


# Web API Design with Spring Boot Week 4 Coding Assignment

Points possible: 70

Category	Criteria	% of Grade
Functionality	Does the code work?	25
Organization	Is the code clean and organized? Proper use of white space, syntax, and consistency are utilized. Names and comments are concise and clear.	25
Creativity	Student solved the problems presented in the assignment using creativity and out of the box thinking.	25
Completeness	All requirements of the assignment are complete.	25

**Instructions:** In Eclipse, or an IDE of your choice, write the code that accomplishes the objectives listed below. Ensure that the code compiles and runs as directed. Take screenshots of the code and of the running program (make sure to get screenshots of all required functionality) and paste them in this document where instructed below. Create a new repository on GitHub for this week's assignments and push this document, with your Java project code, to the repository. Add the URL for this week's repository to this document where instructed and submit this document to your instructor when complete.

**Here's a friendly tip:** as you watch the videos, code along with the videos. This will help you with the homework. When a screenshot is required, look for the icon:  You will keep adding to this project throughout this part of the course. When it comes time for the final project, use this project as a starter.

**Project Resources:** <https://github.com/promineotech/Spring-Boot-Course-Student-Resources>

## Coding Steps:

For this week's homework you need to copy source code from the supplied resources.


For this week's homework you need to copy source code from the Source folder in the supplied resources. Wait until the instructions tell you to copy the resources or you will get errors.

- 1) Select some options for a Jeep order:
  - a) Use the `data.sql` file or the jeep database tables to select options for a Jeep order. Select any one of each of the following for the order:

- i) color
  - ii) customer
  - iii) engine
  - iv) model
  - v) tire(s)
- b) Select one or more options from the options table as well. Keep in mind that some options may work better than others – but if you want to put 37-inch tires on your Jeep Renegade, so be it!
- 2) Create a new integration test class to test a Jeep order named `CreateOrderTest.java`. Create this class in `src/test/java` in the `com.promineotech.jeep.controller` package.
- a) Add the Spring Boot Test annotations: `@SpringBootTest`, `@ActiveProfiles`, and `@Sql`. They should have the same parameters as the test created in weeks 1 and 2.
  - b) Create a test method (annotated with `@Test`) named `testCreateOrderReturnsSuccess201`.
  - c) In the test class, create a method named `createOrderBody`. This method returns a type of `String`. In this method, return a JSON object with the IDs that you picked in Step 1a and b. For example:

```
{
  "customer": "MORISON_LINA",
  "model": "WRANGLER",
  "trim": "Sport Altitude",
  "doors": 4,
  "color": "EXT_NACHO",
  "engine": "2_0_TURBO",
  "tire": "35_TOYO",
  "options": [
    "DOOR_QUAD_4",
    "EXT_AEV_LIFT",
    "EXT_WARN_WINCH",
    "EXT_WARN BUMPER_FRONT",
    "EXT_WARN BUMPER_REAR",
    "EXT_ARB_COMPRESSOR"
  ]
}
```

Make sure that the JSON is correct! If necessary, use a JSON formatter/validator like the one here: <https://jsonformatter.curiousconcept.com/>.

Produce a screenshot of the `createOrderBody()` method. 

In the test method, assign the return value of the `createOrderBody()` method to a variable named `body`.

- d) In the test class, add an instance variable named `serverPort` to hold the port that Tomcat is listening on in the test. Annotate the variable with `@LocalServerPort`.

e) Add another instance variable for an injected `TestRestTemplate` named `restTemplate`.

f) In the test method, assign a value to a local variable named `uri` as follows:

```
String uri = String.format("http://localhost:%d/orders", serverPort);
```

g) In the test method, create an `HttpHeaders` object and set the content type to "application/json" like this:

```
HttpHeaders headers = new HttpHeaders();  
headers.setContentType(MediaType.APPLICATION_JSON);
```

Make sure to import the package `org.springframework.http.HttpHeaders`.

