SEW

IT-Medientechnik

NVS

Informatik

RESTful Services

mit Entities

TWS

Projekt Vehicle - Server

```java
package at.htl.vehicle.rest;

import javax.ws.rs.core.Application;
import javax.ws.rs.ApplicationPath;

@ApplicationPath("/rs")
public class RestConfig extends Application {
}
```

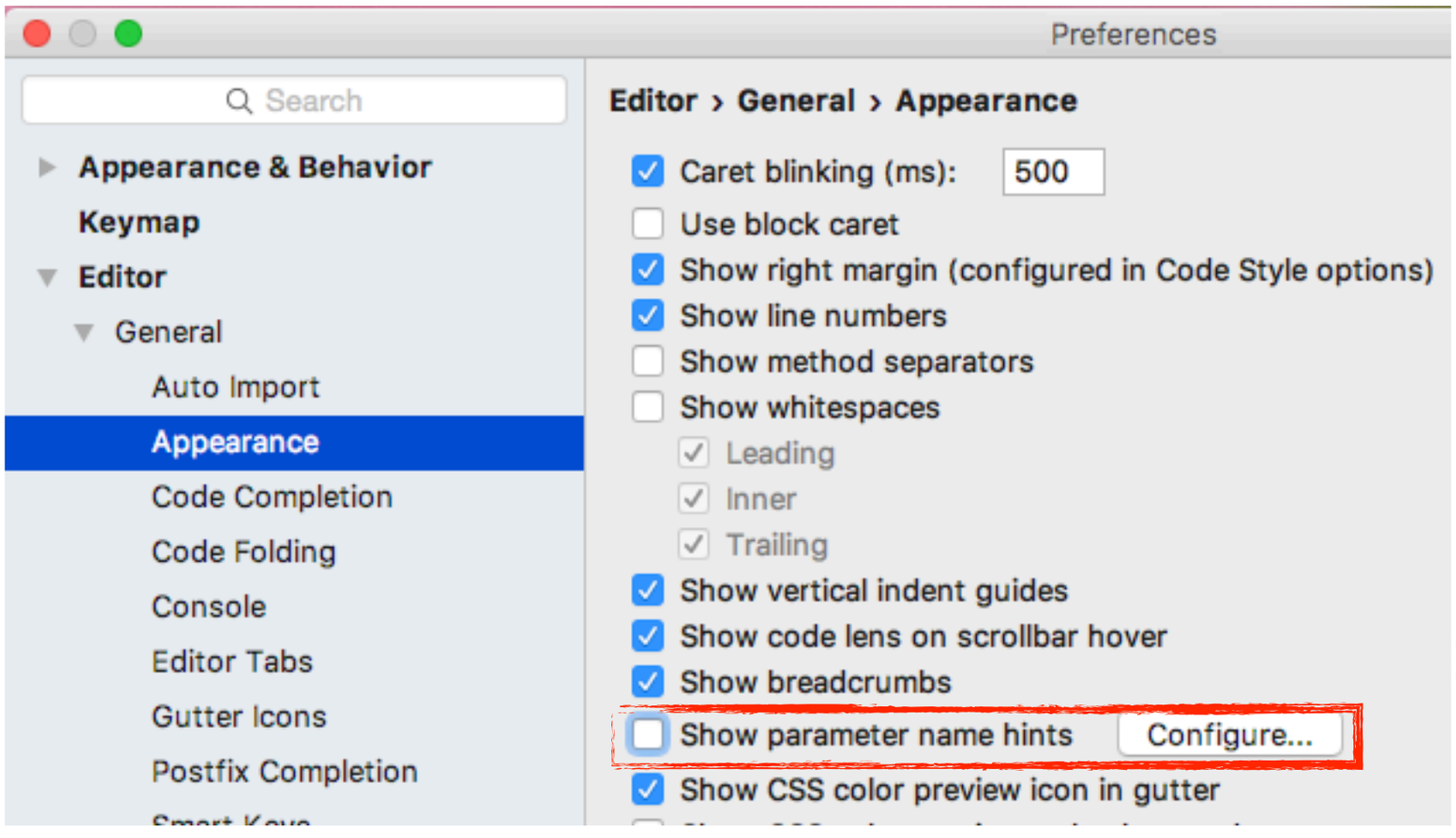
```java
package at.htl.vehicle.rest;

import at.htl.vehicle.entity.Vehicle;

import javax.ws.rs.GET;
import javax.ws.rs.Path;
import javax.ws.rs.PathParam;
import java.util.ArrayList;
import java.util.List;

@Path("vehicle")
public class VehicleEndpoint {

    @GET
    @Path("{id}")
    public Vehicle find(@PathParam("id") long id) {
        return new Vehicle("Opel " + id, "Commodore");
    }

    @GET
    public List<Vehicle> findAll() {
        List<Vehicle> all = new ArrayList<>();
        all.add(find(42));
        return all;
    }
}
```

```java
@XmlRootElement
package at.htl.vehicle.entity;

public class Vehicle {
    private String brand;
    private String type;

    public Vehicle() {}

    public Vehicle(String brand, String type) {
        this.brand = brand;
        this.type = type;
    }

    //region Getter and setter
    public String getBrand() {
        return brand;
    }

    public void setBrand(String brand) {
        this.brand = brand;
    }

    public String getType() {
        return type;
    }

    public void setType(String type) {
        this.type = type;
    }
    //endregion
}
```

