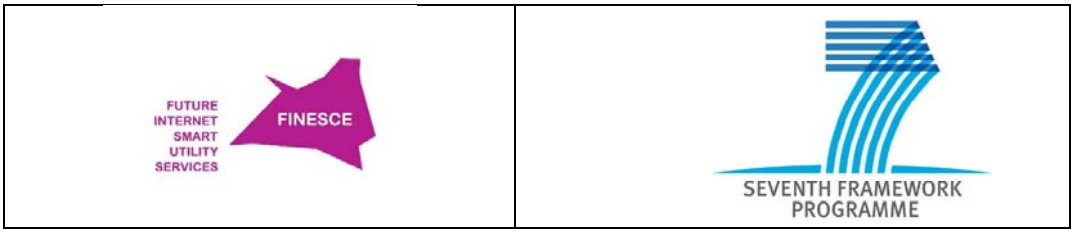


# FI.ICT-2011.1.8 FINESCE

# D7.7 v1.0

## *Consolidated FINESCE API and Handbook*

| | |
|---|---|
| **Contractual Date of Delivery to the CEC:** | February 28 2015 |
| **Actual Date of Delivery to the CEC:** | |
| **Author(s):** | Artemis Voulkidis, Theodore Zahariadis |
| **Participant(s):** | SYN |
| **Workpackage:** | *WP6 – FI in Energy Business Innovation* |
| **Estimated person months:** | 4 |
| **Security:** | PU |
| **Nature:** | R = Report |
| **Version:** | 1.0 |
| **Total number of pages:** | 180 |

**Abstract:**

The Consolidated FINESCE API and Handbook overviews and documents the FINESCE API specification. The set of services provided by the FINESE trials to interested parties and in particular the FI-PPP Phase III projects are presented and explained. The goal of this handbook is to provide a complete, consistent and homogenous overview of the FINESCE API in order to facilitate exploitation from third parties and allow for building smart energy ecosystems on top of the FI-enabled FINESCE trial infrastructures.

**Keyword list:**

API, Trial sites, Service, RESTful, JSON, XML, Building Management System, Demand Side Management, Demand Side Response, Distributed Energy Resources, End-user engagement, Electric Vehicles, Measurements, Marketplace, Metering, Microgrid

# Executive Summary

FINESCE, composed of seven distinct trials, exposes a multitude of services addressing a variety of topics related to smart energy grids and systems, in general. The diversity of the various FINESCE trials' scopes has allowed for successfully capturing the requirements for effective and efficient smart energy systems operation. Considering the rapid evolution of the Smart City concepts and the need for direct integration with Smart Energy systems for reasons of sustainability, a framework to expedite such an integration is the actual cause of the FINESCE platform and API.

The consolidated FINESCE API and Handbook classifies and presents the FINESCE trial services APIs, also detailing them in order to highlight their hierarchical structure and hide the internal trial infrastructures complexity from third parties. Due to its open nature, the FINESCE API specification will allow third parties to easily experiment with the FINESCE trials and take full advantage of their capabilities, in an attempt to render feasible the foundation of a business-ready ecosystem of FINESCE-based smart energy added-value services. In the context of FI-PPP continuity, the FINESE API will allow for Phase-III energy-related projects to develop with ease novel business models and applications, using data and expertise deriving from the FINESCE trials and consortium members, respectively. In the context of a more general Smart City ecosystem embracing Smart Energy capabilities, the FINESCE API could serve as a guide for developers to develop applications and services that expose FINESCE-compliant APIs and, combined with the FINESCE API Mediator DSE, directly integrate them with well tested services and infrastructures provided by FINESCE trials.

In this framework, a number of related application aspects have been identified by the FINESCE consortium members that necessitate the emersion of services handling and giving access to information among others related to (a) building and electric vehicles monitoring and control systems, (b) demand response and pricing management operations, (c) smart grid energy power/energy monitoring, (d) smart factories and (f) virtual power plants. As the relevant application domains often necessitate the exposure of similar information services, a classification of the latter has been attempted and is thoroughly documented. Since all FINESCE trials expose RESTful interfaces, the documentation focuses on the determination of the various parameters that should be defined to invoke the services in a meaningful way. Moreover, it provides an in depth view of the expected service responses, uncovering the common FINESE API data representation format and providing examples of usage.

## Authors


| Partner | Name | Phone / Fax / e-mail |
|---|---|---|
| **Synelixis Solutions Ltd.** | | |
| | **Artemis Voulkidis** | |
| | | Phone: +30 210 2511584<br>e-mail: voulkidis@synelixis.com |
| | **Theodore Zahariadis** | |
| | | Phone: +30 210 2511584<br>e-mail: zahariad@synelixis.com |

# Table of Contents

# List of tables

# List of Figures

# 1 Preface

## 1.1 About this document

This document details the application programming interfaces (APIs) as specified by the global FINESCE API. For information about the FINESCE project, the interested reader is requested to visit the official FINESCE API website [1].

## 1.2 Who should read this document

This document is meant to be ready by anyone interested to use or adopt the FINESCE API specification in order to interact with or offer FINESCE API-compatible services.

## 1.3 How should this document be read

Section 2 provides all the information needed to the interested readers. The structure of the document follows a strict structure to enhance API readability. In this context, sections 2.X (X = 1, …, 16) denote the start of a new group of APIs, namely all services documented under such a section share the same general service scope. The different services exposed by each group of APIs have been marked as sections following the numbering format 2.X.Y, where Y indicates the index of the service in the API group in hand. Last, sections numbered as 2.X.Y.Z offer indicative requests and responses when triggering service 2.X.Y.

The documentation lying in the sections numbered in the 2.X.Y format (indicating service Y of the API group X) also follows a common format throughout the whole document. Specifically, following the service title, the endpoint URL of the specific service is documented which, in turn, is also followed by a brief description of the service functionality. Next, the (path or query) parameters of the service are tabulated, explicitly stating the name of the parameter, its type and description. In addition to this information, an indicative value for each parameter is provided.

Having defined the structure of the Endpoint URL, the service description is continued with a UML Class diagram providing an overview of the connection on data-model basis of the various object classes involved in the request/response to/from the service. The UML Class diagram is also accompanied by a number of tables documenting the various fields that compose the request/response classes of interest.

Regarding the sections numbered as 2.X.Y.Z containing exemplary use of the service, including the request/response bodies (if any) along with the HTTP headers used for the request (if needed). In case the service endpoint URL needs to be configured with a set of parameters, the example provided is using the indicative parameter values appearing in the table documenting the service (path or query) parameters.

An indicative Service API documentation section is presented below. This indicative service may be invoked through the endpoint URL /{version}/{trial}/service/{parameter}. Since the words in the curly brackets indicate endpoint URL parameters, this endpoint URL can be configured by three parameters, namely API version, trial hosting the service and, last, the service parameter called 'parameter'. The class type of the response is of IndicativeClass type, the respective class diagram being depicted in Figure 1.

The document also reflects the current state of implementation of the FINESCE API Mediator (FAM) DSE [2], the latter being the actual software infrastructre implementing the FINESCE API specification and interconnecting the various FINESCE trials. Optimally, the current documentation should be combined with a critical examination of the two FINESCE API Mediator DSE documentation and experimentation services hosted in the DSE's default Swagger [3] interface [4] and Apiary [5].

## 6.X.Y Specific Service Title

**Endpoint URL: [/{version}/{trial}/service/{parameter}]**

Brief service functionality description.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to |
| *trial* | String | Horsens | The trial infrastructure invoking the respective s |
| *parameter* | Parameter Type | indicative parameter value | Parameter description |

The class type of the response (instance of Indicative class) is depicted in Figure 1, below.

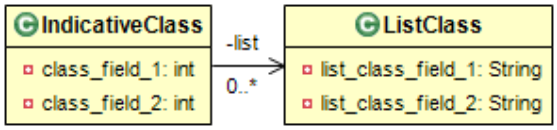


**Figure 1: Class diagram of an (indicative)**

**Table 1: Attributes of an (indicative) IndicativeClass type**

| Name | Type | Description |
|---|---|---|
| **class_field_1** | Integer | Class field description |
| **class_field_2** | Integer | Class field description |
| **list** | List<ListClass> | A list of ListClass objects (documented in the next table) |

**Table 2: Attributes of an (indicative) ListClass type**

| Name | Type | Description |
|---|---|---|
| **list_class_field_1** | String | Class field description |
| **list_class_field_2** | String | Class field description |

*6.X.Y.1 Retrieve a list of IndicativeClass objects [GET]*

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
3. {
4.     . . .
5. }
```

**Figure 2: Example of a service documentation section**

## 1.4 Legal Notice

As the FINESCE trials are tightly bound to real infrastructure uses and interface with actual end-users (customers), the use of the data originating from the FINESCE platform is subject to trial-specific treatment. In this context, the following table summarizes the approach of the various FINESCE trials with respect to data licensing.

**Table 3: FINESCE trials live data licensing**

| *Trial* | *Requires NDA* | *Data Handling* |
|---|---|---|
| ***Malmo*** | No | Data are open for public use[1] |
| ***Horsens*** | Yes | An NDA with the trial owner should be signed |
| ***Madrid*** | No | Data are open for public use |
| ***Virtual Power Plant*** | No | Data are open for public use |
| ***Smart Factory*** | No | Data are open for public use |
| ***Terni*** | Yes | An NDA with the trial owner should be signed |
| ***Ireland*** | Yes | An NDA with the trial owner should be signed |

For all trials offering open data, the CC-by-SA license [6] is used, allowing for "*re-distribution and re-use of a licensed work on the conditions that the creator is appropriately credited and that any derivative work is made available under "the same, similar or a compatible license*". Data originating from the trials requiring NDA will be available under the terms specified in the NDA, which are available from the respective trial site owner.

## 1.5 FINESCE data availability and further exploitation

The FINESCE API Mediator DSE is envisioned to be mediating trial data after the end of the project (September 2015) without any foreseen time restriction. However, the period during which the FINESCE trials will continue to offer live data after the end of the project varies per trial.

A historical, anonymised version of the gathered FINESCE data will be made available after the end of the FINESCE project as Open Data under a CC-by-SA license. This offering is currently under development and further information on it will be published on the FINESCE web site.

[1] Weather data originate from the online web service http://www.yr.no/ and not from the trial infrastructure.

# 2 FINESCE API Specification

FINESCE API follows a common convention with regards to responses, using a standard, lightweight envelop to wrap the FINESCE-API compatible responses. Specifically, this standard wrapper includes a Metadata object documented in Table 4 and Table 5 and is depicted as a UML Class diagram in

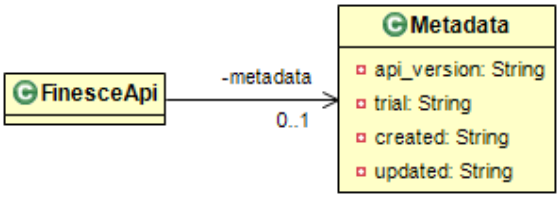


**Figure 3: The FINESCE API wrapping interface**

**Table 4: The attributes of the FINESCE API wrapping interface**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |

**Table 5: Attributes of a FINESCE API metadata object**

| Name | Type | Description |
|---|---|---|
| **api_version** | String | The version of the API specification used |
| **trial** | String | The name of the responder trial site |
| **created** | String | The time when the report was created (in ISO8601 CET) |
| **updated** | String | The time when the report was updated (in ISO8601 CET) |

Every class implemented as a response of a FINESCE API resource inherits this standard interface, so the FINESCE API classes are always implemented and documented as class diagrams as follows:

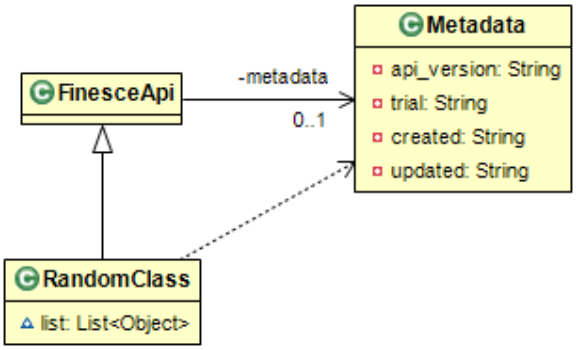


**Figure 4: Class diagram of an indicative RandomClass following the FINESCE API wrapping interface**

The JSON representation of the RandomClass encapsulation into the FINESCE API, is as follows:

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"A_Trial",
        "created":"ISO8601 date",
        "updated":" ISO8601 date"
    },
    list:[
```

```
14.
15.     ]
16.}
```

Having in mind the above discussion, in the next paragraphs the FINESCE API is documented.

## 2.1 Authentication

This set of APIs is used for authenticating users against oauth2 authentication and authorization services.

### 2.1.1 Authenticate a user

**Endpoint URL: [/{version}/{trial}/tokens]**

Authenticates a user against a set of credentials. 'Horsens', 'Malmo', 'Aachen' (VPP services), Terni and 'Ireland' are the trials offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for invoking the respective service. |

Since only a POST request is foreseen from the service, a relevant body request should be defined. Next, the class diagram of the request object is presented, followed by the class diagram of the response, in Figure 6.

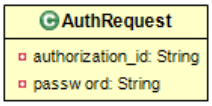


**Figure 5: Class diagram of the authentication request body**

**Table 6: Attributes of the AuthRequest class**

| Name | Type | Description |
|---|---|---|
| **authorization_id** | String | The id of the user initiating the authentication process, e.g. the email of the user |
| **password** | String | The secret (password) of the user |

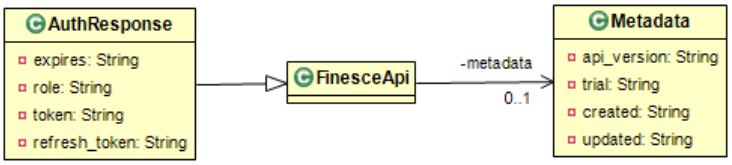


**Figure 6: Class diagram of the authentication response body**

**Table 7: Attributes of the AuthResponse class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **expires** | String | The time of the token expiration |
| **role** | String | The role of the user |
| **token** | String | The actual token to be used |
| **refresh_token** | String | A refresh token |

Note that the response (AuthResponse class in the diagram) follows the standard FINESCE API response wrapping presentation, as presented in paragraph 1.3, page 11.

#### 2.1.1.1 Get an authorization token based on user data [POST]

**Request**

- Headers

```
1. Accept: application/json
2. Content-Type: application/json
```

- Body

```
1. {
2.     "authorization_id":"an_auth_id",
3.     "password":"a_password"
4. }
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-20T16:49:30+02:00",
6.         "updated":"2015-01-20T16:49:30+02:00"
7.     },
8.     "expires":"2015-01-20T16:49:30+02:00",
9.     "role":"a_role",
10.    "token":"an_auth_token",
11.    "refresh_token":"a_refresh_token"
12.}
```

### 2.1.2 Refresh a token

**Endpoint URL: [/{version}/{trial}/tokens/refresh]**

Retrieves a new authentication token based on a previously issued refresh token. 'Horsens' and 'Ireland' are the trials offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for invoking the respective service. |

Similarly to the /{version}/{trial}/tokens (2.1.1) service, only a POST request is foreseen from the service, so a relevant body request should be defined. Next, the class diagram of the request object is presented.


**Figure 7: Class diagram of the authentication refresh body**

| Name | Type | Description |
|---|---|---|
| **refresh_token** | String | The refresh token to validate the request |

The class diagram of the service response is the same as presented in 2.1.1 and is, thus, omitted.

#### 2.1.2.1 Get a refreshed authentication token [POST]

**Request**

- Headers

```
1. Accept: application/json
2. Content-Type: application/json
```

- Body

```
1. {
2.     "refresh_token":"a_refresh_token"
3. }
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-20T16:51:25+02:00",
6.         "updated":"2015-01-20T16:51:25+02:00"
7.     },
8.     "expires":"2015-01-20T16:51:25+02:00",
9.     "role":"a_role",
10.    "token":"an_auth_token",
11.    "refresh_token":"a_refresh_token"
12. }
```

## 2.2 Building information

This set of APIs provide access to information related to smart buildings presentation.

### 2.2.1 Get list of buildings in trial

**Endpoint URL: [/{version}/{trial}/buildings]**

List the buildings known to the selected trial infrastructure. 'Horsens' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Horsens | The trial infrastructure to use for invoking the respective service. |

The class diagram of the reponse (instance of Buildings) of the service follows in Figure 8.

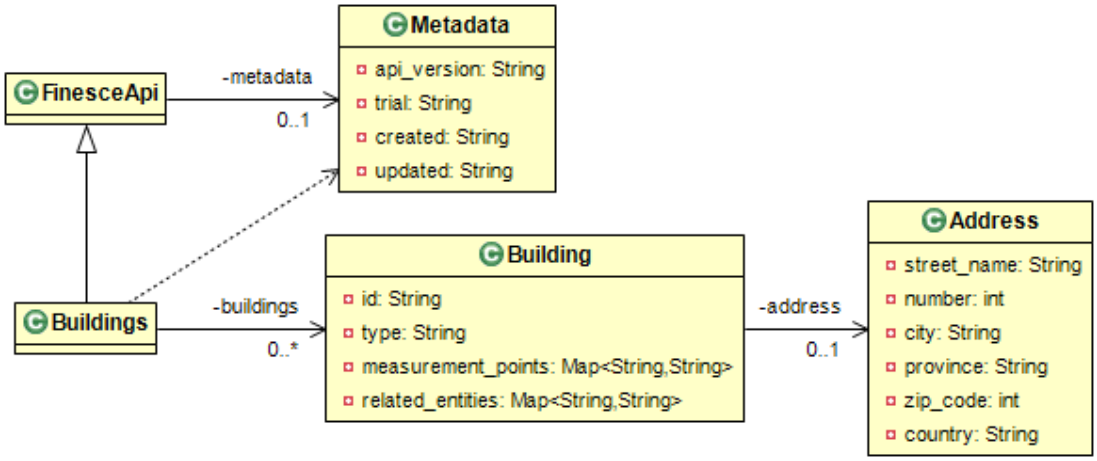


**Figure 8: Class diagram of a report related to a list of Buildings request**

**Table 8: Attributes of the Buildings class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **buildings** | List<Building> | The list of trial buildings of interest (see Table 9, page 19) |

**Table 9: Attributes of the Building class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the building |
| **type** | String | The type of the building |
| **measurement_points** | Map<String,String> | The types of measurements that are associated with the specific building |
| **related_entities_ids** | Map<String,String> | A list of entities associated with the building in hand (e.g. a vehicle) |
| **address** | Address | The address of the building (see Table 10, page 20) |

**Table 10: Attributes of the Address class**

| Name | Type | Description |
|---|---|---|
| **street_name** | String | The street name of the building address |
| **number** | Integer | The number of the building address |
| **city** | String | The city of the building address |
| **province** | String | The province of the building address |
| **zip** | Integer | The zip code of the building address |
| **country** | String | The country of the building address |

#### 2.2.1.1 Retrieve a list of building descriptions [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Ireland",
        "created":"2015-03-06T11:44:39+02:00",
        "updated":"2015-03-06T11:44:39+02:00"
    },
    "buildings":[
        {
            "id":"1234",
            "type":"House",
            "address":{
                "street_name":"A street name",
                "number":1,
                "city":"A city",
                "province":"A provice",
                "zip_code":12345,
                "country":"A Country"
            },
            "measurement_points":{
                "hmhf-1234":"HeatpumpHeatFlow",
                "ita-1234":"IndoorTemperatureAverage"
            },
            "related_entities":{
                "Vehicle#1234":"Vehicle"
            }
        },
        {
            "id":"4567",
            "type":"House",
            "address":{
                "street_name":"A street name",
                "number":1,
                "city":"A city",
                "province":"A provice",
                "zip_code":12345,
                "country":"A Country"
```

```
            },
            "measurement_points":{
                "ita-4567":"IndoorTemperatureAverage",
                "hmhf-4567":"HeatpumpHeatFlow"
            },
            "related_entities":{
                "Vehicle#4567":"Vehicle"
            }
        }
    ]
}
```

### 2.2.2 Get building Description

**Endpoint URL: [/{version}/{trial}/buildings/{id}]**

List the properties of the identified building. The measurement types associated with the building are delivered as well. 'Horsens' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Horsens | The trial infrastructure to use for invoking the respective service. |
| *id* | String | 1234 | The id of the building to be displayed. |

The data model of the answer is the same as the one documented in paragraph 2.2.1.

#### 2.2.2.1 Retrieve a description of a single building [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Horsens",
        "created":"2015-02-26T13:53:10+02:00",
        "updated":"2015-02-26T13:53:10+02:00"
    },
    "buildings":[
        {
            "id":"1234",
            "type":"House",
            "address":{
                "street_name":"A street name",
                "number":1,
                "city":"A city",
```

```
16.                 "province":"A provice",
17.                 "zip_code":12345,
18.                 "country":"A Country"
19.             },
20.             "measurement_points":{
21.                 "hmhf-1234":"HeatpumpHeatFlow",
22.                 "ita-1234":"IndoorTemperatureAverage"
23.             },
24.             "related_entities":{
25.                 "Vehicle#1234":"Vehicle"
26.             }
27.         }
28.     ]
29. }
```

### 2.2.3 Get available measurement types for a specific building

**Endpoint URL: [/{version}/{trial}/buildings/{id}/measurement_types]**

Provides information regarding the available measurements types for the specific building. A valid {id} can be obtained by the /{version}/{trial}/buildings service. 'Horsens' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Horsens | The trial infrastructure to use for invoking the respective service. |
| *id* | String | 1234 | The id of the building to query for measurement types. |

The class diagram of the response (instance of a MeasurementTypesReport class) is presented in Figure 9.

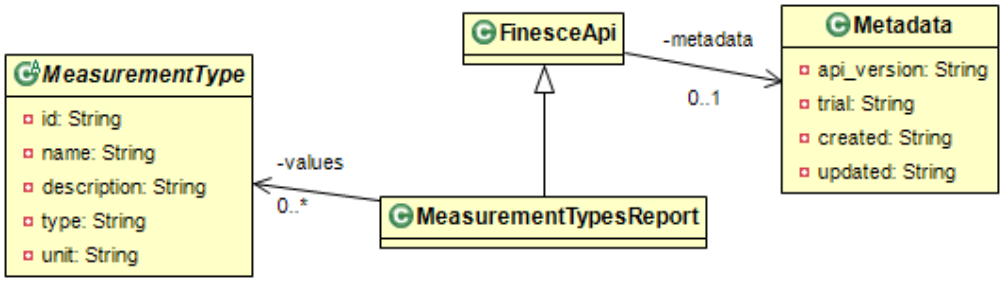


**Figure 9: Class diagram of a report related to a request for a list of MeasurementType objects.**

**Table 11: Attributes of the MeasurementTypesReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **value** | List<MeasurementType> | The list of measurement types of interest (see Table Table 12, page 23) |

**Table 12: Attributes of the MeasurementType class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the measurement type |
| **name** | String | The descriptive name of the measurement type |
| **description** | String | The description of the measurement type |
| **type** | String | The type of the measurement |
| **unit** | String | The unit of the measurement |

#### 2.2.3.1 Retrieve the list of available measurement types for a building [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     “metadata”:{
3.         “api_version”:”0.1”,
4.         “trial”:”Horsens”,
5.         “created”:”2014-12-30T19:52:13+02:00”,
6.         “updated”:”2014-12-30T19:52:13+02:00”
7.     },
8.     “measurement_types”:[
9.         {
10.            “id”:null,
11.            “name”:”IndoorTemperatureAverage”,
12.            “description”:”Indoor temperature average for period”,
13.            “type”:”Temperature”,
14.            “unit”:”C”
15.        }
16.    ]
17.}
```

### 2.2.4 Get the available measurement types for the trial

**Endpoint URL: [/{version}/{trial}/buildings/measurement_types]**

Provides a detailed list of all the available building measurements types in the trial. 'Horsens' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Horsens | The trial infrastructure to use for invoking the respective service. |

The class diagram of the response (instance of a MeasurementTypesReport class) is presented in Figure 9, page 22. The detailed description of the response attributes is given in Table 11, page 22.

#### 2.2.4.1 Retrieve the list of available measurement types [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Horsens",
5.         "created":"2014-12-30T20:00:39+02:00",
6.         "updated":"2014-12-30T20:00:39+02:00"
7.     },
8.     "measurement_types":[
9.         {
10.            "id":null,
11.            "name":"IndoorTemperatureAverage",
12.            "description":"Indoor temperature average for period",
13.            "type":"Temperature",
14.            "unit":"C"
15.        },
16.        {
17.            "id":null,
18.            "name":"HouseNaturalGasConsumption",
19.            "description":"Accumulated house natural gas consumption fo
    r all time",
20.            "type":"Volume",
21.            "unit":"m^3"
22.        },
23.        {
24.            "id":null,
25.            "name":"ICMIndoorCO2LevelAverage",
26.            "description":"Indoor CO2 level average as measured by IC-M
    eter",
27.            "type":"-",
28.            "unit":"ppm"
29.        }
30.    ]
31.}
```

### 2.2.5 Get the available measurement types for the trial, based on their id

**Endpoint URL: [/{version}/{trial}/buildings/measurement_types/id/{id}]**

Provides a detailed list of all the available measurements types that match a specific measurements type name. A valid {id} can be obtained by calling the /{version}/{trial}/buildings/measurement_types service. 'Horsens' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Horsens | The trial infrastructure to use for invoking the respective service. |
| *id* | String | IndoorTemperatureAverage | The id of the measurement type to query for. |

The class diagram of the response (instance of a MeasurementTypesReport class) is presented in Figure 9, page 22. The detailed description of the response attributes is given in Table 11, page 22.

#### 2.2.5.1 Retrieve a list of measurement types, based on their id [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Horsens",
5.         "created":"2014-12-30T20:02:41+02:00",
6.         "updated":"2014-12-30T20:02:41+02:00"
7.     },
8.     "measurement_types":[
9.         {
10.            "id":null,
11.            "name":"IndoorTemperatureAverage",
12.            "description":"Indoor temperature average for period",
13.            "type":"Temperature",
14.            "unit":"C"
15.        }
16.    ]
17.}
```

### 2.2.6 Get the available measurement types for buildings, based on their type

**Endpoint URL: [/{version}/{trial}/buildings/measurement_types/type/{type}]**

Provides a detailed list of all the available measurements types that match a specific measurements type. A valid {type} can be obtained by calling the /{version}/{trial}/buildings/measurement_types service and check the 'type' attribute of the answer.'Horsens' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |

| | | | |
|---|---|---|---|
| *trial* | String | Horsens | The trial infrastructure to use for invoking the respective service. |
| *type* | String | temperature | The type of the measurement type to query for. |

The class diagram of the response (instance of a MeasurementTypesReport class) is presented in Figure 9, page 22. The detailed description of the response attributes is given in Table 11, page 22.

#### 2.2.6.1 Retrieve a list of measurement types, based on their type [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Horsens",
5.         "created":"2014-12-30T20:05:44+02:00",
6.         "updated":"2014-12-30T20:05:44+02:00"
7.     },
8.     "measurement_types":[
9.         {
10.            "id":null,
11.            "name":"IndoorTemperatureAverage",
12.            "description":"Indoor temperature average for period",
13.            "type":"Temperature",
14.            "unit":"C"
15.        }
16.    ]
17.}
```

### 2.2.7 Get the available measurements for a specific building

**Endpoint URL: [/{version}/{trial}/buildings/{id}/measurements/{type_id}/{from}/{to}]**

Provides information regarding the available measurements of a specific type for a specific building, during a certain period of time. A valid {id} can be obtained by calling the /buildings service. A valid {type_id} can be obtained by calling the /buildings service and check the 'measurement_points' section of the answer. Valid {from} and {to} values are expressed in ISO8601 format. 'Horsens' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Horsens | The trial infrastructure to use for invoking the respective service. |

| | | | |
|---|---|---|---|
| *id* | String | 1234 | The id of the building to query for measurement types. |
| *type_id* | String | IndoorTemperatureAverage | The id of the measurement type to query the building for. |
| *from* | String | 2014-12-29T19:52:13+02:00 | The lower limit of the duration of the query, in an ISO8601 compatible format |
| *to* | String | 2014-12-29T20:52:13+02:00 | The upper limit of the duration of the query, in an ISO8601 compatible format |

The class diagram of the response (instance of a MeasurementReport class) is presented in Figure 10.

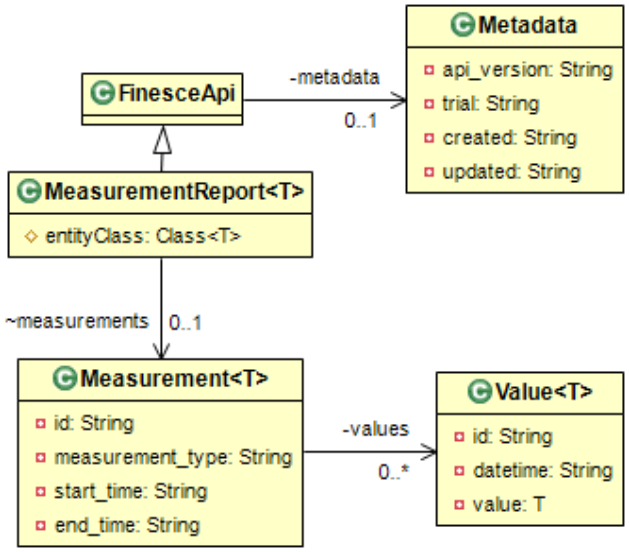


**Figure 10: Class diagram of a MeasurementReport response.**

As can be deduced from Figure 10, the MeasurementReport instance acts as a FINESCE API wrapper for a Measurement object which, in turn, acts as a container for a number of measured values. The details of the MeasurementReport and Measurement classes are given in Table 13 - Table 15.

