Machine to Machine (M2M) Communications

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Agenda

- What are standards & why are they important?
- M2M background
- ETSI M2M => Smart M2M
- oneM2M Partnership Project
- Conclusion
What is a standard?

It is a document that defines technical or quality requirements with which current or future products, production processes, services or methods may comply.
Standard are:

- Always voluntary
- Consensus based
- Established by all interested parties
- Driven mainly by Industry
- Drafted by technical experts
- Approved by a recognized, independent standardization body
Why standards are important?

- Enhance safety of products
- Promote common understanding
- Facilitate trade by reducing TBs
- Promote interoperability of products and services
- Benefits of economies of scale
- Support environmental sustainability
- Facilitate the uptake of innovation and reflect the outcome of research and development
What is M2M?

- **Machine to Machine**: Ubiquitous or Pervasive Computing
- **Four Step Process:**
  - Data Generated, Transmitted, Analyzed and Acted Upon
- **Other related terms**
  - Internet of Things (IoT), Connected Devices, Smart Computing, Smart Metering and Extended Internet etc.
- Leveraging Innovation in **Micro Computing and Wireless Technology** allowing devices to collect distribute real time data
- **Potential to connect Millions** of Machines in near future
- It’s a **technology that enables electronics and mechanical devices to communicate** with each other **seamlessly and perform actions without human intervention**.
Maturity cycle of M2M?

Government stimulus programs boost M2M standards:
- EC mandate to ETSI/CEN/CENELEC to develop EU standards for Smart Metering (M/441), and later on for Smart Grid (M/490)
- NIST mandated to pilot delivery of standards for Smart Grids

**Principal focus of ETSI M2M:** prepare the deployment “transition phase” to horizontal platforms

**Transition**
- Horizontal solutions in select markets
- B2C services emerging
- Multi-network enterprise solutions
- Service provider hyper-growth

**Emergent**
- Custom point solutions
- Cellular network dominant
- Emerging business models
- Mainly nascent market growth
- Dominated by B2B services

**Gross Market Revenue**

**Advancement**
- Significant business model disruption
- Capex shifts to opex investment
- B2C passes B2B service revenue
- Maturity-driven consolidation accelerates

Source: of graphic: The Yankee Group
Rationale

- M2M has been around for several decades now – some deployments date back more than 20 years. However M2M markets are struggling to realize the full M2M market potential

- The M2M market is taking-off:
  - Government and industry initiatives
  - Telecom actors business opportunity
  - Ubiquitous networks and affordable hardware

- Fragmented industry
  - Industry verticals are solving their M2M needs on their own

  Fast and global standardization is a key enabler to remove the technical barriers and ensure interoperable M2M services and networks
M2M Use Cases

- Fleet Management
- Home Energy Management
- Smart Parking

Service Configuration

Terminal System
- Vehicle information (Brake, RPM, Speed, Location etc)
- DTG
- M2M Gateway

Mobile Network
- DTG Data Storage
- Application server
- GIS Map
- DB

M2M service provider

Internet
- Client
- Service gateway
- Provide Taxi call and fleet management (Truck and Bus etc)

Gateway Device
- Remote Management Server
- HEMS Application Server

Access Network
- 3GPP 3GPP2

Parking Provider (mall)
Parking Provider (street)
Billing Provider
Police Center

Amity University | New Delhi, 21-03-2014
Smart City – wide range of different services

- RMC
- Home Alarm
- Security
- Connected street lights
- Smart meters
- Smart Energy
- Tracking
- Transport
- Automotive
- Logistics
- ITS
- mHealth
- Digital Signage
- eMobility
Smart Solutions

... meaning interlinked intelligent infrastructure solutions

<table>
<thead>
<tr>
<th>Transportation &amp; Safety</th>
<th>Energy &amp; Home/Building Automation</th>
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<tbody>
<tr>
<td>▪ Public Transport (\text{road, rail, air and sea transport as well as ticketing and passenger information systems})</td>
<td>▪ Smart Grid (\text{intelligent management of load between energy generation and consumption e.g. loading stations for e-Cars})</td>
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<td>▪ Traffic Management (\text{parking space management and payment, congestion charging and road tolls, traffic volume monitoring, connected road signs, traffic lights, enforcement cameras, in-vehicle congestion and toll devices})</td>
<td>▪ Smart Buildings (\text{intelligent, integrated management of all building systems e.g. hospitals, offices, residential, restaurants, hotels, shopping centers, schools})</td>
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<td>▪ Environment and Public Safety (\text{CCTV, street lighting, waste collection, public alarms, intercoms, tourist information services})</td>
<td>▪ Networked infrastructure for business services, payment systems, housing, leisure and lifestyle services, and ICTs (mobile and fixed phones, satellite TVs, computer networks, e-commerce, internet services)</td>
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<td>▪ Public Space Advertising (\text{static advertising and billboards})</td>
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What is emerging from the Use Cases?

- What is a device?
- How do devices interact with multiple applications?
- Need to interwork?
- How are devices managed?
- How is data shared?
- How secure is the system?

