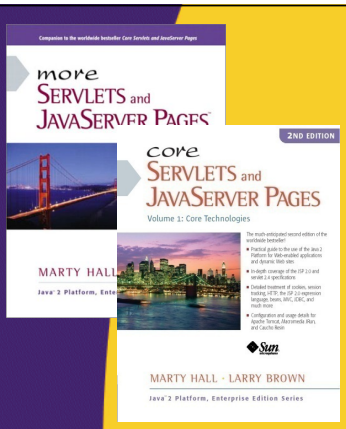
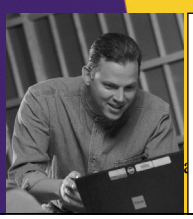
Creating Custom JSP Tag Libraries: The Basics

Originals of Slides and Source Code for Examples:
http://courses.coreservlets.com/Course-Materials/csajsp2.html





Agenda

- **What are tags? Why use them?**
- **Java-based tags**
  - Components of a tag library
  - Basic tags
  - Tags that use attributes
  - Tags that use body content
  - Tags that optionally use body content
- **JSP-based tags (tag files)**
  - Components of a tag library
  - Basic tags
  - Tags that use attributes
  - Tags that use body content

Intro

Uses of JSP Constructs

Simple Application

Complex Application

- Scripting elements calling servlet code directly
- Scripting elements calling servlet code indirectly (by means of utility classes)
- Beans
- Servlet/JSP combo (MVC)
- MVC with JSP expression language
- Custom tags
- MVC with beans, custom tags, and a framework like JSF 2.0

Tag Examples

```
Blah, blah, blah. <mytags:showDate/>
Blah, blah, blah. <mytags:showDate format="short"/>
Blah, blah, blah.

<mytags:emphasize color="red" blink="true" size="100">
  This is a very important message
</mytags:emphasize>

Blah, blah, blah.

<mytags:translate language="spanish">
  Hello World
</mytags:translate>
```

Java-Based Tags

Components That Make Up a Tag Library

- **The Tag Handler Class**
  - Java code that says what to output
  - Must implement javax.servlet.jsp.tagext.SimpleTag
  - Usually extends SimpleTagSupport
  - Goes in same directories as servlet class files and beans
- **The Tag Library Descriptor File**
  - XML file describing tag name, attributes, and implementing tag handler class
  - Goes under WEB-INF
- **The JSP File**
  - Imports a tag library (referencing URL of descriptor file)
  - Defines tag prefix
  - Uses tags

Defining a Simple Tag Handler Class

- **Extend the SimpleTagSupport class**
- **Import needed packages**
  - import javax.servlet.jsp.*;
    import javax.servlet.jsp.tagext.*;
    import java.io.*;
- **Override doTag**
  - Obtain the JspWriter with getJspContext().getOut()
  - Use the JspWriter to generate output
  - Code gets called at *request* time
    - Tag instances are not reused like servlet instances, so no worry about race conditions, even if you have instance variables

Defining a Simple Tag Handler Class: Example

```
package coreservlets.tags;

import javax.servlet.jsp.*;
import javax.servlet.jsp.tagext.*;
import java.io.*;
import java.math.*;
import coreservlets.Primes;

public class SimplePrimeTag extends SimpleTagSupport {
  protected int length = 50;

  public void doTag() throws JspException, IOException {
    JspWriter out = getJspContext().getOut();
    BigInteger prime =
      Primes.nextPrime(Primes.random(length));
    out.print(prime);
  }
}
```

Defining a Simple Tag Library Descriptor

- **Start with XML header**
- **Top-level element is `taglib`**
  - Just use tlib-version and short-name as in example
- **Each tag defined by `tag` element with:**
  - **description**, which gives short info. Optional.
  - **name**, which defines the base tag name.
  - **tag-class**, which gives the fully qualified class name of the tag handler.
  - **body-content**, which specifies if tag is standalone or contains content between start and end tag.
- **You can have multiple `tag` entries in each TLD file**
- **Put TLD file somewhere under WEB-INF**

TLD File for SimplePrimeTag

```
<?xml version="1.0" encoding="UTF-8" ?>
<taglib xmlns="http://java.sun.com/xml/ns/j2ee"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://java.sun.com/xml/ns/j2ee
  http://java.sun.com/xml/ns/j2ee/web-jsptaglibrary_2_0.xsd"
  version="2.0">
  <tlib-version>1.0</tlib-version>
  <short-name>csajsp-taglib</short-name>

  <tag>
    <description>Outputs 50-digit primes</description>
    <name>simplePrime</name>
    <tag-class>coreservlets.tags.SimplePrimeTag</tag-class>
    <body-content>empty</body-content>
  </tag>
  ...
</taglib>
```

- **Don't memorize XML header and standard part; download and modify online version**
  - The important thing is to know how to write **tag** entries
  - Place TLD file somewhere under WEB-INF

Accessing Custom Tags From JSP Files

- **Import the tag library**
  - Specify location of TLD file
    <%@ taglib uri="/WEB-INF/tlds/csajsp-taglib.tld"
    prefix="csajsp" %>
  - Define a tag prefix (namespace)
    <%@ taglib uri="/WEB-INF/tlds/csajsp-taglib.tld"
    prefix="csajsp" %>
- **Use the tags**
  - <prefix:tagName />
    - Tag name comes from TLD file
    - Prefix comes from taglib directive
  - E.g., <csajsp:simplePrime />

