Chapter 2

How to structure a web application with the MVC pattern

© 2014, Mike Murach & Associates, Inc.

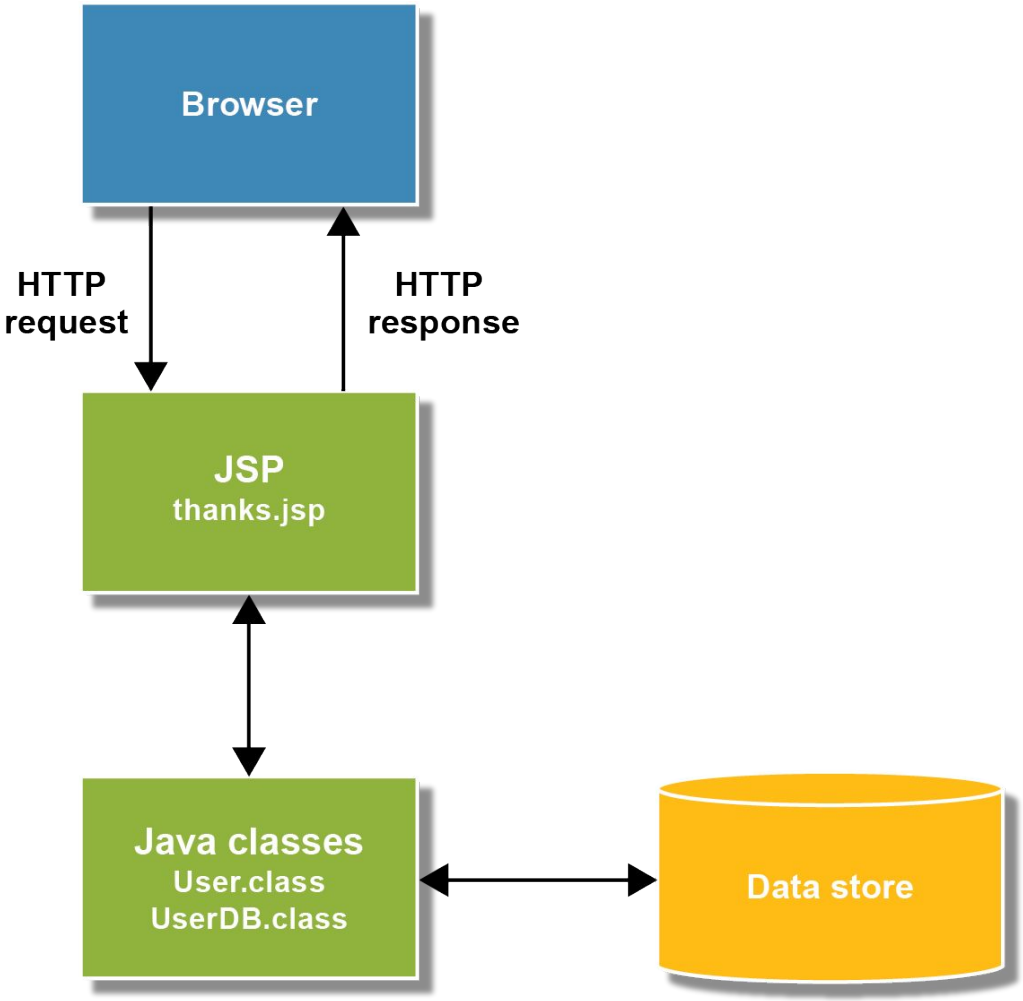
Objectives

Knowledge

1. Describe the Model 1 pattern.
2. Describe the Model 2 (MVC) pattern
3. Explain how the MVC pattern can improve application development.
4. Distinguish between the HTML and CSS for a web page.
5. Distinguish between the code for a servlet and a JSP.
6. Explain why you typically use both servlets and JSPs in a Java web application.
7. Describe the purpose of the deployment descriptor in a web application.
8. Describe the purpose of a JavaBean within a web application.

