Spring Workshop

Schnelleinstieg Spring

https://github.com/Michaeli71/AMTC_Spring_Workshop

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Agenda

Workshop Contents

- **PART 1: Einführung**
  - Geschichte von Spring
  - Spring Architecture & ApplicationContext
- **PART 2: Dependency Injection**
  - Grundlagen IoC / DI
  - Spring Beans
  - Configuration
    - XML
    - Annotation
    - Java Config
  - Arten der Dependency Injection
  - Dependency Resolution Strategies

https://github.com/Michaeli71/AMTC_Spring_Workshop

Workshop Contents

- **PART 3: Bean Initialization / Scopes + Lifecycle**
  - Bean Initialization & Laziness
  - Zirkuläre Abhängigkeiten
  - Bean Scopes
  - Bean Lifecycle Callbacks

- **PART 4: Spring MVC**
  - Grundlagen DispatcherServlet & Controller
  - Beispiele Simple Rest Controller
  - Beispiele mit Thymeleaf

- **PART 5: Spring Tool Suite**

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PART 3:
Bean Initialization / Scopes + Lifecycle

- Bean Initialization & Laziness
- Zirkuläre Abhängigkeiten
- Bean Scopes
- Bean Lifecycle Callbacks

Bean Initialization

Bean Initialization

- Bisher keine Gedanken gemacht
- immer den Standard genutzt
- standardmäßig werden Beans DIREKT BEIM START initialisiert
- **hilft, Fehler bei der Konfiguration von Abhängigkeiten zu vermeiden**

Beispielklasse

```
@Component
public class SimpleCar {

    public void run() {
          //start battery
          //start engine
          //start the wheel
    }

    public void playMusic(){
          audioPlayer.playMusic();
    }

    @Autowired
    public void setAudioPlayer(AudioPlayer pl){
       this.audioPlayer = pl;
    }

    //setter injected battery,engine,
    //wheel & audioplayer
}
```

Anwendungskontext

```
@Component
public class AndroidAuto implements AudioPlayer {

        public AndroidAuto() {
          //check the internet connection (3 secs)
          //google account login (2 secs)
          //access for microphone and camera (4 secs)
          //load the playlists (2 secs)
          //cache the playlists (5 secs)
        }
}

var context = new AnnotationConfigApplicationContext(App.class);
SimpleCar simpleCar = context.getBean(SimpleCar.class);
simpleCar.run();

//later if user press the play button
simpleCar.playMusic();
```

Laziness is good ☺

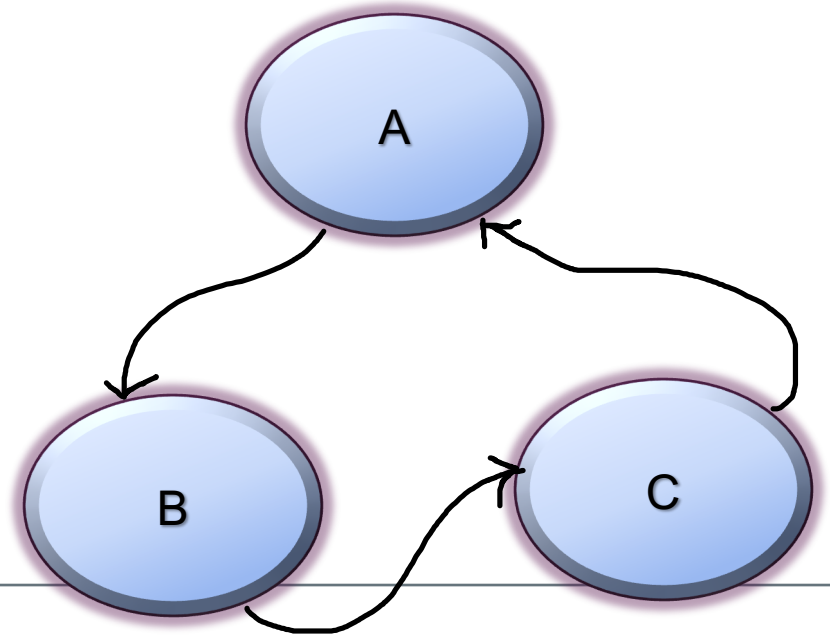
Lazy Init als eine Abhilfe

```
@Component
public class SimpleCar {

  public void run() {
     //start battery
     //start engine
     //start the wheel
   }

   public void playMusic(){
      if (audioPlayer == null)
          audioPlayer = context.getBean(AudioPlayer.class);
          audioPlayer.playMusic();
      }

    //setter injected battery,engine,wheel
}
```

```
@Lazy
@Component
public class AndroidAuto implements AudioPlayer {

        public AndroidAuto() {
           //check the internet connection (3 secs)
           //google account login (2 secs)
           //access for microphone and camera (4 secs)
           //load the playlists (10 secs)
           //cache the playlists (5 secs)
        }
}
```

Was sollte man generell im Design verbessern?

Zirkuläre Abhängigkeiten



Circular Dependency Example

```
@Component
public class Student {

  private Department department;

  @Autowired
  public Student(Department department) {
      ...
  }

}
```

```
@Component
public class Department {

  private Student student;

  @Autowired
  public Department(Student student) {
      ...
  }

}
```

Caused by: org.springframework.beans.factory.BeanCurrentlyInCreationException: Error creating bean with name 'department': Requested bean is currently in creation: Is there an unresolvable circular reference?

Circular dependencies solution

Modify some dependencies to be injected through setters => after conctruction

```
@Component
public class Student {

  private Department department;

  public Student(Department department) {
       ...
  }

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

}
```

Circular dependencies solution

Lazy initialize certain dependencies => Proxy gets created (*Interface as Indirection)

```
@Component
public class Student {

    private Department department;

    public Student(@Lazy Department department) {
       ...
    }
}
```

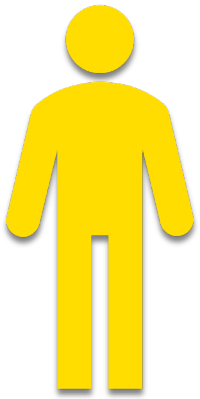
```
@Component
public class Student {

    private Department department;

    private int age=36;

    public Student(@Lazy Department department) {
        this.department = department;
    }

    public int getAge() {
        return age;
    }
```

department= Department$$EnhancerBySpringCGLIB$$f030f2cb (id=38)
CGLIB$BOUND= false
CGLIB$CALLBACK_0= CglibAopProxy$DynamicAdvisedInterceptor (id=58)
CGLIB$CALLBACK_1= CglibAopProxy$DynamicUnadvisedInterceptor (id=63)

