



**oneM2M;  
Application Developer Guide  
(oneM2M TR-0025 version 1.0.0 Release 1)**

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## Foreword

This Technical Report (TR) has been produced by ETSI Partnership Project oneM2M (oneM2M).

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# 1 Scope

The present document provides a guide for application developers to develop applications using functionalities provided by any oneM2M compliant service platform with the scope of as follows:

- Objective of the use case,
- The architecture of the use case mapped into an oneM2M service platform,
- The execution procedures for implementation of the use case, and
- Implementation details of the use case.

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## 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.

Referenced documents which are not found to be publicly available in the expected location might be found at <https://docbox.etsi.org/Reference/>.

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

Not applicable.

### 2.2 Informative references

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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] ETSI TS 118 101 (V1.1.0): "oneM2M; Functional Architecture (oneM2M TS-0001)".

[i.3] ETSI TS 118 104 (V1.1.0): "oneM2M; Service Layer Core protocol Specification (oneM2M TS-0004)".

[i.4] ETSI TS 118 109 (V1.1.0): "oneM2M; HTTP Protocol Binding (oneM2M TS-0009)".

[i.5] ETSI TS 118 111: "oneM2M; Common Terminology (oneM2M TS-0011)".

## 3 Definitions and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in ETSI TS 118 111 [i.5] and the following apply.

NOTE: A term defined in the present document takes precedence over the definition of the same term, if any, in ETSI TS 118 111 [i.5].

**M2M service provider domain:** part of the M2M System that is associated with a specific M2M Service Provider

**registrar CSE:** CSE where an Application or another CSE has registered

**resource:** uniquely addressable entity in oneM2M architecture

### 3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ACP	Access Control Policy
ADN	Application Dedicated Node
ADN-AE	AE which resides in the Application Dedicated Node
AE	Application Entity
CoAP	Constrained Application Protocol
CSE	Common Services Entity
CSE-ID	Common Service Entity Identifier
DNS	Domain Name System
FQDN	Fully Qualified Domain Name
HTTP	HyperText Transfer Protocol
IN	Infrastructure Node
IN-AE	Application Entity that is registered with the CSE in the Infrastructure Node
IN-CSE	CSE which resides in the Infrastructure Node
IP	Internet Protocol
JSON	JavaScript Object Notation
M2M	Machine to Machine
Mca	Reference Point for M2M Communication with AE
Mcc	Reference Point for M2M Communication with CSE
MN	Middle Node
MN-AE	Application Entity that is registered with the CSE in Middle Node
MN-CSE	CSE which resides in the Middle Node
PoA	Point of Access
SP	Service Provider
URI	Uniform Resource Identifier
XML	eXtensible Markup Language

## 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 Use case

This clause briefly describes the use case from perspective of service being provided by the oneM2M platform. The physical device components are introduced in the current section.

The described use case enables the remote control of lights via a smartphone or smart tab which embeds an application that gains access to a oneM2M service platform. The overview of the use case of remote lights control is shown in figure 5.1. The main components are introduced as follows:

- Light lamps shown in the current use case are deployed at a house and attached to a home gateway. The light lamps are able to interact with a oneM2M platform through a wireless access interface.
- The home gateway is configured to be able to search and connect light lamps into itself and to communicate with a oneM2M service platform in terms of exchanging and storing light lamps states between the light lamps and the oneM2M service platform.
- oneM2M service platform provides vertical application services targeted at different field domains, for instance, home, vehicle, and industry. The oneM2M service platform supports a group of common service functionalities such as registration, discovery, data management, group management, subscription/notification etc.
- The smartphone application is embedded into a smartphone and acts as a remote light controller with capabilities as the follows:
  - Discovery of light lamps deployed into the home gateway.
  - Sending commands to change light states i.e. ON and OFF.
  - Retrieval of light states.