Show parameter name hints

```java
@GET
@Path("{id}")
public Vehicle find(@PathParam("id") long id) {
    return new Vehicle( brand: "Opel " + id,  type: "Commodore");
}
```

Manchmal irritieren diese Hints




```java
@GET
@Path("{id}")
public Vehicle find(@PathParam("id") long id) {
    return new Vehicle("Opel " + id, "Commodore");
}
```

Testclient

File Authentication Headers View Favorite Requests Setting **RESTClient**

[-] Request

Method GET URL http://localhost:8080/vehicle/rs/vehicle/1 SEND

Body

Request Body

[-] Response

Response Headers | Response Body (Raw) | Response Body (Highlight) | Response Body (Preview)

```
Could not find MessageBodyWriter for response object of type: at.htl.vehicle.entity.Vehicle of media type: text/html
```

File Authentication Headers View Favorite Requests Setting **RESTClient**

[-] Request

Method GET URL http://localhost:8080/vehicle/rs/vehicle/1 SEND

Body

Request Body

[-] Response

Response Headers | Response Body (Raw) | Response Body (Highlight) | Response Body (Preview)

```
1.  Status Code       : 500 Internal Server Error
2.  Connection        : keep-alive
3.  Content-Length    : 116
4.  Content-Type      : text/html
5.  Date              : Sun, 13 Nov 2016 16:58:30 GMT
6.  Server            : WildFly/10
7.  X-Powered-By      : Undertow/1
```

File Authentication Headers View Favorite Requests Setting **RESTClient**

[-] Request

Method GET URL http://localhost:8080/vehicle/rs/vehicle/1 SEND

Headers

Remove All

Accept: application/json ×

Body

Request Body

[-] Response

Response Headers | Response Body (Raw) | Response Body (Highlight) | Response Body (Preview)

```
1. Status Code       : 200 OK
2. Connection        : keep-alive
3. Content-Length    : 37
4. Content-Type      : application/json
5. Date              : Sun, 13 Nov 2016 17:00:32 GMT
6. Server            : WildFly/10
7. X-Powered-By      : Undertow/1
```

