

# Session Management

## Sessions and Listeners

### Technique: Error Handling in Servlets

*#Session #UrlRewriting #HiddenForm*

*#SessionTracking #Cookie*

*#ShoppingCart #ErrorHandle*

*#JSP*

Kiều Trọng Khánh

- **JSP**

- JSP Syntax

- Comment
    - Scripting Element: declaration, scriptlets, expression
    - Directives (page, include, taglib)

- JSP Life Cycles

- JSP Implicit Object

- **MVC Pattern**

- No MVC

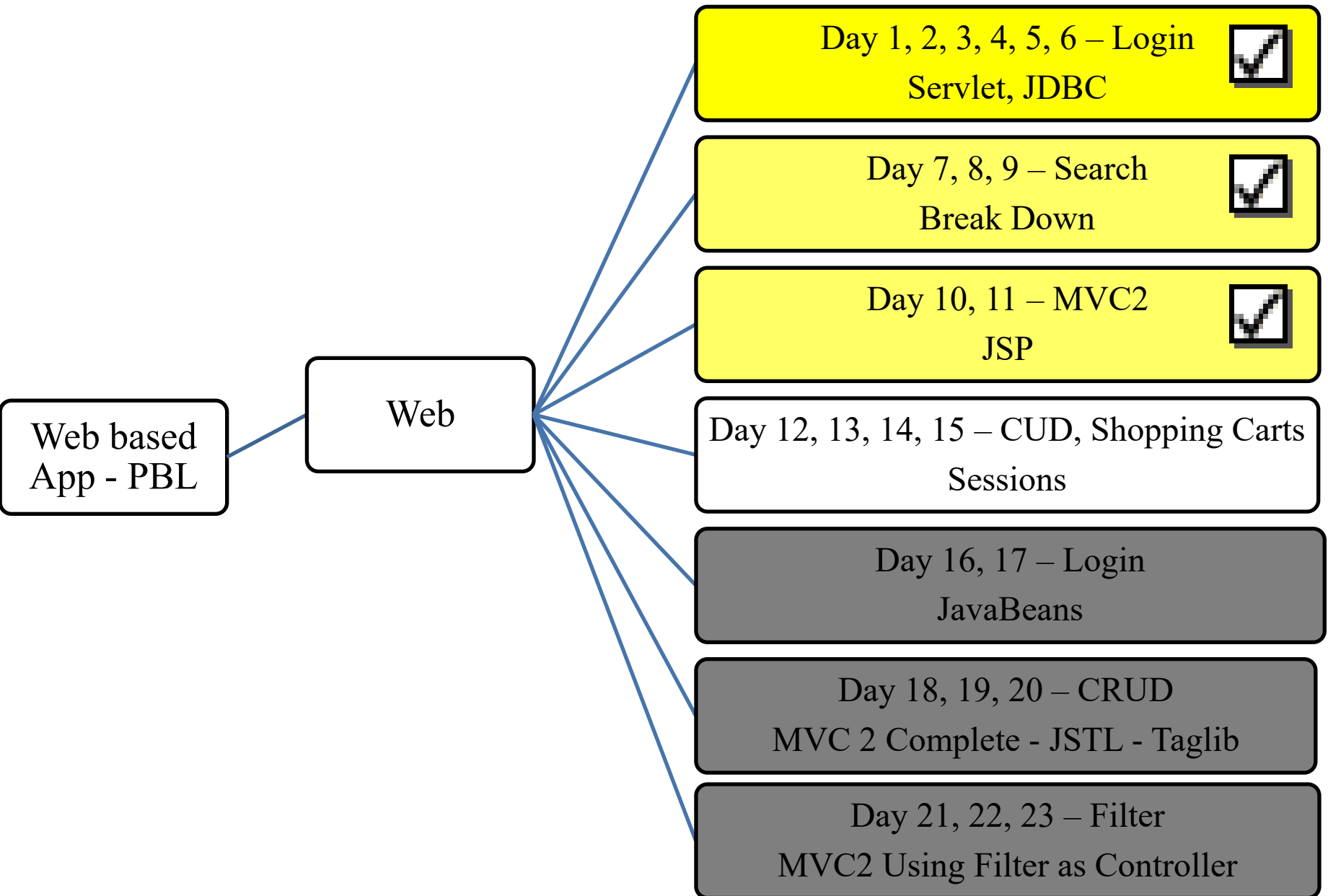
- MVC 1

- MVC 2

# Objectives

- **How to write CUD Web Application?**
  - Session Tracking Techniques
  - Manipulate DB Techniques in Web Application
  - Break down structure component in building web application
- **Techniques: Error Handling in Servlets**
  - Reporting Errors
  - Logging Errors
  - Users Errors vs. System Errors

# Objectives



# How to write CRUD Web Application

## Requirements

- After the web application had searched and shown the result, some following functions are required
  - The data grid allows the user **delete the selected row. After delete action is completed, the data grid is updated**
  - The data grid also allows the user **update the password and roles on the selected row. After update action is completed, the data grid is refreshed**
  - The application allows to **store the user's account that the user can access the resource without login in the second access. The username can be shown at the search result**
  - The application allows the user **shopping book and order them**
  - When the user login fail, the **register page** is shown. When **register is fail, the error page is shown. Otherwise, the login page is shown**
- The GUI of web application is present as following

# How to write CRUD Web Application

## Expectation



Welcome, khanh

## Search Page

Search Value

No.	Username	Password	Last name	Role	Delete
1	IA1161	123456	Class IA1161	<input type="checkbox"/>	<a href="#">Delete</a>
2	khanh	kieu123	Khanh Kieu	<input checked="" type="checkbox"/>	<a href="#">Delete</a>
3	SE1161	123456	Class SE1161	<input type="checkbox"/>	<a href="#">Delete</a>
4	SE1162	123456	Class Se1162	<input type="checkbox"/>	<a href="#">Delete</a>
5	SE1163	123456	Class SE1163	<input type="checkbox"/>	<a href="#">Delete</a>

http://localhost:8084/SE1162Servlet/SE1162Servlet?btAction=delete&pk=IA1161&lastSearchValue=a

# How to write CRUD Web Application

## Expectation



http://localhost:8084/SE1162Servlet/SE1162Servlet?txtSearchValue=a&btAction=Search

Welcome, khanh

## Search Page

Search Value

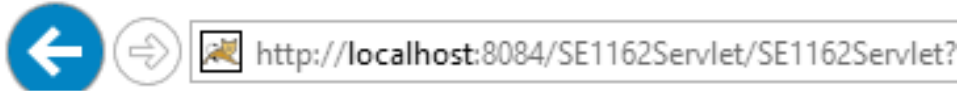


No.	Username	Password	Last name	Role	Delete	Update
1	IA1161	123456	Class IA1161	<input type="checkbox"/>	<a href="#">Delete</a>	<input type="button" value="Update"/>
2	khanh	kieu123	Khanh Kieu	<input checked="" type="checkbox"/>	<a href="#">Delete</a>	<input type="button" value="Update"/>
3	SE1161	123456	Class SE1161	<input type="checkbox"/>	<a href="#">Delete</a>	<input type="button" value="Update"/>
4	SE1162	123456	Class Se1162	<input type="checkbox"/>	<a href="#">Delete</a>	<input type="button" value="Update"/>
5	SE1163	123456	Class SE1163	<input type="checkbox"/>	<a href="#">Delete</a>	<input type="button" value="Update"/>

# How to write CRUD Web Application

## Expectation

---



Welcome, khanh

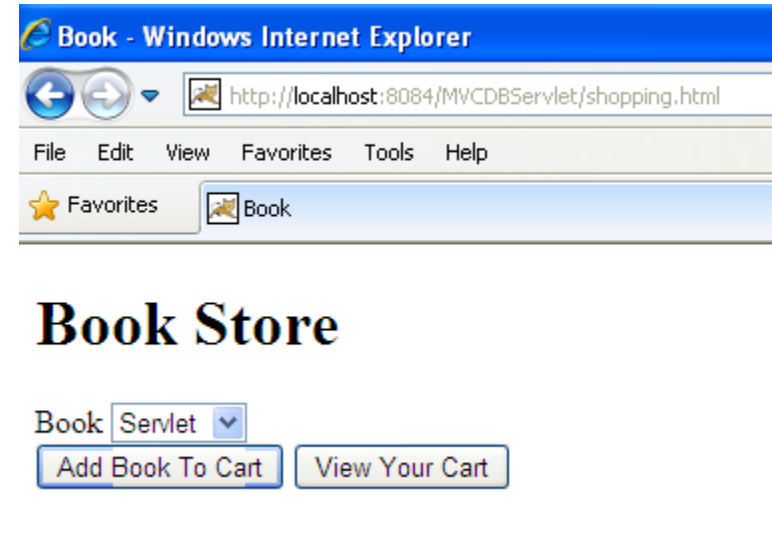
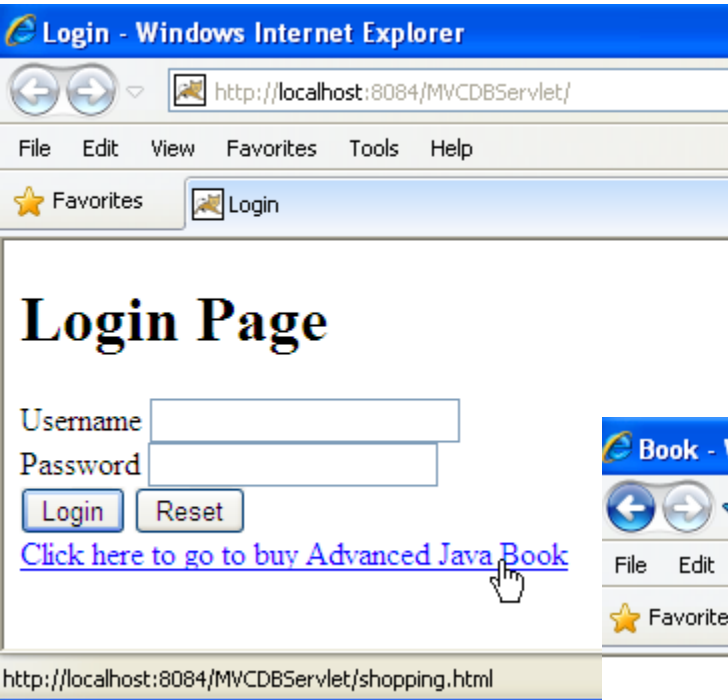
## Search Page

Search Value

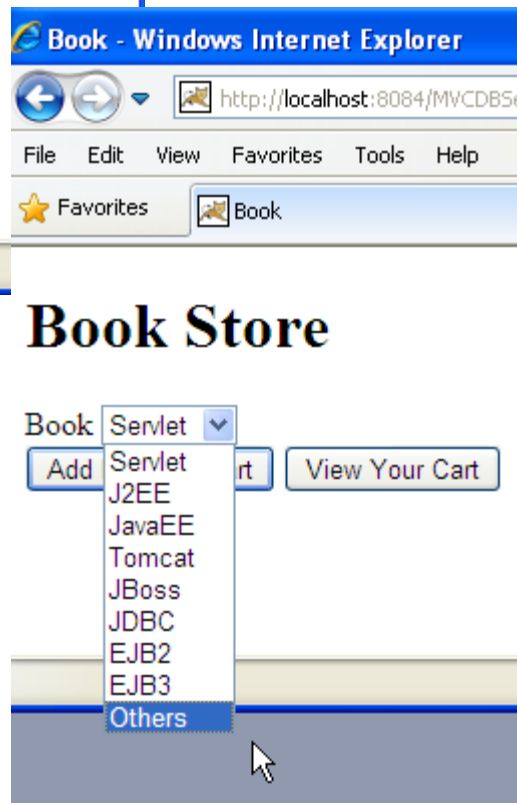


# How to write CRUD Web Application

## Expectation



http://localhost:8084/MVCDServlet/shopping.html



# How to write CRUD Web Application

## Expectation

http://localhost:8084/MVCDBServlet/ProcessServlet?cboBook=Servlet&btAction=View+Your+Cart

File Edit View Favorites Tools Help

★ Favorites Carts

### Your Cart Items

No.	Title	Quantity	Action
1	JavaEE	1	<input type="checkbox"/>
2	Servlet	2	<input type="checkbox"/>
3	Tomcat	2	<input type="checkbox"/>

[Add More Item to Cart](#)

### Your Cart Items

No.	Title	Quantity	Action
1	JavaEE	1	<input checked="" type="checkbox"/>
2	Servlet	2	<input type="checkbox"/>
3	Tomcat	2	<input checked="" type="checkbox"/>

[Add More Item to Cart](#)

http://localhost:8084/MVCDBServlet/ProcessServlet?btAction=View%20Your%20Cart

File Edit View Favorites Tools Help

★ Favorites Carts

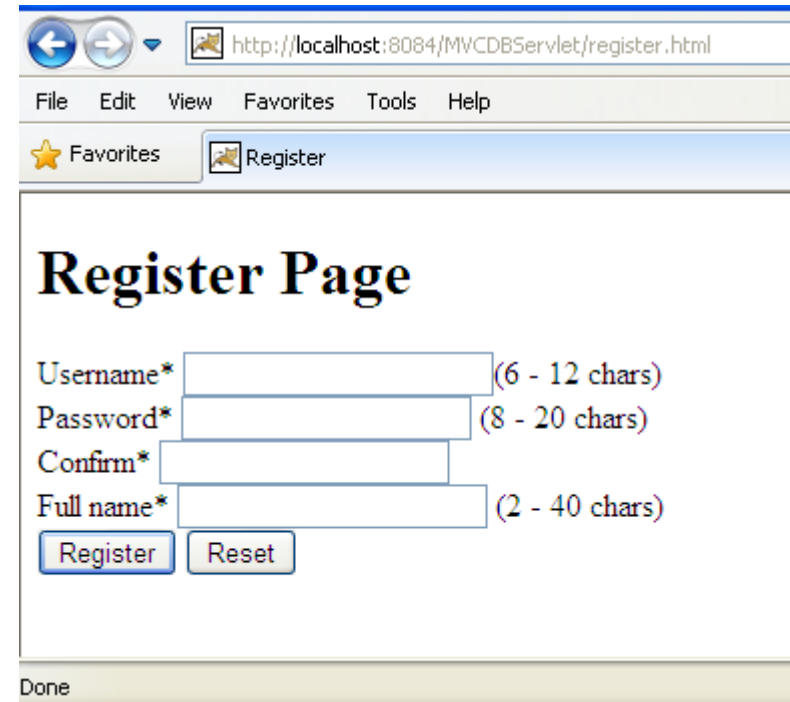
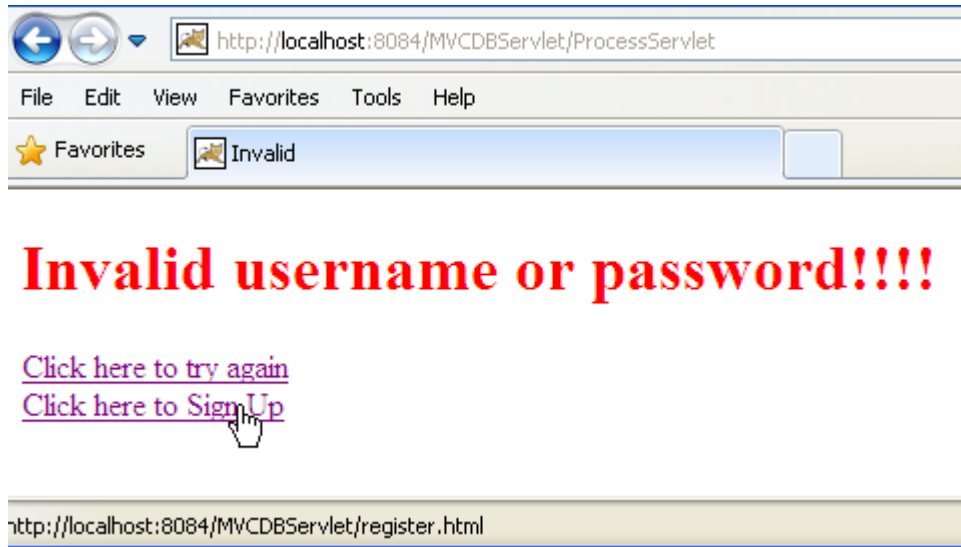
### Your Cart Items

No.	Title	Quantity	Action
1	Servlet	2	<input type="checkbox"/>

[Add More Item to Cart](#)

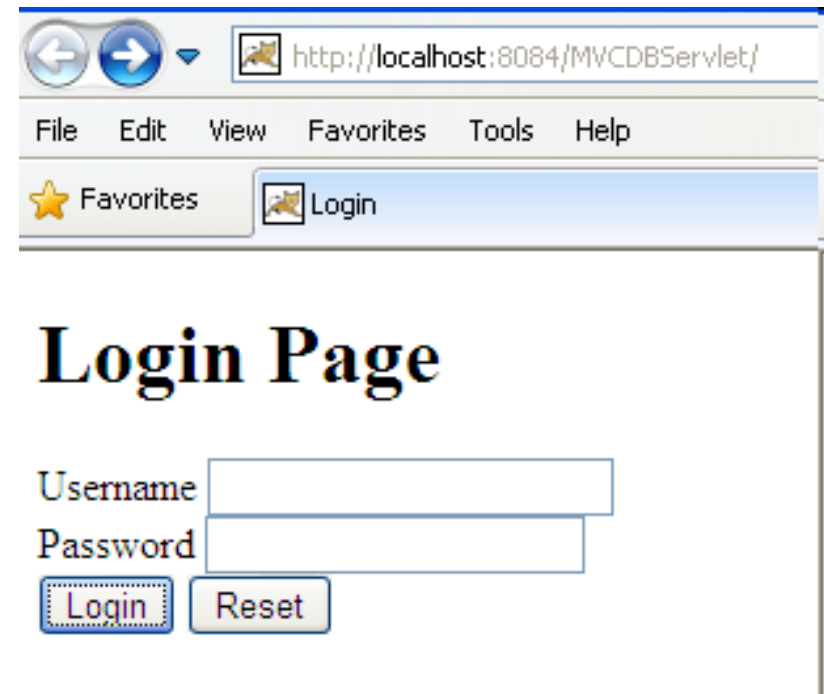
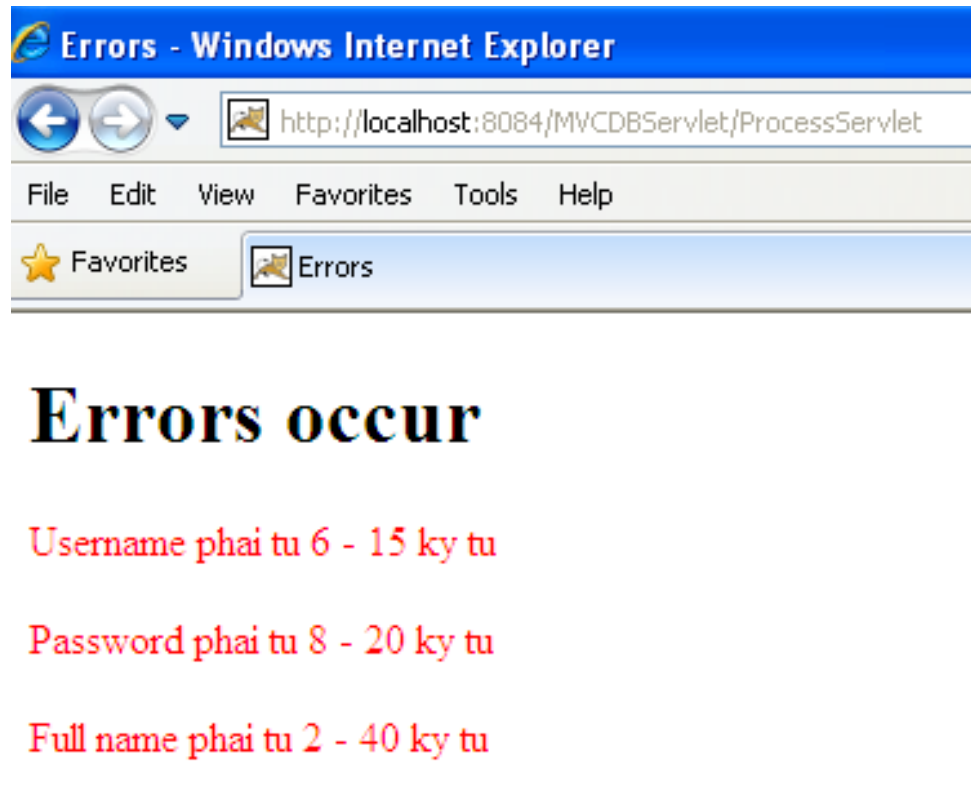
# How to write CRUD Web Application

## Expectation



# How to write CRUD Web Application

## Expectation



# Sessions & Listeners

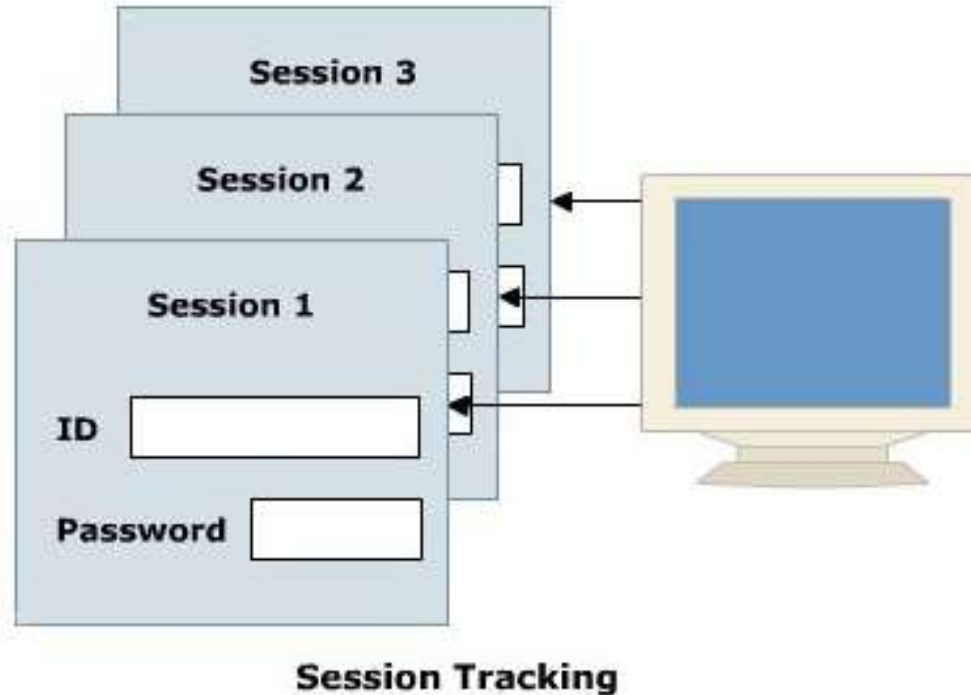
## Session

- Is the **period of connection** between client and server
- Is a group of activities that are performed by a user while accessing a particular web site
- HttpSession are **virtual connection** between client and server
- Web container reserves **an individual memory block for storing information about each session** → **Session objects.**
- **The session tracking (mechanism)**
  - Serves the purpose **tracking** the client identity and other state information required throughout the session
  - Allows the **server to keep a track of successive requests** made by same client
  - Allows **the customer to maintain the information with the server** as long as the customer does not log out from the website

# Sessions & Listeners

## Session Tracking Techniques

- URL Rewriting
- Hidden form field
- Cookies
- HttpSession interface



# Sessions & Listeners

## URL Rewriting

- **Maintains the state** of end user by **modifying the URL**.
- **Adds some extra data** at the end of the URL
- Is **used** when the **information to be transferred** is not critical.
- **Syntax: `url?query_string`**
- **Ex**
  - `<a href=“http://localhost:8080/Books?category=java”> Java Books </a>`
  - `<form action=“http://localhost:8080/UpdateProfile?uid=123” method=“get”>  
----- </form>`
- **Disadvantages:**
  - Server side **processing is tedious**.
  - Every URL that is **returned** to the **user** should have **additional information appended** to it.
  - If the user **leaves the session** and **opens the Web page using a link or bookmark** then the session information is lost.
  - The **query string is limited**

# How to write CRUD Web Application

## Delete Function



Welcome, khanh

### Search Page

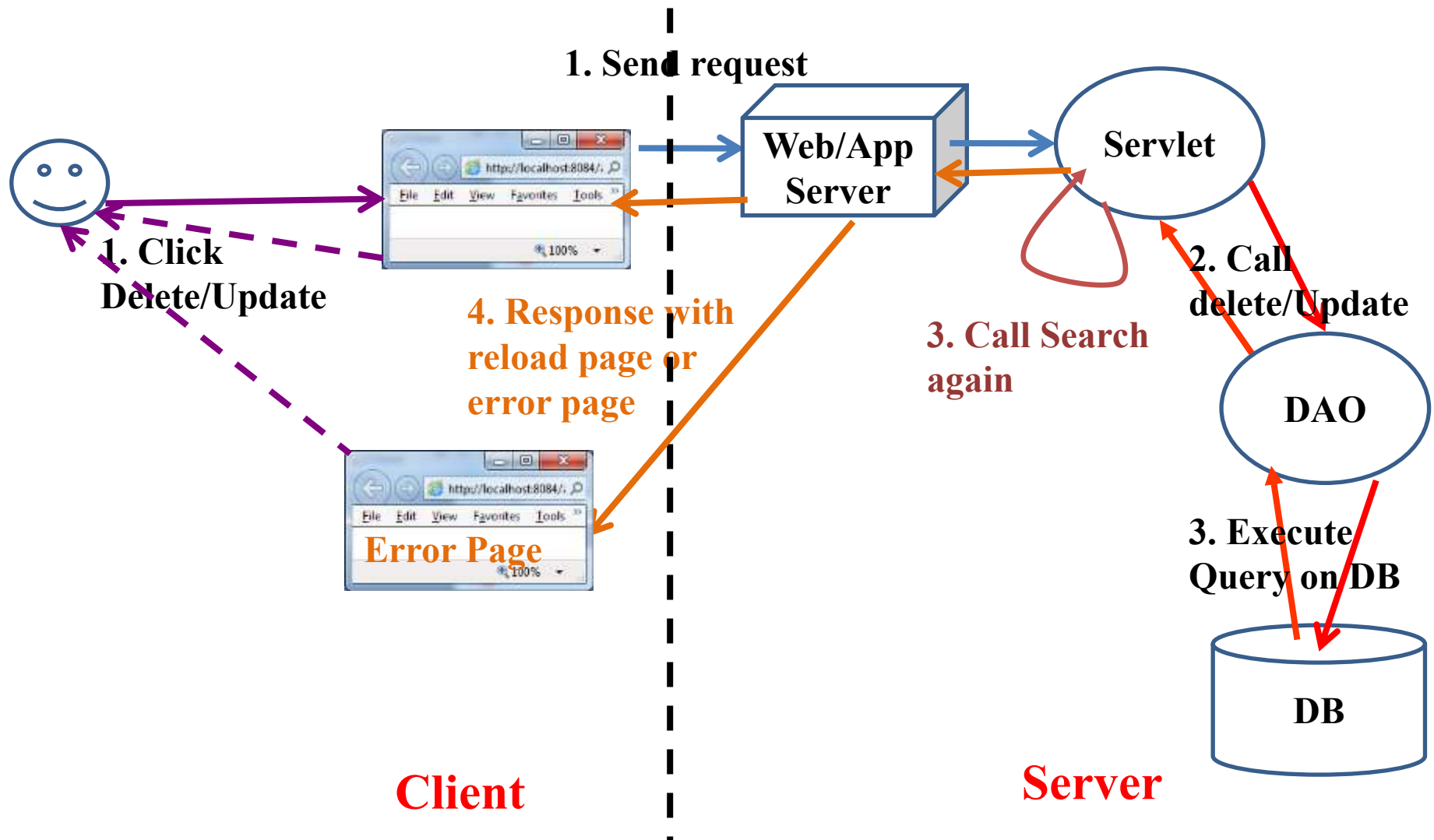
Search Value

No.	Username	Password	Last name	Role	Delete
1	IA1161	123456	Class IA1161	<input type="checkbox"/>	<a href="#">Delete</a>
2	khanh	kieu123	Khanh Kieu	<input checked="" type="checkbox"/>	<a href="#">Delete</a>
3	SE1161	123456	Class SE1161	<input type="checkbox"/>	<a href="#">Delete</a>
4	SE1162	123456	Class Se1162	<input type="checkbox"/>	<a href="#">Delete</a>
5	SE1163	123456	Class SE1163	<input type="checkbox"/>	<a href="#">Delete</a>



# How to write CRUD Web Application

## Interactive Server Model



# How to write CRUD Web Application

## Delete Function



Welcome, khanh

### Search Page

Search Value

No.	Username	Password	Last name	Role	Delete
1	IA1161	123456	Class IA1161	<input type="checkbox"/>	<a href="#">Delete</a>
2	khanh	kieu123	Khanh Kieu	<input checked="" type="checkbox"/>	<a href="#">Delete</a>
3	SE1161	123456	Class SE1161	<input type="checkbox"/>	<a href="#">Delete</a>
4	SE1162	123456	Class Se1162	<input type="checkbox"/>	<a href="#">Delete</a>
5	SE1163	123456	Class SE1163	<input type="checkbox"/>	<a href="#">Delete</a>

http://localhost:8084/SE1162Servlet/SE1162Servlet?btAction=delete&pk=IA1161&lastSearchValue=a

# Sessions & Listeners

## Hidden Form Fields

- Simplest technique to **maintain the state of an end user**.
- **Insert** the session identifier into the **hidden form field** in the HTML of each page
- **Embedded the hidden form field in an HTML form and not visible** when you view an HTML file in a browser window.
- The session information can be **extracted** by the application by **searching** for these fields. The servlets or JSP pages read the field using **request.getParameter()**.
- **Syntax**

**<input type="hidden" name="..." value="...">**

- **Ex**  
  
`<input type="hidden" name="productId" value="P01">`
- **Advantages**
  - **Simplest** way to implement session tracking
  - Displays **nothing** on the HTML page but can be used to hold any kind of data
  - Helps to maintain a **connection between two pages**
- **Disadvantages:**
  - **Work** on the **dynamic pages**.
  - This method of session tracking **displays sensitive information to the user**.

# How to write CRUD Web Application

## Update Function



http://localhost:8084/SE1162Servlet/SE1162Servlet?txtSearchValue=a&btAction=Search

Welcome, khanh

## Search Page

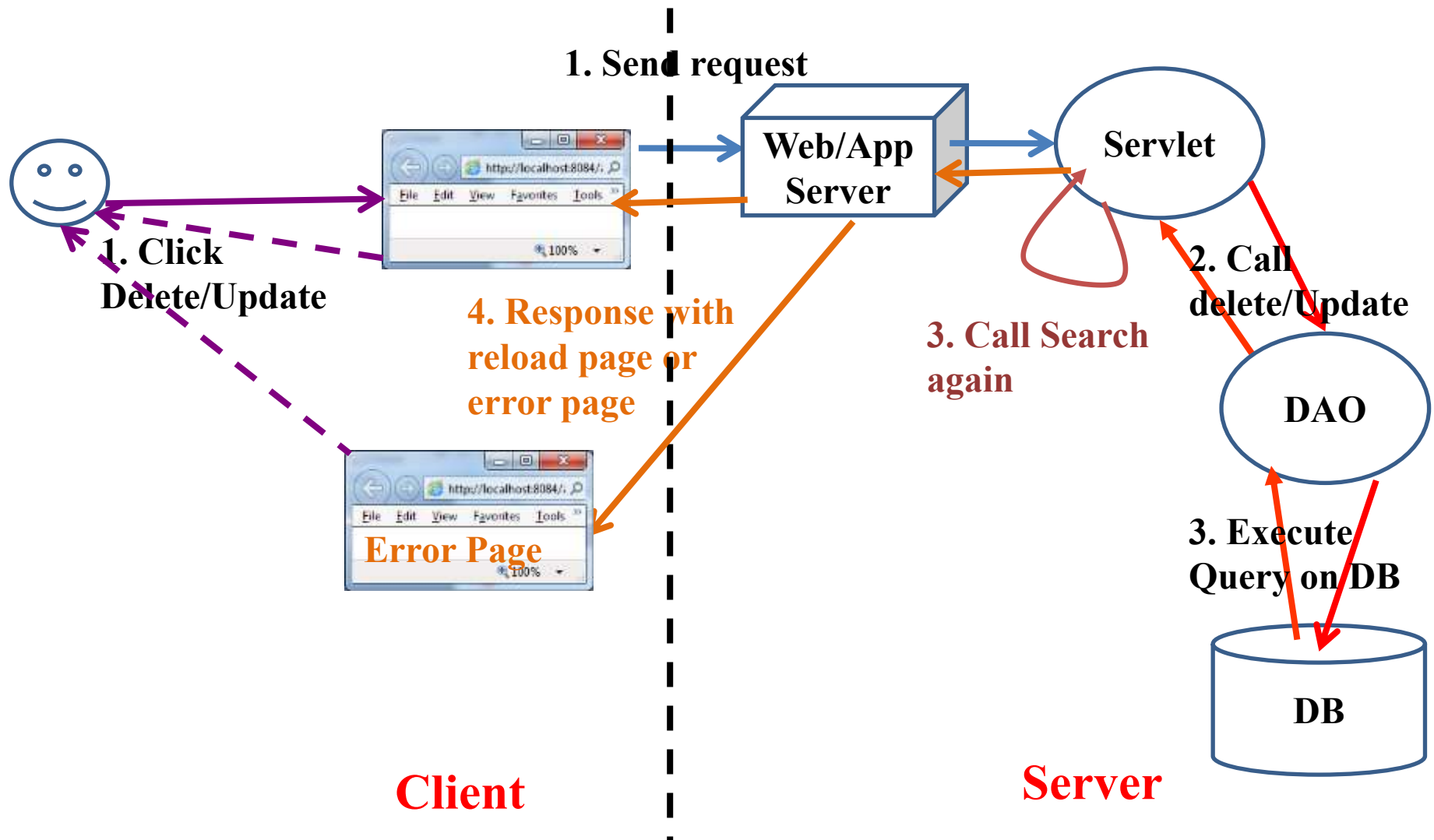
Search Value



No.	Username	Password	Last name	Role	Delete	Update
1	IA1161	123456	Class IA1161	<input type="checkbox"/>	<a href="#">Delete</a>	<input type="button" value="Update"/>
2	khanh	kieu123	Khanh Kieu	<input checked="" type="checkbox"/>	<a href="#">Delete</a>	<input type="button" value="Update"/>
3	SE1161	123456	Class SE1161	<input type="checkbox"/>	<a href="#">Delete</a>	<input type="button" value="Update"/>
4	SE1162	123456	Class Se1162	<input type="checkbox"/>	<a href="#">Delete</a>	<input type="button" value="Update"/>
5	SE1163	123456	Class SE1163	<input type="checkbox"/>	<a href="#">Delete</a>	<input type="button" value="Update"/>

# How to write CRUD Web Application

## Interactive Server Model





### Concept of Cookie

# Sessions & Listeners

## Cookies

- **Advantages**

- **Remember** user IDs and password.(low security)
- To **track** visitors on a Web site for better service and new features.
- Cookies enable **efficient ad processing**.
- Support **e-advertisement** on Internet.
- Security (can not affect virus).

- **Disadvantages**

- **Personal information** is **exposed** to the **other users**.  
(spam/ junk mail, pop up ...)
- Cookies fails to work if the security level is set too high in the Internet browser.
- Most browsers **enable** the **user** at the **client machine** to **deactivate** (not to accept) cookies.
- The size and number of cookies **stored are limited**.

