening tag as it traverses the web page. Examples of opening tags are `<html>`, `<title>`, or `<body>`. Therefore, when you implement the `handleStartTag()` method in the code, you can control what your program does when it finds an opening tag, such as "prepare to grab the text that appears within the opening and closing `title` tag."

[Example 26-1](#) uses a particular algorithm to search a web page for an updated stock quote, and this is what the two methods (`handleStartTag()` and `handleText()`) accomplish in the `MyParserCallback` class:

1. It looks for the text "Last Trade" in the `handleText()` callback method; if it's found, the `lastTradeFlag boolean` variable is set to `true`. This is like "dropping a bread crumb" as the program travels through the vast HTML of the web page.
2. If `handleStartTag()` finds a `b` tag right after "Last Trade" is found (the `lastTradeFlag` flag is `true`), it grabs the nested content of that `b` tag, because this content represents the stock quote.

The big negative of web harvesting, which web services is partly designed to solve, is that when the web page you are parsing is changed, your program throws exceptions and no longer pulls out the information, because its algorithms are based on the old page structure.

[Example 26-2](#) shows a snippet of code that uses the `ParserDelegator` and `MyParserCallback` objects, just to give you an idea of how they fit together before we move on to the servlet and JSP.

Example 26-2. A code snippet shows the parser and callback classes at work

```

//Instance variables
private ParserDelegator htmlParser = null;
private MyParserCallback callback = null;

//Initialize a BufferedReader and a URL inside of a method for connecting
//to and reading a web page
BufferedReader webPageStream = null;
URL stockSite = new URL(BASE_URL + symbol);

//Connect inside of a method
webPageStream = new BufferedReader(
    new InputStreamReader(stockSite.openStream( )));

```

```
//Create the parser and callback
htmlParser = new ParserDelegator( );

callback = new MyParserCallback( );//ParserCallback

//Call parse( ), passing in the BufferedReader and callback objects
htmlParser.parse(webPageStream,callback,true);
```

The `parse()` method of `ParserDelegator` is what triggers the calling of the callback's methods, with the callback passed in as an argument to `parse()`.

Now let's see how these classes work in a servlet, JavaBean, and JSP.

See Also

A Javadoc link for `ParserDelegator`:
<http://java.sun.com/j2se/1.4.1/docs/api/javax/swing/text/html/parser/ParserDelegator.html>;
[Chapter 27](#) on using web services APIs to grab information from web servers.

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Recipe 26.2 Using a Servlet to Harvest Web Data

Problem

You want to use a servlet to harvest web information.

Solution

Use the HTML parsing API classes of the Java 2 Software Development Kit (SDK).

Discussion

The last recipe introduced the relevant subpackages of the `javax.swing.text` package; this is where I show how to use them in a servlet. [Example 26-3](#) imports the necessary classes to parse an HTML page. The servlet's `doGet()` method displays a form in which the user enters a stock symbol (such as "INTC," case insensitive).

Then the `doPost()` method attempts to get a live stock quote for that symbol by parsing a web page from *finance.yahoo.com*.

Example 26-3. Harvesting web data from a servlet

```
package com.jspervletcookbook;

import java.io.IOException;
import java.io.PrintWriter;
import java.io.BufferedReader;
import java.io.InputStreamReader;
import java.net.URL;
import java.net.MalformedURLException;
import javax.servlet.*;
import javax.servlet.http.*;
import javax.swing.text.html.HTMLEditorKit.ParserCallback;
import javax.swing.text.MutableAttributeSet;
import javax.swing.text.html.parser.ParserDelegator;

public class HtmlParseServlet extends HttpServlet {

    private static final String BASE_URL = "http://finance.yahoo.com"+
        "/q?d=t&s=";
    private ParserDelegator htmlParser = null;
```



```
private MyParserCallback callback = null;
private String htmlText = "";
private boolean lastTradeFlag = false;
private boolean boldFlag = false;
private float stockVal = 0f;

public void doGet(HttpServletRequest request,
    HttpServletResponse response) throws ServletException,
    java.io.IOException {

    //set the MIME type of the response, "text/html"
    response.setContentType("text/html");

    //use a PrintWriter to send text
    java.io.PrintWriter out = response.getWriter( );

    //Begin assembling the HTML content
    out.println("<html><head>");

    out.println("<title>Stock Price Fetcher</title></head><body>");
    out.println("<h2>Please submit a valid stock symbol</h2>");

    //make sure method="post" so that the servlet service method
    //calls doPost in the response to this form submit
    out.println(
        "<form method=\"post\" action =\"\" + request.getContextPath( ) +
        \"/stockservlet\" >");

    out.println("<table border=\"0\"><tr><td valign=\"top\">");
    out.println("Stock symbol: </td> <td valign=\"top\">");
    out.println("<input type=\"text\" name=\"symbol\" size=\"10\">");
    out.println("</td></tr><tr><td valign=\"top\">");

    out.println(
        "<input type=\"submit\" value=\"Submit Info\"></td></tr>");

    out.println("</table></form>");
    out.println("</body></html>");

} //doGet

public void doPost(HttpServletRequest request,
    HttpServletResponse response)
    throws java.io.IOException{
    String symbol;//this will hold the stock symbol
    float price;//The stock's latest price
    symbol = request.getParameter("symbol");
    boolean isValid = (symbol == null || symbol.length( ) < 1) ?
    false : true;

    //set the MIME type of the response, "text/html"
```

```

response.setContentType("text/html");
java.io.PrintWriter out = response.getWriter( );

    //Begin assembling the HTML content
out.println("<html><head>");
out.println("<title>Latest stock value</title></head><body>");
if (! isValid){
out.println(
    "<h2>Sorry, the stock symbol parameter was either empty "+
    "or null</h2>");
} else {
    out.println("<h2>Here is the latest value of "+ symbol +"</h2>");
    price = getLatestPrice(symbol);
    out.println( (price==0? "The symbol is probably invalid." :
        ""+price) );
}
out.println("</body></html>");

} // doPost

private float getLatestPrice(String symbol) throws IOException,
    MalformedURLException {

    BufferedReader webPageStream = null;
    URL stockSite = new URL(BASE_URL + symbol);
    webPageStream = new BufferedReader(new InputStreamReader(stockSite.
        openStream( )));
    htmlParser = new ParserDelegator( );
    callback = new MyParserCallback( );
    //the code is designed to make calling parse( ) thread-safe
    synchronized(htmlParser){
        htmlParser.parse(webPageStream,callback,true);
    } //synchronized
    return stockVal;
} //getLatestPrice

class MyParserCallback extends ParserCallback {

    //bread crumbs that lead us to the stock price
    private boolean lastTradeFlag = false;
    private boolean boldFlag = false;

    public MyParserCallback( ){
        //Reset the enclosing class' instance variable
        if (stockVal != 0)
            stockVal = 0f;
    }

    public void handleStartTag(javax.swing.text.html.HTML.Tag t,
        MutableAttributeSet a,int pos) {
        if (lastTradeFlag && (t == javax.swing.text.html.HTML.Tag.B )){

```

```

        boldFlag = true;
    }
} //handleStartTag

public void handleText(char[] data,int pos){

    htmlText = new String(data);
    if (htmlText.indexOf("No such ticker symbol.") != -1){
        throw new IllegalStateException(
            "Invalid ticker symbol in handleText( ) method.");
    } else if (htmlText.equals("Last Trade:")){
        lastTradeFlag = true;
    } else if (boldFlag){
        try{

            stockVal = new Float(htmlText).floatValue( );
        } catch (NumberFormatException ne) {
            try{
                // tease out any commas in the number using
                //NumberFormat
                java.text.NumberFormat nf = java.text.NumberFormat.
                    getInstance( );
                Double f = (Double) nf.parse(htmlText);
                stockVal = (float) f.doubleValue( );
            } catch (java.text.ParseException pe){
                throw new IllegalStateException(
                    "The extracted text " + htmlText +
                    " cannot be parsed as a number!");
            } //try
        } //try

        lastTradeFlag = false;
        boldFlag = false;
    } //if
} //handleText
} //MyParserCallback
} //HttpServlet

