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Contents

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Smart Machine-to-Machine communications (SmartM2M).

The final scope is to provide a set of specifications that assure a smooth communication between the Smart Appliances in the building and between the Smart Appliances and remote applications.

An important aspect is to ensure a common interworking framework to cater for the communication among systems that apply the full set of specifications as referenced in the present document. This is in recognition of the potential long term existence of legacy and specialized systems and the need to communication amongst & between systems.

The full set of specifications cover three aspects:

1) The semantic aspect with a reference ontology and its mapping on the oneM2M Communication Framework, based on the Study on Semantic Assets for Smart Appliances Interoperability of the European Commission DG Communications Networks, Content & Technology [i.1].

    - ETSI TS 103 264 [1].

2) The communication framework, the present document.

3) The full testing support for the above mentioned documents:

    - ETSI TS 103 268-1 [i.6].
    - ETSI TS 103 268-2 [i.7].
    - ETSI TS 103 268-3 [i.8].
    - ETSI TS 103 268-4 [i.9].

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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1 Scope

The present document defines a framework for Smart Appliances communication based on oneM2M specifications. It will also provide adjustments as required by the interested stakeholders.

The present document includes:

- An introduction to the oneM2M framework and its relation with the ETSI M2M one.
- The specification of the interworking framework for Smart Appliances with normative reference to oneM2M specifications.
- The specification about how to interwork with the oneM2M framework.

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 reference document (including any amendments) applies.

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

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 necessary for the application of the present document.

[1] ETSI TS 103 264: "SmartM2M Smart Appliances Common Ontology and oneM2M Mapping".

[2] ETSI TS 118 111: "Common Terminology".

[3] ETSI TS 118 102: "Requirements".

[4] ETSI TS 118 101: "Functional architecture".

[5] ETSI TS 118 104: "Service Layer Core Protocol Specification".

[6] ETSI TS 118 103: "Security solutions".

[7] ETSI TS 118 105: "Management Enablement (OMA)".

[8] ETSI TS 118 106: "Management Enablement (BBF)".

[9] ETSI TS 118 109: "HTTP Protocol Binding".

[10] ETSI TR 102 966: "Machine-to-Machine communications (M2M); Interworking between the M2M Architecture and M2M Area Network technologies".

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 reference document (including any amendments) applies.

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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] D-S4: "Study on Semantic Assets for Smart Appliances Interoperability European Commission DG Communications Networks, Content & Technology".

[i.2] ETSI TR 102 725: "Machine-to-Machine communications (M2M); Definitions".

[i.3] ETSI TS 102 689: "Machine-to-Machine communications (M2M); M2M Service Requirements".

[i.4] ETSI TS 102 690: "Machine-to-Machine communications (M2M); Functional architecture".

[i.5] ETSI TS 102 921: "Machine-to-Machine communications (M2M); mIa, dIa and mId interfaces".

[i.6] ETSI TS 103 268-1: "SmartM2M Smart Appliances Ontology and Communication Framework Testing Part 1: Testing methodology".

[i.7] ETSI TS 103 268-2: "Smart Appliances Ontology and Communication Framework Testing; Part 2: Conformance testing Protocol Implementation Conformence Statements (PICS)".

[i.8] ETSI TS 103 268-3: "Smart Appliances Ontology and Communication Framework Testing; Part 3: Conformance testing; Test Suite Structure and Test Purposes (TSS&TP)".

[i.9] ETSI TS 103 268-4: "Smart Appliances Ontology and Communication Framework Testing; Part 4: Conformance testing Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT)".

3 Definitions and abbreviations

3.1 Definitions

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

A term defined in the present document takes precedence over the definition of the same term, if any, in ETSI TS 118 111 [2].

SmartAppliance: home appliance able to consume or produce energy, with potential communication means with other Smart Appliances and/or local or remote service logics

Smart Appliances communication framework: set of protocols, elements and functionalities that supports communication and interworking for Smart appliances, as specified in the present document and ETSI TS 103 264 [1].

3.2 Abbreviations

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

COSEM COmpanion Specification for Energy Metering
IoT Internet of Things

4 Smart Appliances communication functionality and protocols

4.1 Introduction

The oneM2M specifications define a framework for the communication and sharing of information. The major paradigm can be referred to as "store & share". De facto any object and information is mapped to resources that can be shared, discovered and accessed via a resource oriented architecture and its related protocols,

IP protocols and URI formats are at the basis of the communication and identification, making the solution Internet of Things friendly, so the oneM2M system is a component of IoT.

