



The JSP page Directive: Structuring Generated Servlets

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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 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)

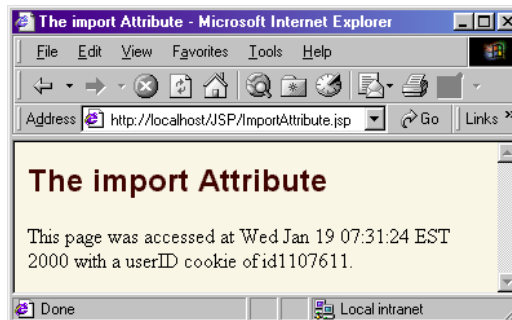
```
<!-- JSP Scriptlet --%>
<%
Cookie[] cookies = request.getCookies();
String oldID =
    ServletUtilities.getCookieValue(cookies, "userID", NO_VALUE);
String newID;
if (oldID.equals(NO_VALUE)) {
    newID = randomID();
} else {
    newID = oldID;
}
LongLivedCookie cookie = new LongLivedCookie("userID", 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**



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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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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.

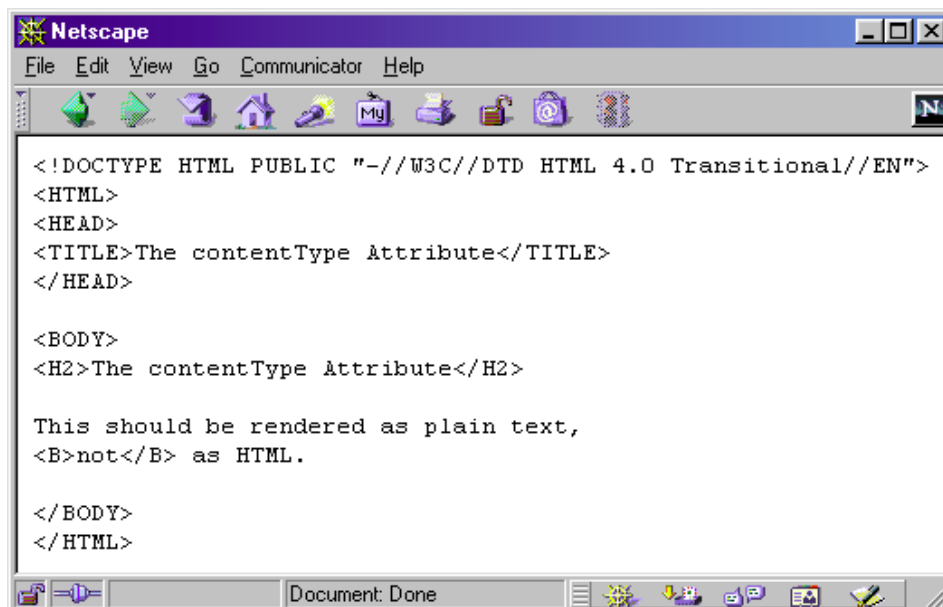
</BODY>
</HTML>
```

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Plain Text Documents in Netscape (Correct)

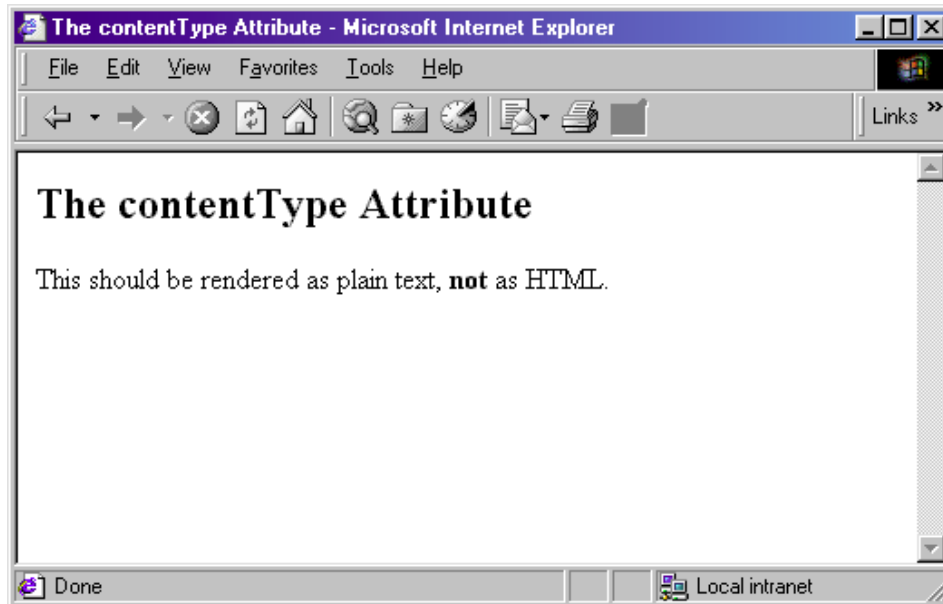


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Plain Text Documents in Internet Explorer (Incorrect)



