SpringMVC

1.SpringMVC概述

MVC：

- **Model（模型）：** 数据模型，提供要展示的数据，：Value Object（数据Dao） 和 服务层（行为Service），提供数据和业务。
- **View（视图）：** 负责进行模型的展示，即用户界面
- **Controller（控制器）：** 调度员，接收用户请求，委托给模型进行处理（状态改变），处理完毕后把返回的模型数据返回给视图，由视图负责展示。

SpringMVC的特点：

- Spring为展现层提供的基于MVC设计理念的Web框架
- SpirngMVC通过一套MVC注解，让POJO成为处理请求的控制器，而无须实现任何接口
- 支持REST风格的URL请求
- 采用了松散耦合可拔插组件结构，扩展性和灵活性

2. HelloWorld

1. 导入依赖

spring-webmvc的maven依赖

```
    <dependencies>
        <!-- SpringWeb基础包-->
        <dependency>
            <groupId>org.springframework</groupId>
            <artifactId>spring-web</artifactId>
            <version>4.0.0.RELEASE</version>
        </dependency>

        <dependency>
            <groupId>org.springframework</groupId>
            <artifactId>spring-webmvc</artifactId>
            <version>4.0.0.RELEASE</version>
        </dependency>

        <!--         核心包-->
        <dependency>
            <groupId>org.springframework</groupId>
            <artifactId>spring-context</artifactId>
            <version>4.0.0.RELEASE</version>
        </dependency>

        <dependency>
            <groupId>org.springframework</groupId>
            <artifactId>spring-beans</artifactId>
            <version>4.0.0.RELEASE</version>
        </dependency>
        <dependency>
            <groupId>org.springframework</groupId>
            <artifactId>spring-core</artifactId>
            <version>4.0.0.RELEASE</version>
        </dependency>

        <dependency>
            <groupId>org.springframework</groupId>
            <artifactId>spring-expression</artifactId>
            <version>4.0.0.RELEASE</version>
        </dependency>

       <!--        日志包-->
        <dependency>
            <groupId>commons-logging</groupId>
            <artifactId>commons-logging</artifactId>
            <version>1.1.3</version>
        </dependency>

        <!--        注解支持包-->
        <dependency>
            <groupId>org.springframework</groupId>
            <artifactId>spring-aop</artifactId>
            <version>4.0.0.RELEASE</version>
        </dependency>
    </dependencies>
```

2. 配置web.xml， 注册DispatcherServlet

`DispatcherServlet`：前端控制器，负责请求分发。

要绑定Spring的配置文件

```
<?xml version="1.0" encoding="UTF-8"?>
<web-app 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_4_0.xsd"
         version="4.0">

    <!--注册DispatcherServlet,请求分发器（前端控制器）-->
    <servlet>
        <servlet-name>springDispatcherServlet</servlet-name>
        <servlet-
class>org.springframework.web.servlet.DispatcherServlet</servlet-class>
        <!--绑定Spring配置文件-->
        <init-param>
            <param-name>contextConfigLocation</param-name>
            <param-value>classpath:springmvc-config.xml</param-value>
        </init-param>
        <!--启动级别为1，即服务器启动后就启动-->
        <!--值越小优先级越高，越先创建对象-->
        <load-on-startup>1</load-on-startup>
    </servlet>

    <!-- /  拦截所有的请求；（不包括.jsp，jsp由Tomcat来处理），
        覆盖了父类的DispatcherServlet的pattern，静态资源被拦截。-->
    <!-- *.jsp 拦截jsp请求，覆盖了父类的JspServlet-->
    <!-- /* 拦截所有的请求；（包括.jsp，一旦拦截jsp页面就不能显示了）-->
    <servlet-mapping>
        <servlet-name>springDispatcherServlet</servlet-name>
        <url-pattern>/</url-pattern>
    </servlet-mapping>

</web-app>
```

3. 导入Spring配置文件

Spring的配置文件Springmvc-config.xml。

1. 开启了包扫描，让指定包下的注解生效，由IOC容器统一管理
2. 配置了视图解析器`InternalResourceViewResolver`，这里可以设置前缀和后缀，拼接视图名字

```
<?xml version="1.0" encoding="UTF-8"?>
<beans xmlns="http://www.springframework.org/schema/beans"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
       xmlns:context="http://www.springframework.org/schema/context"
       xsi:schemaLocation="http://www.springframework.org/schema/beans
       http://www.springframework.org/schema/beans/spring-beans.xsd
       http://www.springframework.org/schema/context
       http://www.springframework.org/schema/context/spring-context.xsd">

    <!--开启包扫描,让指定包下的注解生效,由IOC容器统一管理-->
    <context:component-scan base-package="com.xiao.controller"/>

    <!--配置视图解析器，拼接视图名字，找到对应的视图-->
    <bean id="internalResourceViewResolver"
class="org.springframework.web.servlet.view.InternalResourceViewResolver">
        <!--前缀-->
        <property name="prefix" value="/WEB-INF/page/"/>
        <!--后缀-->
        <property name="suffix" value=".jsp"/>
    </bean>
</beans>
```

4. 编写controller层

HelloController类：

1. @Controller：告诉Spirng这是一个控制器，交给IOC容器管理
2. @RequestMapping("/hello01")：/ 表示项目地址，当请求项目中的hello01时，返回一个/WEB-INF/page/success.jsp页面给前端

```
@Controller
public class HelloController {

    @RequestMapping("/hello01")
    public String toSuccess(){
        System.out.println("请求成功页面");
        return "success";
    }
    @RequestMapping("/hello02")
    public String toError() {
        System.out.println("请求错误页面");
        return "error";
    }
}
```

5. 编写跳转的jsp页面

项目首页 index.jsp，两个超链接，分别发出hello01和hello02的请求

```
<%@ page contentType="text/html;charset=UTF-8" language="java" %>
<html>
  <head>
    <title>$Title$</title>
  </head>
  <body>

  <a href="hello01">点这里去成功页面</a>
  <a href="hello02">点这里去失败页面</a>

  </body>
</html>
```

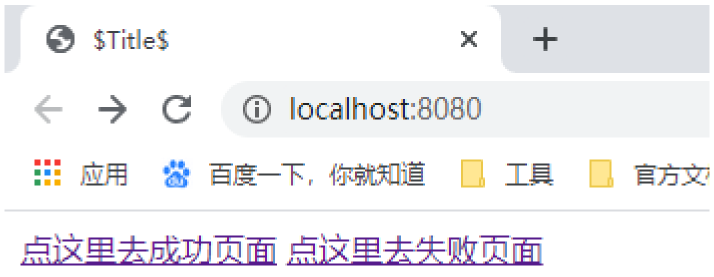
成功页面success.jsp和失败页面error.jsp，要注意文件的路径/WEB-INF/page/...jsp，与上面的保持一致

```
<%@ page contentType="text/html;charset=UTF-8" language="java" %>
<html>
<head>
    <title>成功页面</title>
</head>
<body>
    <h1>这里是成功页面</h1>
</body>
</html>
```

```
<%@ page contentType="text/html;charset=UTF-8" language="java" %>
<html>
<head>
    <title>错误页面</title>
</head>
<body>
    <h1>这里是错误页面</h1>
</body>
</html>
```

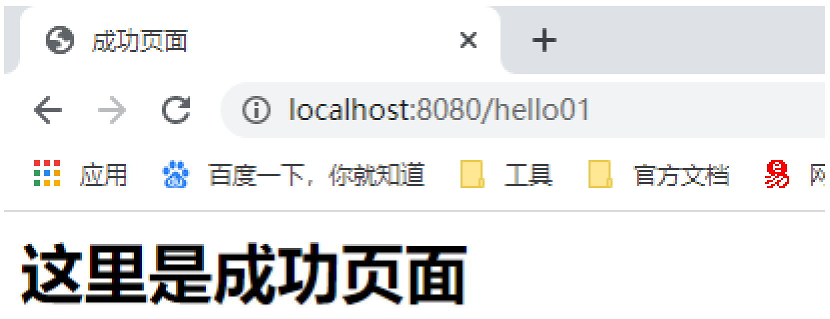
6) 访问

启动项目：



点这里去成功页面 点这里去失败页面

点击去成功页面，可以看到发出了/hello01请求，页面转发到/WEB-INF/page/success.jsp，控制台输出了请求成功页面。



这里是成功页面

3. Url请求

3.1 运行流程

1. 客户端点击链接发送请求：http://localhost:8080/hello01；
2. 来到tomcat服务器；
3. SpringMVC的前端控制器收到所有请求；
4. 看请求地址和@RequestMapping标注的哪个匹配，来找到底使用哪个类的哪个方法来处理；
5. 前端控制器找到目标处理器类和目标方法，直接利用反射执行目标方法；
6. 方法执行完后有一个返回值，SpringMVC认为这个返回值就是要去的页面地址；
7. 拿到方法返回值后，视图解析器进行拼串得到完整的页面地址
8. 得到页面地址，前端控制器帮我们转发到页面

3.2 url映射

> RequestMapping

01 标注在方法上

告诉SpringMVC这个方法用来处理什么请求。

`@RequestMapping("/hello01")`中的`/`可以省略，就是默认从当前项目下开始。

02 标注在类上

表示为当前类中的所有方法的请求地址，指定一个基准路径。toSuccess()方法处理的请求路径是`/haha/hello01`。

```java
@Controller
@RequestMapping("/haha")
public class HelloController {

    @RequestMapping(value = "/hello01")
    public String toSuccess(){
        System.out.println("请求成功页面");
        return "success";
    }
}
```

03 规定请求方式

method属性规定请求方式，默认是所求请求方式都行。method = RequestMethod.GET，method = RequestMethod.POST。

如果方法不匹配会报：**HTTP Status 405 错误 – 方法不被允许**

```java
@RequestMapping(value = "/hello01",method = RequestMethod.GET)
public String toSuccess(){
    System.out.println("请求成功页面");
    return "success";
}
```

组合用法

- @GetMapping 等价于 @RequestMapping(method =RequestMethod.GET)
- @PostMapping
- @PutMapping
- @DeleteMapping
- @PatchMapping

04 规定请求参数

params属性规定请求参数。会造成错误：**HTTP Status 400 – 错误的请求**

不携带该参数，表示参数值为null；携带了不给值表示参数值是空串

```java
//必须携带username参数
@RequestMapping(value = "/hello03",params ={"username"})
//必须不携带username参数
@RequestMapping(value = "/hello03",params ={"! username"})
//必须携带username参数，且值必须为123
@RequestMapping(value = "/hello03",params ={"username=123"})
//username参数值必须不为123，不携带或者携带了不是123都行
@RequestMapping(value = "/hello03",params ={"username=! 123"})
//username参数值必须不为123，不携带password，携带page
@RequestMapping(value = "/hello03",params ={"username=!
123","page","!password"})
```

05 规定请求头

headers属性规定请求头。其中User-Agent：浏览器信息

谷歌浏览器：User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/83.0.4103.97 Safari/537.3

06 Ant风格URL

URL地址可以写模糊的通配符，模糊和精确多个匹配情况下精确优先。

? ：**替代任意一个字符**

```
@RequestMapping( "/hello0?") /
```

*：**替代任意多个字符或一层路径**

```
@RequestMapping( "/hello0*")   //任意多个字符
@RequestMapping( "/a/*/hello01")  //一层路径
```

```
    @RequestMapping(value = "/test/*/a")
    public String myMethodTest01() {
        System.out.println("post01");
        return "success";
    }
    // test/[^\/]+/b ->post01
    // /test/*/b ->post02
    @RequestMapping(value = "/test/**/a")
    public String myMethodTest02() {
        System.out.println("post02");
        return "success";
    }
```

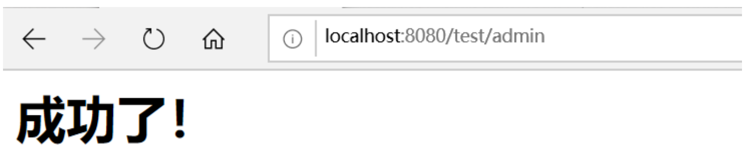
**：替代任意多层路径

```
@RequestMapping( "/a/**/hello01")  //任意多层路径
```

07 PathVariable

可以用/test/{paramsName1}/{paramsName2}来获取Url上传的参数值

```
@RequestMapping(value = "/test/{id}", method = RequestMethod.GET)
    public String myMethodTest03(@PathVariable("id") String id) {
        System.out.println(id);
        return "success";
    }
```


localhost:8080/test/admin

成功了!

```
admin  //打印
```

3.3 Spring配置文件的默认位置

默认位置是 /WEB-INF/**xxx**-servlet.xml，其中**xxx**是自己在web.xml文件中配置的**servlet-name**属性。

例如：

`dispatcherServlet-servlet.xml`

当然也可以手动指定文件位置。

```
<servlet>
        <servlet-name>dispatcherServlet</servlet-name>
        <servlet-
class>org.springframework.web.servlet.DispatcherServlet</servlet-class>
        <init-param>
            <param-name>contextConfigLocation</param-name>
            <param-value>classpath:applicationContext.xml</param-value>
        </init-param>
        <load-on-startup>1</load-on-startup>
</servlet>
```

3.5 url-pattern

/ 拦截所有的请求，不拦截jsp

/* **拦截所有的请求**，包括*.jsp，一旦拦截jsp页面就不能显示了。. jsp是tomcat处理的事情

看Tomcat的配置文件web.xml中，有DefaultServlet和JspServlet，

- DefaultServlet是Tomcat中处理静态资源的，Tomcat会在服务器下找到这个资源并返回。如果我们自己配置`url-pattern=/`，相当于禁用了Tomcat服务器中的DefaultServlet，这样如果请求静态资源，就会去找前端控制器找@RequestMapping，**这样静态资源就不能访问了**。解决办法：

  ```
  <!-- 告诉Spring MVC自己映射的请求就自己处理，不能处理的请求直接交给tomcat -->
  <mvc:default-servlet-handler />
  <!--开启MVC注解驱动模式，保证动态请求和静态请求都能访问-->
  <mvc:annotation-driven/>
  ```

- JspServlet，保证了jsp可以正常访问

```
<servlet>
    <servlet-name>default</servlet-name>
    <servlet-class>org.apache.catalina.servlets.DefaultServlet</servlet-class>
    <init-param>
        <param-name>debug</param-name>
        <param-value>0</param-value>
    </init-param>
    <init-param>
        <param-name>listings</param-name>
        <param-value>false</param-value>
    </init-param>
    <load-on-startup>1</load-on-startup>
</servlet>

    <servlet-mapping>
        <servlet-name>default</servlet-name>
```

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


<servlet>
     <servlet-name>jsp</servlet-name>
     <servlet-class>org.apache.jasper.servlet.JspServlet</servlet-class>
     <init-param>
         <param-name>fork</param-name>
         <param-value>false</param-value>
      </init-param>
      <init-param>
          <param-name>xpoweredBy</param-name>
          <param-value>false</param-value>
      </init-param>
      <load-on-startup>3</load-on-startup>
</servlet>

    <servlet-mapping>
        <servlet-name>jsp</servlet-name>
        <url-pattern>*.jsp</url-pattern>
        <url-pattern>*.jspx</url-pattern>
    </servlet-mapping>
```

4. REST风格

4.1 概述

REST就是一个资源定位及资源操作的风格。不是标准也不是协议，只是一种风格。基于这个风格设计的软件可以更简洁，更有层次，更易于实现缓存等机制。其强调HTTP应当以资源为中心，并且规范了URI的风格；规范了HTTP请求动作（GET/PUT/POST/DELETE/HEAD/OPTIONS）的使用，具有对应的语义。

- 资源（Resource）：网络上的一个实体，每种资源对应一个特定的URI，即URI为每个资源的独一无二的识别符；
- 表现层（Representation）：把资源具体呈现出来的形式，叫做它的表现层。比如txt、HTML、XML、JSON格式等；
- 状态转化（State Transfer）：每发出一个请求，就代表一次客户端和服务器的一次交互过程。GET用来获取资源，POST用来新建资源，PUT用来更新资源，DELETE用来删除资源。

在参数上使用 @PathVariable 注解，可以获取到请求路径上的值，也可以写多个

```
    @RequestMapping(value = "/hello04/username/{id}")
    public String test2(@PathVariable("id") int id){
        System.out.println(id);
        return "success";
    }
```

4.2 页面上发出PUT请求

对一个资源的增删改查用请求方式来区分：

- /book/1 GET：查询1号图书
- /book/1 DELETE：删除1号图书

- /book/1 PUT：修改1号图书
- /book POST：新增图书

页面上只能发出GET请求和POST请求。将POST请求转化为put或者delete请求的步骤：

1. 把前端发送方式改为post 。
2. 在web.xml中配置一个filter：HiddenHttpMethodFilter过滤器
3. 必须携带一个键值对，key=_method, value=put或者delete

```
<!--这个过滤器的作用 ：就是将post请求转化为put或者delete请求-->
<filter>
    <filter-name>HiddenHttpMethodFilter</filter-name>
    <filter-class>org.springframework.web.filter.HiddenHttpMethodFilter</filter-
class>
</filter>
<filter-mapping>
    <filter-name>HiddenHttpMethodFilter</filter-name>
    <url-pattern>/*</url-pattern>
</filter-mapping>

<form action="hello03" method="post">
  <input type="hidden" name="_method" value="delete">
  <input type="submit" name="提交">
</form>
```

注意

高版本Tomcat会出现问题：JSPs only permit GET POST or HEAD，在页面上加上异常处理即可

```
<%@ page contentType="text/html;charset=UTF-8" language="java"
 isErrorPage="true" %>
1
```

5 请求参数处理

5.1 传入参数

1. 如果提交的参数名称和处理方法的参数名一致，则无需处理，直接使用

提交数据 : http://localhost:8080/hello05?username=zhangsan，控制台会输出zhangsan

```
@RequestMapping("/hello05")
public String test03(String username) {
    System.out.println(username);
    return "success";
}
```

2. 提交的参数名称和处理方法的参数名不一致，使用@RequestParam注解

注解`@RequestParam`可以获取请求参数，默认必须携带该参数，也可以指定`required=false`，和没携带情况下的默认值`defaultValue`

```java
@RequestMapping("/hello05")
public String test03(@RequestParam(value = "username",required = false,
defaultValue ="hehe" ) String name) {
    System.out.println(name);
    return "success";
}
```

还有另外两个注解：

- `@RequestHeader`：获取请求头中的信息，比如User-Agent：浏览器信息

  ```java
  @RequestMapping("/hello05")
  public String test03(@RequestHeader("User-Agent" ) String name) {
      System.out.println(name);
      return "success";
  }
  ```

- `@CookieValue`：获取某个cookie的值

  ```java
  @RequestMapping("/hello05")
  public String test03(@CookieValue("JSESSIONID" ) String name) {
       System.out.println(name);
       return "success";
  }
  ```

5.2 传入一个对象

传入POJO，SpringMVC会自动封装，**提交的表单域参数必须和对象的属性名一致，否则就是null，请求没有携带的字段，值也会是null。**同时也还可以级联封装。

新建两个对象User和Address：

```java
public class User {
    private String username;
    private Integer age;
    private Address address;
    //....
}
123456
public class Address {
    private String name;
    private Integer num;
        //....
}
12345
```

前端请求：

```
<form action="hello06" method="post">
    姓名： <input type="text" name="username"> <br>
    年龄： <input type="text" name="age"><br>
    地址名：<input type="text" name="address.name"><br>
    地址编号：<input type="text" name="address.num"><br>
    <input type="submit" name="提交">
</form>
```

后端通过对象名也能拿到对象的值，没有对应的值则为null

```
@RequestMapping("/hello06")
public String test03(User user) {
    System.out.println(user);
    return "success";
}
```

5.3 传入原生ServletAPI

处理方法还可以传入原生的ServletAPI：

```
@RequestMapping("/hello07")
public String test04(HttpServletRequest request, HttpSession session) {
    session.setAttribute("sessionParam","我是session域中的值");
    request.setAttribute("reqParam","我是request域中的值");
    return "success";
}
```

通过EL表达式获取到值，`${requestScope.reqParam}`：

```
<%@ page contentType="text/html;charset=UTF-8" language="java"
 isErrorPage="true" %>
<html>
<head>
    <title>成功页面</title>
</head>

<body>

<h1>这里是成功页面</h1>
${requestScope.reqParam}
${sessionScope.sessionParam}
</body>
</html>
```

5.4 乱码问题

一定要放在在其他Filter前面。

```
<filter>
   <filter-name>encoding</filter-name>
   <filter-class>org.springframework.web.filter.CharacterEncodingFilter</filter-
class>
```

```
     <!--解决请求乱码-->
    <init-param>
        <param-name>encoding</param-name>
        <param-value>utf-8</param-value>
    </init-param>
     <!--解决响应乱码-->
    <init-param>
         <param-name>forceEncoding</param-name>
         <param-value>true</param-value>
    </init-param>
</filter>
<filter-mapping>
    <filter-name>encoding</filter-name>
    <url-pattern>/*</url-pattern>
</filter-mapping>

<!--在Tomcat的server.xml中的8080处 URLEncoding="UTF-8"-->
```

6. 数据输出

6.1 Map、Model、ModelMap

实际上都是调用的 **BindingAwareModelMap**(隐含模型)，将数据放在**请求域(requestScope)中**进行转发，用EL表达式可以取出对应的值。

```
/**
 * SpringMVC除过在方法上传入原生的request和session外还能怎么样把数据带给页面
 *
 * 1）、可以在方法处传入Map、或者Model或者ModelMap。
 *      给这些参数里面保存的所有数据都会放在请求域中。可以在页面获取
 *   关系：
 *      Map，Model，ModelMap：最终都是BindingAwareModelMap在工作；
 *      相当于给BindingAwareModelMap中保存的东西都会被放在请求域中；
 *
 *      Map(interface(jdk))      Model(interface(spring))
 *          ||                          //
 *          ||                         //
 *          \/                        //
 *      ModelMap(class)               //
 *                  \\              //
 *                   \\            //
 *                  ExtendedModelMap
 *                          ||
 *                          \/
 *                  BindingAwareModelMap
 *
 * 2）、方法的返回值可以变为ModelAndView类型；
 *          既包含视图信息（页面地址）也包含模型数据（给页面带的数据）；
 *          而且数据是放在请求域中；
 *          request、session、application；
 *
 *
 * @author lfy
 *
 */
```

- Map

```
@RequestMapping("/Api2")
    public String api2(Map<String,Object> map){
        map.put("msg","hello");
        return "map";
    }
```

- Model

```
@RequestMapping("/Api3")
    public String api3(Model model){
        model.addAttribute("msg","hello2");
        return "map";
    }
```

- ModelMap

```
@RequestMapping("/Api4")
    public String api4(ModelMap modelMap){
        modelMap.addAttribute("msg","hello3");
        return "map";
    }
```

map页面：

```
<%@ page contentType="text/html;charset=UTF-8" language="java" %>
<html>

<head>
    <title>Title</title>
</head>

<body>

pageScope:  ${pageScope.msg}

requestScope :   ${requestScope.msg}

sessionScope:     ${sessionScope.msg}

applicationScope:   ${applicationScope.msg}

</body>
</html>
```

【补充】jsp的4个作用域 pageScope、requestScope、sessionScope、applicationScope的区别：

- **page**指当前页面有效。在一个jsp页面里有效

- **request** 指在一次请求的全过程中有效，即从http请求到服务器处理结束，返回响应的整个过程，存放在**HttpServletRequest**对象中。在这个过程中可以使用forward方式跳转多个jsp。在这些页面里都可以使用这个变量。
- **Session**是用户全局变量，在整个会话期间都有效。只要页面不关闭就一直有效（或者直到用户一直未活动导致会话过期，默认session过期时间为30分钟，或调用HttpSession的invalidate()方法）。存放在HttpSession对象中
- **application**是程序全局变量，对每个用户每个页面都有效。存放在ServletContext对象中。它的存活时间是最长的，如果不进行手工删除，它们就一直可以使用

6.2 ModelAndView

返回一个模型视图对象ModerAndView， 既包含视图信息(页面地址)，也包含模型数据(给页面带的数据)

```
@RequestMapping("/hello04")
public ModelAndView test04 (){
    //新建一个模型视图对象，也可以直接传入名字
    ModelAndView mv = new ModelAndView();
    //封装要显示到视图中的数据
    //相当于req.setAttribute("msg",HelloWorld!);
    mv.addObject("msg","HelloWorld!");
    //设置视图的名字，相当于之前的return "success";
    mv.setViewName("success");
    return mv;
}
```

6.3 @SessionAttributes

给Session域中携带数据使用注解`@SessionAttributes`，只能标在类上，value属性指定key，type可以指定保存类型。这个注解会引发异常**一般不用，就用原生API**

`@SessionAttributes(value = "msg")`：表示给BindingAwareModelMap中保存key为msg的数据时，在session中也保存一份；

`@SessionAttributes(types = {String.class})`：表示只要保存String类型的数据时，给session中也放一份。

```
//表示给BindingAwareModelMap中保存key为msg的数据时，在session中也保存一份
@SessionAttributes(value = "msg")
@Controller
public class outputController {
    @RequestMapping("/hello01")
    public String test01 (Map<String,Object> map){
        map.put("msg","HelloWorld!");
        return "success";
    }
}
```

6.4 @ModelAttribute

```
ModelAttribute:
使用场景:
1）、页面：form提交更新
2）、dao：全字段更新。没带的字段会在数据库中更新为null;
```

```
/**
 * 测试ModelAttribute注解;
 * 使用场景：书城的图书修改为例;
 * 1）页面端;
 *       显示要修改的图书的信息，图书的所有字段都在
 * 2）servlet收到修改请求，调用dao;
 *       String sql="update bs_book set title=?,
 *                   author=?,price=?,
 *                   sales=?,stock=?,img_path=?
 *               where id=?";
 * 3）实际场景?
 *       并不是全字段修改；只会修改部分字段，以修改用户信息为例;
 *       username  password  address;
 *       1）、不修改的字段可以在页面进行展示但是不要提供修改输入框;
 *       2）、为了简单，Controller直接在参数位置来写Book对象
 *       3）、SpringMVC为我们自动封装book;（没有带的值是null）
 *       4）、如果接下来调用了一个全字段更新的dao操作；会将其他的字段可能变为null;
 *           sql = "update bs_book set"
 *           if(book.getBookName()){
 *               sql +="bookName=?,"
 *           }
 *           if(book.getPrice()){
 *               sql +="price=?"
 *           }
 *
 * 4）、如何能保证全字段更新的时候，只更新了页面携带的数据;
 *       1）、修改dao；代价大?
 *       2）、Book对象是如何封装的?
 *           1）、SpringMVC创建一个book对象，每个属性都有默认值，bookName就是null;
 *               1、让SpringMVC别创建book对象，直接从数据库中先取出一个id=100的book对象的
信息
 *               2、Book [id=100, bookName=西游记, author=张三, stock=12, sales=32,
price=98.98]
 *
 *           2）、将请求中所有与book对应的属性一一设置过来;
 *               3、使用刚才从数据库取出的book对象，给它 的里面设置值;（请求参数带了哪些值就
覆盖之前的值）
 *               4、带了的字段就改为携带的值，没带的字段就保持之前的值
 *           3）、调用全字段更新就有问题;
 *               5、将之前从数据库中查到的对象，并且封装了请求参数的对象。进行保存;
 *
 * @author lfy
 */
```

方法入参标注该注解后，入参的对象就会放到数据模型中，会提前于控制方法先执行，并发方法允许的结果放在隐含模型中。

处理这样的场景：

前端传来数据，SpringMVC自动封装成对象，实际上是创建了一个对象，每个属性都有默认值，然后将请求参数中对应是属性设置过来，但是如果没有的值将会是null，如果拿着这个数据去更新数据库，会造成其他字段也变为null。因此希望使用`@ModelAttribute`，会在目标方法执行前先做一些处理

