



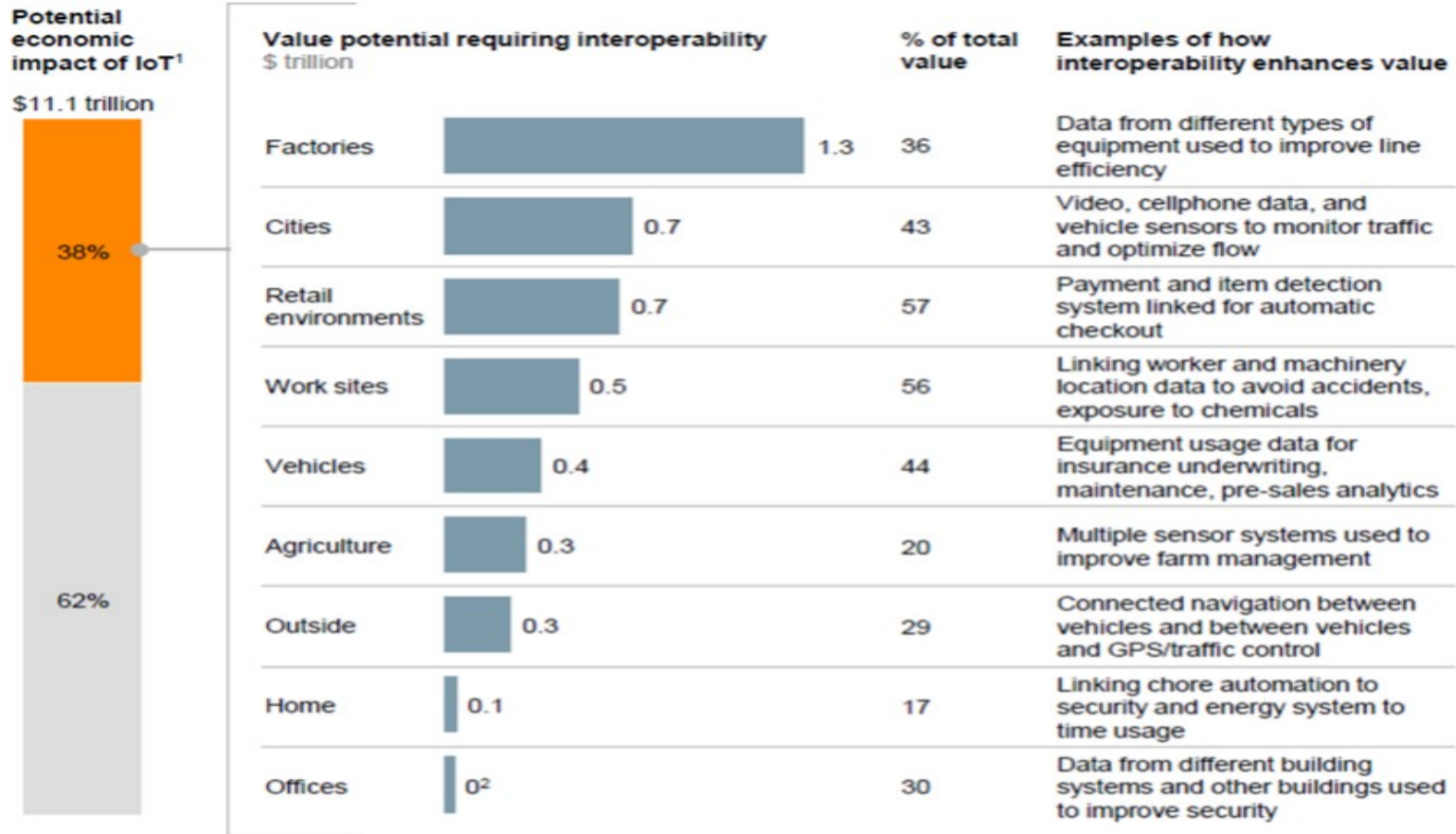
ONEM2M – OPEN STANDARD ENABLES INTEROPERABILITY FOR IOT

**Presenter: Yongjing Zhang, oneM2M MAS WG Chair, Huawei
Technologies Co., Ltd., zhangyongjing@huawei.com**

oneM2M www.oneM2M.org

Nearly 40% of economic impact requires interoperability between IoT systems

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1 Includes sized applications only; includes consumer surplus.