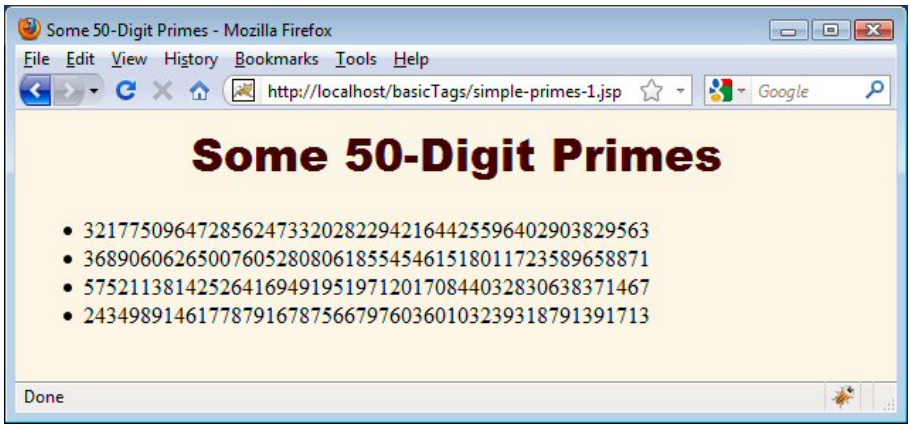
Using simplePrime Tag

```
...
<BODY>
<H1>Some 50-Digit Primes</H1>

<%@ taglib uri="/WEB-INF/tlds/csajsp-taglib.tld"
           prefix="csajsp" %>
<UL>
  <LI><csajsp:simplePrime/>
  <LI><csajsp:simplePrime/>
  <LI><csajsp:simplePrime/>
  <LI><csajsp:simplePrime/>
</UL>

</BODY>
</HTML>
```

Using simplePrime Tag: Result



Assigning Attributes to Tags

- **Allowing tags like**
  - <prefix:name
    attribute1="value1"
    attribute2="value2"
    ...
    attributeN="valueN"
    />
- **Tags are still standalone**
  - No body content between start and end tags

Attributes: The Tag Handler Class

- **Use of an attribute called `attribute1` simply results in a call to a method called `setAttribute1`**
  - Attribute value is supplied to method as a String
- **Example**
  - To support

    <prefix:tagName attribute1="Test" />

    add the following to tag handler class:

```
public void setAttribute1(String value1) {
  doSomethingWith(value1);
}
```


Attributes: PrimeTag.java

```
package coreservlets.tags;

public class PrimeTag extends SimplePrimeTag {
  public void setLength(String length) {
    try {
      this.length = Integer.parseInt(length);
    } catch(NumberFormatException nfe) {
      this.length = 50;
    }
  }
}
```

Attributes: The Tag Library Descriptor File

- The `tag` element must contain a nested `attribute` element
- The `attribute` element has three further-nested elements
  - **name**, a required element that defines the case-sensitive attribute name.
  - **required**, a required element that stipulates whether the attribute must always be supplied (true) or is optional (false).
  - **rtexprvalue**, an optional attribute that indicates whether the attribute value can be a JSP expression like <%= expression %> (true) or whether it must be a fixed string (false). The default value is false.

TLD File for PrimeTag

```
...
<taglib ...>
  ...
  <tag>
    <description>Outputs an N-digit prime</description>
    <name>prime</name>
    <tag-class>coreservlets.tags.PrimeTag</tag-class>
    <body-content>empty</body-content>
    <attribute>
      <name>length</name>
      <required>false</required>
    </attribute>
  </tag>
  ...
</taglib>
```

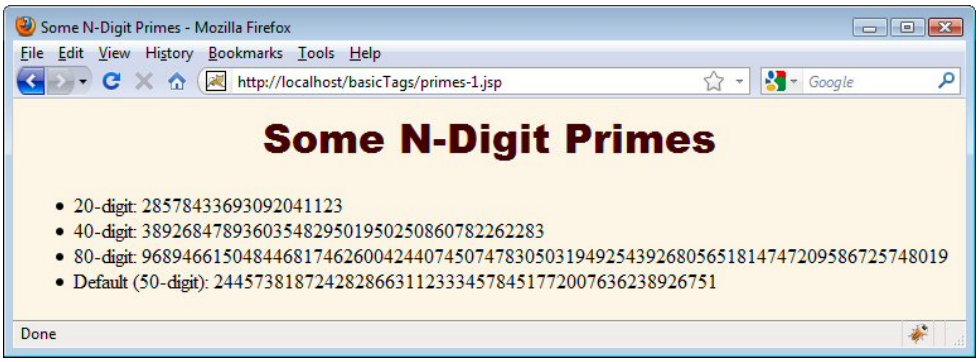
Using prime Tag

```
...
<BODY>
<H1>Some N-Digit Primes</H1>

<%@ taglib uri="/WEB-INF/tlds/csajsp-taglib.tld"
           prefix="csajsp" %>
<UL>
  <LI>20-digit: <csajsp:prime length="20"/>
  <LI>40-digit: <csajsp:prime length="40"/>
  <LI>80-digit: <csajsp:prime length="80"/>
  <LI>Default (50-digit): <csajsp:prime/>
</UL>

</BODY>
</HTML>
```


Using prime Tag: Result



Including the Tag Body

- **Simplest tags**
  - <prefix:tagName/>
- **Tags with attributes**
  - <prefix:tagName att1="val1" ... />
- **Now**
  - <prefix:tagName>
    Scriptless JSP Content
    </prefix:tagName>

