Practice 5: MVC, Services, Controllers and Views, part I

1. Open the project lab5 in IntelliJ IDE: File – New Project from Existing Sources. Add H2 and MySql run configurations **-Dspring.profiles.active=H2**. Remember if H2 profile is running, http://localhost:8080/h2-console is available.

2. Add a new package com.awbd.lab5.services and a new interface com.awbd.lab5.services .ProductsService:

```
public interface ProductService {
    List<Product> findAll();
    Product findById(Long l);
    Product save(Product product);
    void deleteById(Long id);
}
```

3. Implement com.awbd.lab5.services .ProductsService:

```
@Service
public class ProductServiceImpl implements ProductService {
    ProductRepository productRepository;

    @Autowired
    public ProductServiceImpl(ProductRepository productRepository) {
        this.productRepository = productRepository;
    }

    @Override
    public List<Product> findAll(){
        List<Product> products = new LinkedList<>();

productRepository.findAll().iterator().forEachRemaining(products::add);
        return products;
    }

    @Override
    public Product findById(Long l) {
        Optional<Product> productOptional =
productRepository.findById(l);
        if (!productOptional.isPresent()) {
            throw new RuntimeException("Product not found!");
        }
        return productOptional.get();
    }

    @Override
    public Product save(Product product) {
        Product savedProduct = productRepository.save(product);
        return savedProduct;
    }

    @Override
    public void deleteById(Long id) {
        productRepository.deleteById(id);
    }
}
```

Info

Stereotypes annotations are used for different classification. [1]

@Service – component holding the business logic, service layer
@Repository -- persistence layer, database repository

Both annotations are specializations of @Component annotation.

4. Add a new test package com.awbd.lab5.services and a new test class:

```
public class ProductServiceTest {
    ProductService productService;

    @Mock
    ProductRepository productRepository;

    @Rule
    public MockitoRule rule = MockitoJUnit.rule();

    @Before
    public void setUp() throws Exception {
        productService = new ProductServiceImpl(productRepository);
    }

    @Test
    public void findProducts() {
        List<Product> productsRet = new ArrayList<Product>();
        Product product = new Product();
        product.setId(4L);
        product.setCode("TEST");
        productsRet.add(product);

        when(productRepository.findAll()).thenReturn(productsRet);
        List<Product> products = productService.findAll();
        assertEquals(products.size(), 1);
        verify(productRepository, times(1)).findAll();
    }


}
```

Info

Unit Tests
Test specific sections of code/individual units of a software.
test a method
No external dependencies (SpringContext, database etc.)
Few inputs.
Faster than integration tests.

Integration Tests
May use external dependencies.
Test interaction between objects.
Slower than unit test, big-bang approach/top-down, bottom-up, sandwich-approach.

Mock
Dummy implementation for a class.
Simulate real behavior, simplified implementation of an object used in tests.
Register the calls it receives.
("fake object"/"stub object").

Spy
Mock with some real implementations.

Info

Useful dependencies (see spring Initializr):
JUnit, Spring Test, Spring Boot Test, Mockito, AssertJ

Junit Annotations:

@Test test method
@Before method executed before each test, used for initializations
@After method executed after each test, used for cleanup
@BeforeClass method executed only once, before all tests.
@AfterClass method executed only once, after all tests.
@Ignore test will not be performed
@Test (expected = Exception.class)
test succeeds if Exception.class is thrown
@Test (timeout = 100)
test succeeds if it runs in less than100 ms.

Mockito annotations [2][3]:

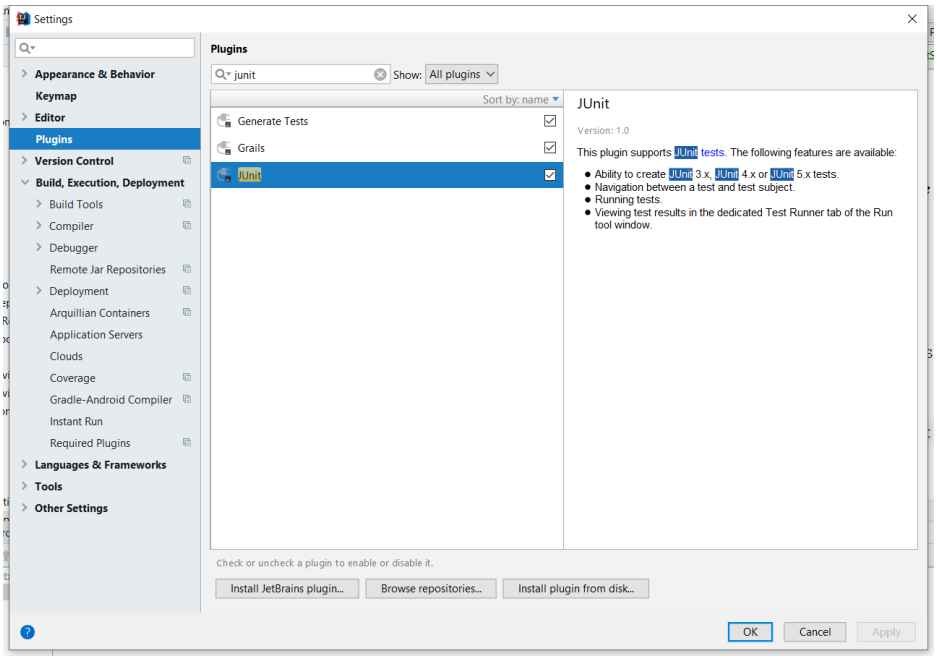
@Rule JUnit versions (>= 4.7), @RunsWith may be replaced with @Rule. @Rule is used by a to indicate work done before and after a test's execution. Older versions: @RunWith(MockitoJUnitRunner.class)

