

JSP Tag Libraries

Tag Libraries
JSTL

The “Classic” Custom Tag Event Model
Custom Tag

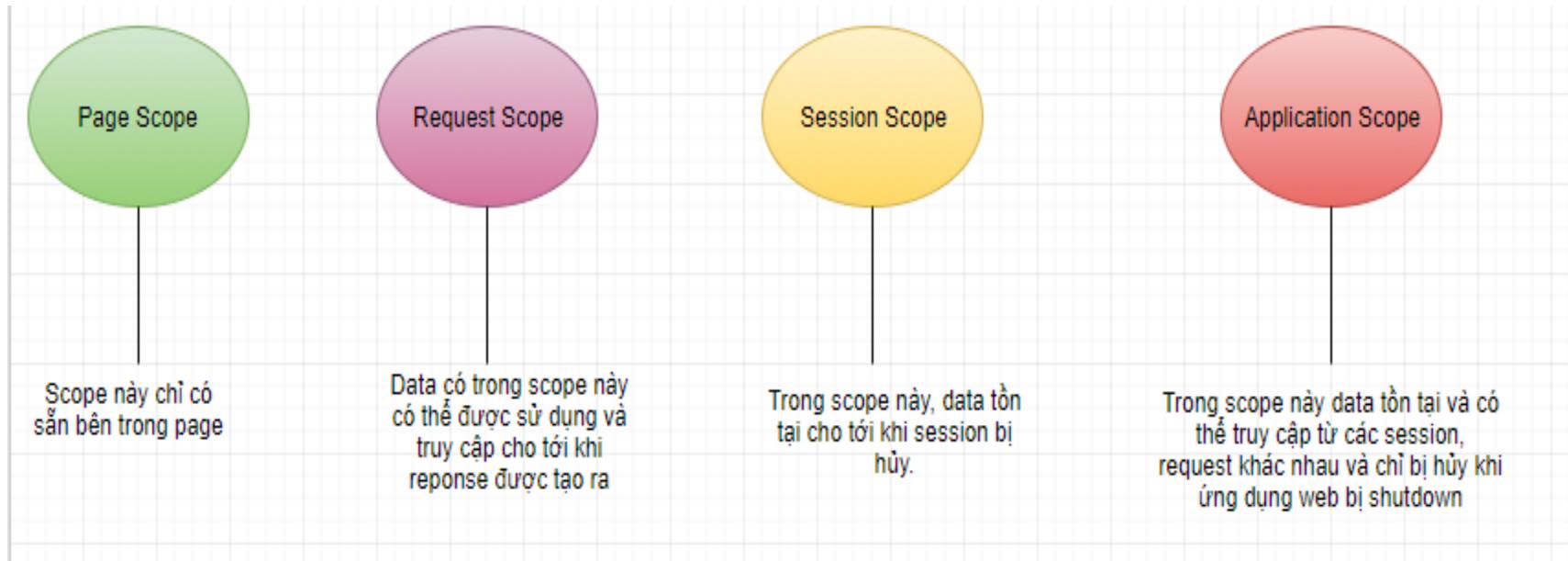
#*JSTL #CustomTag #Dynamic*

Review

- **JSP Standard Actions**
 - jsp:method attribute
- **Java Beans**
 - jsp:useBean, jsp:setProperty, jsp:getProperty
 - Scopes: page, request, session, application
- **Dispatching Mechanisms**
 - jsp:include, jsp:forward, jsp:param
- **Expression Language – EL**
 - \${EL Expression}
 - Operators, Implicit Objects, Scope Variables
 - Functions
 - Coersions

JSP Standard Actions

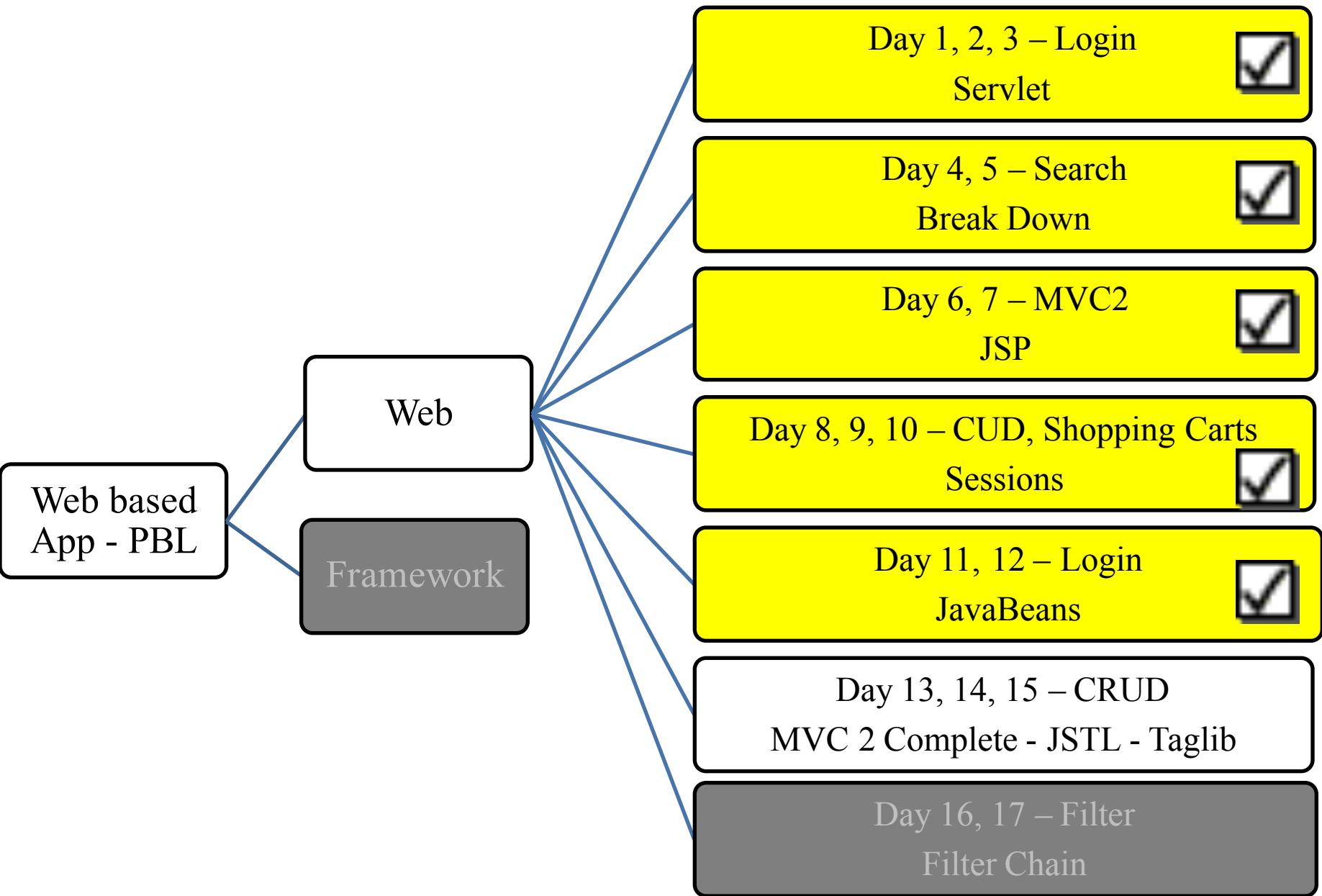
Scope of JavaBeans



Objectives

- How to remove all java code in JSP (View)?
Complete the MVC 2 Design Pattern with View
 - JSTL
- How to build the data grid tag library using in JSP?
 - Tag Libraries
 - Model
 - Classical, Simple, and Handles
 - How to implement the custom Tag Lib and use it in JSP

Objectives



Complete MVC 2 Requirements

- Complete the MVC 2 with CRUD Web Application in previous topic

Login - Windows Internet Explorer

http://localhost:8084/DBMVC865/

File Edit View Favorites Tools Help

★ Favorites Login

Login Page

Username

Password

Invalid - Windows Internet Explorer

http://localhost:8084/DBMVC865/CenterServlet

File Edit View Favorites Tools Help

★ Favorites Invalid

Invalid username or password!!!

[Click here to try again!](#)

[Click here to Sign Up](#)

http://localhost:8084/DBMVC865/login.html

[Click here to try again!](#)

[Click here to Sign Up](#)

http://localhost:8084/DBMVC865/createAccount.jsp

Invalid - Windows Internet Explorer

http://localhost:8084/DBMVC865/CenterServlet

File Edit View Favorites Tools Help

★ Favorites Invalid

Invalid username or password!!!

[Click here to try again!](#)

[Click here to Sign Up](#)

http://localhost:8084/DBMVC865/login.html

Complete MVC 2 Requirements

New - Windows Internet Explorer

http://localhost:8084/DBMVC865/createAccount.jsp

File Edit View Favorites Tools Help

Favorites New

Create New Account

Username* (6 - 20 chars)
Password* (5 - 20 chars)
Confirm*
Full Name* (2 - 50 chars)

>Login - Windows Internet Explorer

http://localhost:8084/DBMVC865/

File Edit View Favorites Tools Help

Favorites Login

Login Page

Username
Password

New - Windows Internet Explorer

http://localhost:8084/DBMVC865/CenterServlet

File Edit View Favorites Tools Help

Favorites New

Create New Account

Username* (6 - 20 chars)
Username phai tu 6 den 20 ky tu
Password* (5 - 20 chars)
Password phai tu 5 den 20 ky tu
Confirm*
Full Name* (2 - 50 chars)
Lastname phai tu 2 den 50 ky tu

Done

Complete MVC 2 Requirements

Home - Windows Internet Explorer

File Edit View Favorites Tools Help

Favorites Home

Welcome, khanh

Welcome to Servlet World

Name

Search

Home - Windows Internet Explorer

File Edit View Favorites Tools Help

Favorites Home

Welcome, khanh

Welcome to Servlet World

Name a

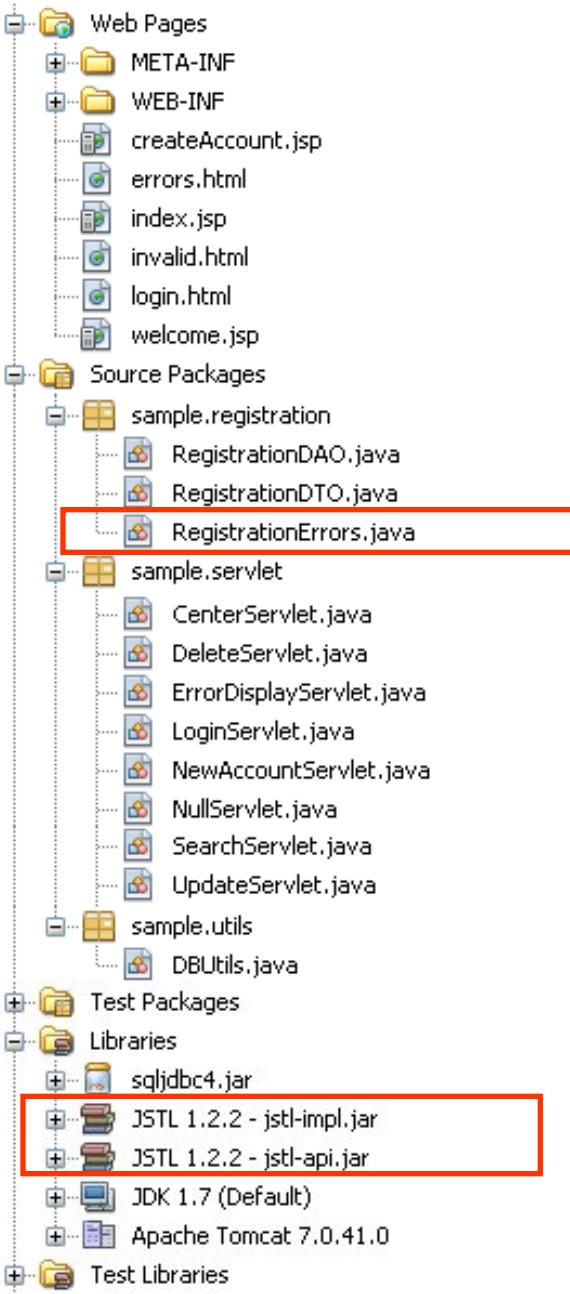
Search

No.	Username	Password	Lastname	Roles	Delete	Update
1	class861	345545423	Khoa	<input checked="" type="checkbox"/>	Delete	Update
2	EntityClass	EJB34	Day11	<input checked="" type="checkbox"/>	Delete	Update
3	khanh	kieu123	Kieu Khanh	<input checked="" type="checkbox"/>	Delete	Update
4	nhanDaiCa	nguoibanthuoc	Thuoc Thuoc Nhan	<input type="checkbox"/>	Delete	Update
5	Taidaica	123456	Tai Dai Dai Ca	<input checked="" type="checkbox"/>	Delete	Update
6	TienDan	1234	Dan Quan Dai	<input type="checkbox"/>	Delete	Update

<http://localhost:8084/DBMVC865/CenterServlet?btAction=delete&user=EntityClass&searchValue=a>

Complete MVC 2

Expectation



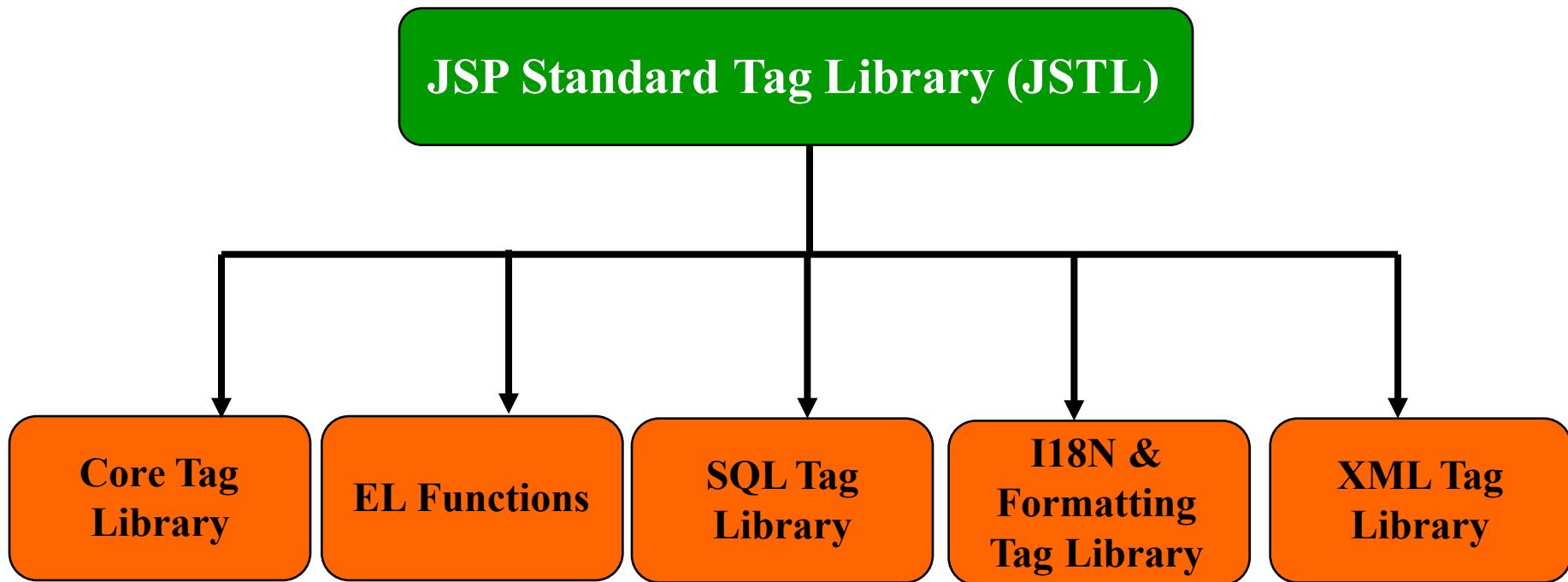
JSTL

JSP Standard Tag Library

- Is a new component being offered by the Sun for JSP programming.
- A library of **predefined tags** (by Sun) that provides **a set of reusable standard tags** that works in the similar manner everywhere
- Allows programming **using tags rather than scriptlet code**
JSTL has reusable standard set of tags.
- Provides the user with a script-free environment
- Are **easier for non-programmers & inexperienced programmers**
- **Disadvantages**
 - It adds **processing overhead** to the server. The **tag** libraries are **compiled into a servlet**, which is **then executed by** the **servelt container**. The server is added with much more code by the JSTL.
 - JSTL is also **less powerful than the scriptlets** as embedded java codes can do everything in JSP pages

JSTL

Type of Tag Library



JSTL

Core Tag Library

- The library contains the tags for **looping, expression evaluation, handle flow controls, and basic input and output.**
- It can be **declared** by
`<%@ taglib prefix="c" uri="http://java.sun.com/jsp/jstl/core" %>`
- **General Purpose Tags**
 - Are used to **set, remove and display variable values** that are created within a JSP page.
 - The core tag library contains tags for **getting, setting and displaying attribute values.**

Core Tag Library – General Purposes

Tags	Descriptions
<code><c:set></code>	<ul style="list-style-type: none"> - <code><c:set var="varName" value="value/exp" scope="page request session application"/></code> - Assigns or update a value to a variable in scope - Similar to set attribute to some scope using setAttribute() method - Ex: <code><c:set var="simple" value="\${2+1}" scope="session"/></code> - Similar to <code><% session.setAttribute("simple", new Integer(2+1)) %></code> - The var of set can be accessed using <ul style="list-style-type: none"> <code> \${varName}</code> on page, or <code> \${scope.varName}</code> on page or other pages, or <code><%= scope.getAttribute("varName") %></code>
<code><c:remove></code>	<ul style="list-style-type: none"> - <code><c:remove var="varName" scope="page request session application"/></code> - Remove a scope variable. This is an empty tag - Similar to remove attribute from some scope using removeAttribute() method - Ex : <code><c:remove var="simple" scope="session"/></code> - Similar to <code><% session.removeAttribute("simple") %></code>

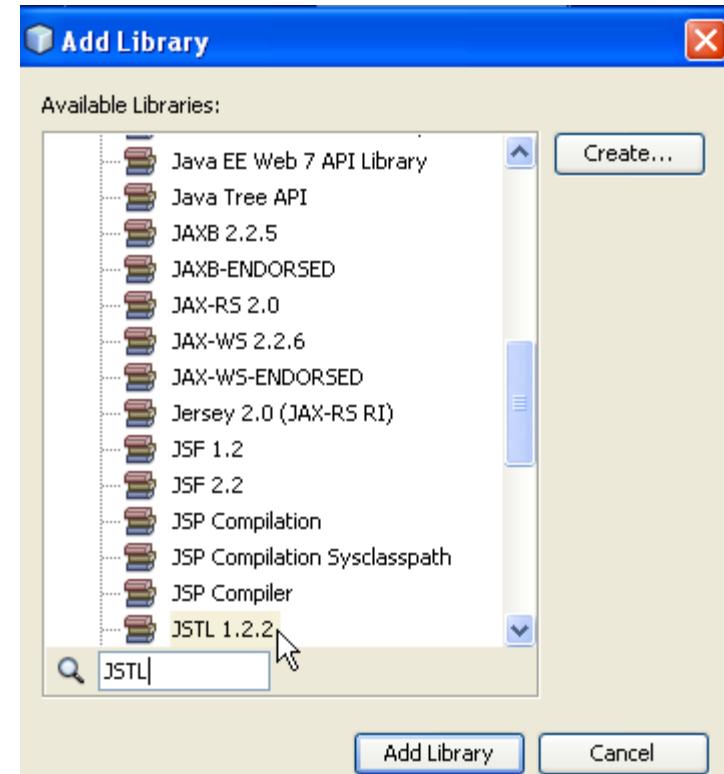
Core Tag Library – General Purposes

Tags	Descriptions
<c:out>	<ul style="list-style-type: none"> - <c:out value="value expression" escapeXml="true false" default="defaultValue" /> - Evaluate an expression & store the result in the current JspWrite object - Default value if the resulting value is null - Similar to print out the data using out object in JSP Implicit Object - Ex: <c:out value="\${simple}" /> similar to <%= pageContext.getAttribute("simple") %>
<c:catch>	<ul style="list-style-type: none"> - <c:catch var="varName">...</c:catch> - Provides an exception handling functionality, such as try-catch, inside JSP pages without using scriptlets

JSTL

Requirement

- Required Library for JSTL
 - JSTL 1.2.2 (jstl-impl.jar, jstl-api.jar)

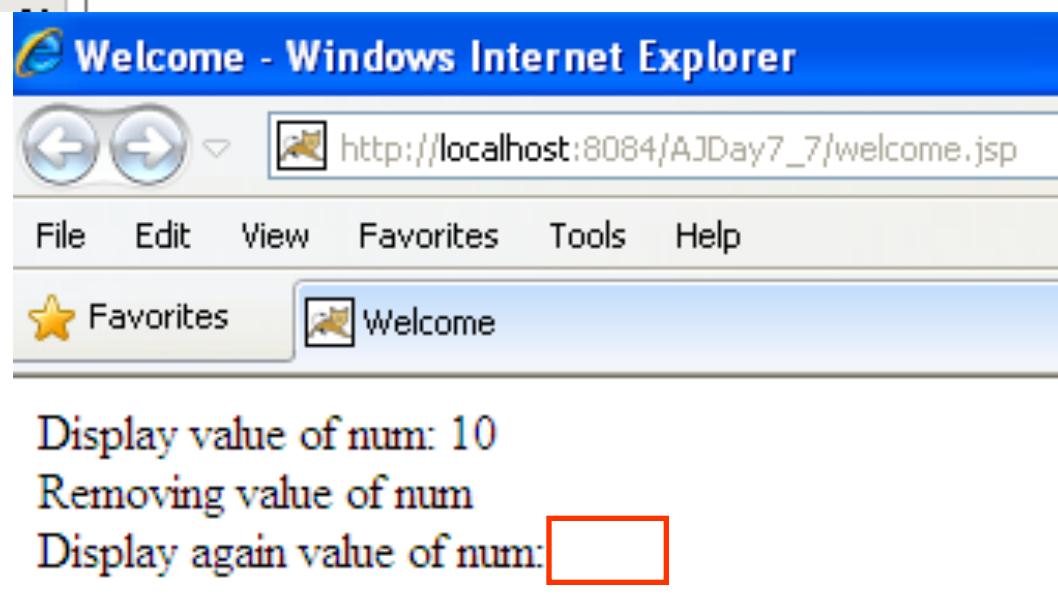


- Choose JSTL 1.2.2



Core Tag Library – Example

```
10 <%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c" %>
11 <html>
12     <head>
13         <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
14         <title>Welcome</title>
15     </head>
16     <body>
17         <c:set var="num" value="10"/>
18         Display value of num: <c:out value="${num}" /><br/>
19         Removing value of num <c:remove var="num"/><br/>
20         Display again value of num: <c:out value="${num}" /><br/>
```



JSTL

Core Tag Library – Example

```
<c:set var="addInfo" value="INFO"/>
${addInfo} <br/>
<%= request.getAttribute("addInfo")%> <br/>
```

Address  http://localhost:8080/JSTLCORE/ex1.jsp

INFO
null

```
<c:set var="addInfo" value="INFO" scope="request"/>
${addInfo} <br/>
<%= request.getAttribute("addInfo")%> <br/>
```

Address  http://localhost:8080/JSTLCORE/ex1.jsp

INFO
INFO

```
<c:set var="addInfo" value="INFO" scope="session"/>
${addInfo} <br/>
<%= request.getAttribute("addInfo")%> <br/>
${requestScope.addInfo}<br/>
<%= session.getAttribute("addInfo") %><br/>
${sessionScope.addInfo}
```

Address  http://localhost:8080/JSTLCORE/ex1.jsp

INFO
null
INFO
INFO

Core Tag Library – Decision Making

- **Support conditions** in a JSP page
- Are necessary as the contents or the output of the JSP page is often conditional based on the value of the dynamic application data

Tags	Descriptions
<c:if>	<ul style="list-style-type: none"> - <code><c:if test =“testcondition” var=“varName” scope=“page request session application”>...</c:if></code> - Is used for conditional execution of the code - Is a container tag that allows the execution of the body if the test attribute evaluates to true
<c:choose>	<ul style="list-style-type: none"> - <code><c:choose></code> <ul style="list-style-type: none"> <code><c:when test=”cond”>...</c:when></code> <code><c:otherwise>...</c:otherwise></code> <code></c:choose></code> - Is similar to the switch statement in Java (multiple conditions) - Performs conditional block execution (replace to c:if) - Multiple <code><c:when></code> tags can be embedded in a <code><c:choose></code> tag - If none of the conditions evaluates to true, then the body of <code><c:otherwise></code> tag is processed.

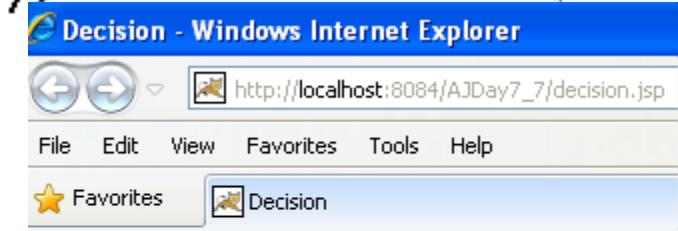
JSTL

Core Tag Library – Example

```
decision.jsp x
Source History |  |            | 
```

Author : Trong Khanh
--%>

```
4
5
6
7 <%@page contentType="text/html" pageEncoding="UTF-8"%>
8 <!DOCTYPE html>
9 <%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
10 <html>
11     <head>
12         <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
13         <title>Decision</title>
14     </head>
15     <body>
16         <h1>Decision Demo</h1>
17         <c:set var="num1" value="20" scope="page" />
18         <c:set var="num2" value="60" scope="page" />
19         <c:if test="${num1 < num2}">
20             Num1 is less than num 2
21         </c:if>
22     </body>
23 </html>
```



Decision Demo

Num1 is less than num 2

Core Tag Library – Example

The screenshot shows a Java IDE interface with a file named "exception.jsp" open. The code demonstrates the use of the JSTL Core Tag Library to handle exceptions.

```
6  <%@page contentType="text/html" pageEncoding="UTF-8"%>
7  <!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN"
8      "http://www.w3.org/TR/html4/loose.dtd">
9  <%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
10 <html>
11     <head>
12         <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
13         <title>Exception</title>
14     </head>
15     <body>
16         <h1>Exception Demo</h1>
17         <form>
18             Num 1: <input type="text" name="num1" value="${param.num1}" /><br/>
19             Num 2: <input type="text" name="num2" value="${param.num2}" /><br/>
20             <c:catch var="ee">
21                 <c:if test="$(not empty param.num1 and not empty param.num2)">
22                     <c:set var="division" value="${param.num1 / param.num2}" />
23                     Division: <c:out value="${division}" /><br/>
24                 </c:if><br/>
25             </c:catch>
26
27             <input type="submit" value="Divide" />
28             <c:if test="$(not empty ee)">
29                 Error occurred<br/>
30                 <c:out value="${ee}" /><br/>
31             </c:if>
32         </form>
33     </body>
34 </html>
```

The code includes a `<c:catch var="ee">` block (highlighted with a red box) that handles exceptions. It contains an `<c:if>` block that checks if both `param.num1` and `param.num2` are not empty. If true, it performs division and outputs the result. If false (an exception occurs), it sets the variable `ee` and outputs the error message. Another `<c:if>` block (also highlighted with a red box) checks if `ee` is not empty, in which case it outputs the error message and its value.

