oneM2M Overview and Positioning

Dr. Josef J. Blanz, 2018-02-08
M2M/IoT: Surge of connected things

~25 Billion
Interconnected devices forecast in 2020¹

Transforming industries with innovative services and useful information

Connected Home  Automotive  Smart Cities  Retail  Education  Healthcare  Industrial

¹ Source: Machina Research, February, 2014
Jungle of Consortia, Standards, OS-Projects

Which groups actually specify technology, which are just doing marketing & promotion?
Which technologies are used / will be used in M2M/IIoT?
Which technologies are overlapping or complementing each other?
Background – Technologies in IoT Stack

Service Layer
aka Service Platform
Middleware
Enablement Platform
Horizontal Platform

Protocols

Access

Applications

Custom IoT Applications

Application
Presentation
Session
Transport
Network
Link
Physical

“OSI equivalent”

CoAP
RTPS
CoAP
RTPS

IoT Applications

CoAP
RTPS

LightweightM2M

CoAP
RTPS

CoAP
RTPS

CoAP
RTPS

CoAP
RTPS

CoAP
RTPS

CoAP
RTPS

CoAP
RTPS

CoAP
RTPS

CoAP
RTPS

CoAP
RTPS

CoAP
RTPS

CoAP
RTPS

CoAP
RTPS

CoAP
RTPS

CoAP
RTPS

CoAP
RTPS

CoAP
RTPS
Notion of “Proximal” versus “Distal” IoT

Technologies designed with different paradigms in mind ⇔ Synergetic

Technologies with “proximal” scope

- Single private network/subnet = proximal network (e.g. smart home)
- Simplify connecting “things” in reach: Monitor, control, automate, no hierarchy
- Enablers: Discovery, Advertisement, Introspection, On-Boarding
- Needs multi-cast techniques
- A “user” is still in the center of this “proximal” paradigm

Examples

- Consumer: OCF, IoTivity, dotot, KNX;
- Industrial OPC-UA, DDS, Profinet, Sercos

Technologies with “distal” scope

- Large scale deployments of devices in an overlay network
- Hide complexity of network usage / management / access control / sharing
- Storing & sharing of distributed data
- Enablers: Security, access control, selective communications, models
- Agnostic to underlying NW technology
- Utilize optimizations for M2M / IoT, better efficiency in WWAN usage

Examples

- oneM2M, 3GPP MTC, proprietary platforms
Trend in Evolution of M2M to IoT

Master/Slave

Yesterday

Proximal ↔ Cloud

Today

Mix of Proximal & Distal

Tomorrow
M2M Service Layer

Horizontal Middleware Platform
Example

HVAC (Heating, Ventilation, Air Conditioning)
Example

HVAC

temp
flow
valve
pump
I/O
heat
A/C
Example

HVAC
Example

HVAC

01101001011011101011
01

01101001
0110101101

011010010110111010110110110110110110110110101

01101001011011101011
01

0110101101

011010010110111010110110110110110110110110101

0110101101

01101001011011101011
01
Example

flow of information

HVAC

01101001011011101011
01
011010101101110111011011
01
011010101101
01
Example

HVAC
Communication Network(s)

HVAC
Functional Architecture

Communication Network(s)

HVAC
eHealth
eHealth
eHealth

Communication Network(s)
Functional Architecture

Communication Network(s)

eHealth
Connected Home
Functional Architecture

Connected Home
Functional Architecture

Communication Network(s)

Automotive
Functional Architecture

Communication Network(s)

Metering
Functional Architecture

Industrial Production
M2M / IoT Service Layer

App: Applications
CS: Common Services
oneM2M Partnership

Standardizing an
Open Horizontal M2M Service Layer Platform
Motivation for oneM2M: Consolidation

Global partnership initiative:
Consolidate standardization of M2M/IoT functions

~200 member organizations in oneM2M

- Partner Type 1: ARIB, ATIS, CCSA, ETSI, TIA, TTA, TTC & TSDSI: All major Telecom SDOs around globe
  - Members (e.g. companies) participate in oneM2M via admitting Partner Type 1
  - IPR policy of admitting Partner Type 1 organization is binding for members
  - Partner Type 1 organizations are committed to transpose specifications into standards
- Partner Type 2: BBF, CEN/CENELEC, New Generation M2M Consortium, OMA, Global Platform
  - Fora/Associations/Consortia participate & contribute in oneM2M with compatible IPR regime

