CSM3023 WEB BASED APPLICATION DEVELOPMENT (K1)

BACHELOR OF COMPUTER SCIENCE (MOBILE COMPUTING) WITH HONORS

SEMESTER 2 2023/2024

LAB 2 – Servlet: Data Sharing and Database Management

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Task 1:Data Sharing in Servlet

login.html

```html
<!DOCTYPE html>
<!--
This is a login page
-->
<html>
    <head>
        <title>Login Page</title>
        <style>
            body {
                background-color: black;
                text-align: left;
                color: white;
                font-family: Arial, Helvetica, sans-serif;
            }
        </style></head>
    <body>
        <h1>Welcome to CSM3023</h1>
        <p>Please insert your username and password</p>
        <form name="login" id="login" action="LoginServlet" method="POST" autocomplete="off">
            Username:<input name="txtUsername" type="text"> <br>
            Password: <input name="txtPassword" type="text"><br>
            <br>
            <input name="btnLogin" value="Login" type="submit">
            <input name="txtReset" value="Reset" type="reset"><br>
        </form>
        <p><br>
        </P>
    </body>
</html>
```

LoginServlet.java

```java
...4 lines

import jakarta.servlet.RequestDispatcher;
import jakarta.servlet.ServletContext;
import java.io.IOException;
import java.io.PrintWriter;
import java.util.HashMap;
import jakarta.servlet.ServletException;
import jakarta.servlet.http.HttpServlet;
import jakarta.servlet.http.HttpServletRequest;
import jakarta.servlet.http.HttpServletResponse;

/**...4 lines */
public class LoginServlet extends HttpServlet {

    HashMap <String, String> users = new HashMap();

    public void init() throws ServletException{
        super.init();
        users.put("Ali", "1234");
        users.put("Ahmad", "4567");
        users.put("Muthu", "8910");
    }
    /**
     * Processes requests for both HTTP <code>GET</code> and <code>POST</code>
     * methods.
     *
     * @param request servlet request
     * @param response servlet response
     * @throws ServletException if a servlet-specific error occurs
     * @throws IOException if an I/O error occurs
     */
    protected void processRequest(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException {
        response.setContentType("text/html;charset=UTF-8");

        String username = request.getParameter("txtUsername");
        String password = request.getParameter("txtPassword");

        if (!username.equals("") && !password.equals("")
                && users.get(username).equals(password)) {
            request.setAttribute("userid", username);
            ServletContext sc = getServletContext();
            RequestDispatcher rd = sc.getRequestDispatcher("/AccountServlet");
            rd.forward(request, response);
        }
        else {
            RequestDispatcher rd = request.getRequestDispatcher("/login.html");
            rd.forward(request, response);
        }
    }

    HttpServlet methods. Click on the + sign on the left to edit the code.

}
```

AccountServlet.java

```java
...4 lines

import java.io.IOException;
import java.io.PrintWriter;
import java.util.HashMap;
import jakarta.servlet.ServletException;
import jakarta.servlet.http.HttpServlet;
import jakarta.servlet.http.HttpServletRequest;
import jakarta.servlet.http.HttpServletResponse;

/**...4 lines */
public class AccountServlet extends HttpServlet {

    HashMap<String, String[]> account = new HashMap();

    public void init() throws ServletException{
        super.init();
        account.put("Ali", new String[]{"31/01/2019: 2000.00","28/02/2019: 3000.00"});
        account.put("Ahmad", new String[]{"31/01/2019: 1000.00","28/02/2019: 5000.00"});
        account.put("Muthu", new String[]{"31/01/2019: 1000","28/02/2019: 2000"});
    }
    /**
     * Processes requests for both HTTP <code>GET</code> and <code>POST</code>
     * methods.
     *
     * @param request servlet request
     * @param response servlet response
     * @throws ServletException if a servlet-specific error occurs
     * @throws IOException if an I/O error occurs
     */
    protected void processRequest(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException {
        response.setContentType("text/html;charset=UTF-8");

        String userid_login = (String)request.getAttribute("userid");

        try (PrintWriter out = response.getWriter()) {

            out.println("<!DOCTYPE html>");
            out.println("<html>");
            out.println("<head>");
            out.println("<title>Servlet AccountServlet</title>");
            out.println("</head>");
            out.println("<body>");

            if(account.get(userid_login)==null) {
                out.println("<h1>Sorry, no information found!</h1>");
            }
            else{
                out.println("<h1>Account status for: " + userid_login + "</h1>");
                for(String tempAcc: account.get(userid_login)){
                    out.println("<h2>"+tempAcc+"</h2>");
                }
            }

            out.println("</body>");
            out.println("</html>");
        }
    }

    HttpServlet methods. Click on the + sign on the left to edit the code.

}
```