**Table 13: Attributes of the MeasurementReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **measurements** | T extends Measurement | The measurement report per se (see Table 14, page 27) |

**Table 14: Attributes of a Measurement class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the measurements container |
| **measurement_type** | String | The type of the measurement |

| | | |
|---|---|---|
| **start_time** | String | The start time of the report, in an ISO8601 compatible format |
| **start_time** | String | The end time of the report, in an ISO8601 compatible format |
| **values** | List<Value<T>> | The list of values accompanying the measurement (see Table 15, page 28). T is the class type of the measured values (e.g. double, int, String) |

**Table 15: Attributes of a Value class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the specific measurement |
| **datetime** | String | The date/time of the measurement, expressed in ISO8601 format |
| **value** | T | The value of the measurement. T is the class type of the measured value (e.g. double, int, String) |

Based on its specification, a Measurement object is dependent on the actual measured values that it is encapsulating. From a technical perspective, it is possible to specify the measurement_type attribute of the object both explicitly (passing the measurement type as a string) and explicitly (passing the measurement type as a MeasurementType instance – see Table 12, page 23 for details) and setting the Measurement's measurement_type attribute equal to the *name* of the MeasurementType object. Figure 11 depicts the two alternative implementations.

```
public Measurement(String identifier, String type) {
    this.id = identifier;
    this.measurement_type = type;
    this.values = new ArrayList<>();
}

public Measurement(String identifier, MeasurementType type) {
    this.id = identifier;
    this.measurement_type = type.getName();
    this.values = new ArrayList<>();
}
```

**Figure 11: Handling the measurement_type attribute of a Measurement object**

Based on the input gathered from the various FINESCE trials, a number of measurement type names have been compiled and are as follows:

BatteryCapacity, BatteryLevel, ChargingSocketPowerConsumption, ChargingSocketPowerDemand, CloudCover, ColdWaterTemperatureAverage, Distance, EnergyConsumption, EnergyConsumptionGrid, EnergyProduction, EnergyProductionGrid, EnergyProductionSolar, EnergyStatus, EnergyStatusSingleton, GlobalHorizontalIrradiance, HeatConsumption, HeatEnergyAverage, HeatpumpForwardFlowTemperatureAverage, HeatpumpHeatFlow, HeatpumpInletFlowDemand, HeatpumpInletFlowSummation, HeatpumpInletTemperature, HeatpumpOutletFlowDemand, HeatpumpOutletFlowSummation, HeatpumpOutletTemperature, HeatpumpPowerAverage, HeatpumpReturnFlowTemperatureAverage, HotWaterEnergyAverage, HotWaterFlow, HotWaterTemperatureAverage, ICMIndoorCO2LevelAverage, ICMIndoorHumidityAverage, ICMIndoorTemperatureAverage, Illuminance, IndoorTemperatureAverage, MaxTemperature, MinTemperature, ModuleStatus, NaturalGasConsumption, OutdoorTemperatureAverage, Position, PowerDemand, PowerDemandGrid, PowerMixed, PowerSupply, PowerSupplyGrid,

RelativeHumidity, Speed, SunriseTime, SunsetTime, Temperature, WindDirection and WindSpeed.

Note that not all measurement types are available to all trials.

#### 2.2.7.1 Retrieve the list of available measurements for a building [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Horsens",
5.         "created":"2015-01-12T15:35:26+01:00",
6.         "updated":"2015-01-12T15:35:26+01:00"
7.     },
8.     "measurements":{
9.         "measurement_type":"IndoorTemperatureAverage",
10.        "values":[
11.            {
12.                "id":null,
13.                "datetime":"2015-01-12T15:35:26+01:00",
14.                "value":18
15.            },
16.            {
17.                "id":null,
18.                "datetime":"2015-01-12T15:35:26+01:00",
19.                "value":19
20.            }
21.        ],
22.        "start_time":"null",
23.        "end_time":"null"
24.    }
25.}
```

### 2.2.8 Get the available building components/modules

**Endpoint URL: [/{version}/{trial}/buildings/{id}/modules]**

Provides a list of devices or modules which status can be monitored by the Building Control Centre. 'Madrid' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Madrid | The trial infrastructure to use for invoking the respective service. |
| *id* | String | 1 | The id of the building of interest |

The class diagram of the response (instance of a BuildingModulesReport class) is presented in Figure 12.

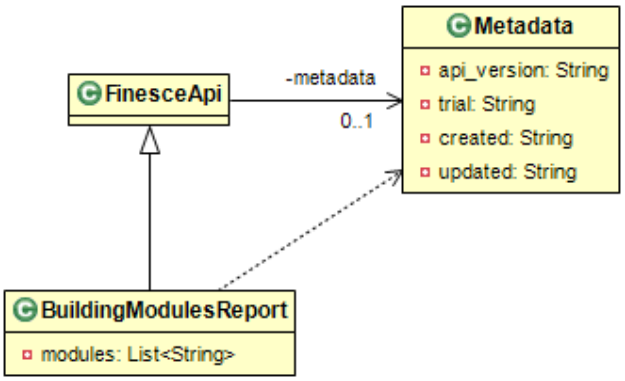


**Figure 12: Class diagram of a BuildingModulesReport response.**

The attributes of the relevant service response class are documented in the table following.

**Table 16: Attributes of the BuildingModulesReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **modules** | List<String> | The list of module names |

#### 2.2.8.1 Retrieve the available building components/modules [GET]

**Request**

- Headers

```
1. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Madrid",
5.         "created":"2015-02-26T16:57:27+02:00",
6.         "updated":"2015-02-26T16:57:27+02:00"
7.     },
8.     "modules":[
9.         "boiler",
10.        "fancoil",
11.        "cooler",
12.        "atu"
13.    ]
14. }
```

### 2.2.9 Get the status of a building component/module

**Endpoint URL: [/{version}/{trial}/buildings/{id}/modules/{module_id}/status/{date}]**

Provides information about the status of a specific building module. The available building modules may be retrieved via the /{version}/{trial}/buildings/{id}/modules service. Valid {date} values are expressed in ISO8601 format. 'Madrid' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Madrid | The trial infrastructure to use for invoking the respective service. |
| *id* | String | 1 | The id of the building of interest |
| *module_id* | String | boiler | The module of interest |
| *date* | String | 2015-02-28T00:00:00+02:00 | The date to fetch information for, in ISO8601 compliant format |

The class diagram of the response (instance of MeasurementReport) has already been presented in Figure 10, page 27, using “Status” as the measurement type.

#### 2.2.9.1 Get the status of a building component/module [GET]

**Request**

- Headers

```
1. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Madrid",
5.         "created":"2015-02-26T16:12:42+01:00",
6.         "updated":"2015-02-26T16:12:42+01:00"
7.     },
8.     "measurements":{
9.         "measurement_type":"Status",
10.        "values":[
11.            {
12.                "id":null,
13.                "datetime":"2015-02-28T00:00:00+02:00",
14.                "value":1
15.            }
16.        ],
17.        "start_time":null,
18.        "end_time":null
19.    }
20.}
```

### 2.2.10 Get the available building zones

**Endpoint URL: [/{version}/{trial}/buildings/{id}/zones]**

Provides a list of zones of a building. 'Madrid' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Madrid | The trial infrastructure to use for invoking the respective service. |
| *id* | String | 1 | The id of the building of interest |

The class diagram of the response (instance of a BuildingZonesReport class) is presented in Figure 13.

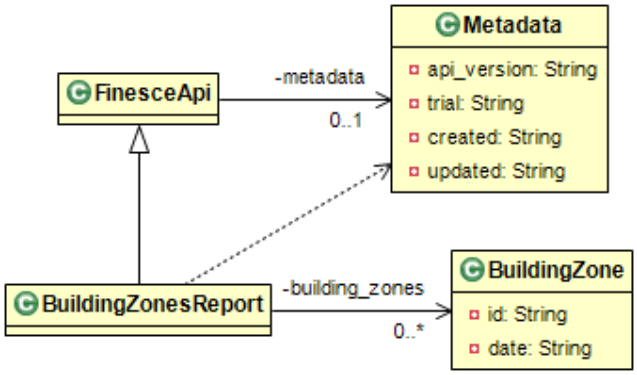


**Figure 13: Class diagram of a BuildingZonesReport response.**

The attributes of the relevant service response class are documented in the table followings.

**Table 17: Attributes of the BuildingZonesReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **building_zones** | List<BuildingZone> | The list of building zones |

**Table 18: Attributes of the BuildingZone class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the building zone |
| **date** | String | The last date the building zone was reported active in an ISO8601 compliant format |

#### 2.2.10.1 Retrieve the available building zones [GET]

**Request**

- Headers

```
1. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Madrid",
5.         "created":"2015-02-26T17:12:20+02:00",
```

```
6.          "updated":"2015-02-26T17:12:20+02:00"
7.      },
8.      "building_zones":[
9.          {
10.             "id":"bz1",
11.             "date":"2015-02-28T00:00:00+02:00"
12.         },
13.         {
14.             "id":"bz2",
15.             "date":"2015-02-28T00:00:00+02:00"
16.         },
17.         {
18.             "id":"bz3",
19.             "date":"2015-02-28T00:00:00+02:00"
20.         }
21.     ]
22. }
```

### 2.2.11 Get the available measurements of a building zone

**Endpoint URL: [/{version}/{trial}/buildings/{id}/zone/{zone_id}/ {measurement_type}/{date}]**

Provides measurements of a certain type of a building zone. Valid measurement types are PowerDemandGrid, EnergyConsumptionGrid, Temperature, RelativeHumidity and BatteryLevel. The available building zones may be retrieved via the /{version}/{trial}/buildings/{id}/zones service. Valid {date} values are expressed in ISO8601 format. 'Madrid' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Madrid | The trial infrastructure to use for invoking the respective service. |
| *id* | String | 1 | The id of the building of interest |
| *zone_id* | String | bz1 | The zone of interest |
| *measurement_type* | String | RelativeHumidity | The type of the measurements |
| *date* | String | 2015-02-28T00:00:00+02:00 | The date to fetch information for, in ISO8601 compliant format |

The class diagram of the response (instance of MeasurementReport) has already been presented in Figure 10, page 27, using “RelativeHumidity” as the measurement type.

#### 2.2.11.1 Get the status of a building component/module [GET]

**Request**

- Headers

```
1. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Madrid",
        "created":"2015-02-26T17:16:32+02:00",
        "updated":"2015-02-26T17:16:32+02:00"
    },
    "measurements":{
        "measurement_type":"RelativeHumidity",
        "values":[
            {
                "id":null,
                "datetime":"2015-02-28T00:00:00+02:00",
                "value":56
            }
        ],
        "start_time":null,
        "end_time":null
    }
}
```

## 2.3 Demand Response

This group of APIs offers services related to demand/response and incentive plans, also exposing services related to contractual energy prices.

### 2.3.1 Get the list of issue resolution plans sharing a common author

**Endpoint URL: [/{version}/{trial}/dsm/irp/author/{author}]**

Allows a user to get a list of issue resolution plans based on their author name. 'Terni' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |
| *author* | String | finesce-wp4-aggregator | The author (aggregator) of the issue resolution plans. |

The class diagram of the response (instance of an IssueResolutionPlanReport class) is presented in

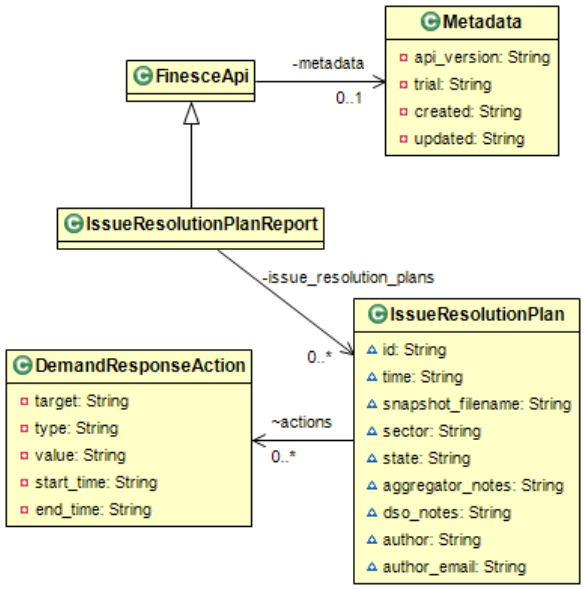


**Figure 14: Class diagram of an IssueResolutionPlanReport response.**

The definitions of the attributes composing the relevant classes follow.

**Table 19: Attributes of the IssueResolutionPlanReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **issue_resolution_plans** | List<IssueResolutionPlan> | The list of the issue resolution plans of interest (see Table 20, page 36) |

**Table 20: Attributes of the IssueResolutionPlan class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the issue resolution plan in hand |
| **time** | String | The time, in ISO8601 compliant format, of the publication of the issue resolution plan |
| **snapshot_filename** | String | The filename of an image object possibly accompanying the issue resolution plan[2] |
| **sector** | String | The sector to which the issue resolution plan refers |
| **state** | String | The state of the issue resolution plan (submitted, accepted or rejected by the Distribution System Operator - DSO) |
| **aggregator_notes** | String | The (optional) notes of the Aggregator |
| **dso_notes** | String | The (optional) notes of the DSO |
| **author** | String | The author of the issue resolution plan |
| **author_email** | String | The email of the author |
| **actions** | List<DemandResponseAction> | The list of actions proposed to the DSO (see Table 21, page 36) |

**Table 21: Attributes of the DemandResponseAction class**

| Name | Type | Description |
|---|---|---|
| **target** | String | The target of the issue resolution plan action |
| **type** | String | The type of the action to be performed (increase, decrease, shift) |
| **value** | String | The value of the action to be performed |
| **start_time** | String | The start time of the action, in an ISO8601 compliant format |
| **end_time** | String | The end time of the action, in an ISO8601 compliant format |

#### 2.3.1.1 Retrieve the list of issue resolution plans sharing a common author [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Terni",
5.         "created":"2015-01-21T17:48:42+02:00",
6.         "updated":"2015-01-21T17:48:42+02:00"
```

[2] In the case of the trial site of Terni, this image contains a snapshot of a combined view of the grid issue predictions along with the short-time predicted load for a sector or customer.

```
    },
    "issue_resolution_plans":[
        {
            "id":"IssueResolutionPlan_finesce-wp4-aggregator_1409308438",
            "time":"2014-08-29T13:33:50+03:00",
            "snapshot_filename":"RP_finesce-wp4-aggregator_1409308438.png",
            "sector":"LIGHTING",
            "action":[
                {
                    "target":"Energy Consumption",
                    "type":"Increase",
                    "value":"1.0",
                    "start_time":"2014-08-30T00:00:00+03:00",
                    "end_time":"2014-09-01T23:30:00+03:00"
                },
                {
                    "target":"Energy Production",
                    "type":"Decrease",
                    "value":"2.0",
                    "start_time":"2014-08-30T00:00:00+03:00",
                    "end_time":"2014-09-01T23:30:00+03:00"
                }
            ],
            "state":"approved",
            "aggregator_notes":"-",
            "dso_notes":"-",
            "author":"finesce-wp4-aggregator",
            "author_email":"email@email.com"
        },
        ........
        {
            "id":"IssueResolutionPlan_finesce-wp4-aggregator_1416473221",
            "time":"2014-11-20T10:46:59+02:00",
            "snapshot_filename":"RP_finesce-wp4-aggregator_1416473221.png",
            "sector":"ALL",
            "action":[
                {
                    "target":"Energy Consumption",
                    "type":"Increase",
                    "value":"2.0",
                    "start_time":"2014-11-20T10:00:00+02:00",
                    "end_time":"2014-11-20T15:00:00+02:00"
                }
            ],
            "state":"submitted",
            "aggregator_notes":"-",
            "dso_notes":"none",
            "author":"finesce-wp4-aggregator",
            "author_email":"email@email.com"
        }
    ]
}
```

### 2.3.2 Get the list of issue resolution plans sharing a common state

**Endpoint URL: [/{version}/{trial}/dsm/irp/state/{state}]**

Allows a user to get a list of issue resolution plans based on their state. 'Terni' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |
| *state* | String | submitted | The state of the issue resolution plans. |

The class diagram of the response (instance of an IssueResolutionPlanResponse class) is presented in Figure 14, page 35.

#### 2.3.2.1 Retrieve the list of issue resolution plans sharing a common state [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Terni",
        "created":"2015-01-21T17:50:42+02:00",
        "updated":"2015-01-21T17:50:42+02:00"
    },
    "issue_resolution_plans":[
        {
            "id":"IssueResolutionPlan_finesce-wp4-aggregator_1409308438",
            "time":"2014-08-29T13:33:50+03:00",
            "snapshot_filename":"RP_finesce-wp4-aggregator_1409308438.png",
            "sector":"LIGHTING",
            "action":[
                {
                    "target":"Energy Consumption",
                    "type":"Increase",
                    "value":"1.0",
                    "start_time":"2014-08-30T00:00:00+03:00",
                    "end_time":"2014-09-01T23:30:00+03:00"
                },
                {
                    "target":"Energy Production",
                    "type":"Decrease",
```

```
                    "value":"2.0",
                    "start_time":"2014-08-30T00:00:00+03:00",
                    "end_time":"2014-09-01T23:30:00+03:00"
                }
            ],
            "state":"submitted",
            "aggregator_notes":"-",
            "dso_notes":"none",
            "author":"finesce-wp4-aggregator",
            "author_email":"email@email.com"
        },
        .......
        {
            "id":"IssueResolutionPlan_finesce-wp4-aggregator_1416473221",
            "time":"2014-11-20T10:46:59+02:00",
            "snapshot_filename":"RP_finesce-wp4-aggregator_1416473221.png",
            "sector":"ALL",
            "action":[
                {
                    "target":"Energy Consumption",
                    "type":"Increase",
                    "value":"2.0",
                    "start_time":"2014-11-20T10:00:00+02:00",
                    "end_time":"2014-11-20T15:00:00+02:00"
                }
            ],
            "state":"submitted",
            "aggregator_notes":"-",
            "dso_notes":"none",
            "author":"finesce-wp4-aggregator",
            "author_email":"email@email.com"
        }
    ]
}
```


### 2.3.3 Get the list of issue resolution plans sharing common authors and states

**Endpoint URL: [/{version}/{trial}/dsm/irp/author/{author}/state/{state}]**

Allows a user to get a list of issue resolution plans based on their state and author. 'Terni' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |
| *author* | String | finesce-wp4-aggregator | The author (aggregator) of the issue resolution plans. |
| *state* | String | submitted | The state of the issue resolution plans. |

The class diagram of the response (instance of an IssueResolutionPlanResponse class) is presented in Figure 14, page 35.

#### 2.3.3.1 Retrieve the list of issue resolution plans sharing common authors and states [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body


```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Terni",
        "created":"2015-01-21T17:52:02+02:00",
        "updated":"2015-01-21T17:52:02+02:00"
    },
    "issue_resolution_plans":[
        {
            "id":"IssueResolutionPlan_finesce-wp4-aggregator_1409308438",
            "time":"2014-08-29T13:33:50+03:00",
            "snapshot_filename":"RP_finesce-wp4-aggregator_1409308438.png",
            "sector":"LIGHTING",
            "action":[
                {
                    "target":"Energy Consumption",
                    "type":"Increase",
                    "value":"1.0",
                    "start_time":"2014-08-30T00:00:00+03:00",
                    "end_time":"2014-09-01T23:30:00+03:00"
                },
                {
                    "target":"Energy Production",
                    "type":"Decrease",
                    "value":"2.0",
                    "start_time":"2014-08-30T00:00:00+03:00",
                    "end_time":"2014-09-01T23:30:00+03:00"
                }
            ],
            "state":"submitted",
            "aggregator_notes":"-",
            "dso_notes":"none",
            "author":"finesce-wp4-aggregator",
            "author_email":"email@email.com"
        },
        .....
        {
            "id":"IssueResolutionPlan_finesce-wp4-aggregator_1416473221",
            "time":"2014-11-20T10:46:59+02:00",
            "snapshot_filename":"RP_finesce-wp4-aggregator_1416473221.png",
```

```
            "sector":"ALL",
            "action":[
                {
                    "target":"Energy Consumption",
                    "type":"Increase",
                    "value":"2.0",
                    "start_time":"2014-11-20T10:00:00+02:00",
                    "end_time":"2014-11-20T15:00:00+02:00"
                }
            ],
            "state":"submitted",
            "aggregator_notes":"-",
            "dso_notes":"none",
            "author":"finesce-wp4-aggregator",
            "author_email":"email@email.com"
        }
    ]
}
```


### 2.3.4 Get the list of incentive plans sharing a common author

**Endpoint URL: [/{version}/{trial}/dsm/ip/author/{author}]**

Allows an energy retailer to get a list of incentive plans based on their author name. 'Terni' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |
| *author* | String | energy-retailer | The author (aggregator) of the incentive plans. |

The class diagram of the response (instance of an IncentivePlanReport class) follows in Figure 15.

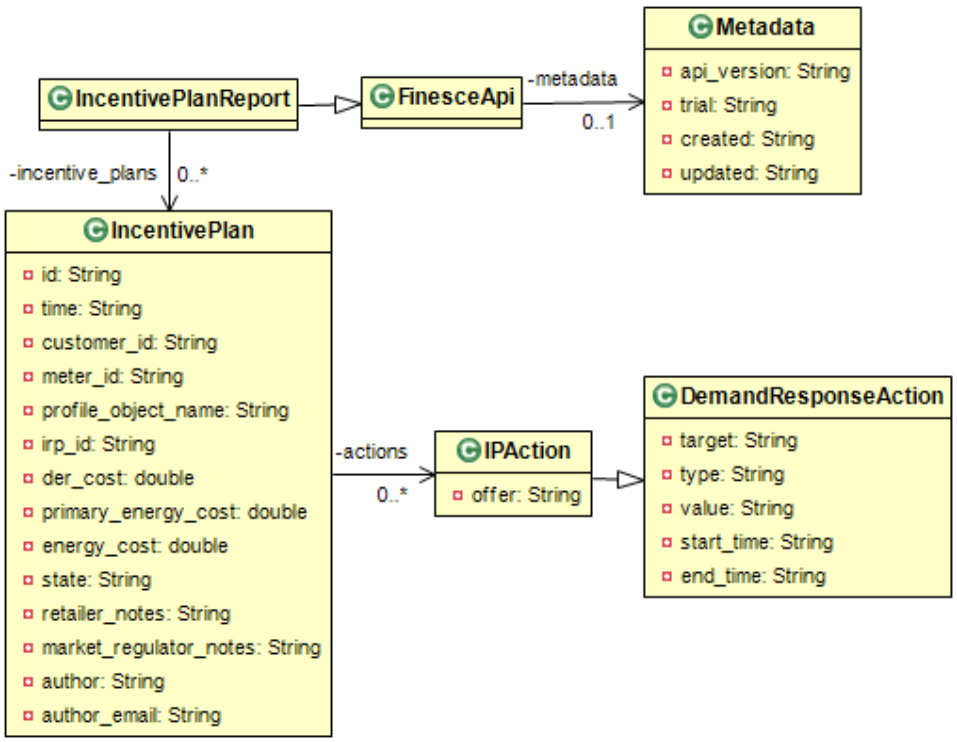


**Figure 15: Class diagram of an IncentivePlanReport response**

The detailed description of the relevant class attributes also follows in the forthcoming tables.

**Table 22: Attributes of the IncentivePlanReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **incentive_plans** | List<IncentivePlan> | The list of the incentive plans of interest (see Table 23, page 42) |

**Table 23: Attributes of the IncentivePlan class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the incentive plan |
| **time** | String | The time of the publication of the incentive plan, in an ISO8601 compliant format |
| **customer_id** | String | The id of the customer the incentive plan refers to |
| **meter_id** | String | The id of the metering device associated with the aforementioned customer |
| **profile_object_name** | String | |
| **irp_id** | String | The id of the issue resolution plan this incentive plan addresses |
| **der_cost** | double | The cost of the energy produced by renewable sources |
| **primary_energy_cost** | double | The cost of the energy produced by traditional methods, at very large scale (e.g. coal) |
| **energy_cost** | double | The final cost of the energy attained by the customer |
| **state** | String | The state of the incentive plan (Submitted, Compliant or Non-Compliant) |
| **retailer_notes** | String | The (optional) notes posed by the energy retailer upon publishing the incentive plan |

| | | |
|---|---|---|
| **market_regulator_notes** | String | The (optional) notes posed by the market regulator upon evaluating the incentive plan |
| **author** | String | The author of the incentive plan |
| **author_email** | String | The email of the author |
| **actions** | List <IPAction> | A list of actions proposed to the customer associated with the incentive plan in hand (see Table 24, below) |

**Table 24: Attributes of the IPAction class**

| Name | Type | Description |
|---|---|---|
| **target** | String | The target of the issue resolution plan action |
| **type** | String | The type of the action to be performed (increase, decrease, shift) |
| **value** | String | The value of the action to be performed |
| **start_time** | String | The start time of the action, in an ISO8601 compliant format |
| **end_time** | String | The end time of the action, in an ISO8601 compliant format |
| **offer** | String | The offer (incentive) of the energy retailer to the customer |

Note that the IPAction class subclasses the DemandResponseAction class (see Table 21, page 36), hence sharing common attributes.

#### 2.3.4.1 Retrieve the list of incentive plans sharing a common author [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body


```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Terni",
        "created":"2015-02-09T15:55:29+01:00",
        "updated":"2015-02-09T15:55:29+01:00"
    },
    "incentive_plans":[
        {
            "id":"IncentivePlan_energy-retailer_1423145897",
            "time":"2015-02-05T15:18:17+01:00",
            "customer_id":"WP4_U_3",
            "meter_id":"",
            "profile_object_name":"-",
            "irp_id":"IssueResolutionPlan_finesce-wp4-aggregator_1423076125",
            "action":[
                {
                    "target":"Energy Consumption",
                    "type":"Increase",
                    "value":"2.0",
                    "start_time":"2015-02-04T20:00:00+01:00",
                    "end_time":"2015-02-05T08:00:00+01:00"
```

```
                }
            ],
            "der_cost":0,
            "primary_energy_cost":0,
            "energy_cost":0,
            "state":"Submitted",
            "retailer_notes":"Limited time offer",
            "market_regulator_notes":"-",
            "author":"energy-retailer",
            "author_email":"-"
        },
        {
            "id":"IncentivePlan_energy-retailer_1423211072",
            "time":"2015-02-06T09:24:32+01:00",
            "customer_id":"WP4_U_3",
            "meter_id":"",
            "profile_object_name":"-",
            "irp_id":"IssueResolutionPlan_finesce-wp4-
   aggregator_1416413747",
            "action":[
                {
                    "target":"Energy Consumption",
                    "type":"Decrease",
                    "value":"5.0",
                    "start_time":"2014-11-21T17:30:00+01:00",
                    "end_time":"2014-11-22T17:30:00+01:00"
                }
            ],
            "der_cost":0,
            "primary_energy_cost":0,
            "energy_cost":0,
            "state":"Compliant",
            "retailer_notes":"-",
            "market_regulator_notes":"OK",
            "author":"energy-retailer",
            "author_email":"-"
        }
    ]
}
```


### 2.3.5 Get the list of incentive plans sharing a common state

**Endpoint URL: [/{version}/{trial}/dsm/ip/state/{state}]**

Allows an energy retailer to get a list of incentive plans based on their state. 'Terni' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |
| *state* | String | Compliant | The state of the incentive plans. |

The class diagram of the response (instance of an IncentivePlanReport class) has been already provided in Figure 15, page 42.

#### 2.3.5.1 Retrieve the list of incentive plans sharing a common state [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body


```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Terni",
        "created":"2015-02-27T12:11:05+02:00",
        "updated":"2015-02-27T12:11:05+02:00"
    },
    "incentive_plans":[
        {
            "id":"IncentivePlan_energy-retailer_1423145897",
            "time":"2015-02-05T16:18:17+02:00",
            "customer_id":"WP4_U_3",
            "meter_id":"0512690040067",
            "profile_object_name":"-",
            "irp_id":"IssueResolutionPlan_finesce-wp4-aggregator_1423076125",
            "actions":[
                {
                    "target":"Energy Consumption",
                    "type":"Increase",
                    "value":"2.0",
                    "start_time":"2015-02-04T21:00:00+02:00",
                    "end_time":"2015-02-05T09:00:00+02:00",
                    "offer":"100E free"
                }
            ],
            "der_cost":0.0,
            "primary_energy_cost":0.0,
            "energy_cost":0.0,
            "state":"Compliant",
            "retailer_notes":"Limited time offer",
            "market_regulator_notes":"OK OK",
            "author":"energy-retailer",
            "author_email":"-"
        },
        {
            "id":"IncentivePlan_energy-retailer_1423578590",
            "time":"2015-02-10T16:33:25+02:00",
            "customer_id":"WP4_U_14",
            "meter_id":"0512690040069",
            "profile_object_name":"-",
            "irp_id":"IssueResolutionPlan_finesce-wp4-aggregator_1423220983",
            "actions":[
```

```
                {
                    "target":"Energy Consumption",
                    "type":"Increase",
                    "value":"2.0",
                    "start_time":"2015-02-08T01:00:00+02:00",
                    "end_time":"2015-02-10T01:00:00+02:00",
                    "offer":"Two free monts"
                }
            ],
            "der_cost":0.0,
            "primary_energy_cost":0.0,
            "energy_cost":0.0,
            "state":"Compliant",
            "retailer_notes":"-",
            "market_regulator_notes":"OK OK",
            "author":"energy-retailer",
            "author_email":"-"
        }
    ]
}
```


### 2.3.6 Get the list of incentive plans sharing common authors and states

**Endpoint URL: [/{version}/{trial}/dsm/ip/author/{author}/state/{state}]**

Allows an energy retailer to get a list of incentive plans based on their state and author. 'Terni' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |
| *author* | String | energy-retailer | The author (aggregator) of the incentive plans. |
| *state* | String | Compliant | The state of the incentive plans. |

The class diagram of the response (instance of an IncentivePlanReport class) has been already provided in Figure 15, page 42.

#### 2.3.6.1 Retrieve the list of incentive plans sharing common authors and states [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Terni",
        "created":"2015-02-27T12:11:05+02:00",
        "updated":"2015-02-27T12:11:05+02:00"
    },
    "incentive_plans":[
        {
            "id":"IncentivePlan_energy-retailer_1423145897",
            "time":"2015-02-05T16:18:17+02:00",
            "customer_id":"WP4_U_3",
            "meter_id":"0512690040067",
            "profile_object_name":"-",
            "irp_id":"IssueResolutionPlan_finesce-wp4-aggregator_1423076125",
            "actions":[
                {
                    "target":"Energy Consumption",
                    "type":"Increase",
                    "value":"2.0",
                    "start_time":"2015-02-04T21:00:00+02:00",
                    "end_time":"2015-02-05T09:00:00+02:00",
                    "offer":"100E free"
                }
            ],
            "der_cost":0.0,
            "primary_energy_cost":0.0,
            "energy_cost":0.0,
            "state":"Compliant",
            "retailer_notes":"Limited time offer",
            "market_regulator_notes":"OK OK",
            "author":"energy-retailer",
            "author_email":"-"
        },
        {
            "id":"IncentivePlan_energy-retailer_1423578590",
            "time":"2015-02-10T16:33:25+02:00",
            "customer_id":"WP4_U_14",
            "meter_id":"0512690040069",
            "profile_object_name":"-",
            "irp_id":"IssueResolutionPlan_finesce-wp4-aggregator_1423220983",
            "actions":[
                {
                    "target":"Energy Consumption",
                    "type":"Increase",
                    "value":"2.0",
                    "start_time":"2015-02-08T01:00:00+02:00",
                    "end_time":"2015-02-10T01:00:00+02:00",
                    "offer":"Two free monts"
                }
            ],
            "der_cost":0.0,
            "primary_energy_cost":0.0,
            "energy_cost":0.0,
            "state":"Compliant",
            "retailer_notes":"-",
            "market_regulator_notes":"OK OK",
```

```
58.             "author":"energy-retailer",
59.             "author_email":"-"
60.         }
61.     ]
62. }
```

### 2.3.7 Get the contracts corresponding to a customer, regardless of their state

**Endpoint URL: [/{version}/{trial}/contracts/customer/{customer}]**

Allows an energy retailer to get the list of contracts corresponding to a specific customer, regardless of their state. 'Terni' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |
| *customer* | String | WP4_U_11 | The customer for which the contracts details will be retrieved. |

The class diagram of the response (instance of a ContractReport class) is presented in Figure 16, below.

