



ONEM2M TECHNICAL SPECIFICATION

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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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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>

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1 Scope

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

2 References

2.1 Normative references

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

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

- [1] Home Gateway Initiative Smart Device Template.
NOTE: Available at <https://git.onem2m.org/MAS/SDT/tree/master>.
- [2] "Java code conventions".
NOTE: Available at <https://www.oracle.com/technetwork/java/codeconventions-150003.pdf>.
- [3] oneM2M TS-0001: "Functional Architecture".
- [4] oneM2M TS-0004: "Service Layer Core Protocol Specification".
- [5] ISO 80000-1: "Quantities and units -- Part 1: General".
- [6] Open Mobile Alliance™ OMA-ERELED-DWAPI-V1_0-20160419-C: "Enabler Release Definition for DWAPI 1.0".
NOTE: Available at http://www.openmobilealliance.org/release/DWAPI/V1_0-20160419-C/OMA-ERELED-DWAPI_V1_0-20160419-C.pdf.
- [7] Open Mobile Alliance™ OMA-TS-Blood_Pressure_Monitor_APIs-V1_0-20160419-C: "Blood Pressure Monitor APIs".
NOTE: Available at http://www.openmobilealliance.org/release/DWAPI/V1_0-20160419-C/OMA-TS-Blood_Pressure_Monitor_APIs-V1_0-20160419-C.pdf.
- [8] Open Mobile Alliance™ OMA-TS-Glucometer_APIs-V1_0-20160419-C: "Glucometer APIs".
NOTE: Available at http://www.openmobilealliance.org/release/DWAPI/V1_0-20160419-C/OMA-TS-Glucometer_APIs-V1_0-20160419-C.pdf.
- [9] Open Mobile Alliance™ OMA-TS-Heart-Rate-Monitor-APIs-V1-0-20160419-C: "Heart Rate Monitor APIs".
NOTE: Available at http://www.openmobilealliance.org/release/DWAPI/V1_0-20160419-C/OMA-TS-Heart_Rate_Monitor_APIs-V1_0-20160419-C.pdf.
- [10] Open Mobile Alliance™ OMA-TS-Pulse_Oximeter_APIs-V1_0-20160419-C: "Pulse Oximeter APIs".
NOTE: Available at http://www.openmobilealliance.org/release/DWAPI/V1_0-20160419-C/OMA-TS-Pulse_Oximeter_APIs-V1_0-20160419-C.pdf.
- [11] Open Mobile Alliance™ OMA-TS-Thermometer_APIs-V1_0-20160419-C: "Thermometer APIs".

- NOTE: Available at http://www.openmobilealliance.org/release/DWAPI/V1_0-20160419-C/OMA-TS-Thermometer_APis-V1_0-20160419-C.pdf.
- [12] Open Mobile Alliance™ OMA-TS-Weight_Scale_Body_Composition_Analyzer_APis-V1_0-20160419-C: "Weight Scale / Body Composition Analyzer APis".
- NOTE: Available at http://www.openmobilealliance.org/release/DWAPI/V1_0-20160419-C/OMA-TS-Weight_Scale_Body_Composition_Analyzer_APis-V1_0-20160419-C.pdf.
- [13] W3C Recommendation: "XML Schema Part 2: Datatypes", 28 October 2004
- NOTE: Available at <https://www.w3.org/TR/xmlschema-2/>.
- [14] NIST standard FIPS PUB 180-4: "Secure Hash Standard (SHS)".
- NOTE: Available at <https://csrc.nist.gov/publications/detail/fips/180/4/final>.
- [15] IETF RFC 4566: "SDP: Session Description Protocol".
- [16] IANA: "Time Zone Database".
- NOTE: Available at <https://www.iana.org/time-zones>.
- [17] Open Mobile Alliance™ OMA-ER-GotAPI-V1_1-20151215-C: "Generic Open Terminal API Framework (GotAPI)".

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] Void.
- [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".
- [i.6] https://en.wikipedia.org/w/index.php?title=Multiple_inheritance&oldid=864942988.
- [i.7] Void.[i.8] Open Connectivity: "OCF Device Specification" V1.3.0.
- NOTE: Available at https://openconnectivity.org/specs/OCF_Device_Specification_v1.3.0.pdf.

Commented [DD1]: In this case we have to use "void" since this reference was already listed in the previous version of TS-0023

Commented [KA2R1]: Thank you for the clarification

3 Definition of terms and abbreviations

3.1 Terms

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

Device Class ID: URN to identify the Device model definition

ModuleClass ID: URN to identify the ModuleClass model definition

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

A	Ampere (unit of measure)
ACO	Auto Change Over
ADF	Auto Document Feeder
AE	Application Entity
AI	Artificial Intelligence
API	Application Programming Interface
BIA	Bio-Electrical Impedance Analysis
BMI	Body Mass Index
C	Celsius (unit of measure)
CCTV	Closed-Circuit Television
CH ₂ O	Formaldehyde (chemical formula)
cm	Centimeter (unit of measure)
CO	Carbon Monoxide (chemical formula)
CO ₂	Carbon Dioxide (chemical formula)
CRUD	Create, Retrieve, Update, Delete
CSE	Common Services Entity
dl	Decilitre (unit of measure)
DLP	Digital Light Processing
DWAPI	Device Web Application Programming Interface
DWAPI-3DP	Device Web Application Programming Interface for 3D Printer
DWAPI-PCH	Device Web Application Programming Interface for Personal Connected Healthcare
DVI	Digital Video Interactive
FDM	Fused Deposition Modelling
FFF	Fused Filament Fabrication
GotAPI	Generic open terminal Application Programming Interface
GSM	Global System for Mobile Communications
HAIM	Home Appliances Information Model and Mapping
HDMI	High-Definition Multimedia Interface
HEMS	Home Energy Management System
HGI	Home Gateway Initiative
Hz	Hertz (unit of measure)
ID	Identifier
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IPE	Interworking Proxy Entity
JSON	JavaScript Object Notation
Kg	Kilogram (unit of measure)
Kcal	Kilocalorie (unit of measure)
KWh	Kilowatt Hour (unit of measure)
LOM	Laminated Object Manufacturing
mAh	Milliampere Hour (unit of measure)
MFP	Multi Function Printer
mg	Milligrams (unit of measure)
mmHg	Millimetre of Mercury (unit of measure)
OAuth	Open Authentication
OCF	Open Connectivity Foundation
OMA	Open Mobile Alliance
PBP	Powder Bed & inkjet head 3D Printing
PBX	Private Branch Exchange
PPM	Parts Per Million
RGB	Red, Green, Blue
RO	Read Only
RR	Respiratory Rate
RW	Read Write
SCART	Syndicat des Constructeurs d'Appareils Radiorécepteurs et Téléviseurs

SDP	Session Description Protocol
SDT	Smart Device Template
SHA	Secure Hash Algorithm
SI	Système International d'unités (International System of Units)
SLA	Stereolithography Apparatus
SLS	Selective Laser Sintering
SOS	Save our Souls (distress signal)
SPO2	Oxygen Saturation
SVIDEO	Separate video
TV	TeleVision
TZ	Time Zone
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
UV	Ultraviolet
VOC	Volatile Organic Compounds
V	Volt (unit of measure)
W	Watt (unit of measure)
Wh	Watt Hour (unit of measure)
WAN	Wide Area Network
WO	Write Only
XML	Extensible Markup Language
XSD	XML Schema 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 5.5, 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.

Specifications of new Device models and ModuleClasses are encouraged to re-use the definitions specified in the present document as much as possible. If re-use is not possible and new Device and/or ModuleClasses definitions are necessary, it is strongly advised to closely follow the guidelines and definition style from the present document.

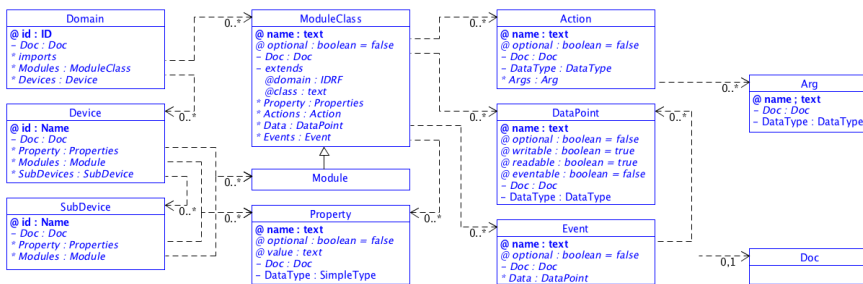


Figure 5.2.1-1: Design Structure of the Home Appliance Information Model using SDT 3.0

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 is 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 5.6.
 - The name of an enumeration type shall start with the prefix "enum". This prefix shall not be used with non-enumeration type names.
 - Rule 8: Rule for unit in documentation:
 - SI (International Systems of Units in [z]) measurement (e.g. meter, kilogram, second.) should be considered as first candidate.
 - Otherwise, it may be kept consistency with implementing technologies such as other SDO's specification.
- NOTE: Popular unit in particular industrial domain should be considered (e.g. cm for human height, calories for energy consumption in healthcare domain).
- Rule 9: Rule for type:
 - Measured and/or calculated values should be represented in float (without taking care of resolution of values).
 - Rule 10: Inheritance of ModuleClasses:
 - A ModuleClass may inherit from another existing ModuleClass in order to provide additional functionalities based on the existing ModuleClass. However, inheritance from multiple ModuleClasses is not allowed (due to the "diamond problem" [i.6]).
 - Inheritance of ModuleClass shall only be used in the case that extending an existing ModuleClass is not appropriate, i.e. the functionality to be added is irrelevant to the original design purpose of the existing ModuleClass (e.g. adding a 'time' DataPoint to a 'binarySwitch' ModuleClass).
 - Rule 11: When to differentiate between current and target Data Points in ModuleClasses:
 - Device operations, which are executed when setting data points to specific values, may take some time to reach the desired result. For example, setting a new temperature to a heater does not immediately change the room temperature, but it may take some time for the heater to increase the temperature. Therefore, it is sometimes necessary to distinguish between current and target data points.
 - A ModuleClass shall provide an additional "target" data point when the "current" data point:
 - is writable; and
 - the functionality that is mapped to the data point is an operation, not a configuration function; and
 - the operation may take some time to start and/or to complete, or reach the desired result.
 - When a ModuleClass provides current and target data points then the name for the current data point shall have the prefix "current", and the name for the target data point shall have the prefix "target". Both data points shall have the same suffix, for example "currentTemperature" and "targetTemperature".

5.3 ModuleClasses

5.3.1 3Dprinter

This ModuleClass provides capabilities for a 3D printer.

Table 5.3.1-1: Actions of 3Dprinter

Return Type	Name	Argument	Optional	Documentation
none	start3Dprint	none	true	Start 3D printing.
none	stop3Dprint	none	true	Stop 3D printing.

Table 5.3.1-2: DataPoints of 3Dprinter ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
printType	hd:enum3DprinterTechnology	true	false	false	The type of printing technology (see clause 5.6.1).
printSizeX	xs:float	true	false	false	This data point represents the maximum size of a printing object in the direction of X-axis. The unit of measure is "mm". (1/10cm).
printSizeY	xs:float	true	false	false	This data point represents the maximum size of printing object in the direction of Y-axis. The unit of measure is "mm". (1/10cm).
printSizeZ	xs:float	true	false	false	This data point represents the maximum size of printing object in the direction of Z-axis. The unit of measure is "mm". (1/10cm).
network	xs:boolean	true	false	false	This value indicates the Wide Area Network (WAN) connectivity of the 3D printer, such as Internet or GSM. "False" indicates that the printer does not have network connectivity to a WAN. "True" indicates that the printer has WAN network connectivity.
memorySize	xs:float	true	false	false	This value represents the total memory size of the printer. The unit of measure is MB (Mega Bytes).

5.3.2 acousticSensor

This ModuleClass provides capabilities for an acoustic sensor.

Table 5.3.2-1: DataPoints of acousticSensor ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
loudness	xs:float	true	false	false	The unit of measure of the loudness is "dB ² ".
acousticStatus	xs:integer	true	false	true	The acousticStatus is expressed in percent, whereas a value of 0 means "no sound" and a value of 100 means "most noisy".

5.3.3 airConJobMode

This ModuleClasses provides capabilities to control and monitor the job modes of an air conditioner.

Table 5.3.3-1: DataPoints of airConJobMode ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
currentJobMode	hd:enumAirConJobMode	true	true	false	Currently active job mode (see clause 5.6.3).
currentJobModeName	xs:string	true	false	true	Name of the current job mode as a string. This can be used when currentJobMode is vendor-specific.
jobModes	list of hd:enumAirConJobMode	true	false	false	List of possible job states the device supports (see clause 5.6.3).

5.3.4 airFlow

This ModuleClass provides capabilities for controlling the air flow of a device.

Table 5.3.4-1: DataPoints of airFlow ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
speed	xs:integer	true	true	false	The current speed level in the range of the [minSpeed, maxSpeed] data points.
minSpeed	xs:integer	true	false	true	The minimum value for the speed level. If not present, the default is 0.
maxSpeed	xs:integer	true	false	true	The maximum value for the speed level. If not present, the default is 100.
verticalDirection	hd:enumVerticalDirection	true	true	true	The vertical direction of the air flow (see clause 5.6.34).
supportedVerticalDirection	List of hd:enumVerticalDirection	true	false	true	List of supported vertical directions.
horizontalDirection	hd:enumHorizontalDirection	true	true	true	The horizontal direction of the air flow (see clause 5.6.20).
supportedHorizontalDirection	List of hd:enumHorizontalDirection	true	false	true	List of supported horizontal directions.
automode	xs:Boolean	true	true	true	Status of the automode feature. "True" indicates that the speed is set by the device, "False" indicates that the device is not controlling the speed.

5.3.5 airPurifierJobMode

This ModuleClasses provides capabilities to control and monitor the job modes of an airPurifier.

Table 5.3.5-1: DataPoints of airPurifierJobMode ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
currentJobMode	hd:enumAirPurifierJobMode	true	true	false	Currently active job mode (see clause 5.6.4).
currentJobModeName	xs:string	true	false	true	Name of the current job mode as a string. This can be used when currentJobMode is vendor-specific.
jobModes	list of hd:enumAirPurifierJobMode	true	false	false	List of possible job states the device supports (see clause 5.6.4).

5.3.6 airQualitySensor

This ModuleClass provides capabilities for a monitoring sensor that measures the air quality.

Table 5.3.6-1: DataPoints of airQualitySense ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
sensorPM1	xs:integer	true	false	true	The concentration of particle matter under 1 μm . The minimum value is 0, and the maximum value is 1 000.
sensorPM2	xs:integer	true	false	true	The concentration of particle matter under 2,5 μm . The minimum value is 0, and the maximum value is 1 000.
sensorPM10	xs:integer	true	false	true	The concentration of particle matter under 10 μm . The minimum value is 0, and the maximum value is 1 000.
sensorOdor	xs:integer	true	false	true	The concentration of odor that reflects air pollution. The minimum value is 0, and the maximum value is 1 000.
sensorHumidity	xs:integer	true	false	true	The measured humidity. The minimum value is 0, and the maximum value is 100.
monitoringEnabled	xs:boolean	true	true	true	The current status of monitoring. "True" indicates enabled, and "False" indicates not enabled.
co2	xs:integer	true	false	true	This value indicates the CO2 level in ppm (parts per million).
co	xs:integer	true	false	true	This value indicates the CO level in ppm.
ch2o	xs:integer	true	false	true	This value indicates the CH2O level in ppm.
voc	xs:integer	true	false	true	This value indicates the VOC (Volatile Organic Compounds) value in ppm.

5.3.7 alarmSpeaker

This ModuleClass provides the capabilities to initiate and monitor an alarm.

Table 5.3.7-1: DataPoints of alarmSpeaker ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
tone	hd:enumTone	true	true	true	Representing the tones of the alarm (see clause 5.6.32).
light	hd:enumAlertColourCode	true	true	true	Representing the lighting mode of the alarm (see clause 5.6.5).
alarmStatus	xs:boolean	true	true	false	"True" indicates the alarm start while "False" indicates the alarm stop.

5.3.8 audioVolume

This ModuleClass provides capabilities to control and monitor volume.

Table 5.3.8-1: Actions of audioVolume

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

Table 5.3.8-2: DataPoints of audioVolume

Name	Type	Readable	Writable	Optional	Documentation
volumePercentage	xs:integer	true	true	false	The rounded percentage of the current volume in the range of [0, maxValue]. 0 percentage shall mean no sound produced.
stepValue	xs:integer	true	false	true	Step value used by the "UpVolume" and "DownVolume" actions.
maxValue	xs:integer	true	false	true	Maximum value allowed for Volume. maxValue is 100 by default if "maxValue" is not provided.
muteEnabled	xs:boolean	true	true	false	The current status of the mute enablement. "True" indicates enabled (that is, no sound), and "False" indicates not enabled (that is, sound is played).

5.3.9 autoDocumentFeeder

This ModuleClasses provides capabilities to monitor the state of autoDocumentFeeder (ADF). ADF is a feature which takes several pages and feeds the paper one page at a time into a scanner or printer, allowing the user to scan, print or fax, multiple-page documents without having to manually replace each page.

Table 5.3.9-1: DataPoints of autoDocumentFeeder ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
currentAdfState	hd:enumAdfState	true	false	false	Current state of the ADF.
adfStates	list of hd:enumAdfState	true	false	false	List of possible ADF states that are supported by the device (see clause 5.6.2).

5.3.10 battery

This ModuleClass provides capabilities to indicate the detection of low battery and gives an alarm if the triggering criterion is met. The level data point in the ModuleClass represents the current battery charge level.

Table 5.3.10-1: DataPoints of battery ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
level	xs:integer	true	false	false	The rounded percentage of the current charging level of a battery in the range of [0, 100]. 0 percentage shall mean that no charge remains.
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 charging, and "False" indicates not charging.
lowBattery	xs:boolean	true	false	true	To indicate that the battery is on a low charge level.
batteryThreshold	xs:integer	true	true	true	When a battery's "level" is less than "batteryThreshold" then "lowBattery" is set to "True". This datapoint can be used to raise an alarm, depending on the implementation.
electricEnergy	xs:integer	true	false	true	Rated electric energy. The unit of measure is ampere (A).
voltage	xs:integer	true	false	true	Rated voltage. The unit of measure is volts (V).
material	xs:string	true	false	true	The material of the cell (for example lithium ion, nickel and lead).

5.3.11 binaryObject

This ModuleClass describes the handling of a binary object (blob).

Table 5.3.11-1: DataPoints of binaryObject ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
object	xs:string	true	true	false	This data point contains the base64 encoded binary object.
objectType	xs:string	true	true	false	This data point contains the type and subtype of the binary object as a MIME type.
size	xs:integer	true	true	true	The size of the decoded binary object.
hash	xs:string	true	true	true	The hash code of the blob. If present, it is used to check the decoded content of the "object" data point for integrity. The algorithm used for generating the hash value is SHA-2 [14]. The data point contains the hash as a hex encoded value.

5.3.12 binarySwitch

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

Table 5.3.12-1: Actions of binarySwitch ModuleClass

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

Table 5.3.12-2: 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.