  - <prefix:tagName att1="val1" ... >
    Scriptless JSP Content
    </prefix:tagName>

Including Tag Body: The Tag Handler Class

- **Call getJspBody().invoke(null);**

```
public void doTag() throws ... {
   JspWriter out = getJspContext().getOut();
   out.print("...");
   getJspBody().invoke(null);
   out.print("...");
}
```

Including Tag Body: HeadingTag.java

```
public class HeadingTag extends SimpleTagSupport {
  private String align;
  private String bgColor;
  private String border;
  private String fgColor;
  private String font;
  private String size;

  public void setAlign(String align) {
    this.align = align;
  }

  public void setBgColor(String bgColor) {
    this.bgColor = bgColor;
  }

  public void setBorder(String border) {
    this.border = border;
  }…
```


Including Tag Body: HeadingTag.java (Continued)

```
  public void doTag() throws JspException, IOException {
    JspWriter out = getJspContext().getOut();
    out.print("<TABLE ALIGN=\"" + align + "\"\n" +
              "       BGCOLOR=\"" + bgColor + "\"\n" +
              "       BORDER=" + border + "\">\n");
    out.print("<TR><TH>");
    out.print("<SPAN STYLE=\"color: " + fgColor + ";\n" +
              "               font-family: " + font + ";\n" +
              "               font-size: " + size + "px; " +
              "\">\n");
    // Output content of the body
    getJspBody().invoke(null);
    out.println("</SPAN></TH></TR></TABLE>" +
                "<BR CLEAR=\"ALL\"><BR>");
  }
}
```

Using Tag Body: The Tag Library Descriptor File

- **Only difference is body-content element**
  - Should be **`scriptless`** instead of **`empty`**:

```
<tag>
  <name>…</name>
  <tag-class>…</tag-class>
  <body-content>scriptless</body-content>
</tag>
```

- **Legal values for body-content**
  - **empty**: no body content
    - Body content is ignored even if supplied
  - **scriptless**: body content is included
    - Can contain plain text, EL elements, other custom tags, and page directives
    - *No* explicit scripting allowed (<%= ... %>)
  - **tagdependent**: body content is processed by tag

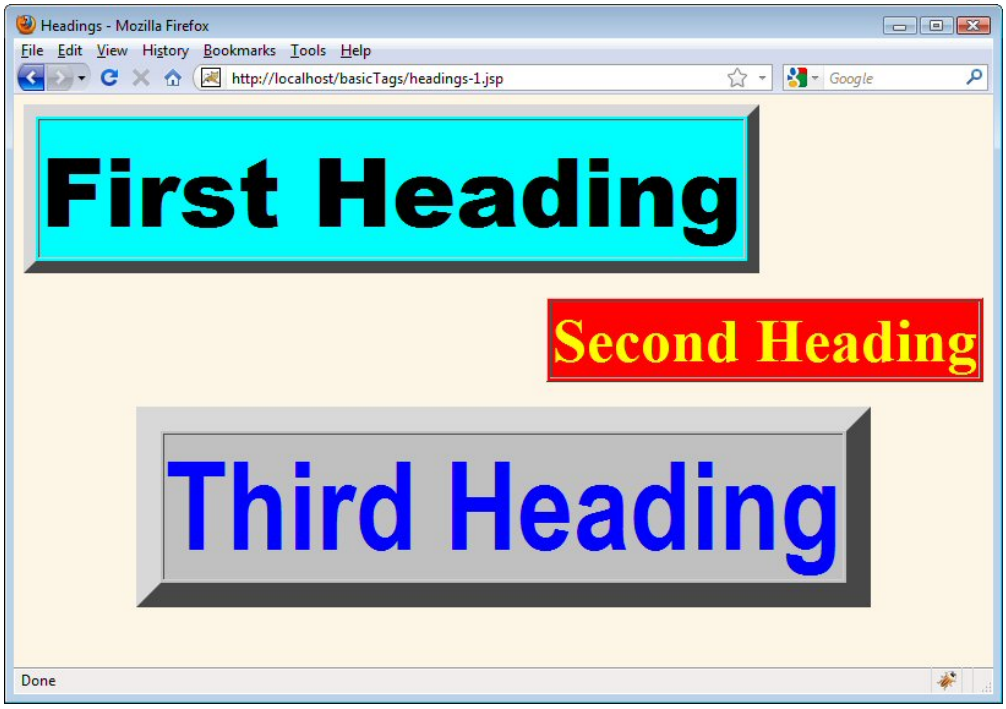
heading Tag: TLD File

```
<tag>
  <description>Formats enclosed heading</description>
  <name>heading</name>
  <tag-class>coreservlets.tags.HeadingTag</tag-class>
  <body-content>scriptless</body-content>
  <attribute>
    <name>align</name>
    <required>true</required>
  </attribute>
  <attribute>
    <name>bgColor</name>
    <required>true</required>
  </attribute>
  ...
</tag>
```

Using heading Tag

```
...
<BODY>
<%@ taglib uri="/WEB-INF/tlds/csajsp-taglib.tld"
           prefix="csajsp" %>
<csajsp:heading align="LEFT" bgColor="CYAN"
                border="10" fgColor="BLACK"
                font="Arial Black" size="78">
  First Heading
</csajsp:heading>
<csajsp:heading align="RIGHT" bgColor="RED"
                border="1" fgColor="YELLOW"
                font="Times New Roman" size="50">
  Second Heading
</csajsp:heading>
<csajsp:heading align="CENTER" bgColor="#C0C0C0"
                border="20" fgColor="BLUE"
                font="Arial Narrow" size="100">
  Third Heading
</csajsp:heading>
```


