TTC仕様書
Technical Specification

# TS-M2M-0023v2.0.2

# oneM2M 技術仕様書
# 家電機器の共通デバイス管理モデル

# oneM2M Technical Specification
# Home Appliances Information Model and Mapping

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一般社団法人
情報通信技術委員会

THE TELECOMMUNICATION TECHNOLOGY COMMITTEE

TS-M2M-0023v2.0.2

oneM2M 技術仕様書－家電機器の共通デバイス管理モデル [oneM2M Technical Specification - Home Appliances Information Model and Mapping]

＜参考＞ [Remarks]

１．英文記述の適用レベル [Application level of English description]

適用レベル [Application level]：E2

本標準の本文、付属資料および付録の文章および図に英文記述を含んでいる。

[English description is included in the text and figures of main body, annexes and appendices.]

２．国際勧告等の関連 [Relationship with international recommendations and standards]

本標準は、oneM2M で承認された Technical Specification 0023V2.0.2 に準拠している。

[This standard is standardized based on the Technical Specification 0023 (V2.0.2) approved by oneM2M.]

３．上記国際勧告等に対する追加項目等 [Departures from international recommendations]

原標準に対する変更項目 [Changes to original standard]

原標準が参照する標準のうち、TTC 標準に置き換える項目。

[Standards referred to in the original standard, which are replaced by TTC standards.]

原標準が参照する標準のうち、それらに準拠した TTC 標準等が制定されている場合は自動的に最新版 TTC 標準等に置き換え参照するものとする。

[Standards referred to in the original standard should be replaced by derived TTC standards.]

４．工業所有権 [IPR]

本標準に関わる「工業所有権等の実施の権利に係る確認書」の提出状況は、ＴＴＣホームページによる。

[Status of “Confirmation of IPR Licensing Condition” submitted is provided in the TTC web site.]

５．作成専門委員会 [Working Group]

oneM2M 専門委員会 [oneM2M Working Group]

# ONEM2M
# TECHNICAL SPECIFICATION

| | |
|---|---|
| Document Number | TS-0023-V2.0.2 |
| Document Name: | Home Appliances Information Model and Mapping |
| Date: | 2018-03-12 |
| Abstract: | This technical specification includes oneM2M defined information model for home appliances and the mapping with other information models from external organization. |

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About oneM2M

The purpose and goal of oneM2M is to develop technical specifications which address the need for a common M2M Service Layer that can be readily embedded within various hardware and software, and relied upon to connect the myriad of devices in the field with M2M application servers worldwide.

More information about oneM2M may be found at: http//www.oneM2M.org

# Contents

# 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.

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/7c890b69d9764e341ef1768c5a0e7d53a47cff5c.

[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] oneM2M TS-0001: "Functional Architecture".

[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] oneM2M TS-0012: "Base Ontology".

# 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.

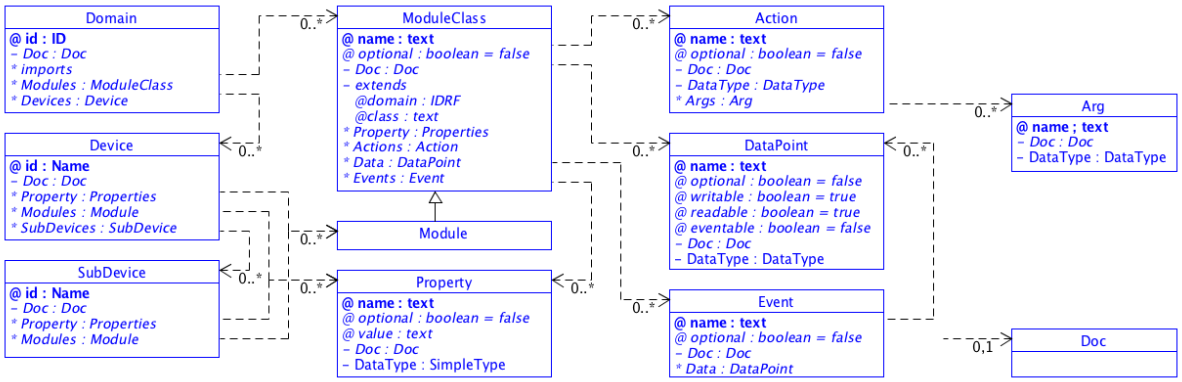


**Figure 5.2.1-1: Design Structure of the Home Appliance Information Model using SDT 3.0**

### 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. |
| supportedInput Sources | 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 |
|---|---|---|---|---|---|
| volumePercent age | 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. |
| 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 colourful 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,<br>"Open"indicates that the door is open,<br>"Opening" indicates that the door is opening,<br>"Closing" indicates that the door is closing,<br>"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. |

## 5.3.14 energyConsumption

This ModuleClass describes the energy consumed by the device since power up. One particular use case for energyConsumption ModuleClass is smart meter.

**Table 5.3.14-1: DataPoints of energyConsumption ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| power | xs:float | true | false | false | The power of the device. The common unit is Watt (W). |
| absoluteEnergyConsumption | xs:float | true | false | true | The absolute energy consumption, reflecting the real measurement of accumulative energy. The common unit is Watt-hour (Wh). |
| roundingEnergyConsumption | xs: integer | true | false | true | This energy consumption data can be calculated by using significantDigits and multiplyingFactors. |
| significantDigits | xs:integer | true | false | true | The number of effective digits for data. |
| multiplyingFactors | xs:floatr | true | false | true | The unit for data (multiplying factors)., e.g. 1 kWh, 0,1 kWh, 0,01 kWh, etc. |
| voltage | xs:float | true | false | true | The voltage of the device. The common unit is volts (V). |
| current | xs:float | true | false | true | The current of the device. The common unit is ampere (A). |
| frequency | xs:float | true | false | true | The frequency of the device. The common unit is hertz (Hz). |

## 5.3.15 energyGeneration

This ModuleClass provides information about generation data on electric generator devices such as a photo voltaic power system, fuel cells, or microgeneration.

**Table 5.3.15-1: DataPoints of energyGenerationModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| powerGenerationData | xs:float | true | false | true | Amount of instaneous generation data. |
| roundingEnergyGeneration | xs:integer | true | false | true | This energy generation data can be calculated by using significantFigures and multiplyingFactors. |
| significantDigits | xs:integer | true | false | true | The number of effective digits for data. |
| multiplyingFactors | xs:floatr | true | false | true | The unit for data (multiplying factors), e.g. 1 kWh, 0,1 kWh, 0,01 kWh, etc. |

## 5.3.16 faultDetection

This ModuleClass provides information about whether a fault has occurred in the actual device.

**Table 5.3.16-1: DataPoints of faultDetection ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| status | xs:boolean | true | false | false | Status of fault detection. |
| code | xs:integer | true | false | true | Code of the fault. |
| description | xs:string | true | false | true | Message of the fault. |

## 5.3.17 height

This ModuleClass provides the capability to report the measurement of height.

**Table 5.3.17-1: DataPoints of height ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| height | xs:float | true | false | false | The height measurement. The common unit is centimetre (cm). |

## 5.3.18 hotWaterSupply

This ModuleClass provides information about the status of supplying hot water into tanks or bath tubs.

**Table 5.3.18-1: DataPoints of hotWaterSupply ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| status | xs:boolean | true | false | false | The status of watering operation. |
| bath | xs:boolean | true | true | true | The status of filling bath tub. |

## 5.3.19 keypad

This ModuleClass provides the capability to require a user defined service through the key-in number. For example, a user can define key 1 as "require a takeout from restaurant XXX with combo meal 1". The IoT service provider or user can define the services.

**Table 5.3.19-1: DataPoints of keypad ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| keyNumber | xs:integer | true | false | false | The number of key. |

## 5.3.20 motionSensor

This ModuleClass provides the capabilities to indicate the occurrence of motion and raises an alarm if the triggering criterion is met.

**Table 5.3.20-1: DataPoints of motionSensor ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| alarm | xs:boolean | true | false | false | The detection of the motion occurrence. |
| silentTime | xs:integer | true | true | true | The time that the motionSensor restrains from sending an alarm in case continuous motions are detected after one alarm is produced. This DataPoint can be used to avoid repeated alarm reports. |
| sensitivity | xs:integer | true | true | true | The level of the detection accuracy of the motion sensor. This DataPoint can be used to control the number of the report. |

## 5.3.21 oximeter

This ModuleClass provides the capability to report the measurement of blood characteristics.

**Table 5.3.21-1: DataPoints of oximeter ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| diastolicPressure | xs:integer | true | false | false | The measurement of diastolic pressure by Oximeter. The common unit is millimetre of mercury (mmHg). |
| systolicPressure | xs:integer | true | false | false | The measurement of systolic pressure by Oximeter. The common unit is millimetre of mercury (mmHg). |
| pulseRate | xs:integer | true | false | false | The measurement of pulserate by Oximeter. The common unit is in beats per minute. |
| oxygenSaturation | xs:integer | true | false | false | The measurement of oxygensaturation by Oximeter. The common unit is in percentage. |

## 5.3.22 powerSave

This ModuleClass provides capabilities to enable power saving mode and monitor the current status.

**Table 5.3.22-1: DataPoints of powerSave ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| powerSaveEnabled | xs:boolean | true | true | false | The current status of the Power Saving Mode. "True" indicates enabled, and "false" indicates not enabled. |

## 5.3.23 pushButton

This ModuleClass provides the capability to indicate the operation of a button style switch. A typical application can be an SOS button.

**Table 5.3.23-1: DataPoints of pushButton ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| pushed | xs:boolean | true | false | false | To indicate the press of the button. |

## 5.3.24 recorder

This ModuleClass provides the capability to record the video/audio for a defined duration.

**Table 5.3.24-1: DataPoints of recorder ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| duration | xs:integer | true | true | false | The duration for video/audio recording. Set to trigger the recorder. The common unit is seconds. |

## 5.3.25 refrigeration

This ModuleClass describes a refrigeration function. This is not a Refrigerator device. The filter state is a read-only value providing the percentage life time remaining for the water filter. RapidFreeze is a boolean that controls the rapid freeze capability if present. RapidCool is a boolean that controls the rapid cool capability if present. Defrost is a boolean that controls the defrost cycle if present.

**Table 5.3.25-1: DataPoints of refrigeration ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| filterLifetime | xs:integer | true | false | true | Percentage life time remaining for the water filter. |
| rapidFreeze | xs:boolean | true | true | true | Indicates whether the unit has a rapid freeze capability active. |
| rapidCool | xs:boolean | true | true | true | Indicates whether the unit has a rapid cool capability active. |
| defrost | xs:boolean | true | true | true | Indicates whether a defrost cycle is currently active. |

## 5.3.26 relativeHumidity

This ModuleClass provides the capability for the device to report the humidity based on a specified rule that is vendor discretionary.

