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Foreword

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

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1 Scope

The present document specifies the protocol translation and mappings between the oneM2M Service layer and the management technologies specified by OMA such as OMA DM 1.3, OMA DM 2.0 and OMA LightweightM2M. Note that OMA DM 1.3 and OMA DM 2.0 are collectively referenced as OMA DM in the present document.

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] ETSI TS 118 001: "oneM2M; Functional Architecture (oneM2M TS-0001)".

[2] ETSI TS 118 004: "Service Layer Core Protocol Specification".

[3] Open Mobile Alliance™: "OMA Device Management Protocol", Version 1.3.

NOTE: Available at http://www.openmobilealliance.org/.

[4] Open Mobile Alliance™: "OMA Device Management Protocol", Version 2.0.

NOTE: Available at http://www.openmobilealliance.org/.

[5] Open Mobile Alliance™: "OMA LightweightM2M", Version 1.0.

NOTE: Available at http://www.openmobilealliance.org/.

[6] Open Mobile Alliance™: "OMA Diagnostics and Monitoring Management Object Framework".

NOTE: Available at http://www.openmobilealliance.org/.

[7] Open Mobile Alliance™: "OMA Firmware Update Management Object".

NOTE: Available at http://www.openmobilealliance.org/.

[8] Open Mobile Alliance™: "OMA Software Component Management Object".

NOTE: Available at http://www.openmobilealliance.org/.

[9] ETSI TS 103 092: "Machine-to-Machine communications (M2M); OMA DM compatible Management Objects for ETSI M2M".

[10] Open Mobile Alliance™: "OMA Device Capability Management Object".

NOTE: Available at http://www.openmobilealliance.org/.

[11] Open Mobile Alliance™: "OMA Management Interface to M2M Requirements".

NOTE: Available at http://www.openmobilealliance.org/.

[12] ISO 8601:2000: "Data elements and interchange formats -- Information interchange -- Representation of dates and times".

NOTE: Available at http://www.iso.ch/.

[13] W3C Recommendation: "XML Schema Part 2: Datatypes", 02 May 2001.

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

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[14] IETF RFC 4122: "A Universally Unique Identifier (UUID) URN Namespace", P. Leach, et al. July 2005.

NOTE: Available at http://www.ietf.org/rfc/rfc4122.txt.

[15] ETSI TS 123 003: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Numbering, addressing and identification (3GPP TS 23.003)".

[16] BBF: "TR-069 CPE WAN Management Protocol" Issue: 1 Amendment 5, November 2013.

[17] IETF RFC 7252: "The Constrained Application Protocol (CoAP)".

[18] Open Mobile Alliance™: "OMA LightweightM2M - Software Management Object", Version 1.0, Open Mobile Alliance™.

NOTE: Available at http://www.openmobilealliance.org/.

[19] Open Mobile Alliance™: "OMA LightweightM2M - Device Capability Management Object".

NOTE: Available at http://www.openmobilealliance.org/.

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://member.onem2m.org/Static_pages/Others/Rules_Pages/oneM2M-Drafting-Rules-V1_0.doc.

[i.2] ETSI TS 118 111: "oneM2M; Common Terminology (oneM2M TS-0011)".

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3 Definitions

For the purposes of the present document, the terms and definitions given in ETSI TS 118 111 [i.2] apply.

4 Conventions

The keywords "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 OMA DM 1.3 and OMA DM 2.0

5.1 Mapping of basic data types

oneM2M has defined the data types that describe the format of the value stored with the attribute. Those oneM2M data types are listed in the below table, and mapped to the data types specified by OMA DM Protocol [3] and [4]. Note that OMA DM 1.3 [3] and OMA DM 2.0 [4] use the same data types.

Table 5.1-1: Basic data types

oneM2M Data Types	Mapping to data types in OMA DM	Description
TBD	null	OMA DM Nodes with null data type shall not store any value.
xs:base64Binary	b64	Data type for Base64-encoded binary data.
xs:base64Binary	bin	Data type for binary data.
xs:boolean	bool	Data type for Boolean.
xs:string	chr	Data type for text. The length limitation should be considered for the mapping.
xs:integer	int	Data type for 32-bit signed integer.
xs:date	date	Data type for date in ISO 8601 [12] format with the century being included in the year.
xs:time	time	Data type specifying that the Node value is a time in ISO 8601 [12] format.
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:nonNegativeInteger	int	Data type for numbers equal or larger than 0, mapped from 64-bit to 32-bit representation.
xs:positiveInteger	int	Data type for numbers equal or larger than 1, mapped from 64-bit to 32-bit representation.
xs:long	int	Data type for signed integer numbers, mapped from 64-bit to 32-bit representation.
The *mgmtLink* attribute in the <mgmtObj> Resource	node	The OMA DM 'node' data type describes the format of the Interior Node that can have child Nodes. The mgmtLink attribute in the <mgmtObj> Resource supports the hierarchy of <mgmtObj> Resource. Note that this is not data type mapping.

