2 - oneM2M Common Architecture for IoT

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M2M world of connected services
The current marketplace is extremely fragmented, which has increased the R&D cost in each specific domain.

Current IoT silo model is not an efficient way to communicate, it is a barrier to further development.

Many vertical IoT solutions have been designed independently and separately for different applications, which impedes large-scale M2M deployment.

Source: CRYSTAL project/Philips
IoT cross-domain interoperability

- Highly fragmented market with small vendor-specific applications.
- Reinventing the wheel: Same services developed again and again.
- Each silo contains its own technologies without interop.

- End-to-end platform: common service capabilities layer.
- Interoperability at the level of communications and data.
- Seamless interaction between heterogeneous applications and devices.
Standards landscape for IoT

- 143 organizations around the world are involved in M2M standardization according to the Global Standards Collaboration M2M Task Force.
IoT high level architecture
Standards for Wide Area Networks (3GPP, fixed NW, WiMax...): **Target:** protect networks against negative effects of M2M traffic (many devices, non-human traffic ...)

http://www.etsi.org/technologies-clusters/technologies/m2m
Standards for Local Area Networks (ZigBee, BLE, Enocean, PLC, etc.)

**Target:** foster use of LAN technology by supporting diverse ecosystem of service providers and device manufacturers.

http://www.etsi.org/technologies-clusters/technologies/m2m
Standards for vertical industries

**Target:** enable interoperable, cost-efficient Solutions.

http://www.etsi.org/technologies-clusters/technologies/m2m
Standards for M2M Service capabilities:

**Target:** end-to-end enablement across servers, gateways, and devices.

Standardized service interfaces.

http://www.etsi.org/technologies-clusters/technologies/m2m
oneM2M: The Partnership Project
Over 200 member organizations in oneM2M
oneM2M liaisons
Purpose
To specify and promote an
M2M Common Service Layer

Work
Six physical 1-week meetings per year
About 5 conference calls per week between the meetings
200+ documents produced and discussed at each meeting
3800 docs in 2013  4200 docs in 2014

Deliverables
Technical Reports and Technical Specifications
Planning for Release 2 - Timeline

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<tr>
<th>Color Code</th>
<th>Release 2</th>
<th>Release 3</th>
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### Stage 1
- **R3 normative work**
- **Stage 1 Freeze**

### Stage 2
- **R2 approval**
- **R2 ratification**

### Stage 3
- **R3 normative work**
- **Stage3 Freeze**

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- **TP18**
- **TP19**
- **TP20**
- **TP21**
- **TP22**
- **TP23**
- **TP24**
- **TP25**
- **TP26**

- **ARC 19.4**
- **Stage2 Freeze**
- **R3 start norm work**
Planning for Release 2 – Planned Features

**Industrial domain enablement**
- Time series, etc.
- In conjunction with the TR

**Security**
- Enhancement for authorization
- Privacy support
- E2E security

**Advanced protocol binding**
- WebSocket

**Semantic interoperability**
- Base ontology
- Semantic discovery
- Semantic descriptions

**Home domain enablement**
- Home appliance information models

**oneM2M Application Identification Registry established**

**oneM2M interworking framework**
- Generic interworking
- AllJoyn/AllSeen
- OIC
- OMA LightWeight M2M
- 3GPP Rel.13 interworking
oneM2M high level architecture

Entities: AE (Application Entity), CSE (Common Services Entity) and NSE (Network Services Entity)

Reference Point: One or more interfaces - Mca, Mcn, Mcc and Mcc’
oneM2M functional architecture

**MN-AE**
- **REG**
- **ASM**
- **LOC**
- **CMDH**

**MN-CSE**
- **SUB**
- **SEC**
- **DMR**
- **GMG**

**MN-NSE**
- **REG**
- **ASM**
- **LOC**
- **CMDH**

**IN-AE**
- **Registration (REG)**
- **Application and Service Layer Mgmt (ASM)**
- **Location (LOC)**
- **Communication Mgmt & Delivery Handling (CMDH)**

**IN-CSE**
- **Subscription and Notification (SUB)**
- **Security (SEC)**
- **Group Management (GMG)**
- **Data Mgmt and Repository (DMR)**