**Table 5.3.26-1: DataPoints of relativeHumidity ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| relativeHumidity | xs:float | true | false | false | The measurement of the relative humidity value; the common unit is percentage. |
| desiredHumidity | xs:float | true | true | true | Desired value for Humidity. |

## 5.3.27 rinseLevel

This ModuleClass provides capabilities to control and monitor the level of rinse. It is intended to be part of object which uses rinse such as a washing machine.

**Table 5.3.27-1: DataPoints of rinseLevel ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| rinseLevel | hd:liquidLevel | true | true | false | The level of rinse (see clause 5.5.3). A higher value indicates a higher rinse level. |

## 5.3.28 runMode

This ModuleClasses provides capabilities to control and monitor the operational modes of appliances.

**Table 5.3.28-1: DataPoints of runMode ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| operationMode | hd:supportedModes | true | true | false | Currently active mode. |
| supportedModes | list of hd:supportedModes | true | true | false | List of possible modes the device supports (see clause 5.5.7) |

## 5.3.29 signalStrength

This ModuleClass provides the capability to monitor the strength of the signal.

**Table 5.3.29-1: DataPoints of signalStrength ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| lqi | xs:integer | true | false | false | The current value of link quality indicator, which reflects the scaling of rssi by dividing the received signal strength over reference signal strength. The common unit for lqi is percentage [0,100]. For the detailed definition, please see IEEE 802.15.4 [i.4], clause 6.7.8. |
| rssi | xs:float | true | false | true | The current value of received signal strength indicator, which reflects the raw signal level. |

## 5.3.30 smokeSensor

This ModuleClass provides the capabilities to indicate the detection of smoke and raises an alarm if the triggering criterion is met.

**Table 5.3.30-1: DataPoints of smokeSensor ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| alarm | xs:boolean | true | false | false | The detection of smoke. |
| detectedTime | m2m:timestamp | true | true | true | The time the smoke is detected. |

## 5.3.31 spinLevel

This ModuleClass provides capabilities to control and monitor the level of spin. It is intended to be part of objects which use spinning function such as a washing machine and a dryer.

**Table 5.3.31-1: DataPoints of spinLevel ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| spinLevelStrength | hd:spinLevel Strength | true | true | false | The value of spin-dry level (see clause 5.5.4). A higher value indicates a higher spin level. |

## 5.3.32 televisionChannel

This ModuleClass provides capabilities to set and get channels of a device that has a channel list.

**Table 5.3.32-1: Actions of televisionChannel ModuleClass**

| Return Type | Name | Argument | Optional | Documentation |
|---|---|---|---|---|
| none | upChannel | none | true | Change the current channel to the next channel in the stored list of available channels. If the current channel is the last one in the list, the new set channel may be the first one in the list. |
| none | downChannel | none | true | Change the current channel to the previous channel in the stored list of available channels. If the current channel is the first one in the list, the new set channel may be the last one in the list. |

**Table 5.3.32-2: DataPoints of televisionChannel ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| channelId | xs:integer | true | true | false | Current channel ID. |
| availableChannels | list of xs:integer | true | false | true | The list of available channel numbers which may be built by automatic scan and/or manual selection. |
| previousChannel | xs:integer | true | false | true | The channel number which was selected previously. |

## 5.3.33 temperature

This ModuleClass provides capabilities to represent the current temperature and target temperature of devices such as an air conditioner, refrigerator, oven, etc.

**Table 5.3.33-1: DataPoints of temperature ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| currentTemperature | xs:float | true | false | false | The current temperature. |
| targetTemperature | xs:float | true | true | true | The desired temperature to reach. |
| unit | xs:string | true | false | true | The unit for the temperature values. The default is Celsius (C). |
| minValue | xs:float | true | false | true | Minimum value of targetTemperature. |
| maxValue | xs:float | true | false | true | Maximum value of targetTemperature. |
| stepValue | xs:float | true | false | true | Step value allowed for targetTemperature. |

## 5.3.34 temperatureAlarm

This ModuleClass provides the capabilities to indicate the detection of abnormal temperatures and raises an alarm if the triggering criterion is met.

**Table 5.3.34-1: DataPoints of temperatureAlarm ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| alarm | xs:boolean | true | false | false | The detection of abnormal temperature. |
| temperature | xs:float | true | false | true | To report the value of the temperature. The common unit is Celsius (C). |
| temperatureThreshhold | xs:integer | true | true | true | The threshold to trigger the alarm. |

## 5.3.35 timer

This ModuleClass provides capabilities to monitor and control the times when the appliance executes its operations (i.e. when it starts, when it ends, etc.).

**Table 5.3.35-1: Actions of timer ModuleClass**

| Return Type | Name | Argument | Optional | Documentation |
|---|---|---|---|---|
| none | activateClockTimer | none | true | Activate current clock timer. |
| none | deactivateClockTimer | none | true | Deactivate current clock timer. |

**Table 5.3.35-2: DataPoints of timer ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| referenceTimer | xs:integer | true | false | true | A Timer (e.g. a time-based value, App Defined Epoch, Progressive) expressed in seconds. The value indicates a time counter to be used as reference for the other time-based data points of this ModuleClass. Usually it is the time since the last event of power on of the producer (or more in detail the boot of its connectivity node). |
| targetTimeToStart | xs:integer | true | true | true | A TimeSpan (e.g. a time-based value, App Defined Epoch, Fixed) expressed in seconds. The value indicates the time when the appliance is expected to start its operation, starting counting from the last ReferenceTimer. |
| targetTimeToStop | xs:integer | true | true | true | A TimeSpan (e.g. a time-based value, App Defined Epoch, Fixed) expressed in seconds. The value indicates the time when the appliance is expected to stop its operation, starting counting from the last ReferenceTimer. |
| estimatedTimeToEnd | xs:integer | true | false | true | A Timer (e.g. a time-based value, App Defined Epoch, Progressive) expressed in seconds. The value indicates the time to the ends of appliance operations. It is calculated at runtime by device itself during the execution of its operation. |
| runningTime | xs:integer | true | false | true | It is a Timer (e.g. a time-based value, App Defined Epoch, Progressive) expressed in seconds. It indicates the time of the current operation. Usually its value is increasing of one value each second. It starts counting from 0 when the operation starts and stops counting when the operation ends. |
| targetDuration | xs:integer | true | false | true | A TimeSpan (e.g. a time-based value, App Defined Epoch, Fixed) expressed in seconds. The value indicates a time, representing the target duration of the operation as per user selection. |
| absoluteStartTime | m2m:time stamp | true | true | true | An absolute time to specify the start time. |
| absoluteStopTime | m2m:time stamp | true | true | true | An absolute time to specify the stop time. |

## 5.3.36 turbo

This ModuleClass provides capabilities to enable turbo mode and monitor the current status of the turbo function. It is intended to be part of objects which use turbo function such as an air conditioner, a washing machine, etc.

**Table 5.3.36-1: DataPoints of turbo ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| turboEnabled | xs:boolean | true | true | false | The current status of the Turbo Mode. "True" indicates enabled, and "False" indicates not enabled. |

## 5.3.37 waterFlow

This ModuleClass is for controlling water strength of a device.

**Table 5.3.37-1: DataPoints of waterFlow ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| waterLevelStrength | hd:waterFlowStrength | true | true | false | The desired level of water flow (see clause 5.5.8). A higher value indicates higher water flow. |

## 5.3.38 waterLevel

This ModuleClass provides the level and supply source of water for an appliance.

**Table 5.3.38-1: DataPoints of waterLevel ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| liquidLevel | hd:liquidLevel | true | true | false | The desired level of water (see clause 5.5.3). |

## 5.3.39 waterSensor

This ModuleClass provides the capabilities to indicate whether or not water has been sensed and raises an alarm if the triggering criterion is met.

**Table 5.3.39-1: DataPoints of waterSensor ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| alarm | xs:boolean | true | false | false | The detection of water. |

## 5.3.40 weight

This ModuleClass provides the capability to report the measurement of weight.

**Table 5.3.40-1: DataPoints of weight ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| weight | xs:float | true | false | false | The weight measurement. The common unit is kilogram (kg). |

## 5.3.41 wind

This ModuleClass is for controlling wind strength and direction of a device.

**Table 5.3.41-1: DataPoints of wind ModuleClass**

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| windStrength | hd:windStrength | true | true | false | The current strength of the wind(see clause 5.5.9). |
| directionUp | xs:boolean | true | true | true | The current status of the upward blowing enablement. "True" indicates enabled, and "False" indicates not enabled. |
| directionDown | xs:boolean | true | true | true | The current status of the downward blowing enablement. "True" indicates enabled, and "False" indicates not enabled. |

| Name | Type | Readable | Writable | Optional | Documentation |
|---|---|---|---|---|---|
| directionRight | xs:boolean | true | true | true | Right side enablement (0:off, 1:on) The current status of the rightward blowing enablement. "True" indicates enabled, and "False" indicates not enabled. |
| directionLeft | xs:boolean | true | true | true | The current status of the leftward blowing enablement. "True" indicates enabled, and "False" indicates not enabled. |
| directionAuto | xs:boolean | true | true | true | The current status of the automatic blowing enablement. "True" indicates enabled, and "False" indicates not enabled. |

# 5.4 Device models

## 5.4.1 deviceAirConditioner

An air conditioner is a home appliance used to alter the properties of air (primarily temperature and humidity) to more comfortable conditions. This air conditioner information model provides capabilities to control and monitor air conditioner specific functions and resources.

**Table 5.4.1-1: Modules of deviceAirConditioner Device model**

| Module Instance Name | Module Class Name | Optional | Description |
|---|---|---|---|
| binarySwitch | binarySwitch | true | See clause 5.3.5 |
| runMode | runMode | true | See clause 5.3.28 |
| temperature | temperature | true | See clause 5.3.33 |
| timer | timer | true | See clause 5.3.35 |
| turbo | turbo | true | See clause 5.3.36 |
| wind | wind | true | See clause 5.3.41 |

## 5.4.2 deviceClothesWasher

A clothes washer is a home appliance that is used to wash laundry, such as clothing and sheets. This information model provides capabilities to interact with specific functions and resources of clothes washers.

**Table 5.4.2-1: Modules of deviceClothesWasher Device model**

| Module Instance Name | Module Class Name | Optional | Description |
|---|---|---|---|
| binarySwitch | binarySwitch | true | See clause 5.3.5 |
| timer | timer | true | See clause 5.3.35 |
| runMode | runMode | true | See clause 5.3.28 |
| temperature | temperature | true | See clause 5.3.33 |
| waterLevel | waterLevel | true | See clause 5.3.38 |
| rinseLevel | rinseLevel | true | See clause 5.3.27 |
| waterFlow | waterFlow | true | See clause 5.3.37 |
| spinLevel | spinLevel | true | See clause 5.3.31 |

## 5.4.3 deviceElectricVehicleCharger

An electric vehicle charger is a device that is used for charging or discharging electric vehicles.

