What you will learn in Topic 2

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Topic 2: Introduction to Spring MVC

- Spring MVC - Building Spring Web Apps
- Spring MVC - Creating Controllers and Views
- Spring MVC - Request Params and Request Mappings
- Spring MVC - Form Tags and Data Binding
- Spring MVC Form Validation - Applying Built-In Validation Rules
- Spring MVC Form Validation - Validating Number Ranges and Regular Expressions
- Spring MVC Form Validation - Creating Custom Validation Rules

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What is Spring MVC? ?

Spring MVC in a Nutshell

- Framework for building web applications in Java
- Based on Model-View-Controller design pattern
- Leverages features of the Core Spring Framework (IoC, DI)

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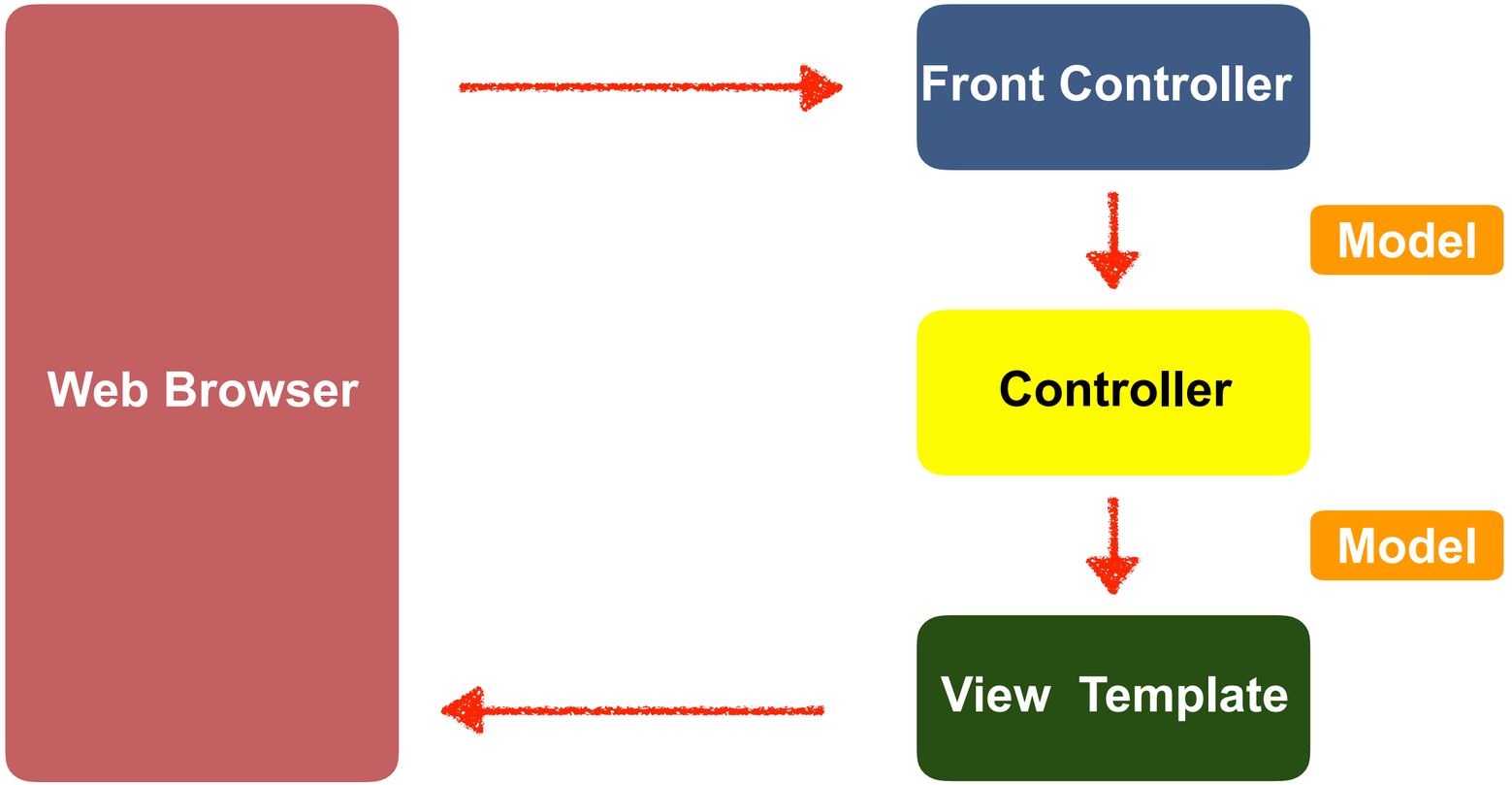
Model-View-Controller (MVC)



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Spring MVC Benefits

- The Spring way of building web app UIs in Java
- Leverage a set of reusable UI components
- Help manage application state for web requests
- Process form data: validation, conversion etc
- Flexible configuration for the view layer

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Spring MVC Documentation

https://docs.spring.io/spring/docs/current/spring-framework-reference/web.html#mvc

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Spring MVC Behind the Scenes

