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Welcome to possible

Spring MVC

Objectives

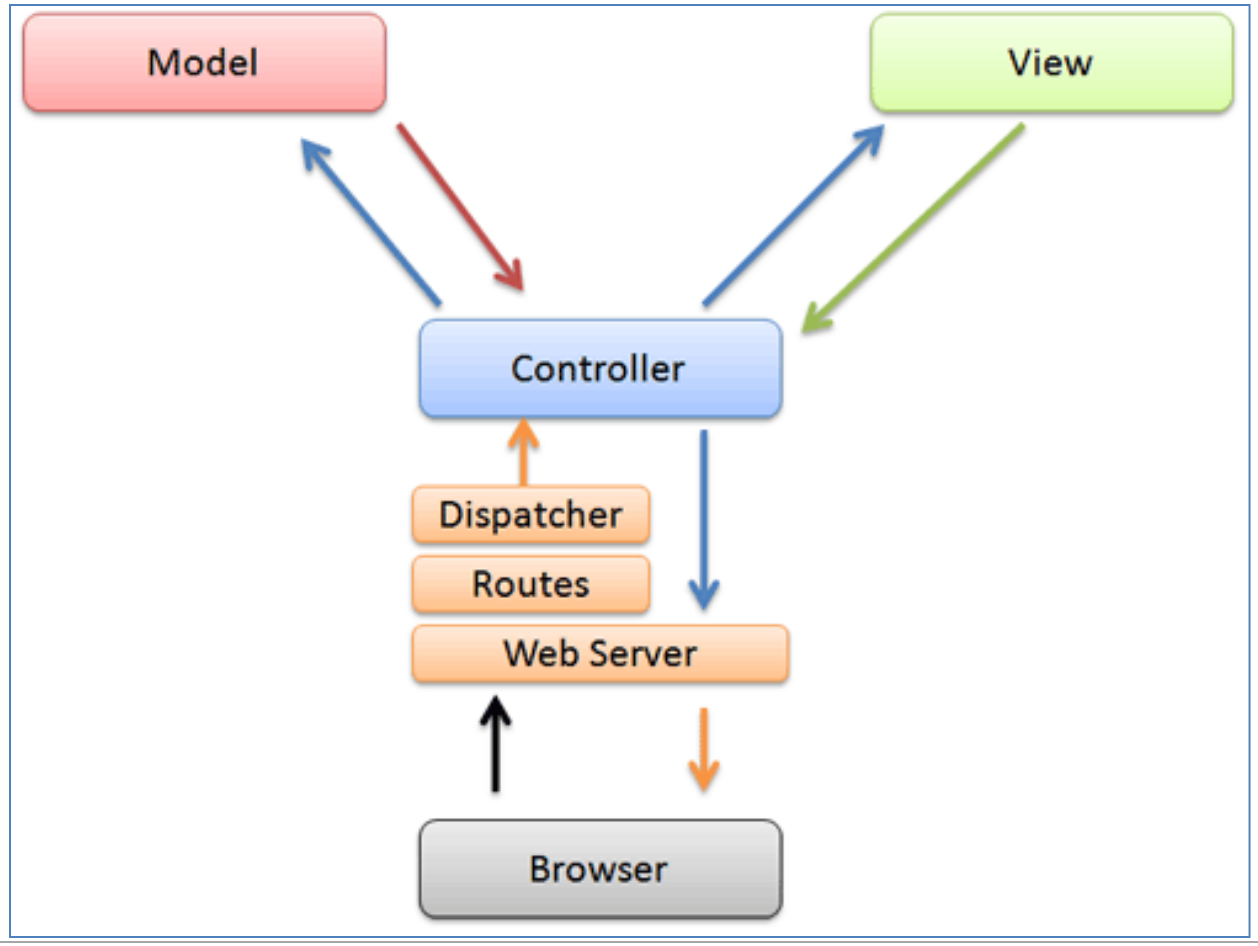
- Overview of MVC Paradigm
- Understand the components of Spring MVC
- Implementing a basic controller
- Creating a Simple view
- Configuring a Spring MVC application
- Understand Spring 3 MVC
- Annotating Controller’s and RequestMapping

Model View Controller (MVC)

- MVC = Model-View-Controller
  - Clearly separates business, navigation and presentation logic
  - Proven mechanism for building a thin and clean web-tier.
- Three core collaborating components
  - Controller
    - Handles navigation logic and interacts with the service tier for business logic
  - Model
    - The contract between the Controller and the View
    - Contains the data needed to render the View
    - Populated by the Controller
  - View
    - Renders the response to the request
    - Pulls data from the model

Model View Controller (MVC)

- MVC Components



Model View Controller (MVC)

