



**Prime**

**2023** *Enter the Java  
Dimension*

MAY 30-31  
TECH PARK SOFIA



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Backbase



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I help professional software engineers (backend, frontend, qa) to develop their quality mindset and deliver bug-free software so they become top-level engineers and get hired for the best positions in the market.



[bit.ly/eliasnogueira](https://bit.ly/eliasnogueira)

**the basics**

# rest api concept

It simplifies the development by supporting HTTP methods, error handling, and other RESTful conventions exposing resources through URLs.

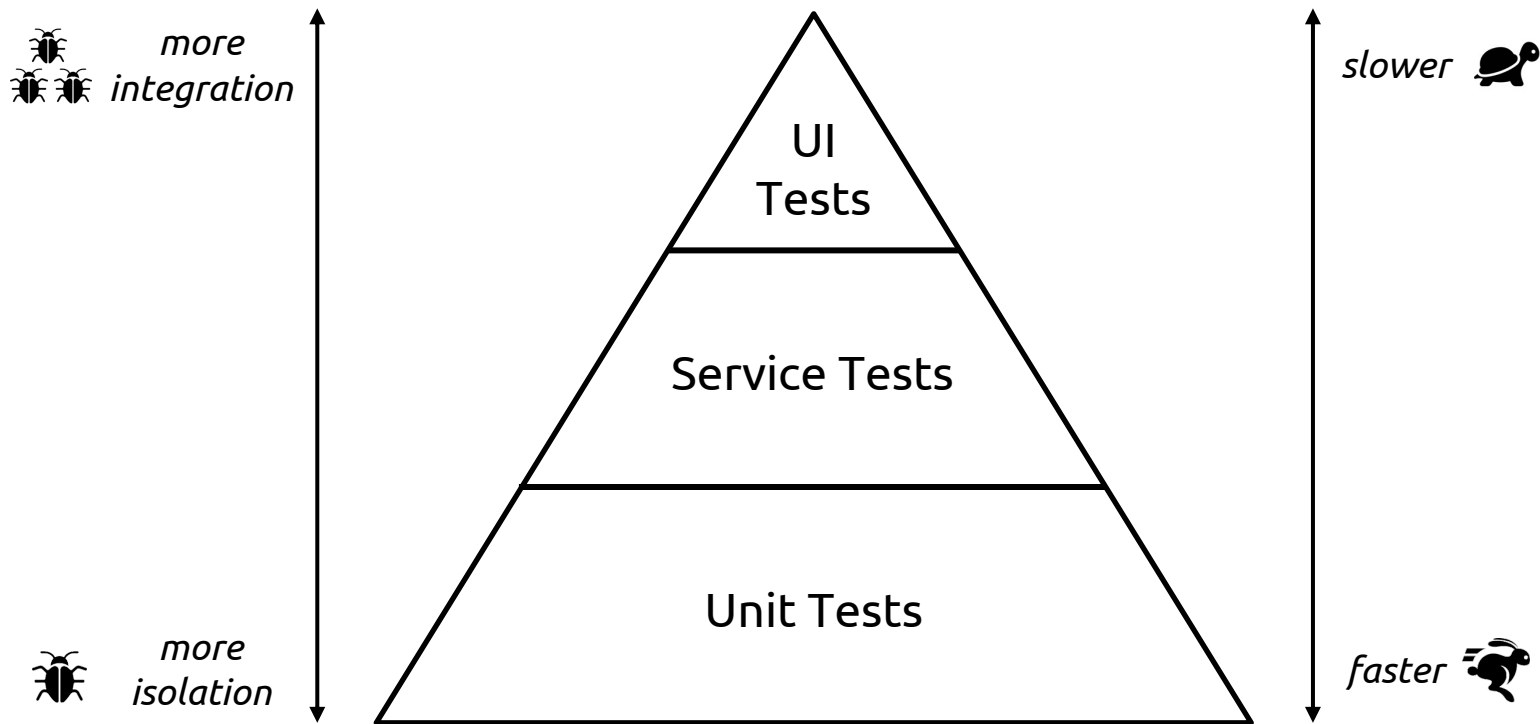
- its programming language independent
- supports different implementations of HTTP methods
- support different representational types (HTML, JSON, XML)

# rest api concept

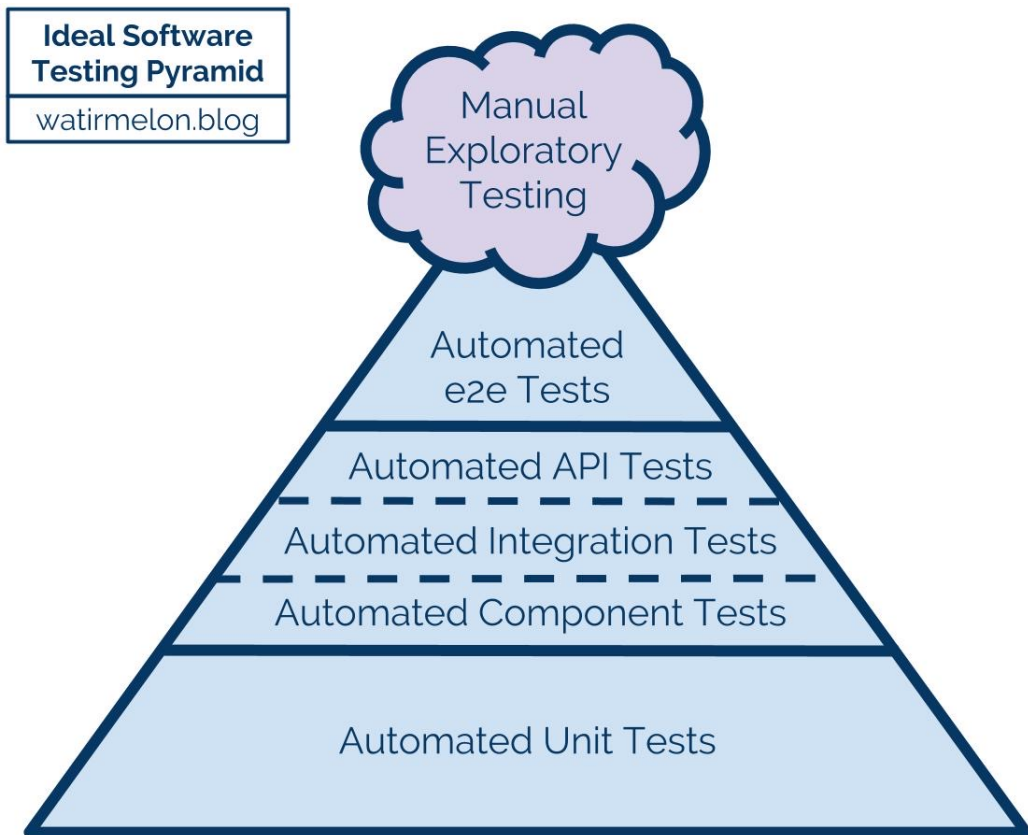
- It has a client-server architecture
- It uses stateless interactions
- Communicates over HTTP using request methods
  - GET, HEAD, POST, PUT, DELETE, CONNECT, OPTION, TRACE, PATCH
- Manipulates resources
- Uses HTTP standard response status codes
  - 100 informational
  - 200 success
  - 300 redirection
  - 400 client error
  - 500 server error

**concept**

# Original Test Pyramid



# Ideal Test Pyramid





**the backend application**

# the backend application

The backend is composed of two services:

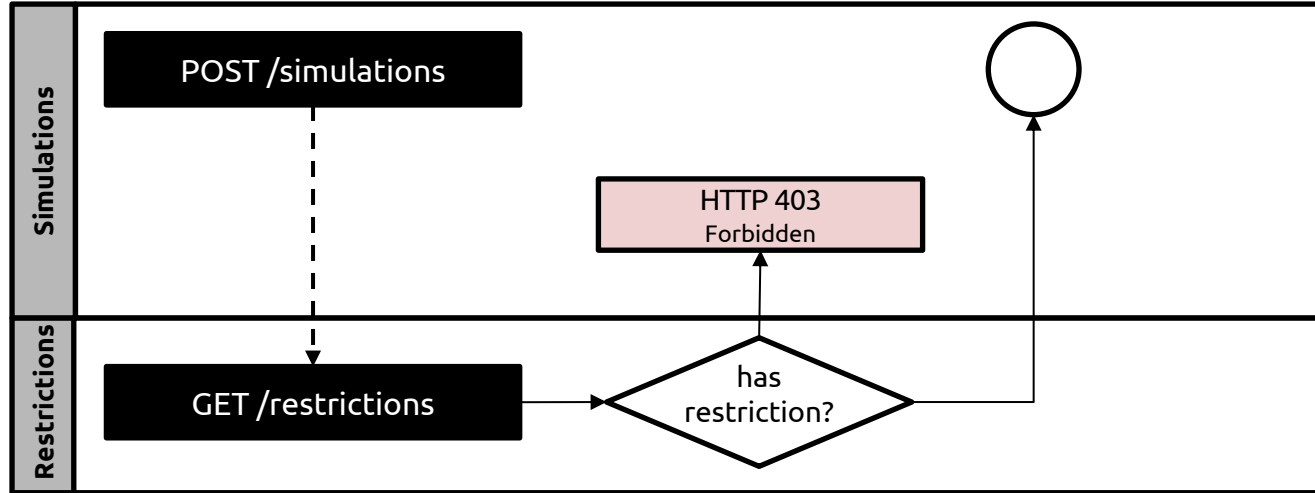
## **Simulations API**

CRUD operation to record a loan simulation

## **Restrictions API**

GET endpoint to know if a consumer has a restriction, if yes, a simulation is not allowed.

# the backend application



# the (non-existent) frontend

ACME Loan Home List

ACME Loan Home List

## Simulate a loan

It is fast and easy! Please fill your CPF.

000.000.000.00

Search...

**Error!**



This CPF has a restriction



## Please, fill in your data

CPF

123.456.789-12

Name

Email

@ john@gmail.com

Amount

\$ from \$ 1.000 to \$ 40.000

Installments

from 2 to 48

installments

Insurance ☒ with insurance

☐ without insurance

Submit


eliasnogueira.com

# API documentation

# api documentation

- Usually, we have the API documentation to know any aspect of the API like the **URI**, **parameters**, **headers**, **response**, etc.
- It's important to know how to read this documentation because we will start to understand how we can make the requests and what will be the response
- The documentation is divided into **Resources** and **Models**

# api documentation

 **Swagger**  
Supporting SMARTBEAR

/credit-api.yaml

Explore

## Credit Simulator API 1.6.0 OAS3

</credit-api.yaml>

Create credit simulation

Servers

//localhost:8088/

### Simulations

CRUD operations for simulator

GET

/api/v1/simulations/

Return all recorded simulations

▼

POST

/api/v1/simulations/

Record a new simulation

▼

GET

/api/v1/simulations/{cpf}

Return a simulation for a given CPF

▼

PUT

/api/v1/simulations/{cpf}

Update a simulation by a given CPF

▼

DELETE

/api/v1/simulations/{cpf}

Delete a simulation by a given CPF

▼

### Restrictions

Query restrictions

GET

/api/v1/restrictions/{cpf}

Query to search for a restricted CPF

▼

GET

/api/v2/restrictions/{cpf}

Query to search for a restricted CPF

▼

# api documentation

- We can access the documentation in the same host and port as the application, but the rest of the URL may vary.
- Always check the correct URL to access the documentation
- The application documentation can be accessed at **`http://localhost:8088/swagger-ui/index.html`**

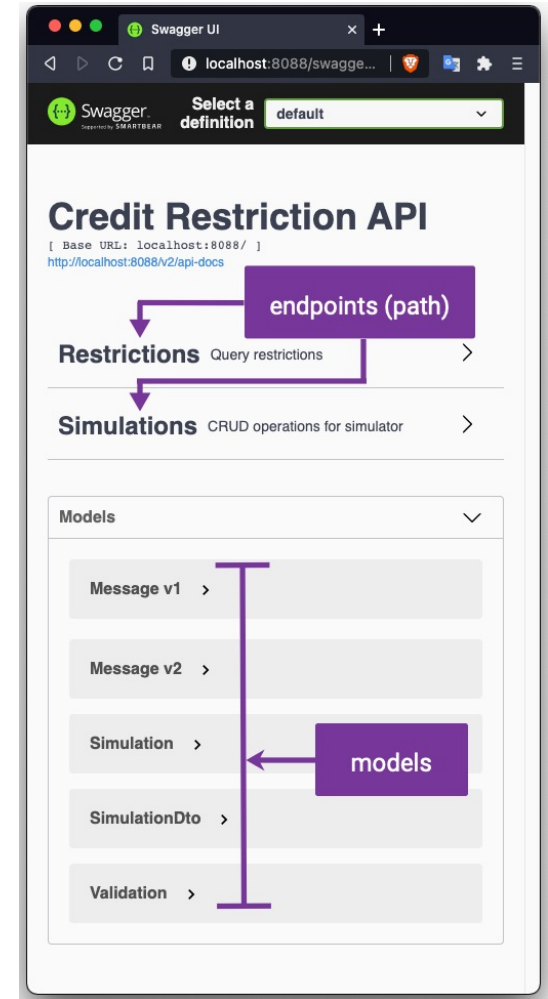


# [Setup] setup the project

Please, access **1. Setup - Local Environment** and follow its steps

# api documentation

- The **endpoints (path)** are composed of the HTTP methods, path, parameters, body, statuses, and response body related to it
- The **models** are the objects as request or response body, where we can know the attribute names and value types



# api documentation

- When you open an endpoint (path), like the **Simulations**, you can see all the HTTP Methods and paths.

