Web Service

Web service dalam sebuah aplikasi atau system berfungsi untuk menghubungkan aplikasi-aplikasi agar saling terhubung. Misalnya sebuah system terdiri dari aplikasi – aplikasi yang terdapat di beberapa server berbeda maka perlu membuat service untuk dapat menghubungkan aplikasi – aplikasi tersebut. Contohnya adalah layer backend (service producer) dan frontend (service consumer). Service consumer merupakan aplikasi yang berinteraksi dengan pengguna. Sedangkan service producer adalah aplikasi yang memberikan data kepada service consumer sesuai dengan data yang diminta. Sehingga kedua aplikasi dapat focus akan fungsi masing-masing.

Web service merupakan sebuah URL yang akan mengembalikan data dalam representasi yang telah disepakati misalnya JSON atau XML.

Membuat Service Producer

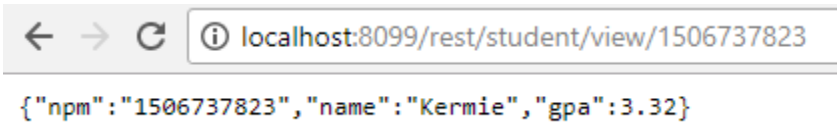
Buatlah class StudentRestController.java seperti pada gambar di bawah ini.

```
@RequestMapping("/student/view/{npm}")
public StudentModel view (@PathVariable(value = "npm") String npm) {
    StudentModel student = studentService.selectStudent (npm);
    return student;
}
```

Untuk membuat controller menggunakan REST web service pada class header perlu diberikan anotasi @RestController, bukan @Controller seperti controller biasa. @RequestMapping("/rest") pada class header tersebut artinya semua request mapping di dalam kelas tersebut harus selalu diawali dengan "/rest". Contohnya pemanggilan service view Student dengan npm 123 diakses melalui "/rest/student/view/123".

- Berbeda dengan controller Web pada biasanya yang mengembalikan String yang merepresentasikan view yang akan digunakan. Method-method di REST Controller mengembalikan objek yang ingin dikembalikan pada service tersebut.
- Spring Boot secara otomatis akan mengembalikan output berupa objek dengan format JSON pada tampilan Web.
- Beberapa object yang dapat dikembalikan misalkan model Class dan Map (key value Map)

Hasilnya adalah seperti pada gambar di bawah ini:



1. **Latihan 1**
   Buatlah service untuk mengembalikan seluruh student yang ada di basis data. Service ini mirip seperti method viewAll di Web Controller. Service tersebut di-mapping ke "/rest/student/viewall".
   Pada StudentRestController perlu ditambahkan sebuah method dengan mapping /student/viewall yang berisi pemanggilan method selectAllStudent yang ada pada kelas StudentService. Dengan

demikian method ini akan memanggil method selectAllStudent dan mengembalikan semua data student dalam bentuk objek yaitu format JSON. Methodnya dapat dilihat pada gambar di bawah ini.

```
@RequestMapping("/student/viewall")
public List<StudentModel> viewall () {
    List<StudentModel> students = studentService.selectAllStudents ();
    return students;
}
```