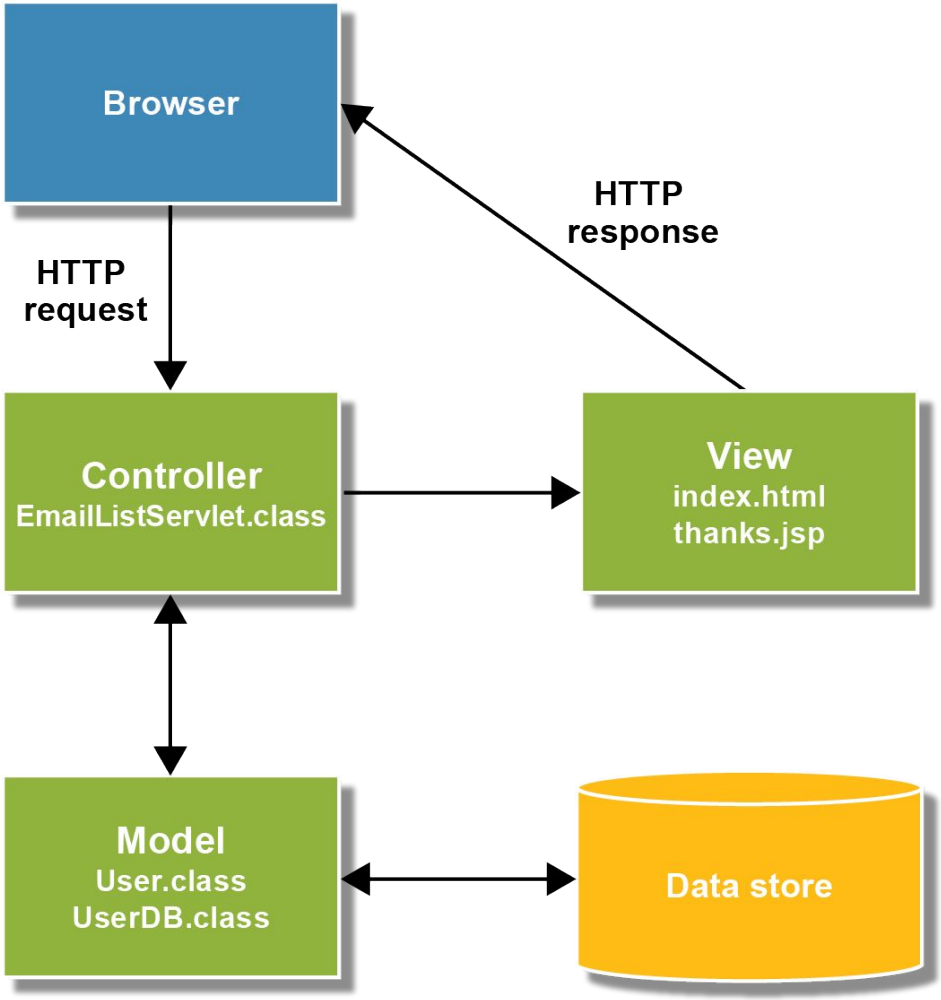
© 2014, Mike Murach & Associates, Inc.

The Model 1 pattern



© 2014, Mike Murach & Associates, Inc.