Simulations <small>CRUD operations for simulator</small>			▼
GET	/api/v1/simulations	Return all recorded simulations	
POST	/api/v1/simulations	Record a new simulation	
GET	/api/v1/simulations/{cpf}	Return a simulation for a given CPF	
PUT	/api/v1/simulations/{cpf}	Update a simulation by a given CPF	
DELETE	/api/v1/simulations/{cpf}	Delete a simulation by a given CPF	

# api documentation

- Inside a path, you can see
  - HTTP Method
  - URL
  - Parameters
  - Content-type

**PUT** /api/v1/simulations/{cpf} Update a simulation by a given CPF

**1** ↑ **2** ↑

**Try it out**

Name	Description
<b>cpf</b> <small>★ required</small> string (path)	CPF to query an existing simulation
<b>simulation</b> <small>★ required</small> object (body)	Simulation object with data to update

**3** ← **3** →

Example Value | Model

```
{
  "amount": 1200,
  "cpf": 9709323014,
  "email": "john.doe@gmail.com",
  "installments": 3,
  "insurance": true,
  "name": "John Doe"
}
```

**4** → Parameter content type  
application/json

# api documentation

- and the API responses

Responses		Response content type
		<input type="text" value="*/"/> ▾
Code	Description	
200	Simulation updated successfully	
	Example Value   Model	
		<pre>{   "amount": 1200,   "cpf": 9709323014,   "email": "john.doe@gmail.com",   "installments": 3,   "insurance": true,   "name": "John Doe" }</pre>
404	Simulation not found	
409	CPF already exists	

# [Setup] Project and libraries

Please, access **1. Setup - Project** and follow its steps.

**REST Assured**

# REST Assured

<http://rest-assured.io>

Java DSL for simplifying testing of REST based services.

It has an intuitive code syntax to create an automated test.

Let's express it in a natural language:

Given I have a parameter to send

When I send a request using an HTTP Method an URL

Then I can validate the status code and response body

**NOTE:** this is not a BDD approach and I have no intention to apply it



# REST Assured

<http://rest-assured.io>

REST Assured uses the same keywords given, when, then to express it

```
import static io.restassured.RestAssured.*;
import static org.hamcrest.Matchers.*;

class RestAssuredExampleTest {

    @Test
    void welcomeTest() {
        given().
            param("name", "Elias").
        when().
            post("/register").
        then().
            statusCode(200).
            body("message", is("Hello Elias"));
    }
}
```

# REST Assured

<http://rest-assured.io>

REST Assured uses the same keywords given, when, then to express it

```
import static io.restassured.RestAssured.*;  
import static org.hamcrest.Matchers.*;
```

import libraries

```
class RestAssuredExampleTest {  
  
    @Test  
    void welcomeTest() {  
        given().  
            param("name", "Elias").  
        when().  
            post("/register").  
        then().  
            statusCode(200).  
            body("message", is("Hello Elias"));  
    }  
}
```

# REST Assured

<http://rest-assured.io>

REST Assured uses the same keywords given, when, then to express it

```
import static io.restassured.RestAssured.*;  
import static org.hamcrest.Matchers.*;
```

```
class RestAssuredTest {
```

test method and annotation from JUnit 5

```
@Test
```

```
void welcomeTest() {
```

```
    given().
```

```
        param("name", "Elias").
```

```
    when().
```

```
        post("/register").
```

```
    then().
```

```
        statusCode(200).
```

```
        body("message", is("Hello Elias"));
```

```
}
```

```
}
```

# REST Assured

<http://rest-assured.io>

REST Assured uses the same keywords given, when, then to express it

```
import static io.restassured.RestAssured.*;  
import static org.hamcrest.Matchers.*;
```

```
class RestAssuredExampleTest {
```

```
@Test
```

```
void welcomeTest() {
```

```
    given().
```

```
        param("name", "Elias").
```

```
    when().
```

```
        post("/register").
```

```
    then().
```

```
        statusCode(200).
```

```
        body("message", is("Hello Elias"));
```

```
}
```

```
}
```

request pre-condition

# REST Assured

<http://rest-assured.io>

REST Assured uses the same keywords given, when, then to express it

```
import static io.restassured.RestAssured.*;  
import static org.hamcrest.Matchers.*;
```

```
class RestAssuredExampleTest {
```

action (request)

```
    .param("name", "Elias").  
    when().  
        post("/register").  
    then().  
        statusCode(200).  
        body("message", is("Hello Elias"));
```

```
}
```

```
}
```

# REST Assured

<http://rest-assured.io>

REST Assured uses the same keywords given, when, then to express it

```
import static io.restassured.RestAssured.*;
import static org.hamcrest.Matchers.*;

class RestAssuredExampleTest {

    @Test
    void welcomeTest() {
        given()
            .header("Content-Type", "application/json")
            .body("{\"name\": \"Elias\"}")
            .when().get("/register")
            .then()
                .statusCode(200)
                .body("message", is("Hello Elias"));
    }
}
```

assert the response body

# GET requests

# GET using path parameters

Commonly, when we need to find a resource, we use unique values as path parameters. This is the case of the GET `/api/v1/restrictions/{cpf}`

GET `/api/v1/restrictions/{cpf}` Query to search for a restricted CPF

Parameters Try it out

Name	Description
<b>cpf</b> * required string (path)	CPF to query

cpf



# GET using path parameters

We could send the path parameter directly in the code request, like in the example below, but we won't because **it will increase the code maintainability**.

```
@Test
void getRequestExample() {

    when().
        get("/restrictions/1234567890").

    // code ignored
}
```

# GET using path parameters

REST Assured has two ways to help us using the path parameter:

## Unnamed parameters

In the requests, directly in the HTTP methods usage.

```
get("/restrictions/${cpf}", "66414919004")
```

## Named parameters

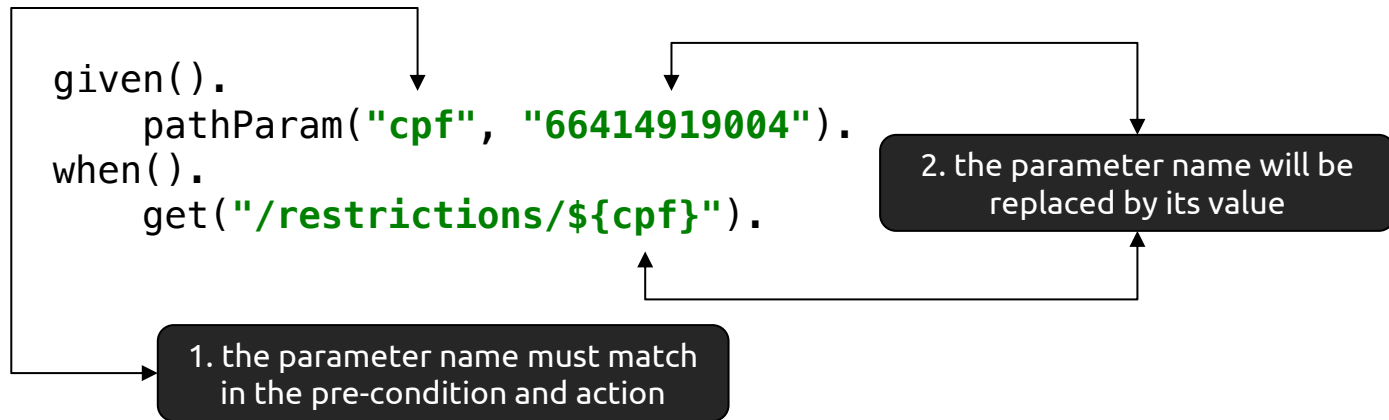
Provide a specific method in the pre-condition.

```
given().  
    pathParam("cpf", "66414919004").  
when().  
    get("/restrictions/${cpf}")
```

# GET using path parameters

The request must be the same as the endpoint described.

REST Assured will try to find the parameter name in brackets in the request and will be replaced by its value.



# [Lab] BaseTest and first test

Please, access **2. REST Assured Basics -> Lab 1** and follow its steps.

**assert the response body**

# assert the response body

Most of the time<sup>1</sup> the API requests a Response Body, which is the information returned after the request.

The OpenAPI specification will show all the status codes that the request can return, and the response body example associated.

<sup>1</sup> 1xx, 201, 204 and 205 usually do not have a response body returned

# assert the response body

The **GET /api/v1/restrictions/{cpf}**  
when a restriction is found, returns:

- HTTP 200
- response body with only one attribute: message

**Restrictions** Query restrictions

**GET** /api/v1/restrictions/{cpf} Query to search for a restricted CPF

**Parameters** Try it out

Name	Description
<b>cpf</b> * required	
string (path)	CPF to query

cpf

**Responses**

Code	Description	Links
200	Restriction found	No links
	Media type application/json Controls Accept header.	
	Example Value   Schema	
	<pre>{  "message": "CPF 999999999 has a restriction"}</pre>	
404	No restrictions	No links

# assert the response body

REST Assured help us to validate the response body in the assert step using the **then()** keyword.

This keyword have the **body()** method where we can assert any value from the response body, and it has two parameters:

- Attribute name, which must match with the one in the response
- Hamcrest matcher



# assert the response body

```
@Test
void shouldReturnRestriction() {
    given()
        .pathParam("cpf", "62648716050")
        .when()
            .get("/restrictions/{cpf}")
        .then()
            .status(200)
            .body("message", CoreMatchers.is("CPF 62648716050 has a restriction"));
}
```

attribute from the response body

assertion method `is()` from Hamcrest  
to assert the value returned

# [Lab] Tests with assertions

Please, access **2. REST Assured Basics -> Lab 2** and follow its steps.

# GET all records

The **GET /api/v1/simulations** will retrieve all the data when there's no search term applied. When we need to verify this:

- There're no pre-conditions (**given**)
- The when part (request) is:
  - The use of HTTP Method **GET**
  - The URL **/simulations**
- The then part (response and our validation) is:
  - Status Code **200**
  - Response body as the same as the Example Value from the OpenAPI

# GET all records

Response body from the  
**GET /api/v1/simulations:**

- array of objects
- two objects returned

first object

second object

Code

Details

200

Response body

```
[
  {
    "id": 1,
    "name": "Tom",
    "cpf": "66414919004",
    "email": "tom@gmail.com",
    "amount": 11000,
    "installments": 3,
    "insurance": true
  },
  {
    "id": 2,
    "name": "John",
    "cpf": "17822386034",
    "email": "john@gmail.com",
    "amount": 20000,
    "installments": 5,
    "insurance": false
  }
]
```



Download

Response headers

```
connection: keep-alive
content-type: application/json
date: Sun, 15 Jan 2023 18:22:07 GMT
keep-alive: timeout=60
transfer-encoding: chunked
```

# GET all records

We already know that we can use the `body()` method to assert one attribute from the response body, and the return from the Simulations API has several:

```
@Test
void getAllSimulations() {
    // code ignored

    // example for the first object returned
    then().
        statusCode(200).
        body("cpf", CoreMatchers.equalTo("66414919004")).
        body("name", CoreMatchers.equalTo("Tom")).
        body("email", CoreMatchers.equalTo("tom@gmail.com")).
        body("amount", CoreMatchers.equalTo(11000f)).
        body("installments", CoreMatchers.equalTo(3)).
        body("insurance", CoreMatchers.equalTo(true))
}
```

# GET all records

We already know that we can use the `body()` method to assert one attribute from the response body, and the return from the Simulations API has several:

```
@Test
void getAllSimulations() {
    // code ignored

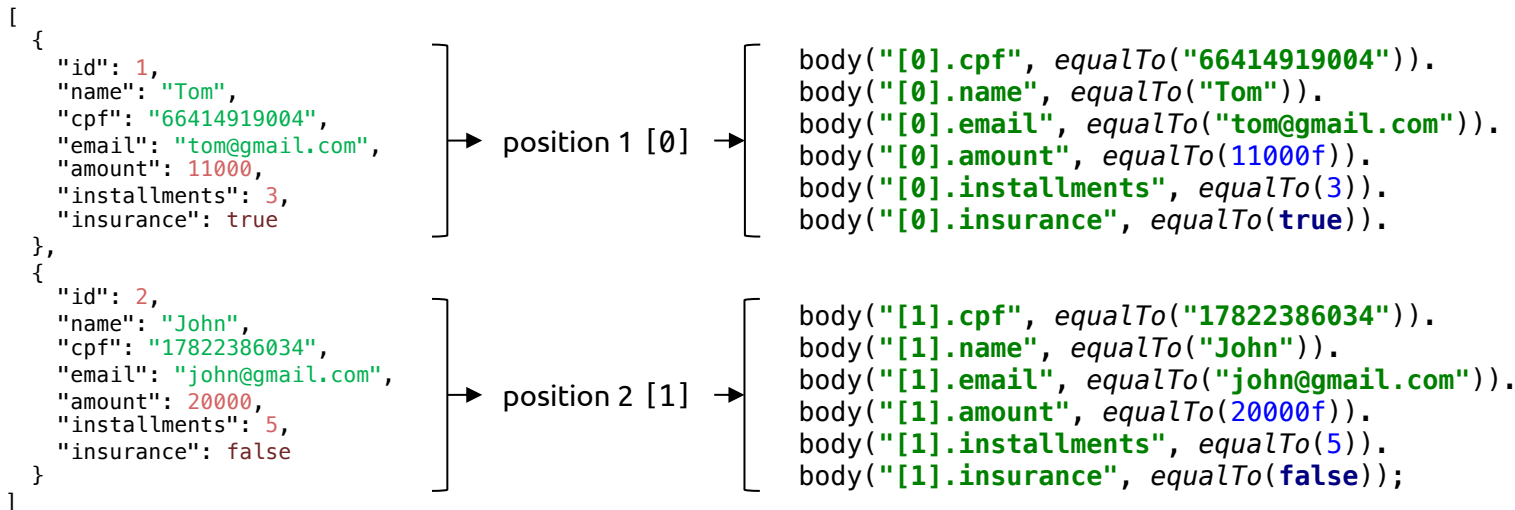
    // example for the first object returned
    then().
        statusCode(200).
        body("cpf", CoreMatchers.equalTo("66414919004")).
        body("name", CoreMatchers.equalTo("Tom")).
        body("email", CoreMatchers.equalTo("tom@gmail.com")).
        body("amount", CoreMatchers.equalTo(11000f)).
        body("installments", CoreMatchers.equalTo(3)).
        body("insurance", CoreMatchers.equalTo(true))
}
```



This code won't work  
as we need to specify  
the object position in  
the array

# GET all records

We must specify the object position when we want to assert all data.  
As it is an array, the first position is zero (0) !