Contoh tampilan keluarannya yang berupa format JSON dapat dilihat pada gamabr di bawah ini:


```
[{"npm":"1506737823","name":"Kermie","gpa":3.32},{"npm":"1506737824","name":"Ellene","gpa":2.89},{"npm":"1506737825","name":"Delmer","gpa":2.58},
{"npm":"1506737826","name":"Kristian","gpa":2.33},{"npm":"1506737827","name":"Marilyn","gpa":3.49},{"npm":"1506737828","name":"Katti","gpa":3.73},
{"npm":"1506737829","name":"Titus","gpa":3.11},{"npm":"1506737830","name":"Glenden","gpa":3.38},{"npm":"1506737831","name":"Milt","gpa":3.39},
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{"npm":"1506737838","name":"Ronda","gpa":2.23},{"npm":"1506737839","name":"Corbin","gpa":3.93},{"npm":"1506737840","name":"Jeanie","gpa":2.5},
{"npm":"1506737841","name":"Berri","gpa":3.9},{"npm":"1506737842","name":"Lesley","gpa":3.0},{"npm":"1506737843","name":"Flss","gpa":3.72},
{"npm":"1506737844","name":"Merell","gpa":3.15},{"npm":"1506737845","name":"Ibbie","gpa":3.45},{"npm":"1506737846","name":"Tony","gpa":2.69},
{"npm":"1506737847","name":"Klarika","gpa":2.83},{"npm":"1506737848","name":"Brewster","gpa":2.62},{"npm":"1506737849","name":"Zacherie","gpa":3.12},
{"npm":"1506737850","name":"Betsey","gpa":2.24},{"npm":"1506737851","name":"Avery","gpa":3.38},{"npm":"1506737852","name":"Gill","gpa":3.12},
{"npm":"1506737853","name":"Stephan","gpa":3.62},{"npm":"1506737854","name":"Viole","gpa":3.91},{"npm":"1506737855","name":"Caryl","gpa":3.83},
{"npm":"1506737856","name":"Nettie","gpa":2.52},{"npm":"1506737857","name":"Emyle","gpa":3.69},{"npm":"1506737858","name":"Bird","gpa":3.15},
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{"npm":"1506737862","name":"Marris","gpa":2.14},{"npm":"1506737863","name":"Sheba","gpa":2.41},{"npm":"1506737864","name":"Marcelline","gpa":3.67},
{"npm":"1506737865","name":"Aubrey","gpa":2.22},{"npm":"1506737866","name":"Bliss","gpa":2.7},{"npm":"1506737867","name":"Merry","gpa":2.32},
{"npm":"1506737868","name":"Portia","gpa":2.56},{"npm":"1506737869","name":"Jewel","gpa":2.35},{"npm":"1506737870","name":"Andris","gpa":3.38},
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{"npm":"1506737886","name":"Zachary","gpa":2.71},{"npm":"1506737887","name":"Oneida","gpa":3.12},{"npm":"1506737888","name":"Dietrich","gpa":2.72},
{"npm":"1506737889","name":"Brucie","gpa":2.1},{"npm":"1506737890","name":"Lucho","gpa":3.27},{"npm":"1506737891","name":"Giorgia","gpa":2.05},
{"npm":"1506737892","name":"Taber","gpa":3.61},{"npm":"1506737893","name":"Carlen","gpa":2.81},{"npm":"1506737894","name":"Bell","gpa":2.58},
{"npm":"1506737895","name":"Nataniel","gpa":2.21},{"npm":"1506737896","name":"Dannie","gpa":3.43},{"npm":"1506737897","name":"Cassandry","gpa":2.74},
{"npm":"1506737898","name":"Madeline","gpa":3.72},{"npm":"1506737899","name":"Linoel","gpa":3.34},{"npm":"1506737900","name":"Cori","gpa":2.39},
{"npm":"1506737901","name":"Bailie","gpa":2.79},{"npm":"1506737902","name":"Suzy","gpa":3.85},{"npm":"1506737903","name":"Mervin","gpa":3.06},
{"npm":"1506737904","name":"Gannie","gpa":2.93},{"npm":"1506737905","name":"Alla","gpa":3.95},{"npm":"1506737906","name":"Rutter","gpa":2.43},
{"npm":"1506737907","name":"Mela","gpa":3.4},{"npm":"1506737908","name":"Conrado","gpa":3.78},{"npm":"1506737909","name":"Isabella","gpa":2.77},
{"npm":"1506737910","name":"Lynett","gpa":2.36},{"npm":"1506737911","name":"Wesley","gpa":3.33},{"npm":"1506737912","name":"Darrel","gpa":2.57},
{"npm":"1506737913","name":"Corrina","gpa":3.38},{"npm":"1506737914","name":"Lorry","gpa":2.8},{"npm":"1506737915","name":"Merrill","gpa":2.12},
{"npm":"1506737916","name":"Claudie","gpa":2.14},{"npm":"1506737917","name":"Dorris","gpa":2.56},{"npm":"1506737918","name":"Silvia","gpa":3.37},
{"npm":"1506737919","name":"Arluene","gpa":2.03},{"npm":"1506737920","name":"Ellissa","gpa":3.64},{"npm":"1506737921","name":"Shirley","gpa":3.23},
{"npm":"1506737922","name":"Vonnie","gpa":3.75},{"npm":"1506737923","name":"Beverlee","gpa":3.39},{"npm":"1506737924","name":"Julissa","gpa":3.82},
{"npm":"1506737925","name":"Patrick","gpa":2.65},{"npm":"1506737926","name":"Gwenneth","gpa":3.03},{"npm":"1506737927","name":"Chiarra","gpa":2.01},
{"npm":"1506737928","name":"Whitaker","gpa":2.71},{"npm":"1506737929","name":"Coreen","gpa":2.81},{"npm":"1506737930","name":"Averell","gpa":2.38},
{"npm":"1506737931","name":"Duffie","gpa":3.35},{"npm":"1506737932","name":"Tasia","gpa":2.63},{"npm":"1506737933","name":"Lorelle","gpa":3.84},
{"npm":"1506737934","name":"Marlo","gpa":2.38},{"npm":"1506737935","name":"Imojean","gpa":2.98},{"npm":"1506737936","name":"Phylys","gpa":3.17},
{"npm":"1506737937","name":"Xenia","gpa":3.47},{"npm":"1506737938","name":"Claybourne","gpa":2.91},{"npm":"1506737939","name":"Nicholas","gpa":3.45},
```


