# Session 5 – Java Server Page

# Agenda

- Why we need JSP
- How JSP works
- Benefits of JSP
- Setting up your environment for JSP
- A simple example

# The Need for JSP

- **With servlets, it is easy to**
  - Read form data
  - Read HTTP request headers
  - Set HTTP status codes and response headers
  - Use cookies and session tracking
  - Share data among servlets
  - Remember data between requests
  - Get fun, high-paying jobs
- **But, it sure is a pain to**
  - Use those println statements to generate HTML
  - Maintain that HTML

# The JSP Framework

- **Idea:**
  - Use regular HTML for most of page
  - Mark servlet code with special tags
  - Entire JSP page gets translated into a servlet (once), and servlet is what actually gets invoked (for each request)
- **Example:**
  - JSP
    - Thanks for ordering <I><%= request.getParameter("title") %></I>
  - URL
    - http://host/OrderConfirmation.jsp ?title=Core+Web+Programming
  - Result
    - Thanks for ordering *Core Web Programming*

# Benefits of JSP

- **Although JSP technically can't do anything servlets can't do, JSP makes it easier to:**
  - Write HTML
  - Read and maintain the HTML
- **JSP makes it possible to:**
  - Use standard HTML tools such as Allaire HomeSite, Macromedia DreamWeaver, or Adobe GoLive.
  - Have different members of your team do the HTML layout than do the Java programming
- **JSP encourages you to**
  - Separate the (Java) code that creates the content from the (HTML) code that presents it

# Advantages of JSP Over Competing Technologies

- **Versus ASP or ColdFusion**
  - Better language for dynamic part
  - Portable to multiple servers and operating systems
- **Versus PHP**
  - Better language for dynamic part
  - Better tool support
- **Versus pure servlets**
  - More convenient to create HTML
  - Can use standard tools (e.g., HomeSite)
  - Divide and conquer
  - JSP programmers still need to know servlet programming

# Advantages of JSP (Continued)

- **Versus Velocity or WebMacro**
  - Standard
- **Versus client-side JavaScript (in browser)**
  - Capabilities mostly do not overlap with JavaScript, but
    - You control server, not client
    - Richer language
- **Versus server-side JavaScript (eg, LiveWire, BroadVision, JRun)**
  - Richer language
- **Versus static HTML**
  - Dynamic features
  - Adding dynamic features no longer "all or nothing" decision

# Setting Up Your Environment

- **Set your CLASSPATH. Not.**
- **Compile your code. Not.**
- **Use packages to avoid name conflicts. Not.**
- **Put JSP page in special directory. Not.**
  - *install_dir*\webapps\ROOT\ (HTML *and* JSP -- Tomcat)
    *install_dir*\servers\default\default-app (JRun)
  - Some servers reserve certain parts of Web hierarchy for JSP pages. Tomcat 3 and JRun (standalone) don't.
- **Use special URL to invoke JSP page. Not.**
- **Caveats**
  - Previous rules about CLASSPATH, install dirs, etc., still apply to regular Java classes used by a JSP page

# Example

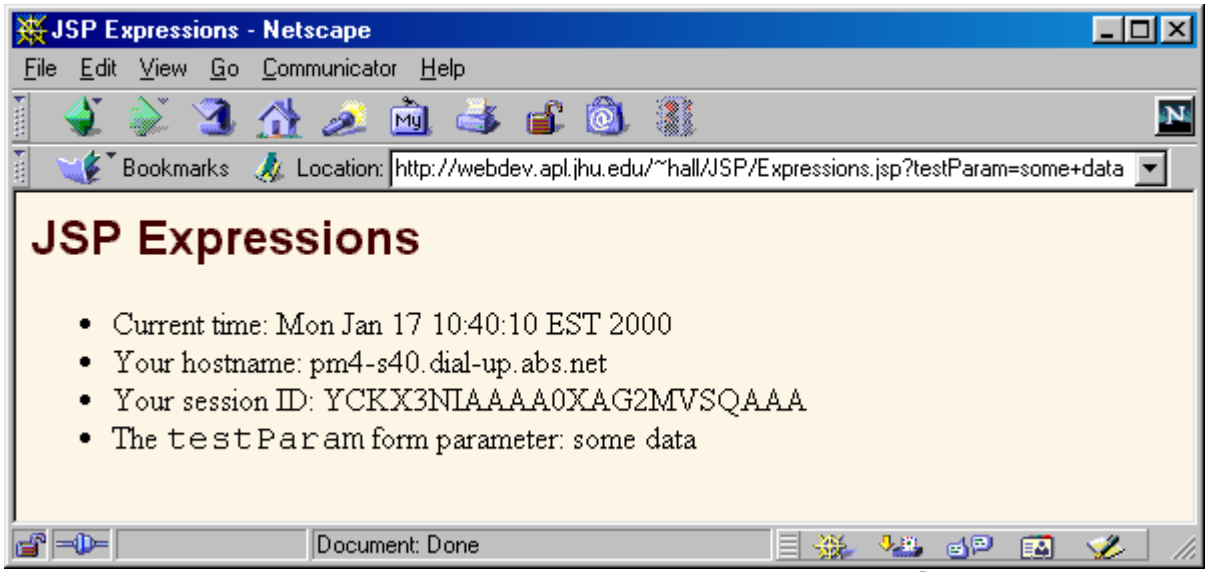
```
<!DOCTYPE HTML PUBLIC
                "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<HEAD>
<TITLE>JSP Expressions</TITLE>
<META NAME="author" CONTENT="Marty Hall">
<META NAME="keywords"
   CONTENT="JSP,expressions,JavaServer,Pages,servlets">
<META NAME="description"
      CONTENT="A quick example of JSP expressions.">
<LINK REL=STYLESHEET
      HREF="JSP-Styles.css"
      TYPE="text/css">
</HEAD>
```

# Example (Continued)

```
<BODY>
<H2>JSP Expressions</H2>
<UL>
  <LI>Current time: <%= new java.util.Date() %>
  <LI>Your hostname: <%= request.getRemoteHost() %>
  <LI>Your session ID: <%= session.getId() %>
  <LI>The <CODE>testParam</CODE> form parameter:
      <%= request.getParameter("testParam") %>
</UL>
</BODY>
</HTML>
```

# Example Result

- **If location was**
  - C:\jakarta-tomcat-4.0\webapps\ROOT\Expressions.jsp or
  - C:\Program Files\Allaire\JRun\servers\default\default-app\Expressions.jsp
- **URL would be**
  - http://localhost/Expressions.jsp



# Most Common Misunderstanding
## Forgetting JSP is Server-Side Technology

- **Very common question**
  - I can't do such and such with HTML. Will JSP let me do it?
- **Why doesn't this question make sense?**
  - JSP runs entirely on server
  - It doesn't change content the client (browser) can handle
- **Similar questions**
  - How do I put a normal applet in a JSP page? Answer: send an <APPLET…> tag to the client
  - How do I put an image in a JSP page? Answer: send an <IMG …> tag to the client
  - How do I use JavaScript/Acrobat/Shockwave/Etc? Answer: send the appropriate HTML tags

# 2nd Most Common Misunderstanding Translation/Request Time Confusion

- **What happens at page translation time?**
  - JSP constructs get translated into servlet code.
- **What happens at request time?**
  - Servlet code gets executed. *No* interpretation of JSP occurs at request time. The original JSP page is totally ignored at request time; only the servlet that resulted from it is used.
- **When does page translation occur?**
  - Typically, the first time JSP page is accessed after it is modified. This should never happen to real user (developers should test all JSP pages they install).
  - Page translation does *not* occur for each request.

# The JSP Lifecycle

| | Page first written | Request #1 | Request #2 | Server restarted | Request #3 | Request #4 | Page modified | Request #5 | Request #6 |
|---|---|---|---|---|---|---|---|---|---|
| JSP page translated into servlet | | Yes | No | | No | No | | Yes | No |
| Servlet compiled | | Yes | No | | No | No | | Yes | No |
| Servlet instantiated and loaded into server's memory | | Yes | No | | Yes | No | | Yes | No |
| init (or equivalent) called | | Yes | No | | Yes | No | | Yes | No |
| doGet (or equivalent) called | | Yes | Yes | | Yes | Yes | | Yes | Yes |