5.3.13 bioElectricalImpedanceAnalysis

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

Table 5.3.13-1: DataPoints of bioElectricalImpedanceAnalysis ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
water	xs:float	true	false	false	The water content measurement from the BIA. The unit of measure is percentage.
fat	xs:float	true	false	false	The fat content measurement from the BIA. The unit of measure is percentage.
muscle	xs:float	true	false	false	The muscle content measurement from the BIA. The unit of measure is percentage.
bone	xs:float	true	false	false	The bone content measurement from the BIA. The unit of measure is percentage.
visceraFat	xs:float	true	false	false	The viscera fat content measurement from the BIA. The unit of measure 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 unit of measure is ohm.

5.3.14 bodyCompositionAnalyser

This ModuleClass provides the capability to report the measurement of body composition analyser characteristics.

Table 5.3.14-1: DataPoints of body composition analyser ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
bodyLength	xs:float	true	false	true	The measurement of body length by Weight scale and Body composition analyser. The unit of measure is centimetre(cm).
Bmi	xs:float	true	false	true	The measurement of Body Mass Index (BMI) by a weight scale and a body composition analyser. The unit of measure is kg/m ² .
fatFreeMass	xs:float	true	false	true	The measurement of fat free mass by a weight scale and a body composition analyser. The unit of measure is kilogram (kg).
softLeanMass	xs:float	true	false	true	The measurement of soft lean mass by a weight scale and a body composition analyser. The unit of measure is kilogram (kg).
muscleMass	xs:float	true	false	true	The measurement of muscle mass by a weight scale and a body composition analyser. The unit of measure is kilogram (kg).
basalMetabolism	xs:float	true	false	true	The measurement of basal metabolism by a weight scale and a body composition analyser. The unit of measure is kilocalorie (kcal).
impedance	xs:float	true	false	true	The measurement of impedance by a weight scale and a body composition analyser. The unit of measure is ohm.

5.3.15 boiler

This ModuleClass provides capabilities to control the status of the boiling functionality for water heaters.

Table 5.3.15-1: DataPoints of boiler ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
status	xs:boolean	true	true	false	The status of boiling. "True" indicates boiling, "False" indicates not boiling.

5.3.16 brewing

This ModuleClass provides capabilities to control and monitor a brewing process. It is intended to be part of devices that prepare hot drinks such as a coffee or a tea.

Table 5.3.16-1: DataPoints of brewing ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
cupsNumber	xs:integer	true	true	false	The current number of the cups requested to brew.
strength	hd:enumTasteStrength	true	true	true	The current strength of the drink taste (see clause 5.6.31). A higher value indicates a stronger taste.

5.3.17 brightness

This ModuleClass provides capabilities to control and monitor the brightness of a light for example 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 5.3.17-1: DataPoints of brightness ModuleClass

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

5.3.18 clock

This ModuleClass provides capabilities to control and monitor time and date information.

Table 5.3.18-1: 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
currentTimeZone	xs:string	true	true	true	Name of current time zone according to the IANA Timezone data format (TZ) [16], for example, "America/New York"

5.3.19 clothesDryerJobMode

This ModuleClasses provides capabilities to control and monitor the job modes of a clothes dryer.

Table 5.3.19-1: DataPoints of clothesDryerJobMode ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
currentJobMode	hd:enumClothesDryerJobMode	true	true	false	Currently active job mode (see clause 5.6.7).
currentJobModeName	xs:string	true	false	true	The name of current job mode as a string. This can be used when "currentJobMode" is vendor-specific.
jobModes	list of hd:enumClothesDryerJobMode	true	false	false	List of possible job states the device supports.

5.3.20 clothesWasherJobMode

This ModuleClasses provides capabilities to control and monitor the job mode of a washer.

Table 5.3.20-1: DataPoints of clothesWasherJobMode ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
currentJobMode	hd:enumClothesWasherJobMode	true	true	false	Currently active job mode (see clause 5.6.8).
currentJobModeName	xs:string	true	true	true	The name of the current job mode as a string. This can be used when the currentJobMode is vendor-specific.
jobModes	list of hd:enumClothesWasherJobMode	true	false	false	List of possible job states that the device supports (see clause 5.6.8).

5.3.21 clothesWasherDryerJobMode

This ModuleClasses provides capabilities to control and monitor the job modes of clothesWasherDryer.

Table 5.3.21-1: DataPoints of clothesWasherDryerJobMode ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
currentJobMode	hd:enumClothesWasherDryerJobMode	true	true	false	Currently active job (see clause 5.6.8).
currentJobModeName	xs:string	true	true	true	The name of the current job mode as a string. This can be used when currentJobMode is vendor-specific.
jobModes	list of hd:enumClothesWasherDryerJobMode	true	false	false	List of possible job states the device supports (see clause 5.6.8).

5.3.22 clothesWasherJobModeOption

This ModuleClasses provides capabilities to control and monitor the washing job mode options of a washer.

Table 5.3.22-1: DataPoints of clothesWasherJobModeOption ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
washTemp	hd:enumGeneralTemperature	true	true	true	This data point represents the water temperature level (see clause 5.6.17).
soilLevel	hd:enumGeneralLevel	true	true	true	This data point represents the washing level (see clause 5.6.15).
spinSpeed	hd:enumGeneralSpeed	true	true	true	This data point represents the spin-dry speed level (see clause 5.6.16).
preWash	xs:boolean	true	true	true	This data point indicates pre-wash. "True" indicates enabled, "False" indicates disabled.
speedWash	xs:boolean	true	true	true	This data point indicates speed wash. "True" indicates enabled, "False" indicates disabled.
steamTreat	xs:boolean	true	true	true	This data point indicates steam treat. "True" indicates enabled, "False" indicates disabled.
coldWash	xs:boolean	true	true	true	This data point indicates cold wash. "True" indicates enabled, "False" indicates disabled.
extraRinse	xs:boolean	true	true	true	This data point indicates extra rinse. "True" indicates enabled, "False" indicates disabled.

5.3.23 colour

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

Table 5.3.23-1: DataPoints of colour ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
red	xs:integer	true	true	false	The value of the Red colour channel of RGB. The range is [0,255].
green	xs:integer	true	true	false	The value of the Green colour channel of RGB. The range is [0,255].
blue	xs:integer	true	true	false	The value of the Blue colour channel of RGB. The range is [0,255].

5.3.24 colourSaturation

This ModuleClass provides capabilities to control and monitor a colour saturation value.

Table 5.3.24-1: DataPoints of colourSaturation ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
colourSaturation	xs:integer	true	true	false	The status of colour saturation level. "colourSaturation" has a range of [0,100]. A "colourSaturation" value of 0 means that a device displays or produces black and white images. A "colourSaturation" value of 50 means that a device displays or produces normal colour images. A "colourSaturation" value of 100 means that a device displays or produces very colourful images.

5.3.25 cookerHoodJobMode

This ModuleClasses provides capabilities to control and monitor the job modes of a cookerHood.

Table 5.3.25-1: DataPoints of cookerHoodJobMode ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
currentJobMode	hd:enumCookerHoodJobMode	true	true	false	The currently active job mode.
currentJobModeName	xs:string	true	false	true	The name of the current job mode as a string. This can be used when currentJobMode is vendor-specific.
jobModes	list of hd:enumCookerHoodJobMode	true	false	false	List of possible job states the device supports (see clause 5.6.10).

5.3.26 credentials

This ModuleClass provides the capability to manage user credentials which allows a user to authenticate on an appliance or a server that is associated with the appliance. The authentication depends on a user login and password, or on a token. An example appliance which may include this ModuleClass is a camera.

Table 5.3.26-1: DataPoints of credentials ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
loginName	xs:string	false	true	true	The user's login name.
password	xs:string	false	true	true	The user's password.
token	xs:string	false	true	true	An authentication token, for example an OAuth token.

5.3.27 dehumidifierJobMode

This ModuleClasses provides capabilities to control and monitor the job modes of a dehumidifier device.

Table 5.3.27-1: DataPoints of dehumidifierJobMode ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
currentJobMode	hd:enumDehumidifierJobMode	true	true	false	The currently active job mode (see clause 5.6.11).
currentJobModeName	xs:string	true	false	true	The name of the current job mode as a string. This can be used when currentJobMode is vendor-specific.
jobModes	list of hd:enumDehumidifierJobMode	true	false	false	List of possible job states the device supports.

5.3.28 dishWasherJobMode

This ModuleClasses provides capabilities to control and monitor the job modes of a dishWasher.

Table 5.3.28-1: DataPoints: DataPoints of dishWasherJobMode ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
currentJobMode	hd:enumDishWasherJobMode	true	true	false	The currently active job mode.
currentJobModeName	xs:string	true	false	true	The name of the current job mode as a string. This can be used when the currentJobMode is vendor-specific.
jobModes	list of hd:enumDishWasherJobMode	true	false	false	List of possible job states the device supports (see clause 5.6.12)

5.3.29 doorStatus

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

Table 5.3.29-1: DataPoints of doorStatus ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
doorState	hd:enumDoorState	true	false	false	Current state of the door (see clause 5.6.13).
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.

5.3.30 electricVehicleConnector

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

Table 5.3.30-1: DataPoints of electricVehicleConnector ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
Status	xs:boolean	true	false	false	The status of connection. "True" means connected, "False" means not connected.
chargingCapacity	xs:integer	true	false	true	Rated charging capacity. The unit of measure is ampere hours.
dischargingCapacity	xs:integer	true	false	true	Rated discharging capacity. The unit of measure is ampere hours.

5.3.31 energyConsumption

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

Table 5.3.31-1: DataPoints of energyConsumption ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
power	xs:float	true	false	false	The power of the device. The unit of measure is Watt (W).
absoluteEnergyConsumption	xs:float	true	false	true	The absolute energy consumption, reflecting the real measurement of accumulative energy. The unit of measure is Watt-hour (Wh).
roundingEnergyConsumption	xs: integer	true	false	true	This energy consumption data is calculated by multiplying significantDigits with multiplyingFactors, and rounding down the result.
significantDigits	xs:integer	true	false	true	The number of effective digits for data.
multiplyingFactors	xs:float	true	false	true	The unit for data multiplying factors, for example 1 kWh, 0,1 kWh, 0,01 kWh, etc.
voltage	xs:float	true	false	true	The voltage of the device. The unit of measure is volts (V).
current	xs:float	true	false	true	The current of the device. The unit of measure is ampere (A).
frequency	xs:float	true	false	true	The frequency of the device. The unit of measure is hertz (Hz).
measuringScope	xs:string	true	true	true	The measuring scope of the meter, for example the whole house, a room, or a device.

5.3.32 energyGeneration

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

Table 5.3.32-1: DataPoints of energyGenerationModuleClass

Name	Type	Readable	Writable	Optional	Documentation
powerGenerationData	xs:float	true	false	true	Amount of instantaneous generation data. The unit of measure is Watt (W).
roundingEnergyGeneration	xs:integer	true	false	true	This energy consumption data is calculated by multiplying significantDigits with multiplyingFactors, and rounding down the result.
significantDigits	xs:integer	true	false	true	The number of effective digits for data.
multiplyingFactors	xs:float	true	false	true	The unit for data multiplying factors, for example 1 kWh, 0,1 kWh, 0,01 kWh, etc.
generationSource	xs:string	true	true	false	The type of generating source.

5.3.33 faultDetection

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

Table 5.3.33-1: DataPoints of faultDetection ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
status	xs:boolean	true	false	false	The status of fault detection.
code	xs:integer	true	false	true	The numeric representation of the fault.
description	xs:string	true	false	true	The message representation of the fault.

5.3.34 filterInfo

This ModuleClass is for monitoring filter information of a device.

Table 5.3.34-1: DataPoints of filterInfo ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
usedTime	xs:integer	true	false	false	The cumulative used time in seconds of a filter.
needsReplacement	xs:boolean	true	false	true	This value indicates that the filter needs to be replaced.
filterLifetime	xs:integer	true	false	true	Percentage life time remaining for the water filter.

5.3.35 foaming

This ModuleClass provides capabilities to control and monitor desired parameters of foam e.g. for foaming milk. It is initially intended to be part of a device that prepare drinks with milk (for example a coffee machine or hot chocolate machine).

Table 5.3.35-1: DataPoints of foaming ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
foamingStrength	hd:enumFoamStrength	true	true	false	The current strength of foamed milk. A higher value indicates more foamed milk (see clause 5.6.14)

5.3.36 geoLocation

This ModuleClass provides the capability to get or set geo-location information.

Table 5.3.36-1: DataPoints of geoLocation ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
latitude	xs:float	true	true	false	The current latitude part of a geo-location. The unit of measures is degrees.
longitude	xs:float	true	true	false	The current longitude part of a geo-location. The unit of measures is degrees.
altitude	xs:float	true	true	true	The optional current altitude part of a geo-location. The unit of measures is meters.
heading	xs:float	true	true	true	The azimuth of a device measured in degrees to true north. North is 0,0°, east is 90,0°, south is 180,0°, west is 270,0°. A negative value indicates an unknown heading.
horizontalAccuracy	xs:float	true	false	true	The optional current horizontal accuracy of the geo-location. The unit of measures is meters and describes a radius around the latitude/longitude coordinate.
verticalAccuracy	xs:float	true	false	true	The optional current vertical accuracy of the altitude. The unit of measures is meters.
headingAccuracy	xs:float	true	false	true	The optional current maximum deviation between the heading and the true geomagnetic heading. The unit of measures is degrees.
targetLatitude	xs:float	true	true	true	The optional target latitude part of a geo-location. This can be used to move a device to a new location. The unit of measures is degrees.
targetLongitude	xs:float	true	true	true	The optional target longitude part of a geo-location. This can be used to move a device to a new location. The unit of measures is degrees.
targetAltitude	xs:float	true	true	true	The optional target altitude part of a geo-location. This can be used to move a device to a new altitude. The unit of measures is meters.

5.3.37 glucometer

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

Table 5.3.37-1: DataPoints of glucometer ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
concentration	xs:float	true	false	false	The measurement of concentration by Glucometer. The unit of measure is mg/dl.
hba1c	xs:float	true	false	true	The measurement of HbA1c by Glucometer. The unit of measure is percentage.
contextExercise	xs:float	true	false	true	The measurement of context exercise by Glucometer. The unit of measure is percentage.
contextMedication	xs:float	true	false	true	The measurement of context medication by Glucometer. The unit of measure is mg/dl.
contextCarbohydratesAmount	xs:float	true	false	true	The measurement of context carbohydrates by Glucometer. The unit of measure is gram (g).
contextCarbohydratesSource	xs:string	true	false	true	The timing of meals (for example "breakfast carbohydrates").
contextMeal	xs:string	true	false	true	The style of meals (for example "casual").
contextLocation	xs:string	true	false	true	The body location where the Glucometer is worn (for example "finger").
contextTester	xs:string	true	false	true	The test style (for example "self").
contextHealth	xs:string	true	false	true	The severity of symptoms (for example "minor").

5.3.38 grinder

This ModuleClass is for controlling a grinder, for example in a coffee machine.

Table 5.3.38-1: DataPoints of grinder ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
useGrinder	xs:boolean	true	true	false	The current status of the grinder enablement. "True" indicates enabled, and "False" indicates disabled.
coarseness	hd:enumGrindCoarseness	true	true	true	The wished coarseness of the solid supplies after grinding, for example for coffee beans (see clause 5.6.19).
grainsRemaining	hd:enumGrainsLevel	true	false	true	The level of remaining grains in a machine having a grinder, for example for remaining coffee beans in the coffee machine grinder (see clause 5.6.18).

5.3.39 heatingZone

This ModuleClass provides the capabilities to monitor the status of the heating zone, for example for a cooktop.

Table 5.3.39-1: DataPoints of heatingZone ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
heatingLevel	xs:integer	true	false	false	The current heating level of the zone. The value range is from 0 (indicating that the zone is not heating) up to the maxHeatingLevel.
maxHeatingLevel	xs:integer	true	false	false	The maximum value allowed for the heating level of the zone.

5.3.40 height

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

Table 5.3.40-1: DataPoints of height ModuleClass

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

5.3.41 hotWaterSupply

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

Table 5.3.41-1: DataPoints of hotWaterSupply ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
bath	xs:boolean	true	true	true	The status of whether a bath tub is filled.

5.3.42 impactSensor

This ModuleClass describes the capabilities on an impact sensor. The impact is a high force or shock over a short time period and the impactSensor detects this.

Table 5.3.42-1: DataPoints of impactSensor ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
impactStatus	xs:boolean	true	false	false	The "impactStatus" indicates as follows: "True" means that a physical impact is detected, "False" means indicates a normal status (no impact detected).
impactLevel	xs:float	true	false	true	The "impactLevel" provides the level of impact. The unit of measure is "g" (G-force).
impactDirectionHorizontal	xs:float	true	false	true	The "impactDirection" indicates the horizontal direction where the impact comes from. The value is 0° to 360°. 0 is the front of the sensor and with clockwise increment.
impactDirectionVertical	xs:float	true	false	true	The "impactDirection" indicates the vertical direction where the impact comes from. The value is 0° to 360°. 0 is the front of the sensor and with upward increment.

5.3.43 keepWarm

This module allows to control the 'keep warm' feature in devices like coffee machines, kettles, etc. It allows to keep water warm for a desired time. This ModuleClass inherits from binarySwitch (see clause 5.3.12) to store setting for the 'keep warm' feature. If the "powerState" data point in a keepWarmSwitch is "True" then the 'keep warm' function will be performed just after boiling (or heating) process is finished (otherwise this function will not be applied).

Table 5.3.43-1: DataPoints of keepWarm ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
time	xs:integer	true	true	true	The desired duration of 'keep water warm' function. It indicates how long water shall be kept warm, for example after the boiling in a kettle. The value indicates a time expressed in minutes.

5.3.44 keypad

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

Table 5.3.44-1: DataPoints of keypad ModuleClass

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

5.3.45 liquidLevel

This ModuleClass provides the desired level of water (or other liquid) for an appliance, for example the desired level of milk for a cup of coffee from a coffee machine.

Table 5.3.45-1: DataPoints of liquidLevel ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
liquidLevel	hd:enumLiquidLevel	true	true	false	The desired level of water or other liquid, for example the desired level of milk in a cup of coffee (see clause 5.6.22).

5.3.46 liquidRemaining

This ModuleClass provides the status of water level (or other liquid) for an appliance, for example the level of remaining milk in a coffee machine.

Table 5.3.46-1: DataPoints of liquidRemaining ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
liquidRemaining	hd:enumLiquidLevel	true	false	false	The remaining level of water or other liquid in an appliance (see clause 5.6.22).

5.3.47 lock

This ModuleClass provides the function to lock and unlock an object.

Table 5.3.47-1: DataPoints of lock ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
lock	xs:boolean	true	true	false	"True" indicates the object is locked, while "False" indicates the object is not locked.

5.3.48 mediaSelect

This ModuleClass provides capabilities to control and monitor media input and output of device such as TV or SetTopBox.

Table 5.3.48-1: DataPoints of mediaSelect ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
mediaID	xs:integer	true	true	false	The numeric index of the activated media in the supported media sources list "supportedMediaSources".
supportedMediaSources	list of hd:enumSupportedMediaSource	true	false	false	List of supported input or output media for the given device (see clause 5.6.30).
mediaName	xs:string	true	false	true	Specifies a pre-defined media input or output.
status	xs:boolean	true	false	true	Specifies whether the specific media instance is selected ("True") or not ("False").
mediaType	hd:enumSupportedMediaSource	true	false	false	Specifies the type of the media (see clause 5.6.30).