Dengan menggunakan link http://json.parser.online.fr hasilnya seperti pada gambar di bawah ini:


```
{
    "npm":"1506737825",
    "name":"Delmer",
    "gpa":2.58
},
{
    "npm":"1506737826",
    "name":"Kristian",
    "gpa":2.33
},
{
    "npm":"1506737827",
    "name":"Marilyn",
    "gpa":3.49
},
{
    "npm":"1506737828",
    "name":"Katti",
    "gpa":3.73
},
{
    "npm":"1506737829",
    "name":"Titus",
    "gpa":3.11
},
```

Membuat Service Consumer

Setelah membuat producer, maka langkah berikutnya adalah membuat service consumer yaitu aplikasi yang akan menggunakan data yang dihasilkan oleh produser. Pertama perlu menambahkan interface dengan nama StudentDAO seperti pada gambar berikut.

```
public interface StudentDAO {
    StudentModel selectStudent (String npm);
    List<StudentModel> selectAllStudents ();
}
```

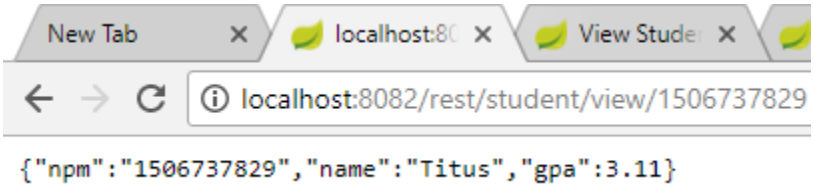
Selanjutnya akan ada kelas yang mengimplementasikan interface tersebut dengan nama StudentDAOimpl yang isinya seprti gambar berikut.

```
package com.example.dao;

import java.util.List;
@Service
public class StudentDAOImpl implements StudentDAO {
    @Autowired
    @Lazy
    private RestTemplate restTemplate;

    @Override
    public StudentModel selectStudent(String npm)
    {
        StudentModel student = restTemplate.getForObject("http://localhost:8090/rest/student/view/"+npm, StudentModel.class);
        return student;
    }

    @Override
    public List<StudentModel> selectAllStudents()
    {
        return null;
//      List<StudentModel> students = restTemplate.getForObject("http://localhost:8080/rest/student/viewall", StudentModel.class);
    }

    @Bean
    public RestTemplate restTemplate(RestTemplateBuilder builder) {
        return builder.build();
    }
}
```

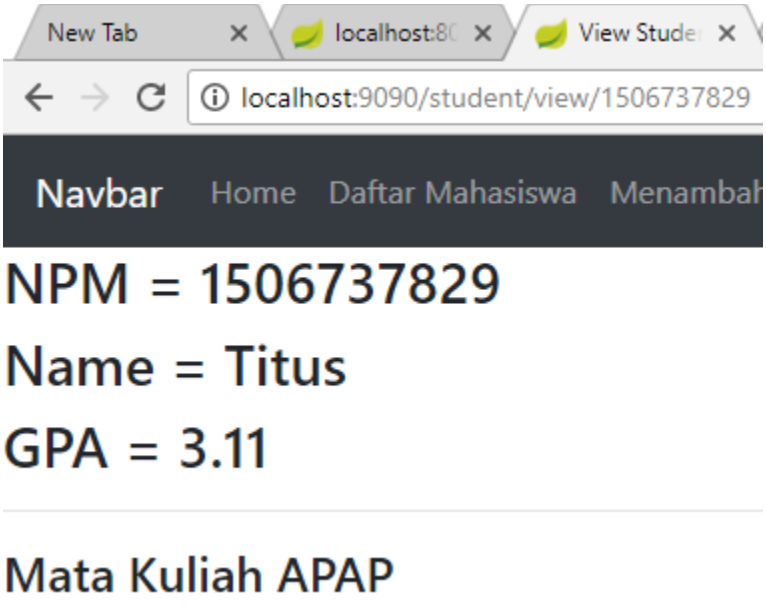
Penjelasan: Kita menggunakan kelas RestTemplate untuk meng-consume object REST web service. Method yang digunakan adalah getForObject yang menerima parameter berupa URL producer web service dan tipe class dari object yang didapatkan.