h) Create an `HttpEntity` object and set the request body and headers:

```
HttpEntity<String> bodyEntity = new HttpEntity<>(body, headers);
```

i) Send the request body and headers to the server. The `Order` class should have been copied earlier from the supplied resources. Ensure that you import `com.promineotech.jeeppromineotech.entity.Order` and not some other `Order` class.

```
ResponseEntity<Order> response = restTemplate.exchange(uri,  
    HttpMethod.POST, bodyEntity, Order.class);
```

j) Add the `AssertJ` assertions to ensure that the response is correct. Replace the expected values to match the JSON in step 2c.



```
assertThat(response.getStatusCode()).isEqualTo(HttpStatus.CREATED);  
assertThat(response.getBody()).isNotNull();  
  
Order order = response.getBody();  
assertThat(order.getCustomer().getCustomerId()).isEqualTo("MORISON_LINA");  
assertThat(order.getModel().getModelId()).isEqualTo(JeepModel.WRANGLER);  
assertThat(order.getModel().getTrimLevel()).isEqualTo("Sport Altitude");  
assertThat(order.getModel().getNumDoors()).isEqualTo(4);  
assertThat(order.getColor().getColorId()).isEqualTo("EXT_NACHO");  
assertThat(order.getEngine().getEngineId()).isEqualTo("2_0_TURBO");  
assertThat(order.getTire().getTireId()).isEqualTo("35_TOYO");  
assertThat(order.getOptions()).hasSize(6);
```

k) Produce a screenshot of the test method. 


3) In the controller sub-package in `src/main/java`, create an interface named `JeepOrderController`. Add `@RequestMapping("/orders")` as a class-level annotation.

a) Create a method in the interface to create an order (`createOrder`). It should return an object of type `Order` (see below). It should accept a single parameter of type `OrderRequest` as described in the video. Make sure it accepts an HTTP POST request and returns a status code of 201 (created).

b) Add the `@RequestBody` annotation to the `orderRequest` parameter. Make sure to add the `RequestBody` annotation from the `org.springframework.web.bind.annotation` package.


- c) Produce a screenshot of the finished `JeepOrderController` interface showing no compile errors. 
- 4) Create a class that implements `JeepOrderController` named `DefaultJeepOrderController`.
  - a) Add `@RestController` as a class-level annotation.
  - b) Add a log line to the implementing controller method showing the input request body (`orderRequest`)
  - c) Run the test to show a red status bar. Produce a screenshot that shows the test method, the log line, and the red JUnit status bar. 
- 5) Find the Maven dependency `spring-boot-starter-validation` by looking it up at <https://mvnrepository.com/>. Add this repository to the project POM file (`pom.xml`).
- 6) Add the class-level annotation `@Validated` to the `JeepOrderController` interface.
- 7) Add Bean Validation annotations to the `OrderRequest` class as shown in the video.
  - a) Use these annotations for String types:
    - i) `@NotNull`
    - ii) `@Length(max = 30)`
    - iii) `@Pattern(regexp = "[\\w\\s]*")`
  - b) Use these annotations for integer types:
    - i) `@Positive`
    - ii) `@Min(2)`
    - iii) `@Max(4)`
  - c) Add `@NotNull` to the enum type.
  - d) Add validation to the list element (type String) by adding the validation annotations *inside* the generic definition. So, to add the String validation to the options, you would do this:

```
private List<@NotNull @Length(max = 30) @Pattern(regexp = "[\\w\\s]*") String> options;
```

Do not apply a `@NotNull` annotation to the `List` because if you have no options the `List` may be null.
  - e) Produce a screenshot of this class with the annotations. 
- 8) In the `jeep.service` sub-package, create the empty (no methods yet) order service interface (named `JeepOrderService`) and implementation (named `DefaultJeepOrderService`).
  - a) Inject the interface into the order controller implementation class.
  - b) Add the `@Service` annotation to the service implementation class.

