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| CHANGE REQUEST |
| Meeting ID:\* |  SDS #49 |
| Source:\* | Andreas Kraft, DT, Andreas.Kraft@t-systems.com Andrew Min-gyu Han, andyhan@hansung.ac.kr Cyrille Bareau, cyrille.bareau@orange.com  |
| Date:\* | 2021-01-28 |
| Reason for Change/s:\* | Integrating SDT4.0 in TS-00023 |
| CR against: Release\* | Release 4 |
| CR against: WI\* | [ ]  Active WI-xxxx[x]  MNT maintenance / < Work Item number(optional)>Is this a mirror CR? Yes [ ]  No [ ] mirror CR number: (Note to Rapporteur - use latest agreed revision)[ ]  STE Small Technical Enhancements / < Work Item number (optional)>Only ONE of the above shall be ticked |
| CR against: TS/TR\* | TS-0023, V4.7.0 |
| Clauses \* | 2.1, 5.2.1, 5.2.2, C.2, C.2.1 |
| Type of change: \* | [x]  Editorial change[ ]  Bug Fix or Correction[ ]  Change to existing feature or functionality[ ]  New feature or functionalityOnly ONE of the above shall be ticked |
| Impacted other TS/TR(s) |  |
| Post Freeze checking:\* | This CR contains only essential changes and corrections? YES [x]  NO [ ] This CR may break backwards compatibility with the last approved version of the TS? YES [ ]  NO [x]  |
| Template Version: January 2017 (Do not modify) |

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GUIDELINES for Change Requests:

Provide an informative introduction containing the problem(s) being solved, and a summary list of proposals.

Each CR should contain changes related to only one particular issue/problem.

In case of a correction, and the change apply to previous releases, a separate “mirror CR” should be posted at the same time of this CR

Mirror CR: applies only when the text, including clause numbering are exactly the same.

Companion CR: applies when the change means the same but the baselines differ in some way (e.g. clause number).

Follow the principle of completeness, where all changes related to the issue or problem within a deliverable are simultaneously proposed to be made E.g. A change impacting 5 tables should not only include a proposal to change only 3 tables. Includes any changes to references, definitions, and acronyms in the same deliverable.

Follow the drafting rules.

All pictures must be editable.

Check spelling and grammar to the extent practicable.

Use Change bars for modifications.

The change should include the current and surrounding clauses to clearly show where a change is located and to provide technical context of the proposed change. Additions of complete clauses need not show surrounding clauses as long as the proposed clause number clearly shows where the new clause is proposed to be located.

Multiple changes in a single CR shall be clearly separated by horizontal lines with embedded text such as, start of change 1, end of change 1, start of new clause, end of new clause.

When subsequent changes are made to content of a CR, then the accepted version should not show changes over changes. The accepted version of the CR should only show changes relative to the baseline approved text.

Introduction

This CR proposes a couple of small changes to introduce the new version of SDT, v4.0, to TS-0023.

It also corrects a couple of small typos.

R01:

Fixed wrong reference to SI unit definitions, added reference [20]

Further alligned Device -> DeviceClass

Corrected typos (Annex C)

Corrected document header

### \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Start of Change 1 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

## 2.1 Normative references

The following referenced documents are necessary, partially or totally, for the application of the present document. Their use in the context of this TS is specified by the normative statements that are referring back to this clause

[1] oneM2M Smart Device Template.

NOTE: Available at <https://git.onem2m.org/MAS/SDT>

[2] Java coding rule.

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

[4] oneM2M TS-0004: “Service Layer Core Protocol Specification”

[5] oneM2M TS-0005: ”Management Enablement (OMA)”.

[6] ISO:80000-1: Quantities and units

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

[7] Open Mobile AllianceTM: “OMA-ER-Device\_WebAPIs-V1\_0-20160419-C”.

NOTE: Available at http://www.openmobilealliance.org/release/DWAPI/V1\_0-20160419-C/OMA-ERELD-DWAPI\_V1\_0-20160419-C.pdf

[8] Open Mobile AllianceTM: “OMA-TS-Blood\_Pressure\_Monitor\_APIs-V1\_0-20160419-C”.

NOTE: Available at http://www.openmobilealliance.org/release/DWAPI/V1\_0-20160419-C/OMA-TS-Blood\_Pressure\_Monitor\_APIs-V1\_0-20160419-C.pdf

[9] Open Mobile AllianceTM: “OMA-TS-Glucometer\_APIs-V1\_0-20160419-C”.

NOTE: Available at http://www.openmobilealliance.org/release/DWAPI/V1\_0-20160419-C/OMA-TS-Glucometer\_APIs-V1\_0-20160419-C.pdf

[10] Open Mobile AllianceTM: “OMA-TS-Heart\_Rate\_Monitor\_APIs-V1\_0-20160419-C”.

NOTE: Available at http://www.openmobilealliance.org/release/DWAPI/V1\_0-20160419-C/OMA-TS-Heart\_Rate\_Monitor\_APIs-V1\_0-20160419-C.pdf

[11] Open Mobile AllianceTM: “OMA-TS-Pulse\_Oximeter\_APIs-V1\_0-20160419-C”.