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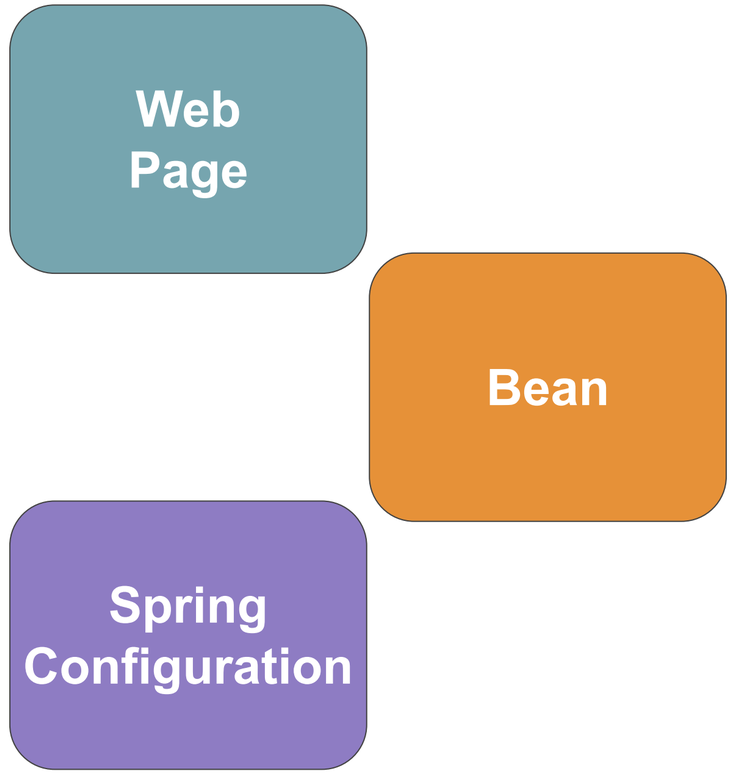
Components of a Spring MVC Application

- A set of web pages to layout UI components
- A collection of Spring beans (controllers, services, etc…)
- Spring configuration (XML, Annotations or Java)



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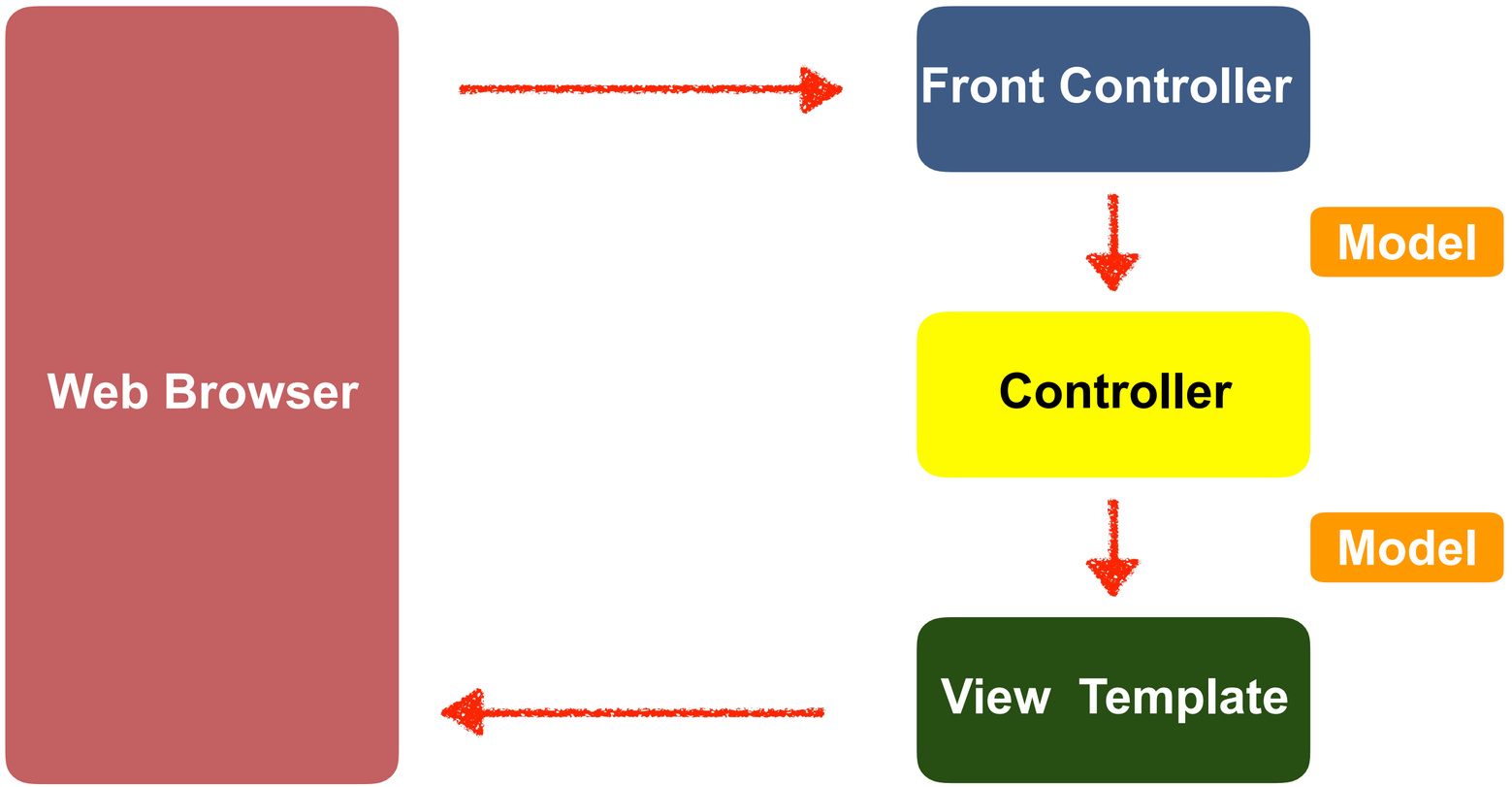
How Spring MVC Works Behind the Scenes