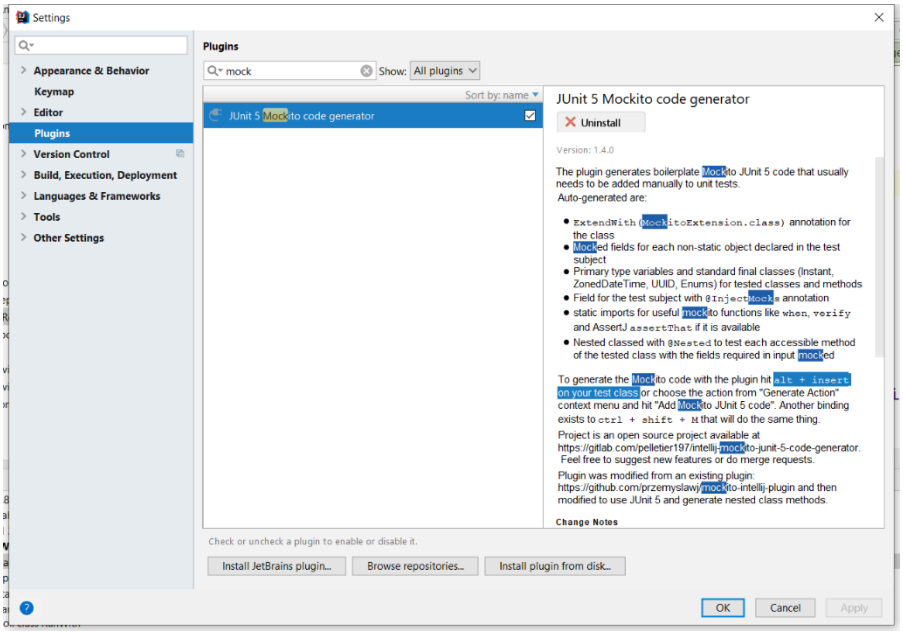
@Mock create and inject mocked instances

When()
thenReturn() are used to specify a return value for a method call.

verify() is used to check the number of calls for a given method.

IntelliJ plugin:





5. Add in pom.xml thymeleaf dependency. SpringBoot will autoconfigure a ViewResolver for Thymeleaf templates.

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

Info **Spring MVC**

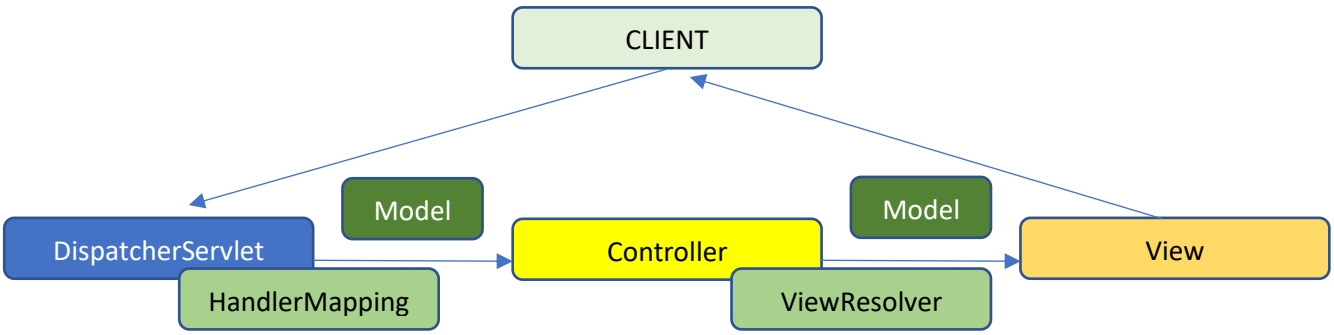
Spring MVC framework **[4][5]** is designed around a central Servlet: **DispatcherServlet** that dispatches requests to controllers.