A common service layer can provide all of these needs and more.
TC M2M Work Programme

TR 102 691 Smart Metering
TR 102 732 e-Health
TR 102 857 Connected consumer
TR 102 898 Automotive applications

TR 102 935 Smart Grid impacts on M2M
TS 103 104 Interop. Test Spec for CoAP bindings of M2M primitives
TS 102 689 M2M Service Requirements
TR 102 725 M2M Definitions
TR 103 167 Threat analysis & counter measures to M2M service layer

TR 102 966 Interworking with M2M Area Networks
TR 103 092 OMA-DM Compatible Management Objects
TR 103 093 BBF TR-069 Compatible Management Objects

TR 103 118 Smart Grid Infrastructures Security
TS 102 690 M2M Functional Architecture
TS 102 921 M2M Comm. mla, dla and mld interfaces
TS 103 094 Interop. Test Spec for M2M primitives
TR 101 584 Semantic Support for M2M Data

MI: Smart Appliance action plan.

Published:
- Since last plenary meeting
- Before last plenary meeting
- Final draft planned at this plenary
TC M2M Release 1 and Release 2

M2M Release 1

- **TS 102 689** \(^{W1-01}\)
  - M2M Service Requirements

- **TS 102 690** \(^{W1-02}\)
  - M2M Functional Architecture

- **TS 102 921** \(^{W1-10}\)
  - M2M Comm. mIa, dIa and mId interfaces

- **TS 103 093** \(^{W1-16}\)
  - BBF TR-069 Compatible Management Objects

M2M Release 2

- **TR 101 584** \(^{W1-17}\)
  - Semantic Support for M2M Data

- **TS 103 092** \(^{W1-15}\)
  - OMA-DM Compatible Management Objects
ETSI TC M2M

- ETSI TC M2M established in 2008
  - Developing and maintaining an end-to-end overall telecommunication high level architecture for M2M
  - Architecture kernel: M2M Service Layer Platform
  - Provided the first set of M2M platform standards to the market in 2011, the second set in 2013

- Renaming: ETSI TC SmartM2M in 2013
  - New scope
ETSI TC SmartM2M

- Maintain ETSI M2M published specifications
- Provide specifications for M2M services and applications
- Identification of EU policy and regulatory requirements on M2M services and applications to be developed by oneM2M, and the conversion of the oneM2M specifications into European Standards.
- Produce specifications as needed for regulatory purposes
Technical Bodies to Partnerships

- ETSI TC M2M established 2008.
- First set of M2M platform standards to market in 2011.

- oneM2M Partnership project established July 2012.
oneM2M objective - ETSI M2M

- Leading regional SDOs have agreed to create a global harmonisation partnership
  - To prepare, approve and maintain globally applicable, access-independent technical specifications and reports related to M2M solutions, with initial focus on the Service Layer
    - *same as ETSI M2M, some of whose work will be transferred to oneM2M and form the basis for further OneM2M work.*
  - With the opportunity for broad and equitable participation by all stakeholders in the M2M marketplace, including manufacturers, service providers and end users from all industries
    - *avoiding any duplication of work between SDOs involved in the same domain of M2M Service Layer*
oneM2M Scope

- **Common set of Service Layer capabilities**
- **Access independent view** of end-to-end services
- **Open /standard interfaces**, **APIs and protocols**
- **Security, privacy, and charging aspects**
- **Reachability and discovery of applications**
- **Interoperability**, including test and conformance specifications
- **Identification and naming of devices and applications**
- **Management aspects** (including remote management of entities)
Benefits

- Boost M2M economies of scale and shorten time-to-market
  - Lower capital and operating expenses
  - Foster and optimize future investments of all involved parties

- Simplify development of applications
  - Intra- and inter-industry integration of services
  - Allow same application to be used across different service platforms

- Leverage the worldwide network for enhanced potential of services and to expand business opportunities
  - Greater reach of services through broader network interoperability

- Reduce standardization overlap and confusion and provide ongoing standards support
  - Enhance interoperability, Reduce market fragmentation, Future proof services via collaboration, Enhance security and reliability
Vertical Pipes
M2M Service Layer

**Middleware** - supporting secure end-to-end data/control exchange between M2M devices and customer applications by providing functions for remote provisioning & activation, authentication, encryption, connectivity setup, buffering, synchronization, aggregation and device management

- a software layer
- sits between M2M applications and communication HW/SW that provides data transport
- normally rides on top of IP
- provides functions that M2M applications across different industry segments
oneM2M Functional Architecture

M2M Applications

M2M Service Layer

Underlying Transport
Common Services Functions

Common Services Entity (CSE)

- Addressing and Identification
- Data Management & Repository
- Location
- Security
- Communication Management/Delivery Handling
- Registration
- Group Management
- Device Management
- Subscription Notification
- Service Charging & Accounting
- Discovery
- Network Service Exposure/Service Ex+Triggering
- Underlying Network Service Entity (NSE)

Mca Reference Point

Mcc Reference Point

Mcn Reference Point
Schedule

oneM2M Work Programme

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Target Date: Release 1
Conclusion

A oneM2M-specified M2M Service Layer (CSF) being access technology independent could become a vehicle to transport and manage data traffic of M2M applications, globally across many M2M sectors and across all regions, enabling the following:

- Efficient use of underlying networks => **lower connectivity cost**
- Abstracting out complexity => **lower development cost**
  => shorter development time
  => faster time to market
- Sharing of components and infrastructure => **lower investments**
- Use of same technology as in other verticals => Synergies => **Lower cost**
- **Focus on business logic** rather then connectivity, security, buffering etc.
- **Expansion** into other business cases due to horizontal nature of M2M CSF
- **Reduction of fragmentation** due to horizontal nature of M2M CSF
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