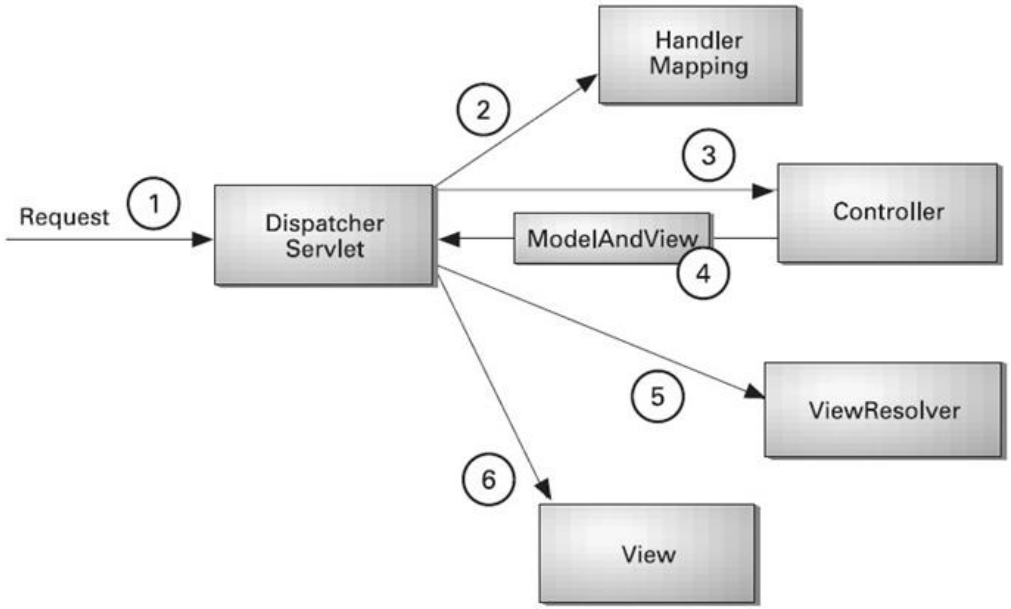
- Motivation
  - Eases maintenance burden
    - Changes to business logic are less likely to break the presentation logic
    - Changes to presentation logic also does not break business logic.
  - Facilitates multi-disciplined team development
    - Developers can focus on creating robust business code without having to worry about breaking the UI
    - Designers can focus on building usable and engaging UIs without worrying about Java
  - Use the best tool for the job
    - Java is especially suited to creating business logic code
    - Markup or template languages are more suited to creating HTML layouts.
  - Ease testability
    - Business and navigation logic are separated from presentation logic meaning they can be tested separately
    - Practically: you can test more code outside the Servlet container

Spring MVC

- Core Components of Spring MVC

  - DispatcherServlet
    - Spring’s Front Controller implementation. Request routing is completely controlled by the Front Controller. As an application developer, you will have to just configure the DispatcherServlet in web.xml
  - Controller
    - An application developer created component for handling requests.
    - Controllers are POJOs which are managed by Spring ApplicationContext just like any other bean
    - Controllers encapsulates navigation logic.
  - View
    - An application developer created pages responsible for rendering output.

