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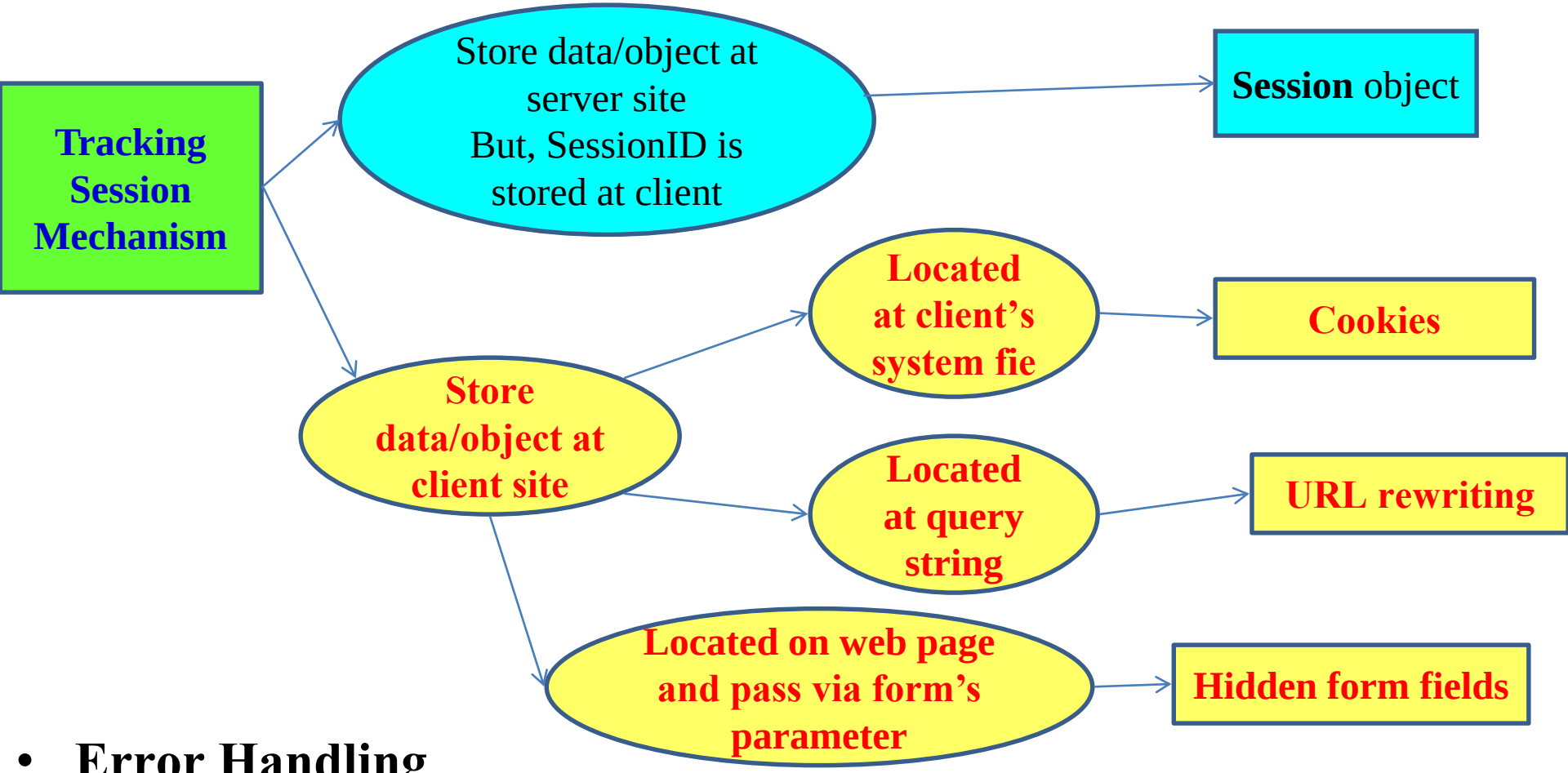
JavaBeans

JSP Standard Actions
Dispatching Mechanisms
Expression Language
JSPs in XML

#StandardAction #EL #MVC1

Review

- **Session Tracking Mechanism**
  - Client must be stored the value that transfer to server in each its request



- **Error Handling**
  - Reporting Error: create the friendly UI to user when the system's errors occur.
  - Logging Error: store the errors (users or/and app) to the file to improve the application and get users' behaviors

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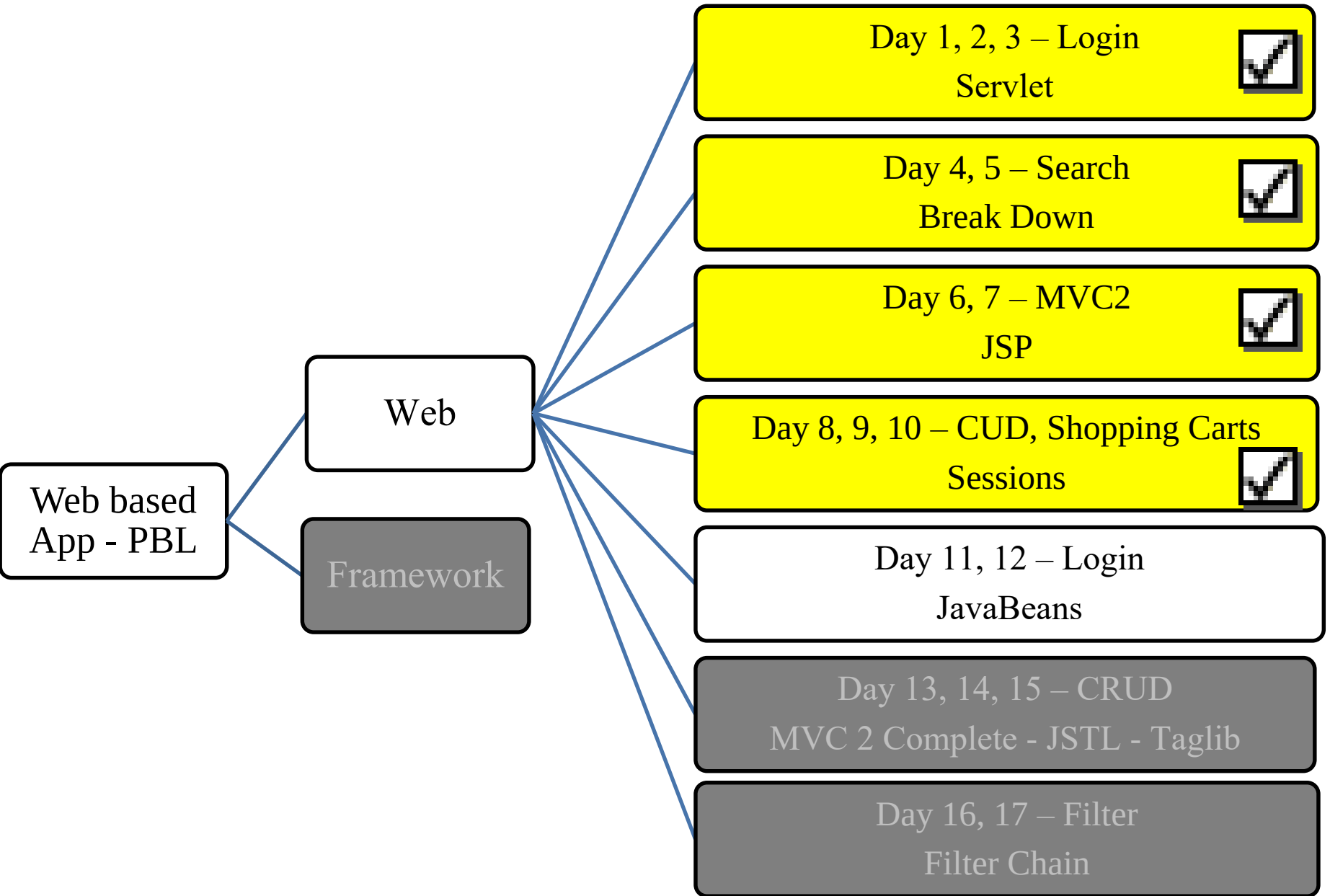
Objectives

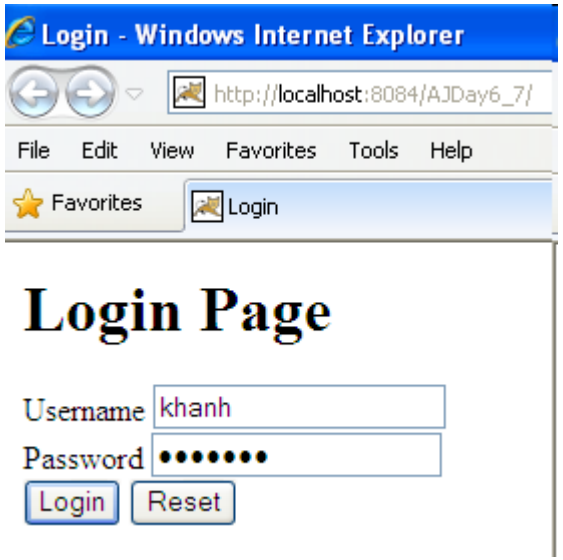
- **How to build the Web Application using MVC1?**
  - Standard Actions
  - Dispatching Mechanisms
- **How to remove the scripting element (Java Code) in the jsp (view)?**
  - Expression Language

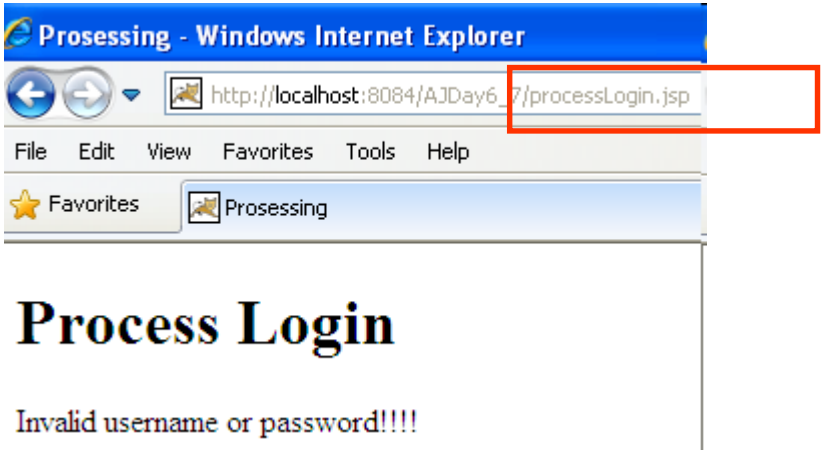
Objectives

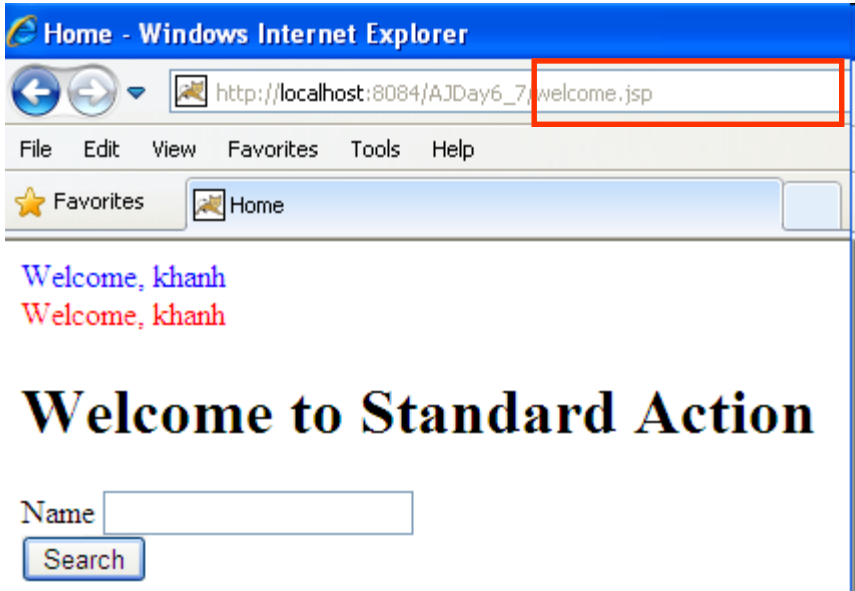

Web based App - PBL
Web
Framework
Day 1, 2, 3 – Login
Servlet
Day 4, 5 – Search
Break Down
Day 6, 7 – MVC2
JSP
Day 8, 9, 10 – CUD, Shopping Carts
Sessions
Day 11, 12 – Login
JavaBeans
Day 13, 14, 15 – CRUD
MVC 2 Complete - JSTL - Taglib
Day 16, 17 – Filter
Filter Chain

MVC 1
Requirements

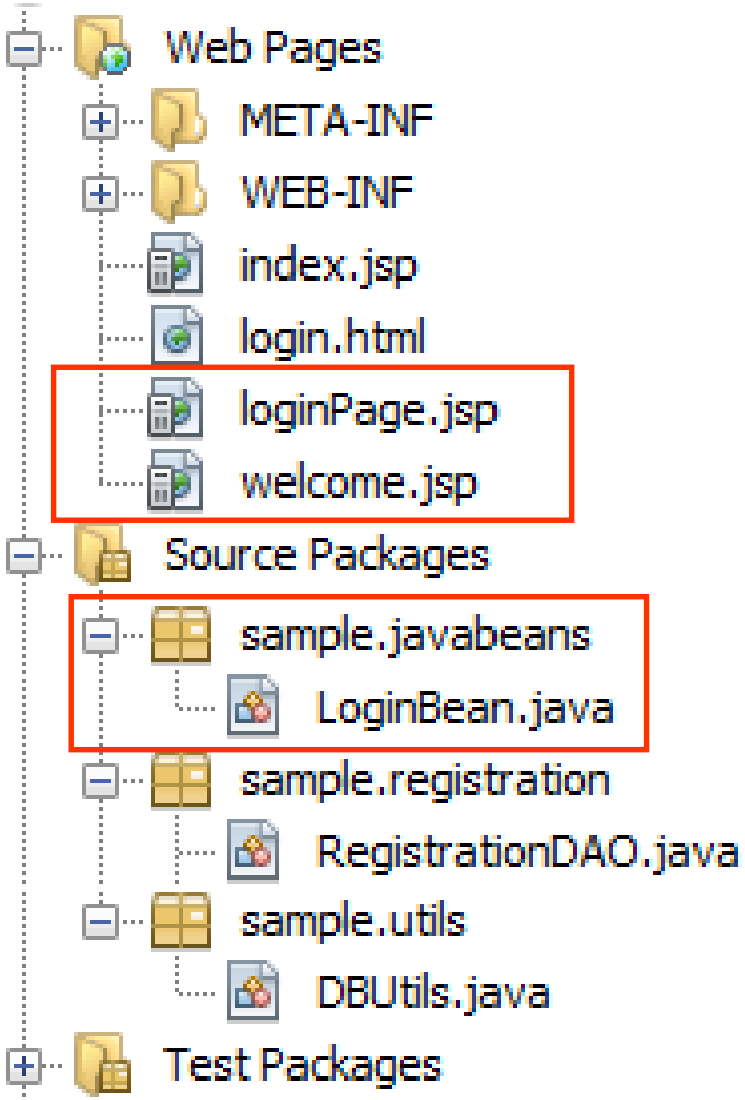
- Building the web application with authentication functions
  - The GUI is shown as