```

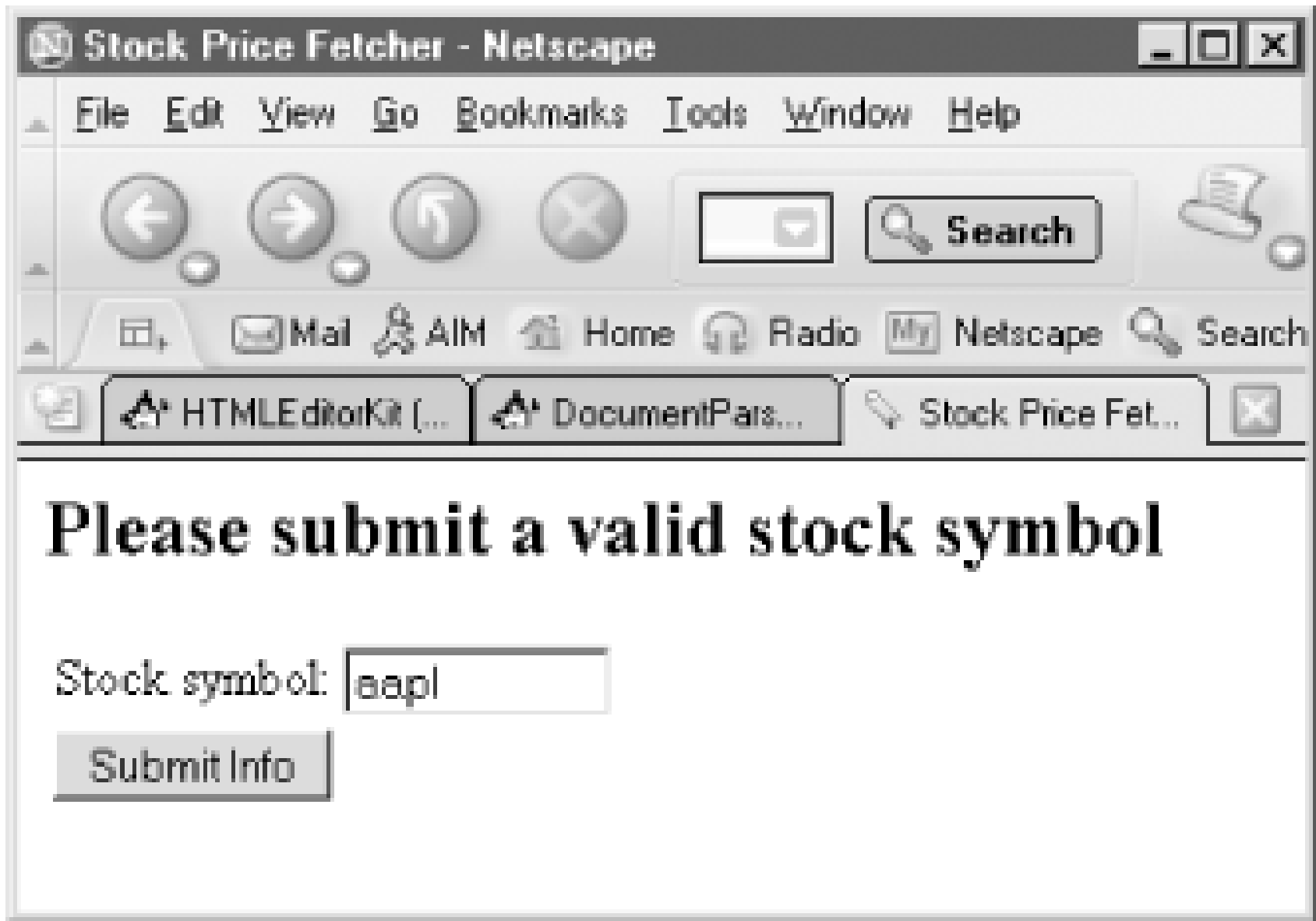
The `MyParserCallback` inner class defines the parsing algorithm for the servlet, which is explained in [Recipe 26.1](#). The `getLatestPrice()` method uses this callback class and an HTML parser to return a stock quote as a `float` type.

The `ParserDelegator` object is synchronized as it calls `parse()`, so that only one thread is parsing the web page and setting the value of `stockVal` (an instance variable representing the stock value) at one time.

This servlet is a little too complicated for one class, as it uses servlet API and HTML parsing API classes. A better design would separate these responsibilities into different Java classes. The upcoming recipes create a JavaBean whose responsibility is to parse HTML for a live stock quote.

[Figure 26-1](#) shows the output of the servlet's `doGet()` method.

Figure 26-1. The user enters a stock symbol and submits the form



[Figure 26-2](#) shows the servlet's `doPost()` method output in a Netscape browser.

Figure 26-2. The servlet returns the latest stock price for the symbol

See Also

[Recipe 26.3](#) on creating a JavaBean as a web-page parser; [Recipe 26.4](#) and [Recipe 26.5](#) on using the bean with a servlet and a JSP, respectively.

[\[Team LiB \]](#)

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Recipe 26.3 Creating a JavaBean as a Web Page Parser

Problem

You want to create a JavaBean that web components can use to parse an HTML page.

Solution

Use the Java API classes for parsing HTML from the `javax.swing.text` subpackages. Store the JavaBean in *WEB-INF/classes* or in a JAR placed inside *WEB-INF/lib*.

Discussion

[Example 26-4](#) is a JavaBean whose sole purpose is to parse a web page for live stock quotes. A servlet or JSP can use this JavaBean for its special purpose, and thus avoid the clutter of taking on the parsing responsibility itself. All of the code, including the inner class representing a `ParserCallback`, is reproduced from this chapter's earlier recipes. What's new is the setter or mutator method for the bean's stock symbol: `setSymbol(String symbol)`.

Example 26-4. A JavaBean for use with servlets and JSPs

```
package com.jspervletcookbook;

import java.io.BufferedReader;
import java.io.IOException;
import java.io.InputStreamReader;
import java.net.URL;
import java.net.MalformedURLException;

import javax.swing.text.html.HTMLEditorKit.ParserCallback;
import javax.swing.text.MutableAttributeSet;
import javax.swing.text.html.parser.ParserDelegator;

public class StockPriceBean {

    private static final String urlBase = "http://finance.yahoo.com/" +
        "q?d=t&s=";

    private BufferedReader webPageStream = null;

    private URL stockSite = null;
```

```
private ParserDelegator htmlParser = null;

private MyParserCallback callback = null;

private String htmlText = "";
private String symbol = "";
private float stockVal = 0f;

public StockPriceBean( ) {}

//Setter or mutator method for the stock symbol
public void setSymbol(String symbol){
    this.symbol = symbol;
}

class MyParserCallback extends ParserCallback {

    //bread crumbs that lead us to the stock price
    private boolean lastTradeFlag = false;
    private boolean boldFlag = false;

    public MyParserCallback( ){
        //Reset the enclosing class' instance variable
        if (stockVal != 0)
            stockVal = 0f;
    }

    public void handleStartTag(javax.swing.text.html.HTML.Tag t,
        MutableAttributeSet a,int pos) {
        if (lastTradeFlag && (t == javax.swing.text.html.HTML.Tag.B )){
            boldFlag = true;
        }

    }

    //handleStartTag

    public void handleText(char[] data,int pos){
        htmlText = new String(data);
        if (htmlText.indexOf("No such ticker symbol.") != -1){
            throw new IllegalStateException(
                "Invalid ticker symbol in handleText( ) method.");
        } else if (htmlText.equals("Last Trade:")){
            lastTradeFlag = true;
        } else if (boldFlag){
            try{

                stockVal = new Float(htmlText).floatValue( );
            } catch (NumberFormatException ne) {
                try{
                    // tease out any commas in the number using
                    //NumberFormat
                    java.text.NumberFormat nf = java.text.NumberFormat.
```

```

        getInstance( );
        Double f = (Double) nf.parse(htmlText);
        stockVal = (float) f.doubleValue( );
    } catch (java.text.ParseException pe){
        throw new IllegalStateException(
            "The extracted text " + htmlText +
            " cannot be parsed as a number!");
    } //try
} //try

lastTradeFlag = false;
boldFlag = false;

    } //if
} //handleText

} //MyParserCallback

public float getLatestPrice( ) throws IOException, MalformedURLException {
    stockSite = new URL(urlBase + symbol);
    webPageStream = new BufferedReader(new InputStreamReader(stockSite.
        openStream( )));
    htmlParser = new ParserDelegator( );
    callback = new MyParserCallback( ); //ParserCallback
    synchronized(htmlParser){
        htmlParser.parse(webPageStream, callback, true);
    } //synchronized
    //reset symbol
    symbol = "";
    return stockVal;
} //getLatestPrice

} //StockPriceBean

```

This bean resets the symbol instance variable to the empty `String` when it's finished fetching the stock quote. The `MyParserCallback` class resets the `stockVal` instance variable to 0, so that the previously attained stock price does not linger between different thread's calls to `getLatestPrice()`.

Now let's see how a servlet and JSP use the bean.

See Also

[Recipe 26.4](#) on using this JavaBean in a servlet; [Recipe 26.5](#) on using the bean in a JSP.

[\[Team LiB \]](#)

[\[Team LiB \]](#)

Recipe 26.4 Using the Web Page Parsing JavaBean in a Servlet

Problem

You want to use the JavaBean for parsing HTML in a servlet.

Solution

Create an instance of the bean in the appropriate service method (e.g., `doGet()` or `doPost()`) and call its methods.

Discussion

The JavaBean has to be available to the servlet, and therefore stored in *WEB-INF/classes*, including subdirectories that match the bean's package name. The JavaBean can also be stored in a JAR inside of *WEB-INF/lib*.

Since the JavaBean in [Example 26-5](#) shares the servlet's package (`com.jspervletcookbook`), the servlet class does not have to import the bean class.

If the JavaBean resides in a different package in the web application, then the servlet has to include an import statement such as the following example:

```
import com.parkerriver.beans.BeanParserServlet;
```

The `doGet()` method provides an HTML form for entering a stock symbol (such as "intc"). The `doPost()` method then creates an instance of the `StockPriceBean`, calls the bean's `setSymbol()` method, and finally displays the stock price by calling the bean's `getLatestPrice()` method.