The following three aspects most characterize the oneM2M solution (and similarly the ETSI M2M specifications) in the context of Smart Appliances:

- The mentioned store & share mechanism allows information sharing among multiple services, without consuming the data or explicitly addressing the interested applications. In fact, the use of a communication that allow the storage of the information (on devices, gateways and servers) and its retrieval using application identities, removes the need for end to end routing of the information.

- A separation between security and privacy, where security is based on existing security mechanisms, while privacy is enforced by the system flexibly determined by the service application. The service application may decide to which applications/applications sets and under which conditions they choose to share the information.

- Transparency with respect to the application semantics. Data is stored and retrieved transparently from the point of view of the communication framework, which knows very little or nothing about the nature of the data contained and its format. This implies that to provide a full communication interoperability at the application level the service application needs to share a semantic model or to interwork with a common semantic model. In the case of Smart Appliances the common semantics are defined in ETSI TS 103 264 [1].

Everything is then integrated with the required communication feature: among others, security, device management, group managements, location management, communication scheduling, etc., are all part of the oneM2M solution. An intelligent independence from the underlying network: multiple IP based networks can be used, and the M2M System is used to hide (or abstract) the data with respect to the applications. This tries to make conscious & efficient use of the available connectivity means, with the possibility of reusing underlying network functionality where available.

Additionally the oneM2M Communication Framework allows a flexible deployment. It is designed as a distributed system, where the functionalities and information can be distributed on devices, gateways and centralized servers, according to the specific service needs and optimizations.

Technically the oneM2M system is an evolution and extension of the ETSI M2M system & specifications, and even if they are not strictly interoperable, the constituent elements are the same, allowing an easy interworking and a smooth evolution from ETSI M2M to oneM2M M2M systems.

4.2 Smart Appliances Communication Framework

The Communication Framework for Smart Appliances shall comply with the following specifications:

- ETSI TS 118 111 (oneM2M TS-0011) [2].
- ETSI TS 118 102 (oneM2M TS-0002) [3].
- ETSI TS 118 101 (oneM2M TS-0001) [4].
- ETSI TS 118 104 (oneM2M TS-0004) [5].
- ETSI TS 118 103 (oneM2M TS-0003) [6].
- ETSI TS 118 105 (oneM2M TS-0005) [7].
- ETSI TS 118 106 (oneM2M TS-0006) [8].
- ETSI TS 118 109 (oneM2M TS-0009) [9].

The communication security may be omitted when reusing an underlying network security (e.g. when the communication is performed on a cellular network).

Any proprietary addition/extension to the protocols on Mca, Mcc and Mcc' shall not be included (i.e. no proprietary parameter or resource is admitted on these interfaces). Proprietary extensions may be included by means of specialized applications that operate by associating semantic means to the standard resources (typically application and containers as defined in ETSI TS 118 101 [4]). This acts as plug in on the communication framework without impacting the communication framework interoperability.

These specifications apply to all the entities in the Smart Appliances Communication Framework including the Smart Appliances themselves.

How the Smart Appliances are represented in the communication framework is defined in ETSI TS 103 264 [1].

The use of precursor ETSI M2M specifications (ETSI TR 102 725 [i.2], ETSI TS 102 689 [i.3], ETSI TS 102 690 [i.4] and ETSI TS 102 921 [i.5]) is allowed for initial prototyping of the Communication Framework.

5 Interworking with the Smart Appliances Communication Framework

In case of a Smart Appliance that is non-compliant to the specification identified in clause 4 of the present document, the interworking shall follow clauses F.1, F.2 and F.4 of ETSI TS 118 101 [4] (oneM2M TS-0001). These mentioned clauses are normative for non-compliant Smart Appliances when interworking with the Smart Appliances in Communication Framework.

Interworking with area network technologies should comply with the solutions described in ETSI TR 102 966 [10].

Annex A (informative): Interworking support in oneM2M and ETSI M2M frameworks

A.1 Introduction

A standardized horizontal platform is a key enabler for multi-technology and multi-domain information sharing and coordination.

The adoption of a horizontal platform needs a standard design to support interworking with different technologies. This is in recognition of the potential variety of deployments generated by legacy and specialized technologies.