Milestones
- Created in 2012, avoiding standards fragmentation
- Published Rel-1 Q1/15, Rel-2 Q3/16, Rel-2a Q1/18
- Rel-3 to be completed by Q3/18
- 5 interop test events so far, several developer events
- Open source implementations (6), commercial take-up ~200 member organizations in oneM2M
Organizational Structure of oneM2M

- **Steering Committee (SC)**
  - Handling procedural, organizational, legal, and budget issues

- **Technical Plenary (TP)**
  - Contains all Working Groups, executes all technical work
  - Focused work program organized into work items, contribution driven, consensus based decisions
oneM2M: Standard for M2M / IoT

Horizontal layer of functions commonly needed across different market segments / not segment-specific

Similar to generic versus use case-specific computer/OS in early times of computers

- Standard for a middleware platform
- Sits between applications and processing/communication HW
- On sensors, actors, gateways, cloud
- Authentication/authorization/encryption
- Connects producers/consumers securely
- Hides complexity of NW usage from apps
- Controls when communication happens
- Increases efficiency of data transport
- Stores and shares data
- Supports access control
- Notifies about events
- Talks to groups of things
- Device & life cycle manages, large scale
Smart Cities: Platform integration around oneM2M

Europe and Asia

Several demos, larger scale pilots, commercial deployments

Documents from ETSI M2M Workshop 2016 and IoT Week 2017
Interworking is Key

• A number of open IoT standards are very complementary
• Need for simple interworking & more consolidation
Vision: Interworking
Based on open standards
Industry collaboration around oneM2M (from InterDigital & Huawei)
10 OPC-UA Interworking

10.1 Introduction of OPC-UA

10.2 Scenarios for Interworking

10.2.1 Overview of interworking scenarios

10.2.2 OPC-UA system interact with oneM2M infrastructure domain

10.2.3 OPC-UA systems in the field domain interact with each other via oneM2M infrastructure domain

10.2.4 OPC-UA system interact with oneM2M field domain via oneM2M infrastructure domain

10.2.5 OPC-UA system directly interact with oneM2M field domain

10.3 Possible Solutions to Address Interworking

10.3.1 Introduction

10.3.2 Functional Architecture for Interworking

10.3.3 Resource Model Mapping

10.3.3.1 Introduction

10.3.3.2 Generic Entities Mapping

10.3.3.3 Analysis and Recommendations

10.3.4 Procedure Mapping

10.3.4.0 Introduction

10.3.4.1 Connection Establishment

10.3.4.1.0 Introduction

10.3.4.1.1 Initialization

10.3.4.2 Data Collection from OPC-UA Device

10.3.4.2.1 Simple Reading Procedures

10.3.4.2.2 Subscription & Notification Procedures

10.4 Possible Impacts on oneM2M TSs

---

**Figure 10.3.4.2.2-1: Interworking procedure for Subscription**

Example figures from TR-0018
Example: Demo of Orange & Deutsche Telekom

oneM2M as unified API to operators’ Consumer IoT

oneM2M APIs & data models: Abstracting out specifics of DT & Orange

Applications independent of operators’ Smart Home solution

Global standard backed by open source
Overview on research project ‘SmartControl’

- Project aims at reducing engineering effort and increasing scalability in the context of Industry 4.0
  - Engineering is based on so-called asset administration shells (AAS, = “digital twins of machines”)
  - Together with a wide range of industry partners, structure and interfaces of these AAS are defined in the public funded collaborative project “BaSys 4.0”

- In SmartControl, oneM2M is used as middleware technology to store and retrieve asset administration shells
  - Utilizing Eclipse oM2M as oneM2M platform
  - Providing a mapping from BaSys 4.0 interfaces to oneM2M
  - Contributing to the BaSys 4.0 open source stack (Eclipse BaSyx)
Devices publish their asset administration shells to a oneM2M CSE

An AAS is represented by an application entity (AE)
AE: Application Entity
CSE: Common Services Entity
RESTful Style & Access Control

Resources = State Information

Infrastructure Node → CSE
Middle Node → CSE
Middle Node → AE
Middle Node → CSE
AE → AE
AE → AE
AE → CSE
AE → CSE
AE → AE
AE → Application Dedicated Node
AE → Application Service Node