- c) Create the `createOrder` method in the interface and implementing service. The method signature should look like this:

```
Order createOrder(OrderRequest orderRequest);
```

- d) Call the `createOrder` method from the controller and return the value returned by the service.
  - e) Add a log line in the `createOrder` method and log the `orderRequest` parameter.
  - f) Run the test `CreateOrderTest` again. Produce a screenshot showing that the service layer `createOrder` method correctly prints the log line in the console. (e.g. prints out the `OrderRequest` in the console from within the Service Layer). 
- 9) In the `jeep.dao` sub-package, create the empty (no methods yet) DAO interface (named `JeepOrderDao`) and implementation (named `DefaultJeepOrderDao`).
- a) Inject the DAO interface into the order service implementation class.
  - b) Add the `@Component` annotation to the DAO implementation class.
- 10) Replace the entire content of `JeepOrderDao.java` with the source found in `JeepOrderDao.source`. The source file is found in the Source folder of the supplied project resources.

**11) \*\*\* The next steps require you to copy source code from the Source directory in the supplied resources. Please follow the instructions EXACTLY. Some steps require you to replace ALL the source in a file. Some steps require you to ADD source to a file.**

- 12) Copy the *contents* of the file `DefaultJeepOrderDao.source` into `DefaultJeepOrderDao.java`. The source file is found in the Source folder of the supplied project resources.

In Eclipse, click the "Source" menu and select "Organize Imports". Pick packages from your project where applicable. Make sure you pick the import `java.util.Optional`, `java.util.List`, and `org.springframework.jdbc.core.RowMapper`.

- 13) Copy the *contents* of the file `DefaultJeepOrderService.source` into `DefaultJeepOrderService.java`. Add the source after the `createOrder()` method, but *inside* the class body. The source file is found in the Source folder of the supplied project resources.


In Eclipse, click the "Source" menu and select "Organize Imports". Pick packages from your project where applicable.

- 14) In `DefaultJeepOrderService.java`, work with the method `createOrder`.

- a) Add the `@Transactional` annotation to the `createOrder` method.
- b) In the `createOrder` method call the copied methods: `getCustomer`, `getModel`, `getColor`, `getEngine`, `getTire` and `getOption`, assigning the return values of these methods to variables of the appropriate types.
- c) Calculate the price, including all options.

15) In `JeepOrderDao.java` and `DefaultJeepOrderDao.java`, add the method:

```
Order saveOrder(Customer customer, Jeep jeep, Color color, Engine engine, Tire
    tire, BigDecimal price, List<Option> options);
```

a) Call the `jeepOrder.Dao.saveOrder` method from the `jeepOrderSalesService.createOrder` service. Produce a screenshot of the `jeepOrderSalesService.createOrder` method. 

b) Write the implementation of the `saveOrder` method in the DAO.

i) Call the supplied `generateInsertSql` method, passing in the customer, jeep, color, engine, tire and price. Assign the return value of the method to a `SqlParams` object.

ii) Call the update method on the `NamedParameterJdbcTemplate` object, passing in a `KeyHolder` object as shown in the video. Create the `KeyHolder` like this:

```
KeyHolder keyHolder = new GeneratedKeyHolder();
```


Be sure to extract the order primary key from the `KeyHolder` object into a variable of type `Long` named `orderPK`.


iii) Write a method named `saveOptions` as shown in the video. This method should have the following method signature:

```
private void saveOptions(List<Option> options, Long orderPK)
```

For each option in the `Options` list, call the supplied `generateInsertSql` method passing the parameters option and order primary key (`orderPK`). Call the update method on the `NamedParameterJdbcTemplate` object.

iv) In the `saveOrder` method in the DAO implementation, return an `Order` object using the `Order.builder`. The `Order` should include `orderPK`, customer, jeep (model), color, engine, tire, options and price.

v) Produce a screenshot of the `saveOrder` method. 

c) Run the integration test in `CreateOrderTest`. Produce a screenshot of the test method that shows the green JUnit status bar, the console output, and the test class. 