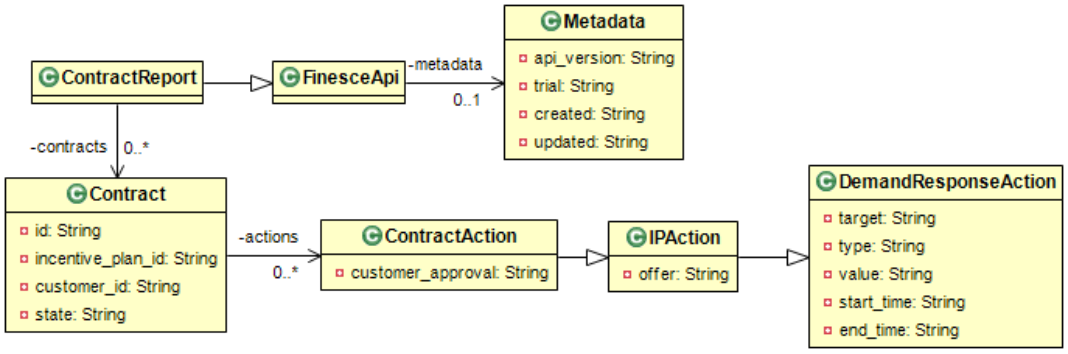


**Figure 16: Class diagram of a ContractReport response.**

**Table 25: Attributes of the ContractReport class.**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **contracts** | List<Contract> | The list of the contracts of interest (see Table 26, page 48) |

**Table 26: Attributes of the Contract class.**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the contract in hand |
| **incentive_plan_id** | String | The id of the incentive plan corresponding to the contract |
| **customer_id** | String | The id of the customer associated with the contract |
| **state** | String | The state of the contract (Submitted, Approved or rejected) |
| **actions** | List<ContractAction> | The list of actions proposed to the customer |

**Table 27: Attributes of the ContractAction class.**

| Name | Type | Description |
|---|---|---|
| **target** | String | The target of the issue resolution plan action |
| **type** | String | The type of the action to be performed (increase, decrease, shift) |
| **value** | String | The value of the action to be performed |
| **start_time** | String | The start time of the action, in an ISO8601 compliant format |
| **end_time** | String | The end time of the action, in an ISO8601 compliant format |
| **offer** | String | The offer (incentive) of the energy retailer to the customer |
| **customer_approval** | String | Indicates when the customer decided (approved or rejected) the contract |

Note that a ContractAction actually extends the already presented IPAction class (see Table 24, page 43), so it also comprises the attributes of this class as well.

#### 2.3.7.1 Retrieve the contracts corresponding to a customer, regardless of their state [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Terni",
5.         "created":"2015-01-22T14:34:44+02:00",
6.         "updated":"2015-01-22T14:34:44+02:00"
7.     },
8.     "contract":[
9.         {
10.            "id":null,
11.            "incentive_plan_id":null,
12.            "customer_id":"WP4_U_11",
13.            "action":[
14.
15.            ],
16.            "state":null
17.        }
18.    ]
19.}
```

### 2.3.8 Get the contracts corresponding to a customer, characterized by a specific state

**Endpoint URL: [/{version}/{trial}/contracts/customer/{customer}/state/{state}]**

Allows an energy retailer to get the list of contracts corresponding to a specific customer, regardless of their state. 'Terni' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |
| *customer* | String | WP4_U_11 | The customer for which the contracts details will be retrieved. |
| *state* | String | Approved | The state of the contracts to be retrieved. |

The class diagram of the response (instance of a ContractReport class) has been already presented in Figure 16, page 48.

#### 2.3.8.1 Retrieve the contracts corresponding to a customer, characterized by a specific state [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Terni",
5.         "created":"2015-01-22T14:34:44+02:00",
6.         "updated":"2015-01-22T14:34:44+02:00"
7.     },
8.     "contract":[
9.         {
10.            "id":null,
11.            "incentive_plan_id":null,
12.            "customer_id":null,
13.            "action":[
14.
15.            ],
16.            "state":"Approved"
17.        }
18.    ]
19. }
```

### 2.3.9 Get the contracts corresponding to a customer, characterized by a specific state

**Endpoint URL: [/{version}/{trial}/contracts/customer/{customer}/state/{state}]**

Allows an energy retailer to get the list of contracts sharing a common state. 'Terni' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |
| *state* | String | Approved | The state of the contracts to be retrieved. |

The class diagram of the response (instance of a ContractReport class) has been already presented in Figure 16, page 48.

#### 2.3.9.1 Retrieve a list of contracts sharing a common state [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Terni",
5.         "created":"2015-01-22T14:34:44+02:00",
6.         "updated":"2015-01-22T14:34:44+02:00"
7.     },
8.     "contract":[
9.         {
10.            "id":null,
11.            "incentive_plan_id":null,
12.            "customer_id":"WP4_U_11",
13.            "action":[
14.
15.            ],
16.            "state":"Approved"
17.        }
18.    ]
19. }
```

### 2.3.10 Get the user-contracted energy prices

Endpoint URL: **[/{version}/{trial}/contracts/prices]**

Allows a user to get the contracted prices for electricity, based on their type. 'Terni' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|

| | | | |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |

The class diagram of the Response (EnergyCostsReport) follows.

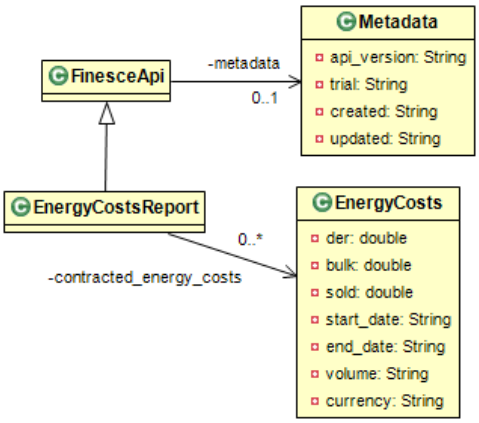


**Figure 17: Class diagram of an EnergyCostsReport response**

The attributes of the referenced classes are as follows:

**Table 28: Attributes of the EnergyCostsReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **contracted_energy_costs** | List<EnergyCosts> | The list of the present contracted energy costs (see Table 29, page 52) |

**Table 29: Attributes of the EnergyCosts class**

| Name | Type | Description |
|---|---|---|
| **der** | double | The cost of the energy coming from renewable energy sources |
| **bulk** | double | The cost of the energy coming from bulk generation sources (e.g. coal) |
| **sold** | double | The cost of the energy actually sold to the customers |
| **volume** | String | The metric of the energy (e.g. kWh) |
| **currency** | String | The currency of the energy sold (default is €) |
| **start_date** | String | The date when the documented prices are valid from, in an ISO8601 compliant format |
| **end_date** | String | The date until when the documented prices are valid, in an ISO8601 compliant format |

#### 2.3.10.1 Retrieve the user-contracted energy prices [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body


```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Terni",
        "created":"2015-02-09T18:17:13+01:00",
        "updated":"2015-02-09T18:17:13+01:00"
    },
    "contracted_energy_cost":[
        {
            "der":0,
            "bulk":0,
            "sold":0,
            "start_date":"1970-01-01T01:00:00+01:00",
            "end_date":"1970-01-01T01:00:00+01:00",
            "volume":"kWh",
            "currency":"Euro"
        }
    ]
}
```

## 2.4 Discrete Time Support

This API set offers services related to supporting discrete timeslots for describing an energy report instead using of continuous entities related to normal, continuous date/time presentation.

### 2.4.1 Get the available timeslots

**Endpoint URL: [/{version}/{trial}/timeslots]**

Allows a user to retrieve a list of the valid timeslots in the trial infrastructure. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the available timeslots. |

The class diagram of the response (TimeslotsReport) follows in Figure 18.

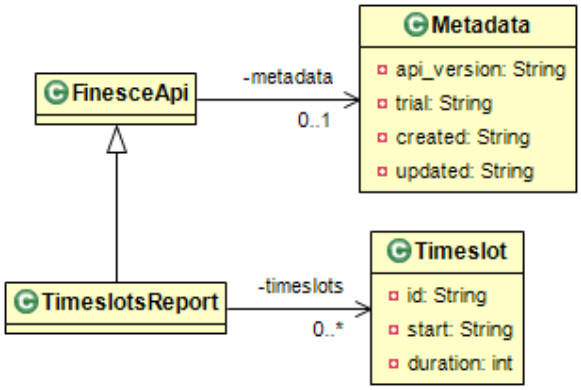


**Figure 18: Class diagram of a TimeslotsReport response.**

The class attributes of the response class are tabulated below.

**Table 30: Attributes of the TimeslotsReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **timeslots** | List<Timeslot> | The list of the valid timeslots of the trial (see Table 31, page 54) |

**Table 31: Attributes of the Timeslot class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the timeslot |
| **start** | String | The start time of the timeslot, in an ISO8601 compliant format |
| **duration** | String | The duration of the timeslot, in minutes |

#### 2.4.1.1 Retrieve the available timeslots [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-13T13:51:07+02:00",
6.         "updated":"2015-01-13T13:51:07+02:00"
7.     },
8.     "timeslots":[
9.         {
10.            "id":"1",
11.            "start":"2014-12-20T02:15:00+02:00",
12.            "duration":15
13.        },
14.        {
15.            "id":"2",
16.            "start":"2014-12-20T02:30:00+02:00",
17.            "duration":15
18.        }
19.    ]
20. }
```

### 2.4.2 Get a timeslots based on its id

**Endpoint URL: [/{version}/{trial}/timeslots/{id}]**

Allows a user to retrieve a time slot record, based on its id. A valid {id} can be obtained by calling the /{version}/{trial}/timeslots service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for invoking the available timeslots. |
| *id* | String | 1 | The id of the timeslot to get information for. |

The class diagram of the response (TimeslotsReport) has been already presented in Figure 18, page 54.

#### 2.4.2.1 Retrieve a timeslot based on its id [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-13T13:53:21+02:00",
6.         "updated":"2015-01-13T13:53:21+02:00"
7.     },
8.     "timeslots":[
9.         {
10.            "id":"1",
11.            "start":"2014-12-20T02:15:00+02:00",
12.            "duration":15
13.        }
14.    ]
15.}
```

### 2.4.3 Get the algorithmic weights associated with a timeslot, based on its id

**Endpoint URL: [/{version}/{trial}/timeslots/{id}/algoweights]**

Allows a user to retrieve a collection of algorithm weight records associated with a time slot. A valid {id} can be obtained by calling the /{version}/{trial}/timeslots service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the available algorithm weight objects |
| *id* | String | 1 | The id of the timeslot to get information for. |

The class diagram of the response (instance of AlgoweightReport) follows in Figure 19.

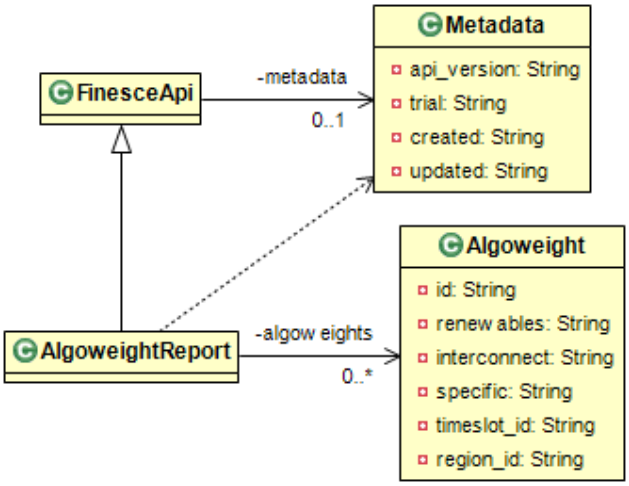


**Figure 19: Class diagram of an AlgoweightReport response**

The attributes of the class response are presented in the tables, next.

**Table 32: Attributes of the AlgoweightReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **algoweights** | List<Algoweight> | The list of the valid algoweight objects of the trial (see Table 33, page 57) |

**Table 33: Attributes of the Algoweight class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the algorithm weight object |
| **renewables** | String | The percentage of renewables optimized by the COS algorithm |
| **interconnect** | String | The percentage of energy flows among regions, optimized by the COS algorithm |
| **specific** | String | The percentage of energy consumed for market requirements optimized by the COS algorithm |
| **timeslot_id** | String | The id of the timeslot associated with the algorithm weight object (see Figure 18, page 54) |
| **region_id** | String | The id of the region to which the optimization the optimization algorithm weight object refers (see Table 64, page 132) |

#### 2.4.3.1 Retrieve the algorithmic weights associated with a timeslot [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
```

```
        "created":"2015-01-13T14:03:03+02:00",
        "updated":"2015-01-13T14:03:03+02:00"
    },
    "algoweights":[
        {
            "id":"1",
            "renewables":"100.0",
            "interconnect":"0.0",
            "specific":"0.0",
            "timeslot_id":"1",
            "region_id":"1"
        }
    ]
}
```


### 2.4.4 Get the charging states associated with a timeslot, based on its id

**Endpoint URL: [/{version}/{trial}/timeslots/{id}/charging_states]**

Allows a user to retrieve a collection of charging state records associated with a time slot, based on its id. A valid {id} can be obtained by calling the /{version}/{trial}/timeslots service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the available charging states. |
| *id* | String | 1 | The id of the timeslot to get information for. |

The class diagram of the response ((instance of ChargingStatesReport) is presented in Figure 20.

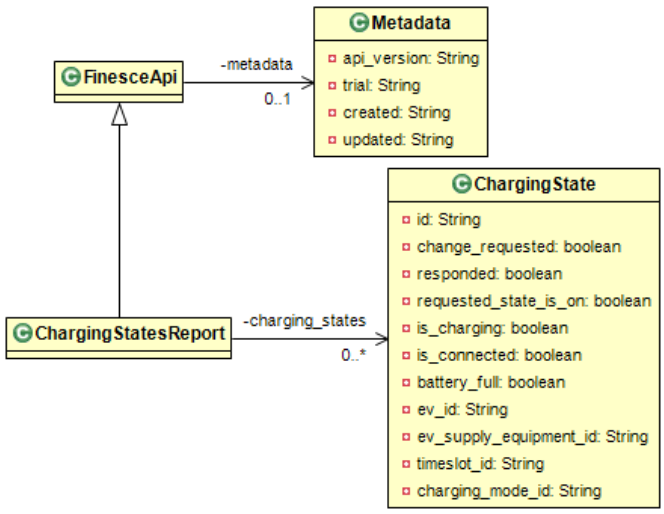


**Figure 20: Class diagram of a ChargingStatesReport response.**

The attributes of the response follow in the forthcoming tables.

| Name | Type | Description |
|---|---|---|

| | | |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **timeslots** | List<ChargingState> | The list of the charging states of the trial (see Table 31, page 54) |

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the charging state instance |
| **change_requested** | Boolean | Indicates if a state change has been requested |
| **responded** | Boolean | The response from the servo for the state change |
| **requested_state_is_on** | Boolean | The state which has been requested on/off |
| **is_charging** | Boolean | Indicates if the electric vehicle is charging |
| **is_connected** | Boolean | Indicates if the electric vehicle is connected to an electric vehicle supply equipment |
| **battery_full** | Boolean | Indicates if the vehicle battery is full |
| **ev_id** | String | The electric vehicle id (see Figure 22, page 75) |
| **ev_supply_equipment_id** | String | The id of the associated electric vehicle supply equipment (see Table 45, page 92) |
| **timeslot_id** | String | The id of the timeslot associate with this charging state instance |
| **charging_mode_id** | String | The id of the charging mode of the electric vehicle (see Table 43, page 89) |

#### 2.4.4.1 Retrieve the charging states associated with a timeslot [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-13T14:06:50+02:00",
6.         "updated":"2015-01-13T14:06:50+02:00"
7.     },
8.     "charging_states":[
9.         {
10.            "id":"1",
11.            "change_requested":false,
12.            "responded":false,
13.            "requested_state_is_on":false,
14.            "is_charging":false,
15.            "is_connected":false,
16.            "battery_full":false,
17.            "ev_id":"1",
18.            "ev_supply_equipment_id":"1",
19.            "timeslot_id":"1",
20.            "charging_mode_id":"1"
21.        }
22.    ]
23.}
```

### 2.4.5 Get the EVSE energy records associated with a timeslot, based on its id

**Endpoint URL: [/{version}/{trial}/timeslots/{id}/energy/regional]**

Allows a user to retrieve a collection of aggregated regional electric vehicle supply equipment (EVSE) energy records associated with a specific timeslot, based on its id. A valid {id} can be obtained by calling the /{version}/{trial}/timeslots service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the available EVSE energy records for the specific timeslot |
| *id* | String | 1 | The id of the timeslot to get information for. |

The class response of the answer (instance of RegionalEnergyReport) follows in the next figure.

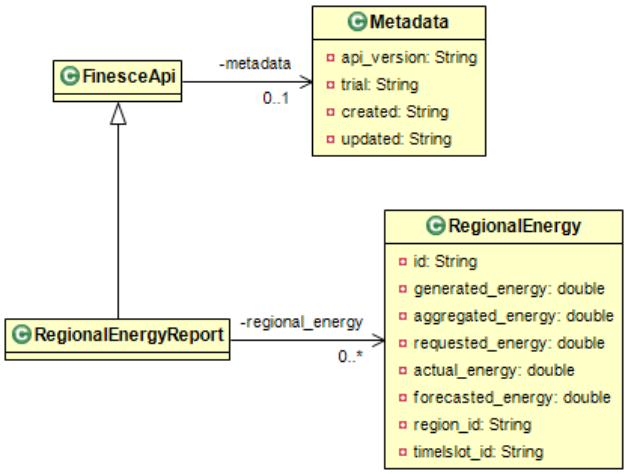


**Figure 21: Class diagram of a RegionalEnergyReport response.**

**Table 34: Attributes of the RegionalEnergyReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **regional_energy** | List<RegionalEnergy> | The list of the charging states of the trial (see Table 35Table 31, page 60) |

**Table 35: Attributes of the RegionalEnergy class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the RegionalEnergy instance |
| **generated_energy** | Double | The generated energy in kWh |
| **aggregated_energy** | Double | The aggregate energy in kWh |
| **requested_energy** | Double | The requested energy in kWh |
| **actual_energy** | Double | The actual energy in kWh |
| **forecasted_energy** | Double | The forecasted energy in kWh |
| **region_id** | String | The id of the region associated with this regional energy reporting (see Table 64, page 132) |

| | | |
|---|---|---|
| **timeslot_id** | String | The id of the timeslot associated with this regional energy reporting (see Figure 18, page 54) |

#### 2.4.5.1 Retrieve the EVSE energy records associated with a timeslot [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-13T14:08:23+02:00",
6.         "updated":"2015-01-13T14:08:23+02:00"
7.     },
8.     "regional_energy":[
9.         {
10.            "id":"1",
11.            "generated_energy":5001.57,
12.            "aggregated_energy":6500.36,
13.            "requested_energy":150.69,
14.            "actual_energy":210.67,
15.            "forecasted_energy":6300,
16.            "region_id":"1",
17.            "timelslot_id":"1"
18.        },
19.        {
20.            "id":"2",
21.            "generated_energy":4808.69,
22.            "aggregated_energy":6200,
23.            "requested_energy":178,
24.            "actual_energy":130.78,
25.            "forecasted_energy":6200,
26.            "region_id":"2",
27.            "timelslot_id":"1"
28.        }
29.    ]
30.}
```

## 2.5 Energy demand / Power consumption

This API set offers services for getting/updating information related to the electricity demand (consumption).

### 2.5.1 Get the energy consumption profile of a sector

**Endpoint URL: [/{version}/{trial}/energy/consumption/profile/sector/{sector}/{from}/{to}]**

Retrieves information regarding the energy consumption profile of a specific sector, during a specific time period. A valid {sector} can be obtained by calling the /{version}/{trial}/meters/sectors service. Valid {from} and {to} values are expressed in ISO8601 format. 'Terni' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for getting energy consumption profile |
| *sector* | String | INDUSTRIAL | The sector to fetch the information for. |
| *from* | String | 2014-12-20T02:15:00+02:00 | The lower limit of the duration of the query, in an ISO8601 compliant format. |
| *to* | String | 2014-12-20T03:15:00+02:00 | The upper limit of the duration of the query, in an ISO8601 compliant format. |

The class diagram of the response (instance of MeasurementReport) has already been presented in Figure 10, page 27, using “EnergyConsumptionGrid” as the measurement type.

#### 2.5.1.1 Retrieve the energy consumption profile of a sector [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1.      "metadata":{
2.          "api_version":"0.1",
3.          "trial":"Terni",
4.          "created":"2015-01-15T10:46:33+02:00",
5.          "updated":"2015-01-15T10:46:33+02:00"
6.      },
7.      "measurements":[
8.          {
9.              "id":"INDUSTRIAL",
10.             "measurement_type":"EnergyConsumptionGrid",
11.             "values":[
12.                 {
13.                     "id":null,
14.                     "datetime":"2014-12-20T02:15:00+02:00",
15.                     "value":277.0
16.                 },
17.                 {
18.                     "id":null,
19.                     "datetime":"2014-12-20T02:30:00+02:00",
20.                     "value":256.0
21.                 },
22.                 {
23.                     "id":null,
24.                     "datetime":"2014-12-20T02:45:00+02:00",
25.                     "value":253.0
26.                 },
27.                 {
```

```
                    "id":null,
                    "datetime":"2014-12-20T03:00:00+02:00",
                    "value":264.0
                },
                {
                    "id":null,
                    "datetime":"2014-12-20T03:15:00+02:00",
                    "value":236.0
                }
            ],
            "start_time":"2014-12-20T02:15:00+02:00",
            "end_time":"2014-12-20T03:15:00+02:00"
        }
    ]
}
```


### 2.5.2 Get the energy consumption profile of a user

**Endpoint URL:**

**[/{version}/{trial}/energy/consumption/profile/user/{customer_id}/{from}/{to}]**

Retrieves information regarding the energy consumption profile of a specific user, during a specific time period. A valid {customer_id} can be obtained by calling the /{version}/{trial}/meters service and checking the 'customer_id' attribute of the response. Valid {from} and {to} values are expressed in ISO8601 format. 'Terni' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for getting the energy profile requested |
| *customer_id* | String | WP4_U_3 | The user to fetch the information for. |
| *from* | String | 2014-12-20T02:15:00+02:00 | The lower limit of the duration of the query, in an ISO8601 compliant format. |
| *to* | String | 2014-12-20T03:15:00+02:00 | The upper limit of the duration of the query, in an ISO8601 compliant format. |

The class diagram of the response (instance of MeasurementReport) has already been presented in Figure 10, page 27, using "EnergyConsumptionGrid" as the measurement type.

#### 2.5.2.1 Retrieve the energy consumption profile of a user [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body


```
{
    "metadata":{
        "api_version":"0.1",
```

```
        "trial":"Terni",
        "created":"2015-01-15T10:49:06+02:00",
        "updated":"2015-01-15T10:49:06+02:00"
    },
    "measurements":[
        {
            "id":"WP4_U_3",
            "measurement_type":"EnergyConsumptionGrid",
            "values":[
                {
                    "id":null,
                    "datetime":"2014-12-20T02:15:00+02:00",
                    "value":242.0
                },
                {
                    "id":null,
                    "datetime":"2014-12-20T02:30:00+02:00",
                    "value":222.0
                },
                {
                    "id":null,
                    "datetime":"2014-12-20T02:45:00+02:00",
                    "value":219.0
                },
                {
                    "id":null,
                    "datetime":"2014-12-20T03:00:00+02:00",
                    "value":230.0
                },
                {
                    "id":null,
                    "datetime":"2014-12-20T03:15:00+02:00",
                    "value":203.0
                }
            ],
            "start_time":"2014-12-20T02:15:00+02:00",
            "end_time":"2014-12-20T03:15:00+02:00"
        }
    ]
}
```


### 2.5.3 Get the total energy consumption of a user

**Endpoint URL:**

**[/{version}/{trial}/energy/consumption/total/user/{customer_id}/{from}/{to}]**

Retrieves information regarding the total energy consumption of a specific user, during a specific time period. A valid {customer_id} can be obtained by calling the /{version}/{trial}/meters service and checking the 'customer_id' attribute of the response. Valid {from} and {to} values are expressed in ISO8601 format. 'Terni' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for getting the requested energy consumption. |
| *customer_id* | String | WP4_U_3 | The user to fetch the information for. |
| *from* | String | 2014-12-20T02:15:00+02:00 | The lower limit of the duration of the query, in an ISO8601 compliant format. |
| *to* | String | 2014-12-20T03:15:00+02:00 | The upper limit of the duration of the query, in an ISO8601 compliant format. |

The class diagram of the response (instance of MeasurementReport) has already been presented in Figure 10, page 27, using “EnergyConsumptionGrid” as the measurement type.

#### 2.5.3.1 Retrieve the total energy consumption of a user [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Terni",
5.         "created":"2015-01-15T10:49:42+02:00",
6.         "updated":"2015-01-15T10:49:42+02:00"
7.     },
8.     "measurements":[
9.         {
10.            "id":"WP4_U_3",
11.            "measurement_type":"EnergyConsumptionGrid",
12.            "values":[
13.                {
14.                    "id":null,
15.                    "datetime":"1970-01-01T02:00:00+02:00",
16.                    "value":1116.0
17.                }
18.            ],
19.            "start_time":"2014-12-20T02:15:00+02:00",
20.            "end_time":"2014-12-20T03:15:00+02:00"
21.        }
22.    ]
23.}
```

### 2.5.4 Get the power demand of a user

**Endpoint URL: [/{version}/{trial}/power/demand/user/{customer_id}/{from}/{to}]**

Retrieves information regarding the power demand of a specific user, during a specific time period. A valid {customer_id} can be obtained by calling the /{version}/{trial}/meters service and checking the 'customer_id' attribute of the response. Valid {from} and {to} values are expressed in ISO8601 format. 'Terni' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for getting the requested power demand report. |
| *customer_id* | String | WP4_U_3 | The user to fetch the information for. |
| *from* | String | 2014-12-20T02:15:00+02:00 | The lower limit of the duration of the query, in an ISO8601 compliant format. |
| *to* | String | 2014-12-20T03:15:00+02:00 | The upper limit of the duration of the query, in an ISO8601 compliant format. |

The class diagram of the response (instance of MeasurementReport) has already been presented in Figure 10, page 27, using “PowerDemandGrid” as the measurement type.