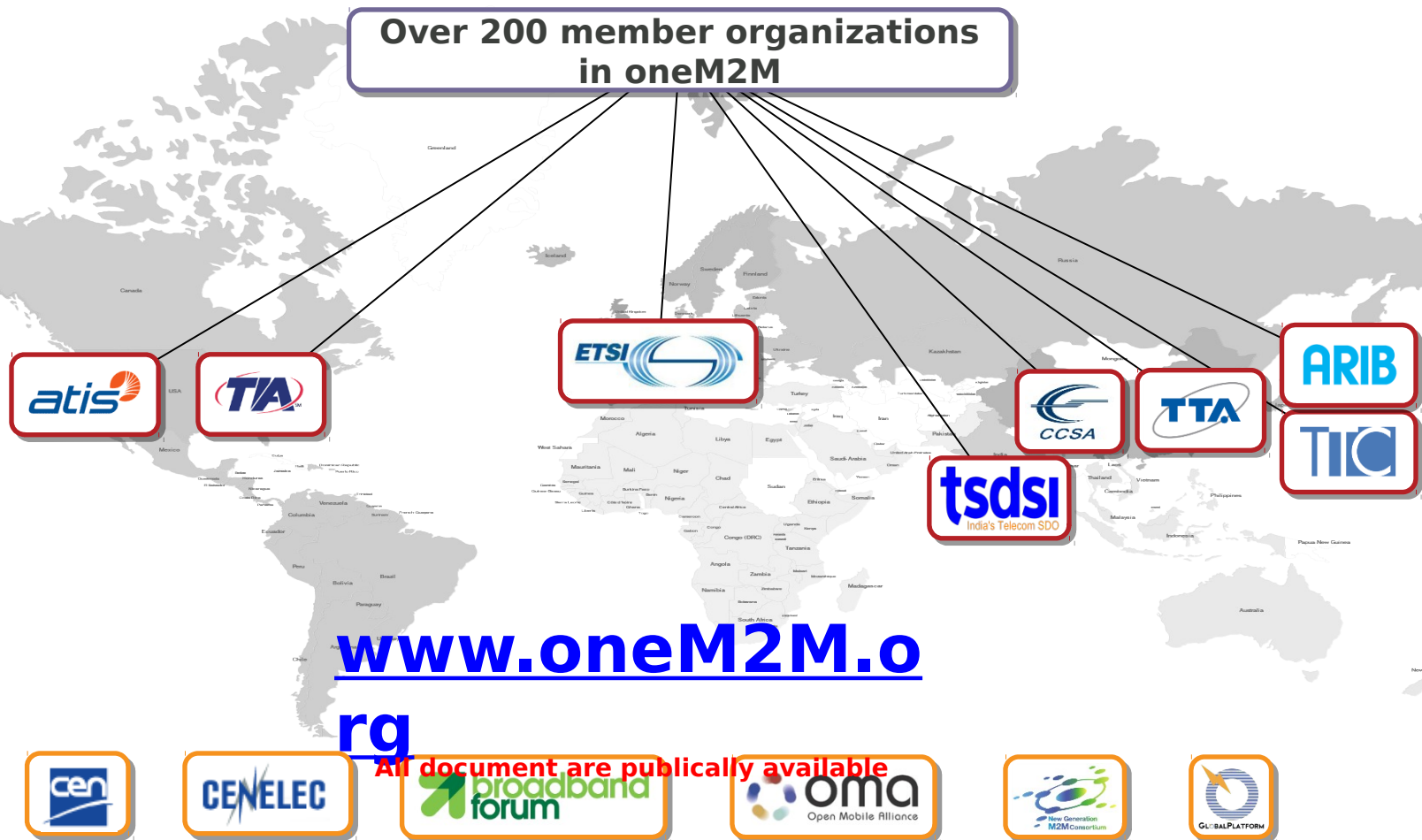
2 Less than \$100 billion.

NOTE: Numbers may not sum due to rounding.

