Spring and Spring Boot

Fundamentals **Handout**

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swisscom

Spring Basics

Spring Basics / Dependency Injection

```
@Component
public class CustomerService {

    private final CustomerLoader customerLoader;
    private final EmailService emailService;

    @Autowired
    public CustomerService(CustomerLoader customerLoader, EmailService emailService) {
        this.customerLoader = customerLoader;
        this.emailService = emailService;
    }
}
```

Constructor Injection

can be omitted (in case of a single constructor)

The Spring team generally advocates constructor injection.

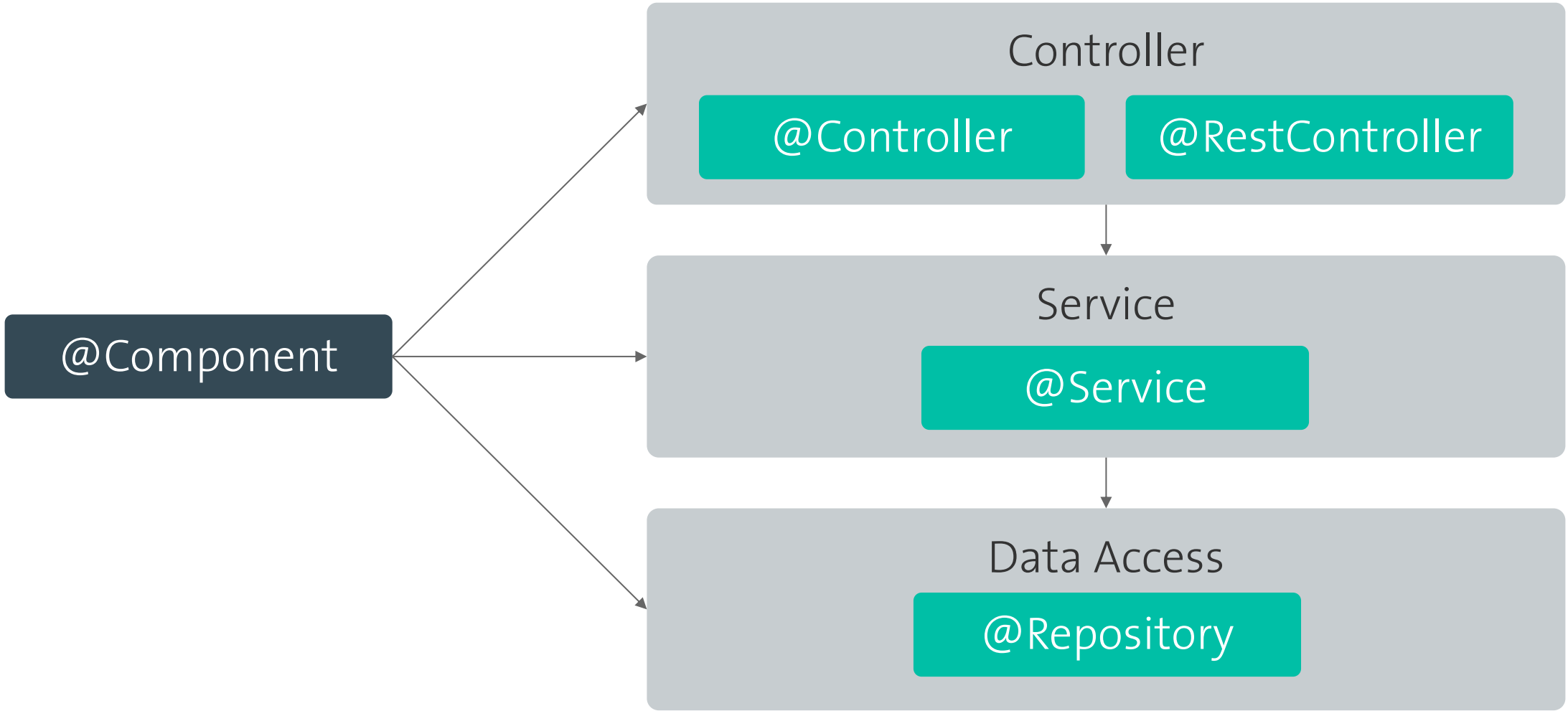
Spring Basics / Dependency Injection

```
@Component
public class CustomerService {
    private CustomerLoader customerLoader;
    private EmailService emailService;

    @Autowired
    public void setCustomerLoader(CustomerLoader customerLoader) {
        this.customerLoader = customerLoader;
    }

    @Autowired
    public void setEmailService(EmailService emailService) {
        this.emailService = emailService;
    }
}
```

Setter Injection

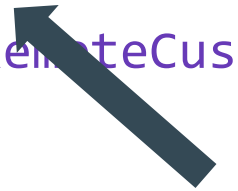
Setter injection can be useful for optional dependencies

Spring Basics / Bean Stereotypes



Spring Basics / Profiles and other Conditions

```
@Component
@Profile("prod")
public class RemoteCustomerLoader implements CustomerLoader {

}
```



This component is only loaded if one of the active profiles is “prod”.

Yes, you can have more than one active profile.

Spring Basics / Profiles and other Conditions

```
@Component
@Profile("default")
public class MockCustomerLoader implements CustomerLoader {


}
```

If no active profile is set, the “default” profile is active.

But you can also set the default profile explicitly.

Spring Basics / Profiles and other Conditions

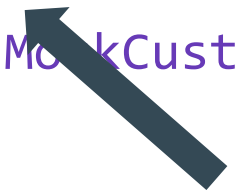
```
@Component
@Profile({"dev", "local"})
public class MockCustomerLoader implements CustomerLoader {

}
```

This component is only loaded if one of the active profiles is “dev” OR “local”.