The Model 2 (MVC) pattern



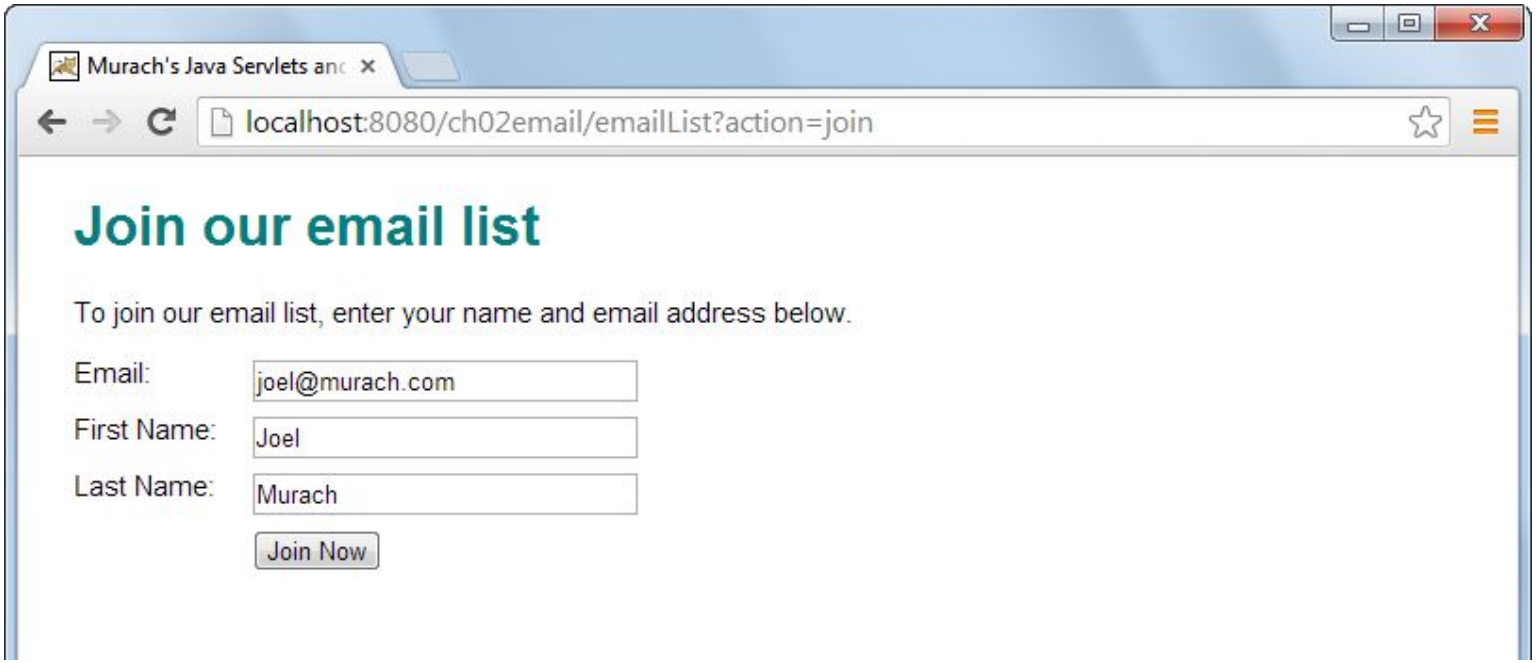
© 2014, Mike Murach & Associates, Inc.

Concepts and terminology

- The *Model 1 pattern* uses JSPs to handle all of the processing and presentation for the application.
- The *Model 2 pattern* separates the code into a model, a view, and a controller. As a result, it's also known as the *Model-View-Controller* (*MVC*) *pattern*.
- The *model* consists of business objects like the User object.
- The *view* consists of HTML pages and JSPs.
- The *controller* consists of servlets.
- The *data access layer* consists of classes like the UserDB class that read and write business objects like the User object to and from the data store.
- Try to construct each layer so it's as independent as possible.

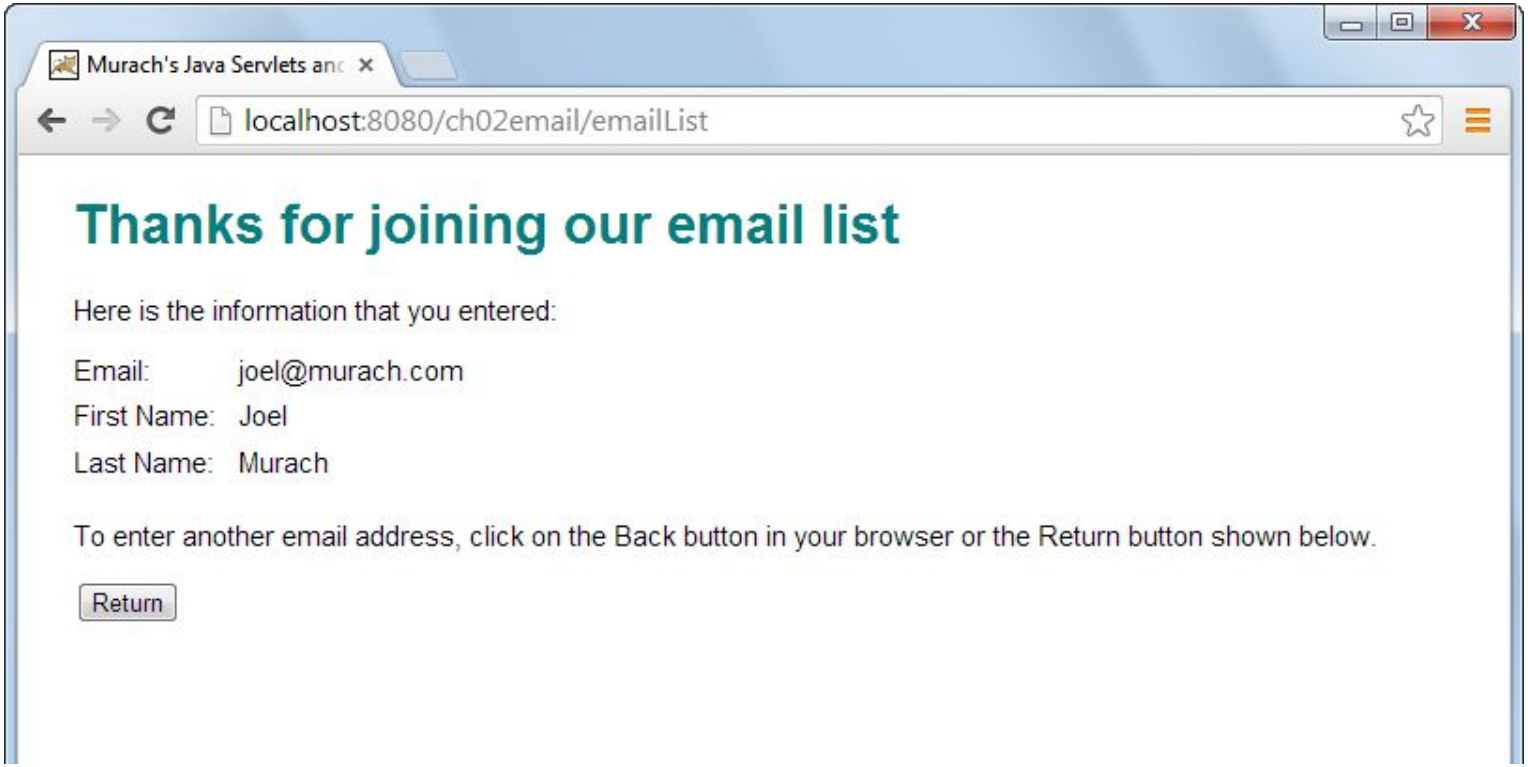
© 2014, Mike Murach & Associates, Inc.