Output:

Account status for: Ali

31/01/2019: 2000.00

28/02/2019: 3000.00

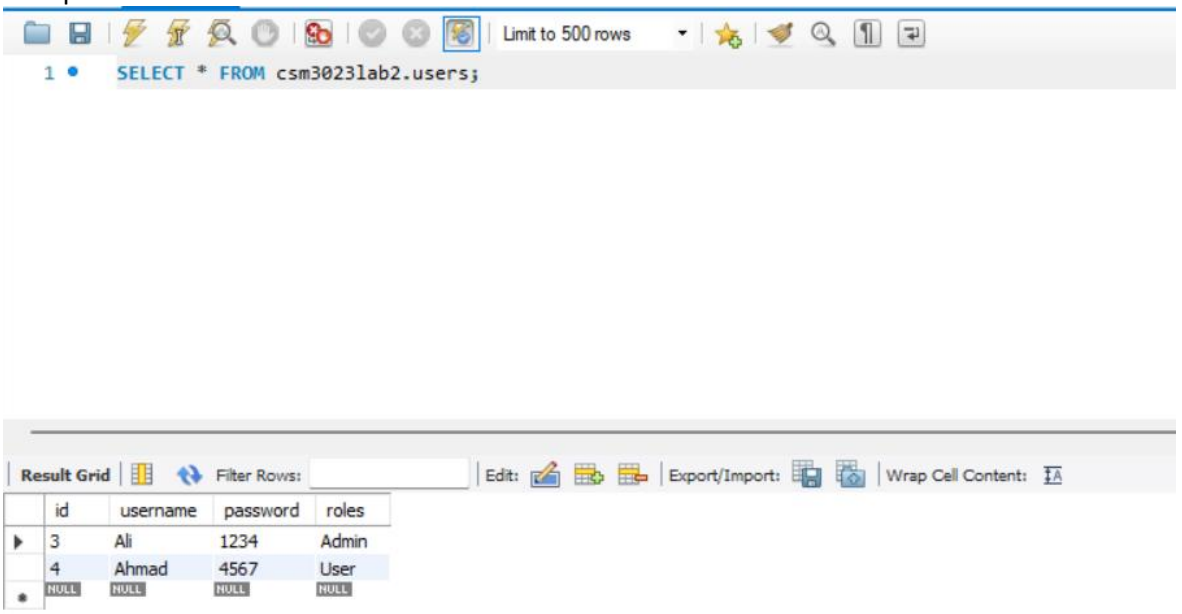
Reflections:

1. What have you learnt form this exercise?
   I have learnt how the data sharing process works by using servlet.

2. What are the common methods used in Java Servlet?
   doGet() and doPost()

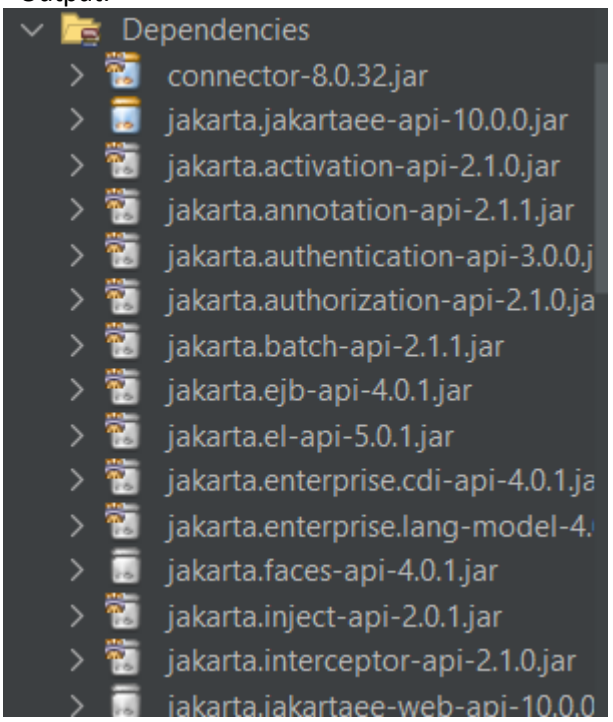
Task 2:Creating a table in MySQL database

