



物联网标准互通与合作 IOT STANDARDS INTERWORKING & COLLABORATION

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oneM2M www.oneM2M.org



Outline

- IoT standardization landscape
- The IoT standardization dilemma
- Introduction to oneM2M
- Take-away

The IoT standardization challenge



The IoT standard Landscape



- 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



The IoT standard Landscape (Vertical & Horizontal)

Manufacturing/ Vehicular/ Farming/ Home/Building Cities Wearables **Industry Automation Transportation** Healthcare Energy Agrifood OASISN CENELEC Bluetooth* **WULE** <u>IEC</u> **ITU** ALLSEEN ISO ISO IEC CAR 2 CAR ITU CENELEC **IEEE UPnP** PI I **ZigB**ee[®] Alliance IŜO cen cen ZigBee[®] Alliance CENELEC ISO JTC 1 IEC Continua CENELEC INDUSTRIE 4.0 Integrating the Healthcare Enterprise Ø ERTICO ISO CLPA CENELEC **IEEE** 峰 eCl@ss° CiA ISO ISO JTC 1 IEC SGIP <u>IEC</u> **SPDICOM ∲IEEE ⊘ IO**-Link ISA Open Automotive Alliance industrial internet industrial internet CONSORTIUM industrial internet industrial internet CONSORTIUM INTERCONNECT **TOIA** TOIA **AIOTI** TOIA **ITOIA** ITOIA 📆 **ITOIA**



Source: AIOTI WG03, 2015 Horizontal/Telecommunication

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

Standards Dilemma



HOW STANDARDS PROLIFERATE: (SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC.)

SITUATION: THERE ARE 14 COMPETING STANDARDS.







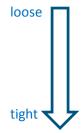
Source: xkcd.com

- 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



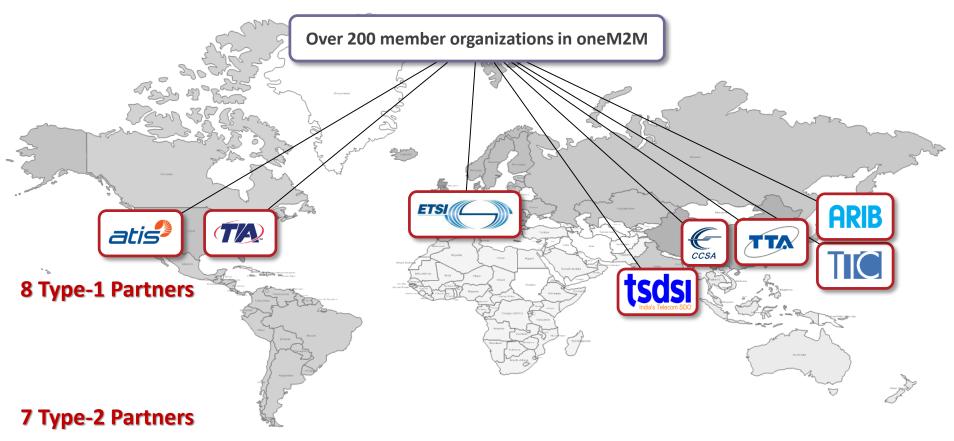
- Where are the solutions?
 - (Operational) Collaboration → to let different organizations to exchange, coordinate and cooperate