# JSP/Servlets in the Real World

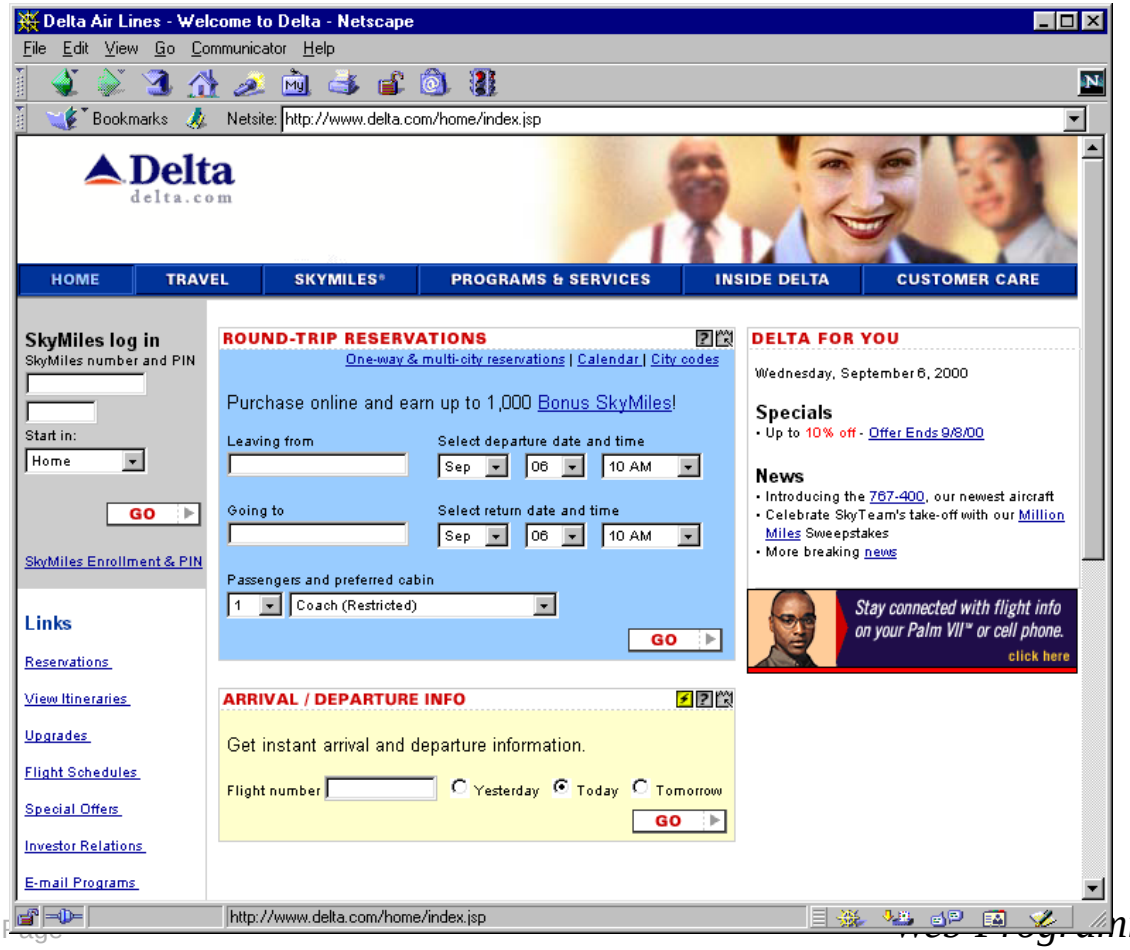
- **ofoto.com: print and manage digital and conventional photos.**

# JSP/Servlets in the Real World

- **First USA Bank: largest credit card issuer in the world; most on-line banking customers**

# JSP/Servlets in the Real World

- **Delta Airlines: entire Web site, including real-time schedule info**

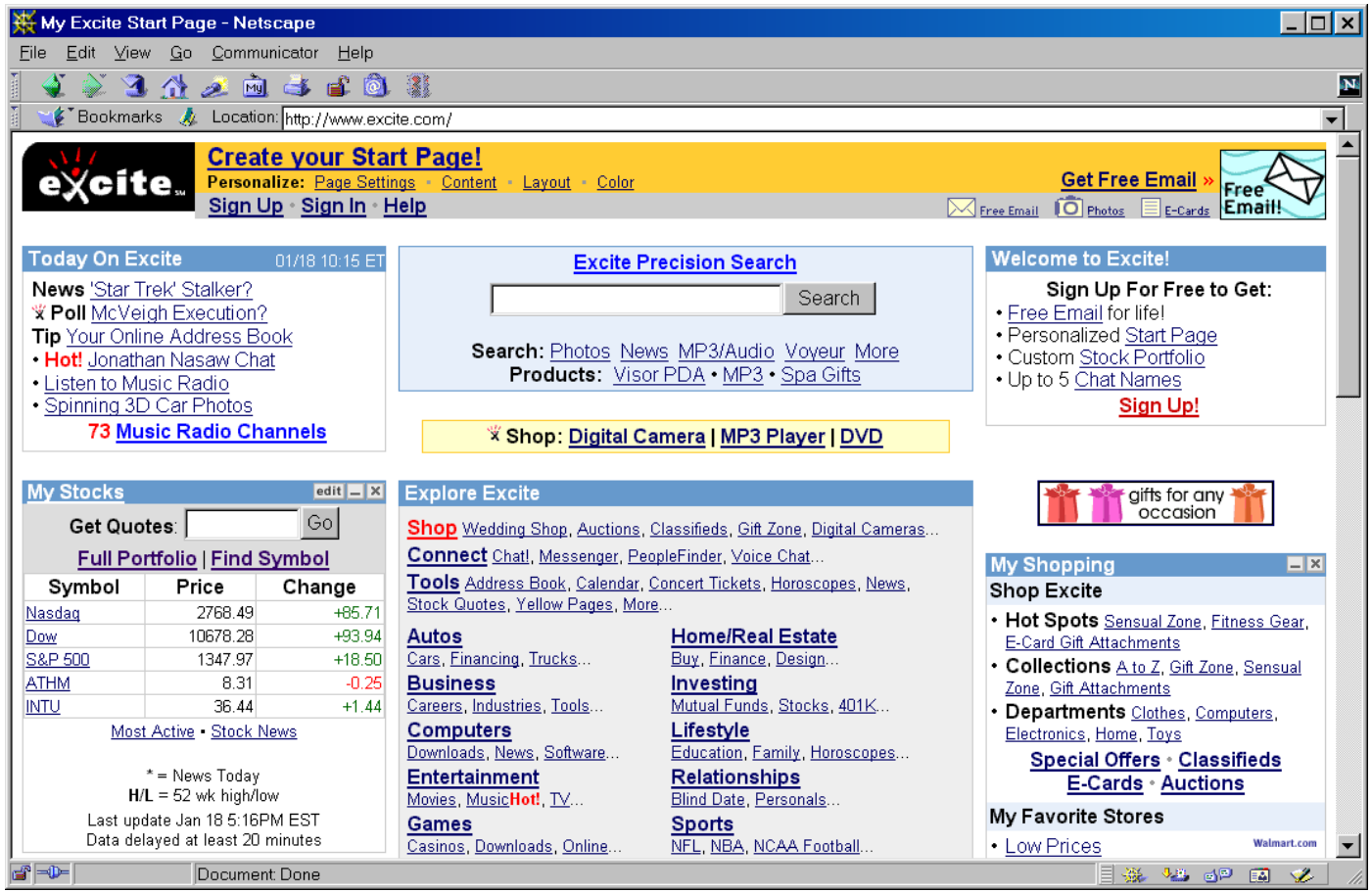


# JSP/Servlets in the Real World

- **American Century Investments: more than 70 mutual funds, $90 billion under management, two million investors**

# JSP/Servlets in the Real World

- **Excite: one of the top five Internet portals; one of the ten busiest sites on the Web**



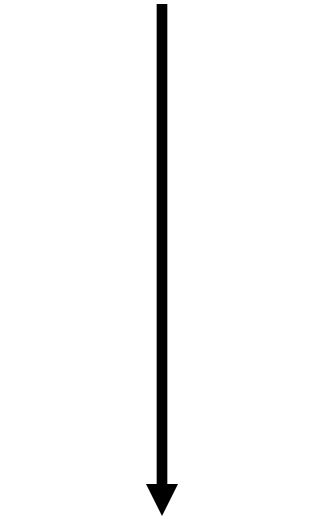
# Summary

- **JSP makes it easier to create and maintain HTML, while still providing full access to servlet code**
- **JSP pages get translated into servlets**
  - It is the servlets that run at request time
  - Client does not see anything JSP-related
- **You still need to understand servlets**
  - Understanding how JSP really works
  - Servlet code called from JSP
  - Knowing when servlets are better than JSP
  - Mixing servlets and JSP
- **Other technologies use similar approach, but aren't as portable and don't let you use Java for the "real code"**

# Agenda - Scripting Elements

- Basic syntax
- Types of JSP scripting elements
- Expressions
- Predefined variables
- Scriptlets
- Declarations

# Uses of JSP Constructs




- Scripting elements calling servlet code directly
- Scripting elements calling servlet code indirectly (by means of utility classes)
- Beans
- Custom tags
- Servlet/JSP combo (MVC), with beans and possibly custom tags

# Design Strategy: Limit Java Code in JSP Pages

- **You have two options**
  - Put 25 lines of Java code directly in the JSP page
  - Put those 25 lines in a separate Java class and put 1 line in the JSP page that invokes it
- **Why is the second option *much* better?**
  - **Development**. You write the separate class in a Java environment (editor or IDE), not an HTML environment
  - **Debugging**. If you have syntax errors, you see them immediately at compile time. Simple print statements can be seen.
  - **Testing**. You can write a test routine with a loop that does 10,000 tests and reapply it after each change.
  - **Reuse**. You can use the same class from multiple pages.

# Basic Syntax

- **HTML Text**
  - <H1>Blah</H1>
  - Passed through to client. Really turned into servlet code that looks like
    - out.print("<H1>Blah</H1>");
- **HTML Comments**
  - <!-- Comment -->
  - Same as other HTML: passed through to client
- **JSP Comments**
  - <%-- Comment --%>
  - Not sent to client
- **To get <% in output, use <\%**

# Types of Scripting Elements

- **Expressions**
  - Format: <%= expression %>
  - Evaluated and inserted into the servlet's output. I.e., results in something like out.print(expression)
- **Scriptlets**
  - Format: <% code %>
  - Inserted verbatim into the servlet's _jspService method (called by service)
- **Declarations**
  - Format: <%! code %>
  - Inserted verbatim into the body of the servlet class, outside of any existing methods

# JSP Expressions

- **Format**
  - <%= Java Expression %>
- **Result**
  - Expression evaluated, converted to String, and placed into HTML page at the place it occurred in JSP page
  - That is, expression placed in _jspService inside out.print
- **Examples**
  - Current time: <%= new java.util.Date() %>
  - Your hostname: <%= request.getRemoteHost() %>
- **XML-compatible syntax**
  - <jsp:expression>Java Expression</jsp:expression>
  - XML version not supported by Tomcat 3. Until JSP 1.2, servers are not required to support it. Even then, you cannot mix versions within a single page.