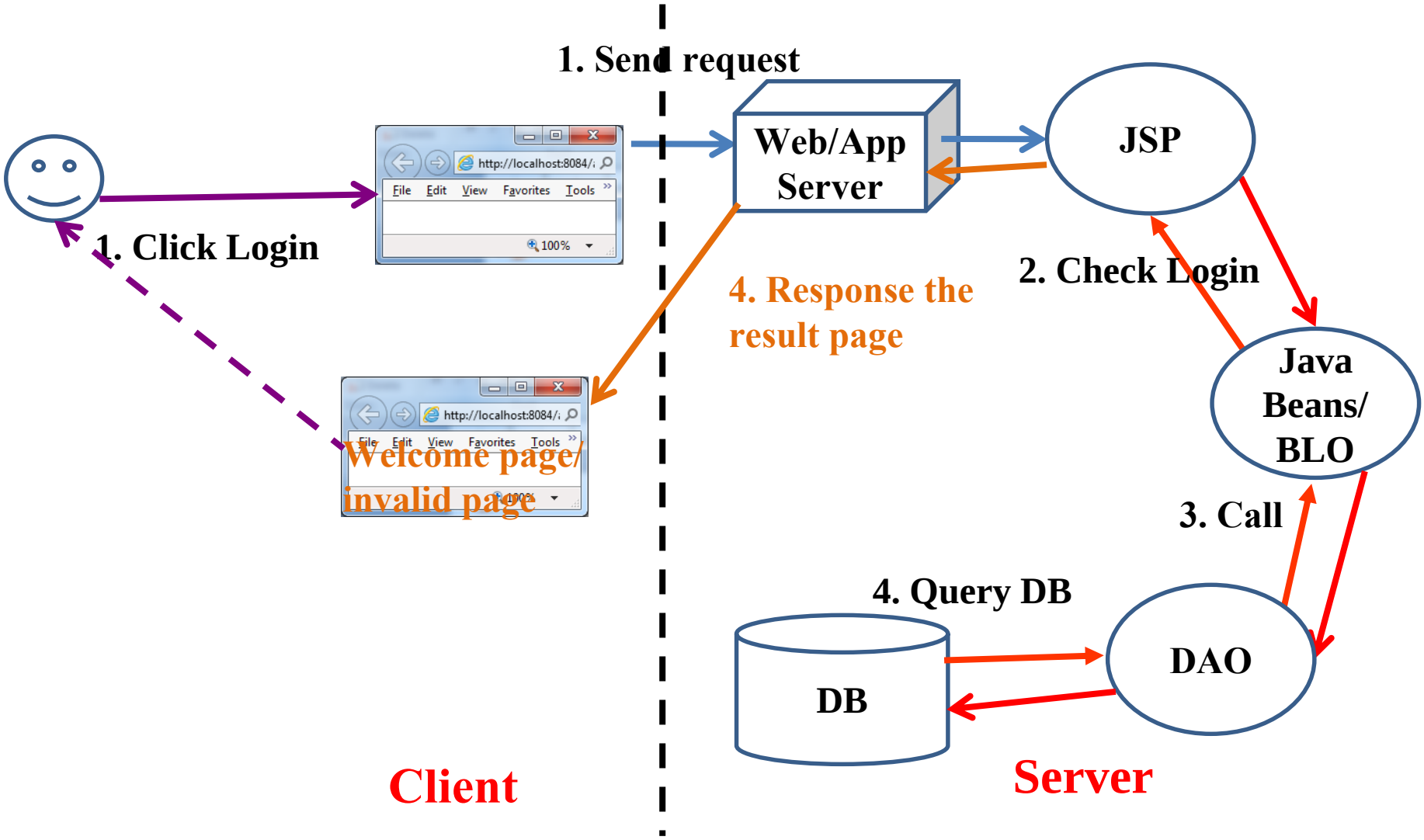


MVC 1
Expectation



MVC1

Interactive Server Model



JSP Standard Actions

Java Beans

- JavaBeans technology is the **component architecture** for the Java 2 Platform, Standard Edition (J2SE).
- JavaBeans technology is based on the **JavaBeans specification.**
- Components (JavaBeans) are **reusable** software programs that you can develop and **assemble easily** to create sophisticated applications.
  - Are reusable components which define the interactivity of Java objects
  - Are reusable software components that work **independently** on a workstation and with a set of other distributed components.
- **Encapsulate state and behavior** of software component
- The **different** point between Java Bean and Java class
  - Java Bean **implemented from Serializable**
    - The process of **create a copy** of an object **suitable** for **passing** to **another object/ package classes into streams** of bytes that **are transmitted through networks** or **saved to** the **disk**

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JSP Standard Actions

Java Beans

- In order to function as a JavaBean class, an object class **must obey certain conventions** about **method naming**, **construction**, and **behavior**.
  - These conventions make it possible to have tools that can **use, reuse, replace, and connect** JavaBeans.
- A Bean a **simple Java Class** that follows certain **coding conventions**
  - Bean class should **always use a package name**
  - Bean class **must have a public no-argument constructor**
  - The **properties of bean** (persistence) is **not declared "public".** They are **accessed** through **getter and setter methods**.
  - Public **getter** method is used to **retrieve** the **properties of a bean class**
  - Public **setter** method is used to **set** the **properties of a bean class**
- **Notes**:
  - The first character of each property should **name in lower case** then the **accessor** methods are used along with property name **with the first character of each word in upper case** (**Ex**: length – getLength and setLength)
  - The dataType of properties is **boolean** then the getter method is **isXxx** instead of getXxx

JSP Standard Actions

Java Beans

- A **JSP** page **accesses Java Beans using tag** action **and gets** the **result** of processing **without how** to **JavaBeans implementation** and **process**
- Java Bean tags are combined with JSP elements
- Java Bean tags are **translated into single java Servlet classes on the server**
- JSP technology directly supports using JavaBeans components with JSP language elements

JSP Standard Actions

Standard Actions

- An **alternative to inserting java code into designed presentation page**
- Are **performed when** a **browser requests** for a **JSP** page
- Are used for
  - **Forwarding** requests and performing **includes** in page
  - **Embedding** the appropriate HTML on pages
  - **Interacting** between pages and JavaBeans
  - **Providing additional functionality** to tag libraries
- **Syntax**: **<prefix:actionName att="…">...</prefix:actionName>**
- Some **properties**
  - It use **"jsp" prefix**
  - The attributes are **case sensitive**
  - Value in the attributes must be **enclosed in double quotes**
  - Standard actions can be either **an empty or a container tag**
- A JSP **provides 03 tags** that use **interact** with JavaBean
  - jsp:useBean, jsp:setProperty, jsp:getProperty

JSP Standard Actions

The <jsp:useBean> tag

- Is used to **locate or instantiate** a JavaBeans component
- **First tries to locate** an instance of the Bean **otherwise it instantiates** the Bean from a class
- To locate or instantiate the Bean, the <jsp:useBean> follows the following steps:
  - **Attempts** to **locate** a Bean (*means attribute containing object*) within the scope
  - **Defines an object reference variable with the name**
  - Stores a reference to it in the variable, if it retrieves the Bean
  - **Instantiates** it from the specified class, **if it cannot retrieve the Bean**
- **Syntax**

  <**jsp:useBean id**="<identifier>" **class**="<class name>" [scope = "scope name"]/>
  - **id**: is used to name the **attribute name**, to **refer** to the Bean **instance in specify scope**
  - **class**: a **class name implementing** a Bean processing.
  - **scope**: the **lifespan** of a bean (sharable). Default value is **page**

JSP Standard Actions

The <jsp:useBean> tag

- **Use scriptlet element** to declare Java Bean:

```
<%
    className id = (className) scope.getAttribute("identifier");
    if (id == null) {
        id = new className();
        scope.setAttribute ("identifier", id);
    }
%>
```

- **Ex**
  - <jsp:useBean id="book1" class="store.book"/>
  - **similar to**

```
<%
    store.book book1 = (store.book) pageContext.getAttribute("book1");
    if (book1 == null) {
      book1 = new store.book();
      pageContext.setAttribute("book1", book1);
    }
%>
```

JSP Standard Actions

The <jsp:useBean> tag

- **Casting**

  <**jsp:useBean id**="<identifier>" **class**="<class name>" **type** = "<dataType>" [scope = "scope type"]/>

  – **type**: Java – DataType

- **JSP Scriptlet element**

```
<%
        dataType id = (dataType) scope.getAttribute("identifier");
        if (id == null) {
                id = (dataType) (new className());
                scope.setAttribute ("identifier", id);
        }
%>
```

- **Ex**

  – <jsp:useBean id="book1" class="store.book" type="library.magazine" />

  – **Similar to**

```
<% library.magazine book1 = (library.magazine) pageContext.getAttribute("book1");
   if (book1 == null) {
     book1 = (library.magazine) (new store.book());
     pageContext.setAttribute("book1", book1);
   } %>
```

JSP Standard Actions

The <jsp:useBean> tag

- **Other syntax**

<jsp:useBean …> statement </jsp:useBean>

  - **Ex**

```
<jsp:useBean id="count" class="ABean.AccessBean" scope="application">
    <jsp:setProperty name="count" property="firstPage" value="ATest.jsp" />
</jsp:useBean>
```

- **Notes**:
  - If using some specified symbol in command, the symbol "\" should put such as ' (\'); " (\"), \ (\\), % (**%**), ...
  - The JSP scriptlets use **id as a variable.**

JSP Standard Actions

The <jsp:getProperty> tag

- **Retrieves a bean property value** using the **getter methods and displays** the output in a JSP page
- **Before** using <jsp:getProperty> you **must create or locate a bean** with <jsp:useBean>
- **Drawback**
  - **Fails** to **retrieve** the **values** of **an indexed property**
  - **Fails** to **directly access** enterprise **beans components**
- **Syntax**

  <jsp:getProperty **name**="<identifier>" **property**="<attr name>" />
  - **name**: the identifier declared in jsp:useBean
  - **property**: the property name is implemented in Java Bean
- **Use scriptlet command**

  <%= <identifier>.getXxx() %>
- **Ex**

  <jsp:getProperty name="book1" property="title"/>

  Similar to <%= book1.getTitle()%>

JSP Standard Actions

The <jsp:setProperty> tag

- **Sets the value** of the properties in a bean, **using** the bean's **setter methods**
- **Before** using <jsp:setProperty> you **must create or locate** a bean with <jsp:useBean>
- **Syntax**

<jsp:setProperty name="<identifiers>" property=
"<attr name>" value="<const/ expression>" />

- **Use scriptlet command:**

```
<%
    id.setXxx(<value>);
    scope.setAttribute("identifier", id);
%>
```

- **Ex:** <jsp:setProperty name="book1" property="title" value="JSP Book" />

  Similar to <% book1.setTitle("JSP Book");
  pageContext.setAttribute("book1", book1);
  %>

JSP Standard Actions

The <jsp:setProperty> tag

- **Assign a expression to action setProperty**
  - String sMsg = request.getParameter("sms");
  - <jsp:setProperty name="msg" property="message" value="**<%= sMsg %>**" />
- **Use param properties in setProperty**: receive an inputted value from a request (from other JSP page, application, or URL)
  - <jsp:setProperty name="msg" property="message" **param="message"** />
- To **set values to whole bean properties**, the **symbol "*"** is assigned to setProperty

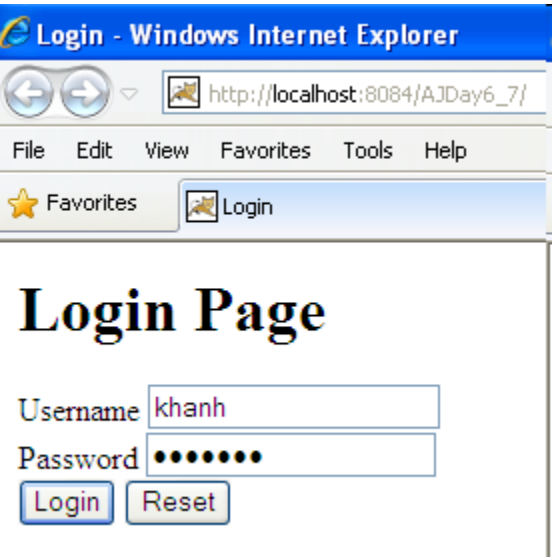
  <jsp:setProperty name="msg" **property="*"** />
- **Notes**:
  - The Bean Action is **executed only if** all of **properties** is **assigned** values **because** the engine **does not assign a null value with lacked properties**.
  - In some web server, the **exceptions** are **thrown if** a **property** value is **assigned** to **double**
  - The **converted mechanism** does **not ensure** a **valid value for property** (instead of manual casting)
  - The **parameters name should similar** to **properties name implemented** in **Bean**

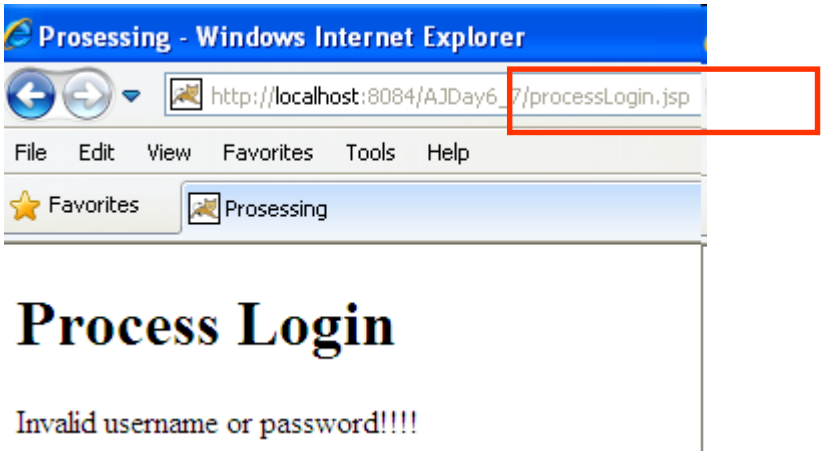
JSP Standard Actions

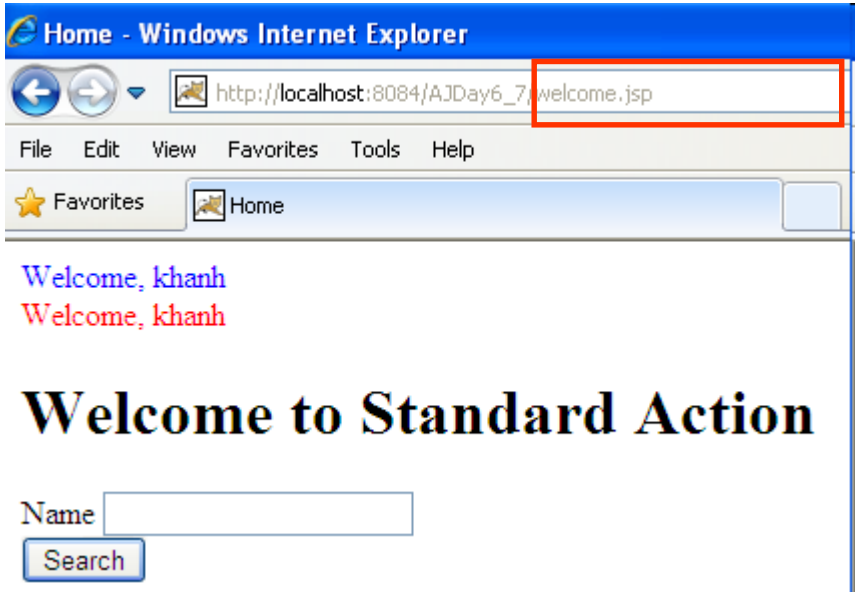
Steps in design Web Application following MVC patterns

- **Step 1**
  - create **View**
- **Step 2**
  - **Depends on** View, **determine some persistence controls** that are implemented as the Java Bean (Model) ‘s properties
  - **Implement** the Java Bean with **accessor methods** and **some utilitie methods** that are used to query the properties of Java Bean
    - The methods are designed following the OO standard
- **Step 3**
  - **Create** servlet (**Controller**)/**JSP page combining View & Model**