```
@ModelAttribute
public void  myModelAttribute(ModelMap modelMap){
    System.out.println("modelAttribute方法执行了");
```

```
        //提前做一些处理
        User user = new User("zhangsan",20);
        //保存一个数据到BindingAwareModelMap中，目标方法可以从中取出来
        modelMap.addAttribute("user",user);
    }

    @RequestMapping("/hello05")
    public void  test05(@ModelAttribute("user") User user){
        System.out.println("目标方法执行了");
        //在参数上加上@ModelAttribute注解，可以拿到提前存入的数据
        System.out.println(user);

    }
```

6.5 @ResponseBody

在控制器类中，在方法上使用**@ResponseBody**注解可以不走视图解析器，如果返回值是字符串，那么直接将字符串写到客户端；如果是一个对象，会将对象转化为JSON串，然后写到客户端。

或者在类上加 **@RestController**注解，可以让类中的所有方法都不走视图解析器，直接返回JSON字符串

7. 视图源码执行流程

7.0 SpringMVC的九大组件

- multipartResolver：文件上传解析器
- localeResolver：区域信息解析器，和国际化有关
- themeResolver：主题解析器
- handlerMappings：handler的映射器
- handlerAdapters：handler的适配器
- handlerExceptionResolvers：异常解析功能
- viewNameTranslator：请求到视图名的转换器
- flashMapManager：SpringMVC中允许重定向携带数据的功能
- viewResolvers：视图解析器

```
         /** 文件上传解析器*/
        private MultipartResolver multipartResolver;
        /** 区域信息解析器；和国际化有关 */
        private LocaleResolver localeResolver;
        /** 主题解析器；强大的主题效果更换 */
        private ThemeResolver themeResolver;
        /** Handler映射信息；HandlerMapping */
        private List<HandlerMapping> handlerMappings;
        /** Handler的适配器 */
        private List<HandlerAdapter> handlerAdapters;
        /** SpringMVC强大的异常解析功能；异常解析器 */
        private List<HandlerExceptionResolver> handlerExceptionResolvers;
        /**  */
        private RequestToViewNameTranslator viewNameTranslator;
        /** FlashMap+Manager：SpringMVC中运行重定向携带数据的功能 */
        private FlashMapManager flashMapManager;
```

```
    /** 视图解析器； */
    private List<ViewResolver> viewResolvers;
```

onRefresh()->initStrategies() DispatcherServlet中：

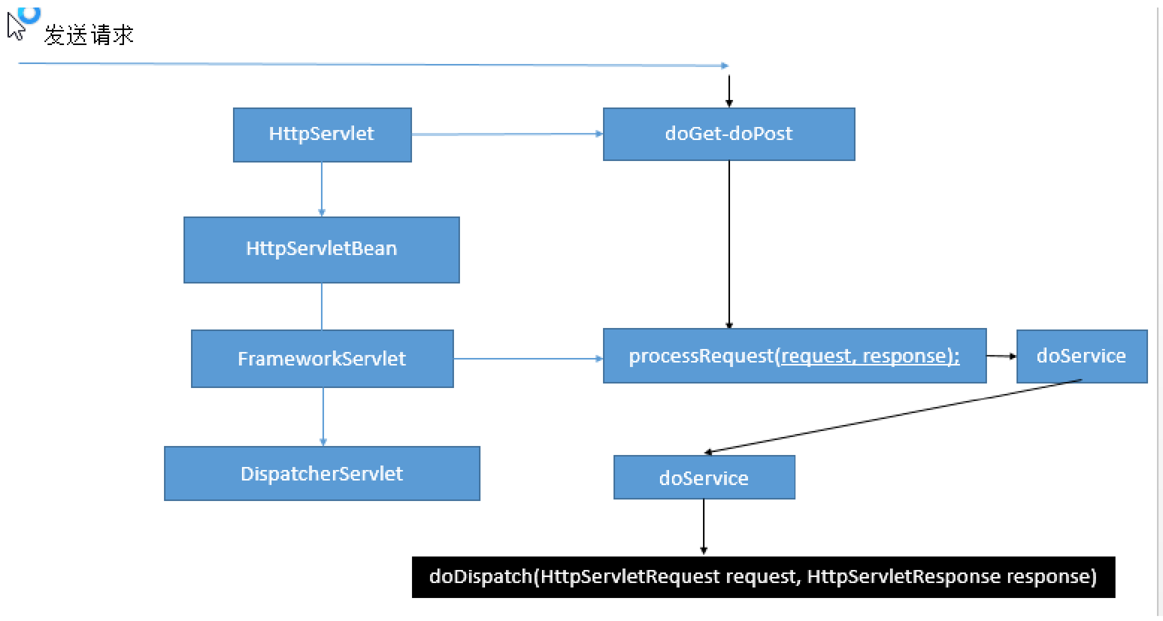
```
protected void initStrategies(ApplicationContext context) {
        initMultipartResolver(context);
        initLocaleResolver(context);
        initThemeResolver(context);
        initHandlerMappings(context);
        initHandlerAdapters(context);
        initHandlerExceptionResolvers(context);
        initRequestToViewNameTranslator(context);
        initViewResolvers(context);
        initFlashMapManager(context);
    }
```

例：初始化HandlerMapping

```
private void initHandlerMappings(ApplicationContext context) {
        this.handlerMappings = null;

        if (this.detectAllHandlerMappings) {
            // Find all HandlerMappings in the ApplicationContext, including
ancestor contexts.
            Map<String, HandlerMapping> matchingBeans =
                    BeanFactoryUtils.beansOfTypeIncludingAncestors(context,
HandlerMapping.class, true, false);
            if (!matchingBeans.isEmpty()) {
                this.handlerMappings = new ArrayList<HandlerMapping>
(matchingBeans.values());
                // We keep HandlerMappings in sorted order.
                OrderComparator.sort(this.handlerMappings);
            }
        }
        else {
            try {
                HandlerMapping hm = context.getBean(HANDLER_MAPPING_BEAN_NAME,
HandlerMapping.class);
                this.handlerMappings = Collections.singletonList(hm);
            }
            catch (NoSuchBeanDefinitionException ex) {
                // Ignore, we'll add a default HandlerMapping later.
            }
        }

        // Ensure we have at least one HandlerMapping, by registering
        // a default HandlerMapping if no other mappings are found.
        if (this.handlerMappings == null) {
            this.handlerMappings = getDefaultStrategies(context,
HandlerMapping.class);
            if (logger.isDebugEnabled()) {
                logger.debug("No HandlerMappings found in servlet '" +
getServletName() + "': using default");
            }
            }
        }
```

组件的初始化： 有些组件在容器中是使用类型找的，有些组件是使用id找的；
去容器中找这个组件，如果没有找到就用默认的配置；

7.1 前端控制器DisatcherServlet


发送请求
HttpServlet
doGet-doPost
HttpServletBean
FrameworkServlet
processRequest(request, response);
doService
DispatcherServlet
doService
doDispatch(HttpServletRequest request, HttpServletResponse response)

7.2 SpringMVC执行流程

```
protected void doDispatch(HttpServletRequest request, HttpServletResponse
response) throws Exception {
        HttpServletRequest processedRequest = request;
        HandlerExecutionChain mappedHandler = null;
        boolean multipartRequestParsed = false;
        WebAsyncManager asyncManager = WebAsyncUtils.getAsyncManager(request);
        try {
            ModelAndView mv = null;
            Exception dispatchException = null;
            try {

                //1、检查是否文件上传请求

                processedRequest = checkMultipart(request);
                multipartRequestParsed = processedRequest != request;

                // Determine handler for the current request.
                //2、根据当前的请求地址找到那个类能来处理；

                mappedHandler = getHandler(processedRequest);

                //3、如果没有找到哪个处理器（控制器）能处理这个请求就404，或者抛异常

                if (mappedHandler == null || mappedHandler.getHandler() == null)
{
                    noHandlerFound(processedRequest, response);
                    return;
                }
                // Determine handler adapter for the current request.
                //4、拿到能执行这个类的所有方法的适配器；（反射工
AnnotationMethodHandlerAdapter）

                HandlerAdapter ha =
getHandlerAdapter(mappedHandler.getHandler());

                // Process last-modified header, if supported by the handler.

                String method = request.getMethod();
                boolean isGet = "GET".equals(method);
                if (isGet || "HEAD".equals(method)) {
                    long lastModified = ha.getLastModified(request,
mappedHandler.getHandler());
                    if (logger.isDebugEnabled()) {
                        String requestUri =
urlPathHelper.getRequestUri(request);
                        logger.debug("Last-Modified value for [" + requestUri +
"] is: " + lastModified);
                    }
                    if (new ServletWebRequest(request,
response).checkNotModified(lastModified) && isGet) {
                        return;
                    }
                }
                if (!mappedHandler.applyPreHandle(processedRequest, response)) {
                    return;
                }
                try {

                    // Actually invoke the handler.处理（控制）器的方法被调用
                    //控制器（Controller），处理器（Handler）
                    //5、适配器来执行目标方法；
                    //将目标方法执行完成后的返回值作为视图名，设置保存到ModelAndView中
                    //目标方法无论怎么写，最终适配器执行完成以后都会将执行后的信息封装成
ModelAndView

                    mv =
ha.handle(processedRequest,response,mappedHandler.getHandler());
                } finally {
                    if (asyncManager.isConcurrentHandlingStarted()) {
                        return;
                    }
                }
                applyDefaultViewName(request, mv);//如果没有视图名设置一个默认的视图
名；
                mappedHandler.applyPostHandle(processedRequest, response, mv);
            } catch (Exception ex) {
                dispatchException = ex;
            }

            //转发到目标页面；
            //6、根据方法最终执行完成后封装的ModelAndView；
            //转发到对应页面，而且ModelAndView中的数据可以从请求域中获取
            processDispatchResult(processedRequest, response, mappedHandler,
                                  mv, dispatchException);
        } catch (Exception ex) {
            triggerAfterCompletion(processedRequest, response, mappedHandler,
ex);
        } catch (Error err) {
            triggerAfterCompletionWithError(processedRequest, response,
mappedHandler, err);
        } finally {
            if (asyncManager.isConcurrentHandlingStarted()) {

                // Instead of postHandle and afterCompletion

 mappedHandler.applyAfterConcurrentHandlingStarted(processedRequest, response);
                return;
            }
            // Clean up any resources used by a multipart request.
            if (multipartRequestParsed) {
                cleanupMultipart(processedRequest);
            }
        }
    }
```

总体概览

1. **用户发出请求，DispatcherServlet接收请求并拦截请求。**
2. **调用doDispatch()方法进行处理：**
    1. getHandler()：根据当前请求地址中找到能处理这个请求的目标处理器类(处理器)；
        - 根据当前请求在HandlerMapping中找到这个请求的映射信息，获取到目标处理器类
        - mappedHandler = getHandler(processedRequest);
    2. getHandlerAdapter()：根据当前处理器类找到能执行这个处理器方法的适配器；
        - 根据当前处理器类，找到当前类的HandlerAdapter（适配器）
        - HandlerAdapter ha = getHandlerAdapter(mappedHandler.getHandler());
    3. 使用刚才获取到的适配器(AnnotationMethodHandlerAdapter)执行目标方法；
        - mv = ha.handle(processedRequest,response,mappedHandler.getHandler());
    4. 目标方法执行后，会返回一个ModerAndView对象
        - **mv** = ha.handle(processedRequest,response,mappedHandler.getHandler());
    5. 根据ModerAndView的信息转发到具体页面，并可以在请求域中取出ModerAndView中的模型数据
        - processDispatchResult(processedRequest, response, mappedHandler, mv, dispatchException);

> HandlerMapping为处理器映射器，保存了每一个处理器能处理哪些请求的映射信息，handlerMap
>
> HandlerAdapter为处理器适配器，能解析注解方法的适配器，其按照特定的规则去执行Handler

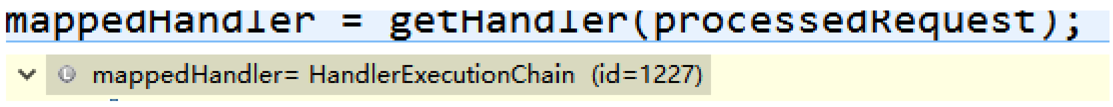
具体细节

步骤一：

getHandler():

> **怎么根据当前请求就能找到哪个类能来处理？**

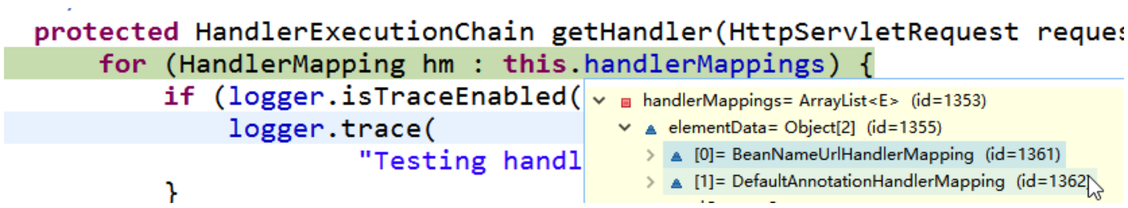
- getHandler()会返回目标处理器类的执行链



```
mappedHandler = getHandler(processedRequest);
```

```
mappedHandler= HandlerExecutionChain  (id=1227)
```

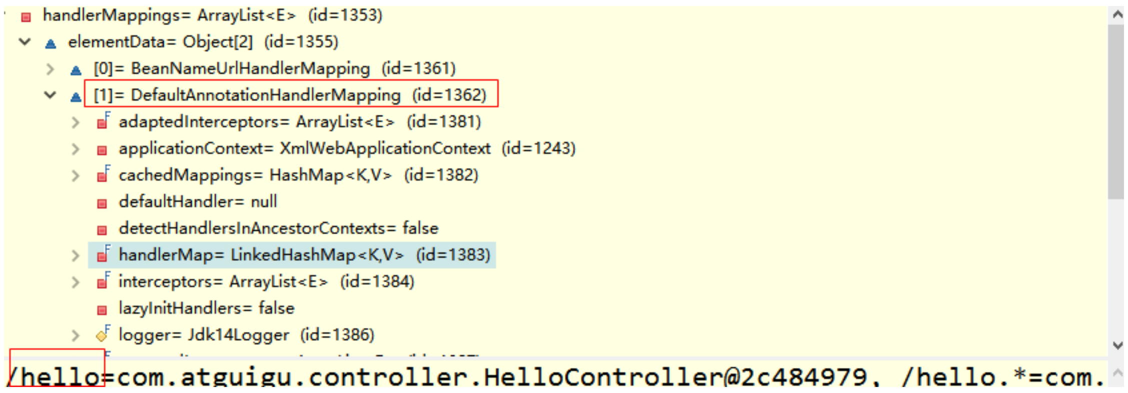
- HandlerMapping：处理器映射：他里面保存了每一个处理器能处理哪些请求的映射信息



```
protected HandlerExecutionChain getHandler(HttpServletRequest reques
        for (HandlerMapping hm : this.handlerMappings) {
            if (logger.isTraceEnabled(
                logger.trace(
                        "Testing handl
            }
```

```
handlerMappings= ArrayList<E>  (id=1353)
  elementData= Object[2]  (id=1355)
    [0]= BeanNameUrlHandlerMapping  (id=1361)
    [1]= DefaultAnnotationHandlerMapping  (id=1362)
```

- handlerMap：ioc容器启动创建Controller对象的时候扫描每个处理器都能处理什么请求，保存在HandlerMapping的handlerMap属性中；下一次请求过来，就来看哪个HandlerMapping中有这个请求映射信息就行了



```
handlerMappings= ArrayList<E>  (id=1353)
  elementData= Object[2]  (id=1355)
    [0]= BeanNameUrlHandlerMapping  (id=1361)
    [1]= DefaultAnnotationHandlerMapping  (id=1362)
      adaptedInterceptors= ArrayList<E>  (id=1381)
      applicationContext= XmlWebApplicationContext  (id=1243)
      cachedMappings= HashMap<K,V>  (id=1382)
      defaultHandler= null
      detectHandlersInAncestorContexts= false
      handlerMap= LinkedHashMap<K,V>  (id=1383)
      interceptors= ArrayList<E>  (id=1384)
      lazyInitHandlers= false
      logger= Jdk14Logger  (id=1386)
/hello=com.atguigu.controller.HelloController@2c484979, /hello.*=com.
```

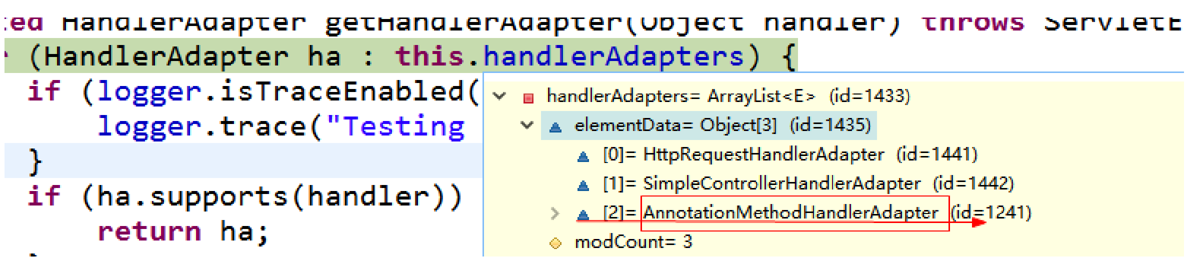
循环遍历拿到能处理url的类

```
protected HandlerExecutionChain getHandler(HttpServletRequest request) throws
Exception {
        for (HandlerMapping hm : this.handlerMappings) {
            if (logger.isTraceEnabled()) {
                logger.trace(
                        "Testing handler map [" + hm + "] in DispatcherServlet
with name '" + getServletName() + "'");
            }
            HandlerExecutionChain handler = hm.getHandler(request);
            if (handler != null) {
                return handler;
            }
        }
        return null;
    }
```

步骤二：

getHandlerAdapter():

> **如何找到目标处理器类的适配器。要拿适配器才去执行目标方法**



```
ed HandlerAdapter getHandlerAdapter(Object handler) throws ServletE
 (HandlerAdapter ha : this.handlerAdapters) {
 if (logger.isTraceEnabled(
     logger.trace("Testing
 }
 if (ha.supports(handler))
     return ha;
```

```
handlerAdapters= ArrayList<E>  (id=1433)
  elementData= Object[3]  (id=1435)
    [0]= HttpRequestHandlerAdapter  (id=1441)
    [1]= SimpleControllerHandlerAdapter  (id=1442)
    [2]= AnnotationMethodHandlerAdapter  (id=1241)
  modCount= 3
```

AnnotationMethodHandlerAdapter：

- 能解析注解方法的适配器；
- 处理器类中只要有标了注解的这些方法就能用；

```
protected HandlerAdapter getHandlerAdapter(Object handler) throws
ServletException {
        for (HandlerAdapter ha : this.handlerAdapters) {
            if (logger.isTraceEnabled()) {
                logger.trace("Testing handler adapter [" + ha + "]");
            }
            if (ha.supports(handler)) {
                return ha;
            }
        }
        throw new ServletException("No adapter for handler [" + handler +
                "]: The DispatcherServlet configuration needs to include a
HandlerAdapter that supports this handler");
    }
```

步骤三：

执行目标方法的细节；

mv = ha.handle(processedRequest, response, mappedHandler.getHandler());

↓

return invokeHandlerMethod(request, response, handler);

```
protected ModelAndView invokeHandlerMethod(HttpServletRequest request,
HttpServletResponse response, Object handler)
            throws Exception {
          //拿到方法的解析器
        ServletHandlerMethodResolver methodResolver =
getMethodResolver(handler);
          //方法解析器根据当前请求地址找到真正的目标方法
        Method handlerMethod = methodResolver.resolveHandlerMethod(request);
          //创建一个方法执行器；
        ServletHandlerMethodInvoker methodInvoker = new
ServletHandlerMethodInvoker(methodResolver);
          //包装原生的request, response,
        ServletWebRequest webRequest = new ServletWebRequest(request, response);
          //创建了一个，隐含模型

        ExtendedModelMap implicitModel = new BindingAwareModelMap();//**重点

         //真正执行目标方法；目标方法利用反射执行期间确定参数值，提前执行modelattribute等所
有的操作都在这个方法中；
        Object result = methodInvoker.invokeHandlerMethod(handlerMethod,
handler, webRequest, implicitModel);
        //=======================看后边补充的代码块==========================
        ModelAndView mav =
                methodInvoker.getModelAndView(handlerMethod, handler.getClass(),
result, implicitModel, webRequest);

        methodInvoker.updateModelAttributes(handler, (mav != null ?
mav.getModel() : null), implicitModel, webRequest);
```

```
        return mav;
    }
```

↓

```
Object result = methodInvoker.invokeHandlerMethod(handlerMethod, handler,
webRequest, implicitModel);
```

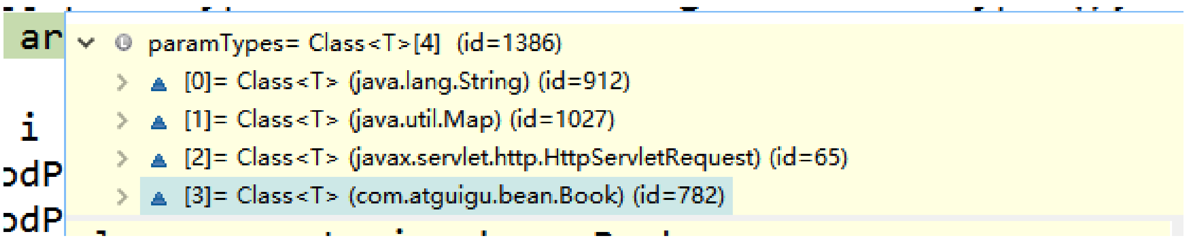
```
publicfinal Object invokeHandlerMethod(Method handlerMethod, Object handler,
            NativeWebRequest webRequest, ExtendedModelMap implicitModel) throws
Exception {
        Method handlerMethodToInvoke =
BridgeMethodResolver.findBridgedMethod(handlerMethod);
        try {
            boolean debug = logger.isDebugEnabled();
            for (String attrName :
this.methodResolver.getActualSessionAttributeNames()) {
                Object attrValue =
this.sessionAttributeStore.retrieveAttribute(webRequest, attrName);
                if (attrValue != null) {
                    implicitModel.addAttribute(attrName, attrValue);
                }
            }

          //找到所有@ModelAttribute注解标注的方法；
            for (Method attributeMethod :
this.methodResolver.getModelAttributeMethods()) {
                Method attributeMethodToInvoke =
BridgeMethodResolver.findBridgedMethod(attributeMethod);
                //先确定modelattribute方法执行时要使用的每一个参数的值；
               Object[] args = resolveHandlerArguments(attributeMethodToInvoke,
handler, webRequest, implicitModel);
       //==========================看后边补充的代码块
=====================================
                if (debug) {
                    logger.debug("Invoking model attribute method: " +
attributeMethodToInvoke);
                }
                String attrName =
AnnotationUtils.findAnnotation(attributeMethod, ModelAttribute.class).value();

                if (!"".equals(attrName) &&
implicitModel.containsAttribute(attrName)) {
                    continue;
                }

                ReflectionUtils.makeAccessible(attributeMethodToInvoke);

               //提前运行ModelAttribute，
                Object attrValue = attributeMethodToInvoke.invoke(handler,
args);
                if ("".equals(attrName)) {
                    Class<?> resolvedType =
GenericTypeResolver.resolveReturnType(attributeMethodToInvoke,
handler.getClass());
```

```
                    attrName =
Conventions.getVariableNameForReturnType(attributeMethodToInvoke, resolvedType,
attrValue);
                }

                /*

                方法上标注的ModelAttribute注解如果有value值
                @ModelAttribute("abc")
                hahaMyModelAttribute()

                标了: attrName="abc"
                没标: attrName="";attrName就会变为返回值类型首字母小写，
                     比如void ,或者book;

                      【
                        @ModelAttribute标在方法上的另外一个作用；
                        可以把方法运行后的返回值按照方法上@ModelAttribute("abc")
                        指定的key放到隐含模型中；
                        如果没有指定这个key；就用返回值类型的首字母小写
                       】

                        {
                            haha=Book [id=100, bookName=西游记, author=吴承恩,
stock=98,                                  sales=10, price=98.98],
                            void=null
                        }
                */
                //把提前运行的ModelAttribute方法的返回值也放在隐含模型中
                if (!implicitModel.containsAttribute(attrName)) {
                    implicitModel.addAttribute(attrName, attrValue);
                }
            }

               //再次解析目标方法参数是哪些值
            Object[] args = resolveHandlerArguments(handlerMethodToInvoke,
handler, webRequest, implicitModel);
            if (debug) {
                logger.debug("Invoking request handler method: " +
handlerMethodToInvoke);
            }
            ReflectionUtils.makeAccessible(handlerMethodToInvoke);


            //执行目标方法
            return handlerMethodToInvoke.invoke(handler, args);
        }
        catch (IllegalStateException ex) {
            // Internal assertion failed (e.g. invalid signature):
            // throw exception with full handler method context...
            throw new HandlerMethodInvocationException(handlerMethodToInvoke,
ex);
        }
        catch (InvocationTargetException ex) {
            // User-defined @ModelAttribute/@InitBinder/@RequestMapping method
threw an exception...
            ReflectionUtils.rethrowException(ex.getTargetException());
            return null;
        }
    }
```

确定方法运行时使用的每一个参数的值

Object[] args = resolveHandlerArguments(attributeMethodToInvoke, handler, webRequest, implicitModel);

```
@RequestMapping("/updateBook")
    public String updateBook
            (
                    @RequestParam(value="author")String author,
                    Map<String, Object> model,
                    HttpServletRequest request,
                    @ModelAttribute("haha")Book book
             )
```



```
paramTypes= Class<T>[4]  (id=1386)
    [0]= Class<T> (java.lang.String) (id=912)
    [1]= Class<T> (java.util.Map) (id=1027)
    [2]= Class<T> (javax.servlet.http.HttpServletRequest) (id=65)
    [3]= Class<T> (com.atguigu.bean.Book) (id=782)
```