- **Note**

- **Browser is accepted cookies**
- **Cookies are stored at**
  - C:\Documents and Settings\LoggedInUserName\Cookies\LoggedInUserName@ContextPath[n].txt
  - C:\Users\LoggedInUserName\AppData\Local\Microsoft\Windows\Temporary Internet Files\LoggedInUserName@host[n].txt
- Cookies are existed following the **setMaxAge** and deleted automatically by OS

# Sessions & Listeners

## Cookies

- The servlet API provides **javax.servlet.http.Cookie** class for creating and working with cookies
- The **constructor** for the cookies class is: `Cookie(java.lang.String name, java.lang.String value)`
- **Sending Cookie**

Methods	Descriptions
<b>addCookie</b>	<ul style="list-style-type: none"> <li>- <b>public void addCookie(cookie1);</b></li> <li>- Adds field to the HTTP response headers to send cookies to the browser, one at a time</li> <li>- Adds specified cookie to the response</li> <li>- Can be called multiple times to set more than one cookies</li> </ul>
<b>setValue</b>	<ul style="list-style-type: none"> <li>- <b>public void setValue(String newValue);</b></li> <li>- Assigns a new value to a cookie after the cookie is created. In case if binary value is used, base 64 can be used for encoding</li> </ul>
<b>setPath</b>	<ul style="list-style-type: none"> <li>- <b>public void setPath(String path);</b></li> <li>- Sets the path for the cookie. The cookie is available to all the pages specified in the directory and its subdirectories. A cookie's path must have the servlet which sets the cookie</li> </ul>
<b>setMaxAge</b>	<ul style="list-style-type: none"> <li>- <b>public void setMaxAge(int expiry);</b></li> <li>- The maximum age of the cookie in seconds. If the value is positive, then the cookie will expire after that many seconds which is specified by the expiry</li> </ul>



# Sessions & Listeners

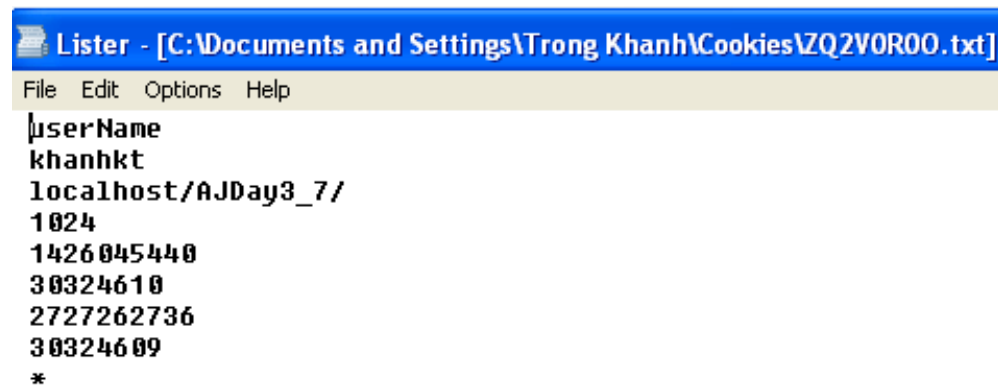
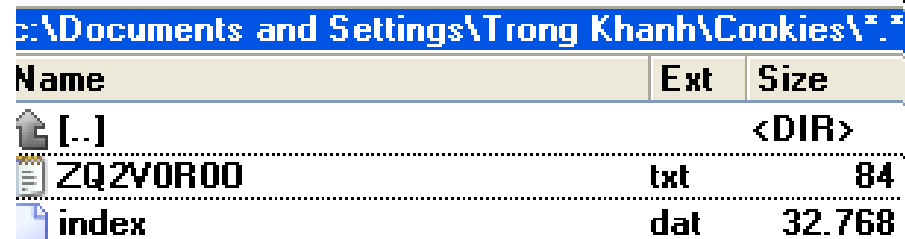
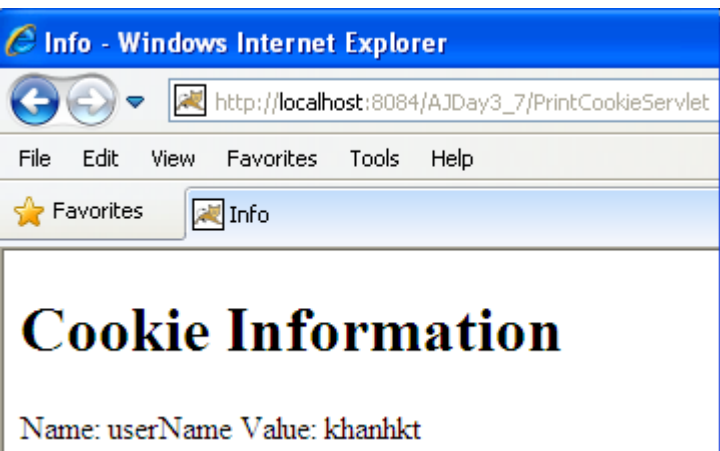
## Cookies

- Reading Cookie

Methods	Descriptions
<b>getCookies</b>	<ul style="list-style-type: none"><li>- <b>Cookie [] cookies = request.getCookies();</b></li><li>- Returns an array containing all of the Cookie objects the client sends with the request</li></ul>
<b>getMaxAge</b>	<ul style="list-style-type: none"><li>- <b>public int getMaxAge();</b></li><li>- Returns the maximum age of the cookie.</li><li>- Returns an integer which specify the maximum age of the cookies in seconds</li></ul>
<b>getValue</b>	<ul style="list-style-type: none"><li>- <b>public String getValue();</b></li><li>- Returns the value of the cookie</li></ul>
<b>getName</b>	<ul style="list-style-type: none"><li>- <b>public String getName()</b></li><li>- Returns the name of cookie. Once the cookie has been created its name cannot be changed</li></ul>
<b>getPath</b>	<ul style="list-style-type: none"><li>- <b>public void getPath()</b></li><li>- Returns the path on the server to which the client return the cookie. The cookie is available to all sub paths on the server</li></ul>

# Sessions & Listeners

## Cookies – Example



# Sessions & Listeners

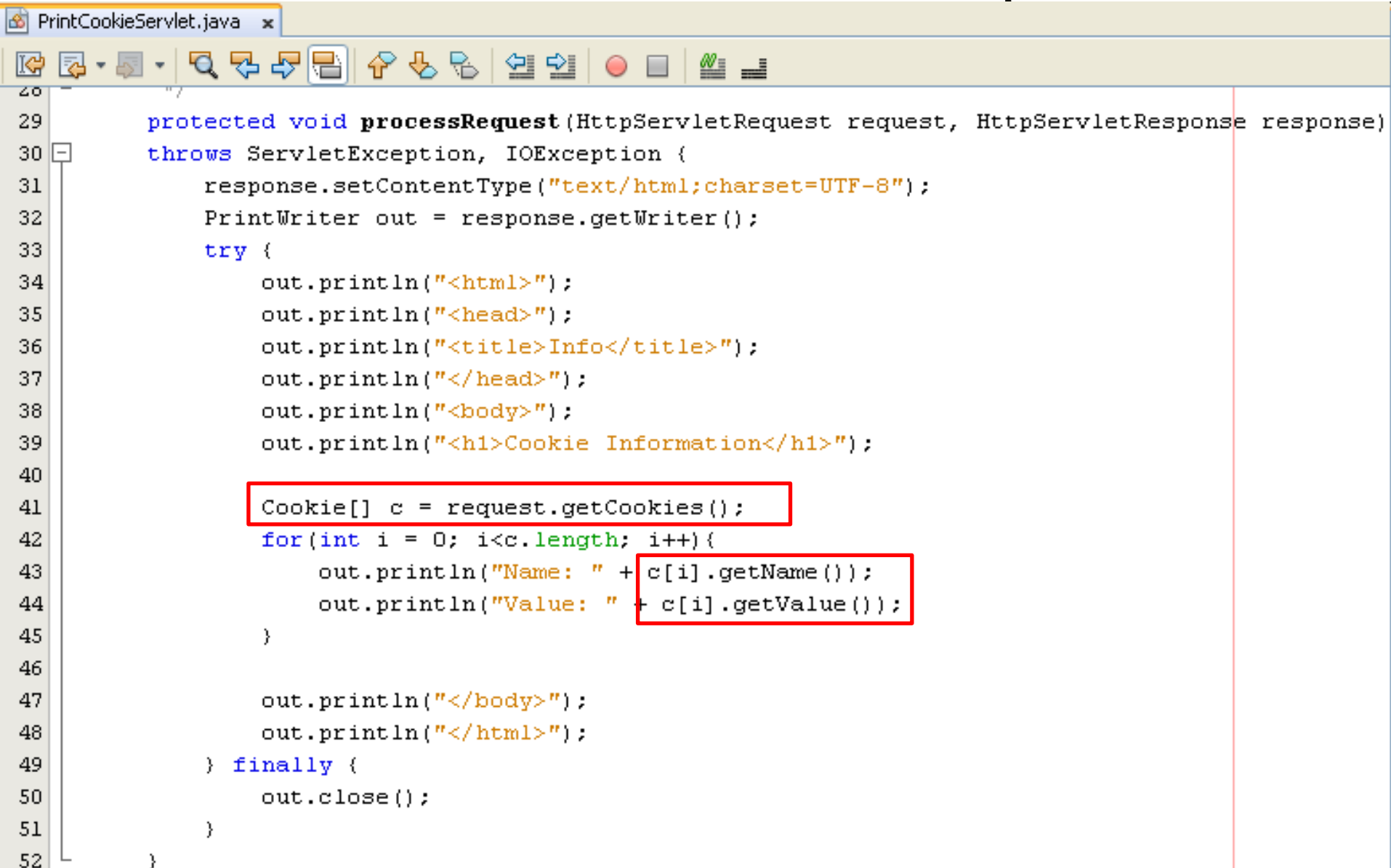
## Cookies – Example

```

AddCookieServlet.java x
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          out.println("<html>");
35          out.println("<head>");
36          out.println("<title>Add</title>");
37          out.println("</head>");
38          out.println("<body>");
39          out.println("<h1>Adding Cookie processing</h1>");
40
41          String sName = request.getParameter("txtName");
42          Cookie cookie = new Cookie("userName", sName);
43          cookie.setMaxAge(60*5);
44          response.addCookie(cookie);
45          out.println("<a href='PrintCookieServlet'>Print Cookie</a>");
46
47          out.println("</body>");
48          out.println("</html>");
49      } finally {
50          out.close();
51      }
52  }
  
```

# Sessions & Listeners

## Cookies – Example



```

PrintCookieServlet.java x
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         out.println("<html>");
35         out.println("<head>");
36         out.println("<title>Info</title>");
37         out.println("</head>");
38         out.println("<body>");
39         out.println("<h1>Cookie Information</h1>");
40
41         Cookie[] c = request.getCookies();
42         for(int i = 0; i<c.length; i++){
43             out.println("Name: " + c[i].getName());
44             out.println("Value: " + c[i].getValue());
45         }
46
47         out.println("</body>");
48         out.println("</html>");
49     } finally {
50         out.close();
51     }
52 }
  
```

# How to write CRUD Web Application Requirements

- After the web application had searched and shown the result, some following functions are required
  - ...
  - The application allows to **store the user's account** that the **user** can **access the resource without login in the second access.** **The username can be shown at the search result**
  - ...
- The GUI of web application is present as following

# How to write CRUD Web Application

## Store Info



Welcome, khanh

## Search Page

Search Value

# How to write CRUD Web Application

## Interactive Server Model

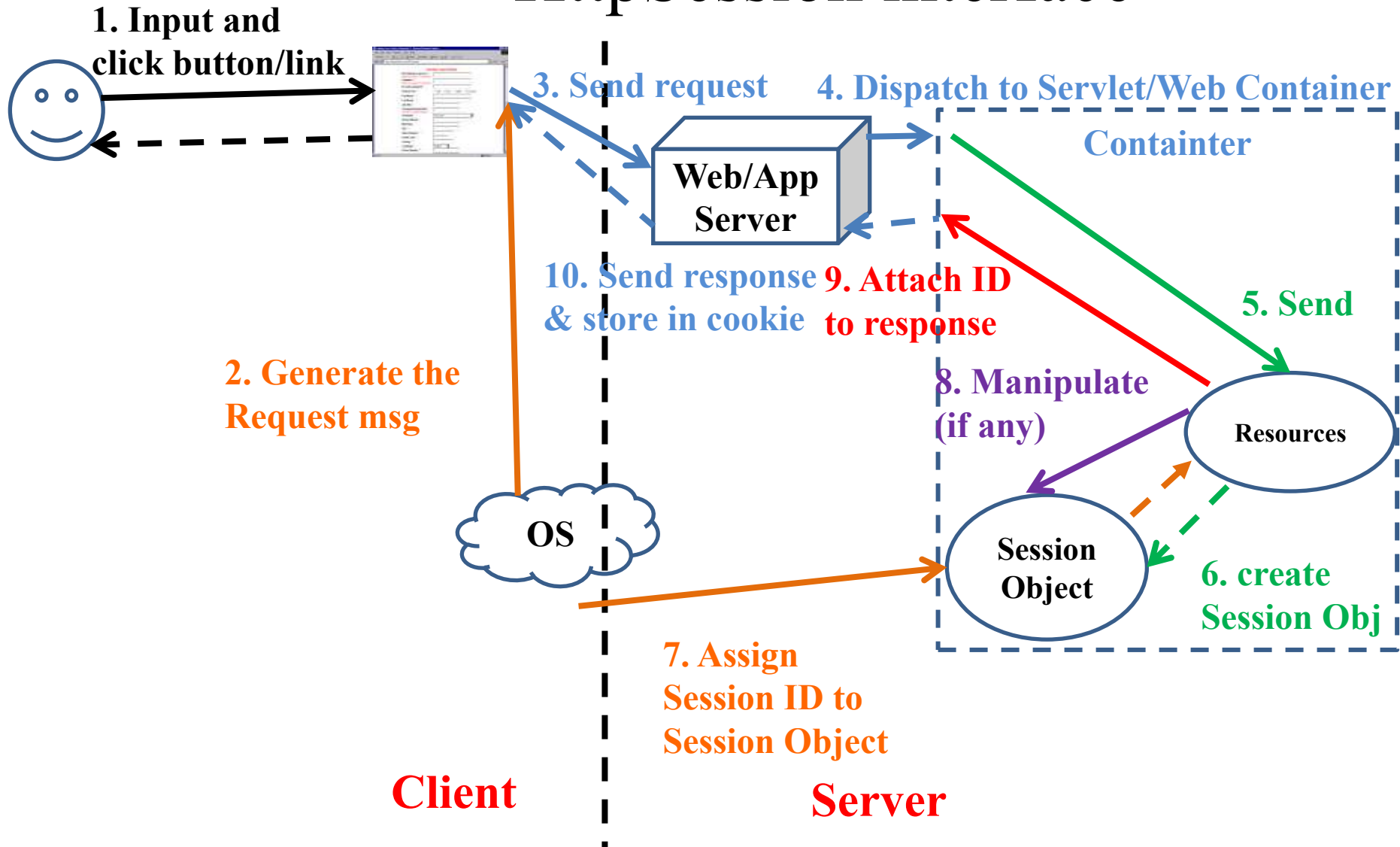
**Draw your self**

**Client**

**Server**

# Sessions & Listeners

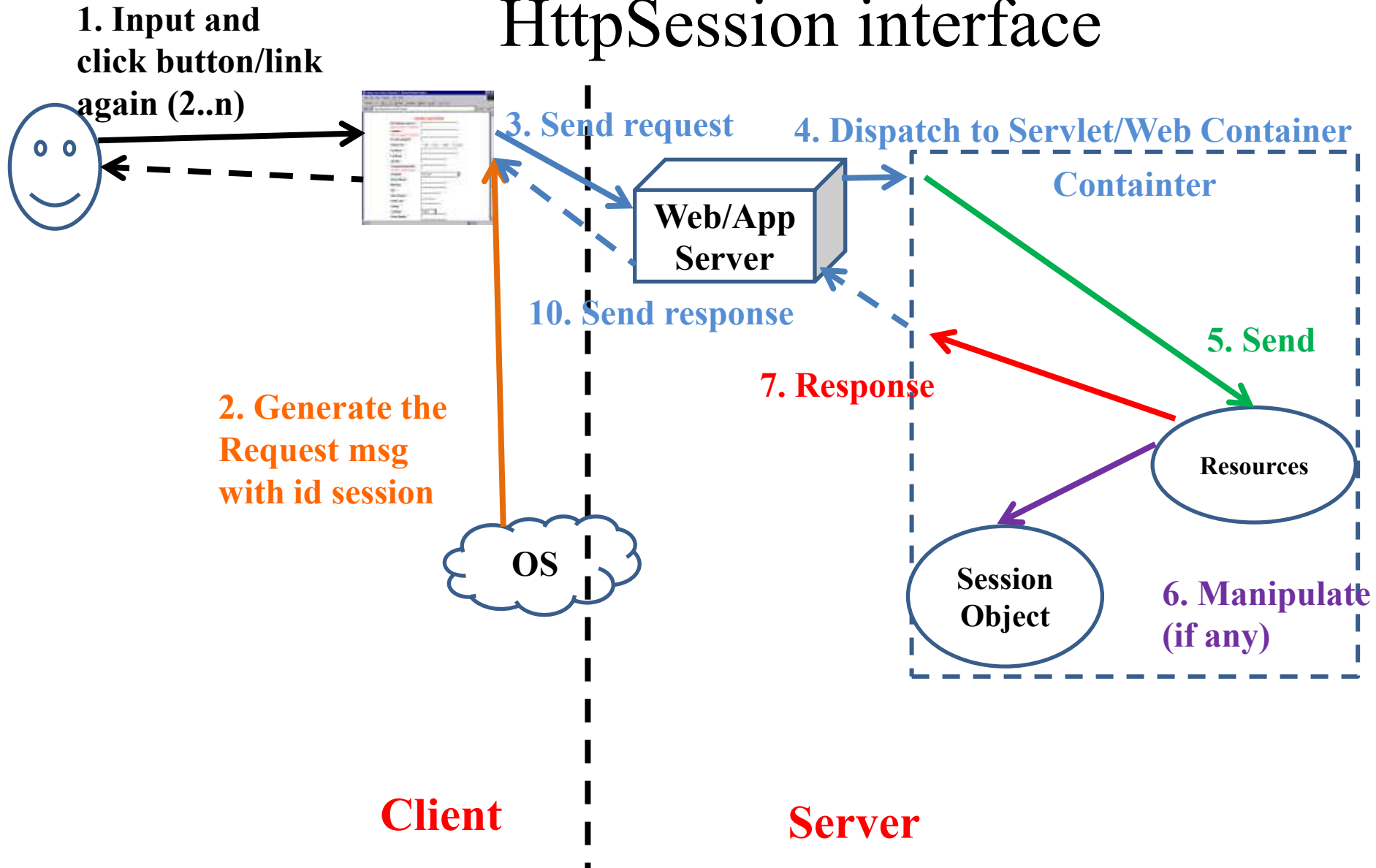
## HttpSession interface





# Sessions & Listeners

## HttpSession interface



# Sessions & Listeners

## Session Management: General Principles

- Each of these requests **needs to carry a unique ID**, which identifies the session to which it belongs.
- The web application will **allocate this unique ID** on the first request from the client.
- The ID **must be passed back to the client** so that the client **can pass it back again with its next request**. In this way, the web application will know to which session the request belongs. This implies that the client **must need to store the unique ID somewhere—and** that's where session management mechanisms come in
- The **default mechanism for session management is cookie**

# Sessions & Listeners

## HttpSession interface

- Identifying user in a multi-page request scenario and information about that user
- Is used to **created** a **session between the client and server** by servlet container
  - When **users make a request**, the **server signs** it a **session object** and a **unique session ID**
  - The session ID matches the user with the session object in subsequent requests
  - The **session ID and the session object** are **passed** along with the **request** to the **server**
- **Session Timeout**
  - Is necessary as session utilizes the memory locations
  - Prevent the number of session increasing infinitely.
  - Set either in the web.xml file or can be set by the method **setMaxInactiveInterval()**

# Sessions & Listeners

## HttpSession interface Methods

Methods	Descriptions
<b>getSession</b>	<ul style="list-style-type: none"> <li>- <b>request.getSession(boolean create);</b></li> <li>- Obtain a current session objects</li> <li>- The getSession() method with true parameter is used to create a new session (no current session)</li> </ul>
<b>getId</b>	<ul style="list-style-type: none"> <li>- <b>public String getId()</b></li> <li>- Returns a string containing the unique identifier assigned to this session. The servlet container assigns the identifier and it is implementation independent</li> </ul>
<b>getCreationTime</b>	<ul style="list-style-type: none"> <li>- <b>public long getCreationTime()</b></li> <li>- Returns the creation time of session.</li> </ul>
<b>getLastAccessedTime</b>	<ul style="list-style-type: none"> <li>- <b>public long getLastAccessedTime()</b></li> <li>- Returns the last accessed Time of session</li> </ul>
<b>getMaxInactiveInterval</b>	<ul style="list-style-type: none"> <li>- <b>public int getMaxInactiveInterval()</b></li> <li>- Returns the maximum time interval, in seconds, for which the servlet container will keep the session alive between the client accesses</li> </ul>
<b>setMaxInactiveInterval</b>	<ul style="list-style-type: none"> <li>- <b>public void setMaxInactiveInterval(int interval)</b></li> <li>- Specifies the time, in seconds, between the client requests before the servlet container invalidates the current session</li> </ul>

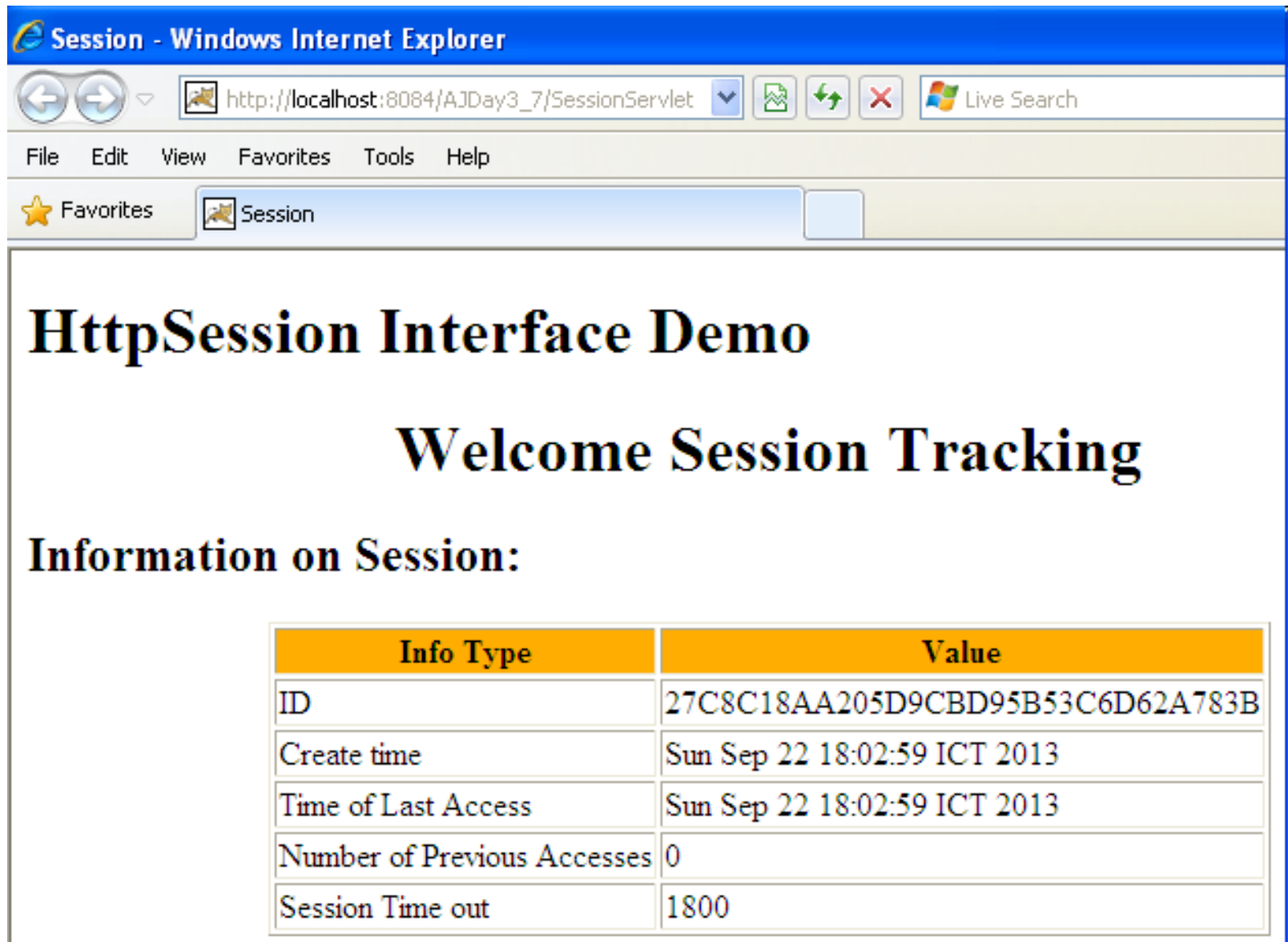
# Sessions & Listeners

## HttpSession interface Methods

Methods	Descriptions
<b>isNew</b>	<ul style="list-style-type: none"><li>- <b>public boolean isNew()</b></li><li>- Returns true if the client is unaware about the session or choose not to be part of the session</li></ul>
<b>invalidate</b>	<ul style="list-style-type: none"><li>- <b>public void invalidate()</b></li><li>- Invalidates the session and the objects bound to the session are bounded. This method throws <code>IllegalStateException</code> if called on already invalidated session</li><li>- To avoid the hacker from causing any harm</li><li>- Destroys the data in a session that another servlet or JSP might require in future. Therefore, invalidating a session should be done cautiously as sessions are associated with client, not with individual servlets or JSP pages</li></ul>

# Sessions & Listeners

## HttpSession interface – Example



The screenshot shows a Windows Internet Explorer browser window titled "Session - Windows Internet Explorer". The address bar displays "http://localhost:8084/AJDay3\_7/SessionServlet". The browser's menu bar includes "File", "Edit", "View", "Favorites", "Tools", and "Help". A "Favorites" bar is visible below the menu bar, showing a single entry named "Session".

The main content area of the browser displays the following text:

### HttpSession Interface Demo

### Welcome Session Tracking

**Information on Session:**

Info Type	Value
ID	27C8C18AA205D9CBD95B53C6D62A783B
Create time	Sun Sep 22 18:02:59 ICT 2013
Time of Last Access	Sun Sep 22 18:02:59 ICT 2013
Number of Previous Accesses	0
Session Time out	1800

# Sessions & Listeners

## HttpSession interface – Example

```

30  protected void processRequest(HttpServletRequest request, HttpServletResponse response)
31      throws ServletException, IOException {
32      response.setContentType("text/html;charset=UTF-8");
33      PrintWriter out = response.getWriter();
34      try {
35          out.println("<html>");
36          out.println("<head>");
37          out.println("<title>Session</title>");
38          out.println("</head>");
39          out.println("<body>");
40          out.println("<h1>HttpSession Interface Demo</h1>");
41
42          HttpSession session = request.getSession(true);
43          String heading;
44          Integer accessCount = (Integer) session.getAttribute("accessCount");
45          if (accessCount == null) {
46              accessCount = new Integer(0);
47              heading = "Welcome Session Tracking";
48          } else {
49              heading = "Comeback";
50              accessCount = new Integer(accessCount.intValue() + 1);
51          }

```

# Sessions & Listeners

## HttpSession interface – Example

```

DateFormat formatter = DateFormat.getDateTimeInstance(
    DateFormat.MEDIUM, DateFormat.MEDIUM);
out.println("<H1 ALIGN=\"CENTER\">" + heading +
    "</H1>\n<H2>Information on Session:</H2>\n"
    + "<TABLE BORDER=1 ALIGN=\"CENTER\">\n<TR BGCOLOR=\""
    + "\"#FFA000\">\n <TH>Info Type<TH>Value\n"
    + "<TR>\n <TD>ID\n <TD>" + session.getId() +
    "\n<TR>\n <TD>Create time\n <TD>"
    + new Date(session.getCreationTime()) +
    "\n<TR>\n <TD>Time of Last Access\n <TD>"
    + new Date(session.getLastAccessedTime()) +
    "\n<TR>\n <TD>Number of Previous Accesses\n <TD>"
    + accessCount + "\n<TR>\n <TD>Session Time out\n <TD>" +
    session.getMaxInactiveInterval()
    + "<TABLE>\n</BODY></HTML>");
out.println("</body>");
out.println("</html>");

} finally {
    out.close();
}
}

```





A screenshot of a Windows taskbar. The taskbar is light blue. On the left, there is a Start button with the Windows logo. To the right of the Start button, there are several taskbar icons. The first icon is a green double arrow. The second icon is a red 'X'. The third icon is the Windows logo, followed by the text 'Live Search'.


## Comeback

Info Type	Value
ID	198A528D0D5B47FD7BCBDA0FCEFA3229
Create time	Sun Sep 22 18:05:14 ICT 2013
Time of Last Access	Sun Sep 22 18:05:14 ICT 2013
Number of Previous Accesses	1
Session Time out	1800

# Sessions & Listeners

## HttpSession interface

- **Distributed Session**
  - A session is available to be shared between web resources in a single web application (*e.g. a session cannot cross web application boundaries*)
- **Session Death is controlled in one of 3 ways**
  - **Application Server Global Default**
  - **Web Application Default (minutes)**
    - A negative value or zero value causes the session to never expire



```

web.xml
General  Servlets  Filters  Pages
132  <session-config>
133      <session-timeout>
134          30
135      </session-timeout>
136  </session-config>
    
```

- Individual Session Setting using **setMaxInactiveInterval()** method
    - A negative value supplied as an argument causes the session to never expire
- **Other Session APIs**
  - **HttpSession.getServletContext()** returns the SessionContext that the session is attached

# How to write CRUD Web Application

## Shopping Cart

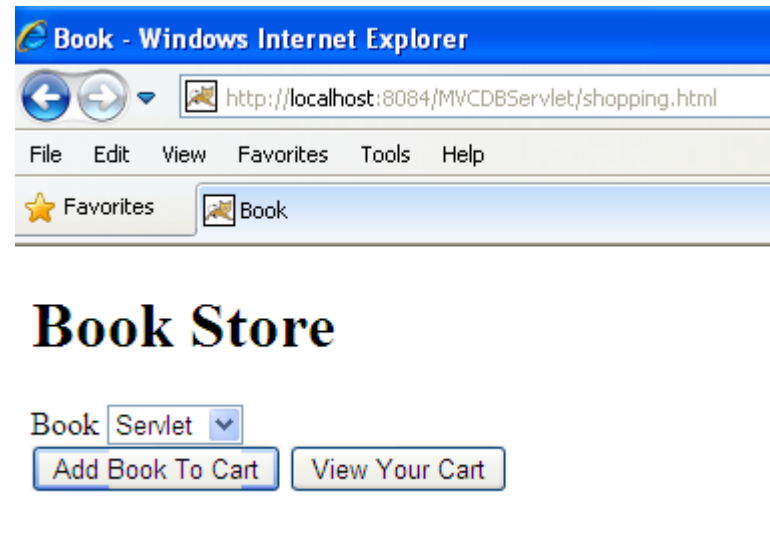
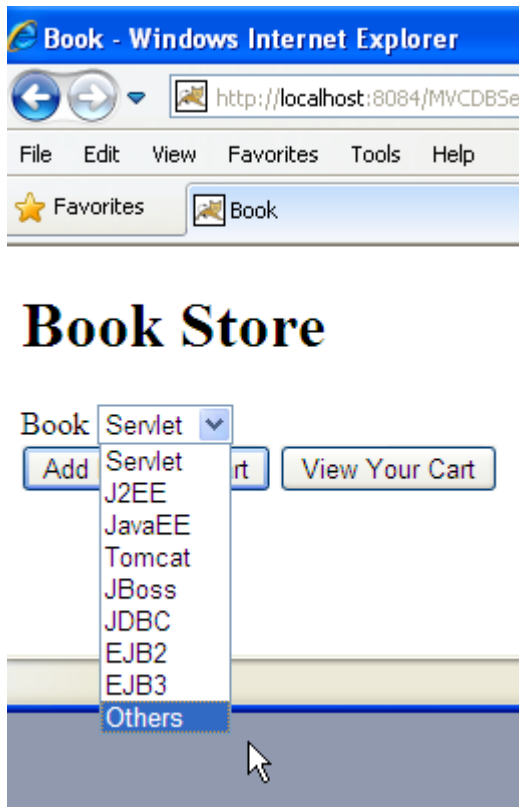


The screenshot shows a Windows Internet Explorer browser window. The title bar reads "Login - Windows Internet Explorer". The address bar shows the URL "http://localhost:8084/MVCDBServlet/". The menu bar includes "File", "Edit", "View", "Favorites", "Tools", and "Help". The Favorites bar shows a single item named "Login". The main content area displays the "Login Page" with the following elements:

- A "Username" label followed by a text input field.
- A "Password" label followed by a text input field.
- Two buttons: "Login" and "Reset".
- A blue underlined link: "Click here to go to buy Advanced Java Book". A mouse cursor is hovering over this link.

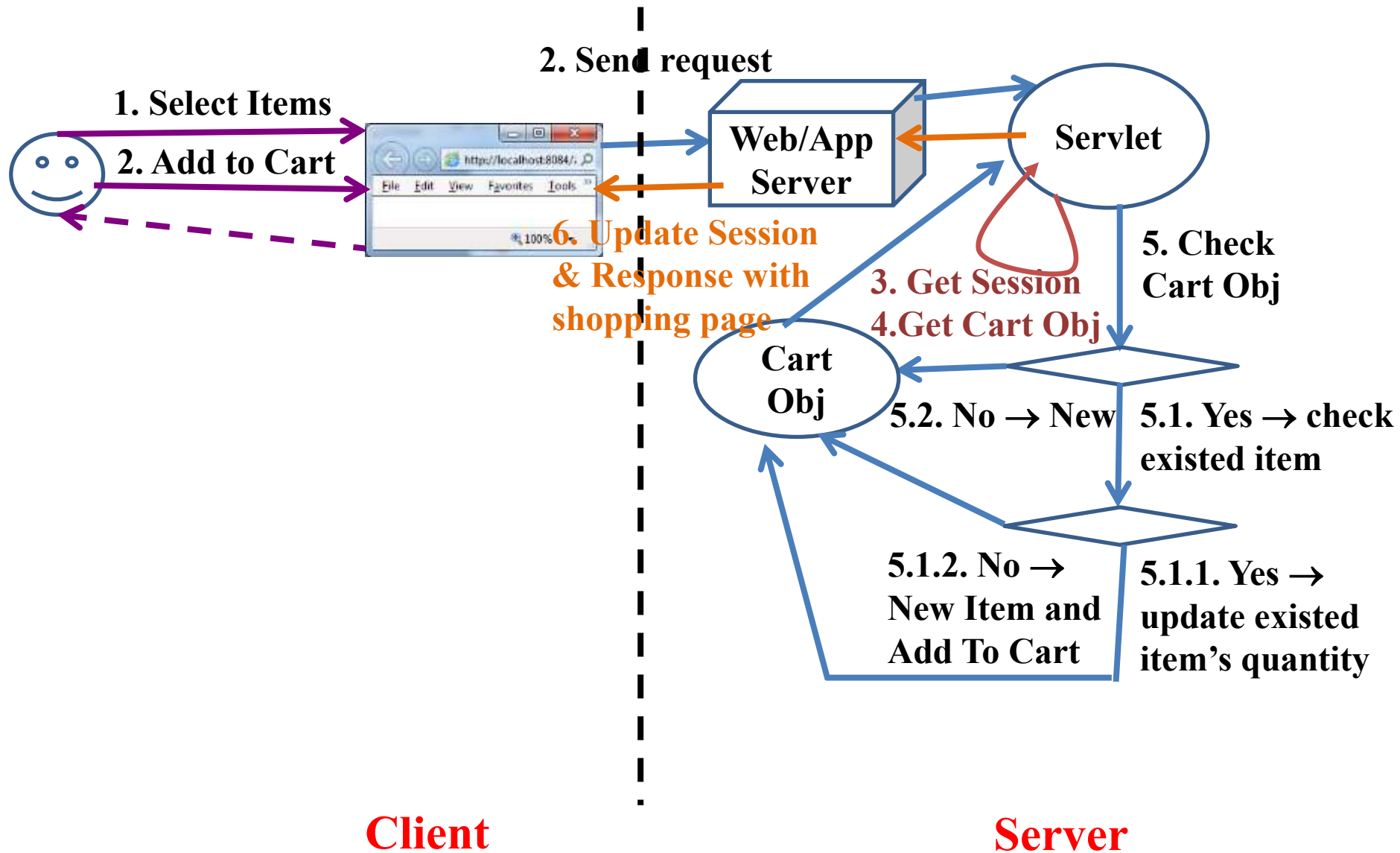
The status bar at the bottom of the browser window shows the full URL: "http://localhost:8084/MVCDBServlet/shopping.html".