Using heading Tag: Results



Optional Tag Bodies

- **First examples**
  - No tag bodies
    - body-content: empty
    - doTag does not call invoke(null)
- **Most recent examples**
  - Always included tag bodies
    - body-content: scriptless
    - doTag calls invoke(null)
- **Now:**
  - Decide at request time whether or not to include tag body
    - body-content: scriptless
    - doTag conditionally calls invoke(null)
      - Depending on run-time information

Optional Tag Bodies: DebugTag.java

```
public class DebugTag extends SimpleTagSupport {
  public void doTag() throws JspException, IOException {
    PageContext context = (PageContext)getJspContext();
    HttpServletRequest request =
      (HttpServletRequest)context.getRequest();
    // Output body of tag only if debug param is present.
    if (request.getParameter("debug") != null) {
      getJspBody().invoke(null);
    }
  }
}
```

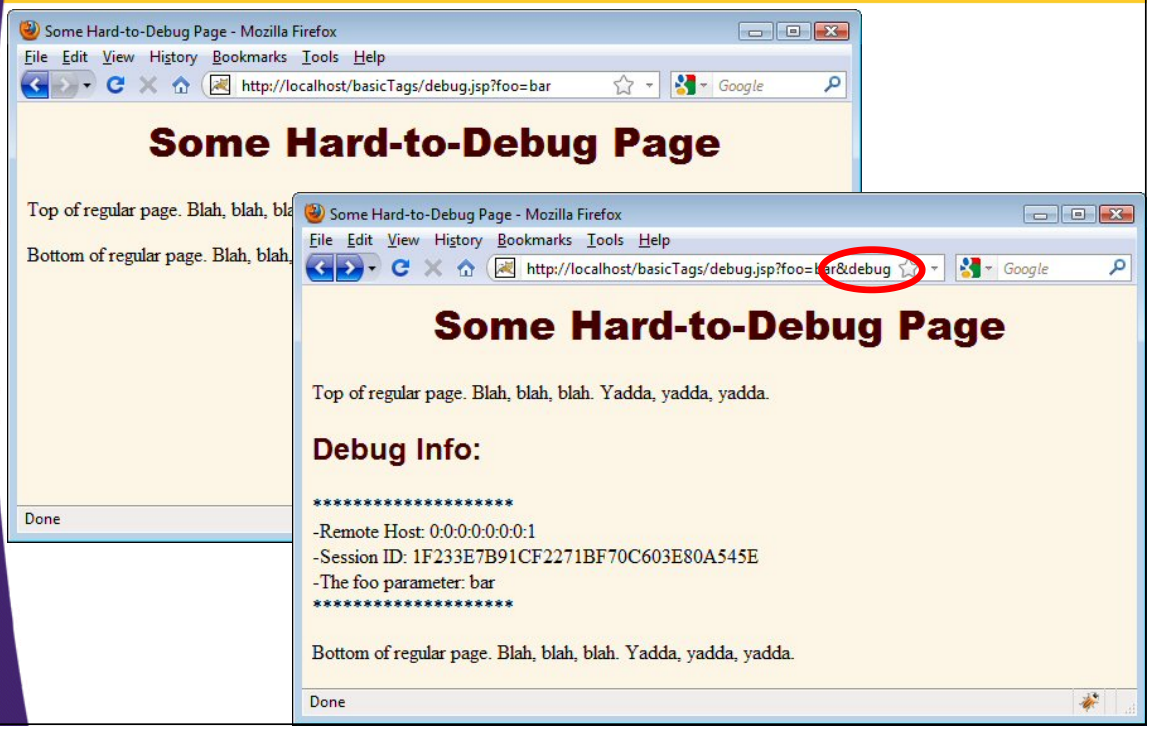
TLD File for DebugTag

```
...
  <tag>
    <description>
      Conditionally outputs enclosed body
    </description>
    <name>debug</name>
    <tag-class>coreservlets.tags.DebugTag</tag-class>
    <body-content>scriptless</body-content>
  </tag>
...
```


Using debug Tag

```
<%@ taglib uri="/WEB-INF/tlds/csajsp-taglib.tld"
           prefix="csajsp" %>
Top of regular page. Blah, blah, blah.
Yadda, yadda, yadda.
<csajsp:debug>
<H2>Debug Info:</H2>
**********************<BR>
-Remote Host: ${pageContext.request.remoteHost}<BR>
-Session ID: ${pageContext.session.id}<BR>
-The foo parameter: ${param.foo}<BR>
**********************<BR>
</csajsp:debug>
<P>
Bottom of regular page. Blah, blah, blah.
Yadda, yadda, yadda.
```

Using debug Tag: Results



Using a Pseudo-URI Instead of TLD Location

The <uri> Tag in TLD Files

- **TLD files can define fake addresses**

```
<?xml version="1.0" encoding="UTF-8" ?>
<taglib ...> ...
  <uri>http://anything/you/want</uri>
```

- **JSP pages import TLD using fake address**

```
<%@ taglib uri="http://anything/you/want" ...%>
```

  - Note: this address is totally made up: it just matches what is in the TLD file. JSP page does not connect to the Web to look for this address.

