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Outline

• IoT standardization landscape
• The IoT standardization dilemma
• Introduction to oneM2M
• Take-away
IoT standards are no doubt the key enablers for IoT industries.

But the growth looks a bit “wild” (and still extending)
The IoT standardization challenge

Different standards may focus differently (vertical/horizontal), but
Sometimes overlap (for good or bad reasons), and
Don’t forget the open source developments...

Source: AIOTI WG03, 2015
Standards Dilemma

Everyone knows the problem, and has the same goal – “global and converged IoT standards”, but the dilemma still exists.

Reasons behind the gap:
- technical differences: comm. ranges, QoS levels, protocol layers, tools vs systems...
- regional interests/policies: local vs international
- business drives: ecosystem dominance
IoT Standards Interworking & Collaboration

• Where are the solutions?
  – (Operational) Collaboration → to let different organizations to exchange, coordinate and cooperate
    • Information Sharing (Liaison, workshop, ...)
    • Endorsement (adopt standards from other organizations)
    • Partnership (joint development based on common agreement)
    • Merging (transfer/integrate the work into one organization)
  – (Technical) Interworking (in a broad sense) → to make different standards working smoothly together
    • Horizontal (complementary, peering)
    • Vertical (bindings, integration, API invoking)
oneM2M Partnership Project

Over 200 member organizations in oneM2M

8 Type-1 Partners

7 Type-2 Partners

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oneM2M enabled IoT Domains

- Energy
- Enterprise
- Healthcare
- Public Services
- Residential
- Other
- Transportation
- Industry

Requirements
TS-0002

Technical Reports
Technical Specs

All documents are publicly available

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oneM2M Positioning

Focuses on the common service layer, while leaves the dev/nwk/app specifics to others

Pipe (vertical):
1 Application, 1 NW, 1 (or few) type of Device
Point to point communications

Common Service Layer (Horizontal)
Applications share common service and network infrastructure
Multipoint communications

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oneM2M Common Service Layer in a nutshell

• It is a software layer
• It sits between M2M applications and communication HW/SW that provides data transport
• It normally rides on top of IP
• It provides functions that M2M applications across different industry segments commonly need. Those functions are exposed to Applications via developer friendly APIs.
• It allows for distributed intelligence (device, gateway, cloud apps)
oneM2M Common Service Functions

Registration
Discovery
Security
Group Management

Data Management & Repository
Subscription & Notification
Device Management
Application & Service Management

Communication Management
Network Service Exposure
Location
Service Charging & Accounting
oneM2M Architecture

**Reference Point**
One or more interfaces - Mca, Mcn, Mcc and Mcc’ (between 2 service providers)

**Common Services Entity**
Provides the set of "service functions" that are common to the M2M environments

**Application Entity**
Provides application logic for the end-to-end M2M solutions

**Network Services Entity**
Provides services to the CSEs besides the pure data transport

**Node**
Logical equivalent of a physical (or possibly virtualized, especially on the server side) device

RESTful APIs over Mca/Mcc/Mcc’, Invoke underlying network capabilities over Mcn

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oneM2M Protocol Bindings

Reuse IP-based existing protocols

XML or JSON Content serialization - HTTP Example

REQUEST
GET   /~/CSE-178/CSEBase/home/temperature HTTP/1.1
Host: provider.net
X-M2M-Origin: /CSE-123/WeatherApp42
X-M2M-RI: 56398096
Accept: application/json

RESPONSE
HTTP/1.1 200 OK
X-M2M-RI: 56398096
X-M2M-RSC: 2000
Content-Type: application/vnd.onem2m-res+json
Content-Length: 101
{“m2m:cin”:[
  "cnf":"application/json:0",
  "con":{"timestamp":1413405177000,'value':25.32}]}

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External Collaboration

✓ Information Sharing (Liaison, workshop, ...)
  - SG20
  - JTC1 WG10
  - P2413
  - Semantics, WoT
  - Connected Living
  - Certification
  - Interworking
  - OIC Interworking
  - AllJoyn Interworking
  - Network Capability Exposure
  - SCP, SmartM2M

✓ Endorsement (adoption)
  - OASIS
  - IETF
  - DDS
  - broadband forum
  - OMA DM/ LWM2M
  - MQTT
  - HTTP/ CoAP/
    (D)TLS/ WebSocket
  - TR-069/ TR-181

✓ Partnership
  - ATIS
  - TIA
  - ETSI
  - TSDSI
  - CCSA
  - TTA
  - ARIB
  - TIC

✓ Merging/Integration
  - HGi
Interworking (in a broad sense)

Infrastructure Domain (Cloud)

Field Domain (Edge)

Area Network Interworking

Gateway (MN)

Platform (IN)

Underlying Networks

App

.........

App

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Strong implementation base

Industry-driven Open source implementations

goiot-forum.org

Examples of Commercial implementations /demos

Two interop test events (Sept 14-16 2015, May 10-13 2016)

With ~30 participating organizations

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oneM2M release 2 features

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

Semantic interoperability
- base ontology
- semantic discovery
- semantic descriptions

Advanced protocol binding
- WebSocket

Security
- Enhancement for authorization
- privacy support
- e2e security

Home domain enablement
- Home appliance information models

oneM2M Application Identification Registry established

oneM2M interworking framework
- Generic interworking
- AllJoyn/AllSeen and/or
- OIC and/or
- OMA LightWeight M2M (OMA LWM2M) and/or
- 3GPP Rel.13 Interworking

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oneM2M Release 3 is coming...

- Proposals under discussion
  - market adoption: interop & certification, device profiling, simplification & optimization, ...
  - more interworking with verticals and networks
  - more advanced features: semantics, analytics, ...

Proposal for R3: three main tracks by order of priority

<table>
<thead>
<tr>
<th>Market adoption track – High priority</th>
<th>Industrial IoT track – second priority</th>
<th>Future looking track – third priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Specification simplification</td>
<td>• A new development area</td>
<td>• Forward looking topics</td>
</tr>
<tr>
<td>• Developer view</td>
<td>• As much as possible should not disrupt the Market adoption track (start with TRs first)</td>
<td>• Generate TRs for next steps</td>
</tr>
<tr>
<td>• Interop and certification</td>
<td>• Need to attract more experts and reassess our collaboration strategy</td>
<td></td>
</tr>
<tr>
<td>• Robustness and optimization</td>
<td>• DDS, time sensitive use cases, semantics evolution</td>
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List of potential topics for Release 3

1. QoS support for IoT/M2M
2. Semantics enhancement
3. Enablement of sequential executions
4. Analytics enablement
5. Zero configuration
6. Cognitive IoT
Take-away

• IoT standards are already very prosperous.
• Standard interworking & collaboration is the key to build a harmonized IoT Ecosystem at the global scale.
• oneM2M is following this approach all the way, and open to collaborate with worldwide IoT organizations and industries.
Thank you!