SOURCE: Expert interviews; McKinsey Global Institute analysis

Source: McKinsey

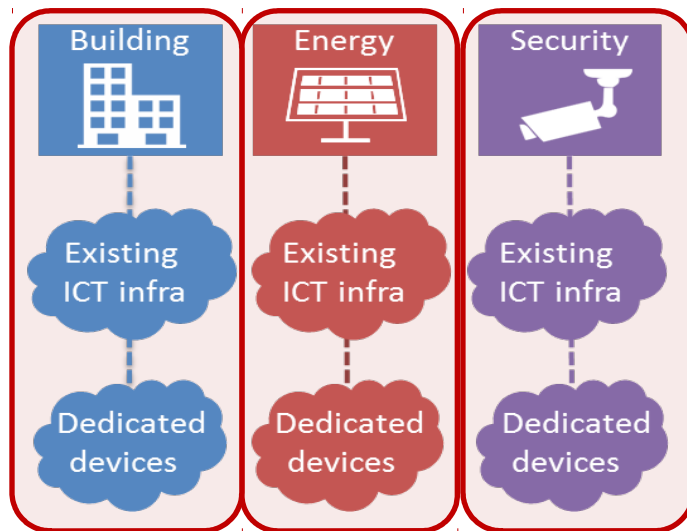
oneM2M Partnership Project



A **global open standard** ensures the interoperability for a large scale ecosystem

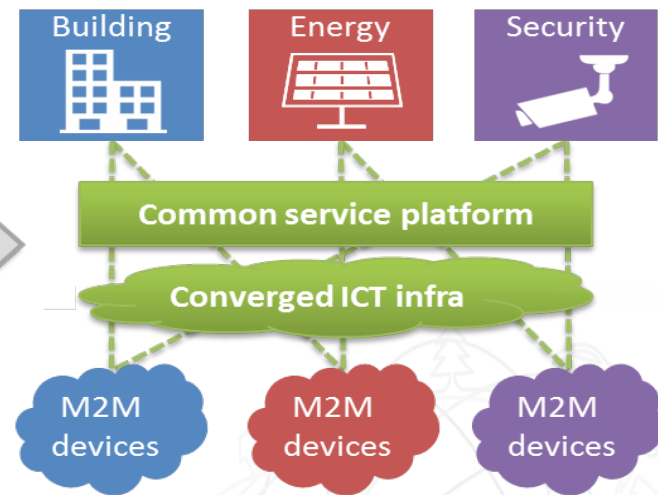
Goal: IoT Cross-Domain Interoperability

- **Standardized Horizontal Service Platform** is key enabler for Operators
- It would stimulate large scale **multi-vendor ecosystem** with transparent product features and benchmarks, encourages industry investment, and promotes new business models.