5.3.49 motionSensor

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

Table 5.3.49-1: 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 a motionSensor restrains from sending an alarm in case continuous motions are detected after one alarm is produced. This data point can be used to avoid repeated alarm reports. The unit of measure is seconds.
sensitivity	xs:integer	true	true	true	The level of the detection accuracy of the motion sensor. This data point can be used to control the number of the report.

5.3.50 numberValue

This ModuleClass provides the capabilities to represent a number. It also has capabilities for controlled increment and decrement a counter. It can be used to present a number-related functionality in a technology where there is only a weak semantic specification of that functionality.

Table 5.3.50-1: Actions of numberValue ModuleClass

Return Type	Name	Argument	Optional	Documentation
none	decrementNumberValue	none	true	Decrement the "numberValue" by the value of "step", down to the value of "minimum".
none	incrementNumberValue	none	true	Increment the "numberValue" by the value of "stepValue", up to the value of "maxValue".
none	resetNumberValue	none	true	Reset the "numberValue" to its "defaultValue".

Table 5.3.50-2: DataPoints of numberValue ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
numberValue	xs:float	true	true	false	The actual value of the number.
minValue	xs:float	true	true	true	The optional minimum value of the number. The default is the system-specific minimum value for a float value.
maxValue	xs:float	true	true	true	The optional maximum value of the number. The default is the system-specific maximum value for a float value.
defaultValue	xs:float	true	true	true	The optional default value for the number. The default is 0,0.
step	xs:float	true	true	true	The optional step size for controlled increment and decrement. The default is 1,0, even when this data point is not implemented.

5.3.51 openLevel

This ModuleClass provides the capabilities to control and monitor the open status of an entity, for example a curtain.

Table 5.3.51-1: Actions of openLevel ModuleClass

Return Type	Name	Argument	Optional	Documentation
none	open	None	true	Increase the open level by the amount of the "stepValue" up to the "maxLevel".
none	close	None	true	Decrease the open level by the amount of the "stepValue" down to the "minLevel".

Table 5.3.51-2: DataPoints of openLevel ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
openLevel	xs:integer	true	true	false	The rounded percentage of the current open level of entity in the range of [0, 100]. 0 percentage shall mean the entity is closed.
stepValue	xs:integer	true	true	true	The step value used by the "open" and "close" actions.
minLevel	xs:integer	true	true	true	The minimum value allowed for the "openLevel" status. The default value is 0, which means fully closed.
maxLevel	xs:integer	true	true	true	The maximum value allowed for the "openLevel" status. The default value is 100, which means fully opened.

5.3.52 operationMode

This ModuleClasses provides capabilities to control or monitor the operation mode of appliances.

Table 5.3.52-1: DataPoints of operationMode ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
startPause	xs:boolean	true	true	false	A value of "True" triggers or starts an operation, and "False" pauses the operation.

5.3.53 overcurrentSensor

This ModuleClass provides capabilities for an over-current sensor.

Table 5.3.53-1: DataPoints of overcurrentSensor ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
overcurrentStatus	xs:boolean	true	false	false	The overcurrentStatus indicates as follows: "True" indicates that an over-current is detected, and "False" indicates a normal status, this means that an over-current is not detected.
detectedTime	m2m:time stamp	true	false	true	The time when the over-current was detected.
duration	xs:float	true	false	true	The duration of the detected over-current. The unit of measure is "ms".

5.3.54 oximeter

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

Table 5.3.54-1: DataPoints of oximeter ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
oxygenSaturation	xs:integer	true	false	false	The measurement of oxygensaturation by Oximeter. The unit of measure is in percentage.

5.3.55 ozoneMeter

This ModuleClass provides capabilities for an ozone meter. The "ozoneValue..." attributes are optional, but one of them SHALL be provided.

Table 5.3.55-1: DataPoints of ozoneMeter ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
ozoneValuePPM	xs:float	true	false	true	The unit of measure of ozone measurement is "ppm".
ozoneValueMG	xs:float	true	false	true	The unit of measure of ozone measurement is "mg/m ³ ".
ozoneStatus	hd:enumOzoneStatus	true	false	true	The ozoneStatus indicates the level of ozone status. (See clause 5.6.24).
maxValue	xs:float	true	false	true	The mazimum value shows the measurement range of the ozone meter (for example maxValue = 5 means the range is 0 to 5 ppm). This attribute is only used that the ozoneMeter provides "ppm" value.

5.3.56 phoneCall

This ModuleClass provides the capability get or set the caller and recipient IDs as well as to initiate and terminate a call.

Table 5.3.56-1: Actions of phoneCall ModuleClass

Return Type	Name	Argument	Optional	Documentation
none	call	none	true	Initiate an outgoing call.
none	answer	none	true	Answer (pickup) an incoming call.
none	hangup	none	true	Hangup an established call.

Table 5.3.56-2: DataPoints of phoneCall ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
callerID	xs:string	true	true	false	This data point represents the initiating caller identification of a call. In case of an outgoing call this would be the local line ID. This data point is optional. When it is empty for an incoming call, then the caller ID is unknown. When it is empty for an outgoing call, then it is expected that it is set by the PBX or the operator. The format of caller ID is not specified here.
recipientID	xs:string	true	true	false	This data point represents the receiving caller identification of a call. In case of an incoming call this would be the local line ID and optionally extension. The format of caller ID is not specified here.
callState	hd:enumCallState	true	false	true	This data point represents the current state of an associated phone device regarding calls.

5.3.57 playerControl

This ModuleClass provides capabilities to control and monitor the operational modes of a media player functionality.

Table 5.3.57-1: Actions of playerControl ModuleClass

Return Type	Name	Argument	Optional	Documentation
none	nextTrack	none	true	Go forward to a next chapter, section or similar marker in the media.
none	previousTrack	none	true	Go back to a previous chapter, section or similar marker in the media.

Table 5.3.57-2: DataPoints of playerControl ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
currentPlayerMode	hd:enumPlayerMode	true	true	false	The current mode of the player.
currentPlayerModeName	xs:string	true	false	true	Name of current player mode in string. This can be used when "currentPlayerMode" is vendor-specific.
supportedPlayerModes	list of hd:enumPlayerMode	true	false	false	List of supported modes for a player.
speedFactor	xs:float	true	true	true	The optional factor of speeding up or slowing down playback, rewind or fast forward.

5.3.58 powerSave

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

Table 5.3.58-1: 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.

5.3.59 printQueue

This ModuleClass provides the capabilities for monitoring printing list information.

Table 5.3.59-1: DataPoints of printQueue ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
uri	list of xs:uri	true	false	false	The URI of the printing file. The URI could be "file://www.example.com/file.extension".
printingState	list of hd:enumJobState	true	false	false	The printingState is indicating the status of the printing file.

5.3.60 pulsemeter

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

Table 5.3.60-1: DataPoints of pulsemeter ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
pulseRate	xs:float	true	false	false	The measurement of pulserate by pulsemeter. The unit of measure is in beats per minute.
rr	xs:float	true	false	true	The measurement of RR interval by pulsemeter. The unit of measure is millisecond (ms).
energy	xs:float	true	false	true	The measurement of energy by pulsemeter. The unit of measure is kilocalorie per hour.
modality	xs:string	true	false	true	The modality of a particular SpO2 measurement.

5.3.61 pushButton

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

Table 5.3.61-1: DataPoints of pushButton ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
pushed	xs:boolean	true	false	false	This data point indicates the press of the button.

5.3.62 recorder

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

Table 5.3.62-1: 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 unit of measure is seconds.

5.3.63 refrigeration

This ModuleClass provides capabilities for a refrigeration function.

Table 5.3.63-1: DataPoints of refrigeration ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
rapidFreeze	xs:boolean	true	True	true	Controls the rapid freeze capability. "True" indicates active, "False" indicates inactive.
rapidCool	xs:boolean	true	True	true	Controls the rapid cool capability. "True" indicates active, "False" indicates inactive.
defrost	xs:boolean	true	True	true	Controls the defrost cycle. "True" indicates active, "False" indicates inactive.

5.3.64 relativeHumidity

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

Table 5.3.64-1: DataPoints of relativeHumidity ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
relativeHumidity	xs:float	true	false	false	The measurement of the relative humidity value; the unit of measure is percentage.
desiredHumidity	xs:float	true	true	true	Desired value for humidity. This data point indicates the desired humidity.

5.3.65 remoteControlEnable

This ModuleClasses provides capabilities to monitor the remote controllability of the appliance.

Table 5.3.65-1: DataPoints of remoteControlEnable ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
remoteControlEnabled	xs:boolean	true	false	false	This data point enables or disables remote controllability and is set by a user locally. "True" indicates enabled remote access, and "False" indicates disabled remote access.

5.3.66 robotCleanerJobMode

This ModuleClasses provides capabilities to control and monitor the job modes of a robotCleaner.

Table 5.3.66-1: DataPoints of robotCleanerJobMode ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
currentJobMode	hd:enumRobotCleanerJobMode	true	true	false	Currently active job mode (see clause 5.6.26).
currentJobModeName	xs:string	true	false	true	Name of current job mode as a string. This can be used when "currentJobMode" is vendor-specific.
jobModes	list of hd:enumRobotCleanerJobMode	true	false	false	List of possible job states the device supports (see clause 5.6.26).

5.3.67 runState

This ModuleClasses provides capabilities to control and the monitor machine state of appliances.

Table 5.3.67-1: DataPoints of runState ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
currentMachineState	hd:enumMachineState	true	true	false	The currently active machine state (see clause 5.6.23).
machineStates	list of hd:enumMachineState	true	false	false	A list of possible machine states the device supports (see clause 5.6.23).
currentJobState	hd:enumJobState	true	false	true	The currently active job state at the level of some transaction being executed by the device (see clause 5.6.21).
jobStates	list of hd:enumJobState	true	false	true	The list of possible job states that the device supports (see clause 5.6.21).
progressPercentage	xs:float	true	false	true	The indication of current job progress in percentage.

5.3.68 securityMode

This ModuleClass provides capabilities to control and monitor a security mode.

Table 5.3.68-1: DataPoints of securityMode ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
currentSecurityMode	hd:enumSecurityMode	true	true	false	Current security mode (see clause 5.6.27).
securityModes	list of hd:enumSecurityMode	true	false	false	List of possible security modes the device supports (see clause 5.6.27).

5.3.69 sessionDescription

This ModuleClass provides the capabilities for a sessionDescription containing a URL at which the specified media can be accessed and the definition of media using SDP.

Table 5.3.69-1: DataPoints of mediaType ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
url	xs:uri	true	false	true	A URL at which the specified media can be accessed.
sdp	xs:string	true	false	true	Media description using SDP. One or more comma separated multiple SDP lines (SDP media or attribute line) can be included using SDP description syntax as defined in the SDP specification in IETF RFC 4566 [15].

5.3.70 signalStrength

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

Table 5.3.70-1: 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.

5.3.71 smokeSensor

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

Table 5.3.71-1: DataPoints of smokeSensor ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
alarm	xs:boolean	true	false	false	The alarm is indicated as follows: "True" indicates that smoke has been detected, "False" indicates a normal status, that means that smoke is not detected.
detectedTime	m2m:timestamp	true	true	true	The date and time the smoke is detected.
smokeThreshold	xs:integer	true	true	true	The Threshold to trigger the alarm. The unit of measure is ppm.
currentValue	xs:integer	true	false	true	The current data value of the smoke sensor.

5.3.72 sphygmomanometer

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

Table 5.3.72-1: DataPoints of sphygmomanometer ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
diastolicPressure	xs:float	true	false	false	The measurement of diastolic pressure by sphygmomanometer. The unit of measure is millimetre of mercury (mmHg).
systolicPressure	xs:float	true	false	false	The measurement of systolic pressure by sphygmomanometer. The unit of measure is millimetre of mercury (mmHg).
meanPressure	xs:float	true	false	false	The measurement of mean arterial pressure by sphygmomanometer. The unit of measure is millimetre of mercury (mmHg).

5.3.73 spinLevel

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

Table 5.3.73-1: DataPoints of spinLevel ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
spinLevelStrength	hd:enumSpinLevelStrength	true	true	false	The value of spin-dry level (see clause 5.6.28). A higher value indicates a higher spin level.

5.3.74 steamClosetJobMode

This ModuleClass provides capabilities to control and monitor the job modes of steamCloset.

Table 5.3.74-1: DataPoints of steamClosetJobMode ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
currentJobMode	hd:enumSteamClosetJobMode	true	true	false	Currently active job mode (see clause 5.6.29).
currentJobModeName	xs:string	true	false	true	Name of current job mode as a string. This can be used when "currentJobMode" is vendor-specific.
jobModes	list of hd:enumSteamClosetJobMode	true	false	false	List of possible job states the device supports (see clause 5.6.29).

5.3.75 televisionChannel

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

Table 5.3.75-1: 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 5.3.75-2: DataPoints of televisionChannel ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
channelNumber	xs:integer	true	true	false	Current channel number.
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.
channelName	xs:string	true	false	true	Current human-friendly channel name in string, for example 'CNN'.

5.3.76 temperature

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

Table 5.3.76-1: 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 of measure 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".

5.3.77 temperatureAlarm

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

Table 5.3.77-1: DataPoints of temperatureAlarm ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
alarm	xs:boolean	true	false	false	This data point indicates the status of detection of an abnormal temperature. "True" indicates an abnormal temperature, "False" indicates a normal temperature.
temperature	xs:float	true	false	true	To report the value of the temperature. The unit of measure is Celsius (C).
temperatureThreshold	xs:integer	true	true	true	The threshold to trigger the alarm.

5.3.78 textMessage

This ModuleClass provides capabilities to set and get a text message.

Table 5.3.78-1: Actions of textMessage ModuleClass

Return Type	Name	Argument	Optional	Documentation
none	resetTextMessage	none	true	Reset the receiver of the message to the "defaultValue".

Table 5.3.78-2: DataPoints of textMessage ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
textMessage	xs:string	true	true	false	The current message value.
supportedMessageValues	list of xs:string	true	false	true	List of supported values for the message. Each of the values in this list shall be URL-encoded. An encoded value shall not contain white spaces.
minLength	xs:integer	true	false	true	The optional minimum length in characters of the message. The default is 0.
maxLength	xs:integer	true	false	true	The optional maximum length in characters of the message. The default is unlimited.
messageEncoding	xs:string	true	false	true	The optional expected method for character encoding of the message. The default is "UTF-8".
defaultValue	xs:string	true	true	true	The optional default value for "textMessage". The default is an empty string.

5.3.79 timer

This ModuleClass provides capabilities to monitor and control the times when the appliance executes its operations, that means when it starts, when it ends, etc.

Table 5.3.79-1: 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 5.3.79-2: DataPoints of timer ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
referenceTimer	xs:integer	true	false	true	A timer (for example, 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 time since the boot of its connectivity node).
targetTimeToStart	xs:integer	true	true	true	A time span (for example 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 time span (for example 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 (for example a time-based value, App Defined Epoch, Progressive) expressed in seconds. The value indicates the time to the end of an appliance's operations. It is calculated at runtime by the device itself during the execution of its operation.
runningTime	xs:integer	true	false	true	A timer (for example a time-based value, App Defined Epoch, Progressive) expressed in seconds. It indicates the time of the current operation. Usually its value is increasing one value per second. It starts counting from 0 when the operation starts and stops counting when the operation ends.
targetDuration	xs:integer	true	false	true	A time span (for a time-based value, App Defined Epoch, Fixed) expressed in seconds. The value indicates a time that represents 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.

5.3.80 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 devices which use turbo function such as an air conditioner, a washing machine, etc.

Table 5.3.80-1: 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.

5.3.81 uvSensor

This ModuleClass describes the capabilities of an ultraviolet sensor.

Table 5.3.81-1: DataPoints of uvSensor ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
uvValue	xs:float	true	false	false	The unit of measure of the UV intensity of radiation is "mW/cm ² ".
uvStatus	hd:enum UvStatus	true	false	true	The "uvStatus" indicates the level of the UV radiation status (see clause 5.6.33).

5.3.82 waterFlow

This ModuleClass provides capabilities for controlling the water strength of a device.

Table 5.3.82-1: DataPoints of waterFlow ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
waterLevelStrength	hd:enumWaterFlowStrength	true	true	false	The desired level of water flow (see clause 5.6.35). A higher value indicates higher water flow.

5.3.83 waterSensor

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

Table 5.3.83-1: DataPoints of waterSensor ModuleClass

Name	Type	Readable	Writable	Optional	Documentation
alarm	xs:boolean	True	false	false	The detection of water. The alarm is indicated as follows: "True" indicates that water has been detected, "False" indicates a normal status, that means that water is not detected.

5.3.84 weight

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

Table 5.3.84-1: 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).

5.4 SubDevice models

5.4.1 subDeviceCuff

A cuff is a subDevice that expresses the attachment device for measuring blood pressure.

Table 5.4.1-1: Modules of subDeviceCuff model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	true	See clause 5.3.12.
sphygmomanometer	sphygmomanometer	false	See clause 5.3.72.
pulsemeter	pulsemeter	false	See clause 5.3.60.

5.4.2 subDevicePowerOutlet

A powerOutlet is a subDevice that specifies the attachment device for deviceSmartPlug.

Table 5.4.2-1: Modules of subDevicePowerOutlet model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	true	See clause 5.3.12.
energyConsumption	energyConsumption	true	See clause 5.3.31.
overcurrentSensor	overcurrentSensor	true	See clause 5.3.53.
dimmingLevel	numberValue	true	See clause 5.3.50. This provides the capability to change the energy.

5.5 Device models

5.5.1 device3DPrinter

A 3D printer is a smart home appliance to provide 3D printing capabilities.

Table 5.5.1-1: Modules of device3DPrinter Device model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.
faultDetection	faultDetection	true	See clause 5.3.33.
3Dprinter	3Dprinter	false	See clause 5.3.1.
runState	runState	false	See clause 5.3.67.
temperature	temperature	false	See clause 5.3.76. This value of "currentTemperature" in this module instance represents the temperature of the nozzle. This value SHALL be a float number in a range from 0,0 to 1 000,0.
printQueue	printQueue	false	See clause 5.3.59.

5.5.2 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 5.5.2-1: Modules of deviceAirConditioner Device model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.
runState	runState	true	See clause 5.3.67.
airConJobMode	airConJobMode	true	See clause 5.3.1.
airConOperationMode	operationMode	true	See clause 5.3.52. This module instance is used to trigger an airCon operation that is pre-set in "airConJobMode". If this data point is not present, then the air conditioner's job mode can be triggered by setting the "airConJobMode".
airCleanOperationMode	operationMode	true	See clause 5.3.52. This module instance is used to trigger airClean operation.
temperature	temperature	true	See clause 5.3.76.
timer	timer	true	See clause 5.3.79.
sleepTimer	timer	true	See clause 5.3.79. The sleep function, which is vendor-specific algorithm (for example increasing the temperature by one degree for every 30 minutes), is triggered instantly when "targetDuration" is set, and it indicates the time to the end of appliance operation. It is set at runtime by a user application.
turbo	turbo	true	See clause 5.3.80.
airFlow	airFlow	true	See clause 5.3.4.
powerSave	powerSave	true	See clause 5.3.58.
airQualitySensor	airQualitySensor	true	See clause 5.3.6.
filterInfo	filterInfo	true	See clause 5.3.34.