## Shopping Cart – Add To Cart



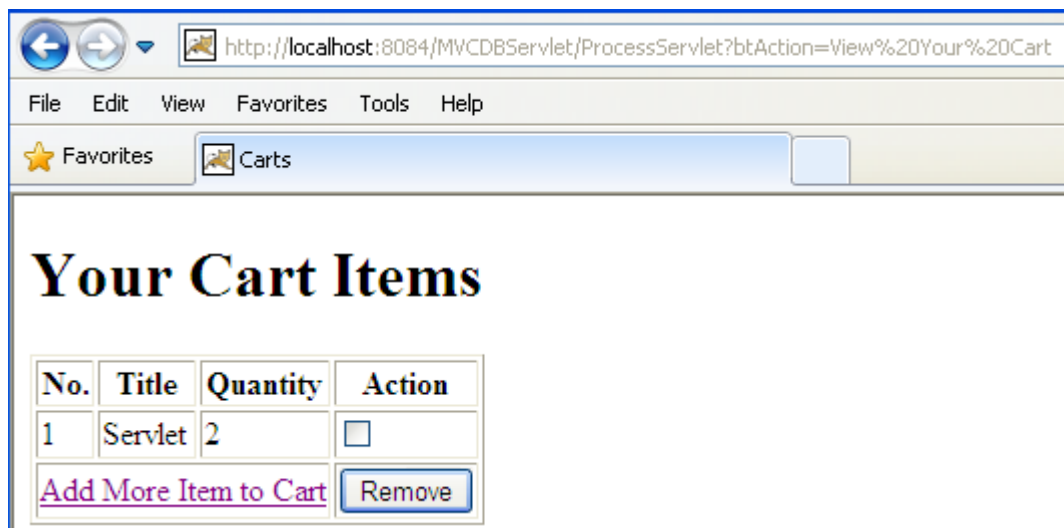
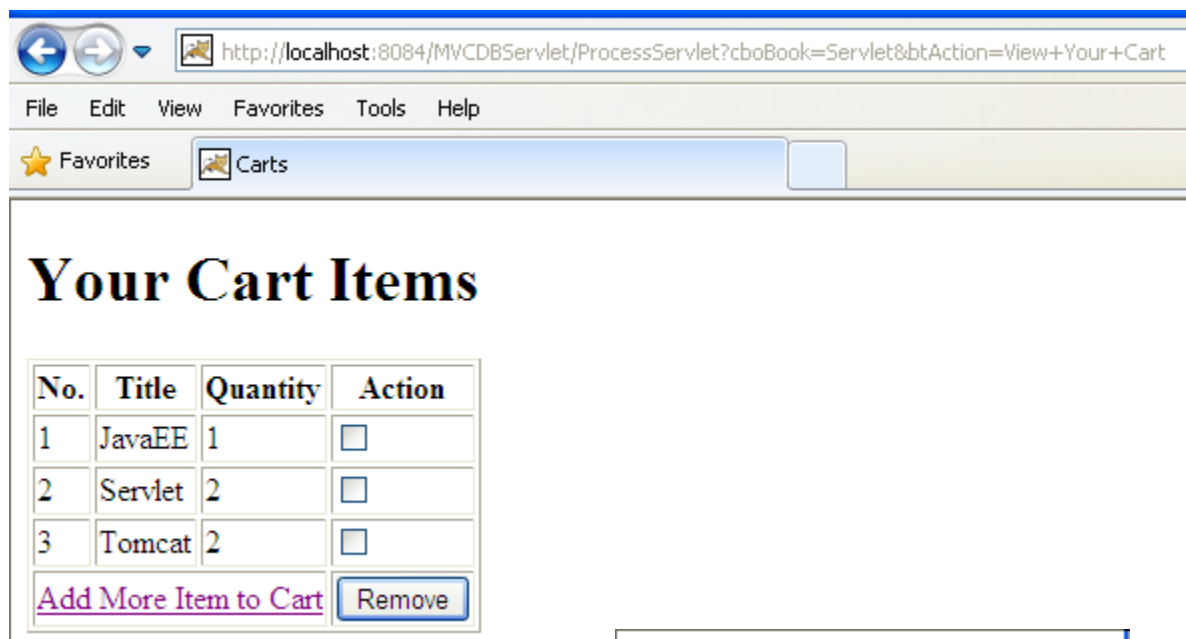
# How to write CRUD Web Application

## Interactive Server Model – Add To Cart



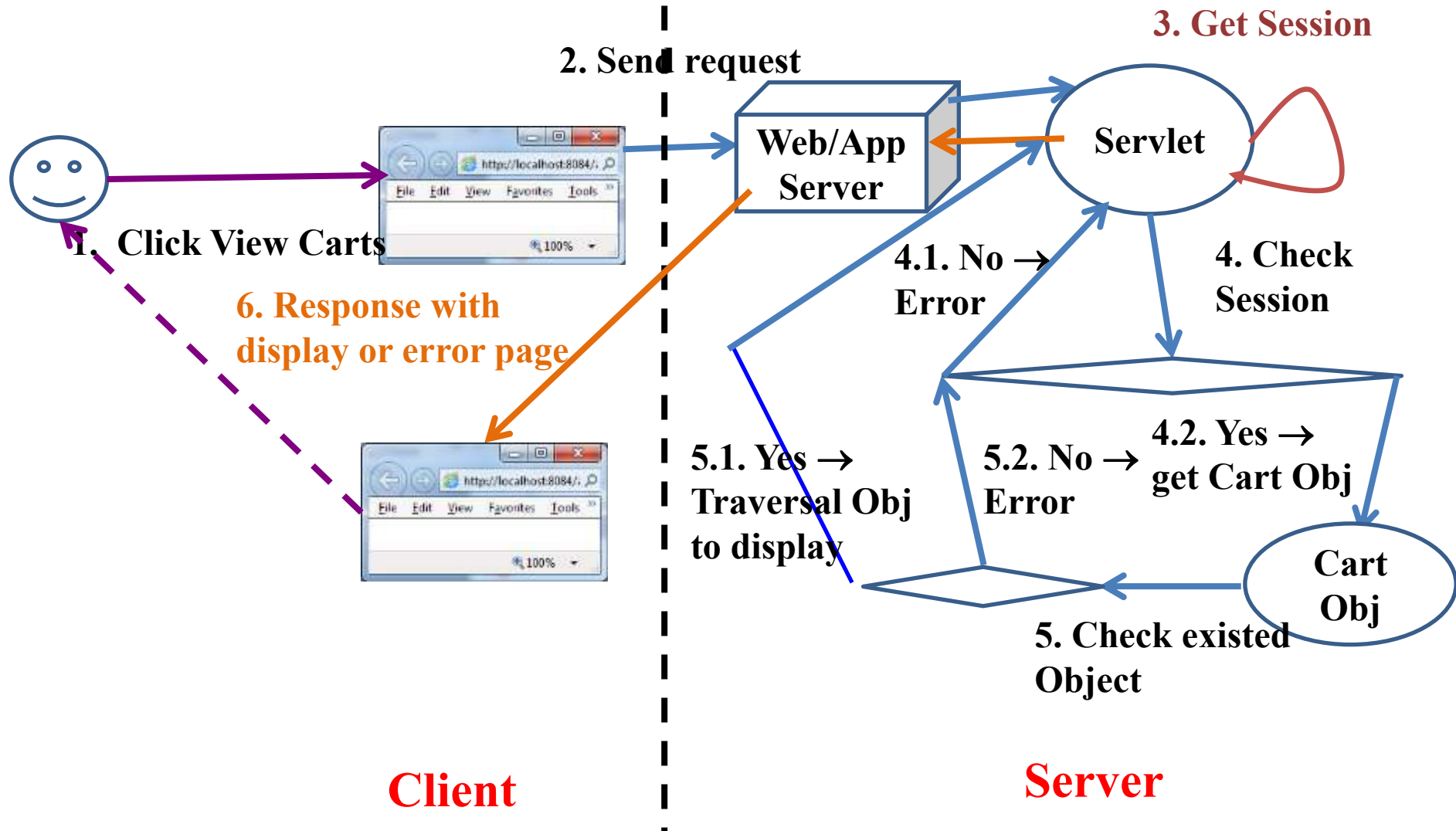
# How to write CRUD Web Application

## Shopping Cart – View Cart



# How to write CRUD Web Application

## Interactive Server Model – View Cart



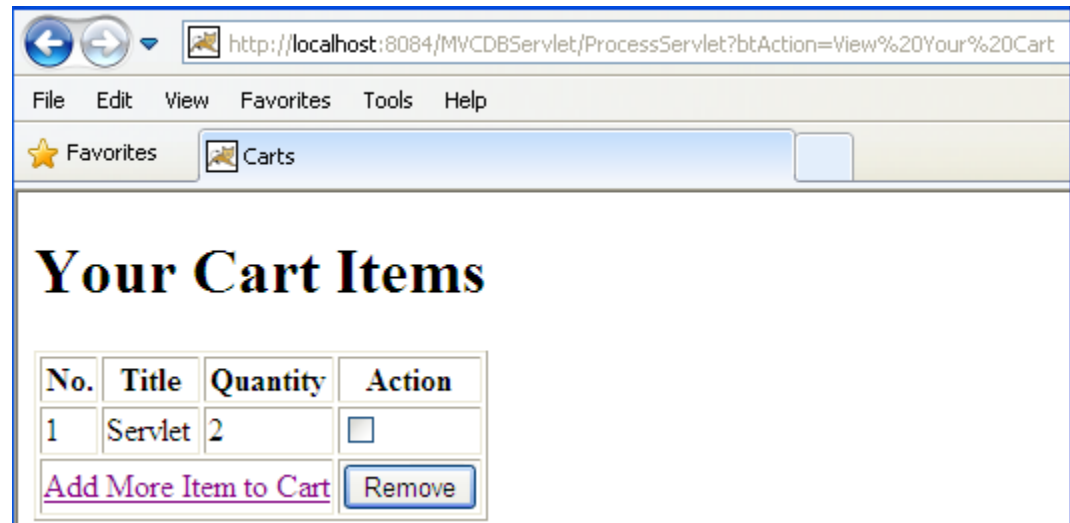
# How to write CRUD Web Application

## Shopping Cart – Remove Cart

**Your Cart Items**

No.	Title	Quantity	Action
1	JavaEE	1	<input checked="" type="checkbox"/>
2	Servlet	2	<input type="checkbox"/>
3	Tomcat	2	<input checked="" type="checkbox"/>

[Add More Item to Cart](#)



**Your Cart Items**

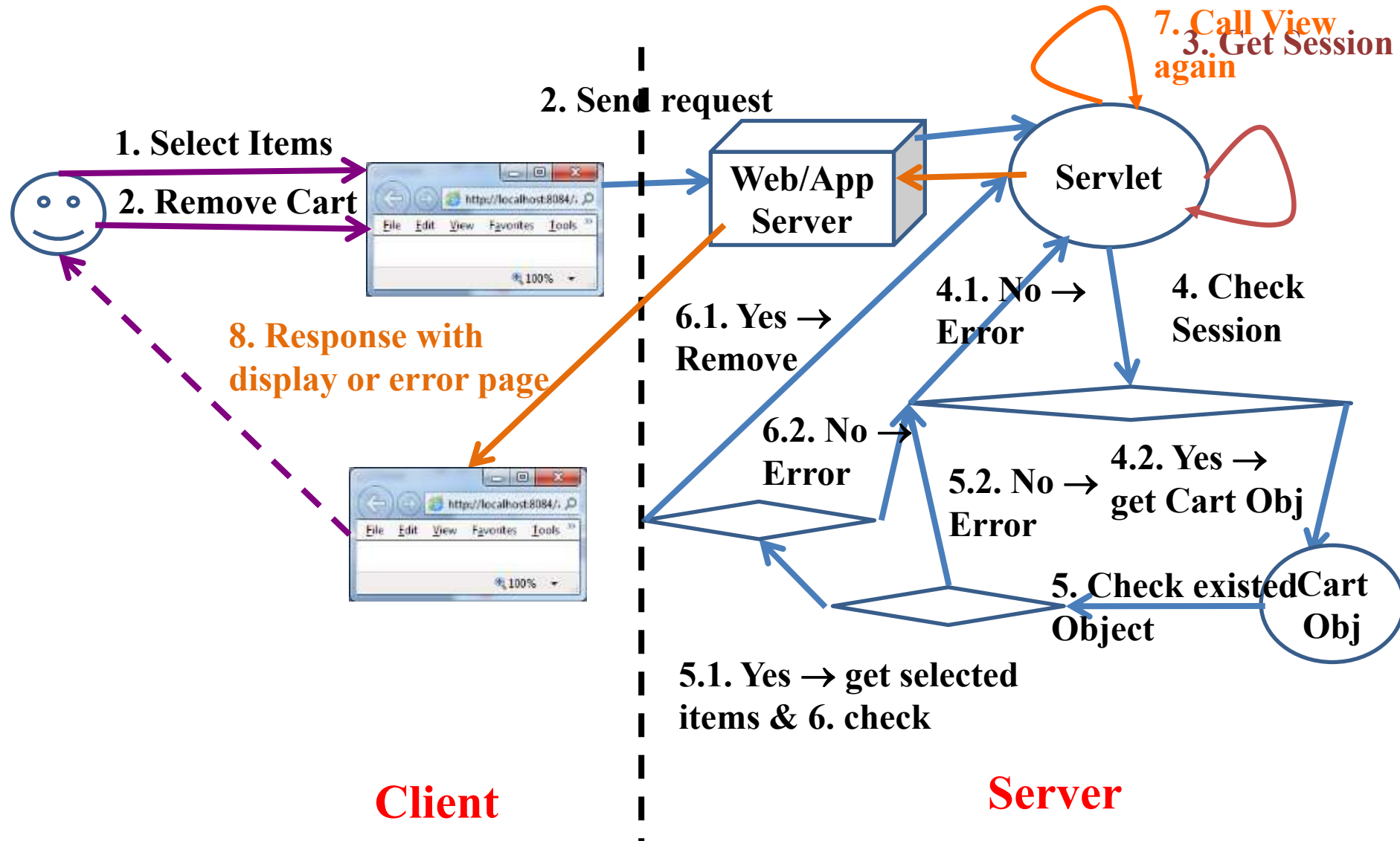
No.	Title	Quantity	Action
1	Servlet	2	<input type="checkbox"/>

[Add More Item to Cart](#)



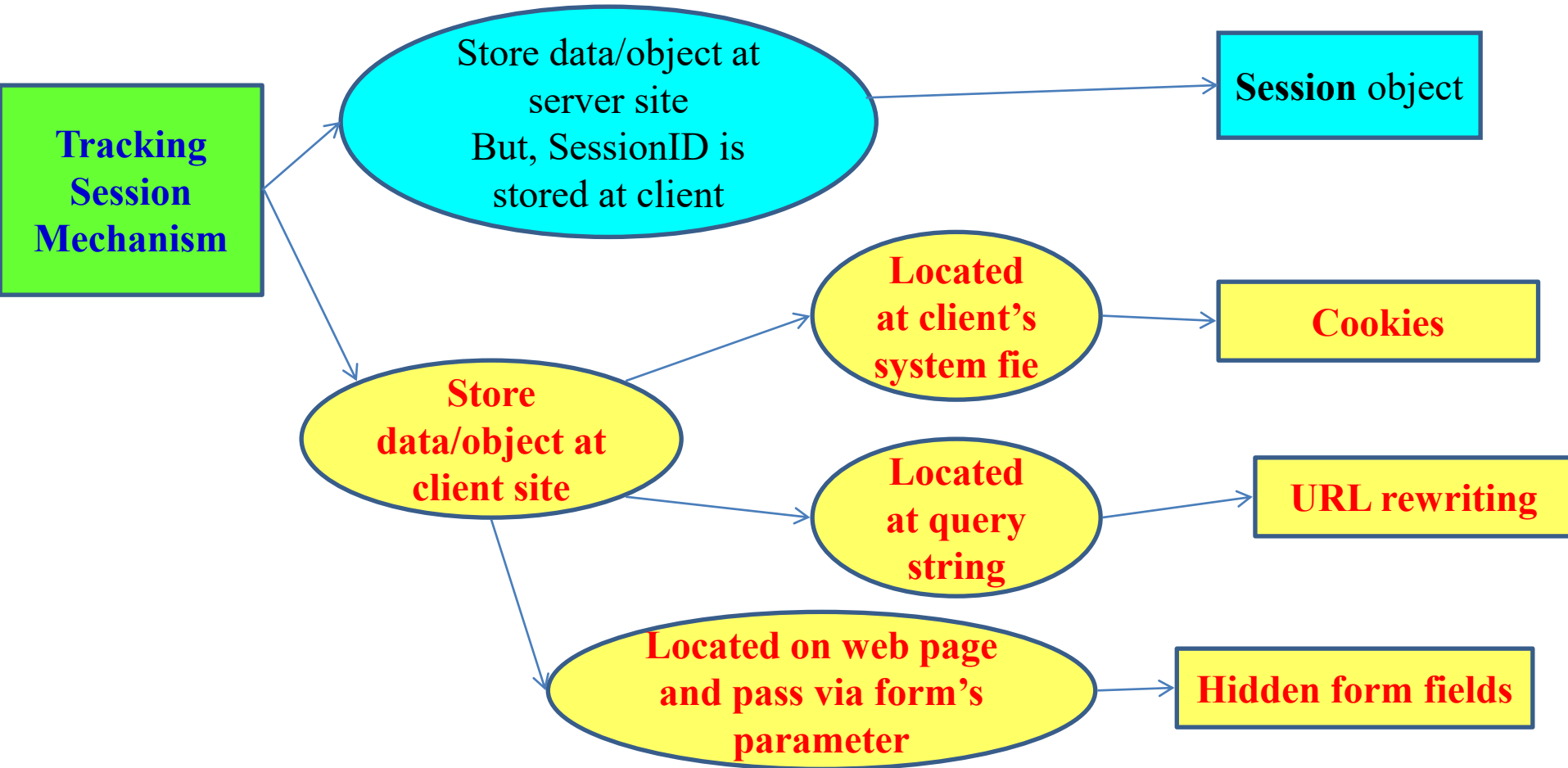
# How to write CRUD Web Application

## Interactive Server Model – Remove



# Sessions & Listeners

## Conclusion



# Error Handling in Servlet

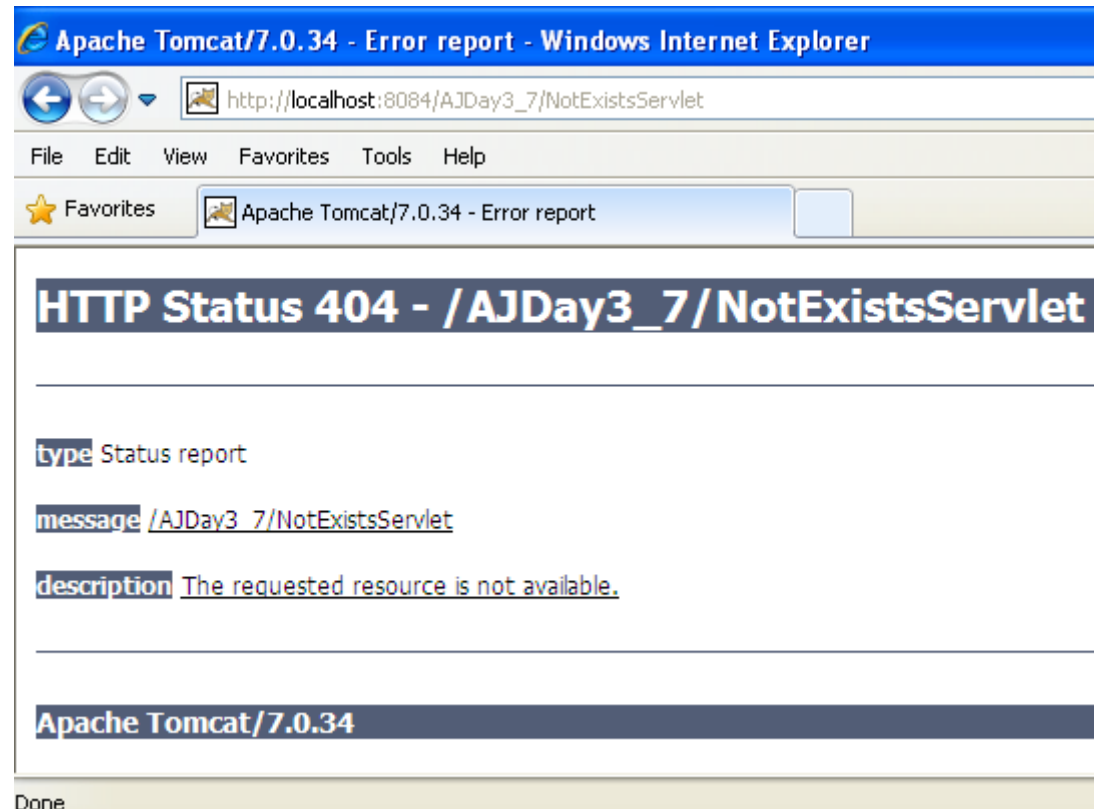
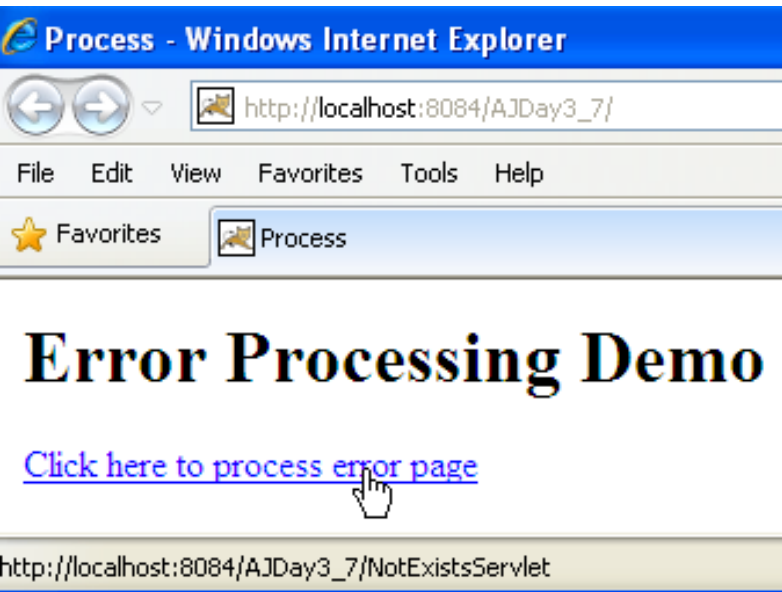
## Reporting Error

- **There are many situations occur an error**
  - A requested page may be moved from one location to another.
  - The address may be wrongly typed.
  - The requested page may be forbidden, may be temporarily deleted or correct HTTP version might not have found.
  - There are other situations where an error may generated.
- Error during the execution of a web application are reported

Methods	Descriptions
<b>sendError</b>	<ul style="list-style-type: none"> <li>- <b>public void sendError(int sc) throws IOException</b></li> <li>- Checks for the status code and sends to the user the specified response message</li> <li>- After sending the error message the buffer is cleared</li> <li>- <code>response.sendError(response.SC_NOT_FOUND);</code></li> </ul>
<b>setStatus</b>	<ul style="list-style-type: none"> <li>- <b>public void HttpServletResponse.setStatus(int sc)</b></li> <li>- This code is specified earlier so that on receiving the setStatus() method, the error message is throw. Or redirected to another default Web page</li> <li>- <code>response.setStatus(response.SC_NOT_MODIFIED);</code></li> </ul>

# Error Handling in Servlet

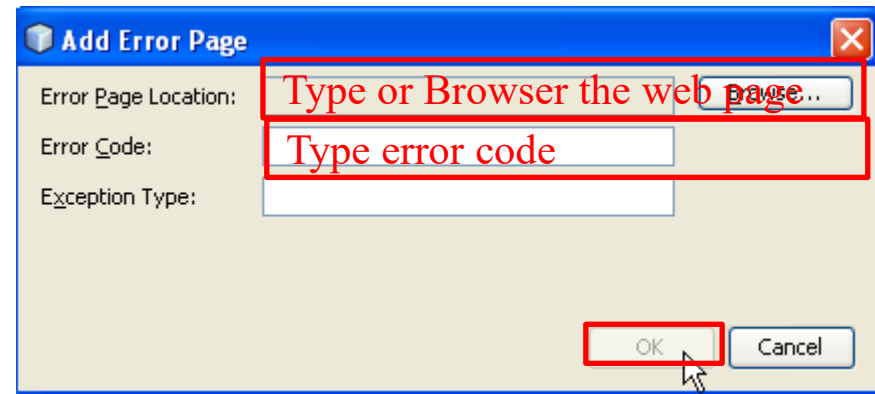
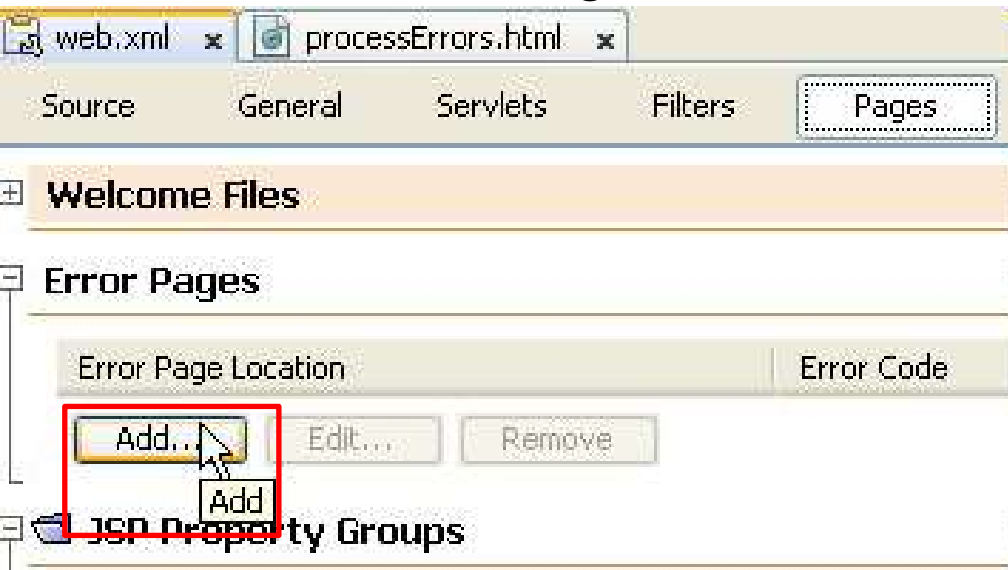
## Reporting Error – Example



# Error Handling in Servlet

## Reporting Error – Example

- Addition the following contents to web.xml file
  - In web.xml, choose Page tab, choose Error Pages, click Add



### Error Pages

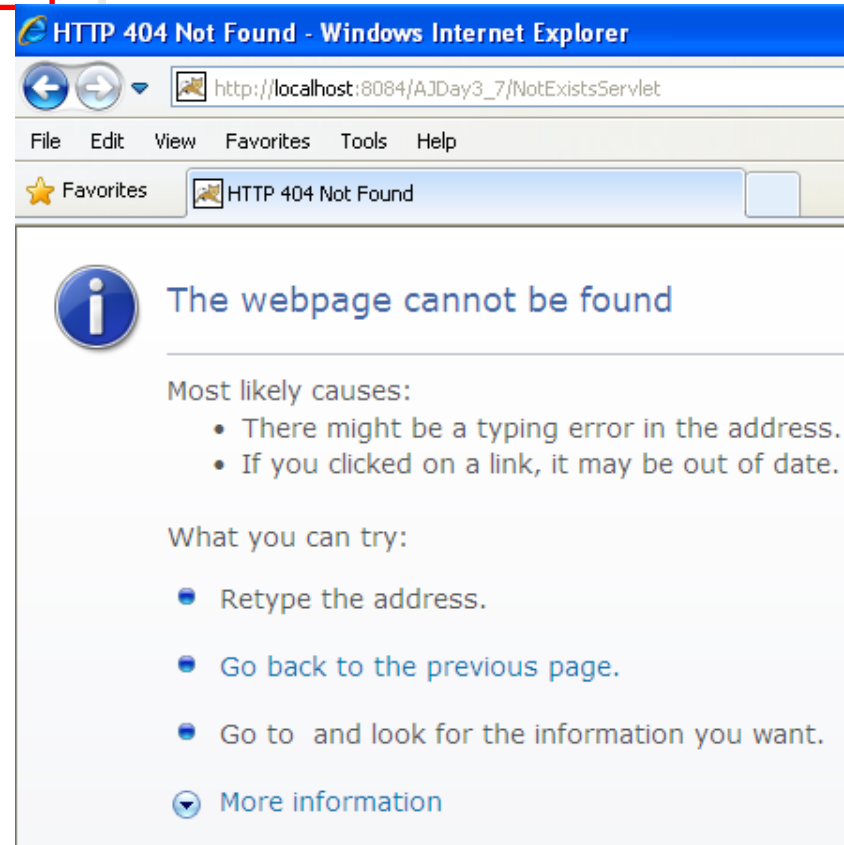
Error Page Location	Error Code
/FileNotFound.html	404
<div> <span>Add...</span> <span>Edit...</span> <span>Remove</span> </div>	

# Error Handling in Servlet

## Reporting Error – Example

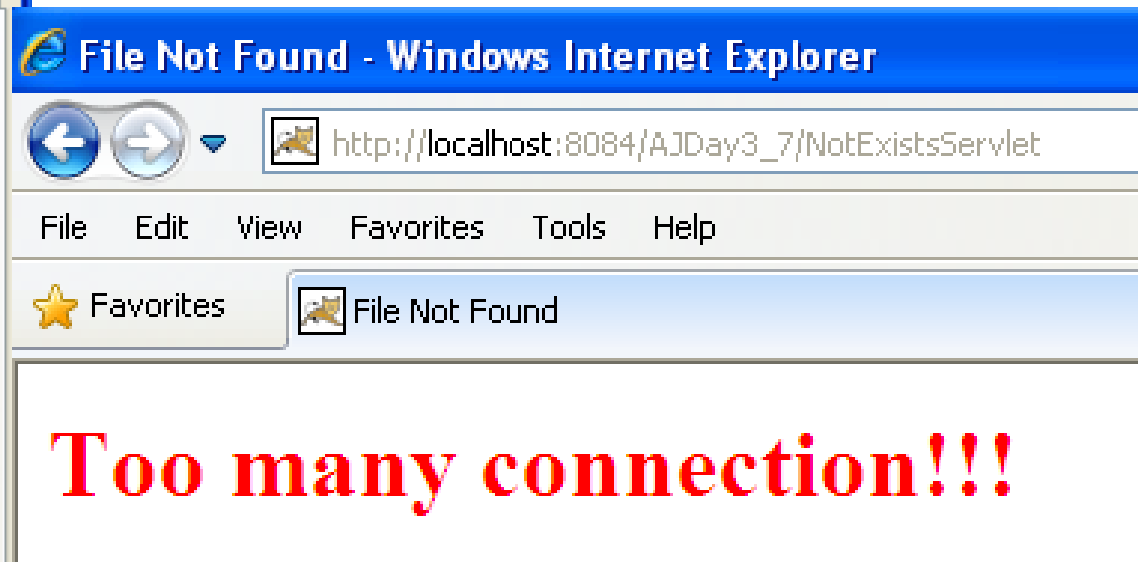
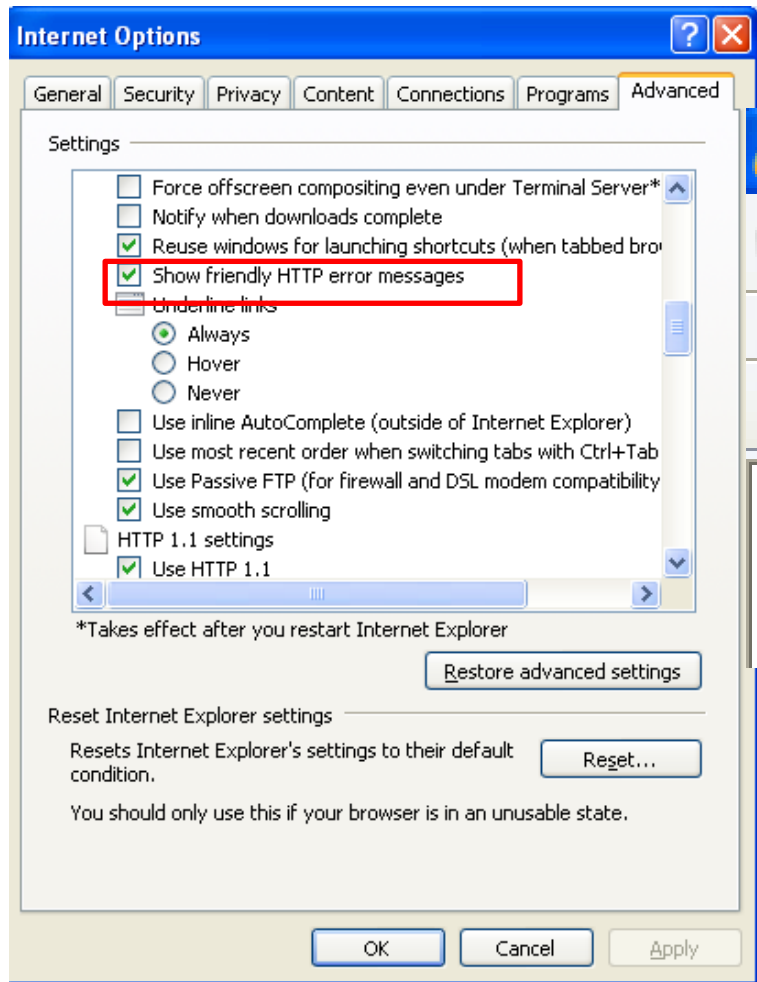
```

web.xml
Source  General  Servlets  Filters  Pages  References  Security
172  <welcome-file-list>
173      <welcome-file>logine.html</welcome-file>
174  </welcome-file-list>
175  <error-page>
176      <error-code>404</error-code>
177      <location>/fileNotFound.html</location>
178  </error-page>
179  </web-app>
    
```



# Error Handling in Servlet

## Reporting Error



**Uncheck the option “Show friendly HTTP error messages” from Tools/ “Internet Options” to set up the browser would be presented the user defined message**

# Error Handling in Servlet

## Reporting Error – Example

ErrorProcessingServlet.java x

```

Source History
16  * @author Trong Khanh
17  */
18  public class ErrorProcessingServlet extends HttpServlet {
19
20      /**...*/
30  protected void processRequest(HttpServletRequest request, HttpServletResponse response)
31      throws ServletException, IOException {
32      response.setContentType("text/html;charset=UTF-8");
33      PrintWriter out = response.getWriter();
34      try {
35          int a = Integer.parseInt("a");
36      } catch (NumberFormatException e) {
37          response.sendError(response.SC_INTERNAL_SERVER_ERROR, e.getMessage());
38      } finally {
39          out.close();
40      }
41  }