Bean Scopes

Bean Scopes

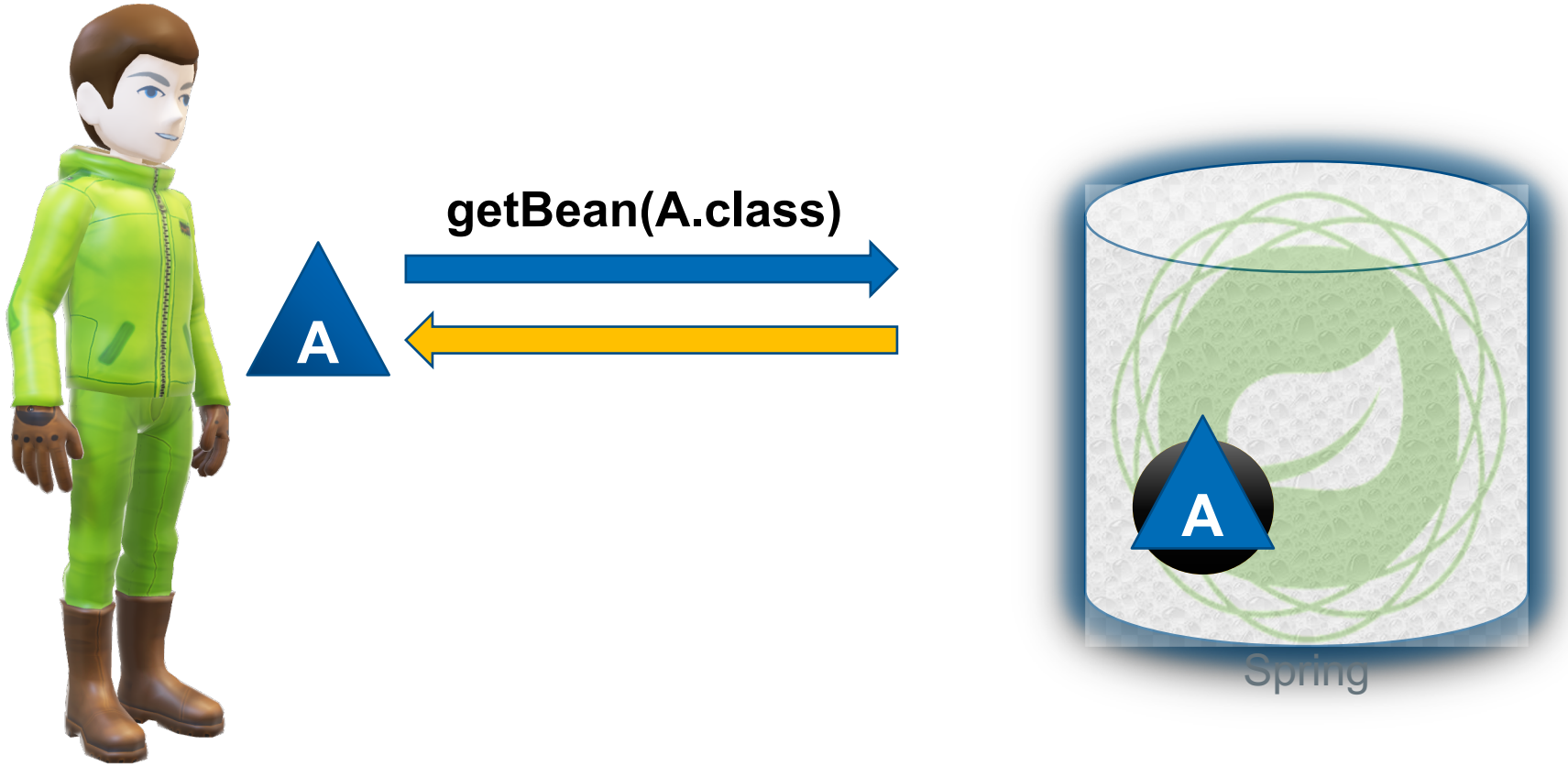
Default



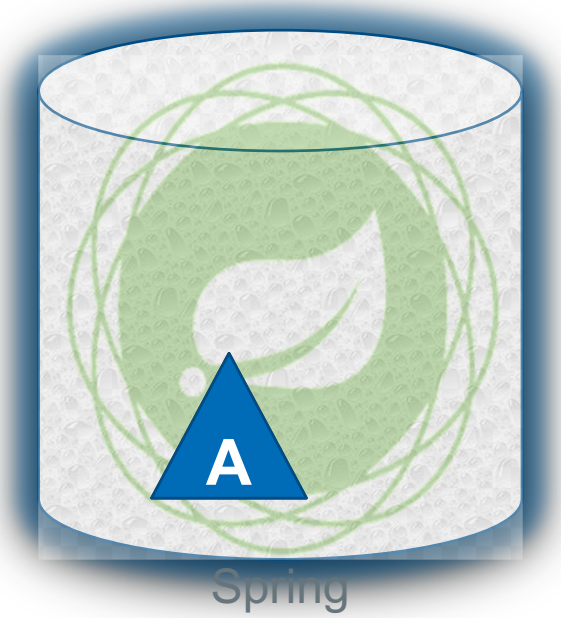
Singleton

Prototype

Singleton

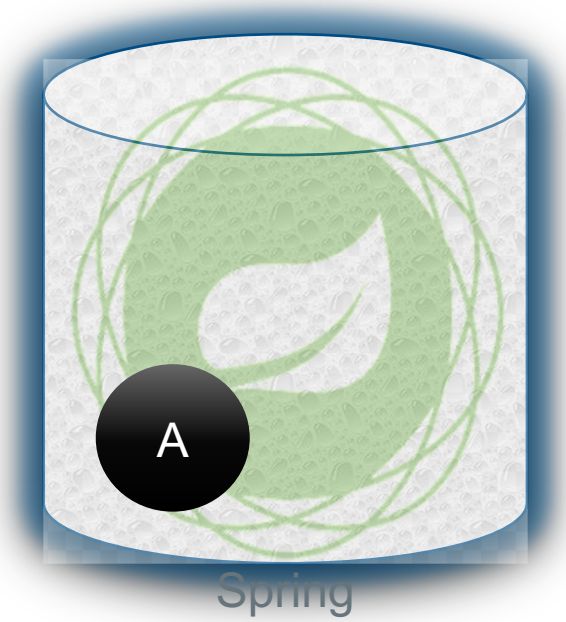


Singleton



getBean(A.class)

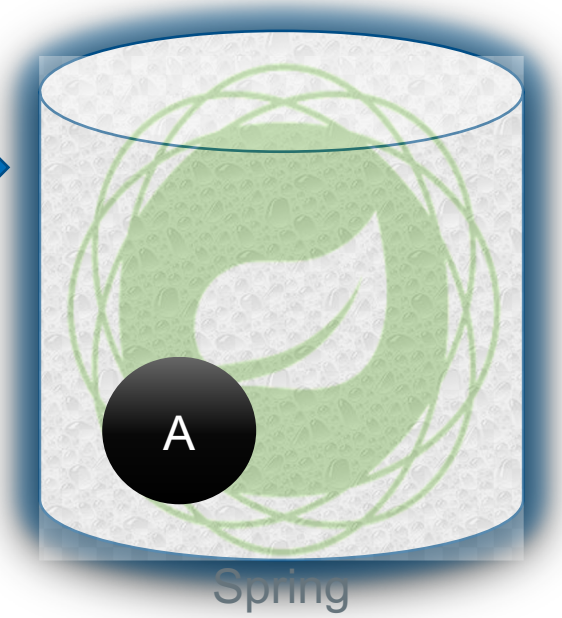
Prototype



getBean(A.class)

Prototype

getBean(A.class)



getBean(A.class)

Singleton Example

```
@Component
public class Shape {

   private String color = "yellow";

   //setter

}
```

```
@ComponentScan("ch.javaprofi_academy")
public class BeanScopesApp {
    public static void main(String[] args) {

        ClassPathXmlApplicationContext context =
                        new ClassPathXmlApplicationContext("bean-def.xml");

        var shape1 = context.getBean(Shape.class);
        System.out.println(shape1);

        shape1.setColor("blue");
        System.out.println(shape1);

        var shape2 = context.getBean(Shape.class);
        System.out.println(shape2);

        context.close();
    }
}
```

Shape [color=yellow]

Shape [color=blue]

Shape [color=blue]

Scope Configuration

@Scope(scopeName=ConfigurableBeanFactory.SCOPE_PROTOTYPE)

@Scope(scopeName=ConfigurableBeanFactory. SCOPE_SINGLETON)

@Scope(“prototype“)

@Scope(“singleton“)

@Scope(“somethingwrong“)

Caused by: java.lang.IllegalStateException: No Scope registered for scope name 'somethingwrong'

Prototype Example

```
@ComponentScan("ch.javaprofi_academy")
public class BeanScopesApp {
    public static void main(String[] args) {

        ClassPathXmlApplicationContext context =
                        new ClassPathXmlApplicationContext("bean-def.xml");

        var shape1 = context.getBean(Shape.class);
        System.out.println(shape1);

        shape1.setColor("blue");
        System.out.println(shape1);

        var shape2 = context.getBean(Shape.class);
        System.out.println(shape2);

        context.close();
    }
}
```

Shape [color=yellow]

Shape [color=blue]

Shape [color=yellow]

```
@Component
@Scope("prototype")
public class Shape {

   private String color = "yellow";

   //setter

}
```

Was bedeutet Singleton für Java? Wo ist die Eindeutigkeit gegeben?

Singleton is per container and not per classloader (~~JVM~~)

```
@Component
public class Shape {

   // shape

}
```

```
@ComponentScan("ch.karthi")
public class App {

    public static void main(String[] args) {
        var container = new AnnotationConfigApplicationContext(App.class);
        var container2 = new AnnotationConfigApplicationContext(App.class);

        var shape1 = container.getBean(Shape.class);
        LOG.info(shape1);

        shape1.setColour("blue");
        LOG.info(shape1);

        var shape2 = container2.getBean(Shape.class);
        LOG.info(shape2);

    }
}
```

INFO: Shape [color=yellow]

INFO: Shape [color=blue]

INFO: Shape [color=yellow]

other singleton pitfalls

```
<?xml version="1.0" encoding="UTF-8"?>

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

    <bean id="scopeTest" class="ch.javaprofi_academy.Shape" scope="singleton">
        <property name="color" value="blue"/>
    </bean>

    <bean id="scopeTestDuplicate" class="ch.javaprofi_academy.Shape"
          scope="singleton">
        <property name="color" value="red"/>
    </bean>
</beans>
```

other singleton pitfalls

```
public class SingletonSurprise {
    public static void main(String[] args) {
        var ctx = new ClassPathXmlApplicationContext("shapes.xml");

        Shape shape1 = ctx.getBean("scopeTest", Shape.class);
        Shape shape2 = ctx.getBean("scopeTestDuplicate", Shape.class);

        System.out.println(shape1 == shape2);
        System.out.println(shape1 + "::" + shape2);
    }
}
```

Was ist die Ausgabe?

other singleton pitfalls

```
public class SingletonSurprise {
    public static void main(String[] args) {
        var ctx = new ClassPathXmlApplicationContext("shapes.xml");

        Shape shape1 = ctx.getBean("scopeTest", Shape.class);
        Shape shape2 = ctx.getBean("scopeTestDuplicate", Shape.class);

        System.out.println(shape1 == shape2);
        System.out.println(shape1 + "::" + shape2);
    }
}
```

```
false
Shape [color=blue]::Shape [color=red]
```

other singleton pitfalls

```
public class SingletonSurprise {
    public static void main(String[] args) {
        var ctx = new ClassPathXmlApplicationContext("shapes.xml");

        Shape shape1 = ctx.getBean("scopeTest", Shape.class);
        Shape shape2 = ctx.getBean("scopeTestDuplicate", Shape.class);

        System.out.println(shape1 == shape2);
        System.out.println(shape1 + "::" + shape2);

        Shape shape3 = ctx.getBean("scopeTest", Shape.class);
        Shape shape4 = ctx.getBean("scopeTestDuplicate", Shape.class);
        System.out.println(shape1 == shape3);
        System.out.println(shape2 == shape4);
        System.out.println(shape3 + "::" + shape4);
    }
}
```

Was ändert sich jetzt?

other singleton pitfalls

```
public class SingletonSurprise {
    public static void main(String[] args) {
        var ctx = new ClassPathXmlApplicationContext("shapes.xml");

        Shape shape1 = ctx.getBean("scopeTest", Shape.class);
        Shape shape2 = ctx.getBean("scopeTestDuplicate", Shape.class);

        System.out.println(shape1 == shape2);
        System.out.println(shape1 + "::" + shape2);

        Shape shape3 = ctx.getBean("scopeTest", Shape.class);
        Shape shape4 = ctx.getBean("scopeTestDuplicate", Shape.class);
        System.out.println(shape1 == shape3);
        System.out.println(shape2 == shape4);
        System.out.println(shape3 + "::" + shape4);
    }
}
```