### Screenshots of Code:

```
JeepSales.java  FetchJeepTest...  JeepSalesServ...  DefaultJeepSa...  JeepSalesDaoj...  DefaultJeepSa...  Jeep.java  *CreateOrderT...
12 /**
13  * @author kdubrovskaya
14  *
15  */
16 @SpringBootTest(webEnvironment = WebEnvironment.RANDOM_PORT)
17 @ActiveProfiles("test")
18 @Sql(scripts = {
19     "classpath:flyway/migrations/V1.0__Jeep_Schema.sql",
20     "classpath:flyway/migrations/V1.1__Jeep_Data.sql"},
21     config = @SqlConfig(encoding = "utf-8"))
22
23     class CreateOrderTest {
24
25     @Test
26     void testCreateOrderReturnsSuccess201() {
27         createOrderBody();
28     }
29
30     protected String createOrderBody() {
31         // @formatter: off
32         return "{\n"
33             + "  \"customer\": \"MORISON_LINA\", \n"
34             + "  \"model\": \"WRANGLER\", \n"
35             + "  \"trim\": \"Sport Altitude\", \n"
36             + "  \"doors\": 4, \n"
37             + "  \"color\": \"EXT_NACHO\", \n"
38             + "  \"engine\": \"2.0 TURBO\", \n"
39             + "  \"tire\": \"35_TOYO\", \n"
40             + "  \"options\": [\n"
41             + "    \"DOOR_QUAD_4\", \n"
42             + "    \"EXT_AEV_LIFT\", \n"
43             + "    \"EXT_WARN_WINCH\", \n"
44             + "    \"EXT_WARN BUMPER_FRONT\", \n"
45             + "    \"EXT_WARN BUMPER_REAR\", \n"
46             + "    \"EXT_ARB_COMPRESSOR\", \n"
47             + "  ] \n"
48             + "}"
49         // @formatter: on
50     }
```

Problems Javadoc Declaration Console ×

No consoles to display at this time.

```
JeepSales.java  FetchJeepTest.java  DefaultJeepSalesDao.java  *CreateOrderTest.java  BaseTest.java  Order.java

33     config = @SqlConfig(encoding = "utf-8"))
34
35     class CreateOrderTest {
36
37     @LocalServerPort
38     private int serverPort;
39
40     @Autowired
41     @Getter
42     private TestRestTemplate restTemplate;
43
44     protected String getBaseUriForOrders() {
45         // return String.format("http://localhost:%d/orders", serverPort);
46
47         HttpHeaders headers = new HttpHeaders();
48         headers.setContentType(MediaType.APPLICATION_JSON);
49     }
50
51     @Test
52     void testCreateOrderReturnsSuccess201() {
53         // Given: an order of JSON
54         String body = createOrderBody();
55         String uri = String.format("http://localhost:%d/orders", serverPort);
56         HttpEntity<String> bodyEntity = new HttpEntity<>(body, headers);
57     }
58     protected String createOrderBody() {
59         // @formatter: off
60         return "{\n"
61             + "  \"customer\": \"MORISON_LINA\", \n"
62             + "  \"model\": \"WRANGLER\", \n"
63             + "  \"trim\": \"Sport Altitude\", \n"
64             + "  \"doors\": 4, \n"
65             + "  \"color\": \"EXT_NACHO\", \n"
66             + "  \"engine\": \"2_0_TURBO\", \n"
67             + "  \"tire\": \"35_TOYO\", \n"
68             + "  \"options\": [\n"
69             + "    \"DOOR_QUAD_4\", \n"
70             + "    \"EXT_AEV_LIFT\", \n"