```

Apache Tomcat/7.0.34 - Error report - Windows Internet Explorer

http://localhost:8084/AJDay3\_7/ErrorProcessingServlet

File Edit View Favorites Tools Help

★ Favorites Apache Tomcat/7.0.34 - Error report

### HTTP Status 500 - For input string: "a"

**type** Status report

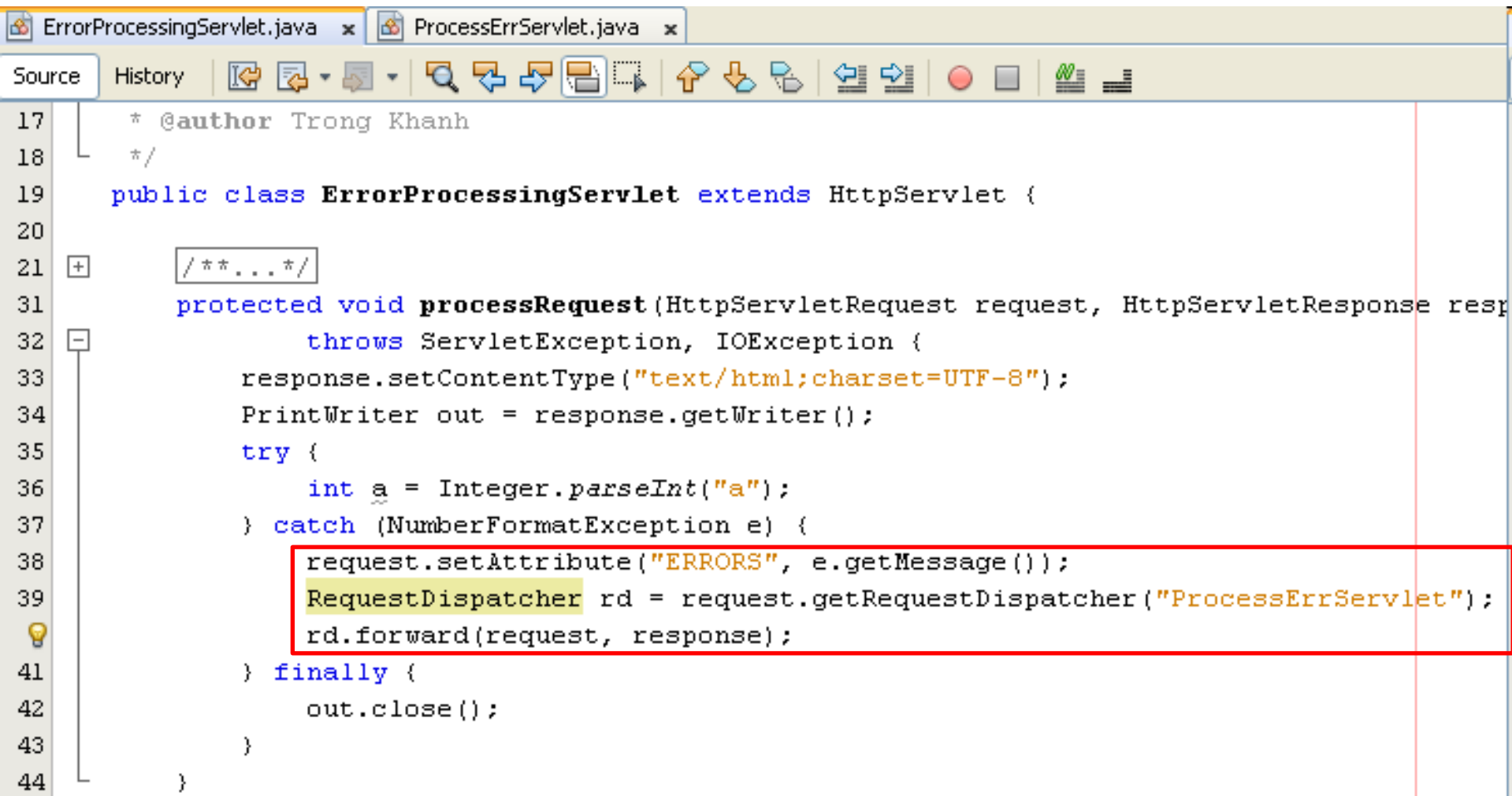
**message** For input string: "a"

**description** The server encountered an internal error that prevented it from



# Error Handling in Servlet

## Reporting Error – Example

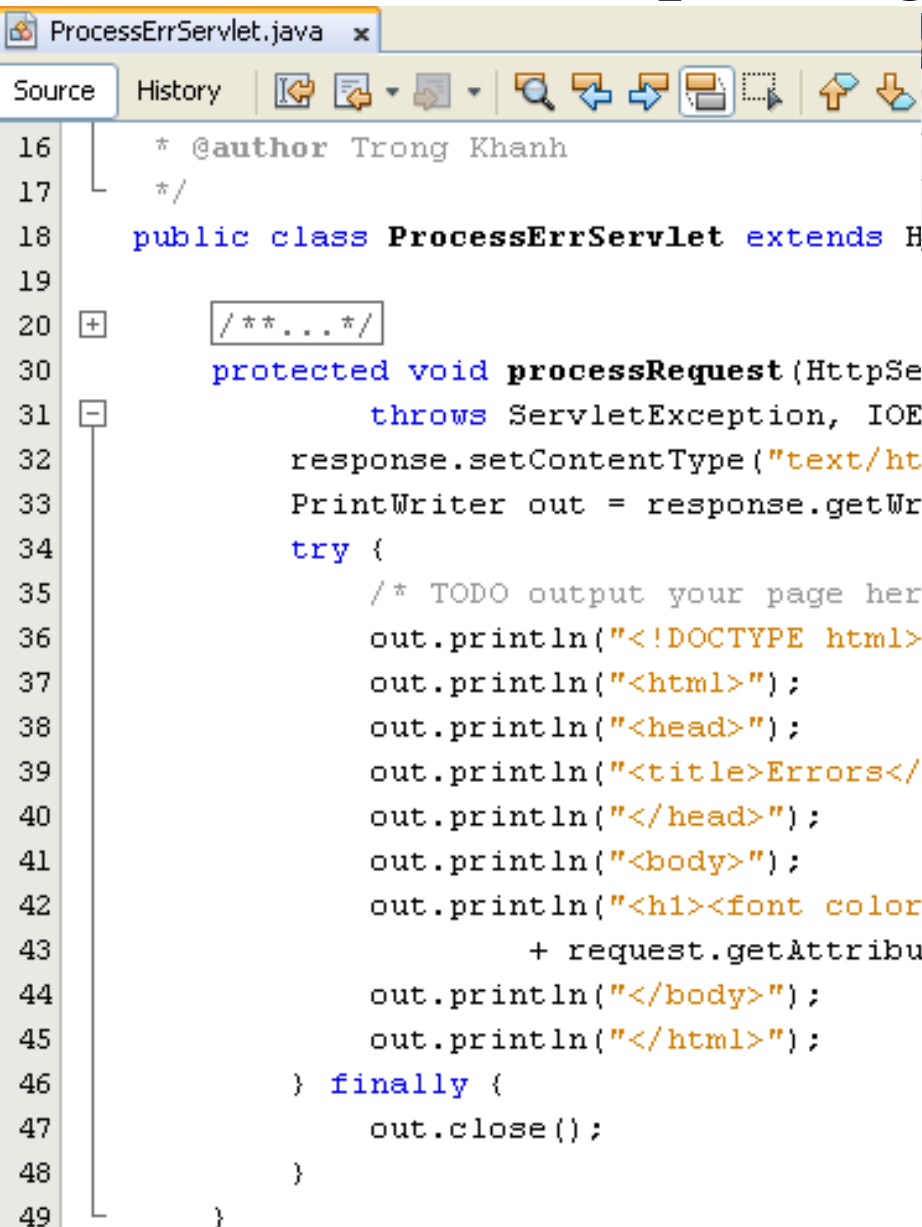


```

17  * @author Trong Khanh
18  */
19  public class ErrorProcessingServlet extends HttpServlet {
20
21      /**...*/
22
23      protected void processRequest(HttpServletRequest request, HttpServletResponse response)
24          throws ServletException, IOException {
25          response.setContentType("text/html; charset=UTF-8");
26          PrintWriter out = response.getWriter();
27          try {
28              int a = Integer.parseInt("a");
29          } catch (NumberFormatException e) {
30              request.setAttribute("ERRORS", e.getMessage());
31              RequestDispatcher rd = request.getRequestDispatcher("ProcessErrServlet");
32              rd.forward(request, response);
33          } finally {
34              out.close();
35          }
36      }
37  }
  
```

# Error Handling in Servlet

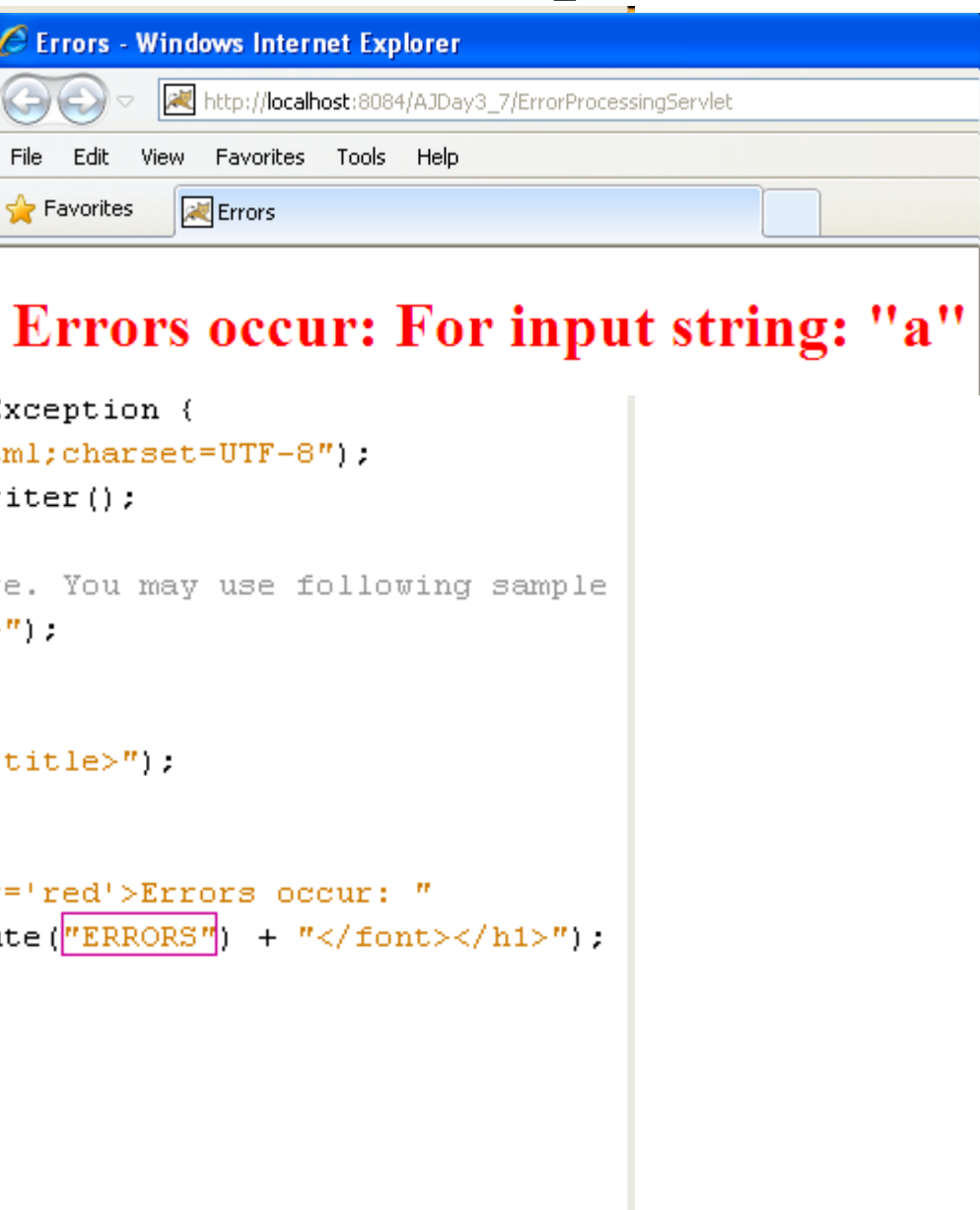
## Reporting Error – Example



```

16  * @author Trong Khanh
17  */
18  public class ProcessErrServlet extends HttpServlet {
19
20      /**
30      protected void processRequest(HttpServletRequest request, HttpServletResponse response)
31          throws ServletException, IOException {
32          response.setContentType("text/html;charset=UTF-8");
33          PrintWriter out = response.getWriter();
34          try {
35              /* TODO output your page here. You may use following sample
36              out.println("<!DOCTYPE html>");
37              out.println("<html>");
38              out.println("<head>");
39              out.println("<title>Errors</title>");
40              out.println("</head>");
41              out.println("<body>");
42              out.println("<h1><font color='red'>Errors occur: "
43                  + request.getAttribute("ERRORS") + "</font></h1>");
44              out.println("</body>");
45              out.println("</html>");
46          } finally {
47              out.close();
48          }
49      }

```



Errors - Windows Internet Explorer

http://localhost:8084/AJDay3\_7/ErrorProcessingServlet

File Edit View Favorites Tools Help

★ Favorites Errors

**Errors occur: For input string: "a"**

# Error Handling in Servlet

## Reporting Error – Example

```

DisplayErrorServlet.java x
Source History
15
16 * @author Trong Khanh
17 */
18 public class DisplayErrorServlet extends HttpServlet {
19
20     /** ... */
30     protected void processRequest(HttpServletRequest request, HttpServletResponse response)
31         throws ServletException, IOException {
32         response.setContentType("text/html;charset=UTF-8");
33         PrintWriter out = response.getWriter();
34         try {
35             String action = request.getParameter("action");
36             if (action == null) {
37                 response.setStatus(HttpServletResponse.SC_TEMPORARY_REDIRECT);
38                 String url = "http://" + request.getLocalName() + ":"
39                     + request.getLocalPort() + request.getContextPath() +
40                     "/login.html";
41                 response.setHeader("Location", url);
42             }
43         } finally {
44             out.close();
45         }
46     }
  
```

# Error Handling in Servlet

## Reporting Error – Example

Login - Windows Internet Explorer

http://localhost:8084/AJDay3\_7/logine.html

File Edit View Favorites Tools Help

Favorites Login

## Login Page

Username

Password

Login Reset

```

logine.html x
Source History
5 <!DOCTYPE html>
6 <html>
7 <head>
8 <title>Login</title>
9 <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
10 </head>
11 <body>
12 <h1>Login Page</h1>
13 <form action="TestServlet" method="POST">
14 Username <input type="text" name="txtUser" value="" /><br/>
15 Password <input type="password" name="txtPass" value="" /><br/>
16 <input type="submit" value="Login" name="action" />
17 <input type="reset" value="Reset" />
18 </form>
19 </body>
20 </html>

```

# Error Handling in Servlet

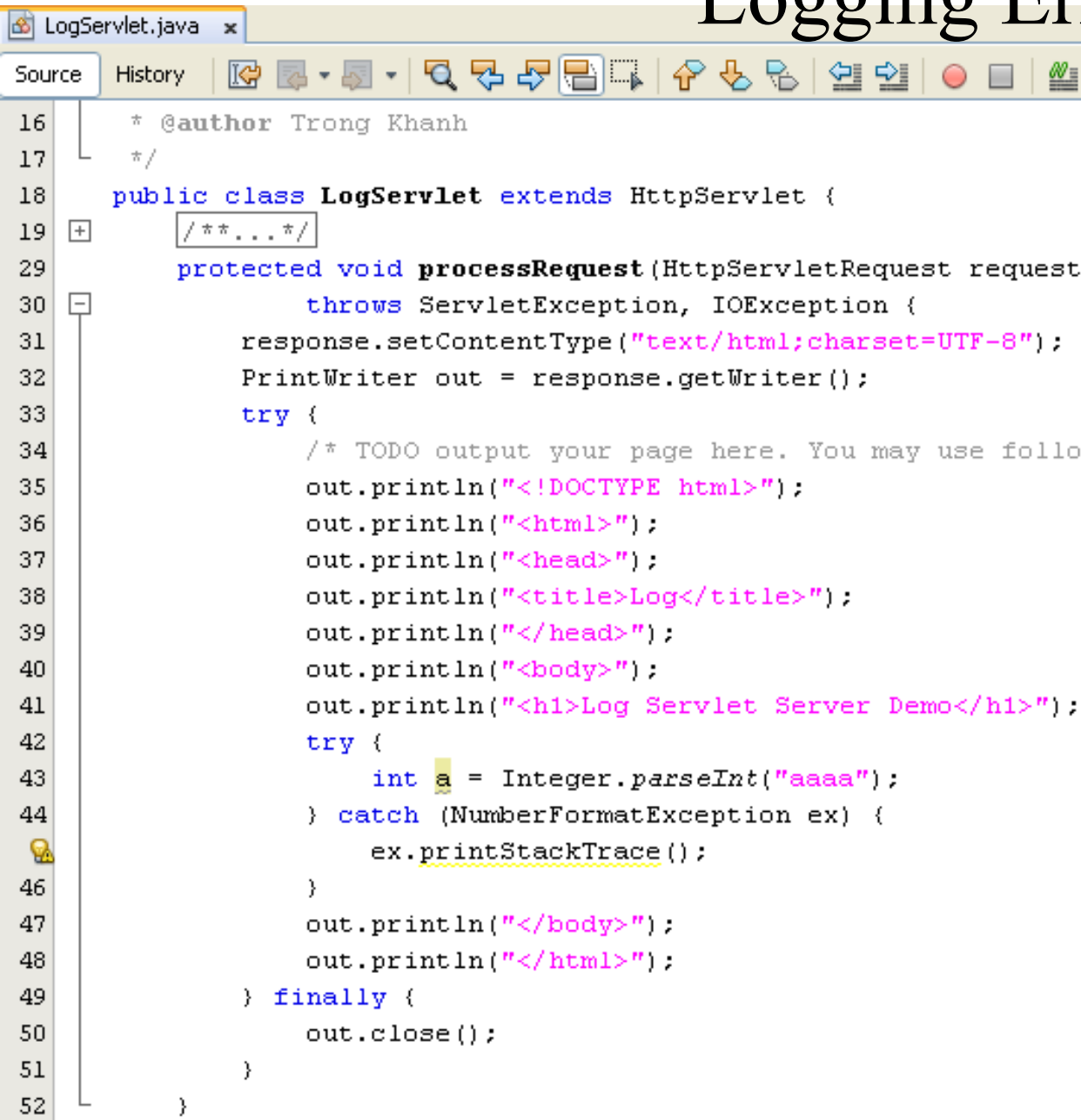
## Reporting Error – Example – Others

```

DisplayErrorServlet.java x
Source History
15
16 * @author Trong Khanh
17 */
18 public class DisplayErrorServlet extends HttpServlet {
19
20     /**...*/
30     protected void processRequest(HttpServletRequest request, HttpServletResponse response)
31         throws ServletException, IOException {
32         response.setContentType("text/html;charset=UTF-8");
33         PrintWriter out = response.getWriter();
34         try {
35             String action = request.getParameter("action");
36             if (action == null) {
37                 response.setStatus(HttpServletResponse.SC_TEMPORARY_REDIRECT);
38                 int pos = request.getRequestURL().lastIndexOf("/");
39                 String url = request.getRequestURL().substring(0, pos);
40                 url = url + "/logine.html";
41                 System.out.println("ddd " + url);
42                 response.setHeader("Location", url);
43             }
44         } finally {
45             out.close();
46         }
47     }
  
```

# Error Handling in Servlet

## Logging Error

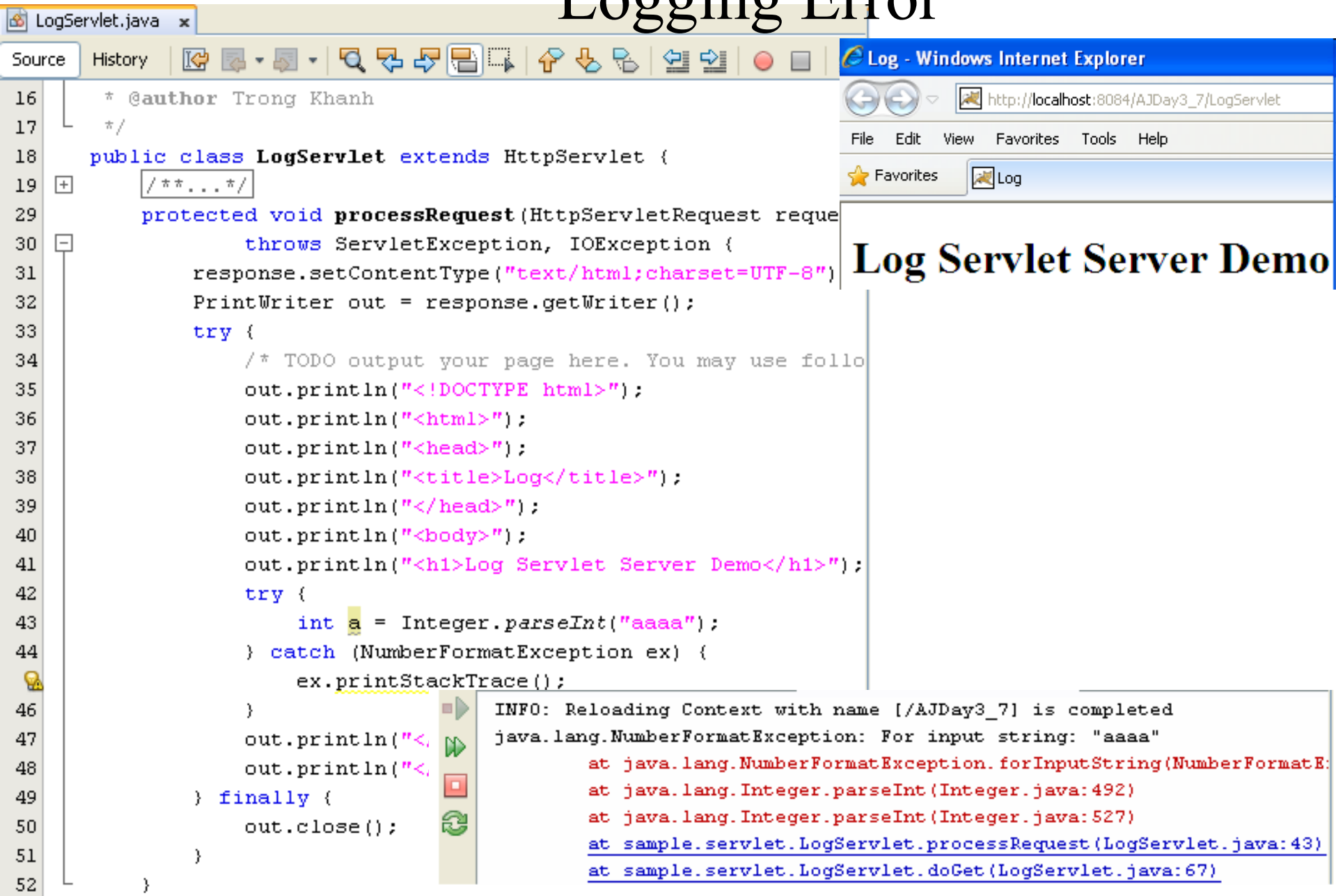


```

16  * @author Trong Khanh
17  */
18  public class LogServlet extends HttpServlet {
19      /**...*/
29  protected void processRequest(HttpServletRequest request
30      throws ServletException, IOException {
31      response.setContentType("text/html;charset=UTF-8");
32      PrintWriter out = response.getWriter();
33      try {
34          /* TODO output your page here. You may use follo
35          out.println("<!DOCTYPE html>");
36          out.println("<html>");
37          out.println("<head>");
38          out.println("<title>Log</title>");
39          out.println("</head>");
40          out.println("<body>");
41          out.println("<h1>Log Servlet Server Demo</h1>");
42          try {
43              int a = Integer.parseInt("aaaa");
44          } catch (NumberFormatException ex) {
45              ex.printStackTrace();
46          }
47          out.println("</body>");
48          out.println("</html>");
49      } finally {
50          out.close();
51      }
52  }
  
```

# Error Handling in Servlet

## Logging Error



The screenshot displays a development environment with two windows. The left window, titled 'LogServlet.java', shows the source code of a Java Servlet. The code defines a class `LogServlet` that extends `HttpServlet`. It implements the `processRequest` method, which sets the content type to `text/html; charset=UTF-8` and uses a `PrintWriter` to output HTML. The HTML includes a title 'Log Servlet Server Demo' and a body with a heading 'Log Servlet Server Demo'. Inside the body, there is a try-catch block that attempts to parse the string 'aaaa' as an integer using `Integer.parseInt`. If a `NumberFormatException` is thrown, the code calls `ex.printStackTrace()` to log the error. The right window, titled 'Log - Windows Internet Explorer', shows the browser's view of the page. The page title is 'Log Servlet Server Demo'. The browser's status bar at the bottom displays the following error message:

```

INFO: Reloading Context with name [/AJDay3_7] is completed
java.lang.NumberFormatException: For input string: "aaaa"
    at java.lang.NumberFormatException.forInputString(NumberFormatE:
    at java.lang.Integer.parseInt(Integer.java:492)
    at java.lang.Integer.parseInt(Integer.java:527)
    at sample.servlet.LogServlet.processRequest(LogServlet.java:43)
    at sample.servlet.LogServlet.doGet(LogServlet.java:67)
  
```

# Error Handling in Servlet

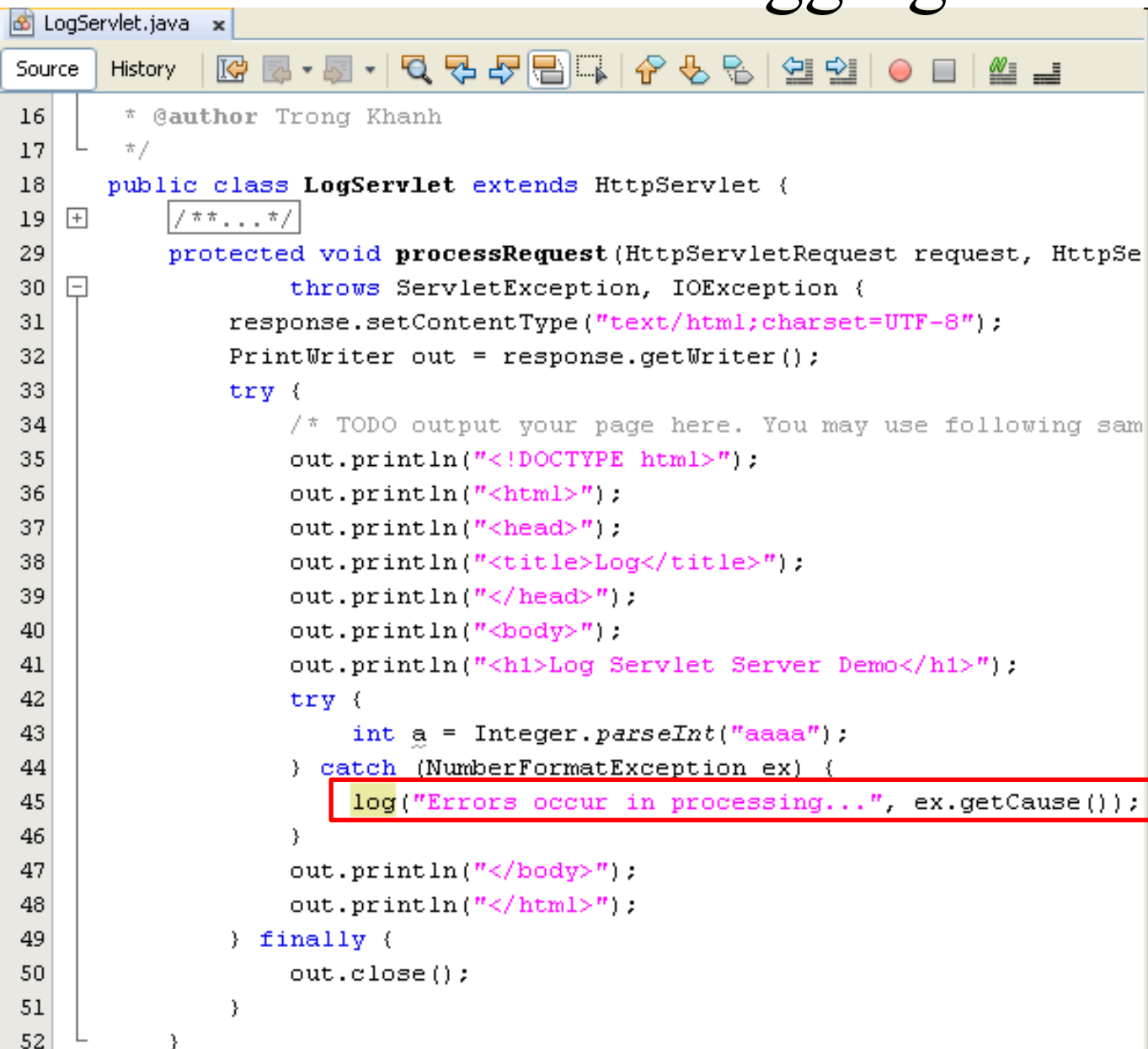
## Logging Error

- Servlet can store the actions and errors through the `log()` method of the **GenericServlet** class.
- The `log()` method also assists in debugging and can viewed record in a server
- **Syntax:** `public void log (String msg [, Throwable t])`
- **Ex:**  
  
...  
`log("Servlet is not found ");`  
`response.sendError(response.SC_INTERNAL_SERVER_ERROR, "The requested page [" + page + "] not found.");`  
...- **A log file locate at**
  - **C:\Documents and Settings\LoggedUser\Application Data\NetBeans\7.4\apache-tomcat-7.0.41.0\_base\logs\localhost.yyyy-mm-dd.log**
  - **C:\Users\LoggedUser\AppData\Roaming\NetBeans\7.4\apache-tomcat-7.0.41.0\_base\work\Catalina\logs\localhost.yyyy-mm-dd.log**



# Error Handling in Servlet

## Logging Error



```

16  * @author Trong Khanh
17  */
18  public class LogServlet extends HttpServlet {
19      /**...*/
20
21      protected void processRequest(HttpServletRequest request, HttpServletResponse response)
22          throws ServletException, IOException {
23          response.setContentType("text/html;charset=UTF-8");
24          PrintWriter out = response.getWriter();
25          try {
26              /* TODO output your page here. You may use following sample code. */
27              out.println("<!DOCTYPE html>");
28              out.println("<html>");
29              out.println("<head>");
30              out.println("<title>Log</title>");
31              out.println("</head>");
32              out.println("<body>");
33              out.println("<h1>Log Servlet Server Demo</h1>");
34              try {
35                  int a = Integer.parseInt("aaaa");
36              } catch (NumberFormatException ex) {
37                  log("Errors occur in processing...", ex.getCause());
38              }
39              out.println("</body>");
40              out.println("</html>");
41          } finally {
42              out.close();
43          }
44      }
45  }

```

# Error Handling in Servlet

## Logging Error

### Output

Apache Tomcat 7.0.27.0 x

Apache Tomcat 7.0.27.0 Log x

AJDay3\_7 (run-deploy) x

```
thg 10 30, 2013 8:22:17 SA org.apache.catalina.core.ApplicationContext log
SEVERE: LogServlet: Errors occur in processing...
```

Lister - [c:\Documents and Settings\Trong Khanh\Application Data\NetBeans\7.2.1\apache-tomcat-7.0.27.0\_base\logs\localhost.2013-10-30.log]

File Edit Options Help

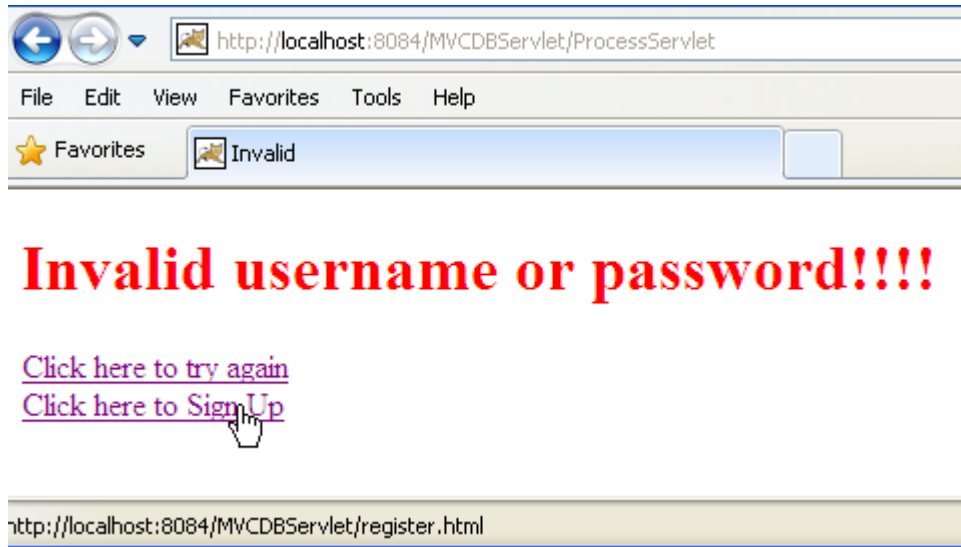
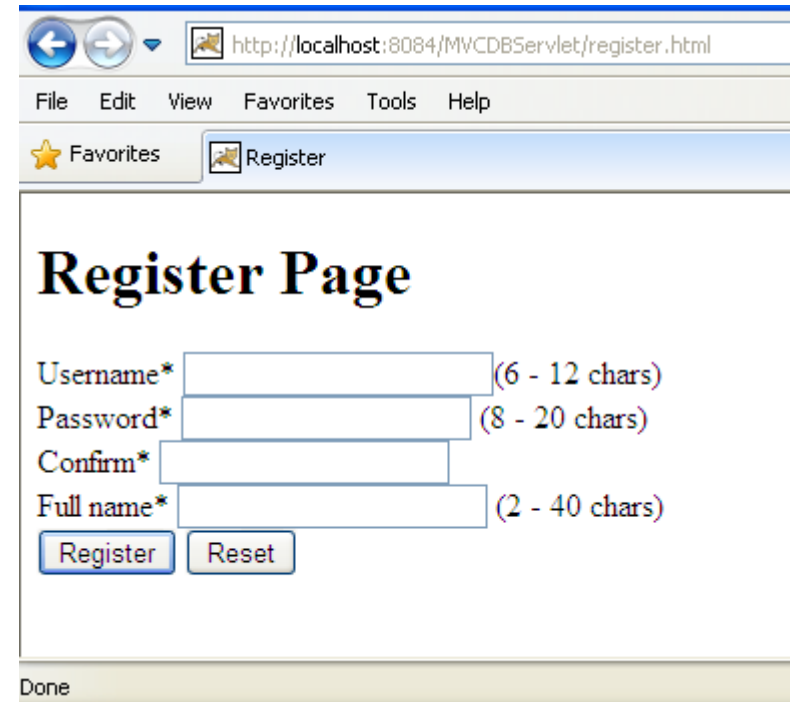
```
thg 10 30, 2013 8:22:17 SA org.apache.catalina.core.ApplicationContext log
SEVERE: LogServlet: Errors occur in processing...
```

c:\Documents and Settings\Trong Khanh\Application Data\NetBeans\7.2.1\apache-tomcat-7.0.27.0\_base\logs

Name	Ext	Size	↓Date
↑ [..]		<DIR>	30/10/2013 08:23
localhost_access_log.2013-10-30	txt	127	30/10/2013 08:23
localhost.2013-10-30	log	1.166	30/10/2013 08:22
manager.2013-10-30	log	10.655	30/10/2013 08:22
catalina.2013-10-30	log	6.253	30/10/2013 08:21
host-manager.2013-10-30	log	0	30/10/2013 07:54

# How to write CRUD Web Application

## Register Functions

### Register Page

Username\*  (6 - 12 chars)

