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**oneM2M;
LWM2M Interworking
(oneM2M TS-0014 version 2.0.0 Release 2)**

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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 interworking capabilities of the M2M Service Layer between ASN/IN/MN CSEs and LWM2M Endpoints using the architecture identified in Annex F of ETSI TS 118 101 [2] for the following interworking scenarios:

- Interworking for transparent transport of encoded LWM2M Objects and commands in Content Sharing Resources between LWM2M Endpoints and M2M Applications.
- Interworking with full mapping of LWM2M Objects in LWM2M Endpoints to semantically enabled Content Sharing Resources that are utilized by M2M Applications.

NOTE: The present document limits Content Sharing Resources to <container> and <contentInstance> resources.

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 118 111: "oneM2M; Common Terminology (oneM2M TS-0011)".
- [2] ETSI TS 118 101: "oneM2M Functional Architecture (oneM2M TS-0001)".
- [3] OMA-TS-LightweightM2M-V1-0-20150318-D: "Lightweight Machine to Machine Technical Specification".
- [4] ETSI TS 118 103: "oneM2M; Security solutions (oneM2M TS-0003)".

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.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

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] IETF RFC 7252: "Constrained Application Protocol (CoAP)".
- [i.3] IETF RFC 6347: "Datagram Transport Layer Security Version 1.2".
- [i.4] OMA OMA-RD-LightweightM2M-V1-0: "OMA Lightweight Machine to Machine Requirement".

[i.5] ETSI TS 118 112: "oneM2M; Base Ontology (oneM2M TS-0012)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ETSI TS 118 111 [1] apply. A term defined in the present document takes precedence over the definition of the same term, if any, in ETSI TS 118 111 [1] and ETSI TS 118 101 [2].

3.2 Abbreviations

For the purposes of the present document, the terms and definitions given in ETSI TS 118 111 [1] and the following apply:

LWM2M	Lightweight M2M
OMA	Open Mobile Alliance

4 Conventions

The key words "Shall", "Shall not", "May", "Need not", "Should", "Should not" in this document are to be interpreted as described in the oneM2M Drafting Rules [i.1].

5 Architecture Model

5.1 Introduction

The architecture model followed in the present document is based on the architecture model in Annex F of ETSI TS 118 101 [2] that describes how interworking between CSEs and non-oneM2M solutions and protocol using specialized Interworking Proxy application Entities (IPE). The present document describes the LWM2M IPE that supports the following scenarios.