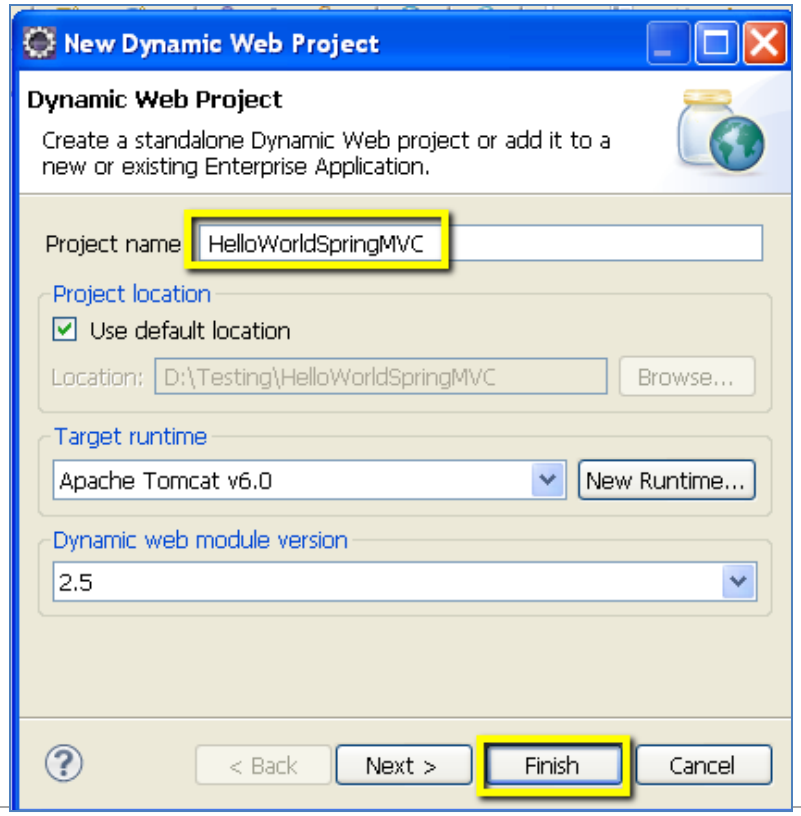
Spring MVC

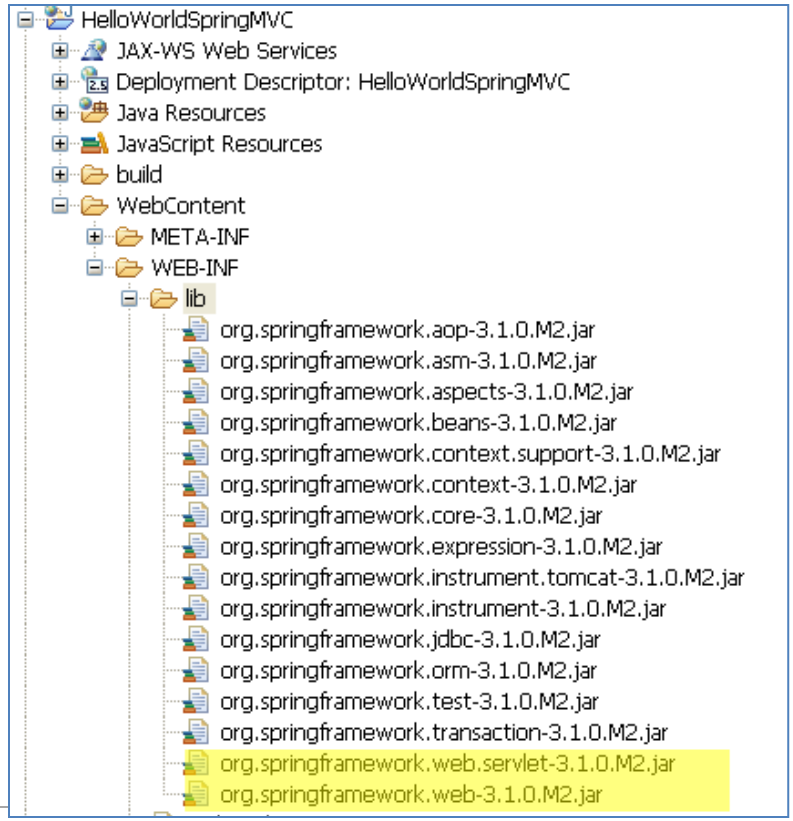


1. The DispatcherServlet first receives the request
2. The DispatcherServlet consults the HandlerMapping and invokes the Controller associated with the request
3. The Controller process the request by calling the appropriate service methods
4. The Controller returns a ModeAndView object to the DispatcherServlet. The ModeAndView object contains the model data and the view name.
5. The DispatcherServlet sends the view name to a ViewResolver to find the actual View to invoke.
6. Now the DispatcherServlet will pass the model object to the View to render the result.The View with the help of the model data will render the result back to the user

Writing your first Spring MVC Web application

- Step 1.
  - Create a Dynamic Web Project
  - Copy Spring jar files to WEB-INF\lib folder





Writing your first Spring MVC Web application

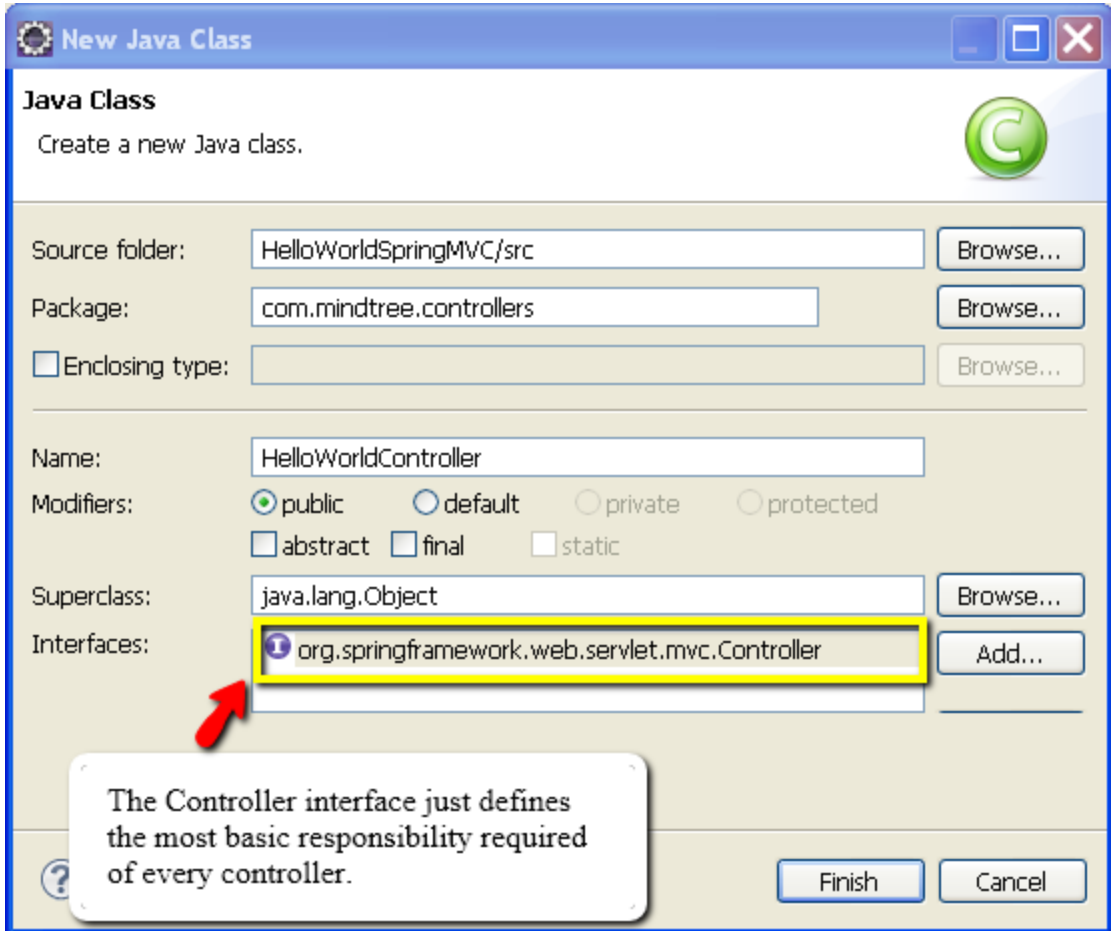
- Step 2
  - Configure DispatcherServlet (FrontController).
    - Requests that you want the DispatcherServlet to handle will have to be mapped using a URL mapping in the same web.xml file.
    - We have configured all requests ending with ".view" will be handled by the 'dispatcher' DispatcherServlet.

```
<servlet>
      <servlet-name>dispatcher</servlet-name>
      <servlet-class>org.springframework.web.servlet.DispatcherServlet</servlet-class>
      <load-on-startup>1</load-on-startup>
  </servlet>

  <servlet-mapping>
      <servlet-name>dispatcher</servlet-name>
      <url-pattern>*.view</url-pattern>
  </servlet-mapping>
```