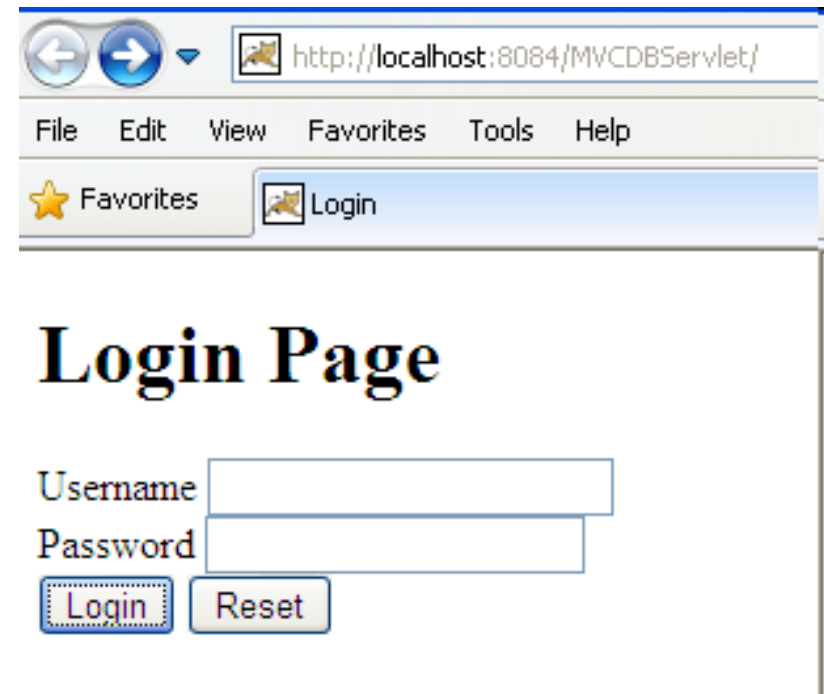
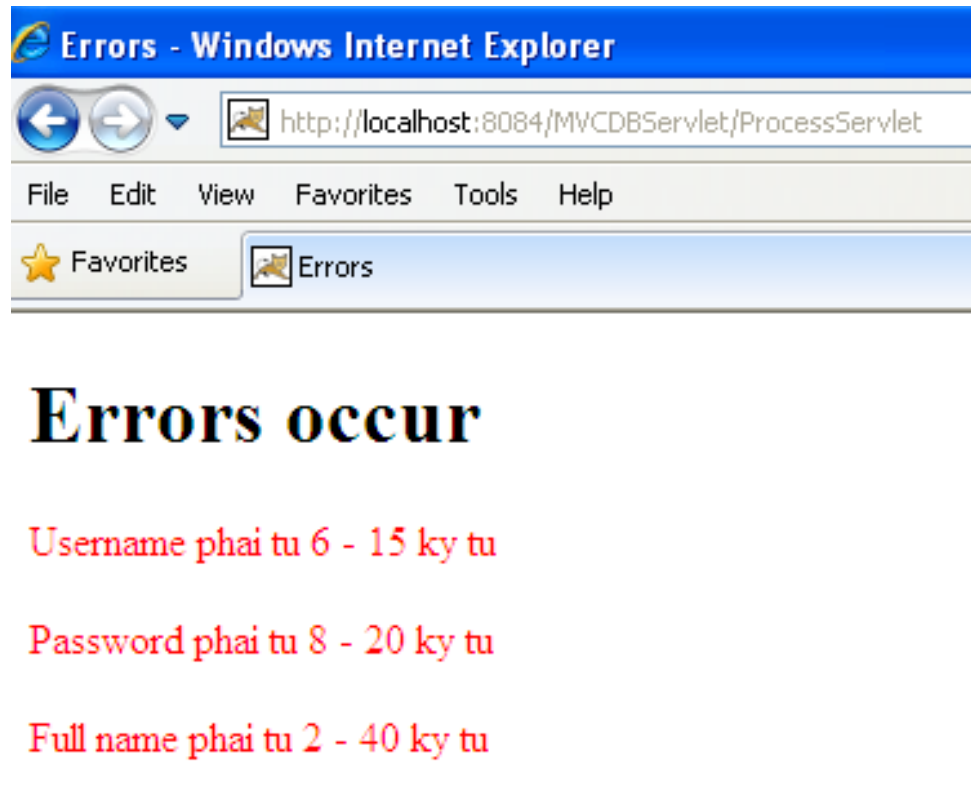
Password\*  (8 - 20 chars)

Confirm\*  (8 - 20 chars)

Full name\*  (2 - 40 chars)

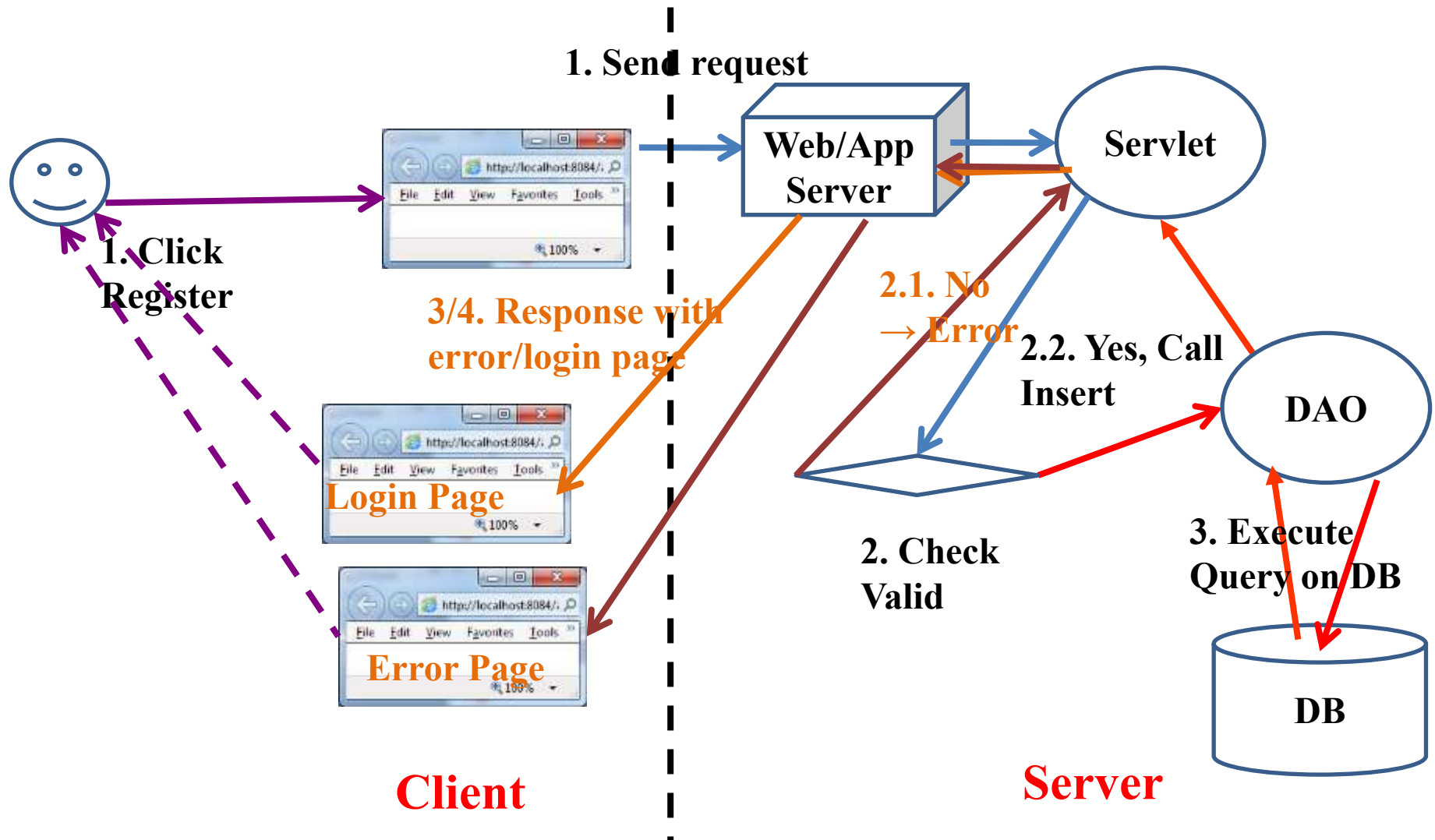
Done

# How to write CRUD Web Application Validation



# How to write CRUD Web Application

## Interactive Server Model



# Summary

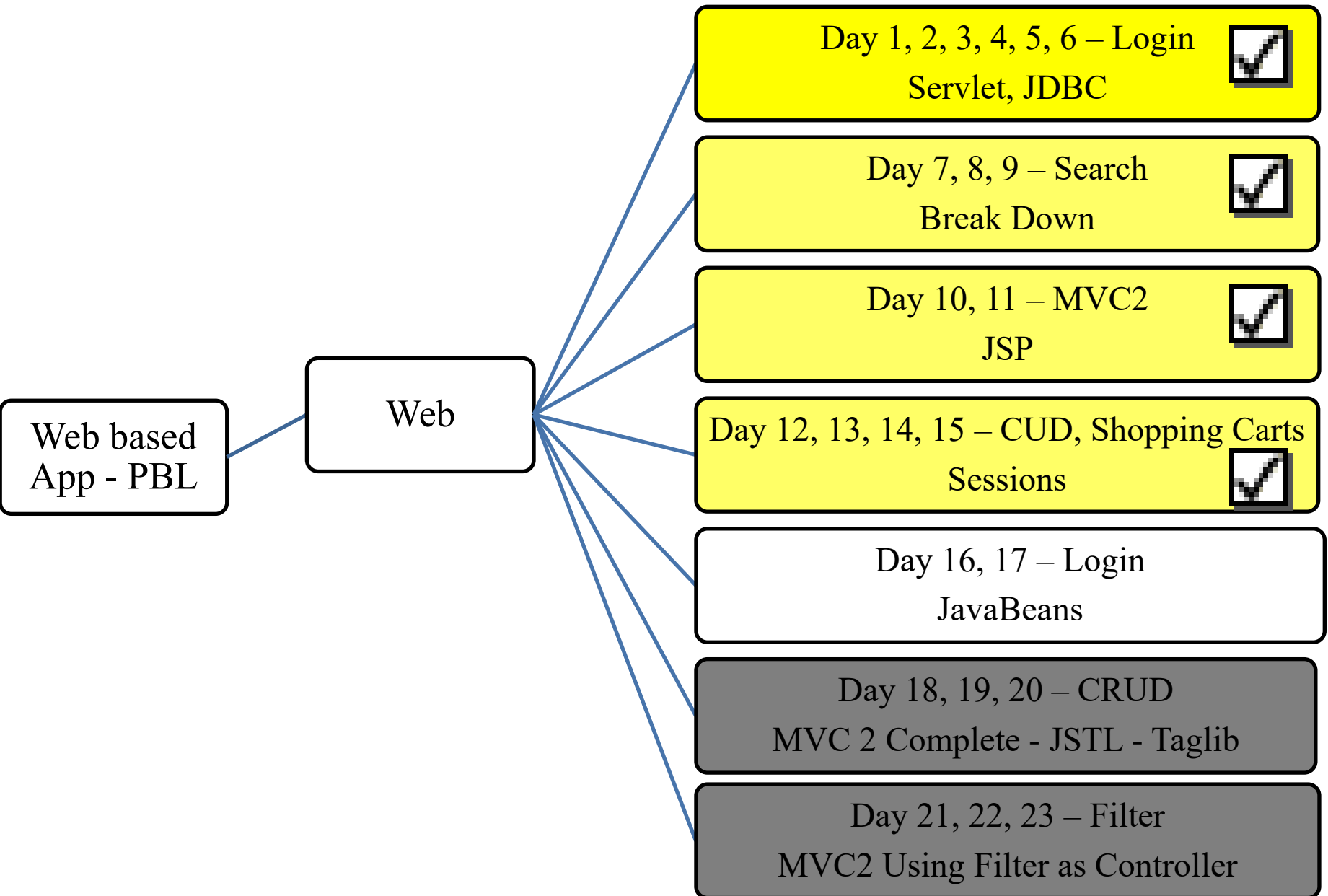
- **How to write CRUD Web Application**
  - Session Tracking Techniques
  - Manipulate DB Techniques in Web Application
  - Break down structure component in building web application
- **Techniques: Error Handling in Servlets**
  - Reporting Errors
  - Logging Errors
  - Users Errors vs. System Errors

## Q&A

# Next Lecture

- **JSP Standard Actions**
  - JavaBeans
  - Standard Actions
- **Dispatcher Mechanism**
  - Including, Forwarding, and Parameters
  - Vs. Dispatcher in Servlets
- **EL – Expression Languages**
  - What is EL?
  - How to use EL in JSP?

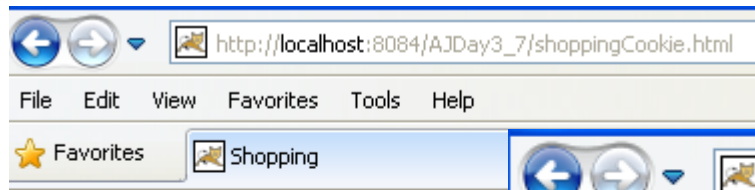
# Next Lecture





# Appendix

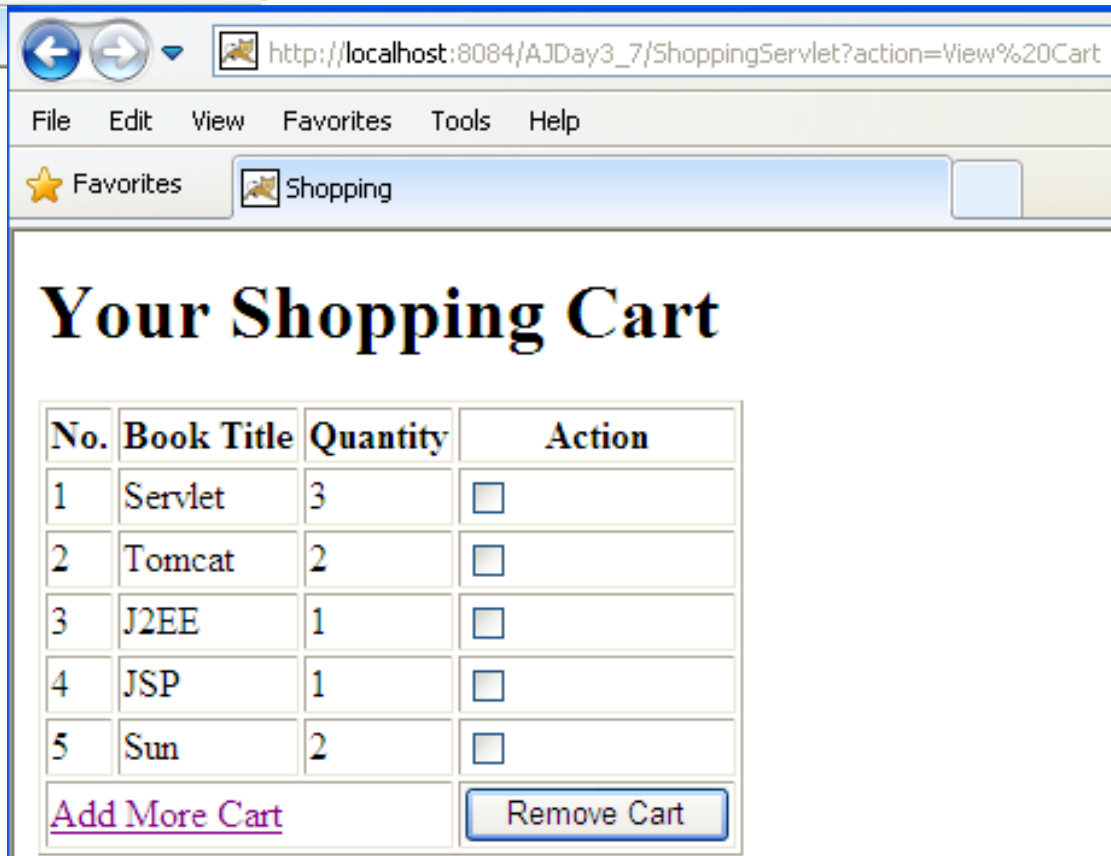
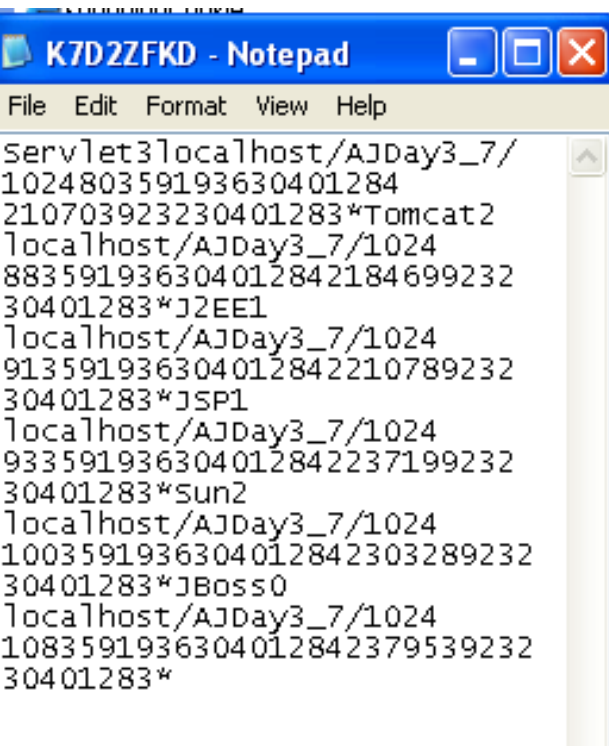
## Shopping Cart using Cookies



### Shopping Cart

Please, choose the book

Servlet



# Appendix

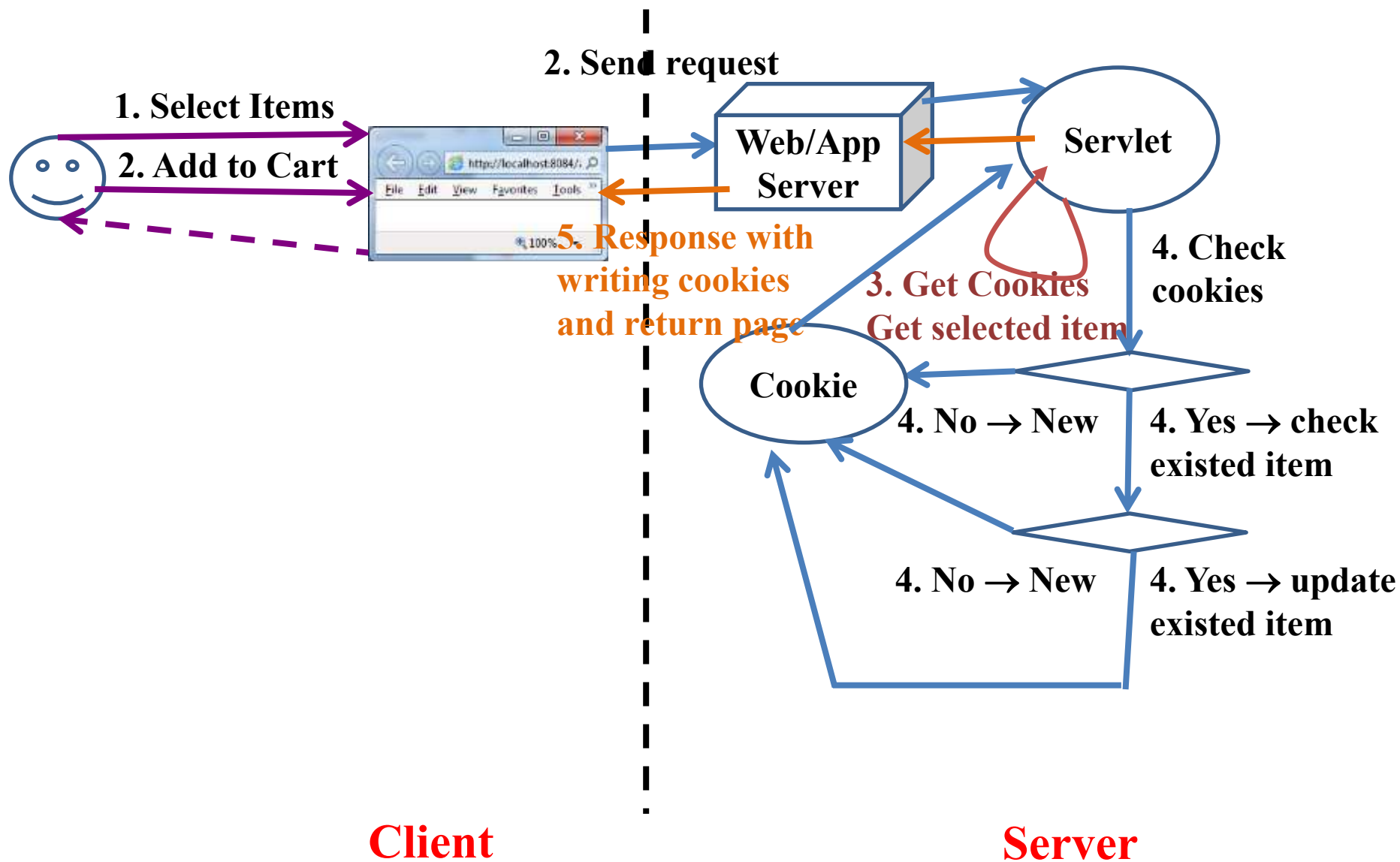
## Shopping Cart using Cookies

```

shoppingCookie.html x
Preview
5 <!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">
6 <html>
7 <head>
8 <title>Shopping</title>
9 <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
10 </head>
11 <body>
12 <h1>Shopping Cart</h1>
13 <form action="ShoppingServlet">
14   Please, choose the book <br/>
15   <select name="bookList">
16     <option>Servlet</option>
17     <option>JSP</option>
18     <option>EJB</option>
19     <option>J2EE</option>
20     <option>Tomcat</option>
21     <option>JBoss</option>
22     <option>Sun</option>
23   </select><br/>
24   <input type="submit" value="Add To Cart" name="action" />
25   <input type="submit" value="View Cart" name="action" />
26 </form>
27 </body>
28 </html>
  
```

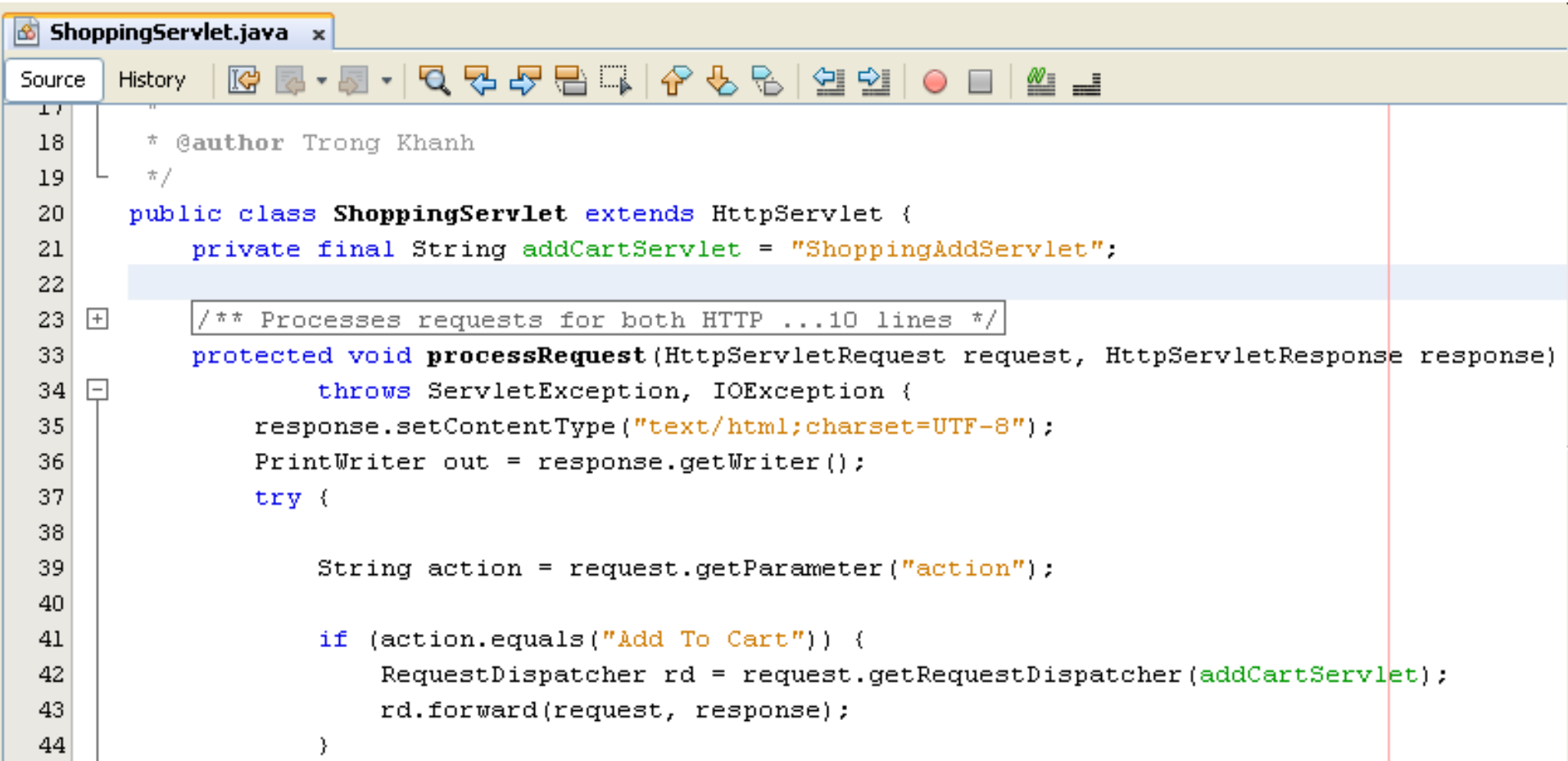
# Appendix

## Interactive Server Model



# Appendix

## Shopping Cart using Cookies



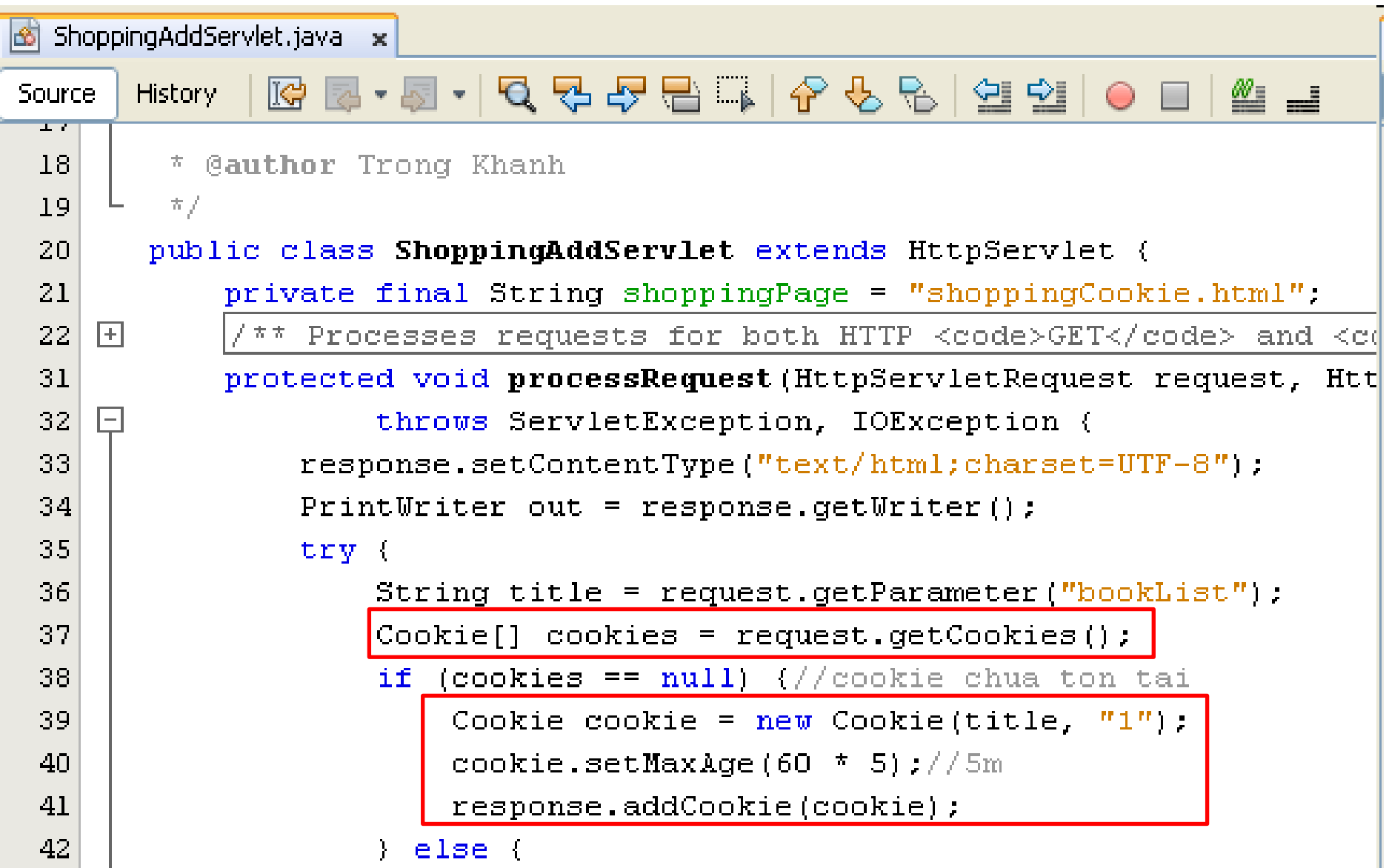
```

17
18  * @author Trong Khanh
19  */
20  public class ShoppingServlet extends HttpServlet {
21      private final String addCartServlet = "ShoppingAddServlet";
22
23      /** Processes requests for both HTTP ...10 lines */
24
25      protected void processRequest(HttpServletRequest request, HttpServletResponse response)
26          throws ServletException, IOException {
27          response.setContentType("text/html; charset=UTF-8");
28          PrintWriter out = response.getWriter();
29          try {
30
31              String action = request.getParameter("action");
32
33              if (action.equals("Add To Cart")) {
34                  RequestDispatcher rd = request.getRequestDispatcher(addCartServlet);
35                  rd.forward(request, response);
36              }
37          }
38      }
39  }
40
41
42
43
44

```

# Appendix

## Shopping Cart using Cookies



```

ShoppingAddServlet.java x
Source History
17
18  * @author Trong Khanh
19  */
20  public class ShoppingAddServlet extends HttpServlet {
21      private final String shoppingPage = "shoppingCookie.html";
22      /** Processes requests for both HTTP <code>GET</code> and <code>POST</code>
31      protected void processRequest(HttpServletRequest request, HttpServletResponse response)
32          throws ServletException, IOException {
33          response.setContentType("text/html;charset=UTF-8");
34          PrintWriter out = response.getWriter();
35          try {
36              String title = request.getParameter("bookList");
37              Cookie[] cookies = request.getCookies();
38              if (cookies == null) { //cookie chua ton tai
39                  Cookie cookie = new Cookie(title, "1");
40                  cookie.setMaxAge(60 * 5); //5m
41                  response.addCookie(cookie);
42              } else {
  
```

# Appendix

## Shopping Cart using Cookies

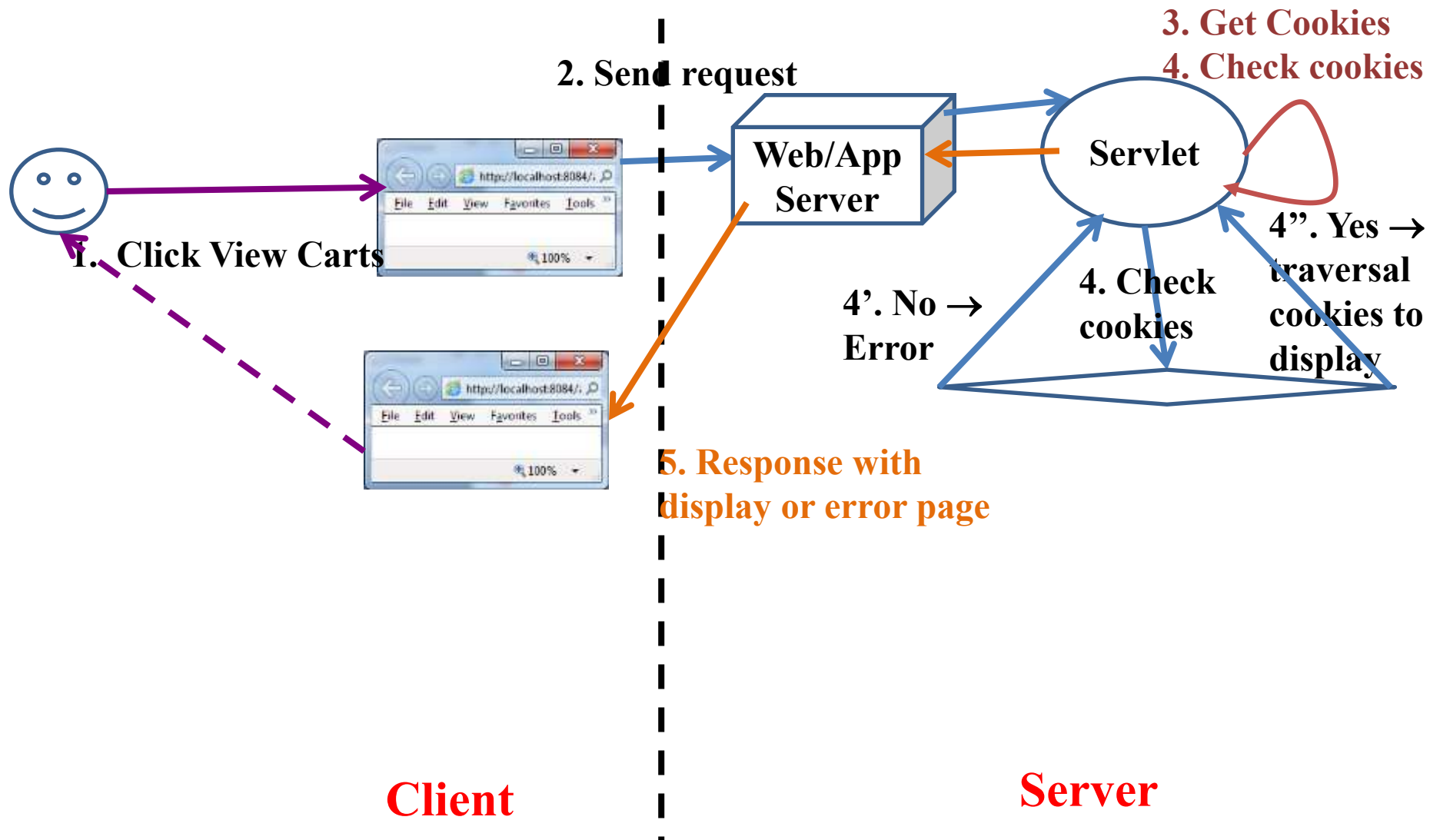
```

42     } else {
43         boolean bFound = false;
44         //find the exist title in the cart
45         for (int i = 0; i < cookies.length; i++) {
46             if (cookies[i].getName().equals(title)) {
47                 bFound = true;
48                 String value = cookies[i].getValue();
49                 int quantity = Integer.parseInt(value) + 1;
50                 Cookie cookie = new Cookie(title, String.valueOf(quantity));
51                 cookie.setMaxAge(60 * 5); //5m
52                 response.addCookie(cookie); //override
53                 break;
54             }
55         }
56         if (!bFound) {
57             Cookie cookie = new Cookie(title, "1");
58             cookie.setMaxAge(60 * 5); //5m
59             response.addCookie(cookie);
60         }
61     }
62
63     response.sendRedirect(shoppingPage);
64 } finally {
65     out.close();
66 }
67 }

```

# Appendix

## Interactive Server Model



# Appendix

## Shopping Cart using Cookies

ShoppingServlet.java x

Source History

```

18  * @author Trong Khanh
19  */
20  public class ShoppingServlet extends HttpServlet {
21      private final String addCartServlet = "ShoppingAddServlet";
22      private final String viewCartServlet = "ShoppingViewServlet";
23
24      /** Processes requests for both HTTP ...10 lines */
34  protected void processRequest(HttpServletRequest request, HttpServletResponse response)
35      throws ServletException, IOException {
36      response.setContentType("text/html;charset=UTF-8");
37      PrintWriter out = response.getWriter();
38      try {
39
40          String action = request.getParameter("action");
41
42          if (action.equals("Add To Cart")) {
43              RequestDispatcher rd = request.getRequestDispatcher(addCartServlet);
44              rd.forward(request, response);
45          } else if (action.equals("View Cart")) {
46              RequestDispatcher rd = request.getRequestDispatcher(viewCartServlet);
47              rd.forward(request, response);
48          }

