Core Servlets and JavaServer Pages / 2e
Volume 1: Core Technologies
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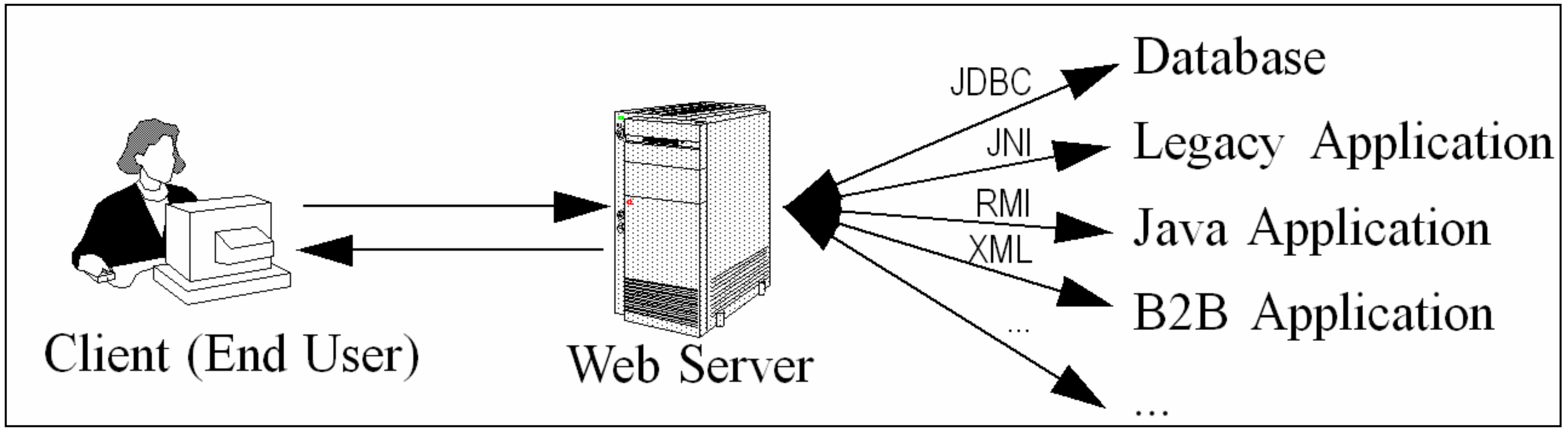
An Overview of Servlet & JSP Technology