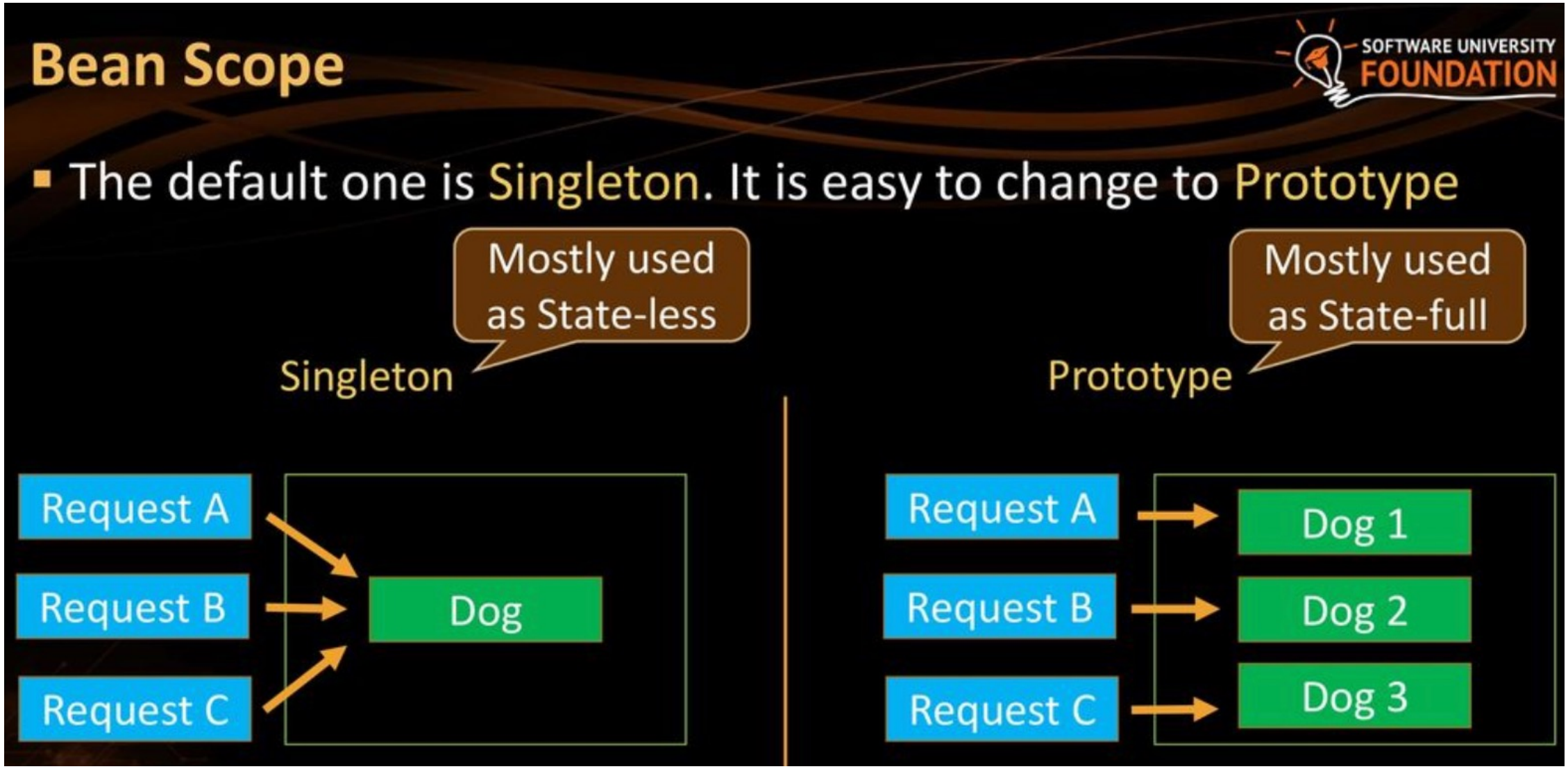
```
false
Shape [color=blue]::Shape [color=red]

true
true
Shape [color=blue]::Shape [color=red]
```

Fazit Singleton vs Prototype

Singleton vs Prototype

- Singleton => Stateless beans
- Prototype => Stateful beans

Fazit Singleton vs Prototype



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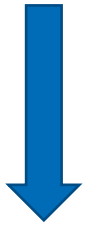
Life Cycle

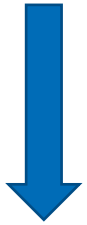
Lifecycle Callbacks

- **Initialization Callbacks**
  - `@PostConstruct`
  - InitializingBean
  - initMethod in `@Bean`



Präzedenz

- **Destruction Callback**
  - `@PreDestroy`
  - DisposableBean
  - destroyMethod in `@Bean`



@PostConstruct

```
@Component
public class VideoPlayer {

	private AsmiqAcademyStream asmiqAcademyStream;
	private YoutubeStream youtubeStream;

	private String youtubeApiKey = "y7k8nd9d92dl2m";
	private String asmiqAcademyApiKey = "y7k8nd9d92dl2m";

	@PostConstruct
	private void initStreams() {
		asmiqAcademyStream =
		 AsmiqAcademyStream.builder().withApiKey(asmiqAcademyApiKey).build();
		youtubeStream = YoutubeStream.builder().withApiKey(youtubeApiKey).build();
	}
}
```

```
<dependency>
<groupId>javax.annotation</groupId>
<artifactId>javax.annotation-api</artifactId>
<version>1.3.2</version>
</dependency>
```

InitializingBean

```
@Component
public class VideoPlayer implements InitializingBean {

	private AsmiqAcademyStream asmiqAcademyStream;
	private YoutubeStream youtubeStream;

	private String youtubeApiKey = "y7k8nd9d92dl2m";
	private String asmiqAcademyApiKey = "y7k8nd9d92dl2m";

	@Override
	public void afterPropertiesSet() throws Exception {
		initStreams();
	}

	private void initStreams() {
		asmiqAcademyStream =
		 AsmiqAcademyStream.builder().withApiKey(asmiqAcademyApiKey).build();
		youtubeStream = YoutubeStream.builder().withApiKey(youtubeApiKey).build();
	}
}
```

initMethod in @Bean

```
@Component
public class VideoPlayer {

    private AsmiqAcademyStream asmiqAcademyStream;
    private YoutubeStream youtubeStream;

    private String youtubeApiKey = "y7k8nd9d92dl2m";
    private String asmiqAcademyApiKey = "y7k8nd9d92dl2m“;

    private void initStreams() {
        asmiqAcademyStream =
                AsmiqAcademyStream.builder().withApiKey(asmiqAcademyApiKey).build();
        youtubeStream = YoutubeStream.builder().withApiKey(youtubeApiKey).build();
    }
}
```

```
@Configuration
public class AppConfig {
    @Bean(initMethod = "initStreams")
    public VideoPlayer videoPlayer() {
        return new VideoPlayer();
    }
}
```

@Predestroy

```
@Component
public class VideoPlayer {

	private AsmiqAcademyStream asmiqAcademyStream;
	private YoutubeStream youtubeStream;

	private String youtubeApiKey = "y7k8nd9d92dl2m";
	private String asmiqAcademyApiKey = "y7k8nd9d92dl2m";

	@PreDestroy
	private void signOffStreams() {
		asmiqAcademyStream.signOff();
		youtubeStream.signOff();
	}

	public void run() {
		// start any of the stream
	}
}
```

DisposableBean

```
@Component
public class VideoPlayer implements DisposableBean {

        private AsmiqAcademyStream asmiqAcademyStream;
        private YoutubeStream youtubeStream;

        private String youtubeApiKey = "y7k8nd9d92dl2m";
        private String asmiqAcademyApiKey = "y7k8nd9d92dl2m";

        @Override
        public void destroy(){
                signOffStreams ();
        }

        private void signOffStreams() {
                asmiqAcademyStream.signOff();
                youtubeStream.signOff();
        }
}
```

destroyMethod in @Bean

```
@Component
public class VideoPlayer {

	private AsmiqAcademyStream asmiqAcademyStream;
	private YoutubeStream youtubeStream;

	private String youtubeApiKey = "y7k8nd9d92dl2m";
	private String asmiqAcademyApiKey = "y7k8nd9d92dl2m";

	private void signOffStreams() {
		asmiqAcademyStream.signOff();
		youtubeStream.signOff();
	}

	public void run() {
		// start any of the stream
	}
}
```

```
@Configuration
public class AppConfig {
    @Bean(destroyMethod = "signOffStreams")
    public VideoPlayer videoPlayer() {
        return new VideoPlayer();
    }
}
```

*Aware-Interfaces für besondere Anwendungsfälle

- Eine weitere Möglichkeit, in den Lebenszyklus einzusteigen, ist das Implementieren von `XyzAware`-Schnittstellen:

```
import org.springframework.beans.BeansException;
import org.springframework.beans.factory.BeanNameAware;
import org.springframework.context.ApplicationContext;
import org.springframework.context.ApplicationContextAware;
import org.springframework.stereotype.Component;

@Component
class MySpringBean implements BeanNameAware, ApplicationContextAware {

    @Override
    public void setBeanName(String name) {
        // ...
    }

    @Override
    public void setApplicationContext(ApplicationContext applicationContext)
                throws BeansException {
        // ...
    }
}
```

Exercises 9 – 11

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PART 4:
Spring MVC

Short Refresher …

Servlet

- Java program that runs on server.