JSTL

Core Tag Library – Example

Exception - Windows Internet Explorer

http://localhost:8084/AJDay7_7/exception.jsp

File Edit View Favorites Tools Help

Favorites Exception

Exception Demo

Num 1:

Num 2:

Divide

Exception - Windows Internet Explorer

http://localhost:8084/AJDay7_7/exception.jsp?num1=a&num2=b

File Edit View Favorites Tools Help

Favorites Exception

Exception Demo

Num 1: a

Num 2: b

Divide Error occurred

java.lang.NumberFormatException: For input string: "a"

Exception - Windows Internet Explorer

http://localhost:8084/AJDay7_7/exception.jsp?num1=4&num2=0

File Edit View Favorites Tools Help

Favorites Exception

Exception Demo

Num 1: 4

Num 2: 0

Division: Infinity

Exception - Windows Internet Explorer

http://localhost:8084/AJDay7_7/exception.jsp?num1=4&num2=3

File Edit View Favorites Tools Help

Favorites Exception

Exception Demo

Num 1: 4

Num 2: 3

Division: 1.3333333333333333

Exception - Windows Internet Explorer

http://localhost:8084/AJDay7_7/exception.jsp?num1=4&num2=0

File Edit View Favorites Tools Help

Favorites Exception

Exception Demo

Num 1: 4

Num 2: 0

Division: Infinity

Divide

Exception - Windows Internet Explorer

http://localhost:8084/AJDay7_7/exception.jsp?num1=4&num2=3

File Edit View Favorites Tools Help

Favorites Exception

Exception Demo

Num 1: 4

Num 2: 3

Division: 1.3333333333333333

Divide

Core Tag Library – Example

The screenshot shows a Java Integrated Development Environment (IDE) displaying a JSP file named 'c_ChOOSE.jsp'. The code implements a decision logic using the JSTL Core Tag Library.

```
8  <!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN"
9    "http://www.w3.org/TR/html4/loose.dtd">
10   <%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
11   <html>
12     <head>
13       <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
14       <title>C_ChOOSE</title>
15     </head>
16     <body>
17       <h1>Decision Demo</h1>
18       <form>
19         Number <input type="text" name="num" value="${param.num}" /><br/>
20         <c:choose>
21           <c:when test="${empty param.num}">
22             </c:when>
23             <c:when test="${param.num%2 != 0}">
24               ${param.num} is an odd number.
25             </c:when>
26             <c:when test="${param.num%2 == 0}">
27               ${param.num} is an even number.
28             </c:when>
29             <c:otherwise>
30             </c:otherwise>
31         </c:choose>
32         <input type="submit" value="Submit" />
33       </form>
34     </body>
35   </html>
```

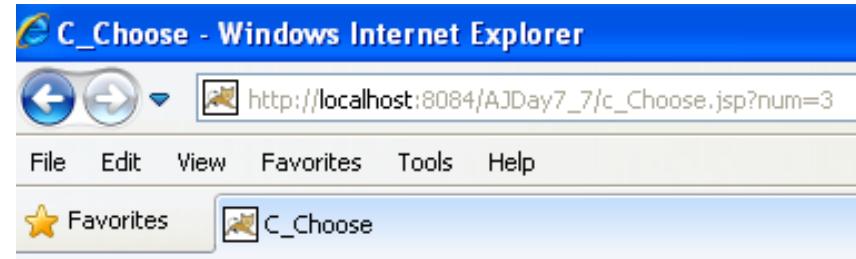
JSTL

Core Tag Library – Example



Decision Demo

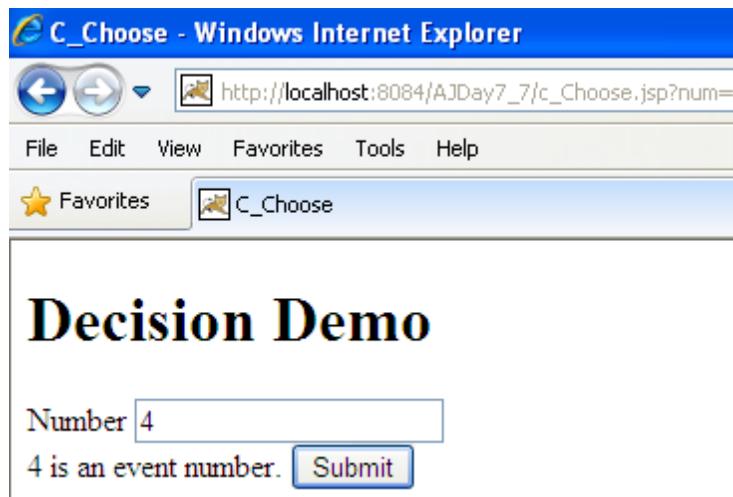
Number



Decision Demo

Number 3

3 is an odd number.

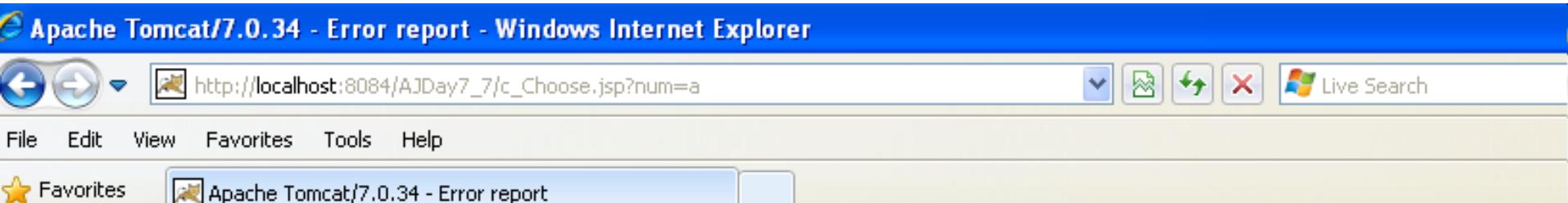


Decision Demo

Number 4

4 is an even number.

Core Tag Library – Example



HTTP Status 500 - An exception occurred processing JSP page /c_ChOOSE.jsp at line 22

type Exception report

message An exception occurred processing JSP page /c_ChOOSE.jsp at line 22

description The server encountered an internal error that prevented it from fulfilling this request.

exception

org.apache.jasper.JasperException: An exception occurred processing JSP page /c_ChOOSE.jsp at line 22

```
19:         <c:choose>
20:             <c:when test="${empty param.num}">
21:                 </c:when>
22:                 <c:when test="${param.num%2 != 0}">
```

JSTL

Example

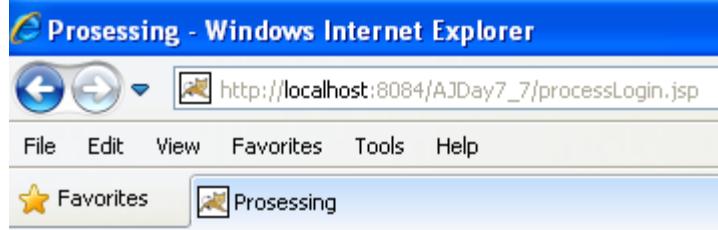
- Improve the 6th topic using EL combining with JSTL



Login Page

Username

Password



Welcome to EL + JSTL

Name

Title Forward
Course AJCourse

Process Login

Invalid username or password!!!

JSTL

Example

login.html x

Source History | 

```
4 --->
5     <!DOCTYPE html>
6     <html>
7         <head>
8             <title>Login</title>
9         </head>
10        <body>
11            <h1>Login Page</h1>
12            <form action="processLogin.jsp" method="POST">
13                Username <input type="text" name="username" value="" /><br/>
14                Password <input type="password" name="password" value="" /><br/>
15                <input type="submit" value="Login" />
16                <input type="reset" value="Reset" />
17            </form>
18        </body>
19    </html>
```

JSTL

Example

processLogin.jsp

Source History | Back Forward | Find | Replace | Save | Print | Open | Close | Help | Exit

```
4 Author : Trong Khanh
5 --%>
6 <%@page contentType="text/html" pageEncoding="UTF-8"%>
7 <!DOCTYPE html>
8 <%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
9 <html>
10 <head>
11     <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
12     <title>Prosessing</title>
13 </head>
14 <body>
15     <h1>Process Login</h1>
16     <jsp:useBean id="loginAtt" class="sample.javabean.LoginBean" scope="session"/>
17     <jsp:setProperty name="loginAtt" property="*" />
18     <c:if test="${loginAtt.checkLogin()}">
19         <jsp:forward page="home.jsp">
20             <jsp:param name="title" value="Forward"/>
21             <jsp:param name="course" value="AJCourse"/>
22         </jsp:forward>
23     </c:if>
24     <h2><font color="red">Invalid username or password!!!</font> </h2>
25 </body>
26 </html>
```

Core Tag Library – Iterations

- Is required for performing **looping function**
- The object can be **retrieved from a collection** in the JavaBeans component and assigned to a scripting variable by using iteration tags

Tags	Descriptions
<code><c:forEach></code>	<ul style="list-style-type: none"> - <code><c:forEach var="varName" items="collection" begin="begin" end="end" step="step" varStatus="internalLoopobject">...</c:forEach></code> - Is used repeat the body content over a collection of objects - Will continue for a number of times specified by the user in the code - varStatus's methods: <code>count</code> (int), <code>current</code> (obj), <code>index</code> (int)
<code><c:forTokens></code>	<ul style="list-style-type: none"> - <code><c:forTokens items="stringofToken" delims="delimiters" var="varName">...</c:forTokens></code> - Is used to iterate over a collection of tokens separated by user-specified delimiters - It is a container tag

JSTL

Core Tag Library – Example

Iterator Demo

Source

History



```

4      Author      : Trong Khanh
5
6  <%@page contentType="text/html" pageEncoding="UTF-8"%>
7  <!DOCTYPE html>
8  <%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
9
10 <html>
11   <head>
12     <meta http-equiv="Content-Type" content="text/html; charset=UTF-8"
13     <title>Iterator</title>
14   </head>
15   <body>
16     <h1>Iterator Demo</h1>
17     <c:set var="language" value="Core Java:Servlet;JSP:EJB" scope="page"/>
18     <%! String[] names = {"Sun Microsystems", "Microsoft", "Oracle", "IBM"};%>
19     <b>Company</b><br/>
20     <c:forEach var="company" items="<%!= names%>" >
21       <c:out value="${company}" /><br/>
22     </c:forEach> <hr/>
23     <b>Language</b><br/>
24     <c:forTokens items="${language}" delims=";" var="lang">
25       <c:out value="${lang}" /><br/>
26     </c:forTokens> <hr/>
27     <b>Counter</b>
28     <c:forEach begin="1" end="10" step="1" var="counter">
29       <c:out value="${11 - counter}" />
30     </c:forEach>
31   </body>
32 </html>
```

Company

Sun Microsystems
Microsoft
Oracle
IBM

Language

Core Java
Servlet
JSP
EJB

Counter 10 9 8 7 6 5 4 3 2 1

Core Tag Library – URL-Related Actions

- Are used to import resources from a given URL, re-encode URLs, redirect to URLs, as well as pass additional request parameters where necessary

Tags	Descriptions
<c:import>	<ul style="list-style-type: none"> - <code><c:import url="url of resource import" var="varName" scope="scopeName">...</c:import></code> - Imports the content of a URL-based resource. - Action main include nested <c:param> tags to specify the query string (unless the varReader attribute is specified). - Ex: <c:import var="xml" url="WEB-INF/abc.xml"/>
<c:url>	<ul style="list-style-type: none"> - <code><c:url var="varName" value="path" scope="scopeName" ...</c:url></code> - Builds a URL with the proper rewriting rules applied (only relative URLs are rewritten). - Action may include nested <c:param> tags to specify the query string (unless the varReader attribute is specified). - Ex: <c:url var="addr" value="test.jsp"/> <pre> <c:url var="delete" value="MainController"> <c:param name="action" value="Delete" /> <c:param name="txtSearch" value="\${param.txtSearch}" /> <c:param name="userId" value="\${list.userId}" /> </c:url> <u> \${delete}</u>>Delete </pre> <p><u> \${addr}</u>>click here</p>

Core Tag Library – URL-Related Actions

Tags	Descriptions
<c:redirect>	<ul style="list-style-type: none"> - <c:redirect url="url path">...</c:redirect> - Sends the client a response to redirect to the specified URL. This action will abort processing of the current page. - Action may include nested <c:param> tags to specify the query string. - Ex: <c:redirect url="abc.jsp"/>
<c:param>	<ul style="list-style-type: none"> - <c:param name="nameOfQuery" value="ValueOfParameter">...</c:param> - Adds request parameters to a URL. - This action can only be nested within <c:import>, <c:url>, or <c:redirect>

JSTL

Core Tag Library – URL-Related Actions

The screenshot shows a Java IDE interface with the title bar "urlJSTL.jsp x". The menu bar includes "Source" and "History". Below the menu is a toolbar with various icons. The code editor displays a JSP file with the following content:

```
Author : Trong Khanh
--%>

<%@page contentType="text/html" pageEncoding="UTF-8"%>
<!DOCTYPE html>
<%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>URL</title>
    </head>
    <body>
        <h1>JSTL URL Relating Demo</h1>
        Demo url in href<hr/>
        <c:url var="nextLink" value="nextPage.jsp">
            <c:param name="user" value="khanh"/>
        </c:url>
        <a href="#">$(nextLink)>Click here to go to next page</a>
    </body>
</html>
```

A red box highlights the JSTL code block from line 18 to 20. A red callout bubble points to the "user" parameter in line 19 with the text "Same as “nextPage.jsp?user=khanh”".

JSTL

Core Tag Library – URL-Related Actions

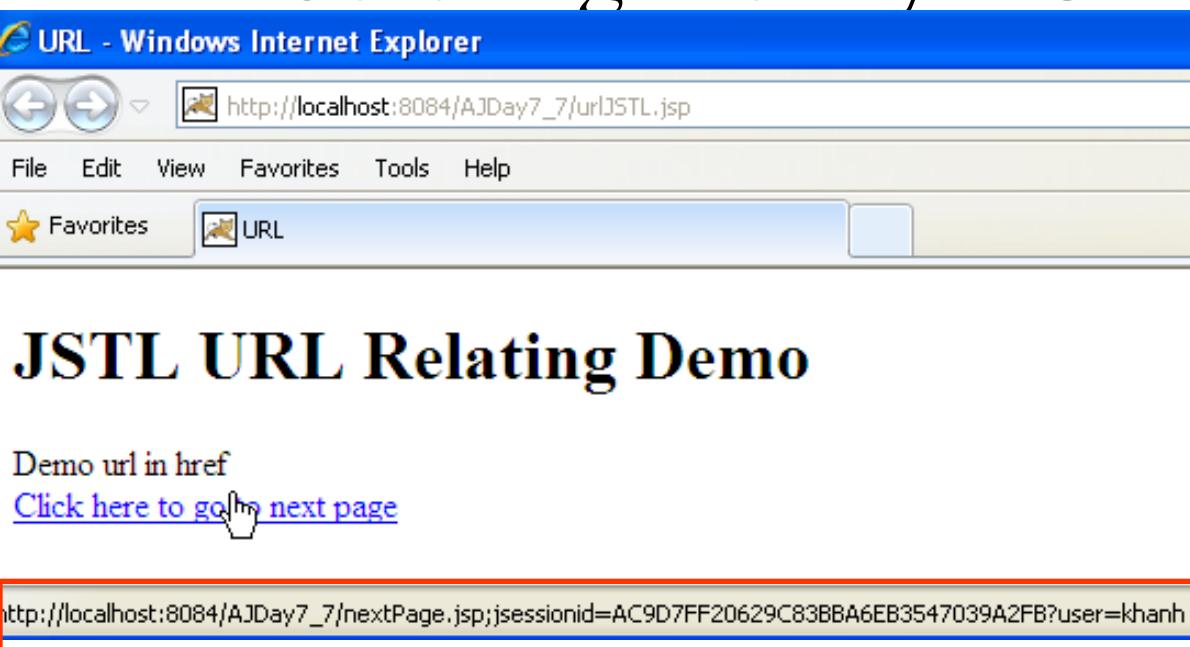
nextPage.jsp

Source History |        |     |  

```
4 Author : Trong Khanh
5 --%>
6
7 <%@page contentType="text/html" pageEncoding="UTF-8"%>
8 <!DOCTYPE html>
9 <%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
10 <html>
11     <head>
12         <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
13         <title>URL</title>
14     </head>
15     <body>
16         <h1>Welcome to next page</h1>
17         ${param.user}
18     </body>
19 </html>
```

Core Tag Library – URL-Related Actions

URL - Windows Internet Explorer



File Edit View Favorites Tools Help

Favorites URL

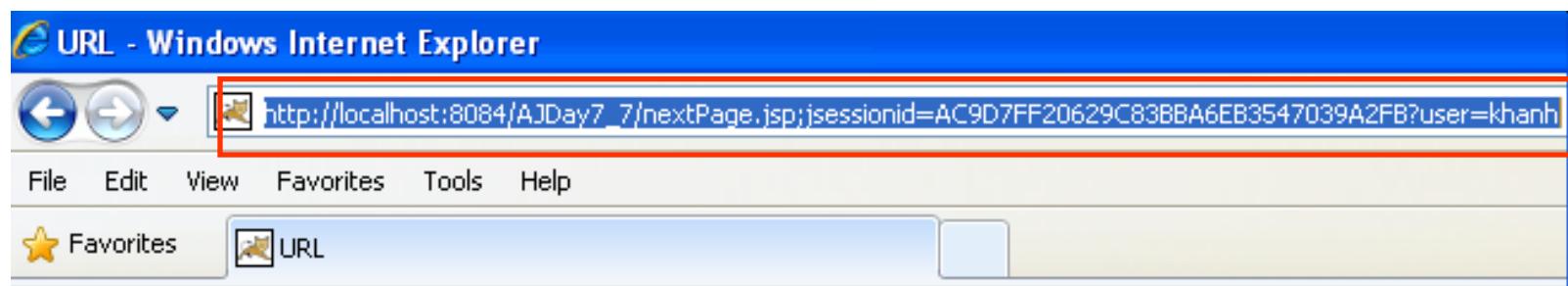
JSTL URL Relating Demo

Demo url in href

[Click here to go to next page](http://localhost:8084/AJDay7_7/nextPage.jsp;jsessionid=AC9D7FF20629C83BBA6EB3547039A2FB?user=khanh)

http://localhost:8084/AJDay7_7/nextPage.jsp;jsessionid=AC9D7FF20629C83BBA6EB3547039A2FB?user=khanh

URL - Windows Internet Explorer



File Edit View Favorites Tools Help

Favorites URL

Welcome to next page

khanh

Welcome to next page

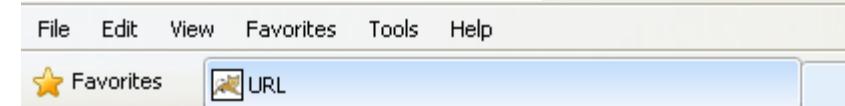
khanh

JSTL

Core Tag Library – URL-Related Actions

```
<title>URL</title>
</head>
<body>
    <h1>Welcome to next page</h1>
    ${param.user}

    <c:import url="urlJSTL.jsp"/>
</body>
```



Welcome to next page

khanh

JSTL URL Relating Demo

Demo url in href

[Click here to go to next page](#)

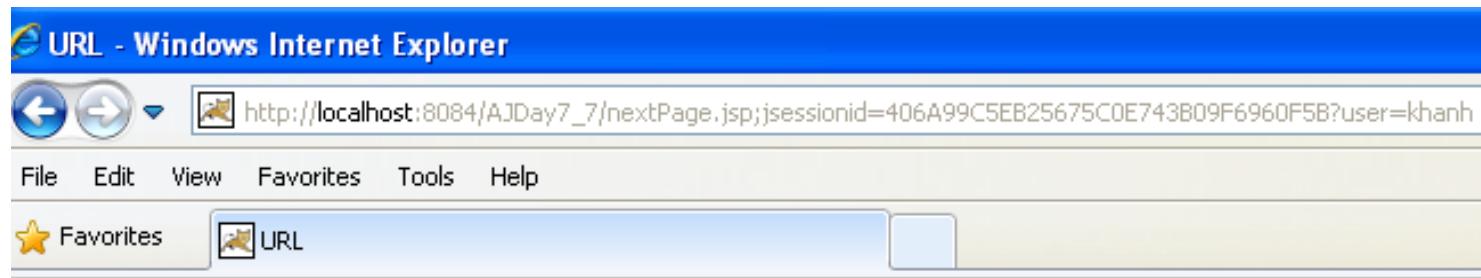
http://localhost:8084/AJDay7_7/nextPage.jsp?user=khanh

JSTL

Core Tag Library – URL-Related Actions

```
<title>URL</title>
</head>
<body>
    <h1>Welcome to next page</h1>
    ${param.user}

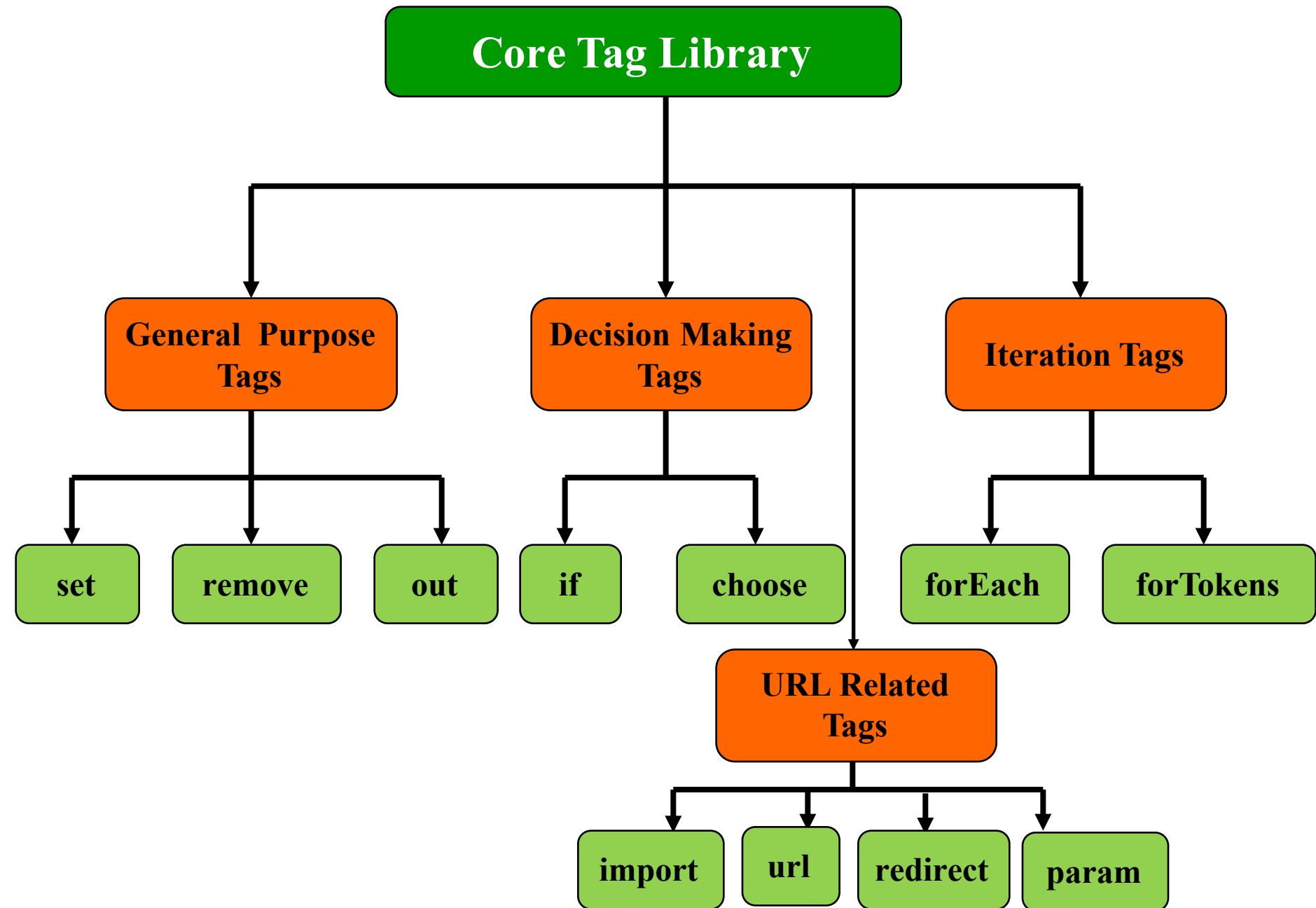
    <c:import var="s" url="urlJSTL.jsp"/>
</body>
```



Welcome to next page

khanh

JSTL Core Tag Library – Summary



Complete MVC 2 Requirements

- Complete the MVC 2 with CRUD Web Application in previous topic

Login - Windows Internet Explorer

http://localhost:8084/DBMVC865/

File Edit View Favorites Tools Help

★ Favorites Login

Login Page

Username

Password

Invalid - Windows Internet Explorer

http://localhost:8084/DBMVC865/CenterServlet

File Edit View Favorites Tools Help

★ Favorites Invalid

Invalid username or password!!!

[Click here to try again!](#)

[Click here to Sign Up](#)

http://localhost:8084/DBMVC865/login.html

[Click here to try again!](#)

[Click here to Sign Up](#)

http://localhost:8084/DBMVC865/createAccount.jsp

Invalid - Windows Internet Explorer

http://localhost:8084/DBMVC865/CenterServlet

File Edit View Favorites Tools Help

★ Favorites Invalid

Invalid username or password!!!

[Click here to try again!](#)

[Click here to Sign Up](#)

http://localhost:8084/DBMVC865/login.html

Complete MVC 2 Requirements

New - Windows Internet Explorer

http://localhost:8084/DBMVC865/createAccount.jsp

File Edit View Favorites Tools Help

Favorites New

Create New Account

Username* (6 - 20 chars)
Password* (5 - 20 chars)
Confirm*
Full Name* (2 - 50 chars)

>Login - Windows Internet Explorer

http://localhost:8084/DBMVC865/

File Edit View Favorites Tools Help

Favorites Login

Login Page

Username
Password

New - Windows Internet Explorer

http://localhost:8084/DBMVC865/CenterServlet

File Edit View Favorites Tools Help

Favorites New

Create New Account

Username* (6 - 20 chars)
Username phai tu 6 den 20 ky tu
Password* (5 - 20 chars)
Password phai tu 5 den 20 ky tu
Confirm*
Full Name* (2 - 50 chars)
Lastname phai tu 2 den 50 ky tu

Done

Complete MVC 2 Requirements

Home - Windows Internet Explorer

File Edit View Favorites Tools Help

Favorites Home

Welcome, khanh

Welcome to Servlet World

Name

Search

Home - Windows Internet Explorer

File Edit View Favorites Tools Help

Favorites Home

Welcome, khanh

Welcome to Servlet World

Name a

Search

No.	Username	Password	Lastname	Roles	Delete	Update
1	class861	345545423	Khoa	<input checked="" type="checkbox"/>	Delete	Update
2	EntityClass	EJB34	Day11	<input checked="" type="checkbox"/>	Delete	Update
3	khanh	kieu123	Kieu Khanh	<input checked="" type="checkbox"/>	Delete	Update
4	nhanDaiCa	nguoibanthuoc	Thuoc Thuoc Nhan	<input type="checkbox"/>	Delete	Update
5	Taidaica	123456	Tai Dai Dai Ca	<input checked="" type="checkbox"/>	Delete	Update
6	TienDan	1234	Dan Quan Dai	<input type="checkbox"/>	Delete	Update

JSTL

Functions Tag Libraries

- The **library contains tags**, which **provides** the **utility functions** in process on jsp page combining jstl
- All functions **treat null Strings as empty Strings**
- It can be **declared** by

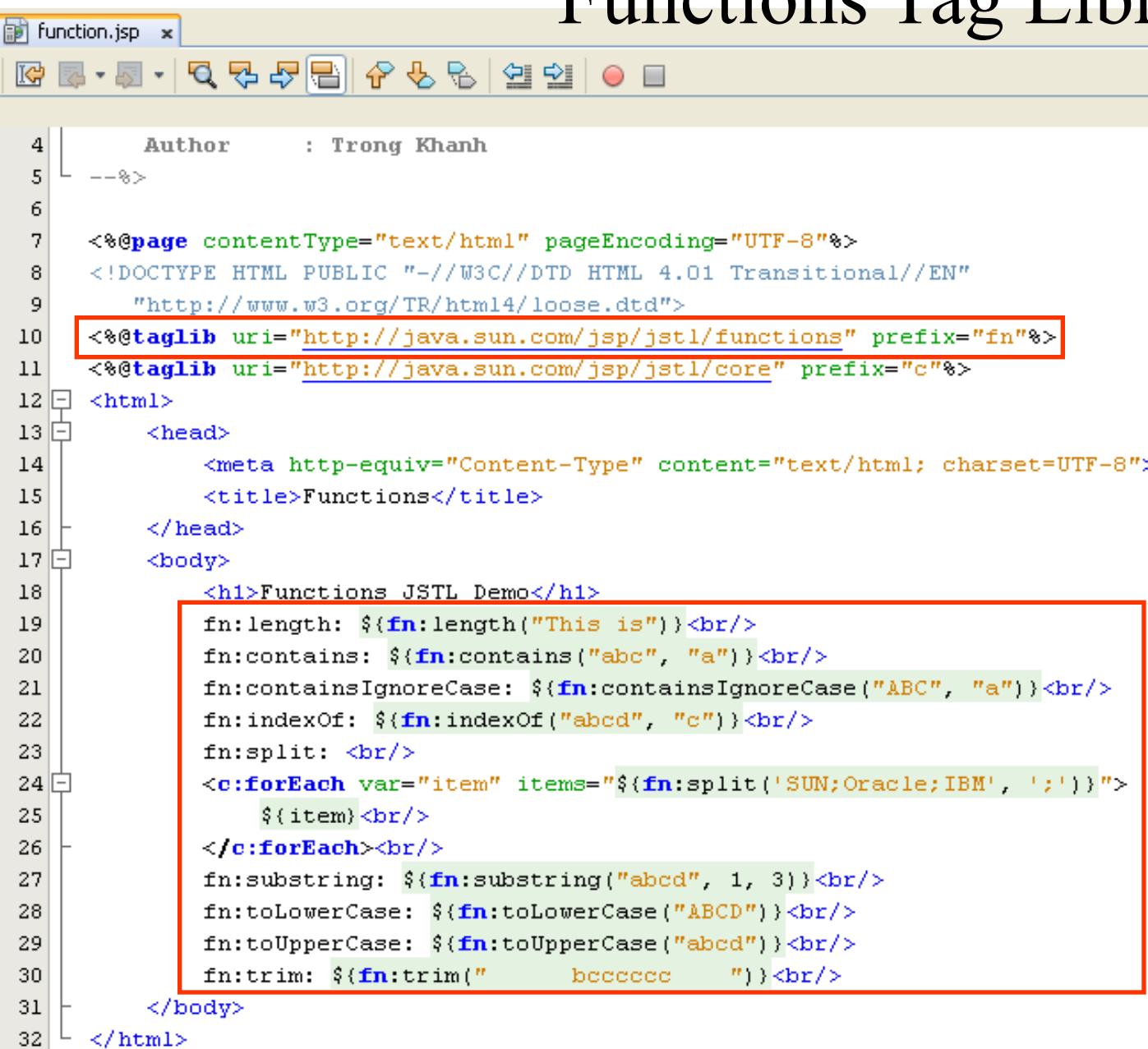
```
<%@ taglib prefix="fn" uri="http://java.sun.com/jsp/jstl/functions" %>
```

- Some **functions**

- fn:length
- fn:contains
- fn:containsIgnoreCase
- fn:indexOf
- fn:split
- fn:trim
- fn:substring
- ...