No, @Profile does not support AND.

Spring Basics / Profiles and other Conditions

```
@Component
@Profile("!prod")
public class MockCustomerLoader implements CustomerLoader {

}
```

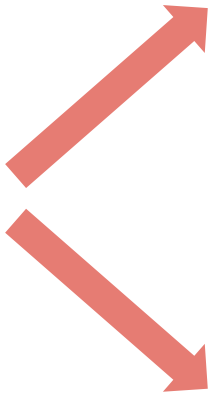


This component is only loaded if none of the active profiles is “prod”.

Spring Basics / Profiles and other Conditions

```
@Component
public class RemoteCustomerLoader implements CustomerLoader {


}
```

This would lead to a NoUniqueBeanDefinitionException



```
@Component
public class MockCustomerLoader implements CustomerLoader {


}
```

Spring Basics / Profiles and other Conditions

```
@Component
public class RemoteCustomerLoader implements CustomerLoader {


}


@Component
@Primary
public class MockCustomerLoader implements CustomerLoader {


}
```

In case of multiple beans with no or the same profile conditions @Primary can serve as an additional condition. The bean that is annotated with @Primary has a higher precedence.

Spring Basics / Profiles and other Conditions

```
@Component
@Profile("prod")
public class RemoteCustomerLoader implements CustomerLoader {

}
```

Furthermore you can define custom conditions

```
@Component
@Conditional(LocalAndMockProfileCondition.class)
public class MockCustomerLoader implements CustomerLoader {

}
```

Spring Basics / Profiles and other Conditions

```
public class LocalAndMockProfileCondition implements Condition {

    @Override
    public boolean matches(ConditionContext context, AnnotatedTypeMetadata metadata) {
        List<String> activeProfiles = asList(context.getEnvironment().getActiveProfiles());
        return activeProfiles.contains("local") && activeProfiles.contains("mock");
    }
}
```

And you have access to the container

You can define any logic here

Spring Basics / Configuration

```
import com.acme.customermasterdata.api.CustomerMasterDataClient;


@Configuration
public class CustomerMasterDataApiConfiguration {


    @Bean
    public CustomerMasterDataClient cmdClient() {
        return new CustomerMasterDataClient();
    }
}
```

From third party library jar

Can be any name.

Spring Basics / Configuration

```
import com.acme.customermasterdata.api.CustomerMasterDataClient;


@Service
public class CustomerLoader {
    private final CustomerMasterDataClient customerMasterDataClient;

    @Autowired
    public CustomerLoader(CustomerMasterDataClient customerMasterDataClient) {
        this.customerMasterDataClient = customerMasterDataClient;
    }
}
```

And now we can inject the client class from the 3rd party lib with our regular mechanisms

Spring Basics / Configuration

@Component (or rather @Service,...)

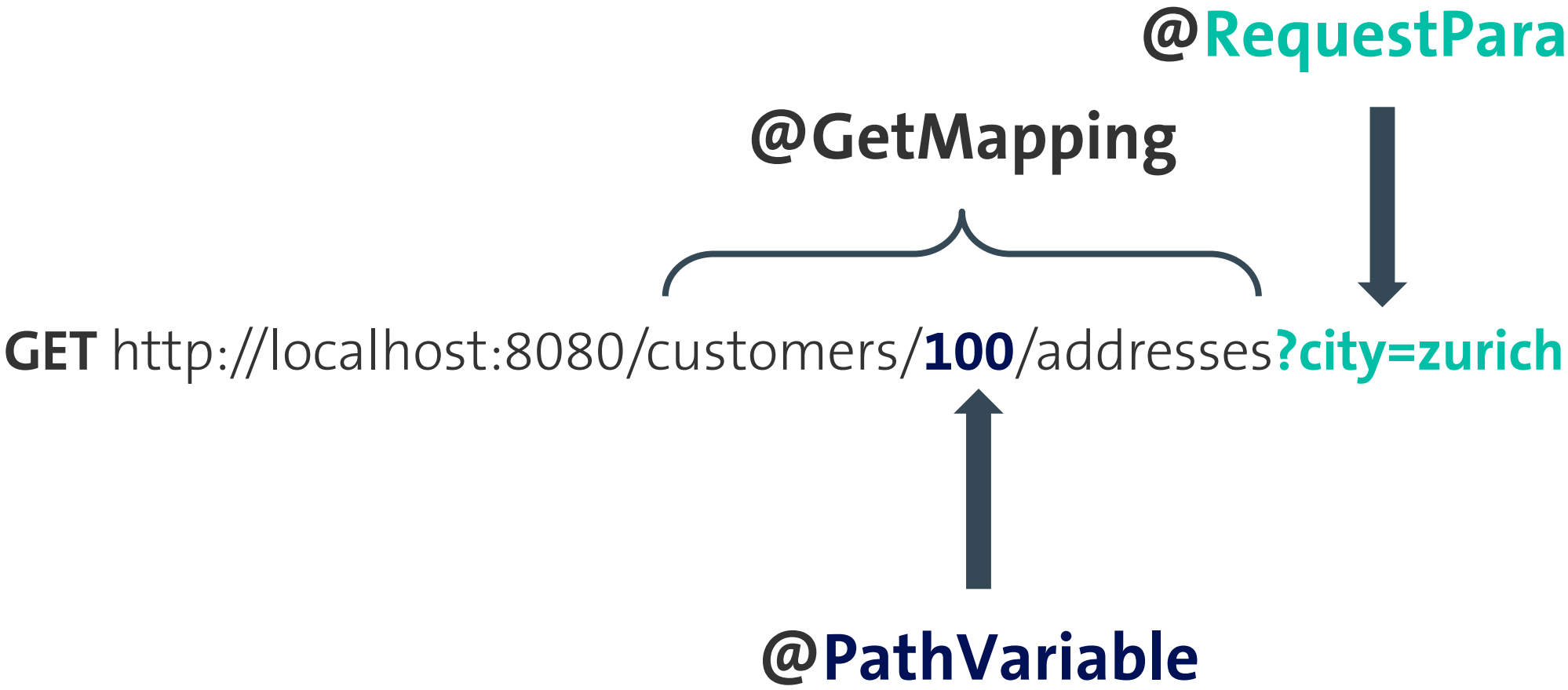
- Class-level annotation
- @Component is used to auto-detect beans using classpath scanning.
- Under normal circumstances we use this approach for defining our bean.

