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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 describes the protocol mappings between the management Resources for oneM2M and the BBF TR-181 Data Model [6].

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.

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

[1] ETSI TS 118 101: "oneM2M; Functional Architecture (oneM2M TS-0001)".

[2] ETSI TS 118 104: "oneM2M; Service Layer Core Protocol Specification (oneM2M TS-0004)".

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

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

[5] BBF: "TR-106 Data Model Template for TR-069-Enabled Devices", Issue 1, Amendment 7, September 2013.

[6] BBF: "TR-181 Device Data Model for TR-069, Issue 2 Amendment 8", September 2014.

[7] BBF: "TR-131 ACS Northbound Interface Requirements, Issue:1", November 2009.

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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.

3 Definitions, abbreviations and acronyms

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ETSI TS 118 111 [3] and the following apply:

CPE Proxier: CPE that is capable of proxying the communication between an ACS and a Proxied Device as defined in TR-069 [4]

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI TS 118 111 [3] and the following apply:

ACS	Auto-Configuration Server
ADN	Application Dedicated Node
AE	Application Entity
ASN	Application Service Node
BBF	BroadBand Forum
CMDH	Communication Management and Delivery Handling
CPE	Customer Premise Equipment
CSE	Common Services Entity
CWMP	CPE WAN Management Protocol
DM	Device Management
DU	Deployment Unit
IN-CSE	CSE which resides in the Infrastructure Node
LAN	Local Area Network
MN	Middle Node
OUI	Organizationally Unique Identifier
PC	Product Class
RPC	Remote Procedure Call
SN	Serial Number
UPA	Universal Powerline Association
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
USB	Universal Serial Bus
UUID	Universal Unique Identifier
XML	Extensible Markup Language

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3.3 Acronyms

For the purposes of the present document, the acronyms given in ETSI TS 118 111 [3] apply.

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 Mapping of basic data types

TR-106 [5] specifies the object structure supported by TR-069 enabled devices and specifies the structural requirements for the data hierarchy. This clause includes the mapping attribute data types to TR-181 [6] parameters which follows the conventions of section 3 of TR-106 [5] and data types described in Table 4 of TR-106 [5].

Table 5-1: Data Type Mapping

oneM2M Data Types	Mapping to data types in TR-106	Conversion Notes
xs:boolean	boolean	
xs:string	string	Mapping is constrained to the size of the string
xs:unsignedInt	unsignedInt	
xs:unsignedLong	unsignedLong	
xs:integer	long	Mapping is constrained to the size of the long data type.
Xs:positiveInteger	unsignedLong	Mapping is constrained to a lower limit of 1 and the size of the unsignedLong data type.
Xs:nonNegativeInteger	unsignedLong	Mapping is constrained the size of the unsignedLong data type.
Comma separated Lists	Comma separated Lists	Data structure is represented by comma separated list as described in section 3.2.3 of TR-106 [5].

In some instances the conversion of the contents between data types will cause an error to occur (e.g. xs:integer to long). When an error occurs in the conversion of a data type, the STATUS_BAD_REQUEST response status code.

6 Mapping of identifiers

6.0 Introduction

The TR-069 [4] specification defines three (3) types of devices, known as CPEs, that are capable of being managed from the perspective of the TR-069 agent:

- CPE that hosts the TR-069 agent: Section A.3.3.1 Inform of TR-069 [4] defines the required fields for a CPE to be identified. These fields include the OUI and Serial Number of the CPE assigned by the CPE manufacturer. Optionally the manufacturer may assign a Product Class to the CPE. The format of the identifier is as follows: OUI-[PC-]SN.
- Virtual Device: This type of device is addressed as a CPE. The Virtual Device has its own OUI-[PC-]SN as represented by the CPE Proxier. The CPE Proxier emulates a CWMP agent for each Virtual Device.
- Embedded Device: This type of device is addressed as one or more objects within the data model of the CPE that hosts the TR-069 agent.