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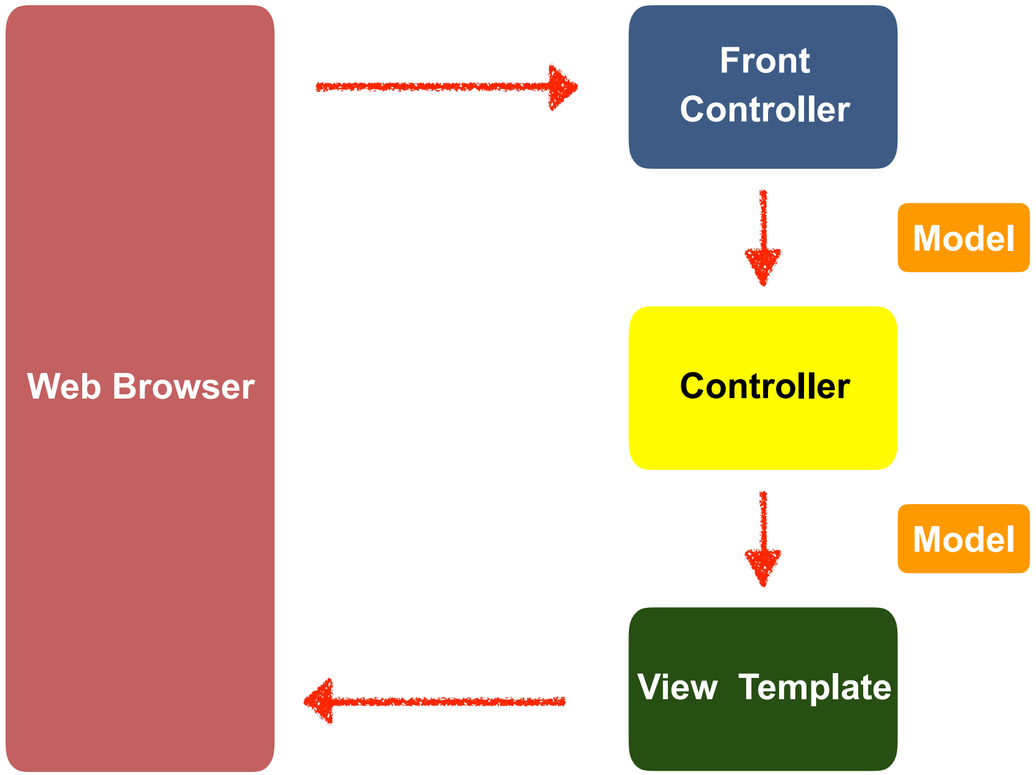
Spring MVC Front Controller

Front controller known as DispatcherServlet

- Part of the Spring Framework
- Already developed by Spring Dev Team

You will create

- **M**odel objects (orange)
- **V**iew templates (dark green)
- **C**ontroller classes (yellow)



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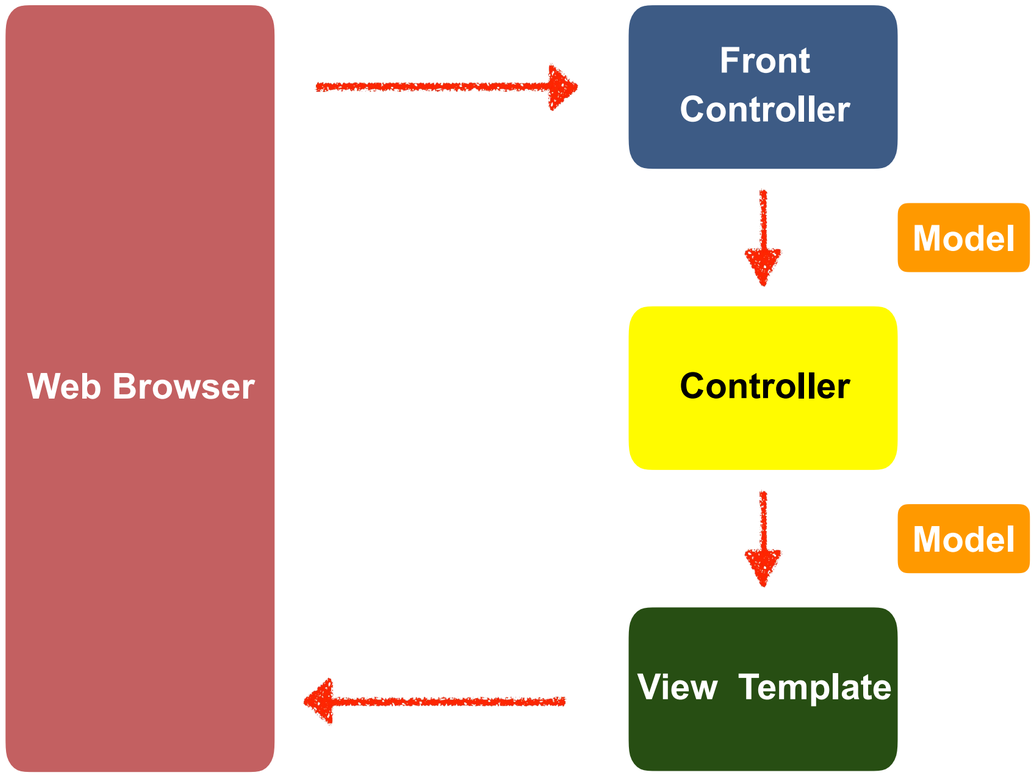
Controller

Code created by developer

- Contains your business logic
- Handle the request
- Store/retrieve data (db, web service…)
- Place data in model
- Send to appropriate view template