Without oneM2M

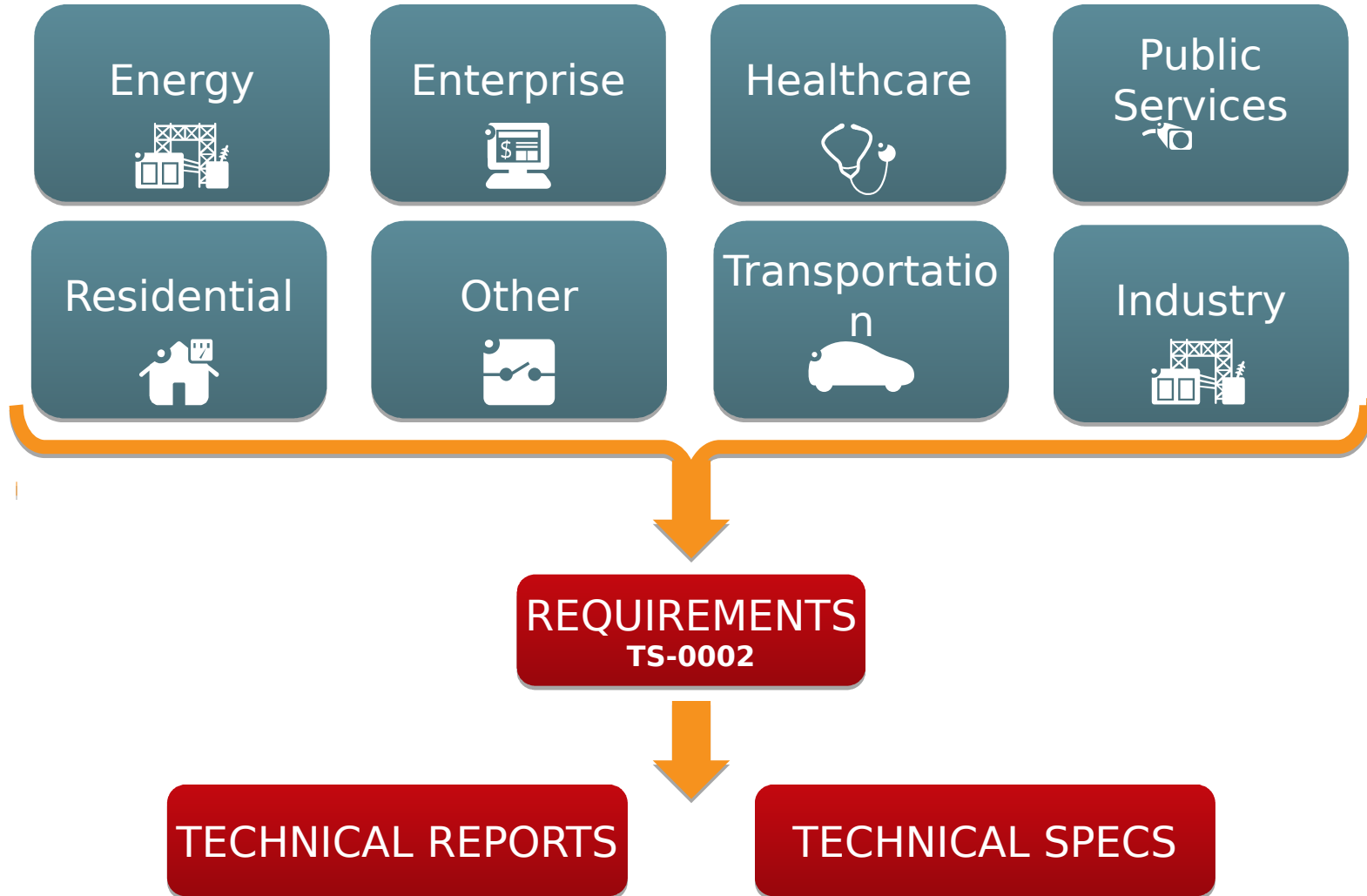
- Highly **fragmented** market with limited **vendor-specific** applications
- **Reinventing the wheel**: Same services developed again and again
- Each **silos** contains its own technologies **without interoperability**