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6.1 Mapping of Device identifiers to the Node Resource

Node Resources are identified for each instance of an ADN, ASN and MN node and are identified using the M2M Node Identifier (M2M-Node-ID) defined in the oneM2M Functional [1].

CPE Device identifiers shall map to the nodeID attribute of the <node> resource. The CPE Device identifiers are obtained from the contents of the following attributes:

- Device.DeviceInfo.ManufacturerOUI
- Device.DeviceInfo.ProductClass
- Device.DeviceInfo.SerialNumber

Virtual Device identifiers shall map to the nodeID attribute of the <node> resource. The Virtual Device identifiers are obtained from the CPE Proxier using the contents of the attributes:

- Device.ManagementServer.VirtualDevice.{i}.ManufacturerOUI
- Device.ManagementServer.VirtualDevice.{i}.ProductClass
- Device.ManagementServer.VirtualDevice.{i}.SerialNumber

Embedded Device identifiers shall map to the nodeID attribute of the <node> resource. The Embedded Device identifiers are obtained using the containing CPE Device or Virtual Device identifiers along with the contents of the attributes of the:

- Device.ManagementServer.EmbeddedDevice.{i}.ControllerID
- Device.ManagementServer.EmbeddedDevice.{i}.ProxiedDeviceID

6.2 Identifier of an object instance

The TR-069 [4] specification permits objects to have multiple object instances where each object instance is contained within the objectPath attribute of the Resource within the context of the Resource's objectId as defined in clause 7.1.

In order to allow the AE or CSE that originated the request that manipulates a Resource to easily align the M2M Service Layer with the Resource's external technology identifier, the value of the object instance "{i}" should be a part of the identifier of the Resource in the M2M Service Layer where possible. For example if the [areaNetwork] resource has an object instance identifier of "Device.X_oneM2M_org_CSE.1.M2MareaNetworkDevice.[foo]" then the M2M Service Layer Resource should be identified using the object instance of the underlying technology (e.g. "/foo" for the Resource areaNetwork).

7 Mapping of resources

7.0 Introduction

This clause contains all information on how to map management resources from ETSI TS 118 104 [2] to managed objects and parameters as defined in the TR-181 [6] data model or the Remote Procedure Calls (RPCs) in TR-069 [4].

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7.1 General mapping assumptions

7.1.0 Introduction

TR-069 [4] specifies a protocol for communication between a CPE (Customer Premises Equipment) and an ACS (Auto-Configuration Server). Any TR-069 enabled device has to follow the data model as described in the TR-106 [5] and TR-181 [6] as well as RPCs described in TR-069 [4].

As TR-181 [6] is the model that the Resources are mapped, all Resources shall have the objects of the TR-181 [6] namespace (e.g. "urn:broadband-forum-org:tr-181-2-7-0").

7.1.1 Mapping of Device Identifiers

The Device identifiers for CPEs are mapped to the Resource Types [deviceInfo].

For CPE and Virtual Devices map their Device Identifiers (OUI-[PC-]SN) to the manufacturer, deviceType and deviceLabel attributes of the Resource [deviceInfo].

For Embedded Devices, the ControllerID and ProxiedDeviceID parameters of the Device.ManagementServer.EmbeddedDevice.{i} object instance are mapped to the deviceLabel attribute of the Resource [deviceInfo] as a comma separated list: "Device.ManagementServer.EmbeddedDevice.{i}.ControllerID, Device.ManagementServer.EmbeddedDevice.{i}.ProxiedDeviceID".

7.1.2 Mapping of Embedded Devices

The TR-181 [6] specification does not provide a mechanism where Embedded Devices provide information related to the Device.DeviceInfo objects and sub-objects. Instead the TR-181 [6] provides this information in a manner that is reliant on the Embedded Device's underlying technology (e.g. ZigBee®, UpnP).

As such the mapping of the [memory] and [battery] Resources are implementation specific for each underlying technology and is outside the scope of the present document.