Writing your first Spring MVC Web application

- Step 3
  - Adding Controller



Writing your first Spring MVC Web application

- Step 4: Coding your controller

```
/**
 * @author Banu Prakash
 * © 2011 MindTree Limited
 */
public class HelloWorldController implements Controller {
    protected final Logger logger = Logger.getLogger(getClass());
    @Override
    public ModelAndView handleRequest(HttpServletRequest request,
            HttpServletResponse response) throws Exception {
            logger.info("returning hello view with Model data");
            Map<String, Object> model = new HashMap<String, Object>();
            // populate some book list. generally this data comes from service layer
            List<String> books = new ArrayList<String>();
            books.add("Spring in Action");
            books.add("Hibernate in Action");
            books.add("Head First Java");
            // Add date and book information to model
            model.put("now", new Date());
            model.put("bookList", books);
            //return ModelAndView(viewName, modelParameterName, modelParameterValue)
            return new ModelAndView("hello", "model", model);
    }
}
```

Writing your first Spring MVC Web application

- Step 5:Configure the Controller class
  - Here the Servlet name is *dispatcher*. By default the *DispatcherServlet* will look for a file name *dispatcher-servlet.xml* to load the Spring MVC configuration. This file name is formed by concatenating the Servlet name ("*dispatcher*") with "*-servlet.xml*".

WEB-INF/web.xml

```
<servlet>
      <servlet-name>dispatcher</servlet-name>
      <servlet-class>org.springframework.web.servlet.DispatcherServlet</servlet-class>
      <load-on-startup>1</load-on-startup>
</servlet>
```

WEB-INF/dispatcher-servlet.xml

```
<beans xmlns="http://www.springframework.org/schema/beans"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://www.springframework.org/schema/beans
         http://www.springframework.org/schema/beans/spring-beans-3.0.xsd">

    <bean name="/HelloWorld.view" class="com.mindtree.controllers.HelloWorldController"/>
</beans>
```

BeanNameUrlHandlerMapping maps the bean name "/HelloWorld.view" to HelloWorldController

Writing your first Spring MVC Web application

- Step 6:Configure ViewResolver

WEB-INF/dispatcher-servlet.xml

```
<beans xmlns="http://www.springframework.org/schema/beans"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://www.springframework.org/schema/beans
         http://www.springframework.org/schema/beans/spring-beans-3.0.xsd">

    <!-- configure controller -->
    <bean name="/HelloWorld.view" class="com.mindtree.controllers.HelloWorldController" />

    <!-- configure view resolver -->
    <bean id="viewResolver"
        class=" org.springframework.web.servlet.view.InternalResourceViewResolver">
        <property name="prefix" value="/WEB-INF/pages/" />
        <property name="suffix" value=".jsp" />
    </bean>

</beans>
```

- When the controller returns “hello” as the view name, the viewResolver adds “/WEB-INF/pages” as prefix to “hello” and adds “.jsp” as suffix.
- The view now becomes “/WEB-INF/pages/hello.jsp”

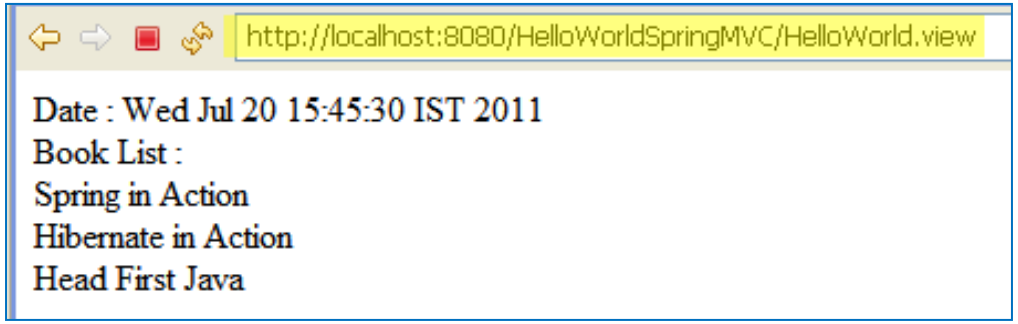
Writing your first Spring MVC Web application