5.5.3 deviceAirPurifier

An airPurifier is a home appliance is used to prevent dust and other particles from air by filtering, washing or electrostatic precipitation. This airPurifier information model provides capabilities to control and monitor airPurifier specific functions and resources.

Table 5.5.3-1: Modules of deviceAirPurifier Device model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.
runState	runState	true	See clause 5.3.67.
airPurifierJobMode	airPurifierJobMode	true	See clause 5.3.5.
airPurifierOperationMode	operationMode	true	See clause 5.3.52. This module instance is used to trigger the airPurifier operation.
timer	timer	true	See clause 5.3.79.
powerSave	powerSave	true	See clause 5.3.58.
airQualitySensor	airQualitySensor	true	See clause 5.3.6.
filterInfo	filterInfo	true	See clause 5.3.34.

5.5.4 deviceAirQualityMonitor

An air quality monitor is a home appliance for monitoring the air quality. This airQualityMonitor information model provides capabilities to monitor the airQualityMonitor functions and resources.

Table 5.5.4-1: Modules of deviceAirQualityMonitor Device model

Module Instance Name	Module Class Name	Optional	Description
airQualitySensor	airQualitySensor	false	See clause 5.3.6.

5.5.5 deviceAudioReceiver

An audio receiver is a device that receives audio signals from a number of sources, processing them to drive speakers.

Table 5.5.5-1: Modules of deviceAudioReceiver model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.
audioVolume	audioVolume	false	See clause 5.3.8.
mediaInput	mediaSelect	true	See clause 5.3.48.
mediaOutput	mediaSelect	true	See clause 5.3.48.

5.5.6 deviceBloodPressureMonitor

A blood pressure monitor is a device that can be used to monitor the blood pressure and is composed of one or more cuffs and a main monitor machine.

Table 5.5.6-1: Modules of deviceBloodPressureMonitor Device model

Module Instance Name	Module Class Name	Optional	Description
battery	battery	false	See clause 5.3.10
binarySwitch	binarySwitch	true	See clause 5.3.12

Table 5.5.6-2: Subdevice of deviceBloodPressureMonitor Device model

Subdevice Instance Name	Subdevice Name	Optional	Description
cuff0	subDeviceCuff	false	See clause 5.4.1
cuff1	subDeviceCuff	true	See clause 5.4.1
cuff2	subDeviceCuff	true	See clause 5.4.1
cuff3	subDeviceCuff	true	See clause 5.4.1
cuff4	subDeviceCuff	true	See clause 5.4.1
cuff5	subDeviceCuff	true	See clause 5.4.1

5.5.7 deviceCamera

A camera is an optical instrument for recording or capturing images, which may be stored locally or transmitted to another location.

Table 5.5.7-1: Modules of deviceCamera Device model

Module Instance Name	Module Class Name	Optional	Description
sessionDescription	sessionDescription	false	See clause 5.3.69.
playerControl	playerControl	true	See clause 5.3.57.
motionSensor	motionSensor	true	See clause 5.3.49.

5.5.8 deviceClothesDryer

A clothes dryer is a home appliance for drying clothes. This clothesDryer information model provides capabilities to control and monitor clothes dryer specific functions and resources.

Table 5.5.8-1: Modules of deviceClothesDryer Device model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.
runState	runState	true	See clause 5.3.67.
clothesDryerJobMode	clothesDryerJobMode	true	See clause 5.3.19.
clothesDryerOperationMode	operationMode	true	See clause 5.3.52. This module instance is used to trigger the clothesDryer operation.

5.5.9 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 5.5.9-1: Modules of deviceClothesWasher Device model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.
clothesWasherOperationMode	operationMode	true	See clause 5.3.52.
runState	runState	false	See clause 5.3.67.
clothesWasherJobMode	clothesWasherJobMode	false	See clause 5.3.20.
clothesWasherJobModeOption	clothesWasherJobModeOption	true	See clause 5.3.22.
remoteControlEnable	remoteControlEnable	true	See clause 5.3.65.
timer	timer	true	See clause 5.3.79.

5.5.10 deviceClothesWasherDryer

A clothes washer dryer is a home appliance that is a combination of cloth washer and cloth dryer in a single cabinet. This information model provides capabilities to interact with specific functions and resources of clothes washers and dryers.

Table 5.5.10-1: Modules of deviceClothesWasherDryer Device model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.
clothesWasherDryerOperation Mode	operationMode	true	See clause 5.3.52.
runState	runState	false	See clause 5.3.67.
clothesWasherDryerJobMode	clothesWasherDryerJobMode	false	See clause 5.3.21.
clothesWasherJobModeOption	clothesWasherJobModeOption	true	See clause 5.3.22.
remoteControlEnable	remoteControlEnable	true	See clause 5.3.65.
timer	timer	true	See clause 5.3.79.

5.5.11 deviceCoffeeMachine

A coffee machine is a device that is used to brew a coffee, may add foamed milk, and may include some variants, for example a grinder.

Table 5.5.11-1: Modules of deviceCoffeeMachine Device model

Module Instance Name	Module Class Name	Optional	Description
faultDetection	faultDetection	true	See clause 5.3.33.
runState	runState	true	See clause 5.3.67.
clock	clock	true	See clause 5.3.18.
brewing	brewing	false	See clause 5.3.16.
waterStatus	liquidRemaining	true	See clause 5.3.46.
milkStatus	liquidRemaining	true	See clause 5.3.46.
grinder	grinder	true	See clause 5.3.38.
milkFoaming	foaming	true	See clause 5.3.35.
milkQuantity	liquidLevel	true	See clause 5.3.45.
brewingSwitch	binarySwitch	false	See clause 5.3.12.
keepWarm	keepWarm	true	See clause 5.3.43.

5.5.12 deviceCookerHood

A cooker hood is a device containing a mechanical fan that hangs above the stove or cooktop in the kitchen.

Table 5.5.12-1: Modules of deviceCookerHood model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.
runState	runState	true	See clause 5.3.67.
airFlow	airFlow	true	See clause 5.3.4.
cookerHoodJobMode	cookerHoodJobMode	true	See clause 5.3.25.

5.5.13 deviceCooktop

A cooktop is a device that is a kitchen appliance designed for the purpose of cooking food.

Table 5.5.13-1: Modules of deviceCooktop model

Module Instance Name	Module Class Name	Optional	Description
heatingZone0	heatingZone	false	See clause 5.3.39.
heatingZone1	heatingZone	true	See clause 5.3.39.
heatingZone2	heatingZone	true	See clause 5.3.39.
heatingZone3	heatingZone	true	See clause 5.3.39.
heatingZone4	heatingZone	true	See clause 5.3.39.
heatingZone5	heatingZone	true	See clause 5.3.39.

5.5.14 deviceDehumidifier

A dehumidifier is a device that is used to monitor or control the state of a dehumidifying appliance.

Table 5.5.14-1: Modules of deviceDehumidifier Device model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.
relativeHumidity	relativeHumidity	true	See clause 5.3.64.
runState	runState	true	See clause 5.3.67.
dehumidifierJobMode	dehumidifierJobMode	true	See clause 5.3.27.
dehumidifierOperationMode	operationMode	true	See clause 5.3.52. This module instance is used to trigger dehumidifier operation.
Timer	timer	true	See clause 5.3.79.
powerSave	powerSave	true	See clause 5.3.58.

5.5.15 deviceDishWasher

A dish washer is a home appliance used to wash dishes. This information model provides capabilities to interact with specific functions and resources of a dish washer.

Table 5.5.15-1: Modules of deviceDishWasher Device model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.
runState	runState	true	See clause 5.3.67.
dishWasherJobMode	dishWasherJobMode	true	See clause 5.3.28.

5.5.16 deviceDoor

A deviceDoor is a device that is used to open and close a door.

Table 5.5.16-1: Modules of deviceDoor model

Module Instance Name	Module Class Name	Optional	Description
openLevel	openLevel	true	See clause 5.3.51.
doorlock	lock	true	See clause 5.3.47.
doorStatus	doorStatus	true	See clause 5.3.28.

5.5.17 deviceDoorLock

A door lock is a device that can be used to lock, for example, a door.

Table 5.5.17-1: Modules of deviceDoorLock Device model

Module Instance Name	Module Class Name	Optional	Description
doorLock	lock	false	See clause 5.3.47.
doorStatus	doorStatus	true	See clause 5.3.28.
battery	battery	true	See clause 5.3.10.

5.5.18 deviceElectricVehicleCharger

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

Table 5.5.18-1: Modules of deviceElectricVehicleCharger Device model

Module Instance Name	Module Class Name	Optional	Description
faultDetection	faultDetection	false	See clause 5.3.33.
binarySwitch	binarySwitch	false	See clause 5.3.12.
runState	runState	false	See clause 5.3.67.
battery	battery	false	See clause 5.3.10.
electricVehicleConnector	electricVehicleConnector	false	See clause 5.3.30.

5.5.19 deviceFan

A fan is a device that is used to monitor or control the state of a fanning device.

Table 5.5.19-1: Modules of deviceFan model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.

5.5.20 deviceFoodProbe

A food probe is a device that is used to measure the internal temperature of food.

Table 5.5.20-1: Modules of deviceFoodProbe model

Module Instance Name	Module Class Name	Optional	Description
temperature	temperature	false	See clause 5.3.76.

5.5.21 deviceFreezer

A freezer is a large container like a fridge in which the temperature is kept below freezing point, so that food can be stored inside of it for long periods. This freezer information model provides capabilities to monitor freezer specific functions and resources.

Table 5.5.21-1: Modules of deviceFreezer Device model

Module Instance Name	Module Class Name	Optional	Description
temperature	temperature	false	See clause 5.3.76.

5.5.22 deviceGlucosemeter

A glucometer is a device that can be used to monitor the blood glucose level.

Table 5.5.22-1: Modules of deviceGlucoseMeter Device model

Module Instance Name	Module Class Name	Optional	Description
glucometer	glucometer	false	See clause 5.3.37.
battery	battery	false	See clause 5.3.10.

5.5.23 deviceHeartRateMonitor

A heart rate monitor is a device that can be used to monitor the heart rate.

Table 5.5.23-1: Modules of deviceHeartRateMonitor Device model

Module Instance Name	Module Class Name	Optional	Description
pulsemeter	pulsemeter	false	See clause 5.3.60.
battery	battery	false	See clause 5.3.10.

5.5.24 deviceHomeCCTV

A home CCTV is a smart home appliance to provide monitoring capabilities when people stay away from their home or a room, or to monitor the environmental status of their home or room.

Table 5.5.24-1: Modules of deviceHomeCCTV Device model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.
sessionDescription	sessionDescription	false	See clause 5.3.69.
playerControl	playerControl	true	See clause 5.3.57.
runState	runState	true	See clause 5.3.67.
motionSensor	motionSensor	true	See clause 5.3.49.
airQualitySensor	airQualitySensor	true	See clause 5.3.6.
ozoneMeter	ozoneMeter	true	See clause 5.3.55.
smokeSensor	smokeSensor	true	See clause 5.3.71.
acousticSensor	acousticSensor	true	See clause 5.3.1.

Module Instance Name	Module Class Name	Optional	Description
impactSensor	impactSensor	true	See clause 5.3.42.
faultDetection	faultDetection	true	See clause 5.3.33.
alarmSpeaker	alarmSpeaker	true	See clause 5.3.7.

5.5.25 deviceHumidifier

A humidifier is a device that is used to monitor or control the state of a humidifying appliance.

Table 5.5.25-1: Modules of Device model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.

5.5.26 deviceKettle

Kettle is a device used to boil water. It may set a desired temperature for water and may keep water warm for a desired time.

Table 5.5.26-1: Modules of deviceKettle Device model

Module Instance Name	Module Class Name	Optional	Description
faultDetection	faultDetection	true	See clause 5.3.33.
runState	runState	true	See clause 5.3.67.
waterStatus	liquidRemaining	true	See clause 5.3.46.
boilingSwitch	binarySwitch	false	See clause 5.3.12.
temperature	temperature	true	See clause 5.3.76.
keepWarm	keepWarm	true	See clause 5.3.43.

5.5.27 deviceLight

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

Table 5.5.27-1: Modules of deviceLight Device model

Module Instance Name	Module Class Name	Optional	Description
faultDetection	faultDetection	true	See clause 5.3.33.
binarySwitch	binarySwitch	false	See clause 5.3.12.
runState	runState	true	See clause 5.3.67.
colour	colour	true	See clause 5.3.23.
colourSaturation	colourSaturation	true	See clause 5.3.24.
brightness	brightness	true	See clause 5.3.17.

5.5.28 deviceMicrogeneration

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

Table 5.5.28-1: Modules of deviceMicrogeneration Device model

Module Instance Name	Module Class Name	Optional	Description
faultDetection	faultDetection	true	See clause 5.3.33.
binarySwitch	binarySwitch	true	See clause 5.3.12.
runState	runState	true	See clause 5.3.67.
energyGeneration	energyGeneration	false	See clause 5.3.32.

5.5.29 deviceMultiFunctionPrinter

A Multi Function Printer (MFP) is an office machine which incorporates the functionality of multiple devices in one, so as to have a smaller footprint in home or office. A typical MFP may act as a combination of printer, scanner and more. This MFP information model provides capabilities to control and monitor MFP specific functions and resources.

Table 5.5.29-1: Modules of deviceMultiFunctionPrinter Device model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.
printerRunState	runState	false	See clause 5.3.67.
scannerRunState	runState	true	See clause 5.3.67.
autoDocumentFeeder	autoDocumentFeeder	true	See clause 5.3.9.
printQueue	printQueue	true	See clause 5.3.59.

5.5.30 deviceOutdoorLamp

An outdoor lamp is a smart home appliance to provide lights and information for outside of home with smart sensing capabilities such as ultraviolet sensing.

Table 5.5.30-1: Modules of deviceOutdoorLamp Device model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.
brightness	brightness	true	See clause 5.3.17.
motionSensor	motionSensor	true	See clause 5.3.49.
airQualitySensor	airQualitySensor	true	See clause 5.3.6.
uvSensor	uvSensor	true	See clause 5.3.81.
timer	timer	true	See clause 5.3.79. The timer is used to set duration of giving lights from the moment of triggering by the "brightness" module or "motionSensor" module.
faultDetection	faultDetection	true	See clause 5.3.33.

5.5.31 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 5.5.31-1: Modules of deviceOven Device model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12. Depending on the manufacturer policies or regulations, the binary switch might only be used to turn the device off.
runState	runState	true	See clause 5.3.67.
timer	timer	true	See clause 5.3.79.
temperature	temperature	false	See clause 5.3.76.

5.5.32 devicePrinter

A printer is a device that is used to monitor or control the state of a printing appliance.

Table 5.5.32-1: Modules of devicePrinter Device model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.
runState	runState	true	See clause 5.3.67.
printQueue	printQueue	true	See clause 5.3.59.

5.5.33 devicePulseOximeter

A pulseoximeter is a device that can be used to monitor the blood characteristics.

Table 5.5.33-1: Modules of devicePulseOxiMeter Device model

Module Instance Name	Module Class Name	Optional	Description
pulsemeter	pulsemeter	true	See clause 5.3.60. When the "oximeter" module does not exist, then the "pulsemeter" module is mandatory.
oximeter	oximeter	true	See clause 5.3.54. When the "pulsemeter" module does not exist, then the "oximeter" module is mandatory.
battery	battery	false	See clause 5.3.10.

5.5.34 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 5.5.34-1: Modules of deviceRefrigerator Device model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	true	See clause 5.3.12.
powerSave	powerSave	true	See clause 5.3.58.
doorStatus	doorStatus	true	See clause 5.3.28.
frozenTemperature	temperature	true	See clause 5.3.76.
fridgeTemperature	temperature	false	See clause 5.3.76.
customTemperature	temperature	true	See clause 5.3.76. This module can be configured to fridge temperature or frozen temperature based on its usage by manufacturer.
refrigeration	refrigeration	true	See clause 5.3.63.
controlPanelLock	lock	true	See clause 5.3.47.
waterFilterInfo	filterInfo	true	See clause 5.3.34.

5.5.35 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 5.5.35-1: Modules of deviceRobotCleaner Device model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.
runState	runState	true	See clause 5.3.67.

Module Instance Name	Module Class Name	Optional	Description
robotCleanerJobMode	robotCleanerJobMode	false	See clause 5.3.66.
robotCleanerOperationMode	operationMode	true	See clause 5.3.52.
battery	battery	true	See clause 5.3.10.
timer	timer	true	See clause 5.3.79.

5.5.36 deviceScanner

A scanner is a device that optically scans images, printed text, handwriting or an object, and converts it to a digital image.

Table 5.5.36-1: Modules of deviceScanner model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.
runState	runState	false	See clause 5.3.67.
autoDocumentFeeder	autoDocumentFeeder	true	See clause 5.3.9.

5.5.37 deviceSecurityPanel

A security panel is a device that can change the security mode of, for example, an alarm system.

Table 5.5.37-1: Modules of deviceSecurityPanel model

Module Instance Name	Module Class Name	Optional	Description
securityMode	securityMode	false	See clause 5.3.68.

5.5.38 deviceSetTopBox

A set top box is a device that in general contains a TV tuner input and displays output to a TV.

Table 5.5.38-1: Modules of deviceSetTopBox model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.
audioVolume	audioVolume	true	See clause 5.3.8.
Channel	televisionChannel	true	See clause 5.3.75.
mediaInput	mediaSelect	true	See clause 5.3.48.
mediaOutput	mediaSelect	true	See clause 5.3.48.

5.5.39 deviceSmartElectricMeter

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

Table 5.5.39-1: Modules of deviceSmartElectricMeter Device model

Module Instance Name	Module Class Name	Optional	Description
faultDetection	faultDetection	true	See clause 5.3.33.
binarySwitch	binarySwitch	true	See clause 5.3.12.
runState	runState	true	See clause 5.3.67.
clock	clock	true	See clause 5.3.18.
energyConsumption	energyConsumption	false	See clause 5.3.31.
energyGeneration	energyGeneration	true	See clause 5.3.32.

5.5.40 deviceSmartPlug

A smart plug is a device that can turn on and off a connected appliance.

Table 5.5.40-1: Modules of deviceSmartPlug model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	true	See clause 5.3.12.
faultDetection	faultDetection	true	See clause 5.3.33.
remoteControlEnable	remoteControlEnable	true	See clause 5.3.65.

Table 5.5.40-2: Subdevice of deviceSmartPlug Device model

Subdevice Instance Name	Subdevice Name	Optional	Description
powerOutlet0	subDevicePowerOutlet	false	See clause 5.4.2.
powerOutlet1	subDevicePowerOutlet	true	See clause 5.4.2.
powerOutlet2	subDevicePowerOutlet	true	See clause 5.4.2.
powerOutlet3	subDevicePowerOutlet	true	See clause 5.4.2.
powerOutlet4	subDevicePowerOutlet	true	See clause 5.4.2.
powerOutlet5	subDevicePowerOutlet	true	See clause 5.4.2.

