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Session Management

Sessions and Listeners
Technique: Error Handling in Servlets

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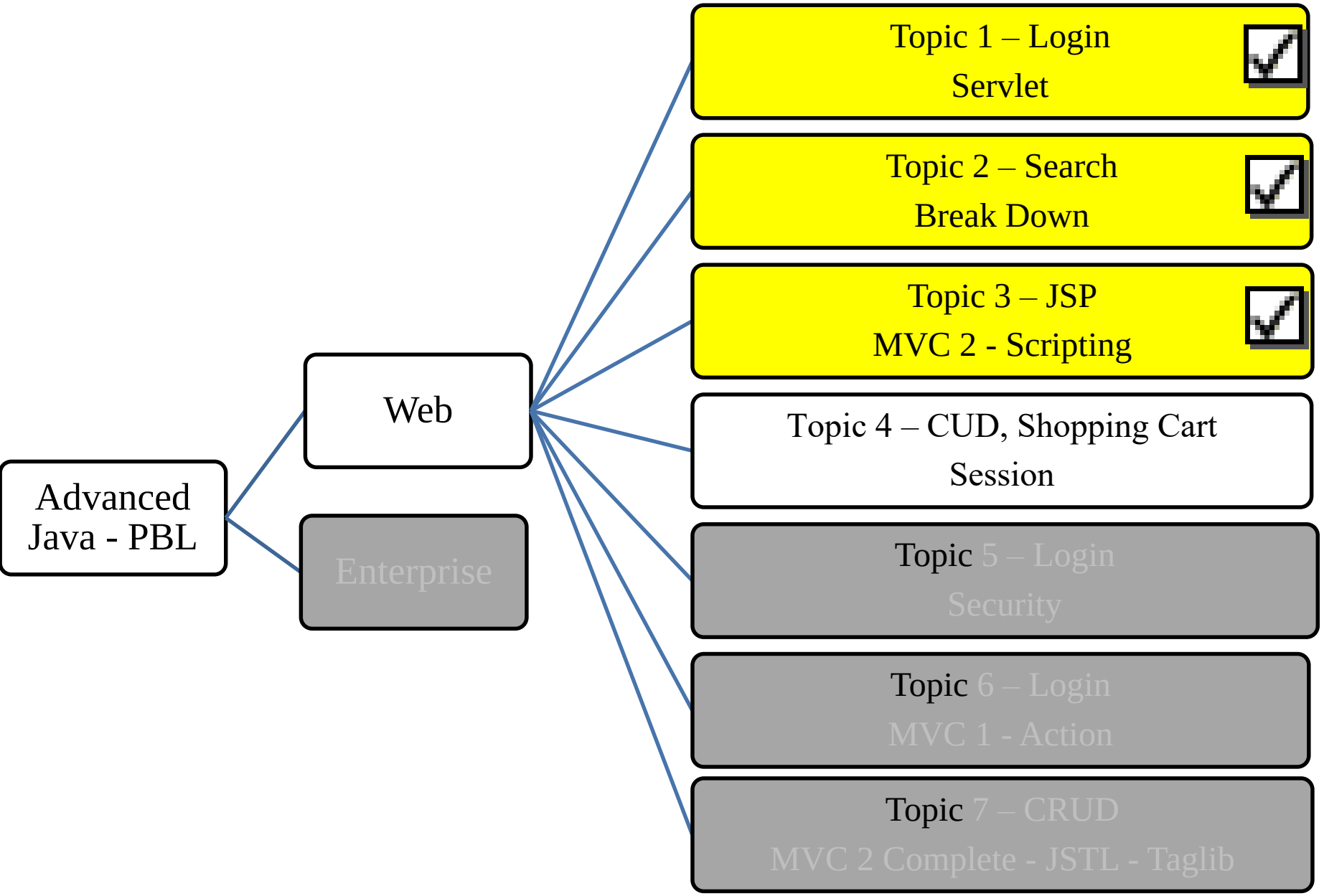
Review

- **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


Advanced Java - PBL
Web
Enterprise
Topic 1 – Login Servlet
Topic 2 – Search Break Down
Topic 3 – JSP MVC 2 - Scripting
Topic 4 – CUD, Shopping Cart Session
Topic 5 – Login Security
Topic 6 – Login MVC 1 - Action
Topic 7 – CRUD MVC 2 Complete - JSTL - Taglib

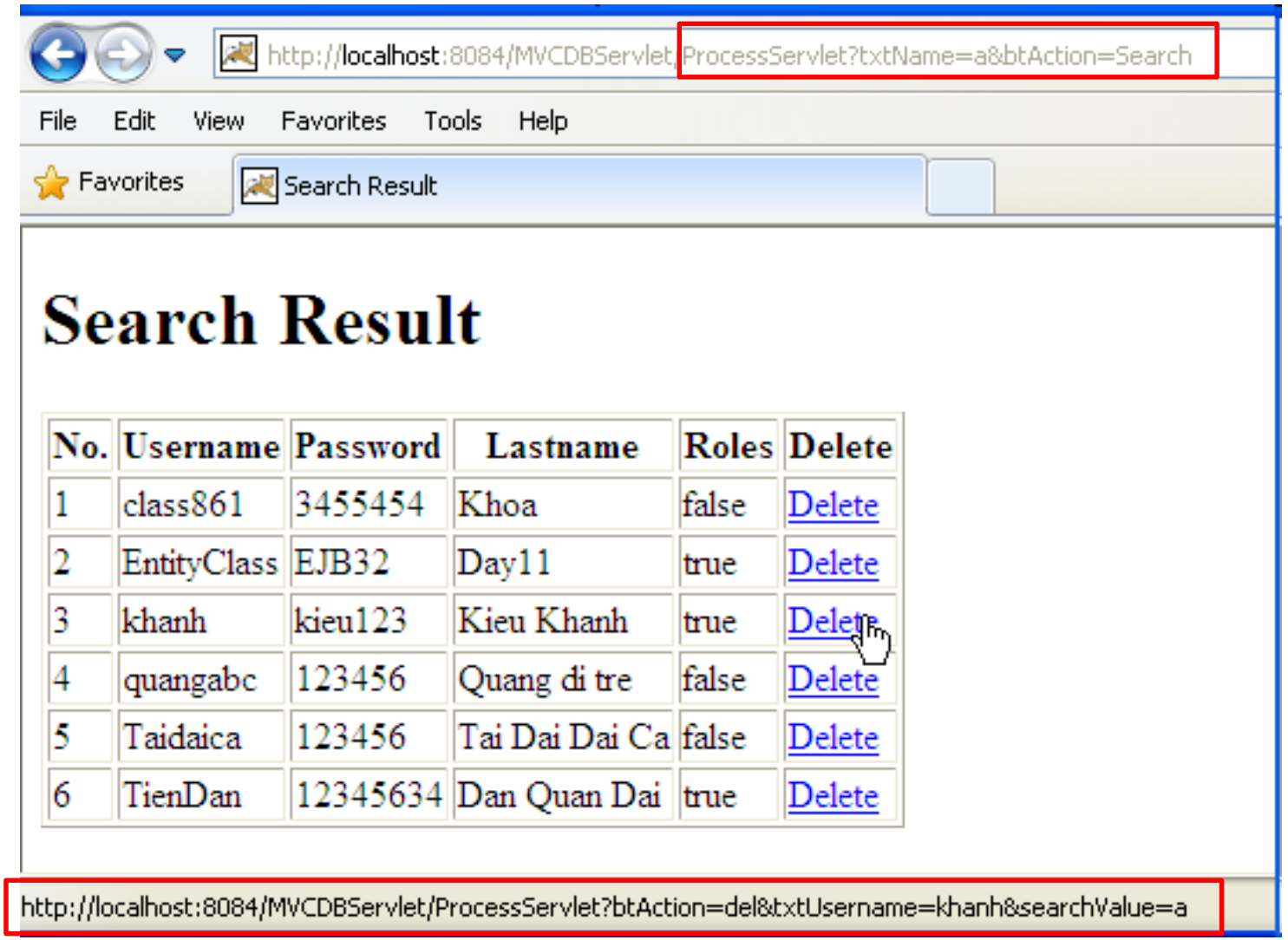
How to write CRUD Web Application

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



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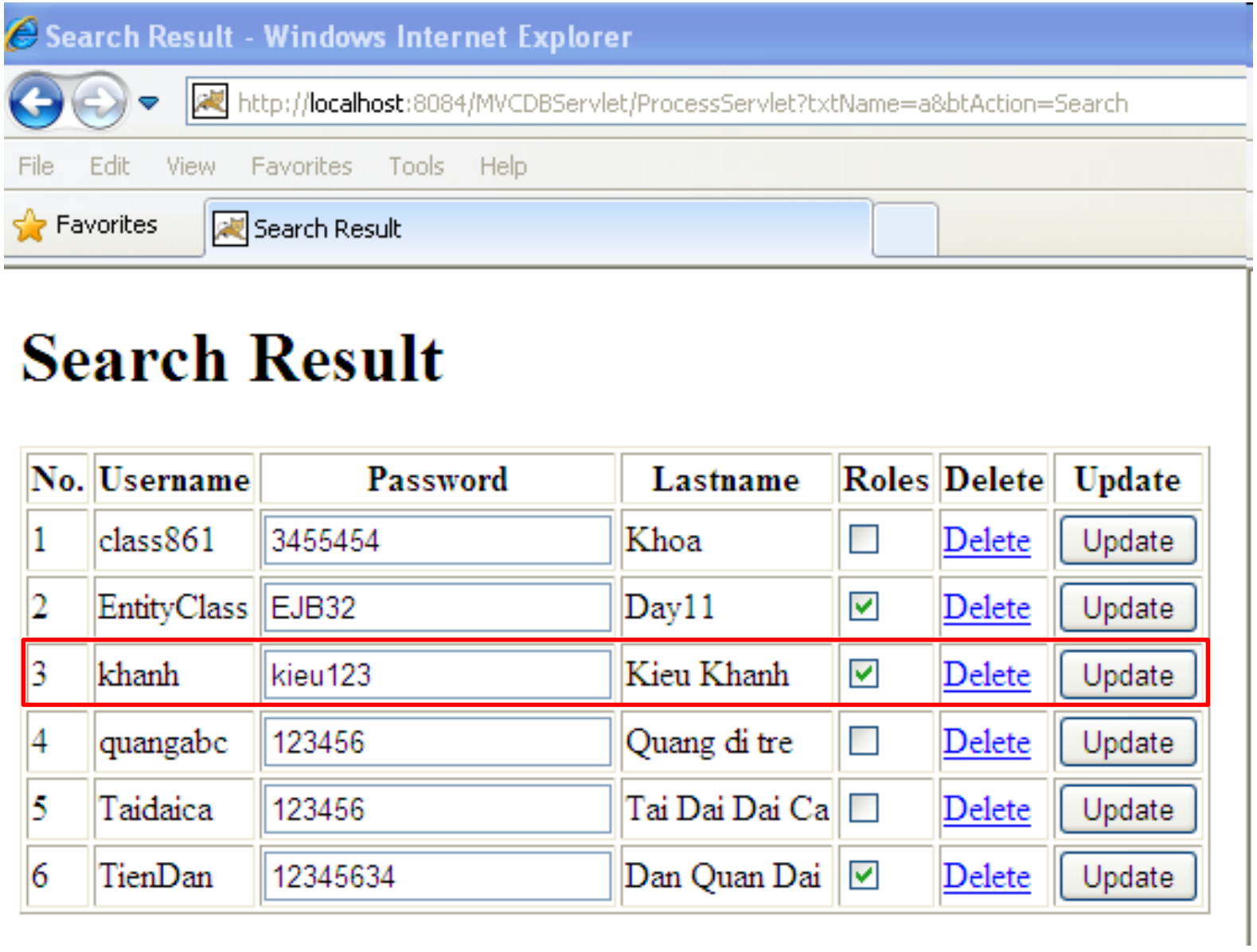

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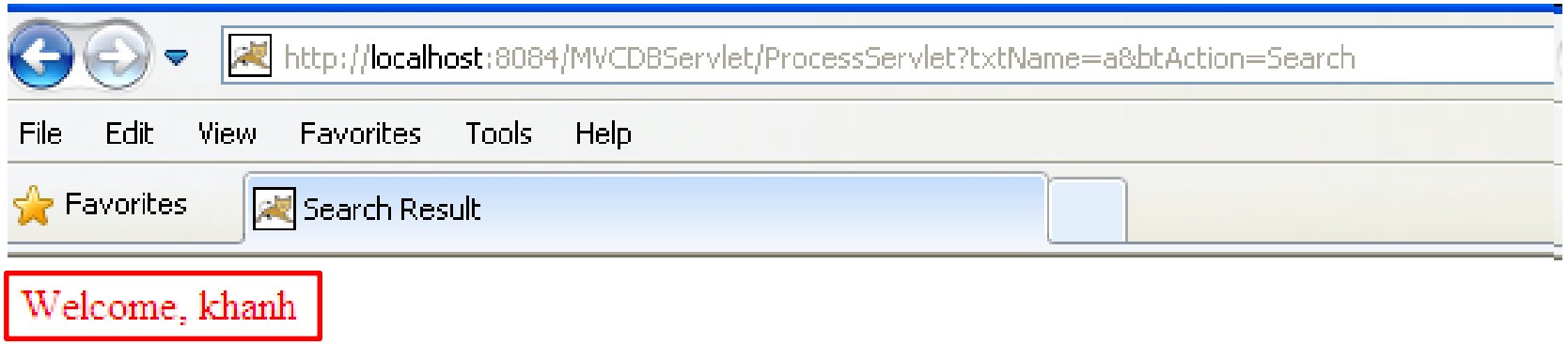
Expectation



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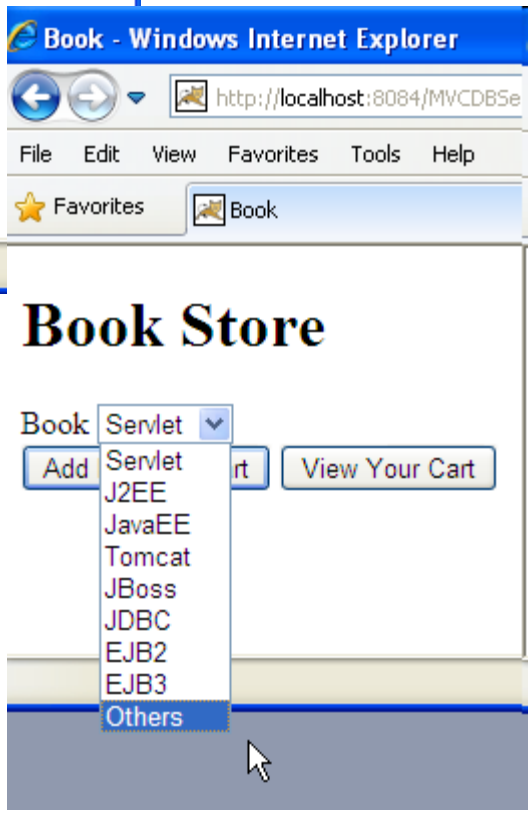
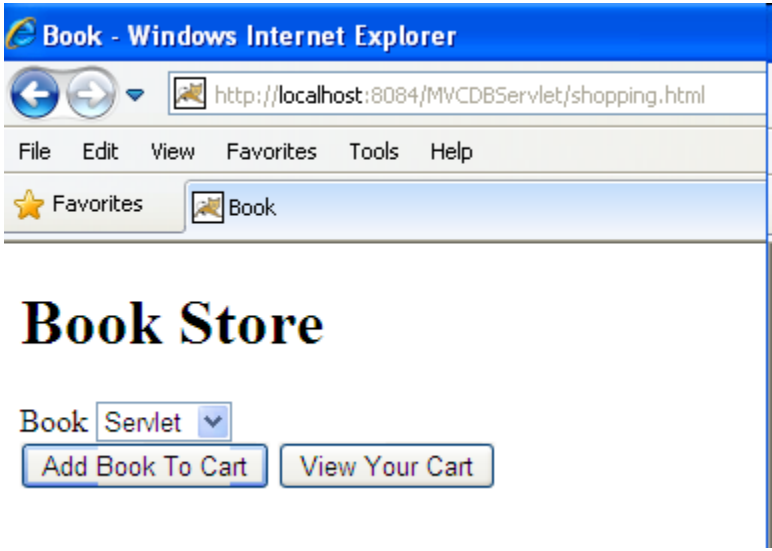
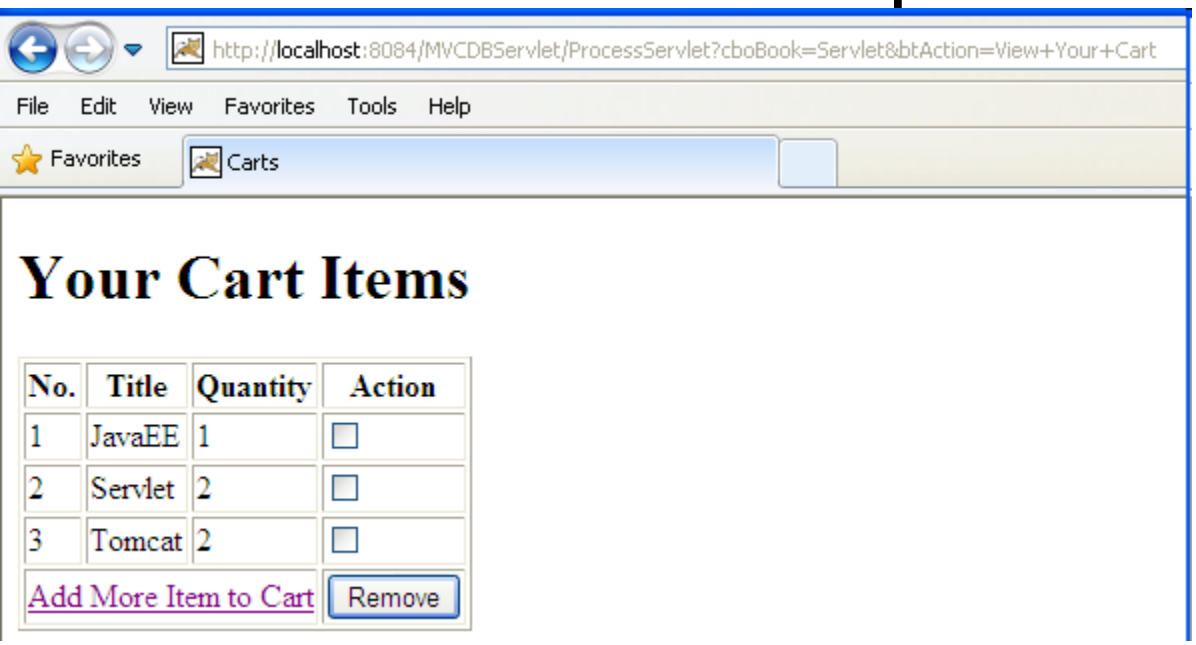
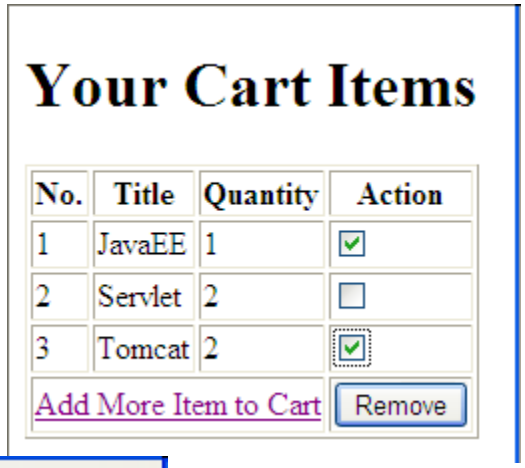


