

## The JSP page Directive: Structuring Generated Servlets

### Lecture 9 – Chapter 11

Core Servlets & JSP book: [www.coreservlets.com](http://www.coreservlets.com)  
 More Servlets & JSP book: [www.moreservlets.com](http://www.moreservlets.com)  
 Servlet and JSP Training Courses: [courses.coreservlets.com](http://courses.coreservlets.com)

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## JSP Directives Overview

- There are 3 types of JSP directives
  - `page`
  - `include`
  - `taglib`
- Chapter 11 – the `page` directive
  - JSP 1.0
- Chapter 12 – the `include` directive
  - JSP 1.0
- Chapter 14 – the `taglib` directive
  - JSP 1.1
- Chapter 13 is on JavaBeans!

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## Agenda

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

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## 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
- Can be placed anywhere in file (put @ top)

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## 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`
  - They can also be in `.jar` files in the `lib` or `lib/ext` directory

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## The import Attribute (cont.)

- **By default, JSPs automatically import:**
  - `java.lang.*`
  - `javax.servlet.*`
  - `javax.servlet.jsp.*`
  - `javax.servlet.http.*`
- The `<%@ page import ... %>` directive is the only directive that can appear multiple times in a JSP file
- It must be placed before the code that refers to the named class or package
- Place it at the top of the JSP file

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## 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>";
%>
```

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## Example of import Attribute

```
<!-- 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>
```

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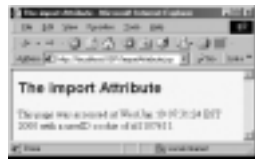
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## Example of import Attribute: Result

- First access



- Subsequent accesses



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## 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

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## The contentType Attribute

- The following JSP statement:

```
<%@ page contentType="text/plain" %>
```

- Is equivalent to the scriptlet:

```
<%
response.setContentType("text/plain");
%>
```

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## 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>
```

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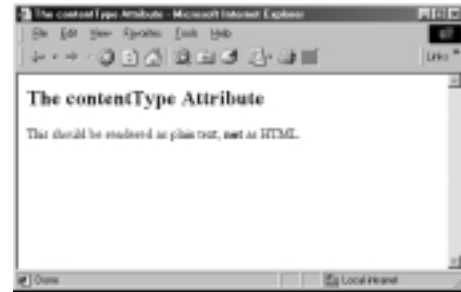
## Plain Text Documents in Netscape (Correct)



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## Plain Text Documents in Internet Explorer (Incorrect)

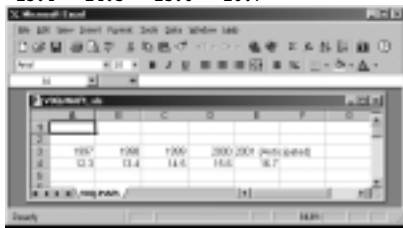


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## Generating Excel Spreadsheets

```
<%@ 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
```



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## 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");
}
%>
```

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## Generating Excel Spreadsheets Conditionally

```
<!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>
<%
String format = request.getParameter("format");
if ((format != null) && (format.equals("excel"))) {
    response.setContentType("application/vnd.ms-excel");
}
%>
```

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## 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>
```

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## Apples and Oranges: Default Result

	Apples	Oranges
First Quarter	2507	4706
Second Quarter	2962	5104
Third Quarter	3011	5228
Fourth Quarter	3055	5287

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## Apples and Oranges: Result with format=excel

	Apples	Oranges
First Quarter	2507	4706
Second Quarter	2962	5104
Third Quarter	3011	5228
Fourth Quarter	3055	5287

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## 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

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## 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;
%>
```

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## 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**
- **A better choice is idNum instead of this**

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## 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

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## The buffer Attribute

- **Format**
  - `<% @ page buffer="sizekb" %>`
  - `<% @ 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

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## The buffer Attribute (cont.)

- **Notes (cont.)**
  - Setting the buffer size to **"none"** is not advised. Doing so requires immediate output to the client. This also requires that all headers be put in the response stream first (and in proper order, if applicable).

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## The autoflush Attribute

- **Format**
  - `<% @ page autoflush="true" %>` `<%-- Default --%>`
  - `<% @ page autoflush="false" %>`
- **Purpose**
  - To designate if buffer should be flushed when full (true) or if an exception should be raised (false)
- **Notes**
  - A value of false is illegal when also using `buffer="none"`

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## 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

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## Error Pages in JSP

- **Cryptic error pages result from JSP or servlet errors**
- **JSPs allow for easy identification and handling of errors encountered on JSPs**
  - The `errorPage` and `isErrorPage` attributes
- **It is always a best practice to anticipate errors and catch all the exceptions on the page where they occurred**
  - In general, the further away you are from the source of the error, the less likely you will be able to handle it.

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## 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 target page must contain the `isErrorPage` attribute (see the next example on the following slide)

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## 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

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## Error Pages: Example (ComputeSpeed.jsp)

```
...
<BODY>

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

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

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

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## 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>
...

```

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## Error Pages: Example (SpeedErrors.jsp)

```
...
<BODY>

<%@ page isErrorPage="true" %>

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

```

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## Error Pages: Example



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## Error Pages: Example



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## Summary

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

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## Questions?

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