MVC1
Requirements







JSP Standard Actions

Scope of JavaBeans

- **page**
  - Accessible for **current page.** The life span tills the current page displayed
  - The information is **stored in pageContext** (get values through the getAttribute method) **– default scope**
- **application**
  - Current and any successive request from the same Web Application. Global to all JSP and servlet.
  - The information is **stored in ServletContext**.
  - The life span is Application
- **session**
  - The information is **stored** in **HttpSession combined current request** (get values through the getValues method of Session interface (Implicit Object)).
  - The life span tills the session destroyed, time out, or Web browser closed.
- **request**
  - Accessible for **current request** (get values through the getAttribute methods)
  - The information is **stored in ServletRequest**
  - The life Span tills the request processed and the response is sent back to the Web browser

JSP Standard Actions

Scope of JavaBeans

- **Notes**:
  - Using JavaBeans with Session or Application scope, a JSP page **must declare a tag action jsp:useBean with** a **same id and class name.**
  - JSP, JSP/ Servlet **engine defines scope** in executing Web application, **if** the instance **bean existed**, the **engine** does **not instantatiate new** one (**the tag jsp:useBean is omited**) to execute Bean's methods. **Otherwise**, **the engine create a new instance.**

Dispatching Mechanisms

The <jsp:include> tag

- Can be used to **include** the **response from another file within** the **JSP** page **output**.
- To **incorporate** the content or **insert** a file from another page into current page
- **Syntax**

  <jsp:include page="…" flush="true" />
- The file whose response should be included **has to reside somewhere** in your web application **but doesn't have to be present until the page is actually requested**

Dispatching Mechanisms

The <jsp:include> tag – Example

myDate.jsp

Source | History

```
4       Author      : Trong Khanh
5   --%>
6
7   <%@page import="java.util.Date"%>
8   <%@page contentType="text/html" pageEncoding="UTF-8"%>
9   <!DOCTYPE html>
10  <html>
11      <head>
12          <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
13          <title>Date JSP program</title>
14      </head>
15      <body>
16          <%= new Date().toLocaleString() %>
17      </body>
18  </html>
```

Dispatching Mechanisms

The <jsp:include> tag – Example

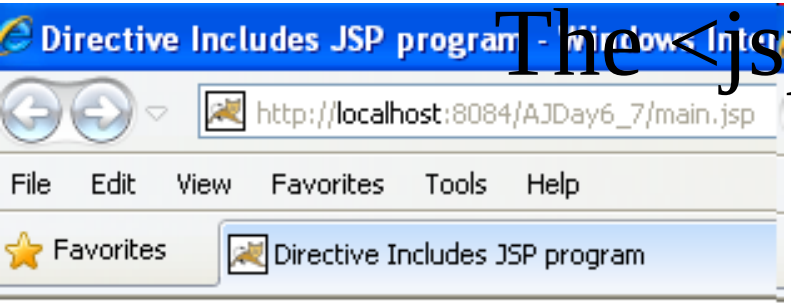
main.jsp

Source | History

```
4       Author      : Trong Khanh
5   --%>
6
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>Directive Includes JSP program</title>
13      </head>
14      <body>
15          Current date is
16          <jsp:include page="myDate.jsp" flush="true"/>
17      </body>
18  </html>
```

Dispatching Mechanisms

The <jsp:include> tag – Example



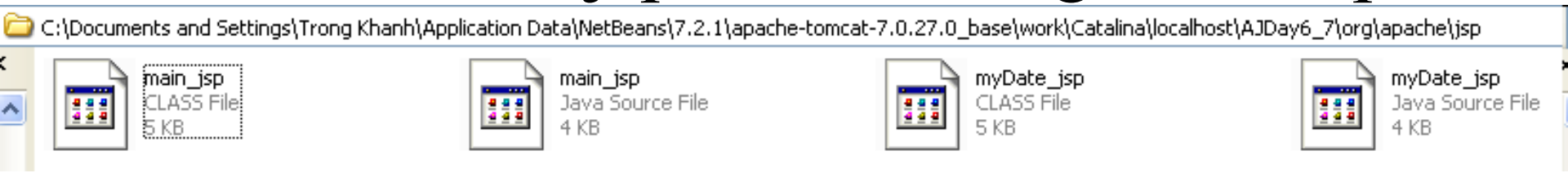
http://localhost:8084/AJDay6_7/main.jsp - Original Source

File Edit Format

```
1
2
3
4  <!DOCTYPE html>
5  <html>
6      <head>
7          <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
8          <title>Directive Includes JSP program</title>
9    </head>
10   <body>
11         Current date is
12
13
14
15
16 <!DOCTYPE html>
17 <html>
18     <head>
19         <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
20         <title>Date JSP program</title>
21   </head>
22   <body>
23       21:44:58 29-09-2013
24     </body>
25 </html>
```

Dispatching Mechanisms

The <jsp:include> tag – Example



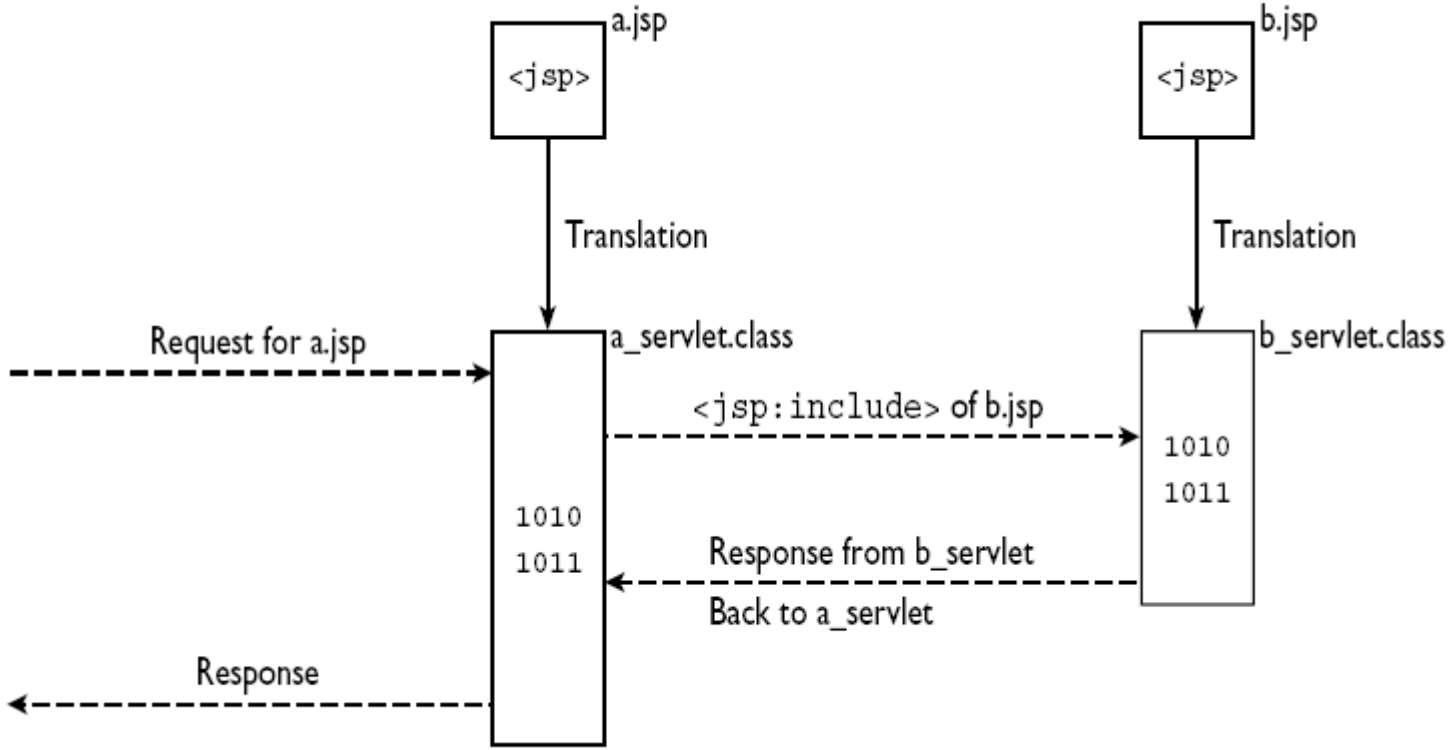
main_jsp.java

Source | History

```
64          out.write("\n");
65          out.write("<!DOCTYPE html>\n");
66          out.write("<html>\n");
67          out.write("    <head>\n");
68          out.write("        <meta http-equiv=\"Content-Type\" c
69          out.write("        <title>Directive Includes JSP progr
70          out.write("  </head>\n");
71          out.write("  <body>\n");
72          out.write("  \tCurrent date is\n");
73          out.write("        ");
74          org.apache.jasper.runtime.JspRuntimeLibrary.include(
75                  request, response, "myDate.jsp", out, true);
76          out.write("\n");
77          out.write("    </body>\n");
78          out.write("</html>\n");
```

Dispatching Mechanisms

<jsp:include> vs. <%@ include …%>

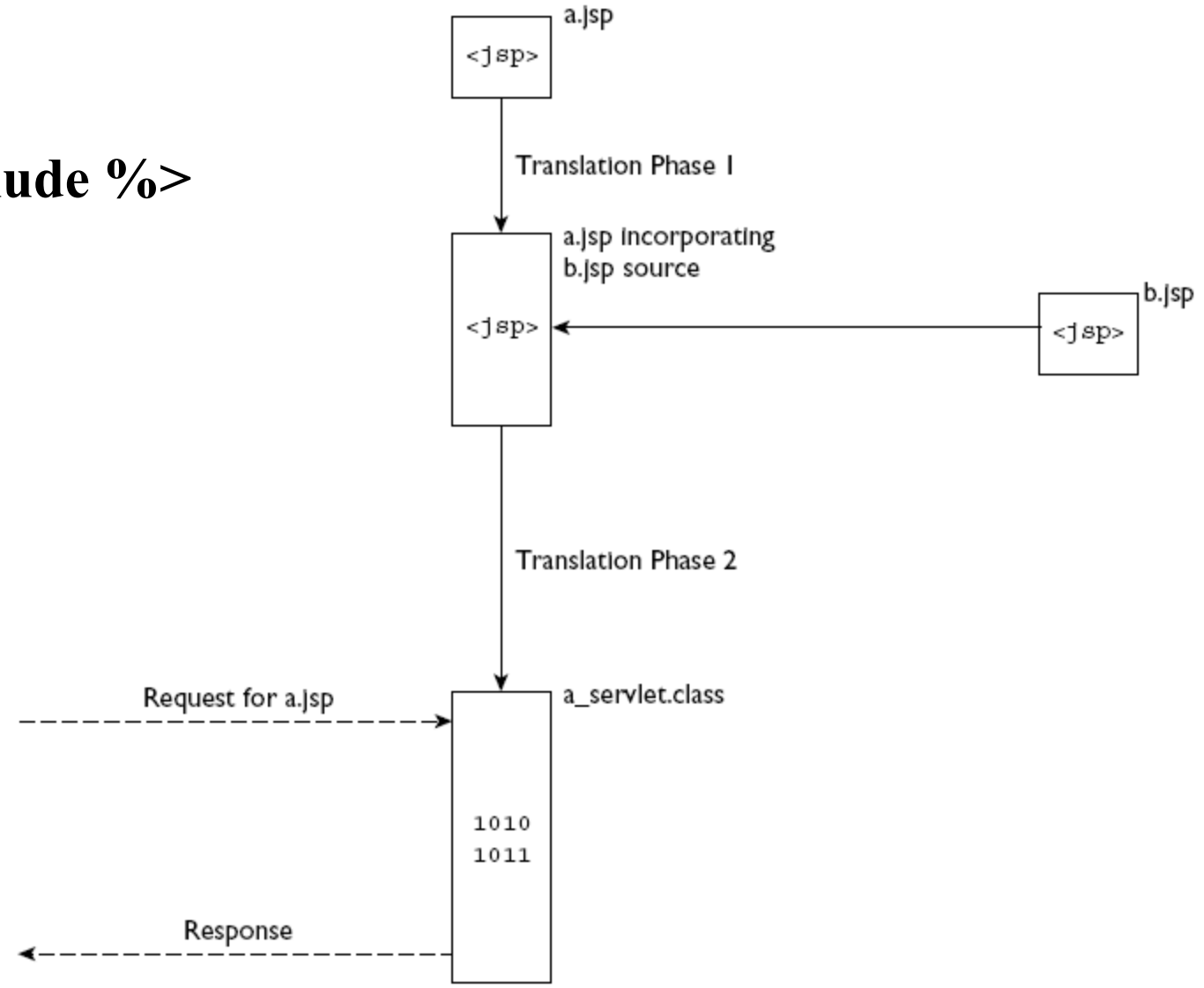


<jsp:include>

Dispatching Mechanisms

<jsp:include> vs. <%@ include …%>

<%@ include %>



Dispatching Mechanisms

The <jsp:forward> tag

- **Forwards processing to another resource** within the web application
- To permanently **transfer control from** a **JSP** page **to another location** on the local server
- Is used to **redirect** the **request object containing** the client **request from** one **JSP** file **to another** file. The **target** file can be an **HTML** file, another **JSP** file or a **servlet**
- **The code after the <jsp:forward> element is not processed**
- **Syntax**

```
<jsp:forward page="…" /> or
<jsp:forward page="…" >
   <jsp:param name="…" value="…"/>
</jsp:forward>
```

Dispatching Mechanisms

The <jsp:param> tag

- Pass **one or more name and value pairs** as parameters to an **included or forwarded** resource like a JSP page, servlet or other resource that can process the parameter (such as jsp:forward and jsp:include)
- **Syntax**