- **Advantages**
  - Can move/rename TLD file with no JSP code changes
    - You can even bundle tag libraries in JAR files under WEB-INF/lib and put TLD files in META-INF in the JAR files
  - If you write JSP pages using XML syntax, you can use an additional xmlns entry to the root element and omit the @taglib declaration.
- **Disadvantage**
  - Confusing: JSP authors don't know where TLD file is

Example: The <uri> Tag

- **TLD File**
  - In WEB-INF/tlds/file.tld

```
<?xml ... ?>
<taglib ...>
  <uri>
    http://foo.com/bar
  </uri>

  <tag>
    <name>myTag</name>
    <tag-class>...</tag-class>
    <body-content>
      empty or scriptless
    </body-content>
  </tag>
</taglib>
```

- **JSP (Approach 1)**

```
<%@ taglib
      uri="/WEB-INF/tlds/file.tld"
      prefix="myPrefix" %>
...
<myPrefix:myTag/>
...
```

- **JSP (Approach 2)**

```
<%@ taglib
      uri="http://foo.com/bar"
      prefix="myPrefix" %>
...
<myPrefix:myTag/>
...
```

JSP-Based Tags (Tag Files)

Tag Files: Custom Tags Using JSP Syntax

- **Two Approaches**
  - When there is lots of logic, use Java to create output
    - Analagous to when you use servlets
  - When there is lots of formatting, use JSP to create output
    - Analagous to when you use JSP pages
- **Pros**
  - Very good for complex text formatting
  - Very concise
- **Cons**
  - Not good for complicated logic
  - Runs only in JSP 2.0 and later
    - Java-based versions had "classic" syntax that worked in older servers (e.g., BEA WebLogic 8.1, Oracle 9i AS)

Simple Standalone Tags

- **Java-based approach requires three pieces**
  - Java code that overrides doTag to generate output
    - Strengths and weaknesses generally similar to those of servlets, but more cumbersome
  - Tag Library Descriptor (TLD) file that maps Java class name to tag name
  - JSP page that refers to specific location of TLD file
- **JSP-based approach requires two pieces**
  - JSP code (tag file) that shows result
    - /WEB-INF/tags/someName.tag
  - No TLD file: tag name taken from tag-file name
  - JSP page that refers to directory containing tag file
    - /WEB-INF/tags or a subdirectory thereof

Tag Files

- **Look just like regular JSP files, except**
  - Must be located in (or under) WEB-INF/tags
  - Must be named blah.tag, not blah.jsp
  - You use <%@ tag ... %> instead of <%@ page ... %>
  - You use predefined variable jspContext instead of pageContext
    - But you can cast it to PageContext
    - Other variables (request, response, etc.) are the same
- **Example**

WEB-INF/tags/date.tag

```
<%@ tag import="java.util.*" %>
Date is <%= new Date() %>
```

some-page.jsp

```
<%@ taglib
    tagdir="/WEB-INF/tags"
    prefix="test" %>
...
<test:date/>
```

Java-Based Tags: Code (Simple Standalone Tag)

```
package coreservlets.tags;

import javax.servlet.jsp.*;
import javax.servlet.jsp.tagext.*;
import java.io.*;
import java.math.*;
import coreservlets.Primes;

public class SimplePrimeTag extends SimpleTagSupport {
   protected int length = 50;

   public void doTag() throws JspException, IOException {
     JspWriter out = getJspContext().getOut();
     BigInteger prime =
       Primes.nextPrime(Primes.random(length));
     out.print(prime);
   }
}
```


Java-Based Tags: TLD File (Simple Standalone Tag)

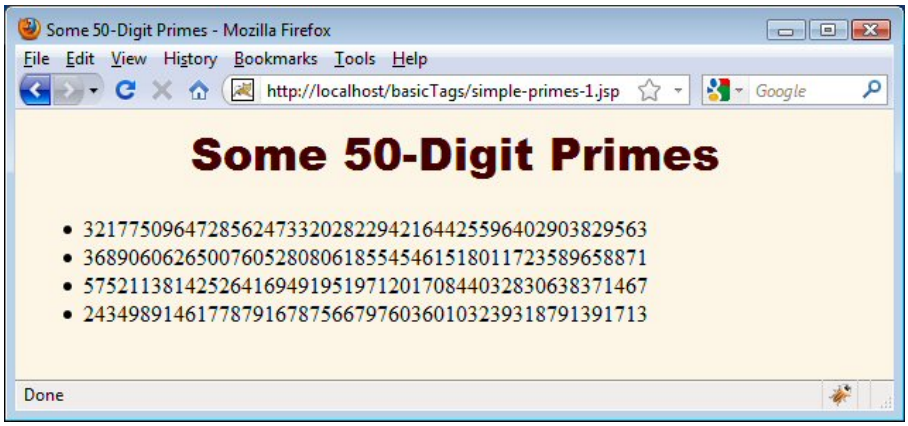
```
<?xml version="1.0" encoding="UTF-8" ?>
<taglib xmlns="http://java.sun.com/xml/ns/j2ee"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://java.sun.com/xml/ns/j2ee
  http://java.sun.com/xml/ns/j2ee/web-jsptaglibrary_2_0.xsd"
  version="2.0">
  <tlib-version>1.0</tlib-version>
  <short-name>csajsp-taglib</short-name>

  <tag>
    <description>Outputs 50-digit primes</description>
    <name>simplePrime</name>
    <tag-class>coreservlets.tags.SimplePrimeTag</tag-class>
    <body-content>empty</body-content>
  </tag>
  ...
</taglib>
```