**Table 5.4.3-1: Modules of deviceElectricVehicleCharger Device model**

| Module Instance Name | Module Class Name | Optional | Description |
|---|---|---|---|
| faultDetection | faultDetection | false | See clause 5.3.16 |
| binarySwitch | binarySwitch | false | See clause 5.3.5 |
| runMode | runMode | false | See clause 5.3.28 |
| battery | battery | false | See clause 5.3.10 |
| electricVehicleConnector | electricVehicleConnector | false | See clause 5.3.13 |

## 5.4.4 deviceLight

A light is a device that is used to control the state of an illumination device.

**Table 5.4.4-1: Modules of deviceLight Device model**

| Module Instance Name | Module Class Name | Optional | Description |
|---|---|---|---|
| faultDetection | faultDetection | true | See clause 5.3.16 |
| binarySwitch | binarySwitch | false | See clause 5.3.5 |
| runMode | runMode | true | See clause 5.3.28 |
| colour | colour | true | See clause 5.3.10 |
| colourSaturation | colourSaturation | true | See clause 5.3.11 |
| brightness | brightness | true | See clause 5.3.8 |

## 5.4.5 deviceMicrogeneration

A microgeneration is a Home Energy Management System (HEMS) device that is used to create energy. Examples of microgeneration devices are photovoltaics device or fuel cells.

**Table 5.4.5-1: Modules of deviceMicrogeneration Device model**

| Module Instance Name | Module Class Name | Optional | Description |
|---|---|---|---|
| faultDetection | faultDetection | true | See clause 5.3.16 |
| binarySwitch | binarySwitch | true | See clause 5.3.5 |
| runMode | runMode | true | See clause 5.3.28 |
| energyGeneration | energyGeneration | false | See clause 5.3.15 |

**Table 5.4.5-2: Device specific properties of deviceMicrogeneration Device model**

| Name | Type | Value | Optional | Documentation |
|---|---|---|---|---|
| propGenerationSource | xs:string | - | false | The type of generating source. |

## 5.4.6 deviceOven

An oven is a home appliance used to roast and heat food in a complete stove. This information model is applicable to different types of ovens: gas ovens, electrical ovens, steam ovens, microwave ovens, etc. This information model provides capabilities to interact with specific functions and resources of ovens.

**Table 5.4.6-1: Modules of deviceOven Device model**

| Module Instance Name | Module Class Name | Optional | Description |
|---|---|---|---|
| binarySwitch | binarySwitch | true | See clause 5.3.5 |
| runMode | runMode | true | See clause 5.3.28 |
| timer | timer | true | See clause 5.3.35 |
| temperature | temperature | true | See clause 5.3.33 |

## 5.4.7 deviceRefrigerator

A refrigerator is a home appliance used to store food at temperatures which are a few degrees above the freezing point of water. This information model provides capabilities to interact with specific functions and resource of refrigerators.

**Table 5.4.7-1: Modules of deviceRefrigerator Device model**

| Module Instance Name | Module Class Name | Optional | Description |
|---|---|---|---|
| binarySwitch | binarySwitch | true | See clause 5.3.5 |
| powerSave | powerSave | true | See clause 5.3.22 |
| doorstatusdoorStatus | doorStatus | true | See clause 5.3.12 |
| frozenTemperature | temperature | true | See clause 5.3.33 |
| freshTemperature | temperature | true | See clause 5.3.33 |
| customTemperature | temperature | true | See clause 5.3.33 |
| refrigeration | refrigeration | true | See clause 5.3.25 |

## 5.4.8 deviceRobotCleaner

A robot cleaner is an autonomous robotic vacuum cleaner that has intelligent programming and a limited vacuum cleaning system. This robot cleaner information model provides capabilities to control and monitor robot cleaner specific functions and resources.

**Table 5.4.8-1: Modules of deviceRobotCleaner Device model**

| Module Instance Name | Module Class Name | Optional | Description |
|---|---|---|---|
| binarySwitch | binarySwitch | true | See clause 5.3.5 |
| runMode | runMode | true | See clause 5.3.28 |
| battery | battery | true | See clause 5.3.10 |
| timer | timer | true | See clause 5.3.35 |

## 5.4.9 deviceSmartElectricMeter

A smart electric meter is a metering device that is used to measure consumption data for electricity.

**Table 5.4.9-1: Modules of deviceSmartElectricMeter Device model**

| Module Instance Name | Module Class Name | Optional | Description |
|---|---|---|---|
| faultDetection | faultDetection | true | See clause 5.3.16 |
| binarySwitch | binarySwitch | true | See clause 5.3.5 |
| runMode | runMode | true | See clause 5.3.28 |
| clock | clock | true | See clause 5.3.9 |
| energyConsumption | energyConsumption | false | See clause 5.3.14 |
| energyGeneration | energyGeneration | true | See clause 5.3.15 |

**Table 5.4.9-2: Device specific properties of deviceSmartElectricMeter Device model**

| Name | Type | Value | Optional | Documentation |
|---|---|---|---|---|
| propMeasuringScope | xs:string | - | true | Measuring scope of the meter (e.g. whole house, room, or device). |

## 5.4.10 deviceStorageBattery

A storage battery is a HEMS device that is used to provide the home with electrical energy.

**Table 5.4.10-1: Modules of deviceStorageBattery Device model**

| Module Instance Name | Module Class Name | Optional | Description |
|---|---|---|---|
| faultDetection | faultDetection | true | See clause 5.3.16 |
| binarySwitch | binarySwitch | true | See clause 5.3.5 |
| runMode | runMode | true | See clause 5.3.28 |
| battery | battery | false | See clause 5.3.10 |

## 5.4.11 deviceTelevision

A television (TV) is a home appliance used to show audio and visual content such as broadcasting programs and network streaming. This TV information model provides capabilities to control and monitor TV specific resources.

**Table 5.4.11-1: Modules of deviceTelevision Device model**

| Module Instance Name | Module Class Name | Optional | Description |
|---|---|---|---|
| binarySwitch | binarySwitch | true | See clause 5.3.5 |
| audioVolume | audioVolume | true | See clause 5.3.6 |
| televisionChannel | televisionChannel | true | See clause 5.3.32 |
| audioVideoInput | audioVideoInput | true | See clause 5.3.5 |

## 5.4.12 deviceThermostat

A thermostat is used to control the ambient temperature of rooms within for example a house. This information model provides capabilities to interact with specific functions of thermostats.

**Table 5.4.12-1: Modules of deviceThermostat Device model**

| Module Instance Name | Module Class Name | Optional | Description |
|---|---|---|---|
| runMode | runMode | true | See clause 5.3.28. The possible values of the supportedModes datapoint for the Thermostat device are included in clause 5.5.7 |
| timer | timer | true | see clause 5.3.35 |
| temperature | temperature | false | see clause 5.3.33 |

### 5.4.13 deviceWaterHeater

A water heater is a device that is used to provide hot water through home facilities.

**Table 5.4.13-1: Modules of deviceWaterHeater Device model**

| Module Instance Name | Module Class Name | Optional | Description |
|---|---|---|---|
| faultDetection | faultDetection | true | See clause 5.3.16 |
| binarySwitch | binarySwitch | false | See clause 5.3.5 |
| runMode | runMode | true | See clause 5.3.28 |
| clock | clock | true | See clause 5.3.9 |
| boiler | boiler | true | See clause 5.3.7 |
| hotWaterSupply | hotWaterSupply | true | See clause 5.3.18 |

## 5.5 Enumeration type definitions

### 5.5.1 hd:deviceType

Used for DeviceType property of device models.

**Table 5.5.1-1: Interpretation of deviceType**

| Value | Interpretation | Note |
|---|---|---|
| 1 | deviceAirConditioner | See clause 5.4.1 |
| 2 | deviceClothesWasher | See clause 5.4.2 |
| 3 | deviceElectricVehicleCharger | See clause 5.4.3 |
| 4 | deviceLight | See clause 5.4.4 |
| 5 | deviceMicrogeneration | See clause 5.4.5 |
| 6 | deviceOven | See clause 5.4.6 |
| 7 | deviceRefrigerator | See clause 5.4.7 |
| 8 | deviceRobotCleaner | See clause 5.4.8 |
| 9 | deviceSmartElectricMeter | See clause 5.4.9 |
| 10 | deviceStorageBattery | See clause 5.4.10 |
| 11 | deviceTelevision | See clause 5.4.11 |
| 12 | deviceThermostat | See clause 5.4.12 |
| 13 | deviceWaterHeater | See clause 5.4.13 |
| 0 | undefinedVendorExt | For vendor specific usage |
| NOTE: See clause 5.4 "Device models". | | |

### 5.5.2 hd:supportedInputSources

Used for supportedInputSources DataPoint of AudioVideoInput ModuleClass.

**Table 5.5.2-1: Interpretation of supportedInputSources**

| Value | Interpretation | Note |
|---|---|---|
| 1 | tuner | |
| 2 | component | |
| 3 | composite | |
| 4 | svideo | |
| 5 | rgb | |
| 6 | dvi | |
| 7 | hdmi | |
| 8 | displayPort | |
| 9 | scart | |
| 10 | externalStorage | |
| 11 | network | |
| NOTE: See clause 5.3.2 "audioVideoInput". | | |

## 5.5.3 hd:liquidLevel

Used for DataPoint indicating level of liquid such as rinseLevel.

**Table 5.5.3-1: Interpretation of liquidLevel**

| Value | Interpretation | Note |
|---|---|---|
| 1 | zero | |
| 2 | low | |
| 3 | medium | |
| 4 | high | |
| 5 | maximum | |
| NOTE: See clause 5.3.27 "rinseLevel", clause 5.3.38 "waterLevel". | | |

## 5.5.4 hd:spinLevelStrength

Used for DataPoints indicating strength of a spinLevel.

**Table 5.5.4-1: Interpretation of strength**

| Value | Interpretation | Note |
|---|---|---|
| 1 | zero | |
| 2 | sensitive | |
| 3 | weak | |
| 4 | medium | |
| 5 | strong | |
| 6 | maximum | |
| NOTE: See clause 5.3.31 "spinLevel". | | |

## 5.5.5 hd:doorState

Used for doorState DataPoint of doorStatus ModuleClass.

**Table 5.5.5-1: Interpretation of doorState**

| Value | Interpretation | Note |
|---|---|---|
| 1 | Closed | |
| 2 | Open | |
| 3 | Opening | |
| 4 | Closing | |
| 5 | Stopped | |
| NOTE: See clause 5.3.12 "doorStatus". | | |

## 5.5.6 hd:tone

Used for tone DataPoint of alarmSpeaker ModuleClass.