#### 2.5.4.1 Retrieve the power demand of a user [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Terni",
5.         "created":"2015-01-15T21:07:09+02:00",
6.         "updated":"2015-01-15T21:07:09+02:00"
7.     },
8.     "measurements":[
9.         {
10.            "id":"WP4_U_3",
11.            "measurement_type":"PowerDemandGrid",
12.            "values":[
13.
14.            ],
15.            "start_time":"2014-12-20T02:15:00+02:00",
16.            "end_time":"2014-12-20T03:15:00+02:00"
17.        }
18.    ]
```

```
19. }
```

## 2.6 Energy supply / Power production

This API set offers services for getting/updating information related to the electricity supply (production).

### 2.6.1 Get the energy production profile of a sector

**Endpoint URL: [/{version}/{trial}/energy/production/profile/sector/{sector}/{from}/{to}]**

Retrieves information regarding the energy production profile of a specific sector, during a specific time period. A valid {sector} can be obtained by calling the /{version}/{trial}/meters/sectors service. Valid {from} and {to} values are expressed in ISO8601 format. 'Terni' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for getting the requested energy production profile. |
| *sector* | String | * | The sector to fetch the information for. |
| *from* | String | 2014-12-20T02:15:00+02:00 | The lower limit of the duration of the query, in an ISO8601 compliant format. |
| *to* | String | 2014-12-20T03:15:00+02:00 | The upper limit of the duration of the query, in an ISO8601 compliant format. |

The class diagram of the response (instance of MeasurementReport) has already been presented in Figure 10, page 27, using “EnergyProductionGrid” as the measurement type.

#### 2.6.1.1 Retrieve the energy production profile of a sector [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Terni",
5.         "created":"2015-01-15T21:09:20+02:00",
6.         "updated":"2015-01-15T21:09:20+02:00"
7.     },
8.     "measurements":[
9.         {
```

```
            "id":"*",
            "measurement_type":"EnergyProductionGrid",
            "values”:[
                {
                    "id":null,
                    "datetime":"2014-12-20T02:15:00+02:00",
                    "value":0.0
                },
                {
                    "id":null,
                    "datetime":"2014-12-20T02:30:00+02:00",
                    "value":0.0
                },
                {
                    "id":null,
                    "datetime":"2014-12-20T02:45:00+02:00",
                    "value":0.0
                },
                {
                    "id":null,
                    "datetime":"2014-12-20T03:00:00+02:00",
                    "value":0.0
                },
                {
                    "id":null,
                    "datetime":"2014-12-20T03:15:00+02:00",
                    "value":0.0
                }
            ],
            "start_time":"2014-12-20T02:15:00+02:00",
            "end_time":"2014-12-20T03:15:00+02:00"
        }
    ]
}
```


### 2.6.2 Get the energy production profile of a user

Endpoint URL: **[/{version}/{trial}/energy/production/profile/user/{customer_id}/{from}/{to}]**

Retrieves information regarding the energy production profile of a specific user, during a specific time period. A valid {customer_id} can be obtained by calling the /{version}/{trial}/meters service and checking the 'customer_id' attribute of the response. Valid {from} and {to} values are expressed in ISO8601 format. 'Terni' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for getting the requested energy production profile. |
| *customer_id* | String | WP4_U_3 | The user to fetch the information for. |
| *from* | String | 2014-12-20T02:15:00+02:00 | The lower limit of the duration of the query, in an ISO8601 compliant format. |
| *to* | String | 2014-12-20T03:15:00+02:00 | The upper limit of the duration of the query, in an ISO8601 compliant format. |

The class diagram of the response (instance of MeasurementReport) has already been presented in Figure 10, page 27, using “EnergyProductionGrid” as the measurement type.

#### 2.6.2.1 Retrieve the energy production profile of a user [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Terni",
        "created":"2015-01-15T21:11:15+02:00",
        "updated":"2015-01-15T21:11:15+02:00"
    },
    "measurements":[
        {
            "id":"WP4_U_3",
            "measurement_type":"EnergyProductionGrid",
            "values":[
                {
                    "id":null,
                    "datetime":"1970-01-01T02:00:00+02:00",
                    "value":0.0
                }
            ],
            "start_time":"2014-12-20T02:15:00+02:00",
            "end_time":"2014-12-20T03:15:00+02:00"
        }
    ]
}
```

### 2.6.3 Get the total energy production of a user

**Endpoint URL: [/{version}/{trial}/energy/production/total/user/{customer_id}/{from}/{to}]**

Retrieves information regarding the total energy production of a specific user, during a specific time period. A valid {customer_id} can be obtained by calling the /{version}/{trial}/meters service and checking the 'customer_id' attribute of the response. Valid {from} and {to} values are expressed in ISO8601 format. 'Terni' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for getting the requested energy production report. |
| *customer_id* | String | WP4_U_3 | The user to fetch the information for. |
| *from* | String | 2014-12-20T02:15:00+02:00 | The lower limit of the duration of the query, in an ISO8601 compliant format. |
| *to* | String | 2014-12-20T03:15:00+02:00 | The upper limit of the duration of the query, in an ISO8601 compliant format. |

The class diagram of the response (instance of MeasurementReport) has already been presented in Figure 10, page 27, using “EnergyProductionGrid” as the measurement type.

#### 2.6.3.1 Retrieve the total energy production of a user [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Terni",
        "created":"2015-01-15T21:11:49+02:00",
        "updated":"2015-01-15T21:11:49+02:00"
    },
    "measurements":[
        {
            "id":"WP4_U_3",
            "measurement_type":"EnergyProductionGrid",
            "values”:[
                {
                    "id":null,
                    "datetime":"1970-01-01T02:00:00+02:00",
```

```
                    "value":0.0
                }
            ],
            "start_time":"2014-12-20T02:15:00+02:00",
            "end_time":"2014-12-20T03:15:00+02:00"
        }
    ]
}
```

### 2.6.4 Get the power supply of a user

**Endpoint URL: [/{version}/{trial}/power/supply/user/{customer_id}/{from}/{to}]**

Retrieves information regarding the power supply of a specific user, during a specific time period. A valid {customer_id} can be obtained by calling the /{version}/{trial}/meters service and checking the 'customer_id' attribute of the response. Valid {from} and {to} values are expressed in ISO8601 format. 'Terni' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for getting the requested power supply report. |
| *customer_id* | String | WP4_U_3 | The user to fetch the information for. |
| *from* | String | 2014-12-20T02:15:00+02:00 | The lower limit of the duration of the query, in an ISO8601 compliant format. |
| *to* | String | 2014-12-20T03:15:00+02:00 | The upper limit of the duration of the query, in an ISO8601 compliant format. |

The class diagram of the response (instance of MeasurementReport) has already been presented in Figure 10, page 27, using “PowerSupplyGrid” as the measurement type.

#### 2.6.4.1 Retrieve the power supply of a user [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Terni",
        "created":"2015-01-15T21:12:21+02:00",
        "updated":"2015-01-15T21:12:21+02:00"
    },
    "measurements":[
```

```
9.          {
10.             "id":"WP4_U_3",
11.             "measurement_type":"PowerSupplyGrid",
12.             "values":[
13.
14.             ],
15.             "start_time":"2014-12-20T02:15:00+02:00",
16.             "end_time":"2014-12-20T03:15:00+02:00"
17.         }
18.     ]
19. }
```

### 2.6.5 Get the power supply of a building module

**Endpoint URL: [/{version}/{trial}/buildings/{id}/modules/pv/*/PowerSupply/{date}]**

Provides measurements regarding the power generated from a module of a building. Currently, 'pv' is the only module supported. Valid {date} values are expressed in ISO8601 format. 'Madrid' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Madrid | The trial infrastructure to use for getting the requested power supply report. |
| *building_id* | String | 1 | The building associated with the module |
| *date* | String | 2015-02-28T00:00:00+02:00 | The date of interest, in an ISO8601 compliant format. |

The class diagram of the response (instance of MeasurementReport) has already been presented in Figure 10, page 27, using “PowerSupplyGrid” as the measurement type.

#### 2.6.5.1 Retrieve the power supply of a building module [GET]

**Request**

- Headers

```
1. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Madrid",
5.         "created":"2015-02-26T17:33:02+02:00",
6.         "updated":"2015-02-26T17:33:02+02:00"
7.     },
8.     "measurements":{
9.         "measurement_type":"PowerSupplyGrid",
10.        "values":[
```

```
            {
                "id":null,
                "datetime":"2015-02-28T00:00:00+02:00",
                "value":7551
            }
        ],
        "start_time":null,
        "end_time":null
    }
}
```

### 2.6.6 Get the total power of a building module

**Endpoint URL: [/{version}/{trial}/buildings/{id}/modules/inverter/*/PowerMixed/{date}]**

Provides measurements regarding the power generated & consumed (mixed) from a module of a building. Currently, 'inverter' is the only module supported. Valid {date} values are expressed in ISO8601 format. 'Madrid' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Madrid | The trial infrastructure to use for getting the requested power supply report. |
| *building_id* | String | 1 | The building associated with the module |
| *date* | String | 2015-02-28T00:00:00+02:00 | The date of interest, in an ISO8601 compliant format. |

The class diagram of the response (instance of MeasurementReport) has already been presented in Figure 10, page 27, using “PowerMixed” as the measurement type.

#### 2.6.6.1 Retrieve the total power of a building module [GET]

**Request**

- Headers

```
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Madrid",
        "created":"2015-02-26T17:34:41+02:00",
        "updated":"2015-02-26T17:34:41+02:00"
    },
    "measurements":{
        "measurement_type":"PowerMixed",
        "values":[
            {
```

```
                "id":null,
                "datetime":"2015-02-28T00:00:00+02:00",
                "value":6508
            }
        ],
        "start_time":null,
        "end_time":null
    }
}
```

## 2.7 Electric Vehicles

This group of APIs offers access to information related to monitoring of Electric Vehicles and their supporting equipment.

### 2.7.1 Get the list of vehicles in trial

**Endpoint URL: [/{version}/{trial}/vehicles]**

List the vehicles known to the selected trial infrastructure. 'Horsens' and 'Ireland' are the only trials offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Horsens | The trial infrastructure to use for invoking the respective service. |

The class diagram of the report (instance of VehichesReport) follows in Figure 22.

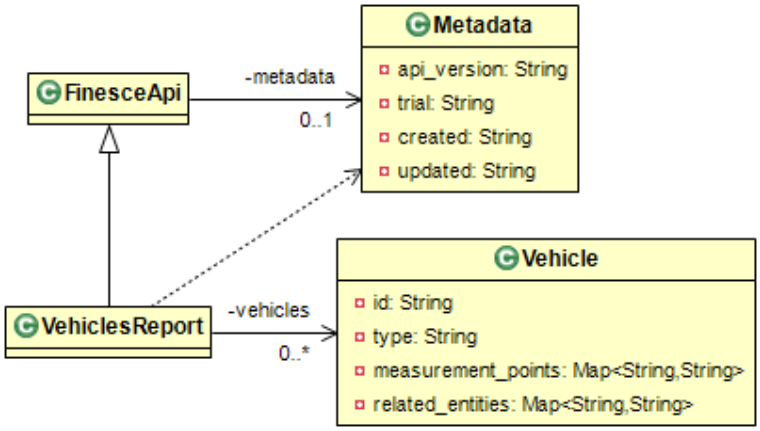


**Figure 22: Class diagram of the VehiclesReport class**

The attributes of the relevant response class follow:

**Table 36: Attributes of the VehiclesReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **vehicles** | List<Vehicle> | The list of vehicles of interest (see Table 37, page 75) |

**Table 37: Attributes of the Vehicle class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the vehicle |
| **type** | String | The type of the vehicle |
| **measurement_points** | Map<String,String> | The map of capabilities (from a metering point of view) of the vehicle |
| **related_entities_ids** | Map<String,String> | The map of related entities (e.g. IDs of related buildings) |

#### 2.7.1.1 Retrieve a list of vehicle descriptions [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Ireland",
        "created":"2015-03-06T11:46:33+02:00",
        "updated":"2015-03-06T11:46:33+02:00"
    },
    "vehicles":[
        {
            "id":"Vechicle#1234",
            "type":"ev-type-1",
            "measurement_points":{
                "pos-Vechicle#1234":"Position",
                "bc-Vechicle#1234":"BatteryCapacity",
                "sp-Vechicle#1234":"Speed"
            },
            "related_entities":{
                "1234":"Building"
            }
        },
        {
            "id":"Vechicle#4567",
            "type":"ev-type-1",
            "measurement_points":{
                "bc-Vechicle#4567":"BatteryCapacity",
                "pos-Vechicle#4567":"Position",
                "sp-Vechicle#4567":"Speed"
            },
            "related_entities":{
                "4567":"Building"
            }
        }
    ]
}
```

### 2.7.2 Get vehicle Description

**Endpoint URL: [/{version}/{trial}/vehicles/{id}]**

GET /Horsens/vehicles/{id} Provides information regarding a single vehicle. A valid {id} can be found by calling the /{version}/{trial}/vehicles service. 'Horsens' and 'Ireland' are the only trials offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Horsens | The trial infrastructure to use for invoking the respective service. |
| *id* | String | Vechicle#1234 | The id of the vehicle to be displayed. |

The class diagram of the response (instance of VehiclesReport) has been already presented in Figure 22, page 75.

#### 2.7.2.1 Retrieve a description of a single vehicle [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Horsens",
5.         "created":"2015-02-26T16:53:39+02:00",
6.         "updated":"2015-02-26T16:53:39+02:00"
7.     },
8.     "vehicles":[
9.         {
10.            "id":"Vechicle#1234",
11.            "type":"ev-type-1",
12.            "measurement_points":{
13.                "pos-Vechicle#1234":"Position",
14.                "bc-Vechicle#1234":"BatteryCapacity",
15.                "sp-Vechicle#1234":"Speed"
16.            },
17.            "related_entities":{
18.                "1234":"Building"
19.            }
20.        }
21.    ]
22. }
```

### 2.7.3 Get vehicles measurement types

**Endpoint URL: [/{version}/{trial}/vehicles/measurement_types]**

Provides a detailed list of all the available vehicle measurements types in the trial. 'Horsens' and 'Ireland' are the only trials offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Horsens | The trial infrastructure to use for invoking the respective service. |

The class diagram of the response (instance of MeasurementTypesReport) has been already presented in Figure 9, page 22.

#### 2.7.3.1 Retrieve the measurement types of the vehicles of the trial [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Horsens",
5.         "created":"2015-01-07T15:36:03+01:00",
6.         "updated":"2015-01-07T15:36:03+01:00"
7.     },
8.     "measurement_types":[
9.         {
10.            "id":null,
11.            "name":"IndoorTemperatureAverage",
12.            "description":"Indoor temperature average for period",
13.            "type":"Temperature",
14.            "unit":"C"
15.        },
16.        {
17.            "id":null,
18.            "name":"HouseNaturalGasConsumption",
19.            "description":"Accumulated house natural gas consumption fo
   r all time",
20.            "type":"Volume",
21.            "unit":"m^3"
22.        },
23.        {
24.            "id":null,
25.            "name":"ICMIndoorCO2LevelAverage",
26.            "description":"Indoor CO2 level average as measured by IC-M
   eter",
27.            "type":"-",
28.            "unit":"ppm"
29.        }
30.    ]
```

```
31. }
```

### 2.7.4 Get vehicles measurement types based on their id

**Endpoint URL: [/{version}/{trial}/vehicles/measurement_types/id/{id}]**

Provides a detailed list of all the available measurements types that match a specific measurements type name. A valid {id} can be obtained by calling the /{version}/{trial}/vehicles/measurement_types service. 'Horsens' and 'Ireland' are the only trials offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Horsens | The trial infrastructure to use for invoking the respective service. |
| *id* | String | ICMIndoorCO2LevelAverage | The id of the measurement type of interest. |

The class diagram of the response (instance of MeasurementTypesReport) has been already presented in Figure 9, page 22.

#### 2.7.4.1 Retrieve a single measurement type based on its id [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Horsens",
5.         "created":"2015-01-07T15:40:26+01:00",
6.         "updated":"2015-01-07T15:40:26+01:00"
7.     },
8.     "measurement_types":[
9.         {
10.            "id":null,
11.            "name":"ICMIndoorCO2LevelAverage",
12.            "description":"Indoor CO2 level average as measured by IC-M
   eter",
13.            "type":"-",
14.            "unit":"ppm"
15.        }
16.    ]
17. }
```

### 2.7.5 Get vehicles measurement types based on their general type

**Endpoint URL: [/{version}/{trial}/vehicles/measurement_types/type/{type}]**

Provides a detailed list of all the available measurements types that match a generic measurements type. A valid {type} can be obtained by calling the /{version}/{trial}/vehicles/measurement_types service and check the 'type' entries. 'Horsens' and 'Ireland' are the only trials offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Horsens | The trial infrastructure to use for invoking the respective service. |
| *type* | String | temperature | The type of the measurement of interest. |

The class diagram of the response (instance of MeasurementTypesReport) has been already presented in Figure 9, page 22.

#### 2.7.5.1 Retrieve a single measurement type based on its type [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Horsens",
5.         "created":"2015-01-07T15:42:23+01:00",
6.         "updated":"2015-01-07T15:42:23+01:00"
7.     },
8.     "measurement_types":[
9.         {
10.            "id":null,
11.            "name":"IndoorTemperatureAverage",
12.            "description":"Indoor temperature average for period",
13.            "type":"Temperature",
14.            "unit":"C"
15.        }
16.    ]
17.}
```

### 2.7.6 Get the available measurement types of a single vehicle

**Endpoint URL: [/{version}/{trial}/vehicles/{id}/measurement_types]**

Provides information regarding the available measurements types for the specific vehicle. A valid {id} can be obtained by calling the /{version}/{trial}/vehicles service. 'Horsens' and 'Ireland' are the only trials offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Horsens | The trial infrastructure to use for invoking the respective service. |
| *id* | String | Vechicle#1234 | The id of the vehicle of interest. |

The class diagram of the response (instance of MeasurementTypesReport) has been already presented in Figure 9, page 22.

#### 2.7.6.1 Retrieve the measurement types of a vehicle of the trial [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Horsens",
5.         "created":"2015-01-07T15:45:23+01:00",
6.         "updated":"2015-01-07T15:45:23+01:00"
7.     },
8.     "measurement_types":[
9.         {
10.            "id":null,
11.            "name":"IndoorTemperatureAverage",
12.            "description":"Indoor temperature average for period",
13.            "type":"Temperature",
14.            "unit":"C"
15.        }
16.    ]
17.}
```

### 2.7.7 Get the measurements of a single vehicle

**Endpoint URL: [/{version}/{trial}/vehicles/{id}/measurements/{type_id}/{from}/{to}]**

Provides information regarding the available measurements of a specific type for a specific vehicle, during a certain period of time. A valid {id} can be obtained by calling the /{version}/{trial}/vehicles service. A valid {type_id} can be obtained by calling the /{version}/{trial}/vehicles service and check the 'measurement_points' section of the answer. Valid {from} and {to} values are expressed in ISO8601 format. 'Horsens' and 'Ireland' are the only trials offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Horsens | The trial infrastructure to use for invoking the respective service. |
| *id* | String | Vechicle#1234 | The id of the vehicle of interest. |
| *type_id* | String | IndoorTemperatureAverage | The id of the measurement type to query the building for. |
| *from* | String | 2014-12-29T19:52:13+02:00 | The lower limit of the duration of the query, in an ISO8601 compliant format. |
| *to* | String | 2014-12-29T20:52:13+02:00 | The upper limit of the duration of the query, in an ISO8601 compliant format. |

The class diagram of the response (instance of MeasurementReport) has already been presented in Figure 10, page 27, using “IndoorTemperatureAverage” as the measurement type.

#### 2.7.7.1 Retrieve the measurement types of a vehicle of the trial [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Horsens",
5.         "created":"2015-01-12T15:33:30+01:00",
6.         "updated":"2015-01-12T15:33:30+01:00"
7.     },
8.     "measurements":{
9.         "measurement_type":"IndoorTemperatureAverage",
10.        "values":[
11.            {
12.                "id":null,
13.                "datetime":"2015-01-12T15:33:30+01:00",
14.                "value":18
15.            },
16.            {
17.                "id":null,
18.                "datetime":"2015-01-12T15:33:30+01:00",
19.                "value":19
```

```
            }
        ],
        "start_time":null,
        "end_time":null
    }
}
```

### 2.7.8 Get the connections of an EV with an electric vehicle supply equipment component

**Endpoint URL: [/{version}/{trial}/vehicles/{id}/connections]**

Allows a user to retrieve a collection of electric vehicle - electric vehicle supply equipment (EVSE) connections associated with an electric vehicle. A valid {id} can be obtained by calling the /{version}/{trial}/vehicles/{id} service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the EVSE connections |

The class diagram of the response (instance of ConnectionsReport) follows in Figure 23.

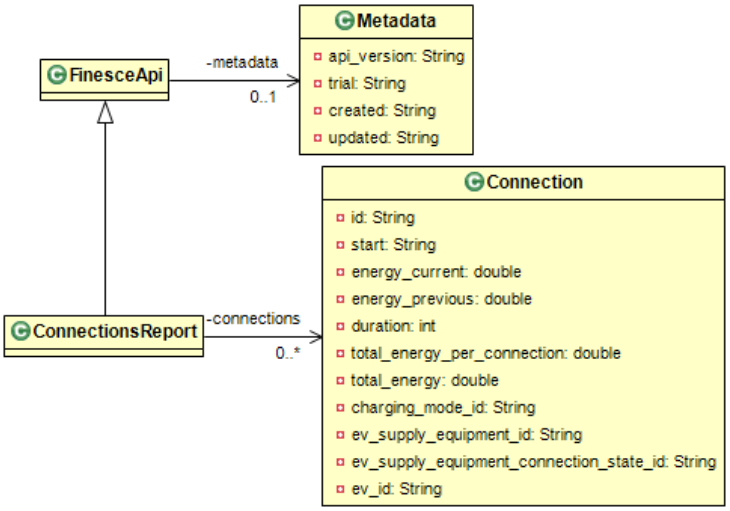


**Figure 23: Class diagram of a ConnectionsReport response.**

The attributes of the relevant response class are detailed next.

**Table 38: Attributes of the ConnectionsReport class.**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **connections** | List<Connection> | The list of connections of interest (see Table 39, page 83) |

**Table 39: Attributes of the Connection class.**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the connection |

| | | |
|---|---|---|
| **start** | String | The time when the connection state changed, in an ISO8601 compliant format |
| **energy_current** | Double | Power being consumed by the connection in this minute |
| **energy_previous** | Double | Power being consumed by the connection in the previous minute |
| **duration** | Integer | Duration of the connection (seconds) |
| **total_energy_per_connection** | Double | The total power demand of this connection |
| **total_energy** | Double | The total power demand of all connections by this electric vehicle supply equipment |
| **charging_mode_id** | String | The id of the associated charging mode (see Table 43, page 89) |
| **ev_supply_equipment_id** | String | The id of the associated charging mode (see Table 45, page 92) |
| **ev_supply_equipment_connection_state_id** | String | The id of the related connection state (see Table 47, page 99) |
| **ev_id** | String | The id of the electric vehicle associated with this connection (see Figure 22, page 75) |

#### 2.7.8.1 Retrieve the available EV-EVSE connections of an electric vehicle [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Ireland",
        "created":"2015-02-10T20:26:55+02:00",
        "updated":"2015-02-10T20:26:55+02:00"
    },
    "connections":[
        {
            "id":"1",
            "start":"2014-09-18T05:13:00.000Z",
            "energy_current":0.51,
            "energy_previous":0.52,
            "duration":3600,
            "total_energy_per_connection":2.2,
            "total_energy":9663.562,
            "charging_mode_id":"1",
            "ev_supply_equipment_id":"1",
            "ev_supply_equipment_connection_state_id":"1",
            "ev_id":"1"
        },
        {
            "id":"2",
```

```
            "start":"2014-09-18T06:13:00.000Z",
            "energy_current":0.49,
            "energy_previous":0.51,
            "duration":3600,
            "total_energy_per_connection":2.2,
            "total_energy":9663.762,
            "charging_mode_id":"1",
            "ev_supply_equipment_id":"1",
            "ev_supply_equipment_connection_state_id":"1",
            "ev_id":"1"
        }
    ]
}
```


### 2.7.9 Get the supported electric vehicle types

**Endpoint URL: [/{version}/{trial}/vehicle_types]**

Provides information regarding the types of the electric vehicles of the trial. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the EVSE charging modes. |

The class diagram of the report (instance of VehicleTypesReport) follows in Figure 24.

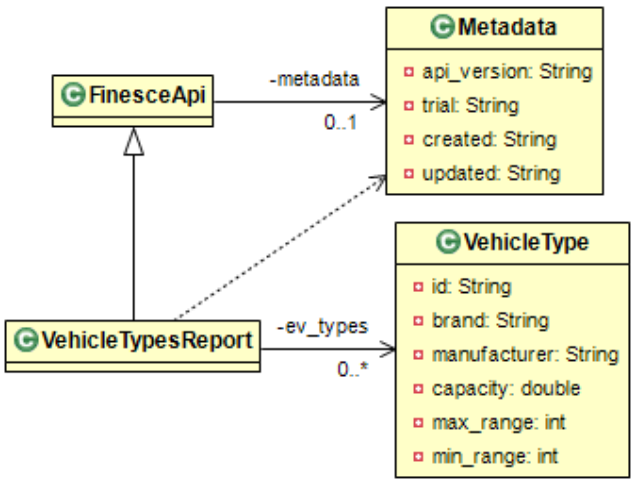


**Figure 24: Class diagram of the VehicleTypesReport class**

The attributes of the relevant class response are detailed in the following tables.

**Table 40: Attributes of the VehicleTypesReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **ev_types** | List<VehicleType> | The list of vehicle types supported by the trial (see Table 41, page 86) |

**Table 41: Attributes of the VehicleType class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the vehicle type |
| **brand** | String | The brand name of the vehicles of this type |
| **manufacturer** | String | The manufacturer of this vehicle type |
| **capacity** | Double | The capacity of the vehicle battery in kWh |
| **max_range** | Integer | The maximum range of the vehicle type in km |
| **min_range** | Integer | The minimum range of the vehicle type in km |

#### 2.7.9.1 Retrieve the available EV types [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-13T15:28:17+02:00",
6.         "updated":"2015-01-13T15:28:17+02:00"
7.     },
8.     "ev_types":[
9.         {
10.            "id":"1",
11.            "brand":"Leaf",
12.            "manufacturer":"Nissan",
13.            "capacity":24,
14.            "max_range":120,
15.            "min_range":160
16.        }
17.    ]
18.}
```

### 2.7.10 Get a specific electric vehicle type description, based on its id

**Endpoint URL: [/{version}/{trial}/vehicle_types/{id}]**

Allows a user to retrieve an electric vehicle type, based on its id. A valid {id} can be obtained by calling the /{version}/{trial}/vehicle_types service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the supported vehicle types. |
| *id* | String | 1 | The id of the electric vehicle type of interest. |

The class diagram of the response (instance of VehicleTypesReport) has been already documented in Figure 24, page 85.

#### 2.7.10.1 Retrieve an EV type description [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-13T15:28:17+02:00",
6.         "updated":"2015-01-13T15:28:17+02:00"
7.     },
8.     "ev_types":[
9.         {
10.            "id":"1",
11.            "brand":"Leaf",
12.            "manufacturer":"Nissan",
13.            "capacity":24,
14.            "max_range":120,
15.            "min_range":160
16.        }
17.    ]
18. }
```

### 2.7.11 Get the electric vehicles sharing a common type, based on its id

Endpoint URL: **[/{version}/{trial}/vehicle_types/{id}/vehicles]**

Allows a user to retrieve a collection of electric vehicles associated with an electric vehicle type. A valid {id} can be obtained by calling the /{version}/{trial}/vehicle_types service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the EVSE charging modes. |
| *id* | String | 1 | The id of the electric vehicle type of interest. |

The class type of the response (instance of VehiclesReport) has been already presented in Figure 22, page 75.

#### 2.7.11.1 Retrieve the electric vehicles sharing a common type [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-13T15:37:40+02:00",
6.         "updated":"2015-01-13T15:37:40+02:00"
7.     },
8.     "vehicles":[
9.         {
10.            "id":"1",
11.            "type":"1",
12.            "measurement_point":[
13.
14.            ],
15.            "related_entity":[
16.
17.            ]
18.        }
19.    ]
20.}
```

### 2.7.12 Get the EVs charging modes

Endpoint URL: **[/{version}/{trial}/charging_modes]**

Provides information regarding the charging modes of the electric vehicle supply equipment (EVSE) of the electric vehicles of the trial. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the EVSE charging modes. |

The class diagram of the response (instance of ChargingModesReport) is given in the next figure.

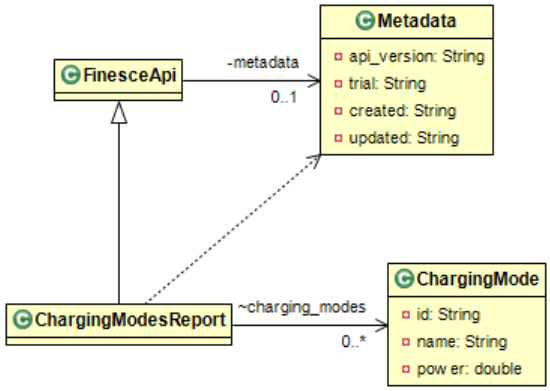


**Figure 25: Class diagram of a ChargingModesReport response**

The attributes of the respective response are detailed in the following tables.

