Project 3: **CMUQFlix**

CMUQ’s Movies Recommendation System
Project Objective

1. Set up a front-end website with PostgreSQL as the back-end

2. Allow users to login, “like” movies, and get personalized movies recommendations
Three-Tier Architecture of CMUQFlix

Client Browser

Front-end Tier
(presentation)

Web Server

Tomcat

Servlets,
JSPs, Java

Middle Tier
(application logic)

PostgreSQL
Database

Movies,
Users, ..

Back-end Tier
(data storage)

HTTP

JDBC
Front-End Tier:
HTML Forms & Javascript
HTML Forms

• HTML forms are a common way for
  – Getting user input at the front-end tier
  – Communicating the given input to the middle tier

• HTML forms are defined using the FORM tag

• FORM tag has three important attributes:
  – NAME: form name
  – ACTION: URI of the page to which the form is submitted
  – METHOD: method used to submit the form (Get*/Post**)  

* A Get request gets (or retrieves) information (e.g. image, HTML page) from a server.
** A Post request posts (or sends) data from the client (e.g. usernames, passwords) to a server.
HTML Forms (contd.)

• Three important tags used to get user input: **INPUT, SELECT, and TEXTAREA**

• **INPUT** is used to render text fields and buttons:

```html
<INPUT TYPE="text" NAME="username" VALUE="Joe Bloggs">
<INPUT TYPE="password" NAME="password" VALUE="123456">
<INPUT TYPE="reset" VALUE="Reset Fields">
<INPUT TYPE="submit" VALUE="Submit Form">
```
Apache Tomcat
Apache Tomcat

• Apache Tomcat is an open-source web server developed by the Apache Software Foundation (ASF)

• Apache Tomcat is a servlet container i.e. it can invoke and execute servlets and JSPs

• Unlike web-servers that run on a TCP port number 80, Tomcat runs on port number 8080
Installing Tomcat

- Login to your VM (<andrew_id>@<andrew_id>-db.qatar.cmu.local)
- Install JDK 7 (apt-get install openjdk-7-jdk)
- Install Tomcat 7 (apt-get install tomcat7 tomcat7-admin)
- Check that Tomcat is running
  - Type service tomcat7 status, or
  - Browse to <andrew_id>-db.qatar.cmu.local:8080
- Manually start/stop/restart Tomcat (service tomcat7 start/stop/restart)
- Deploy your application “cmuqflix” in Tomcat’s webapp (cp cmuqflix /var/lib/tomcat7/webapps)
- View Tomcat’s log files (for debug info.) (cd /var/log/tomcat7; cat *;)


Java Servlets
What are Servlets?

• A servlet is primarily Java code that executes some application logic and produces HTML output

• A servlet can:
  – Interact with databases (using JDBC)
  – Generate custom HTML pages (as output)
  – Maintain session information for each client
Creating a Servlet

• A web-based servlet must:
  – Extend the **HTTPServlet** abstract class
  – Override the **doGet** and/or **doPost** functions
    (to respond to get and post HTTP requests)

• The web-server (i.e. Tomcat) transparently invokes **Service** to determine the type of HTTP request made

<table>
<thead>
<tr>
<th>Methods defined in the HttpServlet Abstract Class*</th>
</tr>
</thead>
<tbody>
<tr>
<td>void doGet ( HttpServletRequest request, HttpServletResponse response )</td>
</tr>
<tr>
<td>void doPost ( HttpServletRequest request, HttpServletResponse response )</td>
</tr>
<tr>
<td>void Service( HttpServletRequest request, HttpServletResponse response )</td>
</tr>
</tbody>
</table>

* Note that all the above functions can throw *ServletException* and *IOException*
Request and Response Classes

- Class **HttpServletRequest** provides methods:
  - `getParameter`, `getParameterNames`, `getParameterValues`, `getCookies`, `getSession`

- Class **HttpServletResponse** provides methods:
  - `addCookie`, `getOutputStream`, `getWriter`, `setContentType`
Integrating a Servlet with Tomcat

- Define the new servlet (e.g., newservlet.java) under cmuqflix/WEB-INF/src

- Compile newservlet.java
  
  javac -cp /usr/share/tomcat7/lib/servlet-api.jar newservlet.java

- Copy newservlet.class to cmuqflix/WEB-INF/classes

- Define the new servlet in cmuqflix/WEB-INF/web.xml
JavaServer Pages (JSPs)
What are JSPs?

• A JavaServer Page (JSP) is primarily HTML that embeds java code to perform some application logic

• JSPs serve the same purposes as servlets
Servlets vs. JSPs

• Use servlets for:
  – Simple HTML
  – Complex application logic

• Use JSPs for:
  – Complex HTML
  – Simple application logic