@Bean

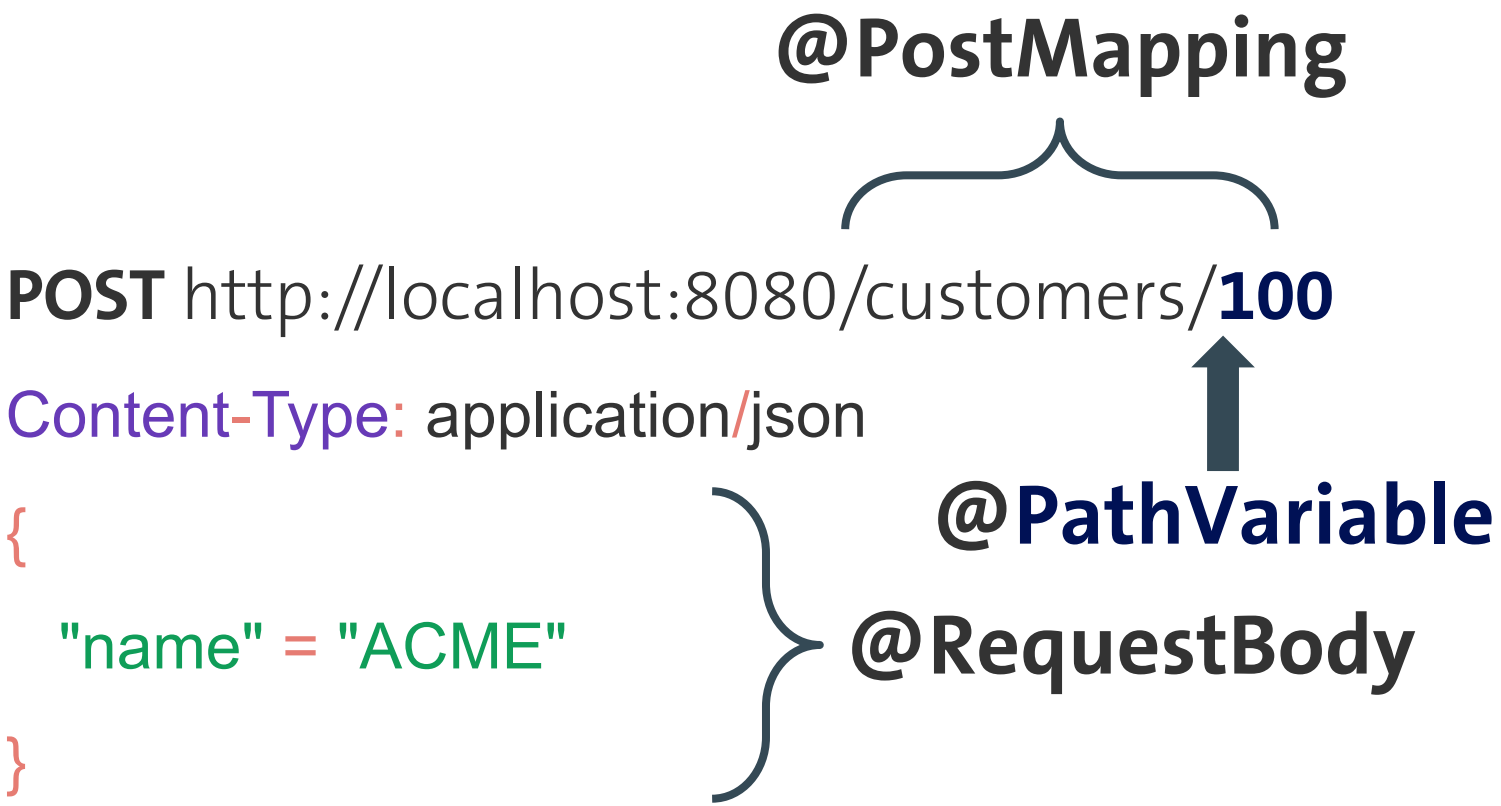
- Method-level annotation
- Decouples bean declaration and class definition.
- With @Bean you can add classes from non Spring-aware libraries to the applilcation context (i.e. third party libraries).
- Can be used to configure Spring-aware libraries.