- 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 WM

















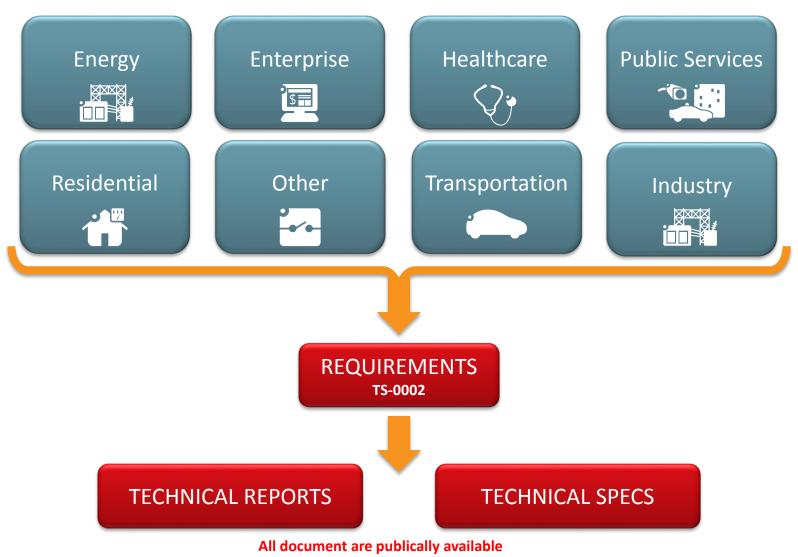


www.oneM2M.org

All document are publically available

oneM2M enabled IoT Domains one

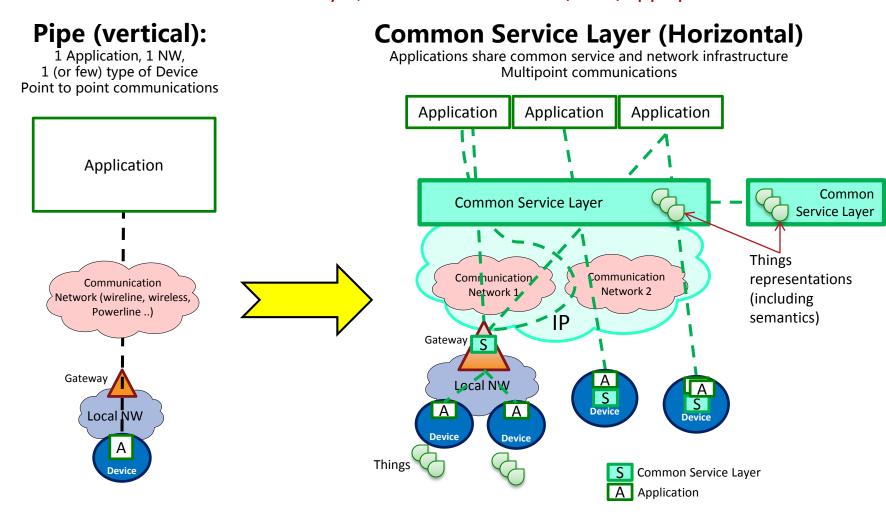






oneM2M Positioning

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



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



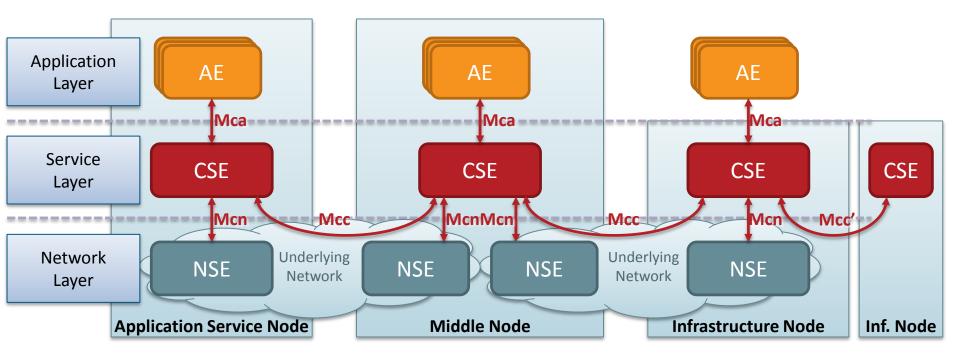
Reference Point One or more interfaces - Mca, Mcn, Mcc and Mcc' (between 2 service providers)

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

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

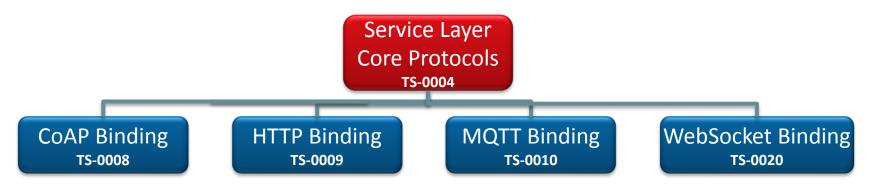


RESTful APIs over Mca/Mcc/Mcc', Invoke underlying network capabilities over Mcn

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}"]

External Collaboration



Information Sharing (Liaison, workshop, ...)