Door Lock
RESTful Style & Access Control

Update Lock Status to “Open”
RESTful Style & Access Control

Update Lock Status to “Open”

Check Authorization: OK
=> Door Lock is open
RESTful Style & Access Control

Update Lock Status to “Close”

Check Authorization: Not OK => Door Lock remains open
Efficient Data Sharing

- GPS
- Local Connectivity
- CSE
- V2I Gateway
- Home WLAN [Owner]
- Cellular Network [Manufacturer]
- Cellular Network [Owner]
- CAN ...
- Engine etc.
- Infotainment
- AE
- AE
- AE
- AE
- AE

Infrastructure

- CSE
- Telematics
- Infotainment
- Geo-data

- AE Manuf.
- AE Owner
- AE Insurance
Efficient Data Sharing

At Home: In Owner’s WLAN Coverage

- GPS
- Local Connectivity
- V2I Gateway
- Home WLAN [Owner]
- Cellular Network [Manufacturer]
- Cellular Network [Owner]
- Infotainment
- Geo-data
- Telematics

- AE
- Engine etc.
- CAN ...
- Infotainment

- CSE

- AE Manuf.
- AE Owner
- AE Insurance
Efficient Data Sharing

At Home: In Owner’s WLAN Coverage

- GPS
- Engine etc.
- CAN ...
- Infotainment

Local Connectivity

V2I Gateway

Home WLAN
[Owner]

Cellular Network
[Manufacturer]

Cellular Network
[Owner]

CSE

Telematics

Infotainment

Geo-data

Infrastructure

AE Manuf.

AE Owner

AE Insurance
Efficient Data Sharing

At Home: In Owner’s WLAN Coverage

- GPS
- Engine etc.
- Infotainment

AE

- Local Connectivity
- V2I Gateway
- Home WLAN [Owner]
- Cellular Network [Manufacturer]
- Cellular Network [Owner]
- Geo-data
- Infotainment

CSE

- Telematics

Infrastructure

- AE Manuf.
- AE Owner
- AE Insurance
Efficient Data Sharing

At Home: In Owner’s WLAN Coverage

- GPS
- Engine etc.
- CAN ...
- Infotainment

Local Connectivity

V2I Gateway

Home WLAN [Owner]

Cellular Network [Manufacturer]

Cellular Network [Owner]

CSE

Telematics

Infotainment

Geo-data

Infrastructure

AE Manuf.

AE Owner

AE Insurance
Efficient Data Sharing

At Home: In Owner’s WLAN Coverage

- GPS
- Local Connectivity
- V2I Gateway
- CSE
  - Home WLAN [Owner]
- Cellular Network [Manufacturer]
- Cellular Network [Owner]
- Infrastructure
  - CSE
    - Telematics
    - Infotainment
    - Geo-data

- AE
  - Engine etc.
- AE
  - CAN ...
- Infotainment

AE Manuf.
AE Owner
AE Insurance
Efficient Data Sharing

At Home: In Owner’s WLAN Coverage

- GPS
- Engine etc.
- CAN ...
- Infotainment
- V2I Gateway

Local Connectivity

Home WLAN [Owner]

Cellular Network [Manufacturer]

Cellular Network [Owner]

Infotainment

Geo-data

Telematics

CSE

AE

AE Manuf.

AE Owner

AE Insurance
Efficient Data Sharing

At Home: In Owner’s WLAN Coverage

GPS

AE
Engine etc.

AE
CAN ...

Infotainment

AE

Local Connectivity

V2I Gateway

Home WLAN [Owner]

Cellular Network [Manufacturer]

Cellular Network [Owner]

Infrastructure

CSE

Telematics

Infotainment

Geo-data

AE Manuf.

AE Owner

AE Insurance
Efficient Data Sharing

At Home: In Owner’s WLAN Coverage

GPS

Local Connectivity

V2I Gateway

Home WLAN [Owner]

Cellular Network [Manufacturer]

Cellular Network [Owner]

Infrastructure

CSE

Telematics

Infotainment

Geo-data

AE Manuf.

AE Owner

AE Insurance

AE

Engine etc.

CAN ...