5.5.41 deviceSteamCloset

A deviceSteamCloset is a home appliance that de-wrinkles, sanitizes and dries to clean fabrics similar to a dry cleaner. This information model provides capabilities to interact with specific functions and resources of the steam closet.

Table 5.5.41-1: Modules of deviceSteamCloset Device model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.
runState	runState	true	See clause 5.3.67.
steamClosetJobMode	steamClosetJobMode	false	See clause 5.3.74.
steamClosetOperationMode	operationMode	true	See clause 5.3.52.

5.5.42 deviceStorageBattery

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

Table 5.5.42-1: Modules of deviceStorageBattery Device model

Module Instance Name	Module Class Name	Optional	Description
faultDetection	faultDetection	true	See clause 5.3.33.
binarySwitch	binarySwitch	true	See clause 5.3.12.
runState	runState	true	See clause 5.3.67.
battery	battery	false	See clause 5.3.10.

5.5.43 deviceSwitch

A switch is a device that is used to control and monitor the state of power.

Table 5.5.43-1: Modules of deviceSwitch Device model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.

5.5.44 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 5.5.44-1: Modules of deviceTelevision Device model

Module Instance Name	Module Class Name	Optional	Description
binarySwitch	binarySwitch	false	See clause 5.3.12.
audioVolume	audioVolume	true	See clause 5.3.8.
televisionChannel	televisionChannel	true	See clause 5.3.75.
playerControl	playerControl	true	See clause 5.3.57.
mediaInput	mediaSelect	true	See clause 5.3.48.
mediaOutput	mediaSelect	true	See clause 5.3.48.

5.5.45 deviceThermometer

A thermometer is a device that can be used to check, for example, the body or other temperatures.

Table 5.5.45-1: Modules of deviceThermoMeter Device model

Module Instance Name	Module Class Name	Optional	Description
temperature	temperature	false	See clause 5.3.76.
battery	battery	false	See clause 5.3.10.

5.5.46 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 5.5.46-1: Modules of deviceThermostat Device model

Module Instance Name	Module Class Name	Optional	Description
runState	runState	true	See clause 5.3.67. The possible values of the "supportedModes" datapoint for the thermostat device are included in clause 5.6.21.
timer	timer	true	See clause 5.3.79.
temperature	temperature	false	See clause 5.3.76.

5.5.47 deviceWaterHeater

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

Table 5.5.47-1: Modules of deviceWaterHeater Device model

Module Instance Name	Module Class Name	Optional	Description
faultDetection	faultDetection	true	See clause 5.3.33.
binarySwitch	binarySwitch	false	See clause 5.3.12.
runState	runState	true	See clause 5.3.67.
clock	clock	true	See clause 5.3.18.
boiler	boiler	true	See clause 5.3.15.
hotWaterSupply	hotWaterSupply	true	See clause 5.3.41.

5.5.48 deviceWaterValve

A water valve is a device that is used to turn the water supply ON or OFF remotely.

Table 5.5.48-1: Modules of waterValve model

Module Instance Name	Module Class Name	Optional	Description
openLevel	openLevel	false	See clause 5.3.51.

5.5.49 deviceWeightScaleAndBodyCompositionAnalyser

A weight scale and body composition analyser is a device that can be used to monitor the weight and body composition.

Table 5.5.49-1: Modules of deviceWeightScaleAndBodyCompositionAnalyser Device model

Module Instance Name	Module Class Name	Optional	Description
weight	weight	false	See clause 5.3.84.
bodyCompositionAnalyser	bodyCompositionAnalyser	false	See clause 5.3.14.
bioElectricalImpedanceAnalysis	bioElectricalImpedanceAnalysis	false	See clause 5.3.13.
battery	battery	false	See clause 5.3.10.

5.5.50 deviceWindowShade

The window shade is an appliance that provides the ability to cover windows. This device type includes but not limited to roller shades, drapes, and tilt-only blinds.

Table 5.5.50-1: Modules of deviceWindowShade Device model

Module Instance Name	Module Class Name	Optional	Description
openLevel	openLevel	false	See clause 5.3.51.
battery	battery	true	See clause 5.3.10.

5.6 Enumeration type definitions

5.6.1 hd:enum3DprinterTechnology

Used for the "printType" data point of the "3Dprinter" ModuleClass.

Table 5.6.1-1: Interpretation of hd:enum3DprinterTechnology

Value	Interpretation	Note
1	Fused Filament Fabrication	FFF
2	Fused Deposition Modelling	FDM
3	Digital Light Processing	DLP
4	Powder Bed & inkjet head 3D Printing	PBP
5	Photopolymer Jetting Technology	PolyJet
6	Laminated Object Manufacturing	LOM
7	Stereolithography Apparatus	SLA
8	Selective Laser Sintering	SLS

NOTE: See clause 5.3.1 "3Dprinter".

5.6.2 hd:enumAdfState

Used for the "currentAdfState" and "adfStates" data points of the "autoDocumentFeeder" ModuleClass.

Table 5.6.2-1: Interpretation of hd:enumAdfState

Value	Interpretation	Note
1	processing	
2	empty	
3	jam	
4	loaded	
5	mispick	The product did not pick up the paper in the document feeder.
6	hatchOpen	The product hatch is open.
7	duplexPageTooShort	
8	duplexPageTooLong	
9	multipickDetected	
10	inputTrayFailed	
11	inputTrayOverloaded	

NOTE: See clause 5.3.9 "autoDocumentFeeder". Negative values are reserved for vendor specific modes.

5.6.3 hd:enumAirConJobMode

Used for the "currentJobMode" and "jobModes" data point of the "airConJobMode" ModuleClass.

Table 5.6.3-1: Interpretation of hd:enumAirConJobMode

Value	Interpretation	Note
1	cool	This value is for deviceAirConditioner and indicates cool mode.
2	airDry	This value is for deviceAirConditioner and indicates air dry mode.
3	fan	This value is for deviceAirConditioner and indicates fan mode.
4	AI	This value is for deviceAirConditioner and indicates artificial intelligence mode.
5	heat	This value is for deviceAirConditioner and indicates heat mode.
6	airClean	This value is for deviceAirConditioner and indicates air clean mode.
7	ACO	This value is for deviceAirConditioner and indicates Auto Change Over mode.
8	aroma	This value is for deviceAirConditioner and indicates aroma mode.

NOTE: See clause 5.3.3 "airConJobMode". Negative values are reserved for vendor specific modes.

5.6.4 hd:enumAirPurifierJobMode

Used for the "currentJobMode" and "jobModes" data points of the "airPurifierJobMode" ModuleClass.

Table 5.6.4-1: Interpretation of hd:enumAirPurifierJobMode

Value	Interpretation	Note
1	normalClean	This indicates the normal mode that operates the basic function.
2	sleep	This indicates the sleep mode that turns the operating function off at the time set by a timer.
3	silent	This indicates the silent mode that generates low noise.
4	wet	This indicates the wet mode that passes the air that's already filtered through water filter once again to provide the humidification effect.
5	circulate	This indicates the circulate mode that circulates the purified air by rotating the fan on top of the air purifier.
6	dual	This indicates the dual mode that operates both the upper and lower parts of the air purifier.
7	auto	This indicates the auto mode that first measures the pollution level (e.g. good, normal, bad, very bad) and then, triggers appropriate modes based on the measured level. In case of bad and very bad condition, the rotating fan on the upper side starts its operation.

NOTE: See clause 5.3.5 "airPurifierJobMode". Negative values are reserved for vendor specific modes.

5.6.5 hd:enumAlertColourCode

Used for the "light" data point of the "alarmSpeaker" ModuleClass.

Table 5.6.5-1: Interpretation of hd:enumAlertColourCode

Value	Interpretation	Note
1	red	This colour indicates the alarm status.
2	green	This colour indicates the alarm has been cleared.

NOTE: See clause 5.3.7 "alarmSpeaker".

5.6.6 hd:enumCallState

Used for the "callState" data point in the "phoneCall" ModuleClass.

Table 5.6.6-1: Interpretation of hd:enumCallState

Value	Interpretation	Note
1	hangup	
2	calling	
3	ringing	
4	busy	
5	answered	
6	noline	

NOTE: See clause 5.3.56 "phoneCall".

5.6.7 hd:enumClothesDryerJobMode

Used for the "currentJobMode" and "jobModes" data points of the "clothesDryerJobMode" ModuleClass.

Table 5.6.7-1: Interpretation of hd:enumClothesDryerJobMode

Value	Interpretation	Note
1	normal	Normal cycle.
2	quickDry	About half the length of a normal cycle, this setting uses high heat to dry a few items.
3	permanentPress	Slow drying with low heat helps wrinkle-free garments live up to their name and keeps the hard creases out of things that can be ironed.
4	heavyDuty	Tumbling for an extended period with high heat for sturdy items (towels, sweats, jeans).
5	delicates	A short, low-heat cycle for delicates and other items such as spandex workout gear, which loses its stretch when too much heat is used.
6	airDry	A cool-air setting for items that cannot take any heat, such as plastic tablecloths and rubber-backed rugs.
7	extendedTumble	Periodically tumbles clothes without heats for a preset amount of time after they are dry to prevent wrinkles.

NOTE: See clause 5.3.19 "clothesDryerJobMode". Negative values are reserved for vendor specific modes.

5.6.8 hd:enumClothesWasherDryerJobMode

Used for "currentJobModes" and "jobModes" data points of "clothesWasherDryerJobMode" ModuleClass. Manufacturers can define their own courses by setting this value to negative values.

Table 5.6.8-1: Interpretation of hd:enumClothesWasherJobMode

Value	Interpretation	Note
1	normal	
2	quick	
3	auto	
4	delicates	
5	heavy duty	

NOTE: See clause 5.3.21 "clothesWasherDryerJobMode". Negative values are reserved for vendor specific modes.

5.6.9 hd:enumClothesWasherJobMode

Used for the "currentJobModes" and "jobModes" data points of the "clothesWasherJobMode" ModuleClass. Washing options such as water temperature and spin speed are decided to pre-set values upon selected washing course. Manufacturers can define their own courses by setting this value to negative values.

Table 5.6.9-1: Interpretation of hd:enumClothesWasherJobMode

Value	Interpretation	Note
1	normal	
2	smallLoad	
3	delicate	
4	comforter	
5	expressWash	
6	cleanWash	
7	kidsWear	
8	workoutWears	

NOTE: See clause 5.3.20 "clothesWashingJobMode". Negative values are reserved for vendor specific modes.

5.6.10 hd:enumCookerHoodJobMode

Used for the "currentJobMode" and "jobModes" DataPoints of the "cookerHoodJobMode" ModuleClass.

Table 5.6.10-1: Interpretation of hd:enumCookerHoodJobMode

Value	Interpretation	Note
1	Always-on	This value indicates the always-on mode which keeps running the fan for ventilation.
2	Intensive	This value indicates the intensive mode used when a large volume of cooking fume is being produced.
3	Sensor	This value indicates the sensor mode which changes fan speed depend on the volume and heat of cooking fume.

NOTE: See clause 5.3.25 "cookerHoodJobMode". Negative values are reserved for vendor specific modes.

5.6.11 hd:enumDehumidifierJobMode

Used for "currentJobMode" and "jobModes" data points of the "dehumidifierJobMode" ModuleClass.

Table 5.6.11-1: Interpretation of hd:enumDehumidifierJobMode

Value	Interpretation	Note
1	smart	This value indicates the smart mode that first gets the target humidity level from user input, next detects the current relative humidity, then automatically change the dehumidity level to keep the target humidity level.
2	fast	This value indicates the fast mode that speeds the operating level up to quickly dehumidify when the humidity level is so high. It is a kind of turbo mode.
3	silent	This value indicates the silent mode that can be used when a user sleeps. It reduces the noise.
4	focus	This value indicates the focus mode that dehumidifies focusing on a particular part.
5	clothes	This value indicates the clothes mode that dehumidifies adjusting the wind direction vertically. It is normally used to dehumidify clothes.

NOTE: See clause 5.3.27 "dehumidifierJobMode". Negative values are reserved for vendor specific modes.

5.6.12 hd:enumDishWasherJobMode

Used for the "currentJobMode" and "jobModes" DataPoints of the "dishWasherJobMode" ModuleClass.

Table 5.6.12-1: Interpretation of hd:enumDishWasherJobMode

Value	Interpretation	Note
1	Normal wash	
2	Intensive wash	
3	Quick wash	
4	Sensor wash	
5	Eco wash	
6	Quiet wash	
7	Maintenance wash	

NOTE: See clause 5.3.28 "dishWasherJobMode". Negative values are reserved for vendor specific modes.

5.6.13 hd:enumDoorState

Used for the "doorState" DataPoint of "doorStatus" ModuleClass.

Table 5.6.13-1: Interpretation of hd:enumDoorState

Value	Interpretation	Note
1	closed	This indicates that door is closed.
2	open	This indicates that the door is open.
3	opening	This indicates that the door is opening.
4	closing	This indicates that the door is closing.
5	stopped	This indicates that the door is in stationary state.

NOTE: See clause 5.3.29 "doorStatus".

5.6.14 hd:enumFoamStrength

Used for data points indicating the strength of a foam, for example, foaming milk from a coffee machine.

Table 5.6.14-1: Interpretation of hd:enumFoamStrength

Value	Interpretation	Note
1	zero	
2	low	
3	medium	
4	high	
5	maximum	

NOTE: See clause 5.3.35 "foaming".

5.6.15 hd:enumGeneralLevel

Used for the "soilLevel" data point of the "clothesWasherJobModeOption " ModuleClass.

Table 5.6.15-1: Interpretation of hd:enumGeneralLevel

Value	Interpretation	Note
1	light	
2	normal	
3	heavy	

NOTE: See clause 5.3.20 "clothesWasherJobModeOption".

5.6.16 hd:enumGeneralSpeed

Used for the "spinSpeed" data point of the "clothesWasherJobModeOption" ModuleClass.

Table 5.6.16-1: Interpretation of hd:enumGeneralSpeed

Value	Interpretation	Note
1	low	
2	medium	
3	high	
4	extraHigh	

NOTE: See clause 5.3.22 "clothesWasherJobModeOption".

5.6.17 hd:enumGeneralTemperature

Used for the "washTemp" data point of the "clothesWasherJobModeOption" ModuleClass.

Table 5.6.17-1: Interpretation of hd:enumGeneralTemperature

Value	Interpretation	Note
1	cold	The actual temperature is defined by the manufacturer.
2	warm	
3	hot	

NOTE: See clause 5.3.22 "clothesWasherJobModeOption".

5.6.18 hd:enumGrainsLevel

Used for the "grainsRemaining" data point of the "grinder" ModuleClass. This type specifies a level for supplies that have a grain-aspect, for example the level of remaining coffee beans in the grinder part of a coffee machine, or the desired level of coffee beans in this machine.

Table 5.6.18-1: Interpretation of hd:enumGrainsLevel

Value	Interpretation	Note
1	zero	
2	low	
3	medium	
4	high	
5	maximum	

NOTE: See clause 5.3.38 "grinder".

5.6.19 hd:enumGrindCoarseness

Used for the coarseness data points of the "grinder" ModuleClass. This type specifies the level of coarseness of a solid after grinding, for example grinded coffee beans.

Table 5.6.19-1: Interpretation of hd:enumGrindCoarseness

Value	Interpretation	Note
1	ultrafine	
2	fine	
3	medium	
4	coarse	
5	coarsest	

NOTE: See clause 5.3.38 "grinder".

5.6.20 hd:enumHorizontalDirection

Used for the "horizontalDirection" and "supportedHorizontalDirection" of the "airflow" ModuleClass, indicating horizontal directions.

Table 5.6.20-1: Interpretation of hd:enumHorizontalDirection

Value	Interpretation	Note
1	auto	
2	center	
3	left	
4	right	

NOTE: See clause 5.3.4 "airFlow".

5.6.21 hd:enumJobStates

Used for the "currentJobState" and "jobStates" data points of the "runState" ModuleClass.

Table 5.6.21-1: Interpretation of hd:enumJobState

Value	Interpretation	Note
1	aborted	
2	cancelled	
3	completed	
4	paused	
5	pending	
6	processing	

NOTE: See clause 5.3.67 "runstate".

5.6.22 hd:enumLiquidLevel

Used for the "liquidLevel" and "liquidRemaining" data points in the respective "liquidLevel" and "liquidRemaining" ModuleClasses.

Table 5.6.22-1: Interpretation of hd:LiquidLevel

Value	Interpretation	Note
1	zero	
2	low	
3	medium	
4	high	
5	maximum	

NOTE: See clause 5.3.45 "liquidLevel" and clause 5.3.46 "liquidRemaining".

5.6.23 hd:enumMachineState

Used for the "currentMachineState" and "machineStates" data points of the "runState" ModuleClass.

Table 5.6.23-1: Interpretation of hd:enumMachineState

Value	Interpretation	Note
1	idle	Machine is ready to operate
2	preActive	Machine is operating its pre-functions (ex. pre-heat)
3	active	Machine is operating its functions
4	reserved	Reservation is made by user
5	stopped	Operation is stopped/aborted by some other reasons
6	error	Error has occurred
7	diagnostic	Machine reports diagnostic information to the server
8	test	Particular functions run for test
9	maintenance	Machine is needed to maintain
10	clear	The result is not removed yet
11	charging	Machine is being charged

NOTE: See clause 5.3.67 "runState".

5.6.24 hd:enumOzoneStatus

Used for the "ozoneStatus" property of the "ozoneMeter" ModuleClass.

Table 5.6.24-1: Interpretation of hd:enumOzoneStatus

Value	Interpretation	Note
1	Good	For example, 0 to 0,030 ppm.
2	Normal	For example, 0,031 to 0,090 ppm.
3	Bad	For example, 0,091 to 0,150 ppm.
4	Very bad	For example, 0,151 ppm or above.

NOTE: See clause 5.3.55 "ozoneMeter".

5.6.25 hd:enumPlayerMode

Used for the "currentMode" and "supportedModes" data points in the "playerControl" ModuleClass.

Table 5.6.25-1: Interpretation of hd:enumPlayerMode

Value	Interpretation	Note
1	stop	
2	play	
3	pause	
4	resume	
5	record	
6	rewind	
7	fast-rewind	
8	forward	
9	fast-forward	
10	searchPrevious	
11	searchNext	

NOTE: See clause 5.3.57 "playerControl".

5.6.26 hd:enumRobotCleanerJobMode

Used for the "currentJobMode" and "jobModes" data points of the "robotCleanerJobMode" ModuleClass.

Table 5.6.26-1: Interpretation of hd:enumRobotCleanerJobMode

Value	Interpretation	Note
1	zigzag	The machine moves forward by going at an angle first to one side then to the other
2	sectorBase	The machine first cleans a specific sector (for example, 1 x 1 m), then moves to another sector
3	spot	The machine cleans a targeted area of about specific spot

NOTE: See clause 5.3.66 "robotCleanerJobMode". Negative values are reserved for vendor specific modes.

5.6.27 hd:enumSecurityMode

Used for the "currentSecurityMode" and "securityModes" data points of the "securityMode" ModuleClass.