- Step 7:Writing view

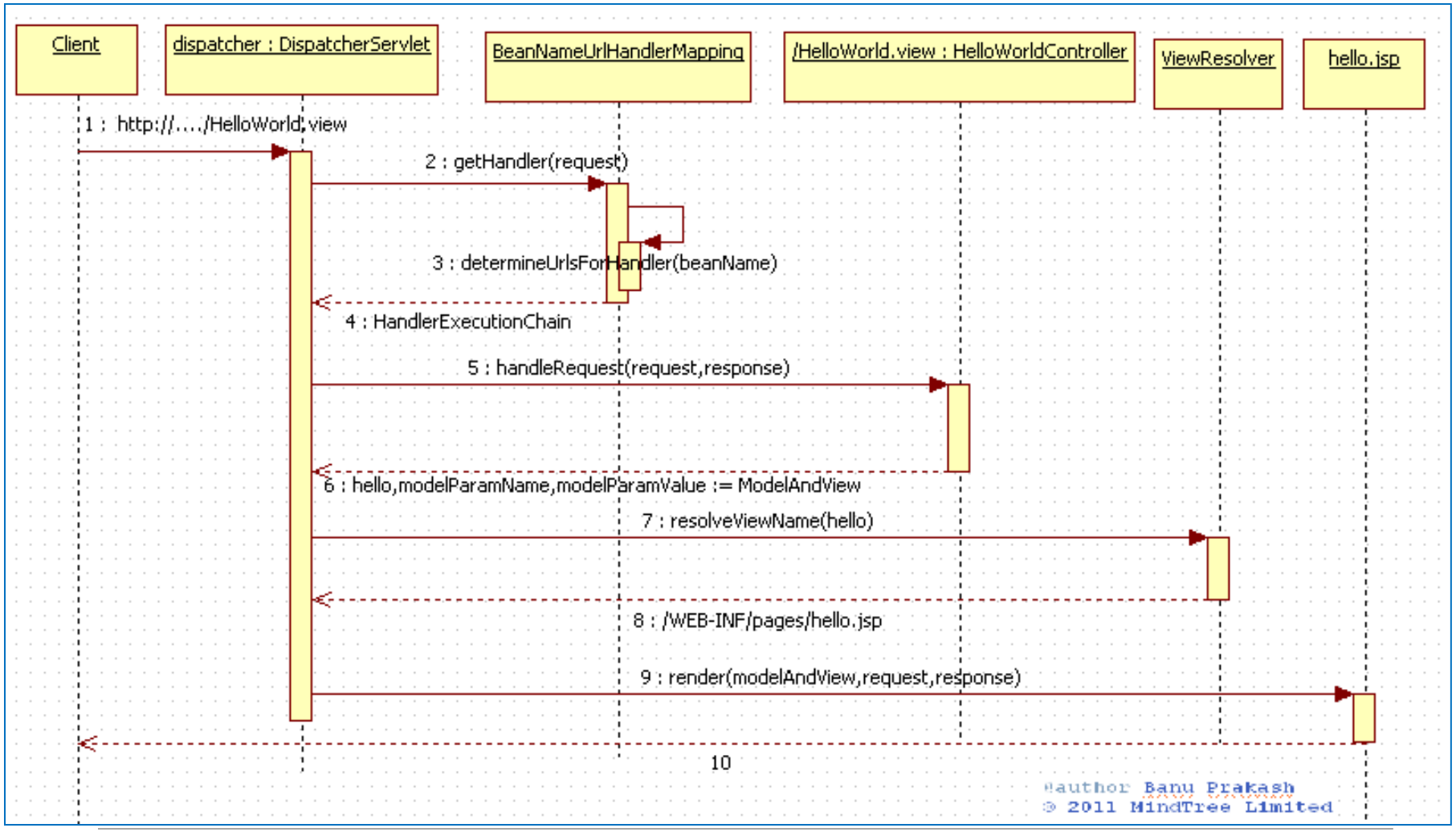
WEB-INF/pages/hello.jsp

```
<body>
    Date : ${requestScope.model.now}<br />
    Book List : <br />
    <c:forEach items="${requestScope.model.bookList}" var="book">
        <c:out value="${book}" /> <br />
    </c:forEach>
</body>
```

- The HelloWorldController returns
  - ModelAndView("hello", "model", model); where “hello” was the view name, “model” was the attribute name stored in request scope.



Sequence diagram for our HelloWorld Spring MVC



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Spring MVC using annotations.