Infotainment
Efficient Data Sharing

At Home: In Owner’s WLAN Coverage

GPS

AE

Local Connectivity

V2I Gateway

Home WLAN [Owner]

Cellular Network [Manufacturer]

Cellular Network [Owner]

CSE

Telematics

Infotainment

Geo-data

Infrastructure

AE Manuf.

AE Owner

AE Insurance

Engine etc.

Infotainment

CAN ...
Efficient Data Sharing

At Home: In Owner’s WLAN Coverage

GPS
AE
Engine etc.

Local Connectivity

V2I Gateway

CSE
Home WLAN
[Owner]

Cellular Network
[Manufacturer]

Cellular Network
[Owner]

Infotainment

CSE
Telematics

Infotainment

Geo-data

Infotainment

AE Manuf.
AE Owner
AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

- GPS
- Engine etc.
- CAN ...
- Infotainment
- AE

Local Connectivity

V2I Gateway

CSE

- Home WLAN [Owner]
- Cellular Network [Manufacturer]

Infrastructure

- CSE
  - Telematics
  - Infotainment
  - Geo-data

- AE Manuf.
- AE Owner
- AE Insurance

Not Urgent
Efficient Data Sharing

On the road: Cellular Coverage

- GPS
- AE
  - Engine etc.
- CAN ...
- Infotainment
- AE

Local Connectivity

V2I Gateway

CSE

Home WLAN [Owner]

Cellular Network [Manufacturer]

Infrastructure

CSE

Telematics

Infotainment

Geo-data

AE Manuf.

AE Owner

AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

- GPS
- Local Connectivity
- V2I Gateway
- Home WLAN [Owner]
- CSE
- Cellular Network [Manufacturer]
- Cellular Network [Owner]
- Infrastructure
- CSE
- Telematics
- Infotainment
- Geo-data

- AE
- Engine etc.
- CAN ...
- AE
- Infotainment

AE Manuf.
AE Owner
AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

- GPS
- AE Connectivity
- Engine etc.

- AE
- CAN ...
- Infotainment

- AE

- V2I Gateway
- CSE

- Home WLAN [Owner]
- Cellular Network [Manufacturer]
- Cellular Network [Owner]

- CSE
- Telematics
- Infotainment
- Geo-data

- AE Manuf.
- AE Owner
- AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

GPS
AE
Engine etc.

Not Urgent

Local Connectivity

AE
CAN ...

Infotainment

AE

CSE

V2I Gateway

Home WLAN
[Owner]

Cellular Network
[Manufacturer]

Cellular Network
[Owner]

CSE

Telematics

Infotainment

Geo-data

Infrastructure

AE Manuf.

AE Owner

AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

GPS

AE

Engine etc.

AE

CAN ...

Infotainment

AE

Local Connectivity

V2I Gateway

Not Urgent

CSE

Home WLAN [Owner]

Cellular Network [Manufacturer]

Cellular Network [Owner]

Infrastructure

CSE

Telematics

Infotainment

Geo-data

AE Manuf.

AE Owner

AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

- GPS
- Local Connectivity
- V2I Gateway
- Home WLAN [Owner]
- Cellular Network [Owner]
- Infrastructure
- CSE
  - Telematics
  - Infotainment
  - Geo-data

- AE
- Engine etc.
- CAN ...
- Infotainment
- AE

- AE Manuf.
- AE Owner
- AE Insurance

Not Urgent
Efficient Data Sharing

On the road: Cellular Coverage

- GPS
- Local Connectivity
- V2I Gateway
- Home WLAN [Owner]
- Cellular Network [Manufacturer]
- Cellular Network [Owner]
- CSE
- Telematics
- Infotainment
- Geo-data

- AE Manuf.
- AE Owner
- AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

GPS

Local Connectivity

V2I Gateway

Home WLAN [Owner]

Cellular Network [Manufacturer]

Cellular Network [Owner]

Infotainment

Geo-data

Telematics

CSE

AE Manuf.

