An Overview of Servlet & JSP Technology
Agenda

• Understanding the role of servlets
• Building Web pages dynamically
• Evaluating servlets vs. other technologies
• Understanding the role of JSP
• Configuring the server
• Configuring your development environment
• Testing the setup
  – Basic server
  – HTML/JSP
  – Servlets
A Servlet’s Job

- Read explicit data sent by client (form data)
- Read implicit data sent by client (request headers)
- Generate the results
- Send the explicit data back to client (HTML)
- Send the implicit data to client (status codes and response headers)
Why Build Web Pages Dynamically?

- The Web page is based on data submitted by the user
  - e.g., results page from search engines and order-confirmation pages at on-line stores
- The Web page is derived from data that changes frequently
  - e.g., a weather report or news headlines page
- The Web page uses information from databases or other server-side sources
  - e.g., an e-commerce site could use a servlet to build a Web page that lists the current price and availability of each item that is for sale.
The Advantages of Servlets Over “Traditional” CGI

• Efficient
  – Threads instead of OS processes, one servlet copy

• Convenient
  – Lots of high-level utilities

• Powerful
  – Sharing data, pooling, persistence

• Portable
  – Run on virtually all operating systems and servers

• Inexpensive
  – There are plenty of free and low-cost servers

• Secure
  – No shell escapes, no buffer overflows

• Mainstream
  – See next page
Mainstream

- **Popular:**
  - The single most common use of Java technology
  - The leading technology for medium/large Web applications

- **Supported by:**
  - Apache, Oracle, IBM, Sybase, BEA, Macromedia, Caucho, Sun/iPlanet, New Atlanta, ATG, Fujitsu, Lutris, Silverstream, the World Wide Web Consortium (W3C), and many others
  - Plugins for IIS and Zeus

- **Runs on:**
  - Windows, Unix/Linux, MacOS, VMS, and IBM mainframe OSs

- **Used for:**
  - Airline companies, hotels, e-commerce sites, search engines, banks, financial sites, etc., etc., etc.
Extending the Power of Servlets: JavaServer Pages (JSP)

- **Idea:**
  - Use regular HTML for most of page
  - Mark dynamic content with special tags
  - Details in second half of course

```html
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<html>
<head><title>Welcome to Our Store</title></head>
<body>
<h1>Welcome to Our Store</h1>
<small>Welcome,
<!-- User name is "New User" for first-time visitors -->
<%= coreservlets.Utils.getUserNameFromCookie(request) %>
To access your account settings, click <a href="Account-Settings.html">here</a>.</small>
<p>
Regular HTML for rest of on-line store’s Web page
</p>
</body></html>
```
Server Setup and Configuration

1. Download and install the Java Software Development Kit (SDK)
2. Download a server.
3. Configure the server
4. Set up your development environment
5. Test your setup
6. Establish a simplified deployment method
7. Create custom Web applications

• For very detailed coverage of these steps, see
  -- http://www.coreservlets.com/Apache-Tomcat-Tutorial/
Download & Install the Java SDK (or JDK)

• **Recommended Java version**
  – JDK 1.4

• **Obtain at** [http://java.sun.com/j2se/1.4/](http://java.sun.com/j2se/1.4/)
  – Be sure to set PATH variable as described in Java documentation

• **Minimum supported Java version**
  – Servlets 2.3 and JSP 1.2 (standalone servers).
    • Java 1.2 or later.
  – J2EE 1.3 (which includes servlets 2.3 and JSP 1.2).
    • Java 1.3 or later.
  – Servlets 2.4 and JSP 2.0 (standalone servers).
    • Java 1.3 or later.
  – J2EE 1.4 (which includes servlets 2.4 and JSP 2.0).
    • Java 1.4 or later.
Download a Free Server for Your Desktop

- **Apache Tomcat**

- **Macromedia JRun**

- **Caucho Resin**

- **New Atlanta ServletExec**

- **Jetty**
  - [http://jetty.mortbay.org/jetty/](http://jetty.mortbay.org/jetty/)
Configure the Server

- **Identify the SDK installation directory.**
  - For Tomcat: set JAVA_HOME

- **Specify the port.**
  - Change the port from default (usually 8080) to 80

- **Make server-specific customizations.**
  - For Tomcat:
    - Enable servlet reloading
    - Enable the ROOT context
    - Turn on the invoker servlet
Set Up Your Development Environment

• **Create a development directory**
  – Choose a location in which to develop your servlets, JSP documents, and supporting classes (e.g., C:\Servlets+JSP)

• **Set your CLASSPATH**
  – Tell the compiler about the servlet and JSP JAR file and the location of your development directory.
  – *Setting this variable incorrectly is the single most common cause of problems for beginners.*

• **Make shortcuts to start and stop the server**
  – Make sure it is convenient to start and stop the server.