Output:



Task 3:Setting the Environment of Web Application for Database Connection

Output:



Task 4: Using Servlets for Database CRUD Operations

Index.html

```
<!DOCTYPE html>
<html>
    <head>
        <title>User Management</title>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
    </head>
    <body>

        <h1>Add New User</h1>
        <form action="SaveServlet" method="post">
            <table>
                <tr><td>Username:</td><td><input type="text" name="name"></td></tr>
                <tr><td>Password:</td><td><input type="password" name="password"></td></tr>
                <tr><td>Role:</td><td>
                    <select name="role">
                        <option>Admin</option>
                        <option>User</option>
                    </select>
                </td></tr>
                <tr><td colspan="2"><input type="submit" value="Save User"></td></tr>
            </table>
        </form>
        <br>
        <a href="ViewServlet">View users</a>

    </body>
</html>
```

User.java

```java
public class User {

    private int id;
    private String username, password, role;

    public int getId() {
        return id;
    }

    public void setId(int id) {
        this.id = id;
    }

    public String getUsername() {
        return username;
    }

    public void setUsername(String username) {
        this.username = username;
    }

    public String getPassword() {
        return password;
    }

    public void setPassword(String password) {
        this.password = password;
    }

    public String getRole() {
        return role;
    }

    public void setRole(String role) {
        this.role = role;
    }

}
```

UserDao.java

```java
import java.util.*;
import java.sql.*;

public class UserDao {

    public static Connection getConnection() {
        Connection con = null;
        try {
            Class.forName("com.mysql.jdbc.Driver");
            con = DriverManager.getConnection("jdbc:mysql://localhost:3306/CSM3023Lab2", "root", "admin");
        }
        catch (Exception e) {
            System.out.println(e);
        }
        return con;
    }

    public static int save(User e) {
        int status = 0;
        try {
            Connection con = UserDao.getConnection();
            PreparedStatement ps = con.prepareStatement(
                    "INSERT INTO users(username, password, roles) VALUES (?, ?, ?)"
            );
            ps.setString(1, e.getUsername());
            ps.setString(2, e.getPassword());
            ps.setString(3, e.getRole());

            status = ps.executeUpdate();

            con.close();
        } catch (Exception ex) {
            ex.printStackTrace();
        }

        return status;
    }

    public static int update(User e) {
        int status = 0;
        try {
            Connection con = UserDao.getConnection();
            PreparedStatement ps = con.prepareStatement(
                    "UPDATE users SET username = ?, password = ?, roles = ? WHERE id = ?"
            );
            ps.setString(1, e.getUsername());
            ps.setString(2, e.getPassword());
            ps.setString(3, e.getRole());
            ps.setInt(4, e.getId());

            status = ps.executeUpdate();

            con.close();
        } catch (Exception ex) {
            ex.printStackTrace();
        }

        return status;
    }

    public static int delete(int id) {
        int status = 0;

        try {
            Connection con = UserDao.getConnection();
            PreparedStatement ps = con.prepareStatement(
                    "DELETE FROM users WHERE id = ?"
            );
            ps.setInt(1, id);

            status = ps.executeUpdate();

            con.close();
        } catch (Exception ex) {
            ex.printStackTrace();
        }

        return status;
    }

    public static User getUserById(int id) {
        User e = new User();

        try {
            Connection con = UserDao.getConnection();
            PreparedStatement ps = con.prepareStatement(
                    "SELECT * FROM users WHERE id = ?"
            );
            ps.setInt(1, id);
            ResultSet rs = ps.executeQuery();
            if (rs.next()) {
                e.setId(rs.getInt(1));
                e.setUsername(rs.getString(2));
                e.setPassword(rs.getString(3));
                e.setRole(rs.getString(4));
            }

            con.close();
        } catch (Exception ex) {
            ex.printStackTrace();
        }

        return e;
    }

    public static List<User> getAllUsers() {
        List<User> list = new ArrayList<User>();

        try {
            Connection con = UserDao.getConnection();
            PreparedStatement ps = con.prepareStatement(
                    "SELECT * FROM users"
            );
            ResultSet rs = ps.executeQuery();
            while (rs.next()) {
                User e = new User();
                e.setId(rs.getInt(1));
                e.setUsername(rs.getString(2));
                e.setPassword(rs.getString(3));
                e.setRole(rs.getString(4));
                list.add(e);
            }
            con.close();
        } catch (Exception ex) {
            ex.printStackTrace();
        }

        return list;
    }
}
```