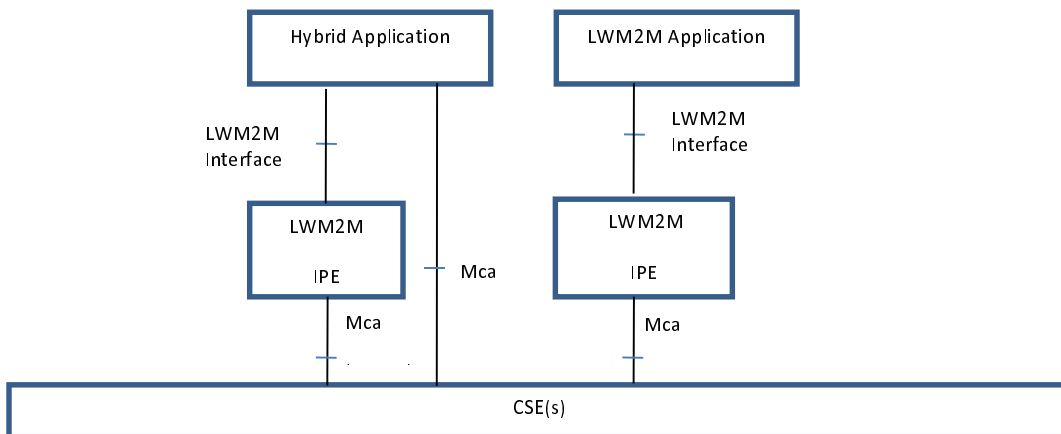
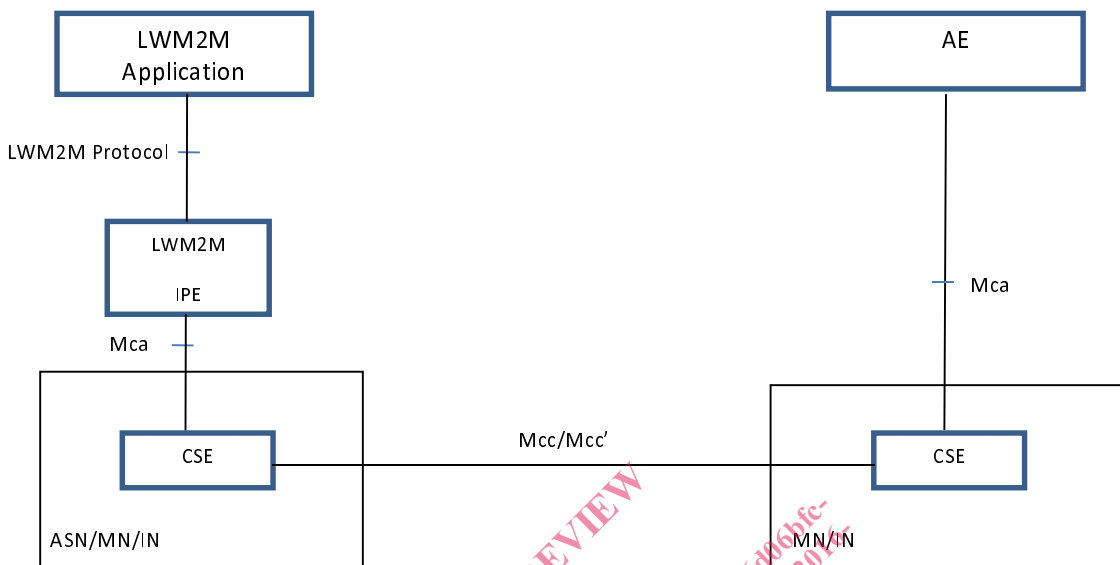


Figure 5.1-1: LWM2M Interworking Scenarios

In the scenarios depicted in Figure 5.1-1, the Hybrid and LWM2M Applications represent applications that implement the LWM2M Client role defined in the LWM2M Protocol [3].

5.2 Reference Model

The LWM2M Interworking reference model utilizes the Functional Architecture's reference model in ETSI TS 118 101 [2]; augmenting the ETSI TS 118 101 [2] reference model with capabilities provided by the LWM2M IPE.



NOTE: The AE in the reference model could be registered with the same CSE as the LWM2M IPE.

Figure 5.2-1: LWM2M Reference Model

5.3 Types of Interworking

LWM2M IPEs provide the following types of interworking:

- 1) Interworking using the Content Sharing Resource for transparent transport of encoded LWM2M Objects that are available to AEs as depicted in Figure 5.3-1.
- 2) Interworking with full mapping of the semantics of LWM2M Objects to semantically enabled resources that are available to AEs as depicted in Figure 5.3-2.
- 3) While depicted outside the hosting CSE, the Content Sharing Resources are hosted in a CSE (e.g. CSE1).