<jsp:param name="…" value="{parValue|<%=exp%>}" />

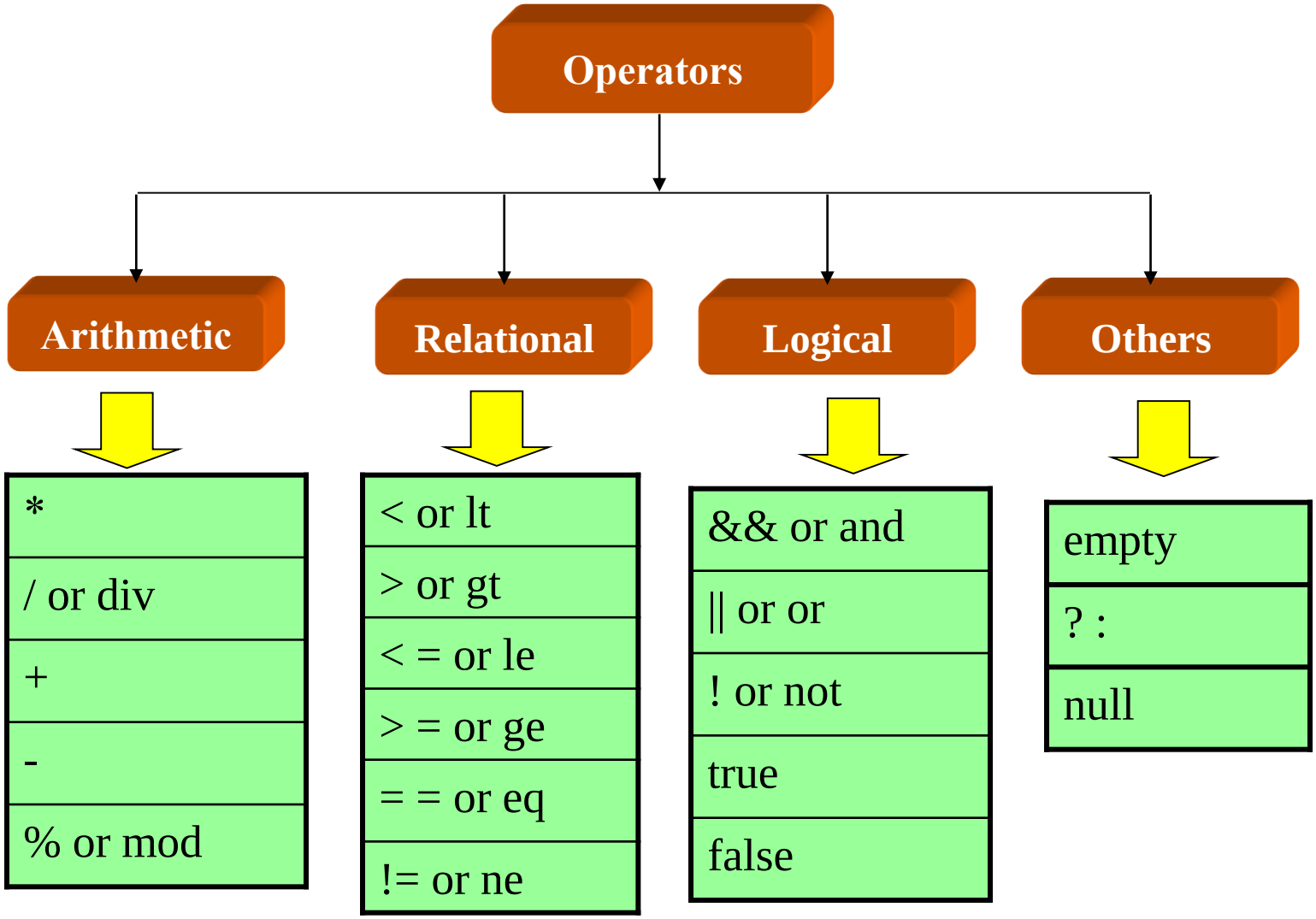
Expression Languages

EL Language Basics

- **New feature** of JSP 2.0
- Allows JSP developers to **access and manipulating java objects** via a **compact**, **easy-to-use shorthand style** (similar to JavaScript)
- It can **handle both expressions and literals**
- Can be used to display the **generated dynamic content** in a table on the web page and can also be used in HTML tags
- **Developed by two groups**
  - JSP Standard Tag Library expert group
  - JSP 2.0 expert group
- **Syntax**: **${EL Expression}**
- **JSP EL expressions are used in**
  - **Static** text
  - **Standard** and **Custom** tags
- **Advantages**
  - **Clear** syntax
  - **Simple** & **robust**
  - **Easy access** application **data stored** (in **JavaBeans**)

Expression Languages

EL Operators



Expression Languages

EL Operators – Example

math.jsp

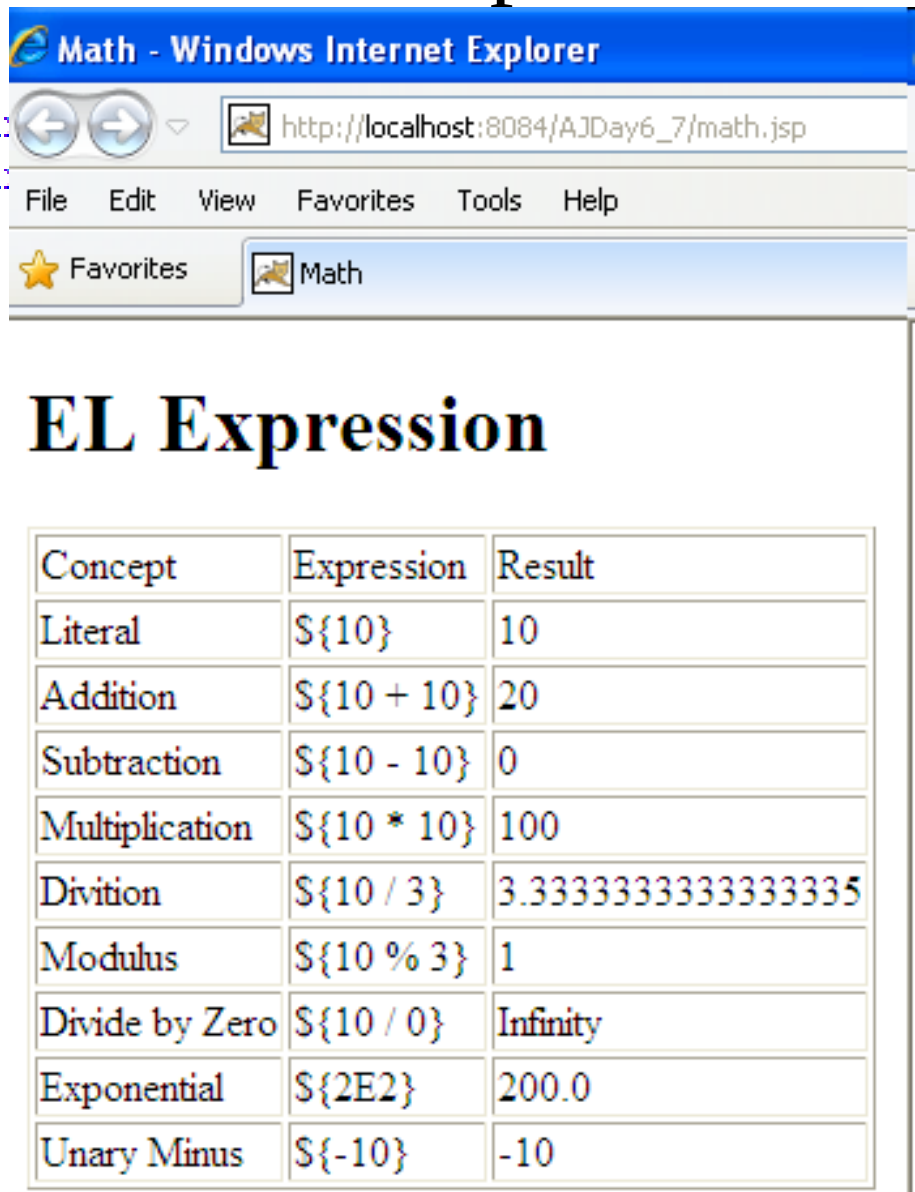
Source | History

```
4       Author      : Trong Khanh
5   --%>
6
7   <%@page contentType="text/html" pageEnco
8   <!DOCTYPE html>
9   <html>
10      <head>
11          <meta http-equiv="Content-Type" 
12          <title>Math</title>
13      </head>
14      <body>
15          <h1>EL Expression</h1>
17          <table border="1">
17              <tr>
18                  <td>Concept</td>
19                  <td>Expression</td>
20                  <td>Result</td>
21              </tr>
22              <tr>
23                  <td>Literal</td>
24                  <td>${"${"}10}</td>
25                  <td>${10}</td>
26              </tr>
27              <tr>
28                  <td>Addition</td>
29                  <td>${"${"}10 + 10}</td>
30                  <td>${10 + 10}</td>
31              </tr>
32              <tr>
33                  <td>Subtraction</td>
34                  <td>${"${"}10 - 10}</td>
35                  <td>${10 - 10}</td>
36              </tr>
37              <tr>
38                  <td>Multiplication</td>
39                  <td>${"${"}10 * 10}</td>
40                  <td>${10 * 10}</td>
41              </tr>
42              <tr>
43                  <td>Divition</td>
44                  <td>${"${"}10 / 3}</td>
45                  <td>${10 / 3}</td>
46              </tr>
47              <tr>
48                  <td>Modulus</td>
49                  <td>${"${"}10 % 3}</td>
50                  <td>${10 % 3}</td>
51              </tr>
```

Expression Languages

EL Operators – Example

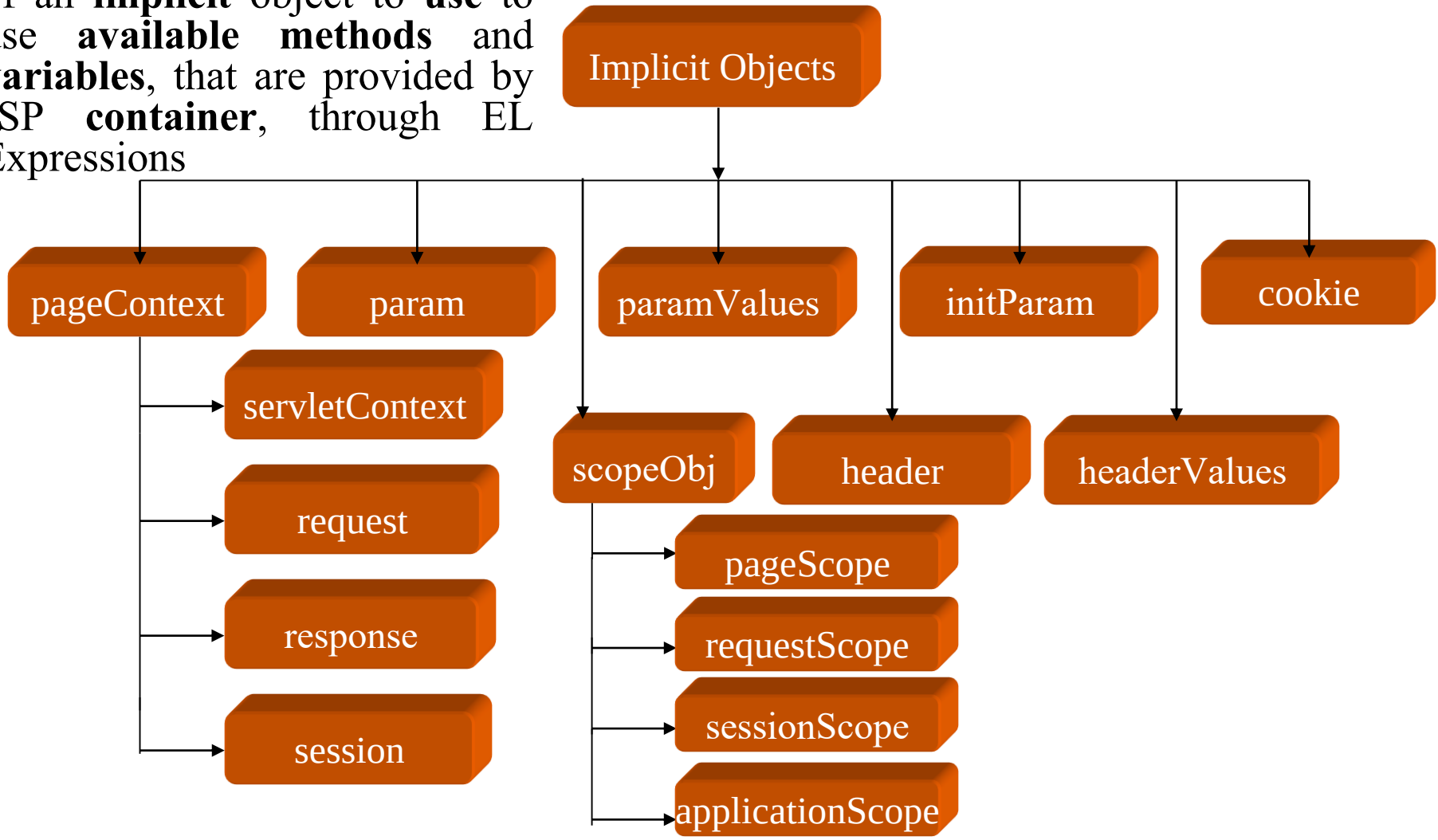
```
52              <tr>
53                  <td>Divide by Zero</td>
54                  <td>${"${"}10 / 0}</td>
55                  <td>${10 / 0}</td>
56              </tr>
57              <tr>
58                  <td>Exponential</td>
59                  <td>${"${"}2E2}</td>
60                  <td>${2E2}</td>
61              </tr>
62              <tr>
63                  <td>Unary Minus</td>
64                  <td>${"${"}-10}</td>
65                  <td>${-10}</td>
66              </tr>
67          </table>
68      </body>
69  </html>
70
```



Expression Languages

EL Implicit Objects

- Are a **standard set of classes**.
- The user **creates** an **instance** of an **implicit** object to **use** to use **available methods** and **variables**, that are provided by JSP **container**, through EL Expressions



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EL Implicit Objects

Objects	Descriptions
pageContext	- Can be used without creating an instance of the object - Provides access to **page attributes** - Can be used to access different page attributes
servletContext	- Specifies the JSP page, servlet and Web components contained in the same **application**. **Communication** with servlet container
session	- Represents the **session** created for the client sending a request
request	- Represents the **request** accepted by the JSP page from client
response	- Represents the **response** sent to the client by the JSP page. The response contains the data passed between a client and servlet
param	- Returns a value that **maps** a request parameter name to a single string value
paramValues	- Returns and **array of values**, which is mapped to the request parameters from client
header	- Returns a request **header** name & maps the value to single string value
headerValues	- Returns an **array** of **values** that is mapped to the request header
cookie	- Returns the **cookie** name mapped to a single cookie object
initParam	- Returns a **context initialization parameter name**, which is mapped to a single value

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Expression Languages

EL Implicit Objects

- **getParameter**
  - **${param.param_Name}**
  - Similar to: **request.getParameter("param_Name")**
- **Get Properties** in Java Beans
  - **${bean_id.property_name}** **or** **${bean_id["property_name"]}**
    - Similar to: **<%= bean_id.getProperty_name %>**
    - **Or, <jsp:getProperty name="bean_id" property="prop_name"/>**

Expression Languages

Scoped Variables

- **Variables**
  - Are used to **store and access values** in JSP program
  - **Refers as a attributes** that are stored in standard scope such as **page, request, session and application**
    - **Ex**: <% xxxContext.setAttribute("info", "att") %>
      ${info} or ${xxxScope.info}
  - **Dot operator "." or square brackets [ ]** can be used to access value of variable
    - The **"." and []** is used to **display** a **property** of java bean (**getter** method)
    - They are **not limited one level**
    - They support **accessing** the **arrays, lists, and map** element (e.g. a[i], list.get(i), map.getValue(key)
  - **Ex**
    - ${pageScope.color}
    - ${pageScope["color"]}
- The term **scoped variable** means that the variable confined to the **mentioned context only**.
- The EL **enhances supporting the retrieval of the stored objects as scoped variables**

Expression Languages

Scoped Variables

Scopes	Descriptions
pageScope	- Returns **page-scoped variable names**, which are mapped to their values - Is accessible from the JSP page that creates the object
requestScope	- Provides access to the attributes of **request object** - Returns **requests coped variable names**, which are mapped to their values - Is accessible from web components handling a request that belongs to the session
sessionScope	- Returns **session-scoped variable names**, which are mapped to their values - Is accessible from Web components handling a request that belong to the session
applicationScope	- Returns **application-scoped variable** and maps the variable name to their values

Expression Languages

Example

welcome.jsp

Source | History

```
4       Author      : Trong Khanh
5   --%>
6
7   <%@page import="sample.javabean.LoginBe
8   <%@page contentType="text/html" pageEnc
9   <!DOCTYPE html>
10  <html>
11      <head>
12          <meta http-equiv="Content-Type"
13          <title>Home</title>
14      </head>
15      <body>
            <font color="green">Welcome, ${sessionScope.loginAtt.username}</font><br/>
17          <jsp:useBean id="loginAtt" class="sample.javabean.LoginBean" scope="session"/>
            <font color="violet">Welcome, ${loginAtt.username}</font><br/>
            <font color="blue">Welcome,
20          <jsp:getProperty name="loginAtt" property="username" /></font><br/>
            <font color="red">Welcome,
```