**IN-NSE**
- **IN-Node**
- **IN-Node**
- **IN-Node**

**ASN-AE**
- **REG**
- **ASM**
- **LOC**
- **CMDH**

**ASN-CSE**
- **SUB**
- **SEC**
- **DMR**
- **GMG**

**ASN-NSE**
- **ASN-Node**
- **Non oneM2M Nodes**
- **ADN-AE**
- **MN-Node**
- **MN-AE**
- **IN-AE**
- **IN-CSE**
- **IN-NSE**
OneM2M resource structure

OneM2M Resource structure

Resource type representation
oneM2M resource types

- Cse BASE
- Access Control Policy
- Remote CSE
- Application Entity
- Container
- Content Instance
- Group
- Subscription
- Polling Channel
- Node
- Mgmt Object
- ...

...
oneM2M resource tree example
Accessing resources in oneM2M (Blocking)
Accessing resources in oneM2M (Non blocking Synchronous)

Non blocking synchronous requests
Accessing resources in oneM2M (Non blocking asynchronous)

Non blocking asynchronous requests
Interworking with non oneM2M devices

• The Interworking Proxy Entity (IPE) abstracts and maps the non-oneM2M data model to the oneM2M resources.
• Bidirectional communication between the oneM2M system and a specific technology (Monitor and Control).
• Seamless interaction between applications and devices using the oneM2M Restful API.
oneM2M implementations

Open source

- LAAS-CNRS
- OM2M
- KETI
- CISCO
- OCEAN

Commercial & Demo

- Huawei
- LG
- Sierra Wireless
- InterDigital
- ILS
- Fraunhofer FOKUS
- Ericsson
- Qualcomm
- Sensinov
oneM2M scenarios

• **Scenario 1** - Nodes mutual authentication and applications registration
• **Scenario 2** - Retrieve data from smart meter
• **Scenario 3** - Get notified when new metering data is created
• **Scenario 4** - Get notified when new smart a meter is registered
• **Scenario 5** - Store smart meter data remotely using announcement
Scenario 1
Nodes mutual authentication and applications registration
Scenario 1

Initial state

ASN-CSE

CseBase-SmartMeter

Smart Meter Device

mcc

ASN-AE

mca

CseBase-MeteringServer

Smart Metering Server

IN-CSE

mca

IN-AE
Scenario 1

Step 1 - AE-PowerProcessing Registers to the Metering Server IN-CSE
Scenario 1

Step 2: The Smart Meter ASN-CSE registers to the Metering Server IN-CSE
Scenario 1

Step 3 - The Smart Meter ASN-CSE Creates locally RemoteCSE-MeteringServer resource
Scenario 1

Step 4- AE-SmartMeter registers to the Smart Meter ASN-CSE
Scenario 2
Retrieve data from smart meter
Scenario 2

Initial state
Scenario 2

Step 1 - AE-SmartMeter Creates Container-Power sub-resource
Scenario 2

Step 2 - AE-SmartMeter creates ContentInstance-Power sub-resource
Scenario 2

Step 3- AE-PowerProcessing retrieves the ContentInstance-Power resource
Scenario 3
Get notified when new metering data is created
Scenario 3

Initial state
Step 1 - AE-PowerProcessing subscribes to Container-Power of AE-SmartMeter
Step 2 - AE-SmartMeter creates ContentInstance-Power. AE-PowerProcessing is notified.
Scenario 4
Get notified when new smart a meter is registered
Scenario 4

Initial state
Scenario 4

Step 1 - AE-PowerProcessing creates Subscription-devices resource to get notified of new meters.
Step 2 - The Smart Meter registers to the Metering Server. AE-PowerProcessing is notified.
Scenario 4

Step 3 - The Smart Meter ASN-CSE Creates locally RemoteCSE-SmartMeter resource
Scenario 5
Store smart meter data remotely using announcement
Scenario 5

Initial state
Scenario 5

Step 1 - AE-SmartMeter registers to the Smart Meter ASN-CSE with announcement.
Scenario 5

Step 2 - AE-SmartMeter remotely creates Container-Power on AE-SmartMeter-Announced
Scenario 5

Step 3 - AE-SmartMeter creates remotely ContentInstance-Power
Scenario 5

Step 4 - AE-PowerProcessing retrieves the ContentInstance-Power resource directly from IN-CSE.
Thank you for your Attention

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