Servlet container

- A software that provides runtime for the servlets. (e.g.) Tomcat, Jetty

Simple Servlet – An example

```
@Override
protected void doGet(HttpServletRequest request,
                     HttpServletResponse response)
              throws ServletException, IOException {
      response.setContentType("text/html");
      request.authenticate(response);
      PrintWriter writer = response.getWriter();
      writer.println("<html>");
      writer.println("<head>");
      writer.println("this is simple serlvet example");
      writer.println("</head>");
      writer.println("<body>");
      writer.println("Hello HBT :-)");
      writer.println("</body>");
      writer.println("</html>");
}
```

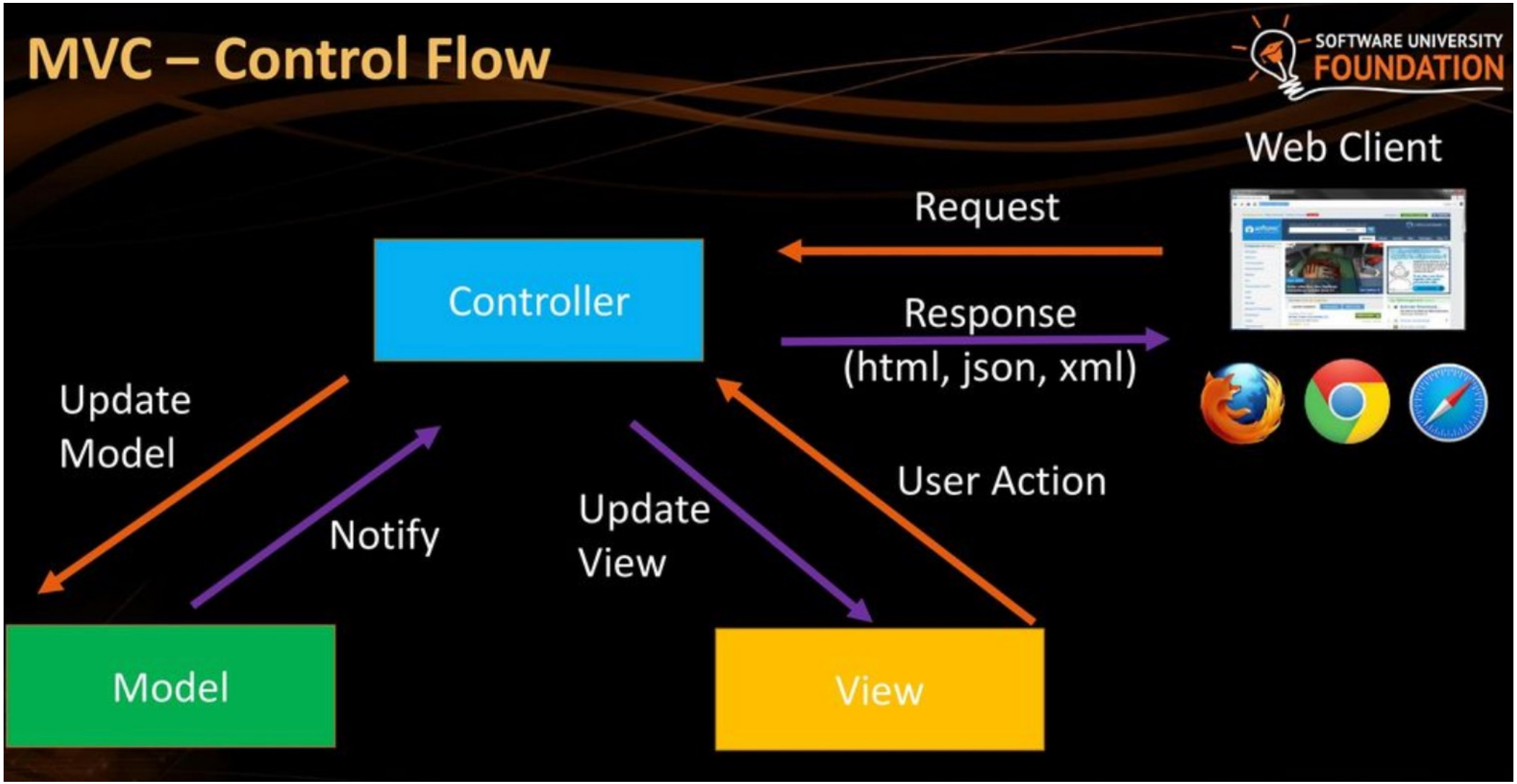
Simple Servlet – An example with methods extracted

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

      authenticate(response);

      createView(response);
}
```

MVC – Model View Controler – Logisches Model



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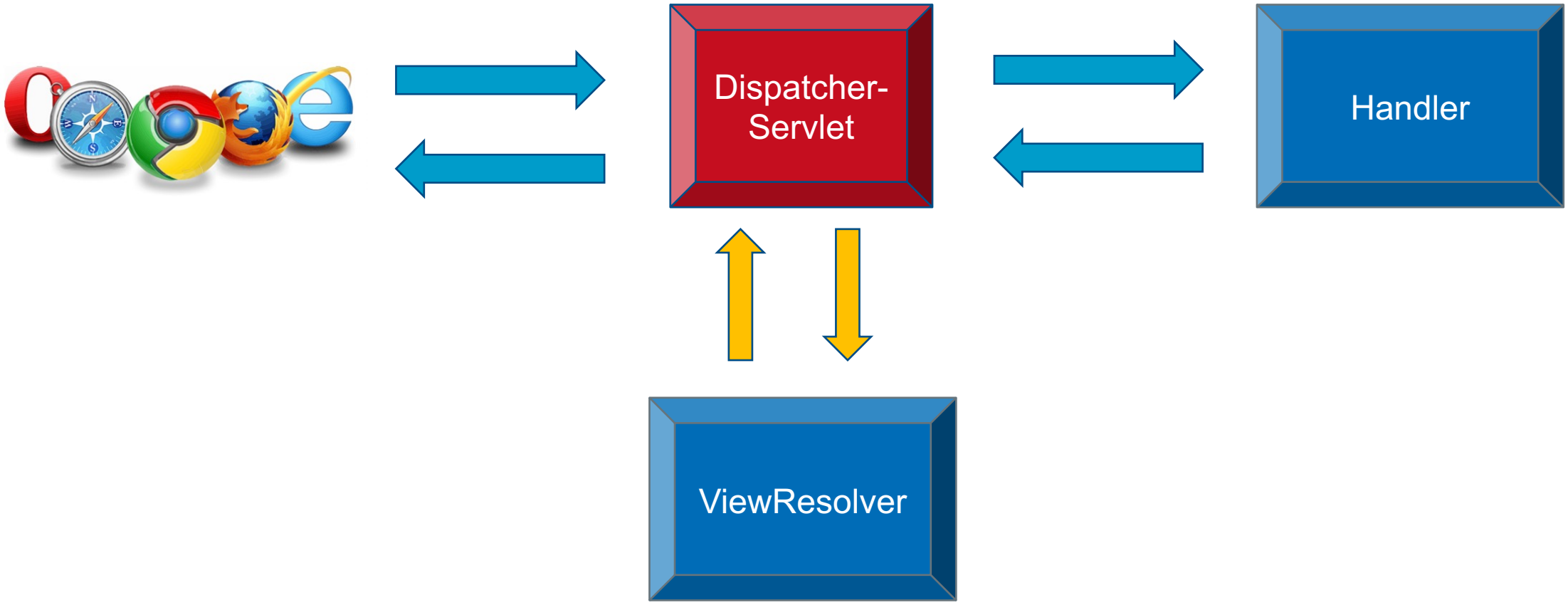
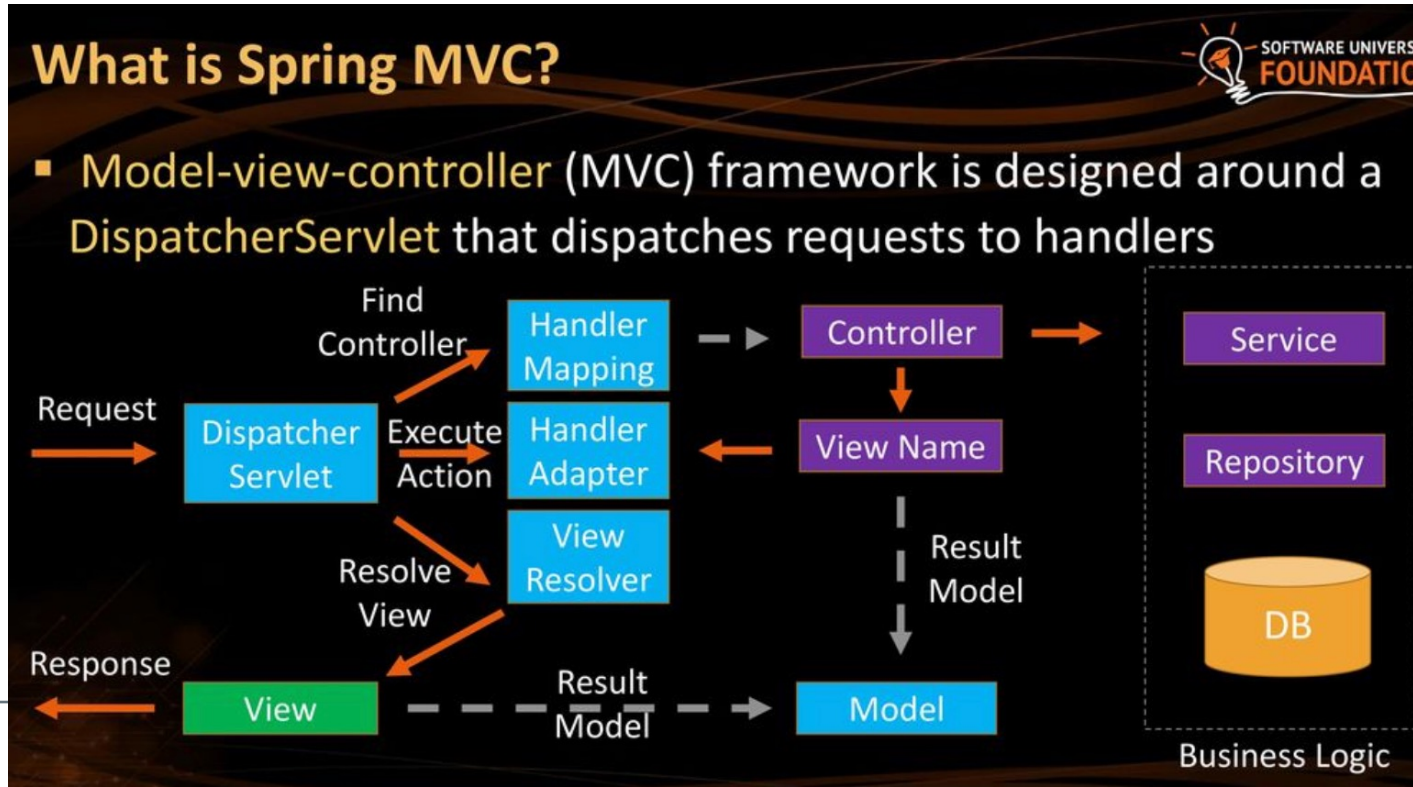
Spring Web-MVC – FrontController Pattern



Blick im Detail

1. Request geht an DispatcherServlet
2. Mithilfe des HandlerMappings wird die URL ausgewertet und es erfolgt die Zuordnung zu Controller und passender Controller-Methode
3. Aufruf vom Controller mit Model-Objekt
4. Ausführung der Controller-Methode und Befüllung des Models, Rückgabe eines View-Namens
5. View-Name wird auf HTML-Seite abgebildet. Das ist Aufgabe vom View-Resolver
6. Schließlich müssen die Model-Daten noch passend ins HTML eingefügt werden.
7. Response wird an Browser geliefert



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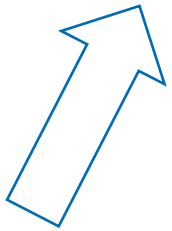
@Controller