With oneM2M

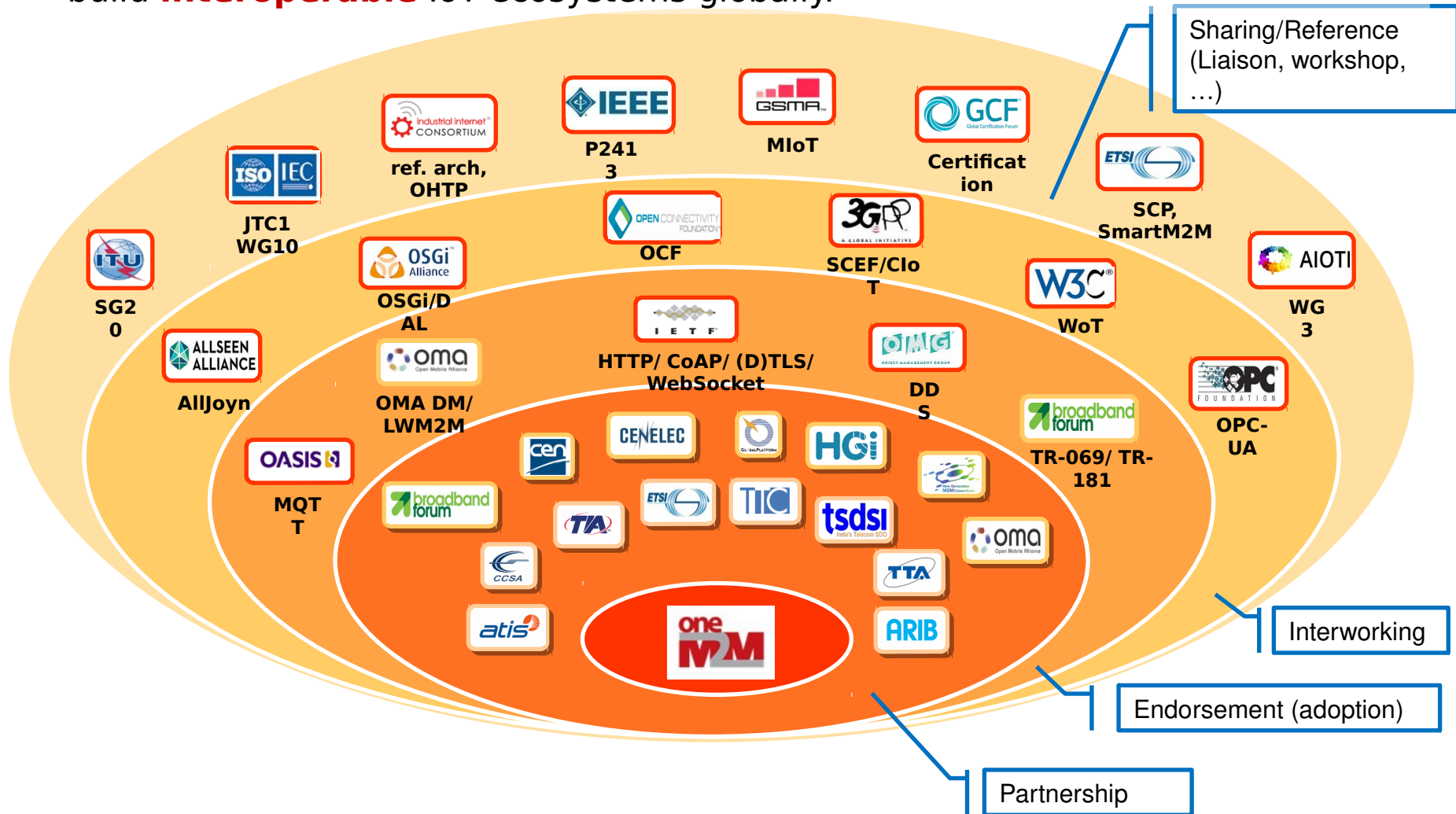
- **End-to-end** platform: common service capabilities layer
- **Interoperability** at the level of communications and data
- **Seamless** interaction between **heterogeneous** applications and devices

Work Process



Ongoing Collaborations

- Collaboration is important to reach common understanding, avoid overlap and build **interoperable** IoT ecosystems globally.



Strong Implementation Base

Industry-driven Open source implementations



Examples of Commercial implementations



Certification

- oneM2M Certification Program was officially launched at Feb. 9, 2017.
- TTA (Korea) is authorized as the first regional oneM2M CB (Certification Body).
- A Global CB (e.g. GCF) to be setup in 2018.
- See oneM2M certified products

www.oneM2Mcert.com



one Certification for oneM2M Standard

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Facilities
Certified Products
Downloads
Reference



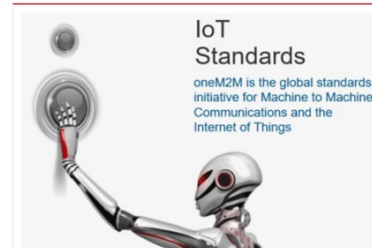
oneM2M Certification logo is intended to represent to consumers that oneM2M products and services meet oneM2M standard testing requirements that ensure interoperability. When your product is oneM2M Certified, it becomes a part of integral ecosystem of oneM2M enabled products, services and applications in the market.

START CERTIFICATION



CERTIFICATION GUIDE

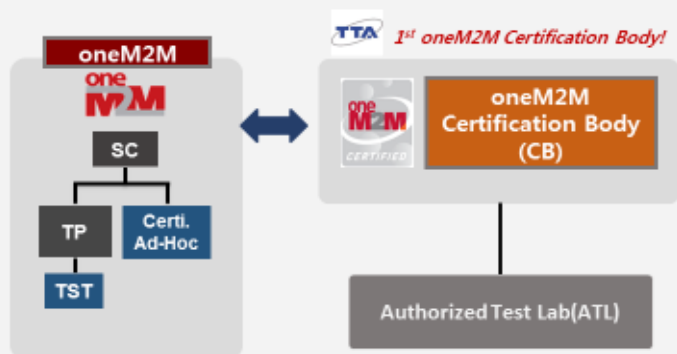
The purpose of the certification program is to certify that products conform to and are in compliance with the requirements of the oneM2M standards.