# [Lab] Tests with assertions

Please, access **2. REST Assured Basics -> Lab 3** and follow its steps for the items 1 and 2.



# GET all records

Alternatively to develop reliable tests, it's a good practice to assert the size of the return and elements (data) you know what will be there.

Later we will learn about better assertions, but for now, using Hamcrest you can simply check the array size returned.

The keyword **\$** is from JSON Path which means the root object or array.

```
@Test
void shouldRetrieveAllSimulationsCheckingSize() {
    // code ignored

    // example for the first object returned
    then().
        statusCode(200).
        body("$", Matchers.hasSize(2));
}
```

# [Lab] Tests with assertions

Please, access **2. REST Assured Basics -> Lab 3** and follow its steps for the item 3.

# hard vs soft assertions

There are two ways to assert the response body values using body:

## Hard assertion

Composed by the usage of multiple **body()** methods where the test stops in an assertion error, ignoring the execution of the other **body()** methods.

## Soft Assertion

Composed by one single **body()** method and multiples values and matches where all assertions will be performed and the execution stops when the test finishes.

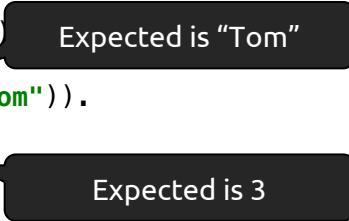
# hard vs soft assertions

## Hard Assertion

Let's assume that the following test has two validation errors: one in the name and another in the installments attribute

```
@Test
void getAllSimulations() {
    // code ignored

    // example for the first object returned
    then().
        statusCode(200).
        body("cpf", CoreMatchers.equalTo("66414919004"))
        body("name", CoreMatchers.equalTo("Unknown"))
        body("email", CoreMatchers.equalTo("tom@gmail.com")).
        body("amount", CoreMatchers.equalTo(11000f)).
        body("installments", CoreMatchers.equalTo(0))
        body("insurance", CoreMatchers.equalTo(true))
}
```



# hard vs soft assertions

## Hard Assertion

The test will fail during the assertion in the name attribute, stop and show the following output:

```
java.lang.AssertionError: 1 expectation failed.  
JSON path [0].name doesn't match.  
Expected: is "Unknown"  
Actual: Tom
```

# hard vs soft assertions

## Soft Assertion

Only one **body()** is used where we have an attribute name and its matches as a list.

```
@Test
void shouldRetrieveAllSimulations() {
    when()
        .get("/simulations/")
    .then()
        .statusCode(HttpStatus.SC_OK)
        .body(
            "[0].id", CoreMatchers.notNullValue(),
            "[0].name", CoreMatchers.is("Unknown"),
            "[0].cpf", CoreMatchers.is("66414919004"),
            "[0].email", CoreMatchers.is("tom@gmail.com"),
            "[0].amount", CoreMatchers.is(new BigDecimal("11000.00")),
            "[0].installments", CoreMatchers.is(0),
            "[0].insurance", CoreMatchers.is(true)
        );
}
```

# hard vs soft assertions

## Soft Assertion

Only one **body()** is used where we have an attribute name and its matches as a list.

```
@Test
void shouldRetrieveAllSimulations() {
    when()
        .get("/simulations/")
    .then()
        .statusCode(HttpStatus.SC_OK)
        .body(
            "[0].id", CoreMatchers.notNullValue(),
            "[0].name", CoreMatchers.is("Unknown"),
            "[0].cpf", CoreMatchers.is("66414919004"),
            "[0].email", CoreMatchers.is("tom@gmail.com"),
            "[0].amount", CoreMatchers.is(new BigDecimal("11000.00")),
            "[0].installments", CoreMatchers.is(0),
            "[0].insurance", CoreMatchers.is(true)
        );
}
```

Expected is "Tom"

Expected is 3

# hard vs soft assertions

## Soft Assertion

The test will fail during the assertion in the name attribute, but won't stop until all assertions are done. We will get the following output:

```
java.lang.AssertionError: 2 expectations failed.  
JSON path [0].name doesn't match.  
Expected: is "Unknown"  
Actual: Tom
```

```
JSON path [0].installments doesn't match.  
Expected: is <0>  
Actual: <3>
```



# [Lab] Tests with assertions

Please, access **2. REST Assured Basics -> Lab 3** and follow its steps for the item 4.

**delete a record**

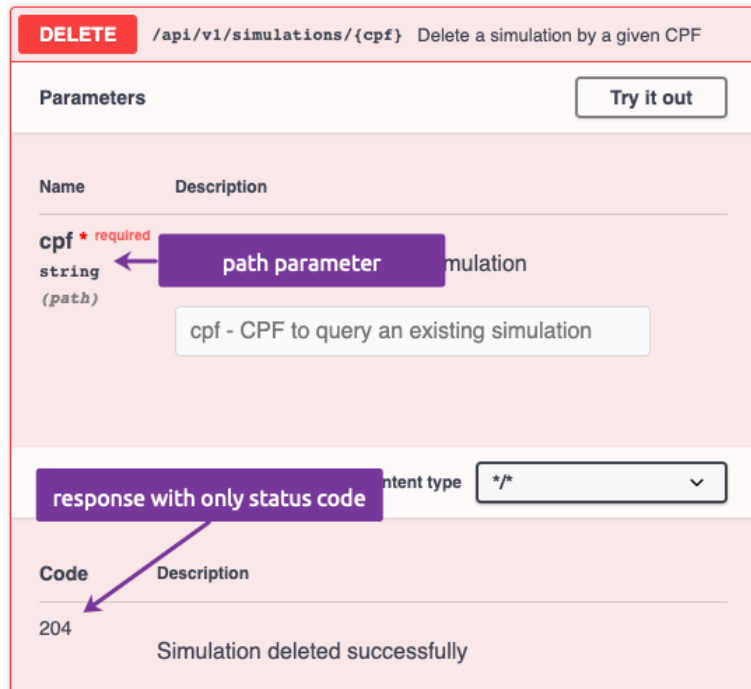
# delete a record

We normally send a delete using the **DELETE** HTTP method sending the key to the object deletion.

The successful return is an empty return with 204 status.

We have the following for the **DELETE /simulations/{cpf}**

- parameter named **cpf** as **path**



**DELETE** `/api/v1/simulations/{cpf}` Delete a simulation by a given CPF

**Parameters** Try it out

Name	Description
<b>cpf</b> * required string (path)	simulation cpf - CPF to query an existing simulation

**response with only status code** Content type: `*/*`

Code	Description
204	Simulation deleted successfully

# delete a record

To remove a record, we need send a valid key (**cpf** in this case) which will be deleted from the existing data.

## NOTE

The return of the successful data must be always empty and have the **204** status code.

# delete a record

To delete a record using Rest-Assured we need to use the method **delete()** and all the knowledge from the previous exercises:

- getting or creating a simulation object
- add as precondition
  - existing **cpf** as **path parameter**
- validate only the status code

# delete a record

```
@Test
void deleteExistingSimulation() {
    given()
        pathParam("cpf", "66414919004").
    when()
        delete("/simulations/{cpf}").
    then()
        statusCode(204);
}
```

existing cpf in the path parameter

# delete a record

```
@Test
void deleteExistingSimulation() {
    delete request with the path parameter
    when().
        delete("/simulations/{cpf}").
    then().
        statusCode(204);
}
```

# delete a record

```
@Test
void deleteExistingSimulation() {
    given().
        header("Authorization", "bearer 4919004").
        url("/simulations/{cpf}").
    then().
        statusCode(204);
}
```

validating only the status code



# [Lab] Tests with assertions

Please, access **2. REST Assured Basics -> Lab 4** and follow its steps for the item 1.

**create a record**

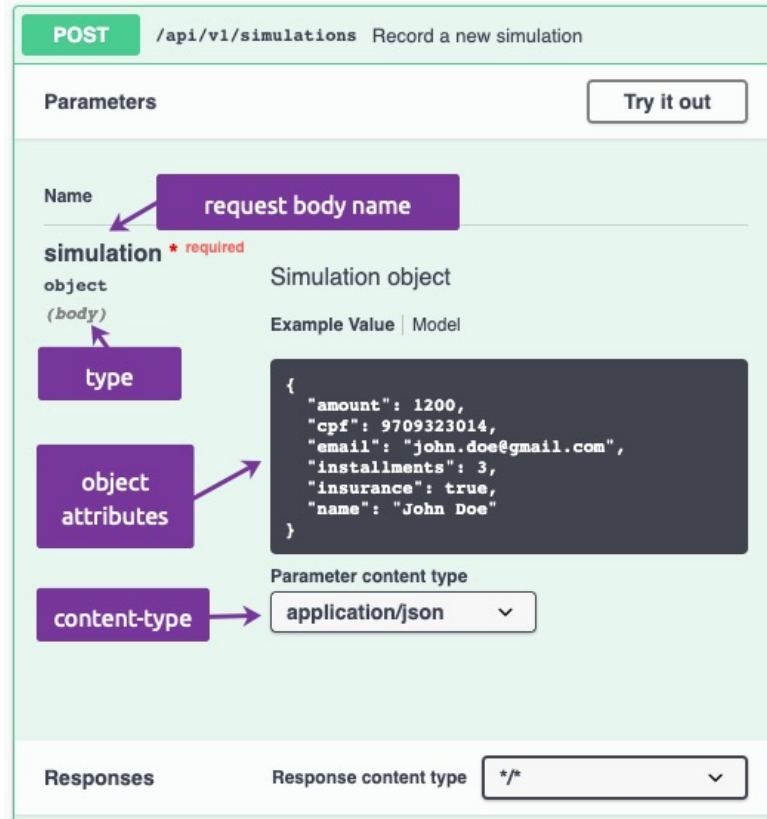
# create a record

To post a record (create) we need to know 2 new information's:

- object/request body
- content-type

We have the following for the  
**POST /api/v1/simulations**

- parameter named **simulations**
- parameter type as body
- attributes the body should have
- the **content-type**



The image shows a Swagger UI interface for the **POST /api/v1/simulations** endpoint. The title bar indicates the method is **POST** and the path is **/api/v1/simulations**, with a description "Record a new simulation". A "Try it out" button is in the top right.

The **Parameters** section shows a single parameter:

- Name:** `simulation` (marked as **required**). A purple box labeled "request body name" points to this field.
- object:** `(body)`. A purple box labeled "type" points to this field.
- Simulation object:** A section with an "Example Value" tab showing a JSON object: 

```
{  "amount": 1200,  "cpf": 9709323014,  "email": "john.doe@gmail.com",  "installments": 3,  "insurance": true,  "name": "John Doe"}
```

. A purple box labeled "object attributes" points to this JSON example.
- Parameter content type:** A dropdown menu set to `application/json`. A purple box labeled "content-type" points to this dropdown.

The **Responses** section at the bottom shows a "Response content type" dropdown set to `*/*`.

# create a record

In order to post a record, we need to create a JSON object (because the content-type is application/json).