**Table 5.5.6-1: Interpretation of tone**

| Value | Interpretation | Note |
|---|---|---|
| 1 | Fire | |
| 2 | Theft | |
| 3 | Emergency | |
| 4 | Doorbell | |
| 5 | DeviceFail | |
| NOTE: See clause 5.3.1 "alarmSpeaker". | | |

## 5.5.7 hd:supportedModes

Used for supportedModes DataPoint of runMode ModuleClass.

**Table 5.5.7-1: Interpretation of supportedModes**

| Value | Interpretation | Note |
|---|---|---|
| 1 | antifreeze | This mode sets the thermostat to a minimum temperature to avoid home system to freeze when the habitants are not there for a long time |
| 2 | manual | This mode allows for direct change of the temperature indication for the thermostat by the user |
| 3 | eco | This is to set the thermostat to the economic mode |
| 4 | program | The program mode is used to set the thermostat to a predefined mode |
| 5 | off | |
| 6 | ready | |
| 7 | running | |
| 8 | paused | |
| 9 | aborted | |
| 10 | cancelled | |
| 11 | completed | |
| 12 | washing | |
| 13 | spinning | |
| 14 | drying | |
| 15 | rinsing | |
| 16 | warming up | |
| 17 | cooking | |
| 18 | cooling | |
| 19 | dehumidifying | |
| 20 | energy saving | |
| 21 | charging | |
| 22 | homing | |
| 23 | docking | |
| NOTE: See clause 5.3.28 "runMode". | | |

## 5.5.8 hd:alertColourCode

Used for light DataPoint of alarmSpeaker ModuleClass.

**Table 5.5.8-1: Interpretation of alertColourCode**

| Value | Interpretation | Note |
|---|---|---|
| 1 | Red | This colour indicates the alarm status. |
| 2 | Green | This colour indicates the alarm has been cleared. |
| NOTE: See clause 5.3.1 "alarmSpeaker". | | |

## 5.5.9 hd:waterFlowStrength

Used for DataPoints indicating strength of a waterflow.

**Table 5.5.9-1: Interpretation of waterFlowStrength**

| Value | Interpretation | Note |
|---|---|---|
| 1 | zero | |
| 2 | sensitive | |
| 3 | weak | |
| 4 | medium | |
| 5 | strong | |
| 6 | maximum | |
| NOTE: See clause 5.3.37 "waterFlow". | | |

### 5.5.10 hd:windStrength

Used for DataPoints indicating strength of wind.

**Table 5.5.10-1: Interpretation of windStrength**

| Value | Interpretation | Note |
|---|---|---|
| 1 | zero | |
| 2 | sensitive | |
| 3 | weak | |
| 4 | medium | |
| 5 | strong | |
| 6 | maximum | |
| NOTE: See clause 5.3.41 "wind". | | |

## 5.6 Universal and Common Properties for Device models

Properties specified in Table 5.6-1 are applicable to all device models. Some properties are mandatory for all device models and called "Universal Properties", since they are universally seen in typical device types and carry necessary information to identify each device instance. Others are optional for all device models and called "Common Properties", since they are commonly used in many device types but not always.

Universal and Common Properties are not repeated in the property table of each device model in clause 5.4, where only device specific properties shall be specified. Universal and Common Properties shall be instantiated in each device model following the optionality specified in table 5.6-1.

NOTE: The instantiated values of the universal properties might be empty in case of exceptional scenarios, e.g. interworking with non-oneM2M device models.

**Table 5.6-1: Universal and Common Properties**

| Name | Type | Value | Optional | Documentation |
|---|---|---|---|---|
| propDeviceSerialNum | xs:string | - | false | Device serial number (assigned by manufacturer) |
| propDeviceType | hd:deviceType | - | false | Device type (see clause 5.5.1) |
| propDeviceModelName | xs:string | - | false | Device model name |
| propDeviceManufacturer | xs:string | - | false | Manufacturer name of the device |
| propDeviceName | xs:string | - | true | Device name |
| propDeviceSubModelName | xs:string | - | true | Device sub-modelname |
| propDeviceAliasName | xs:string | - | true | Device alias name |
| propDeviceFirmwareVersion | xs:string | - | true | Device firmware version |
| propHardwareVersion | xs:string | - | true | Device hardware version |
| propOsVersion | xs:string | - | true | Version of the operation system (defined by manufacturer) |
| propProtocol | xs:string | - | true | A comma separated list of MIME types for all supported communication protocol(s) of the device. Example: "application/x-alljoin;version=1.0,application/x-echonet-lite;version=1.0" indicates the device supports both AllJoyn v1.0 and Echonet Lite v1.0 |
| propCountry | xs:string | - | true | Country code of the device |
| propLocation | xs:string | - | true | Location where the device is installed. It may be configured via the user interface provided by the 'presentationURL' property or any other means |
| propSystemTime | xs:datetime | - | true | Reference time for the device |
| propManufacturerDetailsLink | xs:url | - | true | URL to manufacturer's website |
| propDateOfManufacture | xs:datetime | - | true | Manufacturing date of device |
| propSupportURL | xs:url | - | true | URL that points to product support information of the device |

| Name | Type | Value | Optional | Documentation |
|---|---|---|---|---|
| propPresentationURL | xs:url | - | true | To quote UPnP: "the control point can retrieve a page from this URL, load the page into a web browser, and depending on the capabilities of the page, allow a user to control the device and/or view device status. The degree to which each of these can be accomplished depends on the specific capabilities of the presentation page and device" |

# 6 The Principle of Resource Mapping for Home Appliance Information Model

## 6.1 Introduction

Home appliance information models which are defined in clause 5 need to be represented as resources in the oneM2M system. This clause defines the principle of resource mapping based on <flexContainer>. The individual information mapping is provided in annexes A, B, C and D.

## 6.2 The Resource Mapping Rules

### 6.2.1 Introduction

The present clause specifies the rule to map the "Home Appliance Information Model" in clause 5, to oneM2M resources.

### 6.2.2 Resource mapping for Device model

When the AE exposes a controlling interface for a home domain device which is specified as an information model in clause 5.4, a specialization of the <flexContainer> resource shall be created as the mapping of the model following conversion rules:

Rule 1-1: Each Device model defined in clause 5.4 shall be mapped to a specialization of <flexContainer> resource with associated 'DeviceClass ID' (e.g. "org.onem2m.home.device.tv") on *containerDefinition* attributes.

Rule 1-2: Each entry of 'Module' table shall be mapped to child resource(s) which is mapped as a specialized <flexContainer> following the rule in clause 6.2.3 'Resource mapping for ModuleClass'.

Rule 1-3: Each entry of 'Property' table shall be mapped to a child resource which is mapped as a specialization of the <flexContainer> resource following the rule in clause 6.2.5.

Rule 1-4: XSD file for each Device model shall be named following naming convention:
'HD-<name of Device model>-v<version of TS>.xsd'
For example, XSD file for 'deviceAirConditioner' is named as 'HD-deviceAirConditioner-v1_0_0.xsd'.

### 6.2.3 Resource mapping for ModuleClass

The ModuleClass models (in clause 5.3) shall be mapped to the specializations of <flexContainer> resource. The following rules shall be applied.

When the Device model in clause 5.4 is mapped to the <flexContainer> resource, and if the device supports the functionality associated with a ModuleClass in the model, a <flexContainer> resource which is mapped from ModuleClass definitions shall be created as a child resource:

Rule 2-1: The ModuleClass ID shall be specified on the containerDefinition attribute (e.g. "org.onem2m.home.moduleclass. audiovolume").

Rule 2-2: Each entry of 'Action', 'Property', and 'DataPoint' in ModuleClass definitions shall be mapped following the resource mapping rules for them.

Rule 2-3: XSD file for each ModuleClass shall be named following naming convention:
'HD-mod-<name of ModuleClass>-v<version of TS>.xsd'
For example, XSD file for 'binarySwith' is named as 'HD-mod-binarySwitch-v1_0_0.xsd. The Device model which refer any ModuleClass shall include the XSD of the ModuleClasses.

### 6.2.4 Resource mapping for Action

When the Device model in clause 5.4 or the ModuleClass model in clause 5.3 is mapped to the <flexContainer> resource, and if the device supports the functionality associated with the Action in the model, a <flexContainer> resource which is mapped from the Action definition shall be created as a child resource:

Rule 3-1: The Action ID shall be specified on the containerDefinition attribute (e.g. "org.onem2m.home.moduleclass.audiovolume.upvolume").

Rule 3-2: When the Action supports any 'Arguments' or 'Return Type', they are mapped to [customizedAttribute] with its variable names.

Rule 3-3: XSD file for each Action shall be named following naming convention:
'HD-act-<name of Action>-v<version of TS>.xsd'.
For example, XSD file for 'toggle' is named as 'HD-act-toggle-v1_0_0.xsd'. The device or ModuleClass which refers any Action shall include the XSD of the Action.

Rule 3-4: When the Action does not support any 'Argument' or 'Return Type', the Action shall be triggered by updating with null Content parameter.

### 6.2.5 Resource mapping for Property

When the Device model (in clause 5.4) or the ModuleClass model (in clause 5.3) is mapped to the <flexContainer> resource, and if the device supports a Property, the following rules shall be applied:

Rule 4-1: Each entry of Property table in Device model or ModuleClass model, shall be mapped to the [customAttribute] of <flexContainer> resource which is mapped from associated Device model or ModuleClass model, with its Property name with prefix 'prop'.

### 6.2.6 Resource mapping for DataPoint

When the ModuleClass model (in clause 5.3) is mapped to the <flexContainer> resouce, and if the ModuleClass supports a DataPoint, the following rules shall be applied:

Rule 5-1: Each entry of DataPoint table in ModuleClass model, shall be mapped to [customAttribute] of <flexContainer> resource which is mapped from associated ModuleClass model, with its DataPoint name.

# 6.3 Short names

## 6.3.1 Introduction

XML and JSON representations require the explicit encoding of the names of resource attributes, (in the case of XML) and resource types. Whenever a protocol binding transfers such a name over a oneM2M reference point, it shall use a shortened form of that name. Short names enable payload reduction on involved telecommunication interfaces.

The mapping between the full names and their shortened form is given in the clauses that follow.

## 6.3.2 Resource types

In protocol bindings resource type names for device models shall be translated into short names of table 6.3.2-1.