The HTML page that gets data from the user



© 2014, Mike Murach & Associates, Inc.

The JSP that displays the data



© 2014, Mike Murach & Associates, Inc.

The index.html file

```
<!DOCTYPE html>
<html>
<head>
    <meta charset="utf-8">
    <title>Murach's Java Servlets and JSP</title>
    <link rel="stylesheet" href="styles/main.css" type="text/css"/>
</head>
<body>
    <h1>Join our email list</h1>
    <p>To join our email list, enter your name and
       email address below.</p>
```


© 2014, Mike Murach & Associates, Inc.

The index.html file (continued)

```
    <form action="emailList" method="post">
        <input type="hidden" name="action" value="add">

        <label>Email:</label>
        <input type="email" name="email" required><br>

        <label>First Name:</label>
        <input type="text" name="firstName" required><br>

        <label>Last Name:</label>
        <input type="text" name="lastName" required><br>

        <label> </label>
        <input type="submit" value="Join Now" id="submit">
    </form>
</body>
</html>
```


© 2014, Mike Murach & Associates, Inc.

The main.css file

```
body {
    font-family: Arial, Helvetica, sans-serif;
    font-size: 11pt;
    margin-left: 2em;
    margin-right: 2em;
}
h1 {
    color: teal;
}
label {
    float: left;
    width: 6em;
    margin-bottom: 0.5em;
}
input[type="text"], input[type="email"] {
    width: 15em;
    margin-left: 0.5em;
    margin-bottom: 0.5em;
}
br {
    clear: both;
}
#submit {
    margin-left: 0.5em; }
```


© 2014, Mike Murach & Associates, Inc.

The EmailListServlet class

```
package murach.email;

import java.io.*;
import javax.servlet.*;
import javax.servlet.http.*;

import murach.business.User;
import murach.data.UserDB;

public class EmailListServlet extends HttpServlet  {

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

        String url = "/index.html";

        // get current action
        String action = request.getParameter("action");
        if (action == null) {
            action = "join";  // default action
        }
```


© 2014, Mike Murach & Associates, Inc.