Spring Web / MVC

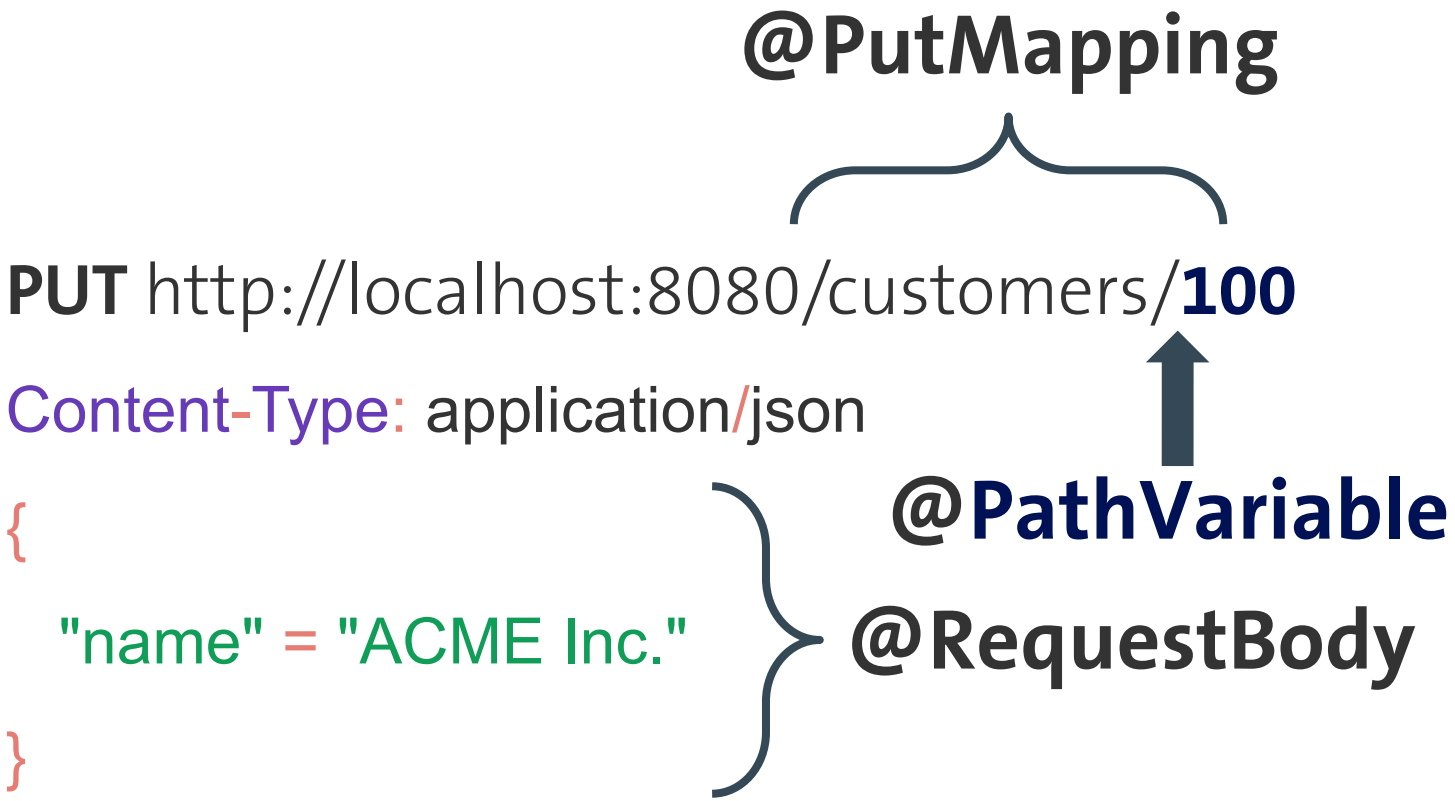
Spring Web / MVC / Important Annotations



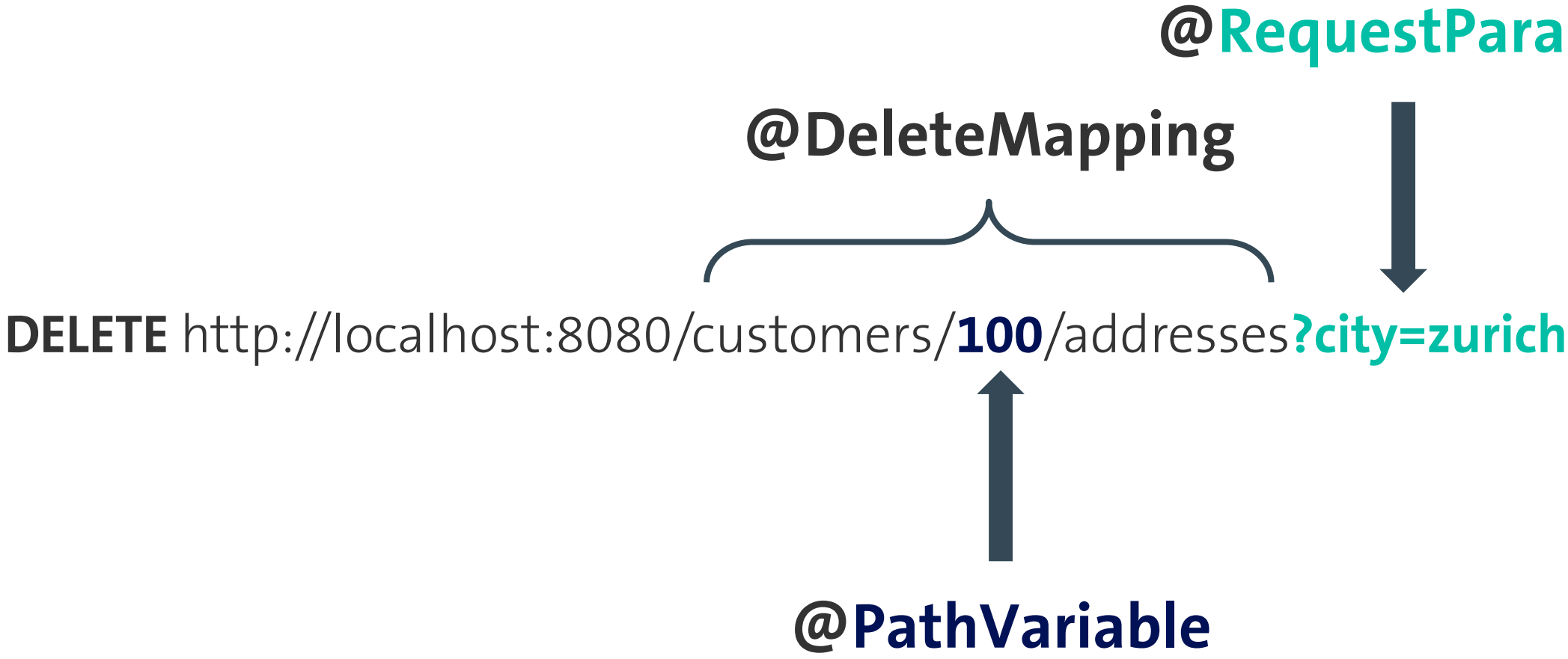
Spring Web / MVC / Important Annotations