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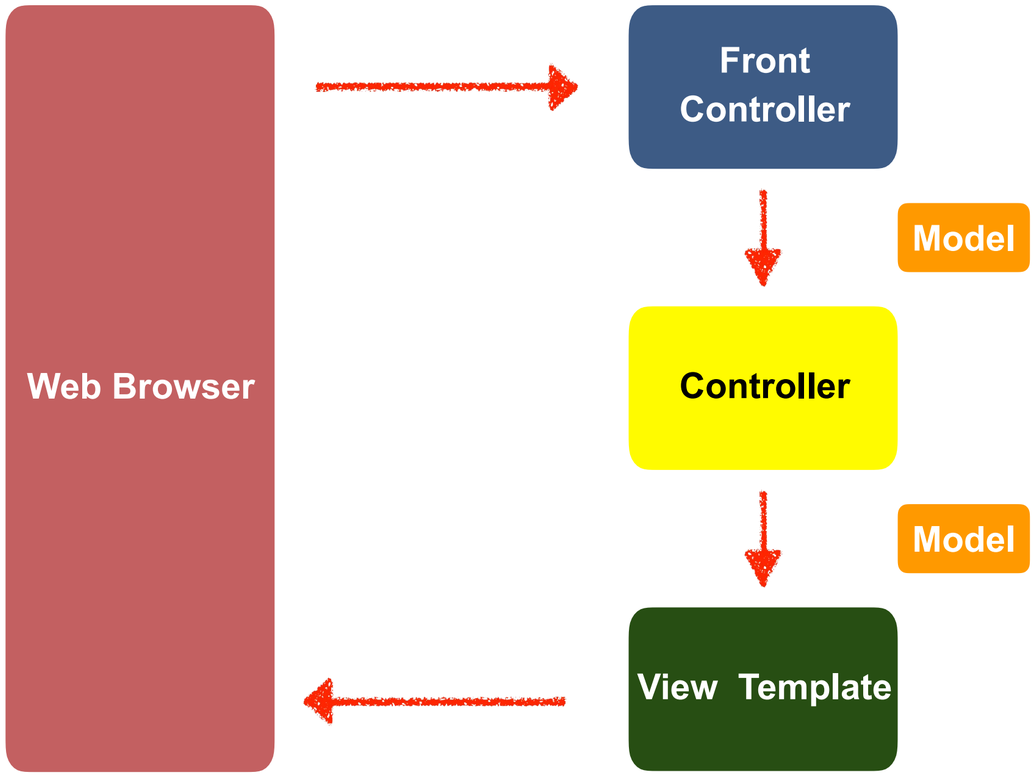
Model

- Model: contains your data
- Store/retrieve data via backend systems
  - database, web service, etc…
  - Use a Spring bean if you like
- Place your data in the model
  - Data can be any Java object/collection



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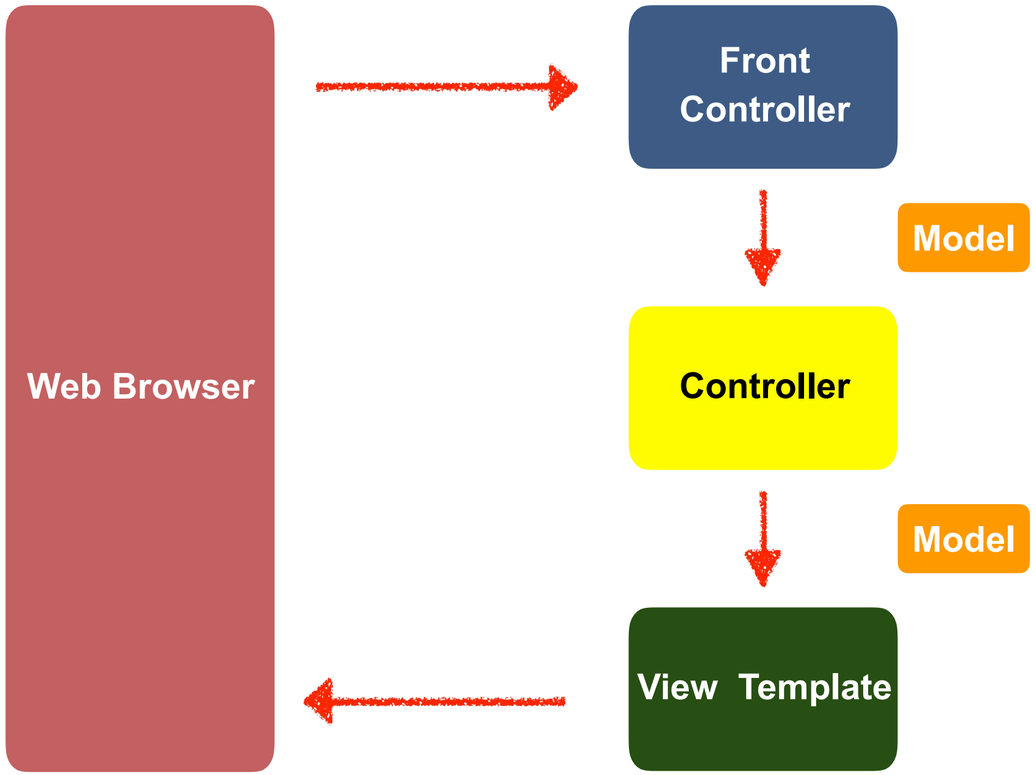
View Template

- Spring MVC is flexible
  - Supports many view templates
- Most common is **JSP** + **JSTL**
- Developer creates a page
  - Displays data



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View Template (more)

- Other view templates supported
  - Thymeleaf, Groovy
  - Velocity, Freemarker, etc…
- For details, see:

https://docs.spring.io/spring/docs/current/spring-framework-reference/web.html#mvc-view

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Dev Environment Check Point

At this point of the course you should have installed:

- Apache Tomcat 8.03
- Eclipse (Java EE version)
- Connected Eclipse to Tomcat

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Dev Environment Check Point

Additional Things To Do:

- Download the **Jars** necessary for annotations, and validation from Github

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Spring MVC Configuration

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Spring MVC Configuration Process - Part 1