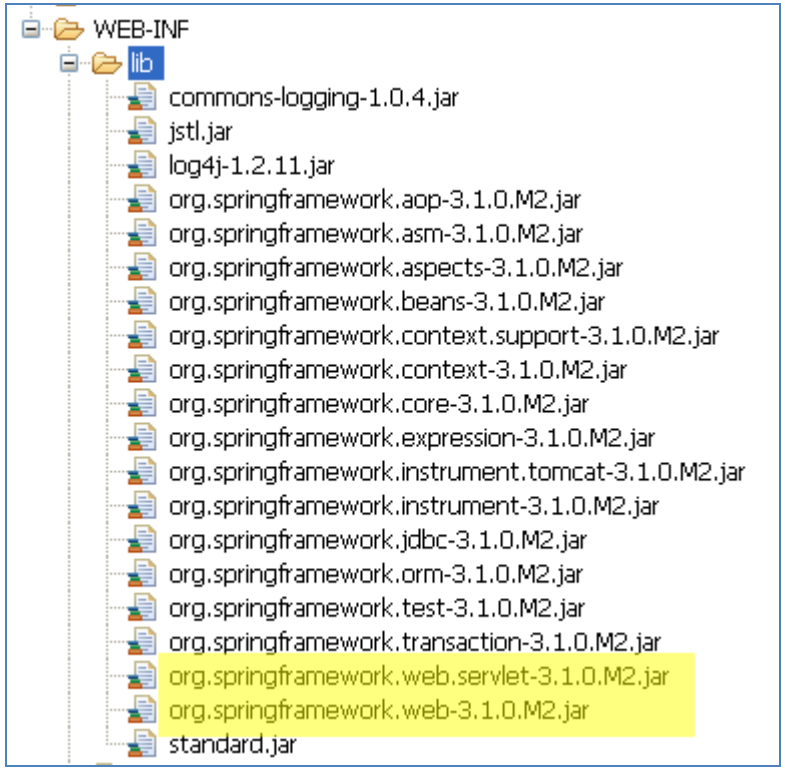
Spring version 3.x style

Spring 3 MVC

- Why Spring 3 MVC?
  - Spring 3 introduces a mvc namespace that greatly simplifies Spring MVC setup.
    - Using mvc namespace Controllers, ViewResoulvers, interceptors and resources configuration becomes that much easier.
  - No changes to the DispatcherServlet configuration in web.xml
  - Many other enhancements makes it easier to get Spring 3.x web applications up and running.

Spring 3 MVC

- Step 1
  - Create a Dynamic Web Project
  - Add Spring 3 Libraries to WEB-INF/lib folder



Spring libraries required for building Spring MVC application

Spring 3 MVC

- Step 2
  - Configure DispatcherServlet in web.xml [this remains the same for every version of spring MVC application]

```
<servlet>
    <servlet-name>dispatcher</servlet-name>
    <servlet-class>org.springframework.web.servlet.DispatcherServlet</servlet-class>
    <load-on-startup>1</load-on-startup>
</servlet>

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

  - The DispatcherServlet is configured as the default Servlet for the application (mapped to "/")

Spring 3 MVC

- Step 3 :Configure Controllers and View Resolver

```
<beans xmlns="http://www.springframework.org/schema/beans"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xmlns:mvc="http://www.springframework.org/schema/mvc"
    xmlns:context="http://www.springframework.org/schema/context"
    xsi:schemaLocation="http://www.springframework.org/schema/beans
         http://www.springframework.org/schema/beans/spring-beans-3.0.xsd
         http://www.springframework.org/schema/context
         http://www.springframework.org/schema/context/spring-context-3.0.xsd
         http://www.springframework.org/schema/mvc
         http://www.springframework.org/schema/mvc/spring-mvc-3.0.xsd">

    <!-- Configures the @Controller programming model -->
    <mvc:annotation-driven />
    <context:component-scan base-package="com.mindtree.controllers"/>

    <!-- Forwards requests to the "/" resource to the "home" view -->
    <mvc:view-controller path="/" view-name="home" />

    <!-- Resolves view names to protected ".jsp" within the /WEB-INF/pages directory  -->
    <bean id="viewResolver"
        class=" org.springframework.web.servlet.view.InternalResourceViewResolver">
        <property name="prefix" value="/WEB-INF/pages/" />
        <property name="suffix" value=".jsp" />
    </bean>
</beans>
```

Registers the HandlerMapping required to dispatch requests to your @Controllers

Spring 3 MVC

- Step 4:Coding your first controller using annotations

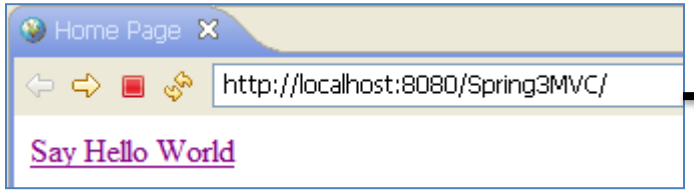
```java
package com.mindtree.controllers;

import java.util.Date;

import org.springframework.stereotype.Controller;
import org.springframework.web.bind.annotation.RequestMapping;
import org.springframework.web.servlet.ModelAndView;

/**
 * @author Banu Prakash
 * © 2011 MindTree Limited
 */
@Controller
public class HelloWorldController {

    @RequestMapping("/helloWorld")
    public ModelAndView helloWorld() {
        ModelAndView mav = new ModelAndView();
        mav.setViewName("helloWorld");
        mav.addObject("message", "Hello World!");
        mav.addObject("time", new Date());
        return mav;
    }
}
```

@Controller annotation allows for auto detection of Controller

@RequestMapping("path") specifies that the method is invoked to handle the request path.

Spring 3 MVC

- Step 5:Writing views



(1)

WEB-INF/pages/home.jsp