File Authentication Headers View Favorite Requests Setting **RESTClient**

[-] Request

Method GET URL http://localhost:8080/vehicle/rs/vehicle/1 SEND

Headers Remove All

Accept: application/json ×

Body

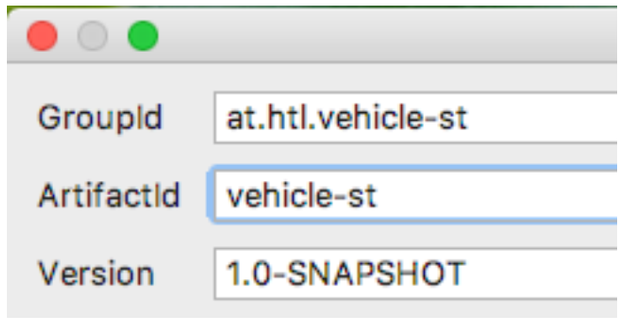
Request Body

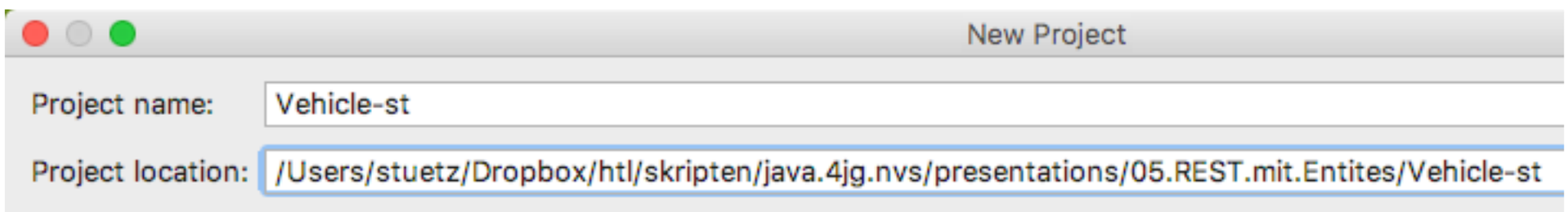
[-] Response

Response Headers | Response Body (Raw) | Response Body (Highlight) | Response Body (Preview)

{"brand":"Opel 1","type":"Commodore"}

jUnit-Client





```xml
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
         xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
    <modelVersion>4.0.0</modelVersion>

    <groupId>at.htl.vehicle-st</groupId>
    <artifactId>vehicle-st</artifactId>
    <version>1.0-SNAPSHOT</version>
    <packaging>jar</packaging>

    <properties>
        <maven.compiler.source>1.8</maven.compiler.source>
        <maven.compiler.target>1.8</maven.compiler.target>
        <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
    </properties>

    <dependencies>
        <dependency>
            <groupId>junit</groupId>
            <artifactId>junit</artifactId>
            <version>4.12</version>
            <scope>test</scope>
            <exclusions>
                <exclusion>
                    <groupId>org.hamcrest</groupId>
                    <artifactId>hamcrest-core</artifactId>
                </exclusion>
            </exclusions>
        </dependency>
        <dependency>
            <groupId>org.hamcrest</groupId>
            <artifactId>hamcrest-all</artifactId>
            <version>1.3</version>
        </dependency>
        <dependency>
            <groupId>org.glassfish.jersey.core</groupId>
            <artifactId>jersey-client</artifactId>
            <version>2.24</version>
        </dependency>
        <dependency>
            <groupId>org.glassfish.jersey.media</groupId>
            <artifactId>jersey-media-json-processing</artifactId>
            <version>2.24</version>
        </dependency>
        <dependency>
            <groupId>org.glassfish</groupId>
            <artifactId>javax.json</artifactId>
            <version>1.1.3</version>
        </dependency>
    </dependencies>

</project>
```