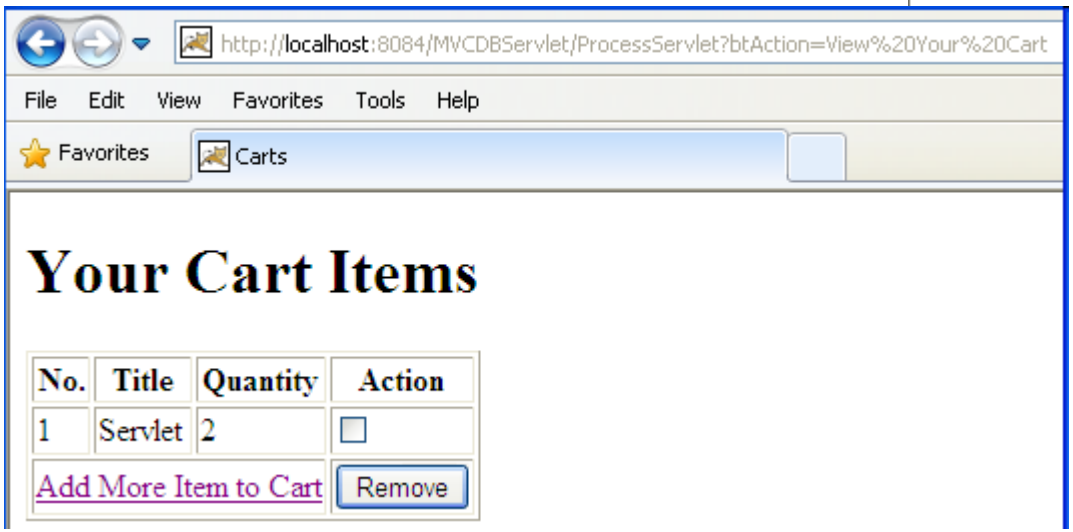


How to write CRUD Web Application

Expectation

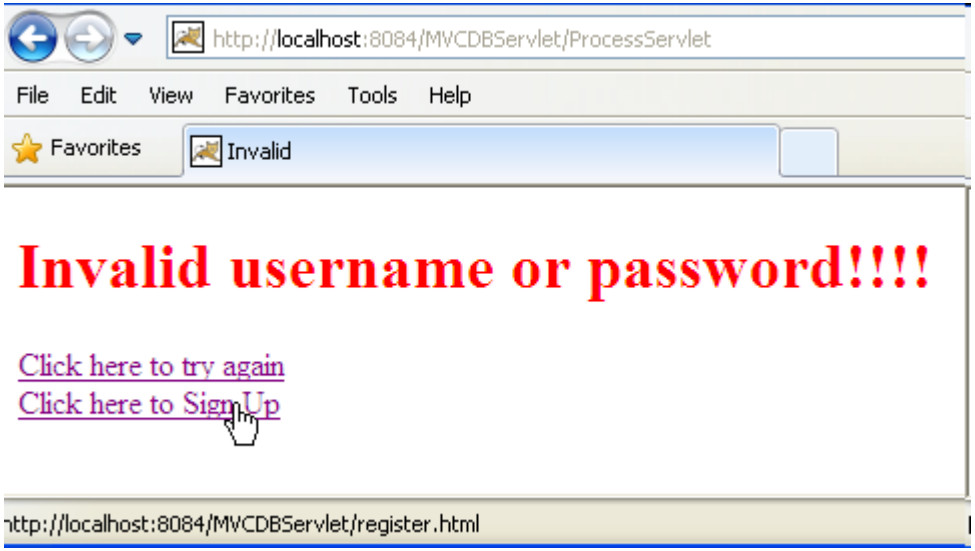


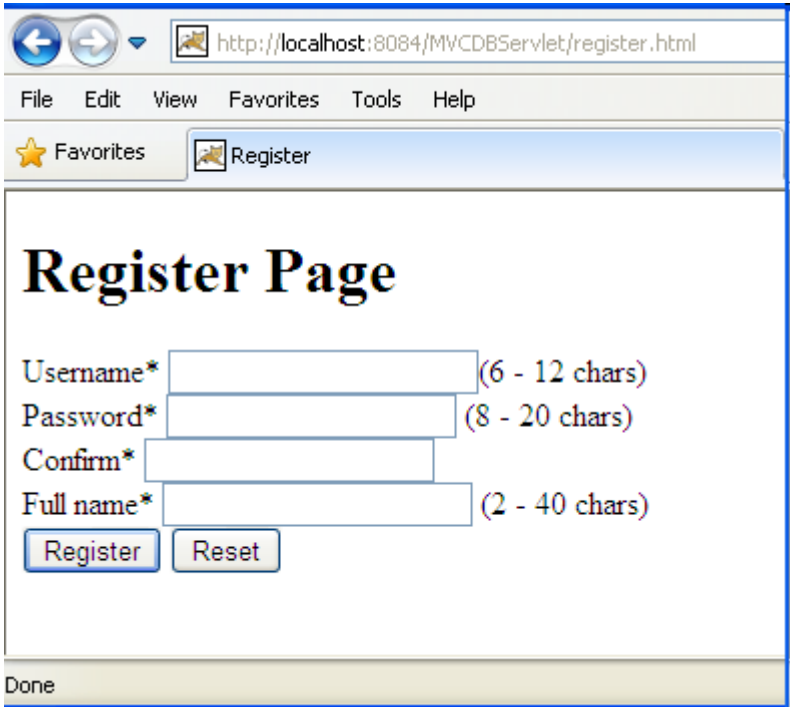




How to write CRUD Web Application

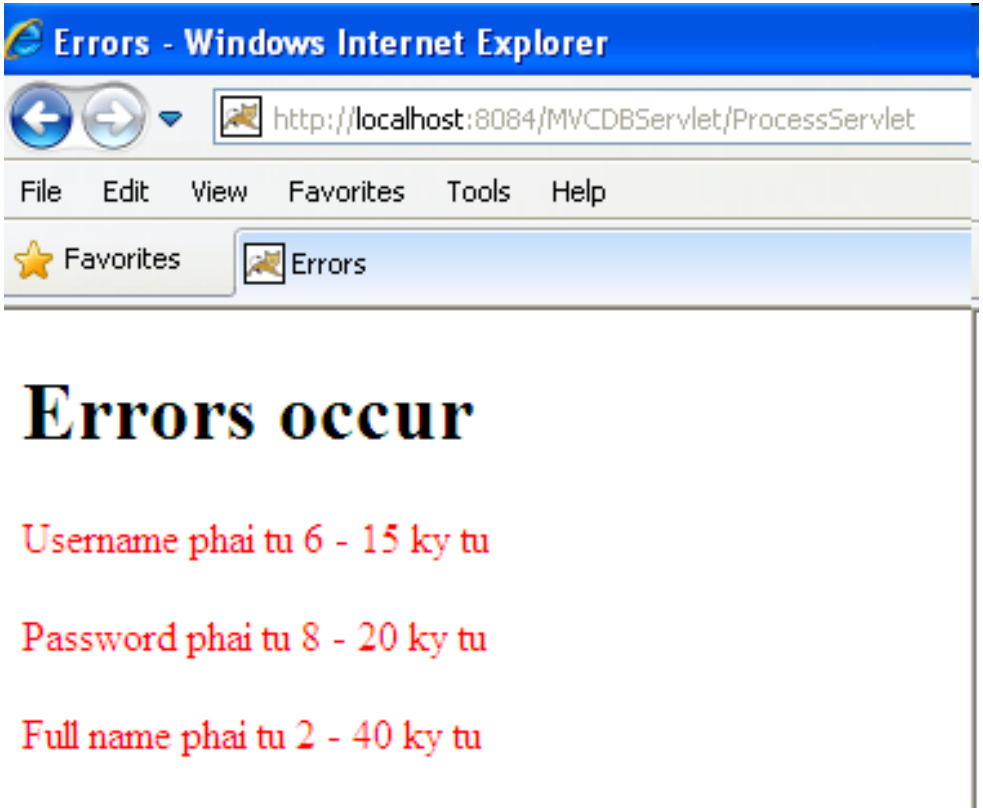
Expectation





How to write CRUD Web Application

Expectation



Sessions & Listeners

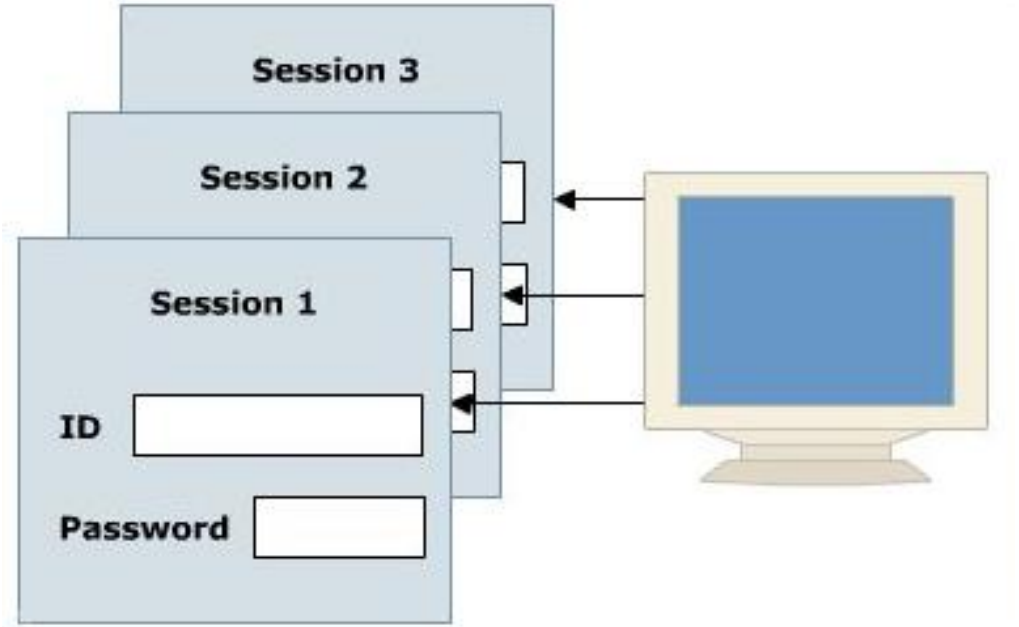
Session

- 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



Session Tracking

Sessions & Listeners

URL Rewriting

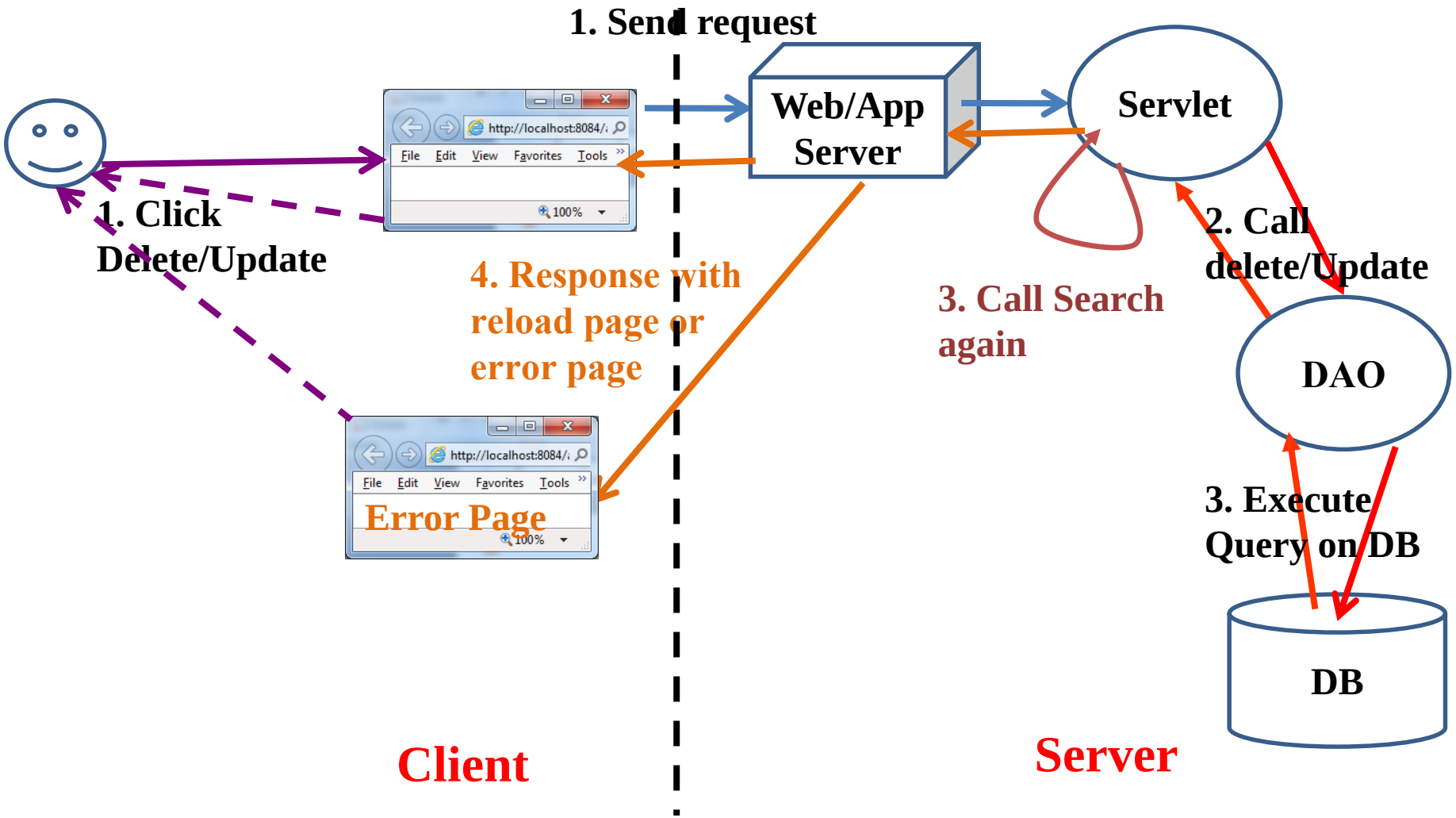
- **Maintains** the **state** of end user by **modifying the URL.**
- **Adds some extra data** at the end of the URL
- Is **used** when the **information to be transferred** is not critical.
- **Syntax**: **url?query_string**
- **Ex**
  - Java Books
  - <form action="http://localhost:8080/UpdateProfile?uid=123" 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

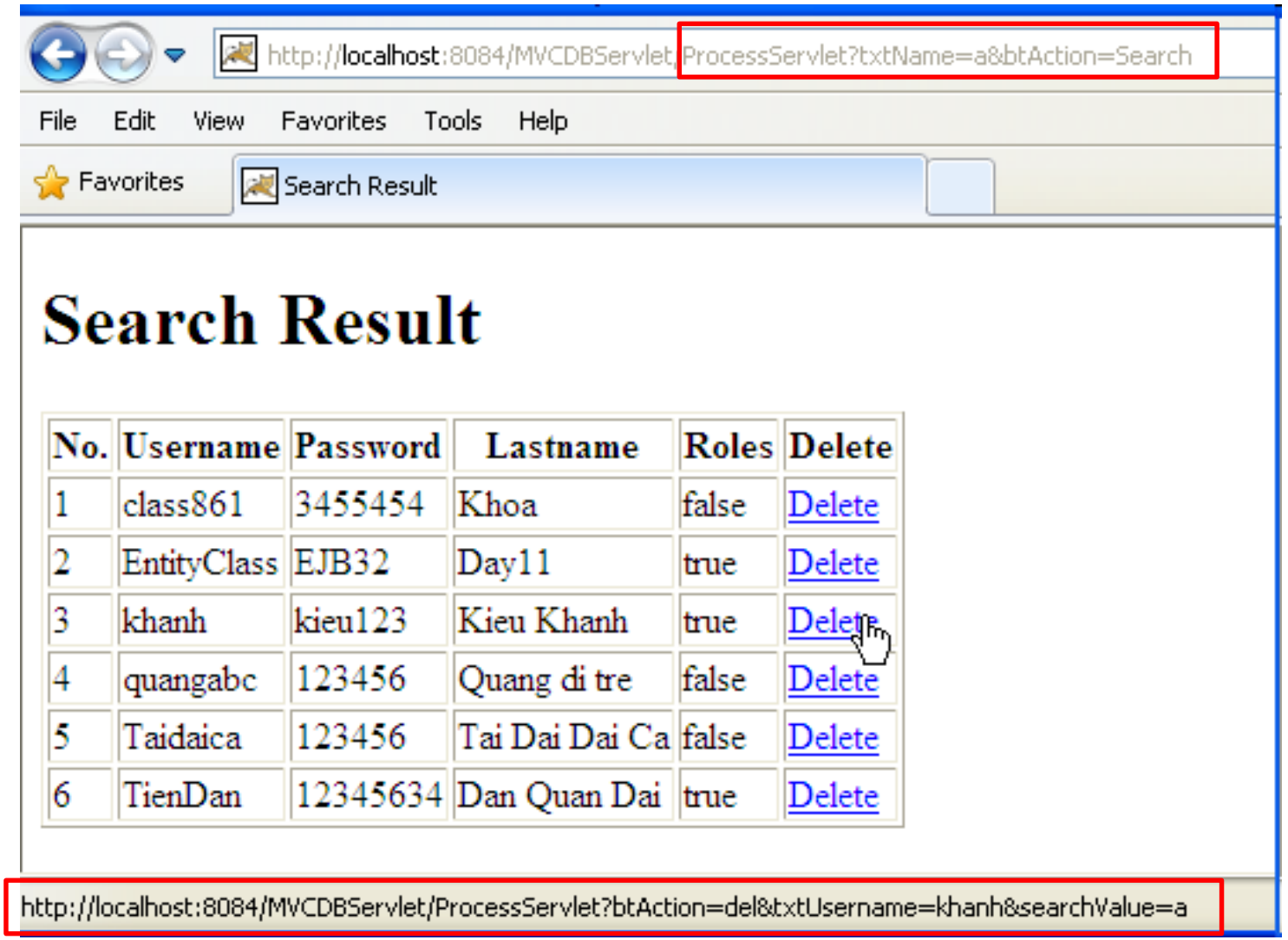
How to write CRUD Web Application

Interactive Server Model



How to write CRUD Web Application

Delete Function



Sessions & Listeners

Hidden Form Fields

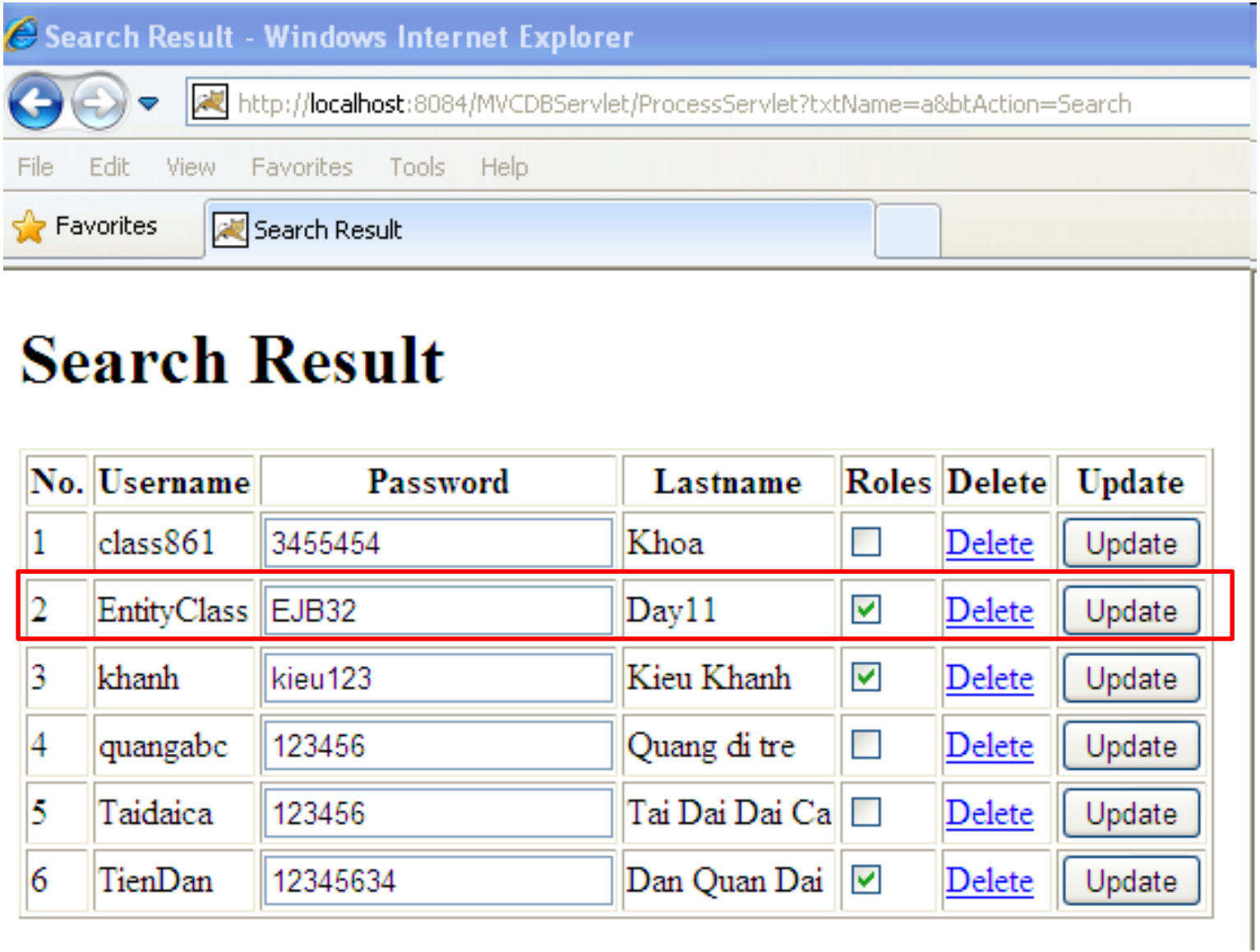
- Simplest technique to **maintain the state of an end user**.
- **Insert** the session identifier into the **hidden form field** in the HTML of each page
- **Embedded the hidden form field in an HTML form** and **not visible** when you view an HTML file in a browser window.
- The session information 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.**

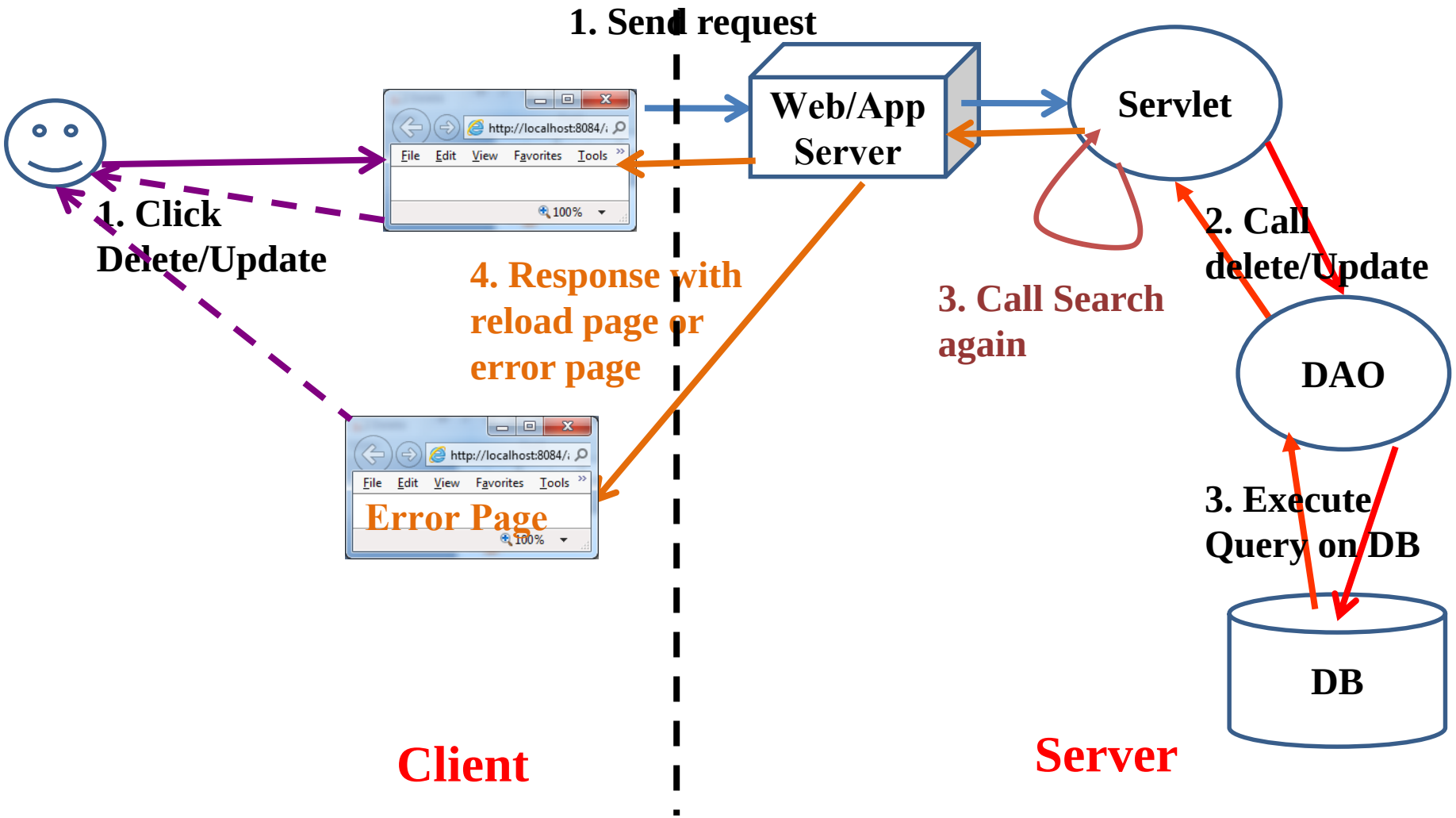
How to write CRUD Web Application

Update Function



How to write CRUD Web Application

Interactive Server Model



Sessions & Listeners

Cookies

- Is a **small piece** of information **sent by** the **web server to** the **client** to keep track of users.
- Size of each cookie can be a maximum of 4 KB.
- Cookie has values in the form of **key-value pairs**
- When the **server sends** a cookie, the **client receives** the cookie, **saves and sends** it **back** to the **server** each **time** the **client accesses** a page on that server
- Can uniquely identify a client (In the case of J2EE web applications, the cookie returned has a standard name **JSESSIONID** and store in memory)
- A web browser is expected to **support 20 Cookies** per host

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\LoggedUserName\Cookies\LoggedUserName@ContextPath[n].txt**
    - **C:\Users\LoggedUserName\AppData\Local\Microsoft\Windows\Temporary Internet Files \LoggedUserName@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
addCookie	- **public void addCookie(cookie1);** - Adds field to the HTTP response headers to send cookies to the browser, one at a time - Adds specified cookie to the response - Can be called multiple times to set more than one cookies
setValue	- **public void setValue(String newValue);** - 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
setPath	- **public void setPath(String path);** - 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
setMaxAge	- **public void setMaxAge(int expiry);** - 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