7.2 Resource [deviceInfo]

The Resource [deviceInfo] is a read-only Resource that shall map to the Device.DeviceInfo object of TR-181 [6] for CPE and Virtual Devices.

The information shall be retrieved using the GetParameterValues RPC of TR-069 [4].

NOTE: The SerialNumber, ModelNumber, ProductClass attributes for a Virtual device are the same values as the Device.ManagementServer.VirtualDevice.{i} object in the CPE Proxier.

Table 7.2-1: Resource [deviceInfo] for CPE and Virtual Devices

Attribute Name of [deviceInfo]	TR-181 Parameter
deviceLabel	Device.DeviceInfo.SerialNumber
manufacturer	Device.DeviceInfo.Manufacturer
model	Device.DeviceInfo.ModelNumber
deviceType	Device.DeviceInfo.ProductClass
fwVersion	Device.DeviceInfo.SoftwareVersion if the device supports only 1 software version. If the device support multiple software versions this shall map to Device.DeviceInfo.AdditionalSoftwareVersion
swVersion	Device.DeviceInfo.SoftwareVersion
hwVersion	Device.DeviceInfo.HardwareVersion

Table 7.2-2: Resource [deviceInfo] for Embedded Devices

Attribute Name of [deviceInfo]	TR-181 Parameter
deviceLabel	Comma separated list: "Device.ManagementServer.EmbeddedDevice.{i}.ControllerID, Device.ManagementServer.EmbeddedDevice.{i}.ProxiedDeviceID
manufacturer	No mapping available
model	No mapping available
deviceType	No mapping available
fwVersion	No mapping available
swVersion	No mapping available
hwVersion	No mapping available

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7.3 Resource [memory]

The Resource [memory] is a read-only Resource that shall map to the Device.DeviceInfo.MemoryStatus object of TR-181 [6] for CPE and Virtual Devices.

The information shall be retrieved using the GetParameterValues RPC of TR-069 [4].

Attempts to modify the attributes of the memory Resource causes an error code "operation unsupported" to be returned.

Table 7.3-1: Resource [memory]

Attribute Name of [memory]	TR-181 Parameter
memAvailable	Device.DeviceInfo.MemoryStatus.Free
memTotal	Device.DeviceInfo.MemoryStatus.Total

7.4 Resource [battery]

The Resource [battery] is a read-only Resource that shall map to an instance of Device.DeviceInfo.X_oneM2M_org_BatteryStatus.Battery.{i} object for CPE and Virtual Devices.

The information shall be retrieved using the GetParameterValues RPC of TR-069 [4].

Table 7.4-1: Resource [battery]

Attribute Name of [battery]	TR-181 Parameter
batteryLevel	Device.DeviceInfo.X_oneM2M_org_BatteryStatus.Battery.{i}.Level
batteryStatus	Device.DeviceInfo.X_oneM2M_org_BatteryStatus.Battery.{i}.Status

7.5 Resource [areaNwkInfo]

The Resource [areaNwkInfo] is a multi-instance Resource where each instance of the Resource shall map to an instance of Device.X_oneM2M_org_CSE.{i}.M2MareaNetwork.{i} object.

As the Resource [areaNwkInfo] is a multi-instance Resource, the M2MareaNetwork object is a multi-object instance that can be created and deleted.

The M2MareaNetwork instance shall be created using the Add Object RPC of TR-069 [4].

The M2MareaNetwork instance shall be deleted using the Delete Object RPC of TR-069 [4].

The information of an M2MareaNetwork shall be retrieved using the GetParameterValues RPC of TR-069 [4].

The information of an M2MareaNetwork shall be modified using the SetParameterValues RPC of TR-069 [4].

Table 7.5-1: Resource [areaNwkInfo]

Attribute Name of [areaNwkInfo]	X_oneM2M_org Parameter
areaNwkType	Device.X_oneM2M_org_CSE.{i}.M2MareaNetwork.{i}.Type
listOfDevices	Device.X_oneM2M_org_CSE.{i}.M2MareaNetwork.{i}.ListOfDevices

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7.6 Resource [areaNwkDeviceInfo]

The Resource [areaNwkDeviceInfo] is a multi-instance Resource where each instance of the Resource shall map to an instance of Device.X_oneM2M_org_CSE.{i}.AreaNetworkDevice.{i} object.