```
@Target({ElementType.TYPE})
@Retention(RetentionPolicy.RUNTIME)
@Documented
@Component
public @interface Controller {


    /**
    * The value may indicate a suggestion for a logical component name,
    * to be turned into a Spring bean in case of an autodetected component.
    * @return the suggested component name, if any (or empty String otherwise)
    */
    @AliasFor(annotation = Component.class)
    String value() default "";


}
```

@Controller

```
public enum RequestMethod {
        GET, HEAD, POST, PUT, DELETE, ...
}
```



```
@Controller
public class ShoppingBasket {

    @RequestMapping(name="/items", method=RequestMethod.GET)
    public String items() {
        // return the view name for the shopping lists
    }

    <<More request mapping methods>>
}
```

Thymeleaf Mini-Intro

Thymeleaf Überblick

- Template Engine zur Gestaltung von Webseiten
- Erlaubt Layouts und Forms
- Basiert auf HTML 5
- Ersatz für JSP / JSF
- Nutzt SpEL
- Kann sowohl im Servlet als auch nicht Web-Umfeld genutzt werden
- Eine Dependency, sofern in Spring Boot:

```
<dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-thymeleaf</artifactId>
    <version>2.5.5</version>
</dependency>
```

Einfaches Beispiel

```
@Controller
public class ThymeleafController {

    @GetMapping("/home")
    public String index(Model model) {
        // Befüllung des Models
        model.addAttribute("msg", "Greetings from Spring Boot to thymeleaf!");

        // Rückgabe des View-Namens
        return "index";
    }
}
```

Bereitstellung des Models

Verzeichnis und einfache Template-Datei

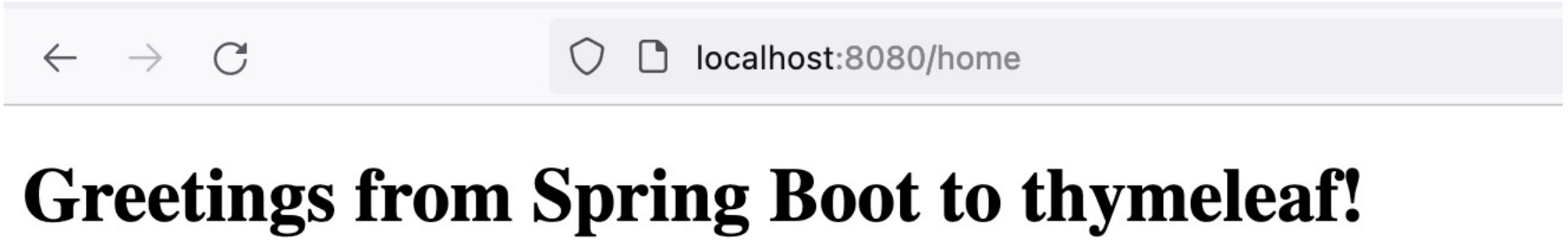
Standardordner für Templates / View-Fragmente

```
<!DOCTYPE html>
<html xmlns:th="http://www.thymeleaf.org">
    <body>
        <h1 th:text="${msg}" />
    </body>
</html>
```

Einfache Auszeichnungssprache

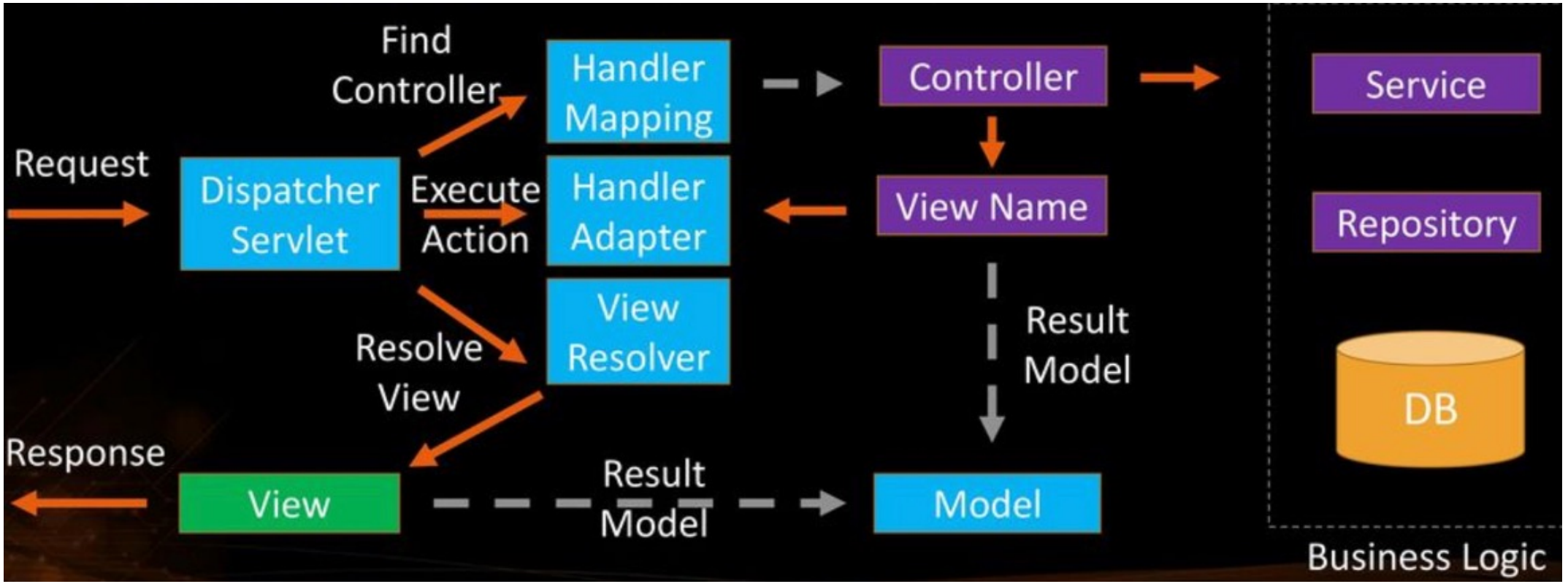
Vorgriff: Spring Boot App

```java
@SpringBootApplication
public class ExampleThymeleafApp {

    public static void main(String[] args) {
        SpringApplication.run(ExampleThymeleafApp.class, args);
    }
}
```



Spring Web-MVC – FrontController RECAP

```
@GetMapping("/home")
    public String index(Model model) {
        model.addAttribute("msg", "Greetings from Spring Boot to thymeleaf!");
        return "index";
    }
```



https://slideplayer.com/slide/13335057/

Controller mit 2 Endpoints

```
@Controller
public class ThymeleafController {

    @Autowired
    PersonDAO personDao;

    @GetMapping("/home")
    public String index(Model model) {
        model.addAttribute("msg", "Greetings from Spring Boot to thymeleaf!");
        return "index";
    }

    @GetMapping(value="/personsList")
    public String getAllPersonsForModel(Model model){
        model.addAttribute("persons", personDao.getAllPersons());
        return "personsList";
    }
}
```

HTML-Datei für Personenliste

```
<!DOCTYPE HTML>
<html xmlns:th="http://www.thymeleaf.org">
    <body>
        <h1>Person List</h1>
        <div>
            <nobr>
                <a th:href="@{/persons/add}">Add Contact</a> |
                <a th:href="@{/home}">Back to Home</a>
            </nobr>
        </div>

        <br/><br/>
        <div>
            <table border="1">
                <tr>
                    <th>Id</th>
                    <th>Firstname</th>
                    <th>Lastname</th>
                    <th>Age</th>
                    <th>Edit</th>
                </tr>
```

HTML-Datei für Personenliste

```
…
                <tr th:each ="person : ${persons}">
                    <td><a th:href="@{/persons/{personId}(personId=${person.id})}"
th:utext="${person.id}">...</a></td>
                    <td><a th:href="@{/persons/{personId}(personId=${person.id})}"
th:utext="${person.firstName}">...</a></td>
                    <td><a th:href="@{/persons/{personId}(personId=${person.id})}"
th:utext="${person.lastName}">...</a></td>
                    <td><a th:href="@{/persons/{personId}(personId=${person.id})}"
th:utext="${person.age}">...</a></td>


                    <td><a
th:href="@{/persons/{personId}/edit(personId=${person.id})}">Edit</a></td>
                </tr>
            </table>
        </div>
    </body>
</html>
```

localhost:8080/personsList

Person List

Add Contact | Back to Home

Id	Firstname	Lastname	Age	Edit
1	Michael	Inden	50	Edit
2	Tim	Bötzmeyer	50	Edit
3	Heinz	Mustermann	32	Edit
4	James	Bond	44	Edit

Alternative JSP

```
<%@ page contentType="text/html;charset=UTF-8" language="java" %>
<%@taglib prefix="c" uri="http://java.sun.com/jsp/jstl/core"%>
<html>
    <head>
        <title>View Books</title>
        <link href="<c:url value="/css/common.css"/>" rel="stylesheet" type="text/css">
    </head>
    <body>
        <table>
            <thead>
                <tr>
                    <th>ISBN</th>
                    <th>Name</th>
                    <th>Author</th>
                </tr>
            </thead>
            <tbody>
                <c:forEach items="${books}" var="book">
                    <tr>
                        <td>${book.isbn}</td>
                        <td>${book.name}</td>
                        <td>${book.author}</td>
                    </tr>
                </c:forEach>
            </tbody>
        </table>
    </body>
</html>
```

Demo

Wie sieht es denn mit REST aus?

REST-Controller basierend auf Controller

```
@Controller
public class ShoppingBasket{


        @RequestMapping(name="/items”, method=RequestMethod.GET)
        @ResponseBody
        public List<ShoppingItem> items(){
                //return the shopping lists
        }

}
```

@RestController

Das Bildelement mit der Beziehungs-ID rId2 wurde in der Datei nicht gefunden.