**Table 6.3.2-1: Specialization type short names (Device models)**

| Resource Type Name | Short Name |
|---|---|
| deviceAirConditioner | ***deACr*** |
| deviceClothesWasher | ***deCWr*** |
| deviceElectricVehicleCharger | ***dEVCr*** |
| deviceLight | ***devLt*** |
| deviceMicrogeneration | ***devMn*** |
| deviceOven | ***devOn*** |
| deviceRefrigerator | ***devRr*** |
| deviceRobotCleaner | ***deRCr*** |
| deviceSmartElectricMeter | ***dSEMr*** |
| deviceStorageBattery | ***deSBy*** |
| deviceTelevision | ***devTn*** |
| deviceThermostat | ***devTt*** |
| deviceWaterHeater | ***deWHr*** |

In protocol bindings resource type names for module classes shall be translated into short names of table 6.3.2-2.

**Table 6.3.2-2: Specialization type short names (ModuleClasses and Module Instances)**

| Resource Type Name | Short Name |
|---|---|
| alarmSpeaker | ***alaSr*** |
| audioVideoInput | ***auVIt*** |
| audioVolume | ***audVe*** |
| battery | ***batty*** |
| binarySwitch | ***binSh*** |
| bioElectricalImpedanceAnalysis | ***bEIAs*** |
| boiler | ***boilr*** |
| brightness | ***brigs*** |
| clock | ***clock*** |
| colour | ***color*** |
| colourSaturation | ***colSn*** |
| customTemperature | ***cusTe*** |
| doorStatus | ***dooSe*** |
| electricVehicleConnector | ***elVCr*** |
| energyConsumption | ***eneCn*** |
| energyGeneration | ***eneGn*** |
| faultDetection | ***fauDn*** |
| freshTemperature | ***freTe*** |
| frozenTemperature | ***froTe*** |
| height | ***heigt*** |
| hotWaterSupply | ***hoWSy*** |
| keypad | ***keypd*** |
| motionSensor | ***motSr*** |
| oximeter | ***oximr*** |
| powerSave | ***powS0*** |
| pushButton | ***pusBn*** |

| Resource Type Name | Short Name |
|---|---|
| recorder | ***recor*** |
| refrigeration | ***refrn*** |
| relativeHumidity | ***relHy*** |
| rinseLevel | ***rinLl*** |
| runMode | ***runMe*** |
| signalStrength | ***sigSh*** |
| smokeSensor | ***smoSr*** |
| spinLevel | ***spiLl*** |
| televisionChannel | ***telCl*** |
| temperature | ***tempe*** |
| temperatureAlarm | ***temAm*** |
| timer | ***timer*** |
| turbo | ***turbo*** |
| waterFlow | ***watFw*** |
| waterLevel | ***watLl*** |
| waterSensor | ***watSr*** |
| weight | ***weigt*** |
| wind | ***wind*** |

In protocol bindings resource type names for actions shall be translated into short names of table 6.3.2-3.

**Table 6.3.2-3: Specialization type short names (Actions)**

| Resource Type Name | Short Name |
|---|---|
| activateClockTimer | ***acCTr*** |
| deactivateClockTimer | ***deCTr*** |
| downChannel | ***dowCl*** |
| downVolume | ***dowVe*** |
| toggle | ***togge*** |
| upChannel | ***uphCl*** |

## 6.3.3 Resource attributes for properties and data points

In protocol bindings resource attributes names for properties of device models shall be translated into short names of table 6.3.3-1.

**Table 6.3.3-1: Resource attribute short names (Device properties)**

| Attribute Name | Occurs in | Short Name |
|---|---|---|
| country | deviceAirConditioner, deviceClothesWasher, deviceOven, deviceRefrigerator, deviceRobotCleaner, deviceTelevision, deviceThermostat | ***couny*** |
| dateOfManufacture | deviceRefrigerator | ***daOMe*** |
| deviceAliasName | deviceAirConditioner, deviceClothesWasher, deviceOven, deviceRefrigerator, deviceRobotCleaner, deviceTelevision | ***deANe*** |
| deviceFirmwareVersion | deviceAirConditioner, deviceClothesWasher, deviceOven, deviceRefrigerator, deviceRobotCleaner, deviceTelevision, deviceThermostat | ***deFVn*** |
| deviceManufacturer | All devices | ***devMr*** |
| deviceModelName | All devices | ***deMNe*** |
| deviceName | deviceAirConditioner, deviceClothesWasher, deviceOven, deviceRefrigerator, deviceRobotCleaner, deviceTelevision, deviceThermostat | ***devNe*** |
| deviceSerialNum | All devices | ***deSNm*** |
| deviceSubModelName | deviceAirConditioner, deviceClothesWasher, deviceOven, deviceRefrigerator, deviceRobotCleaner, deviceTelevision | ***dSMNe*** |
| deviceType | All devices | ***devTe*** |
| generationSource | deviceMicrogeneration | ***genSe*** |
| hardwareVersion | deviceRefrigerator | ***harVn*** |
| location | deviceElectricVehicleCharger, deviceLight, deviceMicrogeneration, deviceSmartElectricMeter, deviceStorageBattery, deviceWaterHeater | ***locan*** |

| Attribute Name | Occurs in | Short Name |
|---|---|---|
| manufacturerDetailsLink | deviceRefrigerator | ***maDLk*** |
| manufacturerName | deviceRefrigerator, | ***manNe*** |
| measuringScope | deviceThermostat | ***meaSe*** |
| osVersion | deviceRefrigerator | ***oseVn*** |
| protocol | deviceElectricVehicleCharger, deviceLight, deviceMicrogeneration, deviceSmartElectricMeter, deviceStorageBattery, deviceWaterHeater | ***protI*** |
| supportURL | deviceRefrigerator | ***suURL*** |
| systemTime | deviceRefrigerator | ***sysTe*** |

In protocol bindings resource attributes names for properties of module classes shall be translated into short names of table 6.3.3-2.

**Table 6.3.3-2: Resource attribute short names (ModuleClass properties)**

| Attribute Name | Occurs in | Short Name |
|---|---|---|
| chargingCapacity | electricVehicleConnector | ***chaCy*** |
| dischargingCapacity | electricVehicleConnector | ***disCy*** |
| electricEnergy | battery | ***eleEy*** |
| material | battery | ***matel*** |
| voltage | battery | ***volte*** |

In protocol bindings resource attributes names for data points of module classes shall be translated into short names of tables 6.3.3-3 and 6.3.3-4.

**Table 6.3.3-3: Resource attribute short names (ModuleClass data points) (1/2)**

| Attribute Name | Occurs in | Short Name |
|---|---|---|
| absoluteEnergyConsumption | energyConsumption | ***abECn*** |
| absoluteStartTime | timer | ***abSTe*** |
| absoluteStopTime | timer | ***abST0*** |
| alarm | motionSensor, smokeSensor, temperatureAlarm, waterSensor | ***alarm*** |
| *alarmStatus* | alarmSpeaker | ***alaSs*** |
| availableChannels | televisionChannel | ***avaCs*** |
| bath | hotWaterSupply | ***bath*** |
| batteryThreshold | battery | ***batTd*** |
| blue | colour | ***blue*** |
| bone | bioelectricalImpedanceAnalysis | ***bone*** |
| brightness | brightness | ***brigs*** |
| capacity | battery | ***capay*** |
| channelId | televisionChannel | ***chaId*** |
| charging | battery | ***charg*** |
| code | faultDetection | ***code*** |
| colourSaturation | colourSaturation | ***colSn*** |
| current | energyConsumption | ***currt*** |
| currentDate | clock | ***curDe*** |
| currentTemperature | temperature | ***curT0*** |
| currentTime | clock | ***curTe*** |
| defrost | refrigeration | ***defrt*** |
| description | faultDetection | ***descn*** |
| desiredHumidity | relativeHumidity | ***desHy*** |
| detectedTime | smokeSensor | ***detTe*** |
| diastolicPressure | oximeter | ***diaPe*** |
| directionAuto | wind | ***dirAo*** |
| directionDown | wind | ***dirDn*** |
| directionLeft | wind | ***dirLt*** |
| directionRight | wind | ***dirRt*** |
| directionUp | wind | ***dirUp*** |
| discharging | battery | ***discg*** |
| doorState | doorStatus | ***dooSe*** |
| duration | recorder | ***duran*** |
| estimatedTimeToEnd | timer | ***eTTEd*** |

| Attribute Name | Occurs in | Short Name |
|---|---|---|
| fat | bioElectricalImpedanceAnalysis | ***fat*** |
| filterLifetime | refrigeration | ***filLe*** |
| frequency | energyConsumption | ***freqy*** |
| green | colour | ***green*** |
| height | height | ***heigt*** |
| inputSourceID | audioVideoInput | ***inSId*** |
| kcal | bioElectricalImpedanceAnalysis | ***kcal*** |
| keyNumber | keypad | ***keyNr*** |
| level | battery | ***level*** |
| light | alarmSpeaker | ***light*** |
| liquidLevel | waterLevel | ***liqLl*** |
| lowBattery | battery | ***lowBy*** |
| lqi | signalStrength | ***lqi*** |
| maxValue | audioVolume, temperature | ***maxVe*** |
| minValue | temperature | ***minVe*** |
| multiplyingFactors | energyConsumption, energyGeneration | ***mulFs*** |
| muscle | bioElectricalImpedanceAnalysis | ***musce*** |
| muteEnabled | audioVolume | ***mutEd*** |
| openAlarm | doorStatus | ***opeAm*** |
| openDuration | doorStatus | ***opeDn*** |
| operationMode | runMode | ***opeMe*** |
| oxygenSaturation | oximeter | ***oxySn*** |

**Table 6.3.3-4: Resource attribute short names (ModuleClass data points) (2/2)**

| Attribute Name | Occurs in | Short Name |
|---|---|---|
| power | energyConsumption | ***power*** |
| powerGenerationData | energyGeneration | ***poGDa*** |
| powerSaveEnabled | powerSave | ***poSEd*** |
| powerState | binarySwitch | ***powSe*** |
| previousChannel | televisionChannel | ***preCl*** |
| pulseRate | oximeter | ***pulRe*** |
| pushed | pushButton | ***pusBn*** |
| rapidCool | refrigeration | ***rapCl*** |
| rapidFreeze | refrigeration | ***rapFe*** |
| red | colour | ***red*** |
| referenceTimer | timer | ***refTr*** |
| relativeHumidity | relativeHumidity | ***relHy*** |
| resistance | bioElectricalImpedanceAnalysis | ***resie*** |
| rinseLevel | rinseLevel | ***rinLl*** |
| roundingEnergyConsumption | energyConsumption | ***roECn*** |
| roundingEnergyGeneration | energyGeneration | ***roEGn*** |
| rssi | signalStrength | ***rssi*** |
| runningTime | timer | ***runTe*** |
| sensitivity | motionSensor | ***sensy*** |
| significantDigits | energyConsumption, energyGeneration | ***sigDs*** |
| silentTime | motionSensor | ***silTe*** |
| status | boiler, electricVehicleConnector, faultDetection, hotWaterSupply | ***stats*** |
| stepValue | audioVolume, temperature | ***steVe*** |
| strength | spinLevel, waterFlow, wind | ***streh*** |
| supportedInputSources | audioVideoInput | ***suISs*** |
| supportedModes | runMode | ***supMs*** |
| systolicPressure | oximeter | ***sysPe*** |
| targetDuration | timer | ***tarDn*** |
| targetTemperature | temperature | ***tarTe*** |
| targetTimeToStart | timer | ***tTTSt*** |
| targetTimeToStop | timer | ***tTTSp*** |
| temperature | temperatureAlarm | ***tempe*** |
| temperatureThreshhold | temperatureAlarm | ***temTd*** |
| tone | alarmSpeaker | ***tone*** |
| turboEnabled | turbo | ***turEd*** |
| unit | temperature | ***unit*** |

| Attribute Name | Occurs in | Short Name |
|---|---|---|
| visceraFat | bioElectricalImpedanceAnalysis | ***visFt*** |
| voltage | energyConsumption | ***volte*** |
| volumePercentage | audioVolume | ***volPe*** |
| water | bioElectricalImpedanceAnalysis | ***water*** |
| weight | weight | ***weigt*** |

# 6.4 containerDefinition values

## 6.4.1 Introduction

Each specialization has a *containerDefinition* attribute which can be used as an unique identifier and contains the information of the resource. In this clause, the detailed values of *containerDenifition* attributes in every specializations for the home appliance information models are given.