Home - Windows Internet Explorer

http://localhost:8084/AJDay6_7/processLogin.jsp

File Edit View Favorites Tools Help

Favorites | Home

Welcome, khanh

Welcome, khanh

Welcome, khanh

Expression Languages
Example

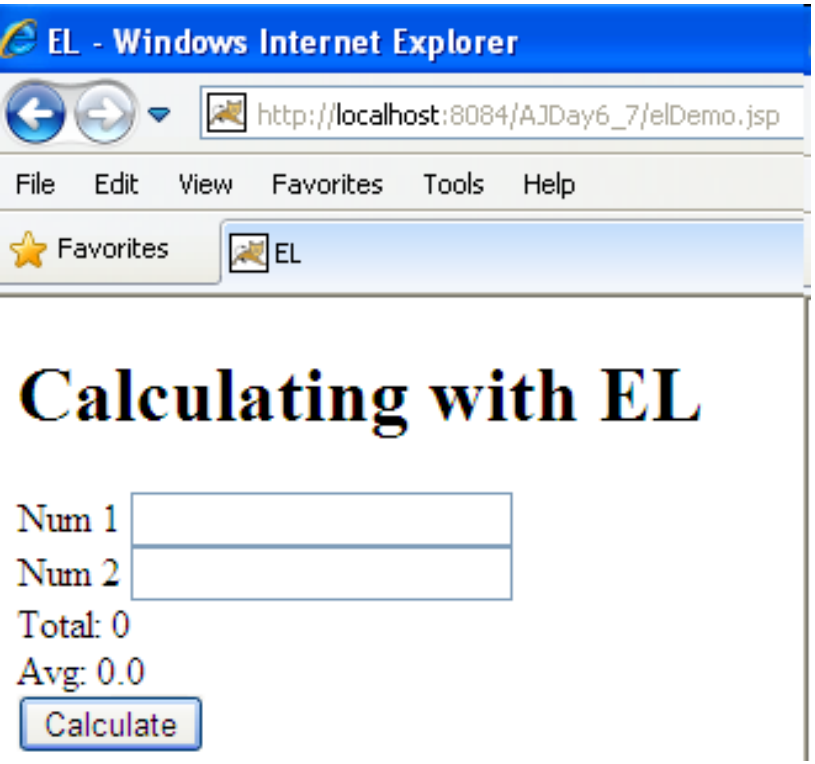
home.jsp

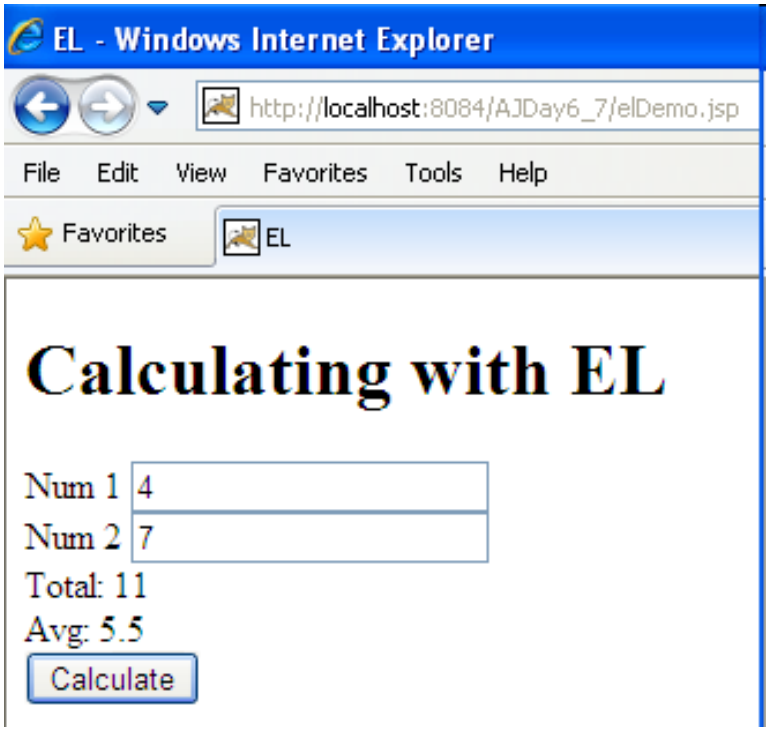
Source | History

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

Expression Languages

Example






```
<form method="POST">
    Num 1 <input type="text" name="num1" value="${param.num1}" /><br/>
    Num 2 <input type="text" name="num2" value="${param.num2}" /><br/>
    Total: ${param["num1"] + param.num2}<br/>
    Avg: ${(param.num1 + param["num2"])/2}<br/>
    <input type="submit" value="Calculate" />
</form>
```

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Summary

- **How to build the Web Application using MVC1? How to remove the java code in the jsp (view)?**
  - Standard Actions
  - Dispatching Mechanisms
  - Expression Language

Q&A

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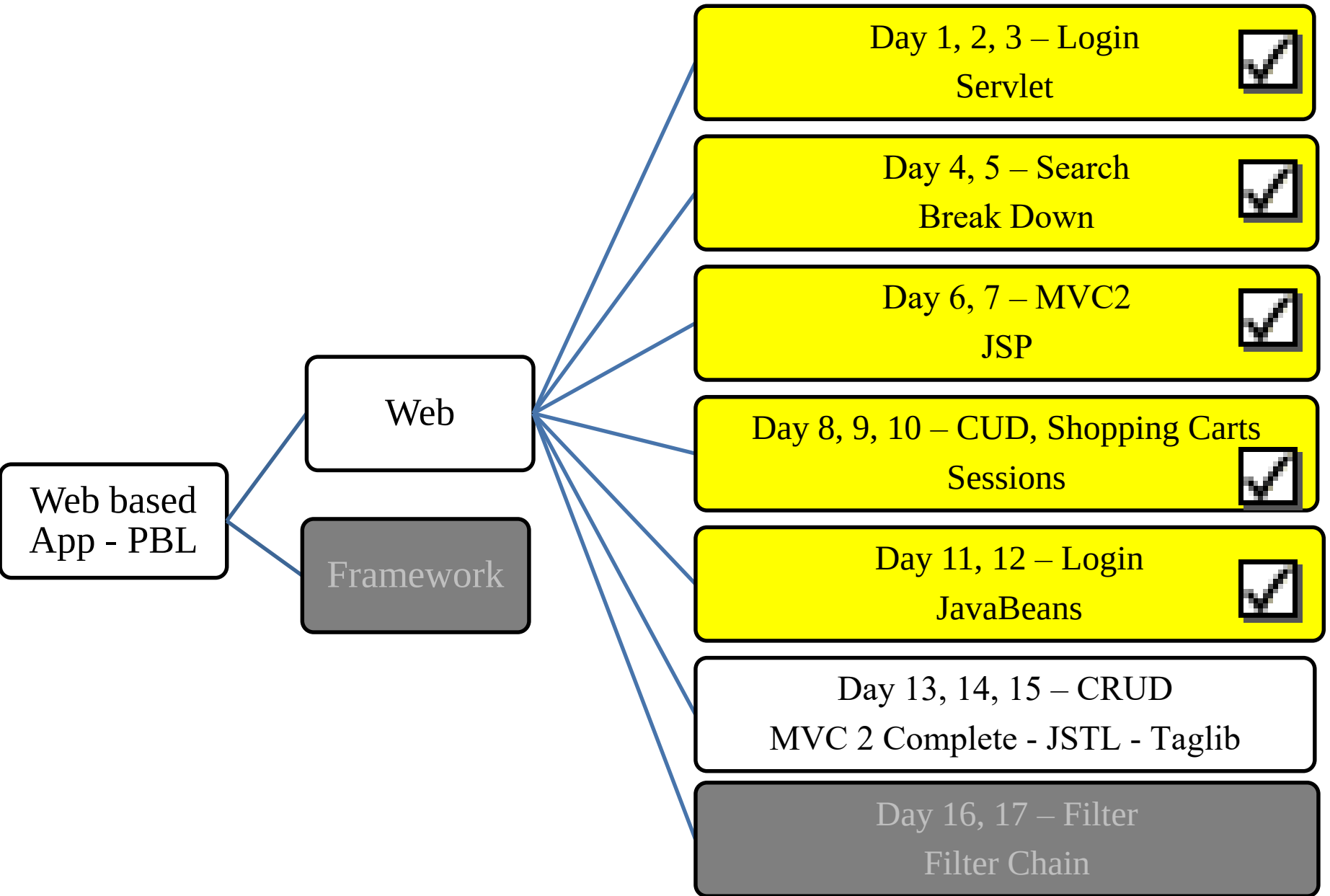
Next Lecture

- **How to remove completed Scripting Element (Java Code) in JSP (View)? Complete the View of MVC 2 Design Pattern**
  - **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

Next Lecture



Appendix - MVC1

Login page

login.html

Source | History

```
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="txtUsername" value="" /><br/>
14              Password <input type="password" name="txtPassword" value="" /><br/>
15              <input type="submit" value="Login" />
16              <input type="reset" value="Reset" />
17          </form>
18      </body>
19  </html>
```

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MVC1
Login Beans

LoginBean.java

Source | History

```
14      * @author Trong Khanh
15      */
16     public class LoginBean implements Serializable {
17         private String username;
18         private String password;
19
20         public LoginBean() {...2 lines }
22
23         /**...3 lines */
26         public String getUsername() {...3 lines }
29
30         /**...3 lines */
33         public void setUsername(String username) {...3 lines }
36
37         /**...3 lines */
40         public String getPassword() {...3 lines }
43
44         /**...3 lines */
47         public void setPassword(String password) {...3 lines }
50
51         public boolean checkLogin () {
52             RegistrationDAO dao = new RegistrationDAO();
53             boolean result = dao.checkLogin(username, password);
54
55             return result;
56         }
57     }
```

MVC1
Process Login JSP

processLogin.jsp

Source | History

```
4       Author      : Trong Khanh
5   --%>
6   <%@page contentType="text/html" pageEncoding="UTF-8"%>
7   <!DOCTYPE html>
8   <html>
9       <head>
10          <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
11          <title>Prosessing</title>
12      </head>
13      <body>
14          <h1>Process Login</h1>
15          <jsp:useBean id="loginAtt" class="sample.javabeans.LoginBean" scope="session"/>
16          <jsp:setProperty name="loginAtt" property="username"
17                           value='<%= request.getParameter("txtUsername") %>'/>
18          <jsp:setProperty name="loginAtt" property="password"
19                           value='<%= request.getParameter("txtPassword") %>'/>
20          <%
21              if (loginAtt.checkLogin()) {
22                  response.sendRedirect("welcome.jsp");
23              } else {
24                  out.print("Invalid username or password!!!!");
25              }
26          %>
27      </body>
```

MVC1
Process Login JSP

processLogin.jsp

Source | History

```
4       Author      : Trong Khanh
5   --%>
6
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>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="username" param="txtUsername"/>
18          <jsp:setProperty name="loginAtt" property="password" param="txtPassword"/>
19          <%
20              if (loginAtt.checkLogin()) {
21                  response.sendRedirect("welcome.jsp");
22              } else {
23                  out.print("Invalid username or password!!!!");
24              }
25          %>
26      </body>
27  </html>
```

MVC1
Welcome page

welcome.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  <html>
11      <head>
12          <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
13          <title>Home</title>
14      </head>
15      <body>
16          <jsp:useBean id="loginAtt" class="sample.javabean.LoginBean" scope="session"/>
17          <font color="blue">Welcome,
18          <jsp:getProperty name="loginAtt" property="username" /></font><br/>
19          <font color="red">Welcome,
20              <%= ((LoginBean) session.getAttribute("loginAtt")).getUsername()%></font><br/>
21          <h1>Welcome to Standard Action</h1>
22          <form action="welcome.jsp">
23              Name <input type="text" name="txtName" value="" /><br/>
24              <input type="submit" value="Search" />
25          </form>
26      </body>
27  </html>
```

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MVC1
Optimizing

```
<form action="processLogin.jsp" method="POST">
    Username <input type="text" name="username" value="" /><br/>
    Password <input type="password" name="password" value="" /><br/>
    <input type="submit" value="Login" />
    <input type="reset" value="Reset" />
</form>
```

```
<jsp:useBean id="loginAtt" class="sample.javabean.LoginBean" scope="session"/>
<jsp:setProperty name="loginAtt" property="username" />
<jsp:setProperty name="loginAtt" property="password" />
```

```
<jsp:useBean id="loginAtt" class="sample.javabean.LoginBean" scope="session"/>
<jsp:setProperty name="loginAtt" property="*" />
```

Appendix – JSP Standard Actions

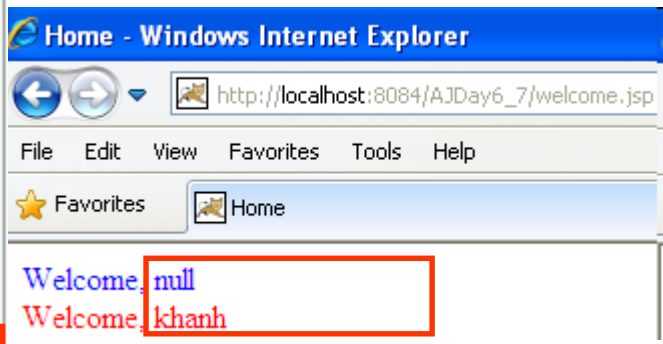
Scope of JavaBeans – Example

processLogin.jsp

```
4       Author      : Trong Khanh
5   --%>
6
7   <%@page contentType="text/html" pageEncoding="UTF-8"%>
8   <!DOCTYPE html>
9   <html>
10      <.../>
14      <body>
15          <h1>Process Login</h1>
16          <jsp:useBean id="loginAtt" class="sample.javabean.LoginBean" scope="session"/>
17          <jsp:setProperty name="loginAtt" property="*" />
```

welcome.jsp

```
4       Author      : Trong Khanh
5   --%>
6
7   <%@page import="sample.javabean.LoginBean"%>
8   <%@page contentType="text/html" pageEncoding="UTF-8"%>
9   <!DOCTYPE html>
10  <html>
11      <.../>
15      <body>
16          <jsp:useBean id="loginAtt" class="sample.javabean.LoginBean"/>
```



JSP Standard Actions

Scope of JavaBeans – Example

welcome.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  <html>
11      <.../>
15      <body>
16
17          <font color="blue">Welcome,
18          <jsp:getProperty name="loginAtt" property="username" /></font><br/>
```

Apache Tomcat/7.0.34 - Error report - Windows Internet Explorer

http://localhost:8084/AJDay6_7/welcome.jsp

File Edit View Favorites Tools Help

Favorites | Apache Tomcat/7.0.34 - Error report

HTTP Status 500 - file:/welcome.jsp(18,8) jsp:getProperty for bean with nar 'loginAtt'. Name was not previously introduced as per JSP.5.3

---

type Exception report

message file:/welcome.jsp(18,8) jsp:getProperty for bean with name 'loginAtt'. Name was not previously introduced as per JSP.5.3

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

exception

```
org.apache.jasper.JasperException: file:/welcome.jsp(18,8) jsp:getProperty for bean with name 'loginAtt'.
```

