NorthBound Interfaces

HTTP per NorthBound Interfaces

These interfaces are exposed by the VO ready to other applications and/or services. The implementation take advantage of RESTful protocol (Representational State Transfer), specifically Hypertext Transfer Protocol (HTTP). This interface level recall the methods used in the OMA LwM2M protocol to enable device management and information notification operations. The specifications of each interface (endpoint) are summarized later in the document.

READ – General info

The VO receives a READ request from an application that wants to read information. It can be read:

- general information of the VO;
- information coming from an object inside the VO;
- information coming from an instance of an object;
- information coming from a resource.

In the case of *information coming from an object*, it will be provided the data coming from all the instance of the object requested.

The VO can hande two different type of **READ** request. The first one is a standard READ request (*READ*), that give back the last stored value by the VO. The second one is the real-time request (*READ Realtime*, described below), that is forwarded to the physical device to obtain an update value.

The different use of the READ requests depends on the application requirements.

READ
- HTTP method: GET
- **Interface:** api/clients
- **Resource path**: /*deviceId*/objectID(opt.)/InstanceID(opt.)/ResourceID(opt.)
- Parameters: *null*
- Payload: *null*

Depending on the requested level of information, it is necessary to specify the specific URI path.

For instance, if the requested information is the value of the resource *5700* of the instance 0 of the temperature object *3303*, the URI would be the following:

http://(VOnameOrIPAddr)/api/clients/deviceId/3303/0/5700

READ Realtime:

- HTTP method: GET
- **Interface:** api/clients
- **Resource path**: /deviceId/objectID(opt.)/InstanceID(opt.)/ResourceID(opz.)
- **Parameters:** ?getRealtime=true
- Payload: *null*

Depending on the requested level of information, it is necessary to specify the specific URI path.

For example, if the requested information is the value of the instance 0 of the object 3303, the URI would be the following:

http://(VOnameOrIPAddr)/api/clients/deviceId/3303/0?getRealtime=true

The response payload will be given in JSON format.

WRITE – General info

The VO receives a WRITE request from an application that wants to write a value or several values to a specific resource or instance. The VO forwards the request to the device and stores the values.

This function can be used for object resources and instances.

WRITE

- **HTTP Method:** *PUT*
- **Interface:** *api/clients*
- **Resource path:** /deviceId/objectID/InstanceID/ResourceID(opt.)
- **Parameters:** *null*
- **Payload:**
  - **Instance:**
    ```
    {"id":"InstanceID","resources":[{"id":resID,"value":"XXX"}
    ,{"id":resID,"value":"YYYY"}]}
    ```
    Example for instance '0':
    ```
    {"id":"0","resources":[{"id":14,"value":"+01"},{"id":15,"val
    ue":"Europe/Reggio Calabria"}]}
    ```
  - **Resource:** `{"id":"resID","value":"+01"}`
    Example for resource '14': `{"id":14,"value":"+01"}`

EXECUTE – General info

The VO receives an execution request. The "Execute" operation is used to start some actions and can only be performed on single resource.

EXECUTE

- **HTTP Method:** *POST*
- **Interface:** *api/clients*
- **Resource path:** /deviceId/objectID/InstanceID/ResourceID
- **Parameters:** *null*
- **Payload:** *null*

OBSERVE – general info

The VO receives the OBSERVE request from an application to track a resource, an object instance, or an object. When an entity is under observation, the observer is registered in a list. This list is used by the VO to notify the application of the new incoming value of the observed entity. Doing so, a new observer for the same entity will be added to the *observer list* without forwarding new OBSERVE requests through the southbound interface and then to the device.

OBSERVE

- **HTTP Method:** *POST*
- **Interface:** *api/clients*
- **Resource path:** /deviceId/objectID/InstanceID/ResourceID(opt.)/observe
- **Parameters:** *null*
- **Payload:** *null*

The *observe request* response will be:

- o **Resource:**
  ```
  {"event":"NOTIFICATION","data":{"ep":"VOid","res":"/3303/0/5
  700","val":{"id":5700,"value":55}}}
  ```
- o **Instance:**
  ```
  {"event": "NOTIFICATION","data":
  {"ep":"GGNotebook","res":"/3303/0","val":
  {"id":0,"resources":[{"id":5601,"value":11.7}, {"id":5602,
  "value":24.0}, {"id":5700,"value":15.6},
  {"id":5701,"value":"cel"}]}}
  ```

DELETE – General info

This functionality is used to delete a previous OBSERVE.

DELETE

- **HTTP Method:** *DELETE*
- **Interface:** *api/clients*
- **Resource path:** /deviceId/objectID/InstanceID/ResourceID(opt.)/observe
- **Parameters:** *null*
- **Payload:** *null*

Datastore

Through the NorthBound, the VO provides the interfaces for directly accessing the history of the data recorded in the chosen period. These interfaces, exposed on the api/data path, will allow:

- data extraction by type of resource, instance/object or object;
- data extraction by value (applicable only on resource);
- time frame definition for data extraction.