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oneM2M; Home Appliances Information Model and Mapping (oneM2M TS-0023 version 2.0.0 Release 2)

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Foreword

This Technical Specification (TS) has been produced by ETSI Partnership Project oneM2M (oneM2M).

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1 Scope

The present document describes the oneM2M defined information model for home appliances, including the description of how it is mapped with other information models from external organizations. It also explains the ontology for the home domain information model.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

[1] Home Gateway Initiative Smart Device Template.

NOTE: Available at <https://github.com/Homegateway/SmartDeviceTemplate/tree/7c890b69d9764e341ef1768c5a0e7d53a47cf5c>.

[2] Java coding rule.

NOTE: Available at <http://www.oracle.com/technetwork/java/codeconventions-135099.html>.

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] oneM2M Drafting Rules.

NOTE: Available at <http://www.onem2m.org/images/files/oneM2M-Drafting-Rules.pdf>.

[i.2] oneM2M TR-0017: "Home Domain Abstract Information Model".

[i.3] ETSI TS 118 101: "Functional Architecture (oneM2M TS-0001)".

[i.4] IEEE 802.15.4™: "IEEE Standard for Local and metropolitan area networks--Part 15.4: Low-Rate Wireless Personal Area Networks (LR-WPANs)".

[i.5] ETSI TS 118 112: "Base Ontology (oneM2M TS-0012)".

3 Definitions

For the purposes of the present document, the following terms and definitions apply:

Device Class ID: URN to identify the Device model definition.

ModuleClass ID: URN to identify the ModuleClass model definition

4 Conventions

The key words "Shall", "Shall not", "May", "Need not", "Should", "Should not" in the present document are to be interpreted as described in the oneM2M Drafting Rules [i.1].

5 Home Appliance Information Model

5.1 Introduction

The present document intends to provide the unified means in the oneM2M system by defining a home appliance information model for the home domain devices such as TV, refrigerator, air conditioner, clothes washer, oven, and robot cleaner. For the reasons of interworking with external technologies and efficiency, the principle of the home appliance information model is designed based on HGI SDT 3.0 [1].

The principle of defining the home appliance information model is introduced in clause 5.2. ModuleClasses which oneM2M systems support are explained in clause 5.3. In the subsequent clause 5.4, Device models are defined.

5.2 Design Principle of the Home Appliance Information Model

5.2.1 Basic design principle of information modelling

The design principle of the oneM2M abstract information model of home appliance, is to use SDT 3.0 as introduced in oneM2M TR-0017 [i.2]. Note that those terms starting with a capital letter in this clause are SDT terms and are explained in [1].

Domain is a unique name which acts like a namespace (e.g. "org.oneM2M.home.modules"). It is set by the organization creating the SDT, allowing reference to a package of definitions for the contained ModuleClasses and Device models.

ModuleClasses specifies a single service (e.g. audioVolume, powerOn/Off) with one or more Actions, Properties, DataPoints and Events. Each service which is described as a ModuleClass can be re-used in many Devices.

Device model is a physical, addressable, identifiable appliance, sensor and actuator with one or more Modules, Properties and SubDevices.

SubDevice is a device which may be embedded in a Device and/or is addressed via another Device.

Module is an instantiation of a ModuleClass for a specific Device or SubDevice.

Figure 5.2.1-1 depicts the basic structure of SDT 3.0.

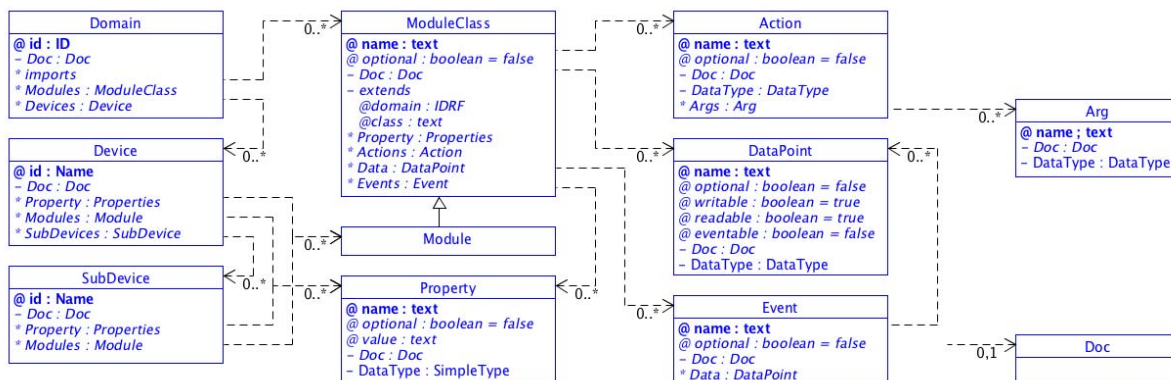


Figure 5.2.1-1: Design Structure of the Home Appliance Information Model using SDT 3.0