Example 26-5. A servlet uses a specially designed JavaBean to get a live stock quote

```
package com.jspervletcookbook;

import java.io.IOException;
import java.io.PrintWriter;

import javax.servlet.*;
```



```

import javax.servlet.http.*;

public class BeanParserServlet extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        //set the MIME type of the response, "text/html"
        response.setContentType("text/html");

        //use a PrintWriter send text data to the client
        java.io.PrintWriter out = response.getWriter( );

        //Begin assembling the HTML content
        out.println("<html><head>");
        out.println("<title>Stock Price Fetcher</title></head><body>");
        out.println("<h2>Please submit a valid stock symbol</h2>");

        //make sure method="POST" so that the servlet service method
        //calls doPost in the response to this form submit
        out.println(
            "<form method=\" POST \" action =\"\" + request.getContextPath( ) +
              \"/stockbean\" >");

        out.println("<table border=\"0\"><tr><td valign=\"top\">");
        out.println("Stock symbol: </td> <td valign=\"top\">");
        out.println("<input type=\"text\" name=\"symbol\" size=\"10\">");
        out.println("</td></tr><tr><td valign=\"top\">");
        out.println("<input type=\"submit\" value=\"Submit Info\"></td></tr>");
        out.println("</table></form>");
        out.println("</body></html>");

    } //doGet

    public void doPost(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        String symbol;//this will hold the stock symbol

        float price = 0f;

        symbol = request.getParameter("symbol");

        boolean isValid = (symbol == null || symbol.length( ) < 1) ?
            false : true;

        //set the MIME type of the response, "text/html"
        response.setContentType("text/html");

```

```

//use a PrintWriter send text data to the client
java.io.PrintWriter out = response.getWriter( );

    //Begin assembling the HTML content
out.println("<html><head>");
out.println("<title>Latest stock value</title></head><body>");

    if (! isValid){
        out.println(
            "<h2>Sorry, the stock symbol parameter was either empty "+
            "or null</h2>");
    } else {
        out.println("<h2>Here is the latest value of "+ symbol + "</h2>");
        StockPriceBean spbean = new StockPriceBean( );
        spbean.setSymbol(symbol);
        price = spbean.getLatestPrice( );
        out.println( (price==0? "The symbol is probably invalid." :
            ""+price) );
    } //if
out.println("</body></html>");
} // doPost
} //HttpServlet

```

The servlet's HTML form (generated by the `doGet()` method) and the stock price display (generated by `doPost()`) has the same web browser display as the one shown in Figures [Figure 26-1](#) and [Figure 26-2](#).

See Also

[Recipe 26.3](#) on creating a JavaBean as a web page parser; [Recipe 26.5](#) on using a web page parsing JavaBean in a JSP.

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Recipe 26.5 Using the Web Page Parsing JavaBean in a JSP

Problem

You want to use a JavaBean and JSP to harvest information from a web page.

Solution

Use the `jsp:useBean` standard action to create an instance of the bean.

Discussion

The same JavaBean that prior recipes created and stored in the web application in *WEB-INF/classes* can be used by a JSP. The JSP in [Example 26-6](#) uses `jsp:useBean` to create an instance of the bean named `priceFetcher`. If the request does not contain a symbol parameter, the JSP displays the HTML form shown in [Figure 26-1](#).

The JSP uses the JSTL core tags to generate this conditional behavior. These tags include `c:choose`, `c:when`, and `c:otherwise`.

If the request to the JSP contains a symbol parameter, the JSP sets the `priceFetcher`'s `symbol` property to the value of this request parameter. This code is the equivalent of calling the bean's `setSymbol()` method; it passes the name of the stock symbol to the bean so that it can grab a live stock quote from the web page.

Example 26-6. A JSP uses `jsp:useBean` to employ a web-harvesting JavaBean

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<jsp:useBean id="priceFetcher" class=
    "com.jspservletcookbook.StockPriceBean" />

<html>
<head><title>Price Fetch</title></head>
<body>

<c:choose>
```

```
<c:when test="\${empty param.symbol}">

    <h2>Please submit a valid stock symbol</h2>

    <form method="POST" action =
        '<c:out value="\${pageContext.request.contextPath}" />/priceFetch.jsp'>

        <table border="0"><tr><td valign="top">Stock symbol: </td>
        <td valign="top">
            <input type="text" name="symbol" size="10"></td></tr>
        <tr><td valign="top">
            <input type="submit" value="Submit Info"></td></tr>
        </table></form>

    </c:when>

    <c:otherwise>

        <h2>Here is the latest value of <c:out value="\${param.symbol}" /></h2>

        <jsp:setProperty name="priceFetcher" property="symbol" value=
            "<%= request.getParameter(\"symbol\") %>" />

        <jsp:getProperty name="priceFetcher" property="latestPrice"/>

    </c:otherwise>

</c:choose>

</body>
</html>
```

Now that the JSP has seeded the bean with the stock symbol, this code will call the bean's `getLatestPrice()` method:

```
<jsp:getProperty name="priceFetcher" property="latestPrice"/>
```

The JSP's output replaces the `jsp:getProperty` standard action with the stock price, as long as the stock symbol sent to the bean with `jsp:setProperty` was valid.

The output of the JSP in [Example 26-6](#) looks just like the output shown in Figures [Figure 26-1](#) and [Figure 26-2](#).

See Also

[Chapter 23](#) on the JSTL; [Recipe 26.4](#) on using a web page parsing JavaBean in a servlet.

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Chapter 27. Using the Google and Amazon Web APIs

[Introduction](#)

[Recipe 27.1. Getting Set Up with Google's Web API](#)

[Recipe 27.2. Creating a JavaBean to Connect with Google](#)

[Recipe 27.3. Using a Servlet to Connect with Google](#)

[Recipe 27.4. Using a JSP to Connect with Google](#)

[Recipe 27.5. Getting Set Up with Amazon's Web Services API](#)

[Recipe 27.6. Creating a JavaBean to Connect with Amazon](#)

[Recipe 27.7. Using a Servlet to Connect with Amazon](#)

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Introduction

Google and Amazon.com are both early adopters in the emerging field of web services.

Google is a giant web search engine and directory. Amazon.com is a e-commerce web site that began as an online bookstore and has since branched out into numerous products such as software and electronics. Both sites separately offer software developers web services Application Programming Interfaces (APIs) that give you the ability to manage Google searches using Java objects and access Amazon's comprehensive product catalogs with your Java code.

For us Java developers, web services means making requests and receiving responses using a special XML format. In other words, you make a request using XML elements and attributes in text form, and receive a response in the same format. Web services typically use an XML-based protocol named Simple Object Access Protocol (SOAP) to transfer information.

In a nutshell, SOAP represents the abstraction of an envelope, that in turn contains optional headers and the message body. The message, composed of its outer envelope, as well as the headers and body, is made up of XML elements that are associated with specified namespaces. The technologies this chapter describes use HTTP to carry these XML-based SOAP messages.

I never really understood SOAP messages until I looked at some samples. [Example 27-1](#) is part of a SOAP response to an Amazon Web Services keyword-search request using the query "Lance Armstrong."

The response is an XML file composed of a `ProductInfo` root element, which contains one or more `Details` elements. Each one of these `Details` represents a book from Amazon's catalog (I omitted all but one of the `Details` elements, just to make the sample easier to view). Only one of the returned books is shown.

Example 27-1. A SOAP response from Amazon Web Services based on a search for the terms "Lance Armstrong"

```
<?xml version="1.0" encoding="UTF-8"?>

<!DOCTYPE ProductInfo PUBLIC "-//Amazon.com //DTD Amazon Product Info//EN"
"http://xml.amazon.com/schemas/dev-lite.dtd">

<ProductInfo xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:noNamespaceSchemaLocation=
    "http://xml.amazon.com/schemas/dev-lite.xsd">

  <Details url=
    "http://www.amazon.com/exec/obidos/ASIN/0399146113/webservices-20?
    dev-t=DCJEAVXSdVPUD%26camp=2025%26link_code=xm2">

    <Asin>0399146113</Asin>
    <ProductName>It's Not About the Bike: My Journey Back to Life
```

```
</ProductName>
<Catalog>Book</Catalog>
<Authors>
  <Author>Lance Armstrong</Author>
  <Author>Sally Jenkins</Author>
</Authors>
<ReleaseDate>June, 2000</ReleaseDate>
<Manufacturer>Putnam Pub Group</Manufacturer>

  <ImageUrlSmall>
http://images.amazon.com/images/P/0399146113.01.THUMBZZZ.jpg
  </ImageUrlSmall>

  <ImageUrlMedium>
http://images.amazon.com/images/P/0399146113.01.MZZZZZZZ.jpg
  </ImageUrlMedium>

  <ImageUrlLarge>
http://images.amazon.com/images/P/0399146113.01.LZZZZZZZ.jpg
  </ImageUrlLarge>

  <ListPrice>$24.95</ListPrice>
  <OurPrice>$17.47</OurPrice>
  <UsedPrice>$9.99</UsedPrice>
```