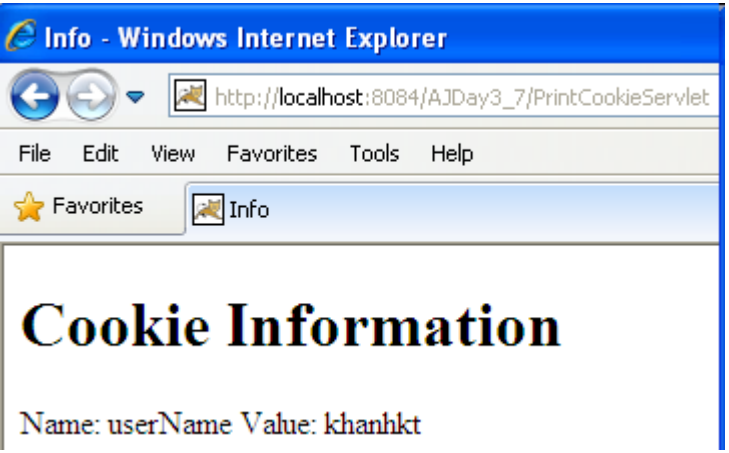
Sessions & Listeners
Cookies

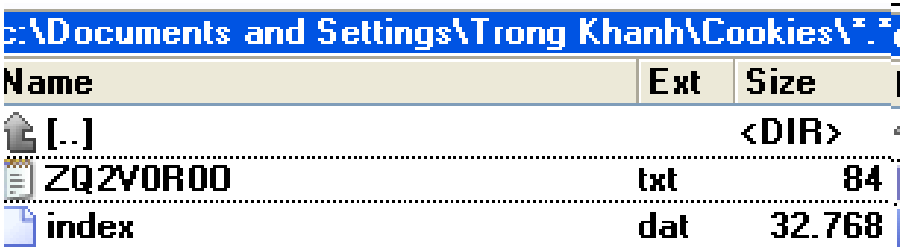
- **Reading Cookie**

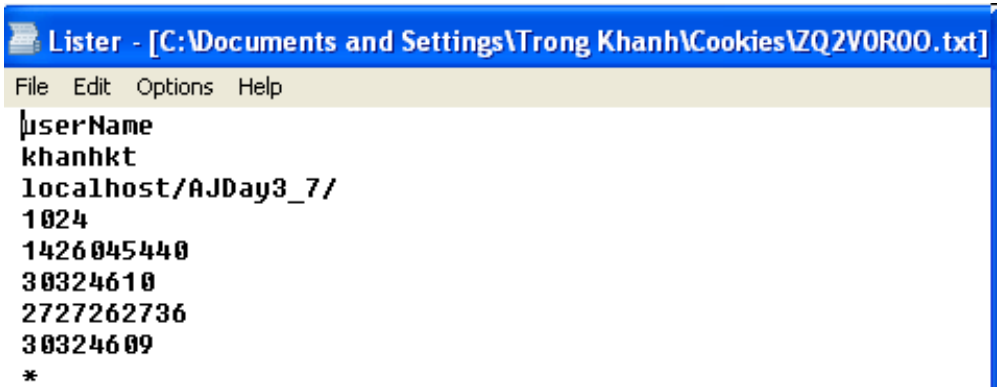
Methods	Descriptions
getCookies	- **Cookie [] cookies = request.getCookies();** - Returns an array containing all of the Cookie objects the client sends with the request
getMaxAge	- **public int getMaxAge();** - Returns the maximum age of the cookie. - Returns an integer which specify the maximum age of the cookies in seconds
getValue	- **public String getValue();** - Returns the value of the cookie
getName	- **public String getName()** - Returns the name of cookie. Once the cookie has been created its name cannot be changed
getPath	- **public void getPath()** - Returns the path on the server to which the client return the cookie. The cookie is available to all sub paths on the server

Sessions & Listeners

Cookies – Example







Sessions & Listeners

Cookies – Example

AddCookieServlet.java

```
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

```
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      }
```

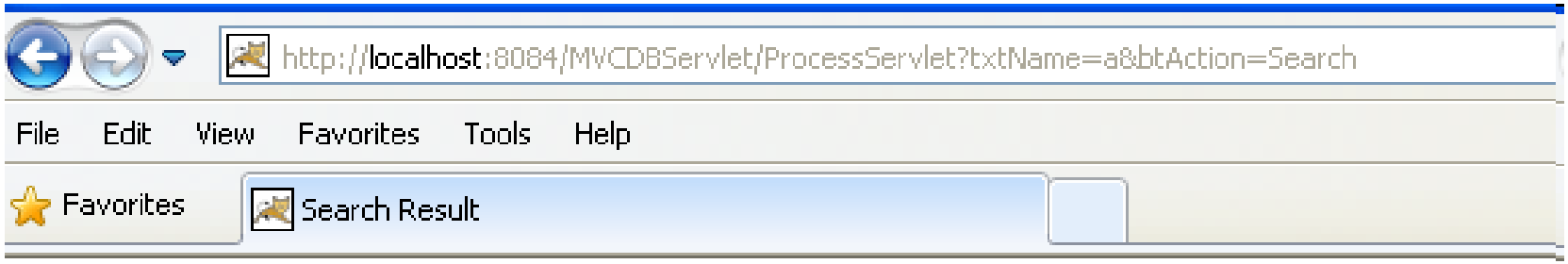
How to write CRUD Web Application

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



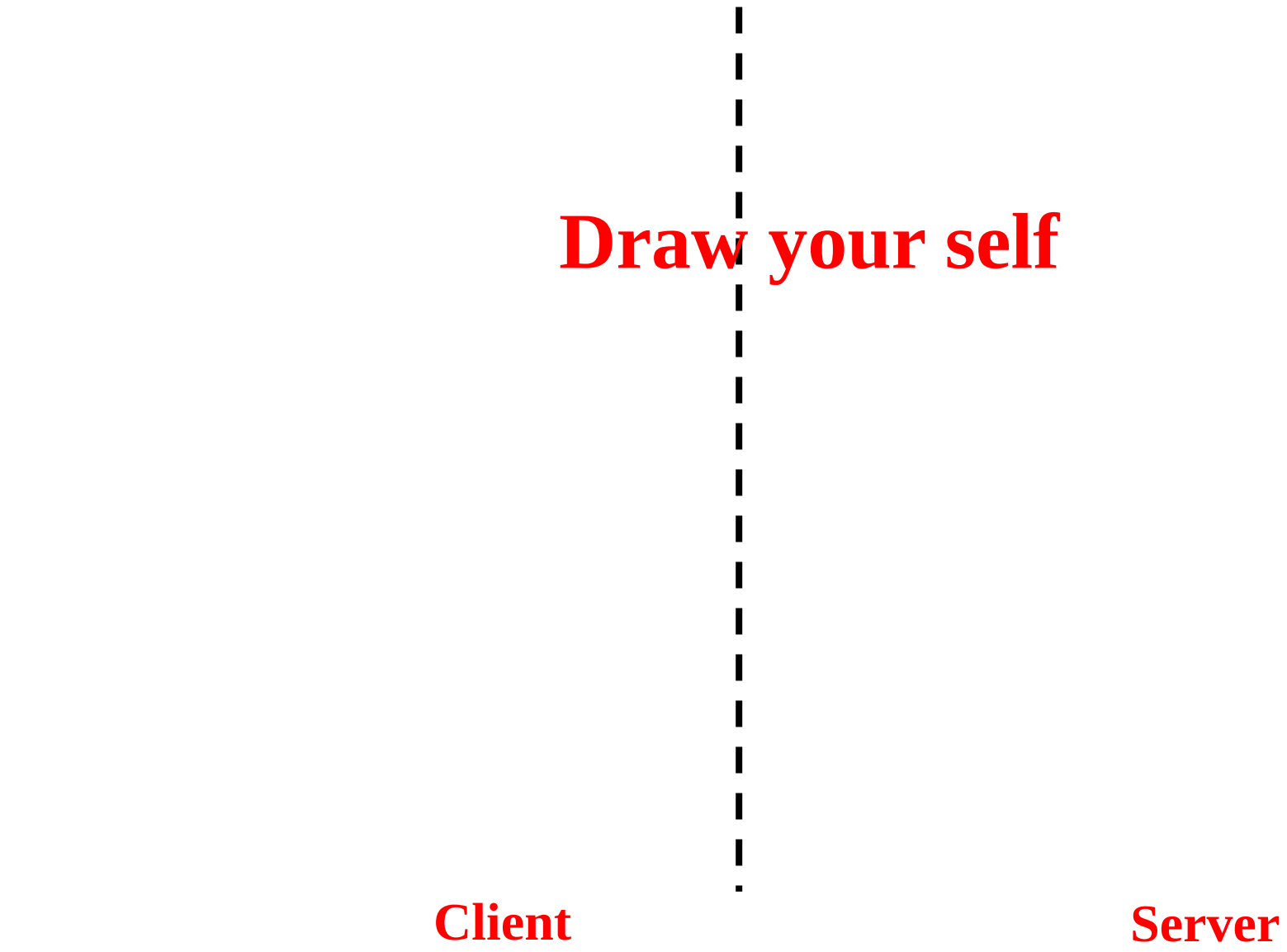
Welcome, khanh

Search Result

No.	Username	Password	Lastname	Roles	Delete	Update
1	class861	345545423	Khoa	☑	Delete	Update
2	EntityClass	EJB34	Day11	☑	Delete	Update
3	khanh	kieu123	Kieu Khanh	☑	Delete	Update
4	nhanDaiCa	nguoibanthuoc	Thuoc Thuoc Nhan	☐	Delete	Update
5	Taidaica	123456	Tai Dai Dai Ca	☑	Delete	Update
6	TienDan	1234	Dan Quan Dai	☐	Delete	Update

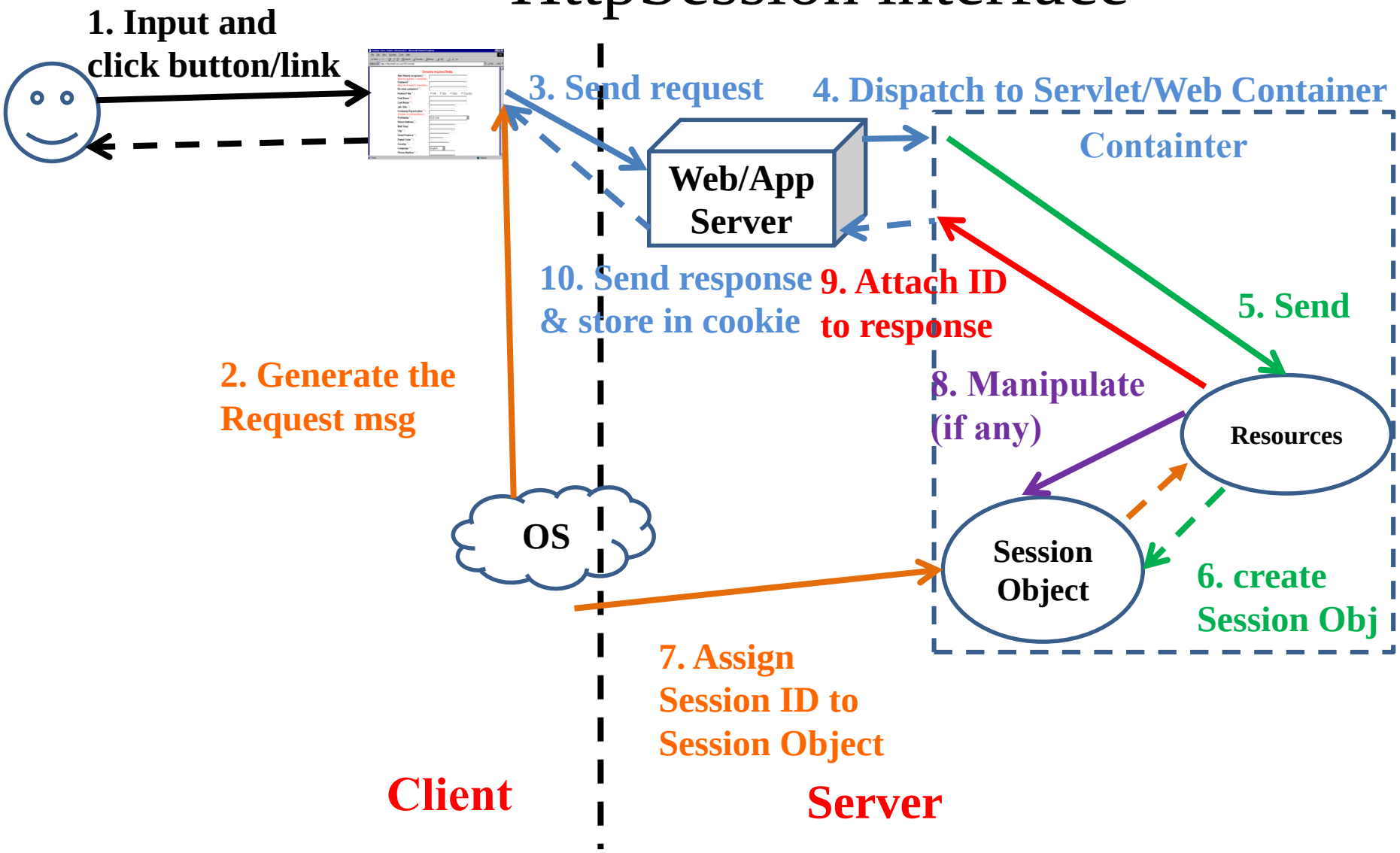
How to write CRUD Web Application

Interactive Server Model



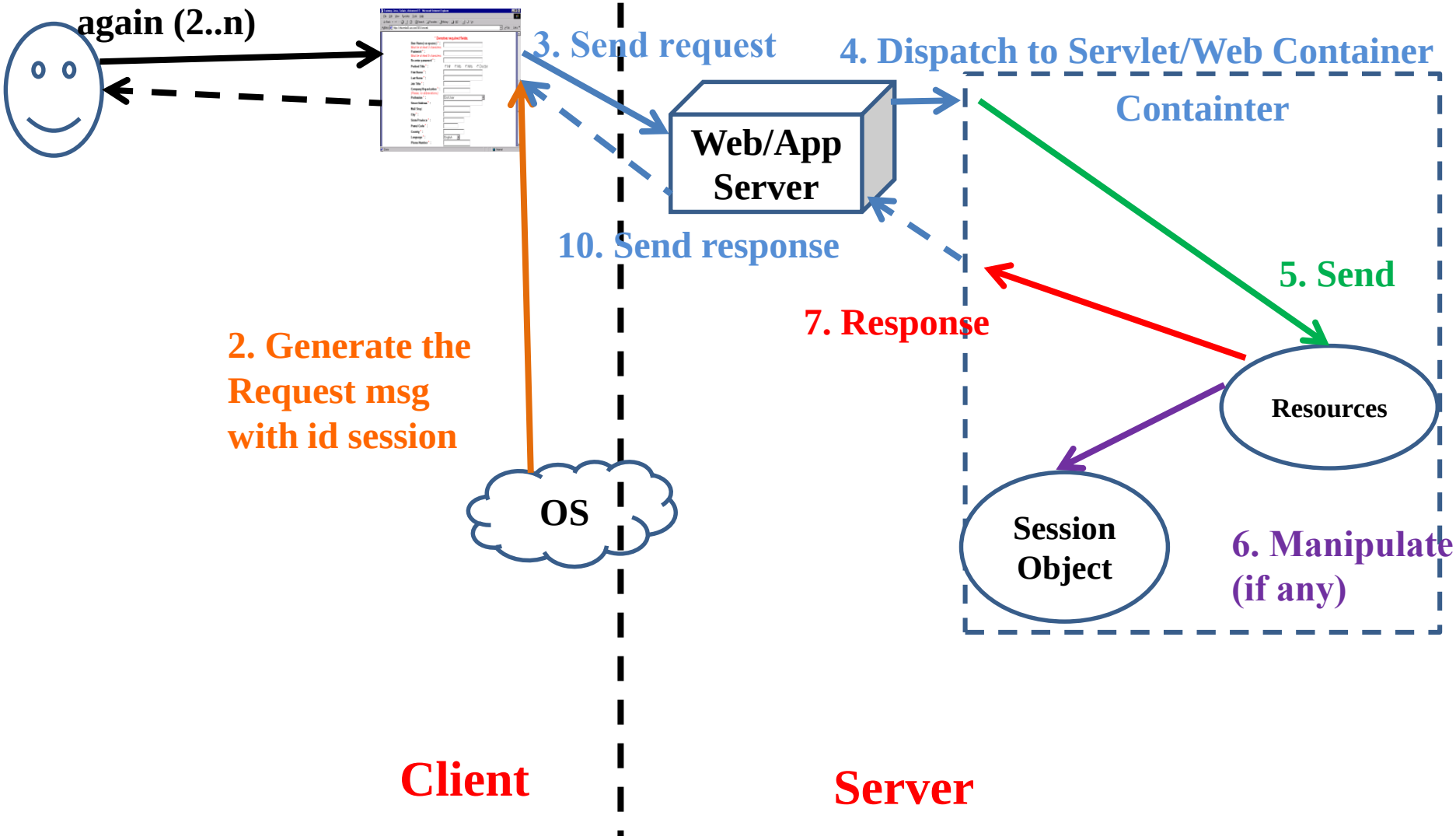
Sessions & Listeners

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**()

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Sessions & Listeners

HttpSession interface Methods

Methods	Descriptions
getSession	- **request.getSession(boolean create);** - Obtain a current session objects - The getSession() method with true parameter is used to create a new session (no current session)
getId	- **public String getId()** - Returns a string containing the unique identifier assigned to this session. The servlet container assigns the identifier and it is implementation independent
getCreationTime	- **public long getCreationTime()** - Returns the creation time of session.
getLastAccessedTime	- **public long getLastAccessedTime()** - Returns the last accessed Time of session
getMaxInactiveInterval	- **public int getMaxInactiveInterval()** - Returns the maximum time interval, in seconds, for which the servlet container will keep the session alive between the client accesses
setMaxInactiveInterval	- **public void setMaxInactiveInterval(int interval)** - Specifies the time, in seconds, between the client requests before the servlet container invalidates the current session

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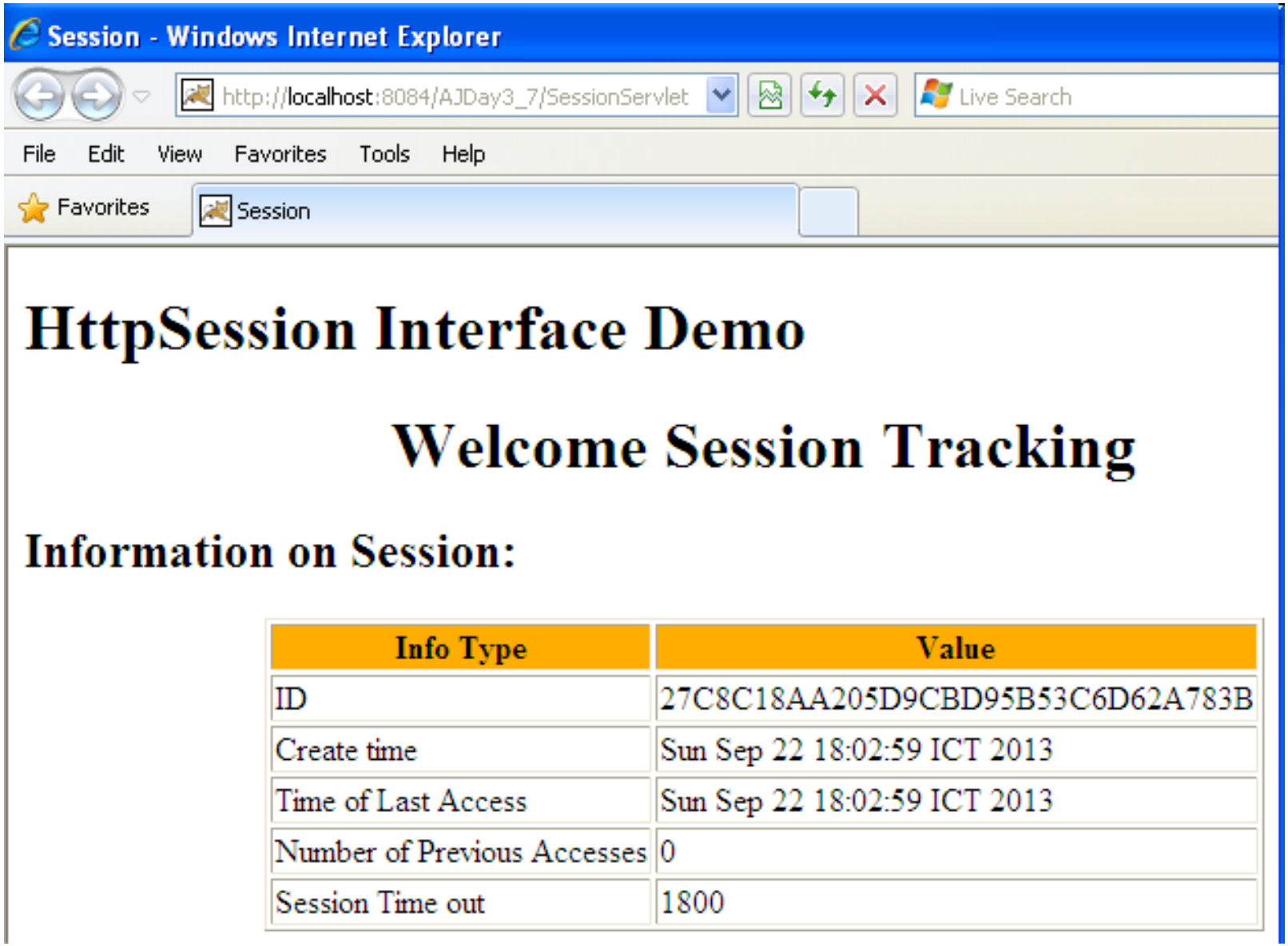
Sessions & Listeners

HttpSession interface Methods

Methods	Descriptions
isNew	- **public boolean isNew()** - Returns true if the client is unaware about the session or choose not to be part of the session
invalidate	- **public void invalidate()** - Invalidates the session and the objects bound to the session are bounded. This method throws IllegalStateException if called on already invalidated session - To avoid the hacker from causing any harm - 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

Sessions & Listeners

HttpSession interface – Example



Sessions & Listeners
HttpSession interface – Example

SessionServlet.java

```
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

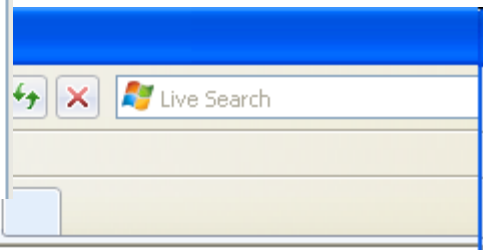
```
        DateFormat formatter = DateFormat.getDateTimeInstance(
                DateFormat.MEDIUM, DateFormat.MEDIUM);
        out.println("<H1 ALIGN=\"CENTER\">" + heading +
                "</H1>\n<H2>Information on Session:</H2>\n"
                + "<TABLE BORDER=1 ALIGN=\"CENTER\">\n<TR BGCOLOR="
                + "\"#FFADOO\">\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();
    }
}
```

Sessions & Listeners
HttpSession interface – Example

SessionServlet.java

```
65                          session.getMaxInactiveInterval()
66                          + "<TABLE>\n</BODY></HTML>");
67                  session.setAttribute("accessCount", accessCount);
68                  out.println("</body>");
69                  out.println("</html>");
70              } finally {
71                  out.close();
72              }
73          }
```



HttpSession Interface Demo

Comeback

Information on Session:

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

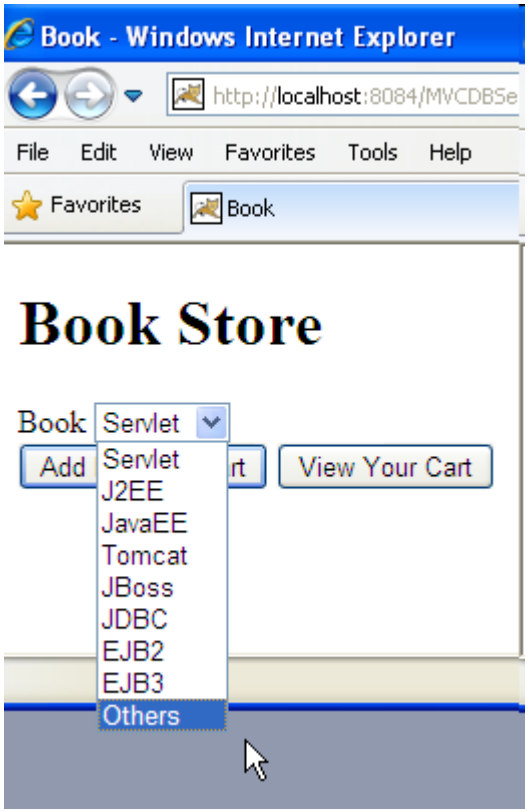
  - Individual Session Setting using **setMaxInactivateInterval**() method
    - A negative value supplied as an argument causes the session to never expire
- Other Session APIs
  - **HttpSession.getServletContext**() returns the SessionContext that the session is attached