Add configurations to file: **WEB-INF/web.xml**

1. Configure Spring MVC Dispatcher Servlet

2. Set up URL mappings to Spring MVC Dispatcher Servlet

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Spring MVC Configuration Process - Part 2

Add configurations to file: **WEB-INF/spring-mvc-servlet.xml**

3. Add support for Spring component scanning

4. Add support for conversion, formatting and validation

5. Configure Spring MVC View Resolver

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Step 1: Configure Spring DispatcherServlet

File: web.xml

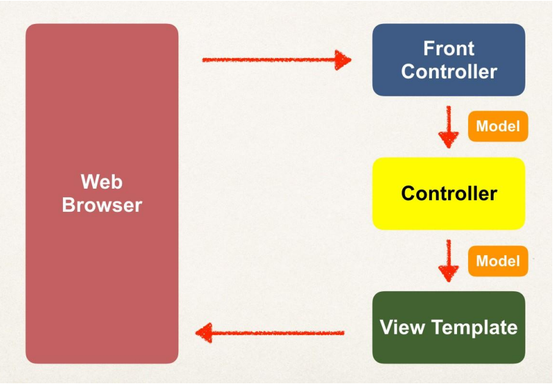
```
<web-app>

    <servlet>
        <servlet-name>dispatcher</servlet-name>
        <servlet-class>org.springframework.web.servlet.DispatcherServlet</servlet-class>

        <init-param>
            <param-name>contextConfigLocation</param-name>
            <param-value>/WEB-INF/spring-mvc-servlet.xml</param-value>
        </init-param>

        <load-on-startup>1</load-on-startup>
    </servlet>

</web-app>
```



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Step 2: Set up URL mappings to Spring MVC Dispatcher Servlet

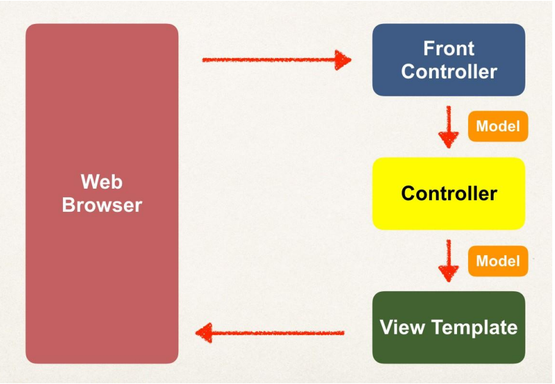
File: web.xml

```
<web-app>

    <servlet>
        <servlet-name>dispatcher</servlet-name>
        <servlet-class>org.springframework.web.servlet.DispatcherServlet</servlet-class>
        ...
    </servlet>

    <servlet-mapping>
        <servlet-name>dispatcher</servlet-name>
        <url-pattern>/</url-pattern>
    </servlet-mapping>

</web-app>
```



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Step 3: Add support for Spring component scanning

File: spring-mvc-servlet.xml

```
<beans>

    <!-- Step 3: Add support for component scanning -->
    <context:component-scan base-package="edu.javaweb.spring.mvc" />

</beans>
```

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Step 4: Add support for conversion, formatting and validation

File: spring-mvc-servlet.xml

```
<beans>

    <!-- Step 3: Add support for component scanning -->
    <context:component-scan base-package="edu.javaweb.spring.mvc" />

    <!-- Step 4: Add support for conversion, formatting and validation support -->
    <mvc:annotation-driven/>

</beans>
```

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Step 5: Configure Spring MVC View Resolver

File: spring-mvc-servlet.xml

```
<beans>

    <!-- Step 3: Add support for component scanning -->
    <context:component-scan base-package="edu.javaweb.spring.mvc" />

    <!-- Step 4: Add support for conversion, formatting and validation support -->
    <mvc:annotation-driven/>

    <!-- Step 5: Define Spring MVC view resolver -->
    <bean
        class="org.springframework.web.servlet.view.InternalResourceViewResolver">
        <property name="prefix" value="/WEB-INF/view/" />
        <property name="suffix" value=".jsp" />
    </bean>
</beans>
```

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View Resolver Configs - Explained

When your app provides a “view” name, Spring MVC will

- prepend the prefix
- append the suffix

```
<bean
        class="org.springframework.web.servlet.view.InternalResourceViewResolver">
        <property name="prefix" value="/WEB-INF/view/" />
        <property name="suffix" value=".jsp" />
</bean>
```

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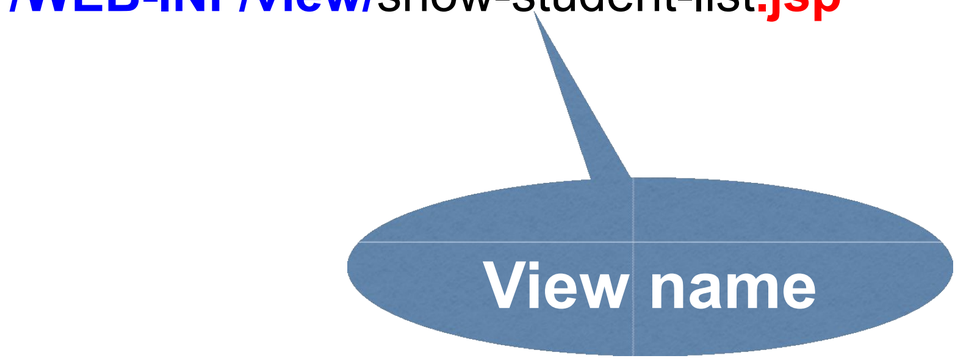
View Resolver Configs - Explained

```
<bean
        class="org.springframework.web.servlet.view.InternalResourceViewResolver">
        <property name="prefix" value="/WEB-INF/view/" />
        <property name="suffix" value=".jsp" />
</bean>
```