```



# Appendix

## Shopping Cart using Cookies

ShoppingViewServlet.java

Source History

```

18  * @author Trong Khanh
19  */
20  public class ShoppingViewServlet extends HttpServlet {
21
22      /** Processes requests for both HTTP <code>GET</code> and <code>POST</code>
31  protected void processRequest(HttpServletRequest request, HttpServletResponse response)
32      throws ServletException, IOException {
33      response.setContentType("text/html;charset=UTF-8");
34      PrintWriter out = response.getWriter();
35      try {
36          Cookie[] cookies = request.getCookies();
37          if (cookies != null) {
38              out.println("<html>");
39              out.println("<head>");
40              out.println("<title>Shopping</title>");
41              out.println("</head>");
42              out.println("<body>");
43              out.println("<h1>Your Shopping Cart</h1>");
44
45              out.println("<table border='1'>");
46              out.println("<tr>");
47              out.println("<th>No.</th>");
48              out.println("<th>Book Title</th>");
49              out.println("<th>Quantity</th>");
50              out.println("<th>Action</th>");
51              out.println("</tr>");
52              out.println("<form action='ShoppingServlet'>");

```

# Appendix

## Shopping Cart using Cookies

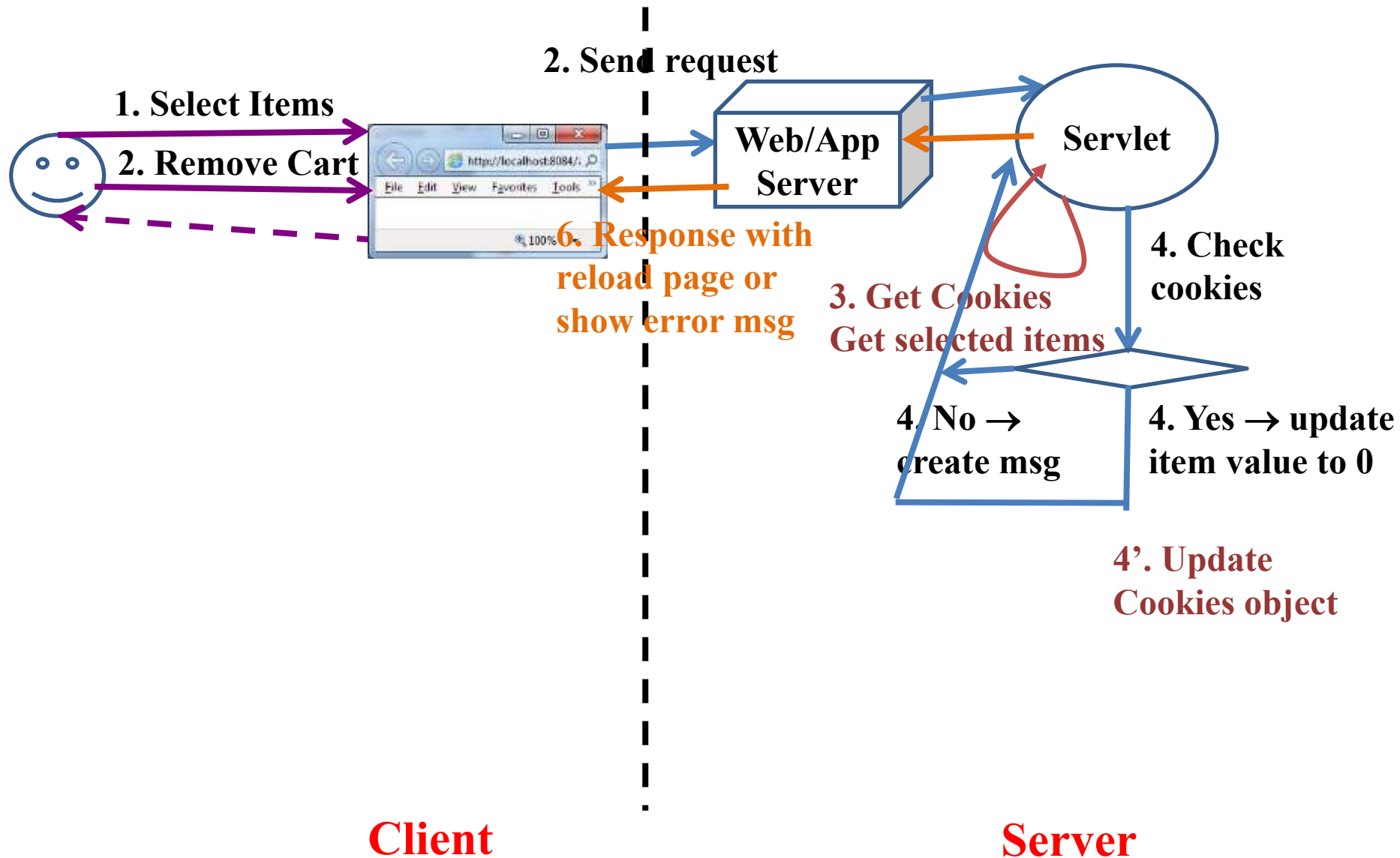
```

53
54     int count = 1;
55     for (int i = 0; i < cookies.length; i++) {
56         int tmp = Integer.parseInt(cookies[i].getValue());
57         if (tmp > 0) {
58             out.println("<tr>");
59             out.println("<td>" + count++ + "</td>");
60             out.println("<td>" + cookies[i].getName() + "</td>");
61             out.println("<td>" + cookies[i].getValue() + "</td>");
62             out.println("<td><input type='checkbox' name='rmv' value='"
63                 + cookies[i].getName() + "' /></td>");
64             out.println("</tr>");
65         }
66     }
67
68     out.println("<tr>");
69     out.println("<td colspan='3'><a href='shoppingCookie.html'>Add More Cart</a></td>");
70     out.println("<td><input type='submit' value='Remove Cart' name='action' /></td>");
71     out.println("</tr>");
72     out.println("</form>");
73     out.println("</table>");
74
75     out.println("</body>");
76     out.println("</html>");
77     return;
78 }
79 out.println("<h2>Cart is removed or No items in cart</h2>");
80 } finally {
81     out.close();
82 }
83

```

# Appendix

## Interactive Server Model



# Appendix

## Shopping Cart using Cookies

ShoppingServlet.java

```

18  * @author Trong Khanh
19  */
20  public class ShoppingServlet extends HttpServlet {
21      private final String addCartServlet = "ShoppingAddServlet";
22      private final String viewCartServlet = "ShoppingViewServlet";
23      private final String removeCartServlet = "ShoppingRemoveServlet";
24      /** Processes requests for both HTTP ...10 lines */
34      protected void processRequest(HttpServletRequest request, HttpServletResponse response)
35          throws ServletException, IOException {
36          response.setContentType("text/html;charset=UTF-8");
37          PrintWriter out = response.getWriter();
38          try {
39
40              String action = request.getParameter("action");
41
42              if (action.equals("Add To Cart")) {
43                  RequestDispatcher rd = request.getRequestDispatcher(addCartServlet);
44                  rd.forward(request, response);
45              } else if (action.equals("View Cart")) {
46                  RequestDispatcher rd = request.getRequestDispatcher(viewCartServlet);
47                  rd.forward(request, response);
48              } else if (action.equals("Remove Cart")) {
49                  RequestDispatcher rd = request.getRequestDispatcher(removeCartServlet);
50                  rd.forward(request, response);
51              } else {
52                  //To Do Code
53              }
54          } finally {
55              out.close();
56          }
57      }

```

# Appendix

## Shopping Cart using Cookies

ShoppingRemoveServlet.java

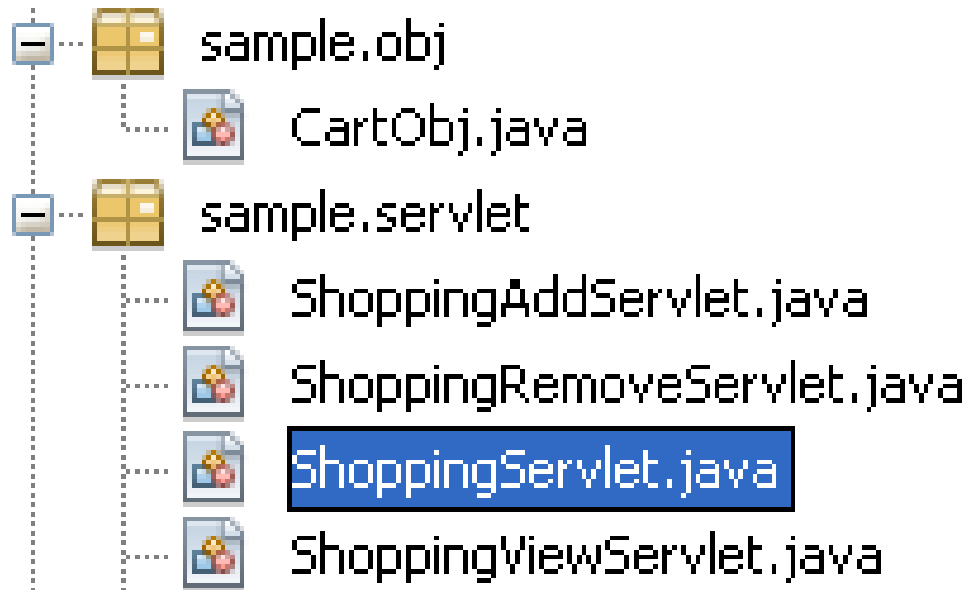
```

18  * @author Trong Khanh
19  */
20  public class ShoppingRemoveServlet extends HttpServlet {
21
22      /** Processes requests for both HTTP GET and POST
31  protected void processRequest(HttpServletRequest request, HttpServletResponse
32      throws ServletException, IOException {
33      response.setContentType("text/html;charset=UTF-8");
34      PrintWriter out = response.getWriter();
35      try {
36          Cookie[] cookies = request.getCookies();
37          if (cookies != null) {
38              String[] list = request.getParameterValues("rmv");
39              if (list != null) {
40                  for (int i = 0; i < list.length; i++) {
41                      String tmp = list[i];
42                      for (int j = 0; j < cookies.length; j++) {
43                          if (cookies[j].getName().equals(tmp)) {
44                              cookies[j].setValue("0");
45                              cookies[j].setMaxAge(60 * 5);
46                              response.addCookie(cookies[j]);
47                              break;
48                          }
49                      }
50                  }
51              }
52              String urlRewriting = "ShoppingServlet?action=View Cart";
53              response.sendRedirect(urlRewriting);
54          } else {
55              out.println("<h2>Cart is removed!!!!</h2>");
56          }

```

# Sessions & Listeners

## Shopping Cart using Cookies – Example



# Appendix

## Request and Context Listeners

Listener Interface Name	Applies to	Function
ServletRequestListener	Request objects	Responds to the life and death of each request.
ServletContextListener	The context object	Responds to the life and death of the context for a web application.
ServletRequestAttributeListener	Request objects	Responds to any change to the set of attributes attached to a request object.
ServletContextAttributeListener	The context object	Responds to any change to the set of attributes attached to the context object.

- There are **two things** that need to do to **set up a listener** in a web application:
  - **Write a class** that **implements** the **appropriate listener interface**.
  - **Register** the **class name** in the **web application deployment descriptor**, web.xml.

**<listener>**

**<listener-class>className</listener-class>**

**</listener>**

# Appendix

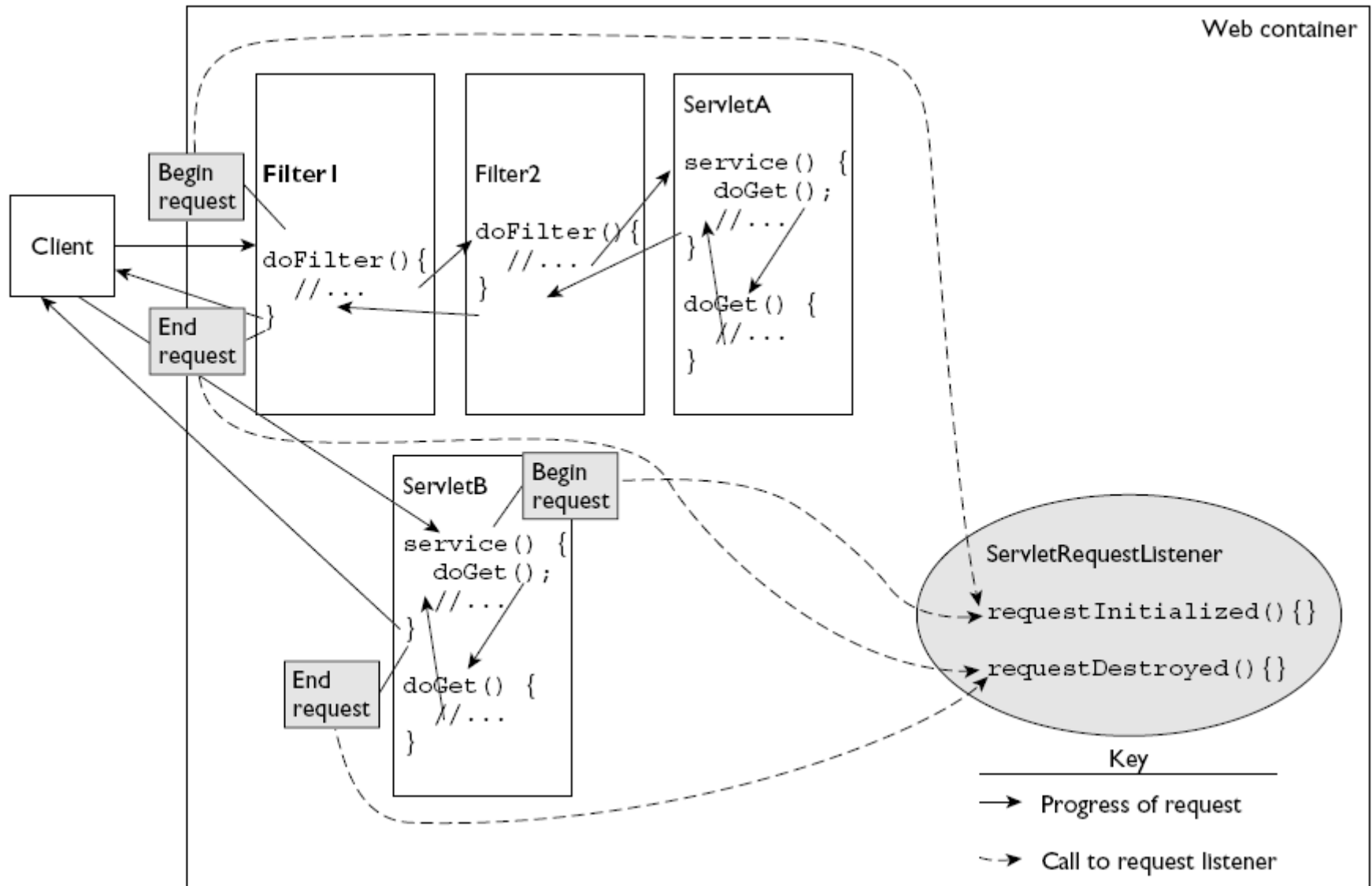
## Request Listeners

- ServletRequestListener **deals** with the **life cycle** of each **request object**
- A class **implementing** the **ServletRequestListener** interface has 2 methods
  - **requestInitialized()**: is called the **moment** that **any request** in the web container **becomes newly available** (or it is called at the **beginning of any request's scope**)
    - This is at the beginning of a servlet's **service()** method or earlier than that if filter chain is involved
  - **requestDestroyed()**: is called for each request that **comes to an end** – either at the **end of the servlet's service() method** or at the **end of the doFilter()** method for the first filter in a chain
- **Each** of these **ServletRequestListener** methods **accept** a **ServletRequestEvent** as a parameter. This event object has 2 methods
  - **getServletContext()**
  - **getRequest()**



# Appendix

## Request Listeners



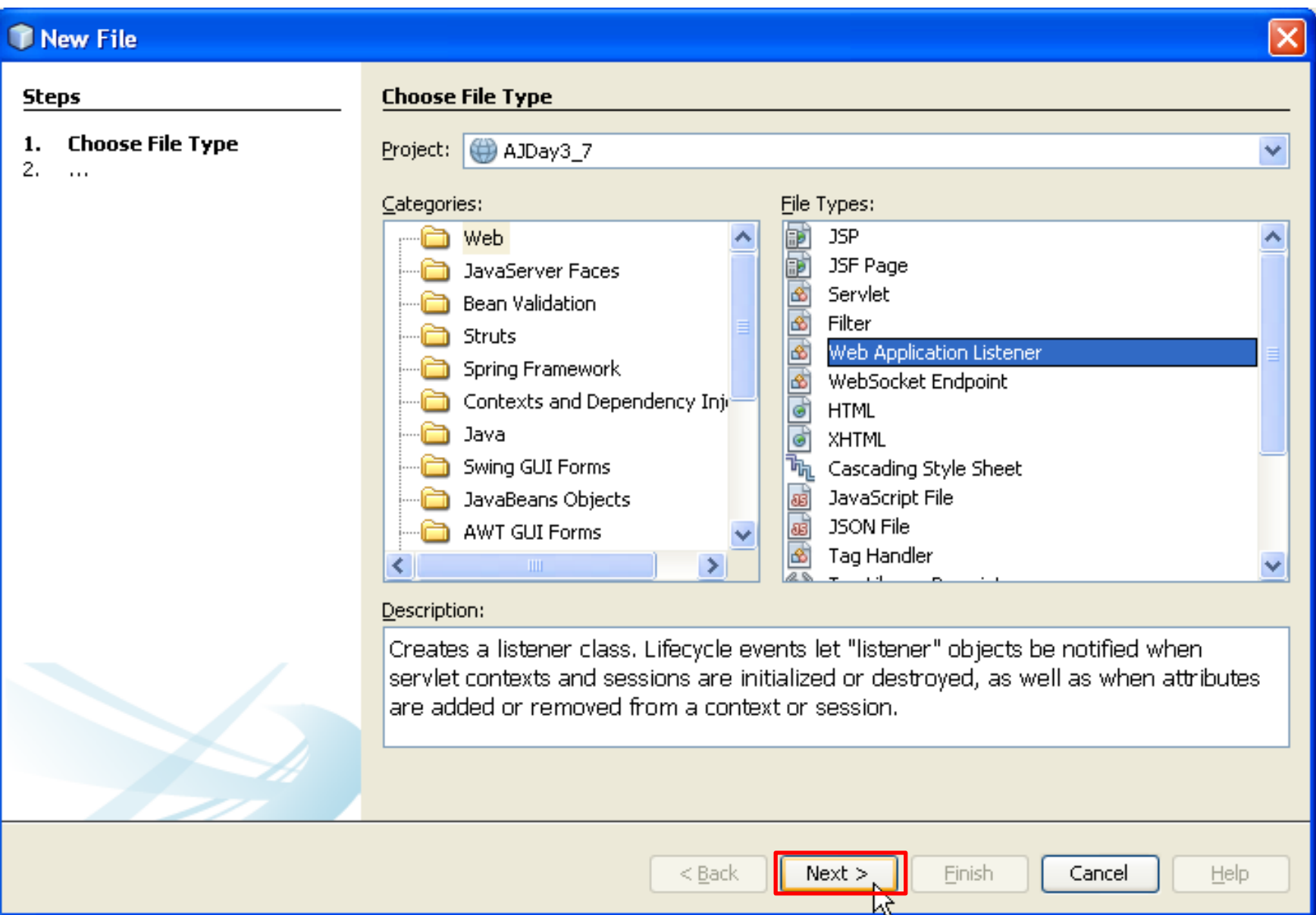
# Appendix

## Request Attribute Listeners

- **ServletRequestAttributeListener** deals with the life cycle of the attributes attached to request objects
- A class implementing the **ServletRequestAttributeListener** interface has 3 methods
  - **attributeAdded()**: is called whenever a new attribute is added to any request
  - **attributeRemoved()**: is called whenever an attribute is removed from a request
  - **attributeReplaced()**: is called whenever an attribute is replaced
- Each of these **ServletRequestAttributeListener** methods **accept** a **ServletRequestAttributeEvent** as a parameter. This event object has 2 methods
  - **getName()**: returns name of attribute
  - **getValue()**: returns old value of attribute
- The **ServletRequestAttributeEvent** inherits from **ServletRequestEvent**
- The “grandparent” of The **ServletRequestEvent** is **java.util.EventObject**
  - The **getSource()** method returns the object that is the source of the event


# Appendix

## How to Add Listener to Web Project



# Appendix

## How to Add Listener to Web Project


**New Web Application Listener**

Steps

1. Choose File Type
2. **Name and Location**

Name and Location

Class Name:

Project:

Location:

Package:

Created File:

Interfaces to implement:

☐ Context Listener  
☐ Context Attribute Listener  
☐ HTTP Session Listener  
☐ HTTP Session Attribute Listener  
☒ Request Listener (J2EE 1.4)  
☐ Request Attribute Listener (J2EE 1.4)

Description:

Context listener observes when servlet context is created or is about to be shut down.

< Back

Next >

**Finish**

Cancel

Help


# Appendix

## Example

MyRequestListener.java

Source

History



```

12
13     * @author Trong Khanh
14     */
15     public class MyRequestListener implements ServletRequestListener {
16
17         public void requestDestroyed(ServletRequestEvent sre) {
18             System.out.println("destroyed in MyRequest is invoked!!!!");
19             sre.getServletRequest().removeAttribute("REQUEST");
20         }
21
22         public void requestInitialized(ServletRequestEvent sre) {
23             System.out.println("context in MyRequest is invoked!!!!");
24             sre.getServletRequest().setAttribute("REQUEST", "ADD");
25         }
26     }

```

web.xml

Source

General

Servlets


Filters

Pages

References

Security

History



```

1     <?xml version="1.0" encoding="UTF-8"?>
2     <web-app version="2.5" xmlns="http://java.sun.com/xml/ns/javaee" xmlns:xsi=
3         <listener>
4             <description>RequestListener</description>
5             <listener-class>sample.listener.MyRequestListener</listener-class>
6         </listener>

```

# Appendix

## Example

```

MyRequestAttributeListener.java x
15 public class MyRequestAttributeListener implements ServletRequestAttributeListener {
16     public void attributeAdded(ServletRequestAttributeEvent srae) {
17         System.out.println("Add is activated");
18         String name = srae.getName();
19         String oldValue = srae.getValue().toString();
20         String newValue = srae.getServletRequest().getAttribute(name).toString();
21         System.out.println("Name: " + name + " -old: " + oldValue + " -new: " + newValue);
22     }
23     public void attributeRemoved(ServletRequestAttributeEvent srae) {
24         System.out.println("Remove is activated");
25         String name = srae.getName();
26         String oldValue = srae.getValue().toString();
27         System.out.println("Name: " + name + " -old: " + oldValue);
28     }
29     public void attributeReplaced(ServletRequestAttributeEvent srae) {
30         System.out.println("Replace is activated");
31         String name = srae.getName();
32         String oldValue = srae.getValue().toString();
33         String newValue = srae.getServletRequest().getAttribute(name).toString();
34         System.out.println("Name: " + name + " -old: " + oldValue + " -new: " + newValue);
35     }
36 }

26 <listener>
27     <listener-class>sample.listener.MyContextAttributeListener</listener-class>
28 </listener>

```

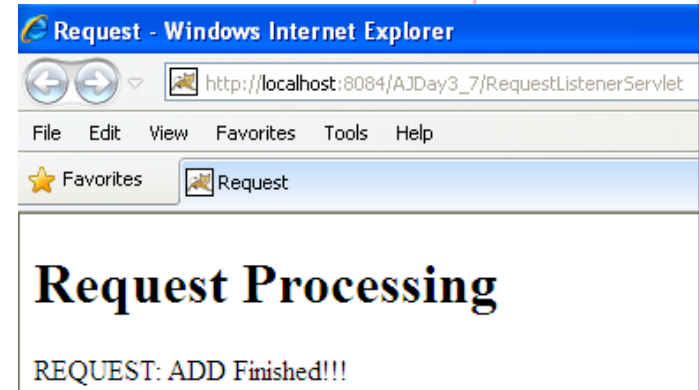
# Appendix

## Example

```

RequestListenerServlet.java x
28 protected void processRequest(HttpServletRequest request, HttpServletResponse response)
29 throws ServletException, IOException {
30     response.setContentType("text/html;charset=UTF-8");
31     PrintWriter out = response.getWriter();
32     try {
33         out.println("<html>");
34         out.println("<head>");
35         out.println("<title>Request</title>");
36         out.println("</head>");
37         out.println("<body>");
38         out.println("<h1>Request Processing</h1>");
39
40         request.setAttribute("VALUE", "ADD");
41         request.setAttribute("VALUE", "MODIFIED");
42         request.removeAttribute("VALUE");
43
44         out.println("REQUEST: " + request.getAttribute("REQUEST"));
45         out.println("Finished!!!");
46
47         out.println("</body>");
48         out.println("</html>");
49     } finally {
50         out.close();
51     }
52 }

```



# Appendix

## Example

```

context in MyRequest is invoked!!!!
Add is activated
Name: REQUEST -old: ADD -new: ADD
Replace is activated
Name: org.apache.catalina.ASYNC_SUPPORTED -old: true -new: false
Add is activated
Name: netbeans.monitor.request -old: uri: /AJDay3_7/RequestListenerServlet
method: GET
QueryString: null
Parameters:
Headers:
    Name: accept      Value: */*
    Name: accept-language  Value: vi
    Name: user-agent   Value: Mozilla/4.0 (compatible; MSIE 8.0; W
    Name: accept-encoding  Value: gzip, deflate
    Name: host          Value: localhost:8084
    Name: connection     Value: Keep-Alive
    -new: uri: /AJDay3_7/RequestListenerServlet
method: GET
QueryString: null
Parameters:
Headers:
    Name: accept      Value: */*
    Name: accept-language  Value: vi
    Name: user-agent   Value: Mozilla/4.0 (compatible; MSIE 8.0; W
    Name: accept-encoding  Value: gzip, deflate
    Name: host          Value: localhost:8084
    Name: connection     Value: Keep-Alive
  
```



# Appendix

## Example

```

Add is activated
Name: netbeans.monitor.monData -old: [MonitorData] -new: [MonitorData]
Add is activated
[Name: netbeans.monitor.response -old: org.netbeans.modules.web.monitor.server
bb5
Add is activated
[Name: netbeans.monitor.filter -old: MonitorFilter(ApplicationFilterConfig[na
ter(ApplicationFilterConfig[name=HTTPMonitorFilter, filterClass=org.netbeans
Add is activated
Name: VALUE -old: ADD -new: ADD
Replace is activated
Name: VALUE -old: ADD -new: MODIFIED
Remove is activated
Name: VALUE -old: MODIFIED
Remove is activated
Name: netbeans.monitor.request -old: uri: /AJDay3_7/RequestListenerServlet
method: GET
QueryString: null
Parameters:
Headers:
    Name: accept      Value: */*
    Name: accept-language  Value: vi
    Name: user-agent   Value: Mozilla/4.0 (compatible; MSIE 8.0; W
    Name: accept-encoding  Value: gzip, deflate
    Name: host           Value: localhost:8084
    Name: connection     Value: Keep-Alive
  
```

# Appendix

## Example

-

```
Remove is activated
Name: netbeans.monitor.response -old: org.netbeans.
Remove is activated
Name: netbeans.monitor.filter -old: MonitorFilter()
Remove is activated
Name: netbeans.monitor.monData -old: [MonitorData]
destroyed in MyRequest is invoked!!!!
Remove is activated
Name: REQUEST -old: ADD
```

# Appendix

## Practices – Example

ReqListener - Windows Internet Explorer

http://localhost:8084/AJDay3\_7/

File Edit View Favorites Tools Help

Favorites ReqListener

### Request Listener Demo

This form requires a integer.

Input Num

Request\_Result - Windows Internet Explorer

http://localhost:8084/AJDay3\_7/ListenerServlet?txtNum=5&btAction=Send

File Edit View Favorites Tools Help

Favorites Request\_Result

### Request Checking

Your input is a number!!!

ReqListener - Windows Internet Explorer

http://localhost:8084/AJDay3\_7/

File Edit View Favorites Tools Help

Favorites ReqListener

### Request Listener Demo

This form requires a integer.

Input Num

Request\_Result - Windows Internet Explorer

http://localhost:8084/AJDay3\_7/ListenerServlet?txtNum=a&btAction=Send

File Edit View Favorites Tools Help

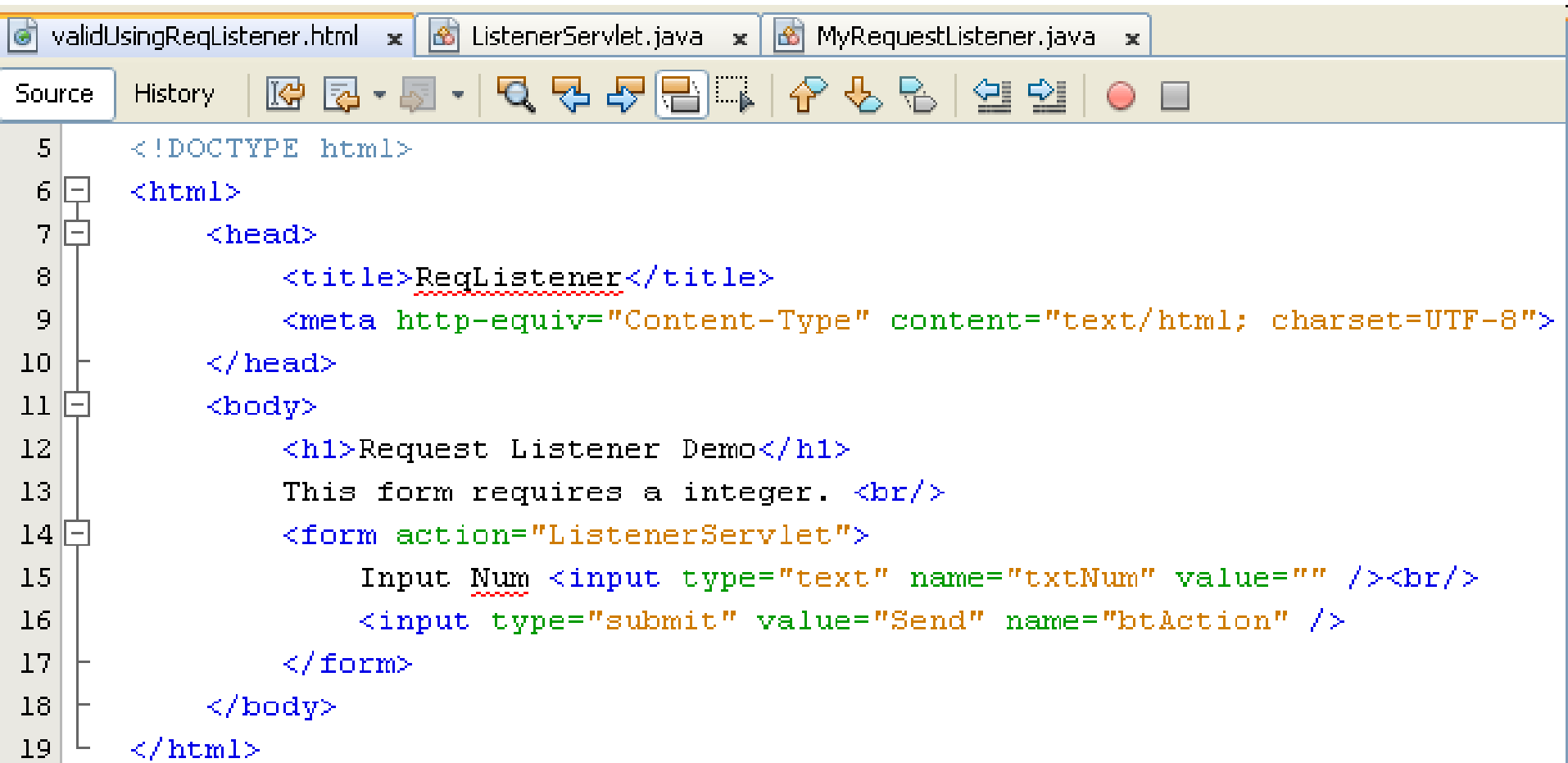
Favorites Request\_Result

### Request Checking

Your input is not a number

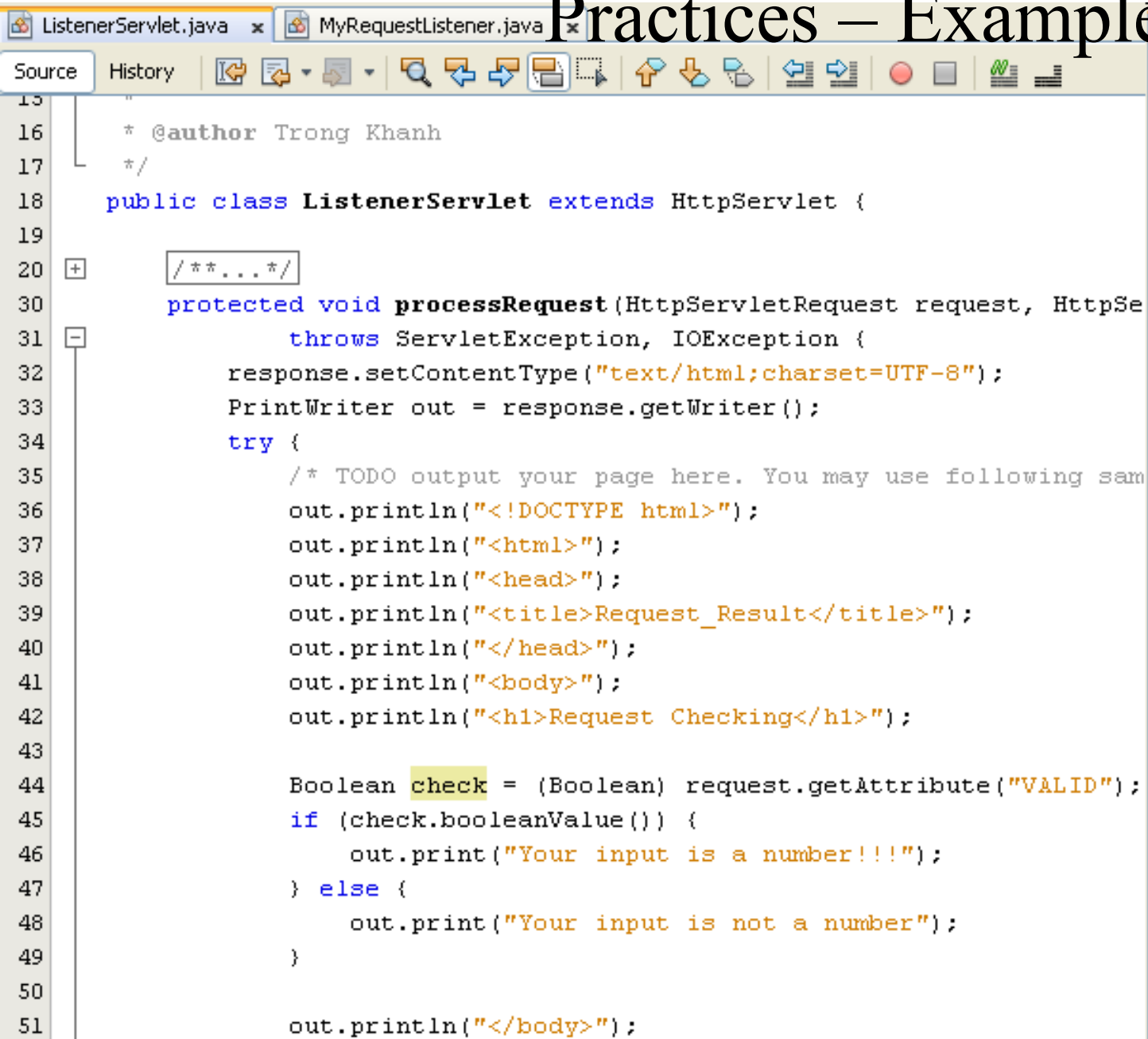
# Appendix

## Practices – Example



```

5  <!DOCTYPE html>
6  <html>
7  <head>
8      <title>ReqListener</title>
9      <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
10 </head>
11 <body>
12     <h1>Request Listener Demo</h1>
13     This form requires a integer. <br/>
14     <form action="ListenerServlet">
15         Input Num <input type="text" name="txtNum" value="" /><br/>
16         <input type="submit" value="Send" name="btAction" />
17     </form>
18 </body>
19 </html>
  