pom.xml

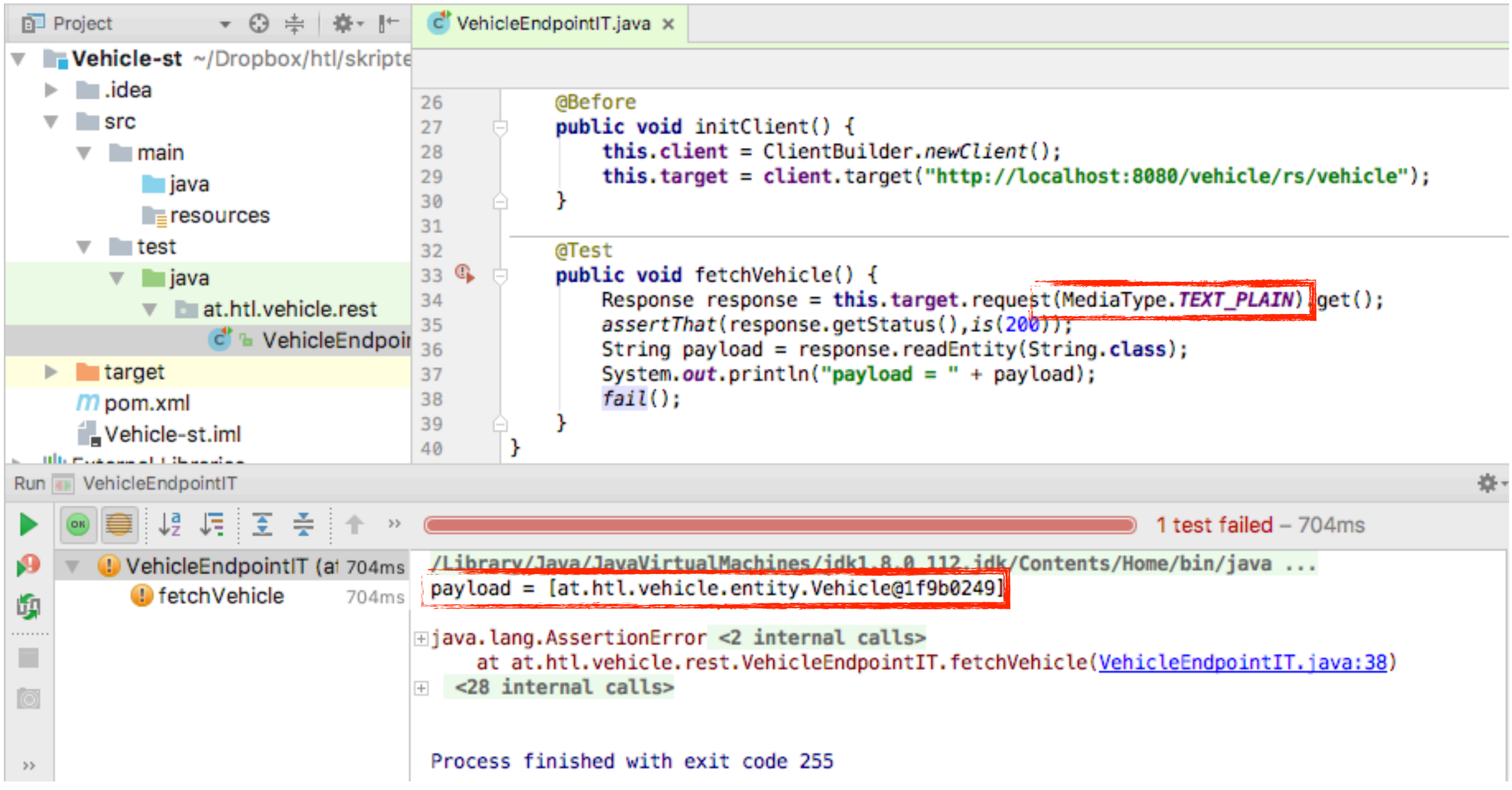
Jersey Client

mit Hamcrest als Matcher-API

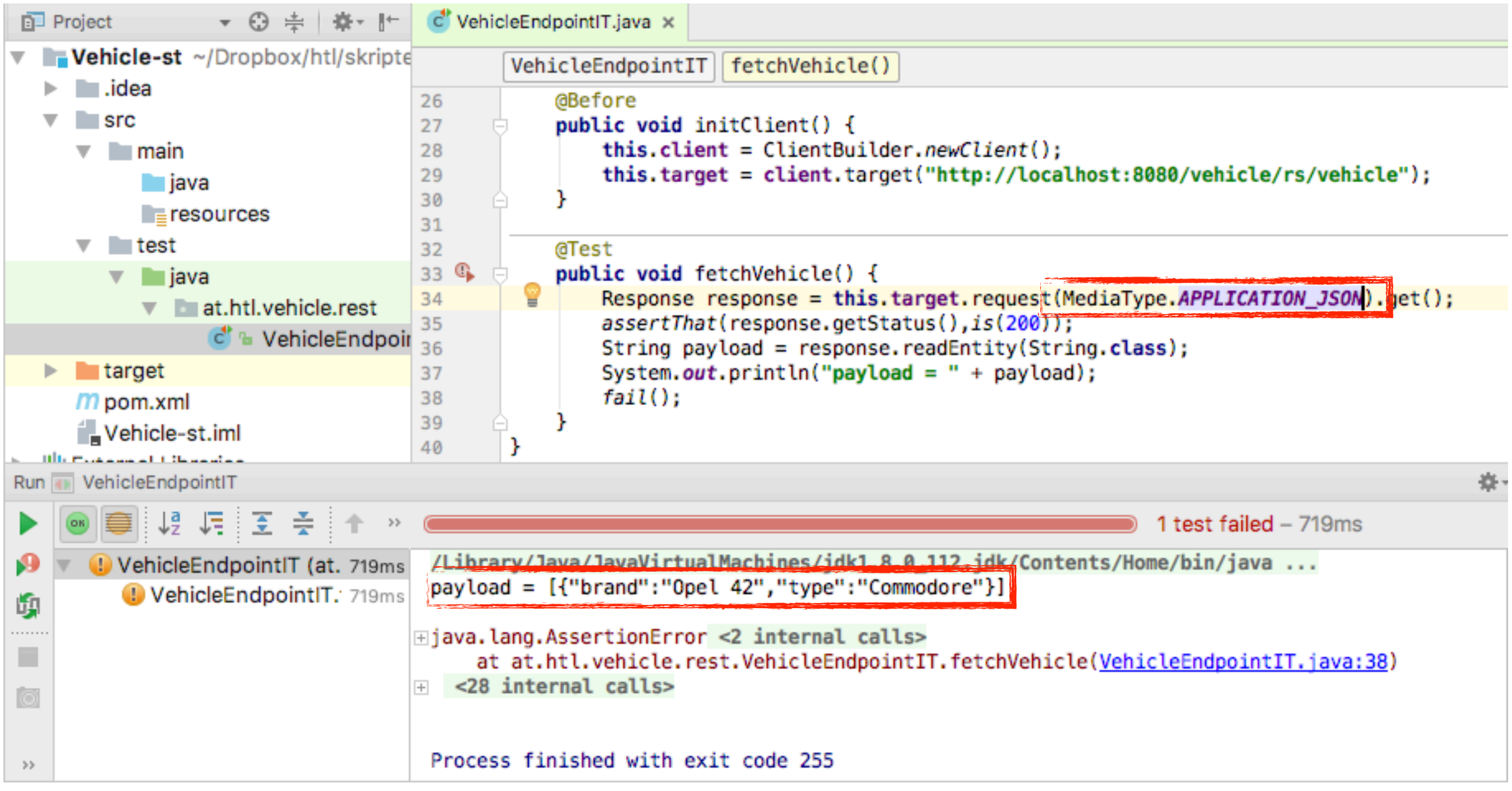
VehicleEndpointIT

```java
package at.htl.vehicle.rest;

import org.junit.Before;
import org.junit.Test;

import javax.json.JsonArray;
import javax.ws.rs.client.Client;
import javax.ws.rs.client.ClientBuilder;
import javax.ws.rs.client.WebTarget;
import javax.ws.rs.core.MediaType;
import javax.ws.rs.core.Response;

import static org.hamcrest.CoreMatchers.*;
import static org.hamcrest.MatcherAssert.assertThat;
import static org.junit.Assert.fail;


public class VehicleEndpointIT {
    private Client client;
    private WebTarget target;

    @Before
    public void initClient() {
        this.client = ClientBuilder.newClient();
        this.target = client.target("http://localhost:8080/vehicle/rs/vehicle");
    }

    @Test
    public void fetchVehicle() {
        Response response = this.target.request(MediaType.TEXT_PLAIN).get();
        assertThat(response.getStatus(),is(200));
        String payload = response.readEntity(String.class);
        System.out.println("payload = " + payload);
    }
}
```