JSTL

Functions Tag Libraries



The screenshot shows a Java Server Page (JSP) editor with the file named "function.jsp". The code demonstrates the use of JSTL Functions Tag Libraries. A red box highlights the declarations of the tag libraries and a red rectangle highlights the usage of various functions within the page body.

```
4 Author      : Trong Khanh
5 --%>
6
7 <%@page contentType="text/html" pageEncoding="UTF-8"%>
8 <!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN"
9   "http://www.w3.org/TR/html4/loose.dtd">
10 <%@taglib uri="http://java.sun.com/jsp/jstl/functions" prefix="fn"%>
11 <%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
12 <html>
13   <head>
14     <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
15     <title>Functions</title>
16   </head>
17   <body>
18     <h1>Functions JSTL Demo</h1>
19     fn:length: ${fn:length("This is")}<br/>
20     fn:contains: ${fn:contains("abc", "a")}<br/>
21     fn:containsIgnoreCase: ${fn:containsIgnoreCase("ABC", "a")}<br/>
22     fn:indexOf: ${fn:indexOf("abcd", "c")}<br/>
23     fn:split: <br/>
24     <c:forEach var="item" items="${fn:split('SUN;Oracle;IBM', ';')}">
25       ${item}<br/>
26     </c:forEach><br/>
27     fn:substring: ${fn:substring("abcd", 1, 3)}<br/>
28     fn:toLowerCase: ${fn:toLowerCase("ABCD")}<br/>
29     fn:toUpperCase: ${fn:toUpperCase("abcd")}<br/>
30     fn:trim: ${fn:trim("      bcccccc      ")}<br/>
31   </body>
32 </html>
```

JSTL

Functions Tag Libraries

 Functions - Windows Internet Explorer

http://localhost:8084/AJDay7_7/function.jsp

File Edit View Favorites Tools Help

Favorites Functions

Functions JSTL Demo

```
fn:length: 7
fn:contains: true
fn:containsIgnoreCase: true
fn:indexOf: 2
fn:split:
SUN
Oracle
IBM

fn:substring: bc
fn:toLowerCase: abcd
fn:toUpperCase: ABCD
fn:trim: bcccccc
```

JSTL

SQL Tag Library

- The library contains tags, which are used to **access SQL databases**, are used to perform the database related tasks, such as **selection, insertion, deletion and modification without using java codes**
- It provides an interface for executing SQL queries on database through JSP.
- **It can be declared by**

```
<%@ taglib prefix="sql" uri="http://java.sun.com/jsp/jstl/sql" %>
```

- **The “setDataSource” Tag**
 - Is used to **set a data source** for the **database**.
 - Is an empty tag and allows the user to set data source information for the database
 - **Syntax:**

```
<sql:setDataSource dataSource="datasource" | url="jdbcurl"  
driver="jdbcclassdriver" user="username" password="password"  
var="varName" scope="page | request | session | application"/>
```

- If the DataSource attribute is used, then url attribute cannot be used.

JSTL

SQL Tag Library

- The “query” Tag
 - Searches the database and returns a result set containing rows of data. (**Passing database queries function**)
 - The tag can either be an empty tag or a container tag.
 - The SELECT statement is used to select data from the table.
 - Syntax

```
<sql:query var="varName" dataSource="datasource" scope="page | request |  
session | application">
```

 SQL Statement

```
        <sql:param value="value" />
```

```
</sql:query>
```

- The “update” Tag

- Executes the **INSERT, UPDATE AND DELETE** statements.
- Zero is returned if no rows are affected by statements
- Syntax

```
<sql:update var="varName" dataSource="datasource" scope="page | request |  
session | application">
```

 SQL Statement

```
        <sql:param value="value" />
```

```
</sql:update>
```

SQL Tag Library

- **The var attribute of query Tag**
 - Is **javax.servlet.jsp.jstl.sql.Result** interface
 - **Methods**
 - **columnNames**: Returns the names of the columns in the result
 - **rowCount**: Returns the number of rows in the cached ResultSet
 - **rows**: Returns the result of the query as an array of SortedMap objects
 - **rowsByIndex**: Returns the result of the query as an array of arrays
 - **limitedByMaxRows**: Returns true if the query was limited by a maximum row setting

Login - Windows Internet Explorer

http://localhost:8084/AJDay7_7/login.html

File Edit View Favorites Tools Help

Favorites Login

Login Page

Username

Password Welcome, khanh

Welcome to EL + JSTL

Name

Title

Course

No.	Username	Password	Lastname	Roles
1	Danh Vong	12345	Danh Dai Ca	false
2	kieukhanh	123445	Khanh Kieu Trong	true

Create new account

Username

Password

Lastname

JSTL SQL Tag Library Example

Home - Windows Internet Explorer

http://localhost:8084/AJDay7_7/processLogin.jsp

File Edit View Favorites Tools Help

Favorites Home

Welcome, khanh

Welcome, khanh

Welcome to EL + JSTL

Name

Title Forward

Course AJCourse

No.	Username	Password	Lastname	Roles
1	1008	333	345	
2	apttech	apttech1	0000	false
3	Danh Vong	12345	Danh Dai Ca	false
4	HieuLegend	legend1345	Hieu kk	false
5	khanh	kieu123	kieu	true
6	kieukhanh	123445	Khanh Kieu Trong	true
7	Phong	123456	Phong cui	false

Create new account

Username

Password

Lastname

JSTL

SQL Tag Library

- **The “transaction” Tag**
 - Is used to **established a transaction** context for `<sql:query>` and `<sql:update>` tags.
 - The connection object is obtained from `<sql:transaction>` as this tag is responsible for managing access to the database.
 - **Syntax**

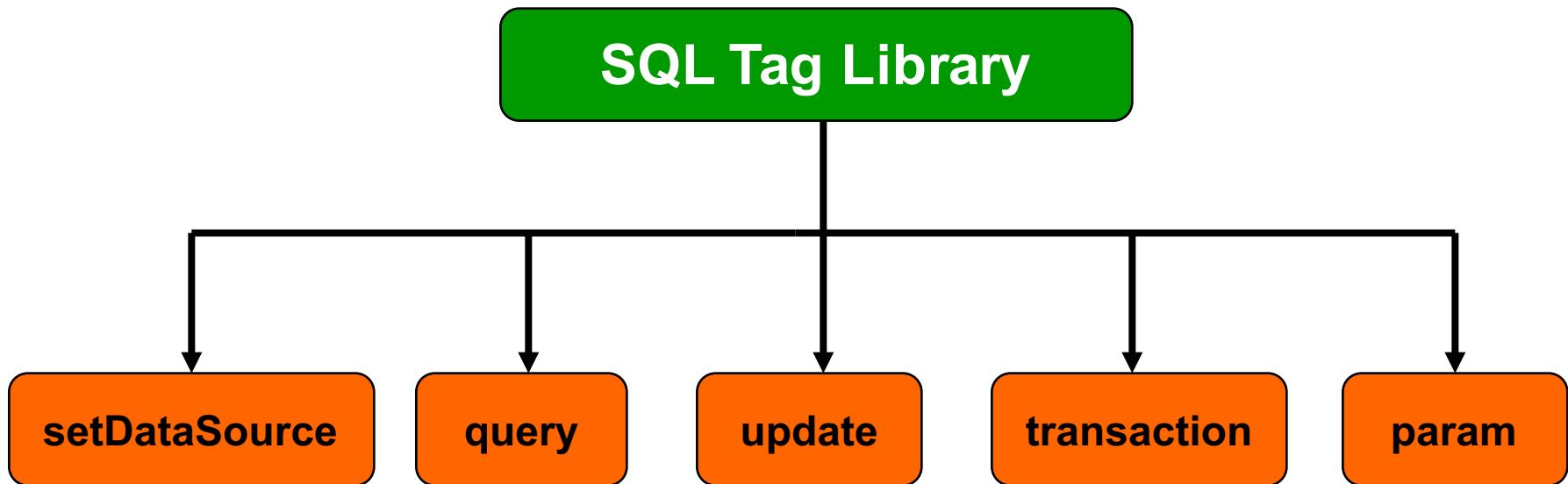
```
<sql:transaction dataSource="datasource" isolation="isolationLevel">
    <sql:update> or <sql:query> Statements
</sql:transaction>
```

- **The “param” Tag**
 - Is used to **set values for parameters markers** (“?”) in SQL statements.
 - It acts as a sub tag for `<sql:query>` and `<sql:update>`
 - **Syntax**

```
<sql:param value="value"/>
```

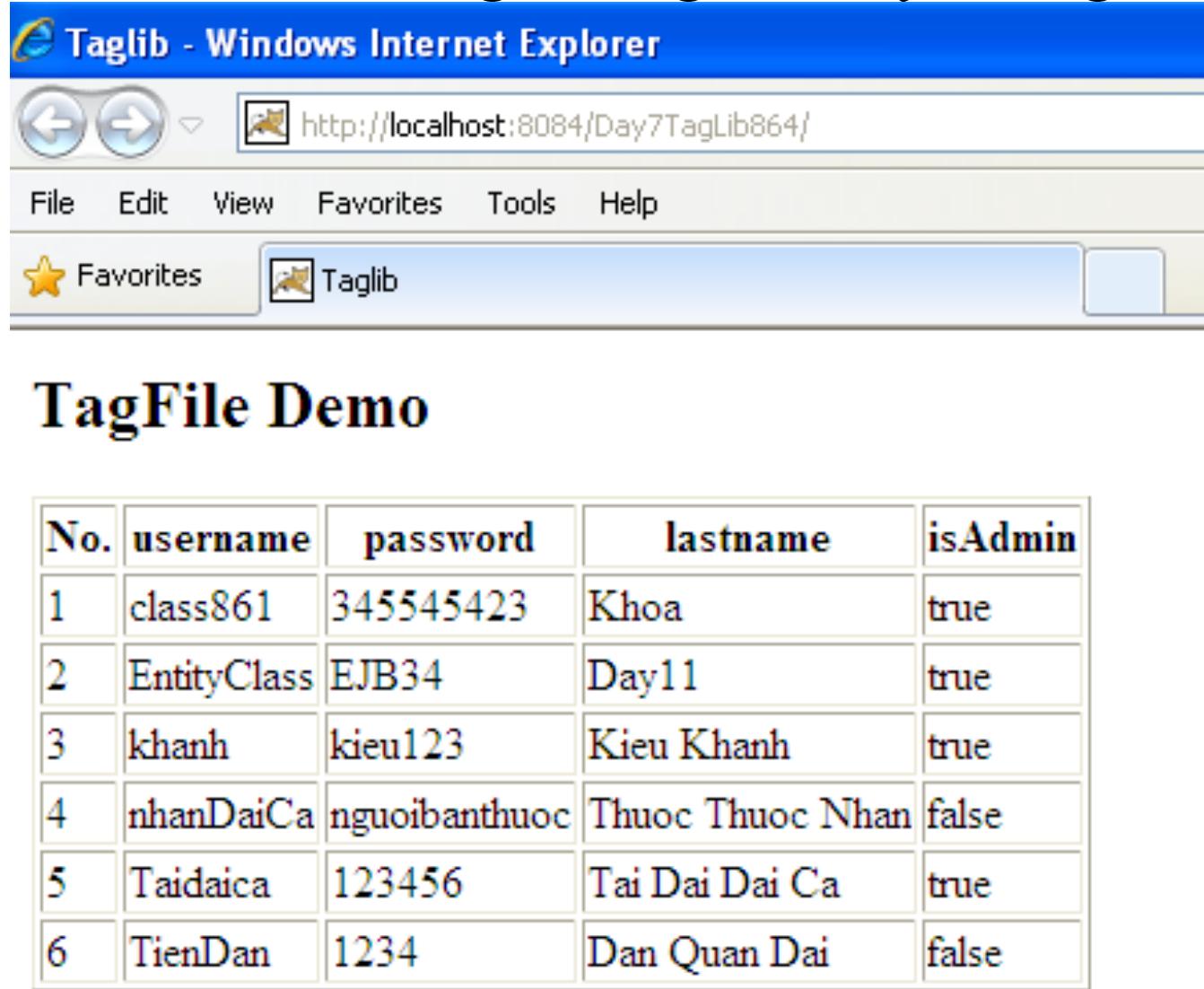
JSTL

SQL Tag Library



Build Library Tag Lib Library Requirements

- Build the data grid tag library using in JSP as



The screenshot shows a Windows Internet Explorer window titled "Taglib - Windows Internet Explorer". The address bar displays the URL "http://localhost:8084/Day7TagLib864/". The browser menu bar includes File, Edit, View, Favorites, Tools, and Help. A toolbar below the menu bar contains icons for Favorites and Taglib. The main content area is titled "TagFile Demo" and displays a data grid table with the following data:

No.	username	password	lastname	isAdmin
1	class861	345545423	Khoa	true
2	EntityClass	EJB34	Day11	true
3	khanh	kieu123	Kieu Khanh	true
4	nhanDaiCa	nguoibanthuoc	Thuoc Thuoc Nhan	false
5	Taidaica	123456	Tai Dai Dai Ca	true
6	TienDan	1234	Dan Quan Dai	false

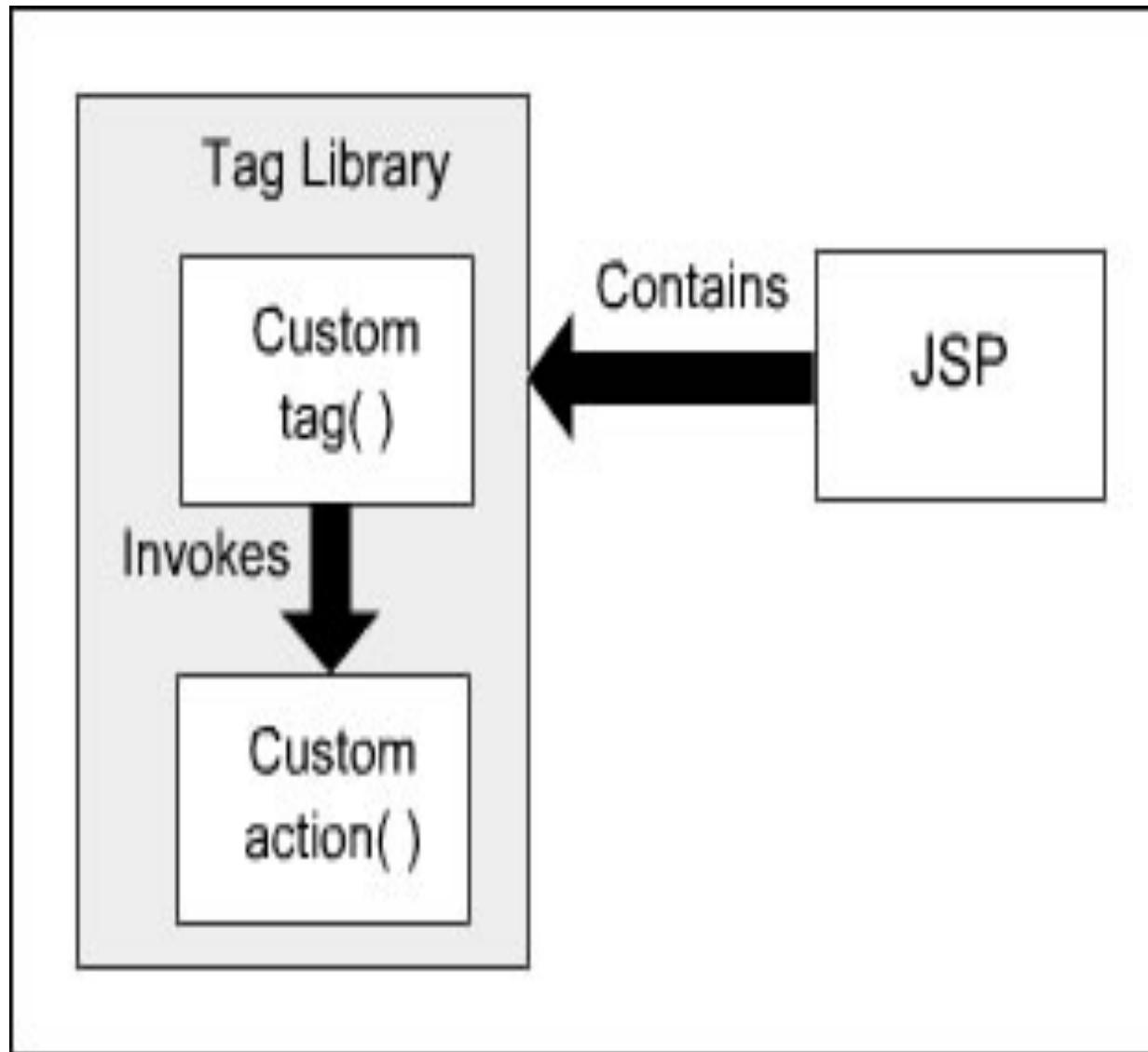
Tag Libraries

Tag Extension Mechanism

- Enables **creation** of custom tags
 - Java code can be **avoided** using custom tags
 - **Separates the work profiles** of Web designers and developers (representation and business logic)
- Custom tags **can be reused**
- **Written using XML** syntax
- **Encapsulation**
- Components of custom tag
 - **Tag Library Descriptor (TLD)**: an XML document contains information about the contents of a tag library.
 - **Custom Action**: a Java class implements the contents in the TLD
 - **Web deployment descriptor**: locate the custom tag library to use
- A Tag is implemented through extending some interfaces of the **javax.servlet.jsp.tagext** package

Tag Libraries

Tag Extension Mechanism



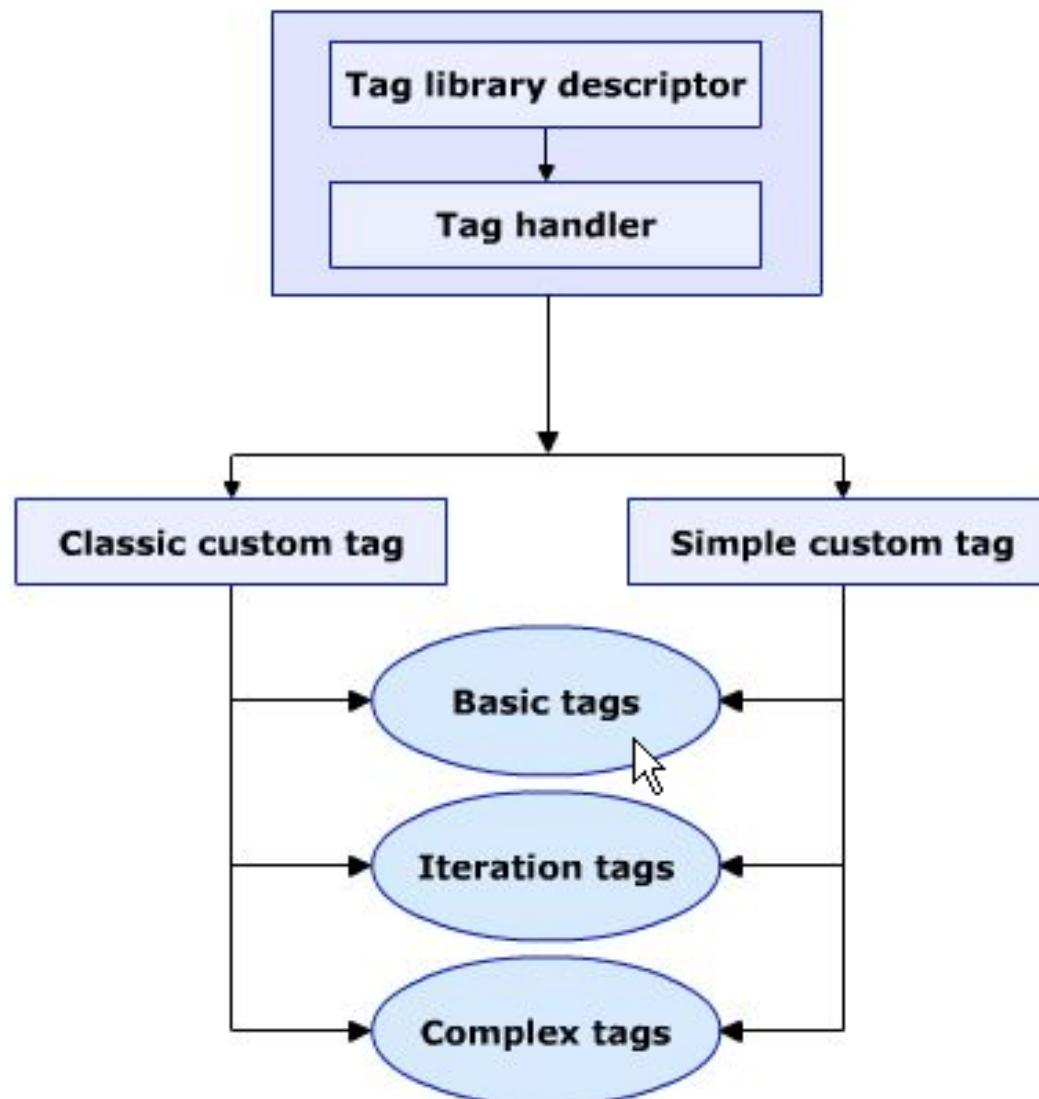
Tag Libraries

Terminologies

- **Classic** custom tag is defined by the classic tag handler class.
- **Simple** custom tag is defined by the simple tag handler classes.
- **Basic tags**
 - Generally do not contain any body. (Even if it contains body, the body is not processed by the tag.)
 - The tag handler class of the basic tag implements the Tag interface and extends the TagSupport class.
- **Iteration** tags
 - Are evaluated time and again.
 - Are generally empty tags.
 - The tag handler class for an iteration tags needs implementation of IterationTag interface that extends the Tag interface.
- **Complex** tags
 - Support evaluation of the body content of the tag including other services provided in the basic tag or iteration tag.
 - Implement BodyTag interface and extend the BodyTagSupport class.

Tag Libraries

Terminologies



Tag Libraries

Custom Tags

- Allow Java programmer to **embed Java codes** in JSP documents
- Helps the developer **reducing the overhead of writing** the same business logic again for a particular action to be repeated in programs
- Supporting **the front end**, developer **need not bother about the complexity of the logic of a tag** because the tag is created by a Java developer and the front end developer only imports it to the JSP page.
- Provide a mechanism to **reuse and encapsulate complex recurring code or tasks** in JSP
- Provide **simplicity and reusability** of Java code
- Custom tag body can include **static text, HTML, and JSP elements like scriptlets**, between the start and the end tag

Tag Libraries

The Custom Tag Development Process

- There are 4 essential steps to writing a custom tag
 - **Create a Tag Library Descriptor (.tld) – TLD file**
 - Is an XML document that is used to validate the tags.
 - Contains the information on each tag available in the library
 - Provides the JSP engine with meta-information about the custom tag and about its implementation
 - Contains the list and description of all custom tags in the library
 - Usually locates at the tlds folder inside WEB-INF directory
 - **Create a Tag Handler class** in proper package with tld file.
 - Is a Java class that defines a tag described in the TLD file.
 - What a tag will implement depends on what methods can be called and what is required to be implemented.
 - These are of two types, classic and simple.
 - **Provide details of where to find the TLD file in web.xml (option – required if the tld files don't put at the WEB-INF/tlds directory)**
 - **Creating a JSP page** that will access the custom tags: using a **taglib directive** in the page before any custom tag is used.

Tag Libraries

The TLD file

```
<?xml version="1.0" encoding="UTF-8"?>
<taglib version="2.0" 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/web-
    jsptaglibrary_2_0.xsd">
    <tlib-version>1.0</tlib-version>
    <short-name>shortName-prefix</short-name>
    <uri>/WEB-INF/tlds/CustomTag</uri>
    <tag>
        <name>tagName-method</name>
        <tag-class>TagHandlerName</tag-class>
        <body-content>JSP|EMPTY|scriptless|tagdependent</body-content>
        <attribute>
            <name>attributeName</name>
            <required>false/true</required>
            <rteprvalue>false/true</rteprvalue>
        </attribute>
    </tag>
</taglib>
```

Tag Libraries

Mapping TLD file in web.xml

```
<web-app>
```

```
...
```

```
<jsp-config>
```

```
  <taglib>
```

```
    <taglib-uri>tld file name</taglib-uri>
```

```
    <taglib-location>tld location path</taglib-location>
```

```
  </taglib>
```

```
</jsp-config>
```

```
...
```

```
</web-app>
```

- **Ex:**

```
<taglib>
```

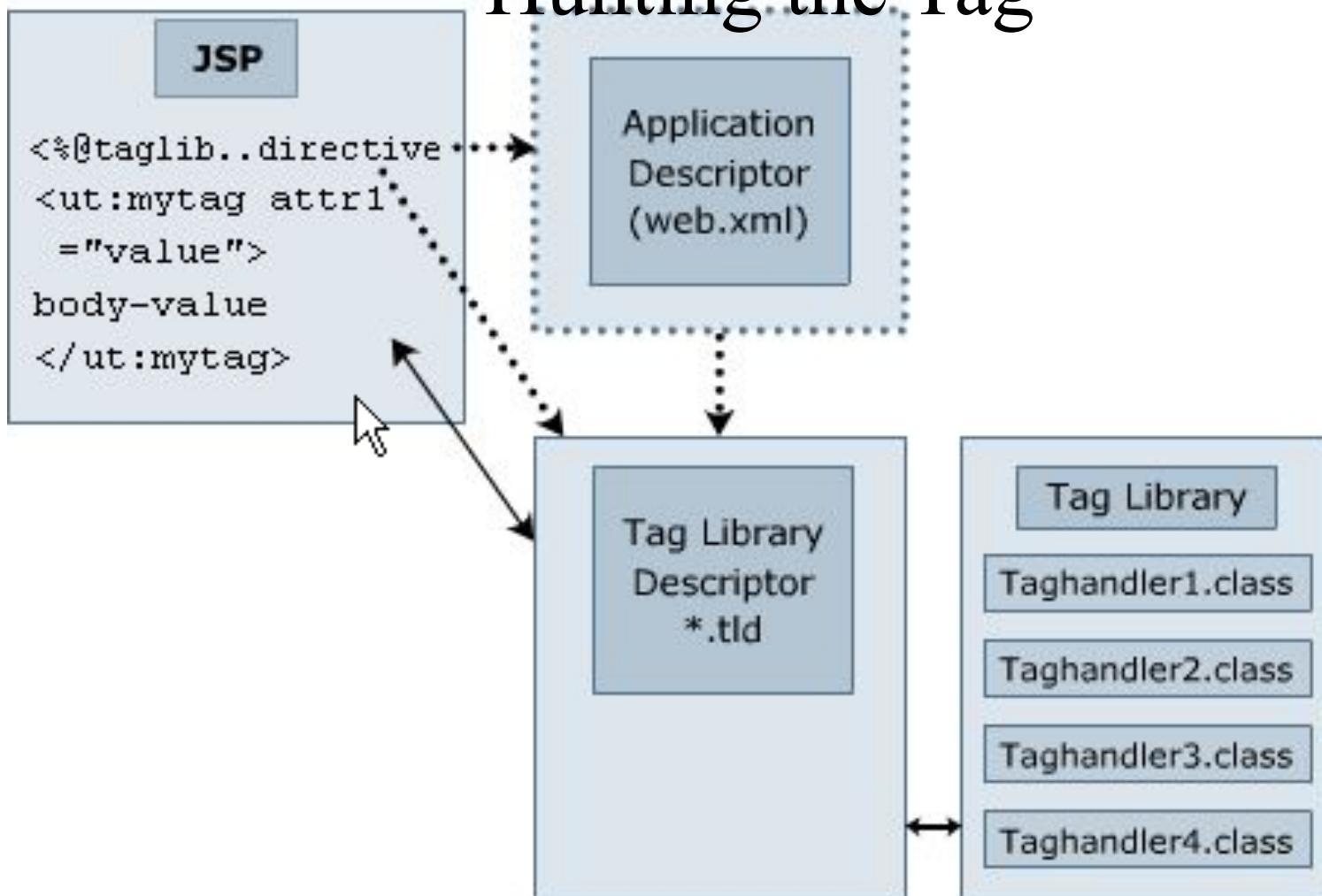
```
  <taglib-uri>CustTags-taglib.tld</taglib-uri>
```

```
  <taglib-location>/WEB-INF/classes/CustTags-taglib.tld</taglib-location>
```

```
</taglib>
```

Tag Libraries

Hunting the Tag



Working of Custom Tag Libraries

Tag Libraries

The Tag Libraries

- Is a collection of custom tags
- Allows the developer to **write reusable code fragments**, which assign functionality to tags
- The reference to each tag is stored in the tag library
- When a tag is used in a JSP page, **the taglib directive must be imported as**

`<%@ taglib uri="/WEB-INF/tlds/TagHandler" prefix="u" %>`

- **Locating TLD File:** after iterating with the `<%@taglib...%>` directive, traces the location of the **tag library descriptor** file (through URI) and subsequently to the **location of the tag handle class**
- **Associating URIs with TLD File Locations:** The uri attribute is mapped to the .tld file by **two methods**
 - **Implicit**
 - By referring to the tag library descriptor from the expanded WEB-INF folder.
 - By referring to a JAR file containing a tag library.
 - **Explicit:** By defining reference to the tag library descriptor in the deployment descriptor, web.xml of the Web application

Tag Libraries

The Tag Libraries

- **Tag Library Prefix**
 - Distinguish these tags from one another, they are named uniquely by using prefix attributes in the taglib directive
 - Is used as a reference by the container to invoke its respective TLD file and tag handler class
 - The value of prefix and the sub element <short-name> inside the <taglib> within the TLD file should match
- **Notes:**
 - The tld files can be mapped in implicit (e.g. they should be put at the WEB-INF/tlds)
 - The tld files can be packaged into a jar file, and the tld files within the jar file must have a path that begins /META-INF directory
 - The tld files must contain the optional <uri> element, which must match the uri of the taglib directive or the namespace value

The “Classic” Custom Tag Event Model

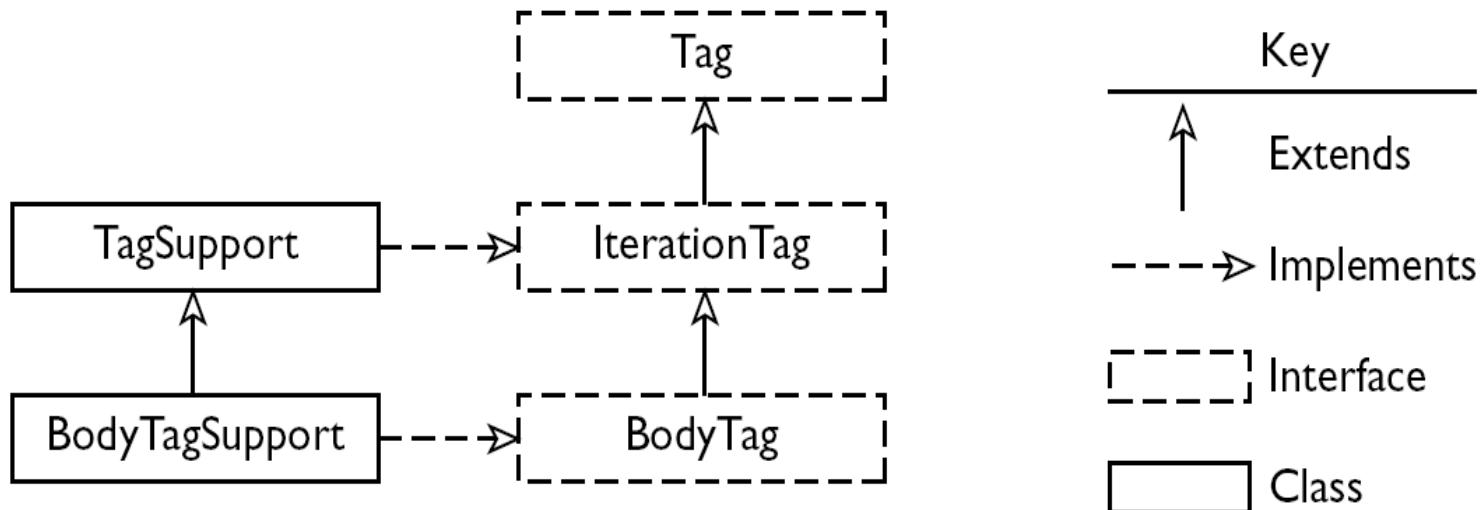
Basics

- Uses a tag handler class, which **implements Tag, IterationTag and BodyTag interfaces** or **extends the classes TagSupport or BodyTagSupport**

Interfaces/Classes	Descriptions
Tag	<ul style="list-style-type: none"> - Allows communication between a tag handler and the servlet of a JSP page. - Is particularly useful when a classic custom tag is without any body or even if it has body when it is not for manipulation
IterationTag	<ul style="list-style-type: none"> - Is used to by tag handlers that require executing the tag, time and again without manipulating its content. - Extends to the Tag interface
BodyTag	<ul style="list-style-type: none"> - The tag handler class of a tag which manipulates its body needs to implement - Extends to the IterationTag and in turn to the Tag interface.
TagSupport Class	<ul style="list-style-type: none"> - Acts as the base class for most tag handlers which support, empty tag, tag with attributes and a tag with body iterations. - Implements the Tag and IterationTag interfaces. Thus, it implements all the methods in these interfaces. - Contains methods such as, doStartTag(), doEndTag() and doAfterBody().
BodyTagSupport	<ul style="list-style-type: none"> - Can support tags that need to access and manipulate the body content of a tag. - Implements the BodyTag interface. - Extends the TagSupport class. - Contains the following methods: setBodyContent() and doInitBody().