```
标了注解：
            保存时哪个注解的详细信息；
            如果参数有ModelAttribute注解；
                  拿到ModelAttribute注解的值让attrName保存
                        attrName="haha"

没标注解：
            1）、先看是否普通参数（是否原生API）
                  再看是否Model或者Map，如果是就传入隐含模型；
            2）、自定义类型的参数没有ModelAttribute 注解
                        1）、先看是否原生API
                        2）、再看是否Model或者Map
                        3）、再看是否是其他类型的比如SessionStatus、HttpEntity、Errors
                        4）、再看是否简单类型的属性；比如是否Integer，String，基本类型
                                  如果是paramName=“”
                        5)、attrName="";

如果是自定义类型对象，最终会产生两个效果；
      1）、如果这个参数标注了ModelAttribute注解就给attrName赋值为这个注解的value值
      2）、如果这个参数没有标注ModelAttribute注解就给attrName赋值"";
```

```
private Object[] resolveHandlerArguments(Method handlerMethod, Object handler,
              NativeWebRequest webRequest, ExtendedModelMap implicitModel) throws
Exception {
         Class<?>[] paramTypes = handlerMethod.getParameterTypes();
           //创建了一个和参数个数一样多的数组，会用来保存每一个参数的值
```

```
        Object[] args = new Object[paramTypes.length];


        for (int i = 0; i < args.length; i++) {
            MethodParameter methodParam = new MethodParameter(handlerMethod, i);

 methodParam.initParameterNameDiscovery(this.parameterNameDiscoverer);
            GenericTypeResolver.resolveParameterType(methodParam,
handler.getClass());
            String paramName = null;
            String headerName = null;
            boolean requestBodyFound = false;
            String cookieName = null;
            String pathVarName = null;
            String attrName = null;
            boolean required = false;
            String defaultValue = null;
            boolean validate = false;
            Object[] validationHints = null;
            int annotationsFound = 0;
            Annotation[] paramAnns = methodParam.getParameterAnnotations();

            //找到目标方法这个参数的所有注解，如果有注解就解析并保存注解的信息；
            for (Annotation paramAnn : paramAnns) {
                if (RequestParam.class.isInstance(paramAnn)) {
                    RequestParam requestParam = (RequestParam) paramAnn;
                    paramName = requestParam.value();
                    required = requestParam.required();
                    defaultValue =
parseDefaultValueAttribute(requestParam.defaultValue());
                    annotationsFound++;
                }
                else if (RequestHeader.class.isInstance(paramAnn)) {
                    RequestHeader requestHeader = (RequestHeader) paramAnn;
                    headerName = requestHeader.value();
                    required = requestHeader.required();
                    defaultValue =
parseDefaultValueAttribute(requestHeader.defaultValue());
                    annotationsFound++;
                }
                else if (RequestBody.class.isInstance(paramAnn)) {
                    requestBodyFound = true;
                    annotationsFound++;
                }
                else if (CookieValue.class.isInstance(paramAnn)) {
                    CookieValue cookieValue = (CookieValue) paramAnn;
                    cookieName = cookieValue.value();
                    required = cookieValue.required();
                    defaultValue =
parseDefaultValueAttribute(cookieValue.defaultValue());
                    annotationsFound++;
                }
                else if (PathVariable.class.isInstance(paramAnn)) {
                    PathVariable pathVar = (PathVariable) paramAnn;
                    pathVarName = pathVar.value();
                    annotationsFound++;
                }
                else if (ModelAttribute.class.isInstance(paramAnn)) {
                    ModelAttribute attr = (ModelAttribute) paramAnn;
                    attrName = attr.value();
                    annotationsFound++;
                }
                else if (Value.class.isInstance(paramAnn)) {
                    defaultValue = ((Value) paramAnn).value();
                }
                else if
(paramAnn.annotationType().getSimpleName().startsWith("Valid")) {
                    validate = true;
                    Object value = AnnotationUtils.getValue(paramAnn);
                    validationHints = (value instanceof Object[] ? (Object[])
value : new Object[] {value});
                }
            }
            if (annotationsFound > 1) {
                throw new IllegalStateException("Handler parameter annotations
are exclusive choices - " +
                        "do not specify more than one such annotation on the
same parameter: " + handlerMethod);
            }

             //没有找到注解的情况;
            if (annotationsFound == 0) {

                //解析普通参数
                Object argValue = resolveCommonArgument(methodParam,
webRequest);
                //=====================看后边补充的代码块========================
                 //会进入resolveStandardArgument(解析标准参数)


                if (argValue != WebArgumentResolver.UNRESOLVED) {
                    args[i] = argValue;
                }
                else if (defaultValue != null) {
                    args[i] = resolveDefaultValue(defaultValue);
                }
                else {

               //判断是否是Model或者是Map旗下的,如果是将之前创建的隐含模型直接赋值给这个参
数
                    Class<?> paramType = methodParam.getParameterType();
                    if (Model.class.isAssignableFrom(paramType) ||
Map.class.isAssignableFrom(paramType)) {
                        if
(!paramType.isAssignableFrom(implicitModel.getClass())) {
                            throw new IllegalStateException("Argument [" +
paramType.getSimpleName() + "] is of type " +
                                    "Model or Map but is not assignable from the
actual model. You may need to switch " +
                                    "newer MVC infrastructure classes to use
this argument.");
                        }
                        args[i] = implicitModel;
                    }
                    else if (SessionStatus.class.isAssignableFrom(paramType)) {
                        args[i] = this.sessionStatus;
                    }
                    else if (HttpEntity.class.isAssignableFrom(paramType)) {
                        args[i] = resolveHttpEntityRequest(methodParam,
webRequest);
                    }
                    else if (Errors.class.isAssignableFrom(paramType)) {
                        throw new IllegalStateException("Errors/BindingResult
argument declared " +
                                "without preceding model attribute. Check your
handler method signature!");
                    }
                    else if (BeanUtils.isSimpleProperty(paramType)) {
                        paramName = "";
                    }
                    else {
                        attrName = "";
                    }
                }
            }


               //确定值的环节
            if (paramName != null) {
                args[i] = resolveRequestParam(paramName, required, defaultValue,
methodParam, webRequest, handler);
            }
            else if (headerName != null) {
                args[i] = resolveRequestHeader(headerName, required,
defaultValue, methodParam, webRequest, handler);
            }
            else if (requestBodyFound) {
                args[i] = resolveRequestBody(methodParam, webRequest, handler);
            }
            else if (cookieName != null) {
                args[i] = resolveCookieValue(cookieName, required, defaultValue,
methodParam, webRequest, handler);
            }
            else if (pathVarName != null) {
                args[i] = resolvePathVariable(pathVarName, methodParam,
webRequest, handler);
            }


            //确定自定义类型参数的值；还要将请求中的每一个参数赋值给这个对象
            else if (attrName != null) {
                WebDataBinder binder = resolveModelAttribute(attrName,
methodParam, implicitModel, webRequest, handler);
                //=====================看后边代码补充=============================
                boolean assignBindingResult = (args.length > i + 1 &&
Errors.class.isAssignableFrom(paramTypes[i + 1]));
                if (binder.getTarget() != null) {
                    doBind(binder, webRequest, validate, validationHints,
!assignBindingResult);
                }
                args[i] = binder.getTarget();
                if (assignBindingResult) {
                    args[i + 1] = binder.getBindingResult();
                    i++;
                }
                implicitModel.putAll(binder.getBindingResult().getModel());
            }
        }
        return args;
    }
```

如果没有注解：

resolveCommonArgument）**就是确定当前的参数是否是原生API**；

```
        @Override
        protected Object resolveStandardArgument(Class<?> parameterType,
NativeWebRequest webRequest) throws Exception {
            HttpServletRequest request =
webRequest.getNativeRequest(HttpServletRequest.class);
            HttpServletResponse response =
webRequest.getNativeResponse(HttpServletResponse.class);

            if (ServletRequest.class.isAssignableFrom(parameterType) ||
                    MultipartRequest.class.isAssignableFrom(parameterType)) {
                Object nativeRequest =
webRequest.getNativeRequest(parameterType);
                if (nativeRequest == null) {
                    throw new IllegalStateException(
                            "Current request is not of type [" +
parameterType.getName() + "]: " + request);
                }
                return nativeRequest;
            }
            else if (ServletResponse.class.isAssignableFrom(parameterType)) {
                this.responseArgumentUsed = true;
                Object nativeResponse =
webRequest.getNativeResponse(parameterType);
                if (nativeResponse == null) {
                    throw new IllegalStateException(
                            "Current response is not of type [" +
parameterType.getName() + "]: " + response);
                }
                return nativeResponse;
            }
            else if (HttpSession.class.isAssignableFrom(parameterType)) {
                return request.getSession();
            }
            else if (Principal.class.isAssignableFrom(parameterType)) {
                return request.getUserPrincipal();
            }
            else if (Locale.class.equals(parameterType)) {
                return RequestContextUtils.getLocale(request);
            }
            else if (InputStream.class.isAssignableFrom(parameterType)) {
                return request.getInputStream();
            }
            else if (Reader.class.isAssignableFrom(parameterType)) {
                return request.getReader();
            }
            else if (OutputStream.class.isAssignableFrom(parameterType)) {
                this.responseArgumentUsed = true;
                return response.getOutputStream();
            }
            else if (Writer.class.isAssignableFrom(parameterType)) {
                this.responseArgumentUsed = true;
                return response.getWriter();
            }
            return super.resolveStandardArgument(parameterType, webRequest);
        }
```

resolveModelAttribute

```
SpringMVC确定POJO值的三步；
1、如果隐含模型中有这个key（标了ModelAttribute注解就是注解指定的value，没标就是参数类型的首字母小写）指定的值；
     如果有将这个值赋值给bindObject；
2、如果是SessionAttributes标注的属性，就从session中拿；
3、如果都不是就利用反射创建对象；
```

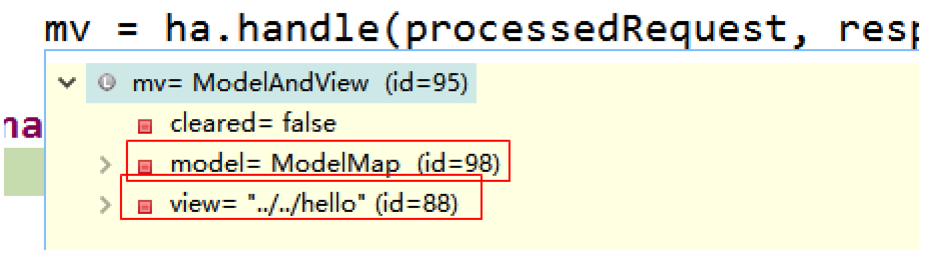
```
private WebDataBinder resolveModelAttribute(String attrName, MethodParameter
methodParam,
            ExtendedModelMap implicitModel, NativeWebRequest webRequest, Object
handler) throws Exception {

        // Bind request parameter onto object...
        String name = attrName;

        if ("".equals(name)) {
               //如果attrName是空串；就将参数类型的首字母小写作为值
                //Book book2121 -> name=book
            name = Conventions.getVariableNameForParameter(methodParam);
        }
        Class<?> paramType = methodParam.getParameterType();
        Object bindObject;

         //确定目标对象的值
        if (implicitModel.containsKey(name)) {
            bindObject = implicitModel.get(name);
        }
        else if (this.methodResolver.isSessionAttribute(name, paramType)) {
            bindObject =
this.sessionAttributeStore.retrieveAttribute(webRequest, name);
            if (bindObject == null) {
                raiseSessionRequiredException("Session attribute '" + name + "'
required - not found in session");
            }
        }
        else {
            bindObject = BeanUtils.instantiateClass(paramType);
        }


        WebDataBinder binder = createBinder(webRequest, bindObject, name);
        initBinder(handler, name, binder, webRequest);
        return binder;
    }
```

总结：

1. 运行流程简单版；
2. 确定方法每个参数的值；
    1. 标注解：保存注解的信息；最终得到这个注解应该对应解析的值；
    2. 没标注解：
        1. 看是否是原生API；
        2. 看是否是Model或者是Map，SessionStatus、HttpEntity、Errors...
        3. 看是否是简单类型；paramName=""
        4. 给attrName赋值；attrName（参数标了@ModelAttribute("")就是指定的，没标就是""）
            1. attrName使用**参数的类型**首字母小写；或者使用之前@ModelAttribute("")的值
            2. 先看隐含模型中有每个这个attrName作为key对应的值；如果有就从隐含模型中获取并赋值
            3. 看是否是@SessionAttributes(value="haha")；标注的属性，如果是从session中拿；
            4. 不是@SessionAttributes标注的，利用反射创建一个对象；
        5. 不是@SessionAttributes标注的，利用反射创建一个对象；

步骤四：

1. 任何方法的返回值，最终都会被包装成ModelAndView对象



```
mv = ha.handle(processedRequest, resp
mv= ModelAndView  (id=95)
    cleared= false
    model= ModelMap  (id=98)
    view= "../../hello" (id=88)
```

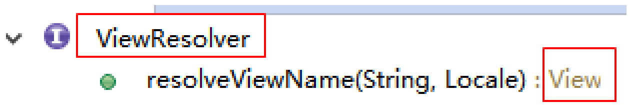
步骤五：

SpringMVC视图解析：

> 1、方法执行后的返回值会作为页面地址参考，转发或者重定向到页面
>
> 2、视图解析器可能会进行页面地址的拼串

```
processDispatchResult(processedRequest, response, mappedHandler,
    mv, dispatchException);
```

1. 调用processDispatchResult(processedRequest, response, mappedHandler, mv, dispatchException)
    - 来到页面的方法视图渲染流程
    - 将域中的数据在页面展示
    - 页面就是用来渲染模型数据的
2. 调用render(mv, request, response)
    - 渲染页面

3. View与ViewResolver
   - ViewResolver的作用是根据视图名（方法的返回值）得到View对象
   - 
     ViewResolver
     resolveViewName(String, Locale) : View

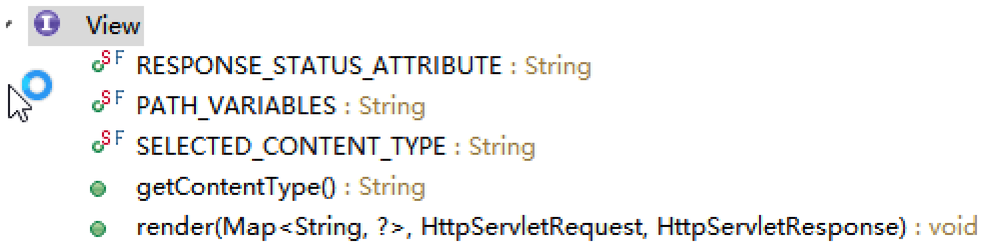
4. 怎么能根据方法的返回值（视图名）得到View对象？

```
protected View resolveViewName(String viewName, Map<String, Object> model,
Locale locale,
            HttpServletRequest request) throws Exception {

          //遍历所有的ViewResolver；
        for (ViewResolver viewResolver : this.viewResolvers) {


          //viewResolver视图解析器根据方法的返回值，得到一个View对象；
            View view = viewResolver.resolveViewName(viewName, locale);


            if (view != null) {
                return view;
            }
        }
        return null;
    }
```

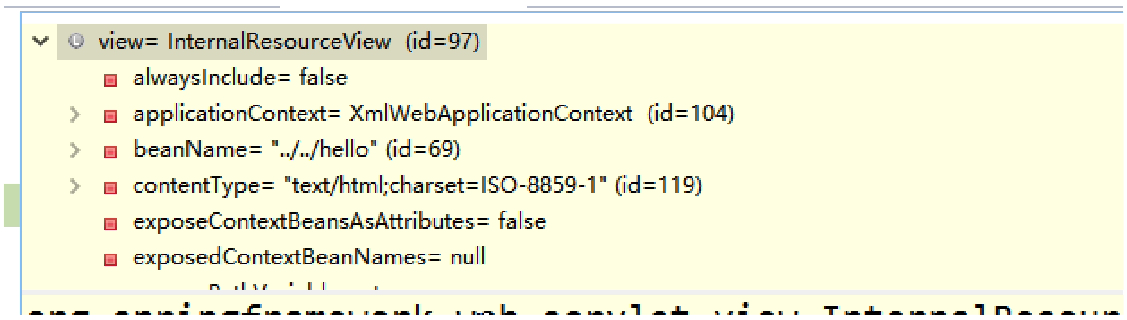
   - resolveViewName实现

```
@Override
    public View resolveViewName(String viewName, Locale locale) throws
Exception {
        if (!isCache()) {
            return createView(viewName, locale);
        }
        else {
            Object cacheKey = getCacheKey(viewName, locale);
            View view = this.viewAccessCache.get(cacheKey);
            if (view == null) {
                synchronized (this.viewCreationCache) {
                    view = this.viewCreationCache.get(cacheKey);
                    if (view == null) {


                        // Ask the subclass to create the View object.
                         //根据方法的返回值创建出视图View对象；
                        view = createView(viewName, locale);


                        if (view == null && this.cacheUnresolved) {
                            view = UNRESOLVED_VIEW;
                        }
                        if (view != null) {
                            this.viewAccessCache.put(cacheKey, view);
                            this.viewCreationCache.put(cacheKey, view);
                            if (logger.isTraceEnabled()) {
                                logger.trace("Cached view [" + cacheKey
+ "]");
                            }
                        }
                    }
                }
            }
            return (view != UNRESOLVED_VIEW ? view : null);
        }
    }
```

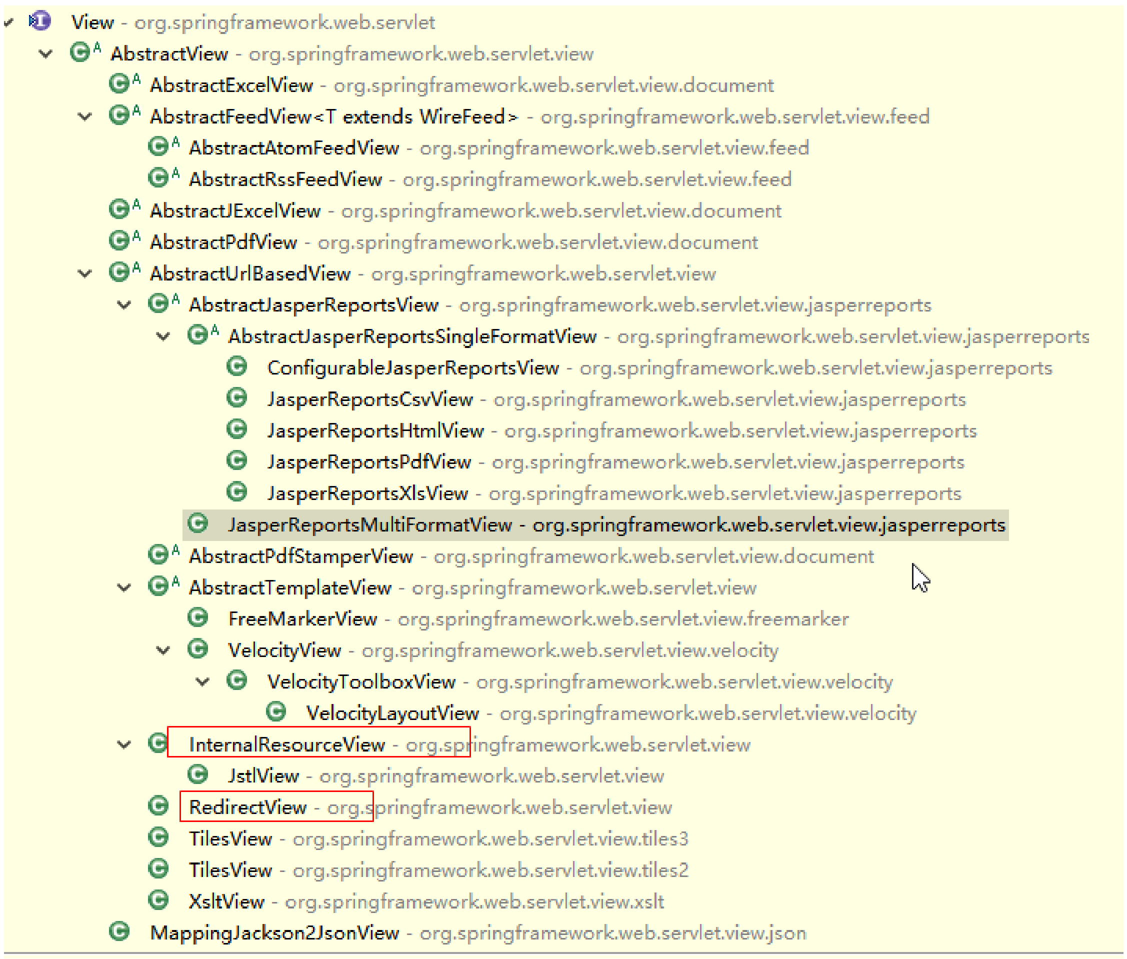
- 创建View对象


View
RESPONSE_STATUS_ATTRIBUTE : String
PATH_VARIABLES : String
SELECTED_CONTENT_TYPE : String
getContentType() : String
render(Map<String, ?>, HttpServletRequest, HttpServletResponse) : void

```
  @Override
      protected View createView(String viewName, Locale locale) throws
Exception {
          // If this resolver is not supposed to handle the given view,
          // return null to pass on to the next resolver in the chain.
          if (!canHandle(viewName, locale)) {
              return null;
          }
          // Check for special "redirect:" prefix.
          if (viewName.startsWith(REDIRECT_URL_PREFIX)) {
              String redirectUrl =
viewName.substring(REDIRECT_URL_PREFIX.length());
              RedirectView view = new RedirectView(redirectUrl,
isRedirectContextRelative(), isRedirectHttp10Compatible());
              return applyLifecycleMethods(viewName, view);
          }
          // Check for special "forward:" prefix.
          if (viewName.startsWith(FORWARD_URL_PREFIX)) {
              String forwardUrl =
viewName.substring(FORWARD_URL_PREFIX.length());
              return new InternalResourceView(forwardUrl);
          }
          // Else fall back to superclass implementation: calling loadView.
          //如果没有前缀就使用父类默认创建一个View;
          return super.createView(viewName, locale);
      }
```



```
view= InternalResourceView  (id=97)
    alwaysInclude= false
  > applicationContext= XmlWebApplicationContext  (id=104)
  > beanName= "../../hello" (id=69)
  > contentType= "text/html;charset=ISO-8859-1" (id=119)
    exposeContextBeansAsAttributes= false
    exposedContextBeanNames= null
```



```
View - org.springframework.web.servlet
  AbstractView - org.springframework.web.servlet.view
    AbstractExcelView - org.springframework.web.servlet.view.document
    AbstractFeedView<T extends WireFeed> - org.springframework.web.servlet.view.feed
      AbstractAtomFeedView - org.springframework.web.servlet.view.feed
      AbstractRssFeedView - org.springframework.web.servlet.view.feed
    AbstractJExcelView - org.springframework.web.servlet.view.document
    AbstractPdfView - org.springframework.web.servlet.view.document
    AbstractUrlBasedView - org.springframework.web.servlet.view
      AbstractJasperReportsView - org.springframework.web.servlet.view.jasperreports
        AbstractJasperReportsSingleFormatView - org.springframework.web.servlet.view.jasperreports
          ConfigurableJasperReportsView - org.springframework.web.servlet.view.jasperreports
          JasperReportsCsvView - org.springframework.web.servlet.view.jasperreports
          JasperReportsHtmlView - org.springframework.web.servlet.view.jasperreports
          JasperReportsPdfView - org.springframework.web.servlet.view.jasperreports
          JasperReportsXlsView - org.springframework.web.servlet.view.jasperreports
        JasperReportsMultiFormatView - org.springframework.web.servlet.view.jasperreports
      AbstractPdfStamperView - org.springframework.web.servlet.view.document
      AbstractTemplateView - org.springframework.web.servlet.view
        FreeMarkerView - org.springframework.web.servlet.view.freemarker
        VelocityView - org.springframework.web.servlet.view.velocity
          VelocityToolboxView - org.springframework.web.servlet.view.velocity
            VelocityLayoutView - org.springframework.web.servlet.view.velocity
      InternalResourceView - org.springframework.web.servlet.view
        JstlView - org.springframework.web.servlet.view
      RedirectView - org.springframework.web.servlet.view
      TilesView - org.springframework.web.servlet.view.tiles3
      TilesView - org.springframework.web.servlet.view.tiles2
      XsltView - org.springframework.web.servlet.view.xslt
    MappingJackson2JsonView - org.springframework.web.servlet.view.json
```

- 返回View对象
    - 视图解析器得到View对象的流程就是，所有配置的视图解析器都来尝试根据视图名（返回值）得到View（视图）对象；如果能得到就返回，得不到就换下一个视图解析器；
    - 调用View对象的render方法

```
@Override
    public void render(Map<String, ?> model, HttpServletRequest
request, HttpServletResponse response) throws Exception {
        if (logger.isTraceEnabled()) {
            logger.trace("Rendering view with name '" + this.beanName +
"' with model " + model +
                " and static attributes " + this.staticAttributes);
        }

        Map<String, Object> mergedModel =
createMergedOutputModel(model, request, response);

        prepareResponse(request, response);

        //渲染要给页面输出的所有数据
        renderMergedOutputModel(mergedModel, request, response);
    }
```

- InternalResourceView有这个方法renderMergedOutputModel;

```
@Override
    protected void renderMergedOutputModel(
            Map<String, Object> model, HttpServletRequest request,
HttpServletResponse response) throws Exception {

        // Determine which request handle to expose to the
RequestDispatcher.
        HttpServletRequest requestToExpose =
getRequestToExpose(request);

        // Expose the model object as request attributes.