oneM2M Standards

Standards for M2M and the Internet of Things

oneM2M - oneM2M CB



47 Bundang-ro, Bundang-gu, Seongnam-City, Gyeonggi-do, Korea (267-2 Seohyeon-dong)

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RESTful Architecture

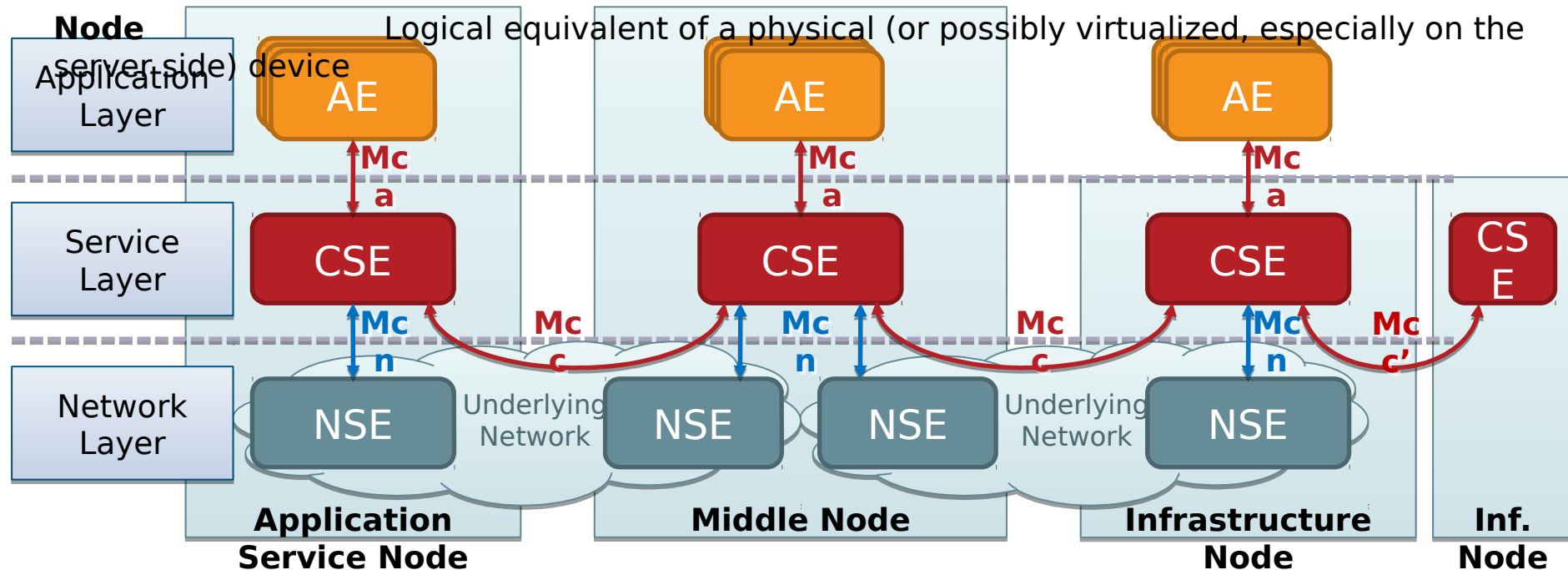
Reference Point One or more interfaces - Mca, Mcn, Mcc and Mcc' (between 2 service providers)

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



Multiple protocol bindings (HTTP, CoAP, MQTT, or WebSocket) over Mca, Mcc, Mcc'

Common Service Functions



Summary of Release 2/3 Features



Industrial Domain Enablement

- Time series data management
- Atomic Transactions
- Action Triggering
- Optimized Group Operations
- M2M Application & Field Domain

Component Configuration

Semantics

- Semantic Description/Annotation
- Semantic Querying
- Semantic Mashups
- oneM2M Base Ontology

Security

- Dynamic Authorization
- End to End Security
- Enrollment & Authentication APIs
- Distributed Authorization
- Decentralized Authentication
- Interoperable Privacy Profiles

Home Domain Enablement

- Home Appliance Information Models & SDT
- Mapping to existing standards (OCF, ECHONET, GoTAPI...)