JSP Standard Actions

Scope of JavaBeans, accessing on Servlet via HttpSession– Example

welcome.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  <html>
11      <.../>
15      <body>
16          <jsp:useBean id="loginAtt" class="sample.javabean.LoginBean" scope="session"/>
17          <font color="blue">Welcome,
18          <jsp:getProperty name="loginAtt" property="username" /></font><br/>
19          <font color="red">Welcome,
20              <%= ((LoginBean) session.getAttribute("loginAtt")).getUsername()%></font><br/>
21          <h1>Welcome to Standard Action</h1>
22          <form action="welcome.jsp">
23              Name <input type="text" name="txtName" value="" /><br/>
24              <input type="submit" value="Search" />
25          </form>
26          <a href="TestServlet">Go to Test Servlet </a>
27      </body>
28  </html>
```

JSP Standard Actions

Scope of JavaBeans, accessing on Servlet via HttpSession– Example

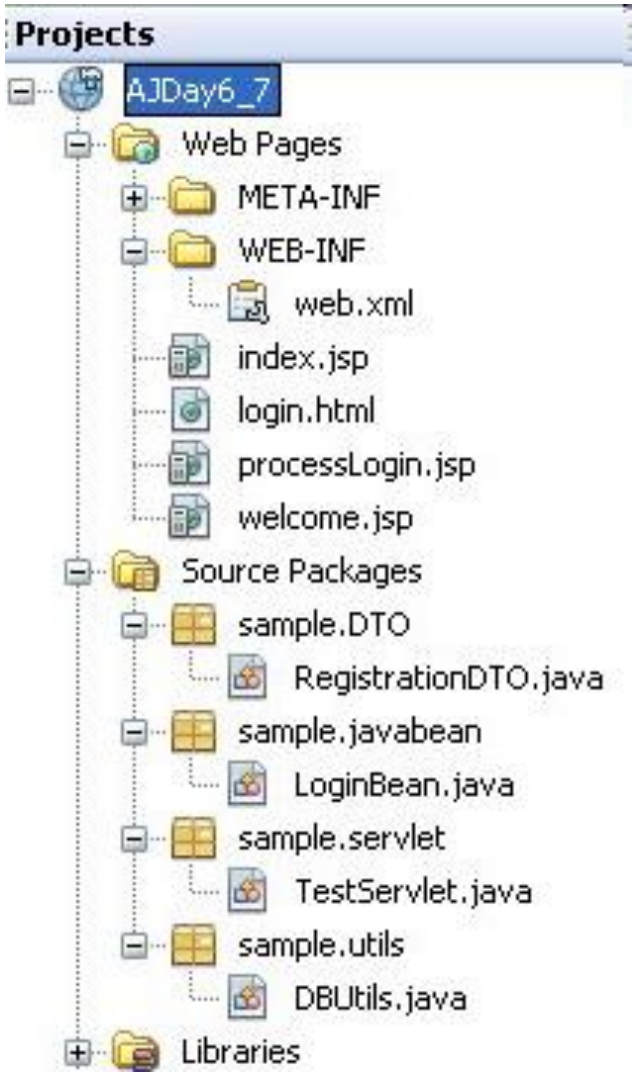
TestServlet.java

Source | History

```
18      * @author Trong Khanh
19      */
20     public class TestServlet extends HttpServlet {
21
22         /**...*/
32         protected void processRequest(HttpServletRequest request, HttpServletRespor
33                 throws ServletException, IOException {
34             response.setContentType("text/html;charset=UTF-8");
35             PrintWriter out = response.getWriter();
36             try {
37                 HttpSession session = request.getSession(false);
38                 if (session != null) {
39                     LoginBean login = (LoginBean)session.getAttribute("loginAtt");
40                     out.println("Username " + login.getUsername());
41                 }
42             } finally {
43                 out.close();
44             }
45         }
```

JSP Standard Actions

Scope of JavaBeans, accessing on Servlet via HttpSession– Example



Appendix – Dispatching Mechanisms

Example

processLogin.jsp

Source | History

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

Dispatching Mechanisms

Example

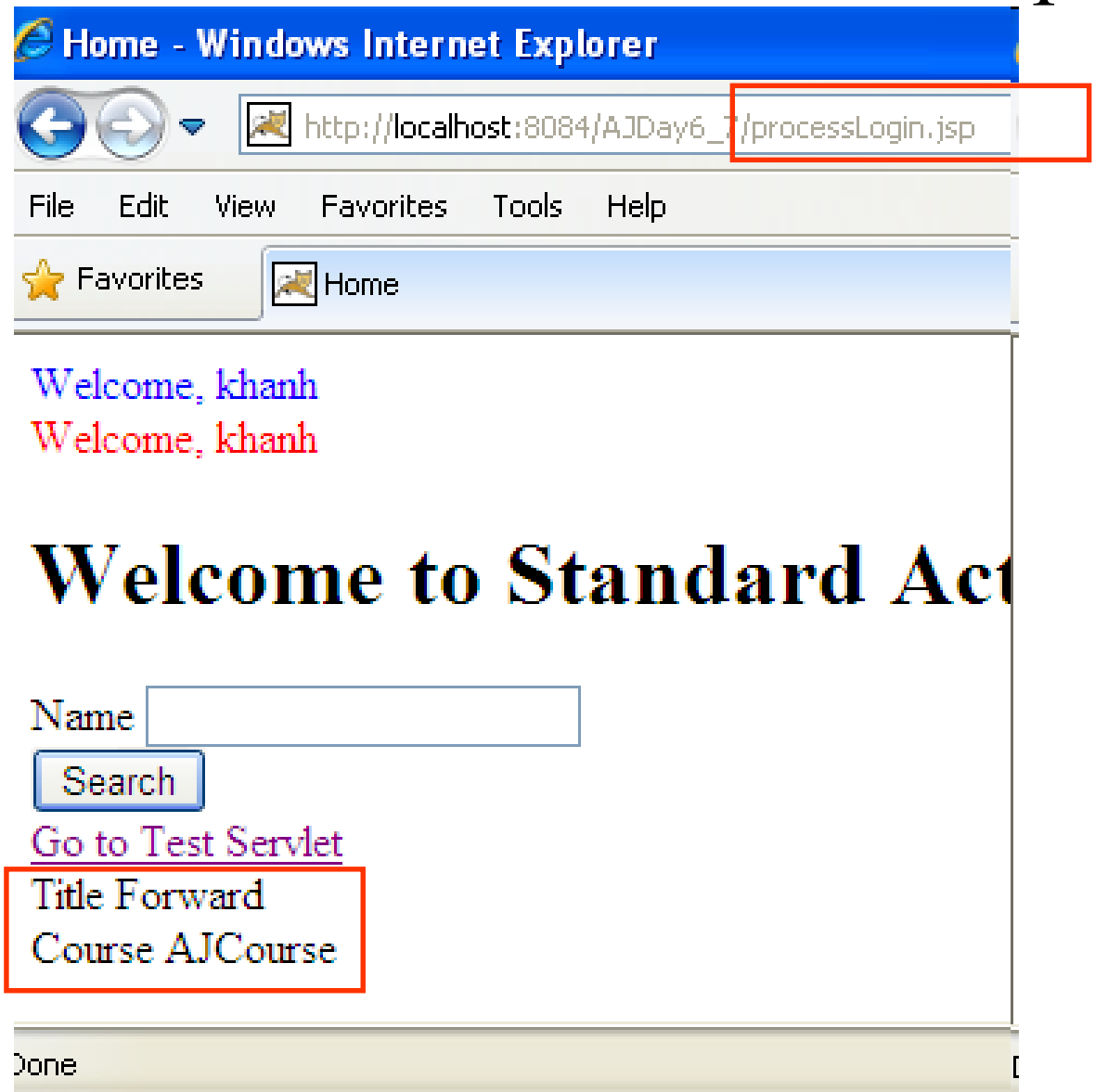
welcome.jsp

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  <html>
11      <head>
12          <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
13          <title>Home</title>
14      </head>
15      <body>
16          <jsp:useBean id="loginAtt" class="sample.javabean.LoginBean" scope="session"/>
17          <font color="blue">Welcome,
18          <jsp:getProperty name="loginAtt" property="username" /></font><br/>
19          <font color="red">Welcome,
20          <%= ((LoginBean) session.getAttribute("loginAtt")).getUsername()%></font><br/>
21          <h1>Welcome to Standard Action</h1>
22          <form action="welcome.jsp">
23              Name <input type="text" name="txtName" value="" /><br/>
24              <input type="submit" value="Search" />
25          </form>
26          <a href="TestServlet">Go to Test Servlet </a><br/>
27          Title <%= request.getParameter("title")%><br/>
28          Course <%= request.getParameter("course")%><br/>
29      </body>
30  </html>
```

Dispatching Mechanisms

Example



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Appendix
XML for JSPs

- **HTML** is **narrowly focused** on marking up take
- **XML** can be **defined by users** and can **used** for **making up text** (as in XHTML), but it has a pretty much infinite set of the other possible uses
- **The tag in jsp has**
  - **Opening** tag
  - **Closing** tag
  - **Data content between** the opening and closing tags (called as the body)
  - The **opening tag can have a prefix** and can **contain many attributes**
  - **Contain the nested tag**

Appendix
XML-Friendly Syntax

- **JSP documents**
  - Are JSP source files written entirely in XML syntax
  - Have **a .jspx extension**
  - Can be also be **identified by setting in web deployment descriptor**

```
<jsp-config>
  <jsp-property-group>
        <url-pattern>/jspx/*</url-pattern>
        <is-xml>true</is-xml>
  </jsp-property-group>
</jsp-config>
```

- Or, Define in a JSP document as form

```
<jsp:root xmlns:jsp="http://java.sun.com/JSP/Page">
```

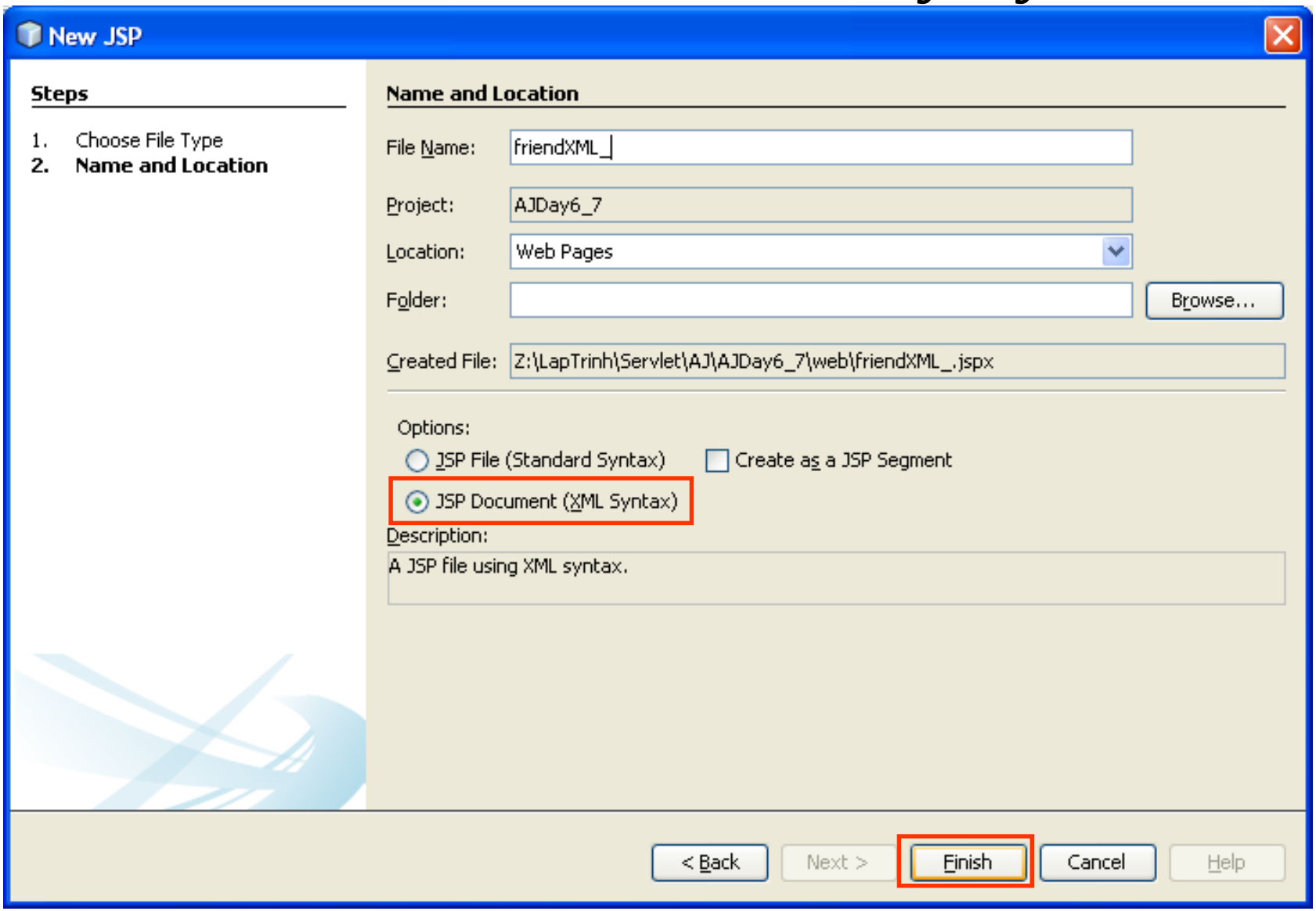
Appendix

XML-Friendly Syntax

- JSP document **syntax provides replacements for all <%-type scripting element syntax**
  - <jsp:scriptlet>…</jsp:scriptlet> replace <%...%>
  - <jsp:expression>…</jsp:expression> replace <%= … %>
  - <jsp:declaration>…</jsp:declaration> replace <%! … %>
  - <jsp:directive.page …/> replace <%@page ...%>
  - <jsp:directive.include …/> replace <%@ include …%>
  - <!-- … --> replace <%-- … --%>
  - There are some things within the Java language itself that are anathema to XML validators (ex: "<" symbol looks like the beginning of an opening or closing tag, and an XML validator will assuredly treat it as such)
    - Using as an **entity** in **XML** that **begin** with an **ampersand (&) and end** on a **semicolon (;). Ex**: <
    - **Using** <![CDATA[**symbol**]]> or <![CDATA[command]]>
      - **Ex**: <![CDATA[for(int i=0; i<10; i++)]]> or i <![CDATA[<]]> 10

Appendix

XML-Friendly Syntax



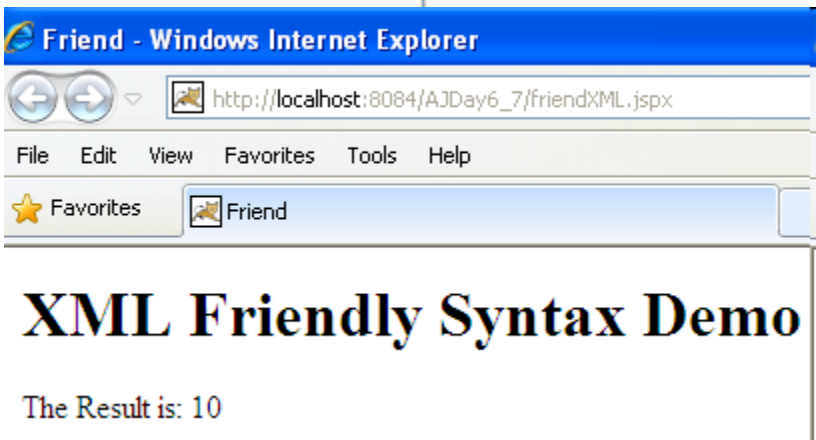
Appendix

XML-Friendly Syntax – Sample

friendXML.jspx

Source | History

```
5       Author      : Trong Khanh
6   -->
7   <jsp:root xmlns:jsp="http://java.sun.com/JSP/Page" version="2.0">
8       <jsp:directive.page contentType="text/html" pageEncoding="UTF-8"/>
9       <jsp:element name="text">
10          <title>Friend</title>
11          <jsp:body>
12              <h1>XML Friendly Syntax Demo</h1>
13              <jsp:declaration>
14              public int add(int n) {
15                  return n + 5;
16              }
17              </jsp:declaration>
18              <jsp:scriptlet>int a = add(5);</jsp:scriptlet>
19              The Result is: <jsp:expression>a</jsp:expression>
20          </jsp:body>
21      </jsp:element>
22  </jsp:root>
```