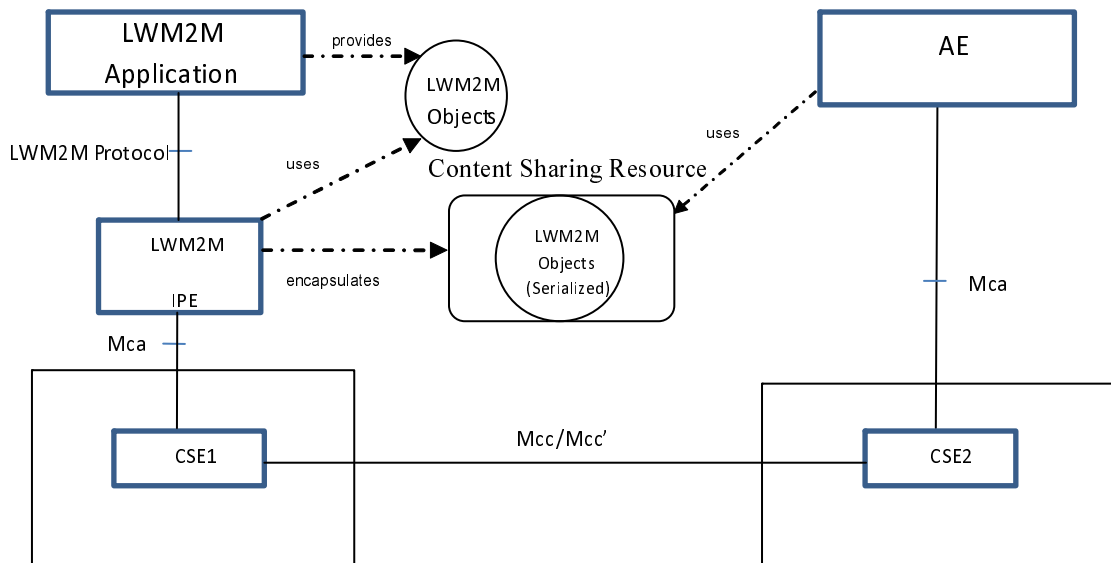


Figure 5.3-1: LWM2M Transparent Interworking Function

In Figure 5.3-1, the LWM2M Objects are provided by the LWM2M Application to the LWM2M IPE using the LWM2M Protocol. The LWM2M IPE then encapsulates the LWM2M Objects in Content Sharing Resources and then hosts the Content Sharing Resources in a CSE using the Mca reference points for use by AEs. The AE accesses the Content Sharing Resource from the CSE that hosts the resource using the Mca reference point. Once the AE receives the Content Sharing Resource, the AE extracts the LWM2M Object from the Content Sharing Resource for the AE's purpose. Clause 7 describes this type of interworking in greater detail.