```
@Target(ElementType.TYPE)
@Retention(RetentionPolicy.RUNTIME)
@Documented
@Controller
@ResponseBody
public @interface RestController {


    /**
    * The value may indicate a suggestion for a logical component name,
    * to be turned into a Spring bean in case of an autodetected component.
    * @return the suggested component name, if any (or empty String otherwise)
    * @since 4.0.1
    */
    @AliasFor(annotation = Controller.class)
    String value() default "";

}
```

@RestController

@Controller @RestController

```
public class ShoppingBasket{


        @RequestMapping(name="/items”, method=RequestMethod.GET)
        @ResponseBody
        public List<ShoppingItem> items(){
                //return the shopping lists
        }

}
```

@RestController

```
@RestController
public class ShoppingBasket{

        @GetMapping("/items")
        @RequestMapping(name="/items", method=RequestMethod.GET)
        public List<ShoppingItem> items(){
                //return the shopping lists
        }

}
```

Shortcut Handler Methods

@RequestMapping(… , method=RequestMethod.GET)	@GetMapping(..).
@RequestMapping(… , method=RequestMethod.POST)	@PostMapping(…).
@RequestMapping(… , method=RequestMethod.PUT)	@PutMapping(…).
@RequestMapping(… , method=RequestMethod.DELETE)	@DeleteMapping(…)

produces => accept header

```
curl http://localhost:8080/items
```

```
@GetMapping("/items")
public List<ShoppingItem> items(){
	return items;
}
```

```
curl -H "accept: application/json" http://localhost:8080/items
```

```
@GetMapping(value="/items", produces=MediaType.APPLICATION_JSON_VALUE)
public List<ShoppingItem> itemsInJSON(){
	return items;
}
```

produces => accept header

```
curl -H "accept: application/xml" http://localhost:8080/items
```

```
@GetMapping(value="/courses", produces= { MediaType.APPLICATION_JSON_VALUE,
                                          MediaType.APPLICATION_XML_VALUE })
public List<ShoppingItem> getItems(){
       return items;
}
```

```
<dependency>
    <groupId>com.fasterxml.jackson.core</groupId>
    <artifactId>jackson-core</artifactId>
    <version>2.12.5</version>
</dependency>
<dependency>
    <groupId>com.fasterxml.jackson.core</groupId>
    <artifactId>jackson-databind</artifactId>
    <version>2.12.5</version>
</dependency>
<dependency>
    <groupId>com.fasterxml.jackson.dataformat</groupId>
    <artifactId>jackson-dataformat-xml</artifactId>
    <version>2.12.5</version>
</dependency>
```

MEDIA TYPES

Field Summary

Fields

Modifier and Type	Field and Description
static MediaType	**ALL** Public constant media type that includes all media ranges (i.e.
static java.lang.String	**ALL_VALUE** A String equivalent of **ALL**.
static MediaType	**APPLICATION_ATOM_XML** Public constant media type for `application/atom+xml`.
static java.lang.String	**APPLICATION_ATOM_XML_VALUE** A String equivalent of **APPLICATION_ATOM_XML**.
static MediaType	**APPLICATION_FORM_URLENCODED** Public constant media type for `application/x-www-form-urlencoded`.
static java.lang.String	**APPLICATION_FORM_URLENCODED_VALUE** A String equivalent of **APPLICATION_FORM_URLENCODED**.
static MediaType	**APPLICATION_JSON** Public constant media type for `application/json`.
static MediaType	**APPLICATION_JSON_UTF8** Public constant media type for `application/json;charset=UTF-8`.
static java.lang.String	**APPLICATION_JSON_UTF8_VALUE** A String equivalent of **APPLICATION_JSON_UTF8**.
static java.lang.String	**APPLICATION_JSON_VALUE** A String equivalent of **APPLICATION_JSON**.
static MediaType	**APPLICATION_OCTET_STREAM** Public constant media type for application/octet-stream

XML

JSON

consumes => content-type header

```
curl -H "Content-Type: application/json" -X PUT -d {"id":1, "price":32}
http://localhost:8080/items
```

```
@PutMapping(value="/items", consumes= {MediaType.APPLICATION_JSON_VALUE})
public List<ShoppingItem> updateItem(@RequestBody ShoppingItem item){
        //update Item
}
```

headers

```
curl -H "quantity=3" http://localhost:8080/items
```

```
@GetMapping(value="/items", headers="quantity=3")
public List<ShoppingItem> itemsWithHeaderFiltered(){

	//return items
}
```

params

```
curl http://localhost:8080/items?quantity=2
```

```
@GetMapping(value="/items", params="quantity=2")
public List<ShoppingItem> itemsWithParamterFiltered(){
	//return items
}
```

Get a particular item

```
@GetMapping("/items/{itemId}")
public ShoppingItem getItemById(@PathVariable String itemId){
      //return item with itemId
}
```

http://host:port/items/1

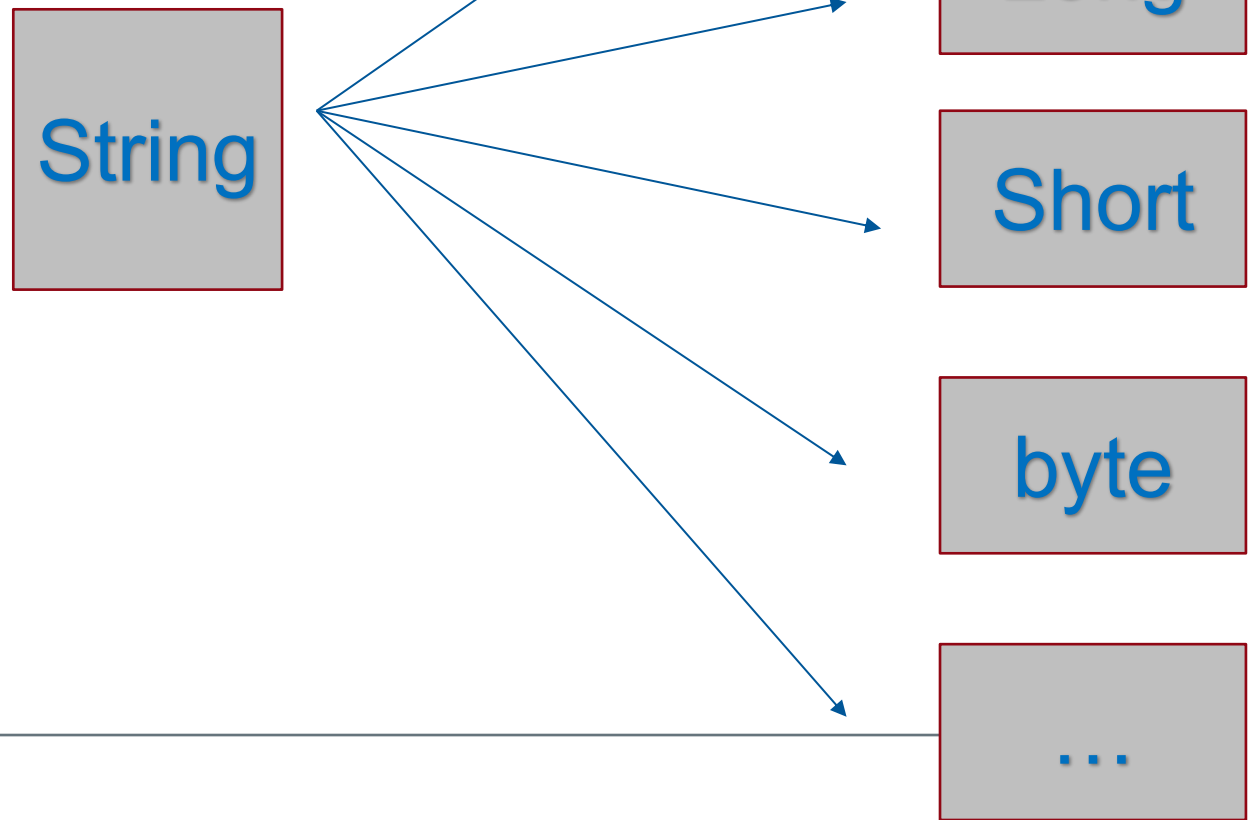
```
@GetMapping("/items")
public ShoppingItem getItemById(@RequestParam String itemId){
      //return item with itemId
}
```

http://host:port/items?itemId=1

Type Conversion (1)

```
@GetMapping("/items/{itemId}")
public void items(@PathVariable String itemId){
        ...
}
```

http://host:port/items/1



Type Conversion (2)

```
curl -H "Content-Type: application/json" -X POST -d {"id":1, "price":3}
http://localhost:8080/items
```