NOTE: Available at http://www.openmobilealliance.org/release/DWAPI/V1\_0-20160419-C/OMA-TS-Pulse\_Oximeter\_APIs-V1\_0-20160419-C.pdf

[12] Open Mobile AllianceTM: “OMA-TS-Thermometer\_APIs-V1\_0-20160419-C”.

NOTE: Available at http://www.openmobilealliance.org/release/DWAPI/V1\_0-20160419-C/OMA-TS-Thermometer\_APIs-V1\_0-20160419-C.pdf

[13] Open Mobile AllianceTM: “OMA-TS-Weight\_Scale\_Body\_Composition\_Analyzer\_APIs-V1\_0-20160419-C”.

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

[14] W3C Recommendation: “XML Schema Part 2: Datatypes”, 02 May 2001.

NOTE: Available at <http://www.w3.org/XML/Schema/>.

[15] NIST standard FIPS PUB 180-2

[16] IETF RFC 4566: "SDP: Session Description Protocol".

[17] IANA Time Zone Database

NOTE: Available at <https://www.iana.org/time-zones>

[18] Void

[19] Open Mobile AllianceTM: “OMA-ER-GotAPI-V1\_1-20151215-C”.

[20] [NIST SP 330:2019](https://www.nist.gov/pml/special-publication-330): “Special Publication 330 - The International System of Units (SI) 2019 Edition“

NOTE: Available at <https://www.nist.gov/pml/special-publication-330>

### \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* End of Change 1 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

### \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Start of Change 2 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

### Basic design principle of information modelling

The design principle of the oneM2M abstract information model of home appliance, is to use SDT 4.0 originally 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 DeviceClass 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 DeviceClasses.

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

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

Figure 5.2.1‑1 depicts the basic structure of SDT 4.0. Further details about SDT 4.0 and its elements can be found in [1].

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



Figure 5.2.1‑1: Design Structure of the Home Appliance Information Model using SDT 4.0

The R/W column of the ModuleClasses’s data point tables in clause 5.3 reflects the intentions of how a data point in a ModuleClass shall be used semantically. This is a “behavioral contract” between applications or users of the modeled devices on the semantic level. Further, the devices or IPE’s (for NoDN) are expected to implement and control the mappings in clause 5.2.2 to implement this “behavioral contract".

### \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* End of Change 2 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

### \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Start of Change 3 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

### Description rules for ModuleClasses and DeviceClasses

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 Domains are specified as “org.onem2m.[domain]”, where [domain] is one of the following names: “agriculture”, “city”, “common”, “health”, “home”, “industry”, “railway”, “vehicular” and “management”. The name is chosen according to the domain in which the element is defined.
* The sub-domains for DeviceClasses, SubDevices, ModuleClasses and Actions shall be specified as "org.onem2m.[domain].device", “org.onem2m.[domain].subdevice”, “org.onem2m.[domain].moduleclass”, and “org.onem2m.[domain].action” 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).
* All DeviceClasse s, SubDevices, ModuleClasses, and Actions of a domain shall be uniquely named.
* Rule 6: Criteria for marking elements as optional or mandatory:
* An element shall only be defined as mandatory if it's foreseen to be universally mandatory to all implementing technologies.
* Rule 7: Enumeration type:
* When describing the meaning of values for enumeration type elements, they may be described under clause 5.6.
* The enumeration types for the harmonized 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.
* An enumeration type must be defined under the same domain as the module classes that use it. It also must use the same XSD name space identifiers as defined in clause 6.5.1. If an enumeration type is used in multiple module classes from different domains, then the enumeration type is defined only once.
* Rule 8: Rule for unit in documentation:
* SI (International Systems of Units in [20]) 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.
* Units of measures shall be given in the form of a shortcut compliant to table 5.2.1-1.

Table 5.2.1-1: Shortcuts for units

|  |  |  |
| --- | --- | --- |
| Original name | Short name | Explanation |
| Ampere | A |  |
| Ampere Hour | Ah |  |
| Bar | bar |  |
| Celsius | °C |  |
| Centimeters | cm |  |
| Cubic Meter | m3 |  |
| Cubic meter per hour | m3/h |  |
| Decibel | dB |  |
| Decibel-milliwatts | dBm |  |
| Degrees | deg |  |
| Dots per inch | dpi | dpi is the common unit for spatial dot density |
| g-force | g-f |  |
| Grams | g |  |
| Hertz | Hz |  |
| Kilocalories | kcal |  |
| Kilocalories per hour | kcal/h |  |
| Kilograms per square meter | kg/m2 |  |
| Kilopascal | kPa |  |
| kilovar | kvar |  |
| Kilowatt | kW |  |
| Megabyte | MB | 1 MB = 1024 \* 1024 bytes |
| MegaHertz | MHz |  |
| Meter | m |  |
| Meters per second | m/s |  |
| Miligram per cubic meter | mg/m3 |  |
| Microgram per cubic meter | μg/m3 |  |
| Milligram per deciliter | mg/dl |  |
| Milligram per liter | mg/L |  |
| Millimeter | mm |  |
| Millimeter of mercury | mmHg |  |
| Milliseconds | ms |  |
| Milliwatt per cubic centimetre | mW/cm2 |  |
| Minute | min |  |
| Odor unit per cubic meter | OU/m3 |  |
| Ohm | ohm |  |
| Parts per minute | ppm |  |
| Percent | pct |  |
| Picofarad | pF |  |
| Seconds | s  |  |
| Siemens per meter | S/m |  |
| Volt | V |  |
| Watt | W |  |
| Watt hour | Wh |  |

Editor's note: Popular unit in particular industrial domain shall be considered (e.g. cm for human height, calories for energy consumption in healthcare domain). It shall be made coherent in the document, as possible.

