CS320 Web and Internet Programming
Custom Tag Library

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JSTL Tags

```
<c:if test="${!cart.notEmpty}">

  <c:forEach items="${cart.items}" var="i">
    ${i} <br />
  </c:forEach>

</c:if>
```

ASP.NET Tags

```
<p>Enter a number from 1 to 100:

<asp:TextBox id="tbox1" runat="server" />
<asp:Button Text="Submit" runat="server" />

</p>
```

ColdFusion Tags

```
<cfform action = "cftextinput.cfm" method="post">

  <cftextinput name = "myInput"
     message = "This field must not be blank"
     required = "Yes" />

  <input type = "Submit" value ="submit" />

</cfform>
```

JavaServer Faces (JSF) Tags

```
<h:form id="helloForm">

  <h:outputText value="#{msg.prompt}" />
  <h:inputText value="#{personBean.personName}" />
  <h:commandButton action="greeting"
     value="#{msg.button_text}" />

</h:form>
```

What Do These Tags Have in Common

- Not standard HTML tags → custom tags
- Interpreted by application server, not browser
- Generate code and/or HTML text
- Simpler than code
  - Easier to learn, especially by non-programmers
  - Easier to parse, validate, and interpret by IDEs

Using Custom Tags in JSP

- ◈ Import the tag library
  - Taglib directive
  - URI is an unique identifier of the tag library
- ◈ Reference a tag
  - Library prefix + tag name
- ◈ Example:

```
<%@ page contentType="text/html" %>
<%@ taglib prefix="c" uri="http://java.sun.com/jsp/jstl/core" %>

<html><head><title>JSTL Hello</title></head><body>
<c:out value="Hello World in JSTL." />
</body></html>
```

Create Java Custom Tags

- ◈ Implement a tag
  - Using Java code
  - Using a *tag file* (basically a JSP file)
- ◈ Declare the tag in a Tag Library Descriptor (TLD) file

Example: Add Tag

- ◈ HelloTaglib.jsp
- ◈ AddTag.java
- ◈ cs320.tld

HelloTaglib.jsp

```
<%@ page contentType="text/html" %>
<%@   taglib prefix="cs320"
         uri="http://www.calstatela.edu/cs320/stu31" %>

<html><head><title>Hello Taglib</title></head>
<body>

The sum of 1 and 12 is: <cs320:add op1="1" op2="12" />

</body>
</html>
```

NOTE: make sure your taglib uri is unique, e.g. have stu## somewhere in the uri.

AddTag.java ...

```
package cs320.tag;

import java.io.IOException;

import javax.servlet.jsp.JspException;
import javax.servlet.jsp.JspWriter;
import javax.servlet.jsp.tagext.SimpleTagSupport;

public class AddTag extends SimpleTagSupport {

      int op1, op2;

   public AddTag()
   {
      op1 = op2 = 0;
   }
```

... AddTag.java

```
   public void setOp1( int i )
   {
      op1 = i;
   }

   public void setOp2( int i )
   {
      op2 = i;
   }

   public void doTag() throws JspException, IOException
   {
      JspWriter out = getJspContext().getOut();
      out.print( op1+op2 );
   }

}
```

Tag Library Descriptor (TLD)

- A Java custom tag must belong to a *tag library*
- TLD is an XML document that contains information about a tag library and the tags in the library
- TLDs are used by application servers and development tools to validate the tags

An Empty TLD

```
<taglib xmlns="http://java.sun.com/xml/ns/javaee"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="http://java.sun.com/xml/ns/javaee
      http://java.sun.com/xml/ns/javaee/web-jsptaglibrary_2_1.xsd"
   version="2.1">

   <tlib-version>1.0</tlib-version>
   <short-name>Hello</short-name>

</taglib>
```

Elements of TLD

- description
- display-name
- icon
- **tlib-version**
- **short-name**
- uri
- validator
- listener
- tag
- tag-file
- function

Since JSP 2.1, the order of elements in an TLD must follow the order of the elements in the TLD schema specification.

Declaration for AddTag

```
<tag>
   <name>add</name>
    <tag-class>cs320.stu31.AddTag</tag-class>
    <body-content>empty</body-content>
    <attribute>
       <name>op1</name>
       <required>true</required>
       <rtexprvalue>true</rtexprvalue>
   </attribute>
   <attribute>
        <name>op2</name>
        <required>true</required>
        <rtexprvalue>true</rtexprvalue>
   </attribute>
</tag>
```

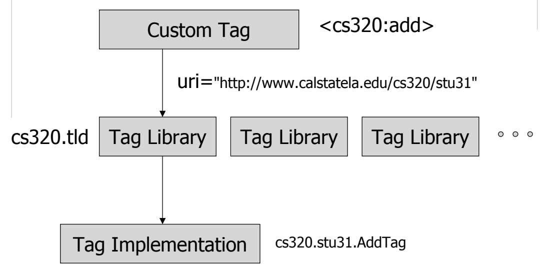
Elements of <tag>

- name
- tag-class
- body-content
  - `JSP`, `scriptless`, `empty`, `tagdependent`
- attribute
  - name
  - required
  - *rtexprvalue* ??

About TLD

- A TLD file must have the `.tld` suffix
- Locations for TLD
  - WAR or unpackaged: `WEB-INF` or its subdirectories, *except* `WEB-INF/classes` and `WEB-INF/lib`
  - JAR: `META-INF` or its subdirectories
- More information about TLD
  - JSP Specification
  - Chapter 15, J2EE 1.4 Tutorial

How Does Server Find a Tag Implementation



A Closer Look at SimpleTagSupport

- http://java.sun.com/products/jsp/2.1/docs/jsp-2_1-pfd2/javax/servlet/jsp/tagext/SimpleTagSupport.html
  - doTag()
  - getJspContext()
  - getJspBody()

Example: RequestInfo Tag

- Display request information
- JspContext → PageContext → Request

Example: Cap Tag

- Capitalize the body content of a tag
- getJspBody() → JspFragment → *invoke(java.io.Writer) ??*

Tag Files

- A way to create a custom tag without writing Java code
- Tag files – *must have .tag suffix*
  - WAR or unpackaged: `WEB-INF/tags` or its subdirectories
  - JAR: `META-INF/tags` or its subdirectories
- Tag file in TLD
  - <tag-file>
    - <name>sometag</name>
    - <path>/WEB-INF/tags/sometag.tag</path>

Example: Greeting Tag

<cs320:greeting name="cysun">Hello</cs320:greeting>

⇩

Hello, cysun!

- greeting.tag
  - A JSP file
  - No page directive
  - tag and attribute directives

EL Functions

- Just like the *function* library in JSTL
- Any static methods can be used as EL functions
- EL function in TLD
  - <function>
    - <name>
    - <function-class>
    - <function-signature>

Example: Leet Talk

${cs320:leetTalk("fear my mad programming skills")}

⇩

ph34r my m4d pr0gr4mming zki11z!

- cs320.tag.Functions
  - String leetTalk(String)

Custom Tag vs. Java Bean

- Custom tags are for the *web tier*
  - Access to HTTP objects
    - request, response, context ...
  - Good for tasks related to presentation
  - One scope
    - page
- Beans are for the *business tier*
  - No access to HTTP objects
    - Plain Old Java Object (POJO)
  - Good for tasks related to processing
  - Four scopes
    - good for sharing data

More Tag Lib Examples

- Tomcat JSP Examples - http://cs3.calstatela.edu:8080/examples/jsp/
- JSTL Source code from http://jakarta.apache.org/