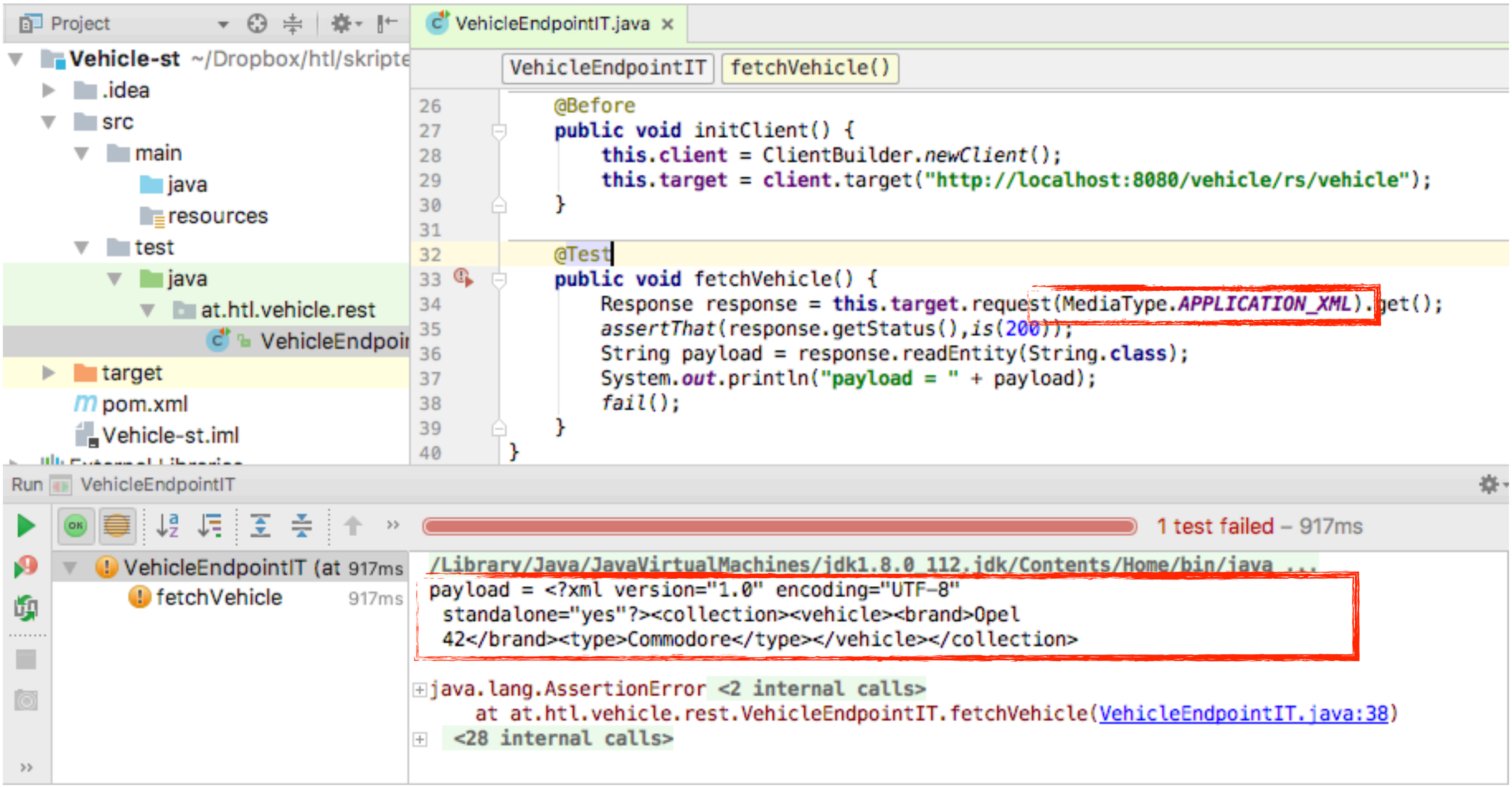
Variante 1: TEXT_PLAIN



Var. 2: APPLICATION_JSON



Var. 3: APPLICATION_XML



Testen gegen JsonObject

Project

- Vehicle-st ~/Dropbox/htl/skripte
  - .idea
  - src
    - main
      - java
      - resources
    - test
      - java
        - at.htl.vehicle.rest
          - VehicleEndpoi
  - target
  - pom.xml
  - Vehicle-st.iml
- External Libraries

VehicleEndpointIT.java

VehicleEndpointIT › fetchVehicle()

```
26      @Before
27      public void initClient() {
28          this.client = ClientBuilder.newClient();
29          this.target = client.target("http://localhost:8080/vehicle/rs/vehicle");
30      }
31
32      @Test
33      public void fetchVehicle() {
34          Response response = this.target.request(MediaType.APPLICATION_JSON).get();
35          assertThat(response.getStatus(),is(200));
36          JsonArray payload = response.readEntity(JsonArray.class);
37          System.out.println("payload = " + payload);
38
39          JsonObject vehicle = payload.getJsonObject(0);
40          assertThat(vehicle.getString("brand"), is("Opel 42"));
41          assertThat(vehicle.getString("type"), is("Commodore"));
42      }
43  }
```

Run VehicleEndpointIT

1 test passed – 732ms

VehicleEndpointIT (a 732ms

fetchVehicle 732ms

```
/Library/Java/JavaVirtualMachines/jdk1.8.0_112.jdk/Contents/Home/bin/java ...
payload = [{"brand":"Opel 42","type":"Commodore"}]

Process finished with exit code 0
```

JSON

- JSON steht für "**JavaScript Object Notation**" und definiert ein Datenformat, in dem Informationen wie Objekte, Arrays und sonstige Variablen in lesbarer Form gespeichert werden können. In den meisten Sprachen gibt es Parser, die den JSON String in eine entsprechende Variable verwandeln.
- Die Notation von JSON in Java weicht in einigen Punkten von der JavaScript-Syntax ab:
  - Alle Eigenschaftsnamen in einem Objekt müssen in doppelten Anführungszeichen notiert sein.
  - Führende Kommas in Objekten und Arrays sind verboten.
  - Bei Zahlen sind führende Nullen verboten und einem Dezimalpunkt muss mindestens eine Ziffer folgen.
  - Strings müssen durch doppelte Anführungszeichen begrenzt sein. Es darf nur ein beschränktes Set von Zeichen escaped werden. Bestimmte Kontrollzeichen sind ganz verboten.
- JSON wird häufig in Verbindung mit Ajax genutzt, um einfach Informationen zwischen dem Clienten und dem Server auszutauschen und ist eine praktische Alternative zu XML.