The “Classic” Custom Tag Event Model

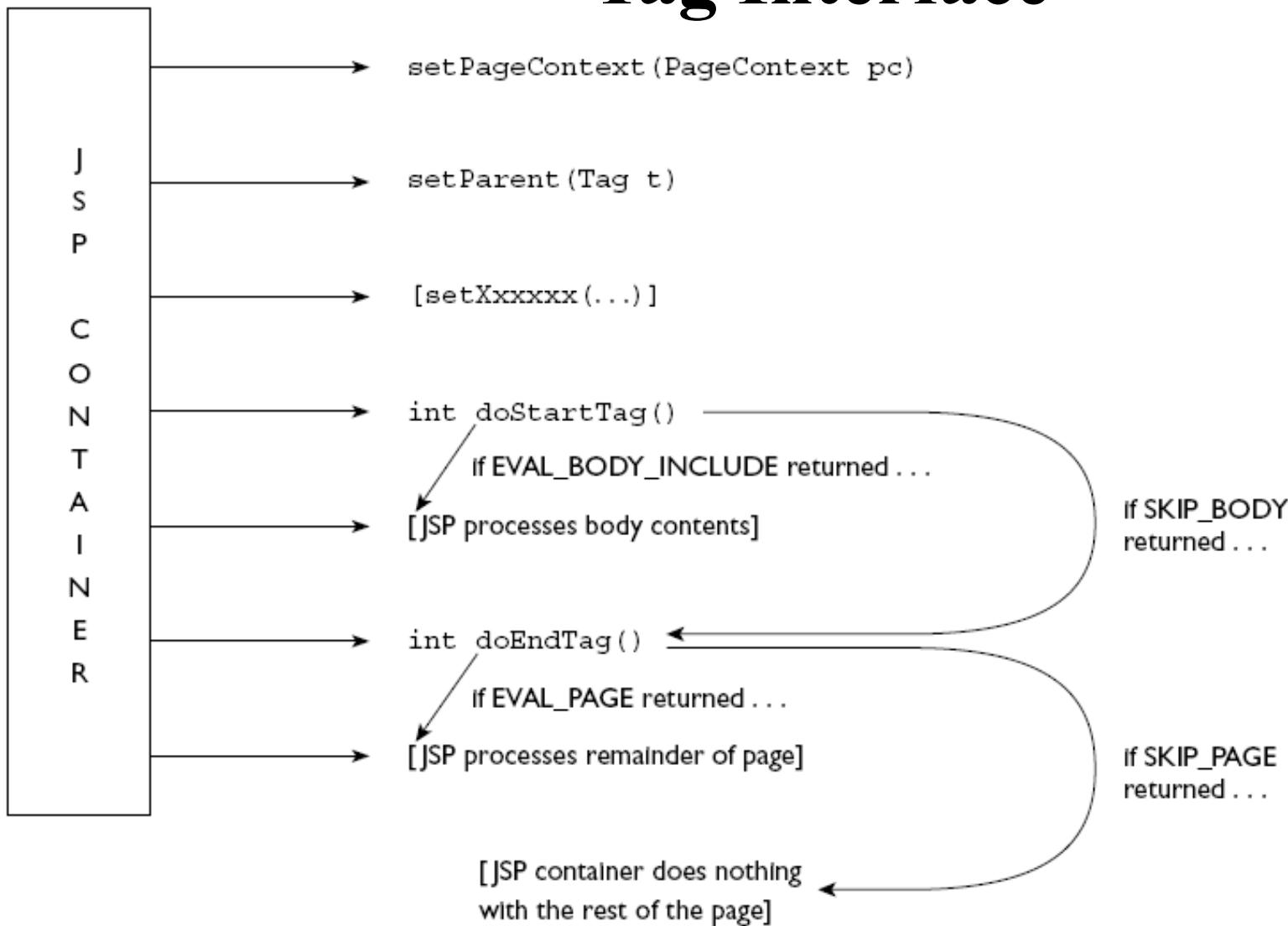
Basics



Tag Interfaces and Classes in `javax.servlet.jsp.tagext`

The “Classic” Custom Tag Event Model

Tag Interface



Tag Interface

Methods	Descriptions
doStartTag	<ul style="list-style-type: none"> - public int doStartTag() throws JSPException - Is invoked when a request is made to a tag or encountering the starting tag of the element - Returns the SKIP_BODY constant if there is no body to evaluate and returns the EVAL_BODY_INCLUDE constant if the body after evaluation needs to be sent to the output stream. - In case of the BodyTag interface, it can return EVAL_BODY_BUFFERED that the evaluated body is to be stored in a buffer temporarily.
doEndTag	<ul style="list-style-type: none"> - public int doEndTag() throws JSPException - Is invoked when the JSP page encounters the end tag. - Generally follows the execution of the doStartTag() if the tag is empty. - Returns the SKIP_PAGE constant if there is no need to evaluate the rest of the page and returns EVAL_PAGE constant if the rest of the page needs to be evaluated.
setParent	<ul style="list-style-type: none"> - public void setParent(Tag t) - Sets the current nesting or parent tag of a nested tag. - Is invoked prior to doStartTag()
getParent	<ul style="list-style-type: none"> - public Tag getParent() - Returns the current parent tag
setPageContext	<ul style="list-style-type: none"> - public void setPageContext(PageContext pc) - Sets the current page context. - Is called by the page implementation prior to doStartTag().
release	<ul style="list-style-type: none"> - public void release() - Is invoked so that the tag handler will release the resource it holds. The resources utilized by the tag instance are now free for further processing inside the remaining JSP page

Tag Implementation

Empty Custom Tags – Reference uri

- Affecting uri on tld file

custom.tld

```

1  <?xml version="1.0" encoding="UTF-8"?>
2  <taglib version="2.1" xmlns="http://java.sun.com/
3      <tlib-version>1.0</tlib-version>
4      <short-name>custom</short-name>
5      <uri>http://kieutrongkhanh.net/customTag</uri>
```

customTag.jsp

```

4 Author : Trong Khanh
5 --%>

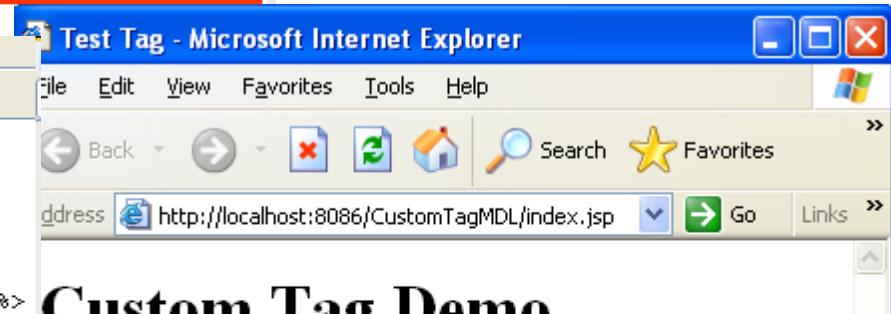
6 <%@page contentType="text/html" pageEncoding="UTF-8"%>
7 <!DOCTYPE html>
8 <%@taglib uri="http://kieutrongkhanh.net/customTag" prefix="ct"%>
```

customTag.jsp

```

4 Author : Trong Khanh
5 --%>

6 <%@page contentType="text/html" pageEncoding="UTF-8"%>
7 <!DOCTYPE html>
8 <%@taglib uri="/WEB-INF/tlds/custom.tld" prefix="ct"%>
```



Custom Tag Demo

Before Custom Tag is invoked!

Empty Tag Create Empty Tag using Tag

After Custom Tag finished!

The “Classic” Custom Tag Event Model

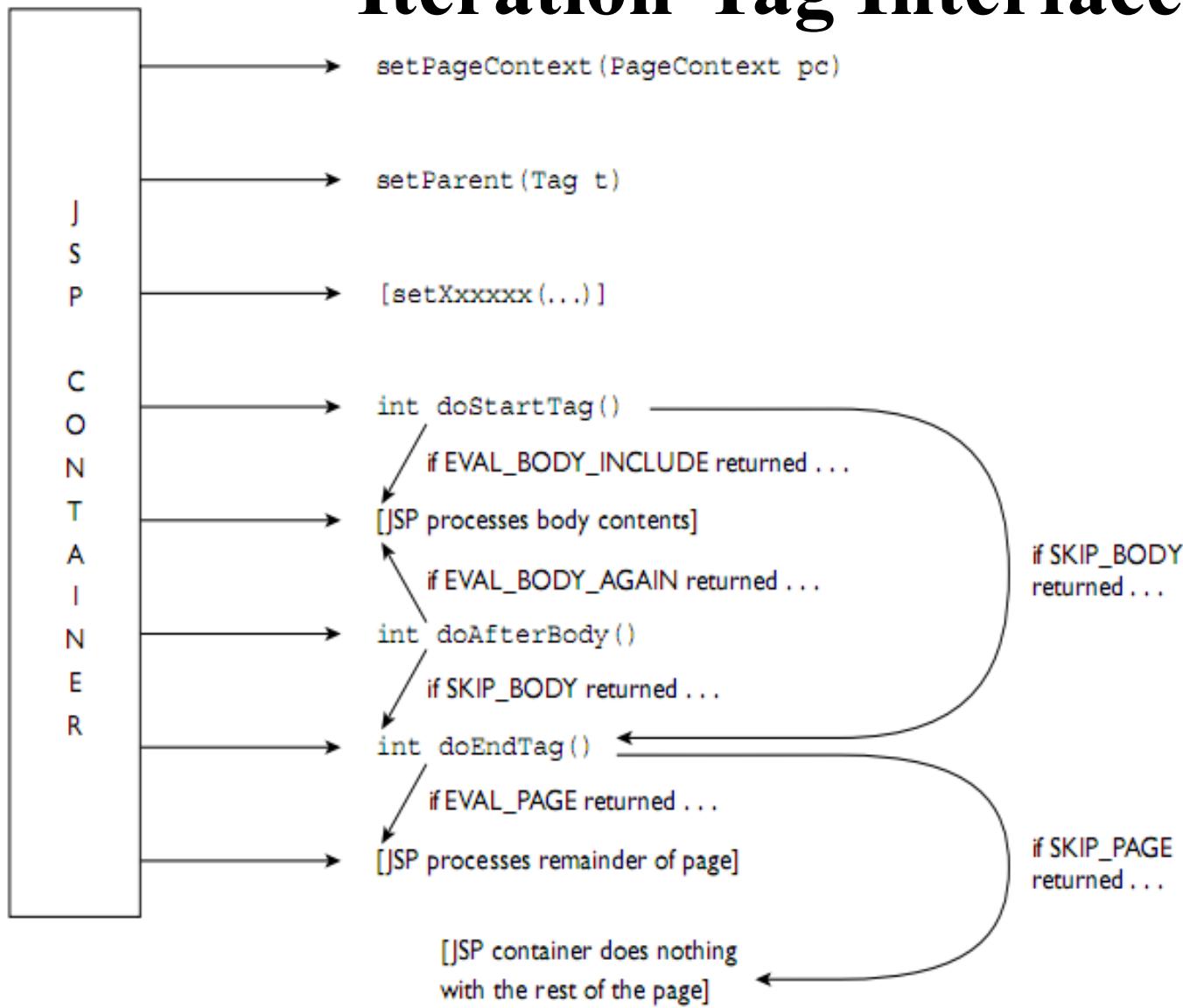
Iteration Tag Interface

- Is implemented to the tag handler class to create tags, which **repeatedly evaluates the body inside it.**
- Is an **extension of the Tag interface**

Methods	Descriptions
doAfterBody	<ul style="list-style-type: none"> - public int doAfterBody() throws JSPException - Allows the user to conditionally re-evaluate the body of the tag. - Is invoked after evaluating the body of the tag. - Returns the constant SKIP_BODY or EVAL_BODY_AGAIN. - If the doStartTag() method returns EVAL_BODY_INCLUDE then this method returns EVAL_BODY_AGAIN. - Then the doStartTag() is evaluated once again. But when the doAfterBody() returns SKIP_BODY, the doEndTag() method is invoked

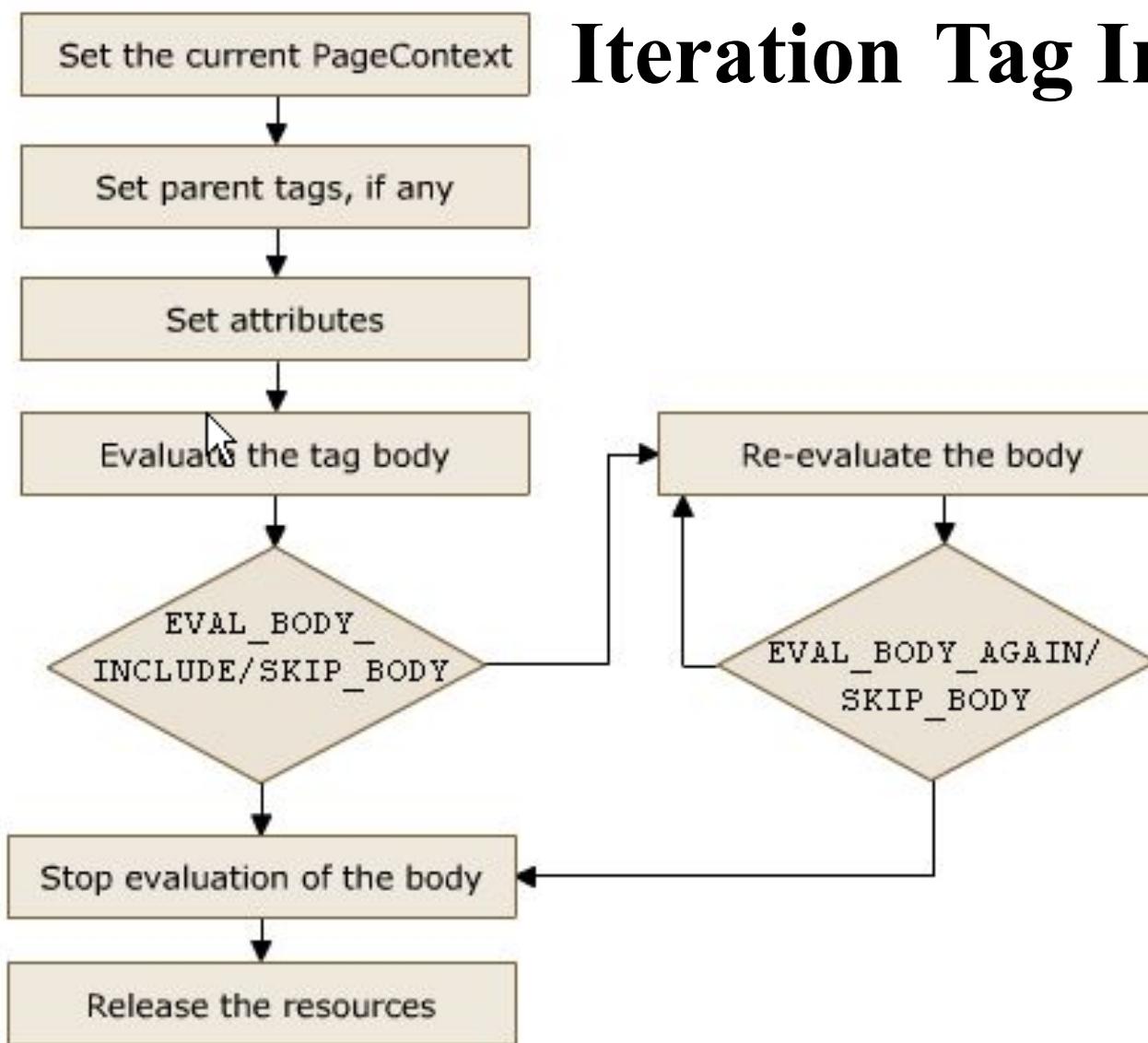
The “Classic” Custom Tag Event Model

Iteration Tag Interface



The “Classic” Custom Tag Event Model

Iteration Tag Interface



Implementing IterationTag Interface

The “Classic” Custom Tag Event Model

TagSupport Class

- Implements the **Tag or Iteration Tag** interface
- Makes it easy to create a handler class by **limiting the implementation of number of methods**
- Acts as the base class for all tag handlers for the tags without body and iterative tags
- Suffers from a limitation of **not being able to manipulate the body content**

The “Classic” Custom Tag Event Model

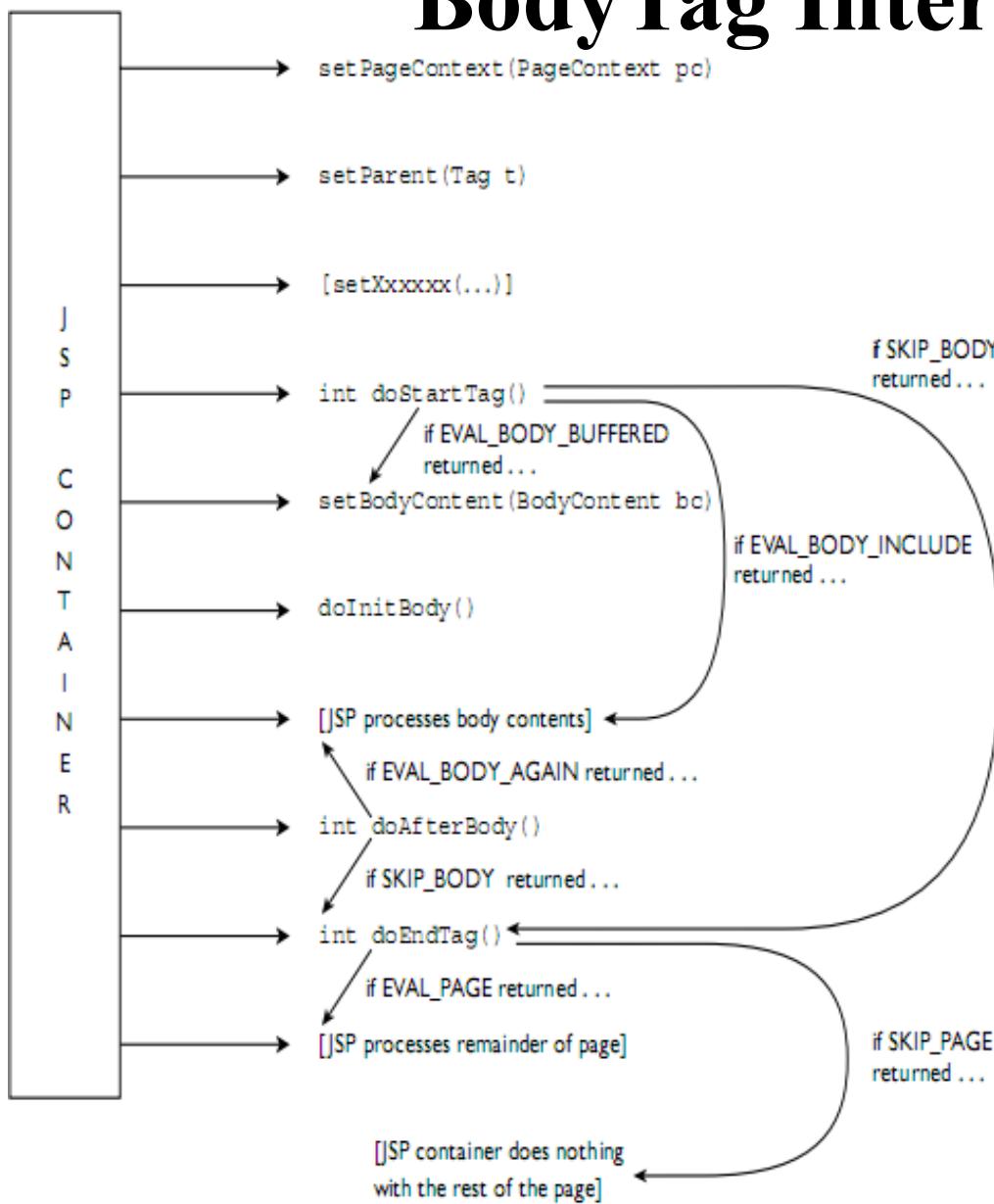
BodyTag Interface

- The tag handler class to **implement the BodyTag interface** that can include body inside it and manipulate the content of the body. This also inherits all the methods from the Tag interface

Methods	Descriptions
doInitBody	<ul style="list-style-type: none"> - public void doInitBody() - Is invoked immediately after the setBodyContent() method returns the bodyContent object and before the first body evaluation. - Can only be invoked if the tag contains any body
setBodyContent	<ul style="list-style-type: none"> - public void setBodyContent(BodyContent bc) - Sets the bodyContent object for the tag handler, the bodyContent object of the BodyContent class encapsulates the body content of the custom tag for processing. - Is automatically invoked by the JSP page before the doInitBody() method.

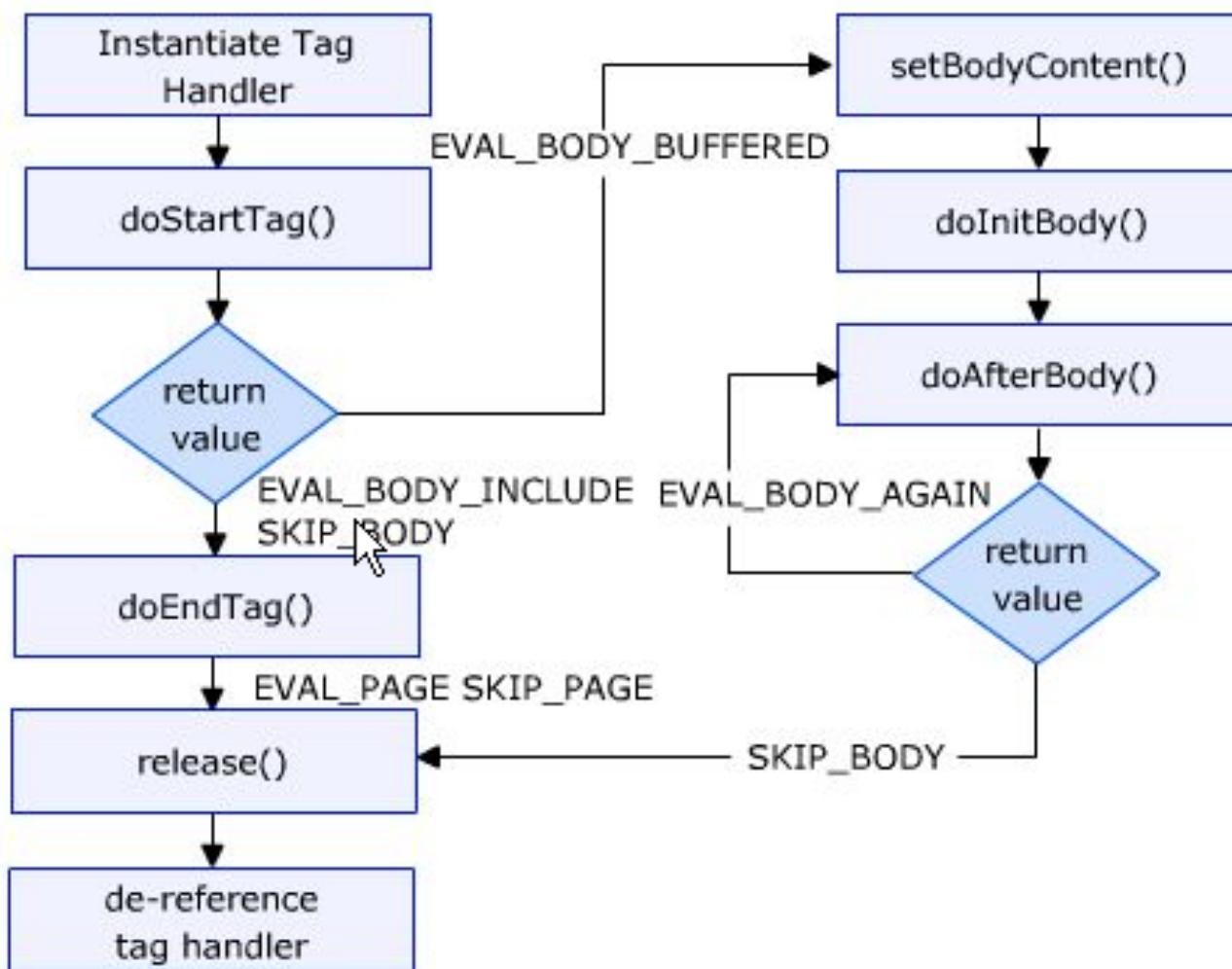
The “Classic” Custom Tag Event Model

BodyTag Interface



The “Classic” Custom Tag Event Model

BodyTag Interface



Implementing BodyTag Interface

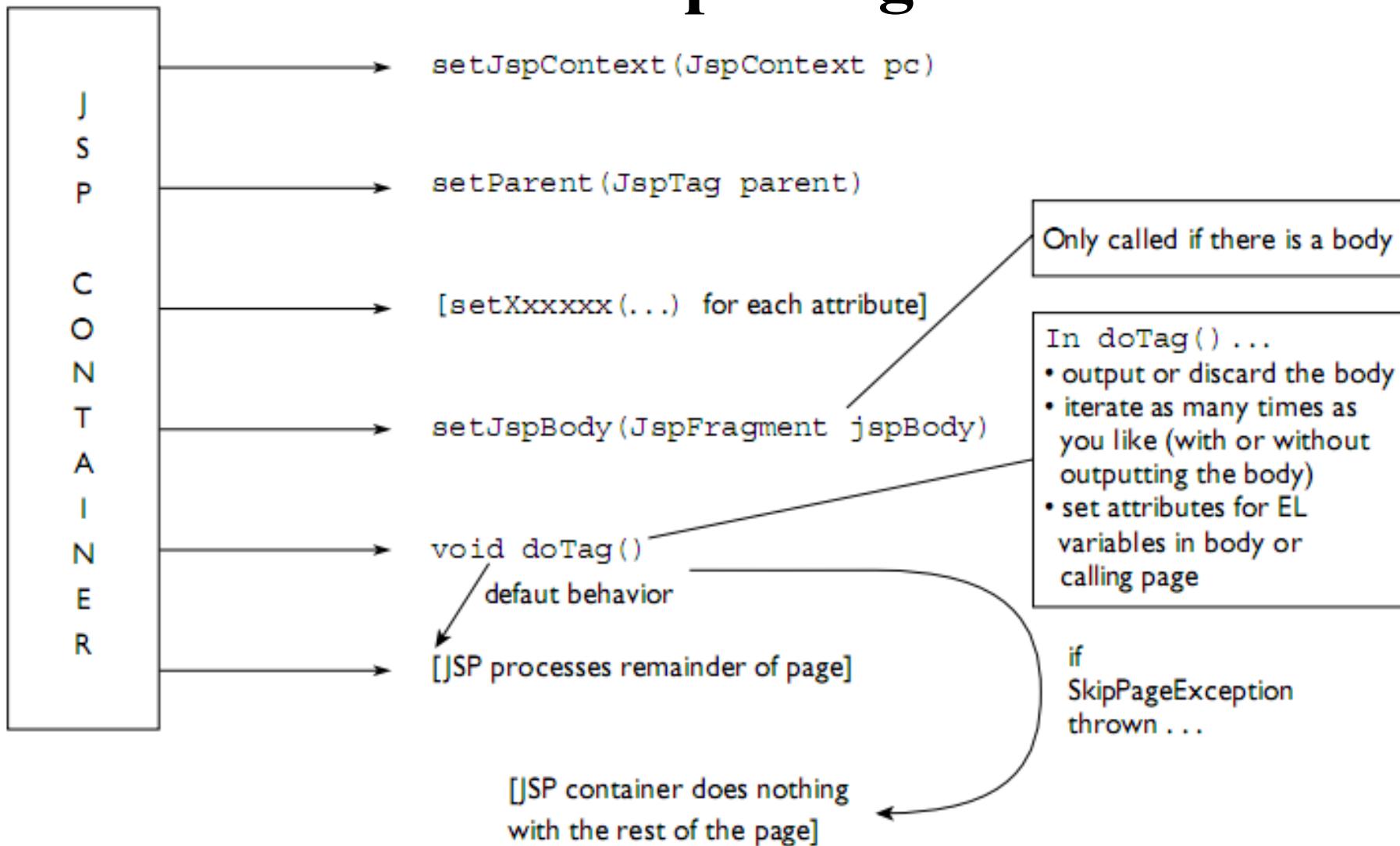
BodyTagSupport Class

- By default **implements the BodyTag interface** and also **extends to the TagSupport class**
- The handler class only **needs to override the methods of the BodyTagSupport class**. All the methods of the TagSupport class and Bodytag interface **are implemented by default** in the handler class. This makes the creation of tag handler class a lot easier.