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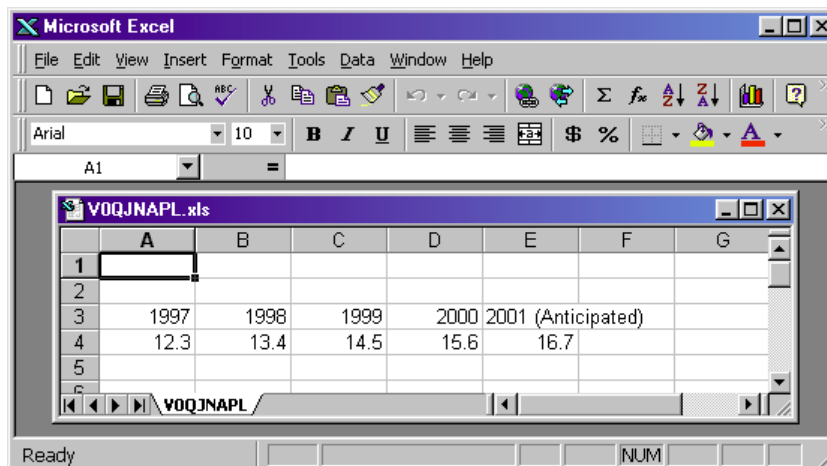
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Generating Excel Spreadsheets

```
<%@ 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");
  }
%>
```

Generating Excel Spreadsheets Conditionally

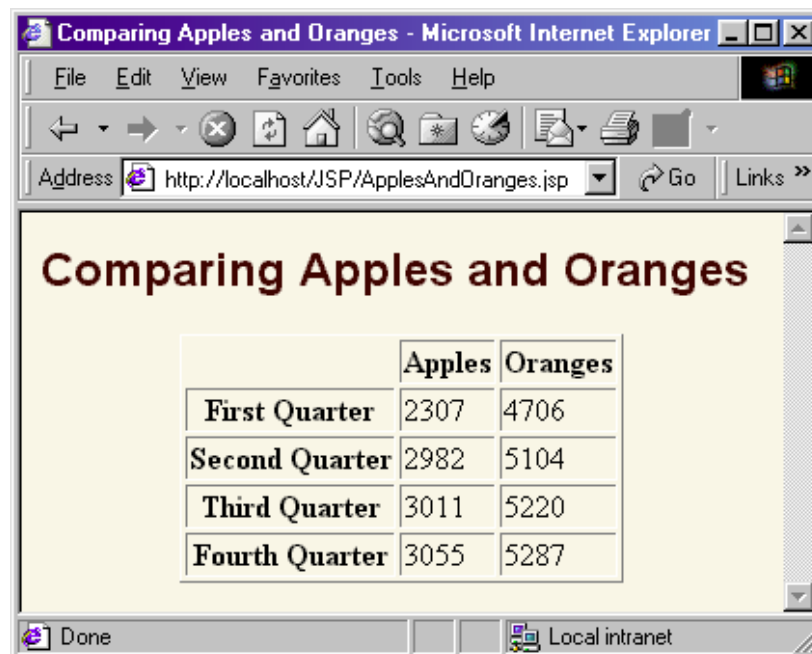
```
<%
String format = request.getParameter("format");
if ((format != null) && (format.equals("excel"))) {
  response.setContentType("application/vnd.ms-excel");
}
%>
<!DOCTYPE ...>
<HTML><HEAD>
<TITLE>Comparing Apples and Oranges</TITLE>
<LINK REL=STYLESHEET
      HREF="JSP-Styles.css"
      TYPE="text/css">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

Generating Excel Spreadsheets Conditionally (Continued)

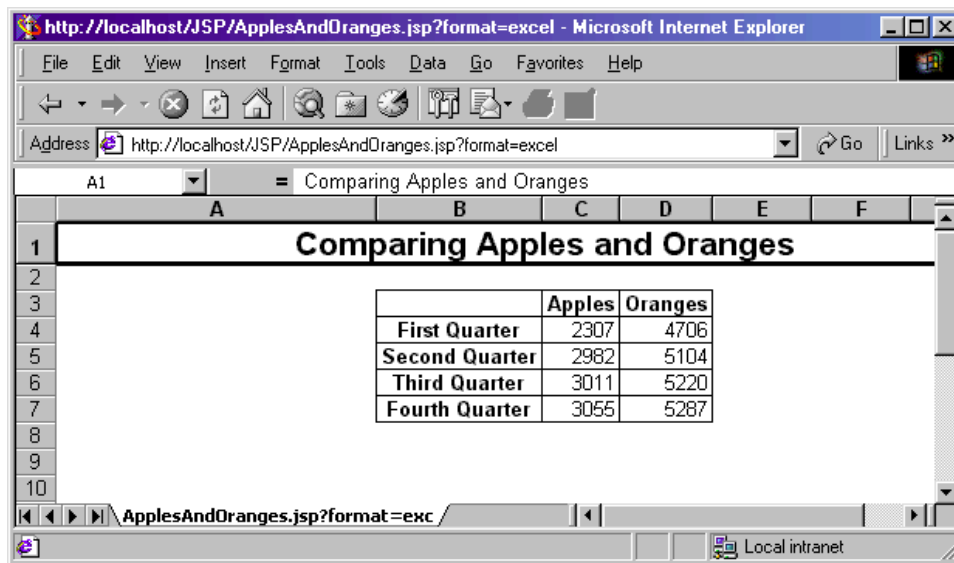
```
<TABLE BORDER=1>
  <TR><TH></TH><TH>Apples<TH>Oranges
  <TR><TH>First Quarter<TD>2307<TD>4706
  <TR><TH>Second Quarter<TD>2982<TD>5104
  <TR><TH>Third Quarter<TD>3011<TD>5220
  <TR><TH>Fourth Quarter<TD>3055<TD>5287
</TABLE>