```

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terminated> CreateOrderTest.getRestTemplate [JUnit] C:\Users\pbuda\Downloads\sts-4.16.0.RELEASE\plugins\org.eclipse.justi.openjdk.hotspot.jre.full.win32.x86\_64\_17.0.4.v202209



```

69     + " \"DOOR_QUAD_4\", \"n\"
70     + " \"EXT_AEV_LIFT\", \"n\"
71     + " \"EXT_WARN_WINCH\", \"n\"
72     + " \"EXT_WARN BUMPER_FRONT\", \"n\"
73     + " \"EXT_WARN BUMPER_REAR\", \"n\"
74     + " \"EXT_ARB_COMPRESSOR\", \"n\"
75     + " ] \"n\"
76     + " } \"n\"
77     + " ";
78     // @formatter: on
79
80     // When: the order is sent
81     ResponseEntity<Order> response = restTemplate.exchange(uri,
82         HttpMethod.POST, bodyEntity, Order.class);
83
84     // Then: a 201 status is returned
85     assertThat(response.getStatusCode()).isEqualTo(HttpStatus.CREATED);
86     assertThat(response.getBody()).isNotNull();
87
88     Order order = response.getBody();
89     assertThat(order.getCustomer().getCustomerId()).isEqualTo("MORISON_LINA");
90     assertThat(order.getModel().getModelId()).isEqualTo(JeepModel.WRANGLER);
91     assertThat(order.getModel().getTrimLevel()).isEqualTo("Sport Altitude");
92     assertThat(order.getModel().getNumDoors()).isEqualTo(4);
93     assertThat(order.getColor().getColorId()).isEqualTo("EXT_NACHO");
94     assertThat(order.getEngine().getEngineId()).isEqualTo("2_0_TURBO");
95     assertThat(order.getTire().getTireId()).isEqualTo("35_TOYO");
96     assertThat(order.getOptions()).hasSize(6);
97
98     //And: the returned order is correct
99
100
101 }
102
103
104
105
106

```

```
JeepSales.java  FetchJeepTest.java  *CreateOrderTest.java  BaseTest.java  Order.java  JeepOrderController.java X
@Operation(
    summary = "Create an order for a Jeep",
    description = "The created Jeep is returned",
    responses = {
        @ApiResponse(
            responseCode = "201",
            description = "A list of Jeeps",
            content = @Content(
                mediaType = "application/json",
                schema = @Schema(implementation = Order.class))),
        @ApiResponse(
            responseCode = "400",
            description = "The request parameters are invalid",
            content = @Content(
                mediaType = "application/json")),
        @ApiResponse(
            responseCode = "404",
            description = "A Jeep component was not found with the input criteria",
            content = @Content(
                mediaType = "application/json")),
        @ApiResponse(
            responseCode = "500",
            description = "An unplanned error occurred",
            content = @Content(
                mediaType = "application/json"))
    },
    parameters = {
        @Parameter(
            name = "orderRequest",
            required = true,
            description = "The order as JSON"),
    }
)
@PostMapping
@ResponseStatus(code = HttpStatus.CREATED)
Order createOrder(@RequestBody OrderRequest orderRequest);
//formatter: on
}
```

Finished after 6.797 seconds  
Runs: 1/1   Errors: 0   Failures: 1

▼ CreateOrderTest (Runner: JUnit 5) (1.916 s)  
    testCreateOrderReturnsSuccess2010 (1.916 s)

Failure Trace  
org.opentest4j.AssertionFailedError:  
    expected: 201 CREATED  
    but was: 400 BAD\_REQUEST  
at java.base/java.lang.reflect.Constructor.newInstance(  
at com.promineotech.jeeptest.controller.CreateOrder  
at java.base/java.util.ArrayList.forEach(ArrayList.java  
at java.base/java.util.ArrayList.forEach(ArrayList.java