Methods	Descriptions
getBodyContent	<ul style="list-style-type: none"> - public BodyContent getBodyContent() - Retrieves the bodyContent object of the class BodyContent. - Contains the body of the tag which is accessed by the container for manipulation.
setBodyContent	<ul style="list-style-type: none"> - public void setBodyContent(BodyContent bc) - The bodyContent object is set by the setBodyContent() method

The “Simple” Custom Tag Event Model

The Simple Tag Interface



The Simple Tag Interface

- Provides **doTag()** method, which is supported by the Classic Tag Handlers.
- The servlet container invokes the **setJspContext()**, **setParent()**, and methods setting attribute, setting JspFragment and then **doTag()** method

Methods	Descriptions
doTag	<ul style="list-style-type: none"> - public void doTag() throws JSPException, IOException - Is used for handling tag processing. - Retains body iteration after being processed. - Is called whenever there is a requirement of tag invocation. All the manipulations and evaluations are carried out by this method.
setParent	<ul style="list-style-type: none"> - public void setParent(JSPTag parent) - Sets the parent of a specified tag
getParent	<ul style="list-style-type: none"> - public JspTag getParent() - Returns the parent if the specified tag
setJspContext	<ul style="list-style-type: none"> - public void setJspContext(JspContext jc) - Sets the context to the tag handler for invocation by the container.
setJspBody	<ul style="list-style-type: none"> - public void setJspBody(JspFragment jspBody) - Is provided by the body of the specified tag, which can be invoked any number of times by the tag handler

The SimpleTagSupport Class

- Acts as a base class for simple tag handlers.
- Implements the SimpleTag interface. It **adds several useful** methods
- The basic implementation of SimpleTag interface is managed by javax.servlet.jsp.tagext.SimpleTagSupport class. The interface is implemented by extending the SimpleTagSupport class and overriding the doTag() method

Methods	Descriptions
getJspContext	<ul style="list-style-type: none"> - protected JspContext getJspContext() - Returns the context passed into the container by setJspContext() method
getJspBody	<ul style="list-style-type: none"> - protected JspFragment getJspBody() - Returns the fragment encapsulating the body of this tag, set by setJspContext().

Custom Tags

Tags and Implicit Variables

JSP Implicit Variable	PageContext Method Used to Obtain Equivalent Object
Request	getRequest()
Response	getResponse()
Out	getout() (inherited from PageContext's parent class JspWriter)
Session	getSession()
Config	getServletConfig()
Application	getServletContext()
Page	getPage()
PageContext	(This is the PageContext object passed to your tag handler)
Exception	getException()

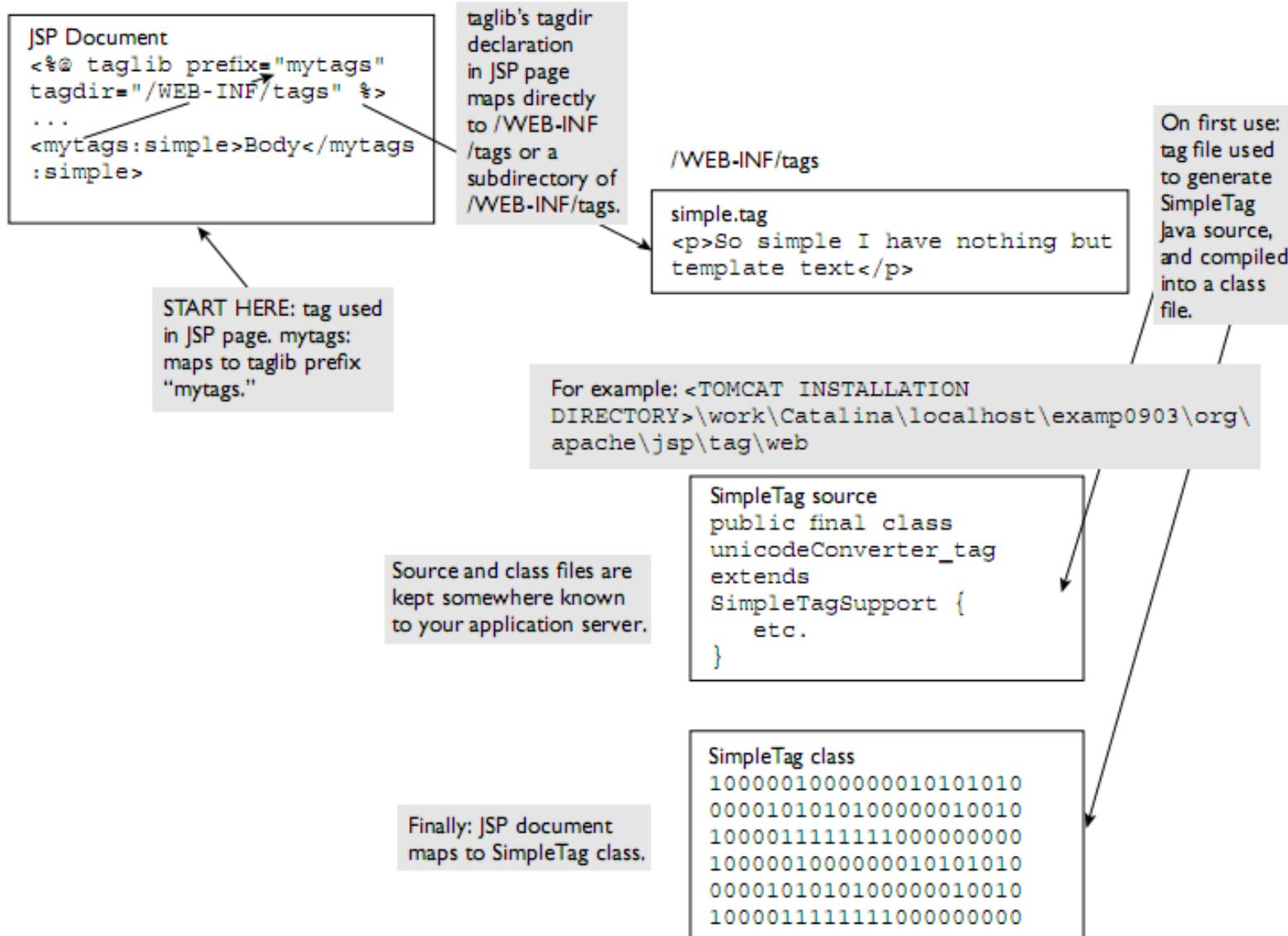
The Tag File Model

Overview

- Are simple tags whose source is **in JSP-syntax form**
- Provide an **advanced way to build standard template** and use it when required.
- Is a text file with **.tag extension stored** in the **WEB-INF/tags** directory of the Web application.
- Acts as a **tag handler file**. During the execution of a JSP page, while coming across a custom tag is initially taken to tag file for processing the tag definition.
- **Separate tag file are not required because the tag files contain the total implementation of the custom tag**
- Can be access through taglib directive as form

```
<%@ taglib tagdir="/WEB-INF/tags" prefix="prefixName"%>
```

The Tag File Model Overview



The Tag File Model

Tag File vs. TLD

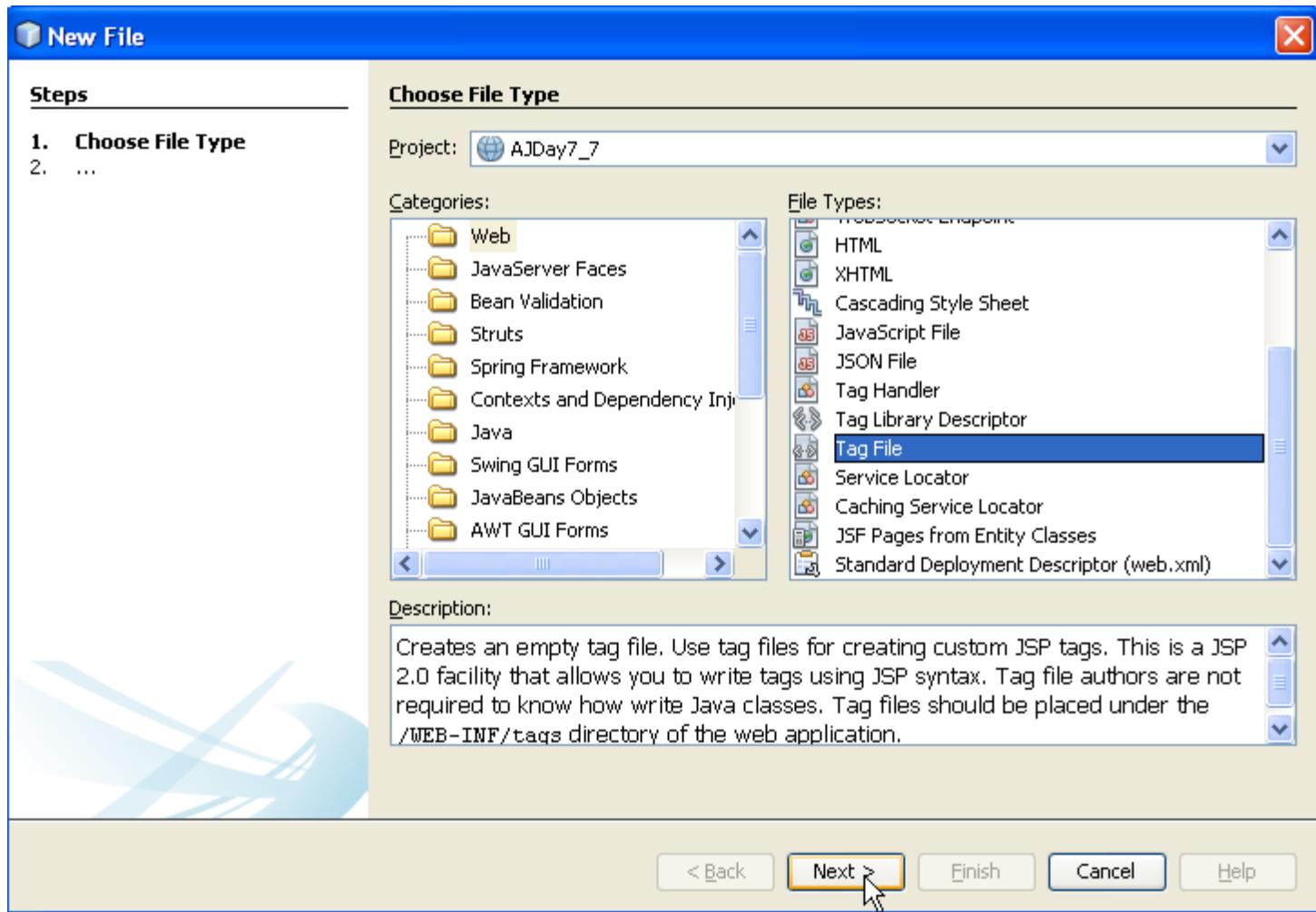
Tags	TLDs
Reusable components of JSP pages	- Local to a project
Can hide and eliminate scriptlets	- Cannot hide and eliminate scriptlets
Can be written easily	- High end programming required
Follow syntax closer to HTML	- Follow java programming syntax
High level as compared to TLD	- Low level components
Need to be defined earlier	- Generated automatically

Tag File Directive

- Is used for **instructing the container to compile or interpret** efficiently
- During deployment, the Web container **generates its own TLD files with the help of these directives**. The **tag receives inputs** through its **directives**. It can also be used to generate data by creating EL variables

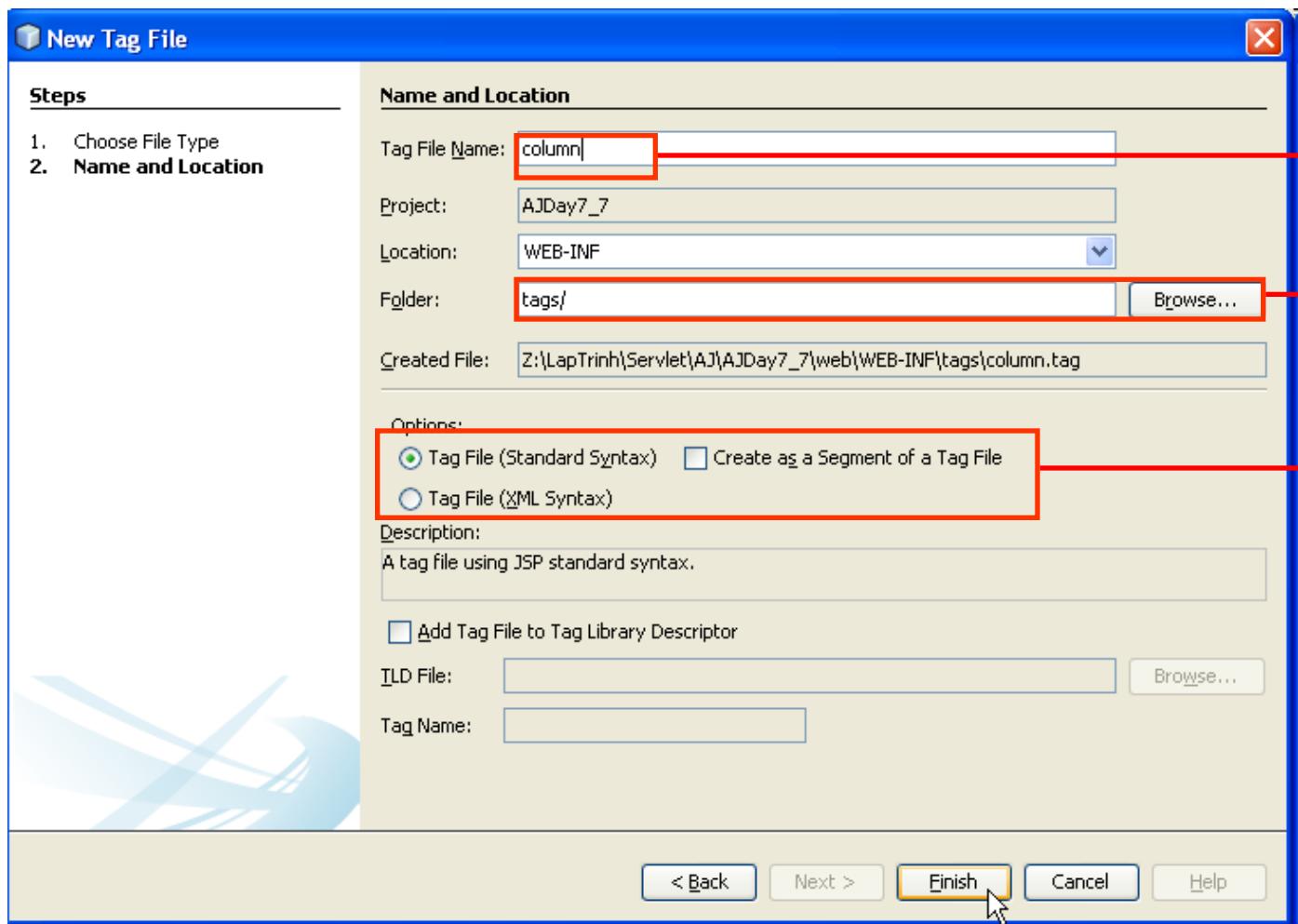
Directives	Descriptions
tag	<ul style="list-style-type: none"> - <code><%@ tag attr1="..." ...%></code> - Is similar to a page directive but it is used in JSP tag files. - It is used to declare custom tag properties. - Ex: <code><%@ tag import="java.util.*"%></code>
include	<ul style="list-style-type: none"> - <code><%@ tag include file="file name"%></code> - Directive is used to include the contents of other files in the present file. - Can be accessed by more than one tag files if a common source is present. - Ex: <code><%@tag include file="process.jsp"%></code>
taglib	<ul style="list-style-type: none"> - <code><%@ taglib uri="tagLibURI" prefix="tagPrefix"%></code> - Custom actions that need to be related from a tag file can be used by the taglib directive - Ex: <code><%@taglib tagdir="WEB-INF/tags" prefix="demo"%></code>
attribute	<ul style="list-style-type: none"> - <code><%@ attribute att1="value1" ...%></code> - Supports the use of attributes in a tag file. - Is similar to attribute element in a TLD. - Ex: <code><%@ attribute name="format" required="false"%></code>
variable	<ul style="list-style-type: none"> - <code><%@ variable att1="varName" att2="value"...%></code> - Is used to define a variable that can be used by the calling JSP page. - Ex: <code><%@variable name-given="price"%></code>

The Tag File Model Implementation



- Click Next Button

The Tag File Model Implementation



Fill your tagfile name

Modify or Browser the location where tags are stored. Should not be changed

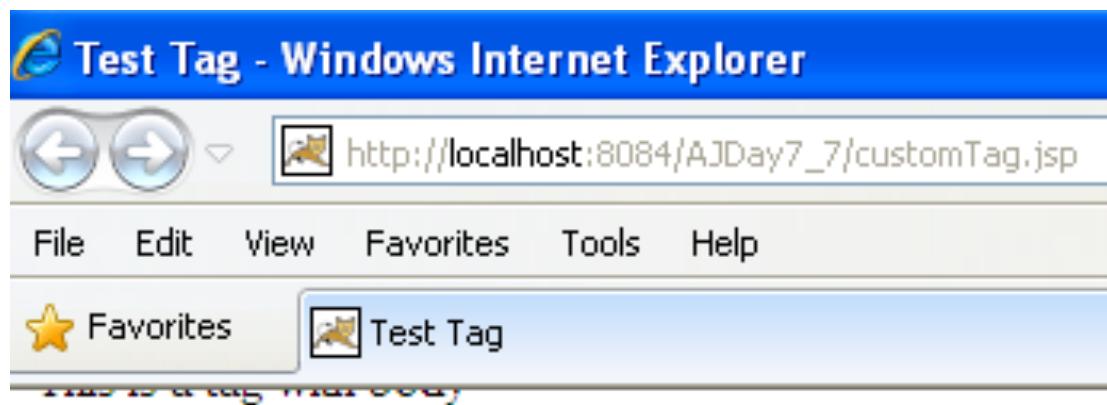
Choose TagFile (Standard Syntax)



- Choose Finish Button
- The tags file is automatically created at WEB-INF/tags
- Coding tags body

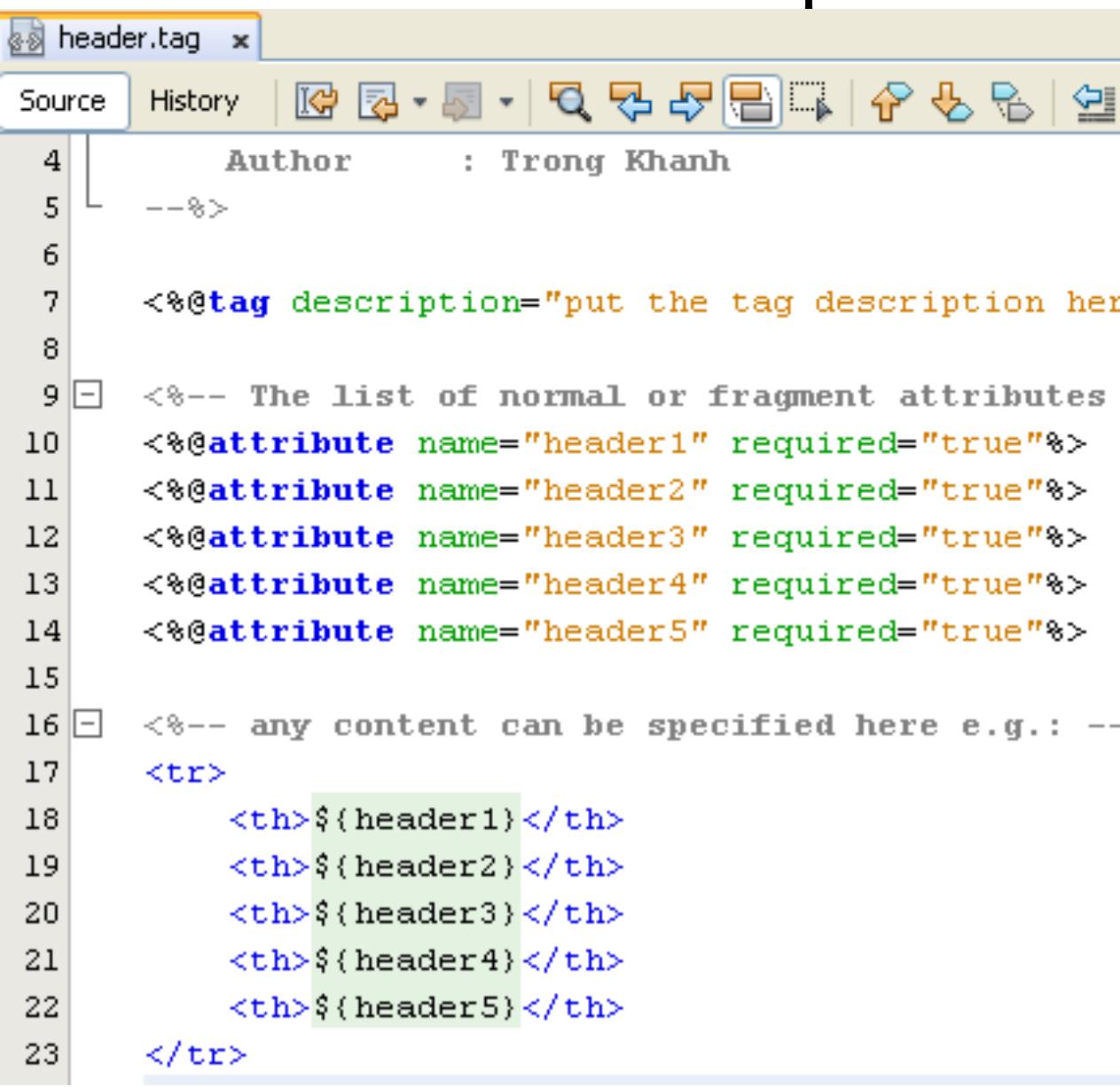
The Tag File Model Implementation

- Building the web application using tag file model has GUI presenting as following



No.	Title	Quantity	Price	Price
1.	JSP	3	45	135
2.	Servlet	1	75	75
3.	Tomcat	2	40	80

The Tag File Model Implementation



A screenshot of a code editor window titled "header.tag". The window has a toolbar with icons for file operations like Open, Save, and Print, and tabs for "Source" and "History". The code is numbered from 1 to 23. Lines 4 and 5 show the declaration of an attribute "Author". Line 7 starts a tag definition with "<%@tag". Lines 9 through 14 define five attributes named "header1" through "header5" with the "required" attribute set to "true". Line 16 contains a comment about specifying content. Lines 17 through 23 show the implementation of these headers in an HTML table row.

```
4 Author      : Trong Khanh
5 --%>
6
7 <%@tag description="put the tag description here"
8
9 [-] <%-- The list of normal or fragment attributes
10 <%@attribute name="header1" required="true"%>
11 <%@attribute name="header2" required="true"%>
12 <%@attribute name="header3" required="true"%>
13 <%@attribute name="header4" required="true"%>
14 <%@attribute name="header5" required="true"%>
15
16 [-] <%-- any content can be specified here e.g.: --
17 <tr>
18     <th>${header1}</th>
19     <th>${header2}</th>
20     <th>${header3}</th>
21     <th>${header4}</th>
22     <th>${header5}</th>
23 </tr>
```

The Tag File Model Implementation

column.tag

Source History | | | | |

```

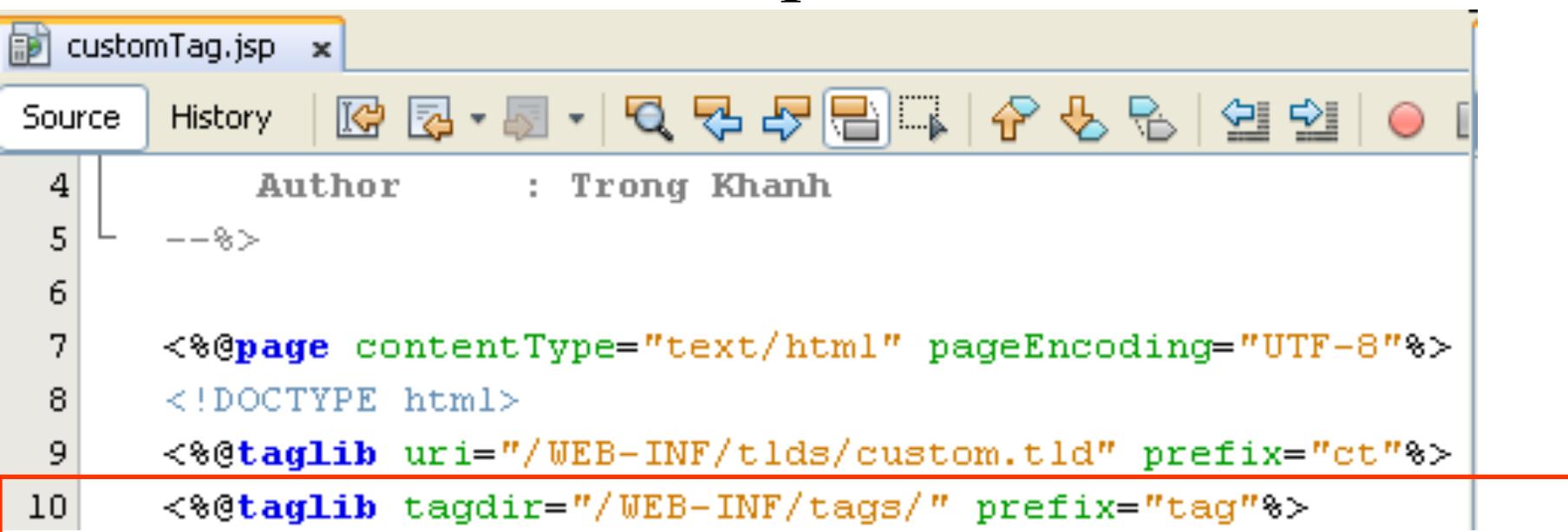
4 Author      : Trong Khanh
5 --%>
6
7 <%@tag description="put the tag description here" pageEncoding="UTF-8"%>
8
9 [-] <%-- The list of normal or fragment attributes can be specified here: --%>
10 <%@attribute name="column1" required="true"%>
11 <%@attribute name="column2" required="true"%>
12 <%@attribute name="column3" required="true"%>
13 <%@attribute name="column4" required="true"%>
14
15 [-] <%-- any content can be specified here e.g.: --%>
16 <tr>
17   <td>${column1}</td>
18   <td>${column2}</td>
19   <td>${column3}</td>
20   <td>${column4}</td>
21   <td>${column3 * column4}</td>
22 </tr>

```

Projects

- AJDay7_7
 - Web Pages
 - META-INF
 - WEB-INF
 - tags
 - column.tag
 - header.tag
 - tlds
 - custom.tld
 - web.xml

The Tag File Model Implementation



customTag.jsp

Source History

```
4 Author : Trong Khanh
5 --%>
6
7 <%@page contentType="text/html" pageEncoding="UTF-8"%>
8 <!DOCTYPE html>
9 <%@taglib uri="/WEB-INF/tlds/custom.tld" prefix="ct"%>
10 <%@taglib tagdir="/WEB-INF/tags/" prefix="tag"%>
```