        //将模型中的数据放在请求域中
        exposeModelAsRequestAttributes(model, requestToExpose);



        // Expose helpers as request attributes, if any.
        exposeHelpers(requestToExpose);

        // Determine the path for the request dispatcher.
        String dispatcherPath = prepareForRendering(requestToExpose,
response);

        // Obtain a RequestDispatcher for the target resource
(typically a JSP).
        RequestDispatcher rd = getRequestDispatcher(requestToExpose,
dispatcherPath);
        if (rd == null) {
            throw new ServletException("Could not get RequestDispatcher
for [" + getUrl() +
                    "]: Check that the corresponding file exists within
your web application archive!");
        }

        // If already included or response already committed, perform
include, else forward.
        if (useInclude(requestToExpose, response)) {
            response.setContentType(getContentType());
            if (logger.isDebugEnabled()) {
                logger.debug("Including resource [" + getUrl() + "] in
InternalResourceView '" + getBeanName() + "'");
            }
            rd.include(requestToExpose, response);
        }

        else {
            // Note: The forwarded resource is supposed to determine
the content type itself.
            if (logger.isDebugEnabled()) {
                logger.debug("Forwarding to resource [" + getUrl() + "]
in InternalResourceView '" + getBeanName() + "'");
            }

            //转发页面
            rd.forward(requestToExpose, response);
        }
    }
```

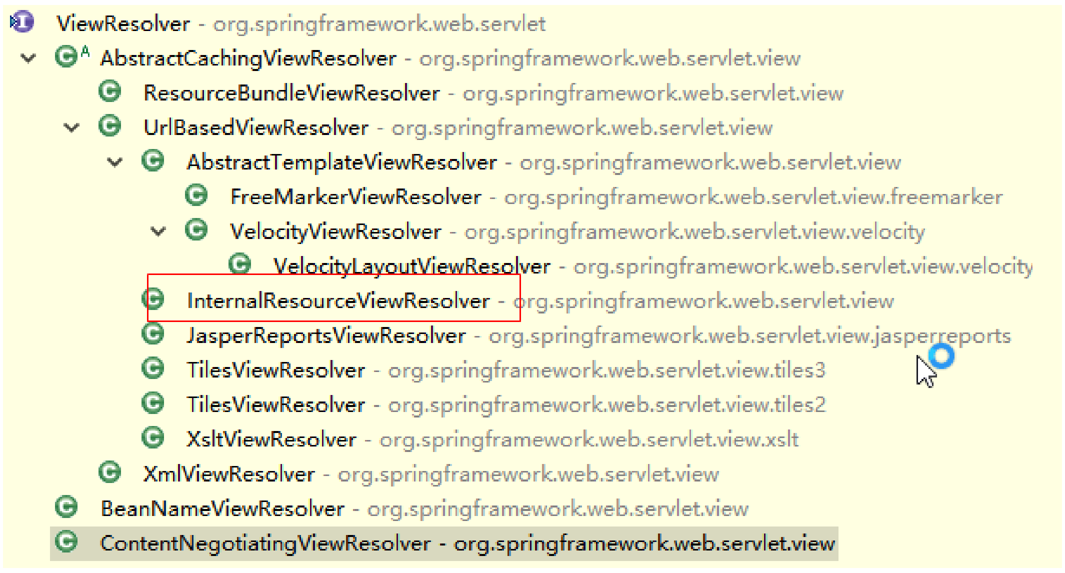
- 将模型中的所有数据取出来全放在request域中

```
protected void exposeModelAsRequestAttributes(Map<String, Object>
model, HttpServletRequest request) throws Exception {
        for (Map.Entry<String, Object> entry : model.entrySet()) {
            String modelName = entry.getKey();
            Object modelValue = entry.getValue();
            if (modelValue != null) {

                //将ModelMap中的数据放到请求域中
                request.setAttribute(modelName, modelValue);


                if (logger.isDebugEnabled()) {
                    logger.debug("Added model object '" + modelName +
"' of type [" + modelValue.getClass().getName() +
                            "] to request in view with name '" +
getBeanName() + "'");
                }
            }
            else {
                request.removeAttribute(modelName);
                if (logger.isDebugEnabled()) {
                    logger.debug("Removed model object '" + modelName +
                            "' from request in view with name '" +
getBeanName() + "'");
                }
            }
        }
    }
```

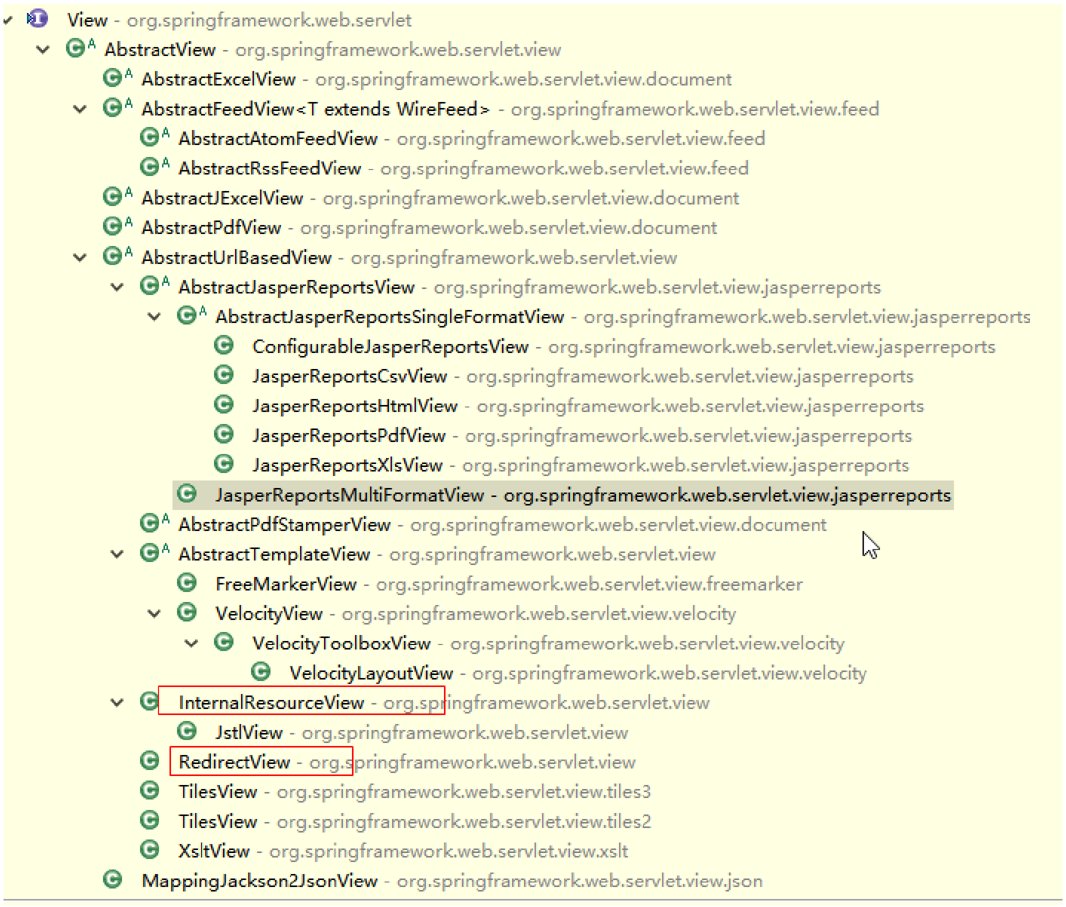
总结：

- 视图解析器只是为了得到视图对象
- 视图对象才能真正的转发（将模型数据全部放在请求域中）或者重定向到页面视图对象才能真正的渲染视图

- ViewResolver


ViewResolver - org.springframework.web.servlet
AbstractCachingViewResolver - org.springframework.web.servlet.view
ResourceBundleViewResolver - org.springframework.web.servlet.view
UrlBasedViewResolver - org.springframework.web.servlet.view
AbstractTemplateViewResolver - org.springframework.web.servlet.view
FreeMarkerViewResolver - org.springframework.web.servlet.view.freemarker
VelocityViewResolver - org.springframework.web.servlet.view.velocity
VelocityLayoutViewResolver - org.springframework.web.servlet.view.velocity
InternalResourceViewResolver - org.springframework.web.servlet.view
JasperReportsViewResolver - org.springframework.web.servlet.view.jasperreports
TilesViewResolver - org.springframework.web.servlet.view.tiles3
TilesViewResolver - org.springframework.web.servlet.view.tiles2
XsltViewResolver - org.springframework.web.servlet.view.xslt
XmlViewResolver - org.springframework.web.servlet.view
BeanNameViewResolver - org.springframework.web.servlet.view
ContentNegotiatingViewResolver - org.springframework.web.servlet.view

- View:


View - org.springframework.web.servlet
AbstractView - org.springframework.web.servlet.view
AbstractExcelView - org.springframework.web.servlet.view.document
AbstractFeedView<T extends WireFeed> - org.springframework.web.servlet.view.feed
AbstractAtomFeedView - org.springframework.web.servlet.view.feed
AbstractRssFeedView - org.springframework.web.servlet.view.feed
AbstractJExcelView - org.springframework.web.servlet.view.document
AbstractPdfView - org.springframework.web.servlet.view.document
AbstractUrlBasedView - org.springframework.web.servlet.view
AbstractJasperReportsView - org.springframework.web.servlet.view.jasperreports
AbstractJasperReportsSingleFormatView - org.springframework.web.servlet.view.jasperreports
ConfigurableJasperReportsView - org.springframework.web.servlet.view.jasperreports
JasperReportsCsvView - org.springframework.web.servlet.view.jasperreports
JasperReportsHtmlView - org.springframework.web.servlet.view.jasperreports
JasperReportsPdfView - org.springframework.web.servlet.view.jasperreports
JasperReportsXlsView - org.springframework.web.servlet.view.jasperreports
JasperReportsMultiFormatView - org.springframework.web.servlet.view.jasperreports
AbstractPdfStamperView - org.springframework.web.servlet.view.document
AbstractTemplateView - org.springframework.web.servlet.view
FreeMarkerView - org.springframework.web.servlet.view.freemarker
VelocityView - org.springframework.web.servlet.view.velocity
VelocityToolboxView - org.springframework.web.servlet.view.velocity
VelocityLayoutView - org.springframework.web.servlet.view.velocity
InternalResourceView - org.springframework.web.servlet.view
JstlView - org.springframework.web.servlet.view
RedirectView - org.springframework.web.servlet.view
TilesView - org.springframework.web.servlet.view.tiles3
TilesView - org.springframework.web.servlet.view.tiles2
XsltView - org.springframework.web.servlet.view.xslt
MappingJackson2JsonView - org.springframework.web.servlet.view.json

8. 视图解析

8.1 forward和redirect前缀

通过SpringMVC来实现转发和重定向。

- 直接 return “success”，会走视图解析器进行拼串
- 转发：return “forward:/succes.jsp”；直接写绝对路径，/表示当前项目下，不走视图解析器
- 重定向：return “redirect:/success.jsp”；不走视图解析器

```
@Controller
public class ResultSpringMVC {
    @RequestMapping("/hello01")
    public String test1(){
        //转发
        //会走视图解析器
        return "success";
    }

    @RequestMapping("/hello02")
    public String test2(){
        //转发二
        //不走视图解析器
        return "forward:/success.jsp";
    }

    @RequestMapping("/hello03")
    public String test3(){
        //重定向
        //不走视图解析器
        return "redirect:/success.jsp";
    }
}
```

使用原生的ServletAPI时要注意，**/路径需要加上项目名才能成功**

```
    @RequestMapping("/result/t2")
    public void test2(HttpServletRequest req, HttpServletResponse resp)
throwsIOException {
        //重定向
        resp.sendRedirect("/index.jsp");
    }

    @RequestMapping("/result/t3")
    public void test3(HttpServletRequest req, HttpServletResponse resp)
throwsException {
        //转发
        req.setAttribute("msg","/result/t3");
        req.getRequestDispatcher("/WEB-INF/jsp/test.jsp").forward(req,resp);
    }
```

8.2 jstlView

导包导入了jstl的时候会自动创建为一个jstlView；可以快速方便的支持国际化功能；

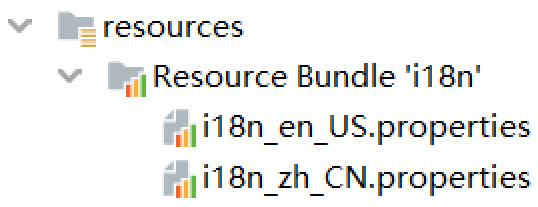
可以支持快速国际化；

javaWeb国际化步骤；

1. 得得到一个Locale对象；
2. 使用ResourceBundle绑定国际化资源文件
3. 使用ResourceBundle.getString("key")；获取到国际化配置文件中的值
4. web页面的国际化，fmt标签库来做
    - `<fmt:setLocale>`
    - `<fmt:setBundle>`
    - `<fmt:message>`

有了JstlView以后

1. 让Spring管理国际化资源就行



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

<bean id="messageSource"
class="org.springframework.context.support.ResourceBundleMessageSource">
        <property name="basename" value="i18n"></property>
</bean>
```

2. 直接在页面使用`<fmt:message>`

```
<%@ taglib prefix="fmt" uri="http://java.sun.com/jsp/jstl/fmt" %>@%>
    ...
<h1>
    <fmt:message key="welcomeinfo"/>
</h1>
<form action="">
    <fmt:message key="username"/>:<input /><br/>
    <fmt:message key="password"/>:<input /><br/>
    <input type="submit" value='<fmt:message key="loginBtn"/>'/>
</form>
    ...
```

注意：

一定要过SpringMVC的视图解析流程，人家会创建一个jstlView帮你快速国际化；

- 不能写redirect:
- 不能写forward:

```
if (viewName.startsWith(FORWARD_URL_PREFIX)) {
            String forwardUrl = viewName.substring(FORWARD_URL_PREFIX.length());
            return new InternalResourceView(forwardUrl);
        }
```

8.3 mvc:view-controller

`mvc:view-controller`：

直接将请求映射到某个页面，不需要写方法了：

注意：会走视图解析的功能

在ioc.xml中加入

```
<mvc:view-controller path="/toLogin" view-name="login"/>
<!--开启MVC注解驱动模式-->
<mvc:annotation-driven/>
```

8.4 自定义视图解析器

扩展：加深视图解析器和视图对象；

- 视图解析器根据方法的返回值得到视图对象
- 多个视图解析器都会尝试能否得到视图对象；
- 视图对象不同就可以具有不同功能

```
 for (ViewResolver viewResolver : this.viewResolvers) {
          //viewResolver视图解析器根据方法的返回值，得到一个View对象；
            View view = viewResolver.resolveViewName(viewName, locale);
            if (view != null) {
                return view;
            }
        }
```

- 让我们的视图解析器工作
- 得到我们的视图对象
- 我们的视图对象自定义渲染逻辑

自定义视图和视图解析器的步骤

1. 编写自定义的视图解析器，和视图实现类

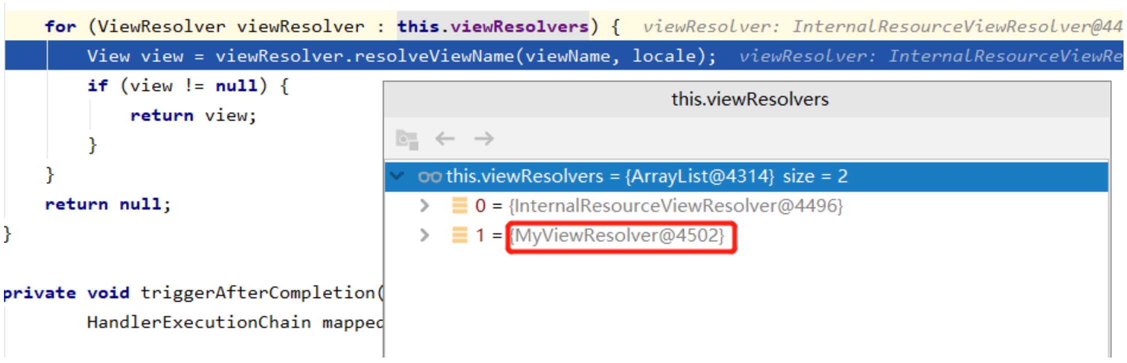
```
public class MyViewResolver implements ViewResolver {
    public View resolveViewName(String viewName, Locale locale) throws
Exception {
        if (viewName.startsWith("myView:")){
           return new MyView();
        }else{
            return null;
        }
    }
}
```

```
public class MyView implements View {
    public String getContentType() {
        return "text/html";
    }

    public void render(Map<String, ?> model, HttpServletRequest request,
HttpServletResponse response) throws Exception {
        System.out.println("保存的数据："+model);
        response.getWriter().write("即将展现内容:");
    }
}
```

2. 视图解析器必须放在ioc容器中，让其工作，能创建出我们的自定义视图对象

```
<bean class="com.chenhui.view.MyViewResolver"></bean>
```

在源码中看到我们的编写的解析器

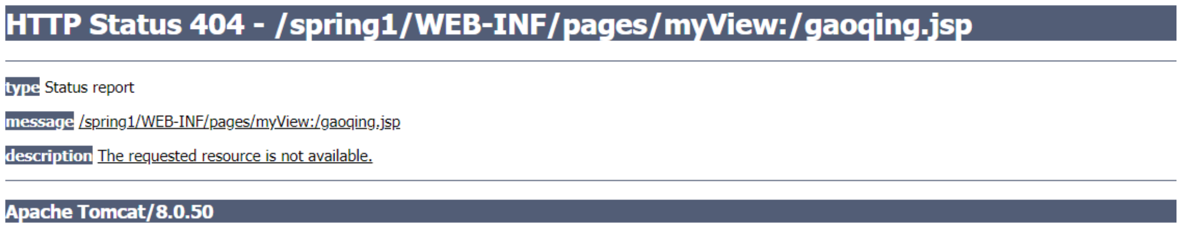


```
    for (ViewResolver viewResolver : this.viewResolvers) {   viewResolver: InternalResourceViewResolver@44
        View view = viewResolver.resolveViewName(viewName, locale);   viewResolver: InternalResourceViewRe
        if (view != null) {
            return view;
        }
    }
    return null;
}

private void triggerAfterCompletion(
        HandlerExecutionChain mappec
```

this.viewResolvers

```
this.viewResolvers = {ArrayList@4314}  size = 2
  0 = {InternalResourceViewResolver@4496}
  1 = {MyViewResolver@4502}
```

但是被InternalResourceViewResolver先拦截了执行了render



HTTP Status 404 - /spring1/WEB-INF/pages/myView:/gaoqing.jsp

type Status report

message /spring1/WEB-INF/pages/myView:/gaoqing.jsp

description The requested resource is not available.

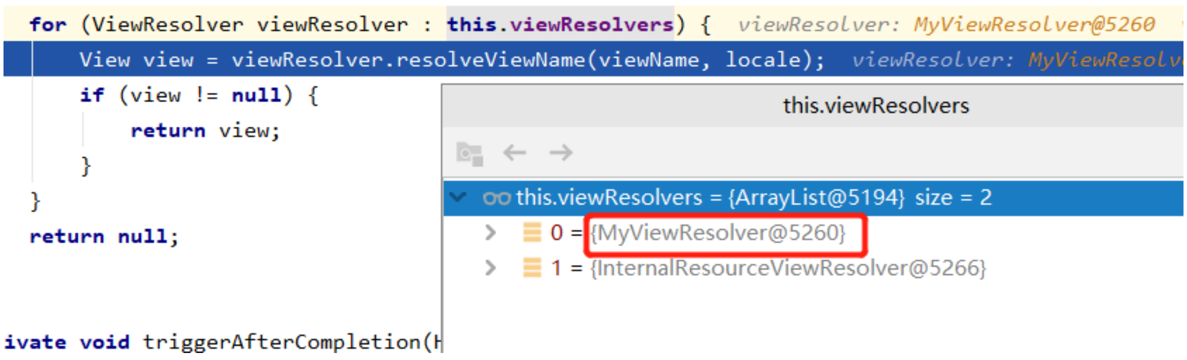
Apache Tomcat/8.0.50

MyViewResolver要实现Ordered接口

```
public class MyViewResolver implements ViewResolver, Ordered {

    private Integer order = 0;

    public View resolveViewName(String viewName, Locale locale) throws Exception
{
        if (viewName.startsWith("myView:")) {
            return new MyView();
        } else {
            return null;
        }
    }

    public int getOrder() {
        return this.order;
    }

    public void setOrder(Integer order) {
        this.order = order;
    }
}
```

```
<bean class="com.chenhui.view.MyViewResolver">
        <property name="order" value="1"></property>
    </bean>
```

发现顺序已经改变

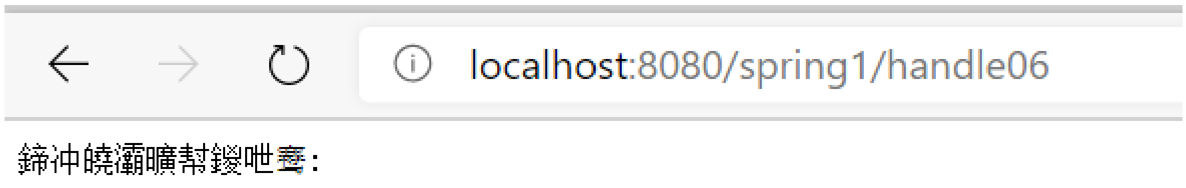

```
for (ViewResolver viewResolver : this.viewResolvers) {   viewResolver: MyViewResolver@5260
    View view = viewResolver.resolveViewName(viewName, locale);   viewResolver: MyViewResolv
    if (view != null) {
        return view;
    }
}
return null;

ivate void triggerAfterCompletion(H
```

this.viewResolvers

```
this.viewResolvers = {ArrayList@5194}  size = 2
  0 = {MyViewResolver@5260}
  1 = {InternalResourceViewResolver@5266}
```

到了我们的页面（虽然乱码），需要设置ContentType

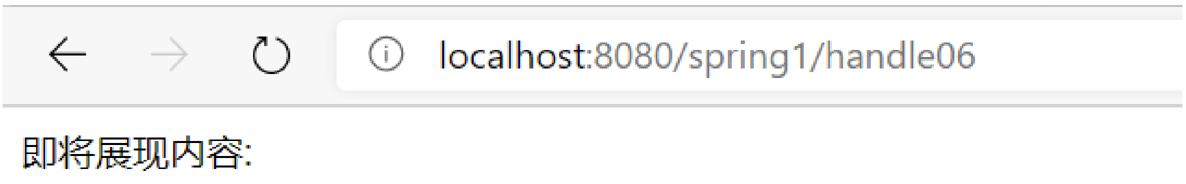
response.setContentType("text/html ");



鍗冲皢灞曠幇鍐呭:

```java
public void render(Map<String, ?> model, HttpServletRequest request,
HttpServletResponse response) throws Exception {
        System.out.println("保存的数据："+model);
        response.setContentType("text/html ");
        response.getWriter().write("即将展现内容:");
    }
```

成功!



即将展现内容:

9. ResetCRUD

9.1 环境搭建

配置文件

ioc.xml

```xml
<?xml version="1.0" encoding="UTF-8"?>
<beans xmlns="http://www.springframework.org/schema/beans"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
       xmlns:context="http://www.springframework.org/schema/context"
       xsi:schemaLocation="http://www.springframework.org/schema/beans
http://www.springframework.org/schema/beans/spring-beans.xsd
http://www.springframework.org/schema/context
http://www.springframework.org/schema/context/spring-context.xsd">

    <context:component-scan base-package="com.chenhui"></context:component-scan>

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



</beans>
```

web.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<web-app 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_4_0.xsd"
         version="4.0">


    <servlet>
        <servlet-name>dispatcherServlet</servlet-name>
        <servlet-
class>org.springframework.web.servlet.DispatcherServlet</servlet-class>
        <init-param>
            <param-name>contextConfigLocation</param-name>
            <param-value>classpath:ioc.xml</param-value>
        </init-param>
        <load-on-startup>1</load-on-startup>
    </servlet>
    <servlet-mapping>
        <servlet-name>dispatcherServlet</servlet-name>
        <url-pattern>/</url-pattern>
    </servlet-mapping>

    <filter>
        <filter-name>CharacterEncodingFilter</filter-name>
        <filter-
class>org.springframework.web.filter.CharacterEncodingFilter</filter-class>
        <init-param>
            <param-name>encoding</param-name>
            <param-value>UTF-8</param-value>
        </init-param>
        <init-param>
            <param-name>forceEncoding</param-name>
            <param-value>true</param-value>
        </init-param>
    </filter>
    <filter-mapping>
        <filter-name>CharacterEncodingFilter</filter-name>
        <url-pattern>/*</url-pattern>
    </filter-mapping>

    <filter>
        <filter-name>HiddenHttpMethodFilter</filter-name>
        <filter-
class>org.springframework.web.filter.HiddenHttpMethodFilter</filter-class>
    </filter>
    <filter-mapping>
        <filter-name>HiddenHttpMethodFilter</filter-name>
        <url-pattern>/*</url-pattern>
    </filter-mapping>
</web-app>
```

bean

Employee

```
package com.chenhui.bean;


import java.util.Date;

public class Employee {

    private Integer id;
    private String lastName;

    private String email;
    //1 male, 0 female
    private Integer gender;

    private Department department;

    public Integer getId() {
        return id;
    }

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

    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;
```

```java
    }

    public Integer getGender() {
        return gender;
    }

    public void setGender(Integer gender) {
        this.gender = gender;
    }

    public Department getDepartment() {
        return department;
    }

    public void setDepartment(Department department) {
        this.department = department;
    }

    public Employee(Integer id, String lastName, String email, Integer gender,
                    Department department) {
        super();
        this.id = id;
        this.lastName = lastName;
        this.email = email;
        this.gender = gender;
        this.department = department;
    }

    public Employee() {
    }

    @Override
    public String toString() {
        return "Employee [id=" + id + ", lastName=" + lastName + ", email="
                + email + ", gender=" + gender + ", department=" + department
                + "]";
    }


}
```

Department

```java
package com.chenhui.bean;


import java.util.Date;

public class Employee {

    private Integer id;
    private String lastName;

    private String email;
    //1 male, 0 female
    private Integer gender;
    private Department department;

    public Integer getId() {
        return id;
    }

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

    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;
    }

    public Integer getGender() {
        return gender;
    }

    public void setGender(Integer gender) {
        this.gender = gender;
    }

    public Department getDepartment() {
        return department;
    }

    public void setDepartment(Department department) {
        this.department = department;
    }

    public Employee(Integer id, String lastName, String email, Integer gender,
                    Department department) {
        super();
        this.id = id;
        this.lastName = lastName;
        this.email = email;
        this.gender = gender;
        this.department = department;
    }

    public Employee() {
    }

    @Override
    public String toString() {
        return "Employee [id=" + id + ", lastName=" + lastName + ", email="
```

```
                + email + ", gender=" + gender + ", department=" + department
                + "]";
    }


}
```

dao

DepartmentDao

```
package com.chenhui.dao;

import java.util.Collection;
import java.util.HashMap;
import java.util.Map;

import com.chenhui.bean.Department;
import org.springframework.stereotype.Repository;



@Repository
public class DepartmentDao {

    private static Map<Integer, Department> departments = null;

    static{
        departments = new HashMap<Integer, Department>();

        departments.put(101, new Department(101, "D-AA"));
        departments.put(102, new Department(102, "D-BB"));
        departments.put(103, new Department(103, "D-CC"));
        departments.put(104, new Department(104, "D-DD"));
        departments.put(105, new Department(105, "D-EE"));
    }

    public Collection<Department> getDepartments(){
        return departments.values();
    }

    public Department getDepartment(Integer id){
        return departments.get(id);
    }

}
```

EmployeeDao

```
package com.chenhui.dao;


import java.util.Collection;
import java.util.HashMap;
import java.util.Map;
```

```java
import com.chenhui.bean.Department;
import com.chenhui.bean.Employee;
import org.springframework.stereotype.Repository;
import org.springframework.beans.factory.annotation.Autowired;




@Repository
public class EmployeeDao {

    private static Map<Integer, Employee> employees = null;