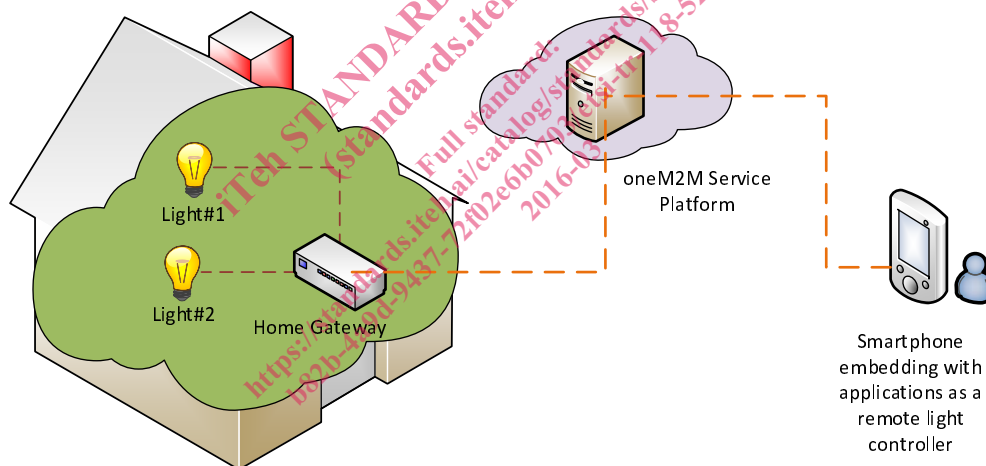


Figure 5.1: Overview of remote lights control use case

## 6 Architecture

This clause describes the architecture of the implemented use case with components represented by the oneM2M entity roles. For instance, a physical device can be modelled as an ADN-AE and the oneM2M service system can be modelled as an IN-CSE, etc.

The remote lights control use case shown in figure 5.1 can be mapped into the oneM2M functional architecture depicted in figure 6.1.



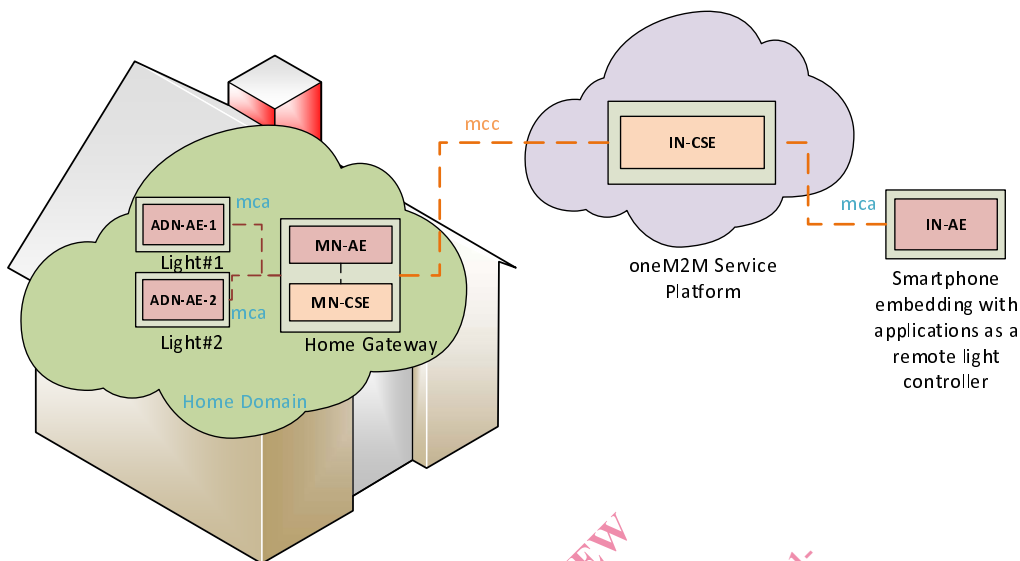


Figure 6.1: oneM2M functional architecture of remote lights control use case

In oneM2M functional architecture two entity roles are defined, one is AE and the other is CSE. Application dedicated devices e.g. light lamps are usually acted as an ADN-AE. Smartphone applications that are embedded into smartphone devices and able to communicate directly with oneM2M service platform can also be acted as an ADN-AE. oneM2M service system is acted as an IN-CSE and the home gateway plays a role of MN-CSE.

