

A consideration of describing SDT for ECHONET devices



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ECHONET Consortium

Corresponding ECHONET device classes for target devices

- The following ECHONET device classes for designated target devices at the first step of SDT project are available shown as in the below table.
(Ref. Appendix Detailed Requirements for ECHONET Device Objects Release F, http://www.echonet.gr.jp/english/spec/spec_app_f_e.htm)

Target devices at the first step of SDT project	ECHONET device classes
Common functions for all devices	2. Super Class
Designated target devices at HGI <i>(7 Devices)</i>	
dimmer-switch	3.3.28 general lighting
thermometer-sensor	3.1.17 temperature sensor
magnet-contact	3.1.40 open/close door sensor
energy-plug	3.1.34 electric energy sensor 3.1.35 current value sensor 3.3.20 watt-hour meter
on/off switch	3.6.1 switch
washing machine	3.4.6 washing machine 3.4.8 clothes dryer 3.4.9 washer and dryer
multi-socket electrical-extension-block	3.3.24 power distribution board metering

Policy for SDT transformation of ECHONET devices

- SDT transformation is proceeded based on the structure of ECHONET device objects specs.
- Each Property for each class is described by an the <DataPoint> element.

The structure of the current ECHONET Device object specification (Appendix. F)			The structure of XML at SDT	
Chapter 2. Device Object Super Class Requirement	2.1~2.22 Details of properties for Super Class		RootDevices/RootDevice/Modules/	
			ModuleClass=superClass	DataPoint
Chapter 3. Detailed Requirements for Device Objects			Modules/	
3.1 Sensor-related Device Class Group	3.1.17 temperature sensor	Details of properties	ModuleClass=gasLeakSensor	DataPoint
	3.1.34 electric energy sensor		...	
	3.1.35 current value sensor		...	
	3.1.40 open/close door sensor		...	
	
3.2 Air-Conditioner related device class group	
3.3 Housing facility related device class group	3.3.24 power distribution board metering	
3.4 Cooking/Household related device class group	3.4.6 Washing Machine	
3.5 Healthcare related device class group	
3.6 Management operation related device class group	3.6.1 switch class	
3.7 Audio/visual related device class group	

Example of ECHONET device object : 3.4.6 Washing Machine

3. 4. 6 Requirements for washing machine class

Class group code: 0x03
 Class code : 0xC5
 Instance code : 0x01–0x7F (0x00 : All-instance specification code)

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	This property indicates the ON/OFF status.	unsigned char	1 byte	—	Set		○	
		ON=0x30, OFF=0x31				Get	○		
Door/cover open/close status	0xB0	This property indicates whether the door/cover is open or closed.	unsigned char	1 byte	—	Get			
		Door/cover open = 0x41 Door/cover closed = 0x42							
Washing machine setting	0xB2	Washing machine setting	unsigned char	1 byte	—	Set/Get			
		Start/restart the washing cycle (started/restarted) = 0x41 Suspend the washing cycle (suspended) = 0x42 Stop the washing cycle (stopped) = 0x43							
Current stage of washing cycle	0xE1	This property indicates the current stage of the washing cycle.	unsigned char	1 byte	—	Get			
		Washing = 0x41, rinsing = 0x42, spin drying = 0x43, suspended = 0x44, washing cycle stopped/completed = 0x45							
Time remaining to complete washing cycle	0xE6	This property indicates the time remaining to complete the current washing cycle in the HH:MM:SS format.	unsigned char × 3	3 bytes	—	Get			
		0–0x17: 0–0x3B: 0–0x3B (= 0–23): (= 0–59): (= 0–59)							
ON timer reservation setting	0x90	Reservation ON/OFF	unsigned char	1 byte	—	Set/Get			
		Reservation ON = 0x41, reservation OFF = 0x42							
ON timer setting	0x91	Timer value (HH:MM)	unsigned char × 2	2 bytes	—	Set/Get			
		0–0x17: 0–0x3B							

Transformation rules about how to transcribe the properties of ECHONET device objects into SDT

Properties of ECHONET device object	Corresponding attribute/element on SDT	Transformation rules
Property name	"Name" attribute	<ul style="list-style-type: none"> Start with small letter all the time and follow lowerCamelCase where for a compound term. (more than 2 words), delete space and start with capital letter for the following words. Transcribe all the letters without any omission. There are some exceptional rules for specific cases (see the reference slide for details).
EPC		<ul style="list-style-type: none"> No transcription into SDT.
Content of property	"type" attribute "Doc" element	<ul style="list-style-type: none"> "Boolean" is assigned as "type" attribute when on/off a property can be switched by "0x30"/"0x31". "Integer" is assigned as "type" attribute when a property takes a numerical value. "enum" is assigned as "type" attribute when a property takes the value which is chosen from the enumerated value table. (ex. 1: Automatic 2:Cooling 3: Heating ...) "time" is assigned as "type" attribute when a property takes time value except relative time "Array" is assigned as "type" attribute when a property takes multiple values. "date" is assigned as "type" attribute when a property takes date value. "string" is assigned as "type" attribute when a property takes string value. Explanation or value range for a property is described using "doc" element.
Value range		<ul style="list-style-type: none"> No transcription into SDT.
Data-type	"type" attribute	<ul style="list-style-type: none"> Follow the same rule described at the 「Content of property」.
Data-size		<ul style="list-style-type: none"> No transcription into SDT.
Unit	"unit" attribute	<ul style="list-style-type: none"> Proper unit is assigned by referring to the ISO document "ISO 80000-1:2009". No transcription into SDT when no definition at ECHONET (shown as "-") No transcription for a coefficient.
Access Rule	"writable" attribute	<ul style="list-style-type: none"> writable=true as long as the property can be operated "set" function. writable=false when the property can be operated by only "get" function.
Mandatory		<ul style="list-style-type: none"> No transcription into SDT.
Announcement at status change	"event" element	<ul style="list-style-type: none"> Transcribe the property name under "Events" element when this property is available.