```
<body>
    <a href="helloWorld"> Say Hello World</a>
</body>
```

(2)

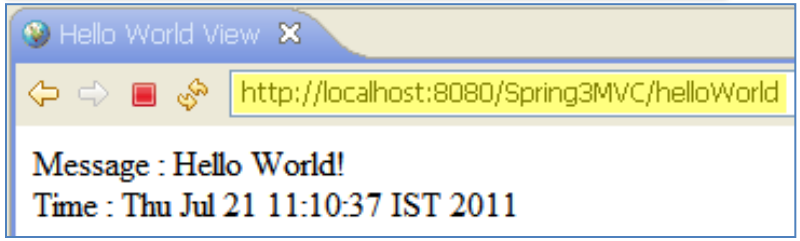
```
@Controller
public class HelloWorldController {

    @RequestMapping("/helloWorld")
    public ModelAndView helloWorld() {
        ModelAndView mav = new ModelAndView();
        mav.setViewName("helloWorld");
        mav.addObject("message", "Hello World!");
        mav.addObject("time", new Date());
        return mav;
    }
}
```

(3)

WEB-INF/pages/helloWorld.jsp

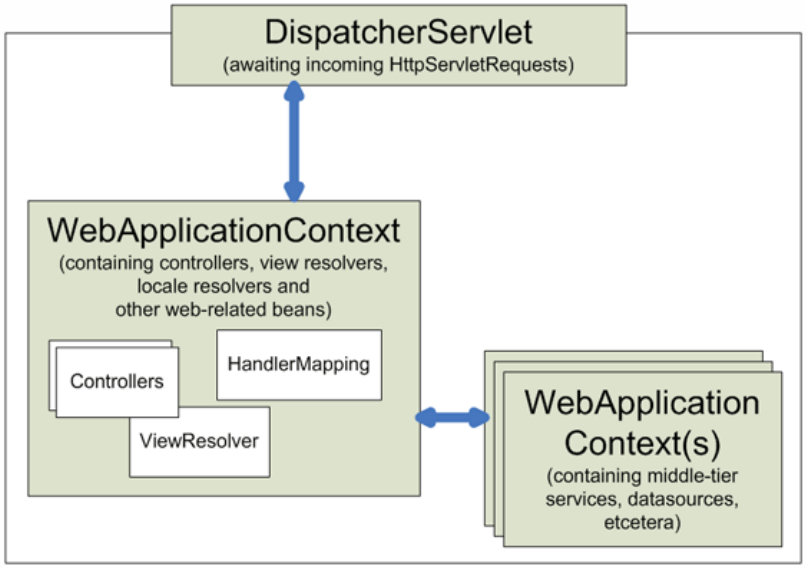
```
<body>
    Message : ${requestScope.message} <br />
    Time : ${requestScope.time}
</body>
```

Rendered output



Spring MVC - Business Layer integration

- The WebApplicationContext is an extension of the plain ApplicationContext that has some extra features necessary for web applications



Spring MVC - Business Layer integration

- **ContextLoaderListener a servlet listener which is responsible for loading additional WebApplicationContext mostly consisting of beans for service layer and dao layer.**

```
<listener>
    <listener-class>org.springframework.web.context.ContextLoaderListener</listener-class>
</listener>

<context-param>
    <param-name>contextConfigLocation</param-name>
    <param-value>/WEB-INF/beans.xml</param-value>
</context-param>
```

beans.xml file consists of all the Dao/Service Layer configurations as discussed in Hibernate Spring integration

- The ContextLoaderListener looks for /WEB-INF/applicationContext.xml by default, but you can override it using the context parameter contextConfigLocation as shown.

Spring MVC - Business Layer integration

- Coding the Controller to interact with service layer

```
/**
 * @author Banu Prakash
 * © 2011 MindTree Limited
 */
@Controller
public class BankController {

    @Autowired
    private BankService bankService;

    @RequestMapping("/getAccounts")
    public String getAccounts(Model model) {
        String target = "printAccounts";
        try {
            model.addAttribute("accountList",
                    bankService.getAllAccounts());
        } catch (ServiceException e) {
            model.addAttribute("errorMessage", e.getMessage());
            target = "home";
        }
        return target;
    }
}
```

Mapping requests

- **Request Mapping**
  - Method Level mapping
  - **By HTTP method**
    - @RequestMapping(“path”, method=RequestMethod.GET)
    - POST, PUT, DELETE, OPTIONS, and TRACE are are also supported
  - **By presence of query parameter**
    - @RequestMapping(“path”, method=RequestMethod.GET, params=”foo”)
    - Negation also supported: params={ “foo”, “!bar” })
  - Class Level Mapping is also supported

Mapping requests

- Configuring MultiAction Controllers
  - A Single controller can handle requests for different URL's

```
@RequestMapping(value = "/addAccount", method = RequestMethod.GET)
public String getAccountForm(Model model) {
    String target = "addAccount";
    Remaining code removed for clarity
    return target;
}

@RequestMapping(value = "/addAccount", method = RequestMethod.POST)
public String addAccount(@ModelAttribute("account") Account account,
        BindingResult errorResults, Model model) {
    String target = "printAccounts";
    Remaining code removed for clarity
    return target;
}
```

For request URI of "/addAccount "and GET request, getAccountForm method is called

For request URI of "/addAccount "and POST request, addAccount method is called

Mapping requests

- GET request flow

home.jsp