SaveServlet.java

```java
...4 lines

import java.io.IOException;
import java.io.PrintWriter;
import jakarta.servlet.ServletException;
import jakarta.servlet.http.HttpServlet;
import jakarta.servlet.http.HttpServletRequest;
import jakarta.servlet.http.HttpServletResponse;

/**...4 lines */
public class SaveServlet extends HttpServlet {

    /**
     * Processes requests for both HTTP <code>GET</code> and <code>POST</code>
     * methods.
     *
     * @param request servlet request
     * @param response servlet response
     * @throws ServletException if a servlet-specific error occurs
     * @throws IOException if an I/O error occurs
     */
    protected void processRequest(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException {
        response.setContentType("text/html;charset=UTF-8");
        PrintWriter out = response.getWriter();

        String name = request.getParameter("name");
        String password = request.getParameter("password");
        String role = request.getParameter("role");

        User e = new User();
        e.setUsername(name);
        e.setPassword(password);
        e.setRole(role);

        int status = UserDao.save(e);
        if (status > 0) {
            out.print("<p>Record saved successfully!</p>");
            request.getRequestDispatcher("index.html").include(request, response);
        }
        else {
            out.println("Sorry! Unable to save record.");
        }

        out.close();
    }

    HttpServlet methods. Click on the + sign on the left to edit the code.

}
```

ViewServlet.java

```java
...4 lines

import java.io.IOException;
import java.io.PrintWriter;
import jakarta.servlet.ServletException;
import jakarta.servlet.http.HttpServlet;
import jakarta.servlet.http.HttpServletRequest;
import jakarta.servlet.http.HttpServletResponse;
import java.util.List;

/**
 *
 * @author Haris Zakuwan
 */
public class ViewServlet extends HttpServlet {

    /**
     * Processes requests for both HTTP <code>GET</code> and <code>POST</code>
     * methods.
     *
     * @param request servlet request
     * @param response servlet response
     * @throws ServletException if a servlet-specific error occurs
     * @throws IOException if an I/O error occurs
     */
    protected void processRequest(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException {
        response.setContentType("text/html;charset=UTF-8");
        PrintWriter out = response.getWriter();
        out.println("<a href='index.html'>Add New User</a>");
        out.println("<h1>User List</h1>");

        List<User> list = UserDao.getAllUsers();

        out.print("<table border='1' width='100%'>");
        out.print("<tr><th>Id</th><th>Name</th><th>Password</th><th>Role</th><th>Edit</th><th>Delete</th>");
        for (User e : list) {
            out.print("<tr><td>" + e.getId() + "</td><td>" + e.getUsername() + "</td><td>"
                    + e.getPassword() + "</td><td>" + e.getRole() + "</td><td><a href='EditServlet?id="
                    + e.getId() + "'>Edit</a></td><td><a href='DeleteServlet?id="
                    + e.getId() + "'>Delete</a></td></tr>"
            );
        }
        out.print("</table>");

        out.close();
    }

    HttpServlet methods. Click on the + sign on the left to edit the code.

}
```