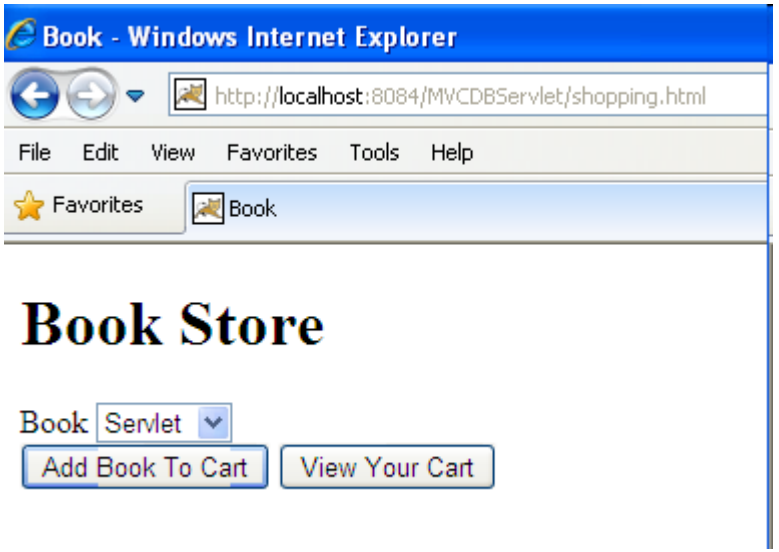
How to write CRUD Web Application

Shopping Cart

How to write CRUD Web Application

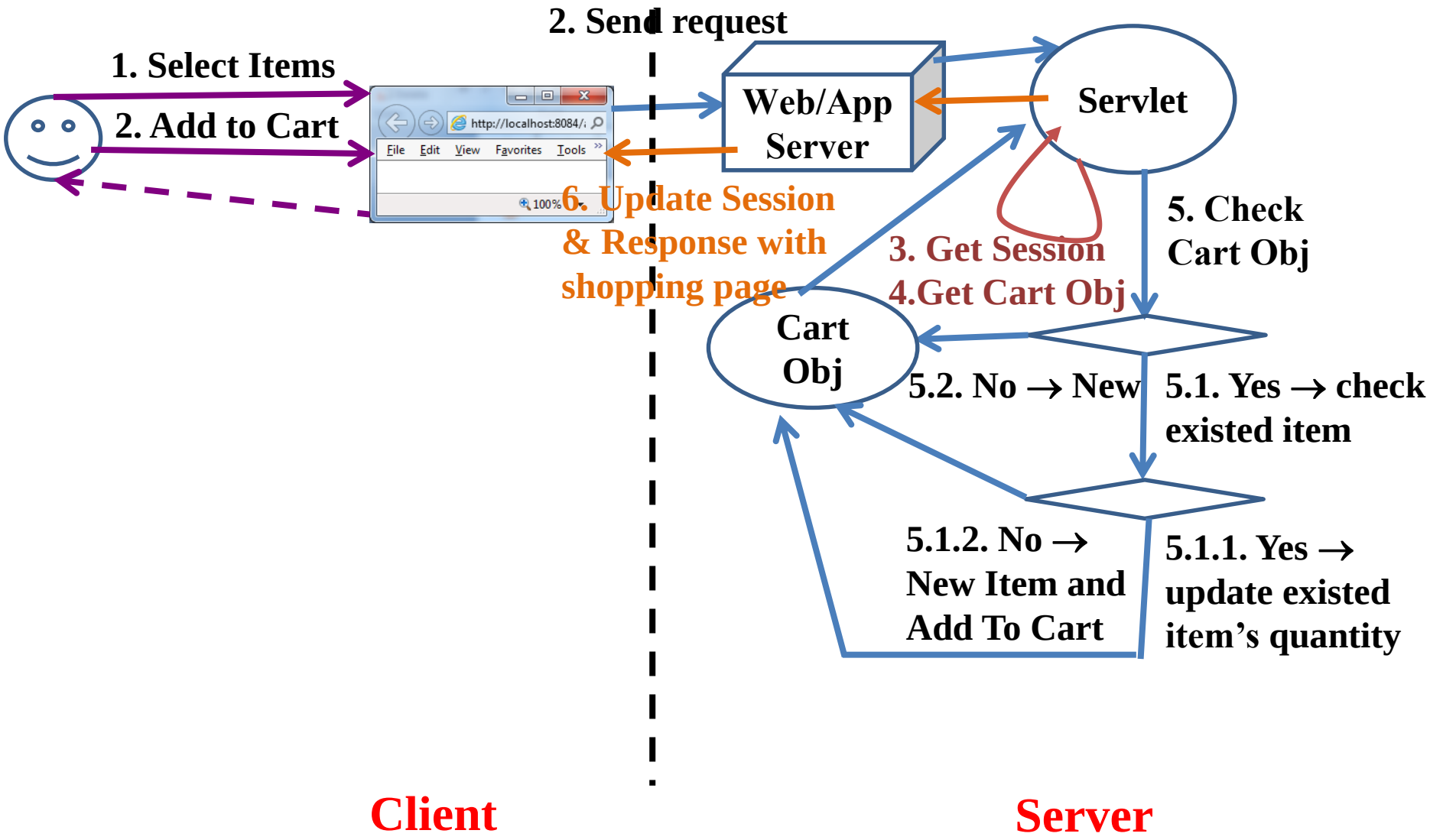
Shopping Cart – Add To Cart





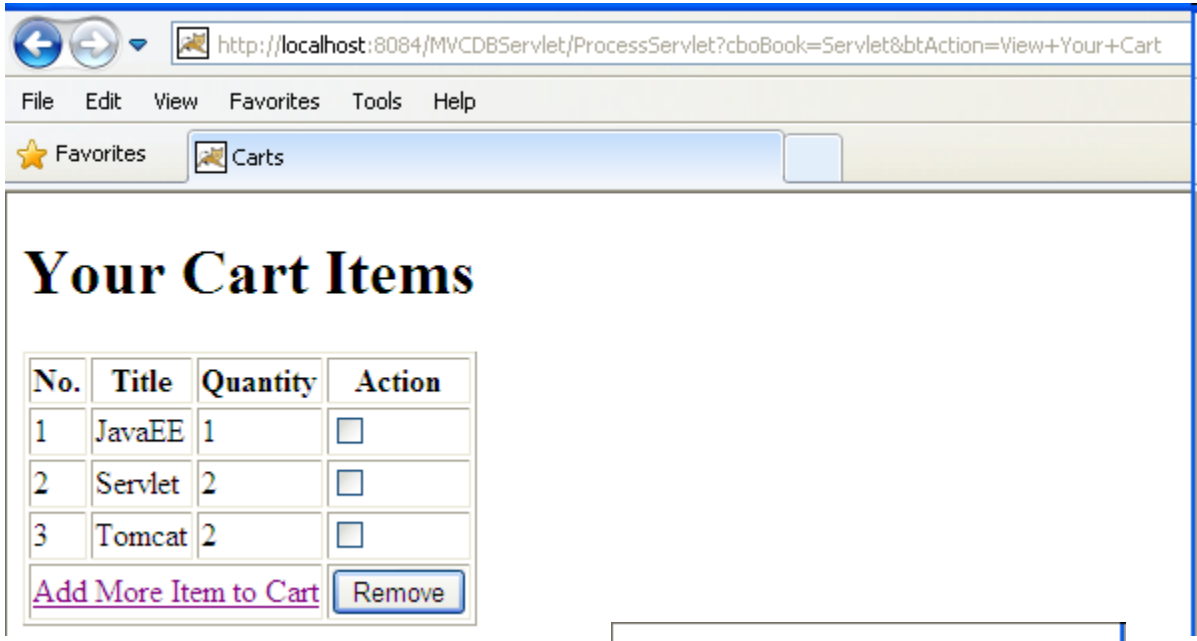
How to write CRUD Web Application

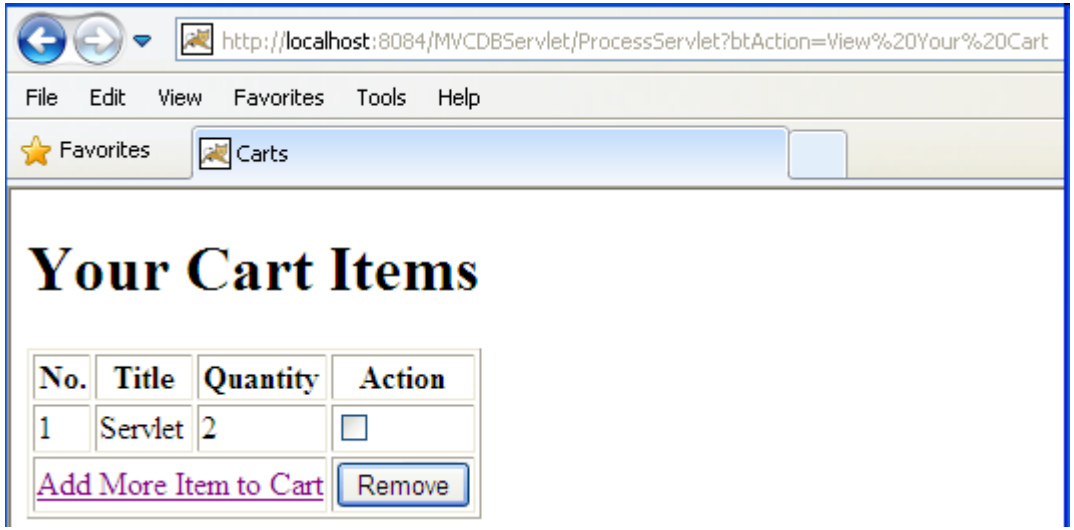
Interactive Server Model – Add To Cart

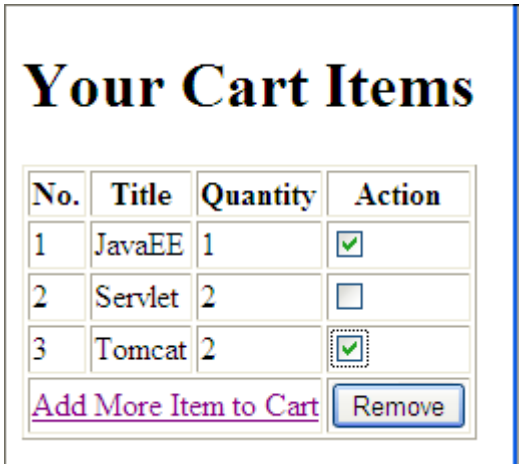


How to write CRUD Web Application

Shopping Cart – View Cart

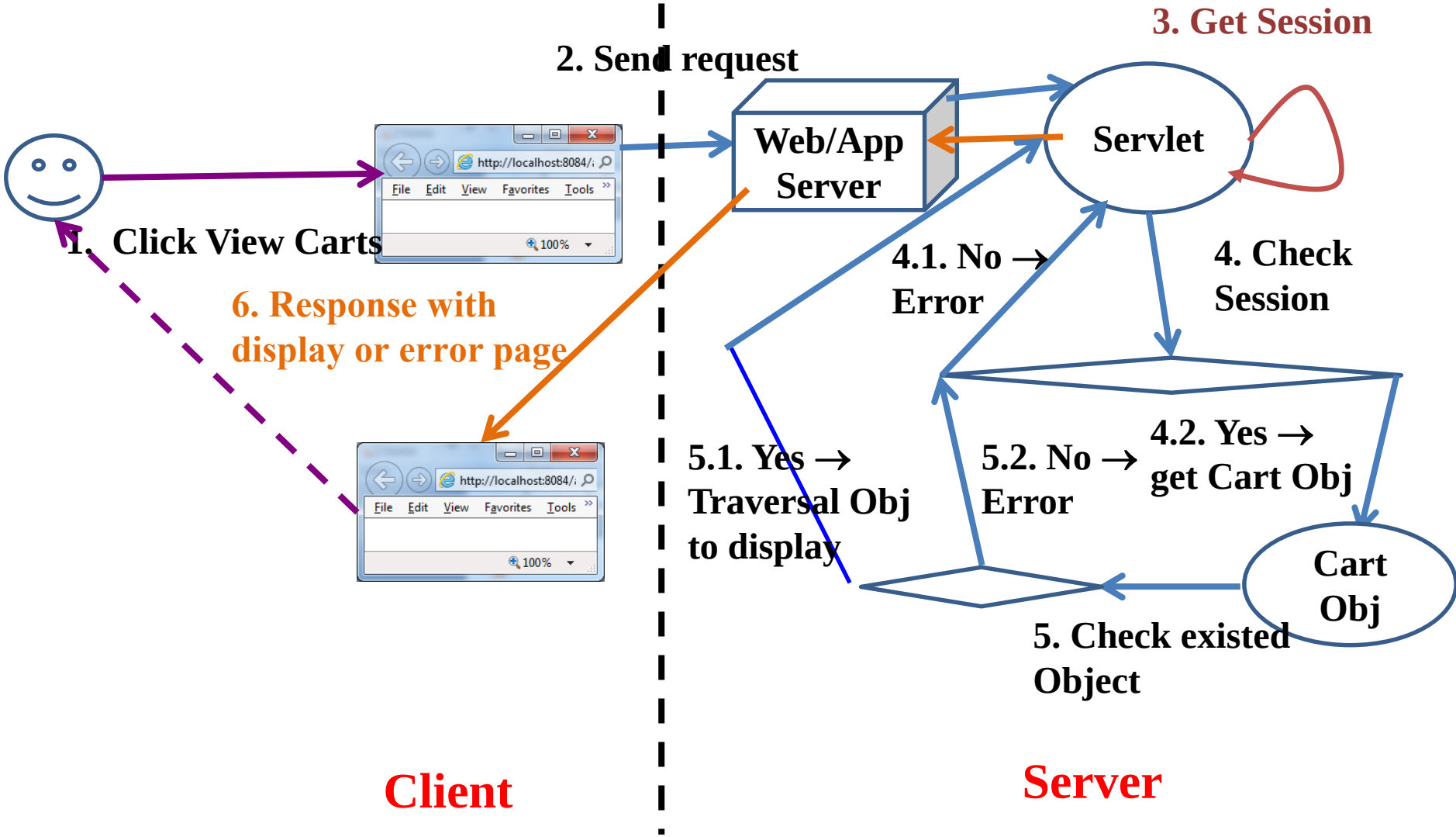






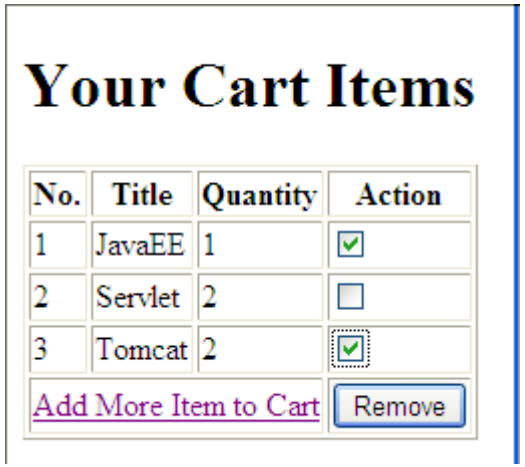
How to write CRUD Web Application

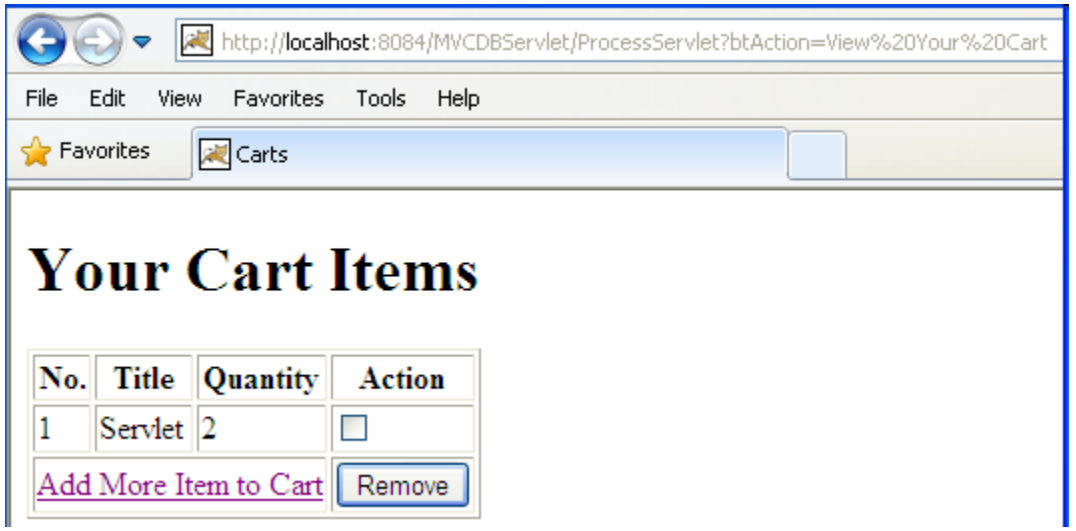
Interactive Server Model – View Cart



How to write CRUD Web Application

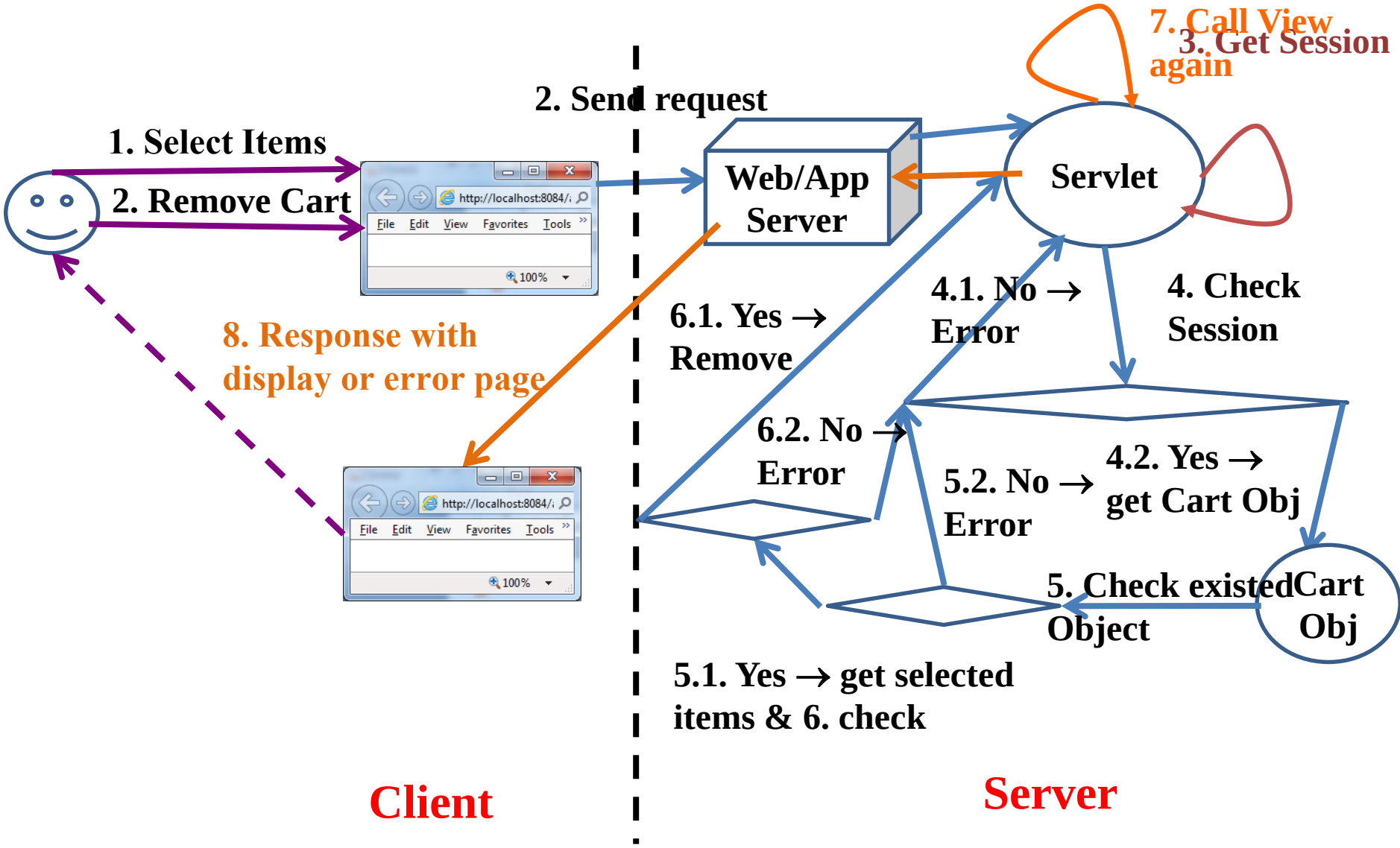
Shopping Cart – Remove Cart





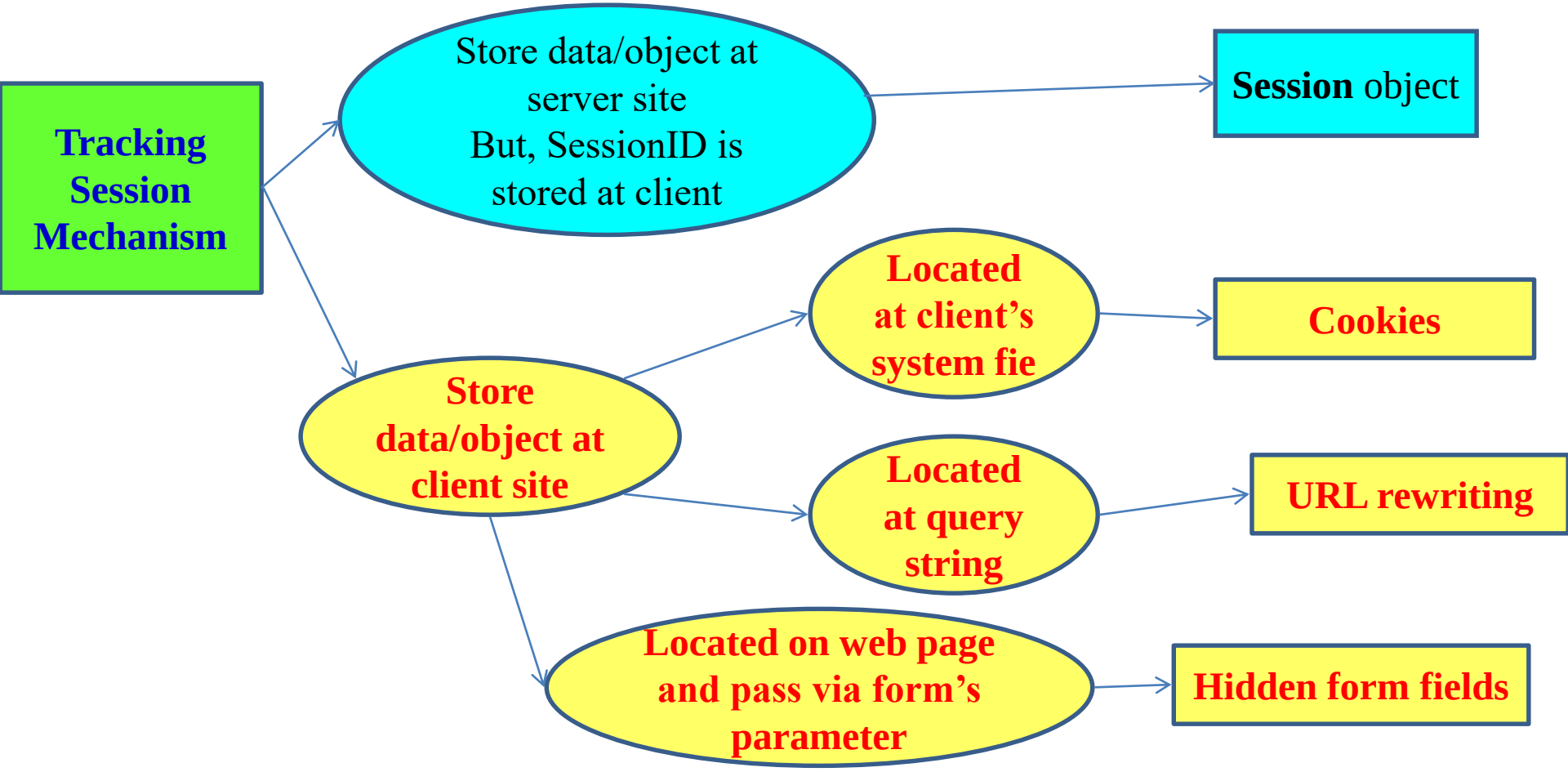
How to write CRUD Web Application

Interactive Server Model – Remove



Sessions & Listeners

Conclusion



Error Handling in Servlet

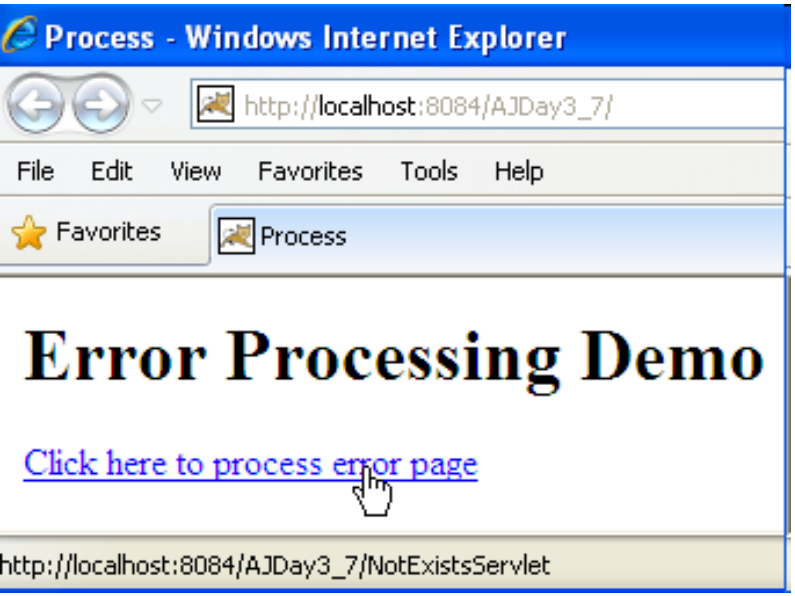
Reporting Error

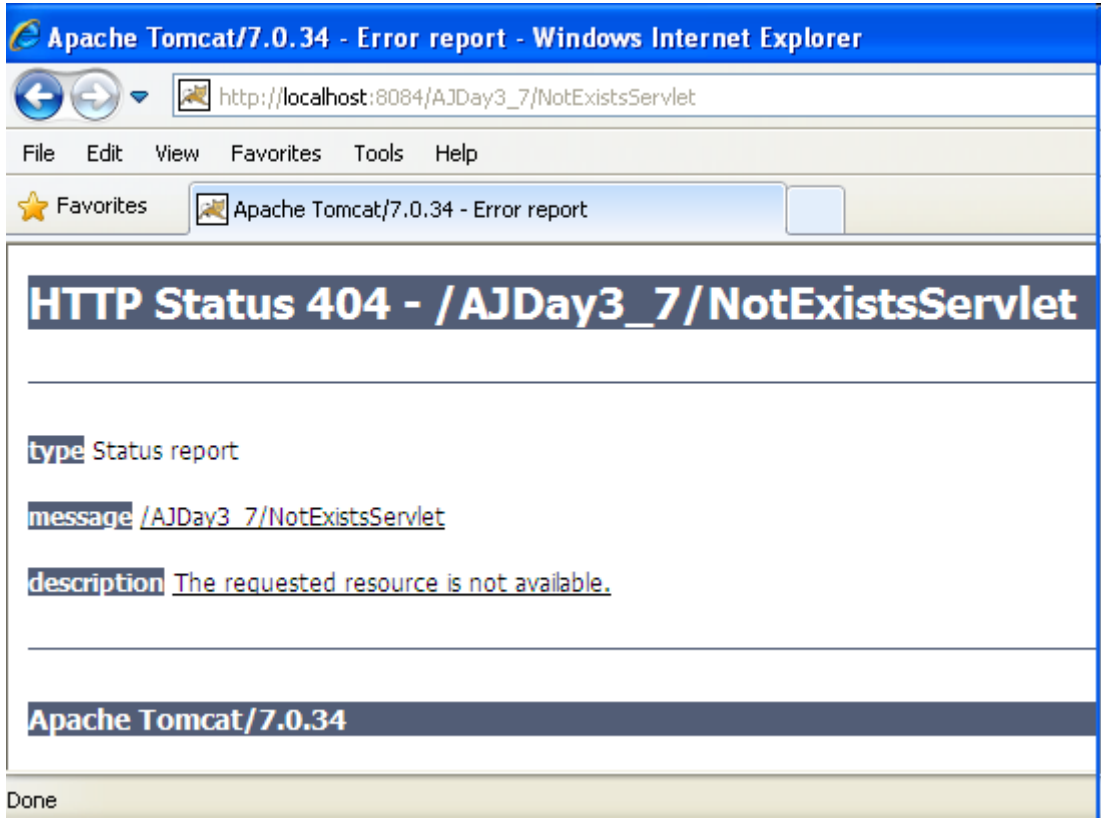
- **There are many situations** occur an error
  - A **requested page** may be **moved from one** location **to another**.
  - The **address** may be **wrongly typed.**
  - The requested page may be **forbidden**, may be **temporarily deleted** or **correct** HTTP version might **not have found**.
 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

Methods	Descriptions
sendError	- **public void sendError (int sc) throws IOException** - **Checks** for the **status code and sends** to the **user the specified** response message - **After sending** the error message the **buffer is cleared** - response.sendError(response.SC_NOT_FOUND);
setStatus	- **public void HttpServletResponse.setStatus (int sc)** - This **code** is **specified earlier** so that on **receiving the setStatus()** method, the error message is throw. Or **redirected to another default Web page** - response.setStatus(response.SC_NOT_MODIFIED);

Error Handling in Servlet

Reporting Error – Example

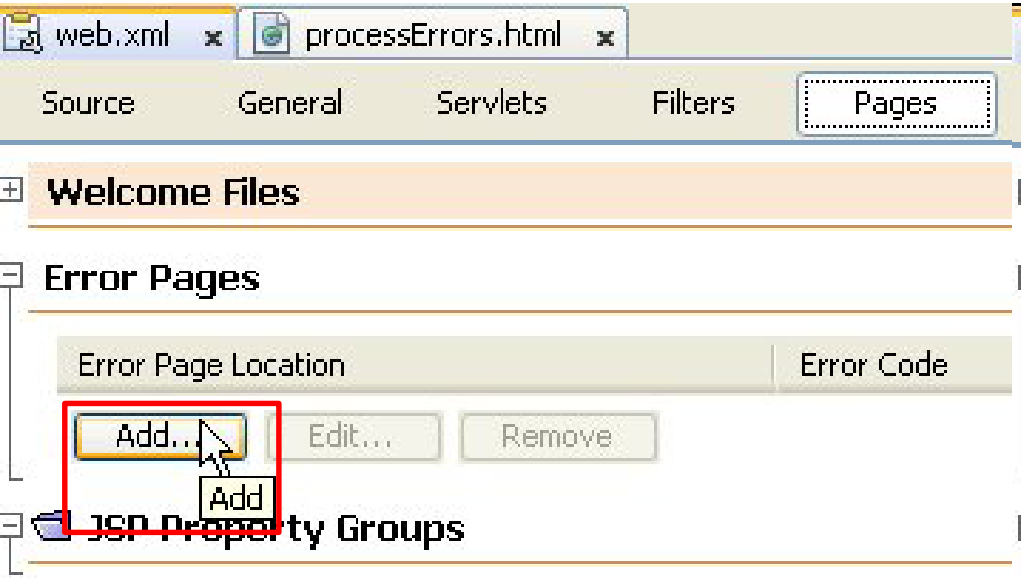


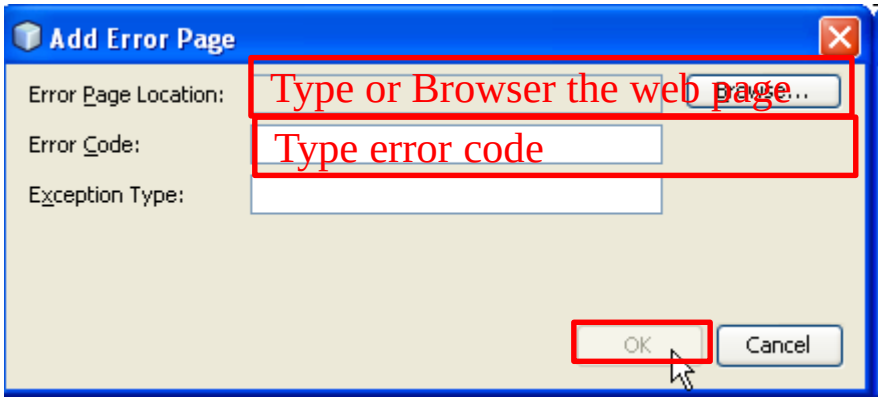


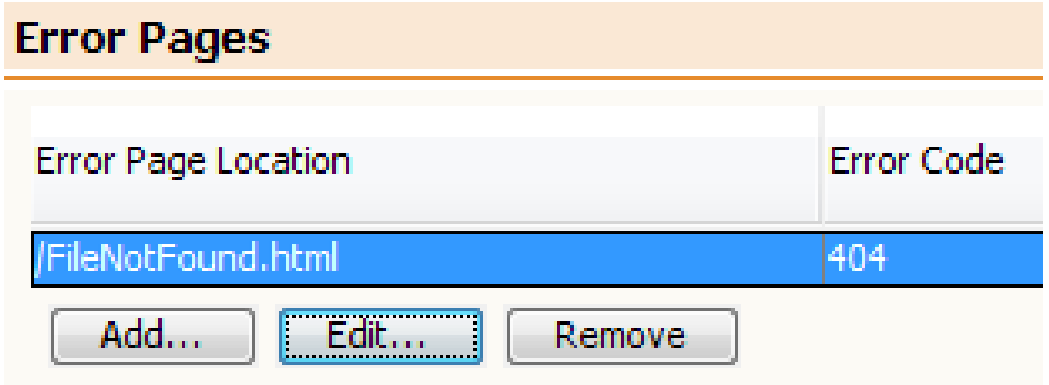
Error Handling in Servlet

Reporting Error – Example

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







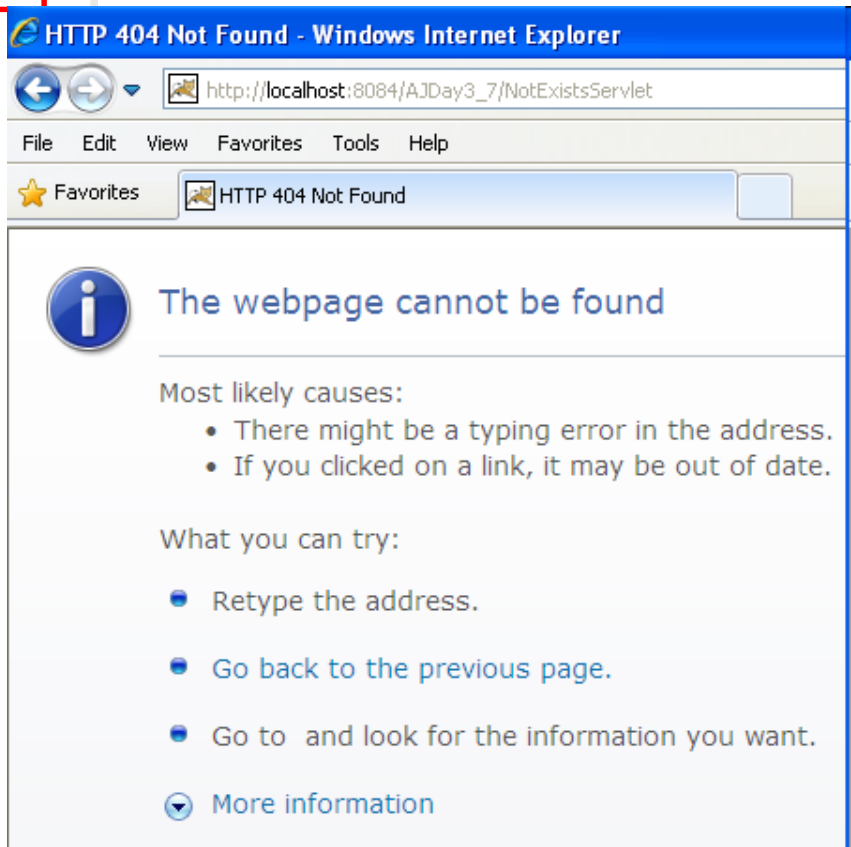
Error Handling in Servlet

Reporting Error – Example

web.xml

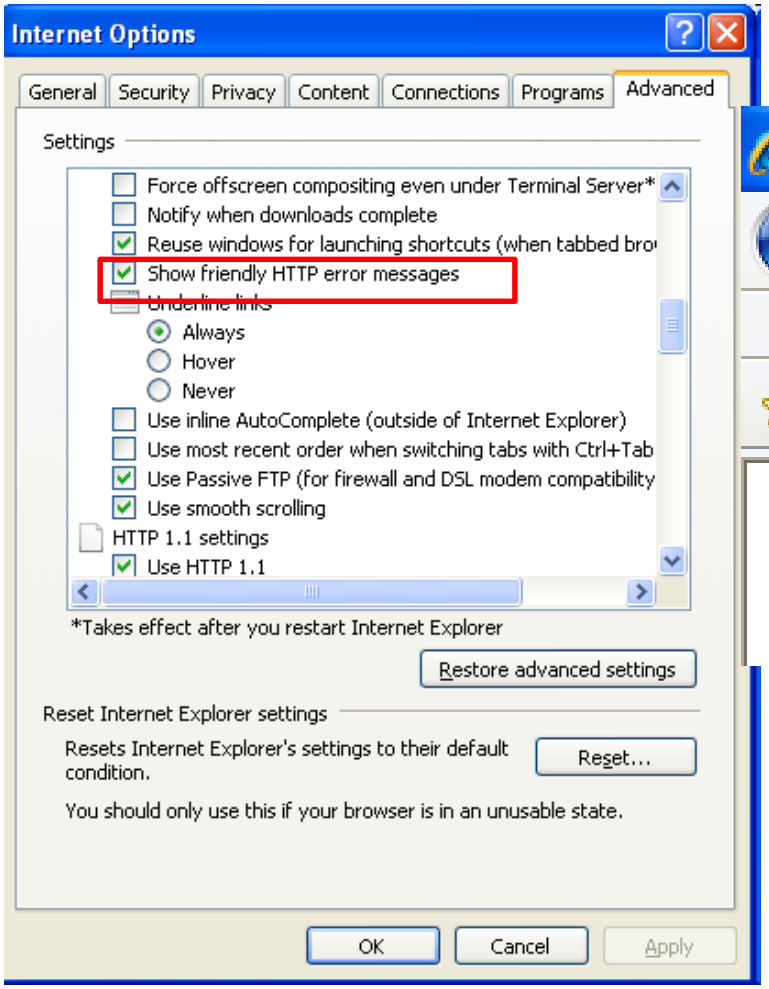
Source | General | Servlets | Filters | Pages | References | Secu

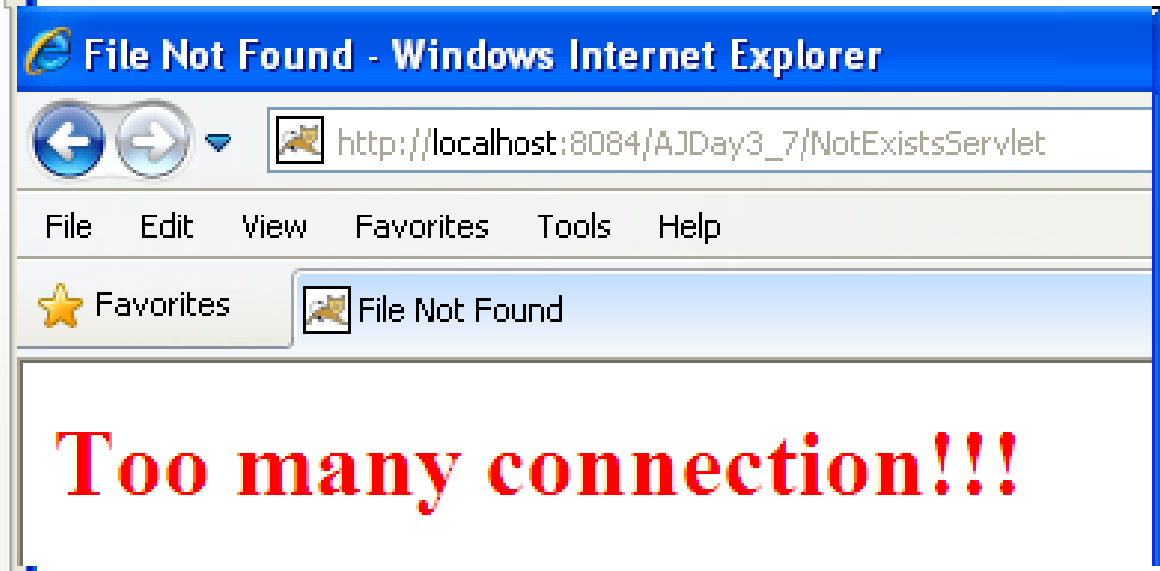
```
172      <welcome-file-list>
173          <welcome-file>logine.html</welcome-file>
174      </welcome-file-list>
175      <error-page>
176          <error-code>404</error-code>
177          <location>/fileNotFound.html</location>
178      </error-page>
179  </web-app>
```



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

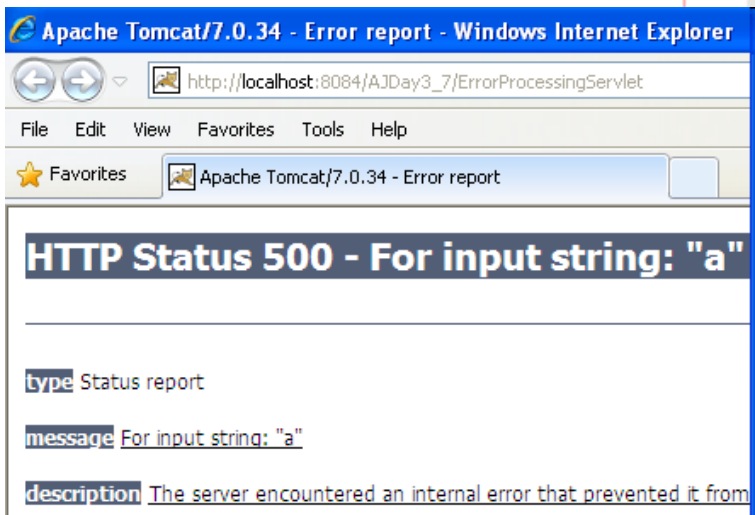
Error Handling in Servlet

Reporting Error – Example

ErrorProcessingServlet.java

Source | History

```
16      * @author Trong Khanh
17      */
18     public class ErrorProcessingServlet extends HttpServlet {
19
20         /**...*/
30         protected void processRequest(HttpServletRequest request, HttpServletResponse r
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) {
                   response.sendError(response.SC_INTERNAL_SERVER_ERROR, e.getMessage());
38             } finally {
39                 out.close();