    @Autowired
    private DepartmentDao departmentDao;

    static{
        employees = new HashMap<Integer, Employee>();

        employees.put(1001, new Employee(1001, "E-AA", "aa@163.com", 1, new
Department(101, "D-AA")));
        employees.put(1002, new Employee(1002, "E-BB", "bb@163.com", 1, new
Department(102, "D-BB")));
        employees.put(1003, new Employee(1003, "E-CC", "cc@163.com", 0, new
Department(103, "D-CC")));
        employees.put(1004, new Employee(1004, "E-DD", "dd@163.com", 0, new
Department(104, "D-DD")));
        employees.put(1005, new Employee(1005, "E-EE", "ee@163.com", 1, new
Department(105, "D-EE")));
    }

    private static Integer initId = 1006;

    public void save(Employee employee){
        if(employee.getId() == null){
            employee.setId(initId++);
        }


 employee.setDepartment(departmentDao.getDepartment(employee.getDepartment().get
Id()));
        employees.put(employee.getId(), employee);
    }

    public Collection<Employee> getAll(){
        return employees.values();
    }

    public Employee get(Integer id){
        return employees.get(id);
    }

    public void delete(Integer id){
        employees.remove(id);
    }
}
```

9.2 Controller编写

EmployeeController

```java
package com.chenhui.controller;

import com.chenhui.bean.Department;
import com.chenhui.bean.Employee;
import com.chenhui.dao.DepartmentDao;
import com.chenhui.dao.EmployeeDao;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Controller;
import org.springframework.ui.Model;
import org.springframework.web.bind.annotation.*;

import java.util.Collection;

@Controller
public class EmployeeController {

    @Autowired
    EmployeeDao employees;

    @Autowired
    DepartmentDao departments;

    @RequestMapping(value = "/emp", method = RequestMethod.GET)
    public String getEmps(Model model) {
        Collection<Employee> all = employees.getAll();
        model.addAttribute("emps", all);
        return "list";
    }

    @RequestMapping(value = "/emp", method = RequestMethod.POST)
    public String addEmp(Employee employee, Model model) {

        employees.save(employee);

        return "redirect:/emp";
    }

    @RequestMapping(value = "/emp/{id}", method = RequestMethod.GET)
    public String getEmp(@PathVariable("id") Integer id, Model model) {
        Employee employee = employees.get(id);
        Collection<Department> departments = this.departments.getDepartments();
        //此处给spring表单添加一个employee对象，以免发生command未找到的异常
        model.addAttribute("employee", employee);
        model.addAttribute("departments", departments);
        return "editEmp";
    }

    @RequestMapping(value = "/emp/{id}", method = RequestMethod.PUT)
    public String updateEmp(@ModelAttribute("employee") Employee employee,
@PathVariable("id") Integer integer) {
        System.out.println("要修改的： " + employee);
        employees.save(employee);
        return "redirect:/emp";
    }

    @RequestMapping(value = "/emp/{id}", method = RequestMethod.DELETE)
    public String deleteEmp(@PathVariable("id") Integer id) {
        employees.delete(id);
        return "redirect:/emp";
    }

    @ModelAttribute
    public void myMethodAttribute(@RequestParam(value = "id", required = false)
Integer id, Model model) {
        System.out.println("modelAttribute");
        if (id != null) {
            Employee employee = employees.get(id);
            model.addAttribute("employee", employee);
        }

    }


    @RequestMapping("/toaddpage")
    public String toAddPage(Model model) {
        Collection<Department> all = departments.getDepartments();

        model.addAttribute("departments", all);
        model.addAttribute("command", new Employee());
        return "addEmp";
    }

}
```

9.3 Jsp编写

list.jsp

```
<%@ taglib prefix="c" uri="http://java.sun.com/jsp/jstl/core" %>
<%--
  Created by IntelliJ IDEA.
  User: admin
  Date: 2020/11/13
  Time: 9:18
  To change this template use File | Settings | File Templates.
--%>
<%@ page contentType="text/html;charset=UTF-8" language="java" %>
<html>
<head>
    <title>员工列表</title>
</head>
<body>
<% pageContext.setAttribute("ctp", request.getContextPath());
//    System.out.println(request.getContextPath());
%>
<h1>员工列表</h1>
<table border="1" cellpadding="5px" cellspacing="0">
    <%--
        private Integer id;
        private String lastName;
        private String email;
        //1 male, 0 female
        private Integer gender;

        private Department department;--%>
    <thead>
    <tr>
        <th>ID</th>
        <th>lastName</th>
        <th>email</th>
        <th>gender</th>
        <th>departmentName</th>
        <th>EDIT</th>
        <th>DELETE</th>
    </tr>
    </thead>
    <tbody>
    <c:forEach items="${emps}" var="emp">
        <tr>
            <td>${emp.id}</td>
            <td>${emp.lastName}</td>
            <td>${emp.email}</td>
            <td>${emp.gender==0?"女":"男"}</td>
            <td>${emp.department.departmentName}</td>
            <td><a href="${ctp}/emp/${emp.id}">修改</a></td>
            <!--删除操作可以绑定单击事件，使用ajax发送delete请求-->
            <td>
                <form action="${ctp}/emp/${emp.id}" method="post">
                    <input type="hidden" name="_method" value="DELETE">
                    <input type="submit" value="delete">
                </form>
            </td>
        </tr>
    </c:forEach>
    </tbody>

</table>
<a href="toaddpage">添加员工</a>
</body>
</html>
```

addEmp.jsp

```
<%@ taglib prefix="c" uri="http://java.sun.com/jsp/jstl/core" %>
<%@ taglib prefix="form" uri="http://www.springframework.org/tags/form" %>
<%--
  Created by IntelliJ IDEA.
  User: admin
  Date: 2020/11/13
  Time: 9:42
  To change this template use File | Settings | File Templates.
--%>
<%@ page contentType="text/html;charset=UTF-8" language="java" %>
<html>
<head>
    <title>添加员工</title>
</head>
```

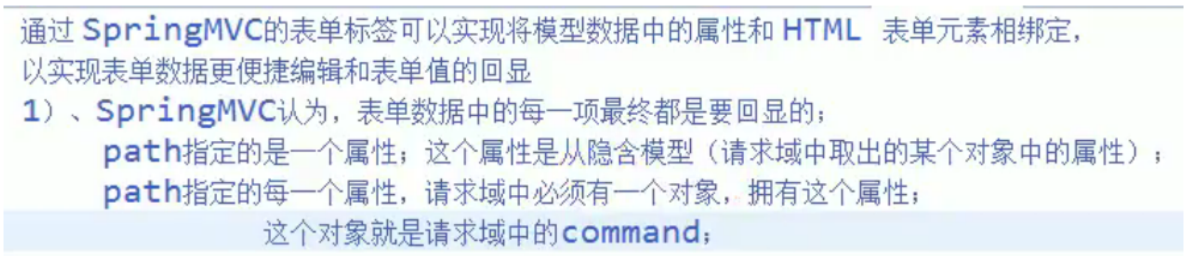
```
<body>
原生表单：<br>

<%
    pageContext.setAttribute("ctp",request.getContextPath());
%>
<form action="${ctp}/emp" method="post">
    姓名：<input type="text" name="lastName"><br>
    邮箱：<input type="text" name="email"><br>
    性别：<br>
    男：<input type="radio" name="gender" value="1"><br>
    女：<input type="radio" name="gender" value="0"><br>
    部门：<select name="department.id">
    <c:forEach items="${departments}" var="department">
        <option value="${department.id}">${department.departmentName}</option>
    </c:forEach>
</select>
    <input type="submit" value="提交">
</form>

SpringMVC表单：<br>
<form:form action="${ctp}/emp" method="post">
    姓名：<form:input path="lastName"></form:input><br>
    邮箱：<form:input path="email"></form:input><br>
    性别：<br>
    男：<form:radiobutton path="gender" value="1"></form:radiobutton>
    女：<form:radiobutton path="gender" value="0"></form:radiobutton><br>
    部门：<form:select path="department.id" items="${departments}"
                    itemLabel="departmentName" itemValue="id">
        </form:select>
    <input type="submit" value="提交">
</form:form>
</body>
</html>
```

Spring表单需要在model中添加command：

```
<form:form action="" modelAttribute="xxxx">
```

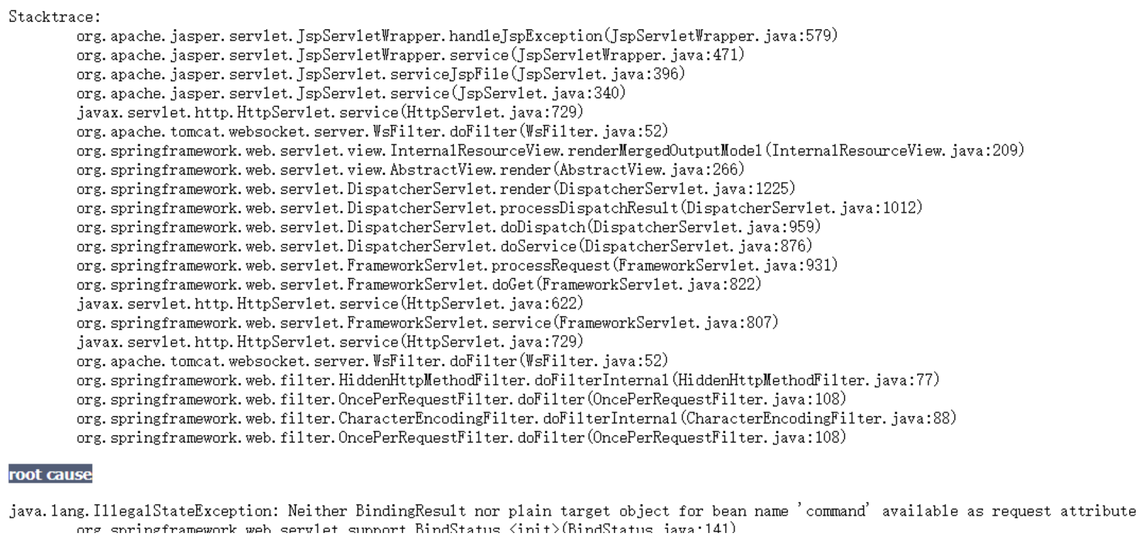
也可以用modelAttribute替换command变量名

- command对象的信息会放在SpringForm中


通过 SpringMVC的表单标签可以实现将模型数据中的属性和 HTML 表单元素相绑定，
以实现表单数据更便捷编辑和表单值的回显
1）、SpringMVC认为，表单数据中的每一项最终都是要回显的；
    path指定的是一个属性；这个属性是从隐含模型（请求域中取出的某个对象中的属性）；
    path指定的每一个属性，请求域中必须有一个对象，拥有这个属性；
            这个对象就是请求域中的command；

```
@RequestMapping("/toaddpage")
    public String toAddPage(Model model) {
        Collection<Department> all = departments.getDepartments();

        model.addAttribute("departments", all);
        model.addAttribute("command", new Employee());
        return "addEmp";
    }
```

不然Spring表单会报错：



```
Stacktrace:
	org.apache.jasper.servlet.JspServletWrapper.handleJspException(JspServletWrapper.java:579)
	org.apache.jasper.servlet.JspServletWrapper.service(JspServletWrapper.java:471)
	org.apache.jasper.servlet.JspServlet.serviceJspFile(JspServlet.java:396)
	org.apache.jasper.servlet.JspServlet.service(JspServlet.java:340)
	javax.servlet.http.HttpServlet.service(HttpServlet.java:729)
	org.apache.tomcat.websocket.server.WsFilter.doFilter(WsFilter.java:52)
	org.springframework.web.servlet.view.InternalResourceView.renderMergedOutputModel(InternalResourceView.java:209)
	org.springframework.web.servlet.view.AbstractView.render(AbstractView.java:266)
	org.springframework.web.servlet.DispatcherServlet.render(DispatcherServlet.java:1225)
	org.springframework.web.servlet.DispatcherServlet.processDispatchResult(DispatcherServlet.java:1012)
	org.springframework.web.servlet.DispatcherServlet.doDispatch(DispatcherServlet.java:959)
	org.springframework.web.servlet.DispatcherServlet.doService(DispatcherServlet.java:876)
	org.springframework.web.servlet.FrameworkServlet.processRequest(FrameworkServlet.java:931)
	org.springframework.web.servlet.FrameworkServlet.doGet(FrameworkServlet.java:822)
	javax.servlet.http.HttpServlet.service(HttpServlet.java:622)
	org.springframework.web.servlet.FrameworkServlet.service(FrameworkServlet.java:807)
	javax.servlet.http.HttpServlet.service(HttpServlet.java:729)
	org.apache.tomcat.websocket.server.WsFilter.doFilter(WsFilter.java:52)
	org.springframework.web.filter.HiddenHttpMethodFilter.doFilterInternal(HiddenHttpMethodFilter.java:77)
	org.springframework.web.filter.OncePerRequestFilter.doFilter(OncePerRequestFilter.java:108)
	org.springframework.web.filter.CharacterEncodingFilter.doFilterInternal(CharacterEncodingFilter.java:88)
	org.springframework.web.filter.OncePerRequestFilter.doFilter(OncePerRequestFilter.java:108)

root cause

java.lang.IllegalStateException: Neither BindingResult nor plain target object for bean name 'command' available as request attribute
	org.springframework.web.servlet.support.BindStatus.<init>(BindStatus.java:141)
```

editEmp.jsp

```
<%@ taglib prefix="form" uri="http://www.springframework.org/tags/form" %>
<%--
  Created by IntelliJ IDEA.
  User: admin
  Date: 2020/11/13
  Time: 11:34
  To change this template use File | Settings | File Templates.
--%>
<%@ page contentType="text/html;charset=UTF-8" language="java" %>
<%
    pageContext.setAttribute("ctp", request.getContextPath());
%>
<html>
<head>
    <title>编辑员工</title>
</head>
<body>

<form:form action="${ctp}/emp/${employee.id}" method="post"
modelAttribute="employee">
    <input type="hidden" name="_method" value="put">
    <input type="hidden" name="id" value="${employee.id}">

    姓名：<form:input path="lastName"></form:input><br>
    邮箱：<form:input path="email"></form:input><br>
    性别：<br>
    男：<form:radiobutton path="gender" value="1"></form:radiobutton>
    女：<form:radiobutton path="gender" value="0"></form:radiobutton><br>
    部门：
    <form:select path="department.id" items="${departments}"
                 itemLabel="departmentName" itemValue="id">
    </form:select>
    <input type="submit" value="修改">
</form:form>
</body>
</html>
```

9.4 解决DispatcherServlet拦截静态文件

让Tomcat托管js文件

- 在ioc.xml文件中加入

```
    <mvc:default-servlet-handler/>
    <mvc:annotation-driven/>
```

10. 数据转换 & 数据格式化 & 数据校验

10.1 数据转换

> ```
> SpringMVC封装自定义类型对象的时候？
> javaBean要和页面提交的数据进行一一绑定？
> 1）、页面提交的所有数据都是字符串？
> 2）、Integer age,Date birth;
>     employName=zhangsan&age=18&gender=1
>     String age = request.getParameter("age");
> 牵扯到以下操作；
> 1）、数据绑定期间的数据类型转换？String--Integer String--Boolean,xxx
> 2）、数据绑定期间的数据格式化问题？比如提交的日期进行转换
>          birth=2017-12-15----->Date    2017/12/15  2017.12.15  2017-12-15
> 3）、数据校验？
>          我们提交的数据必须是合法的？
>          前端校验：js+正则表达式；
>          后端校验：重要数据也是必须的；
>          1）、校验成功！数据合法
>          2）、校验失败？
> ```

bindRequestParameters方法将请求参数于JavaBean进行绑定，为自定义对象赋值。

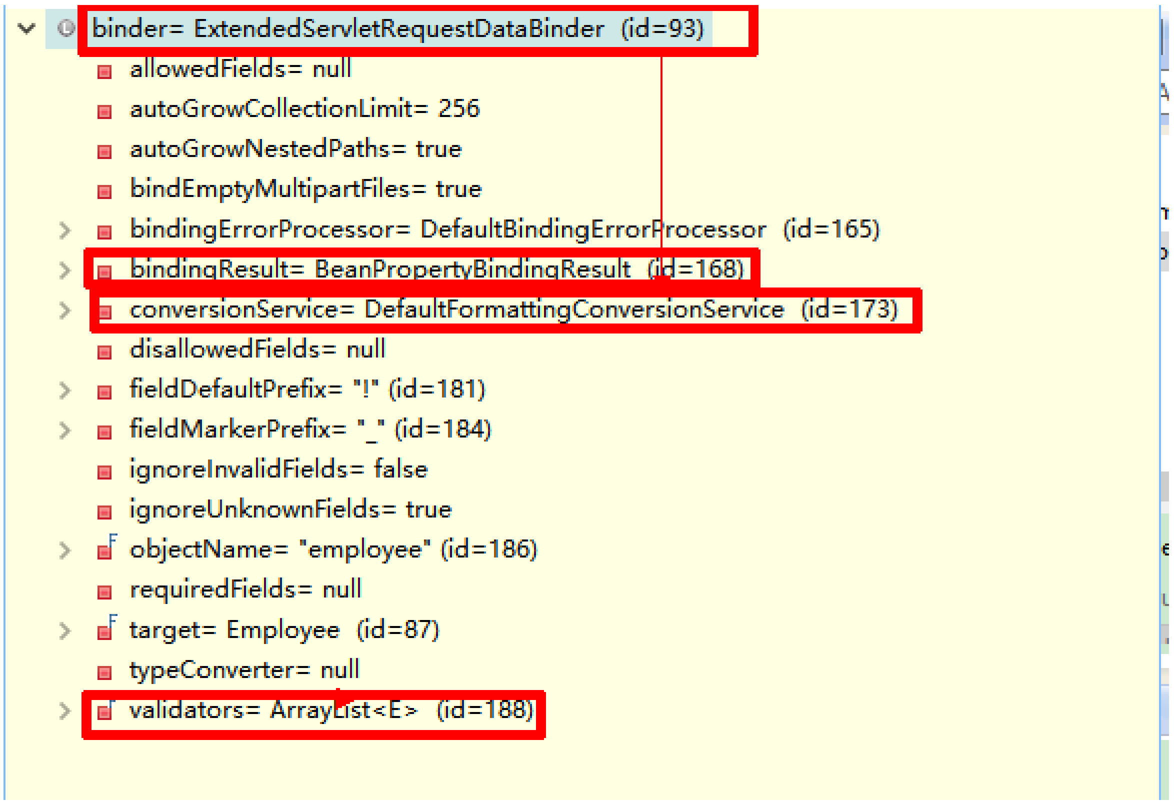
```
ModelAttributeMethodProcessor
public final Object resolveArgument(
            MethodParameter parameter, ModelAndViewContainer mavContainer,
            NativeWebRequest request, WebDataBinderFactory binderFactory)
            throws Exception {
        String name = ModelFactory.getNameForParameter(parameter);
        Object attribute = (mavContainer.containsAttribute(name)) ?
                mavContainer.getModel().get(name) : createAttribute(name,
parameter, binderFactory, request);

        //WebDataBinder
        WebDataBinder binder = binderFactory.createBinder(request, attribute,
name);
```

```
        if (binder.getTarget() != null) {

               //将页面提交过来的数据封装到javaBean的属性中
            bindRequestParameters(binder, request);
               //+++++++++

            validateIfApplicable(binder, parameter);
            if (binder.getBindingResult().hasErrors()) {
                if (isBindExceptionRequired(binder, parameter)) {
                    throw new BindException(binder.getBindingResult());
                }
            }
        }
```

WebDataBinder：

数据绑定器有什么用?

1. 数据绑定器负责数据绑定工作
2. 数据绑定期间产生的类型转换、格式化、数据校验等问题

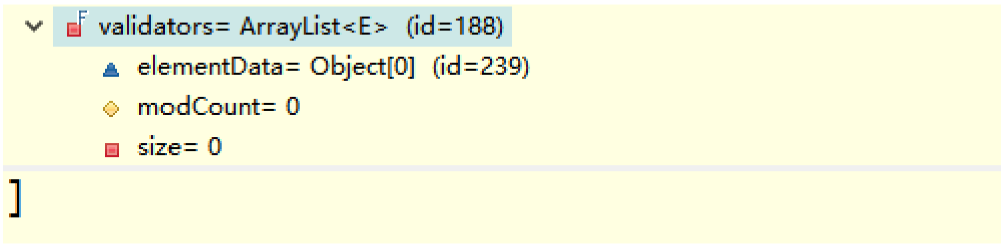


```
binder= ExtendedServletRequestDataBinder  (id=93)
    allowedFields= null
    autoGrowCollectionLimit= 256
    autoGrowNestedPaths= true
    bindEmptyMultipartFiles= true
    bindingErrorProcessor= DefaultBindingErrorProcessor  (id=165)
    bindingResult= BeanPropertyBindingResult  (id=168)
    conversionService= DefaultFormattingConversionService  (id=173)
    disallowedFields= null
    fieldDefaultPrefix= "!" (id=181)
    fieldMarkerPrefix= "_" (id=184)
    ignoreInvalidFields= false
    ignoreUnknownFields= true
    objectName= "employee" (id=186)
    requiredFields= null
    target= Employee  (id=87)
    typeConverter= null
    validators= ArrayList<E>  (id=188)
```

- conversionService组件：
  - 负责数据类型的转换以及格式化功能；
  - ConversionService中有非常多的**converter；**
  - 不同类型的转换和格式化用它自己的**converter**

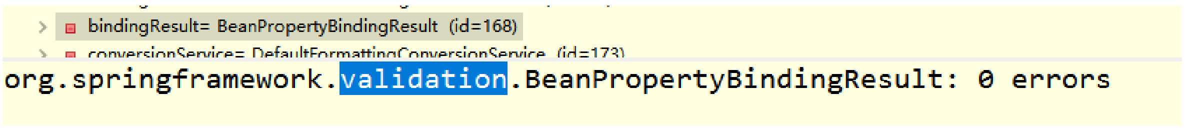
```
    ...
@org.springframework.format.annotation.DateTimeFormat java.util.Date ->
java.lang.String:
org.springframework.format.datetime.DateTimeFormatAnnotationFormatterFactory
@32abc654
    @org.springframework.format.annotation.NumberFormat java.lang.Double ->
java.lang.String:
org.springframework.format.number.NumberFormatAnnotationFormatterFactory@140
bb45d
    @org.springframework.format.annotation.NumberFormat java.lang.Float ->
java.lang.String:
org.springframework.format.number.NumberFormatAnnotationFormatterFactory@140
bb45d
    ....
org.springframework.format.number.NumberFormatAnnotationFormatterFactory@140
bb45d
    java.lang.String -> @org.springframework.format.annotation.NumberFormat
java.math.BigInteger:
org.springframework.format.number.NumberFormatAnnotationFormatterFactory@140
bb45d
    java.lang.String -> java.lang.Boolean :
org.springframework.core.convert.support.StringToBooleanConverter@22f562e2
    java.lang.String -> java.lang.Character :
org.springframework.core.convert.support.StringToCharacterConverter@5f2594f5
    java.lang.String -> java.lang.Enum :
org.springframework.core.convert.support.StringToEnumConverterFactory@1347a7
be
    【java.lang.String -> java.lang.Number :
...
    java...
```

- validators负责数据校验工作

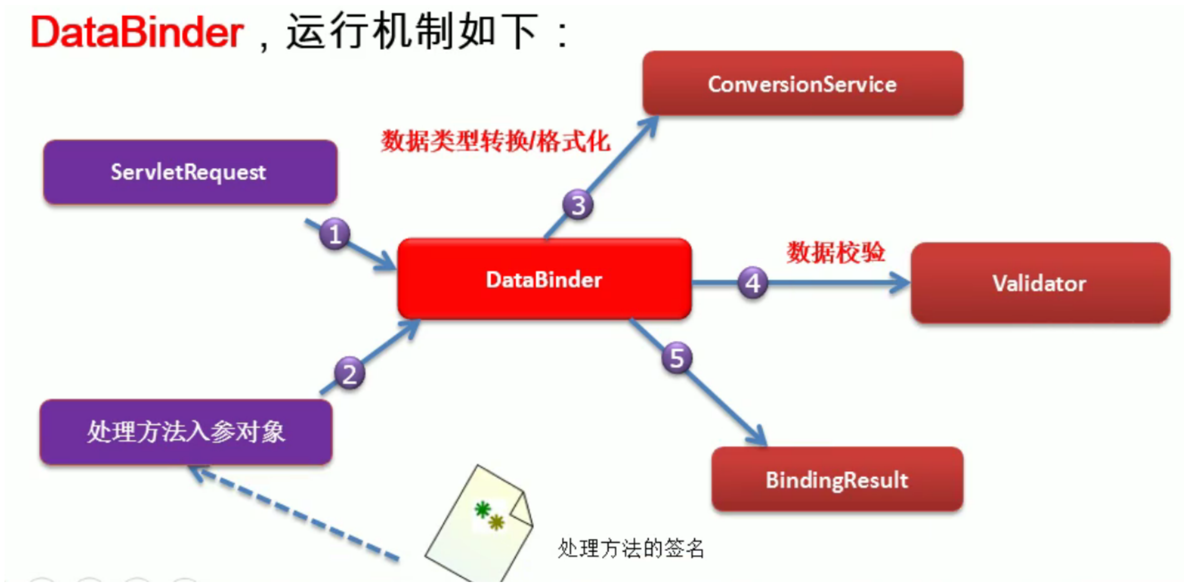


```
validators= ArrayList<E>  (id=188)
    elementData= Object[0]  (id=239)
    modCount= 0
    size= 0
]
```

- bindingResult负责保存以及解析数据绑定期间数据校验产生的错误



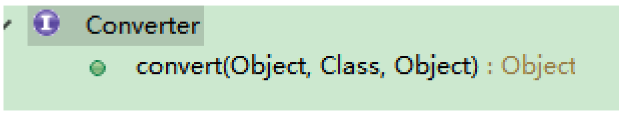
```
bindingResult= BeanPropertyBindingResult  (id=168)
conversionService= DefaultFormattingConversionService  (id=173)
org.springframework.validation.BeanPropertyBindingResult: 0 errors
```



自定义类型转换器：

步骤：

1. ConversionService:：是一个接口


Converter
convert(Object, Class, Object) : Object

2. Converter是ConversionService中的组件；
    1. Converter得放进ConversionService 中；
    2. 将WebDataBinder中的ConversionService设置成我们这个加了自定义类型转换器的ConversionService；
3. 配置ConversionService

需要实现的步骤

1. 实现Converter接口，写一个自定义的类型转换器

```
public class MyStringToEmployeeConverter implements Converter<String,
Employee> {

    @Autowired
    DepartmentDao departmentDao;

    public Employee convert(String source) {
        System.out.println("将要转换的字符串" + source);
        Employee employee = new Employee();
        if (source.contains("-")) {
            String[] split = source.split("-");
            employee.setLastName(split[0]);
            employee.setEmail(split[1]);
            employee.setGender(Integer.parseInt(split[2]));

 employee.setDepartment(departmentDao.getDepartment(Integer.parseInt(split[3
])));
        }
        return employee;
    }
}
```

2. 配置出ConversionService

   在ioc.xml中