## 6.4.2 Device models

The *containerDefinition* attribute of specializations for device models shall have the values specified in table 6.4.2-1.

**Table 6.4.2-1: containerDefinition values of specializations for device models**

| Resource Type Name | ***containerDefinition* value** |
|---|---|
| deviceAirConditioner | "org.onem2m.home.device.deviceAirConditioner" |
| deviceClothesWasher | "org.onem2m.home.device.deviceClothesWasher" |
| deviceElectricVehicleCharger | "org.onem2m.home.device.deviceElectricVehicleCharger" |
| deviceLight | "org.onem2m.home.device.deviceLight" |
| deviceMicrogeneration | "org.onem2m.home.device.deviceMicrogeneration" |
| deviceOven | "org.onem2m.home.device.deviceOven" |
| deviceRefrigerator | "org.onem2m.home.device.deviceRefrigerator" |
| deviceRobotCleaner | "org.onem2m.home.device.deviceRobotCleaner" |
| deviceSmartElectricMeter | "org.onem2m.home.device.deviceSmartElectricMeter" |
| deviceStorageBattery | "org.onem2m.home.device.deviceStorageBattery" |
| deviceTelevision | "org.onem2m.home.device.deviceTelevision" |
| deviceThermostat | "org.onem2m.home.device.deviceThermostat" |
| deviceWaterHeater | "org.onem2m.home.device.deviceWaterHeater" |

## 6.4.3 ModuleClasses

The *containerDefinition* attribute of specializations for module classes shall have the values specified in table 6.4.3-1.

**Table 6.4.3-1: containerDefinition values of specializations for module classes**

| Resource Type Name | ***containerDefinition* value** |
|---|---|
| alarmSpeaker | "org.onem2m.home.moduleclass.alarmSpeaker" |
| audioVideoInput | "org.onem2m.home.moduleclass.audioVideoInput" |
| audioVolume | "org.onem2m.home.moduleclass.audioVolume" |
| battery | "org.onem2m.home.moduleclass.battery" |
| binarySwitch | "org.onem2m.home.moduleclass.binarySwitch" |
| bioElectricalImpedanceAnalysis | "org.onem2m.home.moduleclass.bioElectricalImpedanceAnalysis" |
| boiler | "org.onem2m.home.moduleclass.boiler" |
| brightness | "org.onem2m.home.moduleclass.brightness" |
| clock | "org.onem2m.home.moduleclass.clock" |
| colour | "org.onem2m.home.moduleclass.colour" |
| colourSaturation | "org.onem2m.home.moduleclass.colourSaturation" |
| customTemperature | "org.onem2m.home.moduleclass.customTemperature" |
| doorStatus | "org.onem2m.home.moduleclass.doorStatus" |
| electricVehicleConnector | "org.onem2m.home.moduleclass.electricVehicleConnector" |
| energyConsumption | "org.onem2m.home.moduleclass.energyConsumption" |
| energyGeneration | "org.onem2m.home.moduleclass.energyGeneration" |

| Resource Type Name | *containerDefinition* value |
|---|---|
| faultDetection | "org.onem2m.home.moduleclass.faultDetection" |
| freshTemperature | "org.onem2m.home.moduleclass.freshTemperature" |
| frozenTemperature | "org.onem2m.home.moduleclass.frozenTemperature" |
| height | "org.onem2m.home.moduleclass.height" |
| hotWaterSupply | "org.onem2m.home.moduleclass.hotWaterSupply" |
| keypad | "org.onem2m.home.moduleclass.keypad" |
| motionSensor | "org.onem2m.home.moduleclass.motionSensor" |
| oximeter | "org.onem2m.home.moduleclass.oximeter" |
| powerSave | "org.onem2m.home.moduleclass.powerSave" |
| pushButton | "org.onem2m.home.moduleclass.pushButton" |
| recorder | "org.onem2m.home.moduleclass.recorder" |
| refrigeration | "org.onem2m.home.moduleclass.refrigeration" |
| relativeHumidity | "org.onem2m.home.moduleclass.relativeHumidity" |
| rinseLevel | "org.onem2m.home.moduleclass.rinseLevel" |
| runMode | "org.onem2m.home.moduleclass.runMode" |
| signalStrength | "org.onem2m.home.moduleclass.signalStrength" |
| smokeSensor | "org.onem2m.home.moduleclass.smokeSensor " |
| spinLevel | "org.onem2m.home.moduleclass.spinLevel" |
| televisionChannel | "org.onem2m.home.moduleclass.televisionChannel" |
| temperature | "org.onem2m.home.moduleclass.temperature" |
| temperatureAlarm | "org.onem2m.home.moduleclass.temperatureAlarm" |
| timer | "org.onem2m.home.moduleclass.timer" |
| turbo | "org.onem2m.home.moduleclass.turbo" |
| waterFlow | "org.onem2m.home.moduleclass.waterFlow" |
| waterLevel | "org.onem2m.home.moduleclass.waterLevel" |
| waterSensor | "org.onem2m.home.moduleclass.waterSensor" |
| weight | "org.onem2m.home.moduleclass.weight" |
| wind | "org.onem2m.home.moduleclass.wind" |

### 6.4.4 Actions

The *containerDefinition* attribute of specializations for actions shall have the values specified in table 6.4.4-1.

**Table 6.4.4-1: containerDefinition values of specializations for actions**

| Resource Type Name | *containerDefinition* value |
|---|---|
| activateClockTimer | "org.onem2m.home.moduleclass.timer.activateclocktimer" |
| deactivateClockTimer | "org.onem2m.home.moduleclass.timer.deactivateclocktimer" |
| downChannel | "org.onem2m.home.moduleclass.televisionchannel.downchannel" |
| downVolume | "org.onem2m.home.moduleclass.audiovolume.downvolume" |
| toggle | "org.onem2m.home.moduleclass.binaryswitch.timer" |
| upChannel | "org.onem2m.home.moduleclass.televisionchannel.upchannel" |

## 6.5 XSD definitions

### 6.5.1 Introduction

The present clause provide list of files which defines data types in XSD for Device models, ModuleClasss, and Actions.

Generation process of XSD file is explained in Annex A using some examples.

### 6.5.2 XSD definitions for Device models

The XSD definitions for Device models are listed in table 6.5.2-1.

**Table 6.5.2-1: Data type definition of Device models**

| Device model | File Name | Note |
|---|---|---|
| deviceAirConditioner | HD-deviceAirConditioner-v<TS-version>.xsd | |
| deviceClothesWasher | HD-deviceClothesWasher-v<TS-version>.xsd | |
| deviceElectricVehicleCharger | HD-deviceElectricVehicleCharger-v<TS-version>.xsd | |
| deviceLight | HD-deviceLight-v<TS-version>.xsd | |
| deviceMicrogeneration | HD-deviceMicrogeneration-v<TS-version>.xsd | |
| deviceOven | HD-deviceOven-v<TS-version>.xsd | |
| deviceRefrigerator | HD-deviceRefrigerator-v<TS-version>.xsd | |
| deviceRobotCleaner | HD-deviceRobotCleaner-v<TS-version>.xsd | |
| deviceStorageBattery | HD-deviceStroageBattery-v<TS-version>.xsd | |
| deviceSmartElectricMeter | HD-deviceSmartElectricMeter-v<TS-version>.xsd | |
| deviceTelevision | HD-deviceTelevision-v<TS-version>.xsd | |
| deviceThermostat | HD-deviceThermostat-v<TS-version>.xsd | |
| deviceWaterHeater | HD-deviceWaterHeater-v<TS-version>.xsd | |
| NOTE: The string '<TS-version>' shall be interpreted as the version of the present document. | | |

## 6.5.3 XSD definitions for ModuleClass

The XSD definitions for ModuleClass are listed in table 6.5.3-1.