```
@PostMapping("/items")
public ShoppingItem createItem(@RequestBody ShoppingItem item){
      //create the item
}
```

<<Interface>>
HttpMessageConverter

Type Conversion (2)

<<Interface>>
HttpMessageConverter

- HttpMessageConverter<T>
  - AbstractHttpMessageConverter<T>
    - AbstractGenericHttpMessageConverter<T>
      - AbstractJackson2HttpMessageConverter
        - MappingJackson2CborHttpMessageConverter
        - MappingJackson2HttpMessageConverter
        - MappingJackson2SmileHttpMessageConverter
        - MappingJackson2XmlHttpMessageConverter
      - AbstractJsonHttpMessageConverter
      - ResourceRegionHttpMessageConverter

```
@Configuration
@EnableWebMvc
@ComponentScan("ch.karthi")
public class WebAppConfig {


  @Bean
  public MappingJackson2HttpMessageConverter jsonMessageConverter() {
    return new MappingJackson2HttpMessageConverter();
  }

}
```

Exercises 13 – 15

https://github.com/Michaeli71/AMTC_Spring_Workshop

PART 5:
STS & Tooling

Spring Tool Suite

workspace-spring-tool-suite-4-4.12.0.RELEASE - Spring Tool Suite 4

Package Explorer

There are no projects in your workspace.
To add a project:

- Create a Java project
- Create new Spring Starter Project
- Import Spring Getting Started Content
- Create a project...
- Import projects...

Outline

There is no active editor that provides an outline.

Boot Dashboard

Type tags, projects, or working set name

local

Problems | Javadoc | Declaration

0 items

Description	Resource	Path	Location	Type

New Spring Starter Project

Service URL: https://start.spring.io

Name: demo

Use default location

Location: /Users/michaelinden/Documents/workspace-spring-tool-suite-4-4.12.0 Browse

Type: Maven Project Packaging: Jar

Java Version: 11 Language: Java

Group: com.example

Artifact: demo

Version: 0.0.1-SNAPSHOT

Description: Demo project for Spring Boot

Package: com.example.demo

Working sets

Add project to working sets New...

Working sets: Select...

< Back Next > Cancel Finish

New Spring Starter Project Dependencies

Spring Boot Version: 2.5.5

Available:

Type to search dependencies

- Developer Tools
- Google Cloud Platform
- I/O
- Messaging
- Microsoft Azure
- NoSQL
- Observability
- Ops
- SQL
- Security
- Spring Cloud
- Spring Cloud Circuit Breaker
- Spring Cloud Config
- Spring Cloud Discovery
- Spring Cloud Messaging
- Spring Cloud Routing
- Spring Cloud Tools
- Template Engines
- Testing
- VMware Tanzu Application Service
- Web

Selected:

X Spring Boot Actuator
X Spring Web

Make Default | Clear Selection

< Back | Next > | Cancel | Finish

Package Explorer

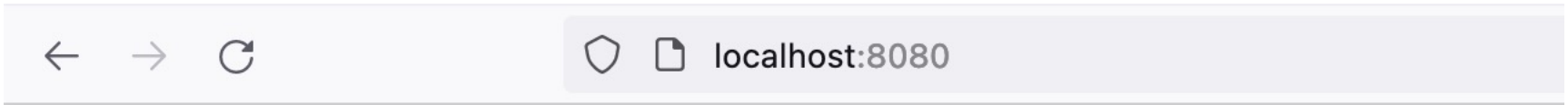
- MyFirstSpringBoot [boot]
  - src/main/java
    - com.example.demo
      - MyFirstSpringBootApplication.java
  - src/main/resources
    - static
    - templates
    - application.properties
  - src/test/java
  - JRE System Library [JavaSE-11]
  - Maven Dependencies
    - accessors-smart-2.4.7.jar - /Users/michaelinden/.m2/repository/ne
    - android-json-0.0.20131108.vaadin1.jar - /Users/michaelinden/.m2/r
    - apiguardian-api-1.1.0.jar - /Users/michaelinden/.m2/repository/org/
    - asm-9.1.jar - /Users/michaelinden/.m2/repository/org/ow2/asm/asn
    - assertj-core-3.19.0.jar - /Users/michaelinden/.m2/repository/org/as
    - byte-buddy-1.10.22.jar - /Users/michaelinden/.m2/repository/net/b
    - byte-buddy-agent-1.10.22.jar - /Users/michaelinden/.m2/repositor
    - hamcrest-2.2.jar - /Users/michaelinden/.m2/repository/org/hamcre
    - HdrHistogram-2.1.12.jar - /Users/michaelinden/.m2/repository/org/
    - jackson-annotations-2.12.5.jar - /Users/michaelinden/.m2/reposito
    - jackson-core-2.12.5.jar - /Users/michaelinden/.m2/repository/com/
    - jackson-databind-2.12.5.jar - /Users/michaelinden/.m2/repository/
    - jackson-datatype-jdk8-2.12.5.jar - /Users/michaelinden/.m2/repos
    - jackson-datatype-jsr310-2.12.5.jar - /Users/michaelinden/.m2/repo
    - jackson-module-parameter-names-2.12.5.jar - /Users/michaelinde
    - jakarta.activation-api-1.2.2.jar - /Users/michaelinden/.m2/repositor
    - jakarta.annotation-api-1.3.5.jar - /Users/michaelinden/.m2/reposito
    - jakarta.xml.bind-api-2.3.3.jar - /Users/michaelinden/.m2/repository
    - jsonassert-1.5.0.jar - /Users/michaelinden/.m2/repository/org/skys
    - json-path-2.5.0.jar - /Users/michaelinden/.m2/repository/com/jayw
    - json-smart-2.4.7.jar - /Users/michaelinden/.m2/repository/net/mini
    - jul-to-slf4j-1.7.32.jar - /Users/michaelinden/.m2/repository/org/slf4
    - junit-jupiter-5.7.2.jar - /Users/michaelinden/.m2/repository/org/juni

- Run As Java Application

```
  .   ____          _            __ _ _
 /\\ / ___'_ __ _ _(_)_ __  __ _ \ \ \ \
( ( )\___ | '_ | '_| | '_ \/ _` | \ \ \ \
 \\/  ___)| |_)| | | | | || (_| |  ) ) ) )
  '  |____| .__|_| |_|_| |_\__, | / / / /
 =========|_|==============|___/=/_/_/_/
 :: Spring Boot ::                (v2.5.5)

2021-09-23 16:47:12.627  INFO 57546 --- [           main] c.e.demo.MyFirstSpringBootApplication    : Starting MyFirstSpringBootApplication using Java 11.0.11 on Air-von-Micha
2021-09-23 16:47:12.629  INFO 57546 --- [           main] c.e.demo.MyFirstSpringBootApplication    : No active profile set, falling back to default profiles: default
2021-09-23 16:47:14.818  INFO 57546 --- [           main] o.s.b.w.embedded.tomcat.TomcatWebServer  : Tomcat initialized with port(s): 8080 (http)
2021-09-23 16:47:14.831  INFO 57546 --- [           main] o.apache.catalina.core.StandardService   : Starting service [Tomcat]
2021-09-23 16:47:14.831  INFO 57546 --- [           main] org.apache.catalina.core.StandardEngine  : Starting Servlet engine: [Apache Tomcat/9.0.53]
2021-09-23 16:47:14.931  INFO 57546 --- [           main] o.a.c.c.C.[Tomcat].[localhost].[/]       : Initializing Spring embedded WebApplicationContext
2021-09-23 16:47:14.932  INFO 57546 --- [           main] w.s.c.ServletWebServerApplicationContext : Root WebApplicationContext: initialization completed in 2181 ms
2021-09-23 16:47:15.894  INFO 57546 --- [           main] o.s.b.a.e.web.EndpointLinksResolver      : Exposing 1 endpoint(s) beneath base path '/actuator'
2021-09-23 16:47:15.980  INFO 57546 --- [           main] o.s.b.w.embedded.tomcat.TomcatWebServer  : Tomcat started on port(s): 8080 (http) with context path ''
2021-09-23 16:47:16.001  INFO 57546 --- [           main] c.e.demo.MyFirstSpringBootApplication    : Started MyFirstSpringBootApplication in 4.239 seconds (JVM running for 4.
2021-09-23 16:47:56.296  INFO 57546 --- [nio-8080-exec-1] o.a.c.c.C.[Tomcat].[localhost].[/]       : Initializing Spring DispatcherServlet 'dispatcherServlet'
2021-09-23 16:47:56.296  INFO 57546 --- [nio-8080-exec-1] o.s.web.servlet.DispatcherServlet        : Initializing Servlet 'dispatcherServlet'
2021-09-23 16:47:56.301  INFO 57546 --- [nio-8080-exec-1] o.s.web.servlet.DispatcherServlet        : Completed initialization in 5 ms
```

- Run As Spring Boot

```
MyFirstSpringBoot - MyFirstSpringBootApplication [Spring Boot App] /Library/Java/JavaVirtualMachines/jdk-11.0.11.jdk/Contents/Home/bin/java  (23.09.2021, 16:49:18)


  .   ____          _            __ _ _
 /\\ / ___'_ __ _ _(_)_ __  __ _ \ \ \ \
( ( )\___ | '_ | '_| | '_ \/ _` | \ \ \ \
 \\/  ___)| |_)| | | | | || (_| |  ) ) ) )
  '  |____| .__|_| |_|_| |_\__, | / / / /
 =========|_|==============|___/=/_/_/_/
 :: Spring Boot ::                (v2.5.5)