# JSP/Servlet Correspondence

- **Original JSP**

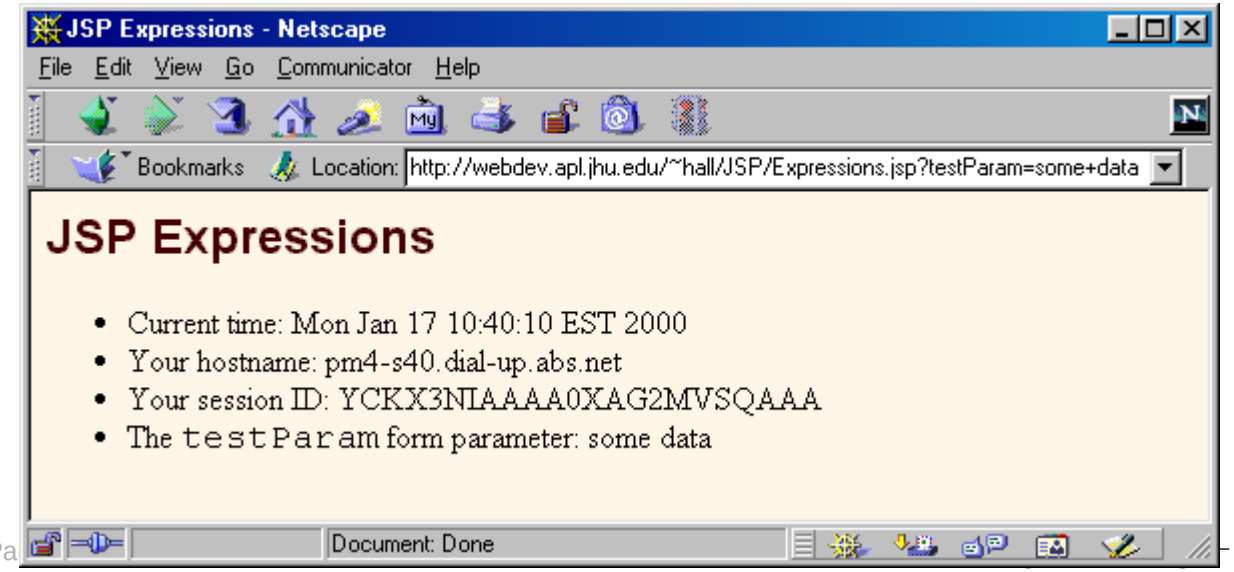
```
<H1>A Random Number</H1>
<%= Math.random() %>
```

- **Possible resulting servlet code**

```
public void _jspService(HttpServletRequest request,
                        HttpServletResponse response)
    throws ServletException, IOException {
  response.setContentType("text/html");
  HttpSession session = request.getSession(true);
  JspWriter out = response.getWriter();
  out.println("<H1>A Random Number</H1>");
  out.println(Math.random());
  ...
}
```

# Example Using JSP Expressions

```
<BODY>
<H2>JSP Expressions</H2>
<UL>
  <LI>Current time: <%= new java.util.Date() %>
  <LI>Your hostname: <%= request.getRemoteHost() %>
  <LI>Your session ID: <%= session.getId() %>
  <LI>The <CODE>testParam</CODE> form parameter:
      <%= request.getParameter("testParam") %>
</UL>
</BODY>
```



# Predefined Variables

- **request**
  - The HttpServletRequest (1st argument to service/doGet)
- **response**
  - The HttpServletResponse (2nd arg to service/doGet)
- **out**
  - The Writer (a buffered version of type JspWriter) used to send output to the client
- **session**
  - The HttpSession associated with the request (unless disabled with the session attribute of the page directive)
- **application**
  - The ServletContext (for sharing data) as obtained via getServletContext().

# JSP Scriptlets

- **Format**
  - <% Java Code %>
- **Result**
  - Code is inserted verbatim into servlet's _jspService
- **Example**
  - <%
    String queryData = request.getQueryString();
    out.println("Attached GET data: " + queryData);
    %>
  - <% response.setContentType("text/plain"); %>
- **XML-compatible syntax**
  - <jsp:scriptlet>Java Code</jsp:scriptlet>

# JSP/Servlet Correspondence

- **Original JSP**

```
<%= foo() %>
<% bar(); %>
```

- **Possible resulting servlet code**

```
public void _jspService(HttpServletRequest request,
                        HttpServletResponse response)
    throws ServletException, IOException {
  response.setContentType("text/html");
  HttpSession session = request.getSession(true);
  JspWriter out = response.getWriter();
  out.println(foo());
  bar();
  ...
}
```

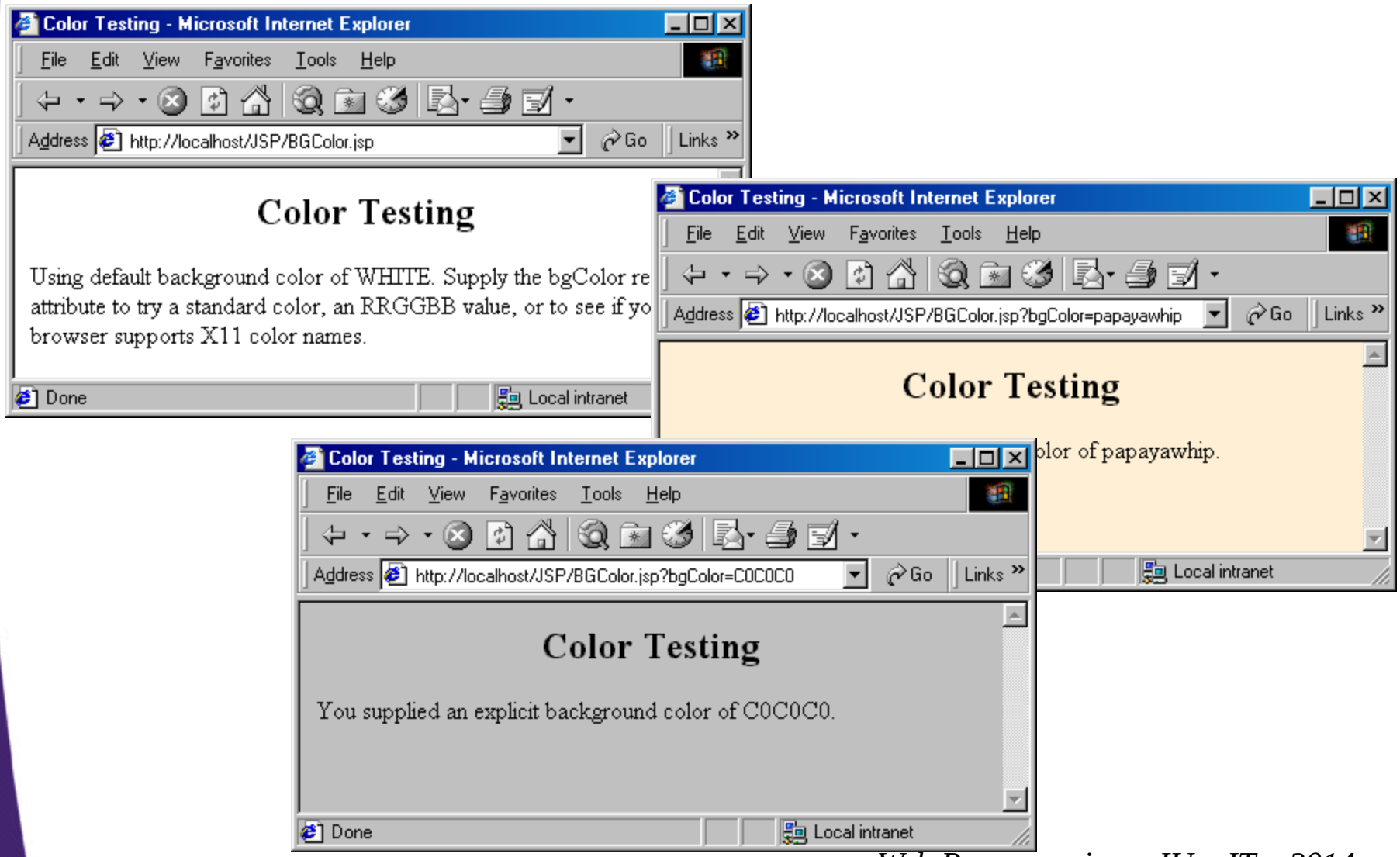
# Example Using JSP Scriptlets

```
<!DOCTYPE HTML PUBLIC
                "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<HEAD>
  <TITLE>Color Testing</TITLE>
</HEAD>
<%
String bgColor = request.getParameter("bgColor");
boolean hasExplicitColor;
if (bgColor != null) {
  hasExplicitColor = true;
} else {
  hasExplicitColor = false;
  bgColor = "WHITE";
}
%>
```

# Example Using JSP Scriptlets (Continued)

```
<BODY BGCOLOR="<%= bgColor %>">
<H2 ALIGN="CENTER">Color Testing</H2>
<%
if (hasExplicitColor) {
   …
} else {
   …
}
%>

</BODY>
</HTML>
```