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

Apples and Oranges: Default Result



Apples and Oranges: Result with format=excel



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

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="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

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
  </TR>
</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>

...
```

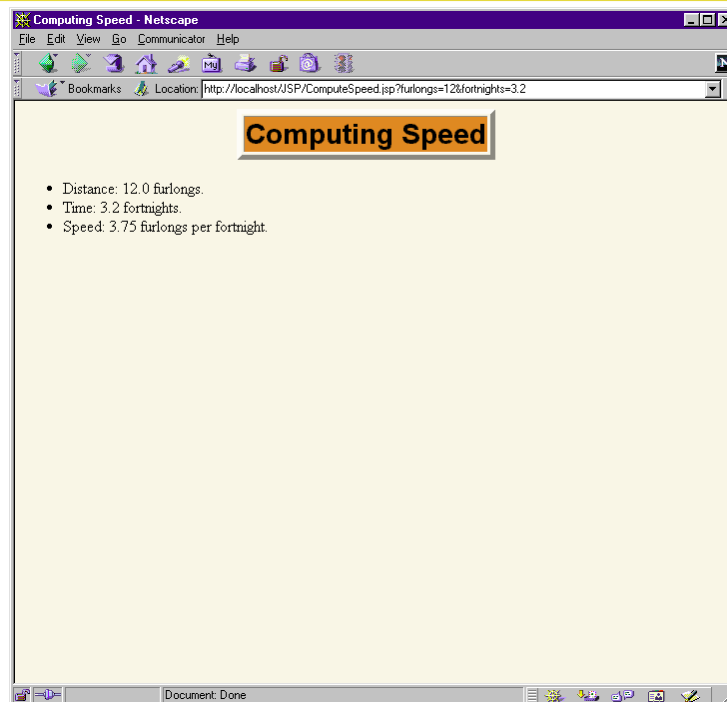
Error Pages: Example (SpeedErrors.jsp)

```
...
<BODY>

<%@ page isErrorPage="true" %>

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

Error Pages: Example

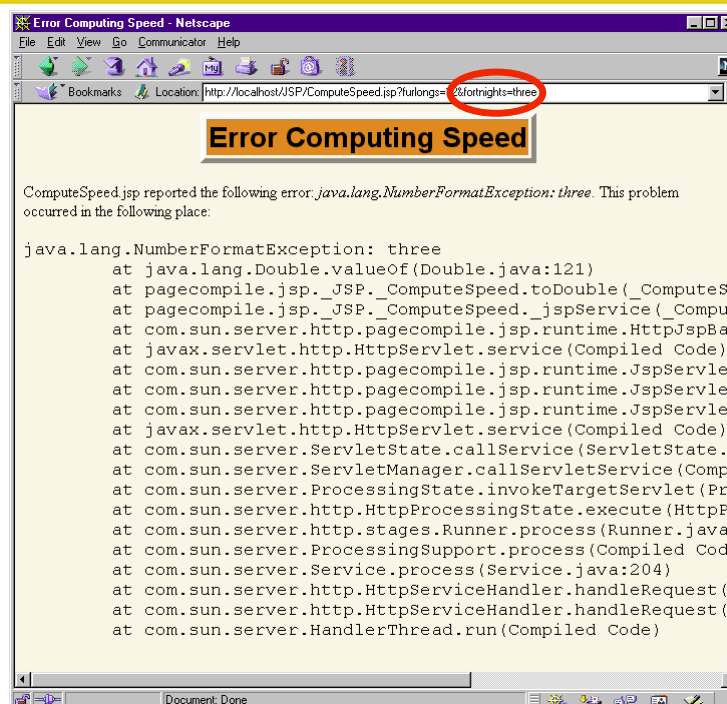


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Error Pages: Example



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Summary

- **The import attribute**
 - Changes the packages imported by the servlet that results from the JSP page
 - *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

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