40             }
41         }
```



Error Handling in Servlet

Reporting Error – Example

ErrorProcessingServlet.java | ProcessErrServlet.java

Source | History

```
17      * @author Trong Khanh
18      */
19     public class ErrorProcessingServlet extends HttpServlet {
20
21         /**...*/
31         protected void processRequest(HttpServletRequest request, HttpServletResponse resp
32                 throws ServletException, IOException {
33             response.setContentType("text/html;charset=UTF-8");
34             PrintWriter out = response.getWriter();
35             try {
36                 int a = Integer.parseInt("a");
37             } catch (NumberFormatException e) {
38                 request.setAttribute("ERRORS", e.getMessage());
39                 RequestDispatcher rd = request.getRequestDispatcher("ProcessErrServlet");
                   rd.forward(request, response);
41             } finally {
42                 out.close();
43             }
44     }
```

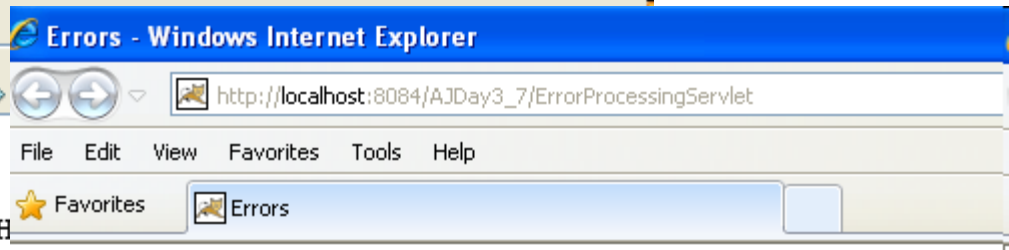
Error Handling in Servlet

Reporting Error – Example

ProcessErrServlet.java

Source | History

```
16      * @author Trong Khanh
17      */
18     public class ProcessErrServlet extends H
19
20         /**...*/
30         protected void processRequest(HttpSe
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         }
```



Error Handling in Servlet

Reporting Error – Example

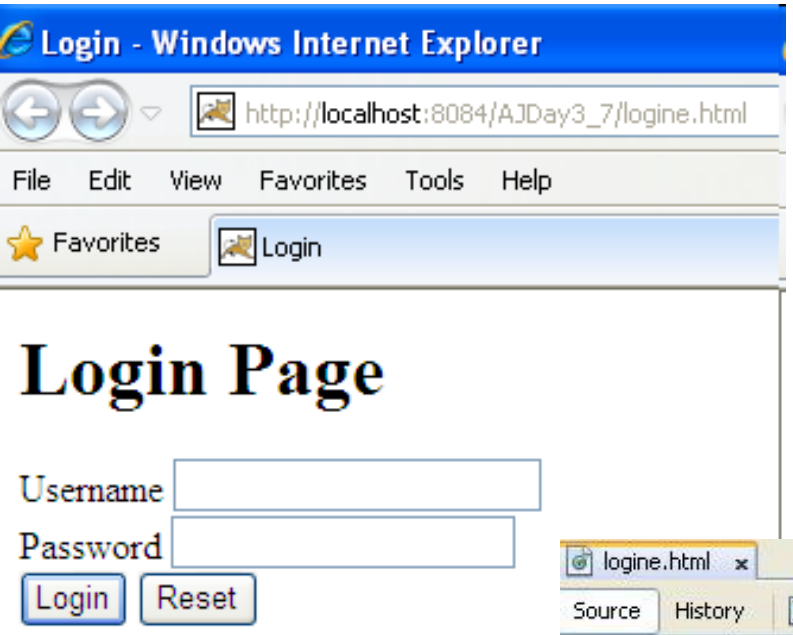
DisplayErrorServlet.java

Source | History

```
15      *
16      * @author Trong Khanh
17      */
18     public class DisplayErrorServlet extends HttpServlet {
19
20         /**...*/
30         protected void processRequest(HttpServletRequest request, HttpServletRespor
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                             "/logine.html";
41                     response.setHeader("Location", url);
42                 }
43             } finally {
44                 out.close();
45             }
46         }
```

Error Handling in Servlet

Reporting Error – Example



logine.html

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

Source | History

```
16   * @author Trong Khanh
17   */
18  public class DisplayErrorServlet extends HttpServlet {
19
20      /**...*/
30      protected void processRequest(HttpServletRequest request, HttpServletRespo
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

LogServlet.java

Source | History

```
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) {
                       ex.printStackTrace();
46                 }
47                 out.println("</body>");
48                 out.println("</html>");
49             } finally {
50                 out.close();
51             }
52         }
```

Error Handling in Servlet

Logging Error

LogServlet.java

Source | History

```
16      * @author Trong Khanh
17      */
18     public class LogServlet extends HttpServlet {
19         /**...*/
29         protected void processRequest(HttpServletRequest reque
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) {
                       ex.printStackTrace();
46                 }
47                 out.println("<
48                 out.println("<
49             } finally {
50                 out.close();
51             }
52         }
```

Log - Windows Internet Explorer

http://localhost:8084/AJDay3_7/LogServlet

File Edit View Favorites Tools Help

Favorites | Log

Log Servlet Server Demo