# JSP Scriptlets: Results



# Using Scriptlets to Make Parts of the JSP File Conditional

- **Point**
  - Scriplets are inserted into servlet exactly as written
  - Need not be complete Java expressions
  - Complete expressions are usually clearer and easier to maintain, however
- **Example**

```
<% if (Math.random() < 0.5) { %>
Have a <B>nice</B> day!
<% } else { %>
Have a <B>lousy</B> day!
<% } %>
```

- **Representative result**

```
if (Math.random() < 0.5) {
  out.println("Have a <B>nice</B> day!");
} else {
  out.println("Have a <B>lousy</B> day!");
}
```

# JSP Declarations

- **Format**
  - <%! Java Code %>
- **Result**
  - Code is inserted verbatim into servlet's class definition, outside of any existing methods
- **Examples**
  - <%! private int someField = 5; %>
  - <%! private void someMethod(...) {...} %>
- **Design consideration**
  - Fields are clearly useful. For methods, it is usually better to define the method in a separate Java class.
- **XML-compatible syntax**
  - <jsp:declaration>Java Code</jsp:declaration>

# JSP/Servlet Correspondence

- **Original JSP**

```
<H1>Some Heading</H1>
<%!
  private String randomHeading() {
    return("<H2>" + Math.random() + "</H2>");
  }
%>
<%= randomHeading() %>
```

- **(Alternative: make randomHeading a static method in a separate Java class)**

# JSP/Servlet Correspondence

- **Possible resulting servlet code**

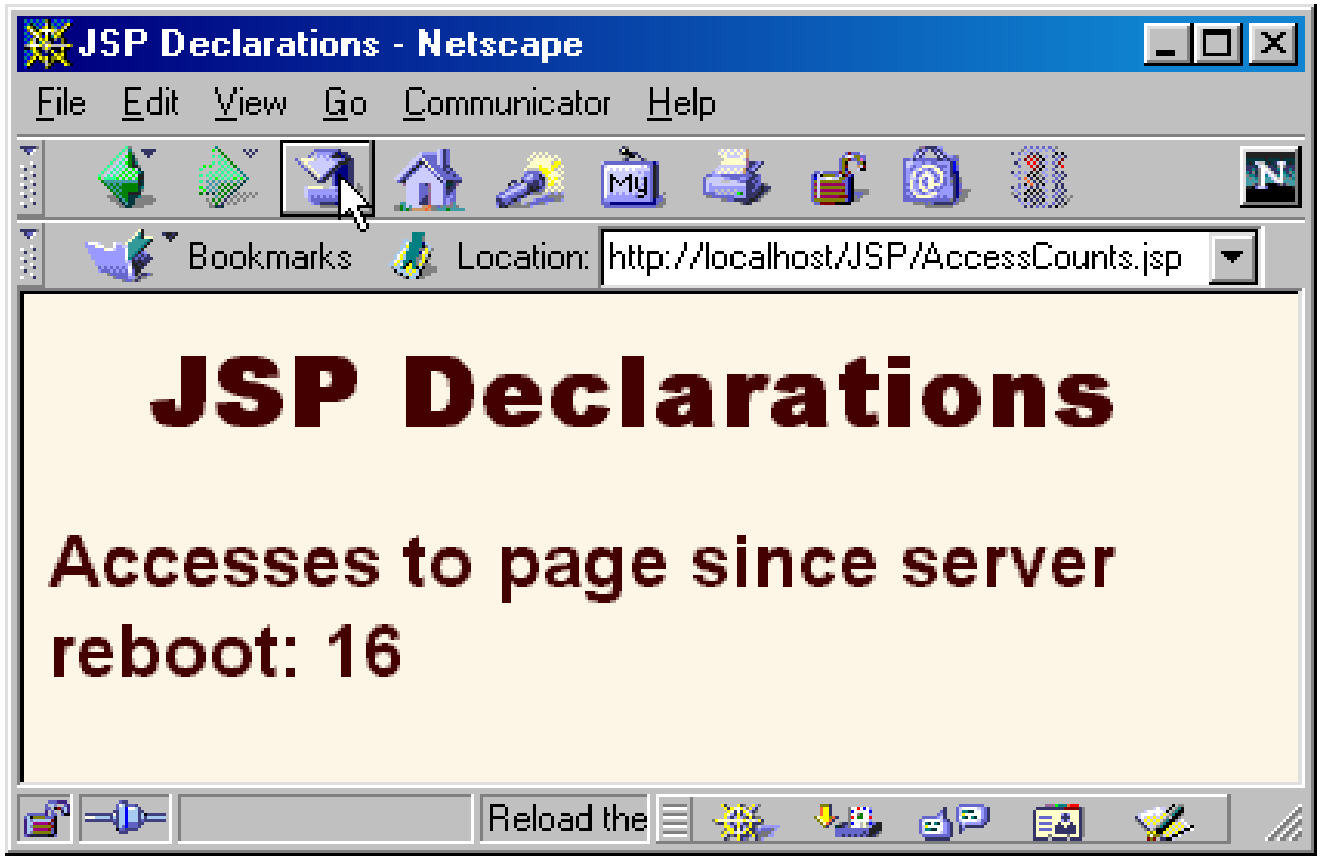
```
public class xxxx implements HttpJspPage {
 private String randomHeading() {
   return("<H2>" + Math.random() + "</H2>");
 }

 public void _jspService(HttpServletRequest request,
                         HttpServletResponse response)
     throws ServletException, IOException {
   response.setContentType("text/html");
   HttpSession session = request.getSession(true);
   JspWriter out = response.getWriter();
   out.println("<H1>Some Heading</H1>");
   out.println(randomHeading());
   ...
 } ...
}
```

# Example Using JSP Declarations

```
<!DOCTYPE HTML PUBLIC
                "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML><HEAD><TITLE>JSP Declarations</TITLE>
<LINK REL=STYLESHEET
      HREF="JSP-Styles.css"
      TYPE="text/css">
</HEAD>

<BODY>
<H1>JSP Declarations</H1>

<%! private int accessCount = 0; %>
<H2>Accesses to page since server reboot:
<%= ++accessCount %></H2>

</BODY>
</HTML>
```

# JSP Declarations: Result

- **After 15 total visits by an arbitrary number of different clients**



# JSP Declarations: the jspInit and jspDestroy Methods

- **JSP pages, like regular servlets, sometimes want to use init and destroy**
- **Problem: the servlet that gets built from the JSP page might already use init and destroy**
  - Overriding them would cause problems.
  - Thus, it is illegal to use JSP declarations to declare init or destroy.
- **Solution: use jspInit and jspDestroy.**
  - The auto-generated servlet is guaranteed to call these methods from init and destroy, but the standard versions of jspInit and jspDestroy are empty (placeholders for you to override).

# JSP Declarations and Predefined Variables

- **Problem**
  - The predefined variables (request, response, out, session, etc.) are *local* to the _jspService method. Thus, they are not available to methods defined by JSP declarations or to methods in helper classes. What can you do about this?
- **Solution: pass them as arguments. E.g.**

```
<%!
private void someMethod(HttpSession s) {
  doSomethingWith(s);
}
%>
<% someMethod(session); %>
```

- **Note that the println method of JspWriter throws IOException**
  - Use "throws IOException" for methods that use println

# Using JSP Expressions as Attribute Values

- **Static Value**
  - 
```
<jsp:setProperty
    name="author"
    property="firstName"
    value="Marty" />
```
- **Dynamic Value**
  - 
```
<jsp:setProperty
    name="user"
    property="id"
    value='<%= "UserID" + Math.random() %>' />
```

# Attributes That Permit JSP Expressions

- **The name and value properties of jsp:setProperty**
  - See upcoming section on beans
- **The page attribute of jsp:include**
  - See upcoming section on including files and applets
- **The page attribute of jsp:forward**
  - See upcoming section on integrating servlets and JSP
- **The value attribute of jsp:param**
  - See upcoming section on including files and applets

# Summary

- **JSP Expressions**
  - Format: <%= expression %>
  - Wrapped in out.print and inserted into _jspService
- **JSP Scriptlets**
  - Format: <% code %>
  - Inserted verbatim into the servlet's _jspService method
- **JSP Declarations**
  - Format: <%! code %>
  - Inserted verbatim into the body of the servlet class
- **Predefined variables**
  - request, response, out, session, application
- **Limit the Java code that is directly in page**
  - Use helper classes, beans, custom tags, servlet/JSP combo

# Agenda - Controlling the Structure of Generated Servlets

- The import attribute
- The contentType attribute
- Generating plain text and Excel documents
- The isThreadSafe attribute
- The session attribute
- The buffer attribute
- The extends attribute
- The errorPage attribute
- The isErrorPage attribute

# Purpose of the page Directive

- **Give high-level information about the servlet that will result from the JSP page**
- **Can control**
  - Which classes are imported
  - What class the servlet extends
  - What MIME type is generated
  - How multithreading is handled
  - If the servlet participates in sessions
  - The size and behavior of the output buffer
  - What page handles unexpected errors

# The import Attribute

- **Format**
  - <%@ page import="package.class" %>
  - <%@ page import="package.class1,...,package.classN" %>
- **Purpose**
  - Generate import statements at top of servlet definition
- **Notes**
  - Although JSP pages can be almost anywhere on server, classes used by JSP pages must be in normal servlet dirs
  - For Tomcat, this is *install_dir*\webapps\ROOT\WEB-INF\classes or ...\ROOT\WEB-INF\classes*directoryMatchingPackage*
    - *Always* use packages for utilities that will be used by JSP!