AE Owner

AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

- GPS
- AE Connectivity
- Engine etc.
- Infotainment

CSE

- Local Connectivity
- V2I Gateway

Home WLAN [Owner]

Cellular Network [Manufacturer]

- CSE
- Telematics
- Infotainment
- Geo-data

- AE Manuf.
- AE Owner
- AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

- GPS
- Local Connectivity
- AE
- Engine etc.
- CAN ...
- Infotainment
- AE
- V2I Gateway
- CSE
- Home WLAN [Owner]
- Cellular Network [Manufacturer]
- Infotainment
- Geo-data
- CSE

- Telematics
- AE Manuf.
- AE Owner
- AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

- GPS
- Local Connectivity
- V2I Gateway
- Home WLAN [Owner]
- CSE
- Telematics
- Geo-data
- Cellular Network [Manufacturer]
- Cellular Network [Owner]
- AE Manuf.
- AE Owner
- AE Insurance

AE
Engine etc.

Infotainment

AE
CAN ...
Efficient Data Sharing

On the road: Cellular Coverage

- GPS
- Local Connectivity
- V2I Gateway
- CSE
  - Home WLAN [Owner]
  - Cellular Network [Owner]
  - Cellular Network [Manufacturer]
  - Telematics
  - Infotainment
  - Geo-data

AE
- Engine etc.
- CAN ...
- Infotainment

AE Manuf.
AE Owner
AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

GPS

AE

Engine etc.

CAN ...

Infotainment

AE

Local Connectivity

V2I Gateway

Home WLAN [Owner]

Cellular Network [Manufacturer]

Cellular Network [Owner]

CSE

Telematics

Infotainment

Geo-data

Infrastructure

AE Manuf.

AE Owner

AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

- GPS
- Engine etc.
- CAN ...
- Infotainment
- AE

Local Connectivity

V2I Gateway

Home WLAN [Owner]

Cellular Network [Manufacturer]

CSE

Telematics

Infotainment

Geo-data

Cellular Network [Owner]

Infrastructure

AE Manuf.

AE Owner

AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

GPS
AE
Engine etc.
CAN ...
Infotainment

AE Connectivity
V2I Gateway

CSE
Home WLAN [Owner]
Cellular Network [Owner]
Cellular Network [Manufacturer]

CSE
Telematics
Infotainment
Geo-data

Infrastructure

AE Manuf.
AE Owner
AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

- GPS
- Local Connectivity
- V2I Gateway
- Home WLAN [Owner]
- Cellular Network [Manufacturer]
- Cellular Network [Owner]
- Telematics
- Infotainment
- Geo-data

- AE Manuf.
- AE Owner
- AE Insurance

AE

Engine etc.

Inotainment

AE

Urgent
Efficient Data Sharing

On the road: Cellular Coverage

- GPS
- Local Connectivity
- V2I Gateway
- Home WLAN [Owner]
- Cellular Network [Manufacturer]
- Cellular Network [Owner]
- CSE
- Telematics
- Infotainment
- Geo-data
- Infotainment

- AE Manuf.
- AE Owner
- AE Insurance

Engine etc.
Infotainment
CAN ...
Urgent
Efficient Data Sharing

On the road: Cellular Coverage

GPS
AE
Engine etc.
AE
CAN ...
Infotainment
AE

Local Connectivity
V2I Gateway

Urgent

Home WLAN
[Owner]

CSE
Telematics
Infotainment
Geo-data

Cellular Network
[Manufacturer]

Cellular Network
[Owner]

Infrastructure

AE Manuf.
AE Owner
AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

- GPS
- Local Connectivity
- V2I Gateway
- Home WLAN [Owner]
- Cellular Network [Manufacturer]
- CSE
- Telematics
- Infotainment
- Geo-data
- Cellular Network [Owner]
- AE Manuf.
- AE Owner
- AE Insurance

- AE
- Infotainment
- CAN ...
- Engine etc.

Urgent
Efficient Data Sharing

On the road: Cellular Coverage

GPS

AE

Local Connectivity

V2I Gateway

Home WLAN [Owner]

CSE

Cellular Network [Manufacturer]

Cellular Network [Owner]

Infotainment

Geo-data

Telematics

CSE

AE Manuf.

AE Owner

AE Insurance

Engine etc.

Infotainment

CAN ...
Efficient Data Sharing

On the road: Cellular Coverage
Efficient Data Sharing

On the road: Cellular Coverage

- **GPS**
- **AE**
- **Engine etc.**
- **Infotainment**

Local Connectivity

- **V2I Gateway**
- **CSE**

Home WLAN [Owner]

Cellular Network [Manufacturer]

Cellular Network [Owner]

Cellular Network [Owner]

Infrastructure

- **CSE**
- **Telematics**
- **Infotainment**
- **Geo-data**

AE Manuf.