Boot Dashboard  
Type tags, projects, or working set names to match  
local

```
10 /**
4  package com.promineotech.jeeptest.controller;
5
6  import javax.validation.Valid;
7  import org.springframework.web.bind.annotation.RestController;
8  import com.promineotech.jeeptest.entity.Order;
9  import com.promineotech.jeeptest.entity.OrderRequest;
10 import lombok.extern.slf4j.Slf4j;
11
12 /**
13  * @author kdubrovskaya
14  *
15  */
16 @Slf4j
17 @RestController
18 public class DefaultJeepOrderController implements JeepOrderController {
19
20     private JeepOrderService jeepOrderService;
21
22     @Override
23     public Order createOrder(@Valid OrderRequest orderRequest) {
24         log.debug("Order = {}", orderRequest);
25         return jeepOrderService.createOrder(orderRequest);
26     }
27
28 }
29
```

FetchJeepTest.java CreateOrderTest... JeepOrderContro... **OrderRequest.java** × JeepOrderDao.java DefaultJeepO

Problems Javadoc Declaration Console

```
<terminated> CreateOrderTest [JUnit] C:\Users\pbuda\Downloads\sts-4.16.0.RELEASE\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64
```



```
CreateOrderTest... *JeepOrderDao.j... JeepOrderServic... *DefaultJeepOr... DefaultJeepOrde...
13 import com.promineotech.jee.entity.Customer;
14 import com.promineotech.jee.entity.Engine;
15 import com.promineotech.jee.entity.Jee;
16 import com.promineotech.jee.entity.JeeModel;
17 import com.promineotech.jee.entity.Option;
18 import com.promineotech.jee.entity.Order;
19 import com.promineotech.jee.entity.OrderRequest;
20 import com.promineotech.jee.entity.Tire;
21
22 public interface JeepOrderDao {
23
24     Optional<Customer> fetchCustomer(String customerId);
25     Optional<Jee> fetchModel(JeeModel model, String trim, int doors);
26     Optional<Color> fetchColor(String colorId);
27     Optional<Engine> fetchEngine(String engineId);
28     Optional<Tire> fetchTire(String tireId);
29
30     /**
31      * @param customer
32      * @param jeep
33      * @param color
34      * @param engine
35      * @param tire
36      * @param price
37      * @param options
38      * @return
39      */
40     Order saveOrder(Customer customer, Jee jeep, Color color, Engine engine, Tire tire,
41         BigDecimal price, List<Option> options);
42
43     /**
44      * @param options
45      * @return
46      */
47     List<Option> fetchOptions(
48         List<String> options);
49 }
50
<
```

Problems Javadoc Declaration Console

```
CreateOrderT... *JeepOrderDa... JeepOrderSer... DefaultJeepO... DefaultJeepO... DefaultJeepO... x DefaultJeepS... Constructor....
35 * @author kdubrovskaya
36 *
37 */
38 @Component
39 public class DefaultJeepOrderDao implements JeepOrderDao {
40
41     @Autowired
42     private NamedParameterJdbcTemplate jdbcTemplate;
43
44     @Override
45     public Order saveOrder(Customer customer, Jeep jeep, Color color, Engine engine, Tire tire,
46         BigDecimal price, List<Option> options) {
47
48         SqlParams params =
49             generateInsertSql(customer, jeep, color, engine, tire, price);
50
51         KeyHolder keyHolder = new GeneratedKeyHolder();
52         jdbcTemplate.update(params.sql, params.source, keyHolder);
53
54         Long orderPK = keyHolder.getKey().longValue();
55         saveOptions(options, orderPK);
56
57         //Formatter:0ff
58         return Order.builder()
59             .orderPK(orderPK)
60             .customer(customer)
61             .model(jeep)
62             .color(color)
63             .engine(engine)
64             .tire(tire)
65             .options(options)
66             .price(price)
67             .build();
68         //Formatter:on
69     }
70
71     /**
72     * @param options
73     * @param orderPK
```

## Screenshots of Running Application:

