



# Lightweight Machine to Machine Architecture

## Candidate Version 1.0 – 10 Dec 2013

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**Open Mobile Alliance**  
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# 1. Scope

**(Informative)**

This document contains an architecture diagram, protocol endpoints description, interfaces definition and detailed descriptions for OMA DM Lightweight M2M enabler. The architecture diagram shows the client and server components in this enabler as well as the interfaces between these two components. Further more, it gives a short description for the functions of these interfaces. In order to help people understand the architecture comprehensively, some detailed information is described in Appendix B.

## 2. References

### 2.1 Normative References

- [LWM2M-RD] “Lightweight Machine to Machine Requirements”, Open Mobile Alliance™, OMA-RD-LightweightM2M-V1\_0, URL:<http://www.openmobilealliance.org/>
- [RFC2119] “Key words for use in RFCs to Indicate Requirement Levels”, S. Bradner, March 1997, URL:<http://www.ietf.org/rfc/rfc2119.txt>

### 2.2 Informative References

- [OMADICT] “Dictionary for OMA Specifications”, Version 2.9, Open Mobile Alliance™, OMA-ORG-Dictionary-V2\_9, URL:<http://www.openmobilealliance.org/>

## 3. Terminology and Conventions

### 3.1 Conventions

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this document are to be interpreted as described in [RFC2119].

All sections and appendixes, except “Scope” and “Introduction”, are normative, unless they are explicitly indicated to be informative.

### 3.2 Definitions

<b>Bootstrap Provisioning</b>	The process of providing initial parameters and/or applications on the LWM2M Device so that it can be brought under management
<b>Client Registration</b>	The process of adding the information of the LWM2M Client to the LWM2M Server so that remote access and management to the LWM2M Client is achievable
<b>Information Reporting</b>	The protocol interface by which an LWM2M Client sends information on a periodic or event-triggered basis to an LWM2M Server.
<b>LWM2M Client</b>	A logical component residing in the LWM2M Device conforming to the requirements for the LWM2M Client specified in this enabler. This LWM2M Client serves as an end-point of the LWM2M protocol, and communicates with the LWM2M Server to execute the operations from the LWM2M Server for the device and the service management
<b>LWM2M Device</b>	A LWM2M Device is a device that runs (a) LWM2M Client(s) and communicates through the Network Service Provider’s network.
<b>LWM2M Server</b>	A logical component residing within the M2M Service Provider or the Network Service Provider which serves as an end-point of the LWM2M protocols. The LWM2M Server provides the following high level functionalities: discovery and registration, bootstrap provisioning, and device and service management
<b>M2M Application</b>	The application that interacts with the LWM2M Server to implement the M2M service. The M2M Service Provider can utilize the M2M Application to provide the M2M service to the M2M User.
<b>M2M Service Provider</b>	A M2M Service Provider provides (a) M2M service(s) to the M2M User by communicating to the LWM2M Client through the Network Service Provider’s network.
<b>M2M Service Subscriber</b>	M2M Service Subscriber is the M2M User that has a contractual relationship with a M2M Service Provider to use M2M Services.
<b>M2M User</b>	A M2M User uses the service provided by the M2M Service Provider.

### 3.3 Abbreviations

<b>LWM2M</b>	LightweightM2M
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## 4. Introduction

(Informative)

### 4.1 Version 1.0

This enabler defines the application layer communication protocol between the LWM2M Server and the LWM2M Client which is placed in the LWM2M Device. The OMA Lightweight M2M enabler includes device management and service enablement for LWM2M Devices. The target LWM2M Devices for this enabler are mainly resource constrained devices. Therefore, this enabler provides a light and compact protocol as well as an efficient resource data model.

Client-Server architecture is introduced for LWM2M enabler. The LWM2M enabler has two components, LWM2M Server and LWM2M Client. Four interfaces are designed between these two components as shown below:

- Bootstrap
- Client Registration
- Device management and service enablement
- Information Reporting

## 5. Architectural Model

### 5.1 Dependencies

There is no dependencies for the Lightweight M2M enabler v1.0.

### 5.2 Architectural Diagram

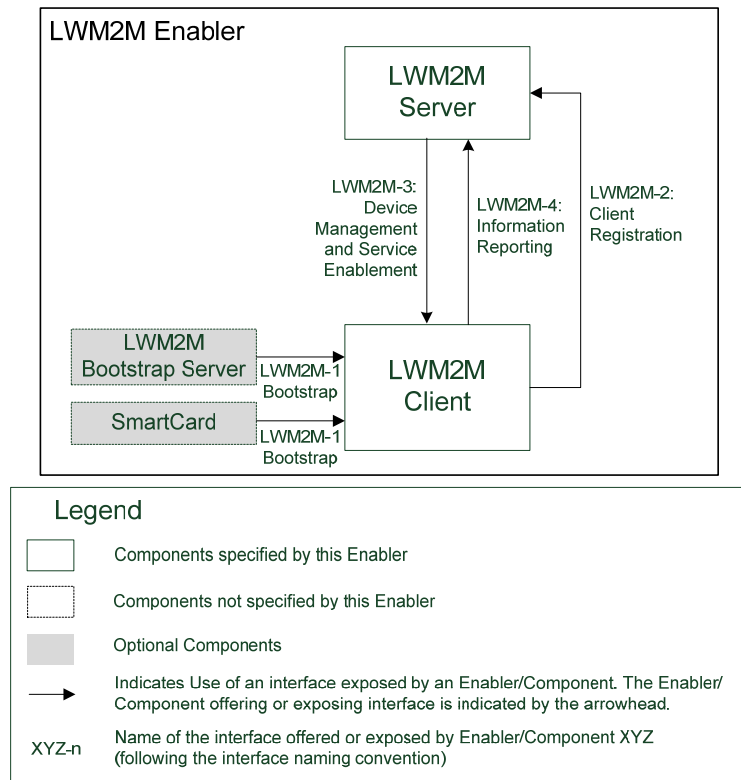


Figure 1: Architectural Diagram

### 5.3 Functional Components and Interfaces/reference points definition

#### 5.3.1 Protocol Endpoints

##### 5.3.1.1 LWM2M Client

The LWM2M Client is a logical component residing in the LWM2M Device conforming to the requirements [LWM2M-RD] specified in this enabler. This LWM2M Client serves as an endpoint of the LWM2M protocol, and communicates with the LWM2M Server to execute the operations from the LWM2M Server for the device management and the service enablement.



### 5.3.1.2 LWM2M Server

The LWM2M Server is a logical component residing within the M2M Service Provider or the Network Service Provider which serves as an endpoint of the LWM2M protocol.

### 5.3.1.3 LWM2M Bootstrap Server

The LWM2M Bootstrap Server is a logical component performing Bootstrap Provisioning over the air prior to Client Registration.

### 5.3.1.4 SmartCard

Also known as UICC (consult [OMADIC]). A Smart Card is a portable tamper resistant device with an embedded microprocessor chip. It can store data and applications along with security functions and mechanisms.

## 5.3.2 Interfaces

### 5.3.2.1 LWM2M-1 Bootstrap

This interface is used for the LWM2M Server to provision bootstrap information into the LWM2M Client.

### 5.3.2.2 LWM2M-2 Client Registration

This interface is used for adding the information of the LWM2M Client to the LWM2M Server so that remote access and management to the LWM2M Client is achievable

### 5.3.2.3 LWM2M-3 Device Management and Service Enablement

This interface is used for the device management and M2M service enablement. This interface can convey commands and response or status of the commands between the LWM2M Server and the LWM2M Client. This interface is transport agnostic and independent from the underlying network.

### 5.3.2.4 LWM2M-4 Information Reporting

This interface is used for the LWM2M Client to report resource information to the LWM2M Server. This Information Reporting can be triggered periodically or by events.

## 5.4 Security Considerations

The Lightweight M2M enabler supports secure communication between the LWM2M Client and LWM2M Server. This secure communication contains authentication, authorization, data integrity, confidentiality and replay attach protection.

## Appendix A. Change History

(Informative)

### A.1 Approved Version History

Reference	Date	Description
n/a	n/a	No prior version

### A.2 Draft/Candidate Version 1.0 History

Document Identifier	Date	Sections	Description
Draft Versions OMA-AD-LightweightM2M-V1_0	16 Apr 2012	All	Baseline agreed in “OMA-DM-LightweightM2M-2012-0041-INP_LightweightM2M_AD_Kick_Off”
	11 Jul 2012	3.2 3.3 5.2 5.3 Appendix B	Incorporated CRs after Saigon meeting: OMA-DM-LightweightM2M-2012-0054R06-CR_Architecture_Draft
	17 Sep 2012	1	Incorporated CRs: OMA-DM-LightweightM2M-2012-0079R01-CR_AD_Scope
	19 Sep 2012	All	Complete Review in Drafting session at Bangkok Incorporated CRs: OMA-DM-LightweightM2M-2012-0087R01-CR_Missing_Definitions_in_AD OMA-DM-LightweightM2M-2012-0082R01-CR_Adding_Definition_in_AD OMA-DM-LightweightM2M-2012-0089R01-CR_AD_Instruction OMA-DM-LightweightM2M-2012-0092R01-CR_Appendix_Modification
	20 Sep 2012	All	Incorporated CRs: OMA-DM-LightweightM2M-2012-0094-CR_New_AD_Baseline
	10 Oct 2012	All	Incorporated CRs: OMA-DM-LightweightM2M-2012-0096R01-CR_Resolving_R_A_comments
	13 Nov 2012	All	Incorporated CRs after ADRR: OMA-DM-LightweightM2M-2012-0105R01-CR_Closing_Items_of_ADRR
Candidate Version OMA-AD-LightweightM2M-V1_0	27 Nov 2012	n/a	Status changed to Candidate by TP TP Ref # OMA-TP-2012-0434- INP_LightweightM2M_V1_0_AD_for_Candidate_approval
Draft Versions OMA-AD-LightweightM2M-V1_0	07 Jun 2013	3.2, 4.1, 5.2, 5.3.1.3, 5.3.1.4, 5.3.2.1, 5.3.2.2	Incorporated CR: OMA-DM-LightweightM2M-2013-0074R01- CR_AD_Update_aligned_with_TS Editorial changes
	02 Sep 2013	1, B	Editorial changes
Candidate Version OMA-AD-LightweightM2M-V1_0	10 Dec 2013	n/a	Status changed to Candidate by TP TP Ref # OMA-TP-2013-0368- INP_LightweightM2M_V1_0_ERP_and_ETR_for_Candidate_approval

## Appendix B. Detailed Descriptions (Informative)

The architecture shown in the Figure 1 in section 5.2 only shows the essential entities for this enabler including two end points of the LWM2M Protocol: the LWM2M Client and the LWM2M Server. However, it might be useful to describe how these two entities are related to other entities (such as the M2M User, the M2M Service Provider, and the M2M Application) that are out of scope of this enabler. This can help the readers understand a big picture of how LWM2M Protocol can be adapted in the overall M2M deployment scenarios. The examples start with the basic scenario and also give some advanced scenarios covering useful cases in the real M2M deployments.

### B.1 LWM2M Entity Relationship Overview

This chapter describes relationship of entities in this enabler for reader to understand LWM2M enabler’s entities easily.