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

```
<!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
</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/**
  - 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**
  - http://jakarta.apache.org/tomcat/
  - For installation and setup details, see http://www.coreservlets.com/Apache-Tomcat-Tutorial/
- **Macromedia JRun**
  - http://www.macromedia.com/software/jrun/
- **Caucho Resin**
  - http://caucho.com/products/resin/
- **New Atlanta ServletExec**
  - http://www.newatlanta.com/products/servletexec/
- **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

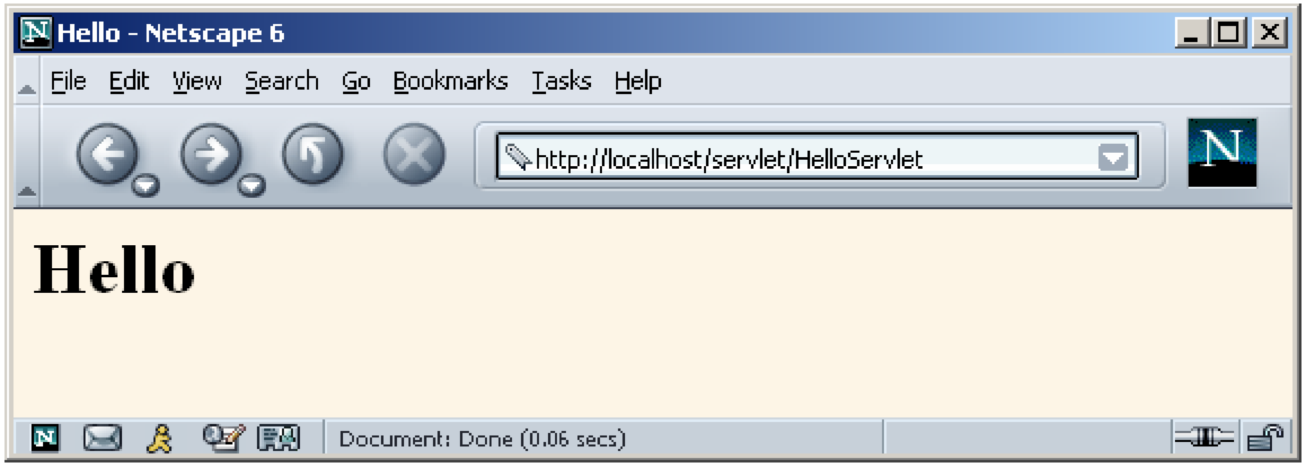
- **Create a development directory**
  - Choose a location in which to develop your servlets, JSP documents, and supporting classes (e.g., C:\Servlets+JSP)
- **Set your CLASSPATH**
  - Tell the compiler about the servlet and JSP JAR file and the location of your development directory.
  - *Setting this 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


Hello - Netscape 6
File Edit View Search Go Bookmarks Tasks Help
http://localhost/servlet/HelloServlet

Hello

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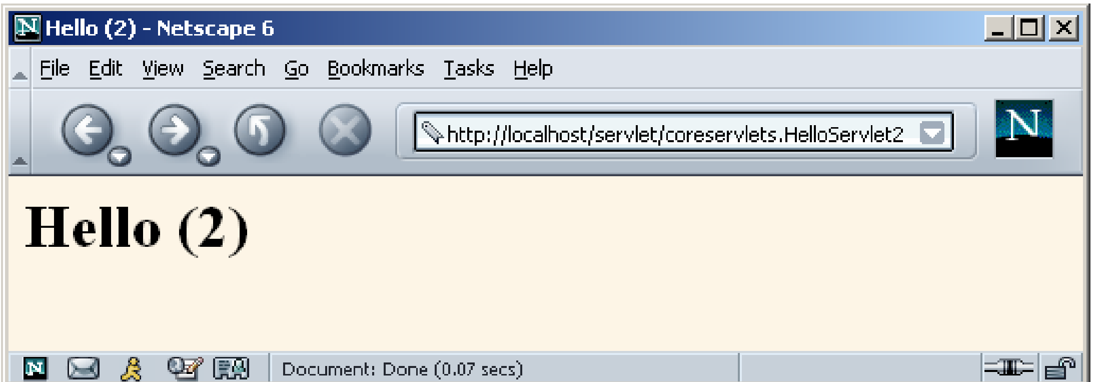
Test Your Setup (Continued)

- **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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http://localhost/servlet/coreservlets.HelloServlet2
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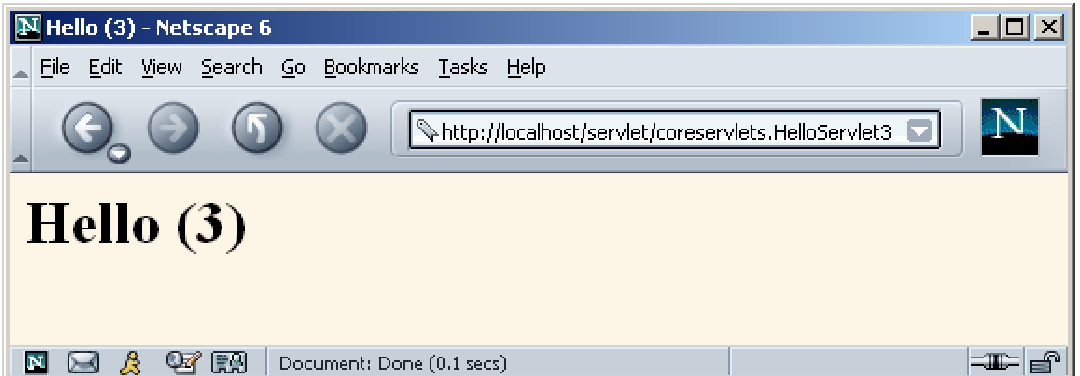
Hello (2)

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


Hello (3) - Netscape 6
File Edit View Search Go Bookmarks Tasks Help
http://localhost/servlet/coreservlets.HelloServlet3

Hello (3)

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Establish a Simplified Deployment Method

- **Copy to a shortcut or symbolic link**
  - Make shortcut to *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

Making Custom Web Apps

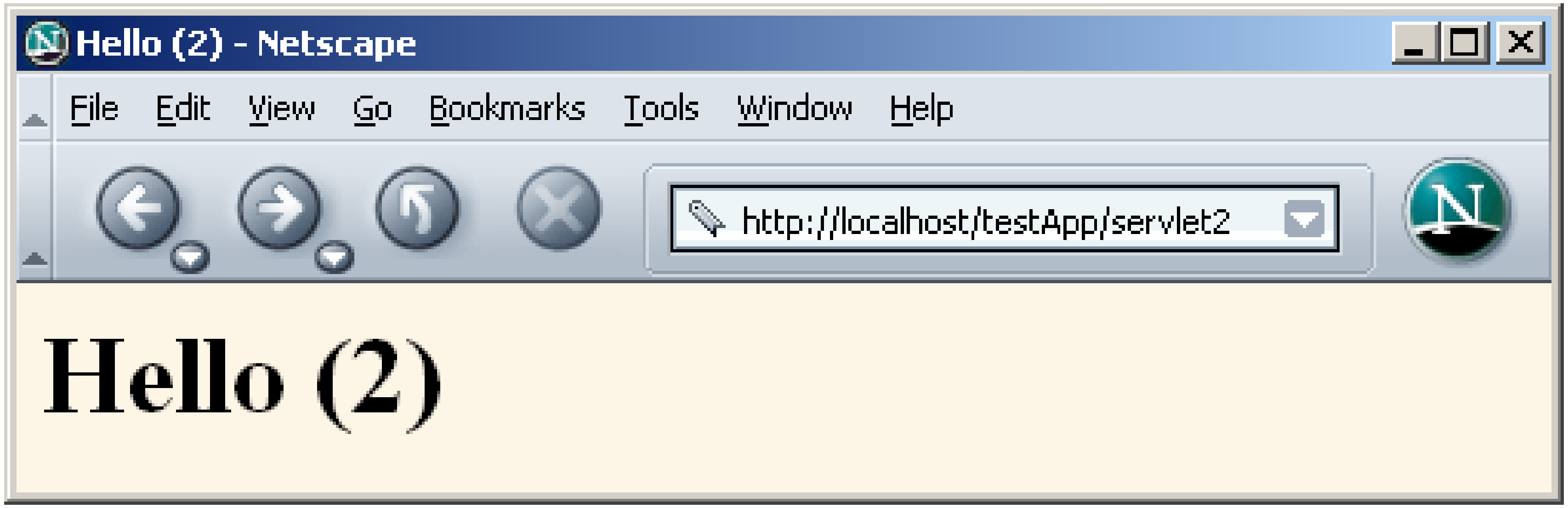
1. **Make a directory whose structure mirrors the structure of the default Web application.**
   - HTML (and, eventually, JSP) documents go in the top-level directory
   - The web.xml file goes in the WEB-INF subdirectory
   - Servlets and other classes go either in WEB-INF/classes or a subdirectory 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.

Making Custom Web Apps

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

```
<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



http://localhost/testApp/servlet2

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