```
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

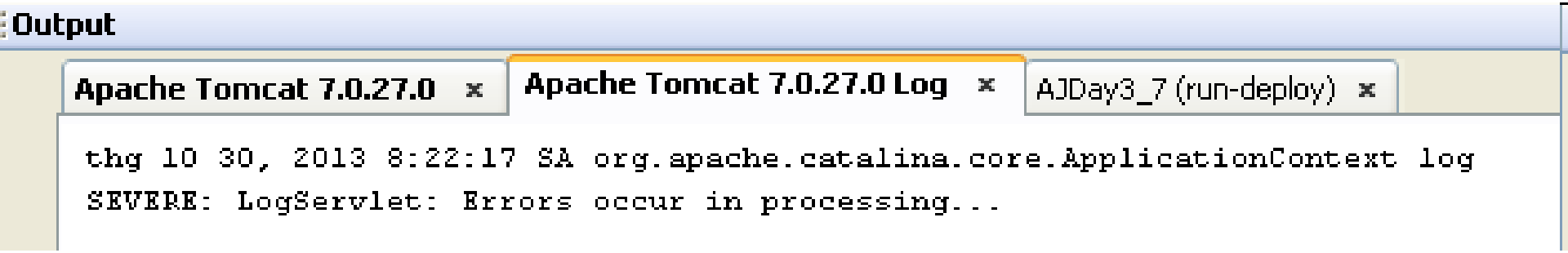
LogServlet.java

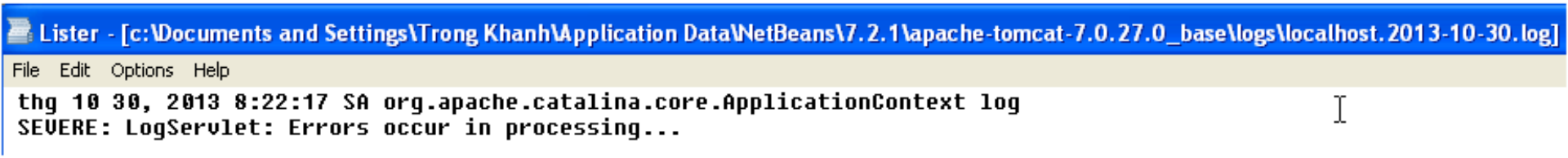
Source | History

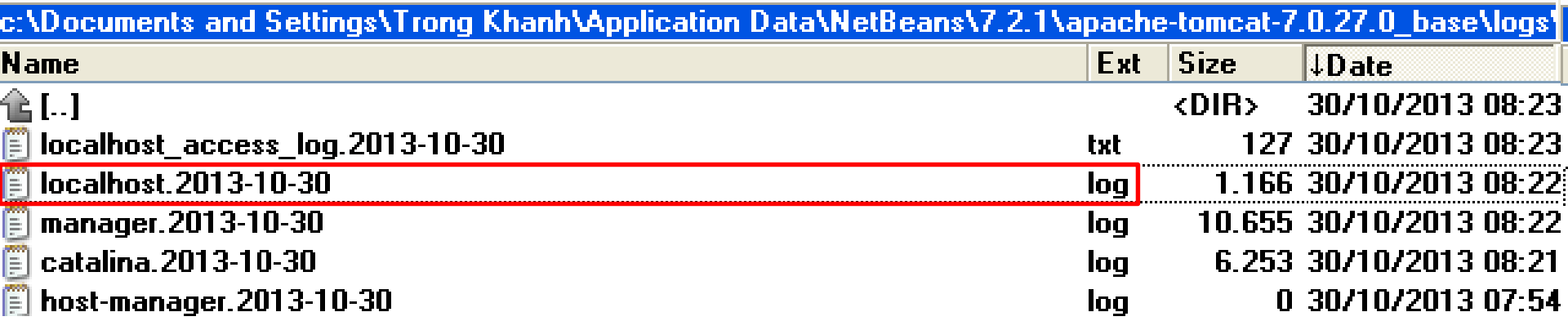
```
16      * @author Trong Khanh
17      */
18     public class LogServlet extends HttpServlet {
19         /**...*/
29         protected void processRequest(HttpServletRequest request, HttpSe
30                 throws ServletException, IOException {
31             response.setContentType("text/html;charset=UTF-8");
32             PrintWriter out = response.getWriter();
33             try {
34                 /* TODO output your page here. You may use following sam
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                     log("Errors occur in processing...", ex.getCause());
46                 }
47                 out.println("</body>");
48                 out.println("</html>");
49             } finally {
50                 out.close();
51             }
52         }
```

Error Handling in Servlet

Logging Error

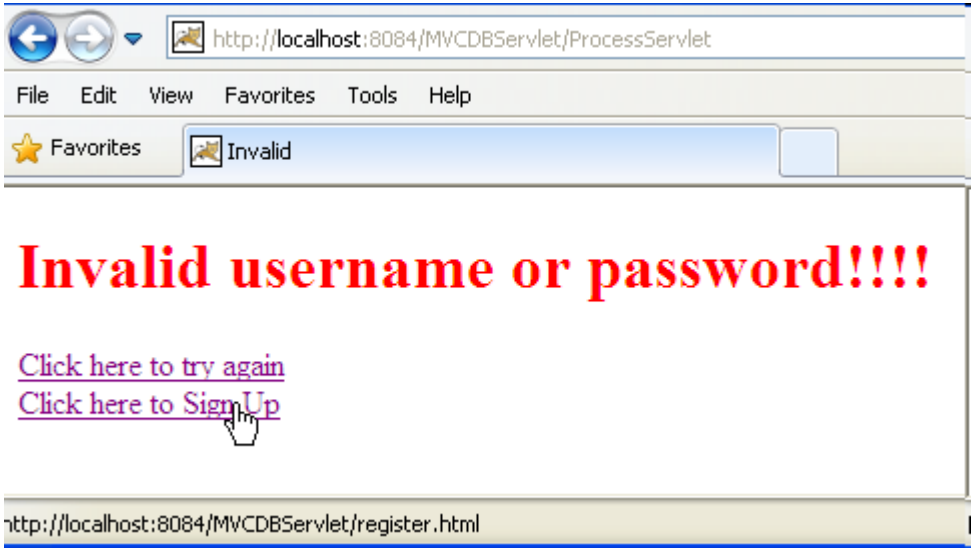


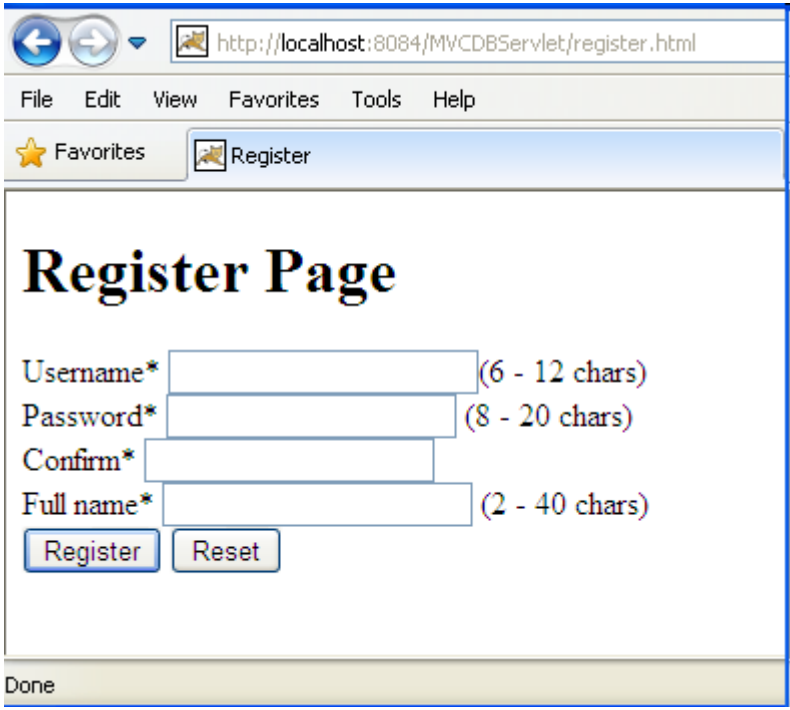




How to write CRUD Web Application

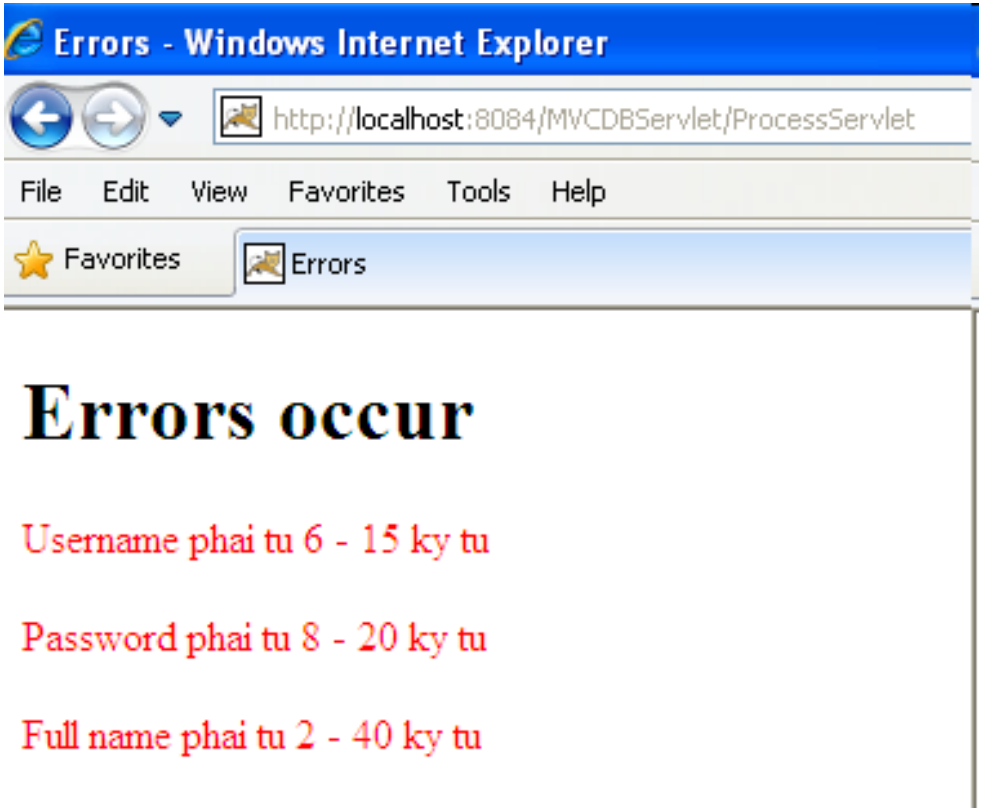
Register Functions





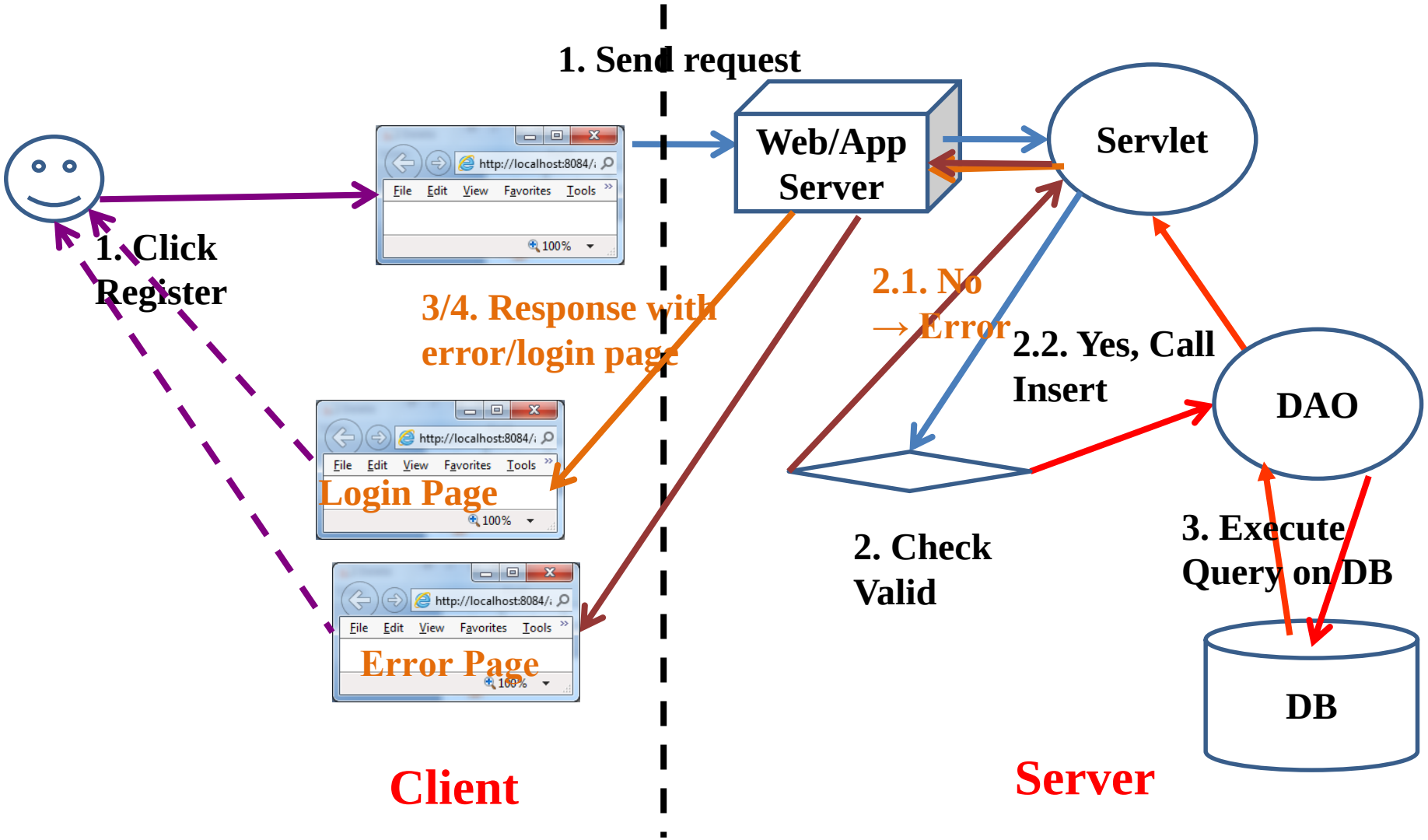
How to write CRUD Web Application

Validation



How to write CRUD Web Application

Interactive Server Model



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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

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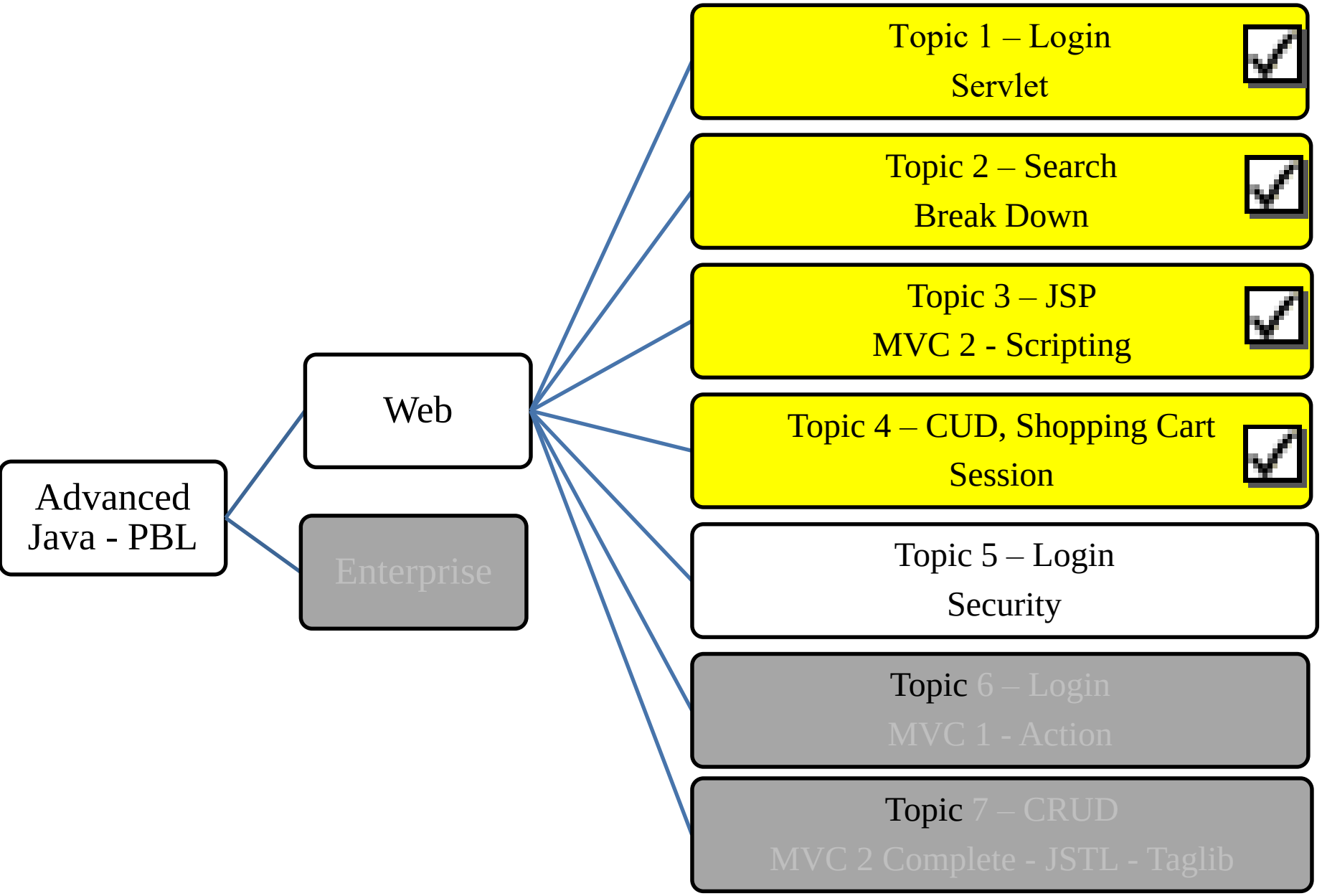
Next Lecture

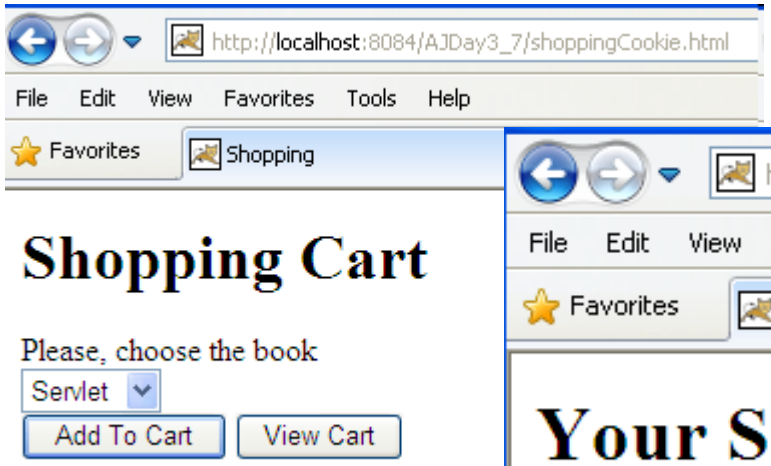
- **How to construct the security on the web site**
  - Authentication and Authorization with Basic, Digest, and Form
  - Confidentiality with HTTPS Client