Two reference points, *mca* and *mcc* which are defined in the oneM2M functional architecture are used between AE and CSE and between two CSEs in the current use case, respectively. As figure 6.1 shows, the reference point used between any light application (ADN-AE-1 or ADN-AE-2) and home gateway MN-CSE is *mca* while that of between home gateway and oneM2M service platform is *mcc*.

In summary, applications used in the current use case are classified as follows:

- ADN-AE1: an application embedded in the light lamp *Light#1* with capabilities to control light lamp *Light#1* and interact with the home gateway MN-CSE through *mca* reference point;
- ADN-AE2: an application embedded in the light lamp *Light#2* with capabilities to control light lamp *Light#2* and interact with the home gateway MN-CSE through *mca* reference point;
- IN-AE: a smartphone application embedded in the smartphone device with capabilities to interact directly with the oneM2M service platform IN-CSE through *mcc* reference point and thereby remotely control light lamps *Light#1* and *Light#2*;
- MN-AE: a gateway application embedded into the home gateway MN-CSE and interact with MN-CSE through *mca* reference point.

## 7 Procedures

### 7.1 Introduction

The deployment of oneM2M standard of present use case requires procedures that are classified as follows:

- **Registration:** The current procedure contains light lamps registration, gateway application registration, and accessControlPolicy resource creation for a selective access to data storage resources.

- **Initial resource creation:** The current procedure contains group resources creation, container resources creation with specific access control policies, content instance resources creation with initial light states, subscription resources creation for notifications.
- **Discovery of container resource:** all containers with a specific filter criteria can be discovered by the gateway application and provided as members of group resources.
- **Discovery and retrieval lights states:** all containers with a specific filter criteria could be discovered and retrieved using resource identities through a smartphone application which gains access to oneM2M service platform and content information could also be retrieved.
- **Single light switch on/off:** Any light that is discovered by and connected to the smartphone application is able to be switched on and off via a smartphone application.
- **Multiple lights switch on/off:** More than one lights that are discovered by and connected to the smartphone application are able to be switched on and off together via a smartphone application.

## 7.2 Call Flows

### 7.2.1 Application registration and Access control policy creation

Call flows regarding the registration phase depicted in figure 7.2.1-1 are ordered as follows:

- Gateway (MN-CSE) registers with the oneM2M service platform (IN-CSE).
- Gateway application (MN-AE) registers with the gateway (MN-CSE).
- Light applications (ADN-AE1 and ADN-AE2) register with the gateway (MN-CSE).
- Smartphone application (IN-AE) registers with the oneM2M service platform (IN-CSE) and then IN-CSE announces the smartphone application resource (IN-AE) to the gateway (MN-CSE).
- Gateway application (MN-AE) discovers the smartphone application (IN-AE) from gateway (MN-CSE) with specific filter criteria. The discovered IN-AE could be granted to access to the remote light control service containers.
- Gateway application (MN-AE) creates an accessControlPolicy resource granting all the entities playing roles in the current use case including ADN-AE1, ADN-AE2, MN-AE and IN-AE could access to the created container and content instance resources.