http://wiki.selfhtml.org/wiki/JavaScript/JSON

JSON Beispiel

JsonObject

Value

Key

Array

```
{
    "hey": "guy",
    "anumber": 243,
    "anobject": {
        "whoa": "nuts",
        "anarray": [1, 2, "thr<h1>ee"],
        "more": "stuff"
    },
    "awesome": true,
    "bogus": false,
    "meaning": null,
    "japanese": "明日がある。",
    "link": "http://jsonview.com",
    "notLink": "http://jsonview.com is great"
}
```

JSON Processing in Java

- JSON-P stellt zwei unterschiedliche JSON-APIs zur Verfügung:
  - Object Model API: wir verwenden diese API ❗
  - Streaming API: Low-Level-API, zur effizienten Verarbeitung großer JSON-Datenmengen, vergleichbar mit der StAX API für XML

https://jsonp.java.net/

Erstellen eines JSON-Objekts

```
Employee emp = createEmployee();

JsonObjectBuilder empBuilder = Json.createObjectBuilder();
JsonObjectBuilder addressBuilder = Json.createObjectBuilder();
JsonArrayBuilder phoneNumBuilder = Json.createArrayBuilder();

for (long phone : emp.getPhoneNumbers()) {
    phoneNumBuilder.add(phone);
}

addressBuilder.add("street", emp.getAddress().getStreet())
                .add("city", emp.getAddress().getCity())
                    .add("zipcode", emp.getAddress().getZipcode());

empBuilder.add("id", emp.getId())
            .add("name", emp.getName())
                .add("permanent", emp.isPermanent())
                    .add("role", emp.getRole());

empBuilder.add("phoneNumbers", phoneNumBuilder);
empBuilder.add("address", addressBuilder);

JsonObject empJsonObject = empBuilder.build();

System.out.println("Employee JSON String\n"+empJsonObject);
```

http://www.journaldev.com/2315/java-json-processing-api-example-tutorial

Zugriff auf JSON-Objekte

```
InputStream fis = new FileInputStream(JSON_FILE);

//create JsonReader object
JsonReader jsonReader = Json.createReader(fis);

//get JsonObject from JsonReader
JsonObject jsonObject = jsonReader.readObject();

//we can close IO resource and JsonReader now
jsonReader.close();
fis.close();
```

aus File in ein JsonObject

```
//Retrieve data from JsonObject and create Employee bean
Employee emp = new Employee();

emp.setId(jsonObject.getInt("id"));
emp.setName(jsonObject.getString("name"));
emp.setPermanent(jsonObject.getBoolean("permanent"));
emp.setRole(jsonObject.getString("role"));

//reading arrays from json
JsonArray jsonArray = jsonObject.getJsonArray("phoneNumbers");
long[] numbers = new long[jsonArray.size()];
int index = 0;
for(JsonValue value : jsonArray){
    numbers[index++] = Long.parseLong(value.toString());
}
emp.setPhoneNumbers(numbers);

//reading inner object from json object
JsonObject innerJsonObject = jsonObject.getJsonObject("address");
Address address = new Address();
address.setStreet(innerJsonObject.getString("street"));
address.setCity(innerJsonObject.getString("city"));
address.setZipcode(innerJsonObject.getInt("zipcode"));
emp.setAddress(address);

//print employee bean information
System.out.println(emp);
```

Zugriff auf Elemente des JsonObjects

http://www.journaldev.com/2315/java-json-processing-api-example-tutorial

CRUD

Ein einfacher Einstieg

Server - Entity

```java
package at.htl.vehicle.entity;

import javax.xml.bind.annotation.XmlRootElement;

@XmlRootElement
public class Vehicle {

    private Long id;
    private String brand;
    private String type;

    public Vehicle() {}

    public Vehicle(String brand, String type) {
        this.brand = brand;
        this.type = type;
    }

    // Getter and setter
}
```