# Example of import Attribute

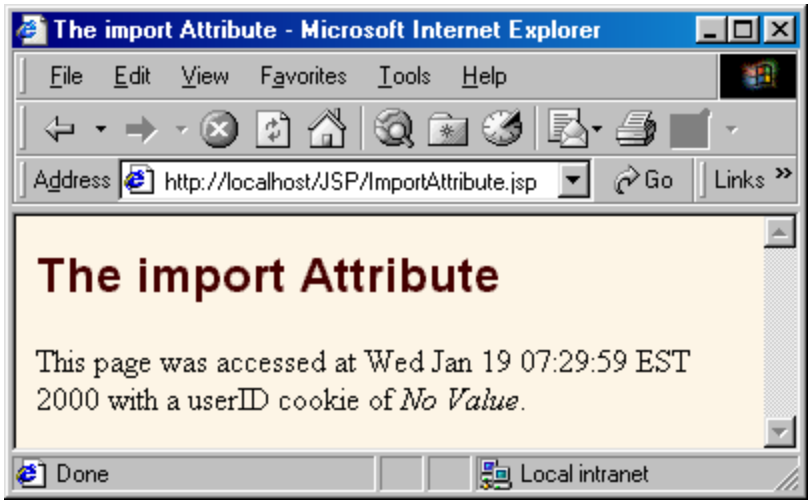
```
...
<BODY>
<H2>The import Attribute</H2>
<%-- JSP page directive --%>
<%@ page import="java.util.*,coreservlets.*" %>

<%-- JSP Declaration --%>
<%!
private String randomID() {
  int num = (int)(Math.random()*10000000.0);
  return("id" + num);
}

private final String NO_VALUE = "<I>No Value</I>";
%>
```

# Example of import Attribute (cont)

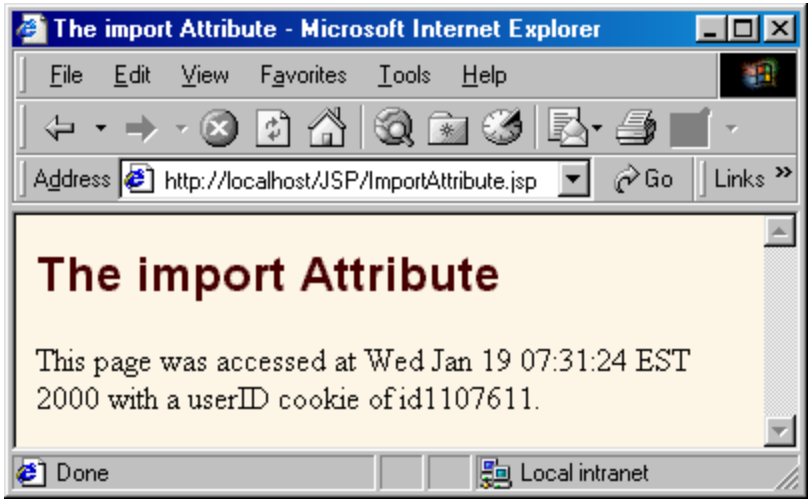
```
<%-- JSP Scriptlet --%>
<%
Cookie[] cookies = request.getCookies();
String oldID =
  ServletUtilities.getCookieValue(cookies, "userID", NO_VALUE);
String newID;
if (oldID.equals(NO_VALUE)) {
  newID = randomID();
} else {
  newID = oldID;
}
LongLivedCookie cookie = new LongLivedCookie("userID", newID);
response.addCookie(cookie);
%>
<%-- JSP Expressions --%>
This page was accessed at <%= new Date() %> with a userID
cookie of <%= oldID %>.
 </BODY></HTML>
```

# Example of import Attribute: Result

- **First access**




- **Subsequent accesses**



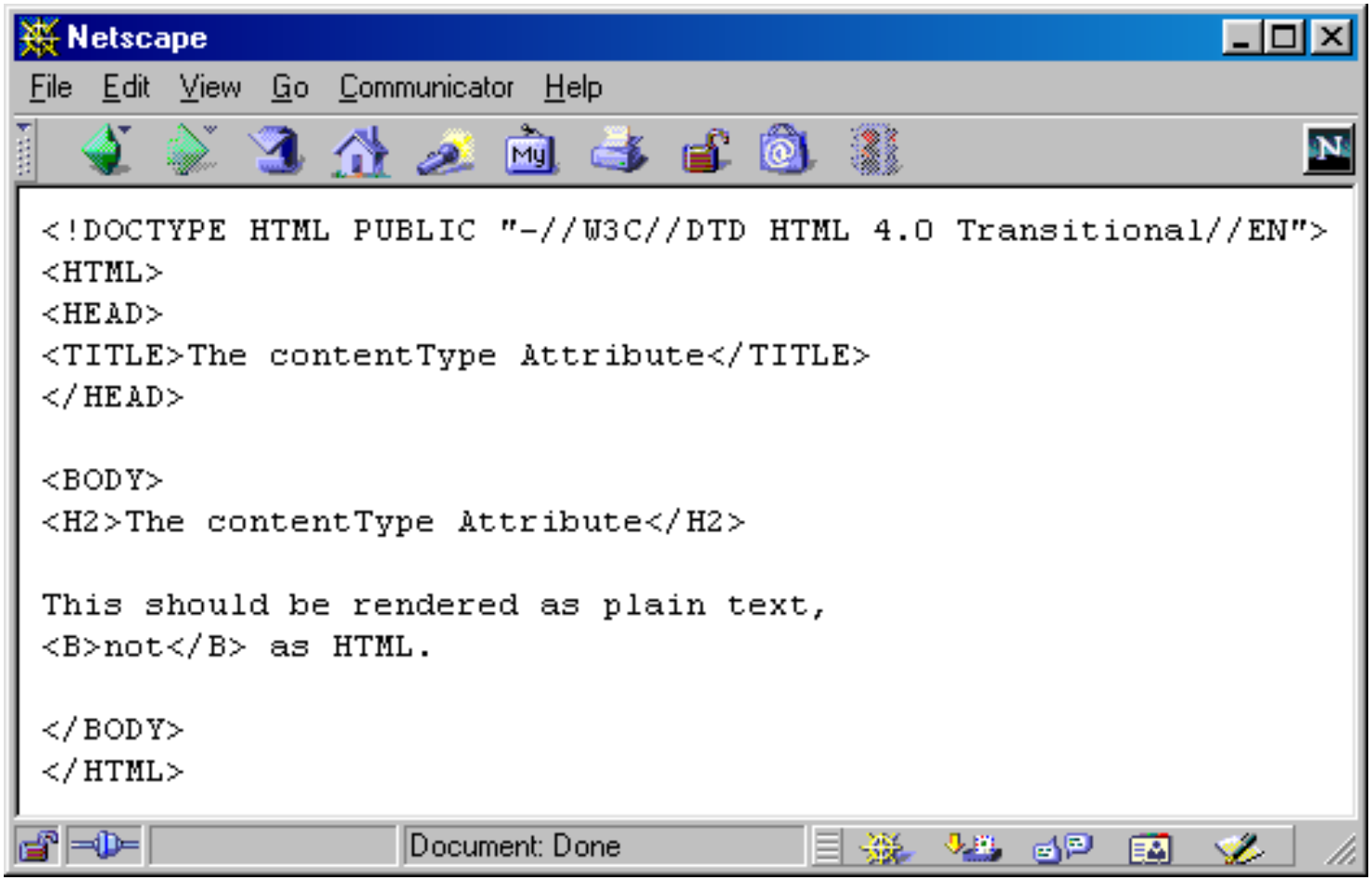
# The contentType Attribute

- **Format**
  - <%@ page contentType="MIME-Type" %>
  - <%@ page contentType="MIME-Type; charset=Character-Set" %>
- **Purpose**
  - Specify the MIME type of the page generated by the servlet that results from the JSP page
- **Notes**
  - Attribute value cannot be computed at request time
  - See section on response headers for table of the most common MIME types