EditServlet.java

```java
...4 lines

import java.io.IOException;
import java.io.PrintWriter;
import jakarta.servlet.ServletException;
import jakarta.servlet.http.HttpServlet;
import jakarta.servlet.http.HttpServletRequest;
import jakarta.servlet.http.HttpServletResponse;

/**
 *
 * @author Haris Zakuwan
 */
public class EditServlet extends HttpServlet {

    /**
     * Processes requests for both HTTP <code>GET</code> and <code>POST</code>
     * methods.
     *
     * @param request servlet request
     * @param response servlet response
     * @throws ServletException if a servlet-specific error occurs
     * @throws IOException if an I/O error occurs
     */
    protected void processRequest(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException {
        response.setContentType("text/html;charset=UTF-8");
        PrintWriter out = response.getWriter();
        out.println("<h1>Update User</h1>");
        String sid = request.getParameter("id");
        int id = Integer.parseInt(sid);

        User e = UserDao.getUserById(id);

        out.print("<form action='EditServlet2' method='post'>");
        out.print("<table>");
        out.print("<tr><td></td><td><input type='hidden' name='id' value='"
                + e.getId() + "'></td></tr>"
        );
        out.print("<tr><td>Name:</td><td><input type='text' name='username' value='"
                + e.getUsername() + "'></td></tr>"
        );
        out.print("<tr><td>Password:</td><td><input type='password' name='password' value='"
                + e.getPassword() + "'></td></tr>"
        );
        out.print("<tr><td>Role:</td><td>");
        out.print("<select name='role' style='width:150px'>");
        out.print("<option>Admin</option>");
        out.print("<option>User</option>");
        out.print("</select>");
        out.print("</td></tr>");
        out.print("<tr><td colspan='2'><input type='submit' value='Edit & Save'></td></tr>");
        out.print("</table></form>");

        out.close();
    }

    HttpServlet methods. Click on the + sign on the left to edit the code.

}
```

EditServlet2.java

```java
...4 lines

import java.io.IOException;
import java.io.PrintWriter;
import jakarta.servlet.ServletException;
import jakarta.servlet.http.HttpServlet;
import jakarta.servlet.http.HttpServletRequest;
import jakarta.servlet.http.HttpServletResponse;

/**
 *
 * @author Haris Zakuwan
 */
public class EditServlet2 extends HttpServlet {

    /**
     * Processes requests for both HTTP <code>GET</code> and <code>POST</code>
     * methods.
     *
     * @param request servlet request
     * @param response servlet response
     * @throws ServletException if a servlet-specific error occurs
     * @throws IOException if an I/O error occurs
     */
    protected void processRequest(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException {
        response.setContentType("text/html;charset=UTF-8");
        PrintWriter out = response.getWriter();

        int id = Integer.parseInt(request.getParameter("id"));
        String username = request.getParameter("username");
        String password = request.getParameter("password");
        String role = request.getParameter("role");

        User e = new User();
        e.setId(id);
        e.setUsername(username);
        e.setPassword(password);
        e.setRole(role);

        int status = UserDao.update(e);
        if (status > 0) {
            out.print("<p>Record saved successfully!</p>");
            request.getRequestDispatcher("index.html").include(request, response);
        }
        else {
            out.println("Sorry! Unable to save record");
        }

        out.close();
    }

    HttpServlet methods. Click on the + sign on the left to edit the code.

}
```

DeleteServlet.java

```java
...4 lines

import java.io.IOException;
import java.io.PrintWriter;
import jakarta.servlet.ServletException;
import jakarta.servlet.http.HttpServlet;
import jakarta.servlet.http.HttpServletRequest;
import jakarta.servlet.http.HttpServletResponse;

/**
 *
 * @author Haris Zakuwan
 */
public class DeleteServlet extends HttpServlet {

    /**
     * Processes requests for both HTTP <code>GET</code> and <code>POST</code>
     * methods.
     *
     * @param request servlet request
     * @param response servlet response
     * @throws ServletException if a servlet-specific error occurs
     * @throws IOException if an I/O error occurs
     */
    protected void processRequest(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException {
        response.setContentType("text/html;charset=UTF-8");
        String sid = request.getParameter("id");
        int id = Integer.parseInt(sid);
        UserDao.delete(id);
        response.sendRedirect("ViewServlet");
    }

    HttpServlet methods. Click on the + sign on the left to edit the code.

}
```

Output:

Add New User

Username: Idan
Password: 8907897
Role: Admin
Save User

View users

Record saved successfully!