```
    <bean id="myconversionService"
class="org.springframework.context.support.ConversionServiceFactoryBean">
        <!--
                ConversionServiceFactoryBean:
                创建的ConversionService组件是没有格式化器(formatter)存在的;
                推荐使用:

"org.springframework.format.support.FormattingConversionServiceFactoryBean"
        -->
        <property name="converters">
            <set>
                <bean
class="com.chenhui.component.MyStringToEmployeeConverter"/>
            </set>
        </property>
    </bean>
```

3. 让SpringMVC用我们的ConversionService

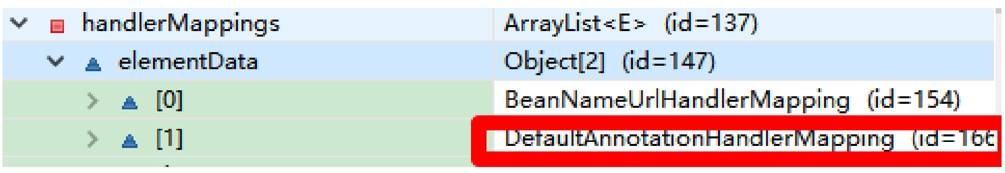
```
<mvc:annotation-driven conversion-service="myconversionService">
</mvc:annotation-driven>
```

动态资源和静态资源访问

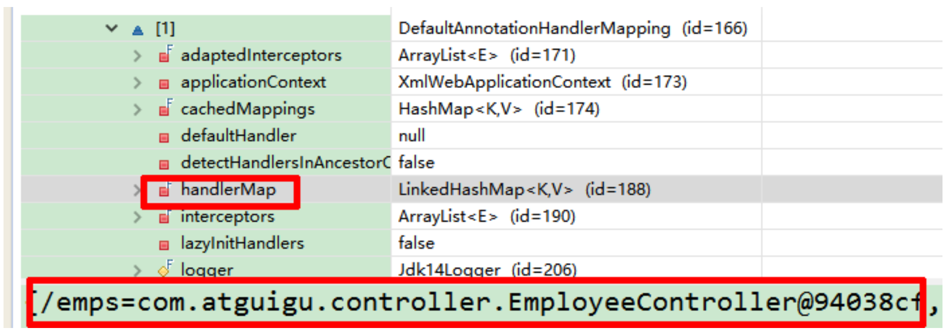
1. `<mvc:default-servlet-handler/>` 与 `<mvc:annotation-driven/>`
   1. 都没配
      - 动态能访问:

        DefaultAnnotationHandlerMapping中的handlerMap中保存了每一个资源的映射信息
      - 静态不能访问:

        handlerMap中没有保存静态资源映射的请求

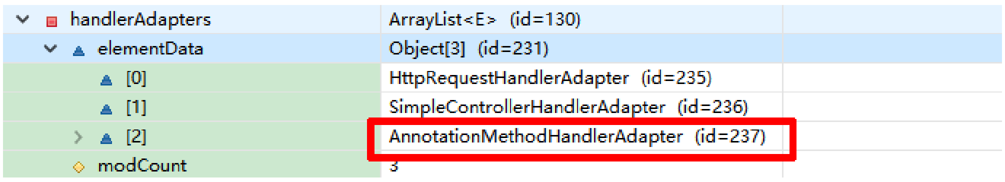


```
handlerMappings        ArrayList<E>  (id=137)
  elementData          Object[2]  (id=147)
    [0]                BeanNameUrlHandlerMapping  (id=154)
    [1]                DefaultAnnotationHandlerMapping  (id=16
```



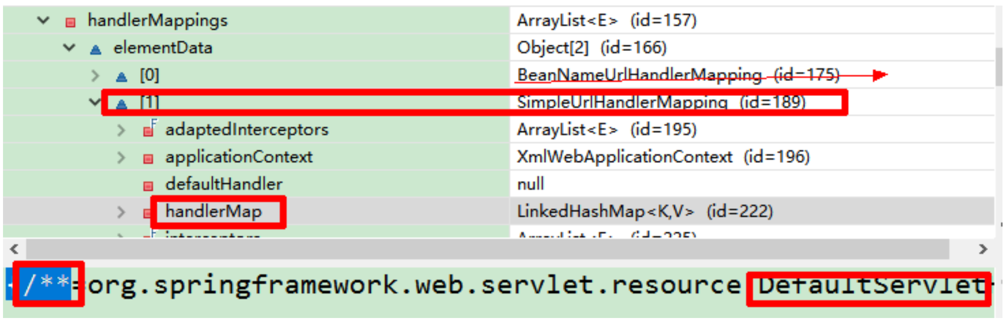
```
[1]                          DefaultAnnotationHandlerMapping  (id=166)
  adaptedInterceptors        ArrayList<E>  (id=171)
  applicationContext         XmlWebApplicationContext  (id=173)
  cachedMappings             HashMap<K,V>  (id=174)
  defaultHandler             null
  detectHandlersInAncestorC  false
  handlerMap                 LinkedHashMap<K,V>  (id=188)
  interceptors               ArrayList<E>  (id=190)
  lazyInitHandlers           false
  logger                     Jdk14Logger  (id=206)
{/emps=com.atguigu.controller.EmployeeController@94038cf,
```

      - handleAdapter



handlerAdapters	ArrayList<E> (id=130)
elementData	Object[3] (id=231)
[0]	HttpRequestHandlerAdapter (id=235)
[1]	SimpleControllerHandlerAdapter (id=236)
[2]	AnnotationMethodHandlerAdapter (id=237)
modCount	3

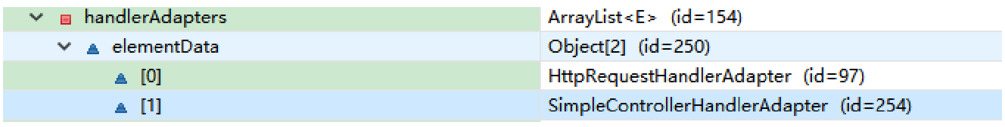
2. `<mvc:default-servlet-handler/>`不加`<mvc:annotation-driven/>`
   - 动态不能访问：DefaultAnnotationHandlerMapping被SimpleUrlHandlerMapping替换。
   - 静态能访问的原因：SimpleUrlHandlerMapping把所有请求都映射给tomcat；



handlerMappings	ArrayList<E> (id=157)
elementData	Object[2] (id=166)
[0]	~~BeanNameUrlHandlerMapping (id=175)~~
[1]	SimpleUrlHandlerMapping (id=189)
adaptedInterceptors	ArrayList<E> (id=195)
applicationContext	XmlWebApplicationContext (id=196)
defaultHandler	null
handlerMap	LinkedHashMap<K,V> (id=222)

```
/**=org.springframework.web.servlet.resource.DefaultServlet
```

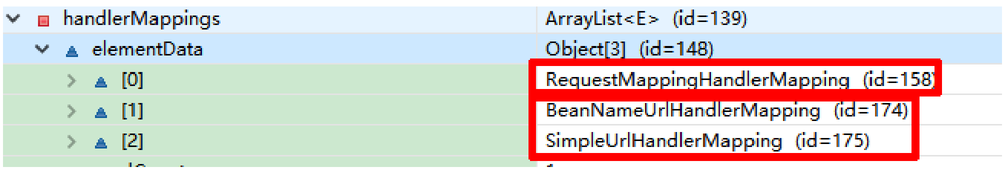
   - handleAdapter



handlerAdapters	ArrayList<E> (id=154)
elementData	Object[2] (id=250)
[0]	HttpRequestHandlerAdapter (id=97)
[1]	SimpleControllerHandlerAdapter (id=254)

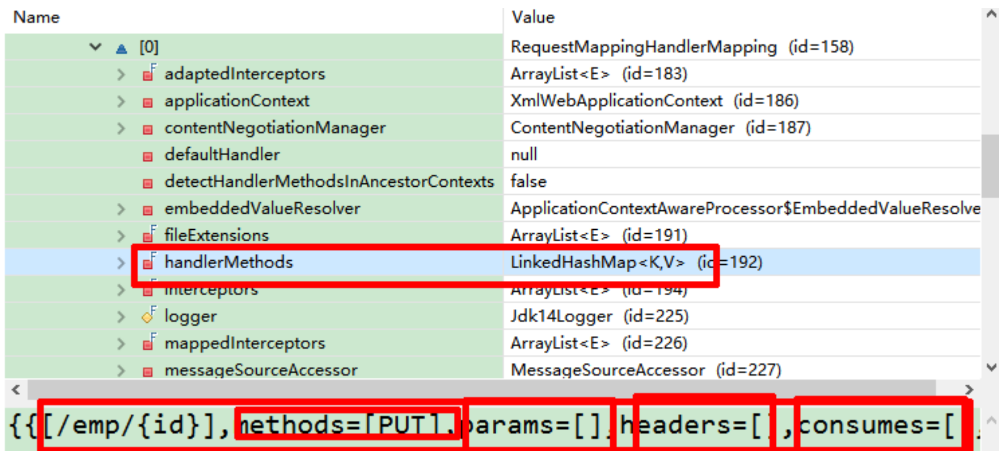
3. 都加上
   - 都能访问

     handlerMap



handlerMappings	ArrayList<E> (id=139)
elementData	Object[3] (id=148)
[0]	RequestMappingHandlerMapping (id=158)
[1]	BeanNameUrlHandlerMapping (id=174)
[2]	SimpleUrlHandlerMapping (id=175)

   - RequestMappingHandlerMapping:动态资源可以访问

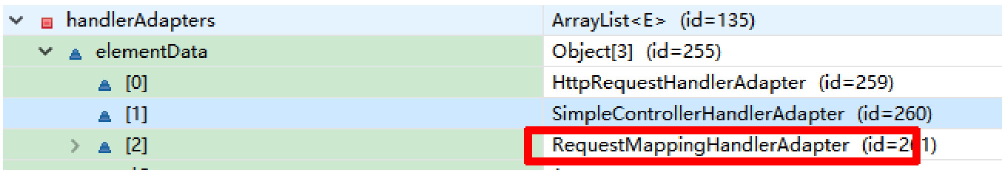


Name	Value
[0]	RequestMappingHandlerMapping (id=158)
adaptedInterceptors	ArrayList<E> (id=183)
applicationContext	XmlWebApplicationContext (id=186)
contentNegotiationManager	ContentNegotiationManager (id=187)
defaultHandler	null
detectHandlerMethodsInAncestorContexts	false
embeddedValueResolver	ApplicationContextAwareProcessor$EmbeddedValueResolve
fileExtensions	ArrayList<E> (id=191)
handlerMethods	LinkedHashMap<K,V> (id=192)
interceptors	ArrayList<E> (id=194)
logger	Jdk14Logger (id=225)
mappedInterceptors	ArrayList<E> (id=226)
messageSourceAccessor	MessageSourceAccessor (id=227)

```
{{[/emp/{id}],methods=[PUT],params=[],headers=[],consumes=[
```

> **handleMethods属性保存了每一个请求用哪个方法来处理；**
>
> **SimpleUrlHandlerMapping：将请求直接交给tomcat；有他，静态资源就没问题**

   - handleAdapter



```
handlerAdapters        ArrayList<E>  (id=135)
  elementData          Object[3]  (id=255)
    [0]                HttpRequestHandlerAdapter  (id=259)
    [1]                SimpleControllerHandlerAdapter  (id=260)
    [2]                RequestMappingHandlerAdapter  (id=2[illegible]1)
```

原来的AnnotationMethodHandlerAdapter被换成RequestMappingHandlerAdapter

4. 只加`<mvc:annotation-driven/>`
   - 动态能访问，静态无法访问

10.2 数据格式化

自定义数据格式化

1. 在属性上加Format标签
2. 更改转换器

   例:

```
@DateTimeFormat(pattern = "yyyy-MM-dd")
    private Date birth;
```

```
<bean id="myconversionService"
class="org.springframework.format.support.FormattingConversionServiceFactoryBean
">
        <property name="converters">
            <set>
                <bean
class="com.chenhui.component.MyStringToEmployeeConverter"/>
            </set>
        </property>
    </bean>
```

10.3 数据校验

步骤

- 导入Jar包

```
        <dependency>
            <groupId>javax.validation</groupId>
            <artifactId>validation-api</artifactId>
            <version>1.1.0.Final</version>
        </dependency>

        <dependency>
            <groupId>org.hibernate</groupId>
            <artifactId>hibernate-validator</artifactId>
            <version>5.4.1.Final</version>
        </dependency>
        <dependency>
            <groupId>org.jboss.logging</groupId>
            <artifactId>jboss-logging</artifactId>
            <version>3.3.0.Final</version>
        </dependency>
        <dependency>
```

```
            <groupId>com.fasterxml</groupId>
            <artifactId>classmate</artifactId>
            <version>1.3.3</version>
        </dependency>
```

- 在变量上放上注解，错误信息message

```
    @NotNull
    @Length(min = 5, max = 10,message='xxxx')
    private String lastName;


    @DateTimeFormat(pattern = "yyyy-MM-dd")
    @Past
    private Date birth;
```

- 对SpringMVC封装对象加上@Valid注解
- 校验结果在BindingResult的result中

```
    @RequestMapping(value = "/emp", method = RequestMethod.POST)
    public String addEmp(@Valid Employee employee, BindingResult result, Model
model) {

        if (result.hasErrors()){
            System.out.println("有校验错误");
            return "addEmp";
        }else{
            employees.save(employee);
        }


        return "redirect:/emp";
    }
```

- 来到页面使用form:errors取出错误信息
- 可以把错误信息存到Model中，然后在页面中取Model的对应的key

```
<form:form action="${ctp}/emp" method="post">
    姓名：<form:input path="lastName"></form:input><form:errors path="lastName">
</form:errors><br>
    邮箱：<form:input path="email"></form:input><form:errors path="email">
</form:errors><br>
    生日：<form:input path="birth"></form:input><form:errors path="birth">
</form:errors><br>
    性别：<br>
    男：<form:radiobutton path="gender" value="1"></form:radiobutton>
    女：<form:radiobutton path="gender" value="0"></form:radiobutton><br>
    部门：<form:select path="department.id" items="${departments}"
                    itemLabel="departmentName" itemValue="id">
        </form:select>
    <input type="submit" value="提交">
</form:form>
```

原生Form显示错误：

1）、原生的表单怎么办？ 将错误放在Model中就行了

国际化定制

国际化定制自己的错误消息显示

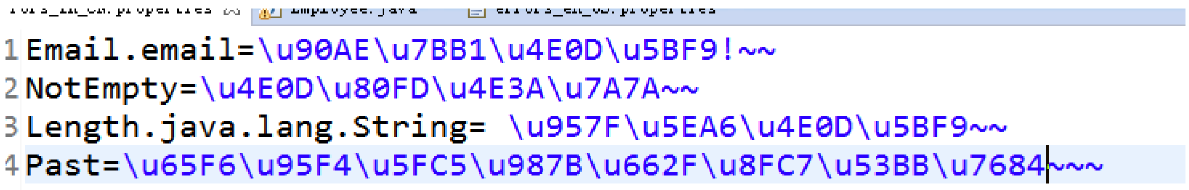
  编写国际化的文件

- errors_zh_CN.properties
- errors_en_US.properties

key有规定（精确优先）：

```
codes
    [
         Email.employee.email,      校验规则.隐含模型中这个对象的key.对象的属性
         Email.email,                        校验规则.属性名
         Email.java.lang.String,      校验规则.属性类型
         Email
   ];
```

1、先编写国际化配置文件



```
Email.email=\u90AE\u7BB1\u4E0D\u5BF9!~~
NotEmpty=\u4E0D\u80FD\u4E3A\u7A7A~~
Length.java.lang.String= \u957F\u5EA6\u4E0D\u5BF9~~
Past=\u65F6\u95F4\u5FC5\u987B\u662F\u8FC7\u53BB\u7684~~
```

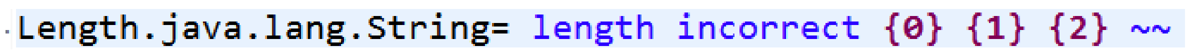
2、让SpringMVC管理国际化资源文件

```
<!-- 管理国际化资源文件 -->
    <bean id="messageSource"
class="org.springframework.context.support.ResourceBundleMessageSource">
        <property name="basename" value="errors"></property>
    </bean>
```

3、来到页面取值

4、高级国际化?

  动态传入消息参数；



```
Length.java.lang.String= length incorrect {0} {1} {2} ~~
```

{0}：永远都是当前属性名；

@Length(min = 5, max = 10,message='xxxx')

按照字母排序

{1}为max {2}为min

11. 其他数据响应与接受

```
ajax：
1、SpringMVC快速的完成ajax功能？
     1）、返回数据是json就ok；
     2）、页面，$.ajax()；
2、原生javaWeb：
     1）、导入GSON；
     2）、返回的数据用GSON转成json
     3）、写出去；
3、SpringMVC-ajax：
     1、导包
        jackson-annotations-2.1.5.jar
        jackson-core-2.1.5.jar
        jackson-databind-2.1.5.jar
     2、写配置
     3、测试
```

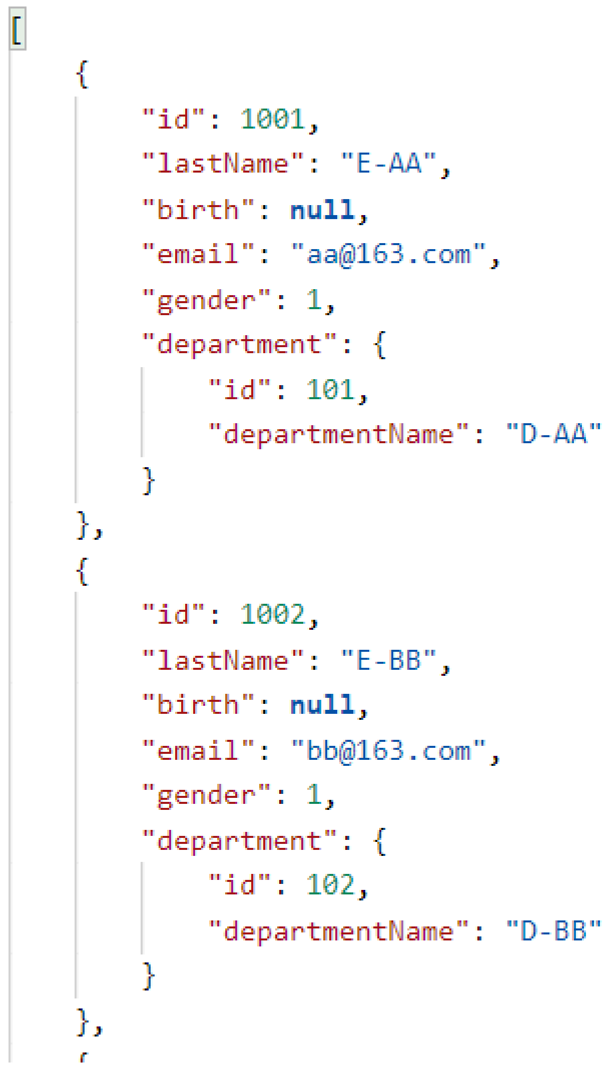
11.1 Json数据响应与接受

ResponseBody

maven导入包

```
        <dependency>
            <groupId>com.fasterxml.jackson.core</groupId>
            <artifactId>jackson-annotations</artifactId>
            <version>2.1.5</version>
        </dependency>
        <dependency>
            <groupId>com.fasterxml.jackson.core</groupId>
            <artifactId>jackson-core</artifactId>
            <version>2.1.5</version>
        </dependency>
        <dependency>
            <groupId>com.fasterxml.jackson.core</groupId>
            <artifactId>jackson-databind</artifactId>
            <version>2.1.5</version>
        </dependency>
```

```
@Controller
public class AjaxController {
    @Autowired
    EmployeeDao employeeDao;


    @ResponseBody
    @RequestMapping("/getallajax")
    public Collection<Employee> ajaxGetAll() {
        Collection<Employee> all = employeeDao.getAll();
        return all;
    }
}
```

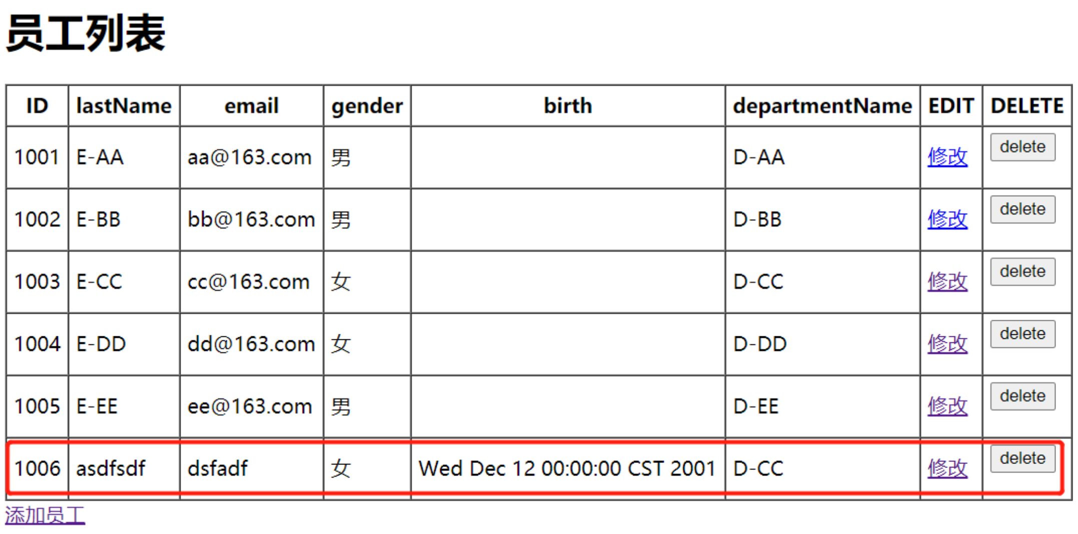


```
[
    {
        "id": 1001,
        "lastName": "E-AA",
        "birth": null,
        "email": "aa@163.com",
        "gender": 1,
        "department": {
            "id": 101,
            "departmentName": "D-AA"
        }
    },
    {
        "id": 1002,
        "lastName": "E-BB",
        "birth": null,
        "email": "bb@163.com",
        "gender": 1,
        "department": {
            "id": 102,
            "departmentName": "D-BB"
        }
    },
```

- @JsonIgnore可以忽略字段
- @JsonFormat(pattern="")

-
  ```
      @DateTimeFormat(pattern = "yyyy-MM-dd")
      @Past
      @JsonFormat(pattern = "yyyy-MM-dd")
      private Date birth;

      private String email;
      //1 male, 0 female

      private Integer gender;

      @JsonIgnore
      private Department department;
  ```

输入：

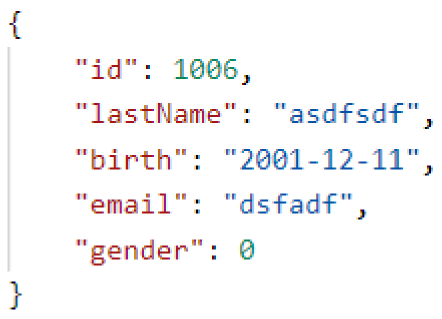


员工列表

ID	lastName	email	gender	birth	departmentName	EDIT	DELETE
1001	E-AA	aa@163.com	男		D-AA	修改	delete
1002	E-BB	bb@163.com	男		D-BB	修改	delete
1003	E-CC	cc@163.com	女		D-CC	修改	delete
1004	E-DD	dd@163.com	女		D-DD	修改	delete
1005	E-EE	ee@163.com	男		D-EE	修改	delete
1006	asdfsdf	dsfadf	女	Wed Dec 12 00:00:00 CST 2001	D-CC	修改	delete

添加员工

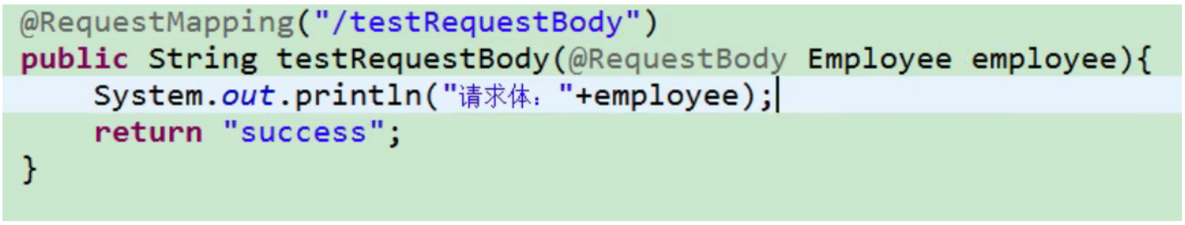
结果:



```
{
    "id": 1006,
    "lastName": "asdfsdf",
    "birth": "2001-12-11",
    "email": "dsfadf",
    "gender": 0
}
```

RequestBody

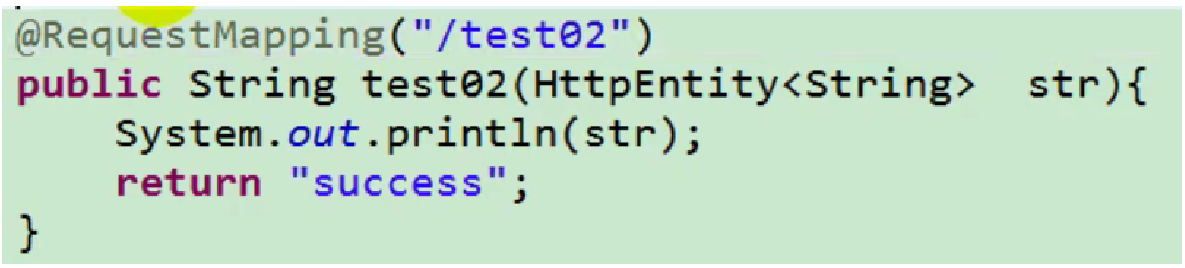
- 可以接受json数据



```
@RequestMapping("/testRequestBody")
public String testRequestBody(@RequestBody Employee employee){
    System.out.println("请求体: "+employee);
    return "success";
}
```

HttpEntity

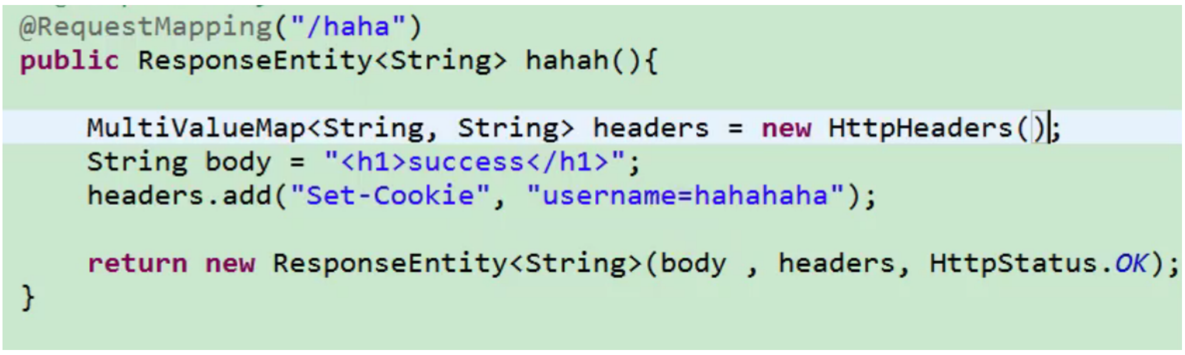
- 代替RequestBody,
- 不仅能拿请求体数据，还能拿请求头数据