```






















```

15
16  * @author Trong Khanh
17  */
18  public class ListenerServlet extends HttpServlet {
19
20      /**...*/
21
22      protected void processRequest(HttpServletRequest request, HttpServletResponse response)
23          throws ServletException, IOException {
24          response.setContentType("text/html;charset=UTF-8");
25          PrintWriter out = response.getWriter();
26          try {
27              /* TODO output your page here. You may use following sample code. */
28              out.println("<!DOCTYPE html>");
29              out.println("<html>");
30              out.println("<head>");
31              out.println("<title>Request_Result</title>");
32              out.println("</head>");
33              out.println("<body>");
34              out.println("<h1>Request Checking</h1>");
35
36              Boolean check = (Boolean) request.getAttribute("VALID");
37              if (check.booleanValue()) {
38                  out.print("Your input is a number!!!");
39              } else {
40                  out.print("Your input is not a number");
41              }
42
43              out.println("</body>");
44          } catch (Exception ex) {
45              out.println("Exception: " + ex.getMessage());
46          }
47      }
48  }
49
50
51
  
```

# Appendix

## Practices – Example


 MyRequestListener.java

Source
 History
 


















```

12  "
13  * @author Trong Khanh
14  */
15  public class MyRequestListener implements ServletRequestListener {
16
17      public void requestDestroyed(ServletRequestEvent sre) { ... }
18
19      public void requestInitialized(ServletRequestEvent sre) {
20
21          String num = sre.getServletRequest().getParameter("txtNum");
22          Boolean result = true;
23          try {
24              int n = Integer.parseInt(num);
25          } catch (NumberFormatException ex) {
26              result = false;
27          }
28          sre.getServletRequest().setAttribute("VALID", result);
29      }
30  }
31
32  }
  
```

# Appendix

## Context Listener

- Sessions have 02 listeners:
  - **ServletContextListener**
    - **Receive notifications about changes to the servlet context of the Web application**
      - **contextInitialized()**: gets called before any servlet's **init()** method or any filter's **doFilter()** method
      - **contextDestroyed()**: gets called after the servlet's or filter's **destroy()** method
      - Both of methods get passed a **ServletContextEvent** object that provides the **getServletContext()** method
  - **ServletContextAttributeListener**
    - **Receives a notification about any modifications made to the attribute list on the servlet context of a web application**
    - Has the same trio of methods as **ServletRequestAttributeListener**

# Appendix

## Example

```

MyContextListener.java x
15  //
16  public class MyContextListener implements ServletContextListener {
17      public void contextInitialized(ServletContextEvent sce) {
18          System.out.println("context in MyContext is invoked!!!!");
19          sce.getServletContext().setAttribute("CONTEXT", "ADD");
20      }
21      public void contextDestroyed(ServletContextEvent sce) {
22          System.out.println("destroyed in MyContext is invoked!!!!");
23          sce.getServletContext().removeAttribute("CONTEXT");
24      }
25  }

```

```

web.xml x
General  Servlets  Filters  Pages  References  Security  XML
15  <listener>
16      <listener-class>sample.listener.MyContextListener</listener-class>
17  </listener>
18  <listener>
19      <listener-class>sample.listener.MyContextAttributeListener</listener-class>
20  </listener>

```



# Appendix

## Example

```

MyContextAttributeListener.java x
[Icons]

15  public class MyContextAttributeListener implements ServletContextAttributeListener {
16      [Info]
17      public void attributeAdded(ServletContextAttributeEvent scab) {
18          System.out.println("Add is activated-");
19          String name = scab.getName();
20          [Warning] String oldValue = scab.getValue().toString();
21          String newValue = scab.getServletContext().getAttribute(name).toString();
22          System.out.println("Name: " + name + "-old: " + oldValue + "-new: " + newValue);
23      }
24      [Info]
25      public void attributeRemoved(ServletContextAttributeEvent scab) {
26          System.out.println("Remove is activated-");
27          String name = scab.getName();
28          [Warning] String oldValue = scab.getValue().toString();
29          System.out.println("Name: " + name + "-old: " + oldValue);
30      }
31      [Info]
32      public void attributeReplaced(ServletContextAttributeEvent scab) {
33          System.out.println("Replace is activated-");
34          String name = scab.getName();
35          [Warning] String oldValue = scab.getValue().toString();
36          String newValue = scab.getServletContext().getAttribute(name).toString();
37          System.out.println("Name: " + name + "-old: " + oldValue + "-new: " + newValue);
38      }
39  }

```

```
ContextListenerServlet.java x
protected void processRequest(HttpServletRequest request, HttpServletResponse response)
throws ServletException, IOException {
    response.setContentType("text/html;charset=UTF-8");
    PrintWriter out = response.getWriter();
    try {
        out.println("<html>");
        out.println("<head>");
        out.println("<title>Process</title>");
        out.println("</head>");
        out.println("<body>");
        out.println("<h1>Context Listener Demo</h1>");

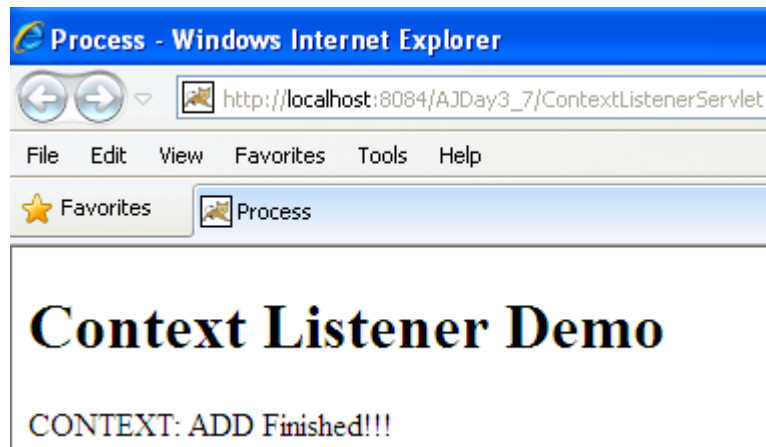
        ServletContext sc = getServletContext();
        sc.setAttribute("VALUE", "ADD");
        sc.setAttribute("VALUE", "MODIFIED");
        sc.removeAttribute("VALUE");

        out.println("CONTEXT: " + sc.getAttribute("CONTEXT"));
        out.println("Finished!!!");

        out.println("</body>");
        out.println("</html>");
    } finally {
        out.close();
    }
}
```

# Appendix

## Example



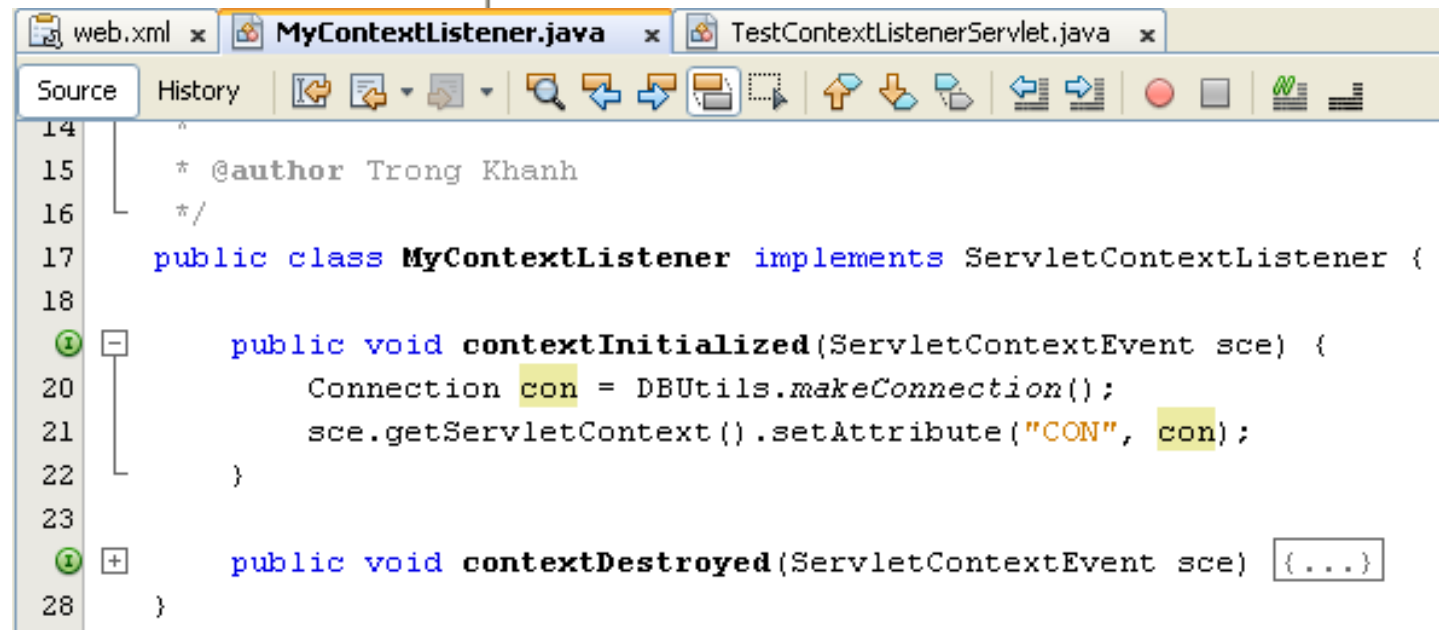
```

context in MyContext is invoked!!!!
Add is activated-
Name: CONTEXT-old: ADD-new: ADD
Add is activated-
Name: org.apache.jasper.compiler.TldLocationsCache-old: org.apache.jasper.
Add is activated
Name: VALID -old: false -new: false
Replace is activated
Name: org.apache.catalina.ASYNC_SUPPORTED -old: true -new: false
Add is activated
Name: netbeans.monitor.request -old: uri: /AJDay3_7/ContextListenerServlet
method: GET
QueryString: null
Parameters:
Headers:

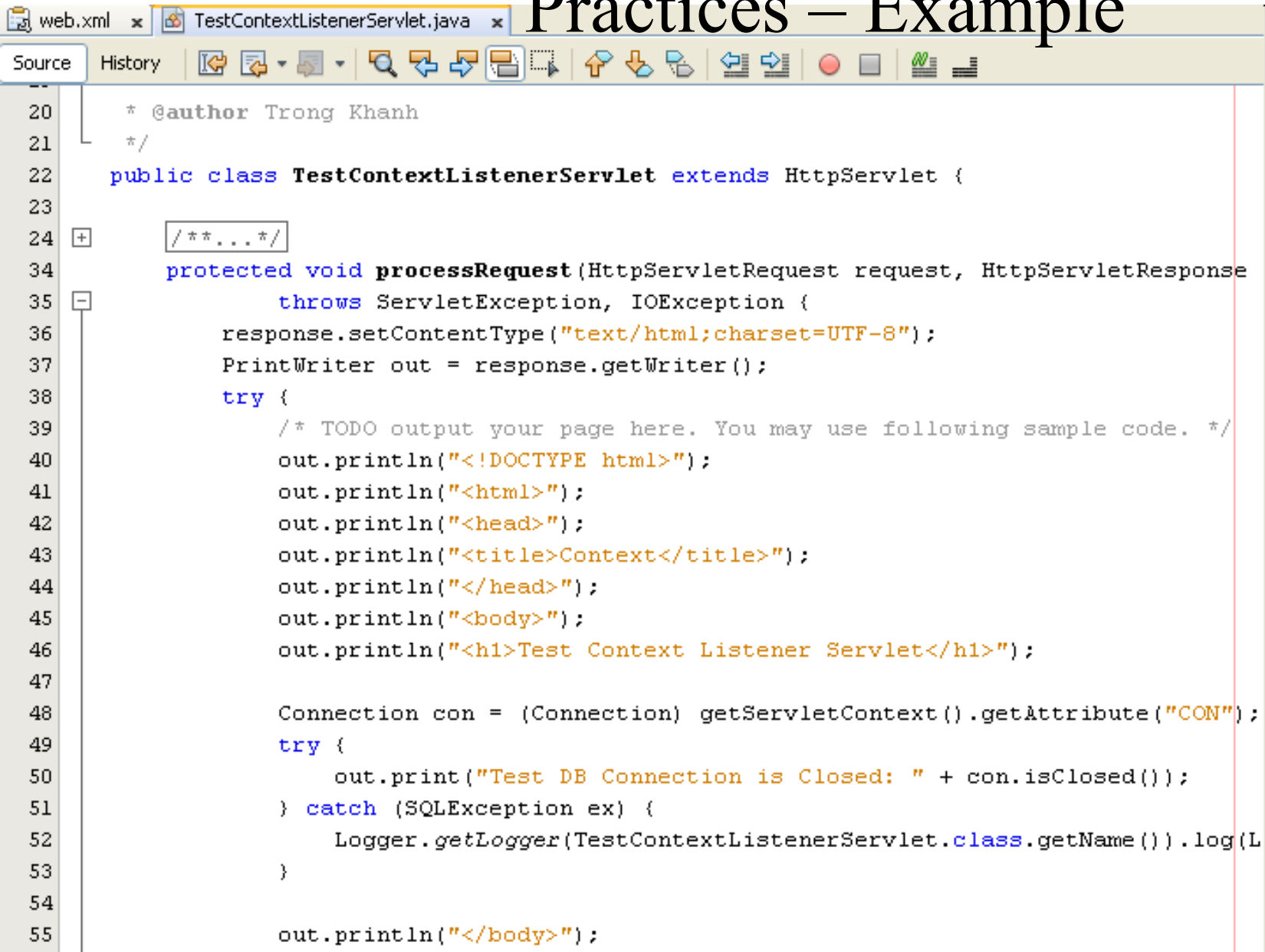
```

# Appendix

## Practices – Example



## Practices – Example



```

web.xml x TestContextListenerServlet.java x
Source History
20  * @author Trong Khanh
21  */
22  public class TestContextListenerServlet extends HttpServlet {
23
24      /**...*/
25
26      protected void processRequest(HttpServletRequest request, HttpServletResponse
27          throws ServletException, IOException {
28          response.setContentType("text/html;charset=UTF-8");
29          PrintWriter out = response.getWriter();
30          try {
31              /* TODO output your page here. You may use following sample code. */
32              out.println("<!DOCTYPE html>");
33              out.println("<html>");
34              out.println("<head>");
35              out.println("<title>Context</title>");
36              out.println("</head>");
37              out.println("<body>");
38              out.println("<h1>Test Context Listener Servlet</h1>");
39
40              Connection con = (Connection) getServletContext().getAttribute("CON");
41              try {
42                  out.print("Test DB Connection is Closed: " + con.isClosed());
43              } catch (SQLException ex) {
44                  Logger.getLogger(TestContextListenerServlet.class.getName()).log(L
45              )
46
47              out.println("</body>");
48
49
50
51
52
53
54
55

```

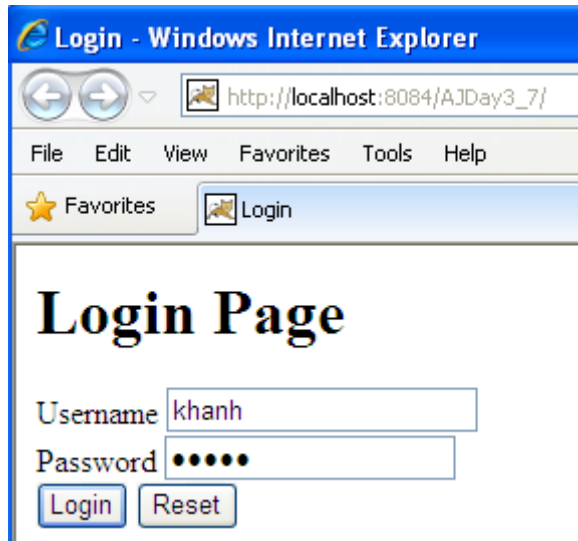
# Appendix

## Session Listeners Declared in DD

- Have **02** listeners:
  - **HttpSessionListener**
    - Implements the changes to the list of active sessions in Web application
    - **sessionCreated()** method: is called whenever a **new session** is provided (*can say that **after** the **getSession()** method*)
    - **sessionDestroyed()**: is called at the **end of the sessions** (*within the call **invalidate()** or **session time out** but **before** the session become invalid*)
    - Both of methods get passed a **HttpSessionEvent** object that provides the **getSession()** method
  - **HttpSessionAttributeListener**
    - Is **called** whenever **some changes** are made to the **attribute** list on the **servlet session** of a Web application
    - Is used to **notify** when an **attribute** has been **added, removed** or **replaced by another attribute**
    - Has the **same trio** of methods as **ServletRequestAttributeListener** that are passed the **HttpSessionBindingEvent** (is inherited from **HttpSessionEvent**)

# Appendix

## Practices – Example



Login - Windows Internet Explorer

http://localhost:8084/AJDay3\_7/

File Edit View Favorites Tools Help

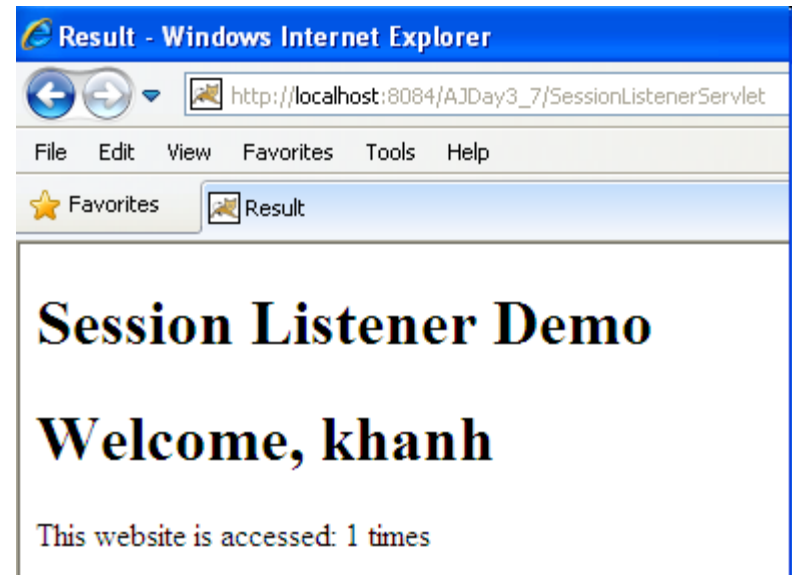
★ Favorites Login

## Login Page

Username

Password

Login Reset



Result - Windows Internet Explorer

http://localhost:8084/AJDay3\_7/SessionListenerServlet

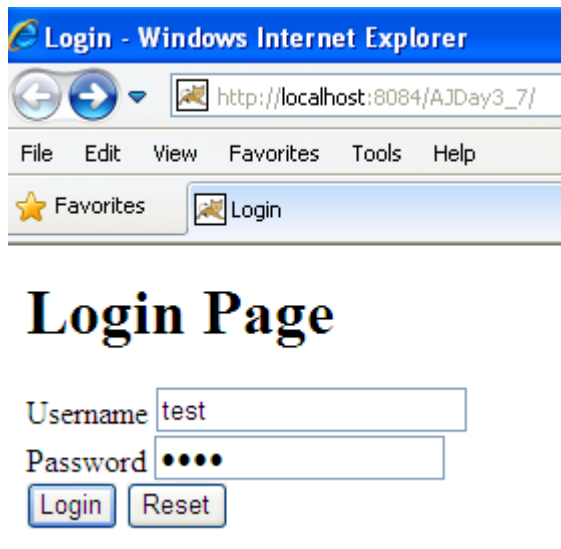
File Edit View Favorites Tools Help

★ Favorites Result

## Session Listener Demo

## Welcome, khanh

This website is accessed: 1 times



Login - Windows Internet Explorer

http://localhost:8084/AJDay3\_7/

File Edit View Favorites Tools Help

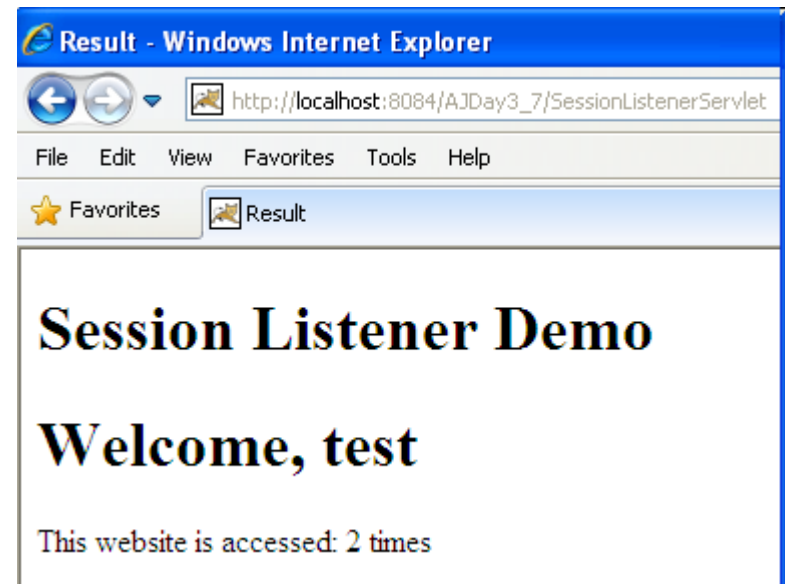
★ Favorites Login

## Login Page

Username

Password

Login Reset



Result - Windows Internet Explorer

http://localhost:8084/AJDay3\_7/SessionListenerServlet

File Edit View Favorites Tools Help

★ Favorites Result

## Session Listener Demo

## Welcome, test

This website is accessed: 2 times

# Appendix

## Practices – Example

```
loginCountSession.html x
Source History
5 <!DOCTYPE html>
6 <html>
7   <head>
8     <title>Login</title>
9     <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
10  </head>
11  <body>
12    <h1>Login Page</h1>
13    <form action="SessionListenerServlet" method="POST">
14      Username <input type="text" name="txtUsername" value="" /><br/>
15      Password <input type="password" name="txtPassword" value="" /><br/>
16      <input type="submit" value="Login" name="btAction" />
17      <input type="reset" value="Reset" />
18    </form>
19  </body>
20 </html>
```



# Appendix

## Practices – Example

```

SessionListenerServlet.java x
Source History
17  * @author Trong Khanh
18  */
19  public class SessionListenerServlet extends HttpServlet {
20
21      /**...*/
31  protected void processRequest(HttpServletRequest request, HttpServletResponse res
32      throws ServletException, IOException {
33      response.setContentType("text/html;charset=UTF-8");
34      PrintWriter out = response.getWriter();
35      try {
36          out.println("<!DOCTYPE html>");
37          out.println("<html>");
38          out.println("<head>");
39          out.println("<title>Result</title>");
40          out.println("</head>");
41          out.println("<body>");
42          out.println("<h1>Session Listener Demo</h1>");
43          String user = request.getParameter("txtUsername");
44          String pass = request.getParameter("txtPassword");
45          if (user.equals(pass)) {
46              HttpSession session = request.getSession();
47              out.println("<h1>Welcome, " + user + "</h1>");
48              Integer count = (Integer) getServletContext().getAttribute("COUNT");
49              out.println("This website is accessed: " + count + " times");
50          } else {
51              out.println("<h1>Invalid username or password</h1>");
52          }
53          out.println("</body>");

```

# Appendix

## Practices – Example

```

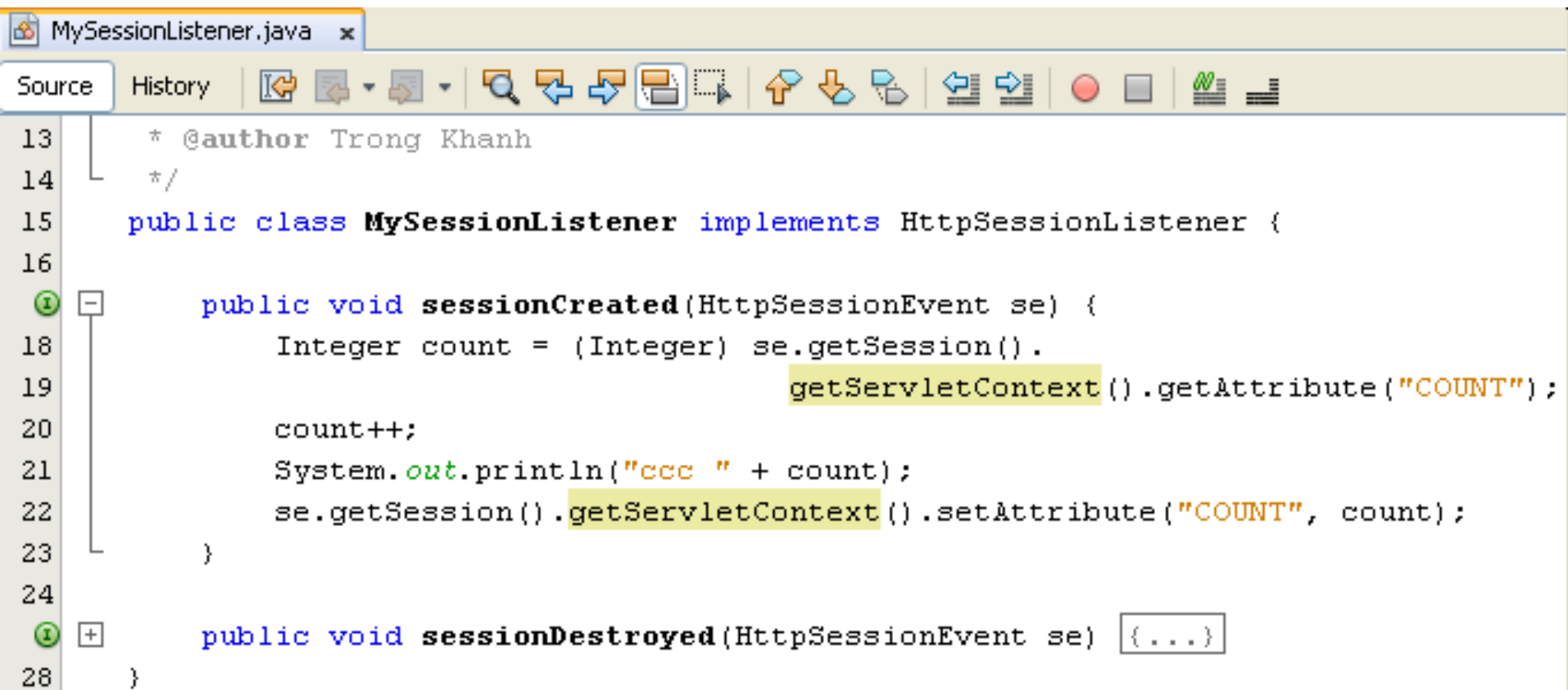
web.xml x
Source General Servlets Filters Pages References Security History
1 <?xml version="1.0" encoding="UTF-8"?>
2 <web-app version="2.5" xmlns="http://java.sun.com/xml/ns/javaee" xmlns:xsi=
3 <listener>
4 <description>ServletContextListener</description>
5 <listener-class>sample.listener.MyContextListener</listener-class>
6 </listener>
7 <listener>
8 <description>HttpSessionListener</description>
9 <listener-class>sample.listener.MySessionListener</listener-class>
10 </listener>
  
```

```

MyContextListener.java x
Source History
15 * @author Trong Khanh
16 */
17 public class MyContextListener implements ServletContextListener {
18
19     public void contextInitialized(ServletContextEvent sce) {
20         sce.getServletContext().setAttribute("COUNT", 0);
21     }
22
23     public void contextDestroyed(ServletContextEvent sce) { ... }
24
25 }
  
```

# Appendix

## Practices – Example



The screenshot shows an IDE window titled "MySessionListener.java". The code is as follows:

```

13  * @author Trong Khanh
14  */
15  public class MySessionListener implements HttpSessionListener {
16
17      public void sessionCreated(HttpSessionEvent se) {
18          Integer count = (Integer) se.getSession().
19                          getServletContext().getAttribute("COUNT");
20          count++;
21          System.out.println("ccc " + count);
22          se.getSession().getServletContext().setAttribute("COUNT", count);
23      }
24
25      public void sessionDestroyed(HttpSessionEvent se) { ... }
26  }
  
```

The code implements the `HttpSessionListener` interface. The `sessionCreated` method increments a counter stored in the session's context attribute named "COUNT" and prints the current count. The `sessionDestroyed` method is currently empty, indicated by `{ ... }`.

# Appendix

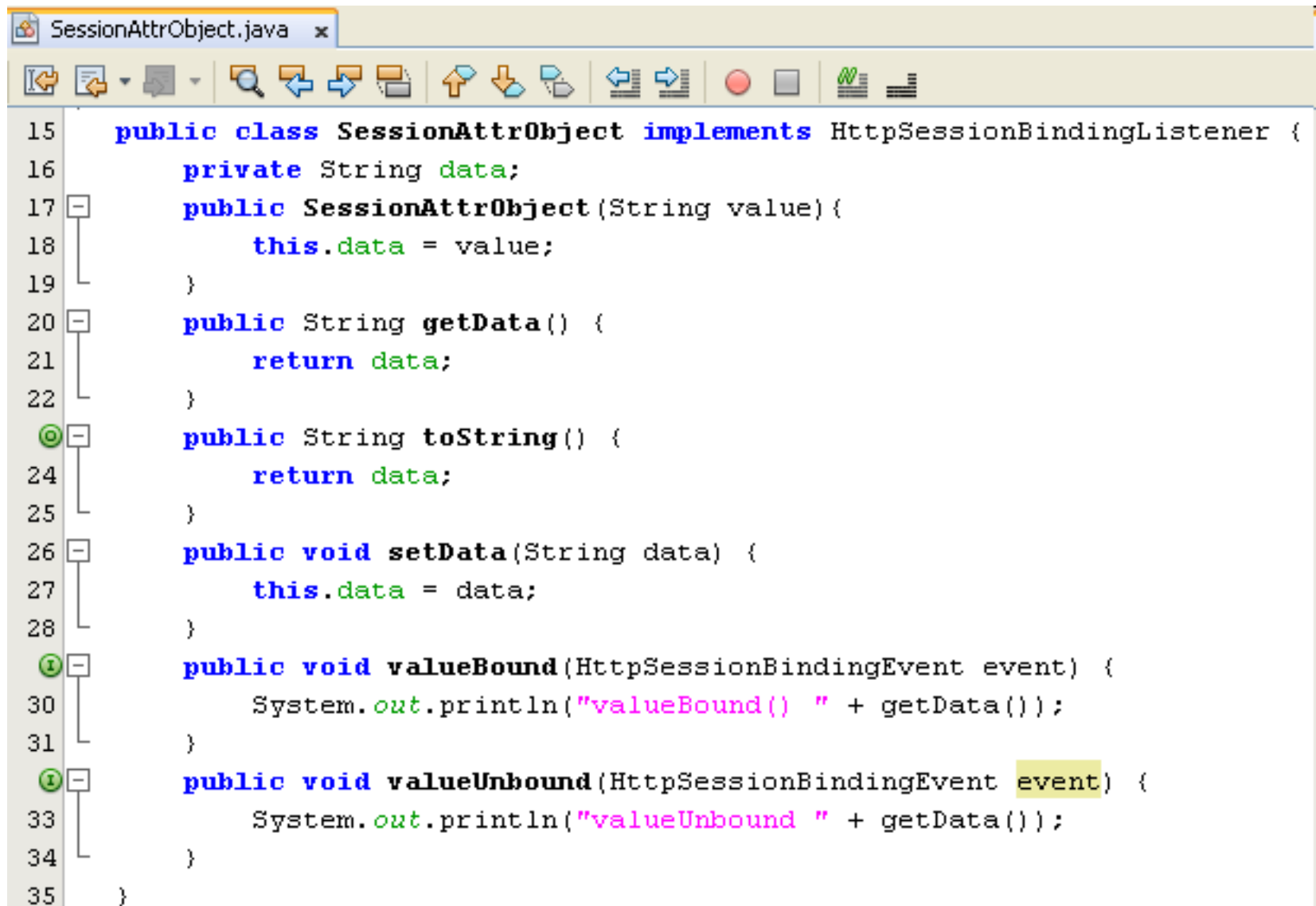
## Session Listeners Not Declared in DD

- Have **02** listeners:
  - **HttpSessionBindingListener**
    - **Notifies** the **object** when it is being **bound** to or **unbound** from a **session**
    - This **notification** can be the **result** of a **forced unbinding** of an **attribute** from a **session** by the **programmer**, **invalidation** of the **session** or due to **timing out** of **session**
    - This **implementation** do **not** **require** any **configuration** within the deployment descriptor of the Web application
    - **Notes:** The object data types not implemented in **BindingListener** **don't** **fire any events!**

Methods	Descriptions
<b>valueBound</b>	<ul style="list-style-type: none"> <li>- <b>public void valueBound(HttpSessionBindingEvent se);</b></li> <li>- <b>Notifies</b> the object in being <b>bound</b> to a <b>session</b> and is responsible for identification of the session</li> </ul>
<b>valueUnbound</b>	<ul style="list-style-type: none"> <li>- <b>public void valueUnbound(HttpSessionBindingEvent se);</b></li> <li>- <b>Notifies</b> the <b>object</b> on being <b>unbound</b> from a <b>session</b> and is responsible for identification of the session</li> </ul>

# Appendix

## Session Listeners Not Declared in DD - Example



```

15  public class SessionAttrObject implements HttpSessionBindingListener {
16      private String data;
17      public SessionAttrObject(String value){
18          this.data = value;
19      }
20      public String getData() {
21          return data;
22      }
23      public String toString() {
24          return data;
25      }
26      public void setData(String data) {
27          this.data = data;
28      }
29      public void valueBound(HttpSessionBindingEvent event) {
30          System.out.println("valueBound() " + getData());
31      }
32      public void valueUnbound(HttpSessionBindingEvent event) {
33          System.out.println("valueUnbound " + getData());
34      }
35  }

```

# Appendix

## Session Listeners Not Declared in DD - Example

```

SessionBindingServlet.java x
40      out.println("<h1>Session Binding Demo</h1>");
41
42      SessionAttrObject bObj1 = new SessionAttrObject("khanh");
43      SessionAttrObject bObj2 = new SessionAttrObject("kieu");
44      HttpSession session = request.getSession();
45      session.setAttribute("BOUND", bObj1);
46      session.setAttribute("BOUND1", bObj2);
47      session.setAttribute("NONBOUND", "NON");
48      session.setAttribute("BOUND", bObj2);
49      session.setAttribute("BOUND", null);
50      session.removeAttribute("BOUND2");
51      session.removeAttribute("NONBOUND");
52      out.println("Finished!!!");
53
54      out.println("</body>");
55      out.println("</html>");
56
57      } finally {
  
```

```

x
valueBound()  khanh
valueBound()  kieu
valueBound()  kieu
valueUnbound  khanh
valueUnbound  kieu
valueUnbound  kieu
  
```

# Appendix

## Session Listeners Not Declared in DD

- Have **02 listeners** (cont)
  - **HttpSessionActivationListener** (*receives events when a value object is transported across JVMs*).
    - **Stateful** session (activated and passivated)
    - Is **implemented** when a **container migrates** the **session between VM** or **persists sessions** and is **not required** any **configuration within the deployment descriptor**