**Table 42: Attributes of the ChargingModesReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **charging_modes** | List<ChargingMode> | The list of charging modes supported by the trial (see Table 43, page 89) |

**Table 43: Attributes of the ChargingMode class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the charging mode |
| **name** | String | The name of the charging mode |
| **power** | Double | The power dissipation of the charging mode in kW |

#### 2.7.12.1 Retrieve the available EVSE charging modes [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
```

```
2.      "metadata":{
3.          "api_version":"0.1",
4.          "trial":"Ireland",
5.          "created":"2015-01-12T16:22:09+01:00",
6.          "updated":"2015-01-12T16:22:09+01:00"
7.      },
8.      "charging_modes":[
9.          {
10.             "id":"1",
11.             "name":"Single Phase 16A",
12.             "power":1.07
13.         },
14.         {
15.             "id":"2",
16.             "name":"Single Phase 8A",
17.             "power":3.05
18.         }
19.     ]
20. }
```

### 2.7.13 Get a charging mode based on an id

**Endpoint URL: [/{version}/{trial}/charging_modes/{id}]**

Allows a user to retrieve a chargingmode based on an id. A valid {id} can be obtained by calling the /{version}/{trial}/charging_modes service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the EVSE charging modes. |
| *id* | String | 1 | The id of the charging_mode to get information for. |

The class diagram of the response (instance of ChargingModesReport) has been already given in Figure 25, page 89.

#### 2.7.13.1 Retrieve a charging mode based on an id [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.      "metadata":{
3.          "api_version":"0.1",
```

```
        "trial":"Ireland",
        "created":"2015-01-12T16:25:32+01:00",
        "updated":"2015-01-12T16:25:32+01:00"
    },
    "charging_modes":[
        {
            "id":"1",
            "name":"Single Phase 16A",
            "power":1.07
        }
    ]
}
```

### 2.7.14 Get the electric vehicle supply equipment components related to a charging mode

Endpoint URL: **[/{version}/{trial}/charging_modes/{id}/evses]**

Allows a user to retrieve a collection of electric vehicle supply equipment components (EVSEs) associated with a charging mode. A valid {id} can be obtained by calling the /{version}/{trial}/charging_modes service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for calling the service |
| *id* | String | 1 | The id of the charging_mode to get information for. |

The class diagram of the response (instance of VehicleSupplyEquipmentReport) is given in the next figure.

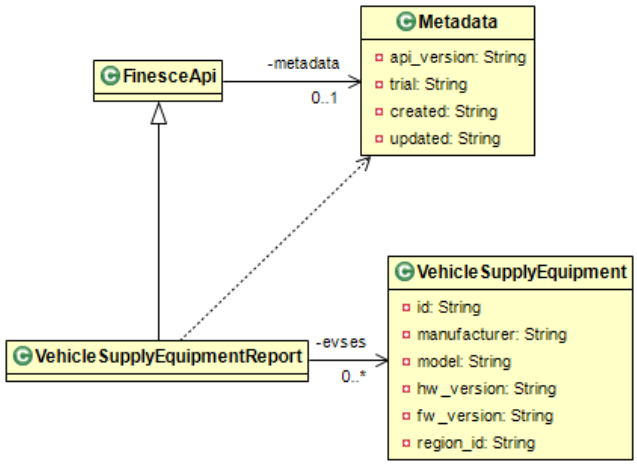


**Figure 26: Class diagram of a VehicleSupplyEquipmentReport response.**

The attributes of the relevant response are detailed in the tables following.

**Table 44: Attributes of the VehicleSupplyEquipmentReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **evses** | List<VehicleSupplyEquipment> | The list of EVSEs supported by the trial (see Table 45, page 92) |

**Table 45: Attributes of the VehicleSupplyEquipment class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the EVSE |
| **manufacturer** | String | The manufacturer of the EVSE |
| **model** | String | The model of the EVSE |
| **hw_version** | String | The hardware version of the EVSE |
| **fw_version** | String | The software version of the EVSE |
| **region_id** | String | The id of the region associated with this EVSE (see Table 64, page 132) |

#### 2.7.14.1 Retrieve the EVSEs related to a charging mode [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Ireland",
        "created":"2015-01-12T16:31:53+01:00",
        "updated":"2015-01-12T16:31:53+01:00"
    },
    " evses ":[
        {
            "id":"1",
            "manufacturer":"M2C",
            "model":"M2C",
            "hw_version":"1.0",
            "fw_version":"1.0",
            "region_id":"1"
        },
        {
            "id":"2",
            "manufacturer":"M2C",
            "model":"M2C",
            "hw_version":"1.0",
            "fw_version":"1.0",
            "region_id":"1"
        }
    ]
}
```

### 2.7.15 Get the EV types related to a charging mode

**Endpoint URL: [/{version}/{trial}/charging_modes/{id}/evtypes]**

Allows a user to retrieve a collection of electric vehicle types associated with a charging mode. A valid {id} can be obtained by calling the /{version}/{trial}/charging_modes service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for calling the service |
| *id* | String | 1 | The id of the charging_mode for which to get the electric vehicle types. |

The class diagram of the response has been already given in Figure 24, page 85.

#### 2.7.15.1 Retrieve the EV types related to a charging mode [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-12T17:17:17+01:00",
6.         "updated":"2015-01-12T17:17:17+01:00"
7.     },
8.     "ev_types":[
9.         {
10.            "id":"1",
11.            "brand":"Leaf",
12.            "manufacturer":"Nissan",
13.            "capacity":24,
14.            "max_range":120,
15.            "min_range":160
16.        }
17.    ]
18. }
```

### 2.7.16 Get the electric vehicle charging states

Endpoint URL: **[/{version}/{trial}/charging_states]**

Provides information regarding the charging states of the electric vehicle supply equipment (EVSE) of the electric vehicles of the trial. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the EVSE charging states. |

The class diagram of the response (instance of ChargingStatesReport) has been already given in Figure 20, page 58.

#### 2.7.16.1 Retrieve the available EVSE charging states [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-12T17:39:53+01:00",
6.         "updated":"2015-01-12T17:39:53+01:00"
7.     },
8.     "charging_states":[
9.         {
10.            "id":"1",
11.            "change_requested":false,
12.            "responded":false,
13.            "requested_state_is_on":false,
14.            "is_charging":false,
15.            "is_connected":false,
16.            "battery_full":false,
17.            "ev_id":"1",
18.            "ev_supply_equipment_id":"1",
19.            "timeslot_id":"1",
20.            "charging_mode_id":"1"
21.        },
22.        {
23.            "id":"2",
24.            "change_requested":false,
25.            "responded":false,
26.            "requested_state_is_on":false,
27.            "is_charging":false,
28.            "is_connected":false,
29.            "battery_full":false,
30.            "ev_id":"1",
31.            "ev_supply_equipment_id":"1",
32.            "timeslot_id":"2",
33.            "charging_mode_id":"1"
34.        }
```

```
    ]
}
```

### 2.7.17 Get an EV charging state based on its id

**Endpoint URL: [/{version}/{trial}/charging_states/{id}]**

Allows a user to retrieve a charging state based on an id. A valid {id} can be obtained by calling the /{version}/{trial}/charging_states service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the EVSE charging modes. |
| *id* | String | 1 | The id of the charging state to get information for. |

The class diagram of the response (instance of ChargingStatesReport) has been already given in Figure 20, page 58.

#### 2.7.17.1 Retrieve a charging state based on an id [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Ireland",
        "created":"2015-01-12T17:41:14+01:00",
        "updated":"2015-01-12T17:41:14+01:00"
    },
    "charging_states":[
        {
            "id":"1",
            "change_requested":false,
            "responded":false,
            "requested_state_is_on":false,
            "is_charging":false,
            "is_connected":false,
            "battery_full":false,
            "ev_id":"1",
            "ev_supply_equipment_id":"1",
            "timeslot_id":"1",
            "charging_mode_id":"1"
        }
    ]
}
```

### 2.7.18 Get the available EVSE connections

**Endpoint URL: [/{version}/{trial}/connections]**

Allows a user to retrieve a collection of the available EVSE connections. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the EV-EVSE connections. |

The class diagram of the response (instance of ConnectionsReport) has been already given in Figure 23, page 83.

#### 2.7.18.1 Retrieve the available EVSE connections [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-12T17:50:21+01:00",
6.         "updated":"2015-01-12T17:50:21+01:00"
7.     },
8.     "connections":[
9.         {
10.            "id":"1",
11.            "start":"2014-09-18T05:13:00.000Z",
12.            "energy_current":0.51,
13.            "energy_previous":0.52,
14.            "duration":3600,
15.            "total_energy_per_connection":2.2,
16.            "total_energy":9663.562,
17.            "charging_mode_id":"1",
18.            "ev_supply_equipment_id":"1",
19.            "ev_supply_equipment_connection_state_id":"1",
20.            "ev_id":"1"
21.        },
22.        {
23.            "id":"2",
24.            "start":"2014-09-18T06:13:00.000Z",
25.            "energy_current":0.49,
26.            "energy_previous":0.51,
27.            "duration":3600,
```

```
            "total_energy_per_connection":2.2,
            "total_energy":9663.762,
            "charging_mode_id":"1",
            "ev_supply_equipment_id":"1",
            "ev_supply_equipment_connection_state_id":"1",
            "ev_id":"1"
        }
    ]
}
```

### 2.7.19 Get an EVSE connection based on its id

**Endpoint URL: [/{version}/{trial}/connections/{id}]**

Allows a user to retrieve an EV-EVSE connection, based on its id. A valid {id} can be obtained by calling the /{version}/{trial}/connections service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the desired EV-EVSE connection |
| *id* | String | 1 | The id of the connection to get information for. |

The class diagram of the response (instance of ConnectionsReport) has been already given in Figure 23, page 83.

#### 2.7.19.1 Retrieve an EVSE connection based on an id [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Ireland",
        "created":"2015-01-12T17:49:54+01:00",
        "updated":"2015-01-12T17:49:54+01:00"
    },
    "connections":[
        {
            "id":"1",
            "start":"2014-09-18T05:13:00.000Z",
            "energy_current":0.51,
            "energy_previous":0.52,
            "duration":3600,
            "total_energy_per_connection":2.2,
            "total_energy":9663.562,
```

```
            "charging_mode_id":"1",
            "ev_supply_equipment_id":"1",
            "ev_supply_equipment_connection_state_id":"1",
            "ev_id":"1"
        }
    ]
}
```

### 2.7.20 Get an EVSE charging mode based on a connection id

**Endpoint URL: [/{version}/{trial}/connections/{id}/charging_mode]**

Allows a user to retrieve a charging mode associated with an EVSE connection. A valid {id} can be obtained by calling the /{version}/{trial}/connections service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the EVSE charging modes. |
| *id* | String | 1 | The id of the connection to get information for. |

The class diagram of the response (instance of ChargingModesReport) has been already given in Figure 25, page 89.

#### 2.7.20.1 Retrieve the charging mode of an EVSE connection based on an id [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Ireland",
        "created":"2015-01-12T17:53:22+01:00",
        "updated":"2015-01-12T17:53:22+01:00"
    },
    "charging_modes":[
        {
            "id":"1",
            "name":"Single Phase 16A",
            "power":1.07
        }
    ]
}
```

### 2.7.21 Get an EVSE connection state based on a connection id

Endpoint URL: **[/{version}/{trial}/connections/{id}/connection_state]**

Allows a user to retrieve an EVSE connection state associated with an EV-EVSE connection. A valid {id} can be obtained by calling the /{version}/{trial}/connections service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the required EVSE connection state. |
| *id* | String | 1 | The id of the connection to get information for. |

The class diagram of the response (instance of ConnectionStatesReport) is given in Figure 27.

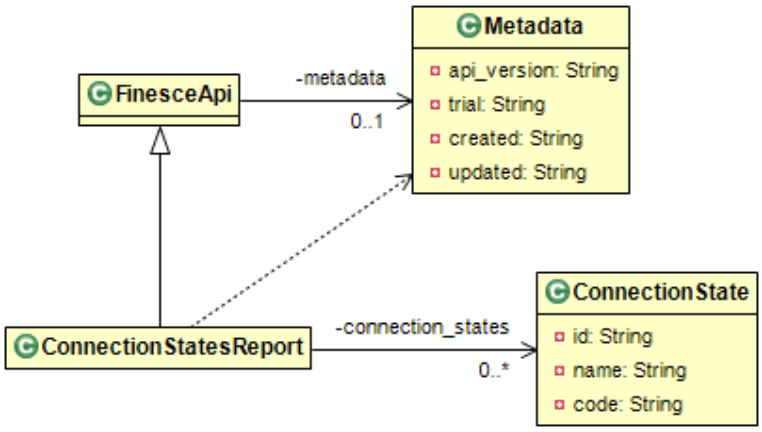


**Figure 27: Class diagram of a ConnectionStatesReport response.**

The attributes of the relevant response class follow:

**Table 46: Attributes of the ConnectionStatesReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **connection_states** | List<ConnectionState> | The list of connection states (see Table 47, page 99) |

**Table 47: Attributes of the ConnectionState class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the connection state |
| **name** | String | The name of the connection state |
| **code** | String | The code of the connection state |

#### 2.7.21.1 Retrieve a connection state based on a connection id [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-12T17:55:30+01:00",
6.         "updated":"2015-01-12T17:55:30+01:00"
7.     },
8.     "connection_states":[
9.         {
10.            "id":"1",
11.            "name":"is_connected",
12.            "code":"2"
13.        }
14.    ]
15.}
```

### 2.7.22 Get the available EVSEs connection states

**Endpoint URL: [/{version}/{trial}/connection_states]**

Allows a user to retrieve a collection of EV-EVSE connection states. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the available EV-EVSE connection states |

The class diagram of the response (instance of ConnectionStatesReport) has been already given in Figure 27, page 99.

#### 2.7.22.1 Retrieve the available EVSE connection states [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Ireland",
        "created":"2015-01-12T17:43:23+01:00",
        "updated":"2015-01-12T17:43:23+01:00"
    },
    "connection_states”:[
        {
            "id":"1",
            "name":"is_connected",
            "code":"2"
        },
        {
            "id":"2",
            "name":"not_connected",
            "code":"3"
        }
    ]
}
```

### 2.7.23 Get an EVSE connection state through its id

**Endpoint URL: [/{version}/{trial}/connection_states/{id}]**

Allows a user to retrieve an EVSE connection state record, based on its id. A valid {id} can be obtained by calling the /{version}/{trial}/connection_states service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the available EV-EVSE connection states |
| *id* | String | 1 | The id of the connection state to get information for. |

The class diagram of the response (instance of ConnectionStatesReport) has been already given in Figure 27, page 99.

#### 2.7.23.1 Retrieve a connection state based on an id [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Ireland",
```

```
        "created":"2015-01-12T17:45:15+01:00",
        "updated":"2015-01-12T17:45:15+01:00"
    },
    "connection_states”:[
        {
            "id":"1",
            "name":"is_connected",
            "code":"2"
        }
    ]
}
```

### 2.7.24 Get all the electric vehicle supply equipment components available

**Endpoint URL: [/{version}/{trial}/supply_equipment]**

Allows a user to retrieve a collection of electric vehicle supply equipment (EVSE) components. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the available EVSEs |

The class diagram of the response (instance of VehicleSupplyEquipmentReport) has been already given in Figure 26, page 91.

#### 2.7.24.1 Retrieve the set of available EVSE components [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Ireland",
        "created":"2015-01-13T14:21:34+02:00",
        "updated":"2015-01-13T14:21:34+02:00"
    },
    "evses":[
        {
            "id":"1",
            "manufacturer":"M2C",
            "model":"M2C",
            "hw_version":"1.0",
            "fw_version":"1.0",
            "region_id":"1"
        },
```

```
        {
            "id":"2",
            "manufacturer":"M2C",
            "model":"M2C",
            "hw_version":"1.0",
            "fw_version":"1.0",
            "region_id":"1"
        }
    ]
}
```

### 2.7.25 Get an electric vehicle supply equipment component, based on its id

**Endpoint URL: [/{version}/{trial}/supply_equipment/{id}]**

Allows a user to retrieve an electric vehicle supply equipment component (EVSE), based on its id. A valid {id} can be obtained by calling the /{version}/{trial}/supply_equipment/ service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the EVSE component of interest |
| *id* | String | 1 | The id of the EVSE to get information for. |

The class diagram of the response (instance of VehicleSupplyEquipmentReport) has been already given in Figure 26, page 91.

#### 2.7.25.1 Retrieve an electric vehicle supply equipment component [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Ireland",
        "created":"2015-01-13T14:25:22+02:00",
        "updated":"2015-01-13T14:25:22+02:00"
    },
    "evses":[
        {
            "id":"1",
            "manufacturer":"M2C",
            "model":"M2C",
            "hw_version":"1.0",
```

```
            "fw_version":"1.0",
            "region_id":"1"
        }
    ]
}
```

### 2.7.26 Get the charging modes associated with an electric vehicle supply equipment component, based on its id

**Endpoint URL: [/{version}/{trial}/supply_equipment/{id}/charging_modes]**

Allows a user to retrieve a collection of charging modes associated with an electric vehicle supply equipment component (EVSE), based on its id. A valid {id} can be obtained by calling the /{version}/{trial}/supply_equipment/ service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the EVSE charging modes. |
| *id* | String | 1 | The id of the EVSE to get information for. |

The class diagram of the response (instance of ChargingModesReport) has been already given in Figure 25, page 89.

#### 2.7.26.1 Retrieve an electric vehicle supply equipment component [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Ireland",
        "created":"2015-01-13T14:29:06+02:00",
        "updated":"2015-01-13T14:29:06+02:00"
    },
    "charging_modes":[
        {
            "id":"1",
            "name":"Single Phase 16A",
            "power":1.07
        },
        {
            "id":"2",
            "name":"Single Phase 8A",
```

```
            "power":3.05
        }
    ]
}
```

### 2.7.27 Get the connections associated with an electric vehicle supply equipment component, based on its id

**Endpoint URL: [/{version}/{trial}/supply_equipment/{id}/connections]**

Allows a user to retrieve a collection of electric vehicle supply equipment (EVSE) connections associated with an EVSE, based on its id. A valid {id} can be obtained by calling the /{version}/{trial}/supply_equipment/ service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the EVSE charging modes. |
| *id* | String | 1 | The id of the EVSE to get information for. |

The class diagram of the response (instance of ConnectionsReport) has been already given in Figure 23, page 83.

#### 2.7.27.1 Retrieve an electric vehicle supply equipment component [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Ireland",
        "created":"2015-01-13T14:31:29+02:00",
        "updated":"2015-01-13T14:31:29+02:00"
    },
    "connections":[
        {
            "id":"1",
            "start":"2014-09-18T05:13:00.000Z",
            "energy_current":0.51,
            "energy_previous":0.52,
            "duration":3600,
            "total_energy_per_connection":2.2,
            "total_energy":9663.562,
            "charging_mode_id":"1",
            "ev_supply_equipment_id":"1",
            "ev_supply_equipment_connection_state_id":"1",
```

```
            "ev_id":"1"
        },
        {
            "id":"2",
            "start":"2014-09-18T06:13:00.000Z",
            "energy_current":0.49,
            "energy_previous":0.51,
            "duration":3600,
            "total_energy_per_connection":2.2,
            "total_energy":9663.762,
            "charging_mode_id":"1",
            "ev_supply_equipment_id":"1",
            "ev_supply_equipment_connection_state_id":"1",
            "ev_id":"1"
        }
    ]
}
```

## 2.8 External information

This API is responsible for handling requests/responses from services that do not directly map to energy-related data.

### 2.8.1 Get the latest known social events

**Endpoint URL: [/{version}/{trial}/social]**

This service is meant to offer a list of social events that can temporarily influence the electricity consumption.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |

The class diagram of the response (instance of SocialEventsReport) is provided in Figure 28.

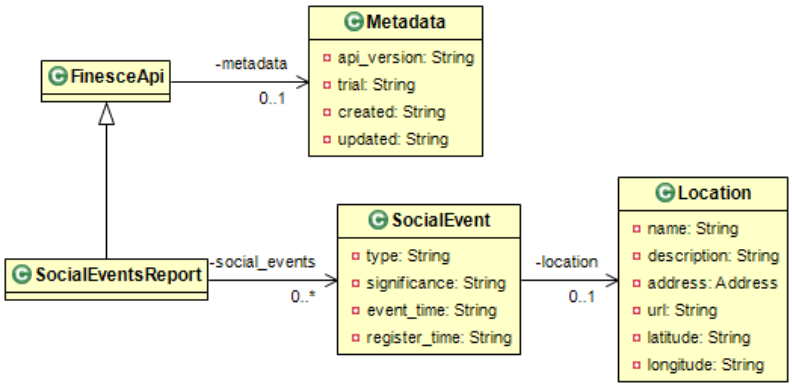


**Figure 28: Class diagram of the SocialEventsReport class.**

The attributes of the respective response are detailed in the following tables.

**Table 48: Attributes of the SocialEventsReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **social_events** | List<SocialEvent> | The list of known social events (see Table 49, page 107) |

**Table 49: Attributes of the SocialEvent class**

| Name | Type | Description |
|---|---|---|
| **location** | Location | The location of the event |
| **type** | String | The type of the event |
| **significance** | String | The significance of the event, in terms of influence to the smart grid load |
| **event_time** | String | The time of the event, in an ISO8601 compliant format |
| **register_time** | String | The registration time of the event, in an ISO8601 compliant format |

**Table 50: Attributes of the Location class**

| Name | Type | Description |
|---|---|---|
| **name** | String | The name of the location |
| **description** | String | A description of the location |
| **address** | String | The address of the location |
| **url** | String | The URL for the location (if any) |
| **latitude** | String | The latitude of the location |
| **longitude** | String | The longitude of the location |

#### 2.8.1.1 Retrieve the list of upcoming social events [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Terni",
5.         "created":"2015-01-21T17:46:35+02:00",
6.         "updated":"2015-01-21T17:46:35+02:00"
7.     },
8.     "event":[
9.         {
10.            "location":{
11.                "name":"Terni Stadium",
12.                "description":null,
13.                "address":{
14.                    "street_name":"Via dello Stadio",
15.                    "number":0,
16.                    "city":null,
17.                    "province":null,
18.                    "zip_code":0,
19.                    "country":null
20.                },
21.                "url":null,
22.                "latitude":"42.558922",
23.                "longitude":"12.63804"
24.            },
25.            "significance":"1",
26.            "event_time": "2014-11-30T20:30:00+02:00",
27.            "type":"Ternana - Cittadella",
28.            "register_time":"2014-11-17T17:24:39+02:00"
29.        },
30.         . . .
31.        {
32.            "location":{
33.                "name":"Central Market",
34.                "description":null,
35.                "address":{
36.                    "street_name":"Piazza Giusti",
```

```
                    "number":0,
                    "city":null,
                    "province":null,
                    "zip_code":0,
                    "country":null
                },
                "url":null,
                "latitude":"42.558922",
                "longitude":"12.63804"
            },
            "significance":"1",
            "event_time":"2014-12-19T20:30:00+02:00",
            "type":"Christmas Markets",
            "register_time":"2014-11-12T15:50:26+02:00"
        }
    ]
}
```


### 2.8.2 Get a specific number of the latest known social events

**Endpoint URL: [/{version}/{trial}/social/{events_number}]**

This service is meant to offer a list containing a specific number of social events that can temporarily influence the electricity consumption.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |
| *events_number* | Number | 2 | The number of known social events to fetch. |

The class diagram of the response (instance of SocialEventsReport) has been already presented in Figure 28, page 107.

#### 2.8.2.1 Retrieve a list of upcoming social events [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body


```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Terni",
        "created":"2015-01-21T17:46:35+02:00",
```

```
        "updated":"2015-01-21T17:46:35+02:00"
    },
    "event":[
        {
            "location":{
                "name":"Central Market",
                "description":null,
                "address":{
                    "street_name":"Piazza Giusti",
                    "number":0,
                    "city":null,
                    "province":null,
                    "zip_code":0,
                    "country":null
                },
                "url":null,
                "latitude":"42.558922",
                "longitude":"12.63804"
            },
            "significance":"1",
            "event_time":"2014-12-20T20:30:00+02:00",
            "type":"Christmas Markets",
            "register_time":"2014-11-12T15:51:25+02:00"
        },
        {
            "location":{
                "name":"Central Market",
                "description":null,
                "address":{
                    "street_name":"Piazza Giusti",
                    "number":0,
                    "city":null,
                    "province":null,
                    "zip_code":0,
                    "country":null
                },
                "url":null,
                "latitude":"42.558922",
                "longitude":"12.63804"
            },
            "significance":"1",
            "event_time":"2014-12-19T20:30:00+02:00",
            "type":"Christmas Markets",
            "register_time":"2014-11-12T15:50:26+02:00"
        }
    ]
}
```

## 2.9 Metering infrastructure details

This set of APIs exposes services related to the presentation of the metering equipment of a Smart Energy site, be it a Smart Grid or a Smart Building.

### 2.9.1 Get the list of all meters

**Endpoint URL: [/{version}/{trial}/meters]**

Gets a list of the available meters along with the set of their accompanying information.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |

The class diagram of the response (instance of MetersReport) is given in Figure 29.

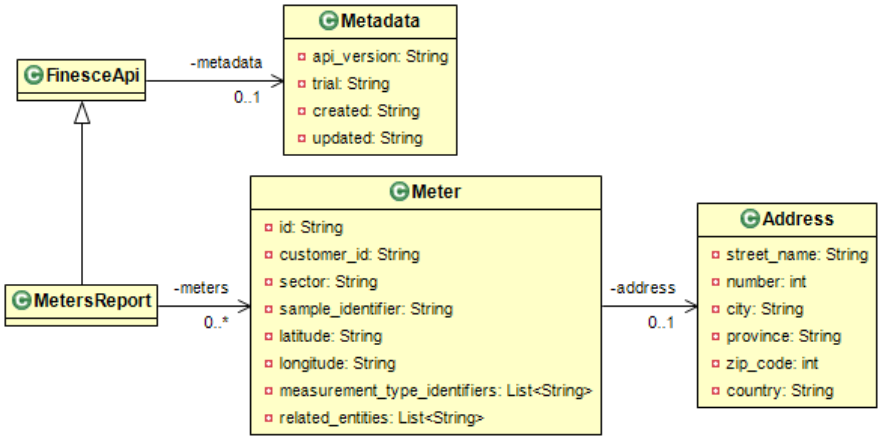


**Figure 29: Class diagram of a MetersReport response.**

The attributes of the response are detailed in the following tables.

**Table 51: Attributes of the MetersReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **meters** | List<Meter> | The list of trial meters (see Table 52, page 111) |

**Table 52: Attributes of the Meter class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the meter |
| **address** | Address | The address of the meter installation (see Table 10, page 20) |
| **customer_id** | String | The id of the customer associated with the meter |

| | | |
|---|---|---|
| **sector** | String | The sector the meter (customer) belongs to |
| **sample_identifier** | String | An indicator of the metering frequency of the meter |
| **latitude** | String | The latitude of the meter installation point |
| **longitude** | String | The longitude of the meter installation point |
| **measurement_type_identifiers** | List<String> | A list of measurement types supported by the meter (see page 28 for details on supported types) |
| **related_entities** | List<String> | A list of entities related to the meter (e.g. a building) |

#### 2.9.1.1 Retrieve the list of available meters [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Terni",
5.         "created":"2015-01-22T11:41:53+02:00",
6.         "updated":"2015-01-22T11:41:53+02:00"
7.     },
8.     "meters":[
9.         {
10.            "id":"P2 AS E",
11.            "customer_id":"WP4_U_17",
12.            "sector":"LIGHTING",
13.            "address":null,
14.            "sample_identifier":null,
15.            "latitude":null,
16.            "longitude":null,
17.            "measurement_type_identifiers":[
18.                "EnergyConsumptionGrid",
19.                "EnergyProductionGrid",
20.                "PowerSupplyGrid",
21.                "PowerDemandGrid"
22.            ]
23.        },
24.         . . .
25.        {
26.            "id":"P2 AS E",
27.            "customer_id":"-",
28.            "sector":"SECONDARY_SUBSTATION",
29.            "address":null,
30.            "sample_identifier":null,
31.            "latitude":null,
32.            "longitude":null,
33.            "measurement_type_identifiers":[
34.                "EnergyConsumptionGrid",
35.                "EnergyProductionGrid",
```

```
                "PowerSupplyGrid",
                "PowerDemandGrid"
            ]
        }
    ]
}
```

### 2.9.2 Get a specific meter description

**Endpoint URL: [/{version}/{trial}/meters/{search_type}:{search_value}]**

Retrieves a meter based on a search string.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |
| *search_type* | String | customer_id | The field of the meter to act as a search index. |
| *search_value* | String | WP4_U_3 | The value of the field to search for. |

The class diagram of the response (instance of MetersReport) is given in Figure 29, page 111.