```
@RequestMapping("/test02")
public String test02(HttpEntity<String>  str){
    System.out.println(str);
    return "success";
}
```

ResponseEntity

- 可以设置响应头



```java
@RequestMapping("/haha")
public ResponseEntity<String> hahah(){

    MultiValueMap<String, String> headers = new HttpHeaders();
    String body = "<h1>success</h1>";
    headers.add("Set-Cookie", "username=hahahaha");

    return new ResponseEntity<String>(body , headers, HttpStatus.OK);
}
```

11.2 文件上传与下载

文件上传

单文件上传:

maven导入包

```xml
        <dependency>
            <groupId>commons-io</groupId>
            <artifactId>commons-io</artifactId>
            <version>2.0</version>
        </dependency>
        <dependency>
            <groupId>commons-fileupload</groupId>
            <artifactId>commons-fileupload</artifactId>
            <version>1.2.1</version>
        </dependency>
```

编写控制器

```java
package com.chenhui.controller;

import org.springframework.stereotype.Controller;
import org.springframework.ui.Model;
import org.springframework.web.bind.annotation.RequestMapping;
import org.springframework.web.bind.annotation.RequestParam;
import org.springframework.web.multipart.MultipartFile;

import java.io.File;
import java.io.IOException;

@Controller
public class FileUploadController {
    @RequestMapping("/upload")
    public String upload(@RequestParam(value = "username", required = false)
String username,
                         @RequestParam(value = "headerImg", required = false)
MultipartFile file,
                         Model model){


        System.out.println("上传信息");
        System.out.println("文件名"+file.getName());
        System.out.println("文件初始名"+file.getOriginalFilename());
        try {
            file.transferTo(new
File("D:\\upload\\"+file.getOriginalFilename()));
            model.addAttribute("message","文件上传成功");
        } catch (IOException e) {
            e.printStackTrace();
            model.addAttribute("message","文件上传失败"+e.getCause());
        }

        return "list";

    }
}
```

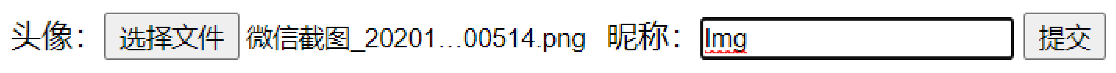
注册文件上传解析器

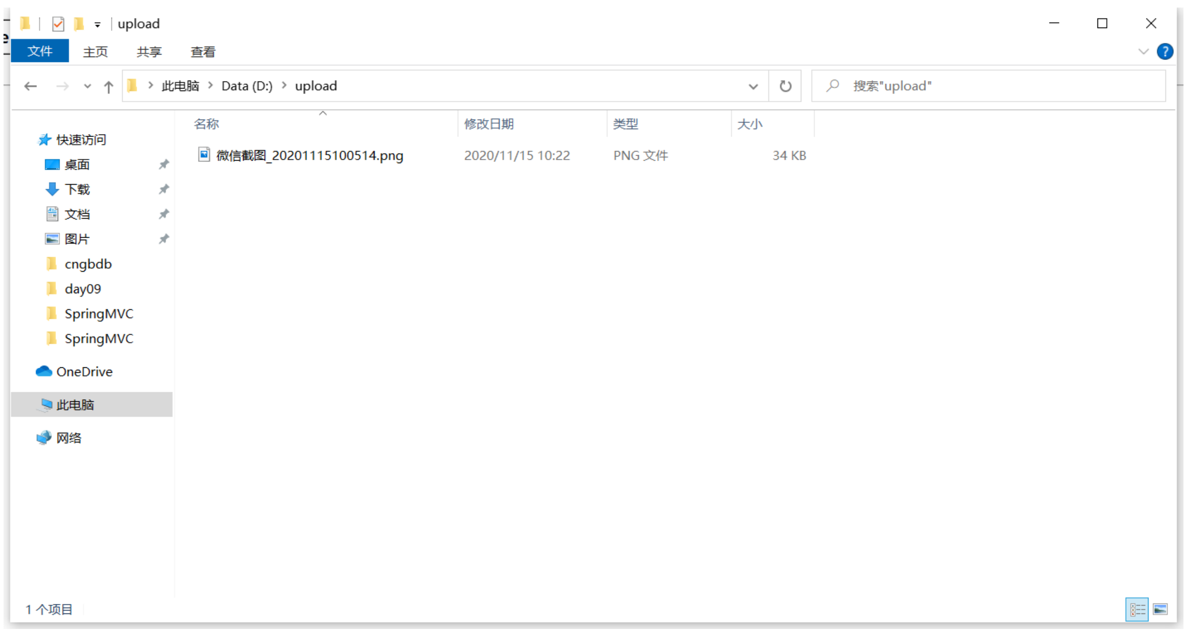
```
    <bean id="multipartResolver"
class="org.springframework.web.multipart.commons.CommonsMultipartResolver">
        <property name="maxUploadSize" value="#{1024*1024*20}"></property>
        <property name="defaultEncoding" value="utf-8"></property>
    </bean>
```

编写jsp页面

```
<%@ taglib prefix="c" uri="http://java.sun.com/jsp/jstl/core" %>
<%--
  Created by IntelliJ IDEA.
  User: admin
  Date: 2020/11/13
  Time: 9:18
  To change this template use File | Settings | File Templates.
--%>
<%@ page contentType="text/html;charset=UTF-8" language="java" %>
<html>
<head>
    <title>员工列表</title>
</head>
<body>
<% pageContext.setAttribute("ctp", request.getContextPath());
//    System.out.println(request.getContextPath());
%>
<a href="toaddpage">添加员工</a><br>
<hr>
<h1>${message}</h1>
<form action="${ctp}/upload" method="post" enctype="multipart/form-data">
    头像：<input type="file" name="headerImg">
    昵称：<input type="text" name="username">
    <input type="submit" value="提交">
</form>
</body>
</html>

```

结果


头像: 选择文件 微信截图_20201...00514.png 昵称: Img 提交



名称	修改日期	类型	大小
微信截图_20201115100514.png	2020/11/15 10:22	PNG 文件	34 KB

多文件上传:

```
@Controller
public class FileUploadController {
    @RequestMapping("/upload")
    public String upload(@RequestParam(value = "username", required = false)
String username,
                         @RequestParam(value = "headerImg", required = false)
MultipartFile[] files,
                         Model model){

        for(MultipartFile file: files){

            System.out.println("上传信息");
            System.out.println("文件名"+file.getName());
            System.out.println("文件初始名"+file.getOriginalFilename());
            if(!file.isEmpty()){
                try {
                    file.transferTo(new
File("D:\\upload\\"+file.getOriginalFilename()));
                    model.addAttribute("message","文件上传成功");
                } catch (IOException e) {
                    e.printStackTrace();
                    model.addAttribute("message","文件上传失败"+e.getCause());
                }
            }
            return "list";
        }
    }
}
```

文件下载

```
@Controller
```

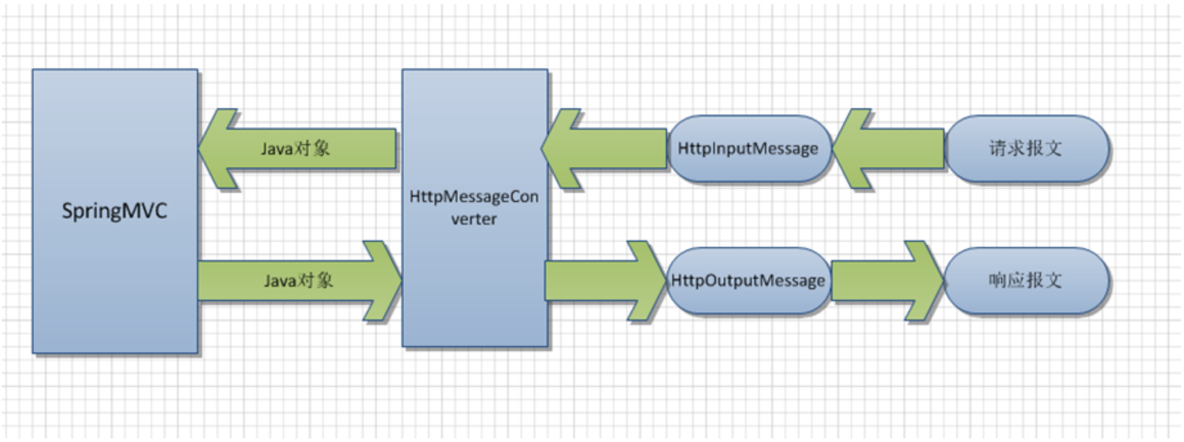
```
public class DownloadController {
    @RequestMapping(value = "/DownLoad/{fileName}/{fileType}", method =
RequestMethod.GET)
    public ResponseEntity<byte[]> download(HttpServletRequest request,
@PathVariable String fileName, @PathVariable String fileType) throws IOException
{
        File file = new File("D:\\Apks\\" + fileName + "." + fileType);
        byte[] body = null;
        InputStream is = new FileInputStream(file);
        body = new byte[is.available()];
        is.read(body);
        HttpHeaders headers = new HttpHeaders();
        headers.add("Content-Disposition", "attchement;filename=" +
file.getName());
        HttpStatus statusCode = HttpStatus.OK;
        ResponseEntity<byte[]> entity = new ResponseEntity<>(body, headers,
statusCode);
        return entity;
    }
}
```

11.3 HttpMessageConverter接口:

> **Spring3.0 新添加的一个接口，负责**
>
> **将请求信息转换为一个对象（类型为 T）**
>
> **将对象（类型为 T）输出为响应信息**

注意：一般Controller返回String类型是走视图解析（ViewResolver）

如果返回其他类型是由HttpMessageConverter负责



HttpMessageConverter接口定义的方法:

- Boolean canRead(Class<?> clazz,MediaType mediaType):
    - 指定转换器可以读取的对象类型，即转换器是否可将请求信息转换为 clazz 类型的对象，同时指定支持 MIME 类型(text/html,applaiction/json等)
- Boolean canWrite(Class<?> clazz,MediaType mediaType):
    - 指定转换器是否可将 clazz 类型的对象写到响应流中，响应流支持的媒体类型在MediaType中定义
- LIst getSupportMediaTypes():
    - 该转换器支持的媒体类型
- T read(Class<? extends T> clazz,HttpInputMessage inputMessage):

    - 将请求信息流转换为 T 类型的对象
- void write(T t,MediaType contnetType,HttpOutputMessgae outputMessage):
    - 将T类型的对象写到响应流中，同时指定相应的媒体类型为 contentType

12. 拦截器

> SpringMVC提供了拦截器机制：
> 　允许运行目标方法之前进行一些拦截工作，或者目标方法运行之后进行一些其他处理。
>
> Filter：javaWeb
> HandlerInterceptor：SpringMVC

HandlerInterceptor：

- preHandle：在目标方法运行之前调用：
    - 返回boolean
        - return true；(chain.doFilter())放行；
        - return false；不放行
- postHandle：在目标方法运行之后调用
- afterCompletion：资源响应之后调用

12.1 操作步骤

1. 实现HandlerInterceptor接口

```java
package com.chenhui.interceptor;

import org.springframework.web.servlet.HandlerInterceptor;
import org.springframework.web.servlet.ModelAndView;

import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;

public class MyFirstInterceptor implements HandlerInterceptor {

    public boolean preHandle(HttpServletRequest request, HttpServletResponse
response, Object handler) throws Exception {
        System.out.println("MyFirstInterceptor...preHandle");
        return true;
    }

    public void postHandle(HttpServletRequest request, HttpServletResponse
response, Object handler, ModelAndView modelAndView) throws Exception {
        System.out.println("MyFirstInterceptor...postHandle");
    }

    public void afterCompletion(HttpServletRequest request,
HttpServletResponse response, Object handler, Exception ex) throws Exception
{
        System.out.println("MyFirstInterceptor...afterCompletion");
    }
}
```

2. 配置拦截器

```
    <mvc:interceptors>
        <!--默认拦截所有请求↓-->
        <!-- <bean class="com.chenhui.interceptor.MyFirstInterceptor">
</bean>-->

        <!--拦截具体请求↓-->
        <mvc:interceptor>
            <!--只拦截path所对应的请求-->
            <mvc:mapping path="/testInter"/>
            <bean class="com.chenhui.interceptor.MyFirstInterceptor"></bean>
        </mvc:interceptor>
    </mvc:interceptors>
```

testInter控制器如下

```
@Controller
public class InterceptorTestController {

    @RequestMapping("/testInter")
    public String testInterceptor(){
        return "hello";
    }
}

```

hello.jsp：

```
<% pageContext.setAttribute("ctp",request.getContextPath());%>

<%@ page contentType="text/html;charset=UTF-8" language="java"
pageEncoding="UTF-8" %>
<html>
  <head>
    <title>$Title$</title>
  </head>
  <body>
  <a href="testInter">测试拦截器</a>
  </body>
</html>
<%--<jsp:forward page="/emp"></jsp:forward>--%>
```

3. 拦截器的运行流程
    1. preHandle
    2. 目标方法
    3. postHandle
    4. 页面渲染
    5. afterCompletion

```
Output
MyFirstInterceptor...preHandle
testInter...
MyFirstInterceptor...postHandle
hello.jsp
MyFirstInterceptor...afterCompletion
```

其他流程：

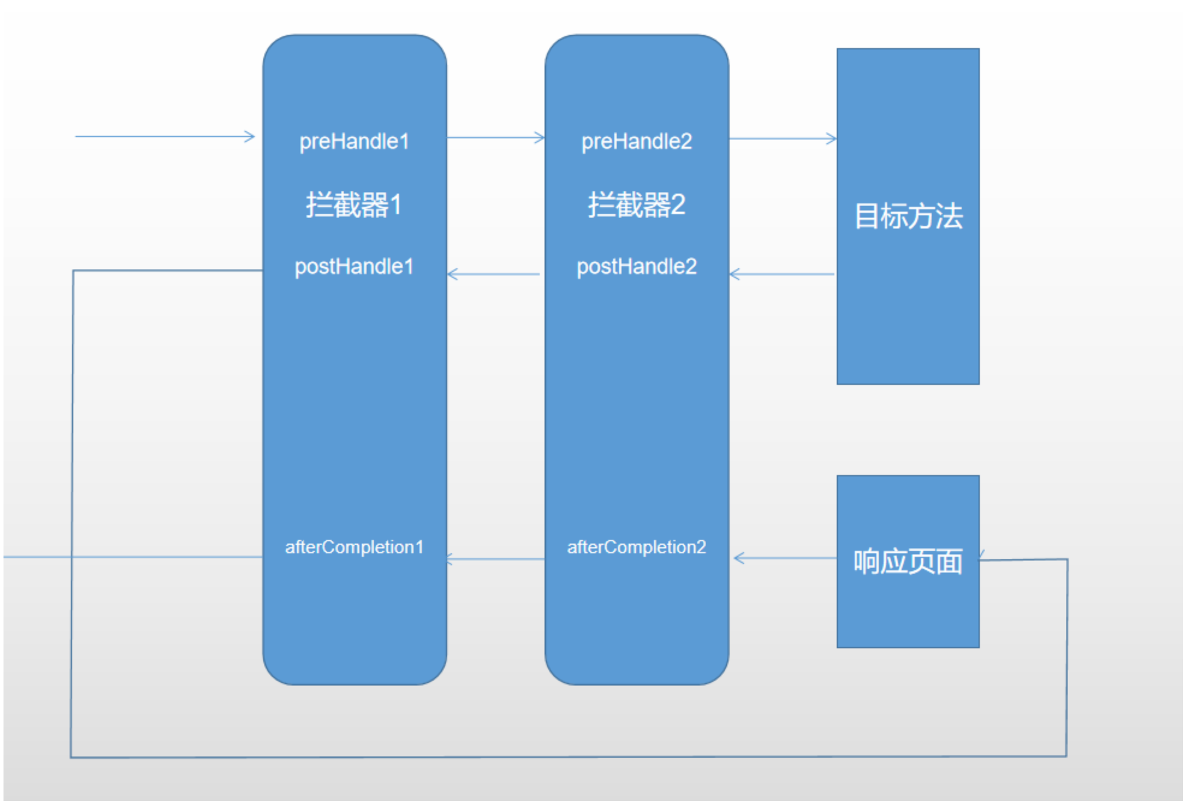
1. 只要preHandle不放行就没有以后的流程；
   - preHandle return false

```
Output
MyFirstInterceptor...preHandle
```

2. 只要放行了，afterCompletion都会执行；
   - 目标方法出现异常，afterCompletion也会执行

```
Output
MyFirstInterceptor...preHandle
testInter...
MyFirstInterceptor...afterCompletion
```

12.2 多个拦截器



```
MyFirstInterceptor...preHandle...
MySecondInterceptor...preHandle...
目标方法....
MySecondInterceptor...postHandle...
MyFirstInterceptor...postHandle...
响应页面....
MySecondInterceptor...afterCompletion...
MyFirstInterceptor...afterCompletion
```

异常流程：

1. 哪一块Interceptor不放行
    1. 哪一块不放行从此以后都没有
2. MySecondInterceptor不放行
    1. 但是他前面已经放行了的拦截器的afterCompletion总会执行

总结interceptor的流程：

拦截器的preHandle：是按照顺序执行

拦截器的postHandle：是按照逆序执行

拦截器的afterCompletion：是按照逆序执行

已经放行了的拦截器的afterCompletion总会执行

12.3 拦截器源码

在DispatcherServlet中

```
try {
            ModelAndView mv = null;
            Exception dispatchException = null;

            try {
                processedRequest = checkMultipart(request);
                multipartRequestParsed = processedRequest != request;


                // Determine handler for the current request.拿到方法的执行链，包含
拦截器

                mappedHandler = getHandler(processedRequest);



                if (mappedHandler == null || mappedHandler.getHandler() == null)
{

                    noHandlerFound(processedRequest, response);
                    return;
                }


                // Determine handler adapter for the current request.
                HandlerAdapter ha =
getHandlerAdapter(mappedHandler.getHandler());

                // Process last-modified header, if supported by the handler.
                String method = request.getMethod();
                boolean isGet = "GET".equals(method);
                if (isGet || "HEAD".equals(method)) {
                    long lastModified = ha.getLastModified(request,
mappedHandler.getHandler());
                    if (logger.isDebugEnabled()) {
                        String requestUri =
urlPathHelper.getRequestUri(request);
                        logger.debug("Last-Modified value for [" + requestUri +
"] is: " + lastModified);
                    }
                    if (new ServletWebRequest(request,
response).checkNotModified(lastModified) && isGet) {
                        return;
                    }
                }



               //拦截器preHandle执行位置;有一个拦截器返回false目标方法以后都不会执行；直接
跳到afterCompletion
                if (!mappedHandler.applyPreHandle(processedRequest, response)) {
                    return;
                }



                try {
                    // Actually invoke the handler.适配器执行目标方法
                    mv = ha.handle(processedRequest, response,
mappedHandler.getHandler());
                }
                finally {
                    if (asyncManager.isConcurrentHandlingStarted()) {
                        return;
                    }
                }

                applyDefaultViewName(request, mv);



                 //目标方法只要正常就会走到postHandle;任何期间有异常
                mappedHandler.applyPostHandle(processedRequest, response, mv);



            }
            catch (Exception ex) {
                dispatchException = ex;
            }
            //页面渲染；如果完蛋也是直接跳到afterCompletion；
            processDispatchResult(processedRequest, response, mappedHandler, mv,
dispatchException);




        }
        catch (Exception ex) {
            triggerAfterCompletion(processedRequest, response, mappedHandler,
ex);
        }
        catch (Error err) {
            triggerAfterCompletionWithError(processedRequest, response,
mappedHandler, err);
        }
        finally {
            if (asyncManager.isConcurrentHandlingStarted()) {
                // Instead of postHandle and afterCompletion

 mappedHandler.applyAfterConcurrentHandlingStarted(processedRequest, response);
                return;
            }
            // Clean up any resources used by a multipart request.
            if (multipartRequestParsed) {
                cleanupMultipart(processedRequest);
            }
        }
    }
```

顺序遍历所有拦截器的preHandle方法

```
boolean applyPreHandle(HttpServletRequest request, HttpServletResponse response)
throws Exception {
        if (getInterceptors() != null) {
            for (int i = 0; i < getInterceptors().length; i++) {
                HandlerInterceptor interceptor = getInterceptors()[i];

                //preHandle-true-false
                if (!interceptor.preHandle(request, response, this.handler)) {
                    //执行完afterCompletion（）；
                    triggerAfterCompletion(request, response, null);
                    //返回一个false
                    return false;
                }
               //记录一下索引
               //this.interceptorIndex = i;
            }
        }
        return true;
    }
```

逆序遍历所有拦截器的postHandle方法

```java
void applyPostHandle(HttpServletRequest request, HttpServletResponse response,
ModelAndView mv) throws Exception {
        if (getInterceptors() == null) {
            return;
        }
        //逆向执行每个拦截器的postHandle
        for (int i = getInterceptors().length - 1; i >= 0; i--) {
            HandlerInterceptor interceptor = getInterceptors()[i];
            interceptor.postHandle(request, response, this.handler, mv);
        }
    }
```

页面渲染方法

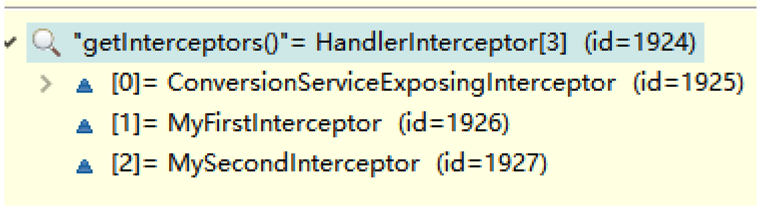
```java
private void processDispatchResult(HttpServletRequest request,
HttpServletResponse response,
            HandlerExecutionChain mappedHandler, ModelAndView mv, Exception
exception) throws Exception {

        boolean errorView = false;

        if (exception != null) {
            if (exception instanceof ModelAndViewDefiningException) {
                logger.debug("ModelAndViewDefiningException encountered",
exception);
                mv = ((ModelAndViewDefiningException)
exception).getModelAndView();
            }
            else {
                Object handler = (mappedHandler != null ?
mappedHandler.getHandler() : null);
                mv = processHandlerException(request, response, handler,
exception);
                errorView = (mv != null);
            }
        }

        // Did the handler return a view to render?
        if (mv != null && !mv.wasCleared()) {

             //页面渲染
            render(mv, request, response);
            if (errorView) {
                WebUtils.clearErrorRequestAttributes(request);
            }
        }
        else {
            if (logger.isDebugEnabled()) {
                logger.debug("Null ModelAndView returned to DispatcherServlet
with name '" + getServletName() +
                        "': assuming HandlerAdapter completed request
handling");
            }
        }
        if
(WebAsyncUtils.getAsyncManager(request).isConcurrentHandlingStarted()) {
            // Concurrent handling started during a forward
            return;
        }


        if (mappedHandler != null) {
               //页面正常执行afterCompletion；即使没走到这，afterCompletion总会执行；
            mappedHandler.triggerAfterCompletion(request, response, null);
        }
    }
```

afterCompletion：

```
void triggerAfterCompletion(HttpServletRequest request, HttpServletResponse
response, Exception ex)
            throws Exception {

        if (getInterceptors() == null) {
            return;
        }

          //有记录最后一个放行拦截器的索引，从他开始把之前所有放行的拦截器的afterCompletion
都执行
        for (int i = this.interceptorIndex; i >= 0; i--) {
            HandlerInterceptor interceptor = getInterceptors()[i];
            try {
                interceptor.afterCompletion(request, response, this.handler,
ex);
            }
            catch (Throwable ex2) {
                logger.error("HandlerInterceptor.afterCompletion threw
exception", ex2);
            }
        }
    }
```

第二个拦截器不放行的情况：

preHandle：


"getInterceptors()"= HandlerInterceptor[3] (id=1924)
[0]= ConversionServiceExposingInterceptor (id=1925)
[1]= MyFirstInterceptor (id=1926)
[2]= MySecondInterceptor (id=1927)

```
第一次：ConversionServiceExposingInterceptor  interceptorIndex=0;
第二次：MyFirstInterceptor                    interceptorIndex=1
第三次；MySecondInterceptor          执行afterCompletion()
已经放行了的拦截器的afterCompletion总会执行
```

从记录的索引开始倒叙执行afterCompletion方法：

```
 for (int i = this.interceptorIndex; i >= 0; i--) {
           HandlerInterceptor interceptor = getInterceptors()[i];
           try {
               interceptor.afterCompletion(request, response, this.handler,
ex);
           }
           catch (Throwable ex2) {
               logger.error("HandlerInterceptor.afterCompletion threw
exception", ex2);
           }
    }
```

13. 国际化

13.1 步骤

1. 写好国际化资源文件

```
username=UserName
password=Password
login=Login
```

```
username=用户名
password=密码
login=登录
```

2. 让Spring的ResourceBundleMessageSource管理国际化资源文件

```
<bean id="messageSource"
class="org.springframework.context.support.ResourceBundleMessageSource">
        <property name="basename" value="loginpage/login"></property>
    </bean>
```

3. 直接去页面取值

```
<%@ page contentType="text/html;charset=UTF-8" language="java" %>
<%@ taglib prefix="fmt" uri="http://java.sun.com/jsp/jstl/fmt" %>
<html>
<head>
    <title>Title</title>
</head>
<body>
<form>
    <fmt:message key="username"/>: <input type="text"><br>
    <fmt:message key="password"/>: <input type="password"><br>
    <input type="submit" value="<fmt:message key="login"/>">
</form>
</body>
</html>
```

4. 现象：是按照浏览器带来语言信息决定

13.2 自定义LocaleResolver

实现LocaleResolver接口

```java
public class MyLocalResolver implements LocaleResolver {
    public Locale resolveLocale(HttpServletRequest request) {
        System.out.println("自己的区域解析器");
        Locale l = null;