5.2 Mapping of Identifiers

OMA DM 1.3 and OMA DM 2.0 specify many identifiers including device identifier, server identifier, client version identifier, manufacturer identifier, etc. To enable the device management using OMA DM Protocol, oneM2M identifiers needs to be mapped to identifiers specified by OMA DM Protocol. Table 5.2.-1 shows the oneM2M identifiers that need to be mapped to OMA DM Protocol.

Table 5.2-1: Map of Identifiers

oneM2M	Mapping to OMA DM Identifiers	Description
M2M-Node-ID.	Device Identifier (i.e. DevId node in DevInfo MO).	In OMA DM, the device identifier is a unique identifier for the device. This value is globally unique and has to be formatted as a URN. OMA DM Gateways and OMA DM enabled devices are assigned with the device identifiers, and each can be mapped to the M2M-Node-ID. Note: In case the notion of the device identifier is not supported by the device, the DM Gateway can assign the local identifier for the device, and the M2M-Node-ID should be mapped to this local identifier.
The *objectID* attribute in <mgmtObj> resource.	Management Object Identifier (MOID).	A unique identifier of the management object. Each MO is characterized by a unique MOID, which is generally a URN.
The *objectPath* attribute in <mgmtObj> resource.	URI for the local path in the device where the relevant Management Object is located.	Management Objects in the device are uniquely addressed by a URI that is stored in the *objectPath* attribute. Note that DM 1.3 and DM 2.0 uses different Addressing scheme, but they are transparent to the oneM2M service layer.

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5.3 Mapping of resources

5.3.0 Introduction

This clause describes how to map <mgmtObj> resources specified in annex D of [1] to the relevant management objects as defined by OMA DM ([3] and [4]). Since OMA DM 1.3 and OMA DM 2.0 use the same management objects except standard management objects, the resource mappings can be considered regardless of the specific version of the OMA DM Protocol.

5.3.1 General Mapping Assumptions

OMA DM Protocol implements the management functionalities by using the Management Objects. Management Object is a collection of Nodes which are related for providing certain management functionalities. For example, SCOMO is for the software management, and FUMO is for the firmware update, and so on. The individual management operations such as firmware update, software management can be achieved by manipulating the corresponding Management Object. Since oneM2M <mgmtObj> Resources are for providing specific management functionalities, oneM2M <mgmtObj> Resources shall be mapped to Management Objects specified by OMA DM [3] and [4].

5.3.2 Resource [firmware]

The resource [firmware] is for firmware management in the service layer. Regardless of OMA DM 1.3 and OMA DM 2.0, the resource shall be mapped to FUMO (urn:oma:mo:omafumo:1.0). The attributes of the resource shall be mapped to nodes of the MO as follows.

Table 5.3.2-1: Resource [firmware]

Attribute Name of [firmware]	Mapping to Nodes in Management Object
version	<x>/PkgVersion
name	<x>/PkgName
URL	<x>/DownloadAndUpdate/PkgURL
update	<x>/DownloadAndUpdate
updateStatus	<x>/State
NOTE: Here <x> is an interior node that acts as a placeholder for the FUMO.	

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5.3.3 Resource [software]

The resource [software] is for software management in the service layer. Regardless of OMA DM 1.3 and OMA DM 2.0, the resource shall be mapped to SCOMO (urn:oma:mo:oma-scomo:1.0). The attributes of the resource shall be mapped to nodes of the MO as follows.