Add New User

Username:
Password:
Role: Admin
Save User

View users

Add New User

User List

Id	Name	Password	Role	Edit	Delete
3	Ali	1234	Admin	Edit	Delete
4	Ahmad	4567	User	Edit	Delete
5	Idan	8907897	Admin	Edit	Delete

Update User

Name: Idan
Password: ••••••••••
Role: Admin
Edit & Save

Add New User

User List

Id	Name	Password	Role	Edit	Delete
3	Ali	1234	Admin	Edit	Delete
4	Ahmad	4567	User	Edit	Delete
5	Idan	8907897sasd	Admin	Edit	Delete

Reflections:

1. What is the name of the Java Library that you need to import before coding the web application with database operations?

   JDBC (Java Database Connectivity).It provides a set of classes and interfaces for accessing and manipulating relational databases from a Java program.It also allows Java applications to connect to a database and perform CRUD process by sending SQL queries to database.

2. Which folder keeps the web.xml file? Copy the contents of the file and explain in brief the tags included such as <servlet-name><servlet-class>

   <servlet-mapping>. etc.

   The web.xml file is kept inside WEB-INF folder.

```
<?xml version="1.0" encoding="UTF-8"?>
<web-app version="6.0" xmlns="https://jakarta.ee/xml/ns/jakartaee"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="https://jakarta.ee/xml/ns/jakartaee
https://jakarta.ee/xml/ns/jakartaee/web-app_6_0.xsd">
  <servlet>
    <servlet-name>SaveServlet</servlet-name>
    <servlet-class>SaveServlet</servlet-class>
  </servlet>
  <servlet>
    <servlet-name>ViewServlet</servlet-name>
    <servlet-class>ViewServlet</servlet-class>
  </servlet>
  <servlet>
    <servlet-name>EditServlet</servlet-name>
    <servlet-class>EditServlet</servlet-class>
  </servlet>
  <servlet>
    <servlet-name>EditServlet2</servlet-name>
    <servlet-class>EditServlet2</servlet-class>
  </servlet>
  <servlet>
    <servlet-name>DeleteServlet</servlet-name>
    <servlet-class>DeleteServlet</servlet-class>
```

```
  </servlet>
  <servlet-mapping>
    <servlet-name>SaveServlet</servlet-name>
    <url-pattern>/SaveServlet</url-pattern>
  </servlet-mapping>
  <servlet-mapping>
    <servlet-name>ViewServlet</servlet-name>
    <url-pattern>/ViewServlet</url-pattern>
  </servlet-mapping>
  <servlet-mapping>
    <servlet-name>EditServlet</servlet-name>
    <url-pattern>/EditServlet</url-pattern>
  </servlet-mapping>
  <servlet-mapping>
    <servlet-name>EditServlet2</servlet-name>
    <url-pattern>/EditServlet2</url-pattern>
  </servlet-mapping>
  <servlet-mapping>
    <servlet-name>DeleteServlet</servlet-name>
    <url-pattern>/DeleteServlet</url-pattern>
  </servlet-mapping>
  <session-config>
    <session-timeout>
      30
    </session-timeout>
  </session-config>
</web-app>
```

<servlet-name> specifies a unique name for the servlet configuration.
<servlet-class> specifies the fully permissioned class name of the implementation.
<servlet-mapping> maps a servlet to a URL pattern. It defines the URLs that invoke the servlet.
<url-pattern> specifies the URL pattern to which the servlet is mapped.

3. Define the usage of Data Access Object (DAO) servlet. How it ease thebusiness process in your servlet-based web application?

   DAO servlet is a design pattern used to separate the data access logic from the business logic of a servlet-based web application.DAO involves creating a separate class or set of classes responsible for interacting with the database, querying data, and perform database CRUD operations.By using a DAO servlet, the business logic in servlets can focus on handling user requests, processing data, and generating responses, while the data access logic is encapsulated within the DAO classes, improving the overall organization and clarity of the application architecture.