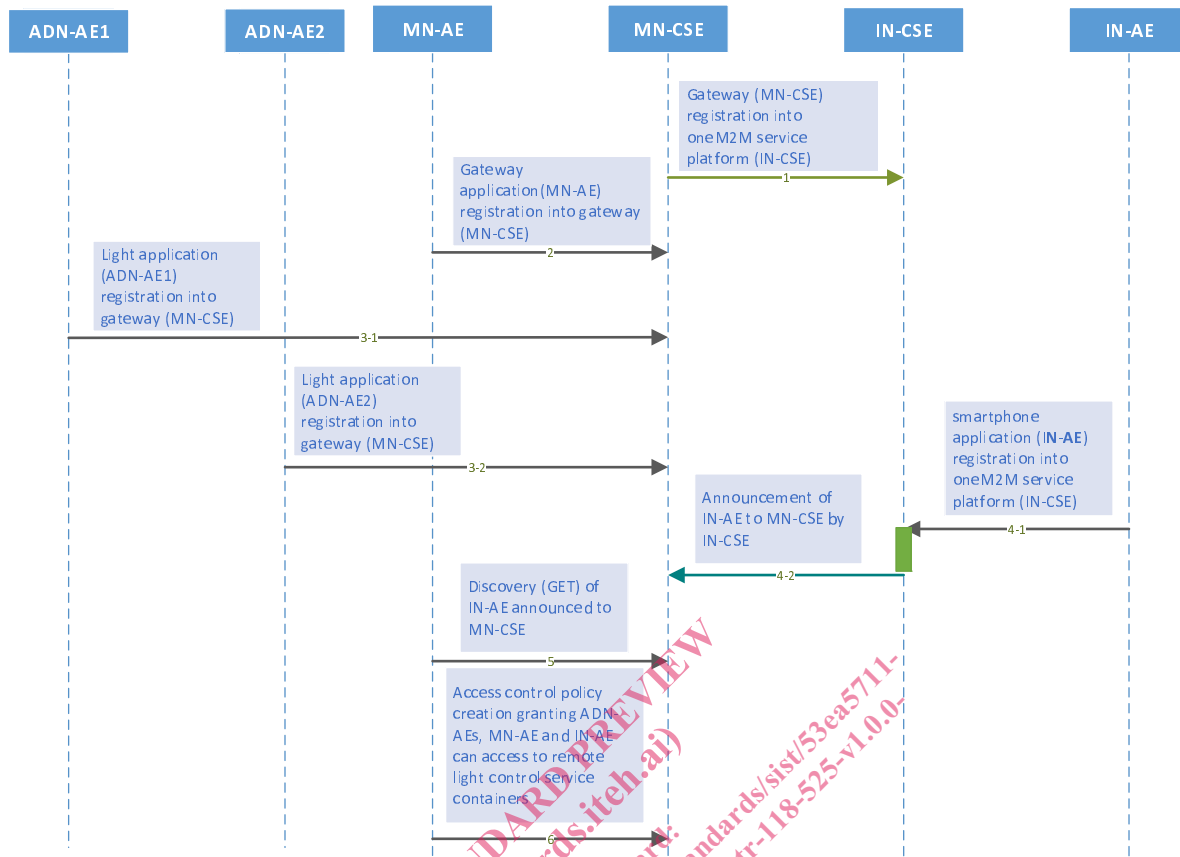


Figure 7.2.1-1: Registration phase call flows

## 7.2.2 Initial resource creation

Call flows regarding the initial resource creation phase depicted in figure 7.2.2-1 are ordered as follows:

- Gateway application (MN-AE) creates two group resources into gateway (MN-CSE), one for updating group light state named as *group\_for\_light\_state\_update* and the other one for retrieving group light state named as *group\_for\_light\_state\_retrieval*. The group members will be added from the list of discovered container resources through the discovery process initialized by MN-AE. These group resources are both created with the same access control policy.
- Two container resources are created in the gateway (MN-CSE) to store the light states under the registered light application ADN-AE1 and ADN-AE2, respectively. The containers are created using the same access control policy.
- Content Instance resources are created by light applications (ADN-AE1 and ADN-AE2) under each created container to represent the controlled light states.
- Subscription resource creation under the containers in the gateway (MN-CSE) so that subscribers i.e. light applications can be notified whenever there is new contentInstance is created by MN-AE or IN-AE.