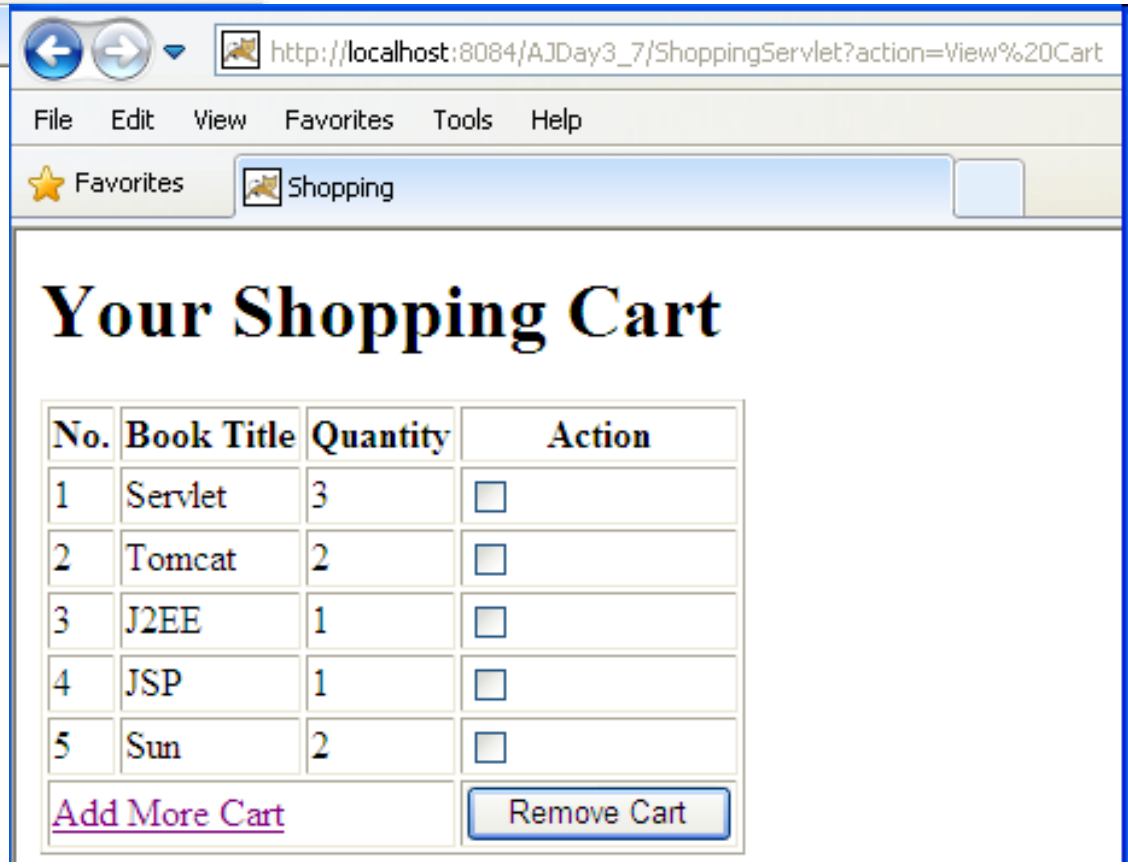
Next Lecture

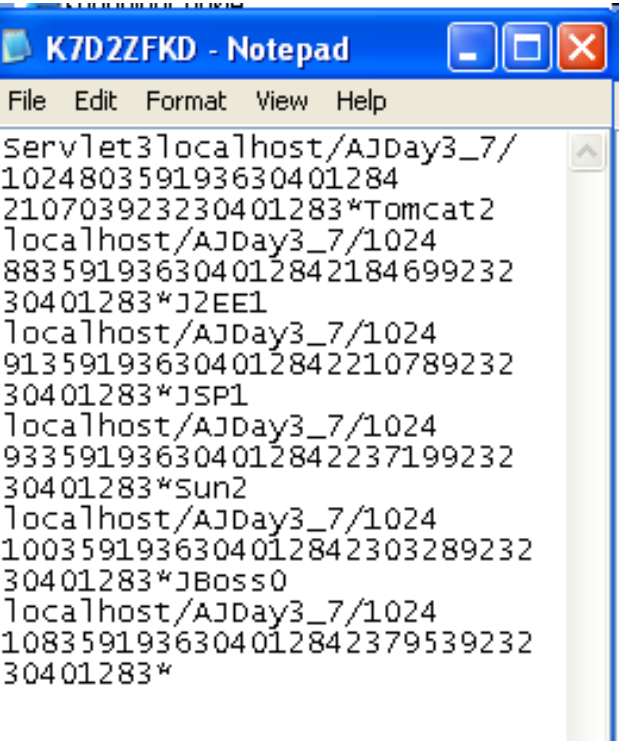


Appendix

Shopping Cart using Cookies







Appendix

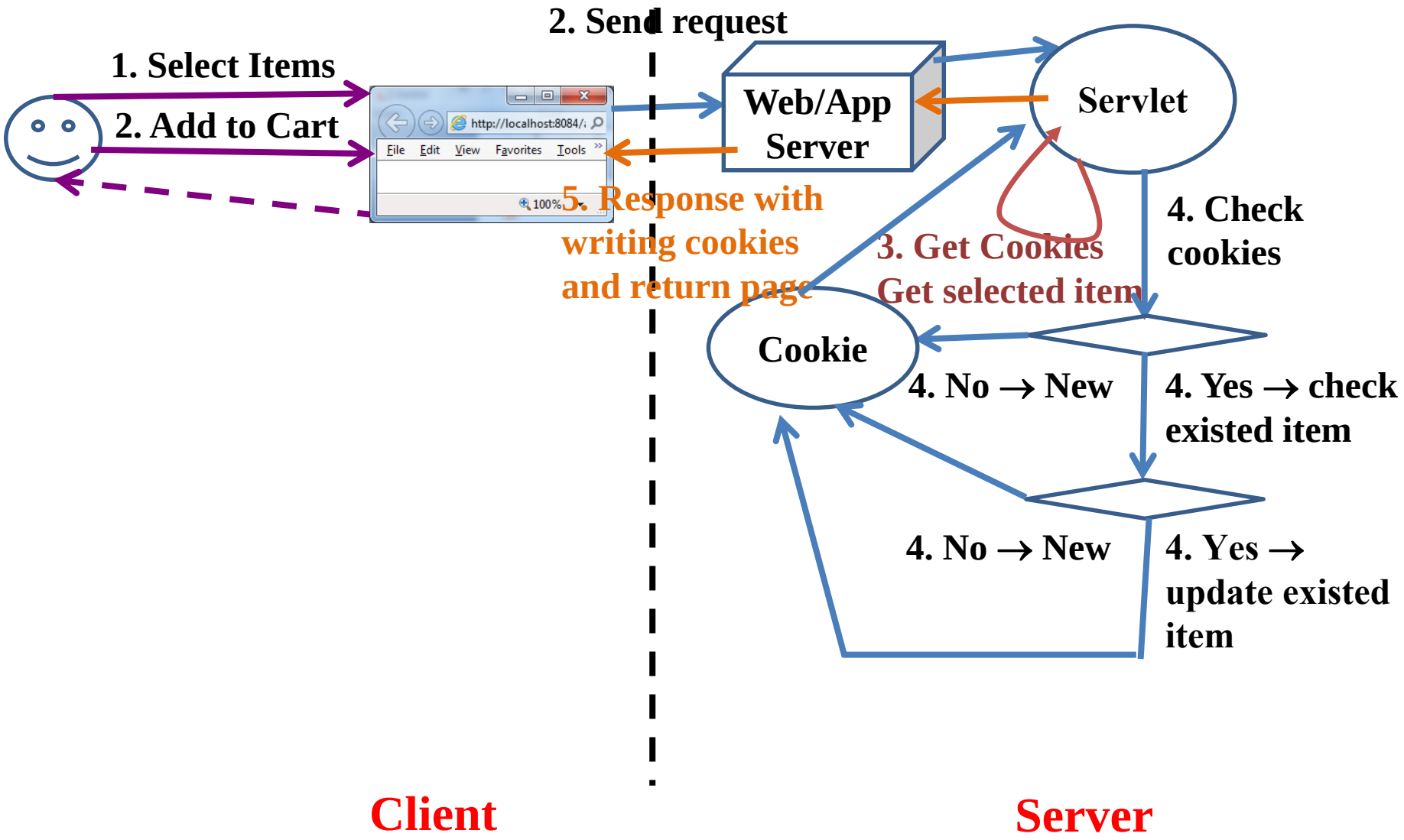
Shopping Cart using Cookies

shoppingCookie.html

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">
<html>
  <head>
    <title>Shopping</title>
    <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
  </head>
  <body>
      <h1>Shopping Cart</h1>
      <form action="ShoppingServlet">
          Please, choose the book <br/>
          <select name="bookList">
              <option>Servlet</option>
              <option>JSP</option>
              <option>EJB</option>
              <option>J2EE</option>
              <option>Tomcat</option>
              <option>JBoss</option>
              <option>Sun</option>
          </select><br/>
          <input type="submit" value="Add To Cart" name="action" />
          <input type="submit" value="View Cart" name="action" />
      </form>
  </body>
</html>
```

Appendix

Interactive Server Model



Appendix

Shopping Cart using Cookies

ShoppingServlet.java

Source | History

```
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 */
33      protected void processRequest(HttpServletRequest request, HttpServletResponse response)
34              throws ServletException, IOException {
35          response.setContentType("text/html;charset=UTF-8");
36          PrintWriter out = response.getWriter();
37          try {
38
39              String action = request.getParameter("action");
40
41              if (action.equals("Add To Cart")) {
42                  RequestDispatcher rd = request.getRequestDispatcher(addCartServlet);
43                  rd.forward(request, response);
44              }
```

Appendix

Shopping Cart using Cookies

ShoppingAddServlet.java

Source | History

```
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 <c
31         protected void processRequest(HttpServletRequest request, Htt
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 {
```

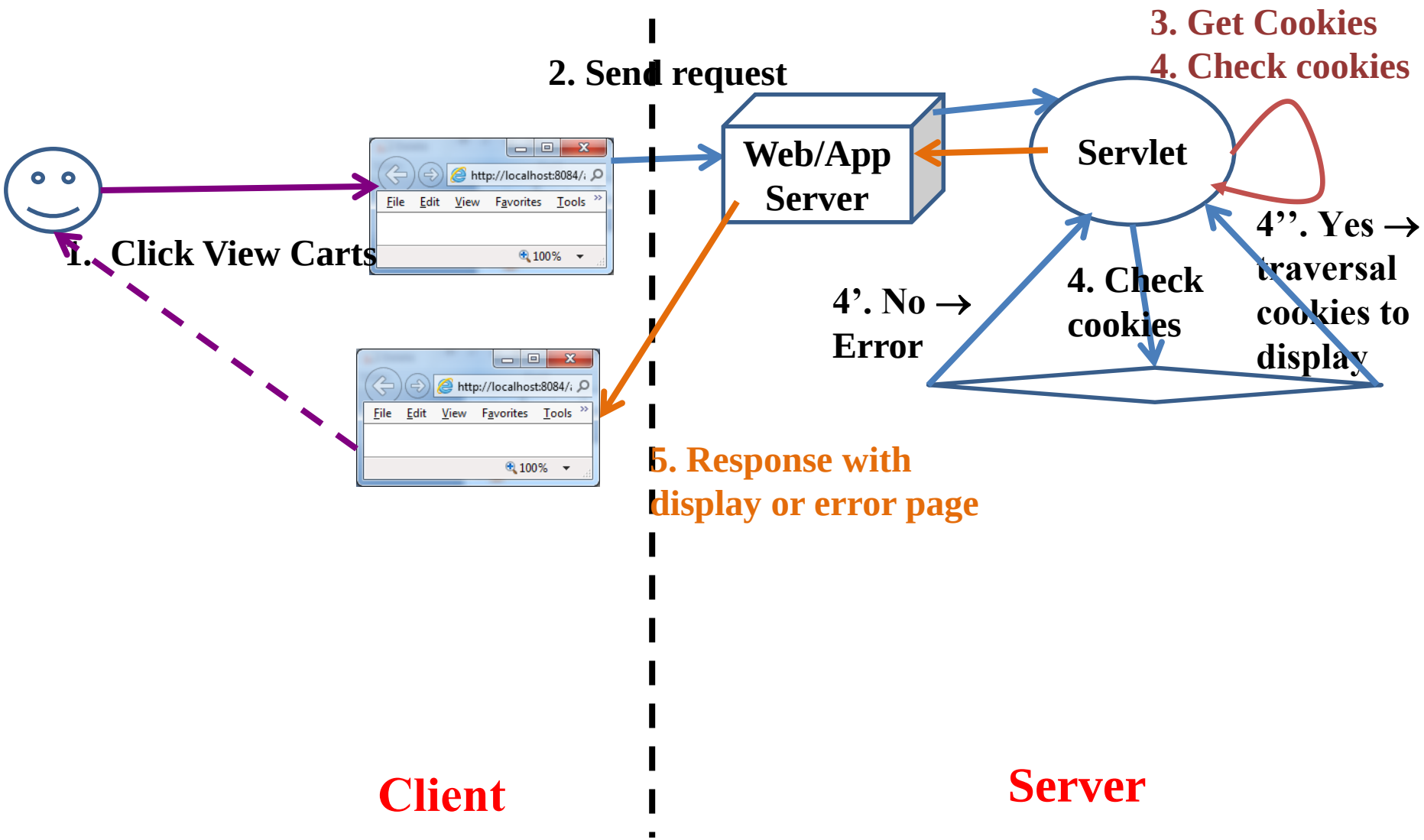
Appendix

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

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 resp
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 <c
31         protected void processRequest(HttpServletRequest request, Htt
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'>");
```

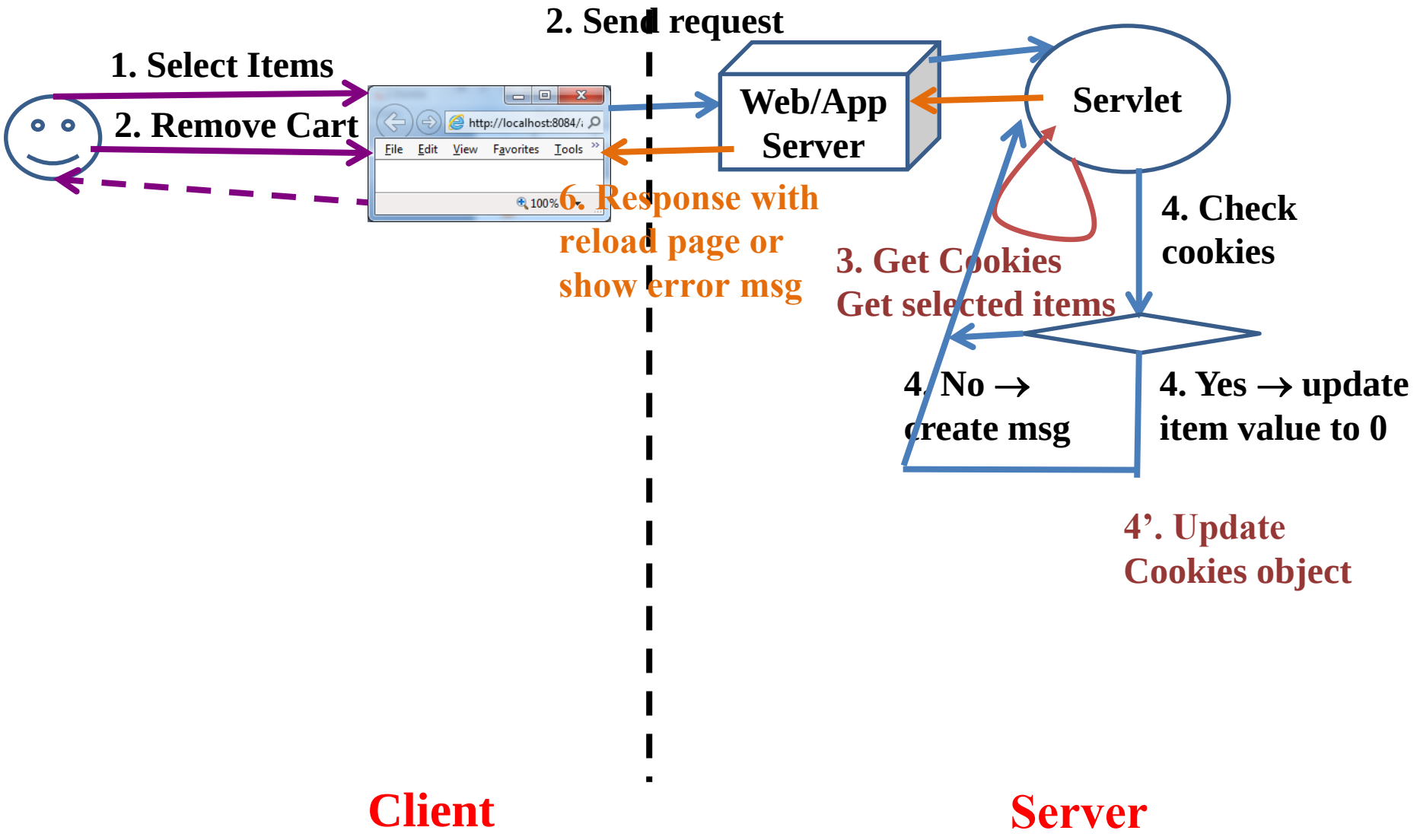
Appendix

Shopping Cart using Cookies

```
53
54                  int count = 1;
                    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

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         private final String removeCartServlet = "ShoppingRemoveServlet";
24         /** Processes requests for both HTTP ...10 lines */
34         protected void processRequest(HttpServletRequest request, HttpServletResponse respo
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

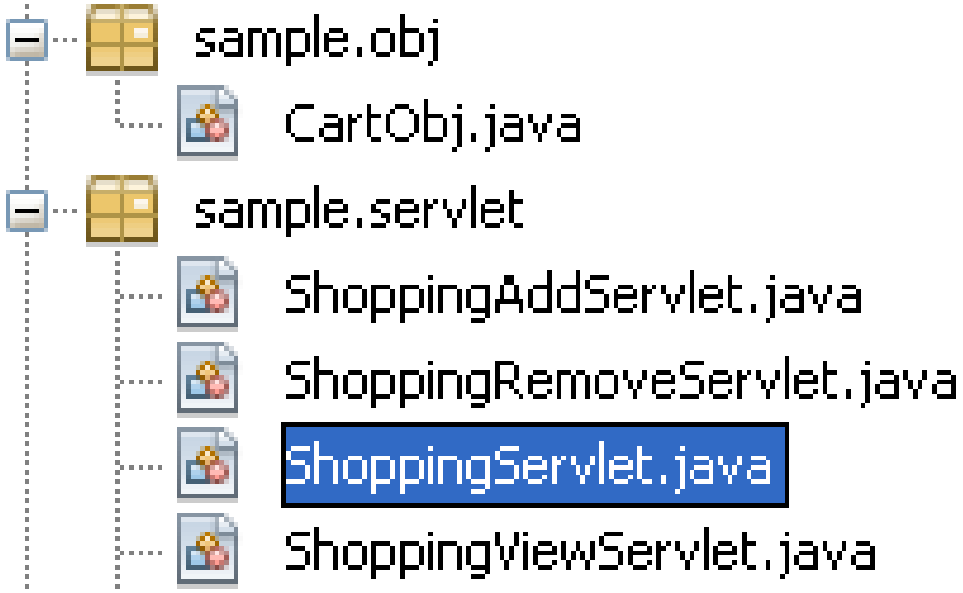
ShoppingRemoveServlet.java

Source | History

```
18      * @author Trong Khanh
19      */
20     public class ShoppingRemoveServlet extends HttpServlet {
21
22         /** Processes requests for both HTTP <code>GET</code> and <code>POST</
31         protected void processRequest(HttpServletRequest request, HttpServletR
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) {
41                         for (int i = 0; i < list.length; i++) {
41                             String tmp = list[i];
43                             for (int j = 0; j < cookies.length; j++) {
44                                 if (cookies[j].getName().equals(tmp)) {
45                                     cookies[j].setValue("0");
46                                     cookies[j].setMaxAge(60 * 5);
47                                     response.addCookie(cookies[j]);
48                                     break;
49                                 }
50                             }//for j
51                         }//for i
52                     }//end if list
53                     String urlRewriting = "ShoppingServlet?action=View Cart";
54                     response.sendRedirect(urlRewriting);
55                 }else {
56                     out.println ("<h2>Cart is removed!!!!</h2>");
                    }
```

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>
```

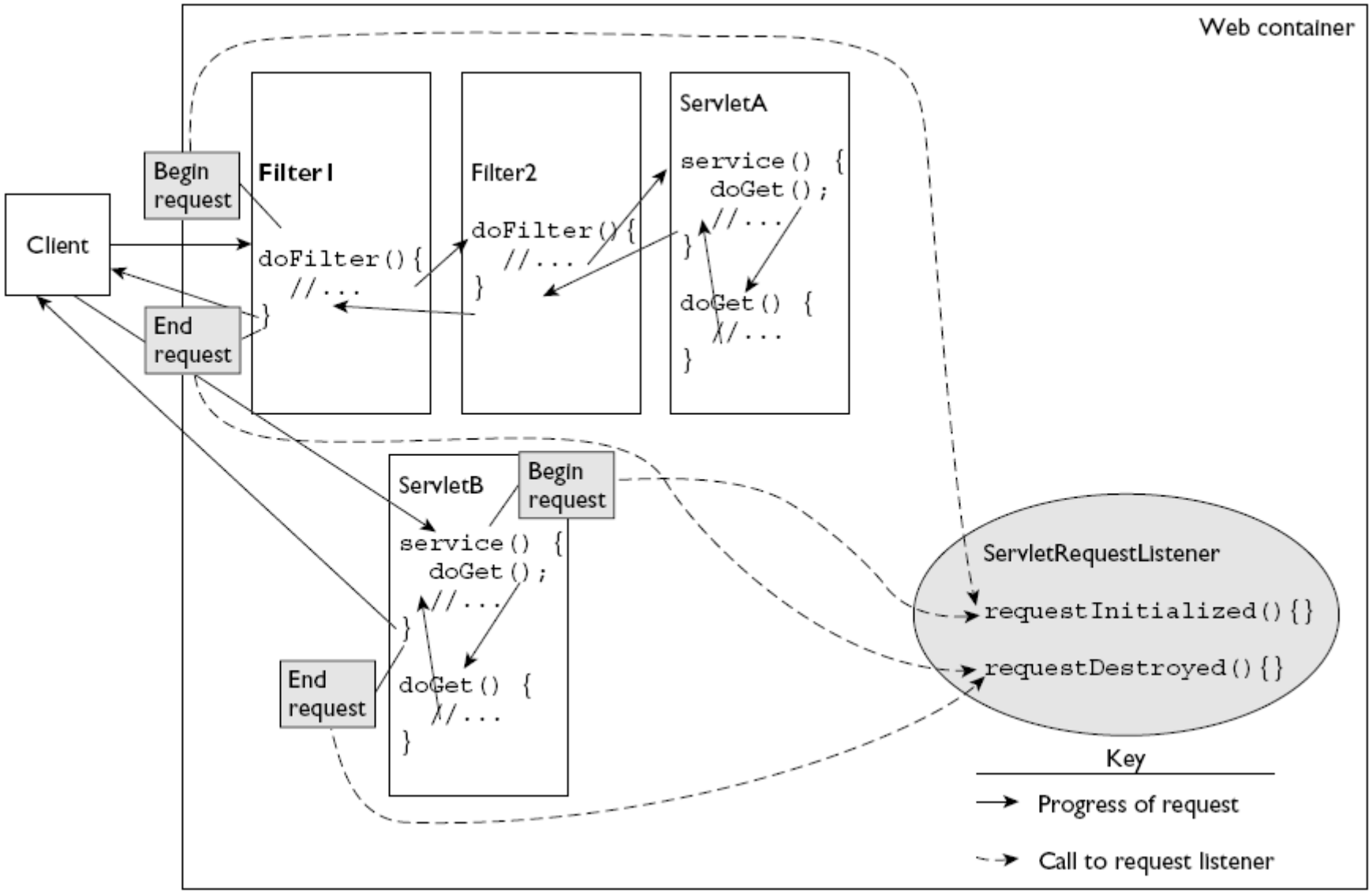
Appendix

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 be **comes 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()
  - getServletRequest()

Appendix

Request Listeners



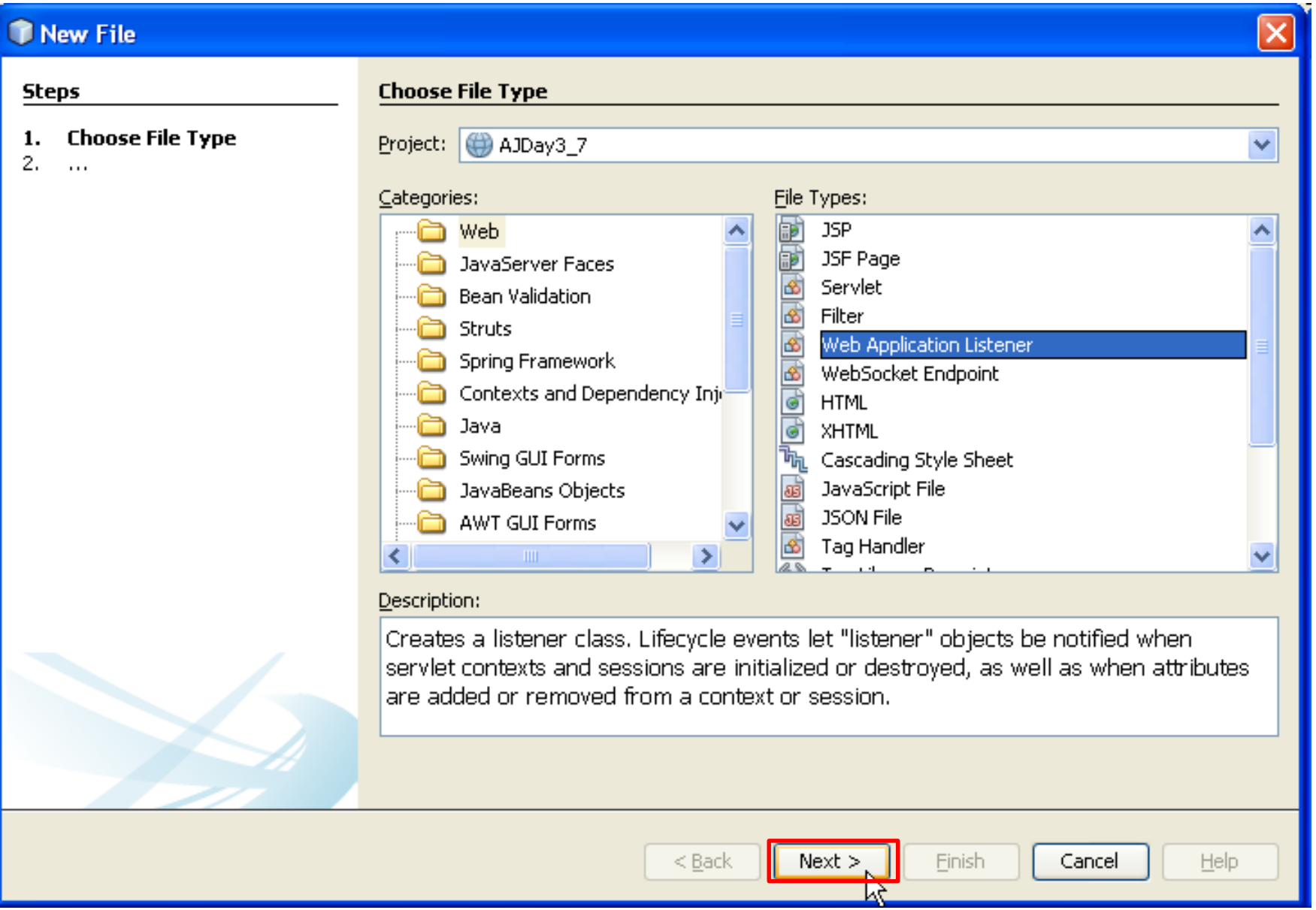
Appendix

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 ServetRequestEvent
- The “grandparent” of The ServletRequestEvent is java.util.EventObject
  - The getSource() method returns the object that is the source of the event