SG20

JTC1 WG10

P2413

Semantics, WoT Connected Living Certification











Interworking

OIC Interworking

AllJoyn Interworking Network Capability SCP, SmartM2M **Exposure**

Endorsement (adoption)



MQTT









TR-069/ TR-181

OMA DM/ LWM2M

Partnership





























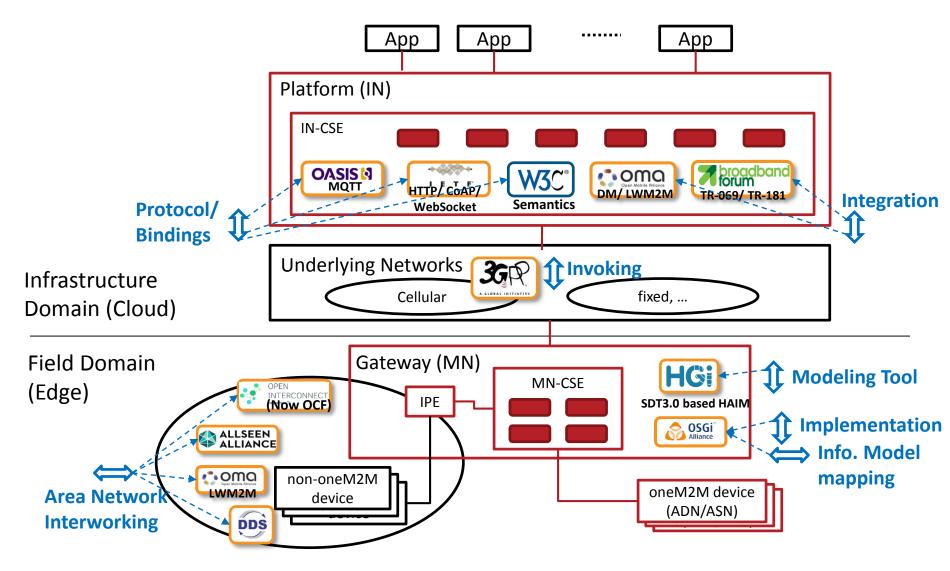


Merging/Integration



Interworking (in a broad sense)





Strong implementation base



Industry-driven Open source implementations

goiot-forum.org













Examples of Commercial implementations /demos



HUAWEI













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

With ~30 participating organizations

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

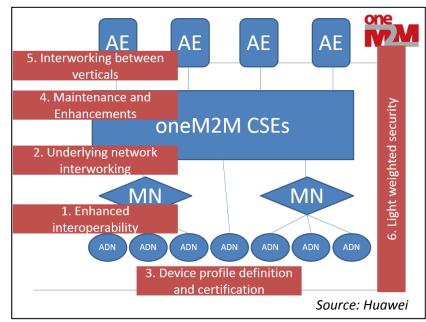


oneM2M Release 3 is coming...

Proposals under discussion

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

<u>Proposal</u> for R3: <u>three</u> main <u>tracks</u> by order of priority Specification simplification Developer view **Market** Interop and certfication adoption track -· Robustness and optimization High priority A new development area Industrial IoT • As much as possible should not disrupt the Market adoption track (start track - second with TRs first) • Need to attrack more experts and reassess our collaboration strategy priority · DDS, time sensitive use cases, semantics evolution Forward looking topics **Future looking** · Generate TRs for next steps track - third priority Source: Nokia/TP Chair



List of potential topics for Release 3



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



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!