Spring Web / MVC / Important Annotations



Spring Web / MVC / Important Annotations



@RequestMapping can be omitted (if no common path)

```
@RestController
@RequestMapping("customers")
public class CustomerRestController {

    @PostMapping("")
    public CustomerDto create(@RequestBody CustomerDto customer) { ... }

    @GetMapping(produces = MediaType.APPLICATION_XML_VALUE)
    public List<CustomerDto> findBy(@RequestParam Optional<String> name) { ... }

    @PutMapping("{id}")
    public CustomerDto update(@PathVariable String id, @RequestBody CustomerDto customer) { ... }

    @DeleteMapping("{id}")
    @ResponseStatus(HttpStatus.NO_CONTENT)
    public void delete(@PathVariable("id") String customerId) { ... }
}
```

The parentheses can be omitted (if empty)

application/json is the default media type

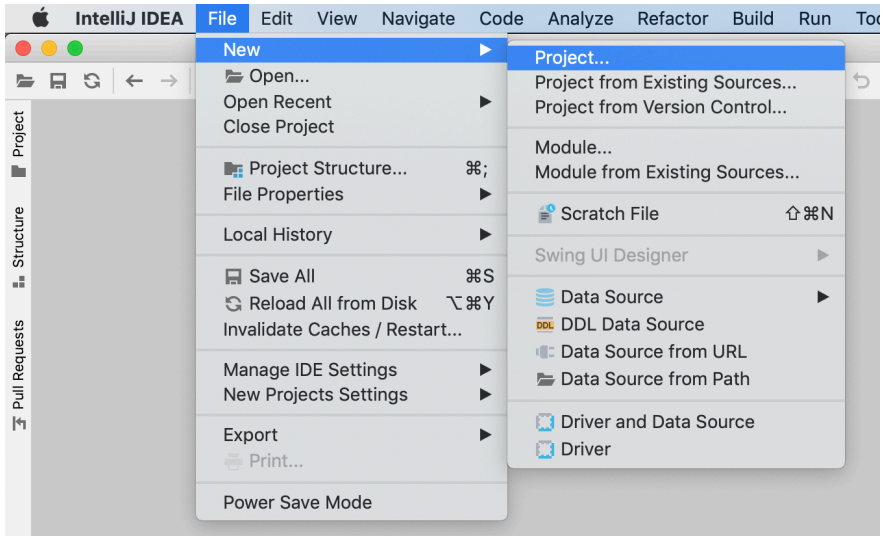
Optional indicates an optional request parameter

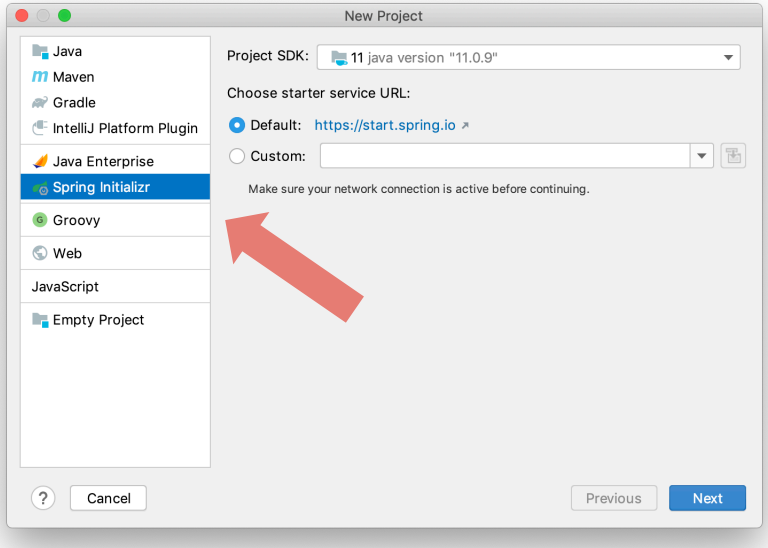
placeholder is required for @PathVariable

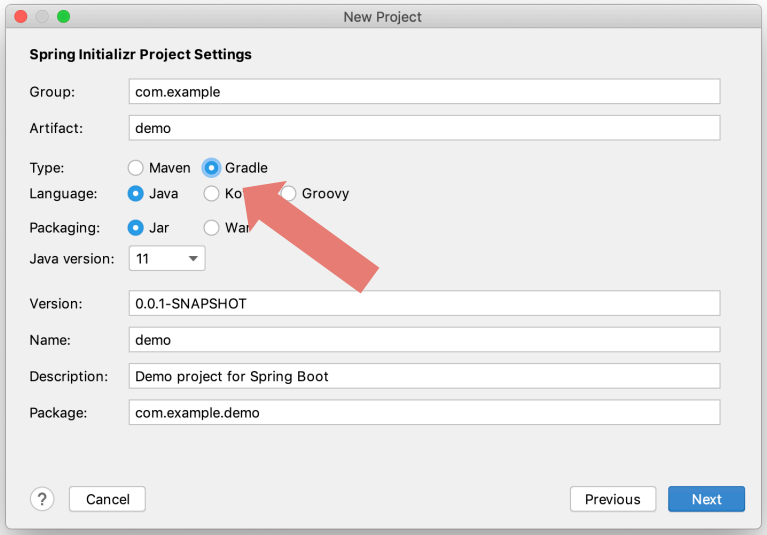
default is 200 (OK)