```
</Details>
```

```
</ProductInfo>
```

Three principal reasons for adopting SOAP-based web services are:

1. SOAP is standards-based, so you can use any technology that has developed a SOAP API or toolkit, including Java, .NET, Perl, and Python. Object-oriented technologies (like Java) allow you to build and read SOAP messages using objects, instead of having to deal with raw XML, which can make web services gratifying to work with.
2. Web services represent interoperability between technologies. A server that is using J2EE technologies such as servlets and JSPs can easily exchange messages with a server running .NET, because they speak the same language: SOAP and XML.
3. SOAP messages can easily be exchanged between web servers without running afoul of the limitations of firewalls, because the messages are made of up XML text and carried by HTTP (in a very general way, just like an HTML page). Developers are embracing SOAP as an easier form of distributed computing: it allows an object residing in the memory of one server to call methods on one or more objects residing on distant computers by exchanging SOAP messages.

A recipe introduction cannot do justice to a complicated topic such as SOAP, but there are plenty of books and free tutorials on this topic (see this chapter's "See Also" sections for some suggestions).

Mostly in a beta stage of development, the Amazon and Googleweb services APIs allow a Java program to create very useful and complex systems that interact with Amazon and Google. The Amazon and Google web services programs are designed to familiarize developers with these new

ways of handling requests and responses to the two popular web destinations.

The programs generally involve creating a developer's account and receiving a key, or token, that will accompany each one of your requests to these sites. This chapter describes how to get set up with using Amazon and Google web services, then shows you how to integrate these APIs with a servlet and JSP.

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Recipe 27.1 Getting Set Up with Google's Web API

Problem

You want to use Google's Web API to make Java-enabled searches of Google's vast web index.

Solution

Download the Google Web APIs SDK. Create a Google account and get a license key that allows the use of Google's Web API.

Discussion

The Google Web APIs SDK includes an archive named *google.jar*. This file contains the classes that your program will use to connect with Google during searches. Here are the specific steps you take to prepare the web application for connecting with Google:

1. Download the zipped SDK from <http://www.google.com/apis/download.html>. Unpack this file into a directory (named *googleapi* in Beta Version 3.0 of the Google Web APIs). This directory contains *google.jar*, along with a lot of code samples and documentation.
2. Create a Google account and get a license key, which is encoded text that looks like "5W1ABCyzPSyl3rIa5Pt3DtXMatsdzaSGB." Your Java code uses this key when it queries Google's index. The query will fail if it is not accompanied by a valid key.
3. Place the *google.jar* file in the *WEB-INF/lib* directory of the web application.
4. Develop your Java classes for connecting with Google, using the `com.google.soap.search` package from the *google.jar* file.

See Also

The home for the Google Web APIs: <http://www.google.com/apis/>; the Google web APIs SDK: <http://www.google.com/apis/download.html>.

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Recipe 27.2 Creating a JavaBean to Connect with Google

Problem

You want to use Google's Web APIs to make Java-enabled searches to Google's site.

Solution

Create a JavaBean so that you can use the bean in both a servlet and JSP.

Discussion

The first thing to do is get set up with a Google Web Services account, as described in Recipe 27.1. Now create a JavaBean that will make keyword searches of Google and return the results.

Example 27-2 first imports the package contained in *googleapi.jar*: `com.google.soap.search`. Remember, you stored that JAR file in *WEB-INF/lib*. This means that the web application can find the Java classes in that package and the `GoogleBean` in Example 27-2 can use it.

Example 27-2. A JavaBean that searches Google's web database

```
package com.jspervletcookbook;

import com.google.soap.search.*;

public class GoogleBean {

    private GoogleSearch search;
    private GoogleSearchResult googleRes;
    private final static String GOOGLE_KEY =
        "5W1BWPyzPSyI3rIa5Pt3DtXMatsniSGB";

    private String lineSep = "\n";

    //Settable bean properties
    private String query;
    private boolean filter;
    private int maxResults;
    private int startRes;
    private boolean safeSearch;
    private String restrict;
    private String langRestrict;

    public GoogleBean( ){ //No-arguments constructor for the bean
```

```

        query = "";
        restrict = "";
        langRestrict = "";
    }

    public String structureResult(GoogleSearchResult res){
        //Each GoogleSearchResultElement
        GoogleSearchResultElement[] elements = res.getResultElements( );
        String url = "";
        String results = "Estimated total results count: " +
            res.getEstimatedTotalResultsCount( ) + lineSep + lineSep;

        for (int i = 0; i < elements.length; i++){
            url = elements[i].getURL( );
            results += ("Title: " + elements[i].getTitle( ) + lineSep +
                "URL: <a href=\"\" + url + "\">" + url + "</a>" + lineSep +
                "Summary: " + elements[i].getSummary( ) + lineSep +
                "Snippet: " + elements[i].getSnippet( ) + lineSep + lineSep);
        }
        return results;
    }

    public String getSearchResults( ) throws GoogleSearchFault {

        search = new GoogleSearch( );
        search.setKey(GOOGLE_KEY);
        search.setFilter(filter);
        if(restrict.length( ) > 0)
            search.setRestrict(restrict);
        search.setQueryString(query);
        googleRes = search.doSearch( );
        return structureResult(googleRes);
    }

    public void setLineSep(String lineSep){
        this.lineSep=lineSep;
    }
    public String getLineSep( ){
        return lineSep;
    }
    public void setQuery(String query){
        this.query = query;
    }

    public String getQuery( ){
        return query;
    }

    public void setRestrict(String query){
        this.restrict = restrict;
    }

```

```

public String getRestrict( ){
    return restrict;
}

public void setLangRestrict(String langRestrict){

    this.langRestrict = langRestrict;
}

public String getLangRestrict( ){
    return langRestrict;
}

public void setFilter(boolean filter){
    this.filter = filter;
}

public boolean getFilter( ){
    return filter;
}

public void setSafeSearch(boolean safeSearch){
    this.safeSearch = safeSearch;
}

public boolean getSafeSearch( ){
    return safeSearch;
}

public void setMaxResults(int maxResults){
    this.maxResults = maxResults;
}

public int getMaxResults( ){
    return maxResults;
}

public void setStartRes(int startRes){
    this.startRes = startRes;
}

public int getStartRes( ){
    return startRes;
}
} //GoogleBean

```

The interesting action in Example 27-2 occurs in the methods `getSearchResults()` and `structureResults()`.

In `getSearchResults()`, the code creates a `GoogleSearch` object, which is then customized with Google search options before the `GoogleSearch doSearch()` method is called. The `GoogleSearch` object uses setter methods to design a specific *google.com* search. For example, the

`setQueryString()` method provides the user's search terms. The Java objects that are using the bean provides the search terms by calling the bean's `setQuery()` method.



You can set the various options for Google searches by calling the `GoogleSearch` setter methods. For example, calling `setFilter(true)` filters out all the results that derive from the same web host. And you can restrict the search to specific Google subsites by calling `setRestrict("mac")`. See <http://www.google.com/apis/reference.html>.

Every SOAP-related search of Google must call the `GoogleSearch setKey()` method with the proper license key, or the search is rejected.

The `structureResults()` method formats the search results. Google search results are encapsulated by a `GoogleSearchResult` object. This object contains an array of `GoogleSearchResultElement` objects, which represent each URL that the Google search has returned. The `GoogleSearchResult getResultElements()` method returns the `GoogleSearchResultElement` array.

The code then iterates through the `array`. Each returned element (the `GoogleSearchResultElement` object) has getter or accessor methods that provides information about the web-page search result:

- `getURL()` returns the URL of the found item
- `getTitle()` returns the title of the found HTML page
- `getSnippet()` returns a snippet (a small, possibly ambiguous, piece of text from the web page)
- `getSummary()` returns a text summary of the found web page

The bean uses these methods to display the URL, title, snippet, and summary of each web page the search returns. Figure 27-2 shows how these results are displayed.

See Also

The home for Google Web Service: <http://www.google.com/apis/>; the Google Web APIs SDK: <http://www.google.com/apis/download.html>; Recipe 27.1 on setting up your programming environment for use with the Google Web APIs.

[Team LiB]

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Recipe 27.3 Using a Servlet to Connect with Google

Problem

You want to connect to Google with a servlet and initiate a search.

Solution

Use the JavaBean described in [Recipe 27.2](#) as a Google search utility class.

Discussion

The servlet in [Example 27-3](#) uses the `GoogleBean` from [Recipe 27.2](#) to initiate *google.com* searches and display the results.

The servlet displays an HTML form in its `doGet()` method. The client uses this form to input Google search parameters, and then `POST` the form parameters back to the same servlet. Finally, the servlet's `doPost()` method creates an instance of the `GoogleBean` to initiate the search. In this case, use the deployment descriptor to map any requests of the form `"/googleservlet"` to [Example 27-3](#).

Example 27-3. A servlet uses a special JavaBean to search Google and display any results

```
package com.jspervletcookbook;

import java.io.IOException;
import java.io.PrintWriter;

import javax.servlet.*;
import javax.servlet.http.*;

public class GoogleServlet extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        response.setContentType("text/html");

        java.io.PrintWriter out = response.getWriter( );
```

```

out.println("<html><head>");
out.println("<title>Initiate a Google Search</title></head><body>");
out.println("<h2>Please enter your search terms</h2>");

```