Java-Based Tags: Usage in JSP (Simple Standalone Tag)

```
...
<BODY>
<H1>Some 50-Digit Primes</H1>
<%@ taglib uri="/WEB-INF/tlds/csajsp-taglib.tld"
           prefix="csajsp" %>
<UL>
  <LI><csajsp:simplePrime/>
  <LI><csajsp:simplePrime/>
  <LI><csajsp:simplePrime/>
  <LI><csajsp:simplePrime/>
</UL>
</BODY></HTML>
```


Java-Based Tags: Result (Simple Standalone Tag)



Tag Files: Tag Code (Simple Standalone Tag)

- **WEB-INF/tags/simplePrime2.tag**
  - Directory name is not arbitrary; must be in /WEB-INF/tags or a subdirectory thereof

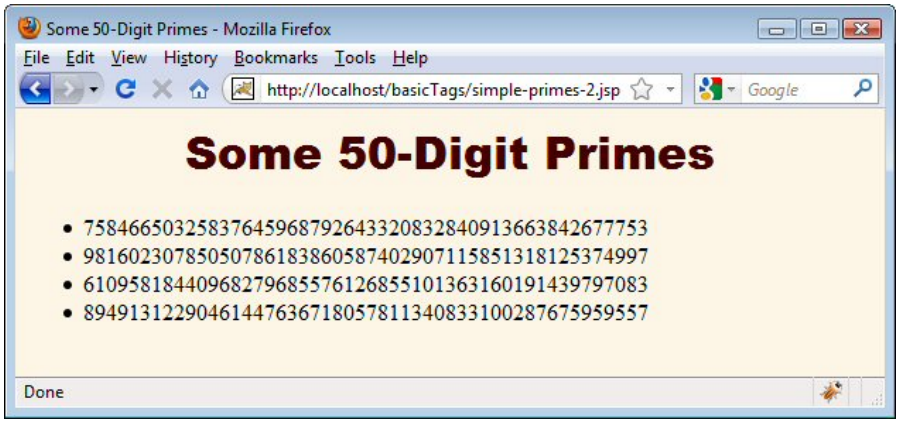
```
<%= coreservlets.Primes.nextPrime
      (coreservlets.Primes.random(50)) %>
```


Tag Files: Usage in JSP (Simple Standalone Tag)

```
...
<BODY>
<H1>Some 50-Digit Primes</H1>

<%@ taglib tagdir="/WEB-INF/tags"
           prefix="csajsp" %>
<UL>
  <LI><csajsp:simplePrime2/>
  <LI><csajsp:simplePrime2/>
  <LI><csajsp:simplePrime2/>
  <LI><csajsp:simplePrime2/>
</UL>
</BODY></HTML>
```

Tag Files: Result (Simple Standalone Tag)



Tags with Attributes

- **Java-based tags**
  - For each attribute, add set*AttributeName* method to the Java class
  - Attribute value usually explicitly stored in instance variable (field) of Java class
  - List each attribute explicitly in TLD file
- **JSP-based tags (tag files)**
  - Each attribute listed in tag file with @attribute
    - Can also list required and rtexprvalue (default false)
  - Attribute value automatically stored in scoped variable (for access from expression language) and in local variable (for access from Java code)
  - No TLD file

Java-Based Tags: Code (Tag with Attributes)

```
package coreservlets.tags;

public class PrimeTag extends SimplePrimeTag {
  public void setLength(String length) {
    try {
      this.length = Integer.parseInt(length);
    } catch(NumberFormatException nfe) {
      this.length = 50;
    }
  }
}
```

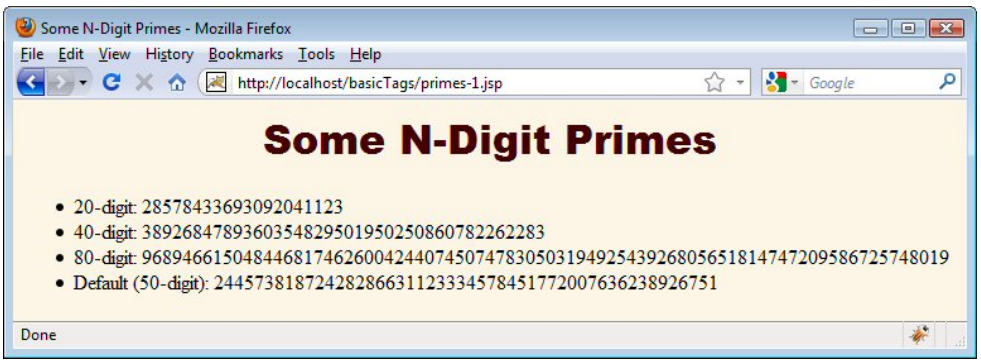

Java-Based Tags: TLD File (Tag with Attributes)

```
...
  <tag>
    <description>Outputs an N-digit prime</description>
    <name>prime</name>
    <tag-class>coreservlets.tags.PrimeTag</tag-class>
    <body-content>empty</body-content>
    <attribute>
      <name>length</name>
      <required>false</required>
    </attribute>
  </tag>
...
```

Java-Based Tags: Usage in JSP (Tag with Attributes)

```
...
<BODY>
<H1>Some N-Digit Primes</H1>
<%@ taglib uri="/WEB-INF/tlds/csajsp-taglib.tld"
           prefix="csajsp" %>
<UL>
  <LI>20-digit: <csajsp:prime length="20" />
  <LI>40-digit: <csajsp:prime length="40" />
  <LI>80-digit: <csajsp:prime length="80" />
  <LI>Default (50-digit): <csajsp:prime />
</UL>
</BODY></HTML>
```