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Summary of Spring Config:

- Two steps in **WEB-INF/web.xml**
- Three steps in our xml config

Check **spring-mvc- demo1-config-files**

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Assignment 8

Configure the Spring Dispatcher Servlet using all Java Code (no xml).html

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Creating Controllers and Views

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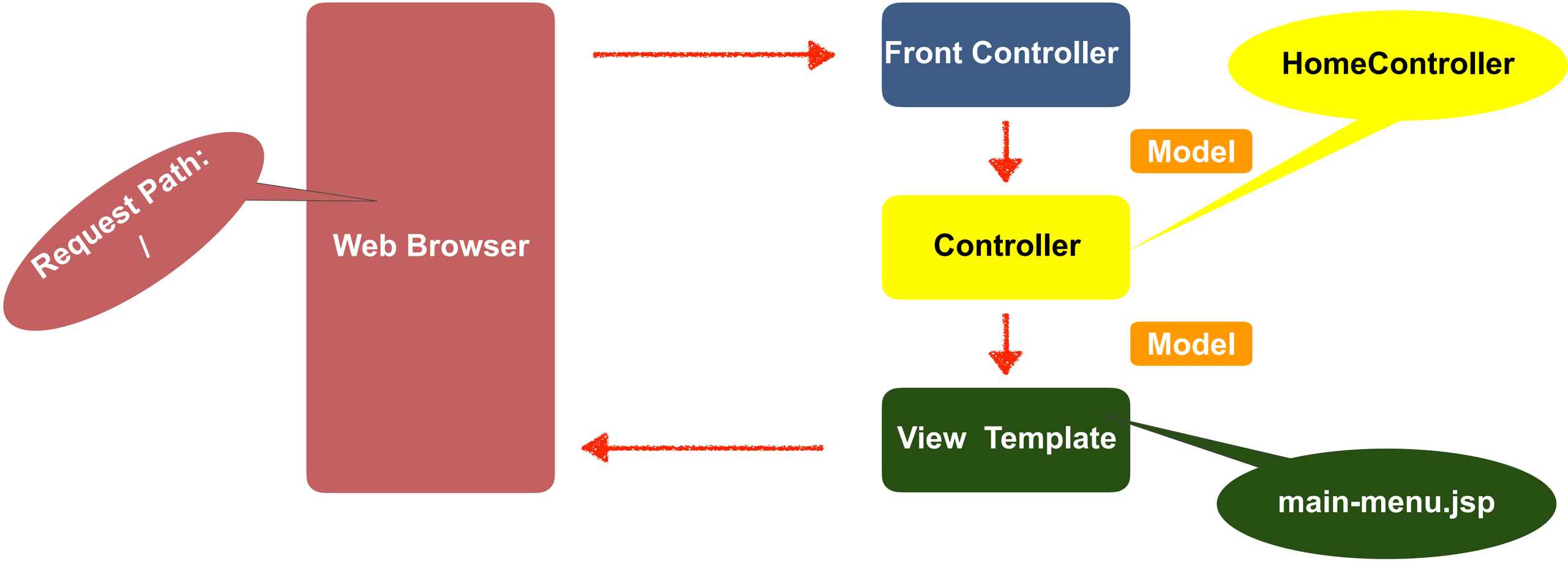
Our First Spring MVC Example



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Development Process

1.Create Controller class

2.Define Controller method

3.Add Request Mapping to Controller method

4.Return View Name

5.Develop View Page

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Step 1: Create Controller class

Annotate class with **@Controller**

- **@Controller** inherits from @Component … supports scanning

```
@Controller
public class HomeController {

                                                    }
```

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Step 2: Define Controller method

```
@Controller
public class HomeController {

    public String showMyPage() {
...
                                    }

}
```

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Step 3: Add Request Mapping to Controller method

```
@Controller
public class HomeController {
    @Request  Mapping("/")
        public String showMyPage() {
                ...
    }

}
```

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Step 4: Return View Name

```
@Controller
public class HomeController {

        @RequestMapping("/")
        public String showMyPage() {
                        return "main-menu";
            }

}
```

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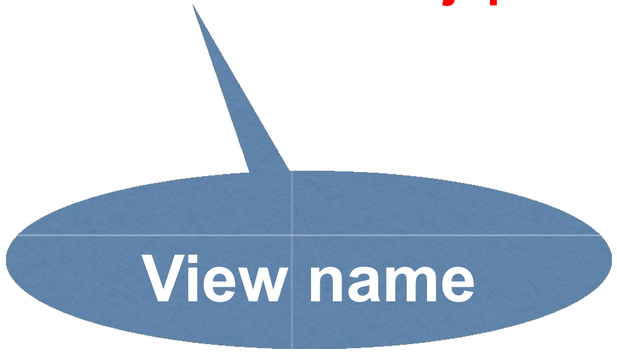
Finding the View Page

```
<bean
        class="org.springframework.web.servlet.view.InternalResourceViewResolver">
        <property name="prefix" value="/WEB-INF/view/" />
        <property name="suffix" value=".jsp" />
</bean>
```

/WEB-INF/view/main-menu.jsp




```
@Controller
public class HomeController {

        @RequestMapping("/")
        public String showMyPage() {
                return "main-menu";
            }
}
```

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Step 5: Develop View Page

File: /WEB-INF/view/main-menu.jsp

```
<html>
    <body>

    <h2>Spring MVC Demo - Home Page</h2>

    </body>
</html>
```

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Recap - Development Process

1.Create Controller class

2.Define Controller method

3.Add Request Mapping to Controller method

4.Return View Name

5.Develop View Page

Check **spring-mvc-demo2-create-home-controller-and-view**

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Assignment 9

Use CSS, JavaScript and Images in Spring MVC Web App.html

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Reading Form Data with Spring MVC