WebApplicationContext contains:

HandlerMapping: maps incoming requests to handlers. The most common implementation is based on annotated **Controllers**

HandlerExceptionResolver: maps exceptions to views.

ViewResolver: resolves string-based view names based on view types.



6. Add webjar dependency:

```
<dependency>
   <groupId>org.webjars</groupId>
   <artifactId>bootstrap</artifactId>
   <version>4.5.0</version>
</dependency>
```

Info **WebJars** [6]:

Client dependencies packed in JAR archives. Easy to manage with maven.
Popular webjars: Bootstrap, JQuery, Angular JS etc.

To automatically resolve the version of any WebJars assets we must include webjars-locator as dependency:

```
<dependency>
   <groupId>org.webjars</groupId>
   <artifactId>webjars-locator</artifactId>
   <version>0.30</version>
</dependency>
```

7. Modify products.html, add bootstrap and thymeleaf namespace:

```
<html lang="en" xmlns:th="http://www.thymeleaf.org">

<head>
    <meta charset="UTF-8">
    <title>Products</title>
    <link rel="stylesheet"
href="/webjars/bootstrap/4.5.0/css/bootstrap.min.css" />
<body>

<script src="/webjars/bootstrap/4.5.0/js/bootstrap.min.js"></script>
</body>
</html>
```

8. Add a new package com.awbd.lab5.controllers and a new class ProductsController and test http://localhost:8080/product/list:

```
@Controller
public class ProductsController {


    @RequestMapping("/product/list")
    public String productsList(){
        return "products";
    }
}
```

9. Add thymeleaf tags in producs.html:

```
<tr th:each="product : ${products}">
            <td th:text="${product.id}">1</td>
            <td th:text="${product.name}">Product 1</td>
            <td th:text="${product.code}">Code</td>
            <td th:text="${product.reservePrice}">Reserved price</td>
            <td><a href="#" th:href="@{'/product/info/' +
${product.id}}">Info</a></td>
            <td><a href="#" th:href="@{'/product/delete/' +
${product.id}}">Delete</a></td>
        </tr>
```

Info

Thymeleaf

Thymeleaf [7][8] is a Java template engine for processing HTML, XML, CSS etc.

Model attributes from Spring are available in Thymeleaf as "context variables". Context variables are accesed with Spring EL expressions [9]. Spring Expression Language is a language for query and manipulate object graph at runtime.

Model Attributes are accesed with:
${attributeName}

Request parameters are accessed with:

${param.param_name}

Iteration [10]

th:each iterates collections (java.util.Map, java.util.Arrays, java.util.Iterable etc.)

```
<tr th:each="product : ${products}">
```

The following properties may be accessed via status variable:
index (itteration index, starting from 0), ***count*** (total number of elements processed), ***size*** (total number of elements), ***even/odd*** boolean, ***first*** (boolean – true if current element is the first element of the collection), ***last*** (boolean true if current element is the last element of the collection)

```
<tr th:each="product, stat : ${products}"
    th:class="${stat.odd}? 'table-light':'table-dark'">
```

10. Modify class ProductsController and test http://localhost:8080/product/list. Check the HTML generated with Thymeleaf.

```
@RequestMapping("/product/list")
public String productsList(Model model){
    List<Product> products = productService.findAll();
    model.addAttribute("products",products);
    return "products";
}
```

Info

Model, ModelAndView

Model [11][4] holds the attributes for rendering views. @RequestMapping annotated methods accept a Model attribute. Attributes are added in model with ***addAttribute*** method.

ModelAndView stores both the model and the view resolved by ViewResolver. Model attributes are store as a map, and added with ***addObject***.

11. Modify @RequestMapping productList, use ModelAndView:

```
@RequestMapping("/products")
public ModelAndView  productsList(){
    ModelAndView modelAndView = new ModelAndView("products");
    List<Product> products = productService.findAll();
    modelAndView.addObject("products",products);
    return modelAndView;
}
```

12. Add a method to process request getting info about a product with a given id:
http://localhost:8080/product/info/4

```
@GetMapping("/product/info/{id}")
public String showById(@PathVariable String id, Model model){
    model.addAttribute("product",
                            productService.findById(Long.valueOf(id)));
    return "info";
}
```

Info **RequestMapping [12][13]**

@RequestMapping map annotation is used to map web requests to Spring Controller methods.
If ***method*** parameter is not specified @RequestMapping will map any HTTP request.
PArameters ***headers*** or ***produces*** may be used to specify *accept* hear.

```
@RequestMapping(
 value = "/ex/foos",
 method = GET,
 produces = { "application/json"}
)
@ResponseBody
```

```
@RequestMapping(
 value = "/ex/foos",
 method = GET,
 headers = "Accept=application/json")
@ResponseBody
```