Smart City & Automotive Enablement

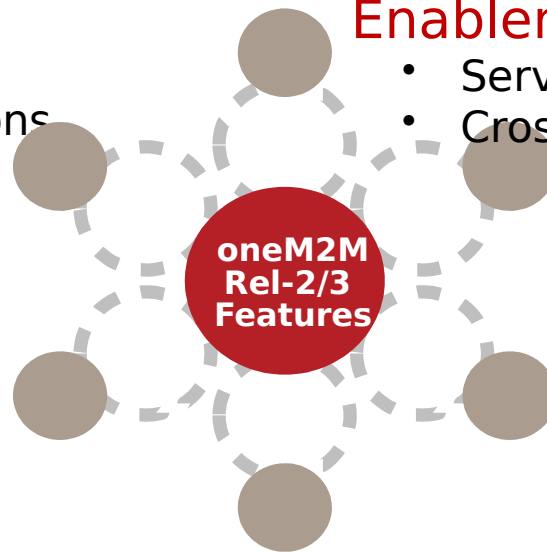
- Service Continuity
- Cross resource subscriptions

Market Adoption

- Developer Guides
- oneM2M Conformance Test
- Feature Catalogues
- Product Profiles

oneM2M as generic interworking framework

- 3GPP SCEF
- OMA LWM2M
- DDS
- OPC-UA
- Modbus
- AllJoyn/OCF
- OSGi



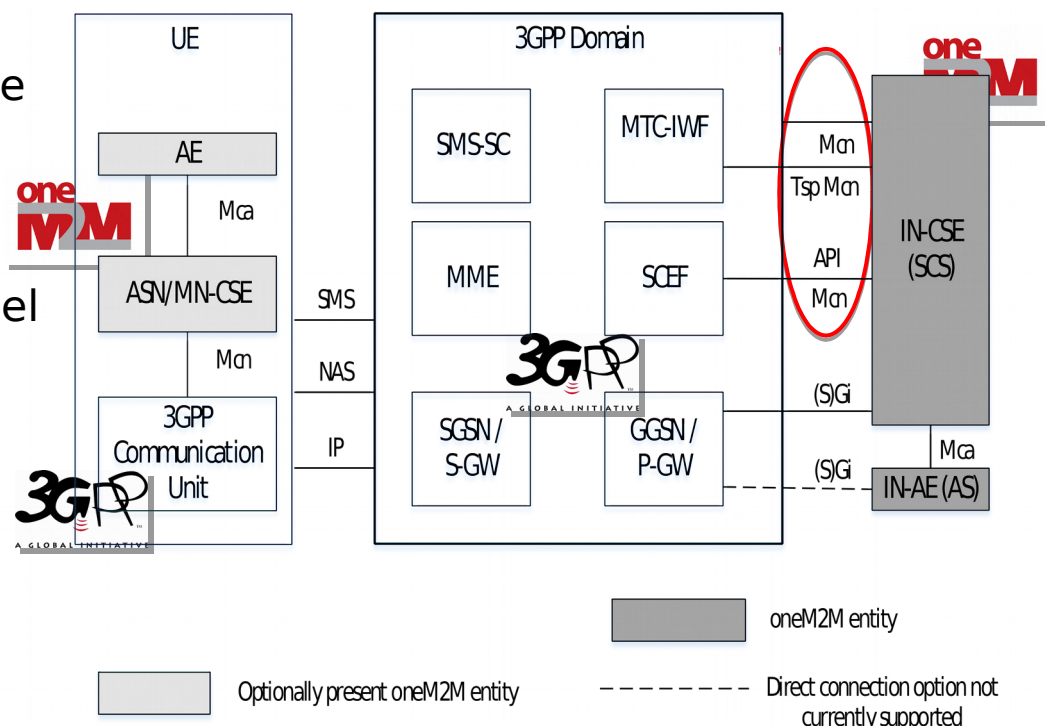
Interworking: Take advantages of operators' network capabilities to the maximum

- **Integrating with the 3GPP Cellular IoT (NB-IoT/eMTC) architecture** to monetize the network capabilities at the service layer.