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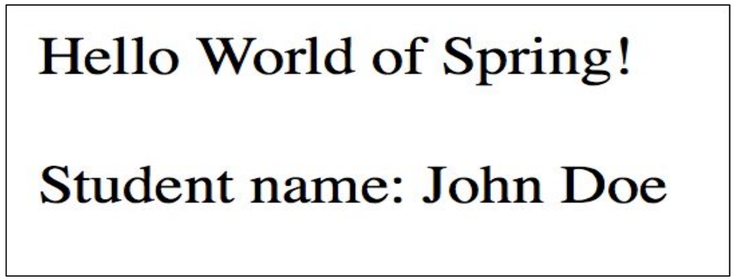
High Level View

helloworld-form.jsp

helloworld.jsp



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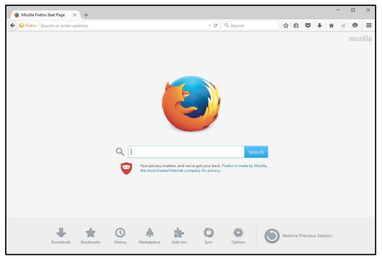
Application Flow



Request Mapping
/showForm

HelloWorld Controller

helloworld-form.jsp

What's your name? Submit Query

helloworld-form.jsp

What's your name? Submit Query

Request Mapping
/processForm

HelloWorld Controller

helloworld.jsp

Hello World of Spring!

Student name: John Doe

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Controller Class

```
@Controller
public class HelloWorldController {
    // need a controller method to show the initial HTML form
    @RequestMapping("/showForm")
    public String showForm() {
        return "helloworld-form";
    }
    // need a controller method to process the HTML form
    @RequestMapping("/processForm")
    public String processForm() {
        return "helloworld";
    }
}
```

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Development Process

1. **Create Controller class**

2. **Show HTML form**
   a. Create controller method to show HTML Form
   b. Create View Page for HTML form

3. **Process HTML Form**
   a. Create controller method to process HTML Form
   b. Develop View Page for Confirmation

Check **spring-mvc- demo3-reading-html-form-data**

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Adding Data to Spring Model

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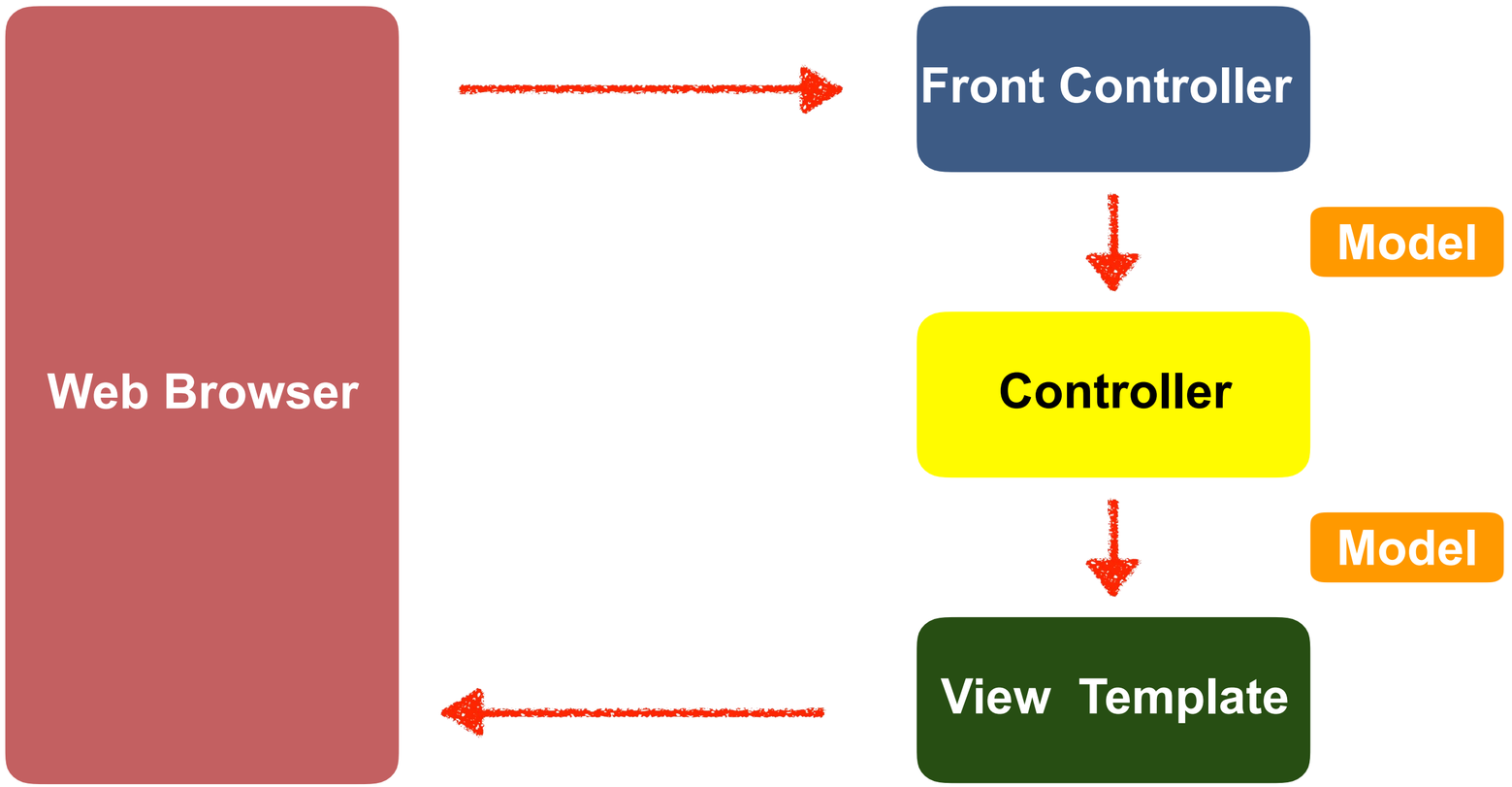
Focus on the Model