Selanjutnya, kita ingin mengubah agar StudentService mengambil data dari web service bukan dari database. Kita tidak perlu menghapus class StudentServiceDatabase. Karena scalable system, kita cukup menambahkan class baru yaitu StudentServiceRest yang mengimplement StudentService di package service.

Pertama jalankan service producer dengan menjalankan localhost:8099/rest/student/view/1506737829



Kemudian untuk menguji service consumer buka localhost:8090/student/view/1506737829



LATIHAN 1.

Latihan 2

Implementasikan service consumer untuk view all Students dengan melengkapi method selectAllStudents yang ada di kelas StudentServiceRest.

Caranya pertama tambahkan file berikut pada StudentServiceRest untuk memanggil studentDAO yang memiliki fungsi selectAllStudents.

```
@Override
public List<StudentModel> selectAllStudents() {
    log.info ("REST - select all students");
    return studentDAO.selectAllStudents();
}
```

Pada StudentDAO tambahkan deklarasi method selectAllStudents yang akan diimplementasi oleh kelas yang meng implements sehingga dapat memanggil service yang disediakan oleh producer.

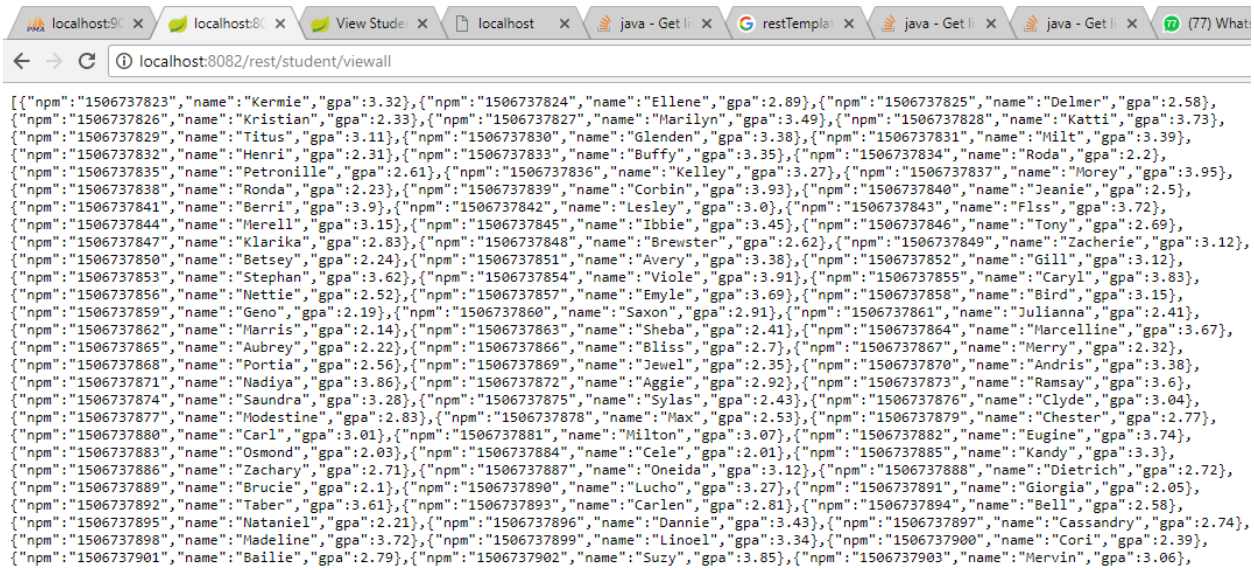
```
public interface StudentDAO {
    StudentModel selectStudent (String npm);
    List<StudentModel> selectAllStudents ();
}
```

Kemudian pada StudentDAOimpl tambahkan pemanggilan restTemplate yang memanggil url yang dimiliki oleh producer sehingga data yang dihasilkan nanti merupakan hasil pemanggilan producer seperti alamat

url yang diakses. Student model akan ditampung dalam arraylist untuk menampung data students hasil pemanggilan url service dan dikembalikan dalam list StudentModel sperti pada gambar di bawah ini.

```
@Override
public List<StudentModel> selectAllStudents()
{
    StudentModel[] students = restTemplate.getForObject("http://localhost:8082/rest/student/viewall/", StudentModel[].class);
    List<StudentModel> results = Arrays.asList(students);
    return results;
}
```

Berikut ini hasil pemanggilan service Producer.



Kemudian consumer akan memannggil student/viewall yang mengambil data darihasil producer seperti pada gambar di bawah ini.