Mit dieser Annotation kann das Objekt in XML serialisiert werden

Die Entität wird mit einem künstlichen Schlüssel ergänzt

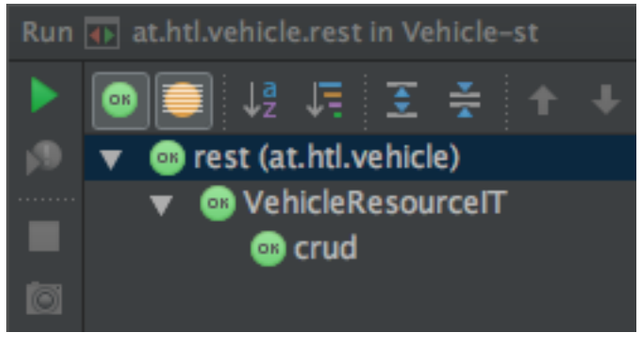
Server - Endpoint

```
@Path("vehicle")
public class VehicleEndpoint {

    @GET
    @Path("{id}")
    public Vehicle find(@PathParam("id") long id) {
        return new Vehicle("Opel " + id, "Commodore");
    }

    @GET
    public List<Vehicle> findAll() {
        List<Vehicle> all = new ArrayList<>();
        all.add(find(42));
        return all;
    }

    @DELETE
    @Path("{id}")
    public void delete(@PathParam("id") long id) {
        System.out.println("deleted = " + id);
    }

    @POST
    public void save(Vehicle vehicle) {
        System.out.println("Vehicle = " + vehicle);
    }
}
```

Client - Tests

```
public class VehicleEndpointIT {
    private Client client;
    private WebTarget target;

    @Before
    public void initClient() {
        this.client = ClientBuilder.newClient();
        this.target = client.target("http://localhost:8080/vehicle/rs/vehicle");
    }

    @Test
    public void crud() {
        Response response = this.target.request(MediaType.APPLICATION_JSON).get();
        assertThat(response.getStatus(),is(200));
        JsonArray payload = response.readEntity(JsonArray.class);
        System.out.println("payload = " + payload);
        assertThat(payload,not(empty()));

        JsonObject vehicle = payload.getJsonObject(0);
        assertThat(vehicle.getString("brand"),equalTo("Opel 42"));
        assertThat(vehicle.getString("type"), startsWith("Commodore"));

        // GET with id
        JsonObject dedicatedVehicle = this.target
                .path("43")
                .request(MediaType.APPLICATION_JSON)
                .get(JsonObject.class);
        assertThat(dedicatedVehicle.getString("brand"),containsString("43"));
        assertThat(dedicatedVehicle.getString("brand"),equalTo("Opel 43"));

        Response deleteResponse = this.target
                .path("42")
                .request(MediaType.APPLICATION_JSON)
                .delete();
        assertThat(deleteResponse.getStatus(),is(204)); // no content
    }
}
```

- Diese Tests sind nicht optimal, da mehrere Testfälle in einer Testmethode enthalten sind.
- Die einzelnen Testfälle sollten voneinander unabhängig sein



```java
package at.htl.vehicle.rest;

import org.junit.Before;
import org.junit.Test;

import javax.json.JsonArray;
import javax.json.JsonObject;
import javax.ws.rs.client.Client;
import javax.ws.rs.client.ClientBuilder;
import javax.ws.rs.client.WebTarget;
import javax.ws.rs.core.MediaType;
import javax.ws.rs.core.Response;

import static org.hamcrest.CoreMatchers.*;
import static org.hamcrest.MatcherAssert.assertThat;
import static org.hamcrest.Matchers.empty;
import static org.hamcrest.Matchers.isEmptyString;
import static org.hamcrest.core.IsNot.not;


public class VehicleEndpointIT {
    private Client client;
    private WebTarget target;

    @Before
    public void initClient() {
        this.client = ClientBuilder.newClient();
        this.target = client.target("http://localhost:8080/vehicle/rs/vehicle");
    }

    @Test
    public void crud() {
        Response response = this.target.request(MediaType.APPLICATION_JSON).get();
        assertThat(response.getStatus(),is(200));
        JsonArray allTodos = response.readEntity(JsonArray.class);
        System.out.println("payload = " + allTodos);
        assertThat(allTodos,not(empty()));

        JsonObject vehicle = allTodos.getJsonObject(0);
        assertThat(vehicle.getString("brand"),equalTo("Opel 42"));
        assertThat(vehicle.getString("type"), startsWith("Commodore"));


        // GET with id
        JsonObject dedicatedVehicle = this.target
                .path("43")
                .request(MediaType.APPLICATION_JSON)
                .get(JsonObject.class);
        assertThat(dedicatedVehicle.getString("brand"),containsString("43"));
        assertThat(dedicatedVehicle.getString("brand"),equalTo("Opel 43"));

        Response deleteResponse = this.target
                .path("42")
                .request(MediaType.APPLICATION_JSON)
                .delete();
        assertThat(deleteResponse.getStatus(),is(204)); // no content
    }
}
```