According to the Example Value the JSON object must contain the following attributes (the values are an illustration):

```
{  
  "name": "John Doe"  
  "cpf": 9709323014,  
  "email": "john.doe@gmail.com",  
  "amount": 1200,  
  "installments": 3,  
  "insurance": true  
}
```

# create a record

There are three ways to create a body:

## String concatenation

It consists in a String object concatenating all the necessary data for the request body

Java 8 to 14: regular String concatenation

```
String requestBody = "{" +  
    "\"name\": \"John Doe\" " +  
    "\"cpf\": 9709323014,\" +  
    "\"email\": \"john.doe@gmail.com\",\" +  
    "\"amount\": 1200,\" +  
    "\" installments\": 3,\" +  
    "\"insurance\": true,}\n";  
}
```

Java 15+: text block

```
String requestBody = ""  
    {  
        "name": "John Doe",  
        "cpf": 9709323014,  
        "email": "john.doe@gmail.com",  
        "amount": 1200,  
        "installments": 3,  
        "insurance": true  
    }"";  
}
```

# create a record

There are three ways to create a body:

## **HashMap or JSON Object**

It consists in creating a HashMap object where the attribute is the key, and the value is the value or a JSONObject (org.json.simple).

### HashMap

```
var request = new HashMap<>();
request.put("name", "John Doe");
request.put("cpf", "9709323014");
request.put("email", "john.doe@gmail.com");
request.put("amount", "1200");
request.put("installments", "3");
request.put("insurance", "true");
```

### JSONObject

```
var request = new JSONObject<>();
request.put("name", "John Doe");
request.put("cpf", "9709323014");
request.put("email", "john.doe@gmail.com");
request.put("amount", "1200");
request.put("installments", "3");
request.put("insurance", "true");
```

# create a record

There are three ways to create a body:

## 👍 Object serialization

It consists in creating a custom object (Model/POJO/DTO) to handle the attributes and data.

This is a feature from REST Assured called [Object Mapping](#) for serialization (request body) and deserialization (response body), supported by the following libraries:

- [default] Jackson 2 (Faster Jackson Databind)
- Jackson (databind)
- Gson
- Johnzon
- JSON-B using Eclipse Yasson

# create a record

REST Assured will transform, using the **Object Serialization** approach, the Java object into a JSON object with the same attribute names.

```
public class Simulation {
```

```
    private String name;  
    private String cpf;  
    private String email;  
    private BigDecimal amount;  
    private int installments;  
    private Boolean insurance;  
}
```

Object  
serialization

```
{  
  "name": "John Doe"  
  "cpf": 9709323014,  
  "email": "john.doe@gmail.com",  
  "amount": 1200,  
  "installments": 3,  
  "insurance": true,  
}
```



# create a record

First, we need to create a Java object with getters, setters, and constructors. To simplify this creation, we will use the **Lombok** library to remove the code boilerplate using its annotations:

```
@Data
@Builder
@NoArgsConstructor
@AllArgsConstructor
public class Simulation {

    private String name;
    private String cpf;
    private String email;
    private BigDecimal amount;
    private int installments;
    private Boolean insurance;
}
```

# [Lab] Object Mapping

Please, access **3. Object Mapping -> Lab 1** and follow its steps for the item 1.

# create a record

As we have the **Simulation** class, that will be Serialized by REST Assured and be transformed into a JSON object, we need to add data into it.

The best way to create it is using the **Builder approach** (we added the **@Build** annotation from Lombok in the class). The usage will be like this:

```
Simulation simulation = Simulation.builder().  
    name("Elias").cpf("123456789").email("elias@eliasnogueira.com").  
    amount(new BigDecimal(3000)).installments(5).insurance(true).build();
```

# create a record

The request body, which is the **Simulation** object must be specified along with its content type. The recommended way is to add the following methods as pre-condition (**given()**):

- **body()**, adding the object as parameter
- **contentType()**, using the **ContentType** enum from REST Assured

```
given().  
    body(simulation).  
    contentType(ContentType.JSON).
```

# create a record

response body object  
creation with data

```
Simulation simulation = Simulation.builder().  
    name("Elias").cpf("123456789").email("elias@eliasnogueira.com").  
    amount(new BigDecimal(3000)).installments(5).insurance(true).build();  
  
given().  
    body(simulation).  
    contentType(ContentType.JSON).  
when().  
    post("/simulations").
```

# create a record

```
Simulation simulation = Simulation.builder().  
    .email("elias@eliasnogueira.com").  
    .installments(5).insurance(true).build();  
given().  
    body(simulation).  
    contentType(ContentType.JSON).  
when().  
    post("/simulations").
```

response body object being used  
into body as a precondition

# create a record

```
Simulation simulation = Simulation.builder().  
    name("Elias").cpf("123456789").email("elias@eliasnogueira.com").  
    amount(new BigDecimal(3000)).installments(5).insurance(true).build();  
given().body(simulation).  
    contentType(ContentType.JSON).  
when().  
    post("/simulations").
```

content-type set as JSON

# create a record

```
Simulation simulation = Simulation.builder().  
    name("Elias").cpf("123456789").email("elias@eliasnogueira.com").  
    amount(new BigDecimal(3000)).installments(5).insurance(true).build();
```

sending the post request

```
    .contentType("application/json").  
when().  
    post("/simulations");
```



# [Lab] Object Mapping

Please, access **3. Object Mapping -> Lab 1** and follow its steps for the item 2.

# create a record

Note that the API shows the response body with the **201** status code and a Header named **location** containing the URL to access the simulation created.

Code	Description	
201	Simulation created successfully	
Headers:		
Name	Description	Type
Location	URI to query the created simulation	string

# create a record

Did you realize that we didn't add the validation part?

First, let's look at the response:

Code	Description	
201	Simulation created successfully	
Headers:		
Name	Description	Type
Location	URI to query the created simulation	string

It will return a status code **201** and the **Location** attribute into the header as the **URI** (complete URL) to use if we need to find it (send a get request)

# create a record

## Example

If you send a post request with **cpf** data as **987654321** the **Location** attribute will have the following

```
connection: keep-alive
content-length: 0
date: Sat,21 Jan 2023 16:26:47 GM
keep-alive: timeout=60
location: http://localhost:8088/api/v1/simulations/987654321
```

To validate the header, we will use the **header()** method instead of **body()** adding into the parameters the attribute name and the assertion method.

# create a record

Notice that we are, in the `header()` method

- adding **Location**, that is the attribute name
- Using the **containsString** method to verify if the return contains...
- And using the **simulation.getCpf()** to verify if the data is present in the **URI**

```
then().  
    statusCode(201).  
    header("Location", containsString(simulation.getCpf()));
```

# [Lab] Object Mapping

Please, access **3. Object Mapping -> Lab 1** and follow its steps for the item 3.

**update a record**

# update a record

We normally send an update using the **PUT** HTTP method sending two information's:

- the object key
- object/request body + content-type

We have the following for the

**PUT /simulations/{cpf}**

- parameter named **cpf** as **path**
- parameter **simulation** as **body**
- attributes the body should have
- the **content-type**

The image shows a Swagger UI interface for the **PUT** endpoint `/api/v1/simulations/{cpf}`. The title is "Update a simulation by a given CPF".

**Parameters**

Name	Description
<b>cpf</b> * required string (path)	existing simulation
<b>simulation</b> * required object (body)	data to update

**Example Value** | **Model**

```
{  "amount": 1200,  "cpf": 9709323014,  "email": "john.doe@gmail.com",  "installments": 3,  "insurance": true,  "name": "John Doe"}
```

**Parameter content type**  
application/json

Annotations: "path parameter" points to **cpf**; "body parameter" points to **simulation**; "object attributes" points to the example JSON; "content-type" points to the dropdown menu.



# update a record

In order to update a record, we need to send a valid key (**cpf** in this case) and create a JSON object with all the data to update.

The simulation object is the same as the previous exercise (**post**).

## NOTE

Normally the PUT must send the whole request object to update, even though the update is only in one field. The partial update is made by PATCH HTTP method, where this workshop does not cover.

# update a record

The API returns the **200** status code and the updated response body when the request is successful.

Responses	
Code	Description
200	Simulations found
Example Value   Model	
<pre>[   {     "amount": 1200,     "cpf": 9709323014,     "email": "john.doe@gmail.com",     "installments": 3,     "insurance": true,     "name": "John Doe"   } ]</pre>	


# update a record

To update a record using Rest-Assured we need to use the method **put()** and all the knowledge from the previous exercises:

- getting or creating a simulation object
- add as precondition
  - existing **cpf** as **path parameter**
  - the **simulation** object in the **response body**
  - the **content-type** as **JSON**
- validate the status code and the response body

# update a record

```
Simulation simulation = Simulation.builder().  
    name("NEW NAME").cpf("66414919004").email("new_name@gmail.com").  
    amount(new BigDecimal(3000)).installments(4).insurance(false).build();  
given().  
    pathParam("cpf", "66414919004").  
    body(simulation).  
    contentType(ContentType.JSON).  
when().  
    put("/simulations/{cpf}").  
then().  
    statusCode(200).  
    body("cpf", equalTo("66414919004")).  
    body("name", equalTo("NEW NAME")).  
    body("email", equalTo("new_name@gmail.com")).  
    body("amount", equalTo(3000)).  
    body("installments", equalTo(4)).  
    body("insurance", equalTo(false));
```



simulation object created

# update a record

```
Simulation simulation = Simulation.builder().  
    name("NEW NAME").cpf("66414919004").email("new_name@gmail.com").  
    amount(new BigDecimal(3000)).installments(4).insurance(false).build();  
given().  
    pathParam("cpf", "66414919004").  
    body(simulation).  
    contentType(ContentType.JSON).  
when().  
    put("api/simulations/{cpf}").  
then().  
    statusCode(200).  
    body("name", equalTo("NEW NAME")).  
    body("email", equalTo("new_name@gmail.com")).  
    body("amount", equalTo(3000)).  
    body("installments", equalTo(4)).  
    body("insurance", equalTo(false));
```

existing cpf as path param and the whole simulation object as a request body

# update a record

```
Simulation simulation = Simulation.builder().  
    name("NEW NAME").cpf("66414919004").email("new_name@gmail.com").  
    amount(new BigDecimal(3000)).installments(4).insurance(false).build();  
given().  
    // PUT request with path parameter  
    put("/simulations/{cpf}").  
when().  
    put("/simulations/{cpf}").  
then().  
    statusCode(200).  
    body("cpf", equalTo("66414919004")).  
    body("name", equalTo("NEW NAME")).  
    body("email", equalTo("new_name@gmail.com")).  
    body("amount", equalTo(3000)).  
    body("installments", equalTo(4)).  
    body("insurance", equalTo(false));
```

# update a record

```
Simulation simulation = Simulation.builder().  
    name("NEW NAME").cpf("66414919004").email("new_name@gmail.com").  
    amount(new BigDecimal(3000)).installments(4).insurance(false).build();  
given().  
    pathParam("cpf", "66414919004").  
    body(simulation).  
    contentType("application/json").  
when().put("http://localhost:8080/api/simulations/{cpf}").  
then().  
    statusCode(200).  
    body("cpf", equalTo("66414919004")).  
    body("name", equalTo("NEW NAME")).  
    body("email", equalTo("new_name@gmail.com")).  
    body("amount", equalTo(3000)).  
    body("installments", equalTo(4)).  
    body("insurance", equalTo(false));
```

status code and response body validation

# [Lab] Object Mapping

Please, access **3. Object Mapping -> Lab 2** and follow its steps for the item 1.



# update a record

## **Object deserialization**

It consists in matching the attributes present in the response body into a class (Model/POJO/DTO) to have access to all returned data.

To achieve it we do need:

- a class containing the attributes that match the response body
- tell REST Assured about the deserialization

# create a record

REST Assured will transform, using the **Object Serialization** approach, the response body (JSON object) into a Java object.

```
public class Simulation {
```

```
    private String name;  
    private String cpf;  
    private String email;  
    private BigDecimal amount;  
    private int installments;  
    private Boolean insurance;  
}
```

Object  
deserialization

```
{  
  "name": "John Doe"  
  "cpf": 9709323014,  
  "email": "john.doe@gmail.com",  
  "amount": 1200,  
  "installments": 3,  
  "insurance": true,  
}
```

# create a record

Now the Simulation object can access the values returned from the response body, as the automatic match was done by REST Assured.

```
simulation.getName(); // will return "John Doe" data
simulation.getCpf(); // will return "9709323014" data
simulation.getEmail(); // will return "john.doe@gmail.com" data
simulation.getAmount(); // will return "1200" data
simulation.getInstallments(); // will return "3" data
simulation.getInstallments(); // will return "true" data
```

```
{
  "name": "John Doe",
  "cpf": 9709323014,
  "email": "john.doe@gmail.com",
  "amount": 1200,
  "installments": 3,
  "insurance": true,
}
```

# create a record

In order to do so, we need to extract the response body, associating it with an existing class where the attributes will match.

To extract the data, instead of using the **body()** method to assert its data, we need to use the **extract().as()**, where the **as()** method must have the class that will be automatically deserialized.