**Table 6.5.3-1: Data type definition of ModuleClasses**

| ModuleClass ID | File Name | Note |
|---|---|---|
| alarmSpeaker | HD-mod-alarmSpeaker-v<TS-version>.xsd | |
| audioVideoInput | HD-mod-audioVideoInput-v<TS-version>.xsd | |
| audioVolume | HD-mod-audioVolume-v<TS-version>.xsd | |
| battery | HD-mod-battery-v<TS-version>.xsd | |
| binarySwitch | HD-mod-binarySwitch-v<TS-version>.xsd | |
| bioElectricalImpedanceAnalysis | HD-mod-bioElectricalImpedanceAnalysis-v<TS-version>.xsd | |
| boiler | HD-mod-boiler-v<TS-version>.xsd | |
| brightness | HD-mod-brightness-v<TS-version>.xsd | |
| clock | HD-mod-clock-v<TS-version>.xsd | |
| colour | HD-mod-colour-v<TS-version>.xsd | |
| colourSaturation | HD-mod-colourSaturation-v<TS-version>.xsd | |
| doorStatus | HD-mod-doorStatus-v<TS-version>.xsd | |
| electricVehicleConnector | HD-mod-electricVehicleConnector-v<TS-version>.xsd | |
| energyConsumption | HD-mod-energyConsumption-v<TS-version>.xsd | |
| energyGeneration | HD-mod-energyGeneration-v<TS-version>.xsd | |
| faultDetection | HD-mod-faultDetection-v<TS-version>.xsd | |
| height | HD-mod-height-v<TS-version>.xsd | |
| hotWaterSupply | HD-mod-hotWaterSupply-v<TS-version>.xsd | |
| keypad | HD-mod-keypad-v<TS-version>.xsd | |
| motionSensor | HD-mod-motionSensor-v<TS-version>.xsd | |
| oximeter | HD-mod-oximeter-v<TS-version>.xsd | |
| powerSave | HD-mod-powerSave-v<TS-version>.xsd | |
| pushButton | HD-mod-pushButton-v<TS-version>.xsd | |
| recorder | HD-mod-recorder-v<TS-version>.xsd | |
| refrigeration | HD-mod-refrigeration-v<TS-version>.xsd | |
| relativeHumidity | HD-mod-relativeHumidity-v<TS-version>.xsd | |
| rinseLevel | HD-mod-rinseLevel-v<TS-version>.xsd | |
| runMode | HD-mod-runMode-v<TS-version>.xsd | |
| signalStrength | HD-mod-signalStrength-v<TS-version>.xsd | |
| smokeSensor | HD-mod-smokeSensor-v<TS-version>.xsd | |
| spinLevel | HD-mod-spinLevel-v<TS-version>.xsd | |
| televisionChannel | HD-mod- HD-mod--v<TS-version>.xsd | |
| temperature | HD-mod-temperature-v<TS-version>.xsd | |
| temperatureAlarm | HD-mod-temperatureAlarm-v<TS-version>.xsd | |
| timer | HD-mod-timer-v<TS-version>.xsd | |
| turbo | HD-mod-turbo-v<TS-version>.xsd | |
| waterFlow | HD-mod-waterFlow-v<TS-version>.xsd | |

| ModuleClass ID | File Name | Note |
|---|---|---|
| waterLevel | HD-mod-waterLevel-v<TS-version>.xsd | |
| waterSensor | HD-mod-waterSensor-v<TS-version>.xsd | |
| weight | HD-mod-weight-v<TS-version>.xsd | |
| wind | HD-mod-wind-v<TS-version>.xsd | |
| NOTE: The string '<TS-version>' shall be interpreted as the version of the present document. | | |

### 6.5.4 XSD definitions for Action

The XSD definitions for Actions are listed in table 6.5.4-1.

**Table 6.5.4-1: Data type definition of Action**

| Action | File Name | Note |
|---|---|---|
| activateClockTimer | HD-act-activateClockTimer-v<TS-version><TS-version>.xsd | |
| deactivateClockTimer | HD-act-deactivateClockTimer-v<TS-version>.xsd | |
| downChannel | HD-act-downChannel-v<TS-version>.xsd | |
| downVolume | HD-act-downVolume-v<TS-version>.xsd | |
| toggle | HD-act-toggle-v<TS-version>.xsd | |
| upChannel | HD-act-upChannel-v<TS-version>.xsd | |
| upVolume | HD-act-upVolume-v<TS-version>.xsd | |
| NOTE: The string '<TS-version>' shall be interpreted as the version of the present document. | | |

# 7 Mapping with Other Information Models from External Organizations

This clause is intended to specify how the Home Appliance Information Model (HAIM) defined in the clause 5 can be mapped with existing external models from AllJoyn, OIC, ECHONET, etc. The mapping is to enable the interworking between the oneM2M system and external technologies at the information model level. This means a oneM2M native application which understand only oneM2M standardized HAIM can interact with non-oneM2M home appliances of different technologies in a consistent way without knowing the technology specific details. An IPE is responsible for translating the HAIM to/from technology specific information model bidirectional following the mapping specification in this clause. Using HAIM as a bridge, home appliances and applications of different technologies can also interact with each other via the oneM2M system (with IPEs).

The mapping details will be specified in future release. ModuleClasses, properties, device models and data types in HAIM may be further updated if gaps are identified for mapping.

# 8 Ontology for the Home Appliance Information Model aligned with oneM2M Base Ontology

The following table shows a mapping of the Home Appliance Information Model to the oneM2M Base Ontology in oneM2M TS-0012 [i.5].

The table only shows mapping of SDT concepts that are used to classify all concepts in the Home Appliance Information Model. Therefore, since any concept in the Home Appliance Information Model can be classified according to a specific SDT concept it also (transitively) maps to the related class of the oneM2M Base Ontology.

**Table 8-1: Mapping between SDT concepts in the Home Appliance Information Model and the oneM2M Base Ontology**

| SDT Concept in the Home Appliance Information Model | Mapping relationship | Class in Base Ontology | Property in Base Ontology | Comment |
|---|---|---|---|---|
| SDT: Device | sub-class of | Device | | |
| SDT: SubDevice | sub-class of | Device | | The base ontology allows a Device to consist of (sub-) Devices |
| SDT: Action | sub-class of | Operation | | |
| SDT: Args (of an Action) | sub-class of | OperationInput | | |
| SDT: ReturnType (of an Action) | sub-class of | OperationOutput | | |
| SDT: Event | sub-class of | Operation | | |
| SDT: Data (of an Event) | sub-class of | OutputDataPoint | | |
| SDT: Module | sub-class of | Service | | The base ontology allows a Service to have subServices. Each SDT:Module implements one SDT:ModuleClass. Therfore SDT:Module can be considered a subclass of SDT:ModuleClass and therefore subclass of oneM2M:Service. See note. |
| SDT: ModuleClass | sub-class of | Service | | See note |
| SDT: UnitOfMeasure | sub-class of | MetaData | | |
| SDT: DataPoint | sub-class of | InputDataPoint | | If SDT:DataPoint is writable |
| SDT: DataPoint | sub-class of | OutputDataPoint | | If SDT:DataPoint is readable |
| SDT: Property (of a Device) | sub-class of | ThingProperty | | |
| SDT: Property (of a ModuleClass) | sub-class of | Aspect | | Aspect (of the Functionality) |
| SDT: SimpleType | sub-property of | | hasDataType | The base ontology's SimpleTypeVariable class has data properties:<br>• hasDataType<br>• hasDataRestriction |
| SDT: Constraint | sub-property of | | hasDataRestriction | |
| NOTE: In RESTful technologies the Service (i.e. the electronic representation of a Functionality in a network) is implicitly bound to its Functionality by the naming of the used resources (e.g. the Functionality of ModuleClass "AudioVolume" is implemented as a Service through CRUD operations on a [audioVolume] <flexContainer> specialization). | | | | |

# Annex A (informative): Resource Mapping Examples

## A.1 Introduction

The AE may construct oneM2M resource tree on hosting CSE as the mapping of associated device, and each XSD definition for the device information models is generated following 'Resource Mapping Rule' in clause 6.2.

The present clause explains how to use the oneM2M resource tree to map Device model for each device (see clause 5.4).

## A.2 Example for Device model 'deviceAirConditioner'

The present clause explains the creation process for the device typed 'deviceAirConditioner' (see clause 5.4.1 for device model definition of 'airConditioner').

Using the definition, 'deviceAirConditioner' model is mapped to [deviceAirConditioner] resource which is a specialization of <flexContainer> resource (see figure A.2-1).

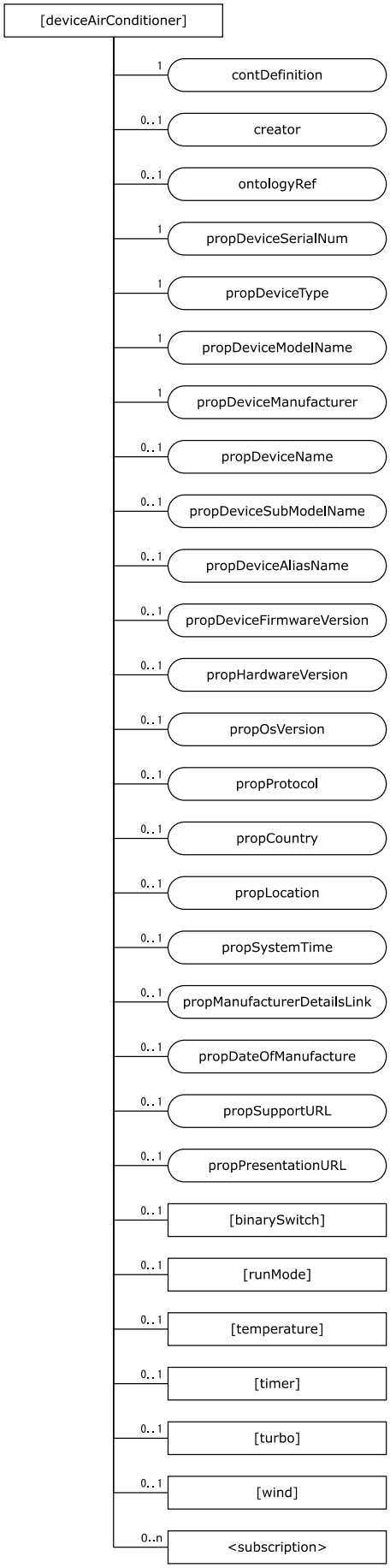


**Figure A.2-1: Structure of *[deviceAirConditioner]* resource**

The AE creates the [deviceAirConditioner] specialization of <flexContainer> resource for the Device model [deviceAirConditioner] resource.

The [deviceAirConditioner] resource contains the child resource specified in table A.2-1.

**Table A.2-1: Child resources of *[deviceAirConditioner]* resource**

| Child Resources of *[airConditioner]* | Child Resource Type | Multiplicity | Description |
|---|---|---|---|
| *[variable]* | *<flexContainer> as defined in the specialization [binarySwitch]* | 0..1 | This resource is used to map 'binarySwith' ModuleClass defined in clause 5. |
| *[variable]* | *<flexContainer> as defined in the specialization [runMode]* | 0..1 | This resource is used to map 'runMode' ModuleClass defined in clause 5. |
| *[variable]* | *<flexContainer> as defined in the specialization [temperature]* | 0..1 | This resource is used to map 'temperature' ModuleClass defined in clause 5. |
| *[variable]* | *<flexContainer> as defined in the specialization [timer]* | 0..1 | This resource is used to map 'timer' ModuleClass defined in clause 5. |
| *[variable]* | *<flexContainer> as defined in the specialization [turbo]* | 0..1 | This resource is used to map 'turbo' ModuleClass defined in clause 5. |
| *[variable]* | *<flexContainer> as defined in the specialization [wind]* | 0..1 | This resource is used to map 'wind' ModuleClass defined in clause 5. |
| *[variable]* | *<subscription>* | 0..n | See clause 9.6.8 in oneM2M TS-0001 [i.3] |

will contain [customAttributes] with variable name for each Properties. Thus, attributes of [deviceAirConditioner] resource are defined in table A.2-2.