Java-Based Tags: Results (Tag with Attributes)



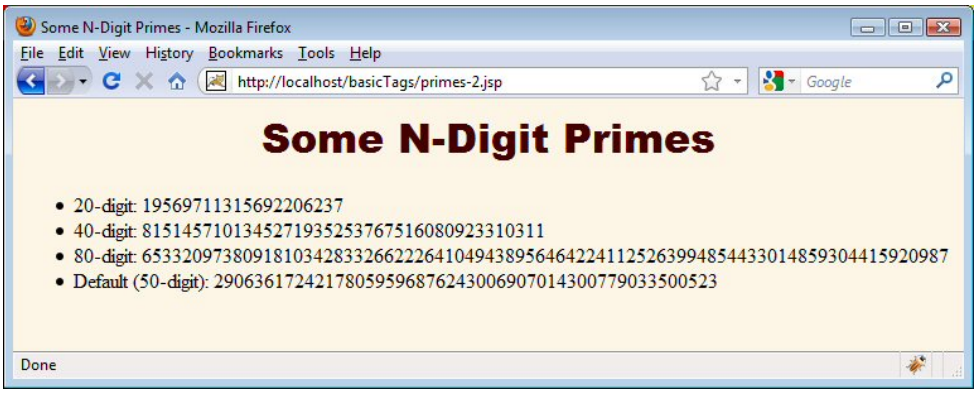
Tag Files: Tag Code (Tag with Attributes)

```
<%@ attribute name="length" required="false" %>
<%
int len = 50;
try {
  len = Integer.parseInt(length);
} catch(NumberFormatException nfe) {}
%>
<%= coreservlets.Primes.nextPrime
      (coreservlets.Primes.random(len)) %>
```


Tag Files: Usage in JSP (Tag with Attributes)

```
...
<BODY>
<H1>Some N-Digit Primes</H1>
<%@ taglib tagdir="/WEB-INF/tags"
           prefix="csajsp" %>
<UL>
  <LI>20-digit: <csajsp:prime2 length="20"/>
  <LI>40-digit: <csajsp:prime2 length="40"/>
  <LI>80-digit: <csajsp:prime2 length="80"/>
  <LI>Default (50-digit): <csajsp:prime2/>
</UL>
</BODY></HTML>
```

Tag Files: Results (Tag with Attributes)



Tags with Bodies

- **Java-based tags**
  - Change body-content from empty to scriptless (in TLD)
  - Call getJspBody().invoke(null)
  - Still need setter method and TLD entry for every attribute
- **JSP-based tags (tag files)**
  - Use <jsp:doBody/> to output tag body
  - No major syntax changes
  - Access to attributes still much simpler

Java-Based Tags: Code (Tag with Body)

```
public class HeadingTag extends SimpleTagSupport {
  private String align;
  private String bgColor;
  private String border;
  private String fgColor;
  private String font;
  private String size;

  public void setAlign(String align) {
    this.align = align;
  }

  public void setBgColor(String bgColor) {
    this.bgColor = bgColor;
  }

  public void setBorder(String border) {
    this.border = border;
  }…
```


Java-Based Tags: Code (Tag with Body -- Continued)

```
  public void doTag() throws JspException, IOException {
    JspWriter out = getJspContext().getOut();
    out.print("<TABLE ALIGN=\"" + align + "\"\n" +
              "       BGCOLOR=\"" + bgColor + "\"\n" +
              "       BORDER=" + border + "\">\n");
    out.print("<TR><TH>");
    out.print("<SPAN STYLE=\"color: " + fgColor + ";\n" +
              "              font-family: " + font + ";\n" +
              "              font-size: " + size + "px; " +
              "\">\n"); //
    // Output content of the body
    getJspBody().invoke(null);
    out.println("</SPAN></TH></TR></TABLE>" +
                "<BR CLEAR=\"ALL\"><BR>");
  }
}
```

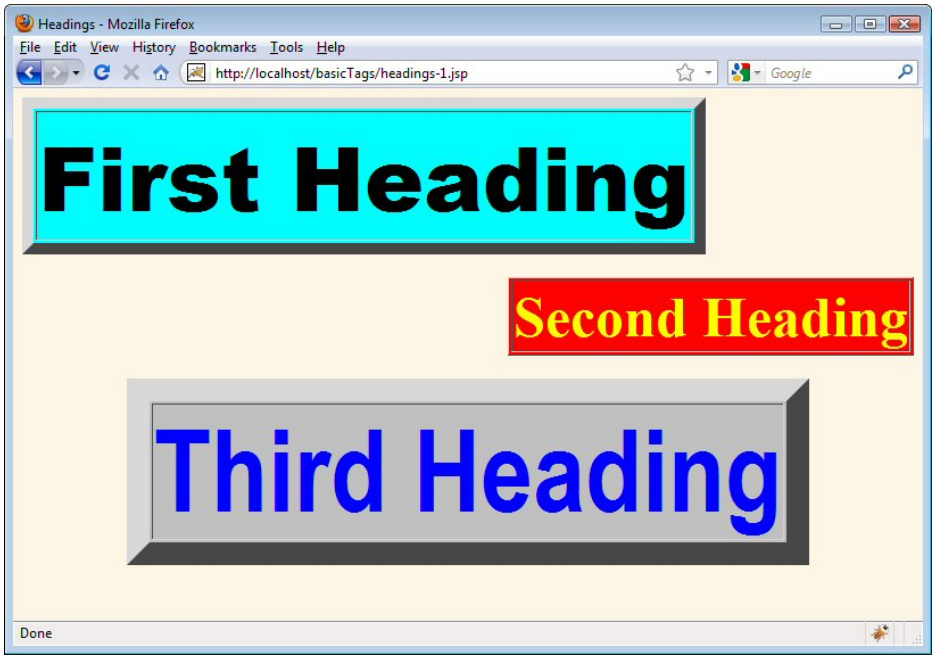
Java-Based Tags: TLD File (Tag with Body)

```
...
  <tag>
    <description>Formats enclosed heading</description>
    <name>heading</name>
    <tag-class>coreservlets.tags.HeadingTag</tag-class>
    <body-content>scriptless</body-content>
    <attribute>
      <name>align</name>
      <required>true</required>
    </attribute>
    <attribute>
      <name>bgColor</name>
      <required>true</required>
    </attribute>
    ...
  </tag>
```