As the Resource [areaNwkDeviceInfo] is a multi-instance Resource, the AreaNetworkDevice object is a multi-object instance that can be created and deleted.

Instances of the Resource [areaNwkDeviceInfo] are referenced in the listOfDevices attribute of the associated Resource [areaNwkInfo].

The M2MareaNetworkDevice instance shall be created using the Add Object RPC of TR-069 [4].

The M2MareaNetworkDevice instance shall be deleted using the Delete Object RPC of TR-069 [4].

The information of an M2MareaNetworkDevice shall be retrieved using the GetParameterValues RPC of TR-069 [4].

The information of an M2MareaNetworkDevice shall be modified using the SetParameterValues RPC of TR-069 [4].

Table 7.6-1: Resource [areaNwkDeviceInfo]

Attribute Name of [areaNwkDeviceInfo]	X_oneM2M_org Parameter
devId	Device.X_oneM2M_org_CSE.{i}.M2MareaNetworkDevice.{i}.Host
devType	Device.X_oneM2M_org_CSE.{i}.M2MareaNetworkDevice.{i}.Type
areaNwkId	Reference to Device.X_oneM2M_org_CSE.{i}.M2MareaNetworkDevice.{i}.M2MareaNetwork
sleepInterval	Device.X_oneM2M_org_CSE.{i}.M2MareaNetworkDevice.{i}.SleepInterval
sleepDuration	Device.X_oneM2M_org_CSE.{i}.M2MareaNetworkDevice.{i}.SleepDuration
status	Device.X_oneM2M_org_CSE.{i}.M2MareaNetworkDevice.{i}.Status
listOfNeighbors	Device.X_oneM2M_org_CSE.{i}.M2MareaNetworkDevice.{i}.Neighbors

7.7 Resource [eventLog]

The Resource [eventLog] is a multi-instance Resource where each instance of the Resource shall map to an instance of Device.DeviceInfo.X_oneM2M_org_Diagnostics.EventLog.{i} object.

The EventLog instance shall be created using the Add Object RPC of TR-069 [4].

The EventLog instance shall be deleted using the Delete Object RPC of TR-069 [4].

The information of an EventLog instance shall be retrieved using the GetParameterValues RPC of TR-069 [4].

The information of an EventLog instance shall be updated using the SetParameterValues RPC of TR-069 [4].

Table 7.7-1: Resource [eventLog]

Attribute Name of [eventLog]	TR-181 Parameter
logTypeId	Device.DeviceInfo.X_oneM2M_org_Diagnostics.EventLog.{i}.Type
logData	Device.DeviceInfo.X_oneM2M_org_Diagnostics.EventLog.{i}.Data
logStatus	Device.DeviceInfo.X_oneM2M_org_Diagnostics.EventLog.{i}.Status
logStart	Set to "True", the Device.DeviceInfo.X_oneM2M_org_Diagnostics.EventLog.{i}.Enable parameter is set to "True".
logStop	Set to "True", the Device.DeviceInfo.X_oneM2M_org_Diagnostics.EventLog.{i}.Enable parameter is set to "False".

7.8 Resource [deviceCapability]

The Resource [deviceCapability] represents a capability of device that can be administratively enabled or disabled. The lists of capabilities that are managed are defined in the enumeration of the capabilityName attribute. The TR-181 [6] data model defines a subset of capabilities listed in the deviceCapability enumeration. The supported device capabilities within TR-181 [6] include:

- LAN Interfaces: USB, Wi-Fi, HomePlug, MoCA, UPA
- Hardware Capabilities: SmartCardReader

The information shall be retrieved using the GetParameterValues RPC of TR-069 [4].

The capabilities shall be enabled and disabled using the SetParameterValues RPC of TR-069 [4].

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