Table 5.6.27-1: Interpretation of hd:enumSecurityMode

Value	Interpretation	Note
1	active	Unit is active
2	armedAway	Unit is armed for away
3	armedInstant	Unit is armed instantly
4	armedMaximum	Unit is armed at maximum level
5	armedNightStay	Unit is armed in night stay
6	armedStay	Unit is armed in stay mode

NOTE: See clause 5.3.68 "securityMode".

5.6.28 hd:enumSpinLevelStrength

Used for the "spinLevelStrength" data points of the "spinLevel" ModuleClass, indicating the strength of a spinLevel.

Table 5.6.28-1: Interpretation of hd:enumSpinLevelStrength

Value	Interpretation	Note
1	zero	
2	sensitive	
3	weak	
4	medium	
5	strong	
6	maximum	

NOTE: See clause 5.3.73 "spinLevel".

5.6.29 hd:enumSteamClosetJobMode

Used for "currentJobMode" and "jobModes" data points of the "steamClosetJobMode" ModuleClass.

Table 5.6.29-1: Interpretation of hd:enumSteamClosetJobMode

Value	Interpretation	Note
1	reduceOdor	Using pure water, the machine helps to remove the smells on clothes.
2	steamWrinkle	The machine steams away wrinkles and also creates pant creases, as well as keep them crisp.
3	helpClean	Using pure water without chemical additives, the machine sanitizes fabrics and items that are difficult to wash.
4	gentleDry	The machine dries fragile garments without worrying about shrinkage or damage.

NOTE: See clause 5.3.74 "steamClosetJobMode". Negative values are reserved for vendor specific modes.

5.6.30 hd:enumSupportedMediaSources

Used for the "supportedMediaSources" data point of the "mediaSelect" ModuleClass.

Table 5.6.30-1: Interpretation of hd:enumSupportedMediaSources

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 5.3.48 "mediaSelect". Negative values are reserved for vender specific sources.

5.6.31 hd:enumTasteStrength

Used for the "strength" data point of the "brewing" ModuleClass, indicating strength of a drink taste, for example coffee strength.

Table 5.6.31-1: Interpretation of hd:enumTasteStrength

Value	Interpretation	Note
1	zero	
2	sensitive	
3	medium	
4	strong	
5	maximum	

NOTE: See clause 5.3.16 "brewing".

5.6.32 hd:enumTone

Used for the "tone" data point of the "alarmSpeaker" ModuleClass.

Table 5.6.32-1: Interpretation of hd:enumTone

Value	Interpretation	Note
1	fire	
2	theft	
3	emergency	
4	doorbell	
5	deviceFail	

NOTE: See clause 5.3.7 "alarmSpeaker".

5.6.33 hd:enumUvStatus

Used for the "uvStatus" data point of the "uvSensor" ModuleClass.

Table 5.6.33-1: Interpretation of hd:enumUvStatus

Value	Interpretation	Note
1	Good	
2	Normal	
3	Bad	
4	Very Bad	
5	Danger	

NOTE: See clause 5.3.81 "uvSensor".

5.6.34 hd:enumVerticalDirection

Used for the "verticalDirection" and "supportedVerticalDirection" data points of the "airFlow" ModuleClass, indicating vertical direction.

Table 5.6.34-1: Interpretation of hd:enumVerticalDirection

Value	Interpretation	Note
1	auto	
2	center	
3	up	
4	down	

NOTE: See clause 5.3.4 "airFlow".

5.6.35 hd:enumWaterFlowStrength

Used for the "waterLevelStrength" data point of the "waterFlow" ModuleClass, indicating the strength of a waterflow.

Table 5.6.35-1: Interpretation of hd:enumWaterFlowStrength

Value	Interpretation	Note
1	zero	
2	sensitive	
3	weak	
4	medium	
5	strong	
6	maximum	

NOTE: See clause 5.3.82 "waterFlow".

5.7 Universal and Common Properties for Device models

Universal and common properties are defined as the specialized [objectAttribute]s of the [deviceInfo] resource in clause D.8 of TS-0001 [3]. 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. The multiplicity of properties shall follow the definition in Table 8-2 in TS-0001 [3].

Universal and common properties are applicable to all device models. They are not repeated in the property table of each device model in clause 5.5, where only device specific properties shall be specified.

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

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 and B.

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 5.5, 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 5.5 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 'Property' of a Device model shall be mapped to a specialized [objectAttribute] of a [deviceInfo] resource that is defined in clause D.8 of TS-0001 [3]. The specialized <flexContainer> resource of the Device model shall contain the *nodeLink* attribute. As defined in TS-0001 [3] and in TS-0004 [4] *nodeLink* is an optional attribute common to all <flexContainer> specializations. The *nodeLink* attribute of a <flexContainer> specialization which represents a Device model links to a <node> resource that is hosted on the same hosting CSE as the <flexContainer>. That <node> resource shall contain as child-resource the [deviceInfo] resource of the Device model instance. The <node> resource contains all the management information as specialized <mgmtObj> resources (e.g. [firmware]) about the Device model instance for different management purposes.
- Rule 1-4: XSD file for each Device model shall be named according to the following naming convention: 'HD-<name of Device model>-v<version of TS>.xsd'
For example, XSD file for 'deviceAirConditioner' as defined in TS-0023v3.7.0 is named as 'HD-deviceAirConditioner-v3_7_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 5.5 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, the XSD file for 'binarySwitch' 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 5.5 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 5.5) 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 ModuleClass model, shall be mapped to the [customAttribute] of <flexContainer> resource which is mapped from associated ModuleClass model, with its Property name with prefix 'prop'.
- Rule 4-2: Each 'Property' of a Device model is mapped to a specialized [objectAttribute] of a [deviceInfo] resource following Rule 1-3.

6.2.6 Resource mapping for DataPoint

When the ModuleClass model (in clause 5.3) is mapped to the <flexContainer> resource, 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.

6.2.7 Resource mapping for SubDevice model

When the AE exposes a controlling interface for a home domain sub-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:

- When the SubDevice model in clause 5.4 is mapped to the <flexContainer> resource, and if the device supports the functionality associated with a SubDevice in the model, a <flexContainer> resource which is mapped from SubDevices definitions shall be created as a child resource.
- Rule 7-1: Follow rules 1-1, 1-2, and 1-3 of clause 6.2.2 "Resource mapping for Device model".
- Rule 7-2: The XSD file for each SubDevice model shall be named following naming convention:
'HD-<name of SubDevice model>-v<version of TS>.xsd'

For example, the XSD file for 'subDeviceCuff' is named as 'HD-subDeviceCuff-v1_0_0.xsd'.
- Rule 7-3: If there is more than one SubDevice with the same name, then the SubDevices are numbered by appending an incrementing integer, starting with 0. Example:
'HD-subDeviceCuff0-v1_0_0.xsd', 'HD-subDeviceCuff1-v1_0_0.xsd', 'HD-subDeviceCuff3-v1_0_0.xsd'.

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
Device3DPrinter	<i>dTDP</i>
deviceAirConditioner	<i>deACr</i>
deviceAirPurifier	<i>deAPr</i>
deviceAirQualityMonitor	<i>dAQMr</i>
deviceAudioReceiver	<i>deARr</i>
deviceBloodPressureMonitor	<i>dBPMr</i>
deviceCamera	<i>devCa</i>
deviceClothesDryer	<i>deCDr</i>
deviceClothesWasher	<i>deCWr</i>
deviceClothesWasherDryer	<i>dCWDr</i>
deviceCoffeeMachine	<i>deCMe</i>
deviceCookerHood	<i>deCHd</i>
deviceCooktop	<i>devCp</i>
deviceDehumidifier	<i>devDr</i>
deviceDishWasher	<i>deDWr</i>
deviceDoor	<i>devD0</i>
deviceDoorLock	<i>deDLk</i>
deviceElectricVehicleCharger	<i>dEVCr</i>
deviceFan	<i>devFn</i>
deviceFoodProbe	<i>deFFe</i>
deviceFreezer	<i>devFr</i>
deviceGlucosemeter	<i>devGr</i>
deviceHeartRateMonitor	<i>dHRMr</i>
deviceHomeCCTV	<i>dHCCT</i>
deviceHumidifier	<i>devHr</i>
deviceKettle	<i>devKe</i>
deviceLight	<i>devLt</i>
deviceMicrogeneration	<i>devMn</i>
deviceMultiFunctionPrinter	<i>dMFPr</i>
deviceOutdoorLamp	<i>deOLp</i>
deviceOven	<i>devOn</i>
devicePrinter	<i>devPr</i>
devicePulseOximeter	<i>dePOR</i>
deviceRefrigerator	<i>devRr</i>
deviceRobotCleaner	<i>deRCr</i>
deviceScanner	<i>devSr</i>
deviceSecurityPanel	<i>deSPI</i>
deviceSetTopBox	<i>dSTBx</i>
deviceSmartElectricMeter	<i>dSEMr</i>
deviceSmartPlug	<i>deSPg</i>
deviceSteamCloset	<i>deSCt</i>
deviceStorageBattery	<i>deSBy</i>
deviceSwitch	<i>devSh</i>
deviceTelevision	<i>devTn</i>
deviceThermometer	<i>devTr</i>
deviceThermostat	<i>devTt</i>

Resource Type Name	Short Name
deviceWaterHeater	deWHR
deviceWaterValve	deWVe
deviceWeightScaleAndBodyCompositionAnalyser	dWSAB
deviceWindowShade	deWSe

In protocol bindings resource type names for SubDevice model shall be translated into short names of Table 6.3.2-2.

Table 6.3.2-2: Specialization type short names (SubDevice models)

Resource Type Name	Short Name
cuff0	cuff0
cuff1	cuff1
cuff2	cuff2
cuff3	cuff3
cuff4	cuff4
cuff5	cuff5
powerOutlet0	powO0
powerOutlet1	powO1
powerOutlet2	powO2
powerOutlet3	powO3
powerOutlet4	powO4
powerOutlet5	powO5
subDeviceCuff	suDCf
subDevicePowerOutlet	sDPot

In protocol bindings resource type names for module classes shall be translated into short names of Table 6.3.2-3.

Table 6.3.2-3: Specialization type short names (ModuleClasses and Module Instances)

Resource Type Name	Short Name
3DPrinter	<i>thDPr</i>
acousticSensor	<i>acoSr</i>
airCleanOperationMode	<i>aCOMO</i>
airConJobMode	<i>aCJMe</i>
airConOperationMode	<i>aCOMe</i>
airFlow	<i>airFw</i>
airPurifierJobMode	<i>aPJMe</i>
airPurifierOperationMode	<i>aPOMe</i>
airQualitySensor	<i>aiQSr</i>
alarmSpeaker	<i>alaSr</i>
audioVolume	<i>audVe</i>
autoDocumentFeeder	<i>auDFr</i>
battery	<i>bat</i>
binaryObject	<i>binOt</i>
binarySwitch	<i>binSh</i>
bioElectricalImpedanceAnalysis	<i>bEIA</i>
bodyCompositionAnalyser	<i>boCAr</i>
boiler	<i>boilr</i>
boilingSwitch	<i>boiSh</i>
brewing	<i>brewg</i>
brewingSwitch	<i>breSh</i>
brightness	<i>brigs</i>
channel	<i>chanI</i>
clock	<i>clock</i>
clothesDryerJobMode	<i>cDJMe</i>
clothesDryerOperationMode	<i>cDOMe</i>
clothesWasherDryerJobMode	<i>cWDJM</i>
clothesWasherDryerOperationMode	<i>cWDOM</i>
clothesWasherJobMode	<i>cWJMe</i>
clothesWasherJobModeOption	<i>cWJMO</i>
clothesWasherOperationMode	<i>cWOMe</i>
colour	<i>color</i>
colourSaturation	<i>colSn</i>
controlPanelLock	<i>coPLk</i>
cookerHoodJobMode	<i>cHJMe</i>
credentials	<i>creds</i>
customTemperature	<i>cusTe</i>
dehumidifierJobMode	<i>deJMe</i>
dehumidifierOperationMode	<i>deOMe</i>
dishWasherJobMode	<i>dWJMe</i>
doorLock	<i>dooLk</i>
doorlock	<i>doork</i>
doorStatus	<i>dooSs</i>
electricVehicleConnector	<i>eIVCr</i>
energyConsumption	<i>eneCn</i>
energyGeneration	<i>eneGn</i>
faultDetection	<i>fauDn</i>
filterInfo	<i>fillo</i>
foaming	<i>foamg</i>
fridgeTemperature	<i>friTe</i>
frozenTemperature	<i>froTe</i>
geoLocation	<i>geoLn</i>
glucometer	<i>glucr</i>
grinder	<i>grinr</i>
heatingZone	<i>heaZe</i>
heatingZone0	<i>heaZ0</i>
heatingZone1	<i>heaZ1</i>
heatingZone2	<i>heaZ2</i>
heatingZone3	<i>heaZ3</i>
heatingZone4	<i>heaZ4</i>
heatingZone5	<i>heaZ5</i>

Resource Type Name	Short Name
height	<i>heigt</i>
hotWaterSupply	<i>hoWSy</i>
impactSensor	<i>impSr</i>
keepWarm	<i>keeWm</i>
keypad	<i>keypd</i>
liquidLevel	<i>liqLI</i>
liquidRemaining	<i>liqRg</i>
lock	<i>lock</i>
mediaInput	<i>medIt</i>
mediaOutput	<i>medOt</i>
mediaSelect	<i>medSt</i>
milkFoaming	<i>milFg</i>
milkQuantity	<i>milQy</i>
milkStatus	<i>milSs</i>
motionSensor	<i>motSr</i>
numberValue	<i>numVe</i>
openLevel	<i>opeLI</i>
operationMode	<i>opeMe</i>
overcurrentSensor	<i>oveSr</i>
oximeter	<i>oximr</i>
ozoneMeter	<i>ozoMr</i>
phoneCall	<i>phoCI</i>
playerControl	<i>plaCI</i>
powerSave	<i>powS0</i>
printerRunState	<i>prRSe</i>
printQueue	<i>priQe</i>
pulsemeter	<i>pulsr</i>
pushButton	<i>pusBn</i>
recorder	<i>recor</i>
refrigeration	<i>refrn</i>
relativeHumidity	<i>relHy</i>
remoteControlEnable	<i>reCEe</i>
robotCleanerJobMode	<i>rCJMe</i>
robotCleanerOperationMode	<i>rCOMe</i>
runState	<i>runSe</i>
scannerRunState	<i>scRSe</i>
securityMode	<i>secMe</i>
sessionDescription	<i>sesDn</i>
signalStrength	<i>sigSh</i>
sleepTimer	<i>sleTr</i>
smokeSensor	<i>smoSr</i>
sphygmomanometer	<i>sphyr</i>
spinLevel	<i>spiLI</i>
steamClosetJobMode	<i>sCJMe</i>
steamClosetOperationMode	<i>sCOMe</i>
televisionChannel	<i>telCI</i>
temperature	<i>tempe</i>
temperatureAlarm	<i>temAm</i>
textMessage	<i>texMe</i>
timer	<i>timer</i>
turbo	<i>turbo</i>
uvSensor	<i>uveSr</i>
waterFilterInfo	<i>waFlo</i>
waterFlow	<i>watFw</i>
waterSensor	<i>watSr</i>
waterStatus	<i>watSs</i>
weight	<i>weigt</i>

In protocol bindings resource type names for actions shall be translated into short names of Table 6.3.2-4.

Table 6.3.2-4: Specialization type short names (Actions)

Resource Type Name	Short Name
activateClockTimer	<i>acCTr</i>
answer	<i>answr</i>
call	<i>call</i>
close	<i>close</i>
deactivateClockTimer	<i>deCTr</i>
decrementNumberValue	<i>deNVe</i>
downChannel	<i>dowCl</i>
downVolume	<i>dowVe</i>
hangup	<i>hangp</i>
incrementNumberValue	<i>inNVe</i>
nextTrack	<i>nexTk</i>
open	<i>open</i>
previousTrack	<i>preTk</i>
resetNumberValue	<i>reNVe</i>
resetTextMessage	<i>reTMe</i>
start3Dprint	<i>staDt</i>
stop3Dprint	<i>stoDt</i>
toggle	<i>togge</i>
upChannel	<i>uphCl</i>
upVolume	<i>upoVe</i>

6.3.3 Resource attributes for properties and data points

In protocol bindings resource attributes names for properties of module classes shall be translated into short names of Table 6.3.3-1.

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

Attribute Name	Occurs in	Short Name
chargingCapacity	electricVehicleConnector	<i>chaCy</i>
dischargingCapacity	electricVehicleConnector	<i>disCy</i>
electricEnergy	battery	<i>eleEy</i>
material	battery	<i>matel</i>
voltage	battery	<i>volte</i>

In protocol bindings resource attributes names for data points 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 data points)

Attribute Name	Occurs in	Short Name
absoluteEnergyConsumption	energyConsumption	abECn
absoluteStartTime	timer	abSTe
absoluteStopTime	timer	abSTO
acousticStatus	acousticSensor	acoSs
adfStates	autoDocumentFeeder	adfSs
alarm	motionSensor, smokeSensor, temperatureAlarm, waterSensor	alarm
alarmStatus	alarmSpeaker	alaSs
altitude	geoLocation	altie
automode	airFlow	autoe
availableChannels	televisionChannel	avaCs
basalMetabolism	bodyCompositionAnalyser	basMm
bath	hotWaterSupply	bath
batteryThreshold	battery	batTd
blue	colour	blue
bmi	bodyCompositionAnalyser	bmi
bodyLength	bodyCompositionAnalyser	bodLh
bone	bioElectricalImpedanceAnalysis	bone
brightness	brightness	brigs
callerID	phoneCall	callD
callState	phoneCall	calSe
capacity	battery	capay
ch2o	airQualitySensor	ch2o
channelId	televisionChannel	chald
channelName	televisionChannel	chaNe
charging	battery	charg
chargingCapacity	electricVehicleConnector	chaCy
co	airQualitySensor	co
co2	airQualitySensor	co2
coarseness	grinder	coars
code	faultDetection, filterInfo	code
coldWash	clothesWasherJobModeOption	colWh
colourSaturation	colourSaturation	colSn
concentration	glucometer	concn
contextCarbohydratesAmount	glucometer	coCAt
contextCarbohydratesSource	glucometer	coCSe
contextExercise	glucometer	conEe
contextHealth	glucometer	conHh
contextLocation	glucometer	conLn
contextMeal	glucometer	conMI
contextMedication	glucometer	conMn
contextTester	glucometer	conTr
cupsNumber	brewing	cupNr
current	energyConsumption	currt
currentAdfState	autoDocumentFeeder	cuASe
currentDate	clock	curDe
currentJobMode	airConJobMode, airPurifierJobMode, clothesDryerJobMode, clothesWasherDryerJobMode, clothesWasherJobMode, cookerHoodJobMode, dehumidifierJobMode, dishWasherJobMode, robotCleanerJobMode, steamClosetJobMode	cuJMe
currentJobModeName	airConJobMode, airPurifierJobMode, clothesDryerJobMode, clothesWasherDryerJobMode, clothesWasherJobMode, cookerHoodJobMode, dehumidifierJobMode, dishWasherJobMode, robotCleanerJobMode, steamClosetJobMode	cJMNe
currentJobState	runState	cuJSe
currentMachineState	runState	cuMSe
currentPlayerMode	playerControl	cuPMe
currentPlayerModeName	playerControl	cPMNe
currentSecurityMode	securityMode	cuSMe
currentTemperature	temperature	curT0
currentTime	clock	curTe
currentTimeZone	clock	cuTZe