Java-Based Tags: Usage in JSP (Tag with Body)

```
<BODY>
<%@ taglib uri="/WEB-INF/tlds/csajsp-taglib.tld"
           prefix="csajsp" %>
<csajsp:heading align="LEFT" bgColor="CYAN"
                border="10" fgColor="BLACK"
                font="Arial Black" size="78">
  First Heading
</csajsp:heading>
<csajsp:heading align="RIGHT" bgColor="RED"
                border="1" fgColor="YELLOW"
                font="Times New Roman" size="50">
  Second Heading
</csajsp:heading>
<csajsp:heading align="CENTER" bgColor="#C0C0C0"
                border="20" fgColor="BLUE"
                font="Arial Narrow" size="100">
  Third Heading
</csajsp:heading>
```

Java-Based Tags: Results (Tag with Body)



Tag Files: Tag Code (Tag with Body)

```
<%@ attribute name="align" required="true" %>
<%@ attribute name="bgColor" required="true" %>
<%@ attribute name="border" required="true" %>
<%@ attribute name="fgColor" required="true" %>
<%@ attribute name="font" required="true" %>
<%@ attribute name="size" required="true" %>
<TABLE ALIGN="${align}"
       BGCOLOR="${bgColor}"
       BORDER="${border}">
  <TR><TH>
      <SPAN STYLE="color: ${fgColor};
                   font-family: ${font};
                   font-size: ${size}px;">
      <jsp:doBody/></SPAN>
</TABLE><BR CLEAR="ALL"><BR>
```

Tag Files: Usage in JSP (Tag with Body)

```
<BODY>
<%@ taglib tagdir="/WEB-INF/tags"
           prefix="csajsp" %>
<csajsp:heading2 align="LEFT" bgColor="CYAN"
                 border="10" fgColor="BLACK"
                 font="Arial Black" size="78">
  First Heading
</csajsp:heading2>
<csajsp:heading2 align="RIGHT" bgColor="RED"
                 border="1" fgColor="YELLOW"
                 font="Times New Roman" size="50">
  Second Heading
</csajsp:heading2>
<csajsp:heading2 align="CENTER" bgColor="#C0C0C0"
                 border="20" fgColor="BLUE"
                 font="Arial Narrow" size="100">
  Third Heading
</csajsp:heading2>
```


Tag Files: Results (Tag with Body)

Wrap-Up

Open Source Tag Libraries

- **JSP Standard Tag Library (JSTL)**
  - Covered in later lecture
- **AjaxTags**
  - Simple Ajax functionality without writing JavaScript
    - http://ajaxtags.sourceforge.net/
- **DisplayTag**
  - Super-fancy table creator
    - http://displaytag.sourceforge.net/1.2/
- **Listing of other open-source tag libraries**
  - http://java-source.net/open-source/jsp-tag-libraries
    - Google queries and searching
    - Google maps wrappers
    - Menus
    - Paging of large data sets
    - Fancy UIs

Summary: Java-Based Tags

- **Tag handler class**
  - Extend SimpleTagSupport
  - Override doTag
  - Get the JspWriter with getJspContext().getOut()
  - Use the JspWriter to generate output
  - Output tag body with getJspBody().invoke(null);
  - Define setBlah for each attribute named blah
- **TLD File (/WEB-INF/.../somefile.tld)**
  - <tag> ... </tag>
    - Contains description (optional), name, tag-class, body-content, attribute (one for each attribute)
  - <uri>http://fake-address</uri> (optional)
- **JSP File**
  - <%@ taglib uri="/WEB-INF/.../somefile.tld" prefix="blah" %>
    - Or <%@ taglib uri="http://fake-address" prefix="blah" %>
  - <blah:tagName/> or <blah:tagName>...</blah:tagName>

Summary: Tag Files

- **Tag File**
  - /WEB-INF/tags/tagName.tag
  - Create chunk of JSP that generates the output
  - Declare attributes with <%@ attribute ...%>
  - Output attributes with ${attributeName}
  - Output the tag body with <jsp:doBody/>
  - Refactor Java code so methods take strings as args
- **JSP File**
  - <%@ taglib tagdir="/WEB-INF/tags prefix="blah" %>
  - <blah:tagName/> or <blah:tagName>...</blah:tagName>

Questions?