```

//Make sure method="POST" so that the servlet service method
//calls doPost in the response to this form submit
out.println(
    "<form method=\"POST\" action =\"" + request.getContextPath( ) +
    "/googleservlet\" >");

```

```

out.println("<table border=\"0\"><tr><td valign=\"top\">");
out.println("Search terms: </td> <td valign=\"top\">");
out.println("<input type=\"text\" name=\"query\" size=\"15\">");
out.println("</td></tr><tr><td valign=\"top\">");
    out.println(
"Restrict to Google sub-site... </td> <td valign=\"top\">");
out.println(
    "<select name=\"restrict\"><option>unclesam</option>"+
    "<option>linux</option><option>mac</option><option>bsd</option>"+
    "</select>");
out.println("</td></tr><tr><td valign=\"top\">");
out.println(
"<input type=\"submit\" value=\"Submit Info\"></td></tr>");
out.println("</table></form>");
out.println("</body></html>");
} //doGet

```

```

public void doPost(HttpServletRequest request,
    HttpServletResponse response)
    throws ServletException, java.io.IOException{

```

```

    String query = request.getParameter("query");
    String restrict = request.getParameter("restrict");
    boolean isValid = (query == null || query.length( ) < 1) ?
        false : true;

```

```

//set the MIME type of the response, "text/html"
response.setContentType("text/html");

```

```

java.io.PrintWriter out = response.getWriter( );

```

```

out.println("<html><head>");
out.println("<title>Google results</title></head><body>");

```

```

if (! isValid){
    out.println(
        "<h2>Sorry, the query parameter was either empty or null</h2>");
    } else {
        out.println("<h2>Here are your search results</h2>");
        GoogleBean gb = new GoogleBean( );
        gb.setFilter(true);

```



```
        //Configure for web display
        gb.setLineSep("<br />");
        if (restrict != null && restrict.length( ) > 0)
            gb.setRestrict(restrict);
        gb.setQuery(query);
        try {
            out.println( gb.getSearchResults( ) );
        } catch (Exception e){
            throw new ServletException( e.getMessage( ) );
        }
    } //if
    out.println("</body></html>");

} // doPost
} //GoogleServlet
```

Using the `GoogleBean` class in `doPost()` is straightforward. The code sets a few search options (such as `setFilter(true)`), then calls the bean's `getSearchResults()` method. This method returns a `String` of formatted search results, which the servlet's `PrintWriter` sends to the browser for display.

[Figure 27-1](#) shows the simple HTML form displayed in the servlet's `doGet()` method.

Figure 27-1. Enter keywords to search Google with a servlet

The "Restrict to Google sub-site . . ." part allows the user to choose one of none, unclesam, linux, mac, or bsd. The user enters the search term "Lance Armstrong" in the HTML form's text field, then presses the "Submit Info" button. [Figure 27-2](#) shows the search results displayed by the servlet's `doPost()` method.

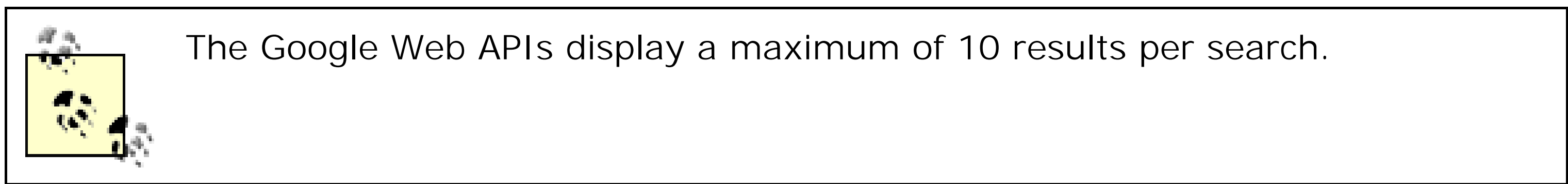
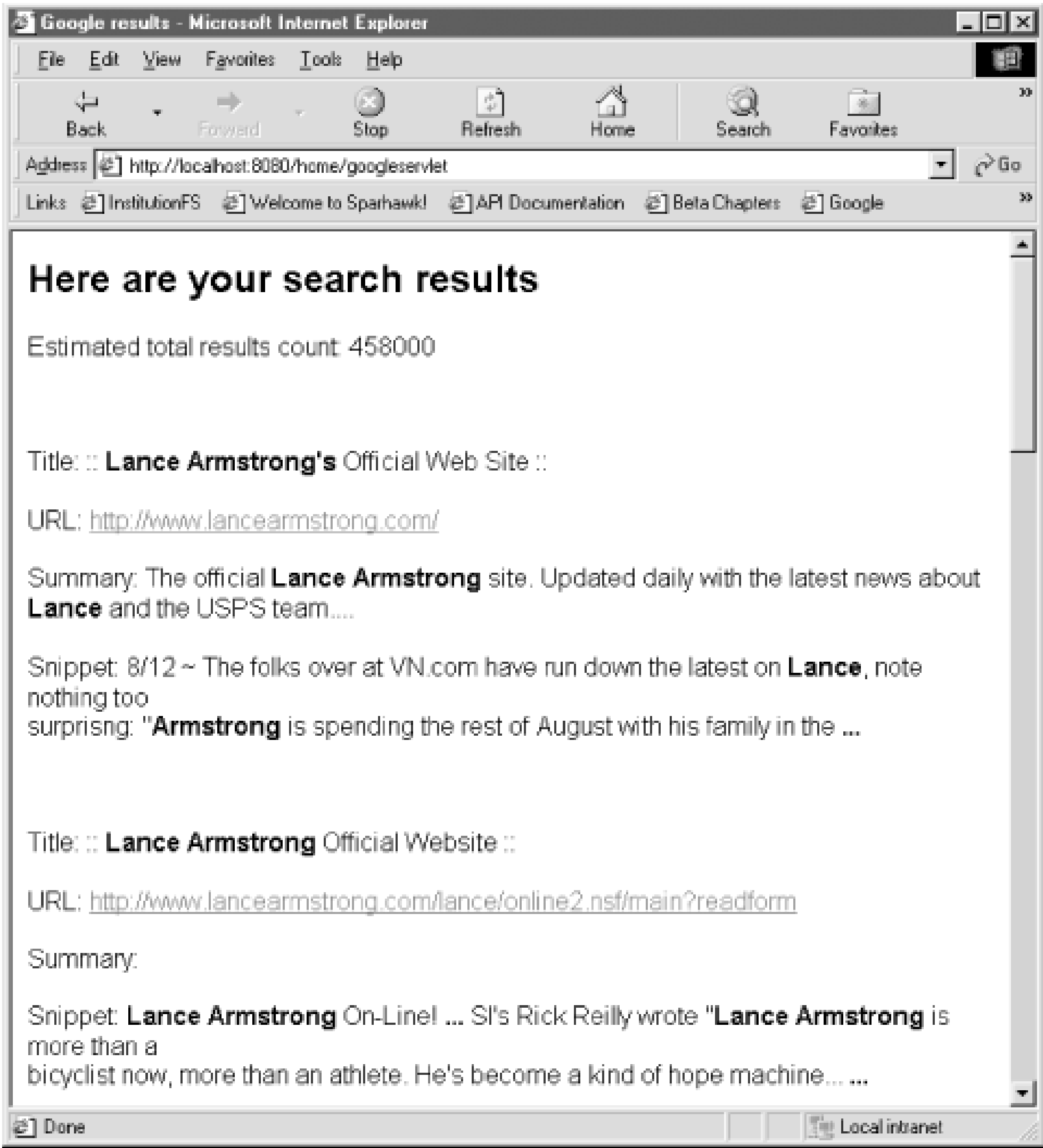


Figure 27-2. A servlet using the Google Web API s displays some search results



See Also

The home for Google Web Service: <http://www.google.com/apis/>; the Google Web APIs SDK: <http://www.google.com/apis/download.html>; [Recipe 3.1](#) on mapping a servlet to a name in *web.xml*; [Recipe 27.1](#) on setting up your programming environment for use with the Google Web APIs; [Recipe 27.4](#) on using a JSP to connect with Google web services.

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Recipe 27.4 Using a JSP to Connect with Google

Problem

You want to search Google using the Google Web APIs and a JSP.

Solution

Use the `jsp:useBean` standard action to get access to the `GoogleBean` from [Example 27-2](#), then use this bean instance to connect with Google's web tools.

Discussion

The JSP in [Example 27-4](#) uses the JSTL core tags to determine if the user has sent a search query along with their request. If the query request parameter is empty, then the JSP displays a form (see [Figure 27-1](#)). See [Chapter 23](#) for details on the JSTL core tags.

If the request parameter is filled by a search query, the JSP uses the `GoogleBean` to search *google.com* and display the results. The JSP uses the `jsp:useBean` standard action to create an instance of the bean, which is stored in the *WEB-INF/lib* directory.

Example 27-4. A JSP uses a JavaBean to search google.com

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<html>
<head><title>Search Google from a JSP</title></head>
<body>

<c:choose>

    <c:when test="${empty param.query}">

        <h2>Please enter your search terms...</h2>

        <%-- Display the HTML form... --%>

        <form method="POST" action = '<c:out value=
"${pageContext.request.contextPath}" />/google.jsp'>
```

```
<table border="0">

<tr><td valign="top">

Search terms: </td> <td valign="top">
<input type="text" name="query" size="15">
</td></tr>

<tr><td valign="top">
Restrict to Google sub-site... </td> <td valign="top">

<select name="restrict">
<option selected>none</option><option>unclesam</option>
<option>linux</option>
<option>mac</option><option>bsd</option></select>
</td></tr>

<tr><td valign="top">
<input type="submit" value="Submit Info"></td></tr>
</table></form>

<%-- End of the HTML form... --%>

</c:when>

<c:otherwise>

<%-- Create an instance of the GoogleBean --%>
<jsp:useBean id="gBean" class="com.jspervletcookbook.GoogleBean" />

<h2>Here are your search results</h2>

<%-- Set the query, restrict, and lineSep properties of the GoogleBean --%>

<jsp:setProperty name="gBean" property="query" param="query"/>
<jsp:setProperty name="gBean" property="restrict" param="restrict"/>
<jsp:setProperty name="gBean" property="lineSep" value="<br /><br />"/>

<%-- Now display any results of the search --%>

<jsp:getProperty name="gBean" property="searchResults" />

</c:otherwise>

</c:choose>

</body>
</html>
```