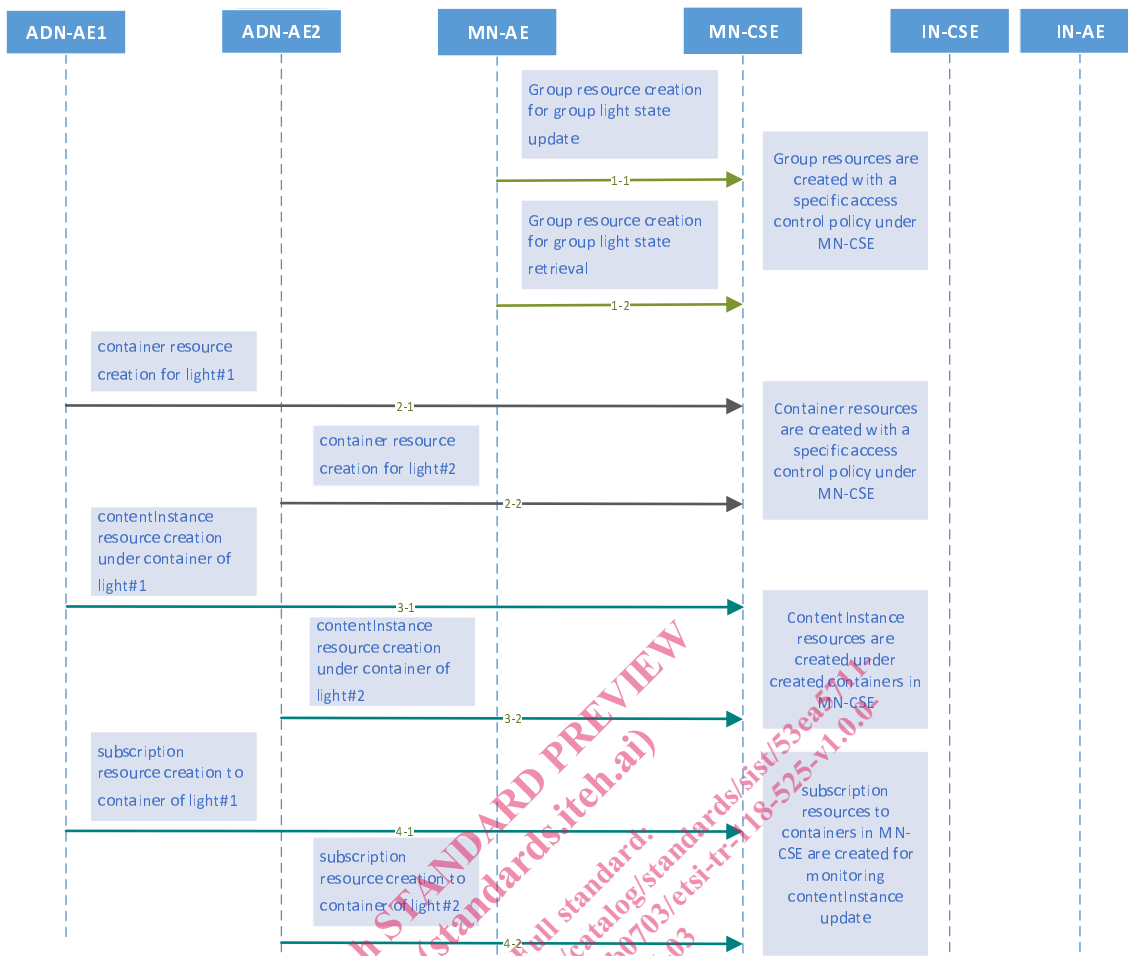


Figure 7.2.2-1: Initial resource creation phase call flows

### 7.2.3 Discovery of group resources

Call flows regarding the discovery and update of group resources phase depicted in figure 7.2.3-1 are ordered as follows:

- Gateway application (MN-AE) could periodically send a RETRIEVE request including the parameter *filterUsage* and specific filter criteria condition(s) as a query string for discovery of container resources stored in the MN-CSE of gateway. A group of filter criteria conditions for the discovery operation includes *createdBefore*, *createdAfter*, *modifiedSince*, *unmodifiedSince*, *label*, *creator*, *expireAfter*, *resourceType* etc.
- Gateway (MN-CSE) responds with URIs of the discovered container resources, if any, to the gateway application (MN-AE) according to the filter criteria(s).
- Gateway application (MN-AE) could also send a POST request to update the list of the group members with the discovered containers providing URIs for contentInstance creation and latest contentInstance resource retrieval. The discovered member URIs are built in the previously created group resource *group\_for\_light\_state\_update*, and *group\_for\_light\_state\_retrieval*.