Methods	Descriptions
<b>sessionDidActivate</b>	<ul style="list-style-type: none"><li>- <b>public void sessionDidActivate(HttpSessionEvent se);</b></li><li>- Provides notification that the session has just been activated.</li></ul>
<b>sessionWillPassivate</b>	<ul style="list-style-type: none"><li>- <b>public void sessionWillPassivate(HttpSessionEvent se);</b></li><li>- Provide notification that the session is about to be passivated.</li></ul>





# Appendix

## CRUD Function

```

35 </font>
36 <h1>Search Page</h1>
37 <form action="SE1162Servlet">
38     Search Value <input type="text" name="txtSearchValue"
39                     value="" /><br/>
40     <input type="submit" value="Search" name="btAction" />
41 </form>
42
43 <br/>
44
45 <%
46     String searchValue = request.getParameter("txtSearchValue");
47
48     if (searchValue != null) {
49         List<RegistrationDTO> result =
50             (List<RegistrationDTO>)request.getAttribute("SEARCHRESULT");
51
52         if (result != null) {
53             %>
54             <table border="1">
55                 <thead>
56                     <tr>
57                         <th>No.</th>
58                         <th>Username</th>
59                         <th>Password</th>
60                         <th>Lastname</th>
61                         <th>Role</th>
62                         <th>Delete</th>
63                         <th>Update</th>
64                     </tr>

```

# Appendix

## CRUD Function

```

65     </thead>
66     <tbody>
67         <%
68             int count = 0;
69             for (RegistrationDTO dto : result) {
70                 String urlRewriting = "SE1162Servlet?btAction=delete&pk="
71                     + dto.getUsername()
72                     + "&lastSearchValue="
73                     + searchValue;
74             %>
75         <form action="SE1162Servlet">
76             <tr>
77                 <td>
78                     <%= ++count %>
79                 </td>
80                 <td>
81                     <%= dto.getUsername() %>
82                     <input type="hidden" name="txtUsername"
83                         value="<%= dto.getUsername() %>" />
84                 </td>
85                 <td>
86                     <input type="text" name="txtPassword"
87                         value="<%= dto.getPassword() %>" />
88                 </td>
89                 <td>
90                     <%= dto.getLastname() %>
91                 </td>

```

# Appendix

## CRUD Function

```

92     <td>
93         <input type="checkbox" name="chkRole" value="ADMIN"
94             <%
95                 if (dto.isRole()) {
96                     %>
97                         checked="checked"
98                 <%
99                     }
100                 %>
101             />
102     </td>
103     <td>
104         <a href="<%= urlRewriting %>">Delete</a>
105     </td>
106     <td>
107         <input type="hidden" name="lastSearchValue"
108             value="<%= searchValue %>" />
109         <input type="submit" value="Update" name="btAction" />
110     </td>
111 </tr>
112 </form>
113 <%
114     }
115 %>
116 </tbody>
117 </table>
118
119 <%
120     } else {
121
122         <h2>No record is matched!!!</h2>
123     <%
124         }
125     } //end if search Value
126 %>
127 </body>
128 </html>
  
```

# Appendix

## CUD Function

```

RegistrationDAO.java x
Source History
public boolean deleteRecord(String username)
    throws SQLException, NamingException {
    Connection con = null;
    PreparedStatement stm = null;
    try {
        con = DBUtils.makeConnection();

        if (con != null) {
            String sql = "Delete From Registration Where username = ?";

            stm = con.prepareStatement(sql);
            stm.setString(1, username);

            int row = stm.executeUpdate();

            if (row > 0) {
                return true;
            }
        } finally {
            if (stm != null) {
                stm.close();
            }
            if (con != null) {
                con.close();
            }
        }

        return false;
    }
}

```

# Appendix

## CRUD Function

RegistrationDAO.java

```

147 public boolean updatePassRole(String username, String password, boolean role)
148     throws SQLException, NamingException {
149     Connection con = null;
150     PreparedStatement stm = null;
151     try {
152         con = DBUtils.makeConnection();
153         if (con != null) {
154             String sql = "Update Registration Set password = ?, isAdmin = ? Where username = ?";
155
156             stm = con.prepareStatement(sql);
157             stm.setString(1, password);
158             stm.setBoolean(2, role);
159             stm.setString(3, username);
160
161             int row = stm.executeUpdate();
162
163             if (row > 0) {
164                 return true;
165             }
166         }
167     } finally {
168         if (stm != null) {
169             stm.close();
170         }
171         if (con != null) {
172             con.close();
173         }
174     }
175     return false;
176 }

```

# Appendix

## CRUD Function

```

NullServlet.java x
Source History
23  * @author kieukhanh
24  */
25  @WebServlet(name = "NullServlet", urlPatterns = {"/NullServlet"})
26  public class NullServlet extends HttpServlet {
27      private final String loginPage = "login.html";
28      private final String searchPage = "search.jsp";
29
30      /** Processes requests for both HTTP <code>GET</code> and <code>POST</code>
31      protected void processRequest(HttpServletRequest request, HttpServletResponse
32      throws ServletException, IOException {
33          response.setContentType("text/html;charset=UTF-8");
34          PrintWriter out = response.getWriter();
35
36          String url = loginPage;
37          try {
38              Cookie[] cookies = request.getCookies();
39
40              if (cookies != null) {
41                  for (Cookie cookie : cookies) {
42                      String username = cookie.getName();
43                      String password = cookie.getValue();
44
45                      RegistrationDAO dao = new RegistrationDAO();
46                      boolean result = dao.checkLogin(username, password);
47
48                      if (result) {
49                          url = searchPage;
50                      }
51                  }
52              }
53          }
54      }
55  }
56  }
57  }
58  }
59  }
60  }

```

# Appendix

## CRUD Function

```
61     } catch (NamingException ex) {  
62         ex.printStackTrace();  
63     } catch (SQLException ex) {  
64         ex.printStackTrace();  
65     } finally {  
66         RequestDispatcher rd = request.getRequestDispatcher(url);  
67         rd.forward(request, response);  
68  
69         out.close();  
70     }  
71 }
```

# Appendix

## CRUD Function

```

SE1162Servlet.java x
Source History
18  * @author kieukhanh
19  */
20  public class SE1162Servlet extends HttpServlet {
21      private final String loginServlet = "LoginServlet";
22      private final String loginPage = "login.html";
23      private final String searchServlet = "SearchServlet";
24      private final String deleteRecordServlet = "DeleteRecordServlet";
25      private final String updatePassRoleServlet = "UpdatePassRoleServlet";
26      private final String nullServlet = "NullServlet";
27      private final String addItemServlet = "AddItemServlet";
28      private final String viewCartPage = "viewCart.jsp";
29      private final String deleteItemServlet = "DeleteItemServlet";
30      private final String createAccountServlet = "CreateAccountServlet";
31
32      /** Processes requests for both HTTP <code>GET</code> and <code>POST</code>
33      protected void processRequest(HttpServletRequest request, HttpServletResponse
34      throws ServletException, IOException {
35          response.setContentType("text/html;charset=UTF-8");
36          PrintWriter out = response.getWriter();
37
38          String button = request.getParameter("btAction");
39          String url = loginPage;
40          try {
41              if (button == null) {
42                  url = nullServlet;
43              } else if (button.equals("Login")) {
44                  url = loginServlet;
45              } else if (button.equals("Search")) {
46                  url = searchServlet;
47              } else if (button.equals("delete")) {

```



# Appendix

## CRUD Function

```
56         url = deleteRecordServlet;  
57     } else if (button.equals("Update")) {  
58         url = updatePassRoleServlet;  
59     } else if (button.equals("Add Book To Your Cart")) {  
60         url = addItemServlet;  
61     } else if (button.equals("View Your Cart")) {  
62         url = viewCartPage;  
63     } else if (button.equals("Remove Selected Items")) {  
64         url = deleteItemServlet;  
65     } else if (button.equals("Create New Account")) {  
66         url = createAccountServlet;  
67     }  
68  
69     } finally {  
70         RequestDispatcher rd = request.getRequestDispatcher(url);  
71         rd.forward(request, response);  
72  
73         out.close();  
74     }  
75 }
```

# Appendix

## CRUD Function

```

DeleteRecordServlet.java x
Source History
21  * @author kieukhanh
22  */
23  @WebServlet(name = "DeleteRecordServlet", urlPatterns = {"/DeleteRecordServlet"}
24  public class DeleteRecordServlet extends HttpServlet {
25      private final String deleteErrPage = "deleteErr.html";
26      /** Processes requests for both HTTP <code>GET</code> and <code>POST</code>
35  protected void processRequest(HttpServletRequest request, HttpServletResponse
36      throws ServletException, IOException {
37      response.setContentType("text/html;charset=UTF-8");
38      PrintWriter out = response.getWriter();
39
40      String urlRewriting = deleteErrPage;
41      try {
42          String username = request.getParameter("pk");
43          String searchValue = request.getParameter("lastSearchValue");
44
45          RegistrationDAO dao = new RegistrationDAO();
46          boolean result = dao.deleteRecord(username);
47
48          if (result) {
49              urlRewriting = "SE1162Servlet?btAction=Search&txtSearchValue="
50              + searchValue;
51          }
52      } catch (NamingException ex) {
53          ex.printStackTrace();
54      } catch (SQLException ex) {
55          ex.printStackTrace();
56      } finally {
57          response.sendRedirect(urlRewriting);
58          out.close();

```

# Appendix

## CRUD Function

```

UpdatePassRoleServlet.java x
Source History
22  * @author kieuhanh
23  */
24  @WebServlet(name = "UpdatePassRoleServlet", urlPatterns = {"/UpdatePassRoleServlet"})
25  public class UpdatePassRoleServlet extends HttpServlet {
26      private final String updateErrPage = "update.Err.html";
27      /** Processes requests for both HTTP <code>GET</code> and <code>POST</code>
36      protected void processRequest(HttpServletRequest request, HttpServletResponse response)
37          throws ServletException, IOException {
38          response.setContentType("text/html;charset=UTF-8");
39          PrintWriter out = response.getWriter();
40
41          String urlRewriting = updateErrPage;
42          try {
43              String username = request.getParameter("txtUsername");
44              String password = request.getParameter("txtPassword");
45              String admin = request.getParameter("chkRole");
46              boolean role = false;
47              if (admin != null) {
48                  role = true;
49              }
50              String searchValue = request.getParameter("lastSearchValue");
51
52              RegistrationDAO dao = new RegistrationDAO();
53              boolean result = dao.updatePassRole(username, password, role);
54
55              if (result) {
56                  urlRewriting = "SE1162Servlet?btAction=Search&txtSearchValue="
57                      + searchValue;
58              }
59          } catch (NamingException ex) {
60              ex.printStackTrace();
61          } catch (SQLException ex) {
62              ex.printStackTrace();
63          } finally {
64              response.sendRedirect(urlRewriting);
65              out.close();
66          }
67      }
    
```

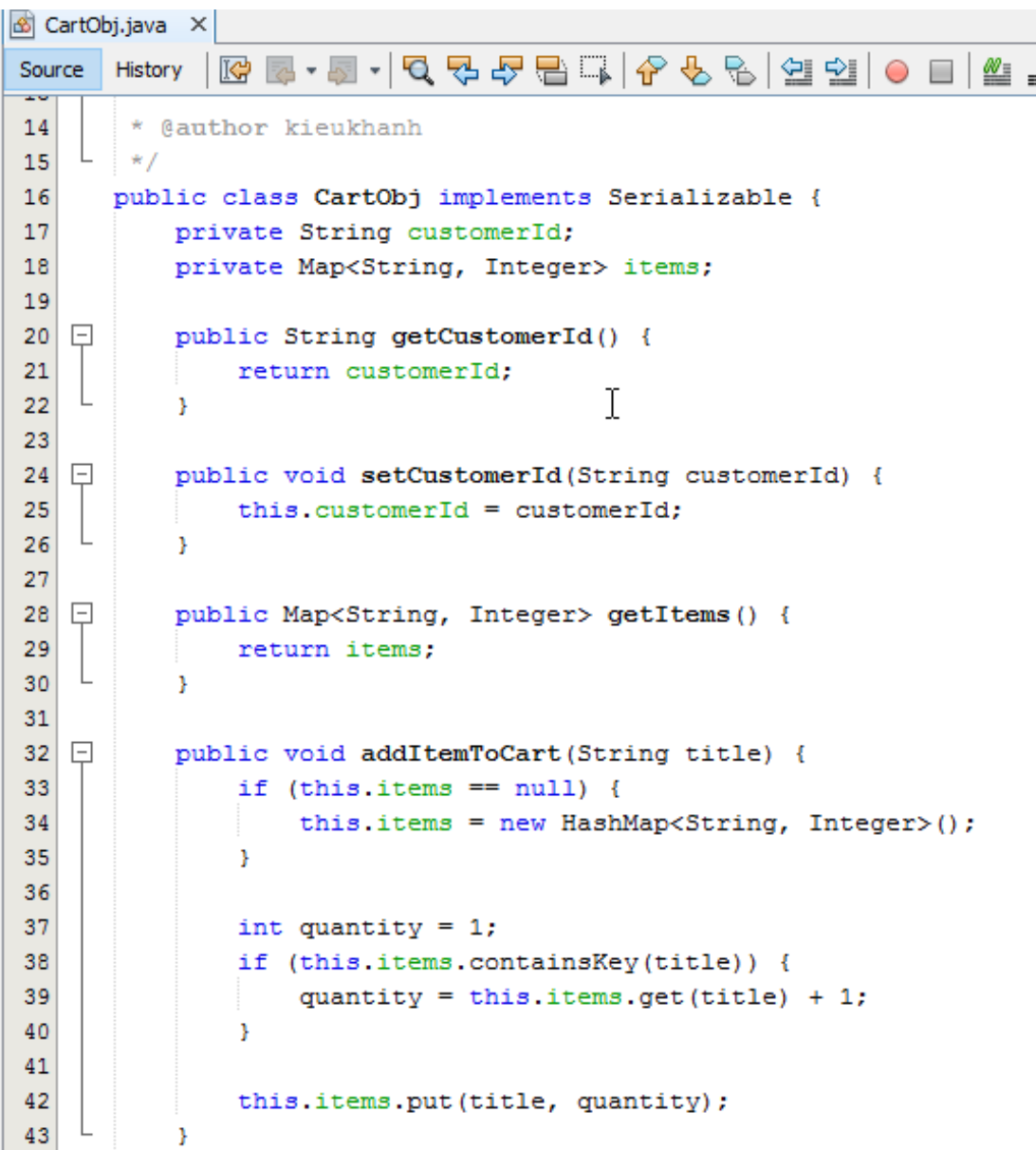
# Appendix

## CRUD Function

```
bookStore.html x
Source History
1 <!DOCTYPE html>
2 ...5 lines
7 <html>
8   <head>
9     <title>Book Store</title>
10    <meta charset="UTF-8">
11    <meta name="viewport" content="width=device-width, initial-scale=1.0">
12  </head>
13  <body>
14    <h1>Book Store</h1>
15    <form action="SE1162Servlet">
16      Choose book <select name="cboBook">
17        <option>Servlet</option>
18        <option>Tomcat</option>
19        <option>JSP</option>
20        <option>MVC</option>
21        <option>JavaEE</option>
22        <option>EL</option>
23        <option>EJB2</option>
24        <option>EJB3</option>
25        <option>JBoss</option>
26      </select><br/>
27      <input type="submit" value="Add Book To Your Cart" name="btAction" />
28      <input type="submit" value="View Your Cart" name="btAction" />
29    </form>
30  </body>
31 </html>
```

# Appendix

## CRUD Function



```
14  * @author kieukhanh
15  */
16  public class CartObj implements Serializable {
17      private String customerId;
18      private Map<String, Integer> items;
19
20      public String getCustomerId() {
21          return customerId;
22      }
23
24      public void setCustomerId(String customerId) {
25          this.customerId = customerId;
26      }
27
28      public Map<String, Integer> getItems() {
29          return items;
30      }
31
32      public void addItemToCart(String title) {
33          if (this.items == null) {
34              this.items = new HashMap<String, Integer>();
35          }
36
37          int quantity = 1;
38          if (this.items.containsKey(title)) {
39              quantity = this.items.get(title) + 1;
40          }
41
42          this.items.put(title, quantity);
43      }
```

# Appendix

## CRUD Function

```
44
45  [-] public void removeItemFromCart(String title) {
46      if (this.items == null) {
47          return;
48      }
49
50      if (this.items.containsKey(title)) {
51          this.items.remove(title);
52          if (this.items.isEmpty()) {
53              this.items = null;
54          }
55      }
56  }
57 }
58
```

# Appendix

## CRUD Function

```

AddItemServlet.java x
Source History
20  * @author kieukhanh
21  */
22  @WebServlet(name = "AddItemServlet", urlPatterns = {"/AddItemServlet"})
23  public class AddItemServlet extends HttpServlet {
24      private final String shoppingPage = "bookStore.html";
25
26  /** Processes requests for both HTTP <code>GET</code> and <code>POST</code>
35  protected void processRequest(HttpServletRequest request, HttpServlet
36      throws ServletException, IOException {
37      response.setContentType("text/html;charset=UTF-8");
38      PrintWriter out = response.getWriter();
39      try {
40          HttpSession session = request.getSession();
41
42          CartObj cart = (CartObj)session.getAttribute("CART");
43          if (cart == null) {
44              cart = new CartObj();
45          }
46
47          String title = request.getParameter("cboBook");
48
49          cart.addItemToCart(title);
50
51          session.setAttribute("CART", cart);
52
53          response.sendRedirect(shoppingPage);
54      } finally {
55          out.close();
56      }
57  }

```

# Appendix

## CRUD Function

viewCart.jsp

Source History

```

4      Author      : kieu Khanh
5      --->
6
7      <%@page import="java.util.Map"%>
8      <%@page import="sample.cart.CartObj"%>
9      <%@page contentType="text/html" pageEncoding="UTF-8"%>
10     <!DOCTYPE html>
11     <html>
12     <head>
13         <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
14         <title>Book Store</title>
15     </head>
16     <body>
17         <h1>Your Cart includes </h1>
18
19         <%
20             if (session != null) {
21                 CartObj cart = (CartObj) session.getAttribute("CART");
22
23                 if (cart != null) {
24                     if (cart.getItems() != null) {
25                         %>
26                         <table border="1">
27                             <thead>
28                                 <tr>
29                                     <th>No.</th>
30                                     <th>Title</th>
31                                     <th>Quantity</th>
32                                     <th>Action</th>
33                                     </tr>

```



# Appendix

## CRUD Function

```

34 </thead>
35 <tbody>
36 <form action="SE1162Servlet">
37 <%
38     Map<String, Integer> items = cart.getItems();
39     int count = 0;
40     for (Map.Entry item : items.entrySet()) {
41         %>
42     <tr>
43     <td>
44         <%= ++count %>
45     .</td>
46     <td>
47         <%= item.getKey() %>
48     </td>
49     <td>
50         <%= item.getValue() %>
51     </td>
52     <td>
53         <input type="checkbox" name="chkItem" value="<%= item.getKey() %>" />
54     </td>
55     </tr>
56 <%
57     } //end for
58 %>
59 <tr>
60 <td colspan="3">
61     <a href="bookStore.html">Add More Items to Your Cart</a>
62 </td>

```

# Appendix

## CRUD Function

```

63 <td>
64 <input type="submit" value="Remove Selected Items" name="btAction" />
65 </td>
66 </tr>
67 </form>
68 </tbody>
69 </table>
70
71 <%
72     return;
73     }//end items
74     }//end cart
75     }//end session
76 %>
77
78 <h2>No cart is existed</h2>
79 </body>
80 </html>

```

# Appendix

## CRUD Function

```

DeleteItemServlet.java x
Source History
20      * @author kieuhanh
21      */
22      @WebServlet(name = "DeleteItemServlet", urlPatterns = {"/DeleteItemServlet"})
23      public class DeleteItemServlet extends HttpServlet {
24
25          /** Processes requests for both HTTP <code>GET</code> and <code>POST</code>
34      protected void processRequest(HttpServletRequest request, HttpServletResponse
35          throws ServletException, IOException {
36          response.setContentType("text/html;charset=UTF-8");
37          PrintWriter out = response.getWriter();
38          try {
39              HttpSession session = request.getSession(false);
40
41              if (session != null) {
42                  CartObj cart = (CartObj)session.getAttribute("CART");
43
44                  if (cart != null) {
45                      String[] items = request.getParameterValues("chkItem");
46
47                      if (items != null) {
48                          for (String item : items) {
49                              cart.removeItemFromCart(item);
50                          } //end for
51                          session.setAttribute("CART", cart);
52                      } //end if items
53                  } //end if cart
54              } //end if session
55
56              String urlRewriting = "SE1162Servlet?btAction=View Your Cart";
57              response.sendRedirect(urlRewriting);

```

# Appendix

## CRUD Function

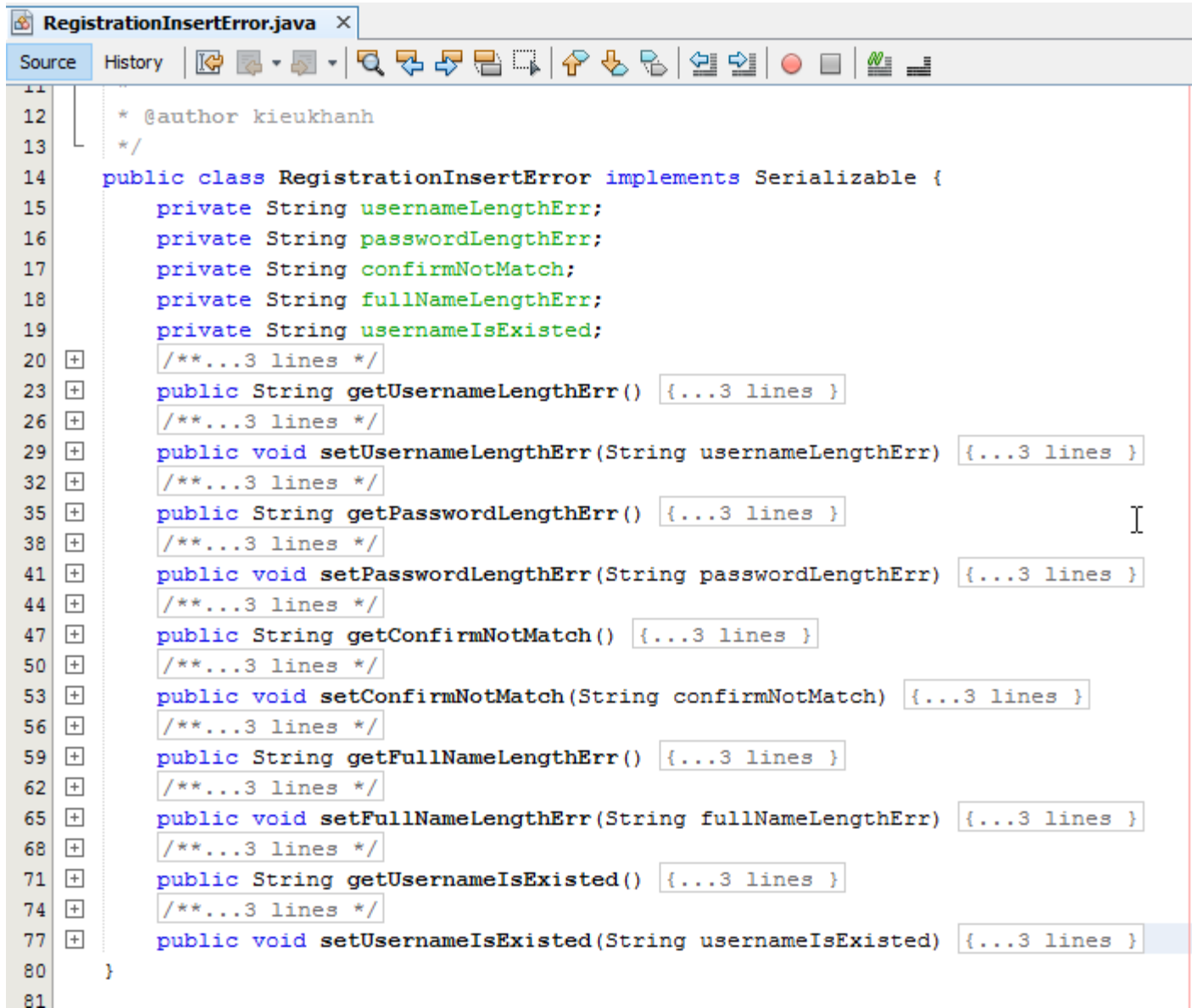
```

createNewAccount.html x
Source History
1 <!DOCTYPE html>
2 ...5 lines
7 <html>
8   <head>
9     <title>New Account</title>
10    <meta charset="UTF-8">
11    <meta name="viewport" content="width=device-width, initial-scale=1.0">
12  </head>
13  <body>
14    <h1>Create New Account</h1>
15    <form action="SE1162Servlet" method="POST">
16      Username* <input type="text" name="txtUsername" value="" />(6 - 20 chars)<br/>
17      Password* <input type="password" name="txtPassword" value="" />(6 - 30 chars)<br/>
18      Confirm* <input type="password" name="txtConfirm" value="" /><br/>
19      Full name <input type="text" name="txtFullname" value="" />(2 - 50 chars)<br/>
20      <input type="submit" value="Create New Account" name="btAction" />
21      <input type="reset" value="Reset" />
22    </form>
23  </body>
24 </html>

```

# Appendix

## CRUD Function



```

11
12  * @author kieukhanh
13  */
14  public class RegistrationInsertError implements Serializable {
15      private String usernameLengthErr;
16      private String passwordLengthErr;
17      private String confirmNotMatch;
18      private String fullNameLengthErr;
19      private String usernameIsExisted;
20      /**...3 lines */
23      public String getUsernameLengthErr() {...3 lines }
26      /**...3 lines */
29      public void setUsernameLengthErr(String usernameLengthErr) {...3 lines }
32      /**...3 lines */
35      public String getPasswordLengthErr() {...3 lines }
38      /**...3 lines */
41      public void setPasswordLengthErr(String passwordLengthErr) {...3 lines }
44      /**...3 lines */
47      public String getConfirmNotMatch() {...3 lines }
50      /**...3 lines */
53      public void setConfirmNotMatch(String confirmNotMatch) {...3 lines }
56      /**...3 lines */
59      public String getFullNameLengthErr() {...3 lines }
62      /**...3 lines */
65      public void setFullNameLengthErr(String fullNameLengthErr) {...3 lines }
68      /**...3 lines */
71      public String getUsernameIsExisted() {...3 lines }
74      /**...3 lines */
77      public void setUsernameIsExisted(String usernameIsExisted) {...3 lines }
80  }
81

```

# Appendix

## CRUD Function

```

RegistrationDAO.java x
Source History
182 public boolean insertRecord(String username, String password, String lastname, boolean role)
183     throws SQLException, NamingException {
184     Connection con = null;
185     PreparedStatement stm = null;
186     try {
187         con = DBUtils.makeConnection();
188         if (con != null) {
189             String sql = "Insert Into Registration(username, password, lastname, isAdmin)"
190                 + " Values(?, ?, ?, ?)";
191             stm = con.prepareStatement(sql);
192             stm.setString(1, username);
193             stm.setString(2, password);
194             stm.setString(3, lastname);
195             stm.setBoolean(4, role);
196             int row = stm.executeUpdate();
197             if (row > 0) {
198                 return true;
199             }
200         }
201     } finally {
202         if (stm != null) {
203             stm.close();
204         }
205         if (con != null) {
206             con.close();
207         }
208     }
209
210     return false;
211 }
  
```

# Appendix

## CRUD Function

```

DeleteRecordServlet.java x
Source History
21  * @author kieukhanh
22  */
23  @WebServlet(name = "DeleteRecordServlet", urlPatterns = {"/DeleteRecordServlet"})
24  public class DeleteRecordServlet extends HttpServlet {
25      private final String deleteErrPage = "deleteErr.html";
26      /** Processes requests for both HTTP <code>GET</code> and <code>POST</code> .
35      protected void processRequest(HttpServletRequest request, HttpServletResponse
36          throws ServletException, IOException {
37          response.setContentType("text/html;charset=UTF-8");
38          PrintWriter out = response.getWriter();
39
40          String urlRewriting = deleteErrPage;
41          try {
42              String username = request.getParameter("pk");
43              String searchValue = request.getParameter("lastSearchValue");
44
45              RegistrationDAO dao = new RegistrationDAO();
46              boolean result = dao.deleteRecord(username);
47
48              if (result) {
49                  urlRewriting = "SE1162Servlet?btAction=Search&txtSearchValue="
50                      + searchValue;
51              }
52          } catch (NamingException ex) {
53              ex.printStackTrace();
54          } catch (SQLException ex) {
55              ex.printStackTrace();
56          } finally {
57              response.sendRedirect(urlRewriting);
58              out.close();

```

# Appendix

## CRUD Function

```

createNewAccount.jsp x
Source History
4      Author      : kieuokhanh
5      --%>
6
7      <%@page import="sample.registration.RegistrationInsertError"%>
8      <%@page contentType="text/html" pageEncoding="UTF-8"%>
9      <%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
10     <!--DOCTYPE html-->
11     <html>
12     <head>
13         <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
14         <title>New Account</title>
15     </head>
16     <body>
17         <h1>Create New Account</h1>
18         <form action="SE1162Servlet" method="POST">
19             Username* <input type="text" name="txtUsername"
20                 value="<%= request.getParameter("txtUsername") %>" />(6 - 20 chars)<br/>
21             <font color="red">
22                 <%
23                     RegistrationInsertError errors =
24                         (RegistrationInsertError) request.getAttribute("INSERTERR");
25
26                     if (errors != null) {
27                         if (errors.getUsernameLengthErr() != null) {
28                             %>
29                             <%= errors.getUsernameLengthErr() %><br/>
30                             <%
31                                 }
32                             }//end if errors
33                 %>

```



# Appendix

## CRUD Function

```

34     </font>
35     Password* <input type="password" name="txtPassword" value="" />(6 - 30 chars)<br/>
36     <font color="red">
37     <%
38         if (errors != null) {
39             if (errors.getPasswordLengthErr() != null) {
40                 %>
41                 <%= errors.getPasswordLengthErr() %><br/>
42             }
43         }
44         }//end if errors
45     %>
46 </font>
47 Confirm* <input type="password" name="txtConfirm" value="" /><br/>
48 <font color="red">
49 <%
50     if (errors != null) {
51         if (errors.getConfirmNotMatch() != null) {
52             %>
53             <%= errors.getConfirmNotMatch() %><br/>
54         }
55     }
56     }//end if errors
57 %>
58 </font>
59 Full name <input type="text" name="txtFullname"
60         value="<%= request.getParameter("txtFullname") %>" />(2 - 50 chars)<br/>
61 <font color="red">

```

# Appendix

## CRUD Function

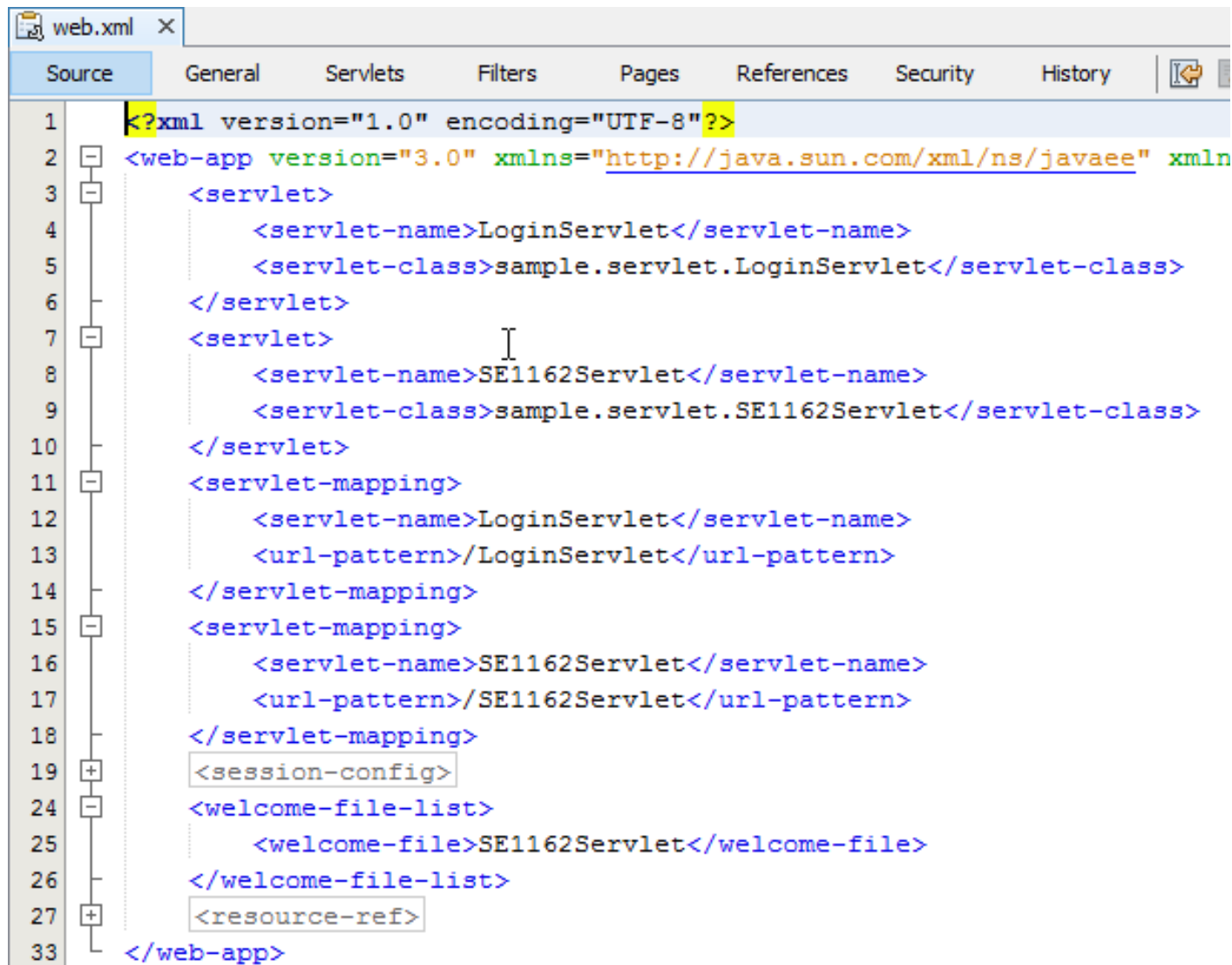
```

62      <%
63          if (errors != null) {
64              if (errors.getFullNameLengthErr() != null) {
65                  %>
66                  <%= errors.getFullNameLengthErr() %><br/>
67              <%
68                  }
69              }//end if errors
70          %>
71      </font>
72      <input type="submit" value="Create New Account" name="btAction" />
73      <input type="reset" value="Reset" />
74  </form><br/>
75  <font color="red">
76      <%
77          if (errors != null) {
78              if (errors.getUsernameIsExisted() != null) {
79                  %>
80                  <%= errors.getUsernameIsExisted() %><br/>
81              <%
82                  }
83              }//end if errors
84          %>
85      </font>
86  </body>
87  </html>

```

# Appendix

## CRUD Function



```

1  <?xml version="1.0" encoding="UTF-8"?>
2  <web-app version="3.0" xmlns="http://java.sun.com/xml/ns/javaee" xmlns:
3      <servlet>
4          <servlet-name>LoginServlet</servlet-name>
5          <servlet-class>sample.servlet.LoginServlet</servlet-class>
6      </servlet>
7      <servlet>
8          <servlet-name>SE1162Servlet</servlet-name>
9          <servlet-class>sample.servlet.SE1162Servlet</servlet-class>
10     </servlet>
11     <servlet-mapping>
12         <servlet-name>LoginServlet</servlet-name>
13         <url-pattern>/LoginServlet</url-pattern>
14     </servlet-mapping>
15     <servlet-mapping>
16         <servlet-name>SE1162Servlet</servlet-name>
17         <url-pattern>/SE1162Servlet</url-pattern>
18     </servlet-mapping>
19     <session-config>
24     <welcome-file-list>
25         <welcome-file>SE1162Servlet</welcome-file>
26     </welcome-file-list>
27     <resource-ref>
33 </web-app>
  
```