Additionally, each service can be stand-alone, but in most of the cases each service is made of a combination of the information coming from other services and deployments. The same information may be reused by different services (e.g. an electric consumption sensor that provides information can be used by a lot of different services). Therefore, the need to share information with other services not pertaining to the Smart Appliances context needs also to be satisfied.

Hence, there are two interworking cases, among Smart Appliances applications and technologies, and between Smart Appliances and other service domains (e.g. Smart Cities, Smart Grid, surveillance security, etc.)

A.2 Guidelines and principles

Assuming that a realistic initial deployment is made of a set of different applications based on different technologies, there are three major implications on the communication framework that supports Smart Appliances.

The first is that the communication framework needs to support the sharing of information among service applications, with simple and light dynamic means to authorize other applications to access the provided information, whilst respecting all the implications for privacy and security.

The second is that the communication framework needs to support the communication interworking among all the different protocols used by the various capillary/access networks. The most probable common denominator is the reuse of IP as main communication means and the use of the URI as identification. However, the efficiency required on the sensor side is leading to the deployment of a lot of optimized technologies in the area networks.

The third is the support of means for semantic interworking: that according to current solution trends will be probably obtained by a combination of mechanisms ranging from real semantic interworking, to native adoption of common semantics, to mechanisms to publish objects with the related ontology and methods via formal languages.

Here follows a description of the mechanism for the communication framework, using as examples the solutions provided by the ETSI M2M and oneM2M. For more details refer to ETSI M2M and oneM2M specifications [1] to [10], [i.2], [i.3], [i.4] and [i.5].

The mechanism is based on the use of standard APIs (Mca/Mcc/mId/dIa/mIa in the figures A.1 and A.2) toward specialized Interworking Application Entities exchanging information on a distributed service platform (CSE/SCL in the figures A.1 and A.2). Such Interworking Application Entities are able to remap the specific technology (or proprietary data model) to the standardized resources exposed by the platform of the standard communication framework. This is typically supported via a full semantic inter-working of the data model used by the specific technology and a related protocol inter-working logic, and, depending on the complexity of the specific technology considered, it can imply the definition of a complex set of resources built via the basic ETSI M2M/oneM2M ones, or a simple direct mapping of the communication via the containers.

The approach enables a unique solution for communication among different protocols, catering for different levels of inter-working including protocol inter-working, semantic information exchange and data sharing among the different solutions and deployments.

In the following two examples the use of such an interworking framework is shown, the first dealing with full protocol and semantic interworking, the second one using only protocol interworking.

The first example is depicted in figure A.1 and shows a typical scenario where different technologies (e.g. ZigBee® specifications with use of telco profile, Mbus specifications with COSEM information model, other) are enabled to communicate with each other. The figures A.1 and A.2 also shows where the common data model and the specific data model awareness are supported.

NOTE: ZigBee® is the trade name of a product supplied by ZigBee Alliance. This information is given for the convenience of users of the present document and does not constitute an endorsement by ETSI of the product named. Equivalent products may be used if they can be shown to lead to the same results.