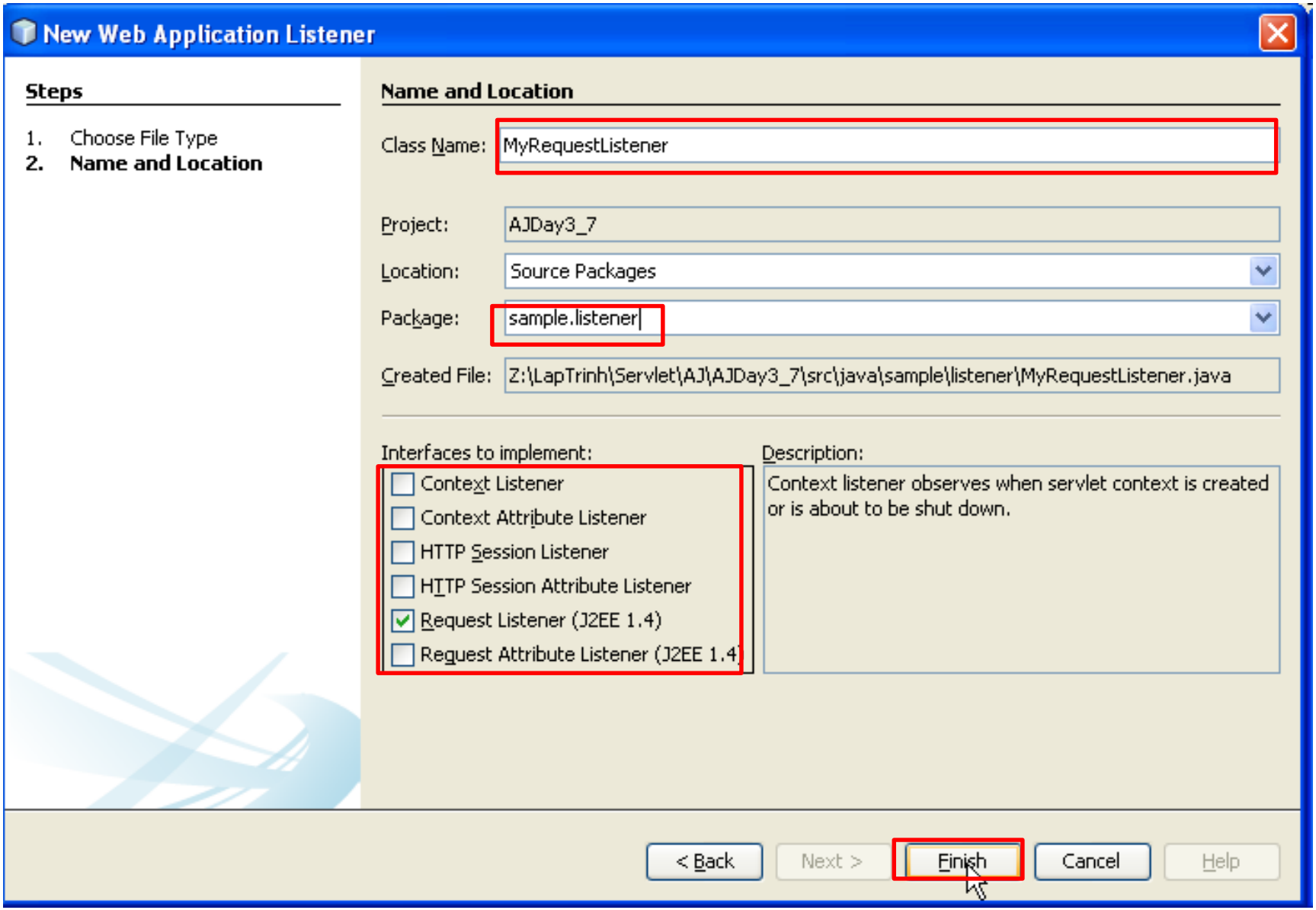
Appendix

How to Add Listener to Web Project



Appendix

How to Add Listener to Web Project



Appendix
Example

MyRequestListener.java

```
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

```
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

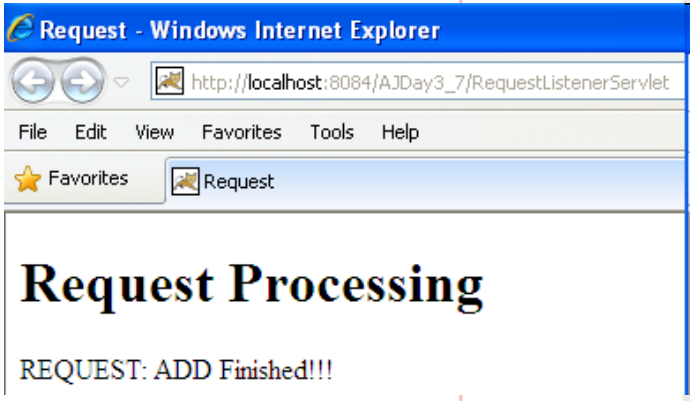
```
15  public class MyRequestAttributeListener implements ServletRequestAttributeListener {
        public void attributeAdded(ServletRequestAttributeEvent srae) {
17          System.out.println("Add is activated");
18          String name = srae.getName();
19          String oldValue = srae.getValue().toString();
20          String newValue = srae.getServletRequest().getAttribute(name).toString();
21          System.out.println("Name: " + name + " -old: " + oldValue + " -new: " + newValue);
22      }
        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      }
        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

```
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.serve
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
```

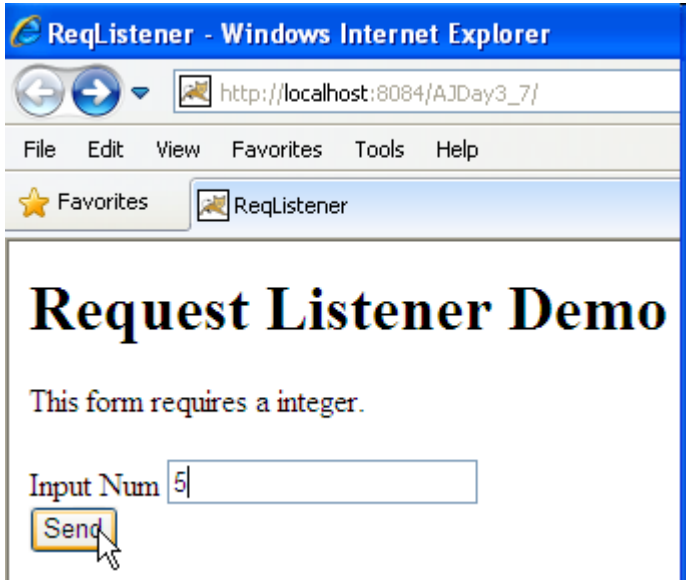
Appendix

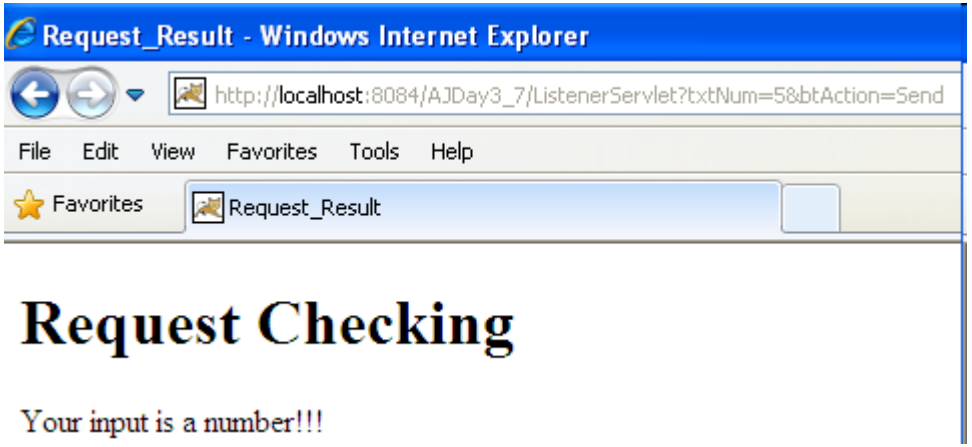
Example

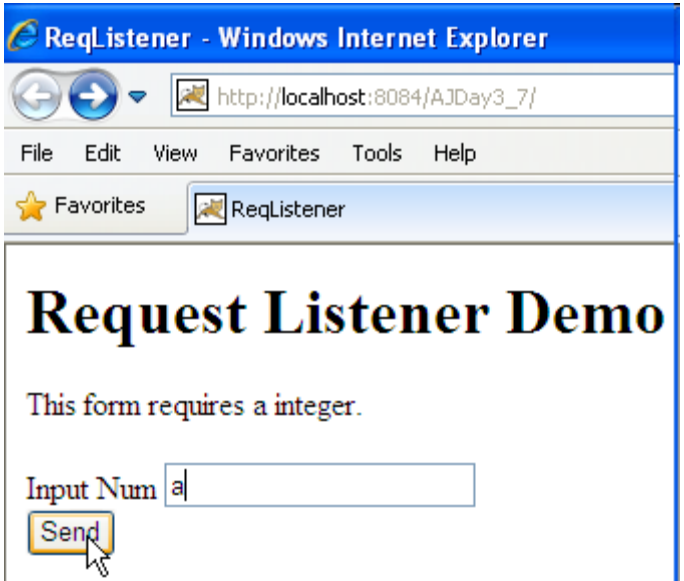
```
Remove is activated
Name: netbeans.monitor.response -old: org.netbeans.
Remove is activated
Name: netbeans.monitor.filter -old: MonitorFilter(A
Remove is activated
Name: netbeans.monitor.monData -old: [MonitorData]
destroyed in MyRequest is invoked!!!!
Remove is activated
Name: REQUEST -old: ADD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

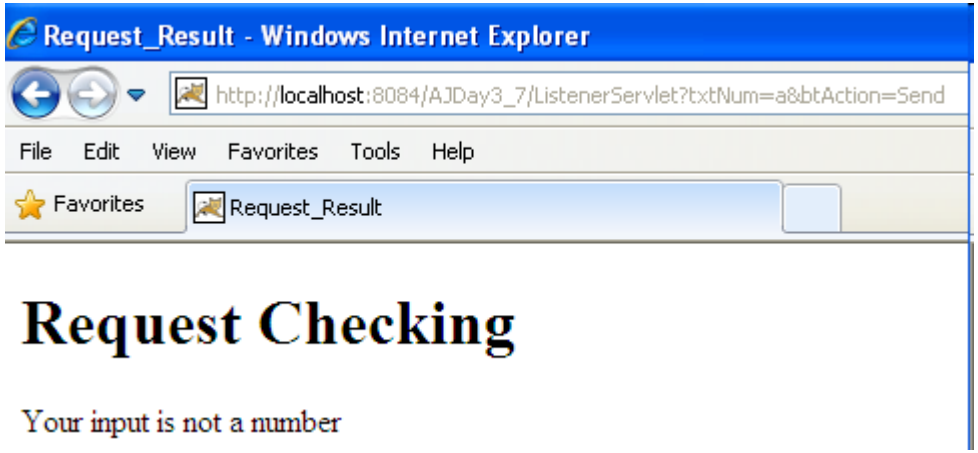
Appendix

Practices – Example









Appendix

Practices – Example

validUsingReqListener.html | ListenerServlet.java | MyRequestListener.java

Source | History

```
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>
```

Appendix

Practices – Example

Fpt University

ListenerServlet.java | MyRequestListener.java

Source | History

```
16   * @author Trong Khanh
17   */
18  public class ListenerServlet extends HttpServlet {
19
20      /**...*/
30      protected void processRequest(HttpServletRequest request, HttpSe
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 sam
36              out.println("<!DOCTYPE html>");
37              out.println("<html>");
38              out.println("<head>");
39              out.println("<title>Request_Result</title>");
40              out.println("</head>");
41              out.println("<body>");
42              out.println("<h1>Request Checking</h1>");
43
44              Boolean check = (Boolean) request.getAttribute("VALID");
45              if (check.booleanValue()) {
46                  out.print("Your input is a number!!!");
47              } else {
48                  out.print("Your input is not a number");
49              }
50
51              out.println("</body>");
```

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) {...}
20
21         public void requestInitialized(ServletRequestEvent sre) {
22
23             String num = sre.getServletRequest().getParameter("txtNum");
24             Boolean result = true;
25             try {
26                 int n = Integer.parseInt(num);
27             } catch (NumberFormatException ex) {
28                 result = false;
29             }
30             sre.getServletRequest().setAttribute("VALID", result);
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**
    - **Recieves** 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

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

web.xml

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

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

Appendix

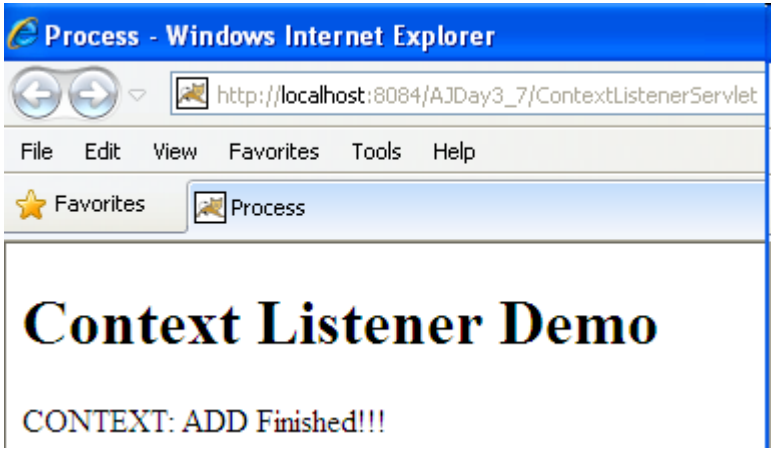
Example

ContextListenerServlet.java

```
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>Process</title>");
37              out.println("</head>");
38              out.println("<body>");
39              out.println("<h1>Context Listener Demo</h1>");
40
41              ServletContext sc = getServletContext();
42              sc.setAttribute("VALUE", "ADD");
43              sc.setAttribute("VALUE", "MODIFIED");
44              sc.removeAttribute("VALUE");
45
46              out.println("CONTEXT: " + sc.getAttribute("CONTEXT"));
47              out.println("Finished!!!");
48
49              out.println("</body>");
50              out.println("</html>");
51          } finally {
52              out.close();
53          }
54      }
```

Appendix

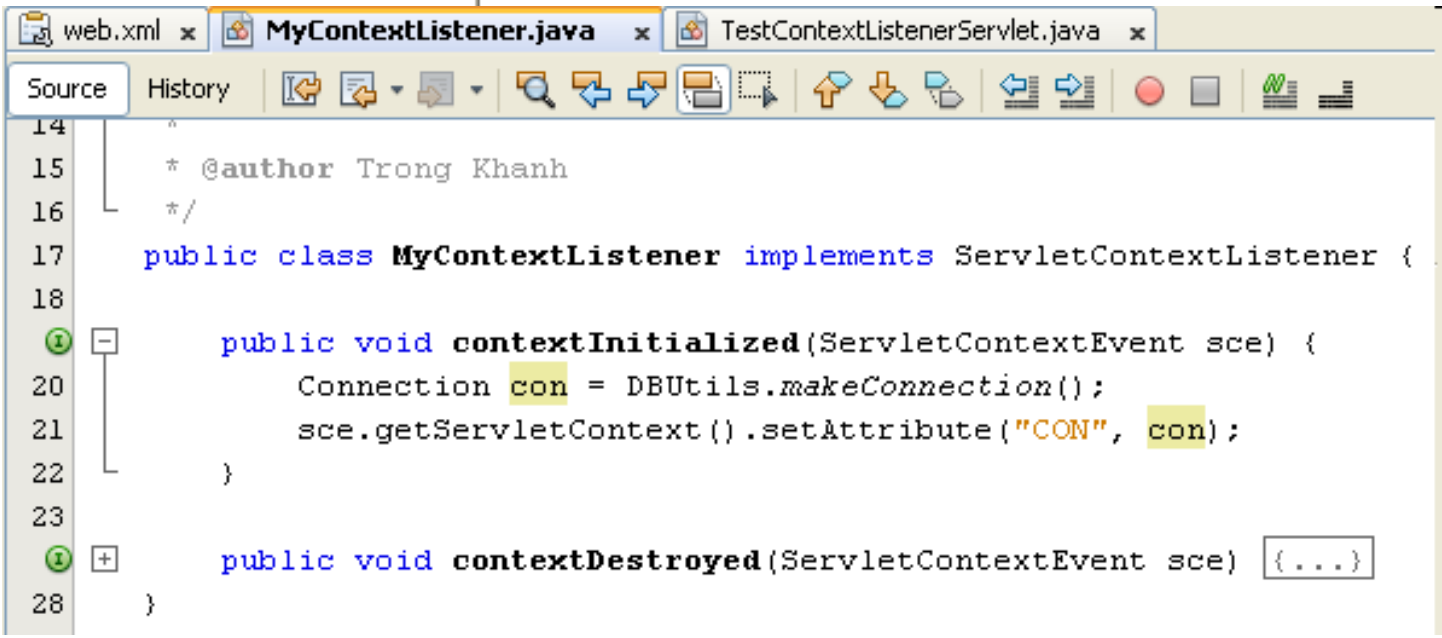
Example




```
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



Appendix

Practices – Example

web.xml | TestContextListenerServlet.java

Source | History

```
20      * @author Trong Khanh
21      */
22     public class TestContextListenerServlet extends HttpServlet {
23
24         /**...*/
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                 /* TODO output your page here. You may use following sample code. */
40                 out.println("<!DOCTYPE html>");
41                 out.println("<html>");
42                 out.println("<head>");
43                 out.println("<title>Context</title>");
44                 out.println("</head>");
45                 out.println("<body>");
46                 out.println("<h1>Test Context Listener Servlet</h1>");
47
48                 Connection con = (Connection) getServletContext().getAttribute("CON");
49                 try {
50                     out.print("Test DB Connection is Closed: " + con.isClosed());
51                 } catch (SQLException ex) {
52                     Logger.getLogger(TestContextListenerServlet.class.getName()).log(L
53                 }
54
55                 out.println("</body>");
```

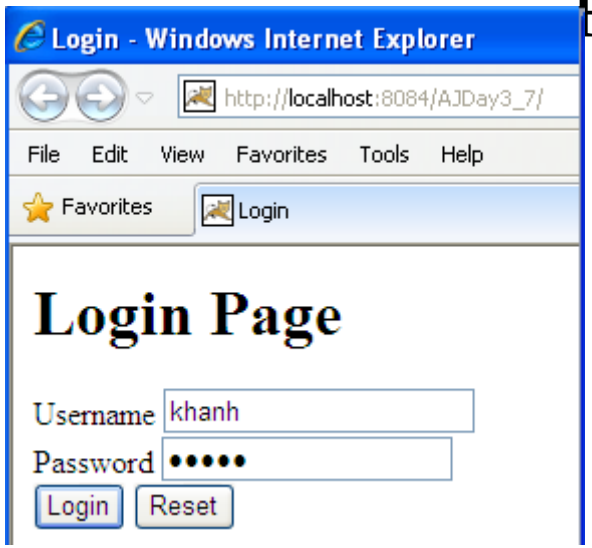
Appendix

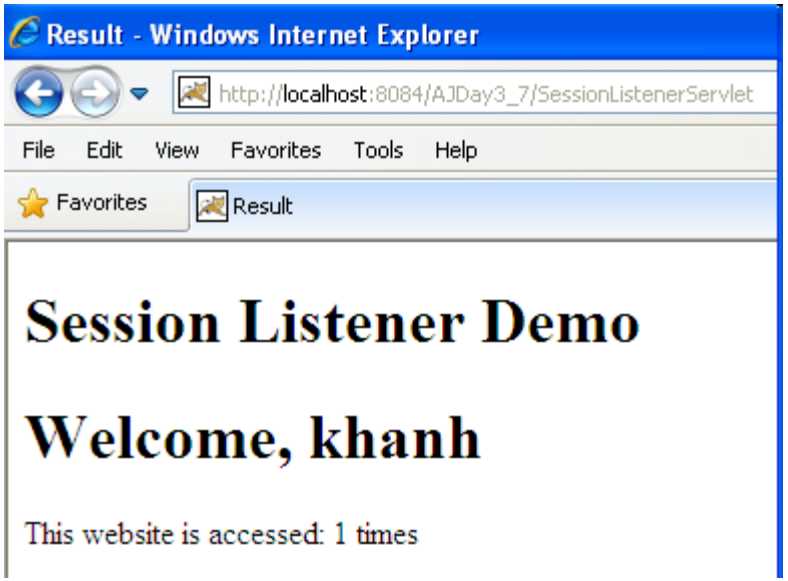
Session Listeners Declared in DD

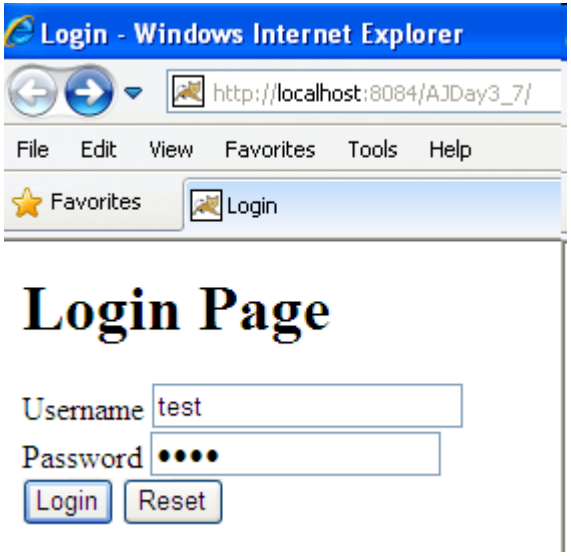
- Have **02 listeners:**
  - **HttpSessionListener**
    - Implements the changes to the list of active sessions in Web application
    - **sessionCreated**() method: is called whenever a **new session** is provided (*can say that **after** the **getSession()** method*)
    - **sessionDestroyed**(): 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)

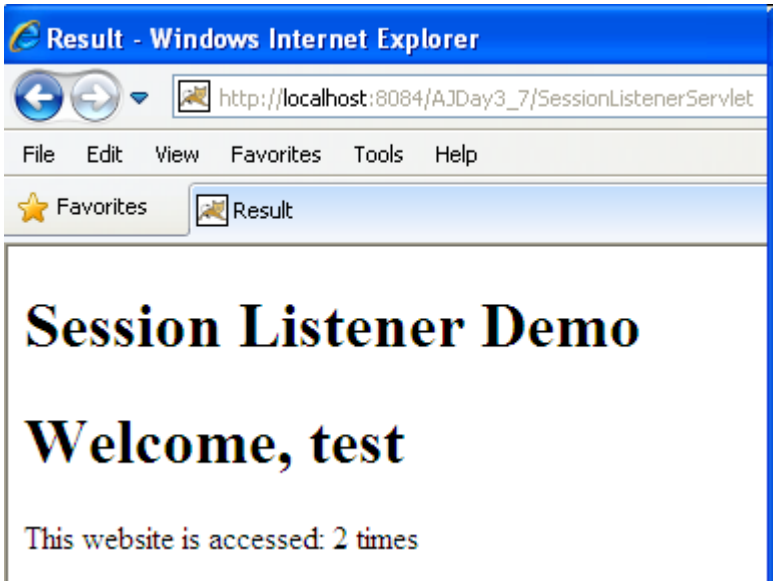
Appendix

Practices – Example









Appendix

Practices – Example

loginCountSession.html

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

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

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

Source | History

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

Appendix
Practices – Example

MySessionListener.java

Source | History

```
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) {...}
28     }
```

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
valueBound	- **public void valueBound(HttpSessionBindingEvent se);** - **Notifies** the object in being **bound** to a **session** and is responsible for identification of the session
valueUnbound	- **public void valueUnbound(HttpSessionBindingEvent se);** - **Notifies** the **object** on being **unbound** from a session and is responsible for identification of the session

Appendix

Session Listeners Not Declared in DD - Example

SessionAttrObject.java

```
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      }
        public String toString() {
24          return data;
25      }
26      public void setData(String data) {
27          this.data = data;
28      }
        public void valueBound(HttpSessionBindingEvent event) {
30          System.out.println("valueBound() " + getData());
31      }
        public void valueUnbound(HttpSessionBindingEvent event) {
33          System.out.println("valueUnbound " + getData());
34      }
35  }
```

Appendix

Session Listeners Not Declared in DD - Example

SessionBindingServlet.java

```
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 {
```

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

Appendix

Session Listeners Not Declared in DD

- Have **02 listeners** (cont)
  - **HttpSesssionActivationListener** (*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
sessionDidActivate	- **public void sessionDidActivate(HttpSessionEvent se);** - Provides notification that the session has just been activated.
sessionWillPassivate	- **public void sessionWillPassivate(HttpSessionEvent se);** - Provide notification that the session is about to be passivated.