5.2.2 Description rules for Module Classes and Device models

When the Home Appliances Information Model is described based on SDT, the following rules shall be applied:

- Rule 1: CamelCase rule:
 - When naming each element, lowerCamelCase shall be used as the Java coding rules [2].
- Rule 2: Rule for description of Action, DataPoint:
 - DataPoint shall be used to represent stateless operations (e.g. powerState of binarySwitch for on/off operations).
 - Action shall be used when describing stateful condition, handling unknown internal state conditions (e.g. upVolume/downVolume by increasing/decreasing the audioVolume in steps, handling transactional procedures, or checking integrity using username plus password at the same time).
- Rule 3: Rule for description of DataPoint and Property:
 - Non-functional information shall be described as a Property. Functional information shall be described as a DataPoint (e.g. non-functional information: version, id; functional information: targetTemperature, targetVolume).
- Rule 4: Definition of the Domain:
 - The Domain, in the case of the Home Appliance Information Model, is specified as "org.onem2m.home".
 - The sub-domain for Device and ModuleClass shall be specified as "org.onem2m.home.devices" and "org.onem2m.home.moduleclasses" respectively.
- Rule 5: Naming rule for the element:
 - the name of each element should be concise and avoid repeating its parent element name; but
 - it may include the name of its parent element for readability. (e.g. lightDimmerUp, lightDimmerDown under lightDimmer).
- Rule 6: Criteria for marking elements as optional or mandatory:
 - An element shall only be defined as mandatory if it's foreseen to be universally mandatory to all implementing technologies.
- Rule 7: Enumeration type:
 - When describing the meaning of values for enumeration type elements, they may be described in another clause.

The enumeration types for Home Appliance Information Model are based on <xs:integer>, and the numeric values are interpreted as specified in clause 5.5.

5.3 ModuleClasses

5.3.1 alarmSpeaker

This ModuleClass provides the capability to initiate an alarm.

Table 5.3.1-1: DataPoints of alarmSpeaker ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
tone	hd:tone	true	true	true	Representing the tones of the alarm
light	hd: alertColour Code	true	true	true	Representing the lighting mode of the alarm.
alarmStatus	xs:boolean	true	true	false	"True" indicates the alarm start while "False" indicates the alarm stop.

5.3.2 audioVideoInput

This ModuleClass provides capabilities to control and monitor audio video input source of device such as TV or SetTopBox.

Table 5.3.2-1: DataPoints of audioVideoInput ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
inputSourceID	xs:integer	true	true	false	Activated input source ID in the supported input source list, supportedInputSources.
supportedInputSources	list of hd:supportedInputS ource	true	false	false	List of supported input sources for the given device (see clause 5.5.2).

5.3.3 audioVolume

This ModuleClass provides capabilities to control and monitor volume.

Table 5.3.3-1: Actions of audioVolume

Return Type	Name	Argument	Optional	Documentation
none	upVolume	none	true	Increase volume by the amount of the stepValue up to the maxValue.
none	downVolume	none	true	Decrease volume by the amount of the stepValue down to 0.

Table 5.3.3-2: DataPoints of audioVolume

Name	Type	Readable	Writable	Optional	Documentation
volumePercentage	xs:integer	true	true	false	The rounded percentage of the current volume in the range of [0, maxValue]. 0 percentage shall mean no sound produced.
stepValue	xs:integer	true	false	true	Step value used by UpVolume and DownVolume Actions.
maxValue	xs:integer	true	false	true	Maximum value allowed for Volume.
muteEnabled	xs:boolean	true	true	false	The current status of the mute enablement. "True" indicates enabled, and "False" indicates not enabled.

5.3.4 battery

Battery indicates the detection of low battery and gives an alarm if triggering criterion is met. The charge value in the module shows the current battery charge level.

Table 5.3.4-1: DataPoints of battery ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
level	xs:integer	true	false	false	The rounded percentage of the current level of battery in the range of [0, 100]. 0 percentage shall mean no battery remained.
capacity	xs:integer	true	false	true	The total capacity of battery in mAh.
charging	xs:boolean	true	false	true	The status of charging. "True" indicates enabled, and "False" indicates not enabled.
discharging	xs:boolean	true	false	true	The status of discharging. "True" indicates enabled, and "False" indicates not enabled.
lowBattery	xs:boolean	true	false	true	To indicate that the battery is in low charge level.
batteryThreshold	xs:integer	true	true	true	When the battery level is less than batteryThreshold then the lowBattery is true (and optionally to generate an alarm, see clause 5.3.1).