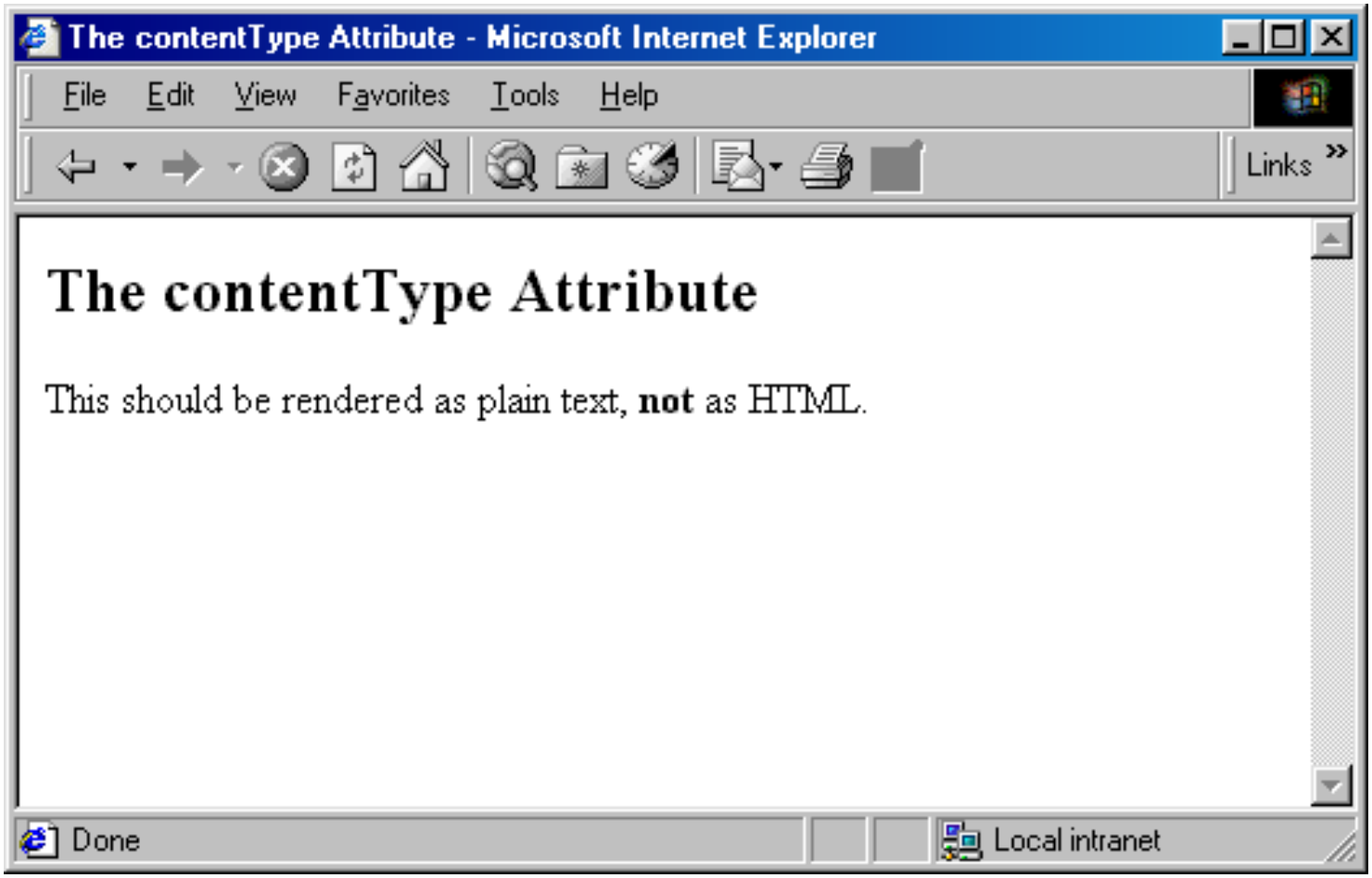
# Using contentType to Generate Plain Text Documents

```
<!DOCTYPE HTML PUBLIC
                "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<HEAD>
<TITLE>The contentType Attribute</TITLE>
</HEAD>
<BODY>

<H2>The contentType Attribute</H2>
<%@ page contentType="text/plain" %>
This should be rendered as plain text,
<B>not</B> as HTML.

</BODY>
</HTML>
```

# Plain Text Documents in Netscape (Correct)

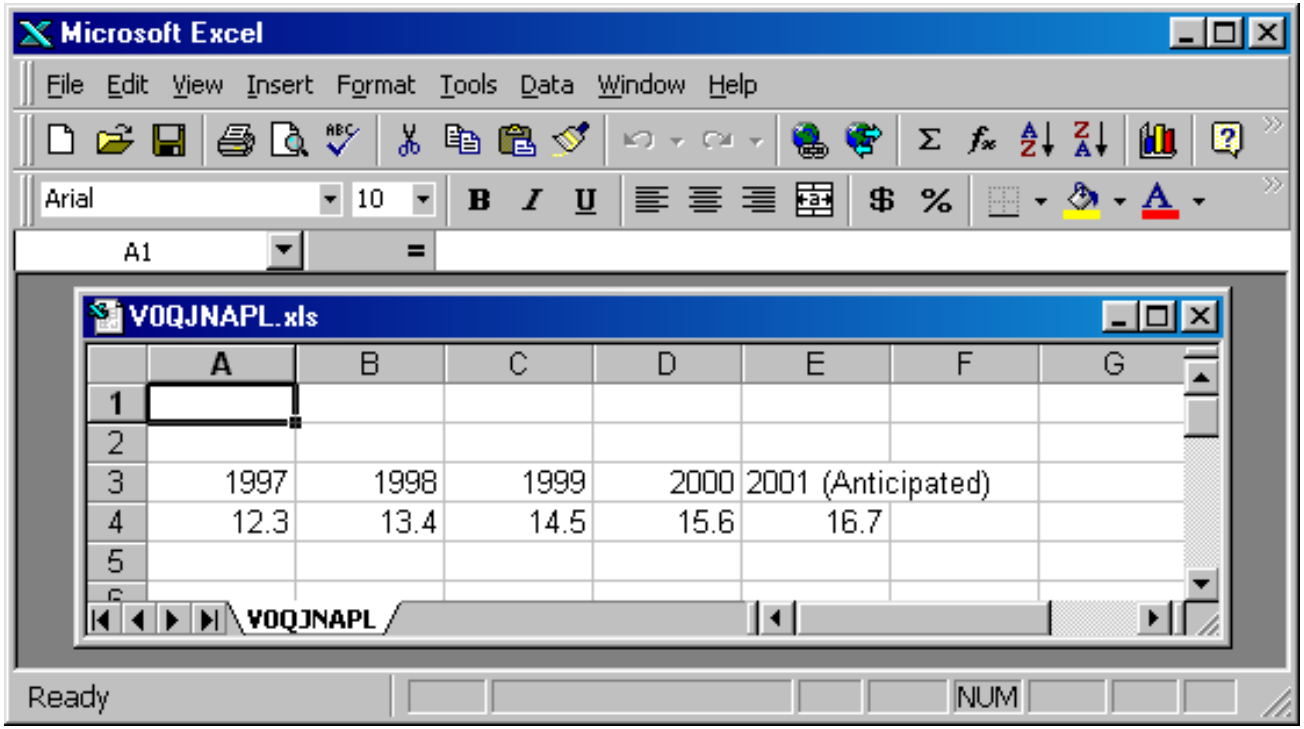


# Plain Text Documents in Internet Explorer (Incorrect)



# Generating Excel Spreadsheets

```
<%@ page contentType="application/vnd.ms-excel" %>
<%-- Note that there are tabs,
     not spaces, between columns. --%>
1997    1998    1999    2000    2001 (Anticipated)
12.3    13.4    14.5    15.6    16.7
```



# Generating Excel Spreadsheets Conditionally

- **Excel can interpret HTML tables**
  - Change MIME type based on request parameters
- **You cannot use page directive**
  - It does not use request-time values.
- **Solution**
  - Use predefined request variable and call setContentType

```
<%
if (someCondition) {
  response.setContentType("type1");
} else {
  response.setContentType("type2");
}
%>
```

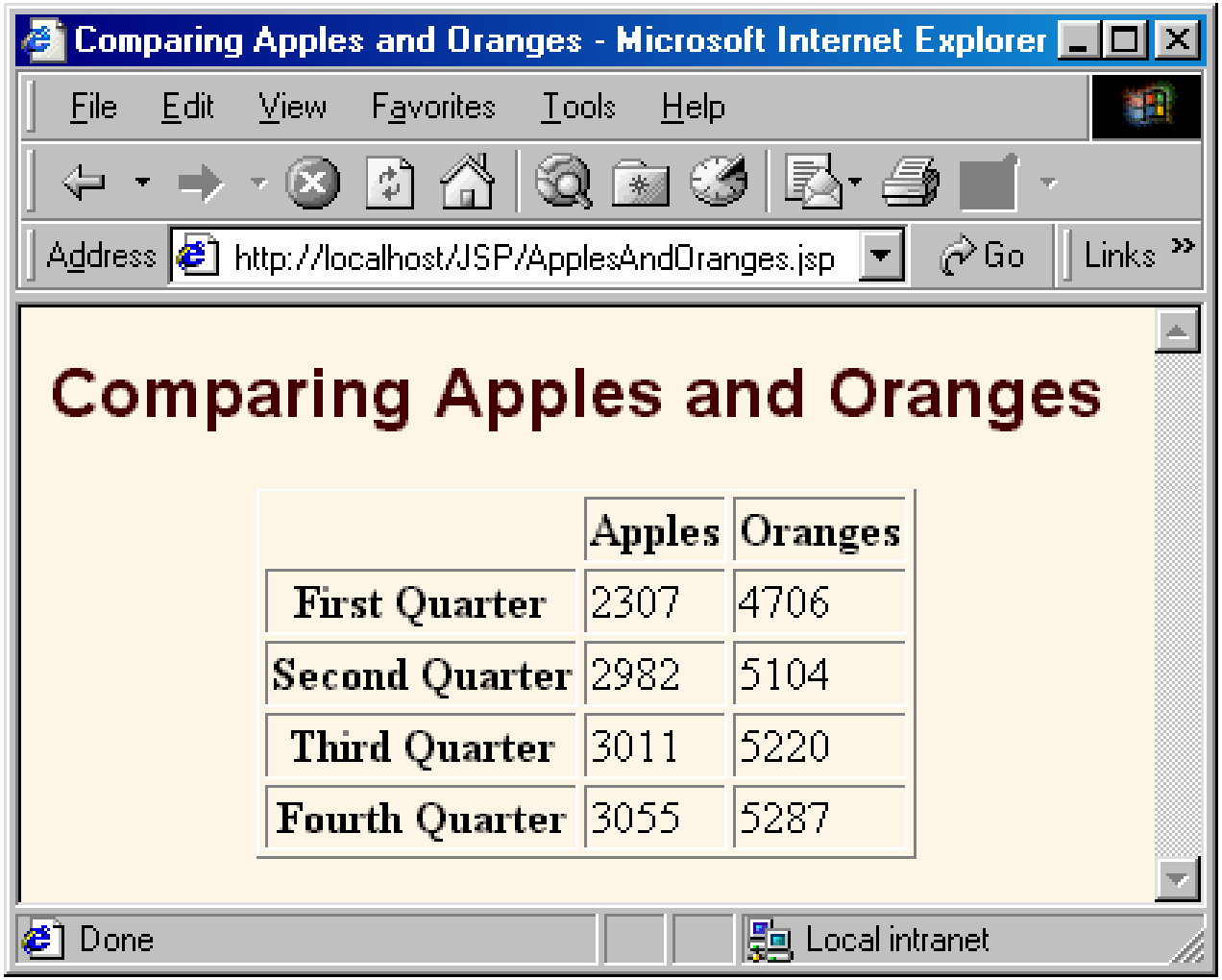
# Generating Excel Spreadsheets Conditionally

```
<%
String format = request.getParameter("format");
if ((format != null) && (format.equals("excel"))) {
  response.setContentType("application/vnd.ms-excel");
}
%>
<!DOCTYPE ...>
<HTML><HEAD>
<TITLE>Comparing Apples and Oranges</TITLE>
<LINK REL=STYLESHEET
      HREF="JSP-Styles.css"
      TYPE="text/css">
</HEAD>
<BODY>
<CENTER>
<H2>Comparing Apples and Oranges</H2>
```