2021-09-23 16:49:20.541  INFO 57608 --- [           main] c.e.demo.MyFirstSpringBootApplication    : Starting MyFirstSpringBootApplication using Java 11.0.11 on Air-von-Micha
2021-09-23 16:49:20.543  INFO 57608 --- [           main] c.e.demo.MyFirstSpringBootApplication    : No active profile set, falling back to default profiles: default
2021-09-23 16:49:21.629  INFO 57608 --- [           main] o.s.b.w.embedded.tomcat.TomcatWebServer  : Tomcat initialized with port(s): 8080 (http)
2021-09-23 16:49:21.637  INFO 57608 --- [           main] o.apache.catalina.core.StandardService   : Starting service [Tomcat]
2021-09-23 16:49:21.638  INFO 57608 --- [           main] org.apache.catalina.core.StandardEngine  : Starting Servlet engine: [Apache Tomcat/9.0.53]
2021-09-23 16:49:21.698  INFO 57608 --- [           main] o.a.c.c.C.[Tomcat].[localhost].[/]       : Initializing Spring embedded WebApplicationContext
2021-09-23 16:49:21.698  INFO 57608 --- [           main] w.s.c.ServletWebServerApplicationContext : Root WebApplicationContext: initialization completed in 1105 ms
2021-09-23 16:49:22.297  INFO 57608 --- [           main] o.s.b.a.e.web.EndpointLinksResolver      : Exposing 1 endpoint(s) beneath base path '/actuator'
2021-09-23 16:49:22.350  INFO 57608 --- [           main] o.s.b.w.embedded.tomcat.TomcatWebServer  : Tomcat started on port(s): 8080 (http) with context path ''
2021-09-23 16:49:22.366  INFO 57608 --- [           main] c.e.demo.MyFirstSpringBootApplication    : Started MyFirstSpringBootApplication in 2.312 seconds (JVM running for 3.
```



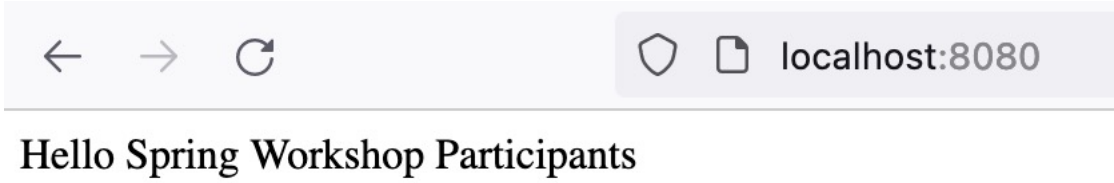
Whitelabel Error Page

This application has no explicit mapping for /error, so you are seeing this as a fallback.

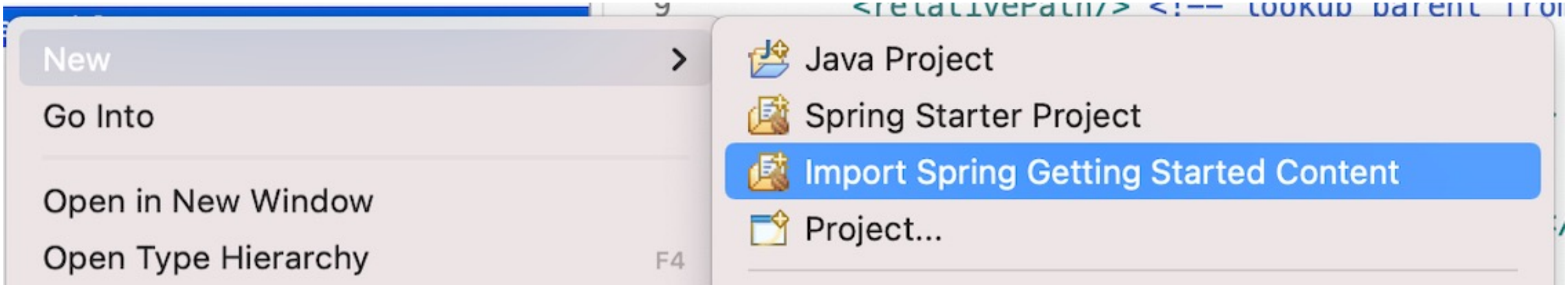
Thu Sep 23 16:47:56 CEST 2021
There was an unexpected error (type=Not Found, status=404).

Simplen Controller hinzufügen

```java
package com.example.demo;

import org.springframework.web.bind.annotation.RequestMapping;
import org.springframework.web.bind.annotation.RestController;

@RestController
public class HelloWorldController
{
    @RequestMapping("/")
    public String hello()
    {
        return "Hello Spring Workshop Participants";
    }
}
```

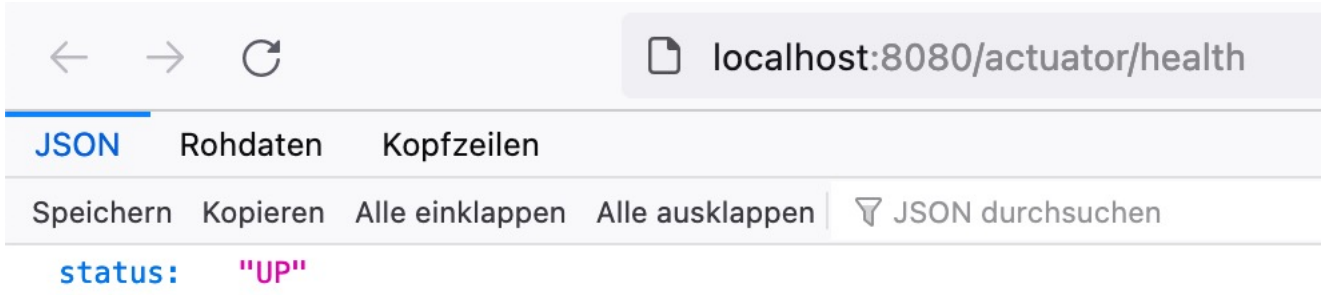


Cooles Feature



Simple Extensions …
Dev Tools + Actuator

Health Check



Spring Initializr

https://start.spring.io

spring initializr

Project
- (●) Maven Project
- ( ) Gradle Project

Language
- (●) Java
- ( ) Kotlin
- ( ) Groovy

Spring Boot
- ( ) 2.6.0 (SNAPSHOT)
- ( ) 2.6.0 (M2)
- ( ) 2.5.6 (SNAPSHOT)
- (●) 2.5.5
- ( ) 2.4.12 (SNAPSHOT)
- ( ) 2.4.11

Project Metadata

Group	com.example
Artifact	demo
Name	demo
Description	Demo project for Spring Boot
Package name	com.example.demo
Packaging	(●) Jar ( ) War
Java	( ) 17 (●) 11 ( ) 8

Dependencies

ADD DEPENDENCIES... ⌘ + B

No dependency selected

GENERATE ⌘ + ↵ | EXPLORE CTRL + SPACE | SHARE...

Demo

Questions?

Hilfe

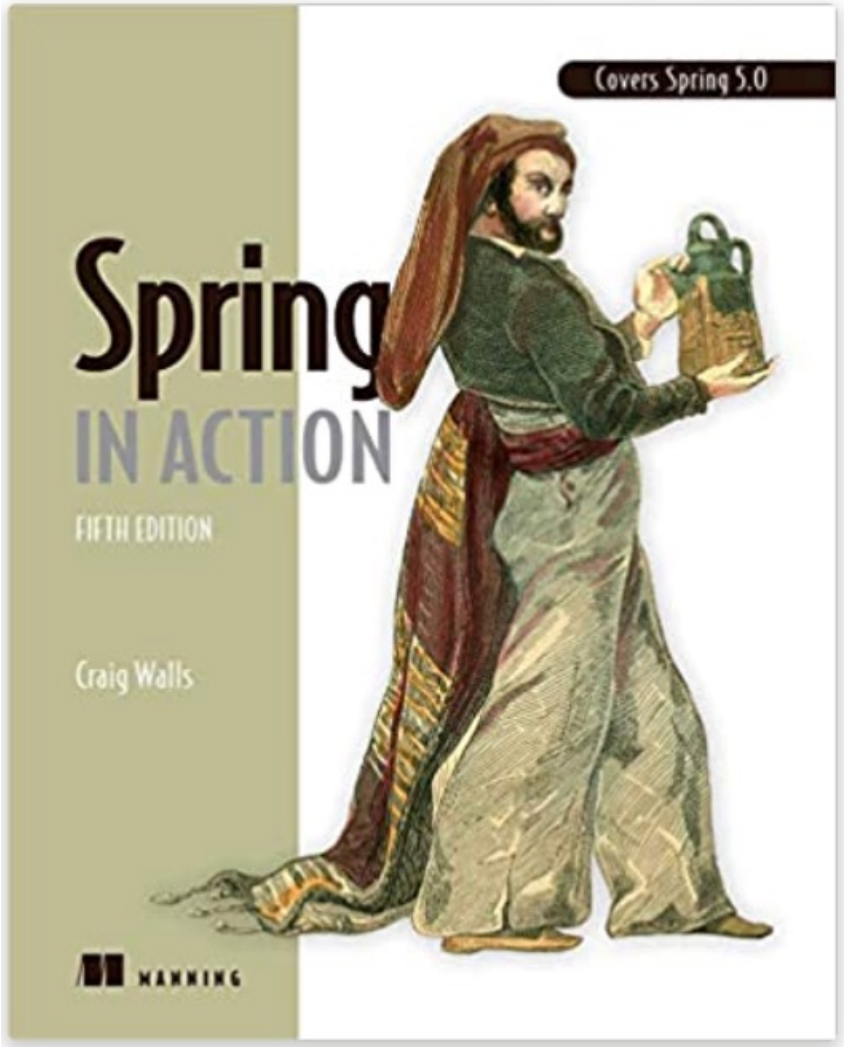

HELP
IS ON THE
WAY


5.
Auflage
Michael Inden
Der Weg zum
Java-Profi
Konzepte und Techniken für die
professionelle Java-Entwicklung
dpunkt.verlag


Michael Inden
Der Java-Profi:
Persistenzlösungen
und REST-Services
Datenaustauschformate,
Datenbankentwicklung
und verteilte Anwendungen
dpunkt.verlag


Java
Michael Inden
Challenge
Fit für das Job-Interview und die Praxis –
mit mehr als 100 Aufgaben
und Musterlösungen
dpunkt.verlag

Empfehlenswerte Bücher



Thank You