# create a record

```
@Test
void shouldUpdateExistingSimulation() {
    String existingCpf = "17822386034";

    var simulation = Simulation.builder().name("Elias").cpf("17822386034")
        .email("elias@eliasnogueira.com").amount(new BigDecimal("3000.00"))
        .installments(5).insurance(true).build();

    var simulation simulationUpdated =
        given()
            .pathParam("cpf", existingCpf)
            .body(simulation)
            .contentType(ContentType.JSON)
        .when()
            .put("/simulations/{cpf}")
        .then()
            .statusCode(HttpStatus.SC_OK)
            .extract().as(Simulation.class);
}
```

# create a record

@Test

void shouldUpdateE

String existingCpf,

simulation object with updated data

```
var simulation = Simulation.builder().name("Elias").cpf("17822386034")  
    .email("elias@eliasnogueira.com").amount(new BigDecimal("3000.00"))  
    .installments(5).insurance(true).build();
```

```
var simulation simulationUpdated =  
    given()  
        .pathParam("cpf", existingCpf)  
        .body(simulation)  
        .contentType(ContentType.JSON)  
    .when()  
        .put("/simulations/{cpf}")  
    .then()  
        .statusCode(HttpStatus.SC_OK)  
        .extract().as(Simulation.class);
```

}

# create a record

```
@Test
void shouldUpdateExistingSimulation() {
    String existingCpf = "17822386034";

    var simulation = new Simulation(
        .email("Elias").cpf("17822386034")
        .amount(new BigDecimal("3000.00"))
        .insurance(true).build());

    var simulationUpdated =
        given()
            .pathParam("cpf", existingCpf)
            .body(simulation)
            .contentType(ContentType.JSON)
        .when()
            .put("/simulations/{cpf}")
        .then()
            .statusCode(HttpStatus.SC_OK)
            .extract().as(Simulation.class);
}
```

new simulation attribute which  
will have the returned data

# create a record

```
@Test
void shouldUpdateExistingSimulation() {
    String existingCpf = "17822386034";

    var simulation = Simulation.builder().name("Elias").cpf("17822386034")
        .email("elias@eliasnogueira.com").amount(new BigDecimal("3000.00"))
        .installments(5).insurance(true).build();

    var simulation simulationUpdated =
        given()
            .pathParam("cpf", existingCpf)
            .body(simulation)
            .when()
            .post()
            .then()
            .statusCode(HttpStatus.SC_OK)
            .extract().as(Simulation.class);
}
```

extraction of the response body  
matching the Simulation class



# create a record

## Assertion

As we have extracted the data a new approach for the assertion must be used because. We could still use the **body()** method to assert its data, but it wouldn't make sense as we have extracted it.

We will use the AssertJ library to assert its data, which is a modern assertion library that provides different assertion ways.

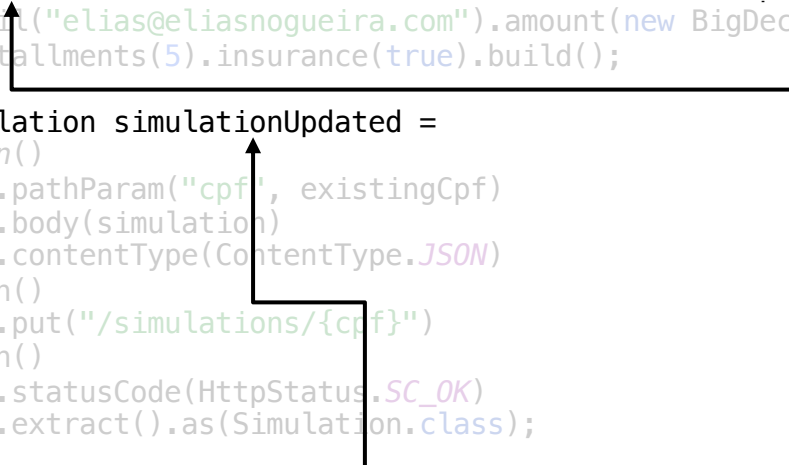
# create a record

```
@Test
void shouldUpdateExistingSimulation() {
    String existingCpf = "17822386034";

    var simulation = Simulation.builder().name("Elias").cpf("17822386034")
        .email("elias@eliasnogueira.com").amount(new BigDecimal("3000.00"))
        .installments(5).insurance(true).build();

    var simulation simulationUpdated =
        given()
            .pathParam("cpf", existingCpf)
            .body(simulation)
            .contentType(ContentType.JSON)
        .when()
            .put("/simulations/{cpf}")
        .then()
            .statusCode(HttpStatus.SC_OK)
            .extract().as(Simulation.class);

    Assertions.assertThat(simulationUpdated).isEqualTo(simulation);
}
```



assertion done by comparing both objects

# [Lab] Object Mapping

Please, access **3. Object Mapping -> Lab 3** and follow its steps for the item 1.

# Logging

# logging

To help you understand the complete request and response details, REST Assured provides a way to log the details to help you correct to manage the expectations in the console.

There are two types of logging:

- Request logging
- Response logging

# logging

## Request logging

Will print, in the output, all the request information as parameters, body, headers, cookies, method, and path, or we can log all of them.

It must be placed after the `given()` method.

```
given().log().all(). .. // Log all of below  
given().log().params(). .. // Log only the parameters of the request  
given().log().body(). .. // Log only the request body  
given().log().headers(). .. // Log only the request headers  
given().log().cookies(). .. // Log only the request cookies  
given().log().method(). .. // Log only the request method  
given().log().path(). .. // Log only the request path
```

# logging

## Response logging

Will print, in the output, the response information as the status, body, headers, and cookies.

It must be placed after the `then( )` method.

```
then().log().all(). .. // All of below  
then().log().statusLine(). .. // Only log the status line  
then().log().headers(). .. // Only log the response headers  
then().log().cookies(). .. // Only log the response cookies
```

# logging

## Only when validation fails

There's also a method present in the request or response that will show it only when the validation fails called `ifValidationFails()`.

But the best way to log it is on the REST Assured global configuration:

```
RestAssured.enableLoggingOfRequestAndResponseIfValidationFails();
```

We have already added it to the **BaseApiConfigurationClass**



# logging

This is the example of the request and response log for the **POST /simulations**

```
Request method: POST
Request URI:    http://localhost:8088/api/v1/simulations/
Proxy:         <none>
Request params: <none>
Query params:  <none>
Form params:   <none>
Path params:   <none>
Headers:       Accept=*//*
               Content-Type=application/json
Cookies:       <none>
Multiparts:    <none>
Body:
{
  "name": "Elias",
  "cpf": "123456789",
  "email": "elias@eliasnogueira.com",
  "amount": 3000,
  "installments": 5,
  "insurance": true
}
HTTP/1.1 201
Location: http://localhost:8088/api/v1/simulations/123456789
Content-Length: 0
Date: Tue, 24 Jan 2023 19:43:19 GMT
Keep-Alive: timeout=60
Connection: keep-alive
```

# logging

This is the example of the request and response log for the **GET /restrictions/{cpf}**

```
Request method: GET
Request URI:    http://localhost:8088/api/v1/restrictions/62648716050
Proxy:         <none>
Request params: <none>
Query params:  <none>
Form params:   <none>
Path params:   cpf=62648716050
Headers:       Accept=/*/*
Cookies:       <none>
Multiparts:    <none>
Body:          <none>
```

```
HTTP/1.1 200
Content-Type: application/json
Transfer-Encoding: chunked
Date: Tue, 24 Jan 2023 20:16:10 GMT
Keep-Alive: timeout=60
Connection: keep-alive
```

```
{
  "message": "CPF 62648716050 has a restriction"
}
```

# filters

Filter allows us to inspect and modify a request and response information before showing it. There are 3 provided filters:

- **RequestLoggingFilter**: print the request details
- **ResponseLoggingFilter**: print the response body details
- **ErrorLoggingFilter**: print the response body when an error occurs

# filters

We can also implement our own filters by creating a class implementing `io.restassured.Filter` interface.

The easiest way to log all the requests and responses during the test execution is to add the default filters to REST Assured global configuration.

*ProTip: create a way, using the properties file, to enable/disable it to avoid excessive log in the console, mainly running into CI/CD*

# filters

One of the possible approaches is to add the filters as a global configuration in the implemented **BaseTest** class.

```
RestAssured.filters(  
    new RequestLoggingFilter(),  
    new ResponseLoggingFilter()  
);
```

# filters

One of the possible approaches is to add the filters as a global configuration in the implemented **BaseTest** class.

global REST Assured filter

```
RestAssured.filters(  
    new RequestLoggingFilter(),  
    new ResponseLoggingFilter()  
);
```

# filters

One of the possible approaches is to add the filters as a global configuration in the implemented **BaseTest** class.

add the default request  
information to the filter

```
RestAssured.filters(  
    new RequestLoggingFilter(),  
    new ResponseLoggingFilter()  
);
```

# filters

One of the possible approaches is to add the filters as a global configuration in the implemented **BaseTest** class.

```
RestAssured.filters(  
    new RequestLoggingFilter(),  
    new ResponseLoggingFilter()  
);
```

add the default response  
information to the filter



# [Lab] Logging and Filters

Please, access **4. Logging and Filters -> Lab 1** and follow its steps for the item 1.

# Specification Re-use

# specification re-use

It's the name given for the re-use approach for the request and response, that might be duplicated across the code.

Both are done by two classes:

- **RequestSpecBuilder:** will carry common request items such as path and query parameters, content type, cookies, headers, and more
- **ResponseSpecBuilder:** will carry the common expectations like expected status code and body

# specification re-use

## Request Specification

In the current tests, we have a common thing: the path parameter informing the CPF. This is a simple example, but it can show how the Request Specification can be used.

```
RequestSpecification requestSpecification =  
    new RequestSpecBuilder().addPathParams("cpf", "1234567890").build();
```

# specification re-use

## Request Specification

In the current tests, we have a common thing: the path parameter informing the CPF. This is a simple example, but it can show how the Request Specification can be used.

```
RequestSpecification requestSpecification =  
    new RequestSpecBuilder().addPathParams("cpf", "1234567890").build();
```



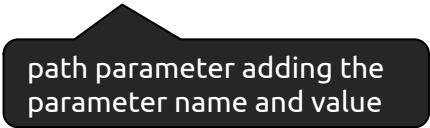
support class to add the specifications

# specification re-use

## Request Specification

In the current tests, we have a common thing: the path parameter informing the CPF. This is a simple example, but it can show how the Request Specification can be used.

```
RequestSpecification requestSpecification =  
    new RequestSpecBuilder().addPathParams("cpf", "1234567890").build();
```



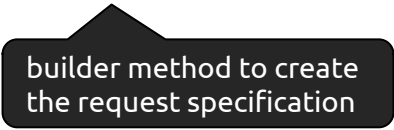
path parameter adding the  
parameter name and value

# specification re-use

## Request Specification

In the current tests, we have a common thing: the path parameter informing the CPF. This is a simple example, but it can show how the Request Specification can be used.

```
RequestSpecification requestSpecification =  
    new RequestSpecBuilder().addPathParams("cpf", "1234567890").build();
```



builder method to create  
the request specification

# specification re-use

We can add the request specification in the test class, or in any other class. The best approach would be to create it in a different class where we can have a set of shared request specifications.

Not talking about where, but about the implementation we can have a method that will have the parameter value as a parameter, making it reusable:

```
public RequestSpecification cpfPathParameter(String cpf) {  
    return new RequestSpecBuilder().addPathParams("cpf", cpf).build();  
}
```



# [Lab] Request and Response Specs

Please, access **5. Request and Response Specs -> Lab 1** and follow its steps for the item 1.

**robust framework**

# robust framework

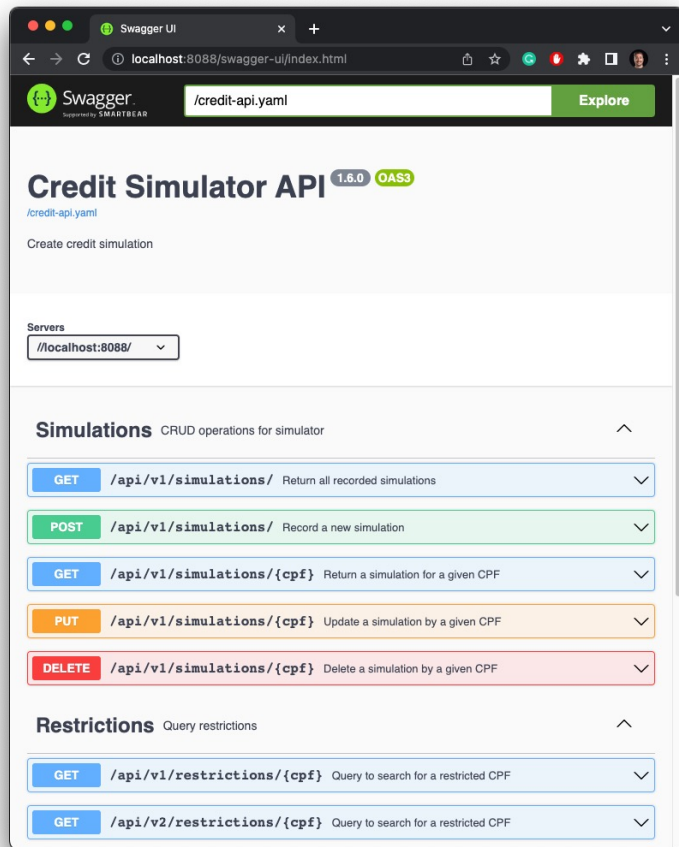
You have noticed, so far, we are using the “raw” REST Assured usage through the methods `given()`, `when()`, and `then()`.