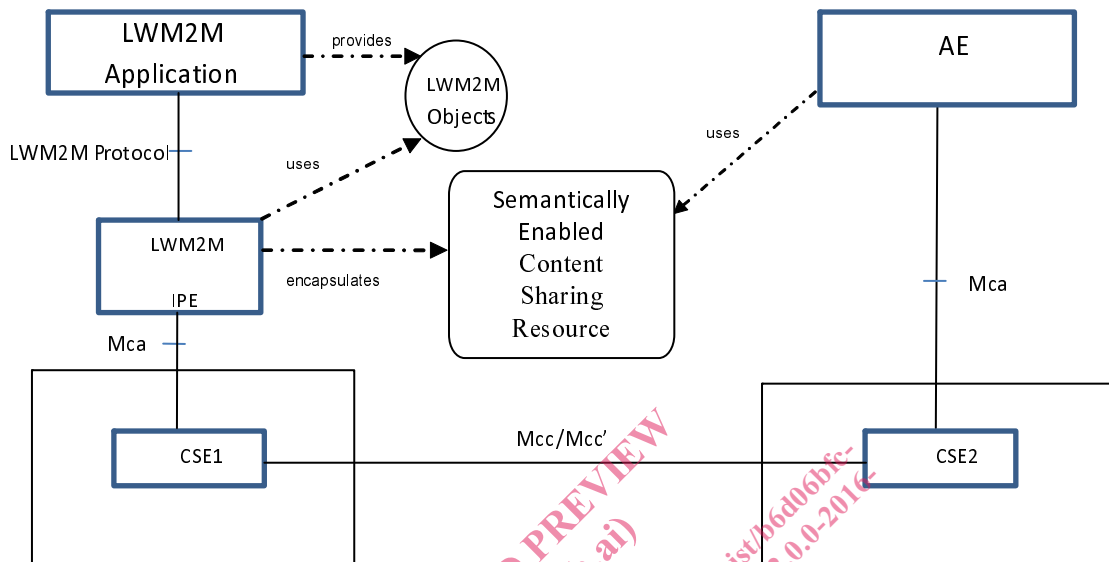


Figure 5.3-2: LWM2M Semantically Enabled Interworking Function

In Figure 5.3-2, the LWM2M Objects are provided by the LWM2M Application to the LWM2M IPE using the LWM2M Protocol. The LWM2M IPE then interworks the LWM2M Objects into Content Sharing Resources. The Content Sharing Resources are based on the oneM2M defined Semantic Ontology. The LWM2M IPE hosts the Content Sharing Resource in a CSE across the Mca reference for use by other AEs. The AE accesses the Content Sharing Resource from the CSE that hosts the resource using the Mca reference point. Once the AE receives the Content Sharing Resource, the AE encodes the information using the Semantic Ontology for the AE's purpose. Clause 8 describes this type of interworking in greater detail.

An instance of a LWM2M IPE shall provide the capability for transparent transport of encapsulated LWM2M Objects as Content Sharing Resources and/or translation of LWM2M Objects as oneM2M semantically enabled Content Sharing Resources.

5.4 Composition of the Interworking Proxy Entity

The LWM2M IPE participation in the LWM2M Protocol as described in clause 5 does so in the role of a LWM2M Server to which LWM2M Applications (LWM2M Clients) interact. For each LWM2M Client (Endpoint) that is maintained by the LWM2M Server in the LWM2M IPE, the LWM2M IPE shall instantiate and maintains an instance of a Resource of type <AE>.

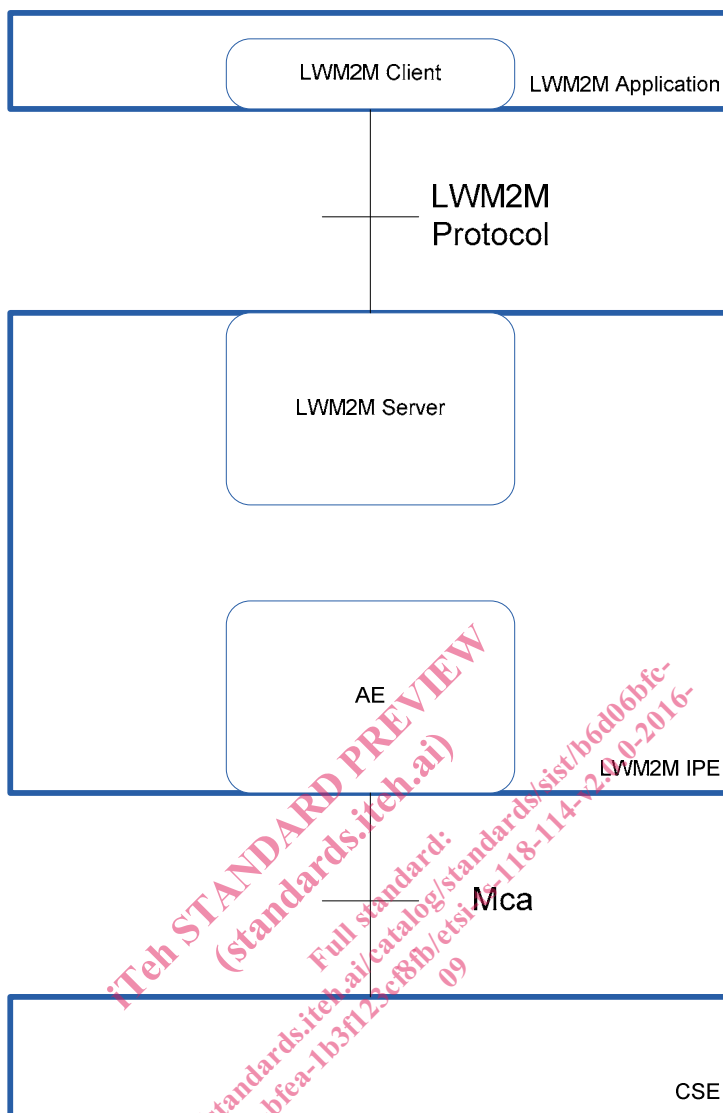


Figure 5.4-1: LWM2M IPE Architecture

6 Architecture Aspects

6.1 Introduction

The LWM2M IPE participation in the LWM2M Protocol as described in clause 5 does so in the role of a LWM2M Server to which LWM2M Applications (LWM2M Clients) interact. As a LWM2M Server, the IPE provides the following Architecture Aspects based on the LWM2M Protocol Aspects described in clause A.2:

- LWM2M Device and Endpoint Lifecycle (Client Registration).
- LWM2M Object Discovery (Client Registration, Device Management and Service Enablement).
- LWM2M Object Transport and Interworking (Device Management and Service Enablement).
- LWM2M Object Subscription and Notification (Information Reporting).
- LWM2M Interworking Proxy Entity Administration.
- LWM2M Client Provisioning (Bootstrap).

- LWM2M Object Security (Device Management and Service Enablement).

6.2 LWM2M Device and Endpoint Lifecycle

6.2.1 Introduction

As the LWM2M IPE discovers LWM2M Endpoints when the LWM2M IPE interacts with the LWM2M Client over the LWM2M protocol's Bootstrap and Client Registration interfaces, the LWM2M IPE shall maintain the associated resources in the CSE that represents the LWM2M Device and Endpoint.

6.2.2 LWM2M Device and Endpoint Resource Representation

6.2.2.1 Introduction

LWM2M Endpoint provides the management and control functions for an M2M Application on a device. As such, the CSE that hosts the M2M Application shall represent the LWM2M Endpoint as a <AE> resource (LWM2M Endpoint <AE> resource). The LWM2M Device that hosts the LWM2M Endpoint shall be represented as a <node> resource.

6.2.2.2 LWM2M Device and Endpoint Resource Identification

LWM2M Endpoints are identified by their Endpoint Client Name described in clause 6.2.1 of the LWM2M Technical Specification [3]. The Endpoint Client Name URN without the "urn:" sequence is used as the AE-ID of the associated <AE> resource that represents the LWM2M Client.

In most deployment scenarios, LWM2M Devices host one (1) LWM2M Endpoint. In this scenario the LWM2M Device's <node> resource's M2M-Node-ID should be the same as the LWM2M Endpoint Client Name URN without the "urn:" sequence. When a LWM2M Device hosts more than one (>1) LWM2M Endpoint, the determination of the <node> resource's M2M-Node-ID is implementation specific. In all deployment scenarios, the <AE> resource is linked with the <node> resource as described in ETSI TS 118 101 [2].

As the LWM2M Endpoint is represented as an <AE> resource and a LWM2M Object is represented as a Content Sharing Resource in the M2M Service Layer, a reference shall be made between the <AE> resource that represents the LWM2M Endpoint and the Content Sharing Resources which represents the list of LWM2M Objects and Object Instances available in that LWM2M Client.

In order to identify interworked entities hosted in a CSE for the LWM2M technology described in this present document, the <AE> resource that represents the LWM2M Endpoint and the Content Sharing Resources which represent the list of LWM2M Objects and Object Instances available in that LWM2M Client, shall have a *Iwked_Technology_labels* attribute set to LWM2M.

In addition the <AE> resource uses the Hierarchical and Non-Hierarchical mechanisms for Resource Addressing as defined in clause 9.3.1 of ETSI TS 118 101 [2] where the *resourceName* attribute of the <AE> resource shall be a Endpoint Client Name URN without the "urn:" sequence.

6.2.2.3 LWM2M Endpoint Lifecycle

LWM2M Endpoint's are discovered when the LWM2M Client is successfully registers with the LWM2M Server using the LWM2M Register operation. In addition to the LWM2M Register operation, the LWM2M Client can periodically refresh the LWM2M Client's registration with the LWM2M IPE using the LWM2M Update operation. Finally a LWM2M Client can deregister when the LWM2M Client issues a De-register operation to the LWM2M IPE or the LWM2M Client's registration lifetime expires.

The LWM2M Client Registration interface's operations and the registration lifetime expiration event maps to the following operations on the <AE> and <node> resources.