# Generating Excel Spreadsheets Conditionally (Continued)

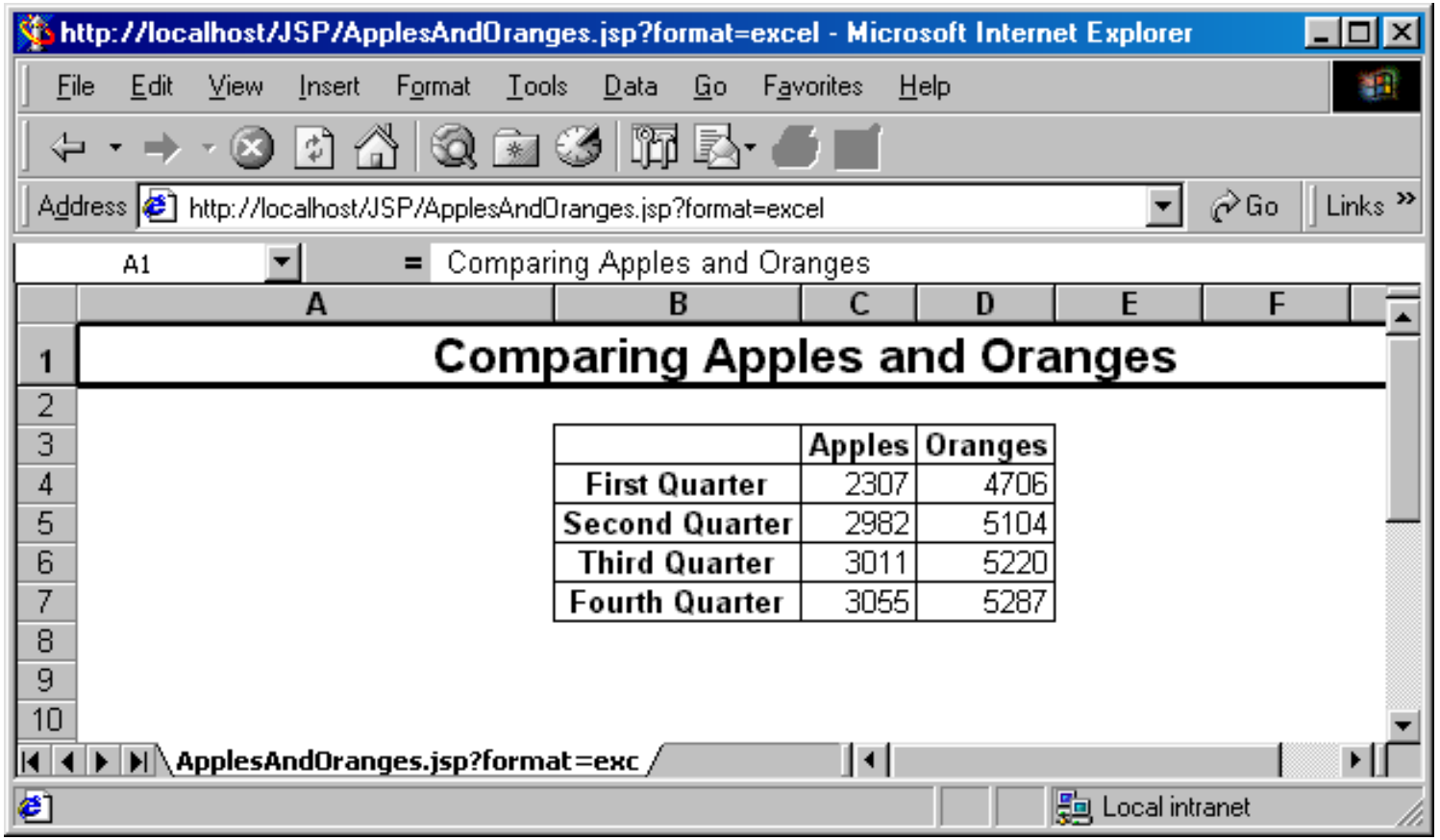
```
<TABLE BORDER=1>
  <TR><TH></TH><TH>Apples<TH>Oranges
  <TR><TH>First Quarter<TD>2307<TD>4706
  <TR><TH>Second Quarter<TD>2982<TD>5104
  <TR><TH>Third Quarter<TD>3011<TD>5220
  <TR><TH>Fourth Quarter<TD>3055<TD>5287
</TABLE>

</CENTER>
</BODY>
</HTML>
```

# Apples and Oranges: Default Result




| | Apples | Oranges |
|---|---|---|
| First Quarter | 2307 | 4706 |
| Second Quarter | 2982 | 5104 |
| Third Quarter | 3011 | 5220 |
| Fourth Quarter | 3055 | 5287 |

# Apples and Oranges: Result with format=excel



# The isThreadSafe Attribute

- **Format**
  - <%@ page isThreadSafe="true" %> <%-- Default --%>
  - <%@ page isThreadSafe="false" %>
- **Purpose**
  - To tell the system when your code is not threadsafe, so that the system can prevent concurrent access
- **Notes**
  - Default is true -- system assumes you have synchronized updates to fields and other shared data
  - Supplying a value of false can degrade performance
  - Systems are permitted to make multiple instances of the servlet class as long as each is called serially.
    Moral: static fields are not necessarily safe

# Example of Non-Threadsafe Code (IDs Must Be Unique)

- **What's wrong with this code?**

```
<%! private int idNum = 0; %>
<%
String userID = "userID" + idNum;
out.println("Your ID is " + userID + ".");
idNum = idNum + 1;
%>
```

# Is isThreadSafe Needed Here?

- **No**

```
<%! private int idNum = 0; %>
<%
synchronized(this) {
  String userID = "userID" + idNum;
  out.println("Your ID is " + userID + ".");
  idNum = idNum + 1;
}
%>
```

- **Totally safe, better performance in high-traffic environments**
- `isThreadSafe= "false"` **deprecated in JSP 2.0 anyhow**

# The session Attribute

- **Format**
  - <%@ page session="true" %> <%-- Default --%>
  - <%@ page session="false" %>
- **Purpose**
  - To designate that page not be part of a session
- **Notes**
  - By default, it is part of a session
  - Saves memory on server if you have a high-traffic site
  - *All* related pages have to do this for it to be useful

# The buffer Attribute

- **Format**
  - <%@ page buffer="*size*kb" %>
  - <%@ page buffer="none" %>
- **Purpose**
  - To give the size of the buffer used by the out variable
- **Notes**
  - Buffering lets you set HTTP headers even after some page content has been generated (as long as buffer has not filled up or been explicitly flushed)
  - Servers are allowed to use a larger size than you ask for, but not a smaller size
  - Default is system-specific, but must be at least 8kb

# The extends Attribute

- **Format**
  - <%@ page extends="package.class" %>
- **Purpose**
  - To specify parent class of servlet that will result from JSP page
- **Notes**
  - Use with extreme caution
  - Can prevent system from using high-performance custom superclasses
  - Real purpose is to let you extend classes *that come from the server vendor* (e.g., to support personalization features), not to extend your own classes.