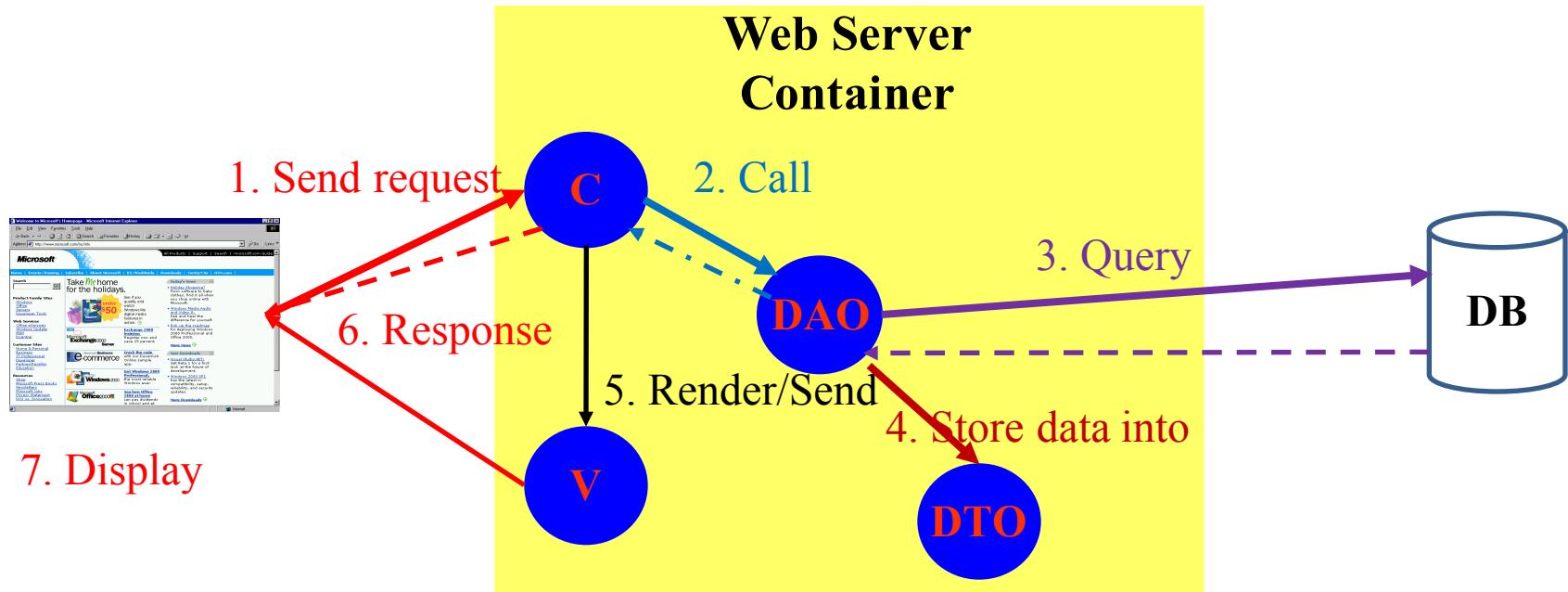
```
<h2>Tag File</h2>
<table border="1">
    <tag:header header1="No." header2="Title"
                header3="Quantity" header4="Price" header5="Price"/>
    <tag:column column1="1." column2="JSP" column3="3" column4="45"/>
    <tag:column column1="2." column2="Servlet" column3="1" column4="75"/>
    <tag:column column1="3." column2="Tomcat" column3="2" column4="40"/>
</table>
```

Summary

- How to remove all java code in JSP (View)?
Complete the MVC 2 Design Pattern with View
 - JSTL
- How to build the data grid tag library using in JSP?
 - Tag Libraries
 - Model
 - Classical, Simple, and Handles
 - How to implement the custom Tag Lib and use it in JSP

Q&A

Summary

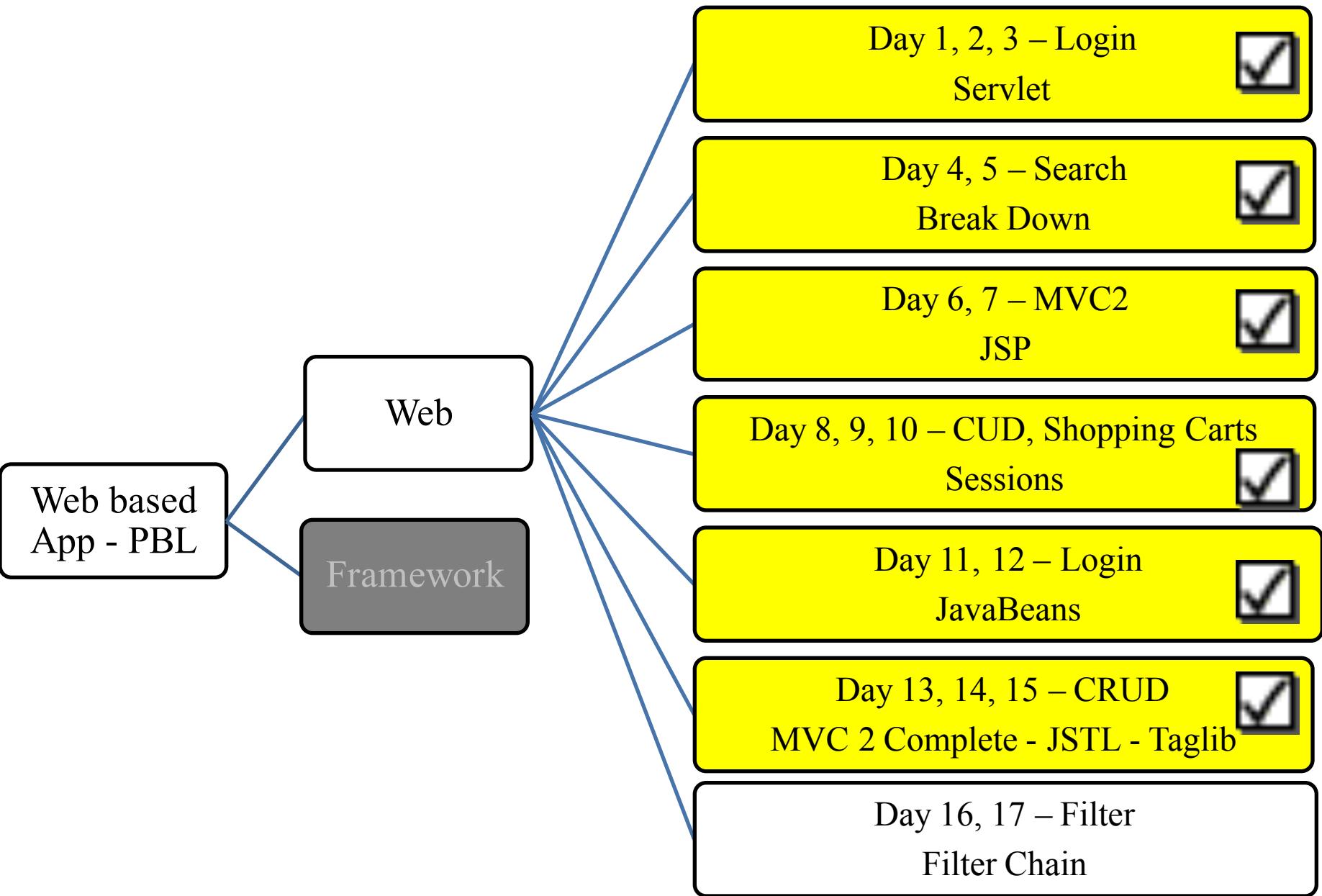


Q&A

Next Lecture

- How to preprocess in web application?
 - Filter
 - Filter Chain

Next Lecture



Appendix – Complete MVC 2

Welcome page

The screenshot shows a Java IDE interface with the file `welcome.jsp` open. The code is a JSP page with session-scoped variables and form input fields.

```
4     Author      : Trong Khanh
5     --%>
6     <%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
7     <%@page contentType="text/html" pageEncoding="UTF-8"%>
8     <!DOCTYPE html>
9     <html>
10    <head>
11        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
12        <title>Home</title>
13    </head>
14    <body>
15        <font color="red">Welcome, ${sessionScope.USERS}</font>
16        <h1>Welcome to Servlet World</h1>
17        <form action="CenterServlet">
18            Name <input type="text" name="txtName" value="" /><br/>
19            <input type="submit" value="Search" name="btAction" />
20        </form> <br/>
```

Complete MVC 2

Welcome page

```
22 <c:set var="name" value="${param.txtName}"/>
23 <c:if test="${not empty name}">
24     <c:set var="info" value="${requestScope.INFO}"/>
25 <c:if test="${not empty info}">
26     <table border="1">
27         <thead>
28             <tr>
29                 <th>No.</th>
30                 <th>Username</th>
31                 <th>Password</th>
32                 <th>Lastname</th>
33                 <th>Roles</th>
34                 <th>Delete</th>
35                 <th>Update</th>
36             </tr>
37         </thead>
38         <tbody>
39             <c:forEach var="dto" items="${info}" varStatus="counter">
40                 <form action="CenterServlet">
41                     <tr>
42                         <td>${counter.count}</td>
43                         <td>
44                             ${dto.username}
45                             <input type="hidden" name="txtUser"
46                                     value="${dto.username}" />
47                         </td>
48                         <td>
49                             <input type="text" name="txtPass"
50                                     value="${dto.password}" />
51                         </td>
```

Complete MVC 2

Welcome page

```
52 <td>
53     ${dto.lastname}
54 </td>
55 <td>
56     <input type="checkbox" name="chkAdmin"
57         value="ADMIN"
58     <c:if test="#{dto.roles}>
59         checked="checked"
60     </c:if>
61     />
62 </td>
63 <c:url var="delLink" value="CenterServlet">
64     <c:param name="btAction" value="delete"/>
65     <c:param name="user" value="#{dto.username}" />
66     <c:param name="searchValue" value="#{name}" />
67 </c:url>
68 <td><a href="#{delLink}">Delete</a> </td>
69 <td>
70     <input type="hidden" name="txtSearchValue"
71         value="#{name}" />
72     <input type="submit" value="Update" name="btAction" />
73 </td>
74     </tr>
75 </form>
76 </c:forEach>
77 </tbody>
78 </table>
79
80 </c:if>
```

Complete MVC 2

Welcome page

```
81      <c:if test="${empty info}">
82          <h2>No record is matched!!!</h2>
83      </c:if>
84  </c:if>
```

Complete MVC 2

Register Errors Object

RegistrationErrors.java

```
Source History | Back Forward | Find Replace | Open Save | Cut Copy Paste | Find Next Previous | Open In New Tab | Close | Minimize | Maximize | Full Screen | Help | About | Exit
```

```
13 * @author Trong Khanh
14 */
15 public class RegistrationErrors implements Serializable {
16     private String usernameErrs;
17     private String passwordErrs;
18     private String confirmErrs;
19     private String lastnameErrs;
20     private String duplicateUsername;
21
22     public RegistrationErrors() { ...2 lines }
23
24
25     public RegistrationErrors(String usernameErrs, String passwordErrs,
26                               String confirmErrs, String lastnameErrs, String duplicateUsername) {
27         this.usernameErrs = usernameErrs;
28         this.passwordErrs = passwordErrs;
29         this.confirmErrs = confirmErrs;
30         this.lastnameErrs = lastnameErrs;
31         this.duplicateUsername = duplicateUsername;
32     }
33
34     /**...3 lines */
35     public String getUsernameErrs() { ...3 lines }
36
37     /**...3 lines */
38     public void setUsernameErrs(String usernameErrs) { ...3 lines }
39
40     /**...3 lines */
41     public String getPasswordErrs() { ...3 lines }
```

Complete MVC 2

Register Errors Object

```
54
55     /**...3 lines */
56     public void setPasswordErrs(String passwordErrs) { ...3 lines }
57
58
59
60
61
62     /**...3 lines */
63     public String getConfirmErrs() { ...3 lines }
64
65
66
67
68
69     /**...3 lines */
70     public void setConfirmErrs(String confirmErrs) { ...3 lines }
71
72
73
74
75
76     /**...3 lines */
77     public String getLastnameErrs() { ...3 lines }
78
79
80
81
82
83     /**...3 lines */
84     public void setLastnameErrs(String lastnameErrs) { ...3 lines }
85
86
87
88
89
90     /**...3 lines */
91     public String getDuplicateUsername() { ...3 lines }
92
93
94
95
96
97     /**...3 lines */
98     public void setDuplicateUsername(String duplicateUsername) { ...3 lines }
99
100
101
102
103
```

Complete MVC 2

Register Page

createAccount.jsp

Source History | 

```
4 Author      : Trong Khanh
5 --%>
6
7 <%@page contentType="text/html" pageEncoding="UTF-8"%>
8 <%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
9 <!DOCTYPE html>
10 <html>
11   <head>
12     <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
13     <title>New</title>
14   </head>
15   <body>
16     <h1>Create New Account</h1>
17     <form action="CenterServlet" method="POST">
18       <c:set var="err" value="${requestScope.ERRORS}" />
19       Username* <input type="text" name="txtUsername" value="" /> (6 - 20 chars) <br/>
20       <c:if test="${not empty err.usernameErrs}">
21         <font color="red">${err.usernameErrs}</font><br/>
22       </c:if>
23       Password* <input type="password" name="txtPassword" value="" /> (5 - 20 chars) <br/>
24       <c:if test="${not empty err.passwordErrs}">
25         <font color="red">${err.passwordErrs}</font><br/>
26       </c:if>
```

Complete MVC 2

Register Page

```
27 Confirm* <input type="password" name="txtConfirm" value="" /><br/>
28 <c:if test="${not empty err.confirmErrs}">
29     <font color="red">${err.confirmErrs}</font><br/>
30 </c:if>
31 Full Name* <input type="text" name="txtLastname" value="" />(2 - 50 chars)<br/>
32 <c:if test="${not empty err.lastnameErrs}">
33     <font color="red">${err.lastnameErrs}</font><br/>
34 </c:if>
35 <input type="submit" value="Create New Account" name="btAction" />
36 <input type="reset" value="Reset" /><br/>
37 <c:if test="${not empty err.duplicateUsername}">
38     <font color="red">${err.duplicateUsername}</font><br/>
39 </c:if>
40     </form>
41 </body>
42 </html>
```

Complete MVC 2

Register Servlet

NewAccountServlet.java

```
Source History |         |    |   |   |   | 
```

```
21 * @author Trong Khanh
22 */
23 public class NewAccountServlet extends HttpServlet {
24     private final String errorDisplayServlet = "createAccount.jsp";
25     private final String loginPage = "login.html";
26     /** Processes requests for both HTTP <code>GET</code> and <code>POST</code>
27      * methods.
28     */
29     protected void processRequest(HttpServletRequest request, HttpServletResponse response)
30             throws ServletException, IOException {
31         response.setContentType("text/html;charset=UTF-8");
32         PrintWriter out = response.getWriter();
33         try {
34             String username = request.getParameter("txtUsername");
35             String password = request.getParameter("txtPassword");
36             String confirm = request.getParameter("txtConfirm");
37             String lastname = request.getParameter("txtLastname");
38
39             boolean errs = false;
40             RegistrationErrors errObj = new RegistrationErrors();
41             if (username.length() < 6 || username.length()>20) {
42                 errs = true;
43                 errObj.setUsernameErrs("Username phai tu 6 den 20 ky tu");
44             }
45             if (password.length() < 6 || password.length()>20) {
46                 errs = true;
47                 errObj.setPasswordErrs("Password phai tu 6 den 20 ky tu");
48             }
49             if (confirm.length() < 6 || confirm.length()>20) {
50                 errs = true;
51                 errObj.setConfirmErrs("Confirm phai tu 6 den 20 ky tu");
52             }
53             if (lastname.length() < 2 || lastname.length()>20) {
54                 errs = true;
55                 errObj.setLastnameErrs("Lastname phai tu 2 den 20 ky tu");
56             }
57             if (errs) {
58                 request.setAttribute("errObj", errObj);
59                 request.getRequestDispatcher(errorDisplayServlet).forward(request, response);
60             } else {
61                 User user = new User();
62                 user.setUsername(username);
63                 user.setPassword(password);
64                 user.setConfirm(confirm);
65                 user.setLastname(lastname);
66                 userDao.insertUser(user);
67                 response.sendRedirect(loginPage);
68             }
69         } catch (SQLException ex) {
70             ex.printStackTrace();
71         }
72     }
73 }
```

Complete MVC 2

Register Servlet

```
52     if (password.length() < 5 || password.length()>20) {
53         errs = true;
54         errObj.setPasswordErrs("Password phai tu 5 den 20 ky tu");
55     } else if (!confirm.equals(password)) {
56         errs = true;
57         errObj.setConfirmErrs("Password khong giuong Confirm");
58     }
59
60     if (lastname.length() < 2 || lastname.length()>50) {
61         errs = true;
62         errObj.setLastnameErrs("Lastname phai tu 2 den 50 ky tu");
63     }
64
65     request.setAttribute("ERRORS", errObj);
66     String url = errorDisplayServlet;
67     System.out.println("ddddd");
68     if (!errs) {
69         RegistrationDAO dao = new RegistrationDAO();
70         boolean result = dao.createAccount(username, password, lastname, false);
71
72         if (result) {
73             url = loginPage;
74         } else {
75             errObj.setDuplicateUsername(username + " da ton tai");
76             request.setAttribute("ERRORS", errObj);
77         }
78     }
}
```

Complete MVC 2

Register Servlet

```
79
80         RequestDispatcher rd = request.getRequestDispatcher(url);
81         rd.forward(request, response);
82     } finally {
83         out.close();
84     }
85 }
86
87 [+] HttpServlet methods. Click on the + sign on the left to edit the code.
125
126 }
127 }
```

Appendix – JSTL SQL Tag Library – Example

home.jsp

Source History | 

```
4     Author      : Trong Khanh
5     --%>
6
7     <%@page import="sample.javabean.LoginBean"%>
8     <%@page contentType="text/html" pageEncoding="UTF-8"%>
9     <!DOCTYPE html>
10    <%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
11    <%@taglib uri="http://java.sun.com/jsp/jstl/sql" prefix="sql"%>
12
13    <html>
14        <head>
15            <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
16            <title>Home</title>
17        </head>
18        <body>
19            <font color="green">Welcome, ${sessionScope.loginAtt.username}</font><br/>
20            <font color="violet">Welcome, ${loginAtt.username}</font><br/>
21            <h1>Welcome to EL + JSTL</h1>
22            <form action="home.jsp">
23                Name <input type="text" name="txtName" value="${param.txtName}" /><br/>
24                <input type="submit" value="Search" />
25            </form>
26            Title ${param.title}<br/>
27            Course ${param.course}<br/>
```

JSTL SQL Tag Library – Example

```

28 <c:set var="username" value="${param.txtUsername}"/>
29 <c:set var="password" value="${param.txtPassword}"/>
30 <c:set var="lastname" value="${param.txtLastname}"/>
31 <c:if test="${not empty username and not empty password and not empty lastname }">
32   <c:catch var="ex">
33     <sql:setDataSource var="con"
34       driver="com.microsoft.sqlserver.jdbc.SQLServerDriver"
35       url="jdbc:sqlserver://localhost:1433;databaseName=Sinhvien;instanceName=SQL2005"
36       user="sa" password="trongkhanh"/>
37     <c:if test="${not empty con}">
38       <sql:update dataSource="${con}">
39         Insert into Registration(username, password, lastname, isAdmin) values (?, ?, ?, 0)
40         <sql:param value="${username}" />
41         <sql:param value="${password}" />
42         <sql:param value="${lastname}" />
43       </sql:update>
44     </c:if>
45   </c:catch>
46   <c:if test="${not empty ex}">
47     <h3>
48       <font color="red">
49         Errors occur in Inserting:<br/>
50         ${ex}
51       </font>
52     </h3>
53   </c:if>
54 </c:if>
```

JSTL SQL Tag Library – Example

```
56      <c:set var="name" value="${param.txtName}"/>
57      <c:catch var="ee">
58          <sql:setDataSource var="con"
59              driver="com.microsoft.sqlserver.jdbc.SQLServerDriver"
60              url="jdbc:sqlserver://localhost:1433;databaseName=Sinhvien;instanceName=SQL2005"
61              user="sa" password="trongkhanh"/>
62          <c:if test="${not empty con}">
63              <sql:query var="rs" dataSource="${con}">
64                  Select * From Registration Where Lastname Like ?
65                  <sql:param value="%${name}%" />
66              </sql:query>
67          <c:if test="${not empty rs}">
68              <table border="1">
69                  <thead>
70                      <tr>
71                          <th>No.</th>
72                          <th>Username</th>
73                          <th>Password</th>
74                          <th>Lastname</th>
75                          <th>Roles</th>
76                      </tr>
77                  </thead>
```

JSTL

SQL Tag Library – Example

```
78      <tbody>
79          <c:forEach var="record" items="${rs.rows}" varStatus="counter">
80              <tr>
81                  <td>${counter.count}</td>
82                  <td>${record.username}</td>
83                  <td>${record.password}</td>
84                  <td>${record.lastname}</td>
85                  <td>${record.isAdmin}</td>
86              </tr>
87          </c:forEach>
88      </tbody>
89  </table>
90
91      </c:if>
92  </c:if>
93 </c:catch>
94 <c:if test="${not empty ee}">
95     <h3>
96         <font color="red">
97             Errors occur:<br/>
98             ${ee}
99             </font>
100        </h3>
101 </c:if>
```

JSTL

SQL Tag Library – Example

```
102 <h1>Create new account</h1>
103 <form action="home.jsp" method="post">
104     Username <input type="text" name="txtUsername" value="" /><br/>
105     Password <input type="password" name="txtPassword" value="" /><br/>
106     Lastname <input type="text" name="txtLastname" value="" /><br/>
107     <input type="submit" value="Create New Account" />
108 </form>
109 </body>
110 </html>
```

SQL Tag Library – Example – Improvement

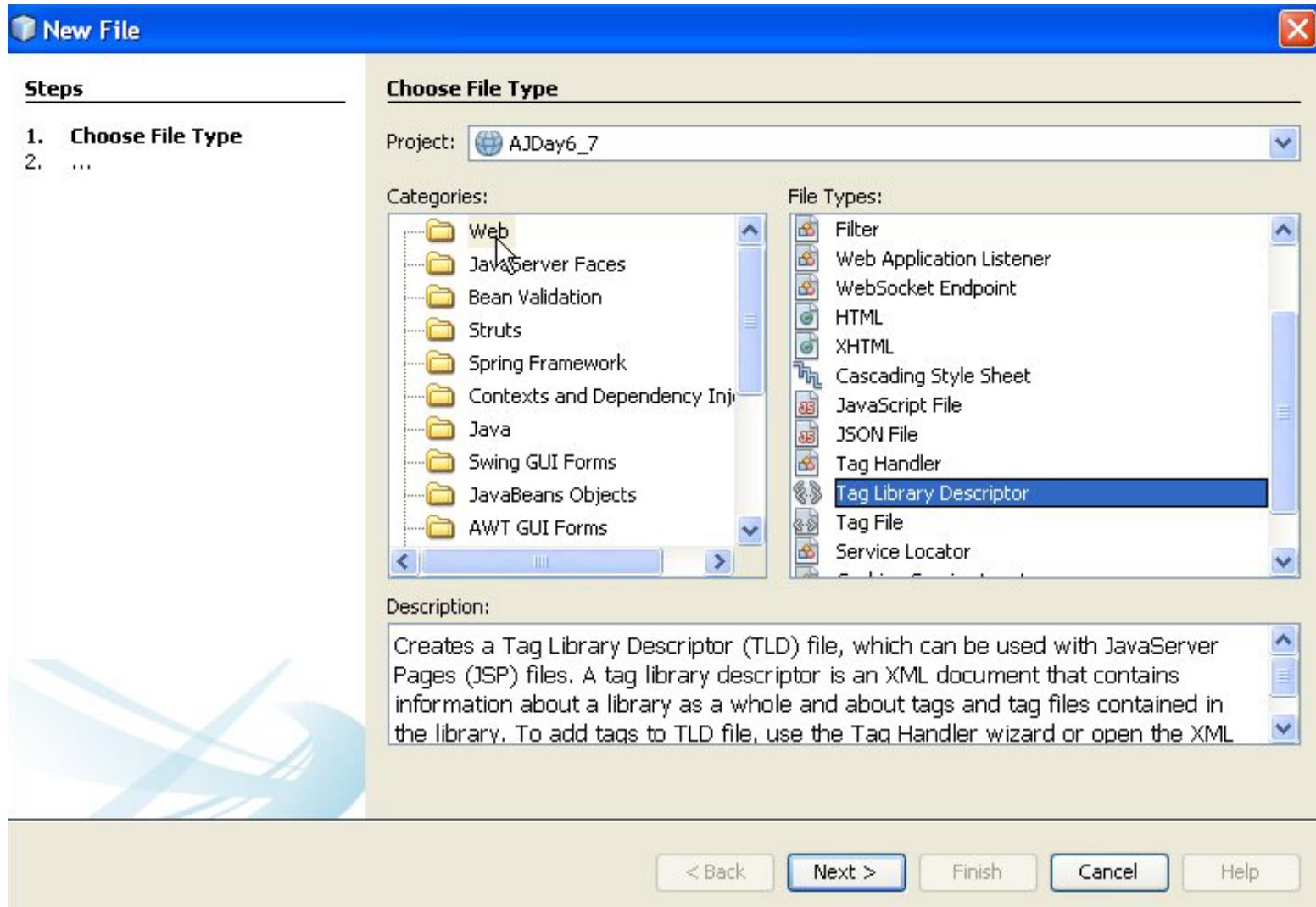
```
<table border="1">
    <thead>
        <tr>
            <th>No.</th>
            <c:forEach var="columnName" items="${rs.columnNames}">
                <th>${columnName}</th>
            </c:forEach>
        </tr>
    </thead>
    <tbody>
        <c:forEach var="row" items="${rs.rowsByIndex}" varStatus="counter">
            <tr>
                <td>${counter.count}</td>
                <c:forEach var="field" items="${row}">
                    <td>${field}</td>
                </c:forEach>
            </tr>
        </c:forEach>
    </tbody>
```

SQL Tag Library – Example – Improvement

No.	username	password	lastname	isAdmin
1	1008	333	345	
2	aptech	aptech1	0000	false
3	Danh Vong	12345	Danh Dai Ca	false
4	HieuLegend	legend1345	Hieu kk	false
5	java7	8765	JDK 7	false
6	khanh	kieu123	kieu	true
7	kieukhanh	123445	Khanh Kieu Trong	true
8	Phong	123456	Phong cui	false

