

VO Southbound interfaces

Intro

This document describes the exchange of information with the physical device within the VO stack.

The communications are based on the MQTT/TCP protocol. The use of topics will be described below depending on the functionality you want to access.

Resources addressing

Given the use of MQTT, the resources addressing will take place using topics. In this implementation it will be distinguished:

- **Topic:** resource identifier (eg. /deviceId/objId/instId/resId/);
- **FullTopic:** composed of a prefix (eg. cmdnd);

Topic

The **Topics** are used following the standard modelling of the *LwM2M protocol*, which identifies a *unique URI* for each resource. The unique resource identifiers are defined using a semantic standard reported in the OMA Registry (see D2.1).

For instance, the topic of the value resource *5700* of the instance *0* of the temperature object *3303* of the hot water device *B01* will be made up as follows: *B01/3303/0/5700*.

FullTopic

FullTopics use, in addition to the topic, a prefix (e.g. cmdnd). The prefixes are used to avoid the possibility of creating any loops between MQTT topics. Within this implementation, three distinct prefixes will be used:

- **cmdnd** - prefix for giving commands or for asking status update;
- **stat** - reports the status or the configuration message;
- **tele** - reports telemetry information at given intervals;

Interfaces

Below are the interfaces and the relative topic where the devices must be available for the exchange of information **from** and **to** device.

READ

Request

Resource	
Topic	cmnd/deviceID/objId/instId/resId
Payload	<i>not required</i>
Instance	
Topic	cmnd/deviceID/objId/instId
Payload	<i>not required</i>
Object	
Topic	cmnd/deviceID/objId
Payload	<i>not required</i>

Response

Resource	
Topic	stat/deviceID/objId/instId/resId
Payload	{"tmstp":"...", "e":[{"v":"value"}]}
Instance	
Topic	stat/deviceID/objId/instId
Payload	{"tmstp":"...", "e":[{"n":"resID", "v":"value"}, {"n":" resID", "v":"v alue"}, {"n":" resID", "v":"value"}]}
Object	
Topic	cmnd/deviceID/objId
Payload	{"tmstp":"...", "e":[{"n":"instId/resId", "v":"value"}, {"n":" instId/resId", "v":"value"}, {"n":" instId/resId", "v":"value"}, {...}]}

*"tmstp" stands for *timestamp* and record the time occurrence of the message dispatch, given in the format "2022-12-25T21:30:34+02:00"

WRITE

Request

Resource	
Topic	cmnd/deviceID/objId/instId/resId
Payload	{"v":"value"}
Instance	
Topic	cmnd/deviceID/objId/instId
Payload	{"e":[{"n":"resID","v":"value"}, {"n":"resID","v":"value"}, {"n":"resID","v":"value"}]}
Object (not available)	

Response

Resource	
Topic	stat/deviceID/objId/instId/resId
Payload	{"tmstp":"...", "e":[{"v":"value"}]}
Instance	
Topic	stat/deviceID/objId/instId
Payload	{"tmstp":"...", "e":[{"n":"resID","v":"value"}, {"n":"resID","v":"value"}, {"n":"resID","v":"value"}]}
Object (not available)	

* 'tmstp' stands for *timestamp* and record the time occurrence of the message dispatch, given in the format "2022-12-25T21:30:34+02:00"

EXECUTE

Available only on the resource.

Request

Resource	
Topic	cmd/deviceID/objId/instId/resId
Payload	opt., every payload activate the button

Response

Resource	
Topic	stat/deviceID/objId/instId/resId
Payload	{"tmstp":"...", "e":[{"v":"value"}]}

* 'value' can be *null*

** 'tmstp' stands for *timestamp* and record the time occurrence of the message dispatch, given in the format "2022-12-25T21:30:34+02:00"

OBSERVE

Request

Resource	
Topic	cmnd/deviceID/objId/instId/resId/ observe
Payload	{“v”:“ON”}
Instance	
Topic	cmnd/deviceID/objId/instId/ observe
Payload	{“v”:“ON”}

Activation Response

Resource	
Topic	stat/deviceID/objId/instId/resId/ observe
Payload	{“v”:“ON”}
Instance	
Topic	stat/deviceID/objId/instId/ observe
Payload	{“v”:“ON”}

Notifications

Resource	
Topic	tele/deviceID/objId/instId/resId
Payload	{“tmstp”:“...”,“e”:[{“v”:“value”}]}
Instance	
Topic	stat/deviceID/objId/instId
Payload	{“tmstp”:“...”,“e”:[{“n”:“resID”,“v”:“value”}, {“n”:“resID”,“v”:“value”},{“n”:“resID”,“v”:“value”}]}

* 'tmstp' stands for *timestamp* and record the time occurrence of the message dispatch, given in the format “2022-12-25T21:30:34+02:00”

DELETE

Request

Resource	
Topic	cmnd/deviceID/objId/instId/resId/ observe
Payload	{"v": " OFF "}
Instance	
Topic	cmnd/deviceID/objId/instId/ observe
Payload	{"v": " OFF "}

Response

Resource	
Topic	stat/deviceID/objId/instId/resId/ observe
Payload	{"v": " OFF "}
Instance	
Topic	stat/deviceID/objId/instId/ observe
Payload	{"v": " OFF "}

HTTP-MQTT Binding

	HTTP			MQTT			
	<i>Request</i>			<i>Request</i>		<i>Response</i>	
	<u>Metodo</u>	<u>Query</u>	<u>PayId</u>	<u>Topic</u>	<u>PayId</u>	<u>Topic</u>	<u>PayId</u>
READ	GET	Api/clients/objID/inst.ID/resID	NO	cmnd/deviceID/objId/instId/resId	NO	stat/deviceID/objId/instId/resId	YES
READ realtime	GET	Api/clients/objID/inst.ID/resID?getRealtime=true	NO				
WRITE	PUT	Api/clients/objID/inst.ID/resID	YES	cmnd/deviceID/objId/instId/resId	YES	stat/deviceID/objId/instId/resId	YES
EXECUTE	POST	Api/clients/objID/inst.ID/resID	NO	cmnd/deviceID/objId/instId/resId	YES	stat/deviceID/objId/instId/resId	YES
OBSERVE	POST	Api/clients/objID/inst.ID/resID/observe	NO	cmnd/deviceID/objId/instId/resId/observe	YES (ON)	stat/deviceID/objId/instId/resId/observe	YES
						tele/deviceID/objId/instId/resId/	
DELETE Observe	POST	Api/clients/objID/inst.ID/resID/observe	NO	cmnd/deviceID/objId/instId/resId/observe	YES (OFF)	stat/deviceID/objId/instId/resId/observe	YES