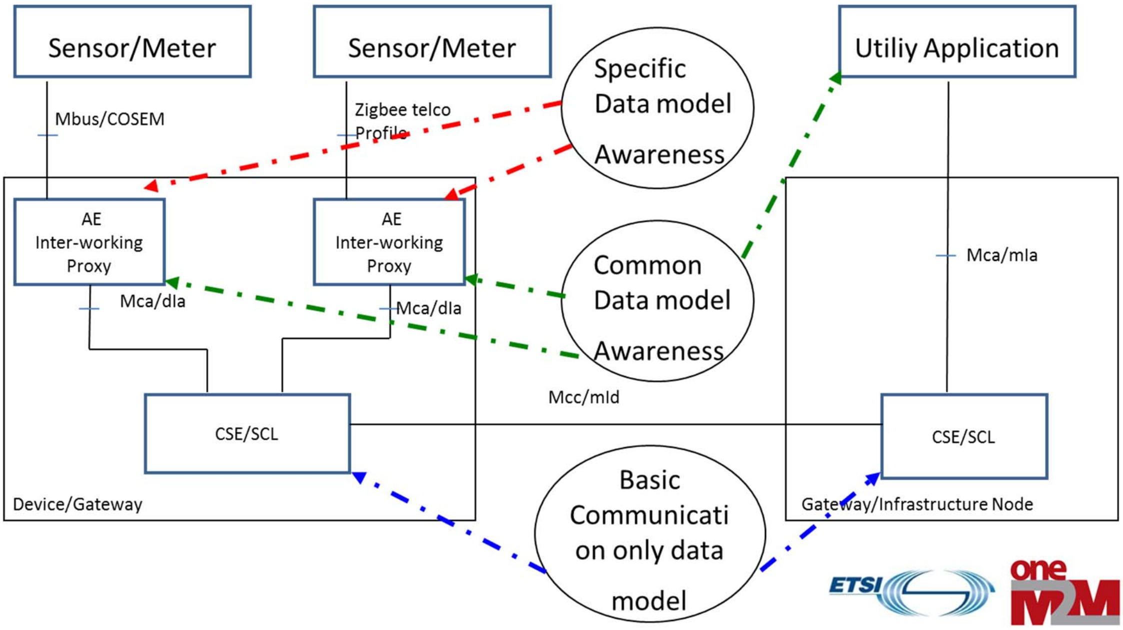

Figure A.1

With this level of interworking an M2M Application can access non-oneM2M solutions without the need to know the specific protocol encoding for these solutions. A drawback is that the Interworking Proxy Application Entity also potentially needs to interwork between a non-oneM2M security solution and oneM2M security (e.g. it needs to be the termination point of any non-oneM2M specific encryption).

The second example depicted in figure A.2 and shows the case when a common data model is shared among applications, so this is by fact only a protocol translation and a basic communication mapping is needed.

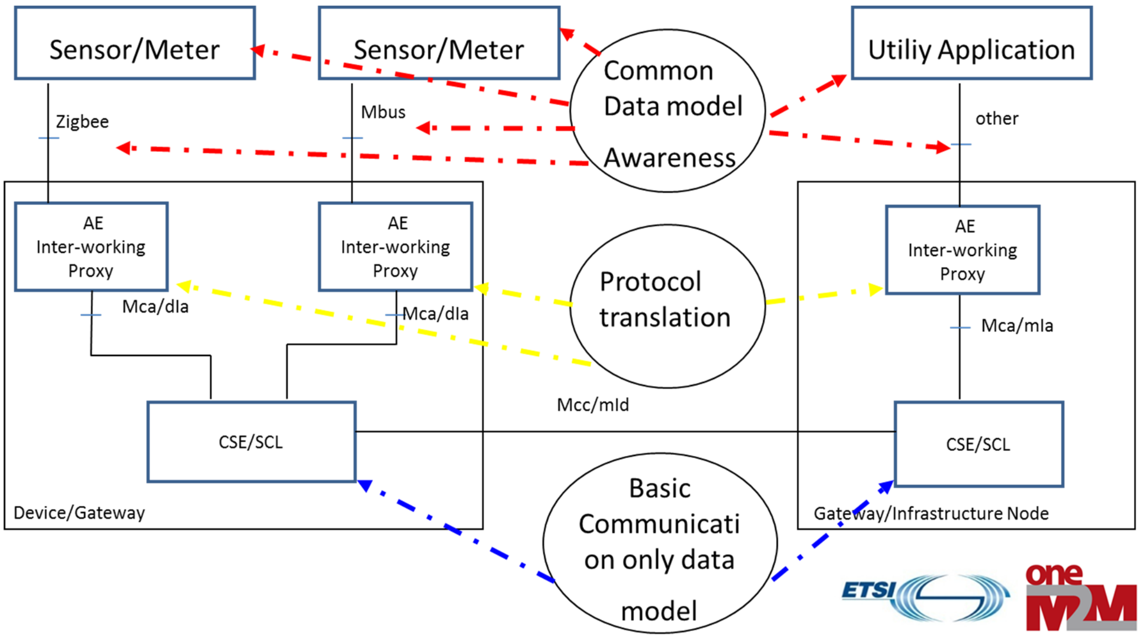

Figure A.2

In this variant data and commands are transparently packed by the Interworking Proxy Application Entity and transported and shared via the service platform. The Interworking Proxy Application Entity makes the protocol translation and the mapping on the basic communication data model of ETSI M2M/oneM2M, assuming that a common semantic data model is defined and shared by the applications.

History

Document history		
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