Appendix – Tag Implementation

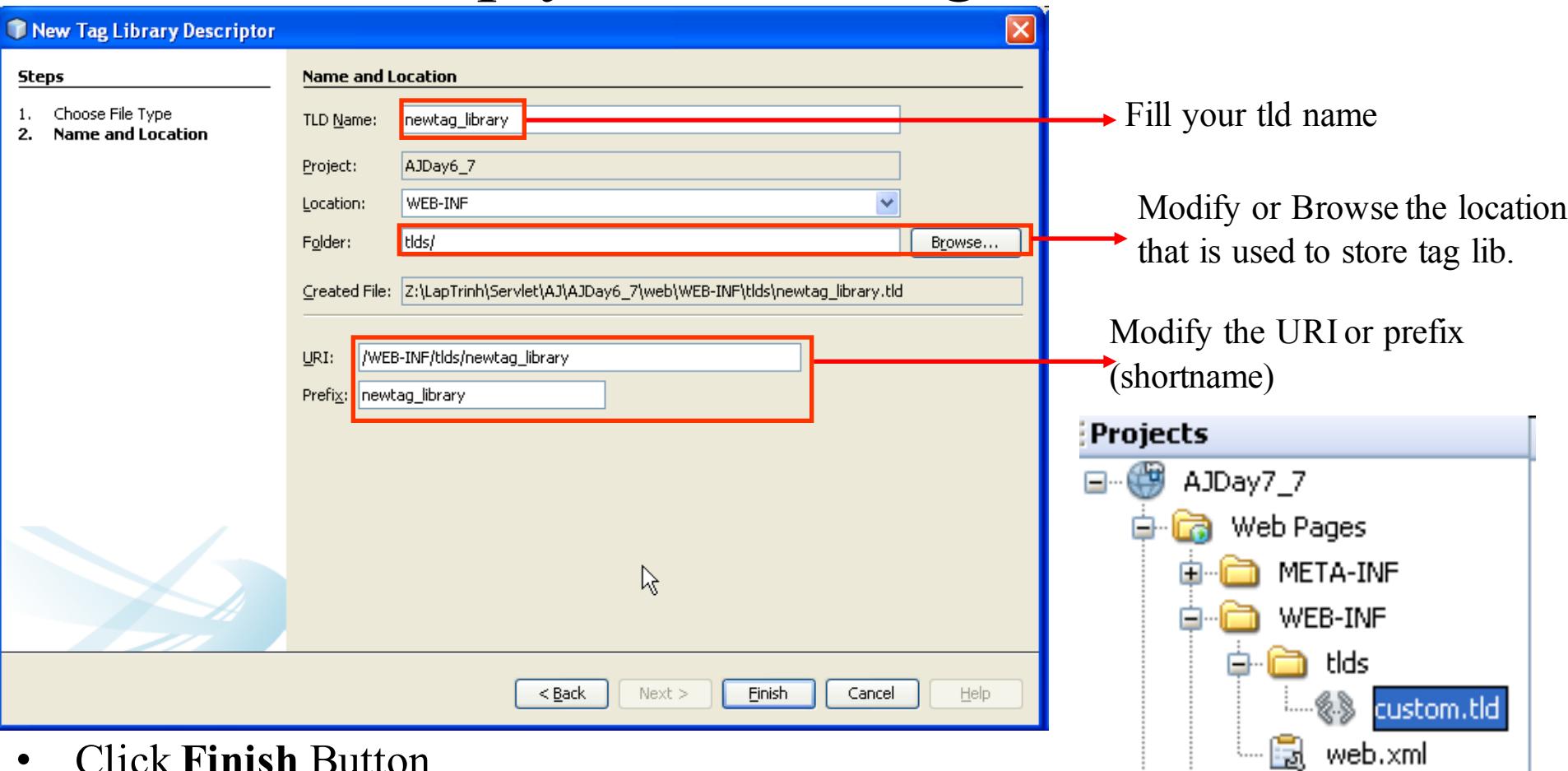
Empty Custom Tags – Create TLD



- Click Next Button

Tag Implementation

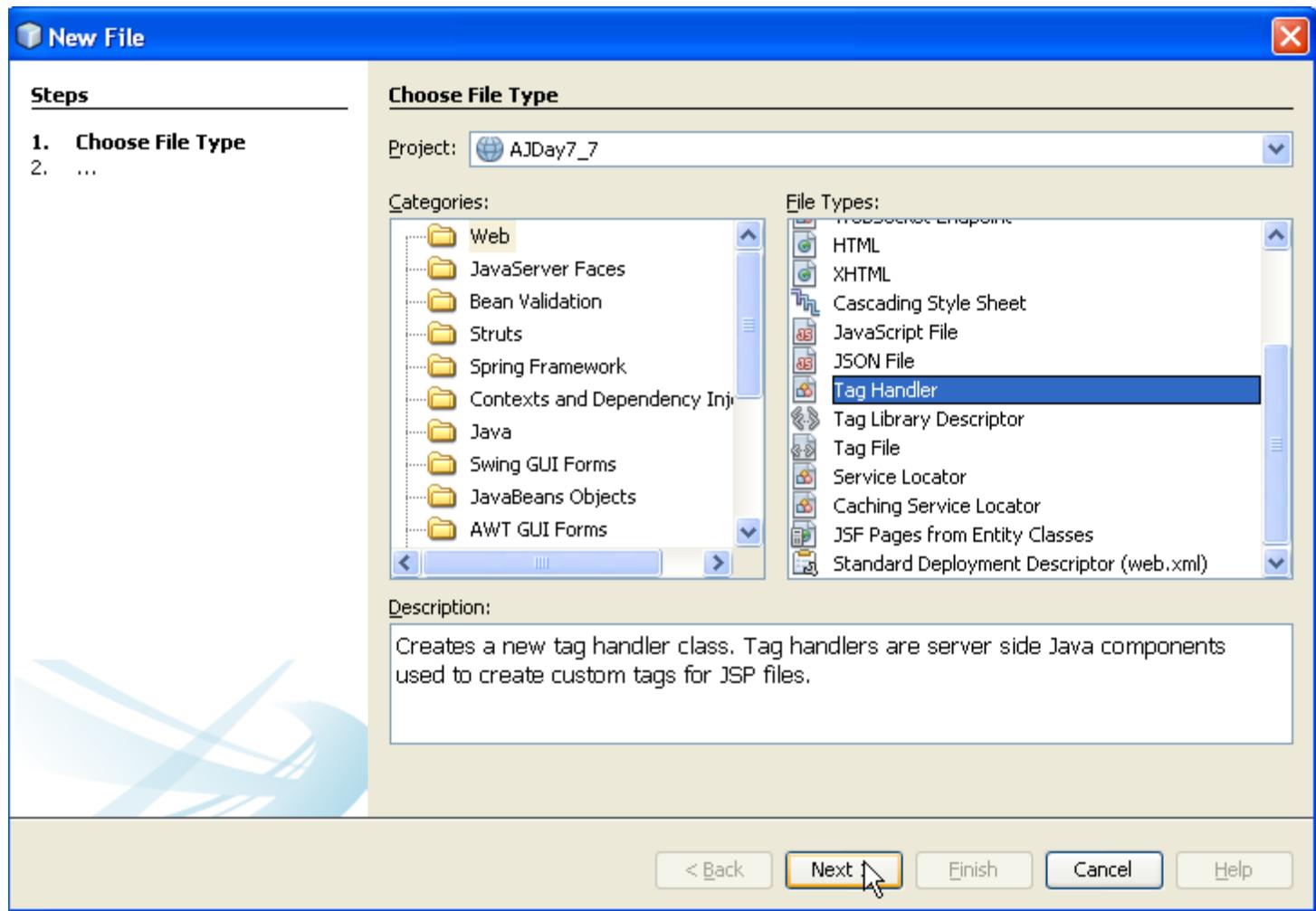
Empty Custom Tags – Create TLD



- Click **Finish** Button
- Then, the **tld** file is **automatically created** in **tlds directory**
- Do not modify anything in this tld file because the netbeans is automatically the tld information when the next step is executed

Tag Implementation

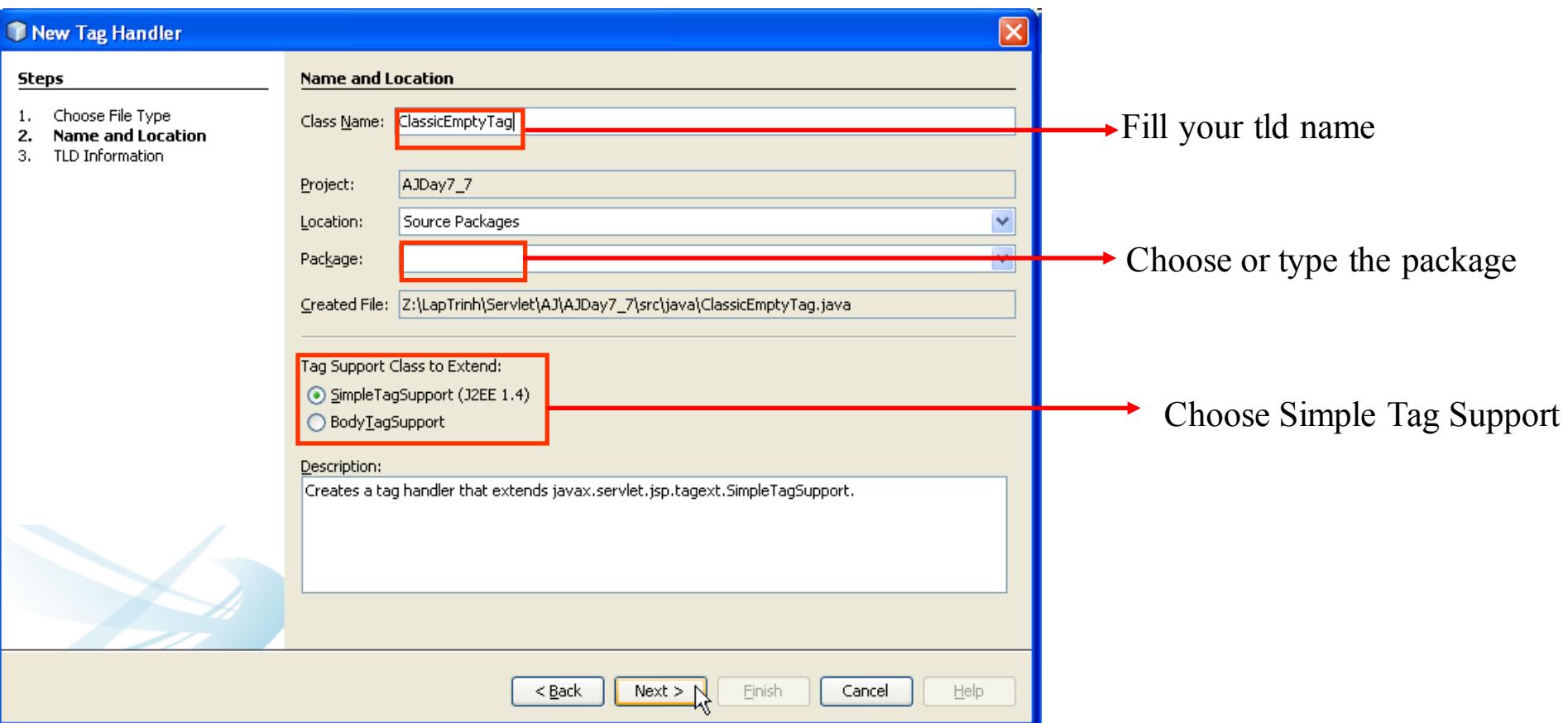
Empty Custom Tags – Create Tag Handler



- Click Next Button

Tag Implementation

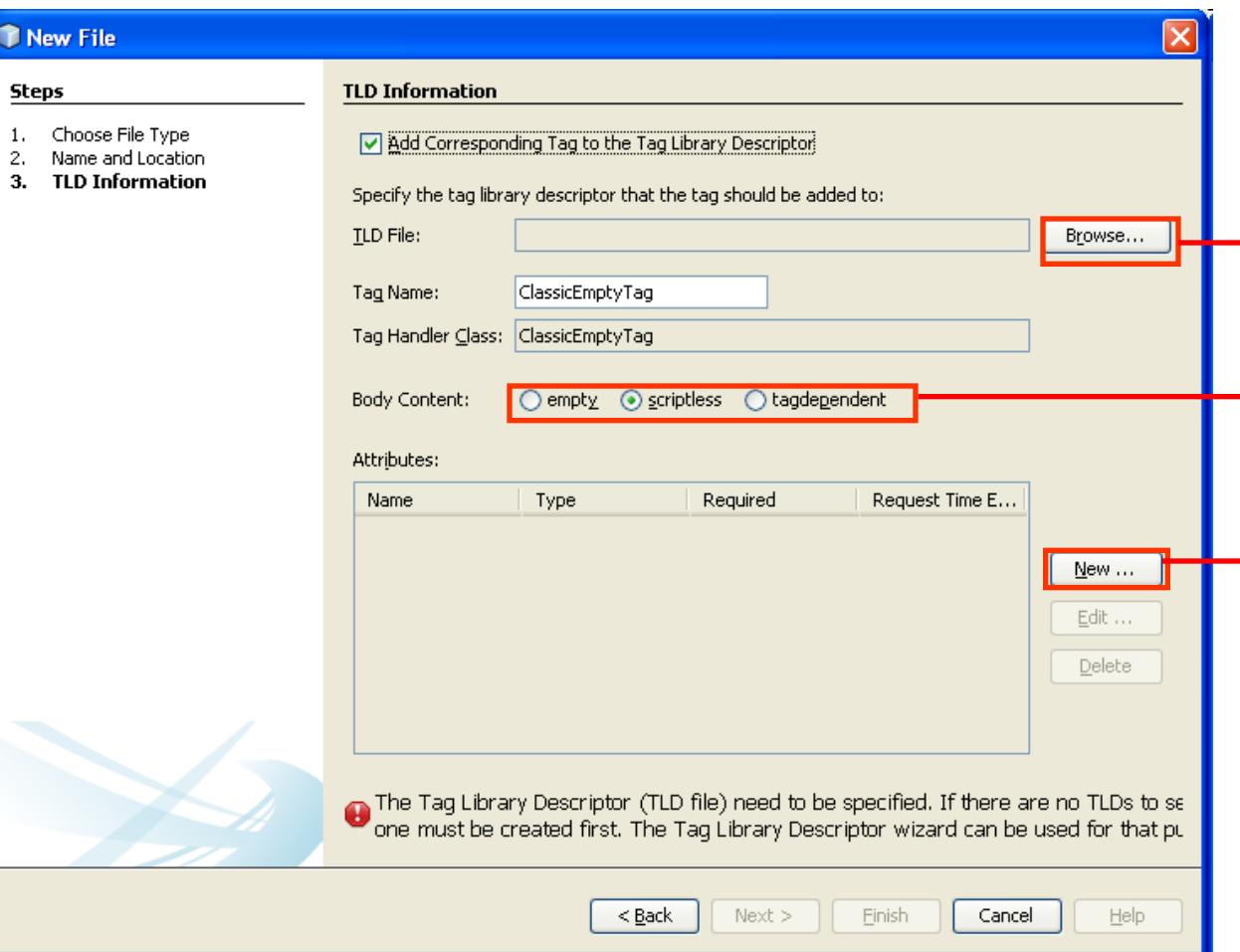
Empty Custom Tags – Create Tag Handler



- Click Next Button

Tag Implementation

Empty Custom Tags – Create Tag Handler



Browse to choose the tld file that will be updated information

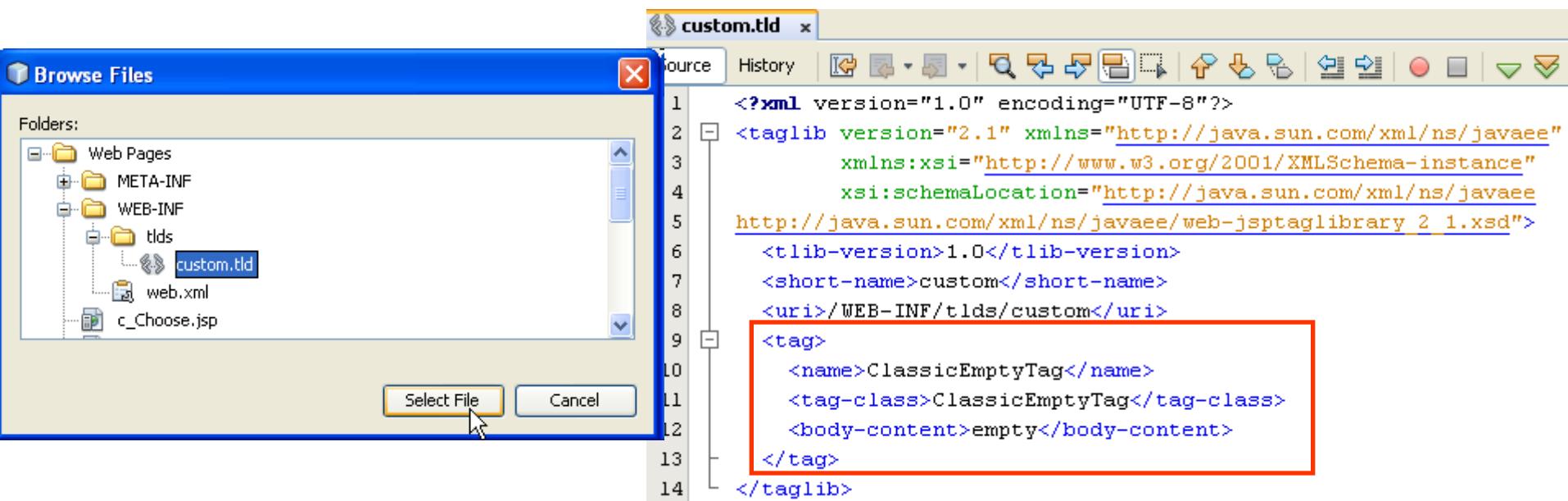
Choose the Body Tag, choose empty

Add attribute to custom tag

- Click Browse Button to add the information to tld

Tag Implementation

Empty Custom Tags – Create Tag Handler



- Choose the tld file
- Then, Click Select File Button, then choose the empty option
- Click Finish Button on New Files Dialog
- The TagHandler Class is created and the custom tag information is automatically updated in the selected tld file

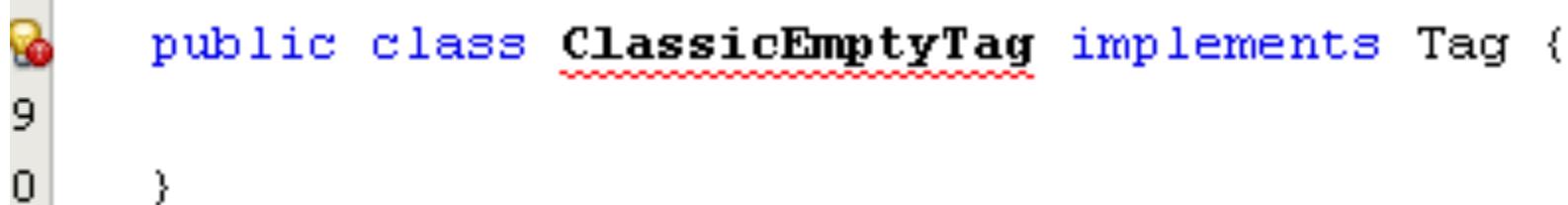
Tag Implementation

Empty Custom Tags – Create Tag Handler

- To create emptyTag, clear the body contents in class

```
public class ClassicEmptyTag extends SimpleTagSupport {  
}
```

- Change “extends SimpleTagSupport” to “implements Tag”



```
public class ClassicEmptyTag implements Tag {  
    :  
    :0  
}
```

- Click “Light Bulb” to implement all abstract methods



```
public class ClassicEmptyTag implements Tag {  
    :  
    :0  
}
```

- Coding the doStartTag, doEndTag method
- Using the tag on the Jsp with taglib directive

Tag Implementation

Empty Custom Tags – Create Tag Handler

```
20 public class ClassicEmptyTag implements Tag {
21     private PageContext pageContext;
22     private Tag parent;
23     ① public void setPageContext(PageContext pc) {
24         this.pageContext = pc;
25     }
26     ① public void setParent(Tag t) {
27         this.parent = t;
28     }
29     ① public Tag getParent() {
30         return this.parent;
31     }
32     ① public int doStartTag() throws JspException {
33         try {
34             pageContext.getOut().println("Create Empty Tag using Tag");
35         } catch(IOException e) {
36             e.printStackTrace();
37         }
38         return SKIP_BODY;
39     }
40     ① public int doEndTag() throws JspException {
41         return EVAL_PAGE;
42     }
43     ① public void release() {
44         System.out.println("Garbage Collection is invoked");
45     }
46 }
```

Tag Implementation

Empty Custom Tags – Reference

- Compile the TagHandler class
- Then create the JSP page with following contents

```
<%@taglib uri="/WEB-INF/tlds/custom" prefix="ct" %>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8"/>
        <title>Test Tag</title>
    </head>
    <body>
        <h1>Custom Tag Demo</h1>
        <h2>Before Custom Tag is invoked!</h2>
        <h3>Empty Tag <ct:ClassicEmptyTag/></h3>
        <h2>After Custom Tag finished!</h2>
    </body>
</html>
```



- Change the EVAL_PAGE to SKIP_PAGE in doEndTag()

Custom Tag Demo

Before Custom Tag is invoked!

Classic Empty Tag Create Empty Tag using Tag

After Custom Tag finished!

Custom Tag Demo

Before Custom Tag is invoked!

Classic Empty Tag Create Empty Tag using Tag

Appendix

Iteration Tag Interface – Example

```
public class ClassicIterationTag implements IterationTag {  
    private String count;  
    private PageContext pageContext;  
    private Tag parent;  
    private int n;  
    private BodyContent bodyContent;  
    public void setCount(String count) {  
        this.count = count;  
        try {  
            n = Integer.parseInt(this.count);  
        } catch(NumberFormatException e){  
            n=10;  
        }  
    }  
    public int doAfterBody() throws JspException {  
        if(n>1){  
            n--;  
            return EVAL_BODY_AGAIN;//forces invoking doStartTag again  
        } else {  
            return SKIP_BODY;  
        }  
    }  
    public void setPageContext(PageContext pc) {...}  
    public void setParent(Tag t) {...}  
    public Tag getParent() {...}
```

Appendix

Iteration Tag Interface – Example

```
public int doStartTag() throws JspException {
    if(n>0) {
        return EVAL_BODY_INCLUDE;
    } else {
        return SKIP_BODY;
    }
}

public int doEndTag() throws JspException {
    try {
        if(bodyContent!=null){
            bodyContent.writeOut(bodyContent.getEnclosingWriter());
        }
    } catch(IOException e){
        throw new JspException(e.getMessage());
    }
    return EVAL_PAGE;
}
public void release() {...}

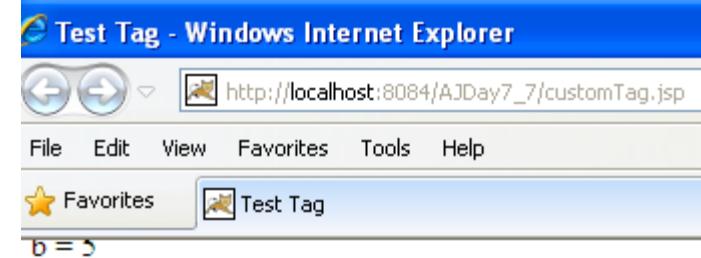
public void setBodyContent(BodyContent bodyContent) {
    this.bodyContent = bodyContent;
}
```

Appendix

Iteration Tag Interface – Example

```
<tag>
  <name>ClassicInterationTag</name>
  <tag-class>sample.custtag.ClassicInterationTag</tag-class>
  <body-content>scriptless</body-content>
  <attribute>
    <name>count</name>
    <required>true</required>
    <type>java.lang.String</type>
  </attribute>
</tag>

<h3>Interation Tag</h3>
<ct:ClassicInterationTag count="5"><b>Iteration</b></ct:ClassicInterationTag>
<br/>This is outside of the customtag <br/>
```



The Length is 6

Interation Tag

IterationIterationIterationIteration
This is outside of the customtag

Appendix

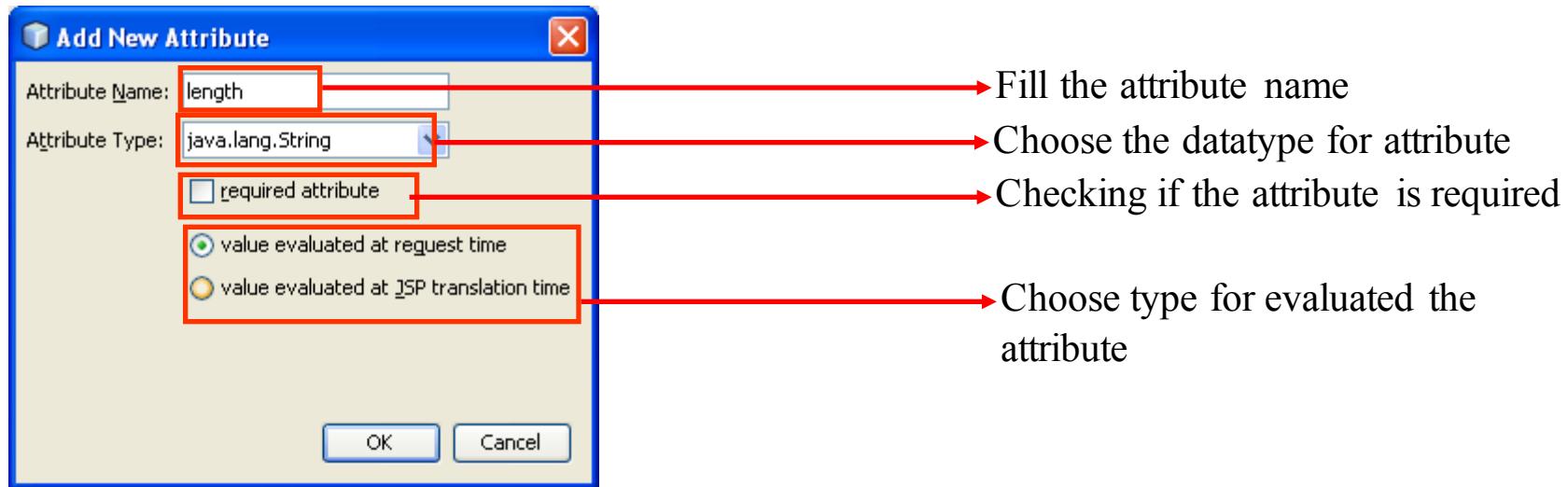
Custom Tags with Attributes – TagSupport

- <**prefix:name attr="value"**></**prefix:name** >
- Tags **with or without body has attributes**
- Are called as **parameterized tags**.
- Attributes are passed to the tags **as arguments** are passed to method.
- Is done to customize the behavior of a custom tag.

Appendix

Custom Tags with Attributes – TagSupport

- After browsing to tld finish, choose the New button to Add Attribute to custom Tag



- Click OK button

Appendix

Custom Tags with Attributes – TagSupport

New File

Steps

1. Choose File Type
2. Name and Location
3. **TLD Information**

TLD Information

Add Corresponding Tag to the Tag Library Descriptor

Specify the tag library descriptor that the tag should be added to:

TLD File: WEB-INF/tlds/custom.tld

Tag Name: ClassicEmptyAttrTag

Tag Handler Class: sample.custtag.ClassicEmptyAttrTag

Body Content: empty scriptless tagdependent

Attributes:

Name	Type	Required	Request Time ...
length	java.lang.String	false	false

Code Preview

```
<tag>
    <name>ClassicEmptyAttrTag</name>
    <tag-class>sample.custtag.ClassicEmptyAttrTag</tag-class>
    <body-content>empty</body-content>
    <attribute>
        <name>length</name>
        <rteprvalue>true</rteprvalue>
        <type>java.lang.String</type>
    </attribute>
</tag>
```

Java Code

```
public class ClassicEmptyAttrTag extends TagSupport {
```

Action Bar

• Click Finish button

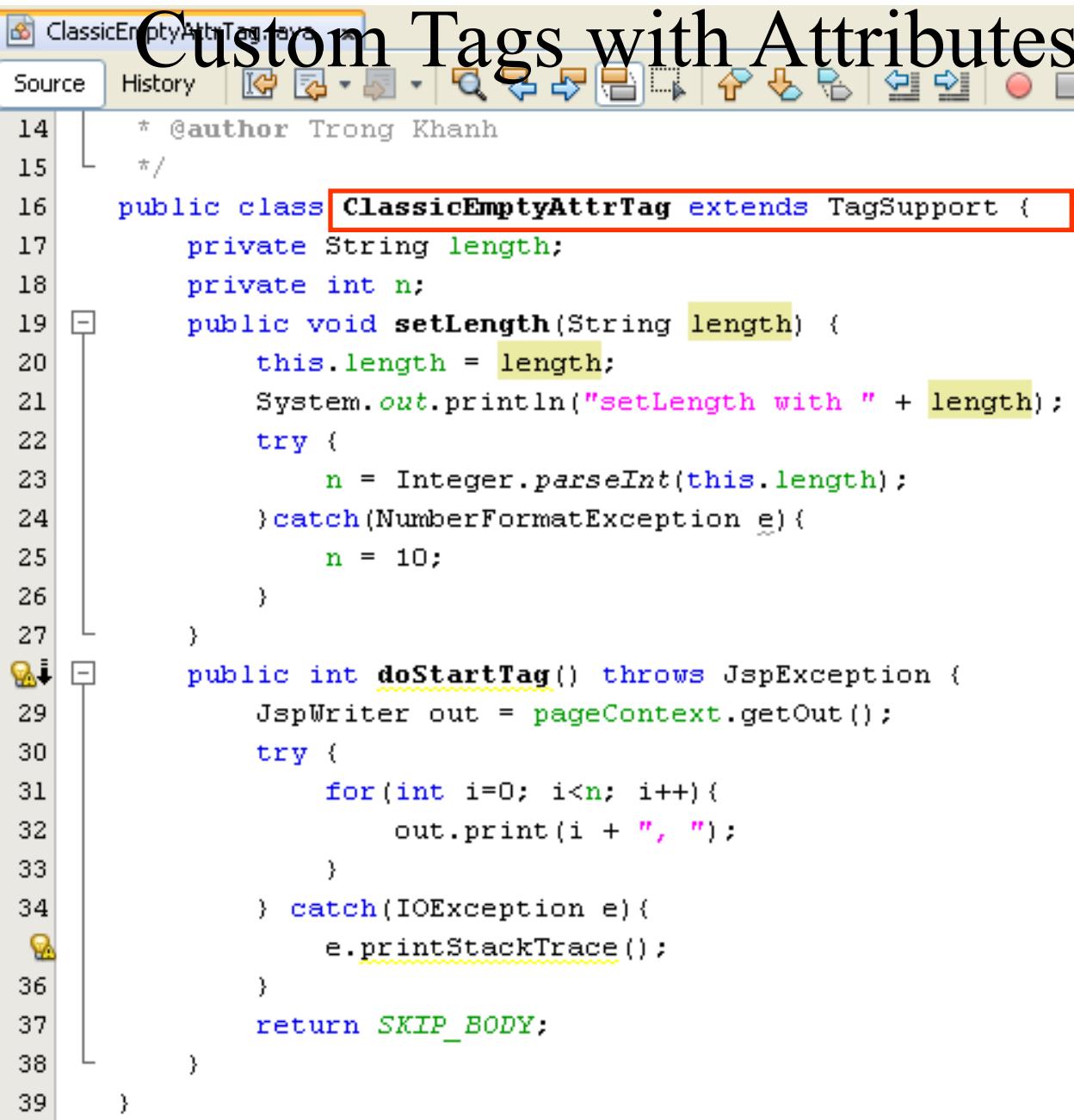
< Back Next > **Finish** Cancel Help

Attribute to add after the above step

- Click Finish button
- The attribute & tag information is automatically updated to the tld file
- Change the SimpleTagSupport to TagSupport in the TagHandler

Appendix

Custom Tags with Attributes – TagSupport



The screenshot shows a Java code editor with the following details:

- File:** ClassicEmptyAttrTag.java
- Toolbars:** Source, History, and various navigation icons.
- Code:** A Java class named **ClassicEmptyAttrTag** extending **TagSupport**. The code includes methods **setLength** and **doStartTag**.
- Annotations:** Lines 14 and 15 contain a comment: `/* @author Trong Khanh */`. Lines 16 and 37 have a red rectangular highlight around them.
- Icons:** There are several small icons on the left margin, including a minus sign, a download arrow, a lightbulb, and a question mark.