# The errorPage Attribute

- **Format**
  - <%@ page errorPage="Relative URL" %>
- **Purpose**
  - Specifies a JSP page that should process any exceptions thrown but not caught in the current page
- **Notes**
  - The exception thrown will be automatically available to the designated error page by means of the "exception" variable
  - The web.xml file lets you specify *application-wide* error pages that apply whenever certain exceptions or certain HTTP status codes result.
    - The errorPage attribute is for *page-specific* error pages

# The isErrorPage Attribute

- **Format**
  - <%@ page isErrorPage="true" %>
  - <%@ page isErrorPage="false" %> <%-- Default --%>
- **Purpose**
  - Indicates whether or not the current page can act as the error page for another JSP page
- **Notes**
  - Use this for emergency backup only; explicitly handle as many exceptions as possible
  - Don't forget to always check query data for missing or malformed values
  - The web.xml file can designate general error pages rather than page-specific ones like this

# Error Pages: Example (ComputeSpeed.jsp)

```
...
<BODY>

<%@ page errorPage="SpeedErrors.jsp" %>

<TABLE BORDER=5 ALIGN="CENTER">
  <TR><TH CLASS="TITLE">
      Computing Speed
</TABLE>

<%!
// Note lack of try/catch for NumberFormatException
private double toDouble(String value) {
  return(Double.valueOf(value).doubleValue());
}
%>
```

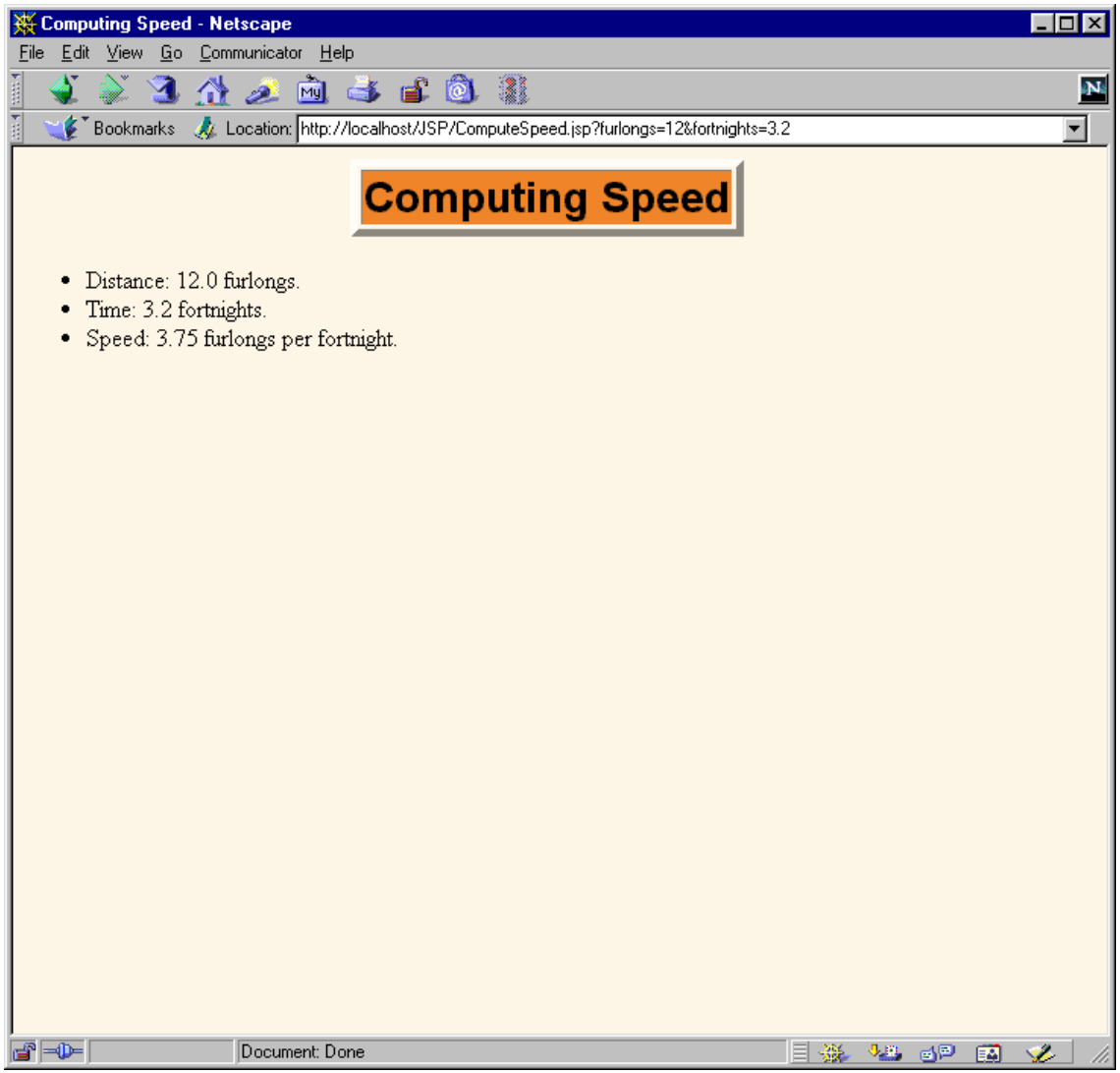
# Error Pages: Example (ComputeSpeed.jsp Cont.)

```
<%
double furlongs =
   toDouble(request.getParameter("furlongs"));
double fortnights =
   toDouble(request.getParameter("fortnights"));
double speed = furlongs/fortnights;
%>

<UL>
  <LI>Distance: <%= furlongs %> furlongs.
  <LI>Time: <%= fortnights %> fortnights.
  <LI>Speed: <%= speed %> furlongs per fortnight.
</UL>
...
```

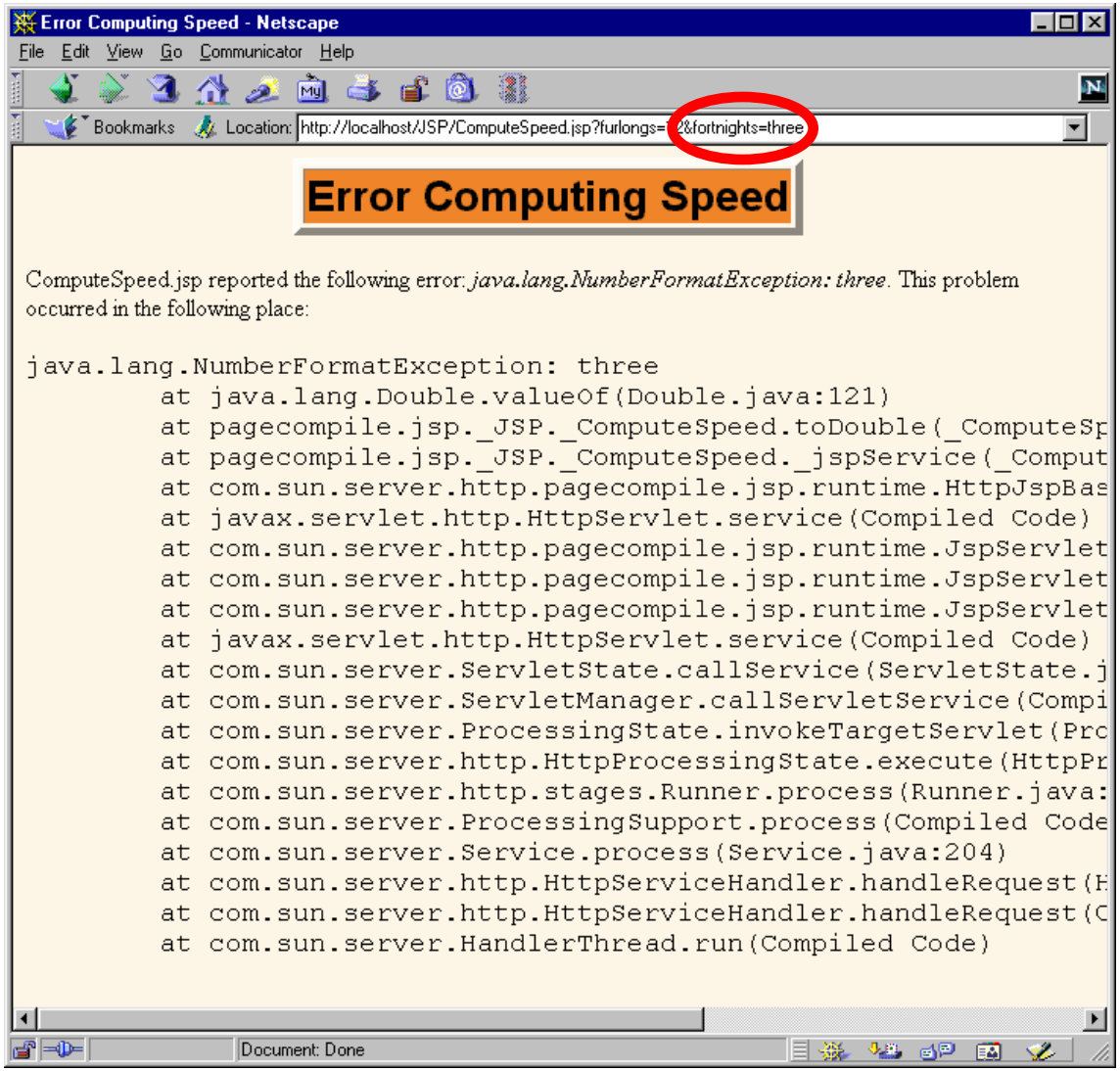
# Error Pages: Example (SpeedErrors.jsp)

```
...
<BODY>

<%@ page isErrorPage="true" %>

<TABLE BORDER=5 ALIGN="CENTER">
  <TR><TH CLASS="TITLE">
      Error Computing Speed</TABLE>
<P>
ComputeSpeed.jsp reported the following error:
<I><%= exception %></I>. This problem occurred in the
following place:
<PRE>
<% exception.printStackTrace(
                    new java.io.PrintWriter(out)); %>
</PRE>
...
```

# Error Pages: Example



# Error Pages: Example



# Summary

- **The import attribute**
  - Changes the packages imported by the servlet that results from the JSP page
    - *Always* use packages for utility classes!
- **The contentType attribute**
  - Specifies MIME type of result
  - Cannot be used conditionally
    - Use <% response.setContentType(...); %> instead
- **The isThreadSafe attribute**
  - Turns off concurrent access
  - Use explicit synchronization instead
- **The errorPage and isErrorPage attributes**
  - Specifies "emergency" error handling pages