        String locale = request.getParameter("locale");
        System.out.println("自己区域解析器接受的locale:"+locale);
        if (locale != null && !"".equals(locale)) {
            l = new Locale(locale.split("_")[0], locale.split("_")[1]);
        } else {
            l = request.getLocale();
        }
        System.out.println("Locale:"+l.toString());
        return l;
    }

    public void setLocale(HttpServletRequest request, HttpServletResponse
response, Locale locale) {
        throw new UnsupportedOperationException("Can't set Locale message");
    }
}
```

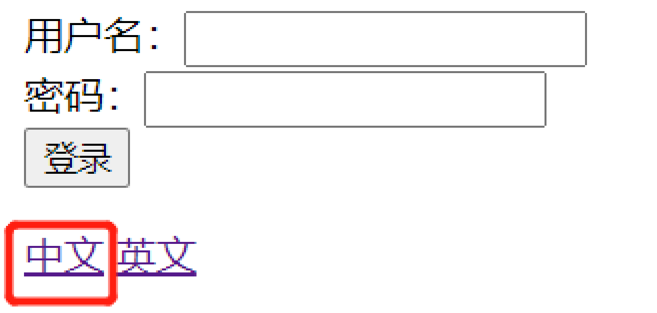
注册到ioc.xml中

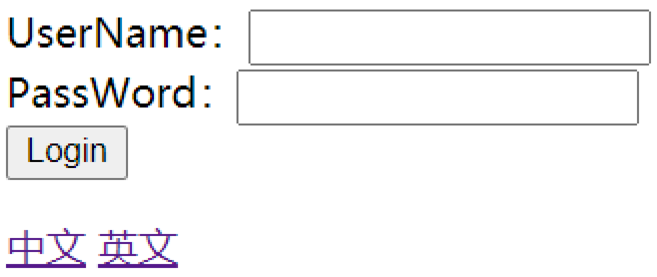
```xml
<bean id="localeResolver" class="com.chenhui.component.MyLocalResolver"></bean>
```

jsp页面修改为

```jsp
<%@ page contentType="text/html;charset=UTF-8" language="java" %>
<%@ taglib prefix="fmt" uri="http://java.sun.com/jsp/jstl/fmt" %>
<html>
<head>
    <title>Title</title>
</head>
<body>
<form>
    <fmt:message key="username"/>: <input type="text"><br>
    <fmt:message key="password"/>: <input type="password"><br>
    <input type="submit" value="<fmt:message key="login"/>">
</form>
<a href="tologinpage?locale=zh_CN">中文</a>
<a href="tologinpage?locale=en_US">英文</a>
</body>
</html>
```

效果





13.3 FixedLocaleResolver：

使用系统默认的区域信息

```
@Override
    public Locale resolveLocale(HttpServletRequest request) {
        Locale locale = getDefaultLocale();
        if (locale == null) {
            locale = Locale.getDefault();
        }
        return locale;
    }

    @Override
    public LocaleContext resolveLocaleContext(HttpServletRequest request) {
        return new TimeZoneAwareLocaleContext() {
            @Override
            public Locale getLocale() {
                return getDefaultLocale();
            }
            @Override
            public TimeZone getTimeZone() {
                return getDefaultTimeZone();
            }
        };
    }

    @Override
    public void setLocaleContext(HttpServletRequest request, HttpServletResponse
response, LocaleContext localeContext) {
        throw new UnsupportedOperationException("Cannot change fixed locale -
use a different locale resolution strategy");
    }
```

13.4 SessionLocaleResolver：

区域信息是从session中获取，可以根据请求参数创建一个locale对象，把他放在session中。

```
@Override
    public Locale resolveLocale(HttpServletRequest request) {
        Locale locale = (Locale) WebUtils.getSessionAttribute(request, 
LOCALE_SESSION_ATTRIBUTE_NAME);
        if (locale == null) {
            locale = determineDefaultLocale(request);
        }
        return locale;
    }
```

13.5 CookieLocaleResolver

区域信息是从cookie中获取

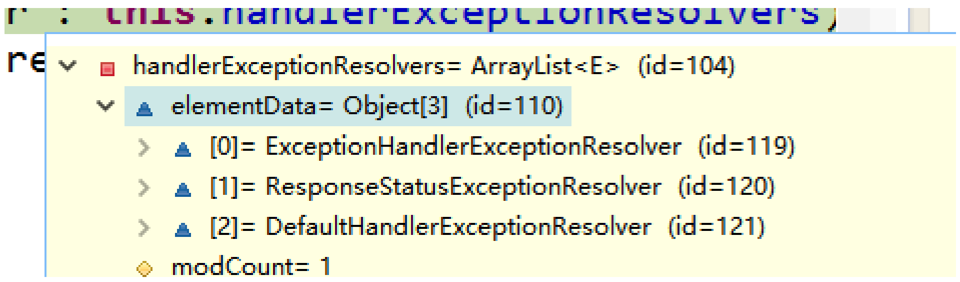
```
@Override
    public Locale resolveLocale(HttpServletRequest request) {
        parseLocaleCookieIfNecessary(request);
        return (Locale) request.getAttribute(LOCALE_REQUEST_ATTRIBUTE_NAME);
    }
```

14. 异常处理

14.1 异常源码

```
processDispatchResult(processedRequest, response, mappedHandler, 
    mv, dispatchException);
```

加了MVC异常处理，默认就是这个几个HandlerExceptionResolver



```
r : this.handlerExceptionResolvers;
re
handlerExceptionResolvers= ArrayList<E>  (id=104)
  elementData= Object[3]  (id=110)
    [0]= ExceptionHandlerExceptionResolver  (id=119)
    [1]= ResponseStatusExceptionResolver  (id=120)
    [2]= DefaultHandlerExceptionResolver  (id=121)
  modCount= 1
```

- ExceptionHandlerExceptionResolver
- ResponseStatusExceptionResolver
- DefaultHandlerExceptionResolver

如果异常解析器都不能处理就直接抛出去;

```
private void processDispatchResult(HttpServletRequest request, 
HttpServletResponse response,
            HandlerExecutionChain mappedHandler, ModelAndView mv, Exception 
exception) throws Exception {

        boolean errorView = false;
        //如果有异常
        if (exception != null) {
            if (exception instanceof ModelAndViewDefiningException) {
                logger.debug("ModelAndViewDefiningException encountered",
exception);
                mv = ((ModelAndViewDefiningException)
exception).getModelAndView();
            }
            else {

                //处理异常
                Object handler = (mappedHandler != null ?
mappedHandler.getHandler() : null);

                //===================================
                mv = processHandlerException(request, response, handler,
exception);


                errorView = (mv != null);
            }
        }

        // Did the handler return a view to render?
        if (mv != null && !mv.wasCleared()) {
               //来到页面
            render(mv, request, response);
            if (errorView) {
                WebUtils.clearErrorRequestAttributes(request);
            }
        }
        else {
            if (logger.isDebugEnabled()) {
                logger.debug("Null ModelAndView returned to DispatcherServlet
with name '" + getServletName() +
                        "': assuming HandlerAdapter completed request
handling");
            }
        }

        if
(WebAsyncUtils.getAsyncManager(request).isConcurrentHandlingStarted()) {

            // Concurrent handling started during a forward
            return;
        }

        if (mappedHandler != null) {
            mappedHandler.triggerAfterCompletion(request, response, null);
        }
    }
```

所有异常解析器尝试解析，解析完成进行后续，解析失败下一个解析器继续解析

```
protected ModelAndView processHandlerException(HttpServletRequest request,
HttpServletResponse response,
            Object handler, Exception ex) throws Exception {
```

```
        // Check registered HandlerExceptionResolvers...
        ModelAndView exMv = null;
        for (HandlerExceptionResolver handlerExceptionResolver :
this.handlerExceptionResolvers) {
            exMv = handlerExceptionResolver.resolveException(request, response,
handler, ex);
            if (exMv != null) {
                break;
            }
        }
        if (exMv != null) {
            if (exMv.isEmpty()) {
                return null;
            }

            // We might still need view name translation for a plain error
model...
            if (!exMv.hasView()) {
                exMv.setViewName(getDefaultViewName(request));
            }
            if (logger.isDebugEnabled()) {
                logger.debug("Handler execution resulted in exception -
forwarding to resolved error view: " + exMv, ex);
            }
            WebUtils.exposeErrorRequestAttributes(request, ex,
getServletName());
            return exMv;
        }

        throw ex;
    }
```

14.2 ExceptionHandler

局部异常处理

```
@Controller
public class ExceptionTestController {
    @RequestMapping("/testException")
    public String exceptionTest(Integer integer){
        System.out.println("testException");
        System.out.println(10/integer);
        return "exception";
    }

    @ExceptionHandler(value = {ArithmeticException.class})
    public String handleException01(){
        System.out.println("handleException-Arithmetic");
        return "myError";
    }
}
```

Jsp页面：

```
<%@ page contentType="text/html;charset=UTF-8" language="java" %>
<html>
<head>
    <title>Title</title>
</head>
<body>
<h1>运算出错</h1>
</body>
</html>
```

若要携带异常信息, 可以返回ModelAndView

注意:

- **异常信息不能给参数位置写Model**
- **同个作用域，有多个Exception异常处理器，精确优先**

```
@ExceptionHandler(value = {ArithmeticException.class})
    public ModelAndView handleException01(Exception exception){
        System.out.println("handleException-Arithmetic");
        System.out.println("exception:"+exception);
        ModelAndView myError = new ModelAndView("myError");
        myError.addObject("ex",exception);
        return myError;
    }
```

全局异常处理

异常处理控制器可以放在@ControllerAdvice下，作用域是全局

```
@ControllerAdvice
public class MyExceptionController {
    @ExceptionHandler(value = {ArithmeticException.class})
    public ModelAndView handleException01(Exception exception){
        System.out.println("handleException-Arithmetic");
        System.out.println("exception:"+exception);
        ModelAndView myError = new ModelAndView("myError");
        myError.addObject("ex",exception);
        return myError;
    }
}
```

全局与本类都有匹配的异常处理器，本类的优先运行

14.3 ResponseStatus

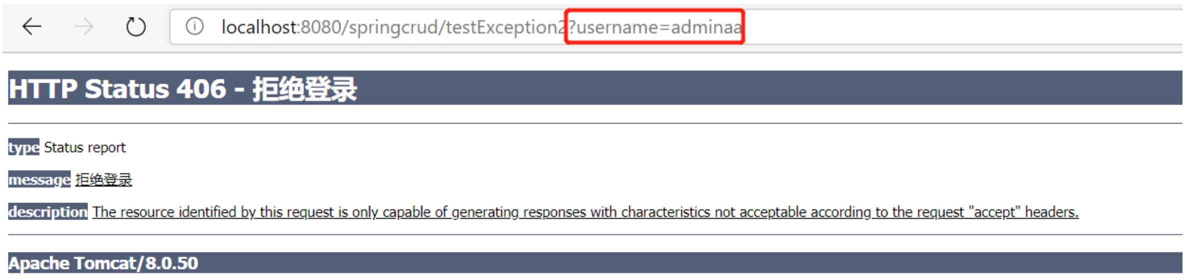
编写一个异常类

```java
package com.chenhui.component;

import org.springframework.http.HttpStatus;
import org.springframework.web.bind.annotation.ResponseStatus;

@ResponseStatus(reason = "拒绝登录", value = HttpStatus.NOT_ACCEPTABLE)
public class UsernameNotFoundException extends RuntimeException {
    static final long serialVersionUID = 1L;
}
```

测试:

```java
    @RequestMapping("/testException2")
    public String exceptionTest2(String username){
        System.out.println("testException");
        if (!"admin".equals(username)){
            System.out.println("登录失败");
            //+++++抛出自己的错误信息
            throw new UsernameNotFoundException();

        }
        System.out.println("登陆成功");
        return "success";
    }
```

结果:


localhost:8080/springcrud/testException2?username=adminaa

HTTP Status 406 - 拒绝登录

type Status report

message 拒绝登录

description The resource identified by this request is only capable of generating responses with characteristics not acceptable according to the request "accept" headers.

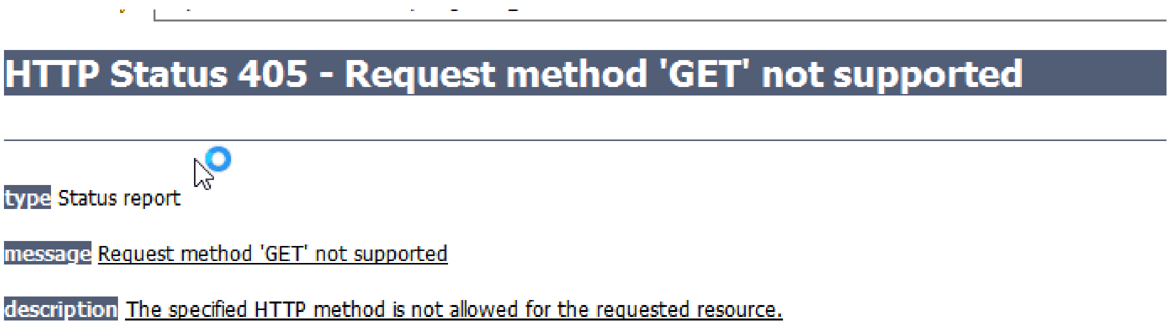
Apache Tomcat/8.0.50

14.4 DefaultHandlerExceptionResolver

DefaultHandlerExceptionResolver:

判断是否是SpringMVC自带的异常或Spring自己的异常:

如：HttpRequestMethodNotSupportedException。如果没人处理则它自己处理


HTTP Status 405 - Request method 'GET' not supported

type Status report

message Request method 'GET' not supported

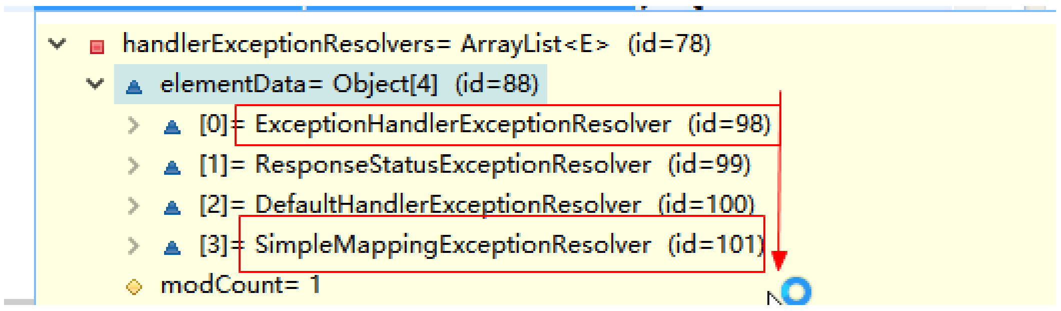
description The specified HTTP method is not allowed for the requested resource.

默认的异常有

```
try {
            if (ex instanceof NoSuchRequestHandlingMethodException) {
                return
handleNoSuchRequestHandlingMethod((NoSuchRequestHandlingMethodException) ex,
request, response,
                        handler);
            }
            else if (ex instanceof HttpRequestMethodNotSupportedException) {
                return
handleHttpRequestMethodNotSupported((HttpRequestMethodNotSupportedException) ex,
request,
                        response, handler);
            }
            else if (ex instanceof HttpMediaTypeNotSupportedException) {
                return
handleHttpMediaTypeNotSupported((HttpMediaTypeNotSupportedException) ex,
request, response,
                        handler);
            }
            else if (ex instanceof HttpMediaTypeNotAcceptableException) {
                return
handleHttpMediaTypeNotAcceptable((HttpMediaTypeNotAcceptableException) ex,
request, response,
                        handler);
            }
            else if (ex instanceof MissingServletRequestParameterException) {
                return
handleMissingServletRequestParameter((MissingServletRequestParameterException)
ex, request,
                        response, handler);
            }
            else if (ex instanceof ServletRequestBindingException) {
                return
handleServletRequestBindingException((ServletRequestBindingException) ex,
request, response,
                        handler);
            }
            else if (ex instanceof ConversionNotSupportedException) {
                return
handleConversionNotSupported((ConversionNotSupportedException) ex, request,
response, handler);
            }
            else if (ex instanceof TypeMismatchException) {
                return handleTypeMismatch((TypeMismatchException) ex, request,
response, handler);
            }
            else if (ex instanceof HttpMessageNotReadableException) {
                return
handleHttpMessageNotReadable((HttpMessageNotReadableException) ex, request,
response, handler);
            }
            else if (ex instanceof HttpMessageNotWritableException) {
                return
handleHttpMessageNotWritable((HttpMessageNotWritableException) ex, request,
response, handler);
            }
            else if (ex instanceof MethodArgumentNotValidException) {
                return
handleMethodArgumentNotValidException((MethodArgumentNotValidException) ex,
request, response, handler);
            }
            else if (ex instanceof MissingServletRequestPartException) {
                return
handleMissingServletRequestPartException((MissingServletRequestPartException)
ex, request, response, handler);
            }
            else if (ex instanceof BindException) {
                return handleBindException((BindException) ex, request,
response, handler);
            }
            else if (ex instanceof NoHandlerFoundException) {
                return handleNoHandlerFoundException((NoHandlerFoundException)
ex, request, response, handler);
            }
        }
        catch (Exception handlerException) {
            logger.warn("Handling of [" + ex.getClass().getName() + "] resulted
in Exception", handlerException);
        }
        return null;
    }
```

14.5 SimpleMappingExceptionResolver：

通过配置的方式进行异常处理



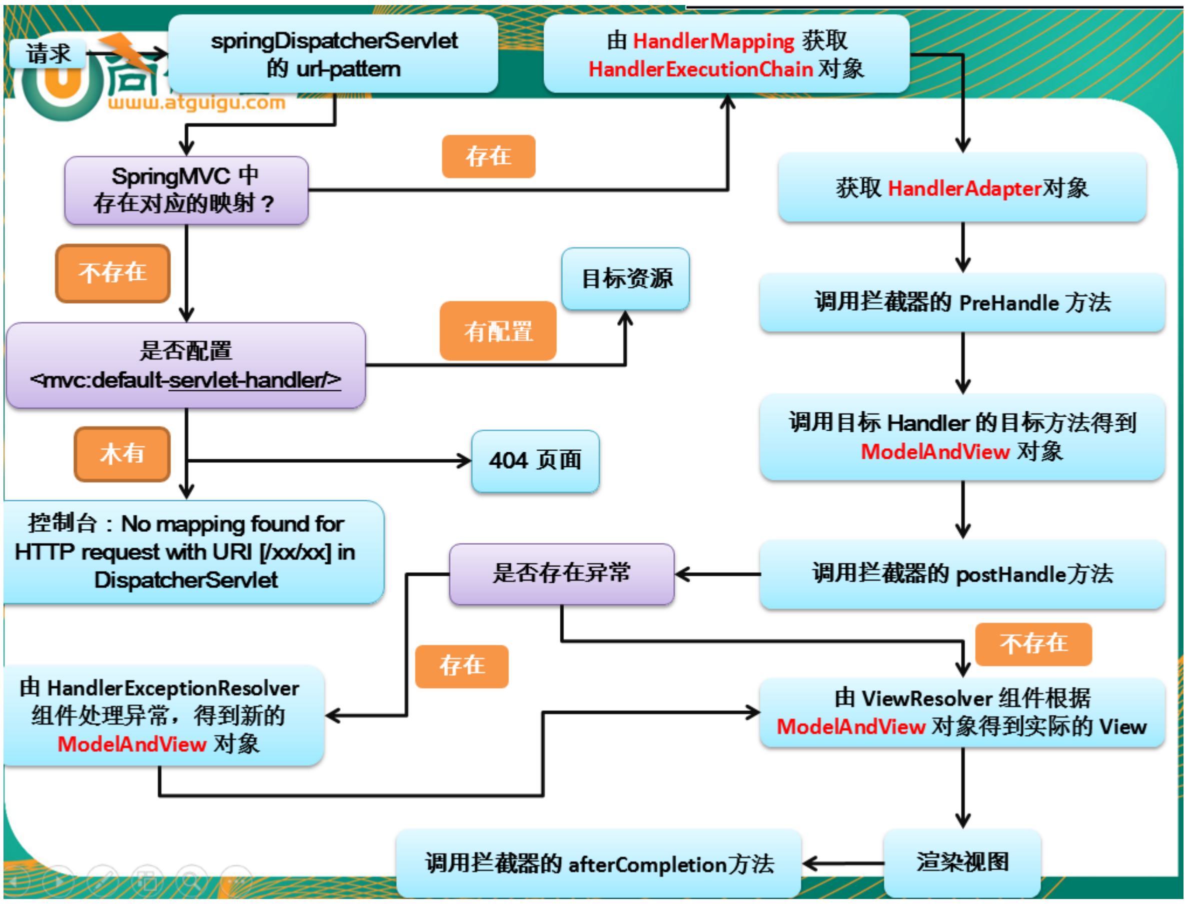
```
handlerExceptionResolvers= ArrayList<E>  (id=78)
    elementData= Object[4]  (id=88)
        [0]= ExceptionHandlerExceptionResolver  (id=98)
        [1]= ResponseStatusExceptionResolver  (id=99)
        [2]= DefaultHandlerExceptionResolver  (id=100)
        [3]= SimpleMappingExceptionResolver  (id=101)
    modCount= 1
```

```
<bean
class="org.springframework.web.servlet.handler.SimpleMappingExceptionResolver">
        <!-- exceptionMappings：配置哪些异常去哪些页面 -->
        <property name="exceptionMappings">
            <props>
                <!-- key：异常全类名；value：要去的页面视图名；会走视图解析 -->
                <prop key="java.lang.NullPointerException">myerror</prop>
            </props>
        </property>
        <!--指定错误信息取出时使用的key  -->
        <property name="exceptionAttribute" value="ex"></property>
    </bean>
```

15. SpringMVC总结

```
SpringMVC运行流程：
```

```
1、所有请求，前端控制器（DispatcherServlet）收到请求，调用doDispatch进行处理
2、根据HandlerMapping中保存的请求映射信息找到，处理当前请求的，处理器执行链（包含拦截器）
3、根据当前处理器找到他的HandlerAdapter（适配器）
4、拦截器的preHandle先执行
5、适配器执行目标方法，并返回ModelAndView
          1）、ModelAttribute注解标注的方法提前运行
          2）、执行目标方法的时候（确定目标方法用的参数）
                    1）、有注解
                    2）、没注解：
                             1）、 看是否Model、Map以及其他的
                              2）、如果是自定义类型
                                            1）、从隐含模型中看有没有，如果有就从隐含
模型中拿
                                             2）、如果没有，再看是否
SessionAttributes标注的属性，如果是从Session中拿，如果拿不到会抛异常
                                            3）、都不是，就利用反射创建对象
6、拦截器的postHandle执行
7、处理结果：（页面渲染流程）
             1）、如果有异常使用异常解析器处理异常；处理完后还会返回ModelAndView
              2）、调用render进行页面渲染
                         1）、视图解析器根据视图名得到视图对象
                         2）、视图对象调用render方法；
               3）、执行拦截器的afterCompletion；
```


请求
springDispatcherServlet 的 url-pattern
由 HandlerMapping 获取 HandlerExecutionChain 对象
SpringMVC 中存在对应的映射？
存在
获取 HandlerAdapter对象
不存在
目标资源
调用拦截器的 PreHandle 方法
是否配置 <mvc:default-servlet-handler/>
有配置
调用目标 Handler 的目标方法得到 ModelAndView 对象
木有
404 页面
控制台：No mapping found for HTTP request with URI [/xx/xx] in DispatcherServlet
是否存在异常
调用拦截器的 postHandle方法
不存在
存在
由 HandlerExceptionResolver 组件处理异常，得到新的 ModelAndView 对象
由 ViewResolver 组件根据 ModelAndView 对象得到实际的 View
调用拦截器的 afterCompletion方法
渲染视图

16. SpringMVC与Spring整合

16.1 分容目的

1. SpringMVC和Spring整合的目的：分工明确

1. SpringMVC的配置文件就来配置和网站转发逻辑以及网站功能有关的

   （视图解析器，文件上传解析器，支持ajax，xxx）
2. Spring的配置文件来配置和业务有关的（事务控制，数据源，xxx）

16.2 SpringMVC和Spring分容器

Spring管理业务逻辑组件

```
    <context:component-scan base-package="com.atguigu">
        <context:exclude-filter type="annotation"
expression="org.springframework.stereotype.Controller"/>
        <context:exclude-filter type="annotation"
expression="org.springframework.web.bind.annotation.ControllerAdvice"/>
    </context:component-scan>
```

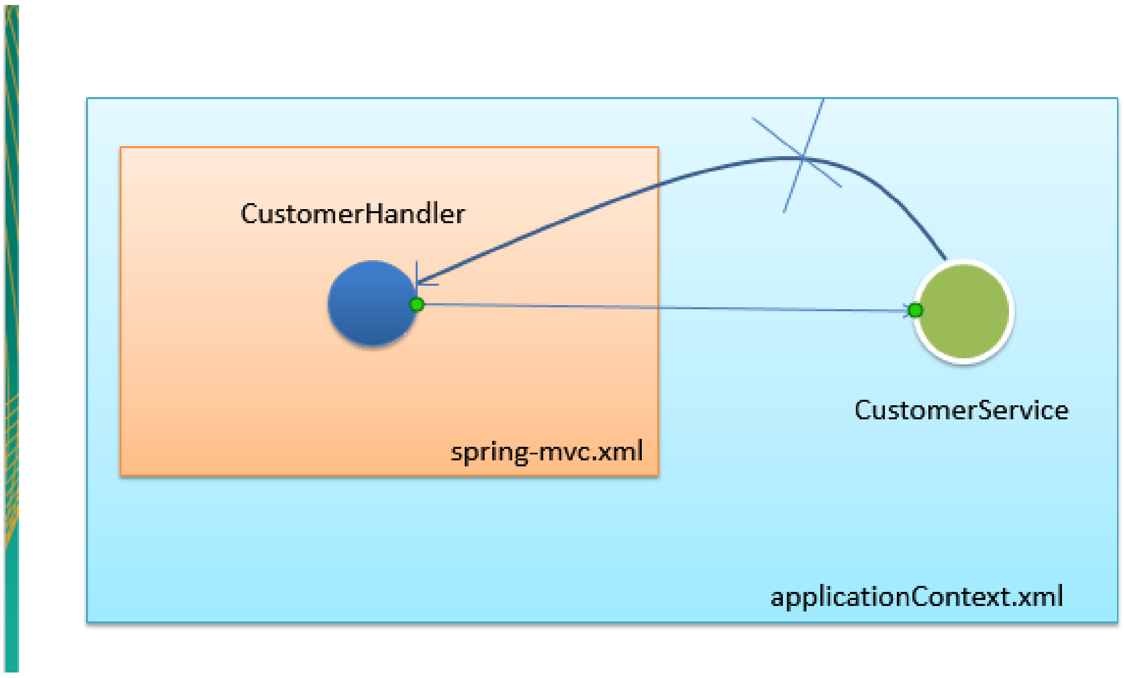
SpringMVC管理控制器组件

```
    <context:component-scan base-package="com.atguigu" use-default-
filters="false">
        <context:include-filter type="annotation"
expression="org.springframework.stereotype.Controller"/>
        <context:include-filter type="annotation"
expression="org.springframework.web.bind.annotation.ControllerAdvice"/>
    </context:component-scan>

```

Spring是一个父容器

SpringMVC是一个子容器

- **子容器还可以引用父容器的组件**
- **父容器不能引用子容器的组件**


CustomerHandler
spring-mvc.xml
CustomerService
applicationContext.xml