```
<body>
    <div id="errDiv" class="errClass">
        ${requestScope.errorMessage}
    </div>
    <div id="msgDiv" class="msgClass">
        ${requestScope.message}
    </div>
    <a href="addAccount">Add a Account</a> <br />
    <a href="getAccounts">Print All Accounts</a>
</body>
```

BankController

```
@RequestMapping(value = "/addAccount", method = RequestMethod.GET)
public String getAccountForm(Model model) {
    String target = "addAccount";


    return target;
}
```

(1)

(2)

addAccount.jsp

```
<form:form method="POST"
    action="addAccount" commandName="account">
    <table>
    <tr>
        <td><form:label path="accountNumber"> Account Number</form:label></td>
        <td><form:input path="accountNumber"/></td>
        <td><form:errors path="accountNumber" cssClass="errClass"/></td>
    </tr>
    <tr>
        <td><form:label path="accountNumber"> Account Owner</form:label></td>
        <td><form:input path="accountOwner"/></td>
        <td><form:errors path="accountOwner" cssClass="errClass"/></td>
    </tr>
    <tr>
        <td><form:label path="balance">Initial Amount:</form:label></td>
        <td><form:input path="balance"/></td>
        <td><form:errors path="balance" cssClass="errClass"/></td>
    </tr>
    <tr>
        <td><input type="submit" value="Create a Account" /></td>
        <td><input type="button" value="cancel" /> </td>
    </tr>
</table>
</form:form>
```

Mapping requests

- POST request flow

addAccount.jsp

```
<form:form method="POST"
    action="addAccount" commandName="account">
    <table>
    <tr>
        <td><form:label path="accountNumber"> Account Number</form:label></td>
        <td><form:input path="accountNumber"/></td>
        <td><form:errors path="accountNumber" cssClass="errClass"/></td>
    </tr>
    <tr>
        <td><form:label path="accountNumber"> Account Owner</form:label></td>
        <td><form:input path="accountOwner"/></td>
        <td><form:errors path="accountOwner" cssClass="errClass"/></td>
    </tr>
    <tr>
        <td><form:label path="balance">Initial Amount:</form:label></td>
        <td><form:input path="balance"/></td>
        <td><form:errors path="balance" cssClass="errClass"/></td>
    </tr>
    <tr>
        <td><input type="submit" value="Create a Account" /></td>
        <td><input type="button" value="cancel" /> </td>
    </tr>
</table>
</form:form>
```

```
@RequestMapping(value = "/addAccount", method = RequestMethod.POST)
public String addAccount(@ModelAttribute("account") Account account,
        BindingResult errorResults, Model model) {
    String target = "printAccounts";



    return target;
}
```

When the form is submitted, since the method of request is "POST" addAccount() is called and not getAccountForm().

Remember both addAccount() and getAccountForm() are mapped to same URI.

@ModelAttribute

- @ModelAttribute maps a model attribute to the specific, annotated method parameter.
  - This is how the controller gets a reference to the object holding the data auto-populated from request parameters entered in the form.

```
<form:form method="POST"
    action="addAccount" commandName="account">
     Account Number<form:input path="accountNumber"/> <br/>
     Account Owner<form:input path="accountOwner"/> <br />
     Initial Amount:<form:input path="balance"/> <br />
     <input type="submit" value="Create a Account" />
    <input type="button" value="cancel" />
</form:form>
```

```
@RequestMapping(value = "/addAccount", method = RequestMethod.POST
public String addAccount(@ModelAttribute("account") Account account,Model model) {
    String target = "printAccounts";
    try {
        bankService.addAccount(account);
    } catch (ServiceException e) {
        model.addAttribute("errorMessage", e.getMessage());
        target = "home";
    }
    return target;
}
```

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References

Contains the reference that will supplement the self learning and will be needed for completing the assignments & practice questions

References

- Spring MVC Documentation:
  - http://static.springsource.org/spring/docs/3.0.x/spring-framework-reference/html/mvc.html
  - http://static.springsource.org/spring/docs/2.5.x/api/org/springframework/orm/hibernate3/support/OpenSessionInViewFilter.html
- Spring MVC Tutorial
  - http://www.mkyong.com/tutorials/spring-mvc-tutorials/
- Spring Form tags
  - http://static.springsource.org/spring/docs/2.0.x/reference/spring-form.tld.html
  - http://static.springsource.org/spring/docs/3.0.x/spring-framework-reference/html/view.html
  - http://www.vaannila.com/spring/spring-form-tags-1.html
- Spring Samples:
  - https://src.springframework.org/svn/spring-samples/
  - Refer: mvc-basic/ mvc-showcase/ petcare/ jpetstore/ mvc-ajax/

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Explore More!!

Never let your curiosity die!

Explore more

- Session handling
  - http://static.springsource.org/spring/docs/2.5.x/api/org/springframework/web/bind/annotation/SessionAttributes.html
  - http://www.infoq.com/articles/spring-2.5-ii-spring-mvc
  - http://static.springsource.org/spring/docs/2.5.x/reference/mvc.html

- **Spring's multipart (file upload) support**
  - http://static.springsource.org/spring/docs/2.5.x/reference/mvc.html

- Internationalization
  - http://www.mkyong.com/spring-mvc/spring-mvc-internationalization-example/

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