

**ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY (ASTU)**

**SCHOOL OF ELECTRICAL ENGINEERING AND COMPUTING**

**DEPARTEMENT OF COMPUTER SCIENCE AND ENGINEERING (CSE)**

**Advanced programming assignment**

Title - **Arithmetic Operations with RequestDispatcher**

**Submitted to Mr.Yared**

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Section - 2

**Report: Java Web Application Using Servlets**

**1. Introduction**

This project is a Java-based web application that demonstrates the use of servlets to perform calculations. The application accepts two numbers from the user through an HTML form. The input is processed by two servlets:

* The first servlet calculates the sum of the numbers.
* The second servlet calculates the square of the sum.

The servlets communicate using the RequestDispatcher mechanism, showcasing inter-servlet communication.

**2. Objectives**

1. To create a web application that uses servlets for backend processing.
2. To demonstrate inter-servlet communication using RequestDispatcher.
3. To perform arithmetic operations and display the results dynamically on a web page.

**3. Technologies Used**

1. **Programming Language**: Java
2. **Web Server**: Apache Tomcat
3. **Frontend**: HTML
4. **Servlet API**: Jakarta.servlet and jakarta.servlet.http
5. **Development Environment**: IDE with Java EE support (NetBeans)

**4. System Design**

**4.1 Architecture**

The application follows a client-server architecture:

1. **Client**:
   * The user interacts with an HTML form to input two numbers.
   * The form data is submitted to the server via HTTP POST.
2. **Server**:
   * Two servlets handle the requests:
     + **SumServlet**: Computes the sum of the input numbers and forwards the result to the next servlet.
     + **SquareServlet**: Calculates the square of the sum and displays the final result.

**4.2 Workflow**

1. The user submits two numbers using the HTML form.
2. The SumServlet retrieves the input, calculates the sum, and forwards the result using RequestDispatcher.
3. The SquareServlet computes the square of the sum and returns the result to the client.

## 5. ****Implementation****

### 5.1 ****HTML Form (index.html)****

### <!DOCTYPE html>

### <html lang="en">

### <head>

### <meta charset="UTF-8">

### <meta name="viewport" content="width=device-width, initial-scale=1.0">

### <title>Sum and Square Calculator</title>

### <style>

### body {

### font-family: Arial, sans-serif;

### background-color: #f4f4f4;

### margin: 0;

### padding: 20px;

### }

### .container {

### max-width: 400px;

### margin: auto;

### background: white;

### padding: 20px;

### border-radius: 8px;

### box-shadow: 0 0 10px rgba(0, 0, 0, 0.1);

### }

### h1 {

### text-align: center;

### color: #333;

### }

### label {

### display: block;

### margin: 10px 0 5px;

### color: #555;

### }

### input[type="number"] {

### width: calc(100% - 10px);

### padding: 8px;

### border: 1px solid #ccc;

### border-radius: 4px;

### box-sizing: border-box; /\* To include padding in width \*/

### }

### input[type="submit"] {

### background-color: #28a745;

### color: white;

### border: none;

### padding: 10px;

### border-radius: 4px;

### cursor: pointer;

### width: 100%;

### font-size: 16px;

### }

### input[type="submit"]:hover {

### background-color: #218838;

### }

### .footer {

### text-align: center;

### margin-top: 20px;

### color: #777;

### }

### </style>

### </head>

### <body>

### <div class="container">

### <h1>Sum and Square Calculator</h1>

### <form action="sum" method="post">

### <label for="num1">Number 1:</label>

### <input type="number" id="num1" name="num1" required>

### <label for="num2">Number 2:</label>

### <input type="number" id="num2" name="num2" required>

### <input type="submit" value="Calculate">

### </form>

### </div>

### <div class="footer">

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### </div>

### </body>

### </html>

### 5.2 ****Servlet 1: SumServlet****

### import java.io.IOException;

### import javax.servlet.RequestDispatcher;

### import javax.servlet.ServletException;

### import javax.servlet.annotation.WebServlet;

### import javax.servlet.http.HttpServlet;

### import javax.servlet.http.HttpServletRequest;

### import javax.servlet.http.HttpServletResponse;

### @WebServlet("/sum")

### public class SumServlet extends HttpServlet {

### protected void doPost(HttpServletRequest request, HttpServletResponse response) throws ServletException, IOException {

### int num1 = Integer.parseInt(request.getParameter("num1"));

### int num2 = Integer.parseInt(request.getParameter("num2"));

### int sum = num1 + num2;

### request.setAttribute("sum", sum);

### RequestDispatcher dispatcher = request.getRequestDispatcher("square");

### dispatcher.forward(request, response);

### }

### }

### 5.3 ****Servlet 2: SquareServlet****

### import java.io.IOException;

### import javax.servlet.ServletException;

### import javax.servlet.annotation.WebServlet;

### import javax.servlet.http.HttpServlet;

### import javax.servlet.http.HttpServletRequest;

### import javax.servlet.http.HttpServletResponse;

### @WebServlet("/square")

### public class SquareServlet extends HttpServlet {

### protected void doPost(HttpServletRequest request, HttpServletResponse response) throws ServletException, IOException {

### int sum = (int) request.getAttribute("sum");

### int square = sum \* sum;

### response.setContentType("text/html");

### response.getWriter().println("<h1>Results</h1>");

### response.getWriter().println("<p>Sum: " + sum + "</p>");

### response.getWriter().println("<p>Square of Sum: " + square + "</p>");

### }

### }

### 5.4 ****Web Deployment Descriptor (web.xml)****

### <!DOCTYPE web-app PUBLIC "-//Sun Microsystems, Inc.//DTD Web Application 2.3//EN"

### "http://java.sun.com/dtd/web-app\_2\_3.dtd">

### <web-app>

### <servlet>

### <servlet-name>SumServlet</servlet-name>

### <servlet-class>SumServlet</servlet-class>

### </servlet>

### <servlet-mapping>

### <servlet-name>SumServlet</servlet-name>

### <url-pattern>/sum</url-pattern>

### </servlet-mapping>

### <servlet>

### <servlet-name>SquareServlet</servlet-name>

### <servlet-class>SquareServlet</servlet-class>

### </servlet>

### <servlet-mapping>

### <servlet-name>SquareServlet</servlet-name>

### <url-pattern>/square</url-pattern>

### </servlet-mapping>

### </web-app>

**6. Testing and Validation**

1. **Input**:
   * Number 1: 3
   * Number 2: 5
2. **Expected Output**:
   * Sum: 8
   * Square of Sum: 64
3. **Procedure**:
   * Open the web application in a browser.
   * Enter the numbers in the form and submit.
   * Validate that the displayed results match the expected output.

**7. Conclusion**

This project demonstrates how servlets can handle user input, perform calculations, and communicate effectively using RequestDispatcher. It provides a solid foundation for building more complex Java-based web applications.