The JSP uses the `jsp:setProperty` standard action to the bean instance's `query`, `restrict`, and `lineSep` properties. The `query` represents the search terms; `restrict` can have values of `mac`, `linux`, `bsd`, or `unclesam`, representing various Google sub-sites, and the `lineSep` property determines

the line-separation characters to use when formatting the results (
 in this example).

Finally, the code uses `jsp:getProperty` to effectively call the `GoogleBean's getSearchResults()` method, which sends a SOAP message to Google and formats the response.

See Also

The home for Google Web Service: <http://www.google.com/apis/>; the Google web APIs SDK: <http://www.google.com/apis/download.html>; [Recipe 27.1](#) on setting up your programming environment for use with the Google Web APIs; [Recipe 27.3](#) on using a servlet to connect with Google web services.

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Recipe 27.5 Getting Set Up with Amazon's Web Services API

Problem

You want to connect to Amazon Web Services (AWS) with a servlet or JSP.

Solution

Download the Amazon Web Services SDK, acquire an Amazon developer's token, and create a Java-SOAP package for interacting with AWS.

Discussion

The process for setting up AWS goes like this:

1. Download the AWS SDK at http://www.amazon.com/gp/aws/download_sdk.html/002-2688331-0628046. This *kit.zip* file includes several code samples and web services API documentation in HTML format.
2. Acquire a developer's token from: <http://associates.amazon.com/exec/panama/associates/join/developer/application.html/002-2688331-0628046>. Similar to the license key you use with Google's Web APIs, the free-of-charge token comprises a series of encoded characters that must accompany each interaction between your Java code and AWS.
3. Develop the Java API for making SOAP requests to AWS. The end result is a JAR file containing the classes that your servlets or JSPs use to make SOAP requests. The rest of this recipe describes how to generate this JAR file, because it is a multistep process.

Interacting with AWS using SOAP messages is one option that Amazon makes available to developers. Another one involves encoding the web services requests in URLs, and thereby making AWS requests via HTTP (called "XML over HTTP"). Recipe 27-7 shows an example of this URL search (they are useful for debugging your SOAP applications). If you store an XSLT file on the Web, AWS uses this file to format the response to XML-over-HTTP requests. See the SDK documentation for more details.

SOAP with Apache Axis

The creation of a Java-SOAP API for using AWS begins with downloading an open source SOAP toolkit named Apache Axis (<http://ws.apache.org/axis/>). Here are the steps involved in creating the API:

1. Download Axis and extract the Axis ZIP file to the directory of your choice (this creates a directory named *axis-1_1*).
2. Inside the *axis-1_1/lib* directory are several JAR files. Place these JAR files on your classpath and then run a program named `org.apache.axis.wsdl.WSDL2Java` to generate Java source files. These Java source files comprise the Java API you will use with AWS when you compile the files.
3. Download the Web Services Description Language (WSDL) file associated with the Amazon Web Services. At this writing, the file can be found at:
<http://soap.amazon.com/schemas3/AmazonWebServices.wsdl>.
4. The following command line generates the `com.amazon.soap.axis` package for your Java API. The command lines in this recipe work on both Windows- and Unix-based machines. The command line is designed to refer to the *AmazonWebServices.wsdl* file in the current directory. The `WSDL2Java` program generates Java classes based on the XML elements described by the WSDL XML file (XML-to-Java conversion). This allows you to work with AWS using only Java objects, which is very nice-it's why you are enduring the initial pain of creating these Java classes! Break up this command line into separate lines to make it more readable, but when you actually run it, the commands must all be combined on one line:

```
java -cp .;lib/axis.jar;lib/commons-discovery.jar;lib/commons-logging.jar;lib/jaxrpc.jar;lib/saaj.jar;lib/wsdl4j.jar
    org.apache.axis.wsdl.WSDL2Java AmazonWebServices.wsdl --verbose
    --package com.amazon.soap.axis
```

5. This command line generates Java source files in a directory tree that matches the specified package name (`com.amazon.soap.axis`). Now you have to compile these classes with the *javac* tool, as in the following command line (the current directory contains the *com* directory). Once again, we break up this single-line command into separate lines just for the sake of readability (you have to run the command line unbroken by any newline characters):

```
javac -classpath .;lib/axis.jar;lib/commons-discovery.jar;lib/commons-logging.jar;lib/jaxrpc.jar;lib/saaj.jar;lib/wsdl4j.jar
    com/amazon/soap/axis/*.java
```

6. Now JAR up all these files. In the same directory containing the top-level *com* directory, this command creates a JAR file named *amazonapi.jar*, which is just a name I created for it:

```
jar cvf amazonapi.jar ./com
```

7. Take the *amazonapi.jar* (or whatever you've named the JAR file) and place it in *WEB-INF/lib*. There's one more step left.

8. Make sure that the JAR files or libraries that the `com.amazon.soap.axis` package depends on are also available to the web application. The *amazonapi.jar* file depends on the same Axis libraries that you added to the class path in the prior *java* and *javac* command-line sequences. You have to add these JARs to *WEB-INF/lib* as well (unless your application server makes all of these libraries generally available to web applications).

Okay, now for the fun part, where your Java code gets to explore books and other stuff at Amazon using servlets. Your servlets should use the `com.amazon.soap.axis` package for this purpose.

See Also

The AWS SDK http://www.amazon.com/gp/aws/download_sdk.html/002-2688331-0628046; Apache Axis: <http://ws.apache.org/axis/>; the Amazon Web Services WSDL file: <http://soap.amazon.com/schemas3/AmazonWebServices.wsdl>.

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Recipe 27.6 Creating a JavaBean to Connect with Amazon

Problem

You want to create a JavaBean as a type of Amazon search utility class.

Solution

Set up your Amazon API as described in [Recipe 27.5](#), then code a JavaBean that uses the `com.amazon.soap.axis` package from this API.

Discussion

The JavaBean in [Example 27-5](#), named `AmazonBean`, imports the `com.amazon.soap.axis` package. This package is stored in *amazonapi.jar*, which (generated by [Recipe 27.5](#)). Store the JAR in the web application's *WEB-INF/lib* directory and the `AmazonBean` in *WEB-INF/classes* (or also in a JAR in *WEB-INF/lib*).

[Example 27-5](#) connects with Amazon in its `getSearchResults()` method. The `AmazonBean` formats and displays the search results in `structureResults()`. The code comments describe what's going on in detail.

Example 27-5. A JavaBean class that searches Amazon

```
package com.jspServletcookbook;

import java.net.URL;

import com.amazon.soap.axis.*;

public class AmazonBean {

    //The developer's token
    private final static String AMAZON_KEY = "DCJEAVDSXVPUD";

    //NOTE: AWS Version 3 uses "http://xml.amazon.com/xml3"
    private final static String END_POINT =
        "http://soap.amazon.com/onca/soap";

    private final static String AMAZON_TAG = "webservices-20";
```

```

private URL endpointUrl;

private String lineSep = "\n";
private String totalResults;
private String keyword;
private String page;
private String type;
private String mode;

public AmazonBean( ){//no-arguments constructor required for a bean

//an easy way to test the bean outside of a servlet
public static void main(String[] args) throws Exception{

    AmazonBean bean = new AmazonBean( );
    bean.setKeyword("Lance%20Armstrong");
    bean.setType("heavy");
    bean.setMode("books");
    bean.setPage("1");

    System.out.println( bean.getSearchResults( ) );
}

//Structure the search result as a String
public String structureResult(ProductInfo info){

    //Amazon searches return ProductInfo objects, which
    //contains array of Details object. A Details object
    //represents an individual search result
    Details[] details = info.getDetails( );

    String results = "";

    //each found book includes an array of authors in its Details
    String[] authors = null;

    String usedP = null;//UsedPrice object

    String rank = null;//SalesRank object

    //for each returned search item...
    for (int i = 0; i < details.length; i++){

        if(mode != null && mode.equals("books")){
            authors = details[i].getAuthors( ); }

        //Include the product name
        results +=
            "<strong>"+(i+1)+" . Product name:</strong> " +
            details[i].getProductName( ) + lineSep;