AE Owner

AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

GPS

Local Connectivity

V2I Gateway

Home WLAN [Owner]

Cellular Network [Manufacturer]

Cellular Network [Owner]

CSE

Telematics

Infotainment

Geo-data

Infotainment

Can ...
Efficient Data Sharing

On the road: Cellular Coverage

GPS

AE

Engine etc.

AE

CAN ...

Infotainment

AE

Local Connectivity

V2I Gateway

Home WLAN [Owner]

Cellular Network [Manufacturer]

Cellular Network [Owner]

CSE

Telematics

Infotainment

Geo-data

Infrastructure

AE Manuf.

AE Owner

AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

- GPS
- Local Connectivity
- V2I Gateway
- Home WLAN [Owner]
- CSE
- Telematics
- Infotainment
- Geo-data
- Cellular Network [Manufacturer]
- Cellular Network [Owner]
- AE Owner
- AE Insurance
- AE Manuf.
- AE
- Engine etc.
- CAN ...
- Infotainment
Efficient Data Sharing

On the road: Cellular Coverage

- GPS
- Local Connectivity
- V2I Gateway
- CSE
- Home WLAN [Owner]
- Cellular Network [Manufacturer]
- Cellular Network [Owner]
- Telematics
- Infotainment
- Geo-data

AE
- Engine etc.
- CAN ...
- Infotainment

Interactive

AE Manuf.
AE Owner
AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

GPS
AE
Engine etc.
AE
Infotainment
AE

Local Connectivity
V2I Gateway

CSE

Home WLAN [Owner]
Cellular Network [Manufacturer]
Cellular Network [Owner]

Interactive

Infotainment
Telematics
Geo-data

Infrastructure

AE Manuf.
AE Owner
AE Insurance
On the road: Cellular Coverage

Efficient Data Sharing

- GPS
- Local Connectivity
- V2I Gateway
- Home WLAN [Owner]
- Cellular Network [Manufacturer]
- Cellular Network [Owner]
- Telematics
- Infotainment
- Geo-data

Interactive

- Engine etc.
- AE
- CAN ...
- AE
- Infotainment

Infrastructure

- AE Manuf.
- AE Owner
- AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

- GPS
- Local Connectivity
- AE Connectivity
- V2I Gateway
- CSE
- Interactive
- Home WLAN [Owner]
- Cellular Network [Manufacturer]
- Cellular Network [Owner]
- CSE
- Telematics
- Infotainment
- Geo-data

AE Manuf.
AE Owner
AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

GPS
AE
Local Connectivity
V2I Gateway
CSE
Home WLAN [Owner]
Cellular Network [Manufacturer]
Cellular Network [Owner]
Infrastructure
CSE
Telematics
Infotainment
Geo-data
AE Manuf.
AE Owner
AE Insurance

Engine etc.
AE
Infotainment
AE
CAN ...
Efficient Data Sharing

On the road: Cellular Coverage

- GPS
- Local Connectivity
- V2I Gateway
- CSE
- Home WLAN [Owner]
- Cellular Network [Manufacturer]
- CSE [Owner]
- Telematics
- Infotainment
- Geo-data
- AE Manuf.
- AE Owner
- AE Insurance

AE
Engine etc.

AE
CAN ...

Infotainment

AE

On the road: Cellular Coverage
Efficient Data Sharing

On the road: Cellular Coverage

GPS

Local Connectivity

V2I Gateway

Home WLAN [Owner]

Cellular Network [Manufacturer]

Cellular Network [Owner]

CSE

Telematics

Infotainment

Geo-data

Infrastructure

AE Manuf.

AE Owner

AE Insurance

AE

Engine etc.

Infotainment

AE

AE

CAN ...
Efficient Data Sharing

On the road: Cellular Coverage

- GPS
- AE Connectivity
- Engine etc.
- CAN ...
- Infotainment
- AE
- V2I Gateway
- Home WLAN [Owner]
- Cellular Network [Manufacturer]
- Cellular Network [Owner]
- CSE
- Telematics
- Infotainment
- Geo-data

AE Manuf.
AE Owner
AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

GPS

AE

Local Connectivity

V2I Gateway

CSE

Home WLAN [Owner]

Cellular Network [Manufacturer]

CSE

Telematics

Infotainment

Geo-data

Infotainment

Cellular Network [Owner]

AE Manuf.