* Rule 9: Rule for type:
* Measured and/or calculated values should be represented in float (without taking care of resolution of values).

Editor’s note: It should be made coherent in the document, as possible. Unit shall not be fixed as a rule but be decided with correspondence to each DeviceClass or ModuleClass.

* 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 must 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 must have the prefix “current”, and the name for the target data point must have the prefix “target”. Both data points must have the same suffix, for example “currentTemperature” and “targetTemperature”.
* Rule 12: Algorithm to generate short names for DeviceClasses, ModuleClasses, Data Points, Actions
* Every domain in oneM2M defines their own short names, i.e. there may exist the same short name in more than one domain, but these short names are distinguished by the domain prefix.
* Previous defined short names of the home domain, e.g. from a previous version of the specification, must be taken into account. They are assigned to the same original names.
* The algorithm to generate the short names from the original names works as follows:
	+ The maximum length of a short name for TS-0023 is 5 characters. This length includes the optional appended distinguishing number (see below), but not the suffix for announced resources.
	+ If the length of the original name is equal or less than 5 characters, then store the original name as an intermediate result.
	+ Else, if the length of the original name is greater than 5 characters, then perform the following procedure:
		- The first and the last character of the original name are stored as first and second character as an intermediate result.
		- All the upper-case characters of the original name, starting with the first upper-case character, are inserted one by one before the last character of the intermediate result, up to a total length of 5 characters of the intermediate result.
		- In case the length of the intermediate result after these steps is less than 5 characters, then the intermediate result is filled with characters from the original string until the length of the intermediate result is 5 characters, following this procedure: the second character of the original name is inserted as the second character of the intermediate result while shifting all characters from the intermediate result by one character forward. This is repeated with the third, fourth, etc., character from the original name.
	+ The intermediate result is now compared with all existing short names. If the intermediate result can be found in the list of existing short names, then execute the following steps until the intermediate result cannot be found in the list of previously defined short names:
		- Replace the last character of the intermediate result with an integer number, starting with 0. If the number becomes a two-digit number, then replace the last two characters of the intermediate result, and so forth.
		- Repeat the check described above. If the intermediate result is still the same as an existing short name, then the appended integer number is increased by 1, and the check is repeated.
	+ The intermediate result is now stored as a new short name in the list of existing short names.
* Short names for announced resources are created by taking the regular short name of the entity and appending the characters “Annc” to it. Short names for announced resources therefore have a maximum length of 9 characters.

The following table provides some examples for short names that have been created by the described algorithm.

Table 5.2.1-2: Examples for original name to short name mappings

|  |  |
| --- | --- |
| Original name | short name |
| co2 | co2 |
| clock | clock |
| currentJobMode | cuJMe |
| absoluteStartTime | abSTe |
| absoluteStopTime | abST0 |
| impactSensor | impSr |
| impactSensorAnnc | impSrAnnc |

* Rule 13: Rule for R/W column
* The value used in this column defines the interface as it applies to the user of this module. The entity that this module represents (device AE or IPE AE) can read or write to any or all of the datapoints as needed in order to implement the defined interface to the user. <accessControlPolicy> resources shall be defined to enforce access control to the datapoints of the module defined such that R in the R/W column has RETRIEVE accessControlOperations and RW in the R/W column has RETRIEVE and UPDATE accessControlOperations.

### \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* End of Change 3 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

### \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Start of Change 4 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

C.2 XML representation of SDT instances

ModuleClasses, SubDevice models and DeviceClass models written in clause 5 are expressed another way with using each class names as the tag. This clause introduces this way.

Normative work for defining the mapping rules from SDT to XML/ JSON instance are defined by SDT 4.0.

### \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* End of Change 4 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

### \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Start of Change 5 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

C.2.1 Mapping Rules of XML representation

Mapping from SDT instance into XML representation is following. Inclusion relationship of SDT instances are directly expressed as inclusion relationship of XML tags. Tag name is same as each classes.

<DeviceClass Class Name>

 <SubDevice Class Name>

 <ModuleClass Class Name>

 <DataPoint Class Name>value</DataPoint Class Name>

 <Property Class Name>value</Property Class Name>

 </ModuleClass Class Name>

 </ SubDevice Class Name>

</DeviceClass Class Name>

Action Class cannot have any value and it only lengthen the message so it is omitted.

When a certain device does not have any SubDevice, the tags about SubDevices don’t appear and tags about ModuleClass are placed under the DeviceClass directly.

### \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* End of Change 5 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*