Table 5.3.3-1: Resource [software]

Attribute Name of [software]	Mapping to Nodes in Management Object
version	<x>/Inventory/Deployed/<x>/Version
name	<x>/Download/<x>/Name (when the software package is not ready for install) <x>/Inventory/Delivered/<x>/Name (when the software package is ready for install) <x>/Deployed/<x>/Name (when the software package is already installed)
URL	<x>/Download/<x>/PkgURL
install	<x>/Download/<x>/Operations/DownloadInstall (when the software package is not yet available) <x>/Inventory/Delivered/<x>/Operations/Install (when the software package has already been downloaded)
uninstall	/<x>/Inventory/Delivered/<x>/Operations/Remove
installStatus	<x>/Download/<x>/Status (started install when the software package is not yet available) <x>/Inventory/Delivered/<x>/Status (started install when the software package has already been downloaded)
activate	<x>/Inventory/Deployed/<x>/Operations/Activate
deactivate	<x>/Inventory/Deployed/<x>/Operations/Deactivate
activeStatus	<x>/Inventory/Deployed/<x>/Status
NOTE: Here <x> is the interior node that groups together the parameters of a Software Component Management Object.	

5.3.4 Resource [memory]

The resource [memory] is for acquire information about the total memory or available memory of the device. Regardless of OMA DM 1.3 and OMA DM 2.0, the resource shall be mapped to memory information of DiagMO (urn:oma:mo:oma-diag:memory:1.0). The attributes of the resource shall be mapped to nodes of the MO as follows.

Table 5.3.4-1: Resource [memory]

Attribute Name of [memory]	Mapping to Nodes in Management Object
memAvailable	<x>/DiagMonData/RAMAvail
memTotal	<x>/DiagMonData/RAMTotal
NOTE: Here <x> is the interior node that acts as a placeholder for the Memory MO.	

5.3.5 Resource [areaNwkInfo]

The resource [areaNwkInfo] is for managing the area network. Regardless of OMA DM 1.3 and OMA DM 2.0, the resource shall be mapped to MANMO (urn:oma:mo:ext-etsi-manmo:1.0). The attributes of the resource shall be mapped to nodes of the MO as follows.

Table 5.3.5-1: Resource [areaNwkInfo]

Attribute Name of [areaNwkInfo]	Mapping to Nodes in Management Object
areaNwkType	M2MAreaNwkInfo/AreaNwks/<x>/AreaNwkType
listOfDevices	M2MAreaNwkInfo/AreaNwks/<x>/ListOfDevices
NOTE: Here <x> is the interior parent node for information about a specific M2M Area Networks connecting to the same M2M Gateway.	

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5.3.6 Resource [areaNwkDeviceInfo]

The resource [areaNwkDeviceInfo] is for managing the device of the area network as well as acquiring information about devices in the area network. Regardless of OMA DM 1.3 and OMA DM 2.0, the resource shall be mapped to MANDMO (urn:oma:mo:ext-etsi-mandmo:1.0). The attributes of the resource shall be mapped to nodes of the MO as follows.

Table 5.3.6-1: Resource [areaNwkDeviceInfo]

Attribute Name of [areaNwkDeviceInfo]	Mapping to Nodes in Management Object
devId	DevInfo/DevId
devType	DevDetail/DevType
areaNwkId	<x>/AreaNwks/<x>/AreaNwkID
sleepInterval	<x>/AreaNwks/<x>/SleepInterval
sleepDuration	<x>/AreaNwks/<x>/SleepDuration
status	<x>/AreaNwks/<x>/Status
listOfNeighbors	<x>/AreaNwks/<x>/Groups/ListOfDeviceNeighbors
NOTE: Here first instance of <x> is the interior node that is the root node for the MANDMO. Second instance of <x> is the interior node that contains information related to a specific M2M Area Network that the device is associated with.	

5.3.7 Resource [battery]

The Resource [battery] is to provide battery related information. Regardless of OMA DM 1.3 and OMA DM 2.0, this Resource shall be mapped to Battery Info Management Object (MOID: "urn:oma:mo:oma-diag:batteryinfo:1.0"). The attributes of this Resource shall be mapped to Nodes in the Management Object as follows.

Table 5.3.7-1: Resource [battery]

Attribute Name of [battery]	Mapping to Nodes in Management Object
batteryLevel	<x>/DiagMonData/<x>/BatteryLevel
batteryStatus	<x>/DiagMonData/<x>/BatteryStatus
NOTE: Here first instance of <x> is the interior node that acts as a placeholder for the Battery MO. Second instance of <x> is the placeholder for zero or more instances of battery data.	