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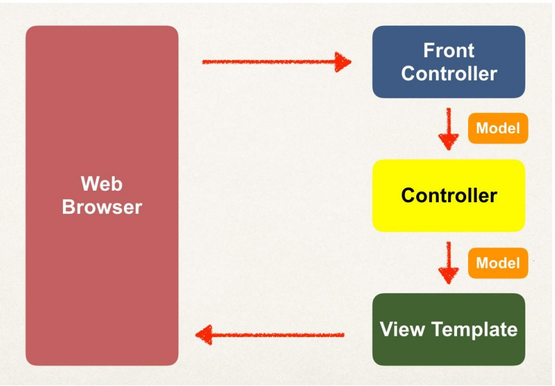
Spring Model

- The **Model** is a container for your application data
- In your Controller
  - You can put anything in the **model**
  - strings, objects, info from database, etc…
- Your View page (JSP) can access data from the **model**



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Code Example

- We want to create a new method to process form data
- Read the form data: student's name
- Convert the name to uppercase
- Add the uppercase version to the model

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Passing Model to your Controller

```
@RequestMapping("/processFormVersionTwo")
public String letsShoutDude(HttpServletRequest request, Model model) {

    // read the request parameter from the HTML form
    String theName = request.getParameter("studentName");
    // convert the data to all caps
    theName = theName.toUpperCase();
    // create the message
    String result = "Yo! " + theName;
    // add message to the model
    model.addAttribute("message", result);

    return "helloworld";
}
```

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View Template - JSP

```
<html>
    <body>

        Hello World of Spring!
        ...

        The message: ${message}

        </body>
</html>
```

Check **spring-mvc- demo4-adding-data-to-the-spring-model**

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Adding more data to your Model

```
// get the data
//
String result = …
List<Student> theStudentList = …
ShoppingCart theShoppingCart = …

// add data to the model
//
model.addAttribute("message", result);
model.addAttribute("students", theStudentList);
model.addAttribute("shoppingCart", theShoppingCart);
```

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Assignment 10

Add a shoppingcart class, with at least attributes: item name and its price
Add a form text that has at least three text inputs then submit them using the the HttpServerletRequest
Finally, display your shopping items, and the sum of the items.

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Reading HTML Form Data with **@RequestParam** Annotation

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Instead of using HttpServletRequest

```
@RequestMapping("/processFormVersionTwo")
public String letsShoutDude(HttpServletRequest request, Model model) {

    // read the request parameter from the HTML form
    String theName = request.getParameter("studentName");

    ...
}
```

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Bind variable using @RequestParam Annotation

```
@RequestMapping("/processFormVersionTwo")
    public String letsShoutDude(
        @RequestParam("studentName") String theName,  Model model) {

    // now we can use the variable: theName

}
```

Behind the scenes:

- **Spring will read param from request: studentName**
- **Bind it to the variable: theName**

Check **spring-mvc- demo5-binding-request-params**

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Add **@RequestMapping** to Controller

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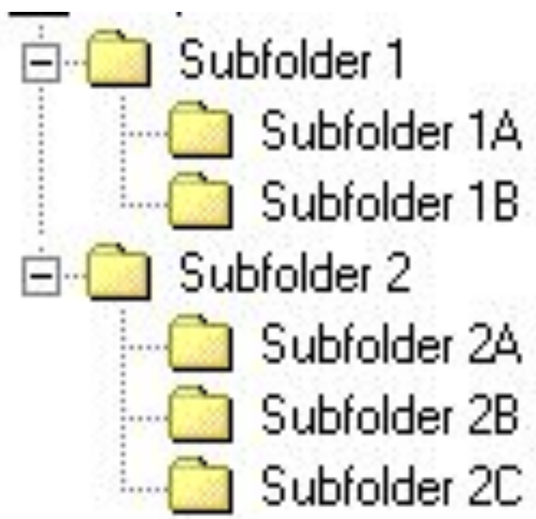
Adding Request Mappings to Controller

- Serves as parent mapping for controller
- All request mappings on methods in the controller are relative
- Similar to folder directory structures



Topic 2, Spring MVC - Request Params and Request Mappings

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Controller Request Mapping

```
@RequestMapping("/funny")
public class FunnyController {

    @RequestMapping("/showForm")
    public String showForm() {
    ...
    }

    @RequestMapping("/processForm")
    public String process(HttpServletRequest request, Model model) {
    ...
    }
}
```

Controller Mapping

/funny/showForm

/funny/processForm

Check **spring-mvc- demo6-controller-level-mappings**

Topic 2, Spring MVC - Form Tags and Data Binding

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Spring MVC Form Tags

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Review HTML Forms

- HTML Forms are used to get input from the user

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Spring MVC Form Tags

- Spring MVC Form Tags are the building block for a web page

- Form Tags are configurable and reusable for a web page

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Data Binding

- Spring MVC Form Tags can make use of data binding

- Automatically setting / retrieving data from a Java object / bean

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Spring MVC Form Tags

- Form tags will generate HTML for you :-)

Form Tag	Description
form:form	Main form container
form:input	Text field
form:textarea	Multi-line text filed
form:checkbox	Check box
form:radiobutton	Radio buttons
Form:select	Drop down list
more….	