• **Bookmark or install the servlet and JSP API documentation**
  – You’ll refer to this documentation frequently, so keep it handy.
Test Your Setup

• **Verify your Java installation**
  – Be sure that you get meaningful results for *both* of these:
    • `java -version`
    • `javac -help`

• **Check your basic server configuration**
  – Start server and access the server home page (http://localhost/)
  – Access a simple user-defined HTML page
    • Download Hello.html from book's source code archive
    • Put in `install_dir/webapps/ROOT`
    • Access with http://localhost/Hello.html
  – Access and a simple user-defined JSP page
    • Download Hello.jsp and put in `install_dir/webapps/ROOT`
    • Access with http://localhost/Hello.jsp
Test Your Setup (Continued)

• Compile and deploy a packageless servlet
  – Download HelloServlet.java from source code archive
  – Place in development directory (e.g., C:\Servlets+JSP)
  – Compile (if errors, check CLASSPATH)
  – Move HelloServlet.class to
    `install_dir/webapps/ROOT/WEB-INF/classes`
  – Access with http://localhost/servlet/HelloServlet
Test Your Setup (Continued)

• Compile and deploy a packaged servlet
  – Download HelloServlet2.java from source code archive
  – Place in coreservlets subdirectory of development directory (e.g., C:\Servlets+JSP\coreservlets)
  – Compile (if errors, check CLASSPATH)
  – Move HelloServlet2.class to install_dir/webapps/ROOT/WEB-INF/classes/coreservlets
  – Access with http://localhost/servlet/coreservlets.HelloServlet2
Test Your Setup (Continued)

- Compile and deploy a packaged servlet that uses a helper class
  - Download HelloServlet3.java and ServletUtilities.java
  - Place in coreservlets subdirectory of development dir
  - Compile (if errors, check CLASSPATH)
  - Move both class files to
    install_dir/webapps/ROOT/WEB-INF/classes/coreservlets
  - Access with
    http://localhost/servlet/coreservlets.HelloServlet3
Establish a Simplified Deployment Method

• Copy to a shortcut or symbolic link
  – Make shortcut to 
    \textit{install\_dir/webapps/ROOT/WEB-INF/classes}
  – For packageless servlets, copy .class file to this shortcut
  – For packaged servlets, copy entire directory to shortcut
    • This is the simplest method for beginners
    • This is the method I will use throughout class

• Use the -d option of javac
  – Lets you have source files in one location but automatically place .class files in another location

• Let your IDE take care of deployment

• Use ant or a similar tool
  – Ant is especially popular when using custom Web apps
Web Applications: A Preview

• **Learning**
  – Use default Web application (**ROOT** on Tomcat)
  – Use default URLs (http://…/*servlet*/ServletName)
  – Advantages
    • Simpler
    • Can test without restarting server or editing web.xml

• **Deployment**
  – Use a custom Web application (on Tomcat, a directory in `install_dir/webapps` with structure similar to ROOT)
  – Register custom URLs in `WEB-INF/web.xml`
  – Advantages
    • URLs look better
    • Advanced features (init params, security, filters, etc.) depend on your using registered URLs
1. **Make a directory whose structure mirrors the structure of the default Web application.**
   - HTML (and, eventually, JSP) documents go in the top-level directory
   - The web.xml file goes in the WEB-INF subdirectory
   - Servlets and other classes go either in WEB-INF/classes or a subdirectory of WEB-INF/classes that matches the package name.
   - On Tomcat, entire directory goes in `install_dir/webapps`

2. **Update your CLASSPATH.**
   - Add `webAppDir/WEB-INF/classes` to it.
3. Use the directory name in the URL
   - All URLs should be of the form http://host/webAppDir/…

4. Use web.xml to assign custom URLs
   - Use the `<servlet>` and `<servlet-mapping>` elements

```xml
<servlet>
    <servlet-name>Servlet2</servlet-name>
    <servlet-class>
        coreservlets.HelloServlet2
    </servlet-class>
</servlet>

<servlet-mapping>
    <servlet-name>Servlet2</servlet-name>
    <url-pattern>/servlet2</url-pattern>
</servlet-mapping>
```
Making Custom Web Apps

Hello (2)
Summary

• Servlets are efficient, portable, powerful, and widely accepted in industry
• Regardless of deployment server, run a free server on your desktop for development
• Getting started:
  – Set your CLASSPATH
    • Servlet JAR file
    • Top of your package hierarchy
  – Put class files in proper location
    • .../WEB-INF/classes
  – Use proper URL, usually http://host/servlet/ServletName
• Download existing servlet first time
  – Start with HelloServlet from www.coreservlets.com