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5.3.8 Resource [deviceInfo]

The Resource [deviceInfo] is to provide device related information. For OMA DM 1.3, this Resource shall be mapped to DevInfo MO (MOID: "urn:oma:mo:oma-dm-devinfo:1.1") and DevDetail MO (MOID: "urn:oma:mo:oma-dm-devdetail:1.1"). The attributes of this Resource shall be mapped to Nodes in two Management Objects as follows.

Table 5.3.8-1: Resource [deviceInfo] mapping in OMA DM 1.3

Attribute Name of [deviceInfo]	Mapping to Nodes in Management Object
deviceLabel	DevInfo/DevId
manufacturer	DevInfo/Man
model	DevInfo/Mod
deviceType	DevDetail/DevType
fwVersion	DevDetail/FwV
swVersion	DevDetail/SwV
hwVersion	DevDetail/HwV

For OMA DM 2.0, this Resource shall be mapped to DevInfo MO (MOID: "urn:oma:mo:oma-dm-devinfo:1.2"). The attributes of this Resource shall be mapped to Nodes in the Management Object as follows.

Table 5.3.8-2: Resource [deviceInfo] mapping in OMA DM 2.0

Attribute Name of [deviceInfo]	Mapping to Nodes in Management Object
deviceLabel	<x>/DevID
manufacturer	<x>/Man
model	<x>/Mod
deviceType	<x>/DevType
fwVersion	<x>/FwV
swVersion	<x>/SwV
hwVersion	<x>/HwV
NOTE: Here <x> is the interior node that is the root node for the DevInfo MO.	

5.3.9 Resource [deviceCapability]

The Resource [deviceCapability] is to manage the device capabilities such USB, camera, etc. Regardless of OMA DM 1.3 and OMA DM 2.0, this Resource shall be mapped to Device Capability Management Object (MOID: "urn:oma:mo:oma-dcmo:1.0"). The attributes of this Resource shall be mapped to Nodes in the Management Object as follows.

Table 5.3.9-1: Resource [deviceCapability]

Attribute Name of [deviceCapability]	Mapping to Nodes in Management Object
capabilityName	<x>/Property
attached	<x>/Attached
capabilityActionStatus	This attribute is managed by the <mgmtObj> resource hosting CSE, and does not need to be mapped to OMA DM management objects
enable	<x>/Operations/Enable
disable	<x>/Operations/Disable
NOTE: Here <x> is the interior node groups together the parameters of a DCMO for a particular Device Capability.	

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(standards.iteh.ai)
Full standard:
https://standards.iteh.ai/catalog/standards/sist/1a949255-f424-4a49-9e5a-c8f92adb434e/etsi-ts-118-105-v1.1.0-2016-03

5.3.10 Resource [reboot]

The Resource [reboot] is to reboot the device. Regardless of OMA DM 1.3 and OMA DM 2.0, this Resource shall be mapped to Restart Management Object (MOID: "urn:oma:mo:oma-diag:restart:1.0") that is specified in DiagMon [6] and Lock and Wipe Management Object (MOID: "urn:oma:mo:oma-lawmo:1.0"). The attributes of this Resource shall be mapped to Nodes in the Management Objects as follows.

Table 5.3.10-1: Resource [reboot]

Attribute Name of [reboot]	Mapping to Nodes in Management Object
reboot	"<x>/Operations/Start" Node in Restart MO. The restarting level described at the "<x>/DiagMonConfig/ConfigParms/RestartLevel" Node is up to the implementation
factoryReset	"<x>/Operations/FactoryReset" Node in LAWMO
NOTE: Here <x> is the interior node that acts as a placeholder for the Restart MO and the LAWMO.	

5.3.11 Resource [eventLog]

The Resource [eventLog] is to record the event log for the device. Regardless of OMA DM 1.3 and OMA DM 2.0, this Resource shall be mapped to several Management Objects according to the logTypeId attribute of this Resource as follows:

- Trap Event Logging Function Management Object (MOID: "urn:oma:mo:oma-diag:trapeventlogging:1.1") if the logTypeId attribute is set to "trap".
- Trace Logs Management Object (MOID: "urn:oma:mo:oma-diag:tracelog:1.0") if the logTypeId attribute is set to "trace".
- Panic Logs Management Object (MOID: "urn:oma:mo:oma-diag:paniclog:1.1") if the logTypeId attribute is set to "panic".

The attributes of this Resource shall be mapped to Nodes in above Management Objects as follows.