Table 5.3.4-2: Properties of battery ModuleClass

Name	Type	Value	Optional	Documentation
propElectricEnergy	xs:integer		true	Rated electric energy.
propVoltage	xs:integer		true	Rated voltage.
propMaterial	xs:string		true	The material (e.g. lithium ion, nickel and lead) of the cell.

5.3.5 binarySwitch

This ModuleClass provides capabilities to control and monitor the state of power.

Table 5.3.5-1: Actions of binarySwitch ModuleClass

Return Type	Name	Argument	Optional	Documentation
none	toggle	none	true	Toggle the switch.

Table 5.3.5-2: DataPoints of binarySwitch ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
powerState	xs:boolean	true	true	false	The current status of the binarySwitch. "True" indicates turned-on, and "False" indicates turned-off.

5.3.6 bioElectricalImpedanceAnalysis

This ModuleClass provides the analysis of human body tissue based on impedance measurement.

Table 5.3.6-1: DataPoints of bioElectricalImpedanceAnalysis ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
water	xs:float	true	false	false	The water content measurement from the BIA; the common unit is percentage.
fat	xs:float	true	false	false	The fat content measurement from the BIA; the common unit is percentage.
muscle	xs:float	true	false	false	The muscle content measurement from the BIA; the common unit is percentage.

Name	Type	Readable	Writable	Optional	Documentation
bone	xs:float	true	false	false	The bone content measurement from the BIA; the common unit is percentage.
visceraFat	xs:float	true	false	false	The viscera fat content measurement from the BIA; the common unit is percentage.
kcal	xs:float	true	false	false	The kcal (kilocalories) measurement from the BIA.
resistance	xs:float	true	false	false	The resistance of human body; the common unit is ohm.

5.3.7 boiler

This ModuleClass provides the status of boiling function for water heaters.

Table 5.3.7-1: DataPoints of boiler ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
status	xs:boolean	true	true	false	The status of boiling.

5.3.8 brightness

This ModuleClass describes the brightness of a light e.g. from a lamp. Brightness is scaled as a percentage. A lamp or a monitor can be adjusted to a level of light between very dim (0 % is the minimum brightness) and very bright (100 % is the maximum brightness).

Table 5.3.8-1: DataPoints of brightness ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
brightness	xs:integer	true	true	false	The status of brightness level in percentage.

5.3.9 clock

This ModuleClass provides the information about current date and time.

Table 5.3.9-1: DataPoints of clock ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
currentTime	xs:time	true	true	false	Information of the current time
currentDate	xs:date	true	true	false	Information of the current date

5.3.10 colour

This ModuleClass provides the capabilities to set the value of Red, Green, Blue for the colour device.

Table 5.3.10-1: DataPoints of colour ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
red	xs:integer	true	true	false	The R value of RGB; the range is [0,255]
green	xs:integer	true	true	false	The G value of RGB; the range is [0,255]
blue	xs:integer	true	true	false	The B value of RGB; the range is [0,255]

5.3.11 colourSaturation

This ModuleClass describes a colour saturation value. The value is an integer. A colourSaturation has a range of [0,100]. A colourSaturation value of 0 means producing black and white images. A colourSaturation value of 50 means producing device specific normal colour images. A colourSaturation value of 100 means producing device very colourfull images.

Table 5.3.11-1: DataPoints of colourSaturation ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
colourSaturation	xs:integer	true	true	false	The status of colour saturation level.

5.3.12 doorStatus

This ModuleClass provides the status of a door. It is intended to be part of a larger object such as a refrigerator and an oven that might have multiple doors.

Table 5.3.12-1: DataPoints of doorStatus ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
doorState	hd:doorState	true	false	false	"Closed" indicates that door is closed, "Open" indicates that the door is open, "Opening" indicates that the door is opening, "Closing" indicates that the door is closing, "Stopped" indicates that the door is in stationary state
openDuration	m2m:timestamp	true	false	true	The time duration the door has been open.
openAlarm	xs:boolean	true	true	true	The state of the door open alarm. "True" indicates that the open alarm is active. "False" indicates that the open alarm is not active.

5.3.13 electricVehicleConnector

This ModuleClass provides the information about charging/discharging devices for electric vehicles.

Table 5.3.13-1: DataPoints of electricVehicleConnector ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
status	xs:boolean	true	false	false	The status of connection.

Table 5.3.13-2: Properties of electricVehicleConnector ModuleClass

Name	Type	Value	Optional	Documentation
propChargingCapacity	xs:integer		true	Rated charging capacity.
propDischargingCapacity	xs:integer		true	Rated discharging capacity.