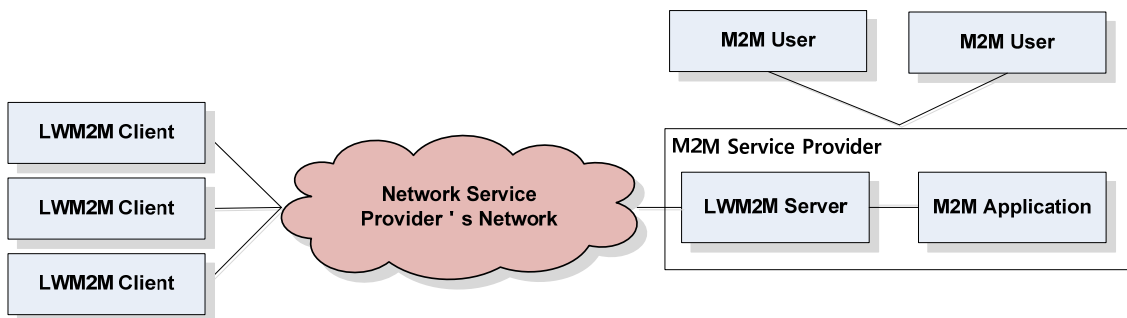


Figure 2: Relationship Type#1

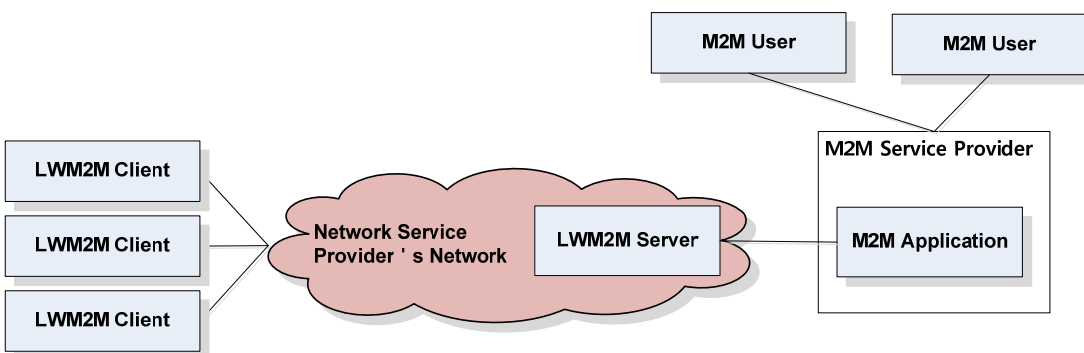
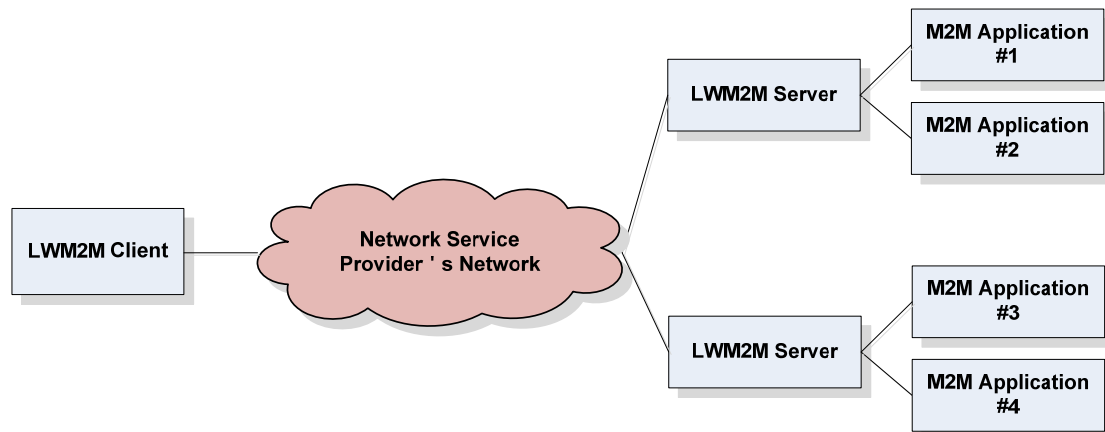


Figure 3: Relationship Type #2

Figure 2 and Figure 3 show a typical deployment of the LWM2M entities. There are two relationship types depending on the scope of the M2M Service Provider. Figure 2 shows that the M2M Service Provider owns the LWM2M Server and the M2M Application both, and the Network Service Provider provides network communication between the LWM2M Client and the LWM2M Server only. Figure 3 shows that the Network Service Provider owns the LWM2M Server and the LWM2M Server connects to the M2M Service Provider which has the M2M Applications. One M2M Application residing within the M2M Service Provider can connect with multiple LWM2M Clients to provide M2M services. With these three entities, the M2M Application, LWM2M Server and LWM2M Client, the M2M Service Provider can give M2M services to the M2M User. The M2M User can get M2M services by connecting the M2M Service Provider.

### B.2 Multiple Server Connection Examples

This chapter describes the connection of a LWM2M Client and multiple LWM2M Servers.



**Figure 4: LWM2M Client Connecting with Multiple LWM2M Servers**

Figure 4 shows that two LWM2M Servers communicating with one LWM2M Client.

With this environment an M2M User can get M2M services from each M2M Application that connects to its own LWM2M Server. Therefore M2M User may subscribe to different M2M Service Providers that run the LWM2M Servers. It can enrich the M2M Users' experience by selecting multiple M2M Service Providers and get M2M services from them.