#### 2.9.2.1 Retrieve a meter based on a search string [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Terni",
        "created":"2015-01-22T11:43:46+02:00",
        "updated":"2015-01-22T11:43:46+02:00"
    },
    "meters":[
        {
            "id":"P2 AS E",
            "customer_id":"WP4_U_3",
            "sector":"INDUSTRIAL",
            "address":null,
            "sample_identifier":null,
            "latitude":null,
            "longitude":null,
            "measurement_type_identifiers":[
                "EnergyConsumptionGrid",
                "EnergyProductionGrid",
```

```
20.                 "PowerSupplyGrid",
21.                 "PowerDemandGrid"
22.             ]
23.         }
24.     ]
25. }
```

### 2.9.3 Get the list of all available sectors

**Endpoint URL: [/{version}/{trial}/meters/sectors]**

Gets a list of the sectors that the meters may be deployed into.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |

The class type of the response (instance of SectorsReport) is given in Figure 30.

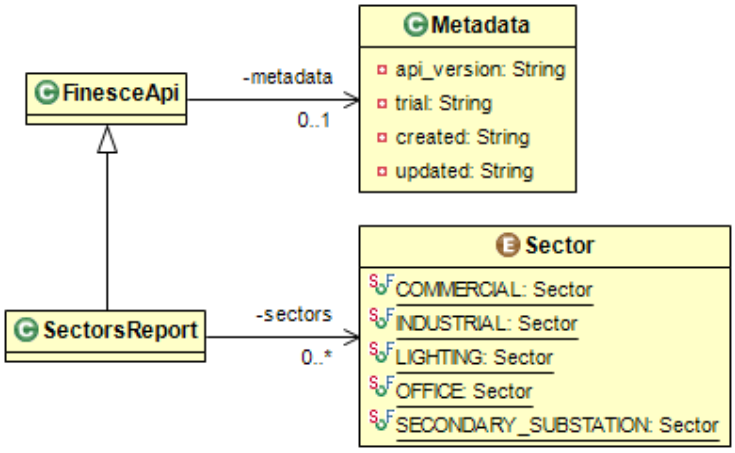


**Figure 30: Class description of a SectorsReport response**

The attributes of the relevant response are detailed below.

**Table 53: Attributes of the SectorsReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **meters** | List<Meter> | The list of trial meters (see Table 54, page 114) |

**Table 54: Attributes of the Sector enumeration**

| Name | Type | Description |
|---|---|---|
| **Sector** | Enumeration | The sector identifiers. Currently, COMMERCIAL, INDUSTRIAL, LIGHTING, OFFICE and SECONDARY_SUBSTATION are the only ones supported |

#### 2.9.3.1 Retrieve the list of available sectors [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Terni",
        "created":"2015-01-22T11:44:34+02:00",
        "updated":"2015-01-22T11:44:34+02:00"
    },
    "sector":[
        "COMMERCIAL",
        "INDUSTRIAL",
        "LIGHTING",
        "OFFICE",
        "SECONDARY_SUBSTATION"
    ]
}
```

## 2.10 Optimization

This group of APIs offers access to supported optimization engines and their parametrization.

### 2.10.1 List available algorithm weights

**Endpoint URL: [/{version}/{trial}/algoweights]**

Allows a user to retrieve a collection of algoweights, as handled by the COS algorithm of the Irish FINESCE trial (WP5). 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for invoking the respective service. |

The class diagram of the response (instance of AlgoweightReport) has been already documented in Figure 19, page 57.

#### 2.10.1.1 Retrieve a list of algorithm weights descriptions [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-07T15:58:33+01:00",
6.         "updated":"2015-01-07T15:58:33+01:00"
7.     },
8.     "algoweights":[
9.         {
10.            "id":"1",
11.            "renewables":"100.0",
12.            "interconnect":"0.0",
13.            "specific":"0.0",
14.            "timeslot_id":"1",
15.            "region_id":"1"
16.        },
17.        {
18.            "id":"2",
19.            "renewables":"100.0",
20.            "interconnect":"0.0",
21.            "specific":"0.0",
22.            "timeslot_id":"2",
23.            "region_id":"1"
24.        }
25.    ]
```

```
26.}
```

### 2.10.2 Get an algorithm weight object based on its id

**Endpoint URL: [/{version}/{trial}/algoweights/{id}]**

Allows a user to retrieve an algoweights record, based on its ID. A valid {id} can be obtained by calling the /algoweights service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for invoking the respective service. |
| *id* | String | 1 | The id of the algoweight object of interest. |

The class diagram of the response (instance of AlgoweightReport) has been already documented in Figure 19, page 57.

#### 2.10.2.1 Retrieve information regarding a single algorithm object [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-07T16:03:51+01:00",
6.         "updated":"2015-01-07T16:03:51+01:00"
7.     },
8.     "algoweights":[
9.         {
10.            "id":"1",
11.            "renewables":"100.0",
12.            "interconnect":"0.0",
13.            "specific":"0.0",
14.            "timeslot_id":"1",
15.            "region_id":"1"
16.        }
17.    ]
18.}
```

## 2.11 Pricing

This group of APIs provides information related to energy pricing at a regional level or customer level.

### 2.11.1 Get the available energy prices in a trial

**Endpoint URL: [/{version}/{trial}/prices]**

Allows a user to get information regarding the energy prices in the wider area of a trial. 'Malmo' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Malmo | The trial infrastructure to use for invoking the respective service. |

The class diagram of the response (instance of PriceReport) is given in Figure 31.

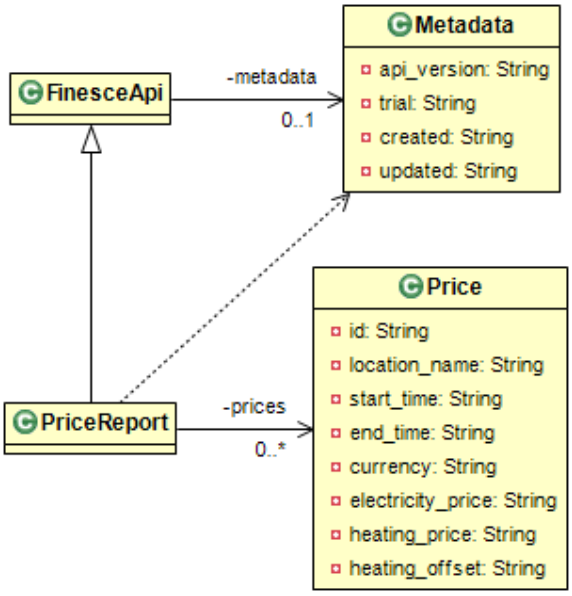


**Figure 31: Class diagram of a PriceReport response.**

The attributes of the relevant response are detailed in the tables below.

**Table 55: Attributes of the PriceReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **prices** | List<Price> | The prices of the trial (see Table 56, page 118) |

**Table 56: Attributes of the Price class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the price object |
| **location_name** | String | The name of the location/region the price refers to |
| **start_time** | String | The time from which on the price is valid, in an ISO8601 compliant format |

| | | |
|---|---|---|
| **end_time** | String | The time until which on the price is valid, in an ISO8601 compliant format |
| **currency** | String | The currency of the prices listed |
| **electricity_price** | String | The price for electricity |
| **heating_price** | String | The price for heating energy |
| **heating_offset** | String | A parameter to calculate the heating energy price |

#### 2.11.1.1 Retrieve the available energy prices in a trial [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Malmo",
5.         "created":"2015-01-13T16:05:15+02:00",
6.         "updated":"2015-01-13T16:05:15+02:00"
7.     },
8.     "prices":[
9.         {
10.            "id":"1",
11.            "location_name":"A",
12.            "start_time":"2015-01-13T15:05:15+02:00",
13.            "end_time":"2015-01-13T16:05:15+02:00",
14.            "currency":"Euro",
15.            "electricity_price":"10.7",
16.            "heating_price":"3.6",
17.            "heating_offset":"1"
18.        },
19.        {
20.            "id":"2",
21.            "location_name":"B",
22.            "start_time":"2015-01-13T15:05:15+02:00",
23.            "end_time":"2015-01-13T16:05:15+02:00",
24.            "currency":"Euro",
25.            "electricity_price":"10.7",
26.            "heating_price":"3.6",
27.            "heating_offset":"1"
28.        }
29.    ]
30.}
```

### 2.11.2 Get the available energy prices in a trial within a time range

**Endpoint URL: [/{version}/{trial}/prices/{from}/{to}]**

Allows a user to get information regarding the energy prices regardless of location. Valid {from} and {to} values are expressed in ISO8601 format. 'Malmo' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Malmo | The trial infrastructure to use for invoking the respective service. |
| *from* | String | 2014-12-29T19:52:13+02:00 | The lower limit of the duration of the query. |
| *to* | String | 2014-12-29T20:52:13+02:00 | The upper limit of the duration of the query. |

The class diagram of the response (instance of PriceReport) is given in Figure 31, page 118.

#### 2.11.2.1 Retrieve the available energy prices in a trial within a time range [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Malmo",
5.         "created":"2015-01-13T16:07:31+02:00",
6.         "updated":"2015-01-13T16:07:31+02:00"
7.     },
8.     "prices":[
9.         {
10.            "id":"1",
11.            "location_name":"A",
12.            "start_time":"2014-12-29T19:52:13+02:00",
13.            "end_time":"2014-12-29T20:12:13+02:00",
14.            "currency":"Euro",
15.            "electricity_price":"10.7",
16.            "heating_price":"3.6",
17.            "heating_offset":"1"
18.        },
19.        {
20.            "id":"2",
21.            "location_name":"A",
22.            "start_time":"2014-12-29T20:12:13+02:00",
23.            "end_time":"2014-12-29T20:32:13+02:00",
24.            "currency":"Euro",
25.            "electricity_price":"10.7",
26.            "heating_price":"3.6",
27.            "heating_offset":"1"
28.        },
29.        {
30.            "id":"3",
```

```
            "location_name":"A",
            "start_time":"2014-12-29T20:32:13+02:00",
            "end_time":"2014-12-29T20:52:13+02:00",
            "currency":"Euro",
            "electricity_price":"10.7",
            "heating_price":"3.6",
            "heating_offset":"1"
        },
        {
            "id":"4",
            "location_name":"B",
            "start_time":"2014-12-29T19:52:13+02:00",
            "end_time":"2014-12-29T20:12:13+02:00",
            "currency":"Euro",
            "electricity_price":"10.7",
            "heating_price":"3.6",
            "heating_offset":"1"
        },
        {
            "id":"5",
            "location_name":"B",
            "start_time":"2014-12-29T20:12:13+02:00",
            "end_time":"2014-12-29T20:32:13+02:00",
            "currency":"Euro",
            "electricity_price":"10.7",
            "heating_price":"3.6",
            "heating_offset":"1"
        },
        {
            "id":"6",
            "location_name":"B",
            "start_time":"2014-12-29T20:32:13+02:00",
            "end_time":"2014-12-29T20:52:13+02:00",
            "currency":"Euro",
            "electricity_price":"10.7",
            "heating_price":"3.6",
            "heating_offset":"1"
        }
    ]
}
```


### 2.11.3 Get the available energy prices in a trial location, based on its name

**Endpoint URL: [/{version}/{trial}/prices/{name}]**

Allows a user to get information regarding the energy prices in a location. A valid {name} can be obtained by calling the /{version}/{trial}/prices service and checking the location_name fields. 'Malmo' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Malmo | The trial infrastructure to use for invoking the respective service. |
| *name* | String | A | The name of the location to get pricing data for. |

The class diagram of the response (instance of PriceReport) is given in Figure 31, page 118.

#### 2.11.3.1 Retrieve the available energy prices in a trial location, based on its name [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Malmo",
5.         "created":"2015-01-13T16:09:35+02:00",
6.         "updated":"2015-01-13T16:09:35+02:00"
7.     },
8.     "prices":[
9.         {
10.            "id":"1",
11.            "location_name":"A",
12.            "start_time":"2015-01-13T15:09:35+02:00",
13.            "end_time":"2015-01-13T16:09:35+02:00",
14.            "currency":"Euro",
15.            "electricity_price":"10.7",
16.            "heating_price":"3.6",
17.            "heating_offset":"1"
18.        }
19.    ]
20.}
```

### 2.11.4 Get the available energy prices within a time range in a trial location, based on its name

**Endpoint URL: [/{version}/{trial}/prices/{name}/{from}/{to}]**

Allows a user to get information regarding the energy prices in a location. A valid {name} can be obtained by calling the /{version}/{trial}/prices service and checking the location_name fields. Valid {from} and {to} values are expressed in ISO8601 format. 'Malmo' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Malmo | The trial infrastructure to use for invoking the respective service. |
| *name* | String | A | The name of the location to get pricing data for. |
| *from* | String | 2014-12-29T19:52:13+02:00 | The lower limit of the duration of the query, in an ISO8601 compliant format |
| *to* | String | 2014-12-29T20:52:13+02:00 | The upper limit of the duration of the query, in an ISO8601 compliant format |

The class diagram of the response (instance of PriceReport) is given in Figure 31, page 118.

#### 2.11.4.1 Retrieve the available energy prices within a time range in a trial location, based on its name [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Malmo",
5.         "created":"2015-01-13T16:14:12+02:00",
6.         "updated":"2015-01-13T16:14:12+02:00"
7.     },
8.     "prices":[
9.         {
10.            "id":"1",
11.            "location_name":"A",
12.            "start_time":"2015-01-13T15:14:12+02:00",
13.            "end_time":"2014-12-29T19:52:13+02:00",
14.            "currency":"Euro",
15.            "electricity_price":"10.7",
16.            "heating_price":"3.6",
17.            "heating_offset":"1"
18.        },
19.        {
20.            "id":"2",
21.            "location_name":"A",
22.            "start_time":"2015-01-13T15:14:12+02:00",
23.            "end_time":"2014-12-29T20:22:13+02:00",
24.            "currency":"Euro",
```

```
            "electricity_price":"10.7",
            "heating_price":"3.6",
            "heating_offset":"1"
        },
        {
            "id":"3",
            "location_name":"A",
            "start_time":"2015-01-13T15:14:12+02:00",
            "end_time":"2014-12-29T20:52:13+02:00",
            "currency":"Euro",
            "electricity_price":"10.7",
            "heating_price":"3.6",
            "heating_offset":"1"
        }
    ]
}
```


### 2.11.5 Get the price locations available to the user

**Endpoint URL: [/{version}/{trial}/prices/locations]**

Allows a user to get information regarding the price locations available to the user. 'Malmo' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Malmo | The trial infrastructure to use for invoking the respective service. |

The class diagram of the response (instance of PriceLocationReport) is given in Figure 32.

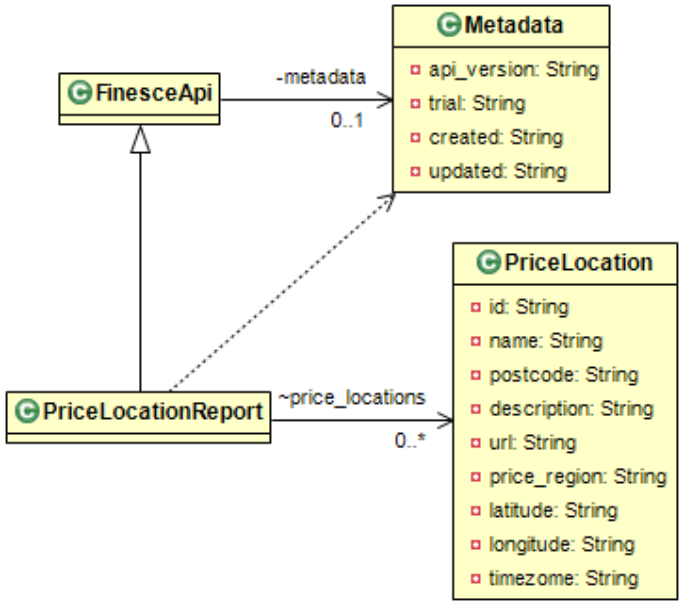


**Figure 32: Class diagram of a PriceLocationReport response**

The attributes of the relevant response class are detailed in the following tables.

**Table 57: Attributes of the PriceLocationReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **price_locations** | List<PriceLocation> | The price locations of the trial (see Table 58, page 125) |

**Table 58: Attributes of the PriceLocation class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the price location |
| **name** | String | The name of the price location |
| **postcode** | String | The post code of the price location |
| **description** | String | A description of the price location |
| **url** | String | The URL of the price location (if any) |
| **price_region** | String | The name of the price region this location belongs to (if any) |
| **latitude** | String | The latitude of the centre of this location |
| **longitude** | String | The longitude of the centre of this location |
| **timezone** | String | The timezone of the price location |

#### 2.11.5.1 Retrieve the price locations available to the user [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Malmo",
5.         "created":"2015-01-13T17:00:06+02:00",
6.         "updated":"2015-01-13T17:00:06+02:00"
7.     },
8.     "price_locations":[
9.         {
10.            "id":"1",
11.            "name":"A",
12.            "postcode":"A1234",
13.            "description":"Description of price location A",
14.            "url":"http://www.random_url.rnd/A",
15.            "price_region":"Price Region A",
16.            "latitude":"55.605833",
17.            "longitude":"13.035833",
18.            "timezome":"GMT+1"
19.        },
20.        {
21.            "id":"2",
22.            "name":"B",
23.            "postcode":"B1234",
24.            "description":"Description of price location B",
25.            "url":"http://www.random_url.rnd/B",
26.            "price_region":"Price Region B",
27.            "latitude":"55.605833",
28.            "longitude":"13.035833",
```

```
            "timezome":"GMT+1"
        }
    ]
}
```

### 2.11.6 Get a price location based on its name

**Endpoint URL: [/{version}/{trial}/prices/locations/{name}]**

Allows a user to get information regarding a price location available to the user, based on the location name. A valid {name} can be obtained by calling the /{version}/{trial}/prices/locations service. 'Malmo' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Malmo | The trial infrastructure to use for invoking the respective service. |
| *name* | String | A | The name of the location to get information for. |

The class diagram of the response (instance of PriceLocationReport) is given in Figure 32, page 124.

#### 2.11.6.1 Retrieve a price location based on its name [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Malmo",
        "created":"2015-01-13T17:00:06+02:00",
        "updated":"2015-01-13T17:00:06+02:00"
    },
    "price_location":[
        {
            "id":"1",
            "name":"A",
            "postcode":"A1234",
            "description":"Description of price location A",
            "url":"http://www.random_url.rnd/A",
            "price_region":"Price Region A",
            "latitude":"55.605833",
            "longitude":"13.035833",
            "timezome":"GMT+1"
        }
    ]
}
```

### 2.11.7 Get a data stream for all the available pricing locations

**Endpoint URL: [/{version}/{trial}/prices/locations/data/]**

Allows a user to get information regarding a data stream available for locations associated with the current user. 'Malmo' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Malmo | The trial infrastructure to use for invoking the respective service. |

The class diagram of the response (instance of PriceLocationReport) is given in Figure 33.

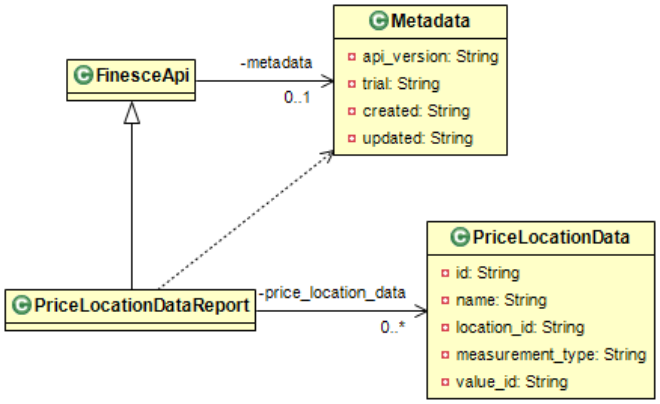


**Figure 33: Class diagram of a PriceLocationDataReport response**

The attributes of the respective response class are detailed in the following tables.

**Table 59: Attributes of the PriceLocationDataReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **price_location_data** | List<PriceLocationData> | The list of value objects required (see Table 60, page 127) |

**Table 60: Attributes of the PriceLocationData class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the price location data object |
| **name** | String | The name of the price location data object |
| **location_id** | String | The location id associated with the price location data object (see Table 58, page 125) |
| **measurement_type** | String | The measurement type of the price location data object (see page 28 for details) |
| **value_id** | String | The id of the value object of the price location data object (see Table 62, page 130) |

#### 2.11.7.1 Retrieve a data stream for all the available locations [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Malmo",
5.         "created":"2015-01-13T20:04:09+02:00",
6.         "updated":"2015-01-13T20:04:09+02:00"
7.     },
8.     "price_location_data":[
9.         {
10.            "id":null,
11.            "name":"A",
12.            "location_id":"1",
13.            "measurement_type":"LocationHeatPowerDemandGrid",
14.            "value_id":"1"
15.        },
16.        {
17.            "id":null,
18.            "name":"B",
19.            "location_id":"2",
20.            "measurement_type":"LocationHeatPowerConsumptionGrid",
21.            "value_id":"2"
22.        }
23.    ]
24.}
```

### 2.11.8 Get a data stream for a specific pricing location

**Endpoint URL: [/{version}/{trial}/prices/locations/data/{name}]**

Allows a user to get information regarding a data stream available for locations associated with the current user. A valid {name} can be obtained by calling the /{version}/{trial}/prices/locations service. 'Malmo' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Malmo | The trial infrastructure to use for invoking the respective service. |
| *name* | String | A | The name of the pricing location to ask information for. |

The class diagram of the response (instance of PriceLocationReport) has been already given in Figure 33, page 127.

#### 2.11.8.1 Retrieve a data stream associated with a pricing location [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Malmo",
5.         "created":"2015-01-13T20:04:09+02:00",
6.         "updated":"2015-01-13T20:04:09+02:00"
7.     },
8.     "price_location_data":[
9.         {
10.            "id":null,
11.            "name":"A",
12.            "location_id":"1",
13.            "measurement_type":"LocationHeatPowerDemandGrid",
14.            "value_id":"1"
15.        }
16.    ]
17.}
```

### 2.11.9 Get a data stream for a specific pricing location, for a specific period of time

**Endpoint URL: [/{version}/{trial}/prices/locations/data/{name}/{from}/{to}]**

Allows a user to get information regarding a data stream available for locations associated with the current user. A valid {name} can be obtained by calling the /{version}/{trial}/prices/locations service. 'Malmo' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Malmo | The trial infrastructure to use for invoking the respective service. |
| *name* | String | A | The name of the pricing location to ask information for. |
| *from* | String | 2014-12-29T19:52:13+02:00 | The lower limit of the duration of the query, in an ISO8601 compliant format. |
| *to* | String | 2014-12-29T20:52:13+02:00 | The upper limit of the duration of the query, in an ISO8601 compliant format |

The class diagram of the response (instance of PriceLocationDataValueReport) are given in Figure 34.

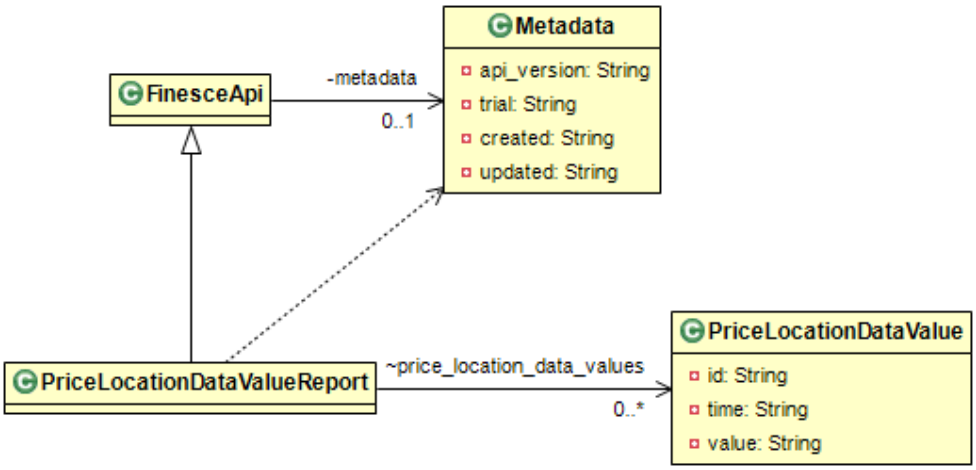


**Figure 34: Class diagram of a PriceLocationDataValueReport response.**

The attributes of the relevant response class are detailed in the following tables.

**Table 61: Attributes of the PriceLocationDataValueReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **price_location_data_values** | List<PriceLocationDataValue> | The list of data values associated with the price location (see Table 62, page 130) |

**Table 62: Attributes of the PriceLocationDataValue class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the data value |
| **time** | String | The time of the measurement, in an ISO8601 compliant format |
| **value** | String | The actual value of the measurement |

#### 2.11.9.1 Retrieve a data stream associated with a pricing location for a specific period of time [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Malmo",
5.         "created":"2015-01-13T20:09:00+02:00",
6.         "updated":"2015-01-13T20:09:00+02:00"
7.     },
```

```
    "price_location_data_values":[
        {
            "id":"1",
            "time":"2014-12-29T19:52:13+02:00",
            "value":"1234"
        },
        {
            "id":"2",
            "time":"2014-12-29T20:22:13+02:00",
            "value":"1235"
        },
        {
            "id":"3",
            "time":"2014-12-29T20:52:13+02:00",
            "value":"1236"
        }
    ]
}
```

## 2.12 Regional Energy-Related Information

This API set offers services related to regional information related to energy resources.

### 2.12.1 Get the available regions

**Endpoint URL: [/{version}/{trial}/regions]**

Allows a user to retrieve a collection of regions supported by the trial. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the trial regions |

The class diagram of the response (instance of RegionsReport) is given in Figure 35.

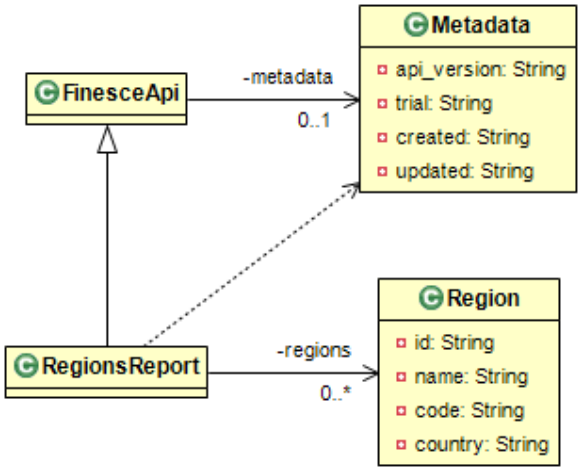


**Figure 35: Class diagram of a RegionsReport response.**

The attributes of the relevant response are detailed in the tables following.

**Table 63: Attributes of the RegionsReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **regions** | List<Regions> | The regions supported by the trial (see Table 64, page 132) |

**Table 64: Attributes of the Region class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the region |
| **name** | String | The name of the region |
| **code** | String | The code of the region |
| **country** | String | The country of the region |

#### 2.12.1.1 Retrieve the available trial regions [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-12T18:05:27+01:00",
6.         "updated":"2015-01-12T18:05:27+01:00"
7.     },
8.     "regions":[
9.         {
10.            "id":"1",
11.            "name":"Region 1",
12.            "code":"R1",
13.            "country":"Ireland"
14.        },
15.        {
16.            "id":"2",
17.            "name":"Region 2",
18.            "code":"R2",
19.            "country":"Ireland"
20.        }
21.    ]
22.}
```

### 2.12.2 Get a region based on its ID

**Endpoint URL: [/{version}/{trial}/regions/{id}]**

Allows a user to retrieve a region record, based on its ID. A valid {id} can be obtained by calling the /{version}/{trial}/regions service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the desired region |
| *id* | String | 1 | The id of the region to get information for. |

The class diagram of the response (instance of RegionsReport) has been already presented in Figure 35, page 132.

#### 2.12.2.1 Retrieve a specific region based on its ID [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body


```
{
  "metadata": {
    "api_version": "0.1",
    "trial": "Ireland",
    "created": "2015-01-12T18:07:12+01:00",
    "updated": "2015-01-12T18:07:12+01:00"
  },
  "region": [
    {
      "id": "1",
      "name": "Region 1",
      "code": "R1",
      "country": "Ireland"
    }
  ]
}
```


### 2.12.3 Get the algorithmic optimization weights associated with a region

**Endpoint URL: [/{version}/{trial}/regions/{id}/algoweights]**

Allows a user to retrieve the algorithm weights set associated with a region. A valid {id} can be obtained by calling the /{version}/{trial}/regions service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the algoweight objects |
| *id* | String | 1 | The id of the region to get the algorithm weights set for. |

The class diagram of the response (AlgoweightReport) has been already presented in Figure 19, page 57.

#### 2.12.3.1 Retrieve the algorithmic optimization weights associated with a region [GET]

**Request**

- Headers


```
x-auth-token: an_auth_token
Accept: application/json
```


**Response 200 (application/json)**

- Body


```
{
  "metadata": {
    "api_version": "0.1",
```

```
    "trial": "Ireland",
    "created": "2015-01-12T18:09:27+01:00",
    "updated": "2015-01-12T18:09:27+01:00"
  },
  "algoweights": [
    {
      "id": "1",
      "renewables": "100.0",
      "interconnect": "0.0",
      "specific": "0.0",
      "timeslot_id": "1",
      "region_id": "1"
    }
  ]
}
```


### 2.12.4 Get an energy report associated with a region

**Endpoint URL: [/{version}/{trial}/regions/{id}/energy]**

Allows a user to retrieve a collection of aggregated regional electric vehicle supply equipment (EVSE) energy records. A valid {id} can be obtained by calling the /{version}/{trial}/regions service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the regional energy report |
| *id* | String | 1 | The id of the region for which to get the energy report. |

The class diagram of the response (RegionalEnergyReport) has been already presented in Figure 21, page 60.