They are a great start, but it won't scale as the API and test grow.

One of the possible approaches is to create an abstraction around the main REST Assured methods, having minimal work using the OpenAPI spec.

# robust framework

We are using the Open API spec,  
but the UI version of it



# robust framework

Normally we can also have the file and use it to generate the basic structure of the request and response.

There're several tools, and we will use the:

- **wagon-maven-plugin**: to download the spec
- **openapi-generator-maven-plugin**: to generate the API client based on the spec

**openapi-generator**

# download the spec file

The **wagon-maven-plugin** will help us to download a file to a specific directory.

In general, we will tell the plugin to:

- download a file
- describe the file location
- describe the destination

# download the spec file

```
<plugin>
  <groupId>org.codehaus.mojo</groupId>
  <artifactId>wagon-maven-plugin</artifactId>
  <version>${wagon-maven-plugin.version}</version>

  <executions>
    <execution>
      <id>download-credit-api-spec</id>
      <goals>
        <goal>download-single</goal>
      </goals>
      <phase>generate-sources</phase>
      <configuration>
        <url>
          URL-TO-THE-FILE-INCLUDING-FILE-NAME-AND-EXTENSION
        </url>
        <toDir>${project.basedir}/target/openapiSpecs</toDir>
      </configuration>
    </execution>
  </executions>
</plugin>
```



# download the spec file

```
<plugin>
  <groupId>org.codehaus.mojo</groupId>
  <artifactId>wagon-maven-plugin</artifactId>
  <version>${wagon.version}</version>
  <executions>
    <execution>
      <id>download-credit-api-spec</id>
      <goals>
        <goal>download-single</goal>
      </goals>
      <phase>generate-sources</phase>
      <configuration>
        <url>
          URL-TO-THE-FILE-INCLUDING-FILE-NAME-AND-EXTENSION
        </url>
        <toDir>${project.basedir}/target/openapiSpecs</toDir>
      </configuration>
    </execution>
  </executions>
</plugin>
```

unique id to identify the execution action, in case of multiple downloads

# download the spec file

```
<plugin>
  <groupId>org.codehaus.mojo</groupId>
  <artifactId>wagon-maven-plugin</artifactId>
  <version>${wagon-maven-plugin.version}</version>

  <executions>
    <execution>
      <id>download-spec-file</id>
      <goals>
        <goal>download-single</goal>
      </goals>
      <phase>generate-sources</phase>
      <configuration>
        <url>
          URL-TO-THE-FILE-INCLUDING-FILE-NAME-AND-EXTENSION
        </url>
        <toDir>${project.basedir}/target/openapiSpecs</toDir>
      </configuration>
    </execution>
  </executions>
</plugin>
```



goal from the plugin

# download the spec file

```
<plugin>
  <groupId>org.codehaus.mojo</groupId>
  <artifactId>wagon-maven-plugin</artifactId>
  <version>${wagon-maven-plugin.version}</version>

  <executions>
    <execution>
      <id>download-spec-file</id>
      <goals>
        <goal>download-spec-file</goal>
      </goals>
      <phase>generate-sources</phase>
      <configuration>
        <url>
          URL-TO-THE-FILE-INCLUDING-FILE-NAME-AND-EXTENSION
        </url>
        <toDir>${project.basedir}/target/openapiSpecs</toDir>
      </configuration>
    </execution>
  </executions>
</plugin>
```

Maven Build Lifecycle that will trigger this action

# download the spec file

```
<plugin>
  <groupId>org.codehaus.mojo</groupId>
  <artifactId>wagon-maven-plugin</artifactId>
  <version>${wagon-maven-plugin.version}</version>

  <executions>
    <execution>
      <id>download-credit-api-spec</id>
      <goals>
        <goal>download-single</goal>
      </goals>
      <phase>generate-sources</phase>
      <configuration>
        <url>
          URL-TO-THE-FILE-INCLUDING-FILE-NAME-AND-EXTENSION
        </url>
        <toDir>${project.basedir}/target/openapiSpecs</toDir>
      </configuration>
    </execution>
  </executions>
</plugin>
```



# download the spec file

```
<plugin>
  <groupId>org.codehaus.mojo</groupId>
  <artifactId>wagon-maven-plugin</artifactId>
  <version>${wagon-maven-plugin.version}</version>

  <executions>
    <execution>
      <id>download-credit-api-spec</id>
      <goals>
        <goal>download-single</goal>
      </goals>
      <phase>generate-sources</phase>
      <configuration>
        <url>
          URL-TO-THE-F
        </url>
        <toDir>${project.basedir}/target/openapiSpecs</toDir>
      </configuration>
    </execution>
  </executions>
</plugin>
```

file internal location

# [Lab] OpenAPI Generator

Please, access **6. OpenAPI Generator -> Lab 1** and follow its steps for the item 1.

# generate the Client API

The **openapi-generator-maven-plugin** will help us to generate the Client API and its models based on the Open API file specification.

In general, we will tell the plugin to:

- look at a specific folder to know the spec file
- define the main, api and model packages
- use REST Assured as a support library
- set the serialization library

# generate the Client API

```
<executions>
  <execution>
    <id>generate-client-api-code</id>
    <goals>
      <goal>generate</goal>
    </goals>
    <phase>generate-sources</phase>
    <configuration>
      <inputSpec>
        ${project.build.directory}/openapiSpecs/credit-api.yaml
      </inputSpec>
      <invokerPackage>com.eliasnogueira.credit.invoker</invokerPackage>
      <apiPackage>com.eliasnogueira.credit.api</apiPackage>
      <modelPackage>com.eliasnogueira.credit.model</modelPackage>
      <generatorName>java</generatorName>
      <generateApiTests>false</generateApiTests>
      <generateModelTests>false</generateModelTests>
      <configOptions>
        <library>rest-assured</library>
        <serializationLibrary>jackson</serializationLibrary>
      </configOptions>
    </configuration>
  </execution>
</executions>
```



# generate the Client API

```
<executions>
  <execution>
    <id>generate-client-api-code</id>
    <goals>
      <goal>
        <unique id in case of many generator>
        </goal>
      </goals>
    <phase>generate-sources</phase>
    <configuration>
      <inputSpec>
        ${project.build.directory}/openapiSpecs/credit-api.yaml
      </inputSpec>
      <invokerPackage>com.eliasnogueira.credit.invoker</invokerPackage>
      <apiPackage>com.eliasnogueira.credit.api</apiPackage>
      <modelPackage>com.eliasnogueira.credit.model</modelPackage>
      <generatorName>java</generatorName>
      <generateApiTests>>false</generateApiTests>
      <generateModelTests>>false</generateModelTests>
      <configOptions>
        <library>rest-assured</library>
        <serializationLibrary>jackson</serializationLibrary>
      </configOptions>
    </configuration>
  </execution>
</executions>
```

# generate the Client API

```
<executions>
  <execution>
    <id>
      <goals>
        <goal>generate</goal>
      </goals>
      <phase>generate-sources</phase>
      <configuration>
        <inputSpec>
          ${project.build.directory}/openapiSpecs/credit-api.yaml
        </inputSpec>
        <invokerPackage>com.eliasnogueira.credit.invoker</invokerPackage>
        <apiPackage>com.eliasnogueira.credit.api</apiPackage>
        <modelPackage>com.eliasnogueira.credit.model</modelPackage>
        <generatorName>java</generatorName>
        <generateApiTests>false</generateApiTests>
        <generateModelTests>false</generateModelTests>
        <configOptions>
          <library>rest-assured</library>
          <serializationLibrary>jackson</serializationLibrary>
        </configOptions>
      </configuration>
    </execution>
  </executions>
```

goal to generate the code

# generate the Client API

```
<executions>
  <execution>
    <id>generate-sources</id>
    <goals>
      <goal>com.eliasnogueira.credit.api:generate-sources</goal>
    </goals>
    <phase>generate-sources</phase>
    <configuration>
      <inputSpec>
        ${project.build.directory}/openapiSpecs/credit-api.yaml
      </inputSpec>
      <invokerPackage>com.eliasnogueira.credit.invoker</invokerPackage>
      <apiPackage>com.eliasnogueira.credit.api</apiPackage>
      <modelPackage>com.eliasnogueira.credit.model</modelPackage>
      <generatorName>java</generatorName>
      <generateApiTests>>false</generateApiTests>
      <generateModelTests>>false</generateModelTests>
      <configOptions>
        <library>rest-assured</library>
        <serializationLibrary>jackson</serializationLibrary>
      </configOptions>
    </configuration>
  </execution>
</executions>
```

Maven Lifecycle phase that will trigger the execution

# generate the Client API

```
<executions>
  <execution>
    <id>generate-client-api-code</id>
    <goals>
      <goal>generate</goal>
    </goals>
    <phase>generate-sources</phase>
    <configuration>
      <inputSpec>
        ${project.build.directory}/openapiSpecs/credit-api.yaml
      </inputSpec>
      <invokerPackage>com.eliasnogueira.credit.invoker</invokerPackage>
      <apiPackage>com.eliasnogueira.credit.api</apiPackage>
      <modelPackage>com.eliasnogueira.credit.model</modelPackage>
      <generatorName>java</generatorName>
      <generateApiTests>false</generateApiTests>
      <generateModelTests>false</generateModelTests>
      <configOptions>
        <library>rest-assured</library>
        <serializationLibrary>jackson</serializationLibrary>
      </configOptions>
    </configuration>
  </execution>
</executions>
```

Open API spec file location

# generate the Client API

```
<executions>
  <execution>
    <id>generate-client-api-code</id>
    <goals>
      <goal>generate</goal>
    </goals>
    <phase>generate-sources</phase>
    <configuration>
      <inputSpec>
        ${project.builtInProcess}
      </inputSpec>
      <invokerPackage>com.eliasnogueira.credit.invoker</invokerPackage>
      <apiPackage>com.eliasnogueira.credit.api</apiPackage>
      <modelPackage>com.eliasnogueira.credit.model</modelPackage>
      <generatorName>java</generatorName>
      <generateApiTests>false</generateApiTests>
      <generateModelTests>false</generateModelTests>
      <configOptions>
        <library>rest-assured</library>
        <serializationLibrary>jackson</serializationLibrary>
      </configOptions>
    </configuration>
  </execution>
</executions>
```

the package used for the generated invoker (common) objects

# generate the Client API

```
<executions>
  <execution>
    <id>generate-client-api-code</id>
    <goals>
      <goal>generate</goal>
    </goals>
    <phase>generate-sources</phase>
    <configuration>
      <inputSpec>
        ${project.buil
      </inputSpec>
      <invokerPackage>com.eliasnogueira.credit.invoker</invokerPackage>
      <apiPackage>com.eliasnogueira.credit.api</apiPackage>
      <modelPackage>com.eliasnogueira.credit.model</modelPackage>
      <generatorName>java</generatorName>
      <generateApiTests>false</generateApiTests>
      <generateModelTests>false</generateModelTests>
      <configOptions>
        <library>rest-assured</library>
        <serializationLibrary>jackson</serializationLibrary>
      </configOptions>
    </configuration>
  </execution>
</executions>
```

the package used for the generated client api

# generate the Client API

```
<executions>
  <execution>
    <id>generate-client-api-code</id>
    <goals>
      <goal>generate</goal>
    </goals>
    <phase>generate-sources</phase>
    <configuration>
      <inputSpec>
        ${project.build.directory}/api.yaml
      </inputSpec>
      <invokerPackage>com.eliasnogueira.credit.api</invokerPackage>
      <apiPackage>com.eliasnogueira.credit.api</apiPackage>
      <modelPackage>com.eliasnogueira.credit.model</modelPackage>
      <generatorName>java</generatorName>
      <generateApiTests>false</generateApiTests>
      <generateModelTests>false</generateModelTests>
      <configOptions>
        <library>rest-assured</library>
        <serializationLibrary>jackson</serializationLibrary>
      </configOptions>
    </configuration>
  </execution>
</executions>
```

the package used for the generated models

# generate the Client API

```
<executions>
  <execution>
    <id>generate-client-api-code</id>
    <goals>
      <goal>generate</goal>
    </goals>
    <phase>generate-sources</phase>
    <configuration>
      <inputSpec>
        ${project.build.directory}/openapiSpecs/credit-api.yaml
      </inputSpec>
      <invokerPackage>com.eliasnogueira.credit.invoker</invokerPackage>
      <apiPackage>com.eliasnogueira.credit</apiPackage>
      <modelPackage>com.eliasnogueira.credit.model</modelPackage>
      <generatorName>java</generatorName>
      <generateApiTests>false</generateApiTests>
      <generateModelTests>false</generateModelTests>
      <configOptions>
        <library>rest-assured</library>
        <serializationLibrary>jackson</serializationLibrary>
      </configOptions>
    </configuration>
  </execution>
</executions>
```

other configurations



# generate the Client API

```
<executions>
  <execution>
    <id>generate-client-api-code</id>
    <goals>
      <goal>generate</goal>
    </goals>
    <phase>generate-sources</phase>
    <configuration>
      <inputSpec>
        ${project.build.directory}/openapiSpecs/credit-api.yaml
      </inputSpec>
      <invokerPackage>com.eliasnogueira.credit.invoker</invokerPackage>
      <apiPackage>com.eliasnogueira.credit.api</apiPackage>
      <modelPackage>com.eliasnogueira.credit.model</modelPackage>
      <generatorName>java</generatorName>
      <generateApi>true</generateApi>
      <generateModels>true</generateModels>
      <configOptions>
        <library>rest-assured</library>
        <serializationLibrary>jackson</serializationLibrary>
      </configOptions>
    </configuration>
  </execution>
</executions>
```

library used in the client api

# generate the Client API

```
<executions>
  <execution>
    <id>generate-client-api-code</id>
    <goals>
      <goal>generate</goal>
    </goals>
    <phase>generate-sources</phase>
    <configuration>
      <inputSpec>
        ${project.build.directory}/openapiSpecs/credit-api.yaml
      </inputSpec>
      <invokerPackage>com.eliasnogueira.credit.invoker</invokerPackage>
      <apiPackage>com.eliasnogueira.credit.api</apiPackage>
      <modelPackage>com.eliasnogueira.credit.model</modelPackage>
      <generatorName>java</generatorName>
      <generateApiTests>false</generateApiTests>
      <generateModelTests>false</generateModelTests>
      <configOptions>
        <library>rest-assured</library>
        <serializationLibrary>jackson</serializationLibrary>
      </configOptions>
    </configuration>
  </execution>
</executions>
```

serialization library

# [Lab] OpenAPI Generator

Please, access **6. OpenAPI Generator -> Lab 2** and follow its steps for the item 1.