AE Owner

AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

- GPS
- Local Connectivity
- V2I Gateway
- CSE
- Home WLAN [Owner]
- Cellular Network [Manufacturer]
- Cellular Network [Owner]
- Infotainment
- Telematics
- Geo-data

- AE
- Engine etc.
- AE
- CAN ...
- AE
- Infotainment

- AE Manuf.
- AE Owner
- AE Insurance
Efficient Data Sharing

On the road: Cellular Coverage

GPS

AE

Engine etc.

AE

CAN ...

Infotainment

AE

Local Connectivity

V2I Gateway

CSE

Home WLAN [Owner]

Cellular Network [Manufacturer]

Infotainment

Geo-data

Cellular Network [Owner]

CSE

Telematics

AE Manuf.

AE Owner

AE Insurance
Releases of oneM2M

Status Quo and Next Steps
Key Features Rel-1 & 2

Simple NW Usage, Enhanced Data Efficiency, NW Protection
- Hides complexity of network technology from applications
- Transport of M2M/IoE traffic gets very simple and more efficient at the same time
- SL is in charge to enforce policies when which modem is used... not the applications
- Capable to use MTC/M2M features of 3GPP (so far triggering, more for Rel-3)

Reliable and Scalable Security
- Hooks up entities using proven authentication/authorization/encryption

Discovery & Data sharing based on Access Control
- Share data amongst one or more stakeholders / applications
- Possibly across different industry segments

Device Management
- Enable efficient management of large number of devices / nodes
Key Features Rel-1 & 2 (contd.)

Selection of protocols: Pick what suits deployment scenario best
- HTTP, CoAP, MQTT, Websockets
- Serializations of data: XML, JSON, CBOR

“Interworking Glue”
- Proximal IoT: OCF/AllJoyn, LwM2M
- Home Domain:
  Information models to bridge different eco systems
  Abstracting out specifics of Proximal IoT technology
  Alignment with OCF progressing
- Industrial Domain:
  Some features in Rel-2 (time series)
  More to come in Rel-3 (OPC UA, DDS, Modbus)
Outlook Rel-3: 3GPP Interworking / better integration

Use MTC features of 3GPP Communication Network:
- Control features based on available meta information
- E.g. Power Saving Mode, Traffic Patterns
- Dynamically switch modes of operation / parameters

Provide information to oneM2M SL:
- Meta information for better scheduling
- Schedules of allowed network usage
- Information on location, loss of connectivity etc.

Related interfaces of 3GPP being integrated with oneM2M provides simplicity, efficiency & scalability enhancements
Outlook Rel-3: Proximal IoT Interworking

Other Technologies connected via oneM2M Entities & Resources

Gateway (oneM2M MN)

- OPC-UA or DDS or Modbus App
- oneM2M AE
- oneM2M CSE

Gateway (oneM2M MN)

- OCF / KNX / Zigbee / XYZ App
- oneM2M AE
- oneM2M CSE

oneM2M Network

- oneM2M IN-CSE
- oneM2M AE
- oneM2M AE
- oneM2M AE
Release 3 Highlights

3GPP Interworking

- Tight integration with 3GPP features for MTC / NB-IoT (long sleep cycles etc.)
- Usage of functions exposed by 3GPP via SCEF (Developer does not need to know)
- Goal: Increase efficiency, lower power consumption, protect network, control traffic

Proximal IoT Interworking

- Generic scheme for “bridging” between oneM2M and other technologies
- Improvement of existing OCF/AllJoyn/LwM2M interworking, addition of OSGi / W3C
- Seamless functionality across border of Proximal IoT (Abstraction)

Industrial Interworking

- New “bridging” specifications for Modbus/DDS/OPC-UA
- Relationship with IIC
Implementations / Deployments

Industry-driven Open source implementations

Announcements, Demos, Commercial implementations

5 interoperability events held so far, 2 expected in 2018
Vision: oneM2M acting as interworking “glue”

Open Standards in IIoT ↔
Interoperability, Efficiency & Scalability
Links & Contact

Website  http://www.oneM2M.org
Webinars  http://www.onem2m.org/insights/webinars
Published Specifications  http://www.onem2m.org/technical/published-documents
Latest Drafts  http://www.onem2m.org/technical/latest-drafts
Events  http://www.onem2m.org/news-events/events

Contacts:
Secretariat  oneM2M_Secretariat@list.oneM2M.org
Liaison matters  oneM2M_liaison@list.oneM2M.org
Thank You!