Attribute Name	Occurs in	Short Name
currentValue	smokeSensor	crv
defaultValue	numberValue, textMessage	defVe
defrost	refrigeration	defrt
description	faultDetection	dc
desiredHumidity	relativeHumidity	desHy
detectedTime	overcurrentSensor, smokeSensor	detTe
diastolicPressure	sphygmomanometer	diaPe
discharging	battery	discg
dischargingCapacity	electricVehicleConnector	disCy
doorState	doorStatus	dooSe
duration	overcurrentSensor, recorder	dur
electricEnergy	battery	eleEy
energy	pulsemeter	enery
estimatedTimeToEnd	timer	eTTEd
extraRinse	clothesWasherJobModeOption	extRe
fat	bioElectricalImpedanceAnalysis	fat
fatFreeMass	bodyCompositionAnalyser	faFMs
filterLifetime	filterInfo	filLe
foamingStrength	foaming	foaSh
frequency	energyConsumption	freqy
generationSource	energyGeneration	genSe
grainsRemaining	grinder	graRg
green	colour	green
hash	binaryObject	hash
hba1c	glucometer	hba1c
heading	geoLocation	headg
headingAccuracy	geoLocation	heaAy
heatingLevel	heatingZone	heaLI
height	height	height
horizontalAccuracy	geoLocation	horAy
horizontalDirection	airFlow	horDn
impactDirectionHorizontal	impactSensor	imDHI
impactDirectionVertical	impactSensor	imDVI
impactLevel	impactSensor	impLI
impactStatus	impactSensor	impSs
impedance	bodyCompositionAnalyser	impee
jobModes	airCon.JobMode, airPurifier.JobMode, clothesWasherDryer.JobMode, clothesWasher.JobMode, cookerHood.JobMode, dehumidifier.JobMode, dishWasher.JobMode, robotCleaner.JobMode, steamCloset.JobMode	jobMs
jobStates	runState	jobSs
kcal	bioElectricalImpedanceAnalysis	kcal
keyNumber	keypad	keyNr
latitude	geoLocation	latie
level	battery	lvl
light	alarmSpeaker	light
liquidLevel	liquidLevel	liqLI
liquidRemaining	liquidRemaining	liqRg
lock	lock	lock
loginName	credentials	logNe
longitude	geoLocation	longe
loudness	acousticSensor	louds
lowBattery	battery	lowBy
lqi	signalStrength	lqi
machineStates	runState	macSs
material	battery	matel
maxHeatingLevel	heatingZone	maHLI
maxLength	textMessage	maxLh
maxLevel	openLevel	maxLI
maxSpeed	airFlow	maxSd
maxValue	audioVolume, numberValue, ozoneMeter, temperature	maxVe
meanPressure	sphygmomanometer	meaPe
measuringScope	energyConsumption	meaSe

Attribute Name	Occurs in	Short Name
mediaID	mediaSelect	medID
mediaName	mediaSelect	medNe
mediaType	mediaSelect	medTe
memorySize	3DPrinter	memSe
messageEncoding	textMessage	mesEg
minLength	textMessage	minLh
minLevel	openLevel	minLI
minSpeed	airFlow	minSd
minValue	numberValue, temperature	minVe
modality	pulsemeter	moday
monitoringEnabled	airQualitySensor	monEd
multiplyingFactors	energyConsumption, energyGeneration	mulFs
muscle	bioElectricalImpedanceAnalysis	musce
muscleMass	bodyCompositionAnalyser	musMs
muteEnabled	audioVolume	mutEd
network	3DPrinter	netwk
numberValue	numberValue	numVe
object	binaryObject	objeT
objectType	binaryObject	objTe
openAlarm	doorStatus	opeAm
openDuration	doorStatus	opeDn
openLevel	openLevel	opeLI
overcurrentStatus	overcurrentSensor	oveSs
oxygenSaturation	oximeter	oxySn
ozoneStatus	ozoneMeter	ozoSs
ozoneValueMG	ozoneMeter	ozVMG
ozoneValuePPM	ozoneMeter	oVPPM
password	credentials	pwd
power	energyConsumption	power
powerGenerationData	energyGeneration	poGDa
powerSaveEnabled	powerSave	poSEd
powerState	binarySwitch	powSe
previousChannel	televisionChannel	preCI
preWash	clothesWasherJobModeOption	preWh
printingState	printQueue	priSe
printSizeX	3DPrinter	priSX
printSizeY	3DPrinter	priSY
printSizeZ	3DPrinter	priSZ
printType	3DPrinter	priTe
progressPercentage	runState	proPe
pulseRate	pulsemeter	pulRe
pushed	pushButton	pushd
rapidCool	refrigeration	rapCI
rapidFreeze	refrigeration	rapFe
recipientID	phoneCall	recID
red	colour	red
referenceTimer	timer	refTr
relativeHumidity	relativeHumidity	relHy
remoteControlEnabled	remoteControlEnable	reCEd
resistance	bioElectricalImpedanceAnalysis	resie
roundingEnergyConsumption	energyConsumption	roECn
roundingEnergyGeneration	energyGeneration	roEGn
rr	pulsemeter	r0
rssi	signalStrength	rssi
runningTime	timer	runTe
sdp	sessionDescription	sdp
securityModes	securityMode	secMs
sensitivity	motionSensor	sensy
sensorHumidity	airQualitySensor	senHy
sensorOdor	airQualitySensor	senOr
sensorPM1	airQualitySensor	sePM1
sensorPM10	airQualitySensor	sePM0
sensorPM2	airQualitySensor	sePM2
significantDigits	energyConsumption, energyGeneration	sigDs

Attribute Name	Occurs in	Short Name
silentTime	motionSensor	silTe
size	binaryObject	size
smokeThreshold	smokeSensor	smoTd
softLeanMass	bodyCompositionAnalyser	soLMs
soilLevel	clothesWasherJobModeOption	soiLI
speed	airFlow	speed
speedFactor	playerControl	speFr
speedWash	clothesWasherJobModeOption	speWh
spinLevelStrength	spinLevel	spLSh
spinSpeed	clothesWasherJobModeOption	spiSd
startPause	operationMode	staPe
status	boiler, electricVehicleConnector, faultDetection, filterInf, mediaSelect	sus
steamTreat	clothesWasherJobModeOption	steTt
step	numberValue	step
stepValue	audioVolume, openLevel, temperature	steVe
strength	brewing	streh
supportedHorizontalDirection	airFlow	suHDn
supportedMediaSources	mediaSelect	suMSs
supportedMessageValues	textMessage	suMVs
supportedPlayerModes	playerControl	suPMs
supportedVerticalDirection	airFlow	suVDn
systolicPressure	sphygmomanometer	sysPe
targetAltitude	geoLocation	tarAe
targetDuration	timer	tarDn
targetLatitude	geoLocation	tarLe
targetLongitude	geoLocation	tarL0
targetTemperature	temperature	tarTe
targetTimeToStart	timer	tTTSt
targetTimeToStop	timer	tTTSp
temperature	temperatureAlarm	tempe
temperatureThreshold	temperatureAlarm	temTd
textMessage	textMessage	texMe
time	keepWarm	time
token	credentials	tk
tone	alarmSpeaker	tone
turboEnabled	turbo	turEd
unit	temperature	unit
uri	printQueue	ur0
url	sessionDescription	ur1
useGrinder	grinder	useGr
uvStatus	uvSensor	uvtSs
uvValue	uvSensor	uvaVe
verticalAccuracy	geoLocation	verAy
verticalDirection	airFlow	verDn
visceraFat	bioElectricalImpedanceAnalysis	visFt
voc	airQualitySensor	voc
voltage	battery	volte
voltage	energyConsumption	volte
volumePercentage	audioVolume	volPe
washTemp	clothesWasherJobModeOption	wasTp
water	bioElectricalImpedanceAnalysis	water
waterFlowStrength	waterFlow	waFSh
weight	weight	weigt

6.4 containerDefinition values

6.4.1 Introduction

Each specialization has a *containerDefinition* attribute which can be used as a unique identifier and contains the information of the resource. In this clause, the detailed values of *containerDefinition* attributes in every specialization 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 that comply with the following rule.

- Rule: "org.onem2m.home.device.[device name]"

For example, the containerDefinition attribute of specialization for deviceAirConditioner shall be "org.onem2m.home.device.deviceAirConditioner".

6.4.3 ModuleClasses

The containerDefinition attribute of specializations for module classes shall have the values that comply with the following rule.

- Rule: "org.onem2m.home.moduleclass.[moduleclass name]"

For example, the containerDefinition attribute of specialization for alarmSpeaker shall be "org.onem2m.home.moduleclass.alarmSpeaker".

6.4.4 Actions

The containerDefinition attribute of specializations for actions shall have the values that comply with the following rule.

- Rule: "org.onem2m.home.moduleclass.[name of moduleclass that the action belongs to].[action name]"

For example, the containerDefinition attribute of specialization for activateClockTimer in the timer ModuleClass shall be "org.onem2m.home.moduleclass.timer.activateclocktimer".

6.5 XSD definitions

6.5.1 Introduction

The present clause specifies how to name the files which define data types in XSD for Device models, ModuleClass, 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 specified upon the following rule.

- Rule: HD-[device name]-v<TS-version>.xsd where the string '<TS-version>' shall be interpreted as the version of the present document

For example, the XSD definition for deviceAirConditioner specified in [TS-0023 v3.3.0] shall be "HD-deviceAirConditioner-v3_3_0.xsd".

Commented [DD3]: the present document? this version does not exist in WPM.

If you intend to refer to another version of the present document, this reference should be added to clause 2.1. or 2.2.

Answer:

Commented [KA4R3]: "the present document" but this is an example how to name the xsd. So, that was a (fictionous) version. I hope the changed text and adapted version numbers clarifies this

Commented [DD5R3]: I have left as it was, since this is an example using the number of the document will be clearer than "the present document". I have done the same in the other clauses containing this kind of example.

Commented [KA6R3]: Okay, thank you

6.5.3 XSD definitions for ModuleClass

The XSD definitions for ModuleClass are specified upon the following rule.

- Rule: HD-mod-[ModuleClass name]-v<TS-version>.xsd where the string '<TS-version>' shall be interpreted as the version of the present document

For example, the XSD definition for alarmSpeaker specified in TS-0023 v3.3.0 shall be "HD-mod-alarmSpeaker-v3_3_0.xsd".

6.5.4 XSD definitions for Action

The XSD definitions for Actions are specified upon the following rule.

- Rule: HD-act-[action name]-v<TS-version>.xsd where the string '<TS-version>' shall be interpreted as the version of the present document

For example, the XSD definition for activateClockTimer specified in TS-0023 v3.3.0 shall be "HD-act-activateClockTimer -v3_3_0.xsd".

6.5.5 XSD definitions for SubDevices

The XSD definitions for SubDevices are specified upon the following rule.

- Rule: HD-[SubDevice name]-v<TS-version>.xsd where the string '<TS-version>' shall be interpreted as the version of the present document

For example, the XSD definition for subDeviceCuff specified in TS-0023 v3.3.0 shall be "HD-subDeviceCuff-v3_3_0.xsd".

7 Mapping with Other Information Models from External Organizations

7.1 Introduction

This clause specifies how the Home Appliance Information Model (HAIM) defined in the clause 5 of the present document can be mapped with existing external models from OCF, ECHONET, OMA GotAPI, etc. and introduction of these models is written in annex B. The mapping shall be 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 shall be able to interact with non-oneM2M home appliances of different technologies in a consistent way without knowing the technology specific details. An IPE shall be responsible for translating the HAIM to/from technology specific information model bidirectionally following the mapping specification in this clause. Using HAIM as a bridge, home appliances and applications of different technologies shall be able to also interact with each other via the oneM2M system (with IPEs).

7.2 OMA GotAPI(DWAPI)

7.2.1 Introduction

The following clauses are intended to specify the mapping relationship between HAIM and OMA DWAPI with tables.

OMA DWAPI (Device Web Application Programming Interface) [6] is based on OMA GotAPI (Generic Open Terminal Application Programming Interface) [17] and supports Personal Healthcare Devices (DWAPI-PCH) and 3D printer (DWAPI-3DP).

OMA DWAPI has no concept that corresponds to ModuleClass in oneM2M. The mappings of DataPoints to data objects of OMA DWAPI are expressed in following clauses.

7.2.2 Device Models

7.2.2.1 device3Dprinter

The device3Dprinter of HAIM shall be mapped to 3D printer of OMA DWAPI-3DP on the basis of Table 7.2.2-1.

Table 7.2.2-1: Map of device3Dprinter of oneM2M HAIM to OMA DWAPI-3DP

ModuleClass	Data Points of oneM2M HAIM	data objects of OMA DWAPI-3DP	Description
binarySwitch	powerState	-	See clause 5.3.12. The powerState is not supported in OMA DWAPI-3DP data object. The power state is assumed power-on in OMA DWAPI-3DP.
faultDetection	code	operatingStatus	See clause 5.3.33. It shall be the integer type at HAIM, but shall be the string type at OMA DWAPI-3DP. See Table 7.2.2-2.
3Dprinter	printType	printType	See clause 5.3.1.
	printSizeX	printSizeX	
	printSizeY	printSizeY	
	printSizeZ	printSizeZ	
	network	network	
	memorySize	memorySize	
runState	currentMachineState	operatingStatus	See clause 5.3.67. This value represents the machineState of the 3D printer itself. This value SHALL be interpreted by using hd:enumMachineState and generated operatingStatus as a string. See Table 7.2.2-2.
temperature	currentTemperature	nozzleTemp	See clause 5.3.76. This value represents the temperature of the nozzle. This value SHALL be a float number in a range from 0,0 to 1 000,0. The unit is C.
printQueue	uri	uri	See clause 5.3.59.
	printingState	msg	See clause 5.3.59. This value represents the machineState of the queued printing job. This value shall be interpreted by using hd:enumMachineState and generated msg as a string. See the Table 7.2.2-3.

Table 7.2.2-2: Map of hd:enumMachineState of oneM2M HAIM to operatingStatus of OMA DWAPI-3DP

Value	Interpretation	operatingStatus of OMA DWAPI-3DP	Note
1	idle	RDY	Ready to use
2	preActive		Not available
3	active	RUN	Under printing operation
4	reserved		Not available
5	stopped		Not available
6	error	MAN	Maintenance needed
7	diagnostic		Not available
8	test		Not available
9	maintenance	MAN	Maintenance needed
10	clear	CLR	Printing completed but the result is not removed yet
11	charging		Not available

Table 7.2.2-3: Map of hd:enumJobState of oneM2M HAIM to msg of OMA DWAPI-3DP

Value	Interpretation	msg of OMA DWAPI-3DP	Note
1	aborted		Not available
2	cancelled		Not available
3	completed	Completed	
4	paused	Waiting	
5	pending	Waiting	
6	processing	Good Start	

7.2.2.2 deviceBloodPressureMonitor

DeviceBloodPressureMonitor of HAIM shall be mapped to Blood Pressure Monitor of OMA DWAPI-PCH [7] on the basis of Table 7.2.2-4.

Table 7.2.2-4: Map of deviceBloodPressureMonitor of oneM2M HAIM to OMA DWAPI-PCH

ModuleClass	DataPoints of oneM2M HAIM	Data objects of OMA DWAPI-PCH	Description
sphygmomanometer	diastolicPressure	diastolic	See clause 5.3.72.
	systolicPressure	systolic	
	meanPressure	mean	
pulsemeter	pulseRate	pulse	See clause 5.3.60
battery	level	batteryLevel	See clause 5.3.10. It shall be the integer type at HAIM, but shall be the float type at OMA DWAPI-PCH. It shall be the rounded percentage of the current level of battery in the range of [0, 100] at HAIM, but shall be a float number in the range of [0,0, 1,0] at OMA DWAPI-PCH.

7.2.2.3 deviceGlucosemeter

DeviceGlucometer of HAIM shall be mapped to Glucometer of OMA DWAPI-PCH [8] on the basis of Table 7.2.2-5.

Table 7.2.2-5: Map of deviceGlucometer of oneM2M HAIM to OMA DWAPI-PCH

ModuleClass	DataPoints of oneM2M HAIM	Data objects of OMA DWAPI-PCH	Description
glucometer	concentration	concentration	See clause 5.3.37.
	hba1c	hba1c	
	contextExercise	contextExercise	
	contextMedication	contextMedication	
	contextCarbohydratesAmount	contextCarbohydrates	
	contextCarbohydratesSource	contextCarbohydrates	
	contextMeal	contextMeal	
	contextLocation	contextLocation	
battery	contextTester	contextTester	See clause 5.3.10. It shall be the integer type at HAIM, but shall be the float type at OMA DWAPI-PCH. It shall be the rounded percentage of the current level of battery in the range of [0, 100] at HAIM, but shall be a float number in the range of [0,0, 1,0] at OMA DWAPI-PCH.
	contextHealth	contextHealth	
	level	batteryLevel	

7.2.2.4 devicePulseOximeter

DevicePulseOximeter of HAIM shall be mapped to Pulse Oximeter of OMA DWAPI-PCH [10] on the basis of Table 7.2.2-6.

Table 7.2.2-6: Map of devicePulseOximeter of oneM2M HAIM to OMA DWAPI-PCH

ModuleClass	DataPoints of oneM2M HAIM	Data objects of OMA DWAPI-PCH	Description
pulsemeter	modality	spo2, pulse	See clause 5.3.60. When oximeter module does not exist, pulsemeter module is mandatory.
oximeter	modality	spo2, pulse	See clause 5.3.54. When pulsemeter module does not exist, oximeter module is mandatory.
battery	level	batteryLevel	See clause 5.3.10. It shall be the integer type at HAIM, but shall be the float type at OMA DWAPI-PCH. It shall be the rounded percentage of the current level of battery in the range of [0, 100] at HAIM, but shall be a float number in the range of [0,0, 1,0] at OMA DWAPI-PCH.

7.2.2.5 deviceThermometer

DeviceThermometer of HAIM shall be mapped to Thermometer of OMA DWAPI-PCH [11] on the basis of Table 7.2.2-7.

Table 7.2.2-7: Map of deviceThermometer of oneM2M HAIM to OMA DWAPI-PCH

ModuleClass	Data Points of oneM2M HAIM	Data objects of OMA DWAPI-PCH	Description
temperature	unit	temperature	See clause 5.3.76.
battery	level	batteryLevel	See clause 5.3.10. It shall be the integer type at HAIM, but shall be the float type at OMA DWAPI-PCH. It shall be the rounded percentage of the current level of battery in the range of [0, 100] at HAIM, but shall be a float number in the range of [0,0, 1,0] at OMA DWAPI-PCH.

7.2.2.6 deviceWeightScaleAndBodyCompositionAnalyser

DeviceWeightScaleAdBodyCompositionAnalyser of HAIM shall be mapped to Weight Scale Body Composition Analyser of OMA DWAPI-PCH [12] on the basis of Table 7.2.2-8.