Appendix

XML-Friendly Syntax – Sample

friendXML.jspx

Source | History

```
5       Author      : Trong Khanh
6   -->
7   <jsp:root xmlns:jsp="http://java.sun.com/JSP/Page" version="2.0">
8       <jsp:directive.page contentType="text/html" pageEncoding="UTF-8"/>
9       <jsp:element name="text">
10          <title>Friend</title>
11          <jsp:body>
12              <h1>XML Friendly Syntax Demo</h1>
13              <jsp:declaration>
14                  public int add(int n) {
15                      return n + 5;
16                  }
17              </jsp:declaration>
18              <jsp:scriptlet>int a = add(5);</jsp:scriptlet>
19              The Result is: <jsp:expression>a</jsp:expression>
20                  <br/>
21              <jsp:scriptlet>
                    for (int i = 0; i < 5; i++) {
23                      out.print("");
24                  }
25              </jsp:scriptlet>
26          </jsp:body>
27      </jsp:element>
28  </jsp:root>
```

```
<jsp:scriptlet>
    for (int i = 0; <![CDATA[i < 5]]>; i++) {
        out.print("");
    }
</jsp:scriptlet>
```

```
<jsp:scriptlet>
    <![CDATA[for (int i = 0; i < 5; i++)]]> {
        out.print("");
    }
</jsp:scriptlet>
```

Appendix

Functions using EL

- Supports **using** of the **Java function within** the JSP page is an **easy** as **using a tag**
- The **following steps** to set up EL to Java functions
  - **Step 1**: Creating “static” method
  - **Step 2**: Creating Tag Library Descriptor
  - **Step 3**: Modifying Deployment Descriptor and locating the TLD file in web deployment descriptor (if necessary)
  - **Step 4**: Access EL functions within JSP

Appendix

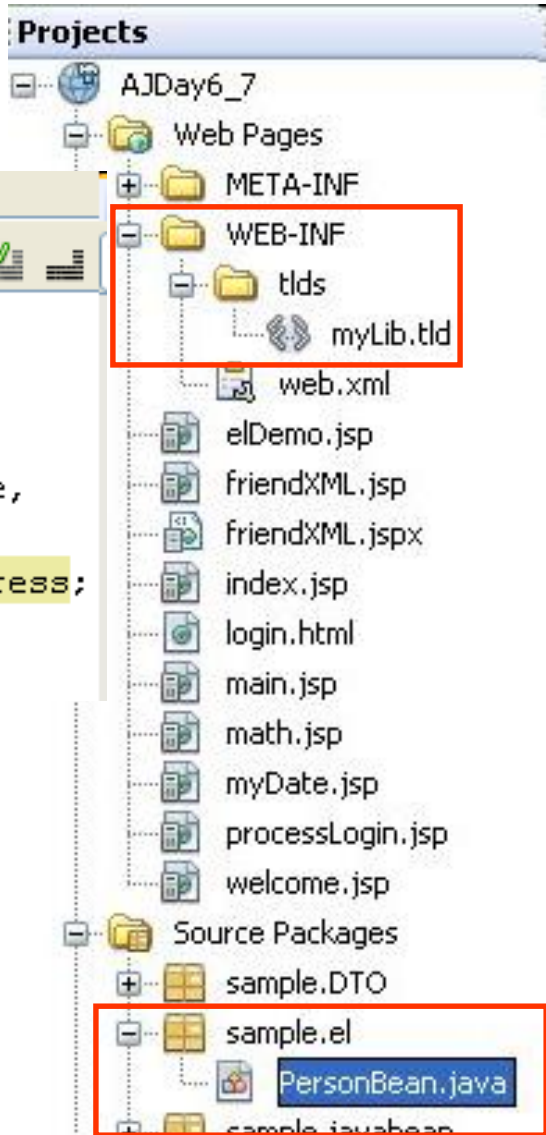
Creating "static" method

- The **static java methods** can be **called within the EL expression**
- **Ex:**

PersonBean.java

Source | History

```
8
9     * @author Trong Khanh
10    */
11   public class PersonBean {
12       public static String displayPersonalDetails(String name,
13               int age, String address) {
14           return "Name: " + name + " - " + age + " - " + address;
15       }
16   }
```



Appendix

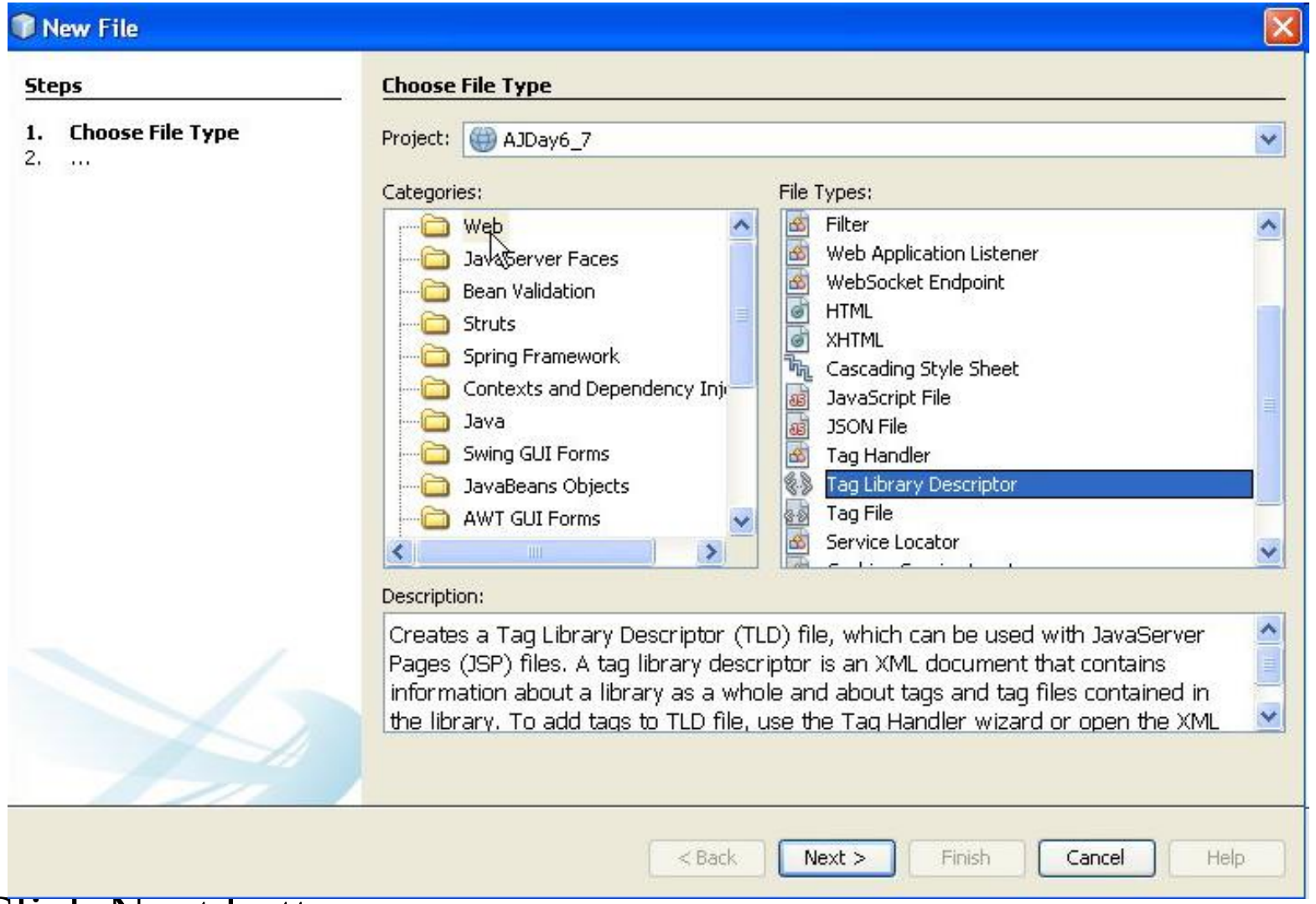
Creating Tag Library Descriptor

- **After defining** the functions, the **function name should** be **mapped** with EL **using** a **Tag Library Descriptor (TLD) file**
- A defined in a class with EL. **TLD file uses XML syntax to map the name of functions**
- Save this TLD file in the **/WEB-INF/tlds folder**, where tlds is a user-created folder

```
<?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>
  <function>
     <description>information description</description>
     <name>functionName</name>
     <function-class>Java class</function-class>
     <function-signature>declared method with parameters</function-signature>
  </function>
</taglib>
```

Appendix

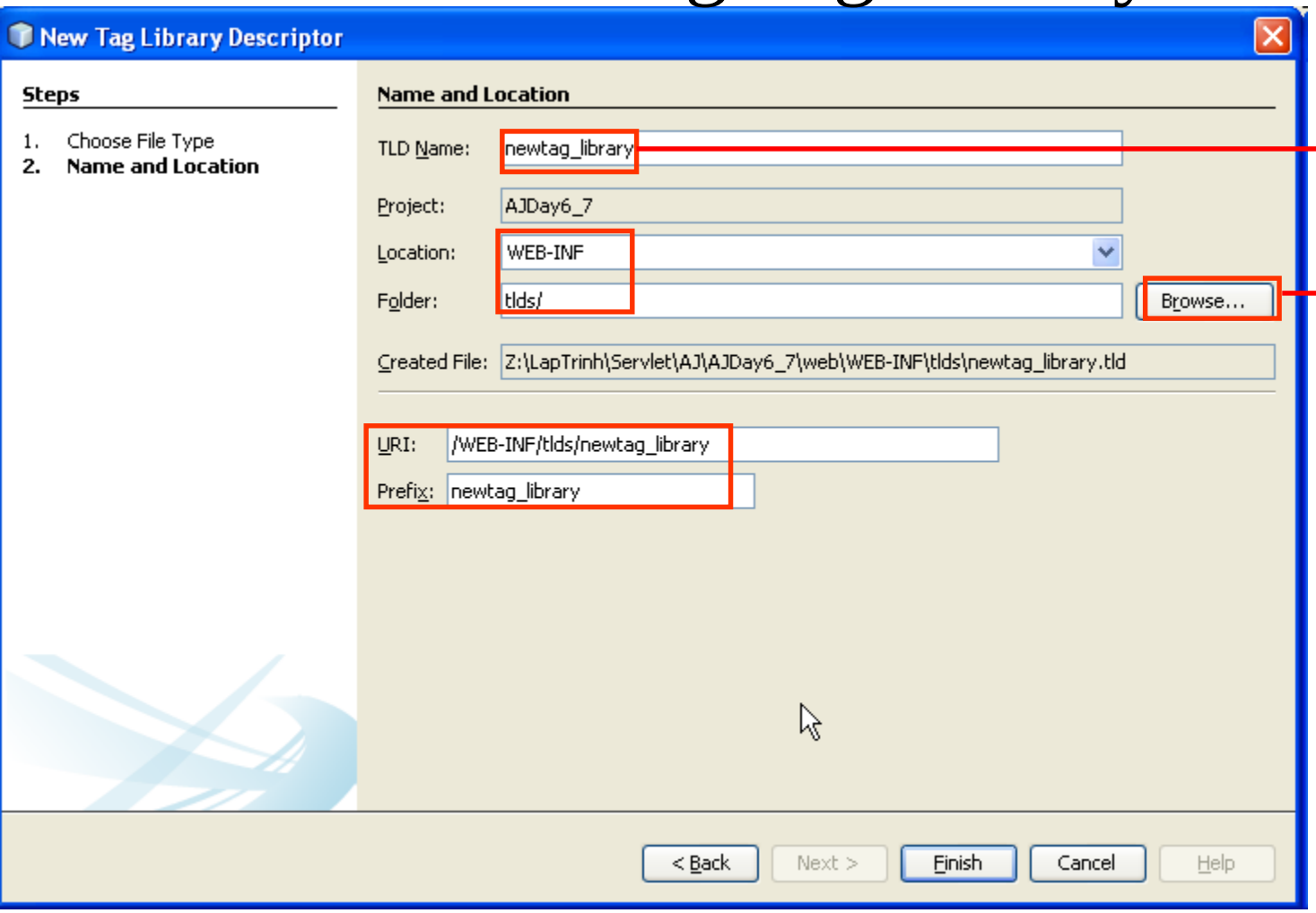
Creating Tag Library Descriptor



- Click Next button

Appendix

Creating Tag Library Descriptor



Fill taglib name

Browse to directory containing taglib. Should not be changed

- Click **Finish** button
- The taglig file with extension is **tld located** at the **WEB-INF/tlds** directory

Appendix

Creating Tag Library Descriptor

- Modified the .tld file

myLib.tld

Source | History

```
1  <?xml version="1.0" encoding="UTF-8"?>
2  <taglib version="2.1" xmlns="http://java.sun.com/xml/ns/javaee"
3          xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
4          xsi:schemaLocation="http://java.sun.com/xml/ns/javaee
5          http://java.sun.com/xml/ns/javaee/web-jsptaglibrary_2_1.xsd">
6    <tlib-version>1.0</tlib-version>
7    <short-name>mylib</short-name>
8    <uri>/WEB-INF/tlds/myLib</uri>
9    <function>
10       <name>displayPersonalDetails</name>
11       <function-class>sample.el.PersonBean</function-class>
12       <function-signature>
13           java.lang.String displayPersonalDetails(java.lang.String, int, java.lang.String)
14       </function-signature>
15   </function>
16 </taglib>
```

Appendix

Modifying the Deployment Descriptor

- The default mode for JSP pages delivered with JSP version 2.0 technology is to evaluate EL expressions
- JSP EL expression can be **enabled or disabled** with **02 ways**
  - **Using isELIgnored attribute in the JSP page directive**

```
<%@ page isELIgnored= “true | false” %>
```

  - **Modifing in web.xml**

```
<jsp-config>
    <jsp-property-group>
        <url-pattern>**.jsp**</url-pattern>
        <el-ignored>**false**</el-ignored>
    </jsp-property-group>
</jsp-config>
```

Appendix

Accessing EL functions within JSP

- To **access** the **function** created in a TLD file using a JSP file, developer need **to import the TLD file** using the **taglib directive**. In the directive statement, developer **need** to **mention** a prefix for the tags and location of the TLD file

<%@taglib prefix="prefix" uri="path" %>

- **After importing** the TLD file, **developer** can **access** the **function using** an EL expression