Example of SDT for 3.4.6 Washing Machine

```
<!-- 3.4.6 洗濯機クラス -->
<!-- washing machine -->
- <ModuleClass name="washingMachine">
- <Data>
- <DataPoint name="operationStatus" type="boolean" writable="true">
  <Doc>This property indicates the ON/OFF status.</Doc>
</DataPoint>
- <DataPoint name="door/CoverOpen/CloseStatus" type="enum" writable="false">
  <Doc>This property indicates whether the door/cover is open or closed.</Doc>
</DataPoint>
- <DataPoint name="washingMachineSetting" type="enum" writable="true">
  <Doc>Washing machine setting</Doc>
</DataPoint>
- <DataPoint name="currentStageOfWashingCycle" type="enum" writable="false">
  <Doc>This property indicates the current stage of the washing cycle.</Doc>
</DataPoint>
- <DataPoint name="timeRemainingToCompleteWashingCycle" type="time" writable="false">
  <Doc>This property indicates the time remaining to complete the current washing cycle in the HH:MM:SS format.</Doc>
</DataPoint>
- <DataPoint name="onTimerReservationSetting" type="enum" writable="true">
  <Doc>Reservation ON/OFF</Doc>
</DataPoint>
- <DataPoint name="onTimerSetting" type="time" writable="true">
  <Doc>Timer value (HH:MM)</Doc>
</DataPoint>
- <DataPoint name="relativeTimeBasedOnTimerSetting" type="time" writable="true">
  <Doc>Timer value (HH:MM)</Doc>
</DataPoint>
</Data>
- <Events>
  <Event name="operationStatus" />
</Events>
</ModuleClass>
```

Questions:

Q1. How to define ID at the RootDevice element?

(ex. We currently defined as follows: <RootDevice id="echonetLiteDevice">); see our xml file)

Q2. Is it necessary to import RootDevice for each ModuleClass ?

Q3. Should we split DataPoint for the properties which are described by the combination of multiple data?

(ex. The property "Measured instantaneous currents" as shown in the reference slide)

Q4. How to define a data type for each element about the property of array data type?

Q5. How to describe a value range for enum data type?

Q6. Is it necessary to describe information about maximum and minimum value for a numerical data?

Q7. How to handle a coefficient to express a real data value with the unit?

Q8. How to handle the meaning of "mandatory" properly?

(ex: Each property of ECHONET device objects is defined as "mandatory" or "optional".)

Q9. How to represent properly such a class as has multiple values with the same data type?

(ex. In case of "Historical data of measured Cumulative amount of electric energy";

48 pieces of half-hourly data for the preceding 24 hours)

References

USING CURRENT SDT ENTITIES TO MODEL DATA POINTS

Ref: Mapping rules for Echonet(1 / 2)

- Source for all models is http://www.echonet.gr.jp/english/spec/pdf_spec_app_e_e/SpecAppendixE_e.pdf
- Property names are mapped as follows
 - Always starts with a small letter
 - Blanks and dashed are removed, and next word is concatenated with a capital letter
 - All words of aforementioned source are used
- EPC is not used in SDT models
- Contents: See following slide
- Data types
 - Default mapping is integer for all values, however, the content semantics are main indicator to typing
- Data size: ignored
- Unit: if there is a “unit” specified, the <DataPoint> must contain an attribute “unit” set the according abbreviation from “ISO 80000-1:2009”
- Access rule, mandatory: see following slide
- Annoucement at status change: Should be mapped to an event definition, details tbd.

USING CURRENT SDT ENTITIES TO MODEL DATA POINTS

Ref: Mapping rules for Echonet(2/2)

- Contents are mapped follows:
 - 2 state values with the value 0x30 and 0x31 are represented as boolean
 - Numeric values are represented as integer (even if they're typed as "char" in the source)
 - Numeric values that represent different named states should be represented as `<xs:enumeration>`
 - Properties that are "Get" access rule only must not be represented without "writable" attribute
 - Properties that a "Get" access rule and an optional or mandatory "Set" access rule must be represented with a "writable" attribute set to "true"
 - Properties that are "Set" only, and do only have 1 possible value, are represented as actions, with an adapted name according to its function
 - Properties containing more than 1 value have to split to multiple data points