Table 7.2.2-8: Map of deviceWeightScaleAdBodyCompositionAnalyser of oneM2M HAIM to OMA DWAPI-PCH

ModuleClass	DataPoints of oneM2M HAIM	Data objects of OMA DWAPI-PCH	Description
bodyCompositionAnalyser	bodyLength	bodyLength	See clause 5.3.14.
	Bmi	bmi	
	fatFreeMass	fatFreeMass	
	softLeanMass	softLeanMass	
	muscleMass	muscleMass	
	basalMetabolism	basalMetabolism	
weight	weight	bodyMass	See clause 5.3.84.
bioElectricalImpedanceAnalysis	water	bodyWater	See clause 5.3.13.
	fat	bodyFat	
	muscle	musclePercentage	
battery	level	batteryLevel	See clause 5.3.10. It shall be the integer type at HAIM, but shall be the float type at OMA DWAPI-PCH. It shall be the rounded percentage of the current level of battery in the range of [0, 100] at HAIM, but shall be a float number in the range of [0,0, 1,0] at OMA DWAPI-PCH.

7.2.2.7 deviceHeartRateMonitor

DeviceHeartRateMonitor of HAIM shall be mapped to Heart Rate Monitor of OMA DWAPI-PCH [9] on the basis of Table 7.2.2-9.

Table 7.2.2-9: Map of deviceHeartRateMonitor of oneM2M HAIM to OMA DWAPI-PCH

ModuleClass	DataPoints of oneM2M HAIM	Data objects of OMA DWAPI-PCH	Description
pulsemeter	pulseRate	rate	See clause 5.3.60.
	rr	rr	
	energy	energy	
battery	level	batteryLevel	See clause 5.3.10. It shall be the integer type at HAIM, but shall be the float type at OMA DWAPI-PCH. It shall be the rounded percentage of the current level of battery in the range of [0, 100] at HAIM, but shall be a float number in the range of [0.0, 1.0] at OMA DWAPI-PCH.

7.2.3 Data Types

Data types of oneM2M HAIM and OMA DWAPI-PCH shall be mapped each other on the basis of Table 7.2.3-1.

Table 7.2.3-1: Map of data types between oneM2M and OMA DWAPI-PCH

oneM2M data type	Mapping to data type in OMA DWAPI	Description
xs:integer	int, number, string	Data type for 32-bit signed integer. For indicating 3D printerState, the integer value should be interpreted into string by referring the tables in clause 7.2.2.1.
xs:string	string, array	Data type for text. The length limitation should be considered for the mapping.
xs:float	float	Data type for a single precision 32-bit floating point type as defined in XML Schema 1.0 [13] as the float primitive type.
xs:boolean	boolean	Data type for Boolean.

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

Table 8-1 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 Therefore 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: <ul style="list-style-type: none"> • hasDataType • 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 5.5).

A.2 Example for Device model 'deviceAirConditioner'

The present clause explains the creation process for the device typed 'deviceAirConditioner' (see clause 5.5.1 for device model definition of 'deviceAirConditioner').

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

Commented [KA7]: Question to editHelp: How does one correctly use automatic references in Word so that tables in annexes (with different numbering scheme (A, B, ...)) automatically follow this scheme?

Commented [DD8R7]: In the first part (A.2) you have to use a field "styleref" (like you have correctly done in the rest of the document) with the appropriate heading style (in this case heading 1) add also the code "r". In the second part starting after the dash you have to use a field "seqfig" if you wish to number figures or a "seqtab" if you wish to number tables. add the code "r"+1 to start the numbering afresh. See also clause 6.9.2 of EDRs.

Commented [KA9R7]: Thank you!

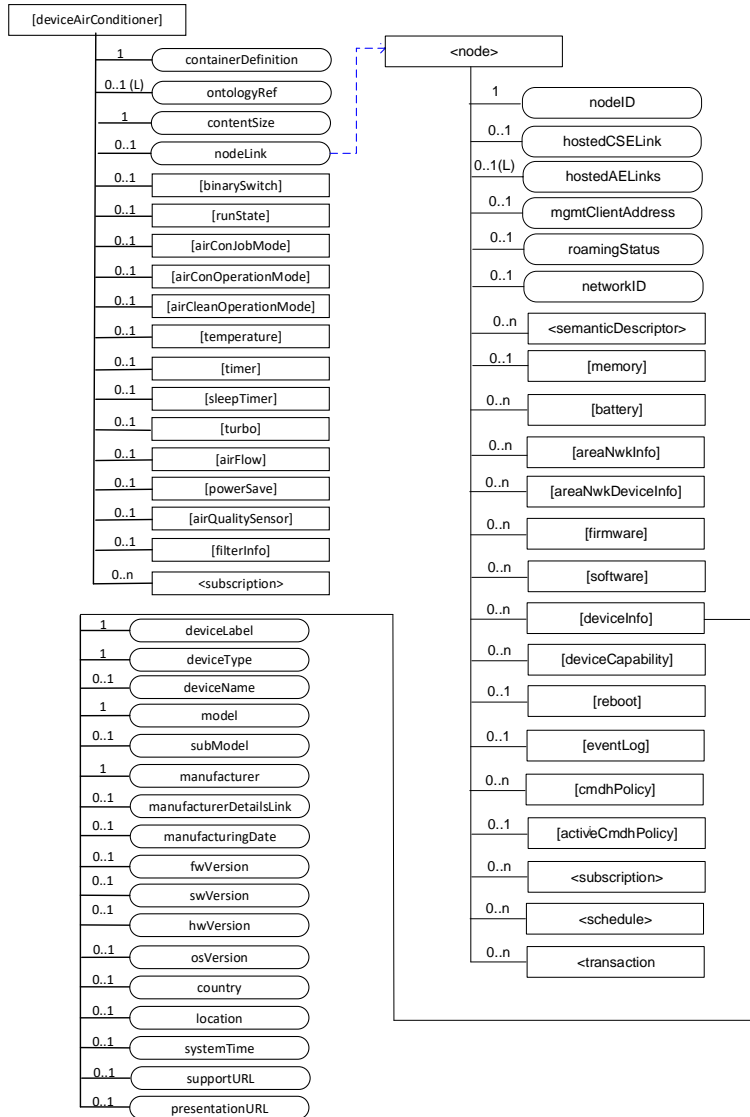


Figure A.2-1: Structure of [deviceAirConditioner] resource

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 [deviceAirConditioner]	Child Resource Type	Multiplicity	Description
[variable]	<flexContainer> as defined in the specialization [binarySwitch]	0..1	This resource is used to map 'binarySwitch' ModuleClass defined in clause 5.
[variable]	<flexContainer> as defined in the specialization [runState]	0..1	This resource is used to map 'runState' ModuleClass defined in clause 5.
[variable]	<flexContainer> as defined in the specialization [airConJobMode]	0..1	This resource is used to map 'airConJobMode' ModuleClass defined in clause 5.
[variable]	<flexContainer> as defined in the specialization [airConOperationMode]	0..1	This resource is used to map 'airConOperationMode' ModuleClass defined in clause 5.
[variable]	<flexContainer> as defined in the specialization [airCleanOperationMode]	0..1	This resource is used to map 'airCleanOperationMode' 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 [sleepTimer]	0..1	This resource is used to map 'sleepTimer' 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 [airFlow]	0..1	This resource is used to map 'airFlow' ModuleClass defined in clause 5.
[variable]	<flexContainer> as defined in the specialization [powerSave]	0..1	This resource is used to map 'powerSave' ModuleClass defined in clause 5.
[variable]	<flexContainer> as defined in the specialization [airQualitySensor]	0..1	This resource is used to map 'airQualitySensor' ModuleClass defined in clause 5.
[variable]	<flexContainer> as defined in the specialization [filterInfo]	0..1	This resource is used to map 'filterInfo' ModuleClass defined in clause 5.
[variable]	<subscription>	0..n	See clause 9.6.8 in oneM2M TS-0001 [3].

The [deviceAirConditioner] resource contains the attributes specified in Table A.2-2.

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

Attributes of [deviceAirConditioner]	Multiplicity	RW/RO/WO	Description
resourceType	1	RO	See clause 9.6.1.3 in oneM2M TS-0001 [3].
resourceID	1	RO	See clause 9.6.1.3 in oneM2M TS-0001 [3].
resourceName	1	RO	See clause 9.6.1.3 in oneM2M TS-0001 [3].
parentID	1	RO	See clause 9.6.1.3 in oneM2M TS-0001 [3].
expirationTime	1	RW	See clause 9.6.1.3 in oneM2M TS-0001 [3].
accessControlPolicyIDs	0..1 (L)	RW	See clause 9.6.1.3 in oneM2M TS-0001 [3].
creationTime	1	RO	See clause 9.6.1.3 in oneM2M TS-0001 [3].
lastModifiedTime	1	RO	See clause 9.6.1.3 in oneM2M TS-0001 [3].
labels	0..1	RW	See clause 9.6.1.3 in oneM2M TS-0001 [3].
dynamicAuthorizationConsultationIDs	0..1 (L)	RW	See clause 9.6.1.3 in oneM2M TS-0001 [3].
stateTag	1	RO	See clause 9.6.1.3 in oneM2M TS-0001 [3].
creator	0..1	RW	See clause 9.6.35 in oneM2M TS-0001 [3].
containerDefinition	1	WO	The value is "org.onem2m.home.device.airconditioner".
ontologyRef	0..1	RW	See clause 9.6.35 in oneM2M TS-0001 [3].
contentSize	1	RO	See clause 9.6.35 in oneM2M TS-0001 [3].
nodeLink	1	RO	nodeLink attribute links to a <node> resource that is hosted on the same hosting CSE of the <flexContainer>. See clauses 6.2.2 and 6.2.5 for more details.

A.3 Example of ModuleClass 'binarySwitch'

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

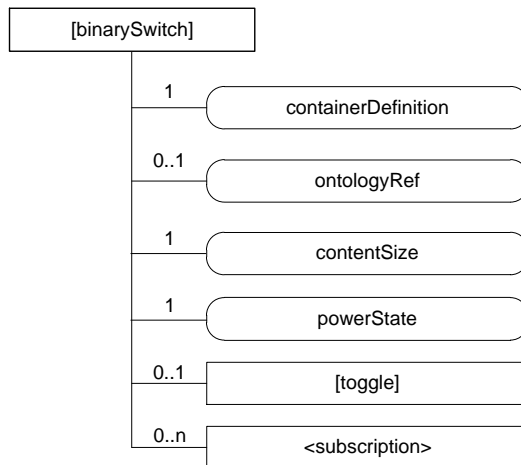


Figure A.3-1: Structure of [binarySwitch] resource

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

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

Child Resources of <i>[binarySwitch]</i>	Child Resource Type	Multiplicity	Description
<i>[variable]</i>	<flexContainer> as defined in the specialization <i>[toggle]</i>	0..1	This resource is used to map 'toggle' Action defined in clause 5.3.12.
<i>[variable]</i>	<subscription>	0..n	See clause 9.6.8 in oneM2M TS-0001 [3].

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

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

Attributes of <i>[binarySwitch]</i>	Multiplicity	RW/RO/WO	Description
<i>resourceType</i>	1	RO	See clause 9.6.1.3 in oneM2M TS-0001 [3]
<i>resourceID</i>	1	RO	See clause 9.6.1.3 in oneM2M TS-0001 [3]
<i>resourceName</i>	1	RO	See clause 9.6.1.3 in oneM2M TS-0001 [3]
<i>parentID</i>	1	RO	See clause 9.6.1.3 in oneM2M TS-0001 [3]
<i>expirationTime</i>	1	RW	See clause 9.6.1.3 in oneM2M TS-0001 [3]
<i>accessControlPolicyIDs</i>	0..1 (L)	RW	See clause 9.6.1.3 in oneM2M TS-0001 [3]
<i>creationTime</i>	1	RO	See clause 9.6.1.3 in oneM2M TS-0001 [3]
<i>lastModifiedTime</i>	1	RO	See clause 9.6.1.3 in oneM2M TS-0001 [3]
<i>labels</i>	0..1	RW	See clause 9.6.1.3 in oneM2M TS-0001 [3]
<i>dynamicAuthorizationConsultationIDs</i>	0..1 (L)	RW	See clause 9.6.1.3 in oneM2M TS-0001 [3]
<i>stateTag</i>	1	RO	See clause 9.6.1.3 in oneM2M TS-0001 [3]
<i>creator</i>	0..1	RW	See clause 9.6.35 in oneM2M TS-0001 [3]
<i>containerDefinition</i>	1	WO	The value is "org.onem2m.home.moduleclass.binaryswitch"
<i>ontologyRef</i>	0..1	RW	See clause 9.6.35 in oneM2M TS-0001 [3]
<i>contentSize</i>	1	RO	See clause 9.6.35 in oneM2M TS-0001 [3]
<i>nodeLink</i>	0..1	RW	Not applicable to a ModuleClass specialization. This attribute is not present in an instantiation of this resource
<i>powerState</i>	1	RW	See clause 5.3.12

A.4 Example of Action 'toggle'

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

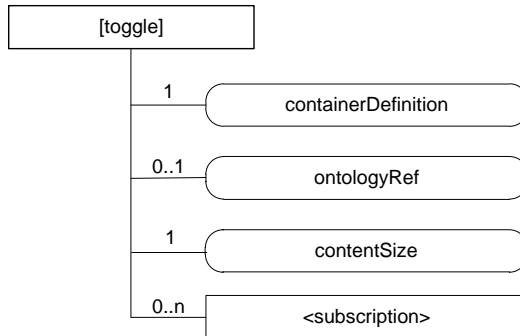


Figure A.4-1: Structure of [toggle] resource

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 [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 [3]
resourceID	1	RO	See clause 9.6.1.3 in oneM2M TS-0001 [3]
resourceName	1	RO	See clause 9.6.1.3 in oneM2M TS-0001 [3]
parentID	1	RO	See clause 9.6.1.3 in oneM2M TS-0001 [3]
expirationTime	1	RW	See clause 9.6.1.3 in oneM2M TS-0001 [3]
accessControlPolicyIDs	0..1 (L)	RW	See clause 9.6.1.3 in oneM2M TS-0001 [3]
creationTime	1	RO	See clause 9.6.1.3 in oneM2M TS-0001 [3]
lastModifiedTime	1	RO	See clause 9.6.1.3 in oneM2M TS-0001 [3]
labels	0..1	RW	See clause 9.6.1.3 in oneM2M TS-0001 [3]
dynamicAuthorizationConsultationIDs	0..1 (L)	RW	See clause 9.6.1.3 in oneM2M TS-0001 [3]
stateTag	1	RO	See clause 9.6.1.3 in oneM2M TS-0001 [3]
creator	0..1	RW	See clause 9.6.35 in oneM2M TS-0001 [3]
containerDefinition	1	WO	The value is "org.onem2m.home.moduleclass.binaryswitch.toggle"
ontologyRef	0..1	RW	See clause 9.6.35 in oneM2M TS-0001 [3]
contentSize	1	RO	See clause 9.6.35 in oneM2M TS-0001 [3]
nodeLink	0..1	RW	Not applicable to an Action specialization. This attribute is not present in an instantiation of this resource

Annex B (informative): Introduction of External Organizations' Data Models

B.1 OMA Got API(DWAPI-PCH)

OMA GotAPI(OMA Generic Open Terminal API Framework) provides the framework to enable applications and multitype devices through GotAPI Servers and Extension Plug-Ins [5]. When APIs are implemented in Extension Plug-Ins under the GotAPI framework, these APIs are called as OMA Device WebAPIs Enabler. In case of healthcare devices, these APIs are called as OMA DWAPI-PCH(Device WebAPIs for Personal Connected Healthcare).

Healthcare devices can be a one of the smart home devices so OMA DWAPI-PCH can have relationship with oneM2M SDT [3].

B.2 OCF

B.2.1 Introduction

OCF specifications provide a common, open connectivity framework for embedded developers that enables a common device discovery and interaction model, common data model and a robust security framework whilst abstracting away the physical connectivity hardware (and related protocols).

OCF Device Specification [i.8]defines list of smart home devices. Each smart home device contains a unique identifier and list of mandatory/optional resources. Each resource definition contains a unique identifier, identification of the default interface and other supported interfaces, list of supported methods, list of allowed actions and list of the mandatory/optional property(-ies) the resource exposes.

This clause specifies the mapping relationship between oneM2M and OCF Devices.

B.2.2 Device Type Mapping

Table B.2.2-1 captures the equivalency mapping between OCF defined Device Types and oneM2M defined Devices. The minimum module sets for each oneM2M device is provided in the present document. The minimum resource sets for each OCF Device is provided in the OCF Device Specification [i.8].

Table B.2.2-1: OCF to oneM2M Device Type Mapping

OCF Device Name	OCF Device Type	oneM2M Device
Active Speaker	oic.d.speaker	N/A
Air Conditioner	oic.d.airconditioner	deviceAirConditioner
Air Purifier	oic.d.airpurifier	deviceAirPurifier
Air Quality Monitor	oic.d.airqualitymonitor	deviceAirQualityMonitor
Battery	oic.d.battery	deviceStorageBattery
Blind	oic.d.blind	deviceWindowShade
Camera	oic.d.camera	deviceCamera
Clothes Washer Dryer	oic.d.washerdryer	deviceClothesWasherDryer
Coffee Machine	oic.d.coffeemachine	deviceCoffeeMachine
Cooker Hood	oic.d.cookerhood	deviceCookerHood
Cooktop	oic.d.cooktop	deviceCooktop
Dehumidifier	oic.d.dehumidifier	deviceDehumidifier
Dishwasher	oic.d.dishwasher	deviceDishWasher
Door	oic.d.door	deviceDoor
Dryer (Laundry)	oic.d.dryer	deviceClothesDryer
Electric Vehicle Charger	oic.d.electricvehiclecharger	deviceElectricVehicleCharger
Electric Meter	oic.d.electricmeter	deviceSmartElectricMeter
Energy Generator	oic.d.energygenerator	deviceMicrogeneration
Fan	oic.d.fan	deviceFan
Food Probe	oic.d.foodprobe	deviceFoodProbe
Freezer	oic.d.freezer	deviceFreezer
Garage Door	oic.d.garagedoor	deviceDoor
Generic Sensor	oic.d.sensor	N/A
Grinder	oic.d.grinder	N/A
Humidifier	oic.d.humidifier	deviceHumidifier
Light	oic.d.light	deviceLight
Oven	oic.d.oven	deviceOven
Printer	oic.d.printer	devicePrinter
Printer Multi-Function	oic.d.multifunctionprinter	deviceMultiFunctionPrinter
Receiver	oic.d.receiver	deviceAudioReceiver
Refrigerator	oic.d.refrigerator	deviceRefrigerator
Robot Cleaner	oic.d.robotcleaner	deviceRobotCleaner
Scanner	oic.d.scanner	deviceScanner
Security Panel	oic.d.securitypanel	deviceSecurityPanel
Set Top Box	oic.d.stb	deviceSetTopBox
Smart Lock	oic.d.smartlock	deviceDoorLock
Smart Plug	oic.d.smartplug	deviceSmartPlug
Switch	oic.d.switch	deviceSwitch
Television	oic.d.tv	deviceTelevision
Thermostat	oic.d.thermostat	deviceThermostat
Washer (Laundry)	oic.d.washer	deviceClothesWasher
Water Heater	oic.d.waterheater	deviceWaterHeater
Water Valve	oic.d.watervalve	deviceWaterValve
Window	oic.d.window	N/A

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