@GetMapping, @PostMapping, @PutMapping, @DeleteMappint, @PatchMapping are shortcuts:

```
@RequestMapping(value = "/get/{id}", method = RequestMethod.GET)
@GetMapping("/get/{id}")
```

@PathVariable maps parts of the URL mapping to variables.

```
@GetMapping("/product/info/{id}")
public String showById(@PathVariable String id, Model model)
```

```
@GetMapping("/product/info/{id}")
public String showById(@PathVariable(“id”) String id, Model model)
```

If the name of the method matches the name of the path variable, the value of @PAthvariable may be omitted:

```
@GetMapping("/product/info/{id}")
public String showById(@PathVariable String id, Model model)
```

13. Add Thymeleaf context variables in info.html.

```
<h1 class="panel-title" th:text="${product.name}">Product</h1>

<li
th:each="category:${product.categories}"th:text="${category.getName()}">
category 3
</li>


<p th:text="${product.code != null ?(product.code):'code'}">code</p>

<p th:text="${product.reservePrice != null ? product.reservePrice:'$'}">
price
</p>


<p th:text="${product.info != null ? product.info.description:''}">
Info
</p>
```

14. Add the request that deletes a product:

```
@RequestMapping("/product/delete/{id}")
public String deleteById(@PathVariable String id){

    productService.deleteById(Long.valueOf(id));
    return "redirect:/products/list";
}
```

15. Add a method in class Product to delete a remove a category from the product, and change delete method in ProductService to remove product-category association before deleting the product:

```
public void removeCategory(Category category) {
    category.getProducts().remove(this);
    categories.remove(category);
}


@Override
public void deleteById(Long id) {
    Optional<Product> productOptional = productRepository.findById(id);
    if (!productOptional.isPresent()) {
        throw new RuntimeException("Product not found!");
    }
    Product product = productOptional.get();
    List<Category> categories = new LinkedList<Category>();

product.getCategories().iterator().forEachRemaining(categories::add);

    for (Category category: categories
            ) {
        product.removeCategory(category);
    }

    productRepository.save(product);
    productRepository.deleteById(id);
}
```

16. Add in productform.html:

```
<div class="container-fluid" style="margin-top: 20px">
    <div class="row">
        <div class="col-md-6 col-md-offset-3">
            <form th:object="${product}" th:action="@{/product/}"
method="post">
                <input type="hidden" th:field="*{id}"/>
                <div class="pannel-group">
                    <div class="panel panel-primary">
                        <div class="panel-heading">
                            <h1 class="panel-title">ADD PRODUCT</h1>
                        </div>
                        <div class="panel-body">
                            <div class="row">
                                <div class="col-md-3 form-group">
                                    <label>product:</label>
                                    <input type="text" class="form-
control" th:field="*{name}"/>
                                </div>
                            </div>
                            <div class="row">
                                <div class="col-md-3 form-group">
                                    <label>code:</label>
                                    <input type="text" class="form-
control" th:field="*{code}"/>
                                </div>
                            </div>
                        </div>

                    </div>

                    <button type="submit" class="btn btn-
primary">Submit</button>
                </div>
            </form>
        </div>
    </div>
</div>
```

17. Add @RequestMapping method to return productform.html:

```
@RequestMapping("/product/new")
public String newFilm(Model model) {
    model.addAttribute("product", new Product());
    return "productform";
}
```

18. Add a post mapping to add a new product:

```
@PostMapping("/product")
public String saveOrUpdate(@ModelAttribute Product product){
    Product savedProduct = productService.save(product);
    //return "redirect:/product/info/" + savedProduct.getId();
    return "redirect:/product/list" ;
}
```

B

[1] https://www.baeldung.com/spring-component-repository-service

[2] https://www.baeldung.com/mockito-annotations

[3] https://alexecollins.com/tutorial-junit-rule/

[4] https://docs.spring.io/spring-framework/docs/3.2.x/spring-framework-reference/html/mvc.html

[5] https://www.baeldung.com/spring-mvc-tutorial

[6] https://www.baeldung.com/maven-webjars

[7] https://www.thymeleaf.org/doc/articles/springmvcaccessdata.html

[8] https://www.baeldung.com/thymeleaf-in-spring-mvc

[9] https://docs.spring.io/spring-framework/docs/current/reference/html/core.html#expressions

[10] https://www.baeldung.com/thymeleaf-iteration

[11] https://www.baeldung.com/spring-mvc-model-model-map-model-view

[12] https://www.baeldung.com/spring-requestmapping

[13] https://www.baeldung.com/spring-new-requestmapping-shortcuts