# architecture

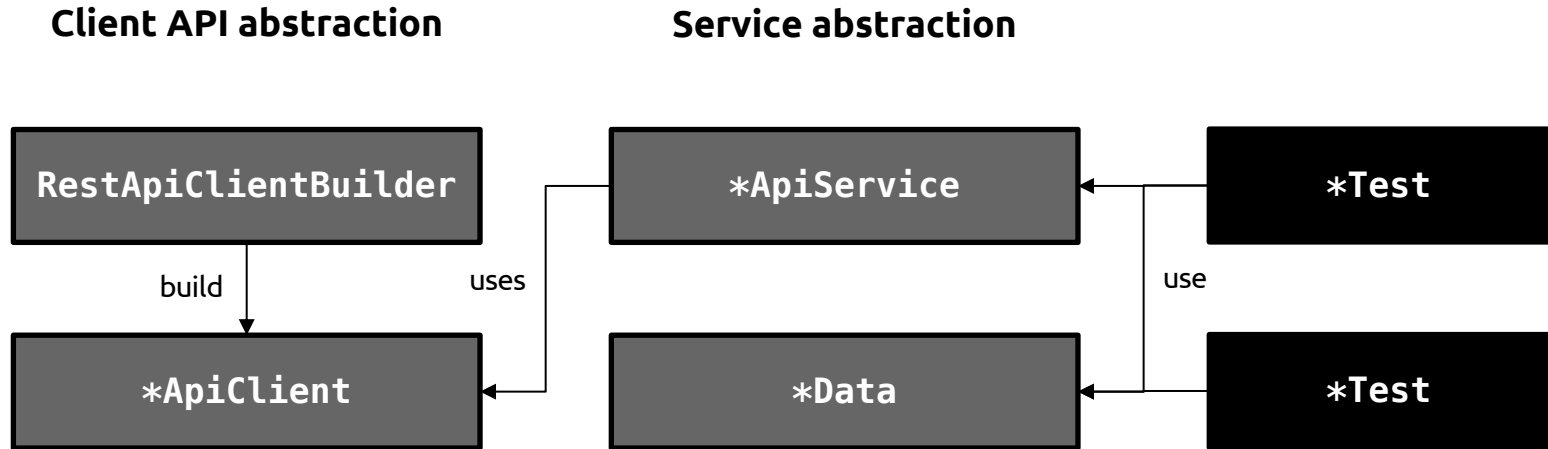
Using the raw features of REST Assured for test creation might not scale as we need to solve possible duplication along its creation.

The changes in the API spec will also influence, increasing the code maintainability.

Thankfully, using abstractions and design patterns we can easily solve these problems.

# architecture

## Proposed architecture



# architecture

## RestApiClientBuilder

Each Client API generated by the OpenAPI Generator will carry the full path to the related HTTP request.

SimulationsApi.java

```
public static class DeleteUsingDELETE0per implements Oper {  
  
    public static final Method REQ_METHOD = DELETE;  
    public static final String REQ_URI = "/api/v1/simulations/{cpf}";  
  
    // code ignored
```

# architecture

## RestApiClientBuilder

The main necessity of this class is to add, to all requests, the **baseUri**, and the port. The **basePath** is not necessary as the generated client already has it.

```
public class RestApiClientBuilder {  
  
    public <T> T build(Function<Supplier<RequestSpecBuilder>, T> clientCreator) {  
        Supplier<RequestSpecBuilder> requestSpecBuilderSupplier = () -> new RequestSpecBuilder()  
            .addRequestSpecification(  
                new RequestSpecBuilder()  
                    .setBaseUri("http://localhost")  
                    .setPort(8088)  
                    .build());  
  
        return clientCreator.apply(requestSpecBuilderSupplier);  
    }  
}
```

# [Lab] OpenAPI Generator

Please, access **7. Better architecture -> Lab 1** and follow its steps for the item 1.



**architecture**

# architecture

## **\*ApiClient**

This will abstract the current Client API class generated by the OpenAPI Generator, based on REST Assured, and will use the **RestClientApiBuilder** to add the common request specification.

The generated Client Api class adds an inner class per HTTP request matching the OpenAPI spec.

# architecture

```
public class RestrictionsApi {  
  
    public static RestrictionsApi restrictions(Supplier<RequestSpecBuilder> reqSpecSupplier) {  
        return new RestrictionsApi(reqSpecSupplier);  
    }  
  
    public OneUsingGET0per oneUsingGET() {  
        return new OneUsingGET0per(createReqSpec());  
    }  
}
```

# architecture

```
public class RestrictionsApi {
```

Will be used by the **RestClientApiBuilder**  
to build the Client Api

```
    public static RestrictionsApi restrictions(Supplier<RequestSpecBuilder> reqSpecSupplier) {  
        return new RestrictionsApi(reqSpecSupplier);  
    }
```

```
    public OneUsingGET0per oneUsingGET() {  
        return new OneUsingGET0per(createReqSpec());  
    }  
}
```

# architecture

```
public class RestrictionsApi {
```

```
pub  
}
```

Inner class with the HTTP method,  
**basePath** and requests specifics (params)

```
er<RequestSpecBuilder> reqSpecSupplier) {
```

```
public OneUsingGET0per oneUsingGET() {  
    return new OneUsingGET0per(createReqSpec());  
}
```

```
}
```

# architecture

```
public static class OneUsingGET0per implements Oper {  
  
    public static final Method REQ_METHOD = GET;  
    public static final String REQ_URI = "/api/v1/restrictions/{cpf}";  
  
    @Override  
    public <T> T execute(Function<Response, T> handler) {  
        // magic  
    }  
  
    public static final String CPF_PATH = "cpf";  
  
    public OneUsingGET0per cpfPath(Object cpf) {  
        reqSpec.addPathParam(CPF_PATH, cpf);  
        return this;  
    }  
}
```

# architecture

```
public static class OneUsingGETOper implements Oper {  
  
    public static final Method REQ_METHOD = GET;  
    public static final String REQ_URI = "/api/v1/restrictions/{cpf}";  
  
    @Override  
    public <T> T execute(  
        // magic  
    )  
  
    public static final String CPF_PATH = "cpf";  
  
    public OneUsingGETOper cpfPath(Object cpf) {  
        reqSpec.addPathParam(CPF_PATH, cpf);  
        return this;  
    }  
  
}
```

HTTP method and baseUri

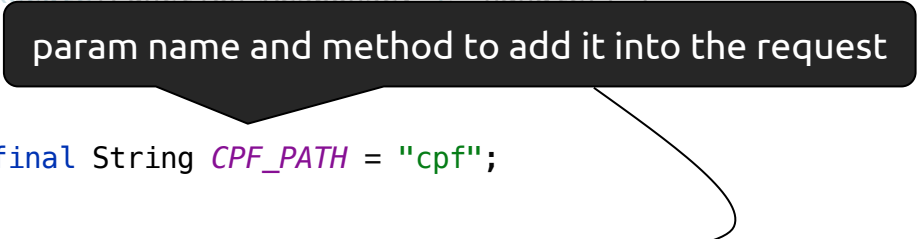
# architecture

```
public static class OneUsingGETOper implements Oper {  
    public static final Method reqMethod = GET;  
    public static final String reqUri = "https://api.br.com/api/usuarios/{cpf}";  
    @Override  
    public <T> T execute(Function<Response, T> handler) {  
        // magic  
    }  
  
    public static final String CPF_PATH = "cpf";  
  
    public OneUsingGETOper cpfPath(Object cpf) {  
        reqSpec.addPathParam(CPF_PATH, cpf);  
        return this;  
    }  
}
```



# architecture

```
public static class OneUsingGETOper implements Oper {  
  
    public static final Method REQ_METHOD = GET;  
    public static final String REQ_URI = "/api/v1/restrictions/{cpf}";  
  
    @Override  
    public <T> T execute(Function<Response, T> handler) {  
        // magic  
    }  
  
    public static final String CPF_PATH = "cpf";  
  
    public OneUsingGETOper cpfPath(Object cpf) {  
        reqSpec.addPathParam(CPF_PATH, cpf);  
        return this;  
    }  
}
```



A black callout box with rounded corners contains the text "param name and method to add it into the request". A line extends from the bottom of this box, ending in an arrow that points to the `CPF_PATH` parameter in the `cpfPath` method of the `OneUsingGETOper` class.

# architecture

## **\*ApiClient Creation**

We need to use the RestApiClientBuilder to build the Client Api instance to add the URL and port.

Then we add a method per HTTP request. This is a recommended approach to ease any change (even to a different library).

# architecture

build of the Client Api using  
the RestApiClientBuilder

```
public class RestrictionsApiClient {  
    private RestrictionsApi restrictionsApi =  
        new RestApiClientBuilder().build(RestrictionsApi::restrictions);  
  
    public Response queryCpf(String cpf) {  
        return restrictionsApi.oneUsingGET().cpfPath(cpf).execute(Function.identity());  
    }  
}
```

# architecture

abstracting the internal (ugly) Client Api usage

- returning a generic response
- adding a meaningful name
- adding the path parameter as the method parameter

```
public class RestrictionsApi {  
    private RestrictionsApi(RestrictionsApi restrictions);  
  
    public Response queryCpf(String cpf) {  
        return restrictionsApi.oneUsingGET().cpfPath(cpf).execute(Function.identity());  
    }  
}
```

# architecture

```
public class RestrictionsApiClient {  
    private RestrictionsApi  
        new RestApiClient(restrictions);  
  
    public Response queryCpf(String cpf) {  
        return restrictionsApi.oneUsingGET().cpfPath(cpf).execute(Function.identity());  
    }  
}
```

using the auto-generated  
internal Client Api method

# architecture

```
public class RestrictionsApiClient {  
    private RestrictionsApi restrictionsApi =  
        new RestApiClientBuilder().build(RestrictionsApi::restrictions);  
  
    public Response queryCpf(String cpf) {  
        return restrictionsApi.oneUsingGET().cpfPath(cpf).execute(Function.identity());  
    }  
}
```

using the path parameter

# [Lab] OpenAPI Generator

Please, access **7. Better architecture -> Lab 1** and follow its steps for the item 2.

# architecture

## **\*ApiService**

The \*ApiService abstraction will use the \*ApiClient abstraction to consume its methods in different ways. This is the class we will use in the tests.

The service can have one or multiple actions from the \*ApiClient and it can be related to the Mediator design pattern, as it encapsulates how a set of objects (methods) interact.



# architecture

## **\*ApiService - Example**

We do have two test for the Restrictions API:

- Expecting a restriction
- Not expecting a restriction

We will create the request for both, returning the correct response, in the service abstraction.