${prefix:funcName(args)}

Appendix
Example

elFunctionDemo.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/myLib.tld" prefix="my"%>
10  <html>
11      <head>
12          <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
13          <title>ElFunc</title>
14      </head>
15      <body>
16          <h1>EL Function Demo</h1>
17          ${my:displayPersonalDetails("KhanhKT", 33, "QTSC")}<br/>
18          ${my:displayPersonalDetails("KTKhanh", 43, "HCMC")}<br/>
19          ${my:displayPersonalDetails("KhanhKK", 23, "HCMC")}
20      </body>
21  </html>
```

7/elFunctionDemo.jsp

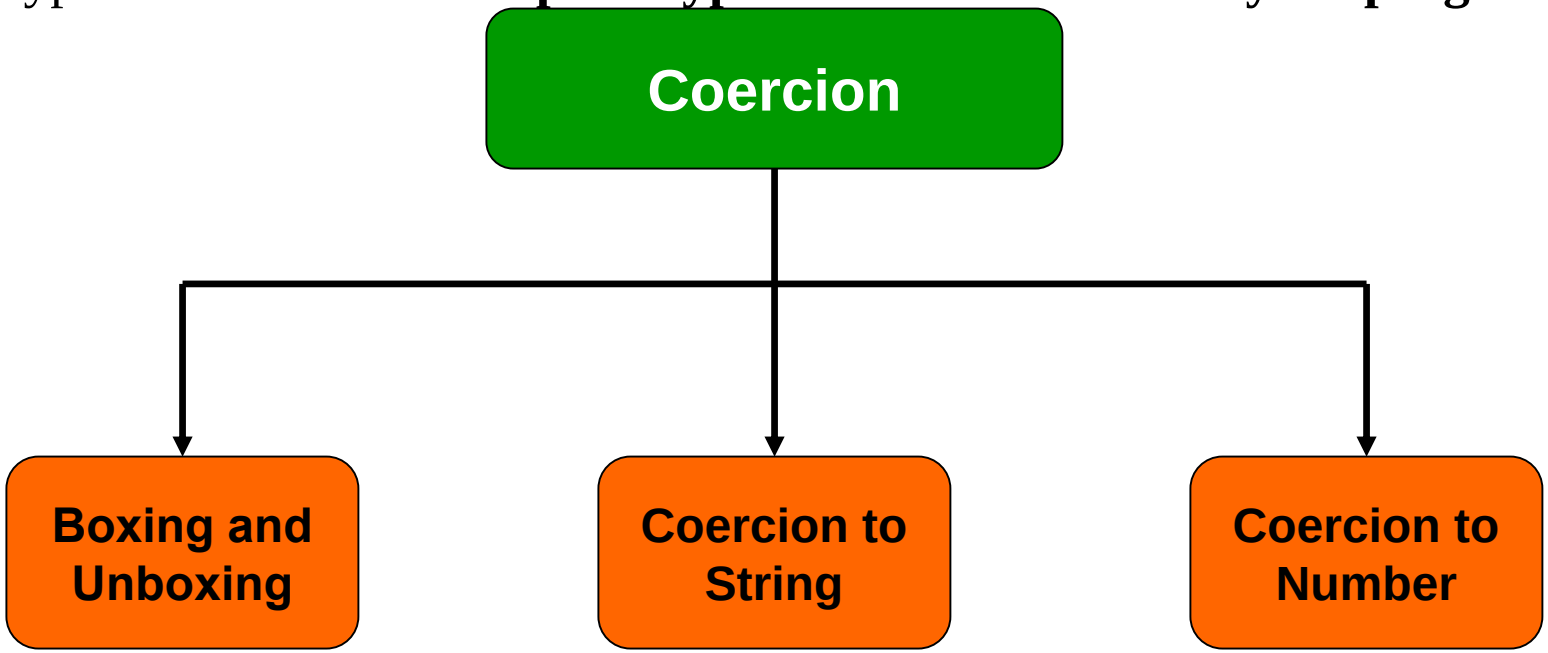
EL Function Demo

Name: KhanhKT - 33 - QTSC
Name: KTKhanh - 43 - HCMC
Name: KhanhKK - 23 - HCMC

Appendix

Coersion

- Means that the **parameters are converted to** the **appropriate objects or primitives automatically**
- EL defines appropriate **conversion with default values**
  - For example, a string parameter from a request will be coerced to the appropriate object or primitive.
- There is a **difference between** type **coercion and type conversion.**
  - **Coercion** is **implicit type conversion** and its usually **performed automatically by** the **compiler**
  - Type **conversion** is an **explicit type conversion** inserted **by** the **programmer**.



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Appendix

Coersion

- **Boxing an Unboxing**
  - **Boxing converts values** of **primitive type to corresponding** values of **reference type.**
    - If i is a **boolean** value, then boxing conversion **converts** i **into** a reference r or class and type **Boolean**, such that r.value() = i.
    - If i is a **byte** value, then boxing conversion **converts** i info a **reference** r of class and type **Byte**, such that r.value() = i
  - **Unboxing converts values** of **reference type to corresponding** values of **primitive type**
    - If r is a **Boolean** reference, then unboxing **conversion converts** r into v of type **boolean**, such that r.value() = v.
    - If r is a **Byte** reference, then unboxing **convertion converts** r into a value **v** of type byte, such that **r.value**() = v.
- **Coercion** to String
  - **A** is **String**, return **A**
  - A is **null**, return **“”**
  - A.toString() **throws exception**, **return error**. Otherwise **return A.toString()**

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Appendix
Coersion

- **Coercion to Number**
  - The rule to coerce a value to number type are If A is **null or “”,** return **0**
  - A is **character** and is **converted to short**, developer apply following rules:
    - If A is **Boolean**, return **error**
    - If A is **number** type, return **A**
  - A is **number**, coerce occurs quietly to type N using the following algorithm:
    - If N is **BigInteger**
      - If A is BigDecimal, return **A.toBigInteger()**
      - **Otherwise**, return **BigInteger.valueOf(A.longValue())**
    - If N is **BigDecimal**
      - If A is a BigInteger, return **new BigDecimal(A)**
      - **Otherwise**, return **new BigDecimal (A.doubleValue())**
    - If N is **Byte**, return new **Byte (A.byteValue())**
    - If N is **Short**, return new **Short (A.shortValue())**
    - If N is **Integer**, return new **Integer(A.integerValue())**
    - If N is **Long**, return new **Long(A.longValue())**
    - If N is **Float**, return new **Float(A.floatValue())**
    - If N is **Double**, return new **Double(A.doubleValue())**
    - **Otherwise** return **error**

Appendix

Coersion – Example

```
\${"2" + "2"} = ${"2" + "2"}
```

${"2" + "2"} = 4

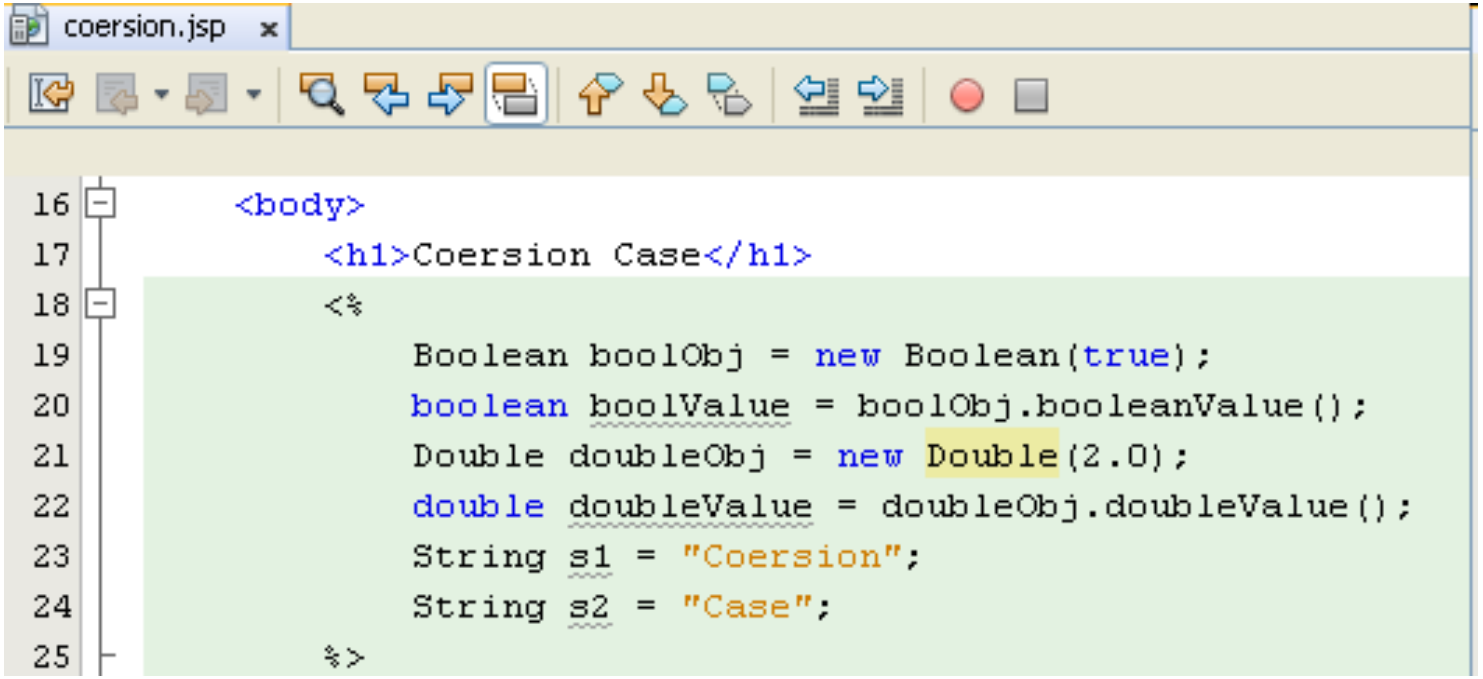
```
\${"2" + "2"} = ${"2" + "2"} <br/>
\${"2" + 2} = ${"2" + 2}
```

${"2" + "2"} = ${"2" + "2"}

${"2" + 2} = 4

Appendix
Coersion

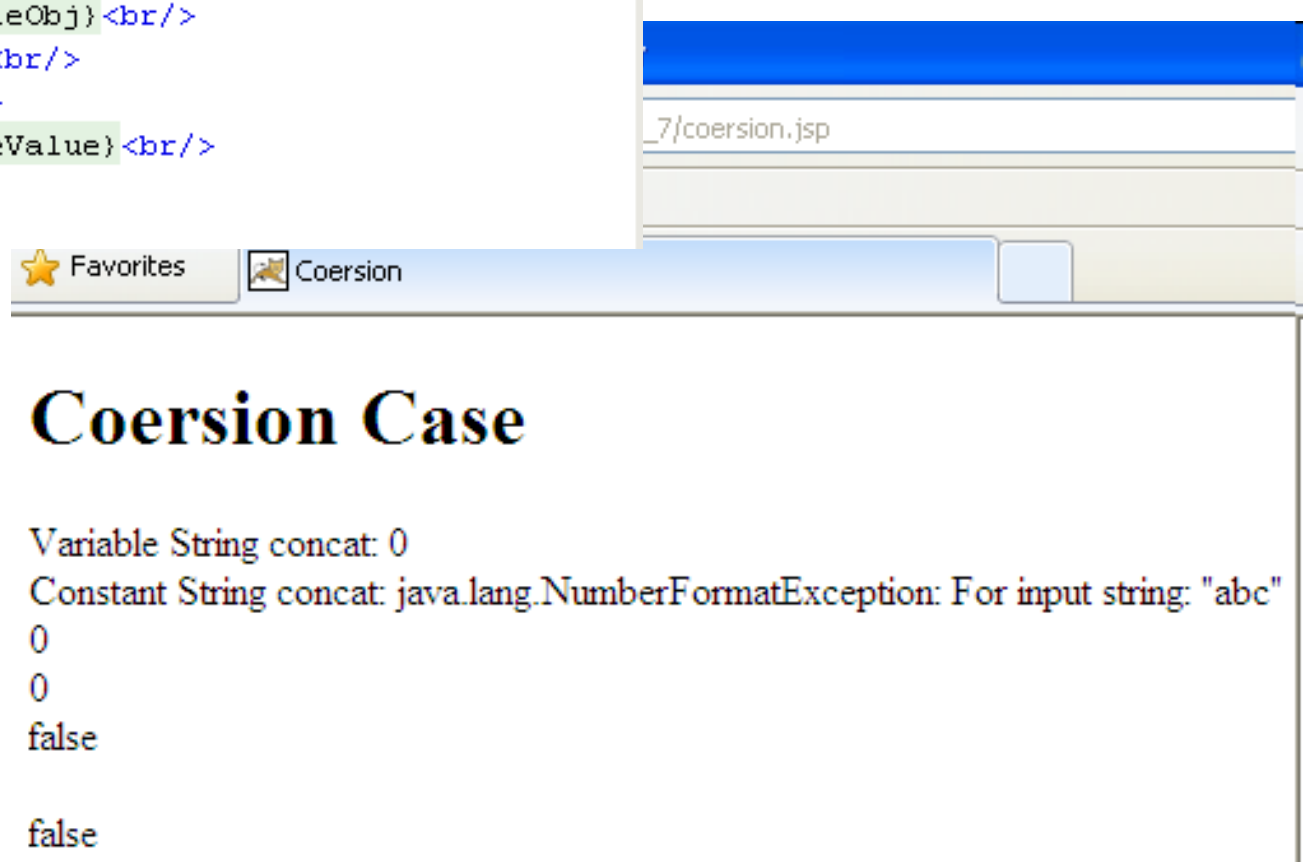
- **Notes**:
  - **Variables declared in JSP page** (in scriptlet or declaration) **cannot be accessed** in JSP page or all of them can be presented with ${variable_name}
  - Therefore, if these **variables are forced in expression with EL**, the **value of these variables are converted to 0 (number) or false (boolean)**
  - The EL operators' arithmetic or logical **is only applied to arithmetic or logic**. If the **value is not same type, the exception is thrown**
  - The EL can **access the attribute in particular scope** (page, request, session, application)
  - The **coersion** is **applied** on **the used operator in expression**



Appendix

Coersion – Example

```
26          Variable String concat: ${s1 + s2}<br/>
27          <% try { %>
28              Constant String concat: ${"abc" + "def"}<br/>
29          <% } catch (Exception e) {
30                  out.print(e + "<br/>");
31              }
32          %>
33          ${doubleValue + doubleValue}<br/>
34          ${doubleObj + doubleObj}<br/>
35          ${boolObj && true}<br/>
36          ${doubleValue}<br/>
37          ${boolObj && doubleValue}<br/>
38      </body>
39  </html>
```



Appendix

Coersion – Example

coersion1.jsp

Source | History

```
4       Author      : Trong Khanh
5   --%>
6
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=
12          <title>Coersion</title>
13      </head>
14      <body>
15          <h1>Coersion Demo</h1>
16          <%
17              pageContext.setAttribute("BOOLOBJ", new Boolean(true));
18              pageContext.setAttribute("STRING1", "khanhkt");
19              pageContext.setAttribute("STRING2", " AJ");
20              pageContext.setAttribute("DOUBLEOBJ", new Double(2.0));
21              pageContext.setAttribute("INTEGER", new Integer(2));
22          %>
23          Presenting the value using EL<br/>
24          ${BOOLOBJ}<br/>
25          ${STRING1}<br/>
26          ${DOUBLEOBJ}<br/>
27          ${INTEGER}<br/>
```

Appendix

Coersion – Example

```
28          Combination with operators in EL Expression<br/>
29          ${BOOLOBJ && BOOLOBJ}<br/>
30          ${BOOLOBJ && false}<br/>
31          ${DOUBLEOBJ + DOUBLEOBJ}<br/>
32          ${DOUBLEOBJ + 5.0}<br/>
33          ${DOUBLEOBJ + 5}<br/>
34          ${INTEGER + INTEGER}<br/>
35          ${INTEGER + DOUBLEOBJ}<br/>
36          ${INTEGER + 5}<br/>
37          ${INTEGER + 5.0}<br/>
38          <% try {%>
39          ${BOOLOBJ + DOUBLEOBJ}<br/>
40          <% } catch (Exception e) {
41                  out.print(e + "<br/>");
42              }
43          %>
44          <% try {%>
45          ${STRING1 + STRING2}<br/>
46          <% } catch (Exception e) {
47                  out.print(e + "<br/>");
48              }
49          %>
50      </body>
51  </html>
```

Appendix

Coersion – Example