#### 2.12.4.1 Retrieve an energy report associated with a region [GET]

**Request**

- Headers


```
x-auth-token: an_auth_token
Accept: application/json
```


**Response 200 (application/json)**

- Body


```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Ireland",
        "created":"2015-01-13T11:36:57+02:00",
        "updated":"2015-01-13T11:36:57+02:00"
```

```
    },
    "regional_energy":[
        {
            "id":"1",
            "generated_energy":5001.57,
            "aggregated_energy":6500.36,
            "requested_energy":150.69,
            "actual_energy":210.67,
            "forecasted_energy":6300,
            "region_id":"1",
            "timelslot_id":"1"
        }
    ]
}
```


### 2.12.5 Get an average energy report associated with a region

**Endpoint URL: [/{version}/{trial}/regions/{id}/energy/avg]**

Allows a user to retrieve a collection of aggregate regional electric vehicle supply equipment (EVSE) energy records associated with a region, based on its ID. A valid {id} can be obtained by calling the /{version}/{trial}/regions service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the average regional energy report |
| *id* | String | 1 | The id of the region for which to get the average energy report. |

The class diagram of the response (instance of RegionalEnergyAvgReport) is given in Figure 36.

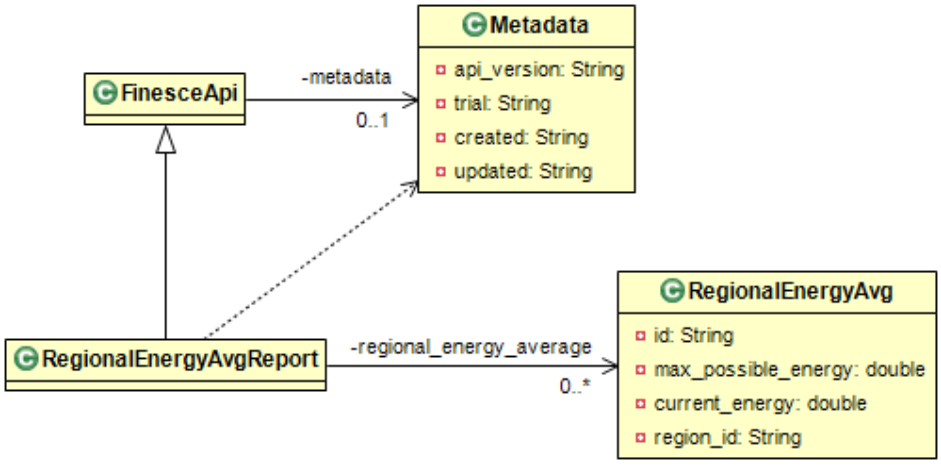


**Figure 36: Class diagram of a RegionalEnergyAvgReport response**

The attributes of the relevant response are detailed in the tables following.

**Table 65: Attributes of the RegionalEnergyAvgReport class**

| Name | Type | Description |
|---|---|---|

| | | |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **regional_energy_average** | List<RegionalEnergyAvg> | The list of current average regional reports (see Table 66, page 137) |

**Table 66: Attributes of the RegionalEnergyAvg class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the specific measurement |
| **max_possible_energy** | double | The maximum possible energy of the region |
| **current_energy** | double | The current average energy of the region |
| **region_id** | String | The region id (see Table 64, page 132) |

#### 2.12.5.1 Retrieve an average energy report associated with a region [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-13T11:42:21+02:00",
6.         "updated":"2015-01-13T11:42:21+02:00"
7.     },
8.     "regional_energy_average":[
9.         {
10.            "id":"1",
11.            "max_possible_energy":6.16,
12.            "current_energy":4.56,
13.            "region_id":"1"
14.        }
15.    ]
16.}
```

### 2.12.6 Get the EVSE entities associated with a region

**Endpoint URL: [/{version}/{trial}/regions/{id}/supply_equipment]**

Allows a user to retrieve a collection of electric vehicle supply equipment (EVSE) entities associated with a region. A valid {id} can be obtained by calling the /{version}/{trial}/regions service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for getting the EVSE details. |
| *id* | String | 1 | The id of the region for which to get the EVSE report. |

The class diagram of the response (instance of VehicleSupplyEquipmentReport) has been already given in Figure 26, page 91.

#### 2.12.6.1 Retrieve the EVSE entities associated with a region [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-13T11:44:06+02:00",
6.         "updated":"2015-01-13T11:44:06+02:00"
7.     },
8.     "evses":[
9.         {
10.            "id":"1",
11.            "manufacturer":"M2C",
12.            "model":"M2C",
13.            "hw_version":"1.0",
14.            "fw_version":"1.0",
15.            "region_id":"1"
16.        }
17.    ]
18. }
```

### 2.12.7 Get the energy status of the trial regions

**Endpoint URL: [/{version}/{trial}/energy/regional]**

Allows a user to retrieve a list of regional energy data objects. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for retrieving the regional energy data. |

The class diagram of the response (instance of RegionalEnergyReport) has been already given in Figure 21, page 60.

#### 2.12.7.1 Retrieve the energy status of the trial regions [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-20T17:33:59+02:00",
6.         "updated":"2015-01-20T17:33:59+02:00"
7.     },
8.     "regional_energy":[
9.         {
10.            "id":"1",
11.            "generated_energy":5001.57,
12.            "aggregated_energy":6500.36,
13.            "requested_energy":150.69,
14.            "actual_energy":210.67,
15.            "forecasted_energy":6300,
16.            "region_id":"1",
17.            "timelslot_id":"1"
18.        },
19.        {
20.            "id":"2",
21.            "generated_energy":4808.69,
22.            "aggregated_energy":6200,
23.            "requested_energy":178,
24.            "actual_energy":130.78,
25.            "forecasted_energy":6200,
26.            "region_id":"2",
27.            "timelslot_id":"1"
28.        }
29.    ]
30.}
```

### 2.12.8 Get the energy status of a region

**Endpoint URL: [/{version}/{trial}/energy/regional/{id}]**

Allows a user to retrieve a regional energy record. A valid {id} can be obtained by calling the /{version}/{trial}/energy/regional service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for retrieving the regional energy data. |
| *id* | String | 1 | The id of the regional energy record to be retrieved. |

The class diagram of the response (instance of RegionalEnergyReport) has been already given in Figure 21, page 60.

#### 2.12.8.1 Retrieve the energy status of a region [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Ireland",
        "created":"2015-01-20T17:33:59+02:00",
        "updated":"2015-01-20T17:33:59+02:00"
    },
    "regional_energy":[
        {
            "id":"1",
            "generated_energy":5001.57,
            "aggregated_energy":6500.36,
            "requested_energy":150.69,
            "actual_energy":210.67,
            "forecasted_energy":6300,
            "region_id":"1",
            "timelslot_id":"1"
        }
    ]
}
```

### 2.12.9 Get a region associated with a regional energy record

**Endpoint URL: [/{version}/{trial}/energy/regional/{id}/region]**

Allows a user to retrieve a region associated with a regional energy record. A valid {id} can be obtained by calling the /{version}/{trial}/energy/regional service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for retrieving the region. |
| *id* | String | 1 | The id of the regional energy record for which the region details will be retrieved. |

The class diagram of the response (instance of RegionsReport) has been already given in Figure 35, page 132.

#### 2.12.9.1 Retrieve a region associated with a regional energy record [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-12T18:05:27+01:00",
6.         "updated":"2015-01-12T18:05:27+01:00"
7.     },
8.     "regions":[
9.         {
10.            "id":"1",
11.            "name":"Region 1",
12.            "code":"R1",
13.            "country":"Ireland"
14.        }
15.    ]
16.}
```

### 2.12.10 Get a timeslot associated with a regional energy record

**Endpoint URL: [/{version}/{trial}/energy/regional/{id}/timeslot]**

Allows a user to retrieve a timelsot associated with a regional energy record. A valid {id} can be obtained by calling the /{version}/{trial}/energy/regional service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for retrieving the timeslot. |
| *id* | String | 1 | The id of the regional energy record for which the timeslot details will be retrieved. |

The class diagram of the response (instance of TimeslotsReport) has been already given in Figure 18, page 54.

#### 2.12.10.1 Retrieve a timeslot associated with a regional energy record [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-13T13:51:07+02:00",
6.         "updated":"2015-01-13T13:51:07+02:00"
7.     },
8.     "timeslots":[
9.         {
10.            "id":"1",
11.            "start":"2014-12-20T02:15:00+02:00",
12.            "duration":15
13.        }
14.    ]
15. }
```

### 2.12.11 Get the average EVSE regional energy records

**Endpoint URL: [/{version}/{trial}/energy/regional/avg]**

Allows a user to retrieve a collection of aggregated regional electric vehicle supply equipment (EVSE) energy records. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for retrieving the aggregated energy data. |

The class diagram of the response (instance of RegionalEnergyAvgReport) has been already given in Figure 36, page 136.

#### 2.12.11.1 Retrieve the average EVSE regional energy records [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Ireland",
5.         "created":"2015-01-20T18:25:22+02:00",
6.         "updated":"2015-01-20T18:25:22+02:00"
7.     },
8.     "regional_energy_average":[
9.         {
10.            "id":"1",
11.            "max_possible_energy":6.16,
12.            "current_energy":4.56,
13.            "region_id":"1"
14.        },
15.        {
16.            "id":"2",
17.            "max_possible_energy":9.58,
18.            "current_energy":3.04,
19.            "region_id":"2"
20.        }
21.    ]
22. }
```

### 2.12.12 Get an average EVSE regional energy record

**Endpoint URL: [/{version}/{trial}/energy/regional/{id}/avg/{id}]**

Allows a user to retrieve an aggregated regional electric vehicle supply equipment (EVSE) energy record. A valid {id} can be obtained by calling the /{version}/{trial}/energy/regional service. 'Ireland' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Ireland | The trial infrastructure to use for retrieving the aggregated energy data. |
| *id* | String | 1 | The id of the regional energy record for which the average energy reports will be retrieved. |

The class diagram of the response (instance of RegionalEnergyAvgReport) has been already given in Figure 36, page 136.

#### 2.12.12.1 Retrieve an average EVSE regional energy record [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Ireland",
        "created":"2015-01-20T18:25:22+02:00",
        "updated":"2015-01-20T18:25:22+02:00"
    },
    "regional_energy_average":[
        {
            "id":"1",
            "max_possible_energy":6.16,
            "current_energy":4.56,
            "region_id":"1"
        }
    ]
}
```

## 2.13 Simulation

This set of APIs may be used to retrieve simulated values for various smart grid/city aspects.

### 2.13.1 Get prediction of user power demand

**Endpoint URL: [/{version}/{trial}/simulation/prediction/power/demand/user/{customer_id}]**

Returns a simulated power demand prediction for a specific user, based on his/her id.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for retrieving the aggregated energy data. |
| *customer_id* | String | WP4_U_3 | The user id to fetch the predictions for. |

The class diagram of the report (instance of PredictionReport) is given in Figure 37.

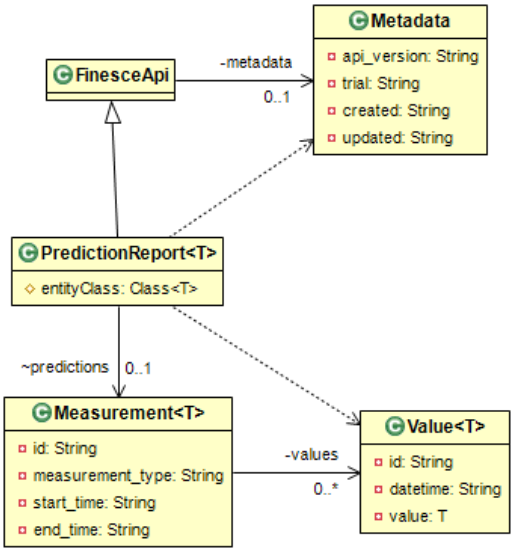


**Figure 37: Class diagram of a PredictionReport response**

In practice, a PredictionReport is an alternative of the MeasurementReport class, following the exact same class structure and working in exactly the same way (see Figure 10, page 27 for details).

#### 2.13.1.1 Retrieve a report related to the predicted user power demand [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Terni",
        "created":"2015-01-22T11:46:40+02:00",
        "updated":"2015-01-22T11:46:40+02:00"
    },
    "predictions":[
        {
            "id":"WP4_U_3",
            "measurement_type":"PowerDemandGrid",
            "values":[
                {
                    "id":null,
                    "datetime":"2015-01-21T10:16:27+02:00",
                    "value":0.0
                },
                {
                    "id":null,
                    "datetime":"2015-01-21T12:16:27+02:00",
                    "value":0.0
                },
                {
                    "id":null,
                    "datetime":"2015-01-21T15:16:27+02:00",
                    "value":0.0
                },
                {
                    "id":null,
                    "datetime":"2015-01-21T21:16:27+02:00",
                    "value":0.0
                },
                {
                    "id":null,
                    "datetime":"2015-01-22T09:16:27+02:00",
                    "value":0.0
                }
            ],
            "start_time":null,
            "end_time":null
        }
    ]
}
```


### 2.13.2 Get prediction of sector power demand

**Endpoint URL: [/{version}/{trial}/simulation/prediction/power/demand/sector/{sector}]**

Returns a simulated power demand prediction for a specific sector.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |
| *sector* | String | INDUSTRIAL | The sector to fetch the predictions for. |

The class diagram of the response (instance of PredictionReport) has been already presented in Figure 37, page 145.

#### 2.13.2.1 Retrieve a report related to the predicted sector power demand [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Terni",
5.         "created":"2015-01-22T11:48:15+02:00",
6.         "updated":"2015-01-22T11:48:15+02:00"
7.     },
8.     "predictions ":[
9.         {
10.            "id":"INDUSTRIAL",
11.            "measurement_type":"PowerDemandGrid",
12.            "values":[
13.                {
14.                    "id":null,
15.                    "datetime":"2015-01-21T10:16:27+02:00",
16.                    "value":0.0
17.                },
18.                {
19.                    "id":null,
20.                    "datetime":"2015-01-21T12:16:27+02:00",
21.                    "value":0.0
22.                },
23.                {
24.                    "id":null,
25.                    "datetime":"2015-01-21T15:16:27+02:00",
26.                    "value":0.0
27.                },
28.                {
29.                    "id":null,
30.                    "datetime":"2015-01-21T21:16:27+02:00",
31.                    "value":0.0
32.                },
33.                {
```

```
                    "id":null,
                    "datetime":"2015-01-22T09:16:27+02:00",
                    "value":0.0
                }
            ],
            "start_time":null,
            "end_time":null
        }
    ]
}
```


### 2.13.3 Get prediction of user power supply

**Endpoint URL: [/{version}/{trial}/simulation/prediction/power/supply/user/{customer_id}]**

Returns a simulated power supply prediction for a specific user, based on his/her id.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |
| *customer_id* | String | WP4_U_3 | The user id to fetch the predictions for. |

The class diagram of the response (instance of PredictionReport) has been already presented in Figure 37, page 145.

#### 2.13.3.1 Retrieve a report related to the predicted user power supply [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body


```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Terni",
        "created":"2015-01-22T11:49:31+02:00",
        "updated":"2015-01-22T11:49:31+02:00"
    },
    "predictions":[
        {
            "id":"WP4_U_3",
            "measurement_type":"PowerSupplyGrid",
            "values":[
                {
                    "id":null,
                    "datetime":"2015-01-21T10:16:27+02:00",
```

```
                    "value":0.0
                },
                {
                    "id":null,
                    "datetime":"2015-01-21T12:16:27+02:00",
                    "value":0.0
                },
                {
                    "id":null,
                    "datetime":"2015-01-21T15:16:27+02:00",
                    "value":0.0
                },
                {
                    "id":null,
                    "datetime":"2015-01-21T21:16:27+02:00",
                    "value":0.0
                },
                {
                    "id":null,
                    "datetime":"2015-01-22T09:16:27+02:00",
                    "value":0.0
                }
            ],
            "start_time":null,
            "end_time":null
        }
    ]
}
```


### 2.13.4 Get prediction of sector power supply

**Endpoint URL: [/{version}/{trial}/simulation/prediction/power/supply/sector/{sector}]**

Returns a simulated power supply for a specific sector.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |
| *sector* | String | INDUSTRIAL | The sector to fetch the predictions for. |

The class diagram of the response (instance of PredictionReport) has been already presented in Figure 37, page 145.

#### 2.13.4.1 Retrieve a report related to the predicted sector power supply [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body


```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Terni",
        "created":"2015-01-22T11:51:09+02:00",
        "updated":"2015-01-22T11:51:09+02:00"
    },
    "predictions":[
        {
            "id":"INDUSTRIAL",
            "measurement_type":"PowerSupplyGrid",
            "values":[
                {
                    "id":null,
                    "datetime":"2015-01-21T10:16:27+02:00",
                    "value":0.0
                },
                {
                    "id":null,
                    "datetime":"2015-01-21T12:16:27+02:00",
                    "value":0.0
                },
                {
                    "id":null,
                    "datetime":"2015-01-21T15:16:27+02:00",
                    "value":0.0
                },
                {
                    "id":null,
                    "datetime":"2015-01-21T21:16:27+02:00",
                    "value":0.0
                },
                {
                    "id":null,
                    "datetime":"2015-01-22T09:16:27+02:00",
                    "value":0.0
                }
            ],
            "start_time":null,
            "end_time":null
        }
    ]
}
```

## 2.14 Smart Factories

This set of APIs offers information related to the monitoring and control of equipment of a smart factory.

### 2.14.1 Get available machines

**Endpoint URL: [/{version}/{trial}/factory/equipment/machines]**

Gets the list of available machines of the factory.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Aachen | The trial infrastructure to use for invoking the respective service. |

The class diagram of the response (instance of MachinesReport) is given in Figure 38.

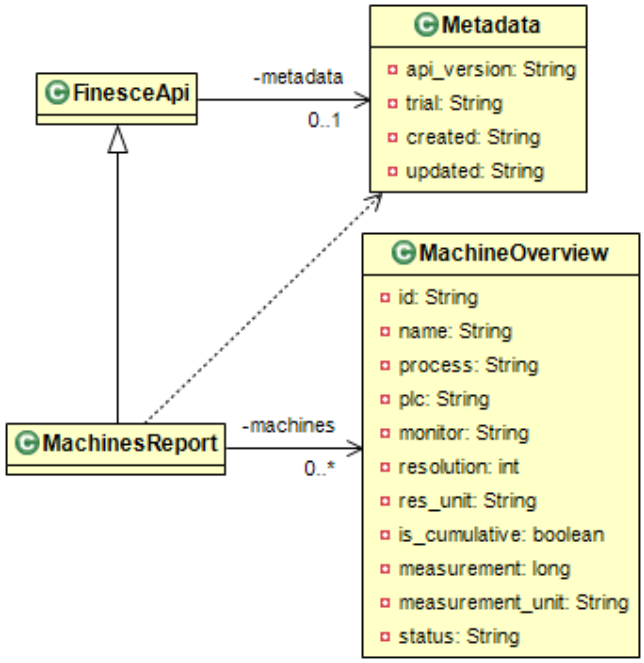


**Figure 38: Class diagram of a MachinesReport response.**

The attributes of the relevant response are detailed in the tables following.

**Table 67: Attributes of the MachinesReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **machines** | List<MachineOverview> | The list of machine details of the trial (see Table 68, page 151) |

**Table 68: Attributes of the MachineOverview class**

| Name | Type | Description |
|---|---|---|

| | | |
|---|---|---|
| **id** | String | The id of the machine |
| **name** | String | The name of the machine |
| **process** | String | The process the machine is currently into |
| **plc** | String | The PLC id of the machine |
| **monitor** | String | The type of the meter monitoring the machine |
| **resolution** | Integer | The period of the measurements |
| **res_unit** | String | The unit of the resolution (e.g. minutes) |
| **is_cumulative** | Boolean | Indicates whether the measurement is cumulative |
| **measurement** | long | The actual measurement |
| **measurement_unit** | String | The measurement unit |
| **status** | String | The status of the machine |

#### 2.14.1.1 Retrieve the list of available machines [GET]

**Response 200 (application/json)**

- Body


```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Aachen",
        "created":"2014-12-30T19:02:41+02:00",
        "updated":"2014-12-30T19:02:41+02:00"
    },
    "machines":[
        {
            "id":"Machine-1",
            "name":"Factory Building Lateral",
            "process":"none",
            "plc":"none",
            "monitor":"SmartMeter (Kellendonk)",
            "resolution":1,
            "res_unit":"minute",
            "is_cumulative":true,
            "measurement":18661250,
            "measurement_unit":"kWh",
            "status":"operating"
        },
        {
            "id":"Machine-172",
            "name":"Manual assembly stations",
            "process":"Assembly",
            "plc":"none",
            "monitor":"Secondary Distributor",
            "resolution":15,
            "res_unit":"minute",
            "is_cumulative":false,
            "measurement":9990,
            "measurement_unit": "kWh",
            "status":"operating"
        }
    ]
}
```


### 2.14.2 Get information over a single machine

**Endpoint URL: [/{version}/{trial}/factory/equipment/machines/{machine_id}]**

Gets detailed, historical information regarding a single machine, based on its id.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Aachen | The trial infrastructure to use for invoking the respective service. |
| *machine_id* | String | Machine-1 | The id of the machine of interest. |

The class diagram of the response (instance of SingleMachineReport) is given in Figure 39: Class diagram of a SingleMachineReport response.Figure 39.

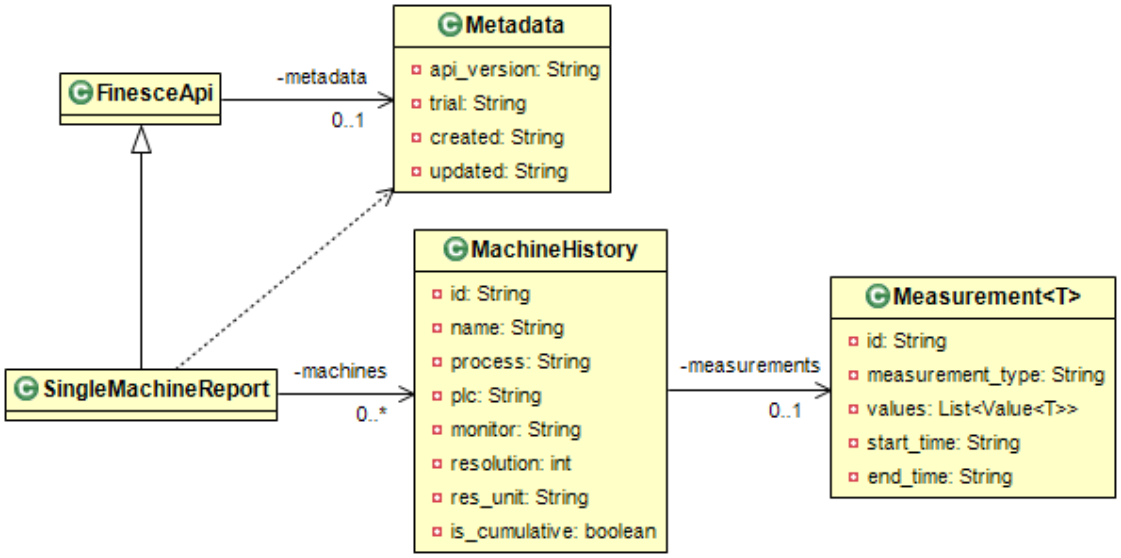


**Figure 39: Class diagram of a SingleMachineReport response.**

The attributes of the relevant response are detailed in the tables following.

**Table 69: Attributes of the SingleMachineReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **machines** | List<MachineHistory> | The list of the machine details of interest (only one machine details object is included, see |

**Table 70: Attributes of the MachineHistory class**

| Name | Type | Description |
|---|---|---|
| **id** | String | The id of the machine |
| **name** | String | The name of the machine |
| **process** | String | The process the machine is currently into |
| **plc** | String | The PLC id of the machine |
| **monitor** | String | The type of the meter monitoring the machine |
| **resolution** | Integer | The period of the measurements |
| **res_unit** | String | The unit of the resolution (e.g. minutes) |
| **is_cumulative** | Boolean | Indicates whether the measurement is cumulative |

| | | |
|---|---|---|
| **measurements** | List<Measurement< EnergyStatusSingleton>> | The list of measurements of the machine (see Table 14, page 27) |

Note that the EnergyStatusSingleton measurement type is more complex than the usual measurement types supported (e.g. EnergyConsumptionGrid etc) which usually follow a more common format. In an attempt to fully and exhaustively analyse the SingleMachineReport class hierarchy, Figure 40 would be of merit.

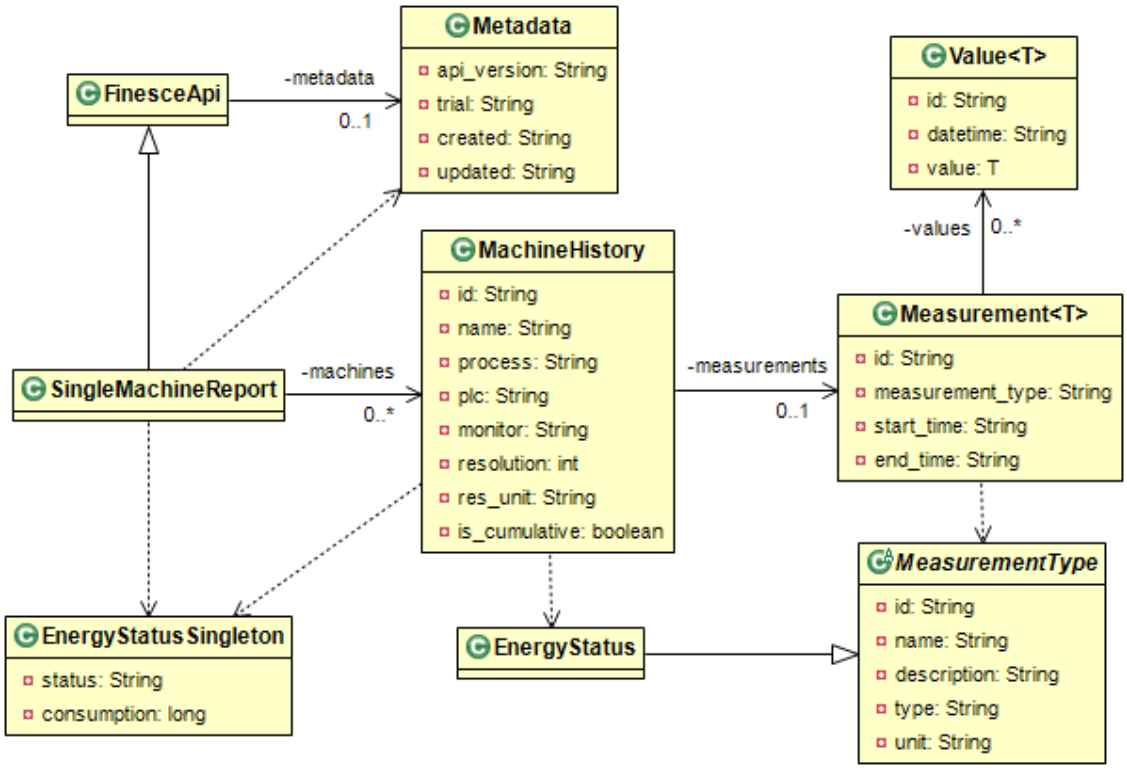


**Figure 40: Class diagram of a SingleMachineReport response (full depth analysis).**

#### 2.14.2.1 Retrieve historical measurements for a single machine [GET]

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Aachen",
5.         "created":"2015-01-12T16:10:02+01:00",
6.         "updated":"2015-01-12T16:10:02+01:00"
7.     },
8.     "machine":[
9.         {
10.            "id":"Machine-1",
11.            "name":"Factory Building Lateral",
12.            "process":"none",
13.            "plc":"none",
```

```
            "monitor":"SmartMeter (Kellendonk)",
            "resolution":1,
            "res_unit":"minute",
            "is_cumulative":true,
            "measurements":{
                "measurement_type":"EnergyStatus",
                "values”:[
                    {
                        "id":null,
                        "datetime":"2015-01-12T16:10:02+01:00",
                        "value":{
                            "status":"operating",
                            "consumption":18661248
                        }
                    },
                    {
                        "id":null,
                        "datetime":"2015-01-12T16:11:02+01:00",
                        "value":{
                            "status":"operating",
                            "consumption":18661250
                        }
                    }
                ]
            }
        }
    ]
}
```

## 2.15 Virtual Power Plant

This set of APIs offers information regarding the operation of Virtual Power Plants (VPP).

### 2.15.1 Get VPP components data

**Endpoint URL: [/{version}/{trial}/vpp/components]**

Gets the available components of the VPP. Currently, 'Aachen' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Aachen | The trial infrastructure to use for invoking the respective service. |

The class diagram of the response (instance of ComponentsReport) is given in Figure 41.

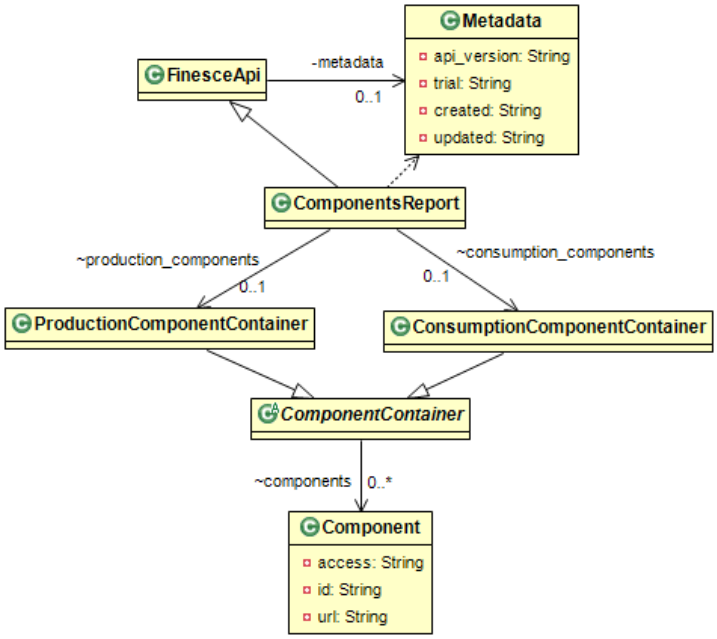


**Figure 41: Class diagram of a ComponentsReport response**

The attributes of the relevant response class are detailed in the tables following.

**Table 71: Attributes of the ComponentsReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **production_components** | ProductionComponentContainer | A container for the production components of the VPP (extends ComponentContainer, see Table 72, page 157) |
| **consumption_components** | ConsumptionComponentContainer | A container for the consumption |

| | |
|---|---|
| | components of the VPP (extends ComponentContainer, see Table 72, page 157) |

**Table 72: Attributes of the ComponentContainer class**

| Name | Type | Description |
|---|---|---|
| **components** | List<Component> | The list of components of interest (see Table 73, page 157) |

**Table 73: Attributes of the Component class**

| Name | Type | Description |
|---|---|---|
| **access** | String | The access permissions of the component |
| **id** | String | The id of the component |
| **url** | String | The URL of the component data |

#### 2.15.1.1 Retrieve VPP components [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Aachen",
5.         "created":"2014-12-30T19:21:59+02:00",
6.         "updated":"2014-12-30T19:21:59+02:00"
7.     },
8.     "consumption_components":{
9.         "components":[
10.            {
11.                "access":"rw",
12.                "id":"machine_1",
13.                "url":"https://130.206.82.22/finesce/api/v0.1/Aachen/v
    pp/consumption/machine_1/data"
14.            },
15.            {
16.                "access":"rw",
17.                "id":"machine_2",
18.                "url":"https://130.206.82.22/finesce/api/v0.1/Aachen/v
    pp/consumption/machine_2/data"
19.            }
20.        ]
21.    },
22.    "production_components":{
23.        "components":[
24.            {
25.                "access":"rw",
26.                "id":"biogas_1",
```

```
27.                 "url":"https://130.206.82.22/finesce/api/v0.1/Aachen/v
    pp/production/biogas_1/data"
28.             },
29.             {
30.                 "access":"rw",
31.                 "id":"biogas_2",
32.                 "url":"https://130.206.82.22/finesce/api/v0.1/Aachen/v
    pp/production/biogas_2/data"
33.             },
34.             {
35.                 "access":"rw",
36.                 "id":"biogas_2",
37.                 "url":"https://130.206.82.22/finesce/api/v0.1/Aachen/v
    pp/production/biogas_3/data"
38.             }
39.         ]
40.     }
41. }
```


### 2.15.2 Get the data of a specific VPP component

**Endpoint URL: [/{version}/{trial}/vpp/{comp_type}/{comp_id}/data]**

Gets the list of dates of available data for a component. The {comp_type} can be either 'production' or 'consumption'. A valid {comp_id} can be found from the /{version}/{trial}/vpp/components service. Currently, 'Aachen' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Aachen | The trial infrastructure to use for invoking the respective service. |
| *comp_id* | String | machine_1 | The component type (can be either 'production' or 'consumption'). |

The class diagram of the response (instance of ComponentDataReport) is given in Figure 42.