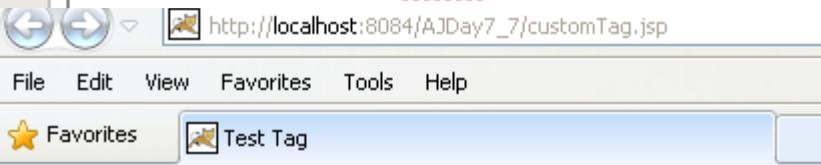
```
14 * @author Trong Khanh
15 */
16 public class ClassicEmptyAttrTag extends TagSupport {
17     private String length;
18     private int n;
19     public void setLength(String length) {
20         this.length = length;
21         System.out.println("setLength with " + length);
22         try {
23             n = Integer.parseInt(this.length);
24         } catch(NumberFormatException e){
25             n = 10;
26         }
27     }
28     public int doStartTag() throws JspException {
29         JspWriter out = pageContext.getOut();
30         try {
31             for(int i=0; i<n; i++){
32                 out.print(i + ", ");
33             }
34         } catch(IOException e){
35             e.printStackTrace();
36         }
37         return SKIP_BODY;
38     }
39 }
```

Appendix

Custom Tags with Attributes – TagSupport

```

21 <h3>Classic Tag with Attributes</h3>
22 Not pass attr: <ct:ClassicEmptyAttrTag/><br/>
23 Pass attr: <ct:ClassicEmptyAttrTag length="8"/> <br/>
24 Pass attr without value: <ct:ClassicEmptyAttrTag length="" /> <br/>
25 Pass attr with not number value: <ct:ClassicEmptyAttrTag length="8"/> <br/>
```



Custom Tag Demo

Before Custom Tag is invoked!

Classic Empty Tag Create Empty Tag using Tag

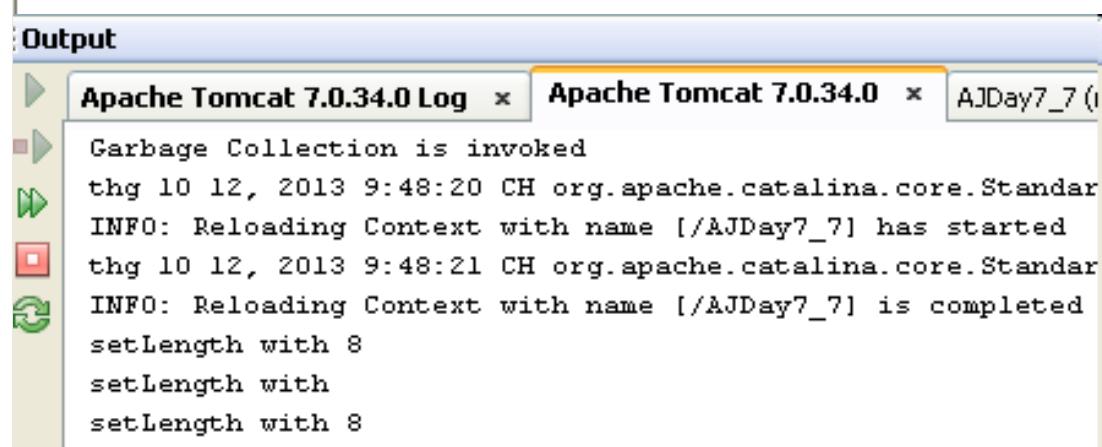
After Custom Tag finished!

Simple Empty Tag © KhanhKT Ltd. 2013

Classic Tag with Attributes

```

Not pass attr:
Pass attr: 0, 1, 2, 3, 4, 5, 6, 7,
Pass attr without value: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9,
Pass attr with not number value: 0, 1, 2, 3, 4, 5, 6, 7,
```



Appendix

Custom Tags with Body – BodyTag

```
public class ClassicBodyTag extends BodyTagSupport {
```

```
/** ... */
```

```
    public int doAfterBody() throws JspException {
        try {
            // This code is generated for tags whose bodyContent is "JSP"
            BodyContent bodyCont = getBodyContent();
            JspWriter out = bodyCont.getEnclosingWriter();
            String bodyString = bodyCont.getString();
            out.println(bodyString.toUpperCase());
            bodyCont.clear();
            writeTagBodyContent(out, bodyCont);
        } catch (Exception ex) {
            handleBodyContentException(ex);
        }
        if (theBodyShouldBeEvaluatedAgain()) {
            return EVAL_BODY_AGAIN;
        } else {
            return SKIP_BODY;
        }
    }
```

Appendix

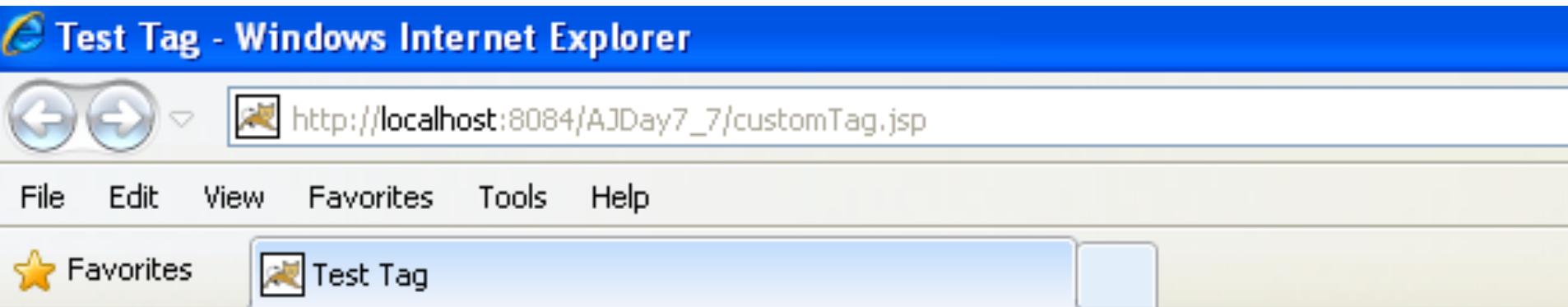
Custom Tags with Body – BodyTag

```
<tag>
  <name>ClassicBodyTag</name>
  <tag-class>sample.custtag.ClassicBodyTag</tag-class>
  <body-content>JSP</body-content>
</tag>
```

```
<h3>Body Tag</h3>
<ct:ClassicBodyTag>
  These following information are displayed using tag handler:
  <li>Current Time: <%= new java.util.Date()%></li>
  <li>Requesting hostname: <%= request.getRemoteHost()%></li>
  <li>SessionID: <%= session.getId()%></li>
</ct:ClassicBodyTag>
```

Appendix

Custom Tags with Body – BodyTag



Iteration**Iteration****Iteration****Iteration****Iteration**

This is outside of the customtag

Body Tag

THESE FOLLOWING INFORMATION ARE DISPLAYED USING TAG HANDLER:

CURRENT TIME: SAT OCT 12 22:06:59 ICT 2013

REQUESTING HOSTNAME: 127.0.0.1

SESSIONID: 353AAEB790A076847E770471D04B3993

Appendix

Empty Custom Tags – using Simple

```
14 * @author Trong Khanh
15 */
16 public class SimpleEmptyTag extends SimpleTagSupport {
17
18     /**
19      */
20
21     @Override
22     public void doTag() throws JspException {
23         JspWriter out = getJspContext().getOut();
24         try {
25             out.println("<b>&copy; KhanhKT Ltd. 2013</b>");
26
27             JspFragment f = getJspBody();
28             if (f != null) f.invoke(out);
29
30         } catch (java.io.IOException ex) {
31             throw new JspException("Error in SimpleEmptyTag tag", ex);
32         }
33     }
34
35     <tag>
36         <name>ClassicEmptyTag</name>
37         <tag-class>sample.custtag.ClassicEmptyTag</tag-class>
38         <body-content>empty</body-content>
39     </tag>
40     <tag>
41         <name>SimpleEmptyTag</name>
42         <tag-class>sample.custtag.SimpleEmptyTag</tag-class>
43         <body-content>empty</body-content>
44     </tag>
```

Appendix

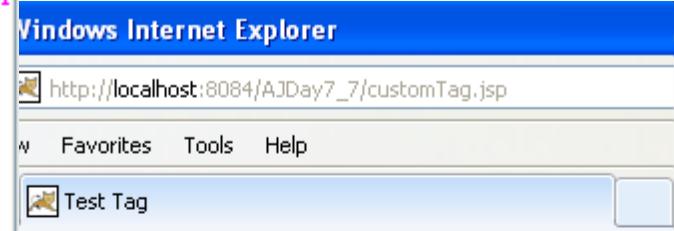
Empty Custom Tags – using Simple

customTag.jsp

```

4      Author      : Trong Khanh
5
6
7 <%@page contentType="text/html" pageEncoding="UTF-8"%>
8 <!DOCTYPE html>
9 <%@taglib uri="/WEB-INF/tlds/custom.tld" prefix="ct"%>
10 <html>
11   <head>
12     <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
13     <title>Test Tag</title>
14   </head>
15   <body>
16     <h1>Custom Tag Demo</h1>
17     <h2>Before Custom Tag is invoked!</h2>
18     <h3>Classic Empty Tag <ct:ClassicEmptyTag/></h3>
19     <h2>After Custom Tag finished!</h2>
20     <h3>Simple Empty Tag <ct:SimpleEmptyTag/></h3>

```



Custom Tag Demo

Before Custom Tag is invoked!

Classic Empty Tag Create Empty Tag using Tag

After Custom Tag finished!

Appendix

Custom Tags with Attributes – using Simple

- **Adding dynamic attributes** to SimpleTag
 - Implementing **javax.servlet.jsp.tagext.DynamicAttributes** interface
 - Define the **setDynamicAttribute()** method that accepts dynamic attributes is **passed an attribute** not present in the tag library

```
public void setDynamicAttribute(String uri, String localName,  
Object value) throws JspException
```

- Addition the <dynamic-attributes>element to true in tld

Appendix

Custom Tags with Attributes – using Simple

The screenshot shows a Java code editor with the following code:

```
16 * @author Trong Khanh
17 */
18 public class SimpleDynaAttrTag extends SimpleTagSupport
19     implements DynamicAttributes{
20     private String length;
21     private ArrayList key = new ArrayList();
22     private ArrayList value = new ArrayList();
23     @Override
24     public void doTag() throws JspException {
25         JspWriter out = getJspContext().getOut();
26         try {
27             for(int i=0; i<key.size(); i++){
28                 String strKey = key.get(i).toString();
29                 String strValue = value.get(i).toString();
30                 out.println("<li>" + strKey + " = " + strValue + "</li>");
31             }
32             out.print("<br/>The Length is " + length);
33             JspFragment f = getJspBody();
34             if (f != null) f.invoke(out);
35         } catch (java.io.IOException ex) {
36             throw new JspException("Error in SimpleDynaAttrTag tag", ex);
37         }
38     }
39     public void setLength(String length) {...}
40     public void setDynamicAttribute(String uri, String localName, Object value)
41         throws JspException {
42         this.key.add(localName);
43         this.value.add(value);
44     }
45 }
```

The code implements a custom JSP tag named `SimpleDynaAttrTag`. It extends `SimpleTagSupport` and implements the `DynamicAttributes` interface. The class contains fields for `length`, `key` (an `ArrayList` of strings), and `value` (an `ArrayList` of objects). The `doTag` method iterates over the `key` list, prints each key-value pair as an `` item, and then prints the total length. It also handles the `JspFragment` body if present. The `setLength` and `setDynamicAttribute` methods are defined to handle attribute assignments.

Appendix

Custom Tags with Attributes – using Simple

```
44 <tag>
45     <name>SimpleDynaAttrTag</name>
46     <tag-class>sample.taglib.SimpleDynaAttrTag</tag-class>
47     <body-content>empty</body-content>
48     <dynamic-attributes>true</dynamic-attributes>
49     <attribute>
50         <name>length</name>
51         <required>true</required>
52         <rtextrvalue>true</rtextrvalue>
53         <type>java.lang.String</type>
54     </attribute>
55 </tag>
```

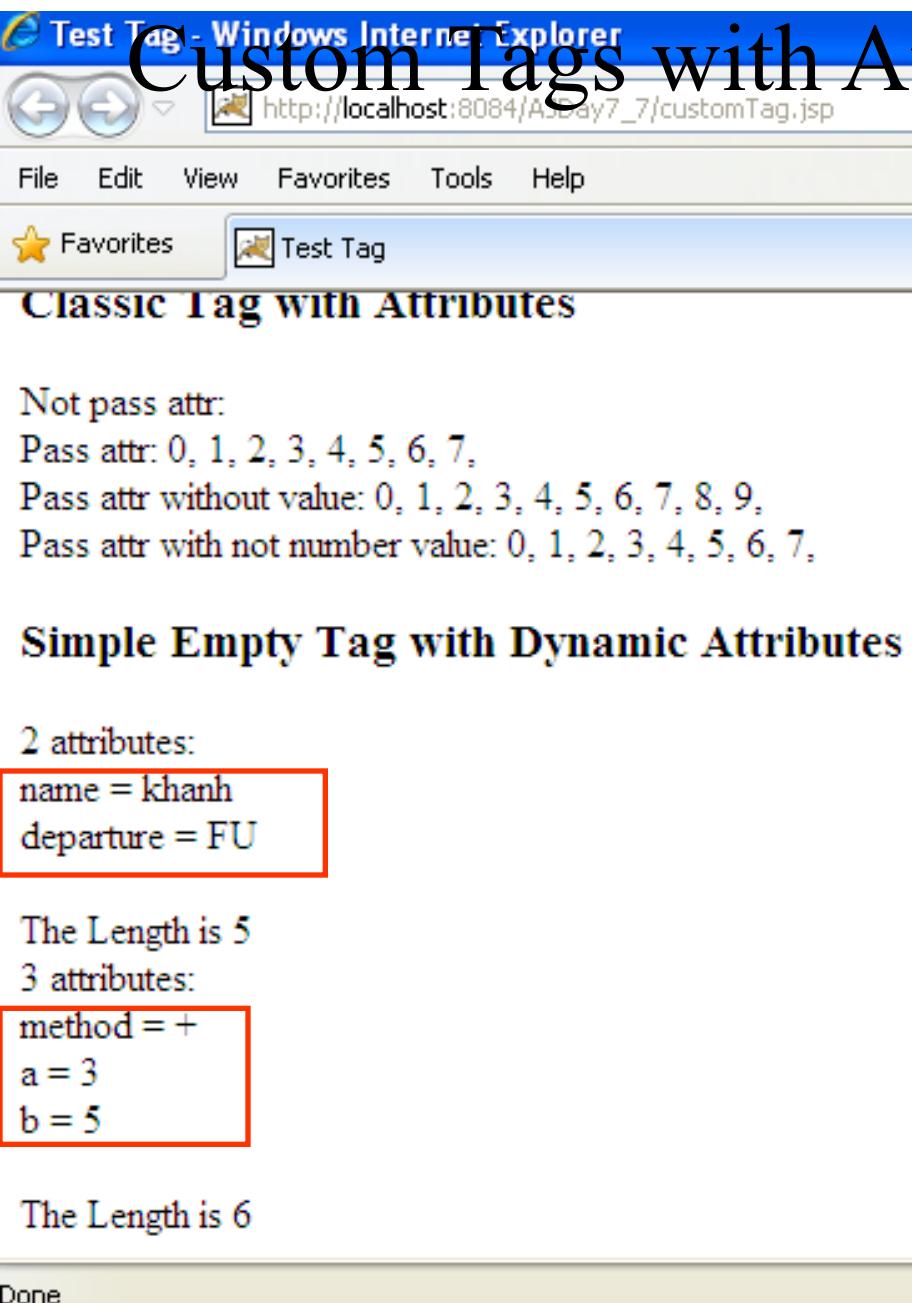
~~~~~  
26 <h3>Simple Empty Tag with Dynamic Attributes</h3>

27 attributes: <ct:SimpleDynaAttrTag name="khanh" departure="FU" length="5"/><br/>

28 attributes: <ct:SimpleDynaAttrTag method="+" a="3" b="5" length="6"/>

# Appendix

## Custom Tags with Attributes – using Simple

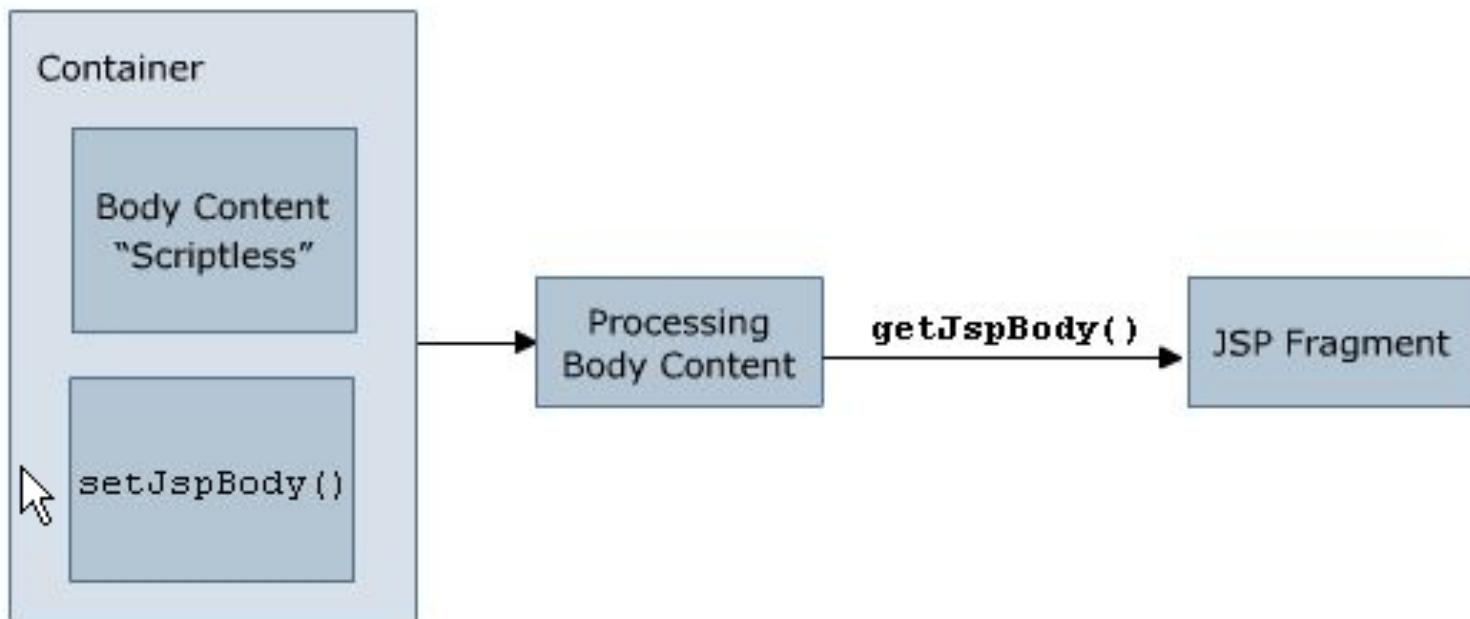


The screenshot shows a Microsoft Internet Explorer window with the title "Test Tag - Windows Internet Explorer". The URL in the address bar is "http://localhost:8084/ASDay7\_7/customTag.jsp". The menu bar includes File, Edit, View, Favorites, Tools, and Help. Under Favorites, there is a link to "Test Tag". The main content area displays the output of a JSP page. It contains several lines of text: "Classic Tag with Attributes", "Not pass attr:", "Pass attr: 0, 1, 2, 3, 4, 5, 6, 7," (in red), "Pass attr without value: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9," (in red), and "Pass attr with not number value: 0, 1, 2, 3, 4, 5, 6, 7," (in red). Below this, under "Simple Empty Tag with Dynamic Attributes", it says "2 attributes:" followed by two lines: "name = khanh" and "departure = FU", both enclosed in a red box. Then it says "The Length is 5". Under "3 attributes:", it shows three lines: "method = +", "a = 3", and "b = 5", all enclosed in a red box. Finally, it says "The Length is 6". At the bottom left, there is a "Done" button.

# Appendix

## Custom Tags with Body – SimpleTag

- The **setJspBody()** method is called by the container. By the use of **getJspBody()** method, **fragment** can be **accessed** and is **executed** using the **invoke()** method.
- Finally, with the help of **out.println()**, the processed body content is **sent** to the **output stream** as a **response**.



# Appendix

## Custom Tags with Body – SimpleTag

```
<tag>
    <name>SimpleBodyTag</name>
    <tag-class>sample.custtag.SimpleBodyTag</tag-class>
    <body-content>scriptless</body-content>
</tag>

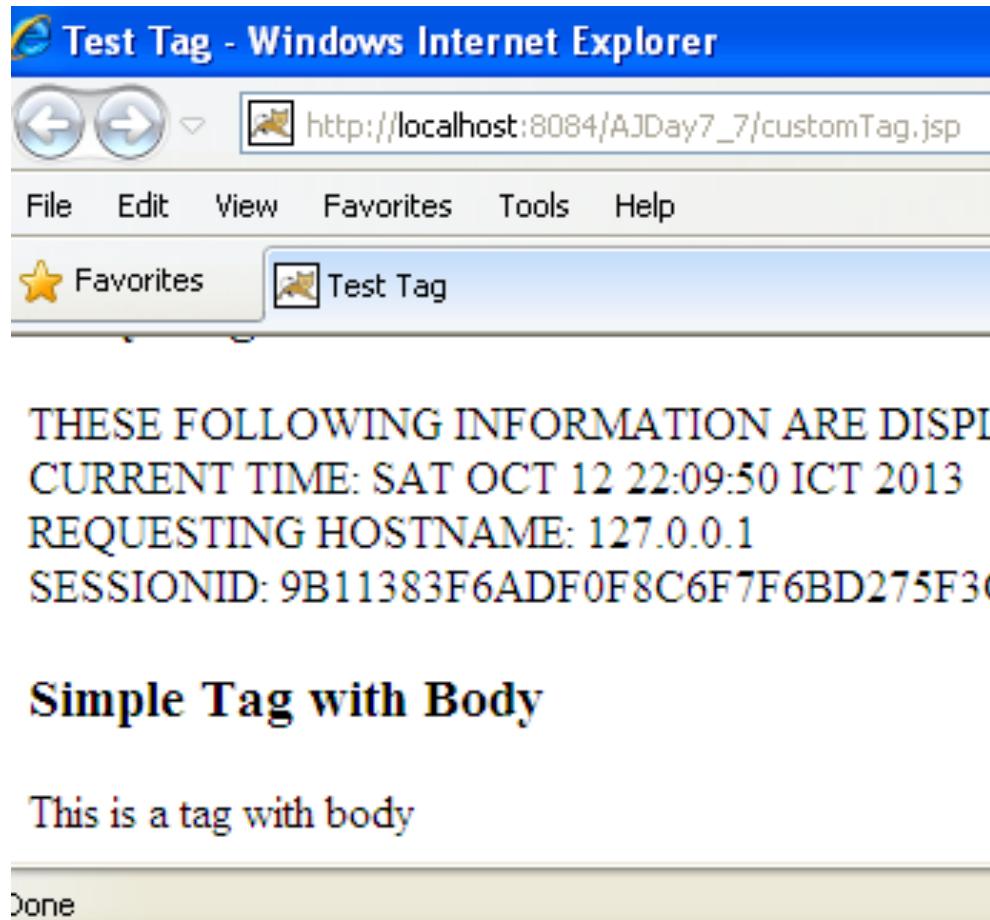
public class SimpleBodyTag extends SimpleTagSupport {
    /**
     */
    public void doTag() throws JspException {
        JspWriter out = getJspContext().getOut();
        try {
            JspFragment f = getJspBody();
            if (f != null) f.invoke(out);
        } catch (java.io.IOException ex) {
            throw new JspException("Error in SimpleBodyTag tag", ex);
        }
    }
}
```

# Appendix

## Custom Tags with Body – SimpleTag

```
<h3>Simple Tag with Body</h3>
```

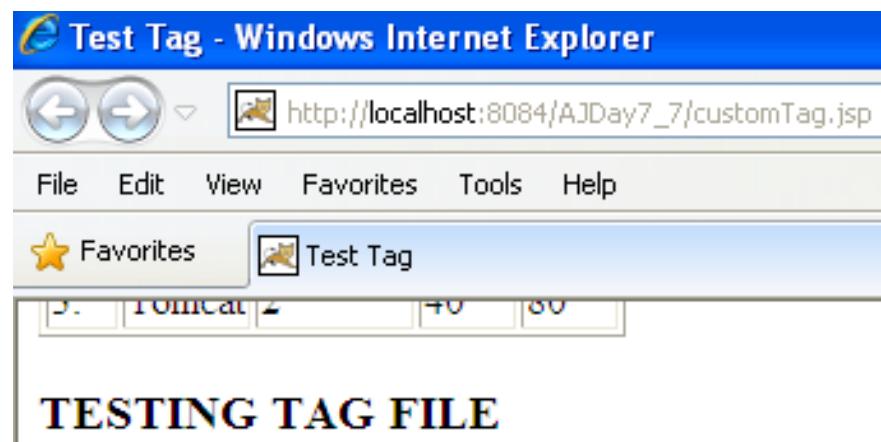
```
<ct:SimpleBodyTag>This is a tag with body</ct:SimpleBodyTag>
```



# Appendix - The Tag File Model Implementation

```
upperTag.tag x
Source History | I O C S D M F G H P A B C E R T
4 Author : Trong Khanh
5 --%>
6
7 <%@tag description="put the tag description here" pageEncoding="UTF-
8
9 -> <%-- The list of normal or fragment attributes can be specified here
10 <%@tag body-content="scriptless" %>
11 <jsp:doBody var="theBody" scope="session"/>
12 <% String bodyContent = (String)session.getAttribute("theBody"); %>
13 <%= bodyContent.toUpperCase() %>
```

<h3><tag:upperTag>Testing Tag file</tag:upperTag></h3>



# Appendix - The Tag File Model

## Implementation – Dynamic Attributes

# Appendix - The Tag File Model Implementation – Dynamic Attributes

```
<br/>Tag file with dynamic attributes:<br/>
<tagFile:dynaAttrTagfile header1="dyna" khanh="123" dyna="khanh" test="aaa"/>
<tagFile:dynaAttrTagfile header1="dyna1"/>
```

The screenshot shows a Windows Internet Explorer window titled "Test Tag - Windows Internet Explorer". The address bar displays the URL "http://localhost:8084/AJDay7\_7/customTag.jsp". The menu bar includes File, Edit, View, Favorites, Tools, and Help. A toolbar icon for "Test Tag" is visible. The main content area contains the text "TESTING TAG FILE" and "Tag with dynamic attributes". Below this, there is a table with the following data:

| dyna  |       |
|-------|-------|
| test  | aaa   |
| khanh | 123   |
| dyna  | khanh |

At the bottom of the page, the text "dyna1 There is not a dynamic attributes" is displayed. The status bar at the bottom right shows "Done".

# Appendix – Build Library Tag File

The screenshot shows a Java code editor window with the title bar "myDataGrid.tag". The menu bar includes "Source" and "History". Below the menu is a toolbar with various icons for file operations like open, save, and search. The code itself is a JSP tag file with the following content:

```
Author      : Trong Khanh
--%>

<%@tag description="put the tag description here" pageEncoding="UTF-8"%>
<%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
<%@taglib uri="http://java.sun.com/jsp/jstl/sql" prefix="sql"%>

<%-- The list of normal or fragment attributes can be specified here: --%
<%@attribute name="dataSource" required="true" rtexprvalue="true"%>
<%@attribute name="sql" required="true" %>
<%@tag dynamic-attributes="params" %>

<%-- any content can be specified here e.g.: --%
<c:catch var="ex">
    <sql:setDataSource var="con" dataSource="${dataSource}"/>
    <c:if test="${not empty con}">
        <sql:query var="rs" dataSource="${con}">
            ${sql}
            <c:forEach var="par" items="${params}">
                <sql:param value="${par.value}" />
            </c:forEach>
        </sql:query>
    </c:if>
</c:catch>
```

# Build Library Tag Lib Library

## Tag File

```
26 <c:if test="${not empty rs}">
27     <table border="1">
28         <thead>
29             <tr>
30                 <th>No.</th>
31                 <c:forEach var="column" items="${rs.columnNames}">
32                     <th>${column}</th>
33                 </c:forEach>
34             </tr>
35         </thead>
36         <tbody>
37             <c:forEach var="row" items="${rs.rowsByIndex}" varStatus="counter">
38                 <tr>
39                     <td>${counter.count}</td>
40                     <c:forEach var="field" items="${row}">
41                         <td>${field}</td>
42                     </c:forEach>
43                 </tr>
44             </c:forEach>
45
46         </tbody>
47     </table>
48
49     </c:if>
50 </c:if>
51 </c:catch>
52 <c:if test="${not empty ex}">
53     <font color="red">
54         Errors occur: ${ex}
55     </font>
56 </c:if>
```

# Build Library Tag Lib Library

## Apply

```
30 <h2>TagFile Demo</h2>
31 <tagFile:myDataGrid dataSource="myDS"
32             sql="Select * From Registration Where lastname Like ?"
33             name="%a%"/><br/>
34
35 <tagFile:myDataGrid dataSource="myDS"
36             sql="Select * From Registration Where username = ? And password = ?"
37             par1="khanh" par2="kieu123"/><br/>
38 </body>
```

# Tag Hierarchies

- **Simple within Simple**
  - Using JSPTag with **getParent()** method
  - Using **instanceOf** to compare
- **Classic within Classic**
  - Using Tag with **getParent()** method
  - Using **instanceOf** to compare
- **Simple within Classic**
  - Using JSPTag with **getParent()** method
  - Using **instanceOf** to compare
- **Classic within Simple**
  - **getAdaptee()** return the wrapper-up JSPTag
  - **getParent()** method return the adaptee's parent