**Table A.2-2: Attributes of *[deviceAirConditioner]* resource**

| Attributes of *[airConditioner]* | Multiplicity | RW/ RO/ WO | Description |
|---|---|---|---|
| *resourceType* | 1 | RO | See clause 9.6.1.3 in oneM2M TS-0001 [i.3]. |
| *resourceID* | 1 | RO | See clause 9.6.1.3 in oneM2M TS-0001 [i.3]. |
| *resourceName* | 1 | RO | See clause 9.6.1.3 in oneM2M TS-0001 [i.3]. |
| *parentID* | 1 | RO | See clause 9.6.1.3 in oneM2M TS-0001 [i.3]. |
| *expirationTime* | 1 | RW | See clause 9.6.1.3 in oneM2M TS-0001 [i.3]. |
| *accessControlPolicyIDs* | 0..1 (L) | RW | See clause 9.6.1.3 in oneM2M TS-0001 [i.3]. |
| *creationTime* | 1 | RO | See clause 9.6.1.3 in oneM2M TS-0001 [i.3]. |
| *lastModifiedTime* | 1 | RO | See clause 9.6.1.3 in oneM2M TS-0001 [i.3]. |
| *labels* | 0..1 | RW | See clause 9.6.1.3 in oneM2M TS-0001 [i.3]. |
| *containerDefinition* | 1 | WO | The value is "org.onem2m.home.device.airconditioner" |
| *Creator* | 0..1 (L) | RW | See clause 9.6.35 in oneM2M TS-0001 [i.3]. |
| *ontologyRef* | 0..1 (L) | RW | See clause 9.6.35 in oneM2M TS-0001 [i.3]. |
| *propDeviceSerialNum* | 1 | RO | This [customAttribute] is used to map Property 'deviceSerialNum'. |
| *propDeviceType* | 1 | RO | This [customAttribute] is used to map Property 'deviceType'. |
| *propDeviceModelName* | 1 | RO | This [customAttribute] is used to map Property 'deviceModelName'. |
| *propDeviceManifacture* | | RO | This [customAttribute] is used to map Property 'devicManufacture' |
| *propDeviceName* | 0..1 | RO | This [customAttribute] is used to map Property 'deviceName' |
| *propDeviceSubModelName* | 0..1 | RO | This [customAttribute] is used to map Property 'deviceSubModelName'. |
| *propDeviceAliasName* | 0..1 | RO | This [customAttribute] is used to map Property 'deviceAliasName'. |
| *propDeviceFirmwareVersion* | 0..1 | RO | This [customAttribute] is used to map Property 'deviceFirmwareVersion'. |
| *propDeviceHardwareVersion* | 0..1 | RO | This [customAttribute] is used to map Property 'deviceHardwareVersion'. |
| *propOsVersion* | 0..1 | RO | This [customAttribute] is used to map Property 'osVersion'. |
| *propLocation* | 0..1 | RO | This [customAttribute] is used to map Property 'location' |
| *propDateOfManufacture* | 0..1 | RO | This [customAttribute] is used to map Property 'dateOfManufacture'. |
| *propSupportURL* | 0..1 | RO | This [customAttribute] is used to map Property 'SupportURL'. |
| *propPresentationURL* | 0..1 | RO | This [customAttribute] is used to map Property 'presentationURL'. |

# A.3 Example of ModuleClass 'binarySwitch'

The [*binarySwitch*] resource is used to share information regarding the modeled binary switch module as a ModuleClass. The [*binarySwitch*] resource is a specialization of the <*flexContainer*> resource.

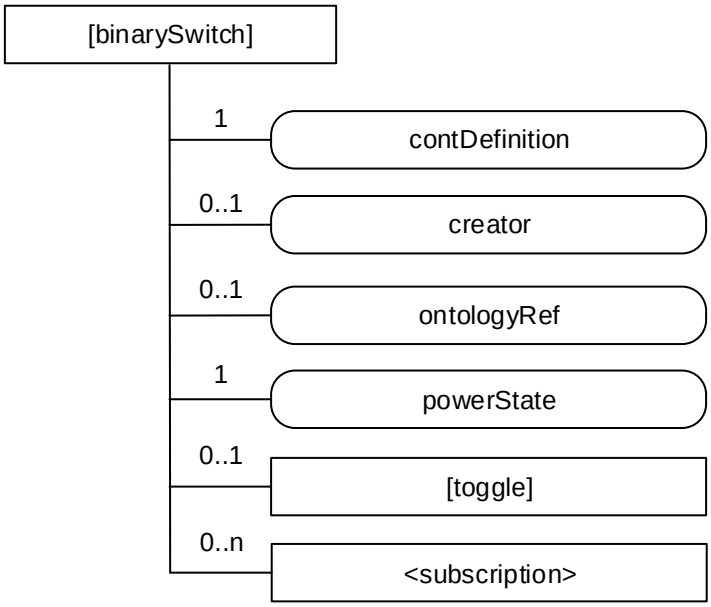


**Figure A.3-1: Structure of *[binarySwitch]* resource**

The *[binarySwitch]* resource contains the child resource specified in table A.3-1.

**Table A.3-1: Child resources of *[binarySwitch]* resource**

| Child Resources of *[binarySwitch]* | Child Resource Type | Multiplicity | Description |
|---|---|---|---|
| *[variable]* | *<flexContainer> as defined in the specialization [toggle]* | 0..1 | This resource is used to map 'toggle' Action defined in clause 5.3.5. |
| *[variable]* | *<subscription>* | 0..n | See clause 9.6.8 in oneM2M TS-0001 [i.3] |

The *[binarySwitch]* resource contains the attributes specified in table A.3-2.

**Table A.3-2: Attributes of *[binarySwitch]* resource**

| Attributes of *[binarySwitch]* | Multiplicity | RW/ RO/ WO | Description |
|---|---|---|---|
| *resourceType* | 1 | RO | See clause 9.6.1.3 in oneM2M TS-0001 [i.3] |
| *resourceID* | 1 | RO | See clause 9.6.1.3 in oneM2M TS-0001 [i.3] |
| *resourceName* | 1 | RO | See clause 9.6.1.3 in oneM2M TS-0001 [i.3] |
| *parentID* | 1 | RO | See clause 9.6.1.3 in oneM2M TS-0001 [i.3] |
| *expirationTime* | 1 | RW | See clause 9.6.1.3 in oneM2M TS-0001 [i.3] |
| *accessControlPolicyIDs* | 0..1 (L) | RW | See clause 9.6.1.3 in oneM2M TS-0001 [i.3] |
| *creationTime* | 1 | RO | See clause 9.6.1.3 in oneM2M TS-0001 [i.3] |
| *lastModifiedTime* | 1 | RO | See clause 9.6.1.3 in oneM2M TS-0001 [i.3] |
| *labels* | 0..1 | RW | See clause 9.6.1.3 in oneM2M TS-0001 [i.3] |
| *containerDefinition* | 1 | WO | The value is "org.onem2m.home.moduleclass.binaryswitch" |
| *creator* | 0..1 (L) | RW | See clause 9.6.35 in oneM2M TS-0001 [i.3] |
| *ontologyRef* | 0..1 (L) | RW | See clause 9.6.35 in oneM2M TS-0001 [i.3] |
| *powerState* | 1 | RW | See clause 5.3.5 |

# A.4 Example of Action 'toggle'

The [*toggle*] resource is used to share information regarding the modeled toggle as an Action. The [*toggle*] resource is a specialization of the <*flexContainer*> resource.

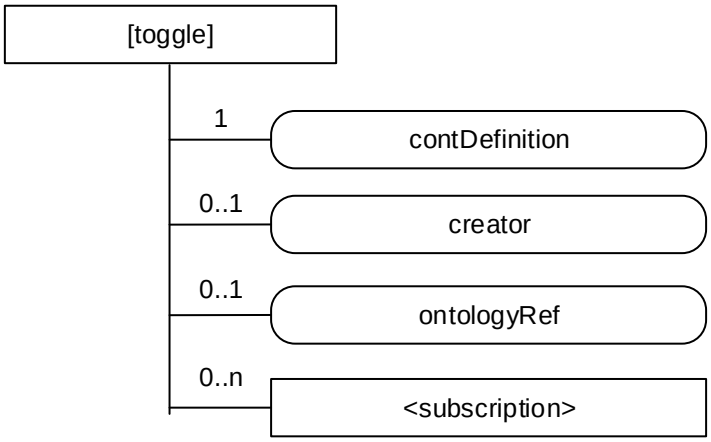


**Figure A.4-1: Structure of *[toggle]* resource**

The *[toggle]* resource contains the child resource specified in table A.4-1.

**Table A.4-1: Child resources of *[toggle]* resource**

| Child Resources of *[toggle]* | Child Resource Type | Multiplicity | Description |
|---|---|---|---|
| *[variable]* | *<subscription>* | 0..n | See clause 9.6.8 in oneM2M TS-0001 [i.3] |

The *[toggle]* resource contains the attributes specified in table A.4-2.

**Table A.4-2: Attributes of *[toggle]* resource**

| Attributes of *[toggle]* | Multiplicity | RW/ RO/ WO | Description |
|---|---|---|---|
| *resourceType* | 1 | RO | See clause 9.6.1.3 in oneM2M TS-0001 [i.3] |
| *resourceID* | 1 | RO | See clause 9.6.1.3 in oneM2M TS-0001 [i.3] |
| *resourceName* | 1 | RO | See clause 9.6.1.3 in oneM2M TS-0001 [i.3] |
| *parentID* | 1 | RO | See clause 9.6.1.3 in oneM2M TS-0001 [i.3] |
| *expirationTime* | 1 | RW | See clause 9.6.1.3 in oneM2M TS-0001 [i.3] |
| *accessControlPolicyIDs* | 0..1 (L) | RW | See clause 9.6.1.3 in oneM2M TS-0001 [i.3] |
| *creationTime* | 1 | RO | See clause 9.6.1.3 in oneM2M TS-0001 [i.3] |
| *lastModifiedTime* | 1 | RO | See clause 9.6.1.3 in oneM2M TS-0001 [i.3] |
| *labels* | 0..1 | RW | See clause 9.6.1.3 in oneM2M TS-0001 [i.3] |
| *containerDefinition* | 1 | WO | The value is "org.onem2m.home.moduleclass.binaryswitch.toggle" |
| *creator* | 0..1 (L) | RW | See clause 9.6.35 in oneM2M TS-0001 [i.3] |
| *ontologyRef* | 0..1 (L) | RW | See clause 9.6.35 in oneM2M TS-0001 [i.3] |

# History

| Publication history | | |
|---|---|---|
| V2.0.0 | 30 Aug 2016 | Release 2 - Publication |
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