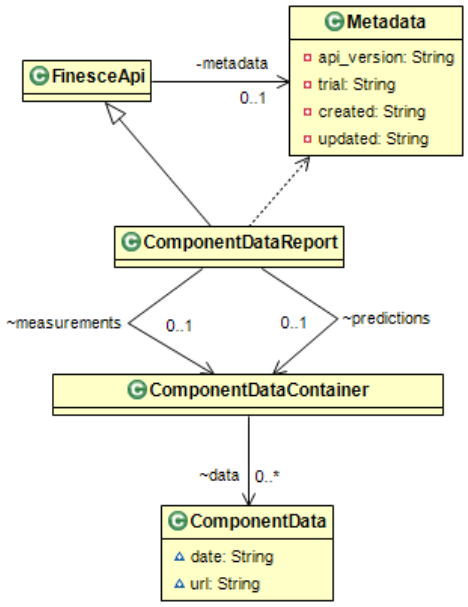


**Figure 42: Class diagram of a ComponentDataReport**

The attributes of the relevant response class are detailed in the tables following.

**Table 74: Attributes of the ComponentDataReport class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **measurements** | ComponentDataContainer | A container for the production components of the VPP (see Table 75, page 159) |
| **predictions** | ComponentDataContainer | A container for the consumption components of the VPP (see Table 75, page 159) |

**Table 75: Attributes of the ComponentDataContainer class**

| Name | Type | Description |
|---|---|---|
| **data** | List<ComponentData> | The list of dates holding data to show (see Table 76, page 159) |

**Table 76: Attributes of the ComponentData class**

| Name | Type | Description |
|---|---|---|
| **date** | String | The date with the data of interest (a full day) |
| **url** | String | The URL of the service for the actual data measurements |

#### 2.15.2.1 Retrieve data for a VPP component [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body


```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Aachen",
        "created":"2014-12-30T19:28:57+02:00",
        "updated":"2014-12-30T19:28:57+02:00"
    },
    "predictions":{
        "data":[
            {
                "date":"2014-12-20",
                "url":"https://130.206.82.22/finesce/api/v0.1/Aachen/vpp/consumption/machine_1/predictions/2014-12-21"
            },
            {
                "date":"2014-12-20",
                "url":"https://130.206.82.22/finesce/api/v0.1/Aachen/vpp/consumption/machine_1/predictions/2014-12-22"
            }
        ]
    },
    "measurements":{
        "data":[
            {
                "date":"2014-12-19",
                "url":"https://130.206.82.22/finesce/api/v0.1/Aachen/vpp/consumption/machine_1/measurements/2014-12-19"
            },
            {
                "date":"2014-12-20",
                "url":"https://130.206.82.22/finesce/api/v0.1/Aachen/vpp/consumption/machine_1/measurements/2014-12-20"
            }
        ]
    }
}
```


### 2.15.3 Get the measurements of a specific VPP component in a day

**Endpoint URL: [/{version}/{trial}/vpp/{comp_type}/{comp_id}/measurements/{date}]**

Gets measurement data for component for a specified data and data type. The {comp_type} can be either 'production' or 'consumption'. A valid {comp_id} can be found from the /{version}/{trial}/vpp/components service. A valid {date} can be found from the /{version}/{trial}/vpp/{comp_type}/{comp_id}/data service. Currently, 'Aachen' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Aachen | The trial infrastructure to use for invoking the respective service. |
| *comp_type* | String | consumption | The component type (can be either 'production' or 'consumption'). |
| *comp_id* | String | machine_1 | The id of the component to check. |
| *date* | String | 2014-12-19 | The date for which to check for measurements. |

The class diagram of the response (instance of MeasurementReport) has been already presented in Figure 10, page 27.

#### 2.15.3.1 Retrieve VPP component measurements [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body

```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Aachen",
        "created":"2015-01-12T16:11:31+01:00",
        "updated":"2015-01-12T16:11:31+01:00"
    },
    "measurements":{
        "measurement_type":"EnergyConsumptionGrid",
        "values":[
            {
                "id":null,
                "datetime":"2014-12-19T00:00:00+01:00",
                "value":1299.6427241955832
            },
            {
                "id":null,
                "datetime":"2014-12-19T00:15:00+01:00",
                "value":1211.496413801941
            },
            . . .
            {
                "id":null,
                "datetime":"2014-12-19T23:30:00+01:00",
                "value":1276.5377229188848
            },
            {
```

```
                "id":null,
                "datetime":"2014-12-19T23:45:00+01:00",
                "value":1183.4397883717554
            }
        ],
        "start_time":null,
        "end_time":null
    }
}
```


### 2.15.4 Get the predictions for a specific VPP component in a day

**Endpoint URL: [/{version}/{trial}/vpp/{comp_type}/{comp_id}/predictions/{date}]**

Gets prediction data for component for a specified data and data type. The {comp_type} can be either 'production' or 'consumption'. A valid {comp_id} can be found from the /{version}/{trial}/vpp/components service. A valid {date} can be found from the /{version}/{trial}/vpp/{comp_type}/{comp_id}/data service. Currently, 'Aachen' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Aachen | The trial infrastructure to use for invoking the respective service. |
| *comp_type* | String | consumption | The component type (can be either 'production' or 'consumption'). |
| *comp_id* | String | machine_1 | The id of the component to check. |
| *date* | String | 2014-12-19 | The date for which to check for measurements. |

The class diagram of the response (instance of PredictionReport) has been already presented in Figure 37, page 145.

#### 2.15.4.1 Retrieve VPP component predictions [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body


```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Aachen",
        "created":"2015-01-12T16:12:46+01:00",
        "updated":"2015-01-12T16:12:46+01:00"
    },
```

```
    "predictions":{
        "measurement_type":"EnergyConsumptionGrid",
        "values":[
            {
                "id":null,
                "datetime":"2014-12-21T00:00:00+01:00",
                "value":1108.2871315269886
            },
            {
                "id":null,
                "datetime":"2014-12-21T00:15:00+01:00",
                "value":1236.4299327191509
            },
            . . .
            {
                "id":null,
                "datetime":"2014-12-21T23:30:00+01:00",
                "value":1090.2929825964893
            },
            {
                "id":null,
                "datetime":"2014-12-21T23:45:00+01:00",
                "value":1192.6908303176292
            }
        ],
        "start_time":null,
        "end_time":null
    }
}
```

## 2.16 Weather forecast

This API is responsible for fetching information related to the weather be it in the past or the near future.

### 2.16.1 Get available forecast descriptors

**Endpoint URL: [/{version}/{trial}/weather/available_descriptors]**

Delivers the available forecast descriptors of the specified trial infrastructure. ‘Terni’, 'Madrid' and 'Malmo' are the only trials providing this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |

The class diagram of the response (instance of WeatherAvailableOptions) is given in Figure 43.

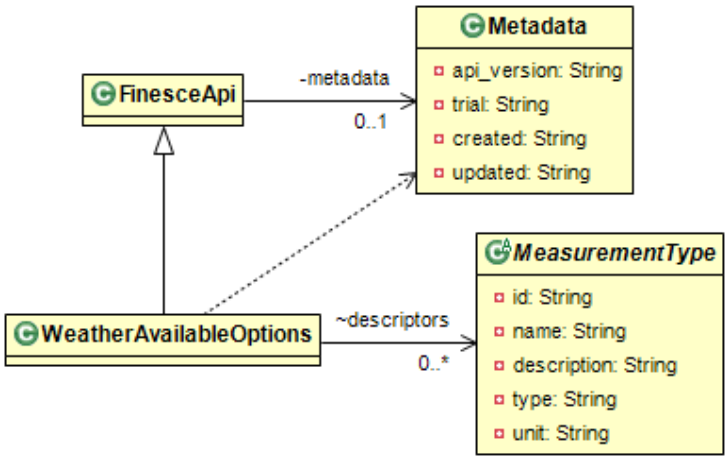


**Figure 43: Class diagram of a WeatherAvailableOptions response.**

The attributes of the relevant response class are detailed in the table following.

**Table 77: Attributes of TH WeatherAvailableOptions class.**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **descriptors** | List<MeasurementType> | The list of descriptors available to/by the trial (see Table 12, page 23) |

In essence, a descriptor is nothing more than a weather-related measurement type.

#### 2.16.1.1 Retrieve the available weather descriptors [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body


```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Terni",
        "created":"2015-01-15T20:27:26+01:00",
        "updated":"2015-01-15T20:27:26+01:00"
    },
    "descriptors":[
        {
            "id":null,
            "name":"Temperature",
            "description":"The instantaneous actual/forecasted temperature (outside)",
            "type":"Weather",
            "unit":"C"
        },
        {
            "id":null,
            "name":"MaxTemperature",
            "description":"The maximum temperature observed/forecasted.",
            "type":"Weather",
            "unit":"C"
        },
        {
            "id":null,
            "name":"MinTemperature",
            "description":"The maximum temperature observed/forecasted",
            "type":"Weather",
            "unit":"C"
        },
        {
            "id":null,
            "name":"CloudCover",
            "description":"The fraction of the sky obscured by clouds",
            "type":"Weather",
            "unit":"-"
        },
        {
            "id":null,
            "name":"WindSpeed",
            "description":"The instantaneous actual/forecasted wind speed",
            "type":"Speed",
            "unit":"kmph"
        },
        {
            "id":null,
            "name":"SunriseTime",
            "description":"The time when the sun is forecasted to rise",
```

```
            "type":"Weather",
            "unit":"Time in iso8601 CET"
        },
        {
            "id":null,
            "name":"SunsetTime",
            "description":"The time when the sun is forecasted to set",
            "type":"Time",
            "unit":"Time in iso8601 CET"
        }
    ]
}
```

### 2.16.2 Get detailed weather report

**Endpoint URL: [/{version}/{trial}/weather/{from}/{to}]**

A weather report for a specific area, in a specific period of time. Valid {from} and {to} values are expressed in ISO8601 format. 'Terni' and 'Malmo' are the only trials providing this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |
| *from* | String | 2014-12-20T02:15:00+02:00 | The lower limit of the duration of the query, in an ISO8601 compliant format |
| *to* | String | 2014-12-20T03:15:00+02:00 | The upper limit of the duration of the query, in an ISO8601 compliant format |

The class diagram of the response (instance of WeatherDetails) is given in Figure 44.

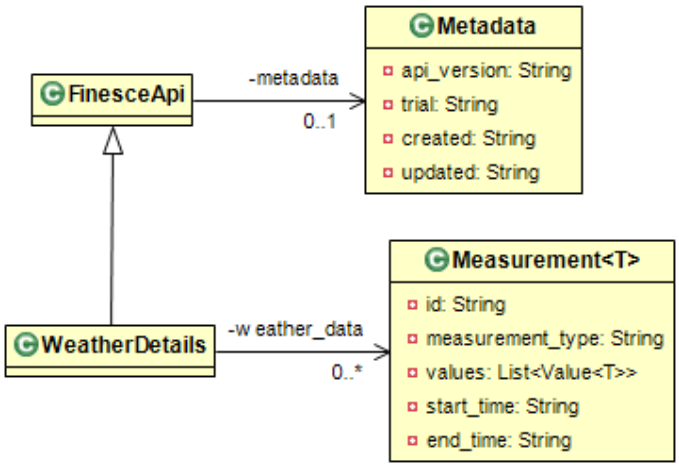


**Figure 44: Class diagram of a WeatherDetails response**

The attributes of the relevant response are detailed in the following table.

**Table 78: Attributes of the WeatherDetails class**

| Name | Type | Description |
|---|---|---|
| **metadata** | Metadata | The metadata of the report (see Table 5, page 14) |
| **weather_data** | Measurement<T> | The weather details (see Figure 10, page 27) |

#### 2.16.2.1 Retrieve a weather report [GET]

**Request**

- Headers

```
x-auth-token: an_auth_token
Accept: application/json
```

**Response 200 (application/json)**

- Body


```
{
    "metadata":{
        "api_version":"0.1",
        "trial":"Terni",
        "created":"2015-01-15T20:25:20+01:00",
        "updated":"2015-01-15T20:25:20+01:00"
    },
    "weather_data":[
        {
            "measurement_type":"Temperature",
            "values":[
                {
                    "id":null,
                    "datetime":"2015-01-20T01:30:20+01:00",
                    "value":7.33
                },
                {
                    "id":null,
                    "datetime":"2015-01-20T01:45:20+01:00",
                    "value":7.33
                },
                {
                    "id":null,
                    "datetime":"2015-01-20T02:00:20+01:00",
                    "value":7.13
                },
                {
                    "id":null,
                    "datetime":"2015-01-20T02:15:20+01:00",
                    "value":6.96
                }
            ]
        },
        {
            "measurement_type":"MaxTemperature",
            "values":[
                {
                    "id":null,
                    "datetime":"2015-01-20T01:30:20+01:00",
                    "value":13.91
```

```
                },
                {
                    "id":null,
                    "datetime":"2015-01-20T01:45:20+01:00",
                    "value":13.91
                },
                {
                    "id":null,
                    "datetime":"2015-01-20T02:00:20+01:00",
                    "value":13.92
                },
                {
                    "id":null,
                    "datetime":"2015-01-20T02:15:20+01:00",
                    "value":13.92
                }
            ]
        },
        {
            "measurement_type":"MinTemperature",
            "values":[
                {
                    "id":null,
                    "datetime":"2015-01-20T01:30:20+01:00",
                    "value":4.92
                },
                {
                    "id":null,
                    "datetime":"2015-01-20T01:45:20+01:00",
                    "value":4.99
                },
                {
                    "id":null,
                    "datetime":"2015-01-20T02:00:20+01:00",
                    "value":4.96
                },
                {
                    "id":null,
                    "datetime":"2015-01-20T02:15:20+01:00",
                    "value":4.96
                }
            ]
        },
        {
            "measurement_type":"CloudCover",
            "values":[
                {
                    "id":null,
                    "datetime":"2015-01-20T01:30:20+01:00",
                    "value":0.04
                },
                {
                    "id":null,
                    "datetime":"2015-01-20T01:45:20+01:00",
                    "value":0.06
                },
                {
                    "id":null,
                    "datetime":"2015-01-20T02:00:20+01:00",
                      "value":0.08
                  },
```

```
                {
                    "id":null,
                    "datetime":"2015-01-20T02:15:20+01:00",
                    "value":0.11
                }
            ]
        },
        {
            "measurement_type":"WindSpeed",
            "values":[
                {
                    "id":null,
                    "datetime":"2015-01-20T01:30:20+01:00",
                    "value":0.0
                },
                {
                    "id":null,
                    "datetime":"2015-01-20T01:45:20+01:00",
                    "value":0.0
                },
                {
                    "id":null,
                    "datetime":"2015-01-20T02:00:20+01:00",
                    "value":0.0
                },
                {
                    "id":null,
                    "datetime":"2015-01-20T02:15:20+01:00",
                    "value":0.0
                }
            ]
        },
        {
            "measurement_type":"SunriseTime",
            "values":[
                {
                    "id":null,
                    "datetime":"2015-01-20T01:30:20+01:00",
                    "value":"2014-12-20T07:36:37+01:00"
                },
                {
                    "id":null,
                    "datetime":"2015-01-20T01:45:20+01:00",
                    "value":"2014-12-20T07:36:37+01:00"
                },
                {
                    "id":null,
                    "datetime":"2015-01-20T02:00:20+01:00",
                    "value":"2014-12-20T07:36:37+01:00"
                },
                {
                    "id":null,
                    "datetime":"2015-01-20T02:15:20+01:00",
                    "value":"2014-12-20T07:36:37+01:00"
                }
            ]
        },
        {
            "measurement_type":"SunsetTime",
            "values":[
                {
```

```
                    "id":null,
                    "datetime":"2015-01-20T01:30:20+01:00",
                    "value":"2014-12-20T16:39:36+01:00"
                },
                {
                    "id":null,
                    "datetime":"2015-01-20T01:45:20+01:00",
                    "value":"2014-12-20T16:39:36+01:00"
                },
                {
                    "id":null,
                    "datetime":"2015-01-20T02:00:20+01:00",
                    "value":"2014-12-20T16:39:36+01:00"
                },
                {
                    "id":null,
                    "datetime":"2015-01-20T02:15:20+01:00",
                    "value":"2014-12-20T16:39:36+01:00"
                }
            ]
        }
    ]
}
```


### 2.16.3 Get detailed weather report

**Endpoint URL: [/{version}/{trial}/weather/{weather_descriptor}/{from}/{to}]**

A weather report (only one weather descriptor) for a specific time frame. Valid {weather_descriptor} values can be derived by calling the /{version}/{trial}/weather/ available_descriptors service. Valid {from} and {to} values are expressed in ISO8601 format. 'Terni', 'Mardid' and 'Malmo' are the trials offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |
| *weather_descriptor* | String | temperature | The type of forecast descriptor to get weather data for |
| *from* | String | 2014-12-20T02:15:00+02:00 | The lower limit of the duration of the query, in an ISO8601 compliant format |
| *to* | String | 2014-12-20T03:15:00+02:00 | The upper limit of the duration of the query, in an ISO8601 compliant format |

The class diagram of the response (instance of WeatherDetails) has been already provided in Figure 44, page 166.

#### 2.16.3.1 Retrieve a weather report [GET]

**Request**

- Headers

```
1. x-auth-token: an_auth_token
2. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Terni",
5.         "created":"2015-01-16T15:11:18+02:00",
6.         "updated":"2015-01-16T15:11:18+02:00"
7.     },
8.     "weather_data":[
9.         {
10.            "measurement_type":"Temperature",
11.            "values":[
12.                {
13.                    "id":null,
14.                    "datetime":"2014-12-20T01:30:00+02:00",
15.                    "value":7.33
16.                },
17.                {
18.                    "id":null,
19.                    "datetime":"2014-12-20T01:45:00+02:00",
20.                    "value":7.33
21.                },
22.                {
23.                    "id":null,
24.                    "datetime":"2014-12-20T02:00:00+02:00",
25.                    "value":7.13
26.                },
27.                {
28.                    "id":null,
29.                    "datetime":"2014-12-20T02:15:00+02:00",
30.                    "value":6.96
31.                }
32.            ]
33.        }
34.    ]
35.}
```

### 2.16.4 Get detailed weather report (limited records)

**Endpoint URL:**

**[/{version}/{trial}/weather/{weather_descriptor}/{from}/{to}/{measurements_number}]**

A weather report (only one weather descriptor) for a specific time frame. Valid {weather_descriptor} values can be derived by calling the /{version}/{trial}/weather/ available_descriptors service. Valid {from} and {to} values are expressed in ISO8601 format. 'Madrid' is the only trial offering this service.

***Parameters***

| *Name* | Type | Example | Description |
|---|---|---|---|
| *version* | String | v0.1 | The version of the API to use. |
| *trial* | String | Terni | The trial infrastructure to use for invoking the respective service. |
| *weather_descriptor* | String | Temperature | The type of forecast descriptor to get weather data for |
| *from* | String | 2014-12-20T02:15:00+02:00 | The lower limit of the duration of the query, in an ISO8601 compliant format |
| *to* | String | 2014-12-20T03:15:00+02:00 | The upper limit of the duration of the query, in an ISO8601 compliant format |

The class diagram of the response (instance of WeatherDetails) has been already provided in Figure 44, page 166.

#### 2.16.4.1 Retrieve a weather report [GET]

**Request**

- Headers

```
1. Accept: application/json
```

**Response 200 (application/json)**

- Body

```
1. {
2.     "metadata":{
3.         "api_version":"0.1",
4.         "trial":"Madrid",
5.         "created":"2015-02-26T17:38:52+02:00",
6.         "updated":"2015-02-26T17:38:52+02:00"
7.     },
8.     "weather_data":[
9.         {
10.            "measurement_type":"Temperature",
11.            "values":[
12.                {
13.                    "id":null,
14.                    "datetime":"2014-12-20T01:15:00+02:00",
15.                    "value":15.57227974062439
16.                },
17.                {
```

```
                    "id":null,
                    "datetime":"2014-12-20T01:27:00+02:00",
                    "value":16.402985633903707
                },
                {
                    "id":null,
                    "datetime":"2014-12-20T01:39:00+02:00",
                    "value":8.330456602614198
                },
                {
                    "id":null,
                    "datetime":"2014-12-20T01:51:00+02:00",
                    "value":1.2384797645123213
                },
                {
                    "id":null,
                    "datetime":"2014-12-20T02:03:00+02:00",
                    "value":0.49984188761267756
                },
                {
                    "id":null,
                    "datetime":"2014-12-20T02:15:00+02:00",
                    "value":7.09751620071414
                }
            ],
            "start_time":"2014-12-20T01:15:00+02:00",
            "end_time":"2014-12-20T02:15:00+02:00"
        }
    ]
}
```

# 3 Conclusion

This report overviews and documents the services provided by the FINESCE trial infrastructures and offered to third parties. A classification of the various services has been performed and the common data model composing the consolidated FINESCE API specification is presented. All the services are exposed in a RESTful way, directing the documentation orientation towards a relevant way of presenting the API, including service endpoint URL breakdown via parameter explanation, presentation of service responses through class diagrams and tabulated definition of the class parameters and, finally, indicative service output examples.

In the framework of a general Smart City ecosystem fuelled by Smart Energy web services, the FINESCE API could play the role of a standard, well documented, implemented and tested interface, designed to cover a large variety of disciplines related to Smart Energy systems.

# 4 References

[1] FINESCE, "http://www.finesce.eu," [Online].

[2] FINESCE API Mediator DSE, "http://finesce.github.io/DSE.html?id=FINESCE_API_Mediator_(FAM)_DSE," FINESCE, 2015. [Online].

[3] Swagger, "http://swagger.io," [Online].

[4] FINESCE API Documentation - Swagger, "https://130.206.82.22/finesce/api/docs/index.html," FINESCE, Feb. 2015. [Online].

[5] FINESCE API Documentation - APIARY, "http://docs.fam.apiary.io," FINESCE, 28 Feb. 2015. [Online].

[6] Creative Commons Attribution Share-Alike 4.0 (cc-by-sa), "http://creativecommons.org/licenses/by-sa/4.0/legalcode," [Online].

# 5 List of Abbreviations

| | |
|---|---|
| API | Application Programming Interface |
| DSM | Demand Side Management |
| EVSE | Electric Vehicle Supply Equipment |
| FI | Future Internet |
| FI-PPP | Future Internet Public Private Partnership |
| FINESCE | Future INtErnet Smart Utility ServiCEs |
| IP | Incentive Plan |
| IRP | Issue Resolution Plan |
| VPP | Virtual Power Plan |

# 6 Appendix A – Summary of the FINESCE API services exposed by the FINESCE API Mediator

## 6.1 Aachen Trial – Smart Factory

| *Method* | Service URL | Page |
|---|---|---|
| *GET* | /Aachen/factory/equipment/machines | 151 |
| *GET* | /Aachen/factory/equipment/machines/{machine_id} | 152 |

## 6.2 Aachen Trial – Virtual Power Plant

| *Method* | Service URL | Page |
|---|---|---|
| *POST* | /Aachen/tokens | 16 |
| *GET* | /Aachen/vpp/components | 156 |
| *GET* | /Aachen/vpp/{comp_type}/{comp_id}/data | 158 |
| *GET* | /Aachen/vpp/{comp_type}/{comp_id}/measurements/{date} | 160 |
| *GET* | /Aachen/vpp/{comp_type}/{comp_id}/predictions/{date} | 162 |

## 6.3 Horsens Trial

| *Method* | Service URL | Page |
|---|---|---|
| *POST* | /Horsens/tokens | 16 |
| *POST* | /Horsens/tokens/refresh | 17 |
| *GET* | /Horsens/buildings | 19 |
| *GET* | /Horsens/buildings/{id} | 21 |
| *GET* | /Horsens/buildings/{id}/measurement_types | 22 |
| *GET* | /Horsens/buildings/measurement_types | 23 |
| *GET* | /Horsens/buildings/measurement_types/id/{id} | 24 |
| *GET* | /Horsens/buildings/measurement_types/type/{type} | 25 |
| *GET* | /Horsens/buildings/{id}/measurements/{type_id}/{from}/{to} | 26 |
| *GET* | /Horsens/vehicles | 75 |
| *GET* | /Horsens/vehicles/{id} | 76 |
| *GET* | /Horsens/vehicles/{id}/measurement_types | 80 |
| *GET* | /Horsens/vehicles/measurement_types | 77 |
| *GET* | /Horsens/vehicles/measurement_types/id/{id} | 79 |
| *GET* | /Horsens/vehicles/measurement_types/type/{type} | 80 |
| *GET* | /Horsens/vehicles/{id}/measurements/{type_id}/{from}/{to} | 81 |

## 6.4 Ireland Trial

| *Method* | Service URL | Page |
|---|---|---|
| *POST* | /Ireland/tokens | 16 |
| *POST* | /Ireland/tokens/refresh | 17 |
| *GET* | /Ireland/algoweights | 116 |
| *GET* | /Ireland/algoweights/{id} | 117 |

## 6.5 Madrid Trial

## 6.6 Malmo Trial



## 6.7 Terni Trial

| | | |
|---|---|---|
| *GET* | /Terni/simulation/prediction/power/demand/sector/{sector_id} | 146 |
| *GET* | /Terni/simulation/prediction/power/demand/user/{customer_id} | 145 |
| *GET* | /Terni/simulation/prediction/power/supply/sector/{sector_id} | 149 |
| *GET* | /Terni/simulation/prediction/power/supply/user/{customer_id} | 148 |
| *GET* | /Terni/social | 107 |
| *GET* | /Terni/social/{events_number} | 109 |
| *GET* | /Terni/weather/available_descriptors | 164 |
| *GET* | /Terni/weather/{descriptor}/{from}/{to} | 166 |
| *GET* | /Terni/weather/{from}/{to} | 170 |