```

```

        //If they are books include each author's name
        if(mode != null && mode.equals("books")){

            for (int j = 0; j < authors.length; j++){
                results += "Author name " + (j+1) + ": " + authors[j] +
                    lineSep;
            } //for
        } //if

        usedP = details[i].getUsedPrice( ); //get the used price

        rank = details[i].getSalesRank( ); //get the sales rank

        results += "Sales rank: " + (rank == null ? "N/A" : rank) +
            lineSep + "List price: " + details[i].getListPrice( ) + lineSep +
            "Our price: " + details[i].getOurPrice( ) + lineSep +
            "Used price: " + (usedP == null ? "N/A" : usedP) + lineSep +
            lineSep;

    }

    return results;

} //structureResult

//Connect with Amazon Web Services then call structureResult( )
public String getSearchResults( ) throws Exception{

    endpointUrl = new URL(END_POINT);
    AmazonSearchService webService = new AmazonSearchServiceLocator( );
    //Connect to the AWS endpoint
    AmazonSearchPort port = webService.getAmazonSearchPort(endpointUrl);
    KeywordRequest request = getKeywordRequest( );
    //Return results of the search
    ProductInfo prodInfo = port.keywordSearchRequest(request);
    //Set totalResults with any provided results total
    setTotalResults( prodInfo.getTotalResults( ) );
    //Make sure the book-search results are structured and displayed
    return structureResult(prodInfo);

} //getSearchResults

//Setter and getter methods...

public void setLineSep(String lineSep){
    this.lineSep=lineSep;
}

public String getLineSep( ){
    return lineSep;
}

```

```
//A KeywordRequest object initialized with search terms, the mode, the
//number of pages to be returned, the type ('lite' or 'heavy'), and the
//developer's token.
```

```
public KeywordRequest getKeywordRequest( ){
    KeywordRequest request = new KeywordRequest( );
    request.setKeyword(keyword);//the search terms
    request.setMode(mode);//the mode, as in 'books'
    request.setPage(page);//the number of pages to return
    request.setType(type);//the type, 'lite' or 'heavy'
    request.setDevtag(AMAZON_KEY);//developer's token
    request.setTag(AMAZON_TAG);//the tag, 'webservices-20'
    return request;
}
```

```
public void setKeyword(String keyword){
    this.keyword = keyword;
}
```

```
public String getKeyword( ){
    return keyword;
}
```

```
public void setMode(String mode){
    this.mode = mode;
}
```

```
public String getMode( ){
    return mode;
}
```

```
public void setPage(String page){
    this.page = page;
}
```

```
public String getPage( ){
    return page;
}
```

```
public void setType(String type){
    this.type = type;
}
```

```
public String getType( ){
    return type;
}
```

```
public void setTotalResults(String results){
    totalResults = results;
}
```



```
    public String getTotalResults( ) {  
        return totalResults;  
    }  
} //AmazonBean
```

The bean has a `main()` method that allows you to test the bean from the command line. Here is code from that method that creates a bean instance, searches for a book using the search terms "Lance Armstrong," and displays some results:

```
AmazonBean bean = new AmazonBean( );  
bean.setKeyword( "Lance%20Armstrong" );  
bean.setType( "heavy" );  
bean.setMode( "books" );  
bean.setPage( "1" );  
System.out.println( bean.getSearchResults( ) );
```

To run the bean from a command line, make sure include all of the necessary Axis-related libraries on your classpath (see [Recipe 27.5](#)). The following command line runs the bean to test it. Note that this command line includes the *amazonapi.jar* file generated by [Recipe 27.5](#):

```
java -cp .;jaxrpc.jar;axis.jar;amazonapi.jar;commons-logging.jar;commons-discovery.jar;saa.jar com.jspServletcookbook.AmazonBean
```

If you set the type option to heavy (as opposed to lite), then the search returns the book's sales rank at Amazon. The lite SOAP responses do not include a value for sales rank.

See Also

The AWS SDK http://www.amazon.com/gp/aws/download_sdk.html/002-2688331-0628046; [Recipe 27.7](#) on using a servlet and a JavaBean to connect with AWS.

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Recipe 27.7 Using a Servlet to Connect with Amazon

Problem

You want to connect with AWS using a servlet.

Solution

Use a specially designed JavaBean to perform the AWS-related tasks.

Discussion

[Example 27-6](#) uses the same design that the Google recipes used, so you should find this servlet code very familiar if you have worked through those examples before. The servlet generates an HTML form in response to a `GET` HTTP request, which sends the Amazon search terms back to the same servlet. The interesting action takes place in the `doPost()` method, where the servlet uses an `AmazonBean` class (from [Recipe 27.6](#)) to connect with AWS and display any search results.

Example 27-6. A servlet uses a JavaBean to connect with AWS

```
package com.jspervletcookbook;

import java.io.IOException;
import java.io.PrintWriter;

import javax.servlet.*;
import javax.servlet.http.*;

public class AmazonServlet extends HttpServlet {

    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException {

        //set the MIME type of the response, "text/html"
        response.setContentType("text/html");

        java.io.PrintWriter out = response.getWriter();

        //Begin assembling the HTML content
        out.println("<html><head>");
```

```

        out.println(
            "<title>Initiate an Amazon Book Search</title></head><body>");

        out.println("<h2>Please enter your Amazon search terms</h2>");

        //Display an HTML form that sends the request back to this
        //'amazonervlet' which will cause the calling of doPost( )

        //make sure method="POST" so that the servlet service method
        //calls doPost in the response to this form submit
        out.println(
            "<form method=\"POST\" action =\"" + request.getContextPath( ) +
                "/amazonervlet\" >");

        out.println("<table border=\"0\"><tr><td valign=\"top\">");
        out.println("Search terms: </td> <td valign=\"top\">");
        out.println("<input type=\"text\" name=\"query\" size=\"15\">");
        out.println("</td></tr>");
        out.println("<tr><td valign=\"top\">");
        out.println(
            "<input type=\"submit\" value=\"Submit Info\"></td></tr>");
        out.println("</table></form>");
        out.println("</body></html>");

    } //doGet

    public void doPost(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, java.io.IOException{

        String query = request.getParameter("query");

        boolean isValid = (query == null || query.length( ) < 1) ?
            false : true;

        response.setContentType("text/html");

        java.io.PrintWriter out = response.getWriter( );

        out.println("<html><head>");
        out.println("<title>Amazon book results</title></head><body>");

        if (! isValid){
            out.println(
                "<h2>Sorry, the query parameter was either empty or null</h2>");
        } else {
            AmazonBean amBean = new AmazonBean( );
            amBean.setKeyword(query);
            amBean.setType("lite");
            amBean.setMode("books");
            amBean.setPage("1");
        }
    }
}

```

```
        amBean.setLineSep("<br />");
        out.println("<h2>Here are your search results</h2>");
        try {
            out.println( amBean.getSearchResults( ) );
        } catch (Exception e){
            out.println(
                "The search terms either returned zero results "+
                "or were invalid.");
        }

        out.println("</body></html>");

    } //doPost
} //AmazonServlet
```