# architecture

```
public class RestrictionsApiService {  
  
    private RestrictionsApiClient restrictionsApiClient = new RestrictionsApiClient();  
  
    /**  
     * Query CPF without a restriction  
     */  
    public boolean queryCpf(String cpf) {  
        restrictionsApiClient.queryCpf(cpf).then().statusCode(HttpStatus.SC_NOT_FOUND);  
        return true;  
    }  
  
    public MessageV1 queryCpfWithRestriction(String cpf) {  
        return restrictionsApiClient.queryCpf(cpf).then().  
            statusCode(HttpStatus.SC_OK).extract().as(MessageV1.class);  
    }  
  
}
```

# architecture

```
public class RestrictionsApiService {  
  
    private RestrictionsApiClient restrictionsApiClient = new RestrictionsApiClient();  
  
    /**  
     * Query CPF without a restriction  
     */  
    public boolean queryCpf(String cpf) {  
        restrictionsApiClient.queryCpf(cpf).then().statusCode(HttpStatus.SC_NOT_FOUND);  
        return true;  
    }  
  
    public MessageV1 queryCpfWithRestriction(String cpf) {  
        return restrictionsApiClient.queryCpf(cpf).then().  
            statusCode(HttpStatus.SC_OK).extract().as(MessageV1.class);  
    }  
}
```



instance of the abstracted Client Api

# architecture

```
public class RestrictionsApiService {  
  
    private RestrictionsApiClient restrictionsApiClient = new RestrictionsApiClient();  
  
    /**  
     * Query CPF expecting no restriction  
     */  
    public boolean queryCpf(String cpf) {  
        restrictionsApiClient.queryCpf(cpf).then().statusCode(HttpStatus.SC_NOT_FOUND);  
        return true;  
    }  
  
    public MessageV1 queryCpfWithRestriction(String cpf) {  
        return restrictionsApiClient.queryCpf(cpf).then().  
            statusCode(HttpStatus.SC_OK).extract().as(MessageV1.class);  
    }  
}
```

# architecture

```
public class RestrictionsApiService {  
  
    private RestrictionsApiClient restrictionsApiClient = new RestrictionsApiClient();  
  
    /**  
     * Query CPF without a restriction  
     */  
    public boolean queryCpf(String cpf) {  
        restrictionsApiClient.queryCpf(cpf).then().statusCode(HttpStatus.SC_NOT_FOUND);  
        return true;  
    }  
  
    public boolean queryCpf(String cpf) {  
        restrictionsApiClient.queryCpf(cpf).then().statusCode(HttpStatus.SC_OK).extract().as(MessageV1.class);  
    }  
}
```

returning true because the status code is an HTTP 404

so, we can add an assertions in the test

# architecture

```
public class RestrictionsApiService {  
  
    private RestrictionsApiClient restrictionsApiClient = new RestrictionsApiClient();  
  
    /**  
     * Query CPF without a restriction  
     */  
    public boolean queryCpf(String cpf) {  
        restrictionsApiClient.queryCpf(cpf).then().statusCode(HttpStatus.SC_NOT_FOUND);  
        return true;  
    }  
  
    public MessageV1 queryCpfWithRestriction(String cpf) {  
        return restrictionsApiClient.queryCpf(cpf).then().  
            statusCode(HttpStatus.SC_OK).extract().as(MessageV1.class);  
    }  
}
```

method to query the cpf expecting a restriction

# architecture

```
public class RestrictionsApiService {  
  
    private RestrictionsApiClient restrictionsApiClient = new RestrictionsApiClient();  
  
    /**  
     * Query CPF without a restriction  
     */  
    public boolean queryCpf(String cpf) {  
        restrictionsApiClient.queryCpf(cpf).then().statusCode(HttpStatus.SC_NOT_FOUND);  
        return true;  
    }  
  
    public MessageV1 queryCpfWithRestriction(String cpf) {  
        return restrictionsApiClient.queryCpf(cpf).then().  
            statusCode(HttpStatus.SC_OK).extract().as(MessageV1.class);  
    }  
}
```

it returns the expected  
response body

# [Lab] OpenAPI Generator

Please, access **7. Better architecture -> Lab 1** and follow its steps for the item 3.



# architecture

## Test

Now the tests will be created using only the Service class.

The different is that we don't need to use the raw REST Assured methods anymore, relying only in the Service.

The structure of precondition, action and assert will be always present in the new way to create tests.

# architecture

## Raw REST Assured Test

```
@Test
void shouldReturnRestriction() {
    given()
        .spec(SharedRequestSpecs.cpfPathParameter("62648716050"))
    .when()
        .get("/restrictions/{cpf}")
    .then()
        .statusCode(HttpStatus.SC_OK)
        .body("message", CoreMatchers.is("CPF 62648716050 has a restriction"));
}
```

# architecture

## Raw REST Assured Test

```
@Test
void shouldReturnRestriction() {
    given()
        .spec(SharedRequestSpecs.cpfPathParameter("62648716050"))
        .when()
            .get("/restrictions/{cpf}")
        .then()
            .statusCode(HttpStatus.SC_OK)
            .body("message", CoreMatchers.is("CPF 62648716050 has a restriction"));
}
```

## REST Assured Test using Client – Service abstraction

```
@Test
void shouldReturnRestriction() {
    RestrictionsApiService restrictionsApiService = new RestrictionsApiService();

    MessageV1 message = restrictionsApiService.queryCpfWithRestriction("60094146012");

    Assertions.assertThat(message.getMessage()).contains("60094146012");
}
```

# architecture

## Test

The usage of the service abstraction add more readability and help us to decrease the maintainability as we will have only one place to change it behaviour (client or service).

```
@Test
void shouldReturnRestriction() {
    RestrictionsApiService restrictionsApiService = new RestrictionsApiService();

    MessageV1 message = restrictionsApiService.queryCpfWithRestriction("60094146012");

    Assertions.assertThat(message.getMessage()).contains("60094146012");
}
```

# architecture

```
@Test
void shouldReturnRestriction() {
    RestrictionsApiService restrictionsApiService = new RestrictionsApiService();
    MessageV1 message = restrictionsApiService.queryCpfWithRestriction("60094146012");
    Assertions.assertThat(message.getMessage()).contains("60094146012");
}
```

# architecture

@Test

void shouldReturnRestricti

instance to use the Service abstraction

```
RestrictionsApiService restrictionsApiService = new RestrictionsApiService();
```

```
MessageV1 message = restrictionsApiService.queryCpfWithRestriction("60094146012");
```

```
Assertions.assertThat(message.getMessage()).contains("60094146012");
```

```
}
```

# architecture

```
@Test
void shouldReturnRestriction() {
    RestrictionsApiService restrictionsApiService = ...
    MessageV1 message = restrictionsApiService.queryCpfWithRestriction("60094146012");
    Assertions.assertThat(message.getMessage()).contains("60094146012");
}
```

usage of the method in the service

# architecture

```
@Test
void shouldReturnRestriction() {
    RestrictionsApiService restrictionsApiService = new RestrictionsApiService();
    MessageV1 message = restrictionsApiService.queryCpfWithRestriction("60094146012");
    Assertions.assertThat(message.getMessage()).contains("60094146012");
}
```

associating the correct return (response body)



# architecture

```
@Test
void shouldReturnRestriction() {
    RestrictionsApiService restrictionsApiService();
    MessageV1 message = restrictionsApiService.queryCpiWithRestriction("60094146012");
    Assertions.assertThat(message.getMessage()).contains("60094146012");
}
```

assertion using the response body object

# [Lab] OpenAPI Generator

Please, access **7. Better architecture -> Lab 2** and follow its steps for the item 1 and 2.

# architecture

## **BaseApiConfiguration**

Within the new approach, the general configuration is now being applied using the **RestClientApiBuilder** class, as it created a common request specification for all the requests.

We can either move the previous configurations from the **BaseApiConfiguration** class to the **RestClientApiBuilder** or continue to use the **BaseApiConfiguration** without the **baseUri**, **basePath**, and **port**.

# architecture

## **Recommendation**

A better approach is to use the `RestClientApiBuilder` to deal only with the global request actions and the `BaseApiConfiguration` with the configurations related to the test.

Both classes do different things, and they must have a single responsibility.

# [Lab] OpenAPI Generator

Please, access **7. Better architecture -> Lab 2** and follow its steps for the item 3.

**data**

# architecture

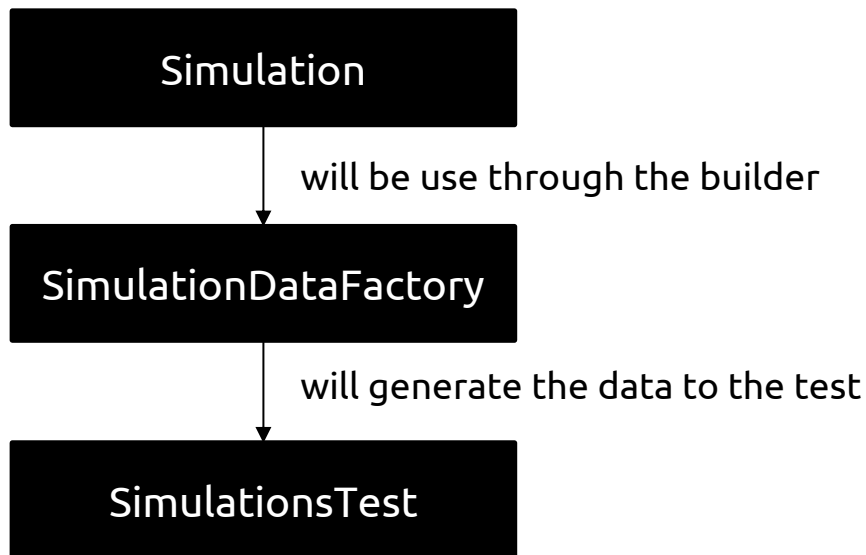
Data is one of the most painful aspects of testing, if not done correctly!

We can use it in different ways... some can be hard-coded, but some must have a meaning, as it can influence the test result.

We will apply a combination of some patterns to create a new one for the data perspective(!!!)

# architecture

Basically, we need a Model which with the Builder ability that will be used by a generator class used by the tests to generate data.





# architecture

## **Factory class**

The idea is to have a Factory class implementation (or sort of) to generate data from different requirements.

# architecture

```
public final class SimulationDataFactory {  
    private SimulationDataFactory() {}  
  
    public static Simulation validSimulation() {  
        return Simulation.builder().  
            cpf("0987654321").name("Robert").email("robert@gmail.com").  
            amount(new BigDecimal("2.000")).  
            installments(5).insurance(false).build();  
    }  
  
    public static Simulation notValidEmail() {  
        return Simulation.builder().  
            cpf("95746263958").name("Lucas").email("not-valid-email").  
            amount(new BigDecimal("10.000")).  
            installments(7).insurance(true).build();  
    }  
}
```

# architecture

```
public final class SimulationDataFactory {  
    // ...  
    public Simulation buildSimulation() {  
        return Simulation.builder().  
            cpf("0987654321").name("Robert").email("robert@gmail.com").  
            amount(new BigDecimal("2.000")).  
            installments(5).insurance(false).build();  
    }  
  
    public static Simulation notValidEmail() {  
        return Simulation.builder().  
            cpf("95746263958").name("Lucas").email("not-valid-email").  
            amount(new BigDecimal("10.000")).  
            installments(7).insurance(true).build();  
    }  
}
```

class cannot be extended

# architecture

```
public final class SimulationDataFactory {  
    private SimulationDataFactory() {}  
  
    public static SimulationDataFactory getInstance() {  
        return new SimulationDataFactory().email("robert@gmail.com").  
            amount(new BigDecimal("2.000")).  
            installments(5).insurance(false).build();  
    }  
  
    public static Simulation notValidEmail() {  
        return Simulation.builder().  
            cpf("95746263958").name("Lucas").email("not-valid-email").  
            amount(new BigDecimal("10.000")).  
            installments(7).insurance(true).build();  
    }  
}
```

restrict the object creation

# architecture

creation of a valid simulation using  
the Builder from the Simulation class

```
public final class Simulation {  
    private Simulation() {}  
  
    public static Simulation validSimulation() {  
        return Simulation.builder().  
            cpf("0987654321").name("Robert").email("robert@gmail.com").  
            amount(new BigDecimal("2.000")).  
            installments(5).insurance(false).build();  
    }  
  
    public static Simulation notValidEmail() {  
        return Simulation.builder().  
            cpf("95746263958").name("Lucas").email("not-valid-email").  
            amount(new BigDecimal("10.000")).  
            installments(7).insurance(true).build();  
    }  
}
```

# architecture

```
public final class SimulationDataFactory {  
    private SimulationDataFactory() {}  
  
    public static Simulation validSimulation() {  
        return Simulation.builder().  
            cpf("0987654321").name("Robert").email("robert@gmail.com").  
            amount(new BigDecimal("10.000")).installments(12).insurance(true).build();  
    }  
  
    public static Simulation notValidEmail() {  
        return Simulation.builder().  
            cpf("95746263958").name("Lucas").email("not-valid-email").  
            amount(new BigDecimal("10.000")).installments(7).insurance(true).build();  
    }  
}
```

creation of an invalid valid simulation

# architecture

## Approach

The previous approach is not the best one for data generation, as we still have hard-coded data that might show a false-positive error.

We must have a way to generate different data during each call from the methods, and for this, we can use the DataFaker library.

# architecture

```
public final class SimulationDataFactory {  
  
    private static Faker faker = new Faker();  
  
    private SimulationDataFactory() {}  
  
    public static Simulation validSimulation() {  
  
        return Simulation.builder().  
            cpf(faker.number().digits(11)).  
            name(faker.name().fullName()).  
            email(faker.internet().emailAddress()).  
            amount(new BigDecimal(faker.number().numberBetween(100, 40000))).  
            installments(faker.number().numberBetween(2, 48)).  
            insurance(faker.bool().bool())  
            .build();  
    }  
}
```



# [Lab] Data

Please, access **8. Data -> Lab 1** and follow its steps for the item 1.

**what's next**

# what's next

You have the Extra section to exercise (here or at home!)

Thank you for your time and don't hesitate giving any feedback about this session!