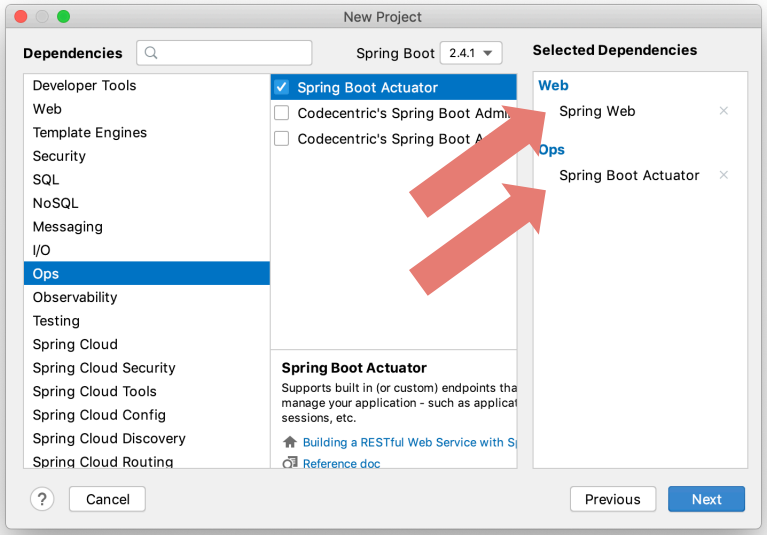
if the method parameter (customerId) and the placeholder (id) are different, the placeholder name must be specified.

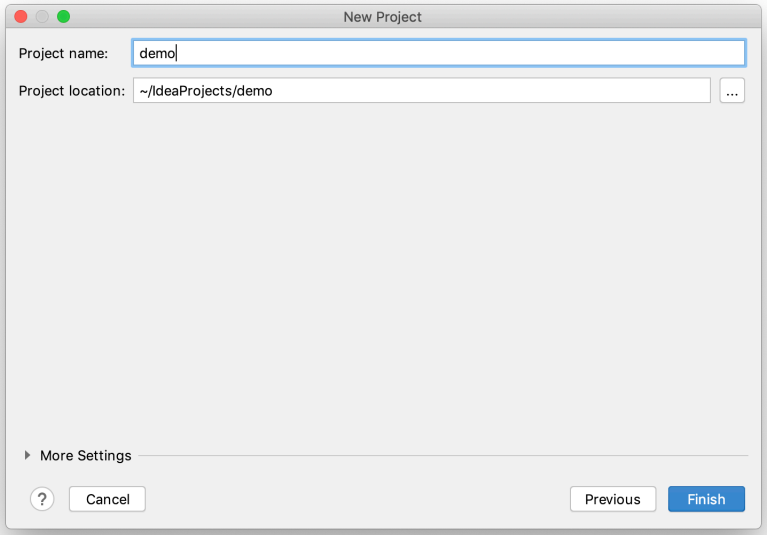
Spring Boot


IntelliJ IDEA
File
Edit
View
Navigate
Code
Analyze
Refactor
Build
Run
New
Open...
Open Recent
Close Project
Project Structure... ⌘;
File Properties
Local History
Save All ⌘S
Reload All from Disk ⌥⌘Y
Invalidate Caches / Restart...
Manage IDE Settings
New Projects Settings
Export
Print...
Power Save Mode
Project...
Project from Existing Sources...
Project from Version Control...
Module...
Module from Existing Sources...
Scratch File ⇧⌘N
Swing UI Designer
Data Source
DDL Data Source
Data Source from URL
Data Source from Path
Driver and Data Source
Driver
Project
Structure
Pull Requests


New Project
Java
Maven
Gradle
IntelliJ Platform Plugin
Java Enterprise
Spring Initializr
Groovy
Web
JavaScript
Empty Project
Project SDK: 11 java version "11.0.9"
Choose starter service URL:
Default: https://start.spring.io
Custom:
Make sure your network connection is active before continuing.
Cancel
Previous
Next


New Project
Spring Initializr Project Settings
Group: com.example
Artifact: demo
Type: Maven Gradle
Language: Java Groovy
Packaging: Jar
Java version: 11
Version: 0.0.1-SNAPSHOT
Name: demo
Description: Demo project for Spring Boot
Package: com.example.demo
Cancel
Previous
Next


New Project
Dependencies
Spring Boot 2.4.1
Developer Tools
Web
Template Engines
Security
SQL
NoSQL
Messaging
I/O
Ops
Observability
Testing
Spring Cloud
Spring Cloud Security
Spring Cloud Tools
Spring Cloud Config
Spring Cloud Discovery
Spring Cloud Routing
Spring Boot Actuator
Codecentric's Spring Boot Admi
Codecentric's Spring Boot A
Spring Boot Actuator
Supports built in (or custom) endpoints tha
manage your application - such as applicat
sessions, etc.
Building a RESTful Web Service with S
Reference doc
Selected Dependencies
Web
Spring Web
Ops
Spring Boot Actuator
Cancel
Previous
Next

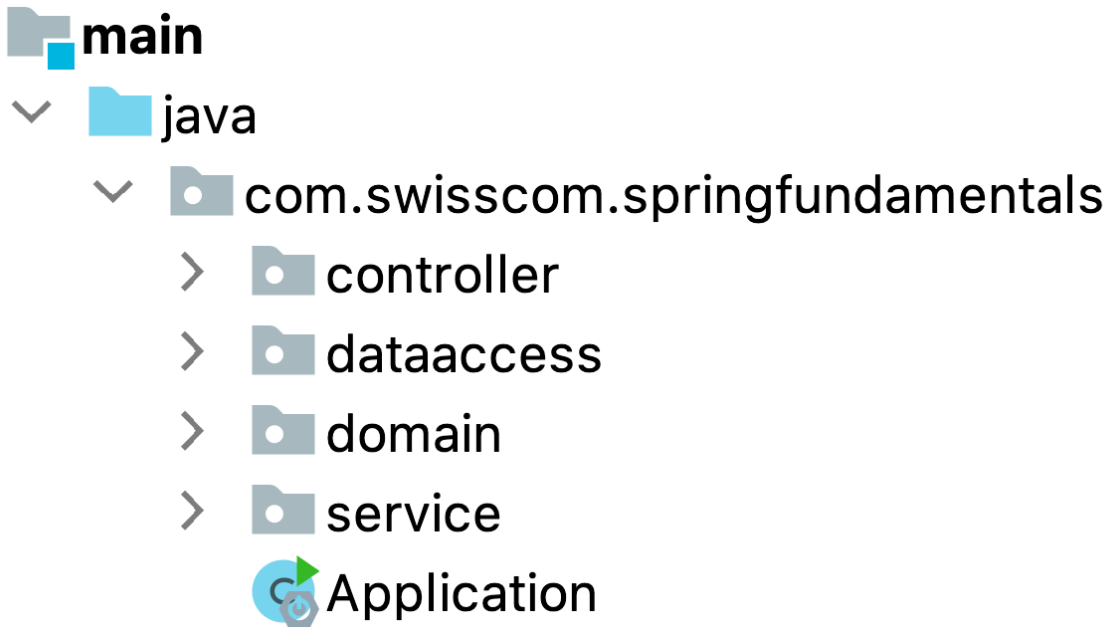

New Project
Project name: demo
Project location: ~/IdeaProjects/demo
More Settings
Cancel
Previous
Finish

Spring Boot / @SpringBootApplication

```java
package com.swisscom.springfundamentals;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;

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

Spring Boot / Project Structure

- Locate your main application in a root package above other classes.
- Don’t use the default package!



This class should contain the main method as well as the @SpringBootApplication annotation

Spring Boot / and Gradle

Provides Spring Boot support in Gradle, allowing you to package executable jar or war archives and run Spring Boot applications

This version also serves as spring boot version for the dependency management plugin

```
plugins { id 'org.springframework.boot' version '2.4.1.' }

plugins { id 'io.spring.dependency-management' version '1.0.10.RELEASE' }
```

Provides Maven-like dependency management

https://github.com/spring-projects/spring-boot/blob/v2.4.1/spring-boot-project/spring-boot-dependencies/build.gradle

Spring Boot / Hands-On

If you don't have a REST Client installed, you can use IntelliJ by creating a new "HTTP Request" scratch file (Mac OS: ⇧⌘N, Windows: Ctrl+Shift+Alt+Insert) from which you can start HTTP Requests in the following format:

```
GET http://localhost:8080/customers
```

```
DELETE http://localhost:8080/customers/1
```

```
PUT http://localhost:8080/customers/1
Content-Type: application/json
{
  "name": "ACME Europe"
}
```

```
POST http://localhost:8080/customers
Content-Type: application/json
{
  "name": "ACME Europe"
}
```

Spring Boot / Profiles, Properties and Externalized Configuration

1. Devtools global settings properties on your home directory (`~/.spring-boot-devtools.properties` when devtools is active).
2. `@TestPropertySource` annotations on your tests.
3. `properties` attribute on your tests. Available on `@SpringBootTest` and the test annotations for testing a particular slice of your application.
4. Command line arguments.
5. Properties from `SPRING_APPLICATION_JSON` (inline JSON embedded in an environment variable or system property).
6. `ServletConfig` init parameters.
7. `ServletContext` init parameters.
8. JNDI attributes from `java:comp/env`.
9. Java System properties (`System.getProperties()`).
10. OS environment variables.
11. A `RandomValuePropertySource` that has properties only in `random.*`.
12. Profile-specific application properties outside of your packaged jar (`application-{profile}.properties` and YAML variants).
13. Profile-specific application properties packaged inside your jar (`application-{profile}.properties` and YAML variants).
14. Application properties outside of your packaged jar (`application.properties` and YAML variants).
15. Application properties packaged inside your jar (`application.properties` and YAML variants).
16. `@PropertySource` annotations on your `@Configuration` classes.
17. Default properties (specified by setting `SpringApplication.setDefaultProperties`).

Spring Boot consider property sources in the following order

We will have a closer look into these property sources

Spring Boot / Profiles, Properties and Externalized Configuration

```
pizza.inventory.mock=false
pizza.inventory.url=https://api.pizza-inventory.com
pizza.inventory.user=admin
pizza.inventory.password=tester11
```

.properties

```
pizza:
  inventory:
    mock: false
    url: https://api.pizza-inventory.com
    user: admin
    password: tester11
```

.yml

Spring Boot / Profiles, Properties and Externalized Configuration

application.properties

Examples: App information like name, context or port.

profile name

application-prod.properties

Examples: Url and credentials from peripheral systems.

application-default.properties

No specific usage. Default can be used as local profile.

The properties in **application.properties** file are loaded independently of the active profile. However, the properties can be overwritten in the profile specific files (see property source order).

If there are explicitly activated profiles, then properties from **application-{profile}.properties** are loaded.

If no profiles are explicitly activated, then properties from **application-default.properties** are loaded.

Spring Boot / Profiles, Properties and Externalized Configuration

All **application.properties** and **application-{profile}.properties** files should be saved to **src/main/resources**. Spring Boot will find them there automatically.

Property values (independently from the property source) can be injected directly into your beans by using the **@Value** annotation.

Spring Boot / Profiles, Properties and Externalized Configuration

```
@Service
public class PizzaInventoryService {

    @Value("${pizza.inventory.url}")
    private String url;

    @Value("${pizza.inventory.user}")
    private String user;

    @Value("${pizza.inventory.password}")
    private String password;
}
```

field injection with @Value

Spring Boot / Exception Handling for REST

By default the methods in an @ControllerAdvice component will be applied to all Controllers

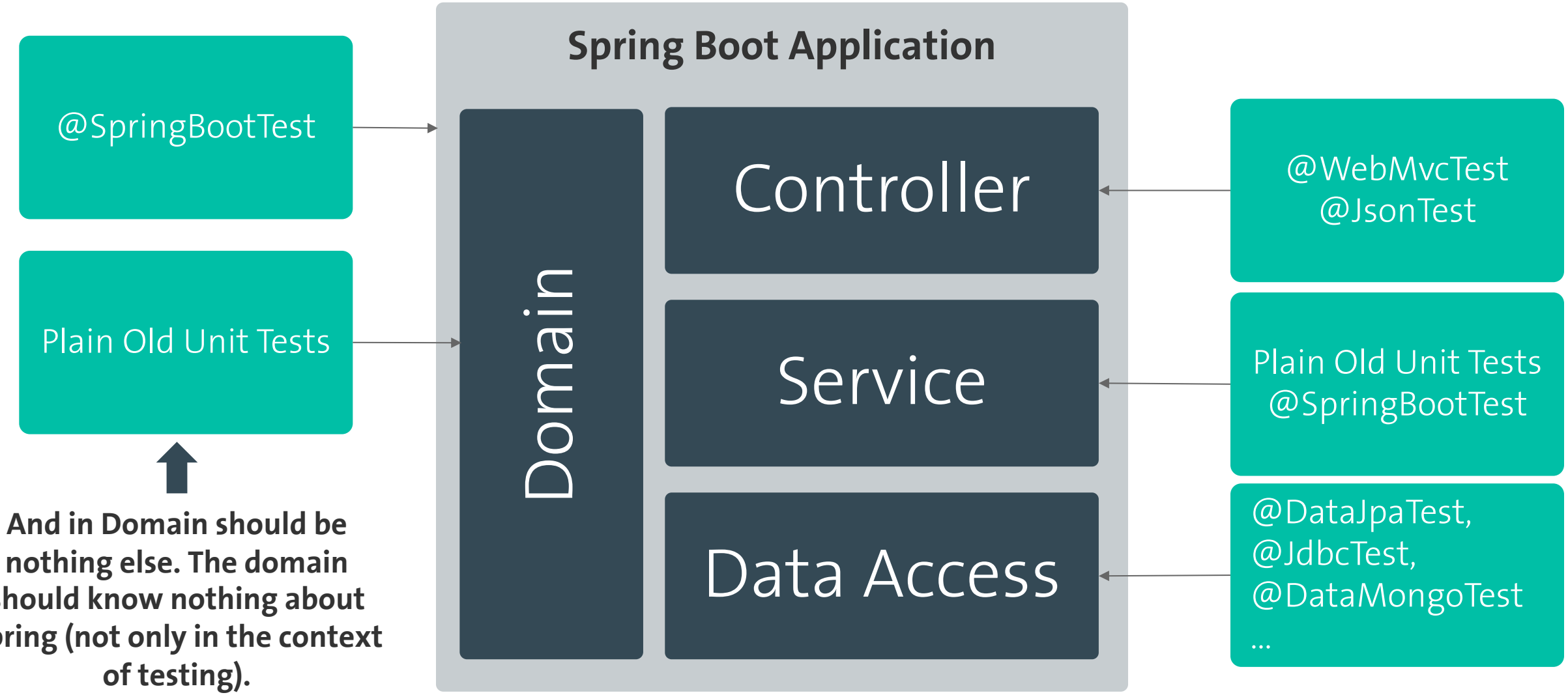
```
@ControllerAdvice
public class ExceptionHandling {

  @ExceptionHandler(IllegalArgumentException.class)
  public ResponseEntity<ProblemDto> handleIllegalArgumentException(IllegalArgumentException
exception) {

    ProblemDto problem = new ProblemDto(BAD_REQUEST.getReasonPhrase(), BAD_REQUEST.value(), "...");

    return ResponseEntity.status(BAD_REQUEST).body(problem);
  }
}
```

Each exception has its own @ExceptionHandler

The body of the response can be anything

Testing with Spring

Testing with Spring / Test Slices



And in Domain should be nothing else. The domain should know nothing about Spring (not only in the context of testing).

Testing with Spring / @WebMvcTest

```java
@WebMvcTest(GreetingRestController.class)
public class GreetingRestControllerTest {
    @Autowired
    private MockMvc mockMvc;
    @MockBean
    private GreetingService greetingService;

    @Test
    public void name() throws Exception {
        doReturn(new GreetDto("Hej", "Joe")).when(greetingService).greet(Optional.of("Joe"));
        mockMvc.perform(get("/greet?name=Joe")).andExpect(status().isOk())
            .andExpect(content().json("{\"name\": \"Joe\", \"greeting\": \"Hej\"}"));
    }
}
```