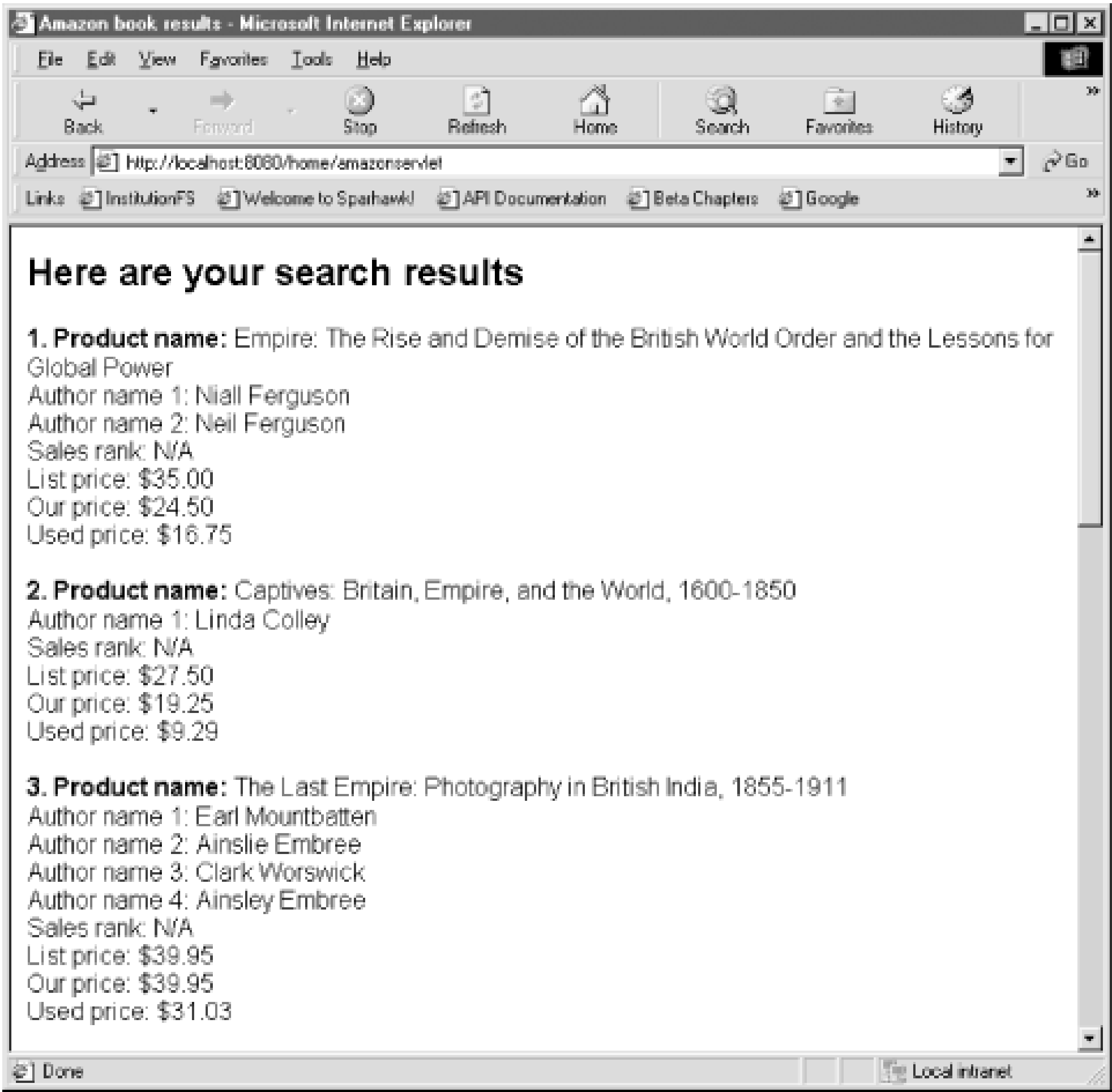
To keep the code simple, limit the keyword search to books. AWS offers a comprehensive method of searching its several catalogs, however, with the API not limited to keyword searches of books. For example, the product modes include DVD, electronics, music, hardware, software, and toys. You can also initiate several different search types (in addition to keywords), such as Amazon Standard Item Number (ASIN) searches.

[Figure 27-3](#) shows the return value of the servlet's `doGet()` method.

Figure 27-3. A servlet's HTML form accepts Amazon search terms

[Figure 27-4](#) shows parts of the servlet's displayed results that are handled by the servlet's `doPost()` method.

Figure 27-4. The results of an Amazon book search



Once you have downloaded and unpacked the AWS SDK, the software documentation is located at: *AmazonWebServices/API Guide/index.html*.

To help debug your AWS searches and servlets, you can initiate an AWS search using a Uniform Resource Locator (URL) in your browser. The following URL initiates a keyword search for a book using the terms "British Empire."

```
http://xml.amazon.com/onca/xml?v=1.0&t=webservices-20&
dev-t=DCJEAVXSDVPUD&KeywordSearch=British%20Empire&mode=books&
type=lite&page=1&f=xml
```

An request for this URL returns an XML file that looks similar to[Example 27-1](#). The sales rank reads "N/A" because the search option `type=lite` returns a `null` value for this ranking. Use `type=heavy` to get a value for the Amazon sales rank.

See Also

The AWS SDK http://www.amazon.com/gp/aws/download_sdk.html/002-2688331-0628046; *Web Services Essentials* (O'Reilly); [Recipe 3.1](#) on mapping a servlet to a name in *web.xml*, [Recipe 27.8](#) on using a JSP and a JavaBean to connect with AWS.

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Recipe 27.8 Using a JSP to Connect with Amazon

Problem

You want to connect with AWS using a JSP.

Solution

Use the `jsp:useBean` standard action to create an instance of the `AmazonBean` from [Recipe 27.6](#). Use this instance to manage the AWS search and results.

Discussion

This recipe uses the same strategy as the JSP in [Recipe 27.4](#): create a JavaBean instance that handles the AWS search and displays the search results. The `jsp:useBean` standard action creates an instance of `com.jspServletcookbook.AmazonBean`, which is located in *WEB-INF/classes*.

Then the code uses `jsp:setProperty` to set some search options, before the JSP uses `jsp:getProperty` to launch the search. [Example 27-7](#) uses the JSTL tag `c:catch` to catch any exceptions thrown by the `AmazonBean`'s `getSearchResults()` method. The variable `except` is of the type `Throwable`, and its error message is displayed by the `c:out` tag if the search query is invalid. The JSP in [Example 27-7](#) displays the HTML form and search results shown in Figures [Figure 27-3](#) and [Figure 27-4](#).

This `jsp:getProperty` code is the equivalent of calling the `AmazonBean`'s `getSearchResults()` method, which returns a `String` of formatted search results.

Example 27-7. A JSP launches an AWS book search

```
<%@ taglib uri="http://java.sun.com/jstl/core" prefix="c" %>

<html>
<head><title>Search Amazon.com for a Book</title></head>
<body>

<c:choose>

    <c:when test="${empty param.keyword}">

        <h2>Please enter your Amazon search terms...</h2>
```

```
<%-- Display the HTML form... --%>

<form method="POST" action =
'<c:out value="${pageContext.request.contextPath}" />/amazon.jsp'>

<%-- form and table tags... --%>
<table border="0"><tr><td valign="top">
Search terms: </td> <td valign="top">
<input type="text" name="keyword" size="15">
</td></tr><tr><td valign="top">

<tr><td valign="top">

<input type="submit" value="Submit Info"></td></tr>
</table></form>
</body></html>

</c:when>

<c:otherwise>

<jsp:useBean id="aBean" class="com.jspServletcookbook.AmazonBean" />
<jsp:setProperty name="aBean" property="keyword" param="keyword"/>
<jsp:setProperty name="aBean" property="mode" value="books"/>
<jsp:setProperty name="aBean" property="page" value="1"/>
<jsp:setProperty name="aBean" property="type" value="lite"/>
<jsp:setProperty name="aBean" property="lineSep" value="<br />"/>

<h2>Here are your search results</h2>

<c:catch var="excep">

    <%-- Now display any results of the search --%>
    <jsp:getProperty name="aBean" property="searchResults" />

    </c:catch >

    <%-- Print any error messages, such as 'Bad Request' if the search
    terms are meaningless --%>

    <c:out value="${excep.message}"/>

</c:choose>

</body>
</html>
```

See Also

The AWS SDK: http://www.amazon.com/gp/aws/download_sdk.html/002-2688331-0628046; *Web Services Essentials* (O'Reilly); [Recipe 27.7](#) on using a servlet and a JavaBean to connect with AWS;

[Chapter 23](#) on using the JSTL.

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Colophon

Our look is the result of reader comments, our own experimentation, and feedback from distribution channels. Distinctive covers complement our distinctive approach to technical topics, breathing personality and life into potentially dry subjects.

The animal on the cover of *Java Servlet and JSP Cookbook* is a fennec fox (*Fennecus zerda*), also known as the desert fox. Fennec foxes live in arid sandy regions of northern Africa, the Sahara, the Sinai Peninsula and Arabia and are one of the tiniest members of the canine family (eight inches at the tallest and usually less than a foot long). Their relatively huge ears and beady black eyes give them a distinctive appearance. The fennec fox's bushy tail is characteristic of most foxes, and a thick creamy coat camouflages them in their sandy habitat.

Fennec foxes live in burrows and are nocturnal hunters, eating plants, small rodents, birds and their eggs, lizards, and insects. Their hearing is so acute that they can hear even the smallest of prey walking across desert sand. These foxes often stalk their prey and pounce upon it; their vertical leap is two feet high and they can jump four feet horizontally from a standing position, astounding feats for an animal of such small stature. They are rapid and prolific diggers, known for "disappearing" into sand while appearing to stand still. Some reports note that this species can dig a 20-foot-long tunnel in one night!

The fennec fox is not listed as endangered, but is now considered rare in some areas where it was once common. They have been hunted extensively and are sometimes taken from the wild for the pet trade.

Philip Dangler was the production editor and copyeditor for *Java Servlet and JSP Cookbook*. Sarah Sherman and Matt Hutchinson were the proofreaders. Reg Aubry and Mary Anne Weeks Mayo provided quality control. Ellen Troutman Zaig wrote the index.

Emma Colby designed the cover of this book, based on a series design by Edie Freedman. The cover image is a 19th-century engraving from *Animate Creations, Volume One*. Emma Colby produced the cover layout with QuarkXPress 4.1 using Adobe's ITC Garamond font.

Melanie Wang designed the interior layout, based on a series design by David Futato. This book was converted from Julie Hawks to FrameMaker 5.5.6 with a format conversion tool created by Erik Ray, Jason McIntosh, Neil Walls, and Mike Sierra that uses Perl and XML technologies. The text font is Linotype Birka, the heading font is Adobe Myriad Condensed, and the code font is LucasFont's TheSans Mono Condensed. The illustrations that appear in the book were produced by Robert Romano and Jessamy Read using Macromedia FreeHand 9 and Adobe Photoshop 6. The tip and warning icons were drawn by Christopher Bing. This colophon was written by Philip Dangler.

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