Dr. Josef J. Blanz (jblanz@qti.qualcomm.com)
Qualcomm Technologies Inc.
Principal Engineer
M2M & IoT Standards & Industry Fora
Chairman oneM2M Industry Liaison Committee
Vice-Chairman oneM2M Technical Plenary
Interworking

- Service Layer
- HAV Apps
- Home Apps: Standard X
- Asset Apps
- eHealth Apps: Standard Y
- Communication Network(s)

Simple APIs via Standardized Reference Points & Interworking

Data Processing Resources & Protocols (selection) & Communication HW
Impact:
Efficiency / Aggregation ↑
NW Protection ↑
Cost ↓
Fragmentation ↓
New Opportunities ↑
CAPEX Impact

Application Development

- Simple APIs
- General Purpose Volume ↑
- Unified Platform
- e.g. Modules or Gateways
- Server

Developer:
- CSE functions ready to use
- No module/network expert needed
- App development independent of underlying transport
- Standard message exchanges
- Focus on use case logic
- Faster development process

Service Deployment

- Only one platform
- Serves commonly needed functions to different use cases and applications
- Shared infrastructure & core service across different customers / verticals

M2M/IoT Service Provider

Lower CAPEX
OPEX Impact

NW Efficiency & Protection

Communication Cost ↓

Sensor/Actor/Data Sharing

Sensor or Data Source -> Storage -> Consumer

Windows Sensors:
- Security Service
- HAV-System
- Home GUI

Door Locks:
- Security Service
- Control Panel
- Home GUI

Certification: Flexible Choices

AE

CSE

Access 1

Access 1&2

Single Platform

• Minimize maintenance expenses
• Shared infrastructure
• Scalable to volume/processing needed

Lower OPEX
Efficient Data Sharing

At Home: In Owner’s WLAN Coverage

- **GPS**
- **Engine etc.**
- **CAN ...**
- **Infotainment**

**AE**

**CSE**

**V2I Gateway**

**Home WLAN [Owner]**

**Cellular Network [Manufacturer]**

**Cellular Network [Owner]**

**Infrastructure**

- **CSE**
  - **Telematics**
  - **Infotainment**
  - **Geo-data**

**AE Manuf.**

**AE Owner**

**AE Insurance**
Efficient Data Sharing

At Home: In Owner’s WLAN Coverage

GPS
AE
Engine etc.
AE
CAN ...
Infotainment
AE

Local Connectivity
V2I Gateway

CSE
Home WLAN [Owner]

Cellular Network [Manufacturer]
Cellular Network [Owner]

Infrastructure

CSE
Telematics
Infotainment
Geo-data

AE Manuf.
AE Owner
AE Insurance
Efficient Data Sharing

At Home: In Owner’s WLAN Coverage

GPS

AE

Local Connectivity

V2I Gateway

CSE

Home WLAN [Owner]

Cellular Network [Manufacturer]

Cellular Network [Owner]

CSE

Telematics

Infotainment

Geo-data

Infrastructure

AE Manuf.

AE Owner

AE Insurance

Engine etc.

Infotainment

AE

CAN ...

AE
Efficient Data Sharing

At Home: In Owner’s WLAN Coverage

- GPS
- Local Connectivity
- V2I Gateway
- CSE
- Infotainment
- Geo-data
- Telematics
- Cellular Network [Manufacturer]
- Cellular Network [Owner]
- Home WLAN [Owner]
- AE Manuf.
- AE Owner
- AE Insurance

AE

Engine etc.

CAN ...

Infotainment

AE

AE

CSE

Infrastructure
Efficient Data Sharing

At Home: In Owner’s WLAN Coverage

- GPS
- Local Connectivity
- V2I Gateway
- Home WLAN [Owner]
- Cellular Network [Manufacturer]
- Cellular Network [Owner]
- CSE
- Telematics
- Infotainment
- Geo-data

- AE
- Engine etc.
- CAN ...
- Infotainment
- AE
- AE Manuf.
- AE Owner
- AE Insurance