The EmailListServlet class (continued)

```
        // perform action and set URL to appropriate page
        if (action.equals("join")) {
            url = "/index.html";    // the "join" page
        }
        else if (action.equals("add")) {
            // get parameters from the request
            String firstName = request.getParameter("firstName");
            String lastName = request.getParameter("lastName");
            String email = request.getParameter("email");

            // store data in User object and save User object in db
            User user = new User(firstName, lastName, email);
            UserDB.insert(user);

            // set User object in request object and set URL
            request.setAttribute("user", user);
            url = "/thanks.jsp";   // the "thanks" page
        }

        // forward request and response objects to specified URL
        getServletContext()
            .getRequestDispatcher(url)
            .forward(request, response);
    }
```


© 2014, Mike Murach & Associates, Inc.

The EmailListServlet class (continued)

```
    @Override
    protected void doGet(HttpServletRequest request,
                         HttpServletResponse response)
                         throws ServletException, IOException {
        doPost(request, response);
    }
}
```


© 2014, Mike Murach & Associates, Inc.

The web.xml file

```
<?xml version="1.0" encoding="UTF-8"?>
<web-app version="3.1"
    xmlns="http://xmlns.jcp.org/xml/ns/javaee"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://xmlns.jcp.org/xml/ns/javaee
        http://xmlns.jcp.org/xml/ns/javaee/web-app_3_1.xsd">

    <servlet>
        <servlet-name>EmailListServlet</servlet-name>
        <servlet-class>murach.email.EmailListServlet</servlet-class>
    </servlet>
    <servlet-mapping>
        <servlet-name>EmailListServlet</servlet-name>
        <url-pattern>/emailList</url-pattern>
    </servlet-mapping>

    <session-config>
        <session-timeout>30</session-timeout>
    </session-config>
```


© 2014, Mike Murach & Associates, Inc.

The web.xml file (continued)

```
    <welcome-file-list>
        <welcome-file>index.html</welcome-file>
        <welcome-file>index.jsp</welcome-file>
    </welcome-file-list>

</web-app>
```


© 2014, Mike Murach & Associates, Inc.

The User class

```
package murach.business;

import java.io.Serializable;

public class User implements Serializable {
    private String firstName;
    private String lastName;
    private String email;

    public User() {
        firstName = "";
        lastName = "";
        email = "";
    }

    public User(String firstName, String lastName, String email) {
        this.firstName = firstName;
        this.lastName = lastName;
        this.email = email;
    }
```


© 2014, Mike Murach & Associates, Inc.

The User class (continued)

```
    public String getFirstName() {
        return firstName;
    }

    public void setFirstName(String firstName) {
        this.firstName = firstName;
    }

    public String getLastName() {
        return lastName;
    }

    public void setLastName(String lastName) {
        this.lastName = lastName;
    }

    public String getEmail() {
        return email;
    }

    public void setEmail(String email) {
        this.email = email;
    }
}
```


© 2014, Mike Murach & Associates, Inc.

The thanks.jsp file

```
<!doctype html>
<html>
<head>
    <meta charset="utf-8">
    <title>Murach's Java Servlets and JSP</title>
    <link rel="stylesheet" href="styles/main.css" type="text/css"/>
</head>

<body>
    <h1>Thanks for joining our email list</h1>

    <p>Here is the information that you entered:</p>

    <label>Email:</label>
    <span>${user.email}</span><br>
    <label>First Name:</label>
    <span>${user.firstName}</span><br>
    <label>Last Name:</label>
    <span>${user.lastName}</span><br>
```


© 2014, Mike Murach & Associates, Inc.

The thanks.jsp file (continued)

```
<p>To enter another email address, click on the Back
    button in your browser or the Return button shown
    below.</p>

    <form action="" method="get">
        <input type="hidden" name="action" value="join">
        <input type="submit" value="Return">
    </form>

</body>
</html>
```


© 2014, Mike Murach & Associates, Inc.

Types of files in the MVC pattern

- An HTML file contains tags that define the content of the web page.
- A *CSS* (*Cascading Style Sheet*) file contains the formatting for the web pages.
- *Servlets* contain Java code for a web application. When a servlet controls the flow of the application, it's known as a *controller*.
- The web.xml file, or *deployment descriptor* (*DD*), describes how the web application should be configured when it's deployed.
- A *JavaBean*, or *bean*, is a Java class that (1) provides a zero-argument constructor, (2) provides get and set methods for all of its instance variables, and (3) implements the Serializable or Externalizable interface.
- A *JavaServer Page* (*JSP*) consists of special Java tags such as *Expression Language* (*EL*) tags that are embedded within HTML code. An EL tag begins with a dollar sign ($).

© 2014, Mike Murach & Associates, Inc.