- **Hide the network layer complexity** from the IoT

Supported 3GPP/CIoT capabilities:

- › Device Triggering (Tsp)
- › Traffic/Communication Pattern
- › NB-IoT/CIoT support
 - › UE reachability
 - › Location
 - › PM/eDRX timer
 - › Non-IP Data Delivery
 - › Group message delivery
- › High Latency Communications
- › Background Data Transfer



source: oneM2M TS-0026

oneM2M Proximal Interworking: Flexible framework of interworking from transparent, translucent to

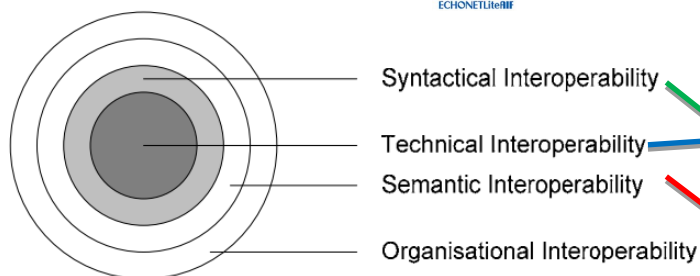
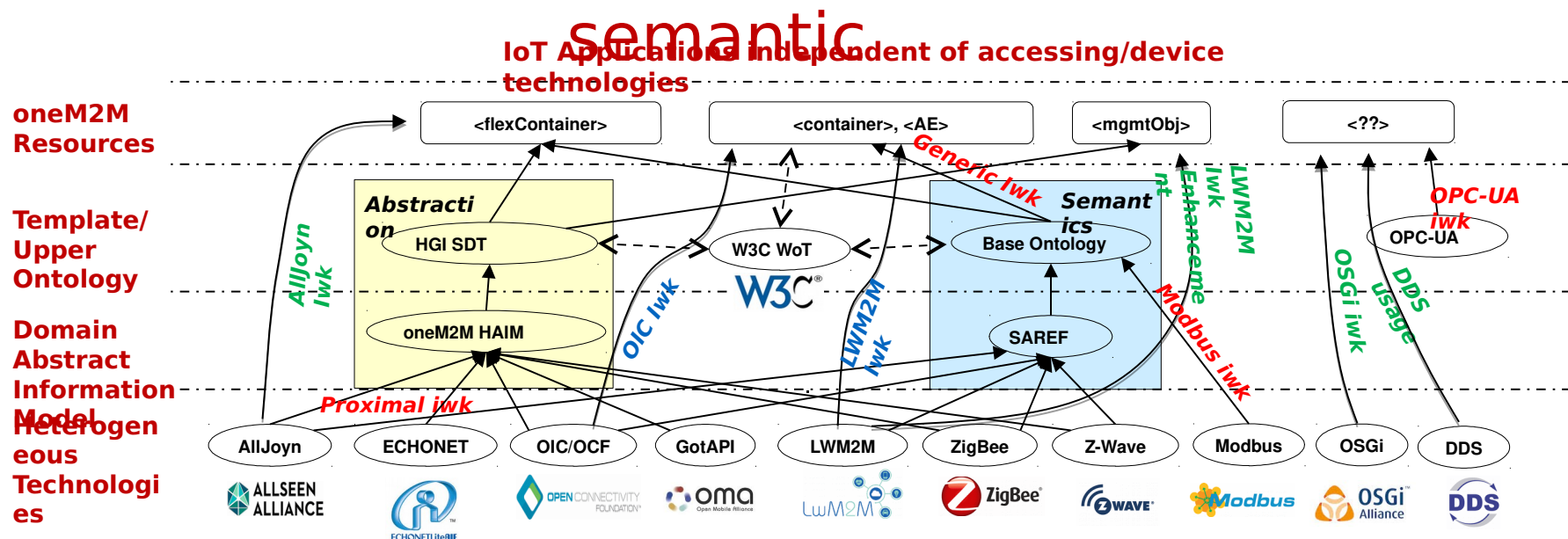


Figure 1: Different levels of interoperability

Source: ETSI IOP Whitepaper 3rd Edition, 2008

To make different technologies working smoothly together and build a converged ecosystem

- **Transparent Interworking:** encapsulate the data model of one technology into another (as a pipe)
- **Translucent Interworking:** data model structures are mapped, while semantics/data types are not
- **Semantic Interworking:** mapping not only protocols, but also full data models and semantics

Device Management - Built on top of proven technologies



Designing Philosophy:

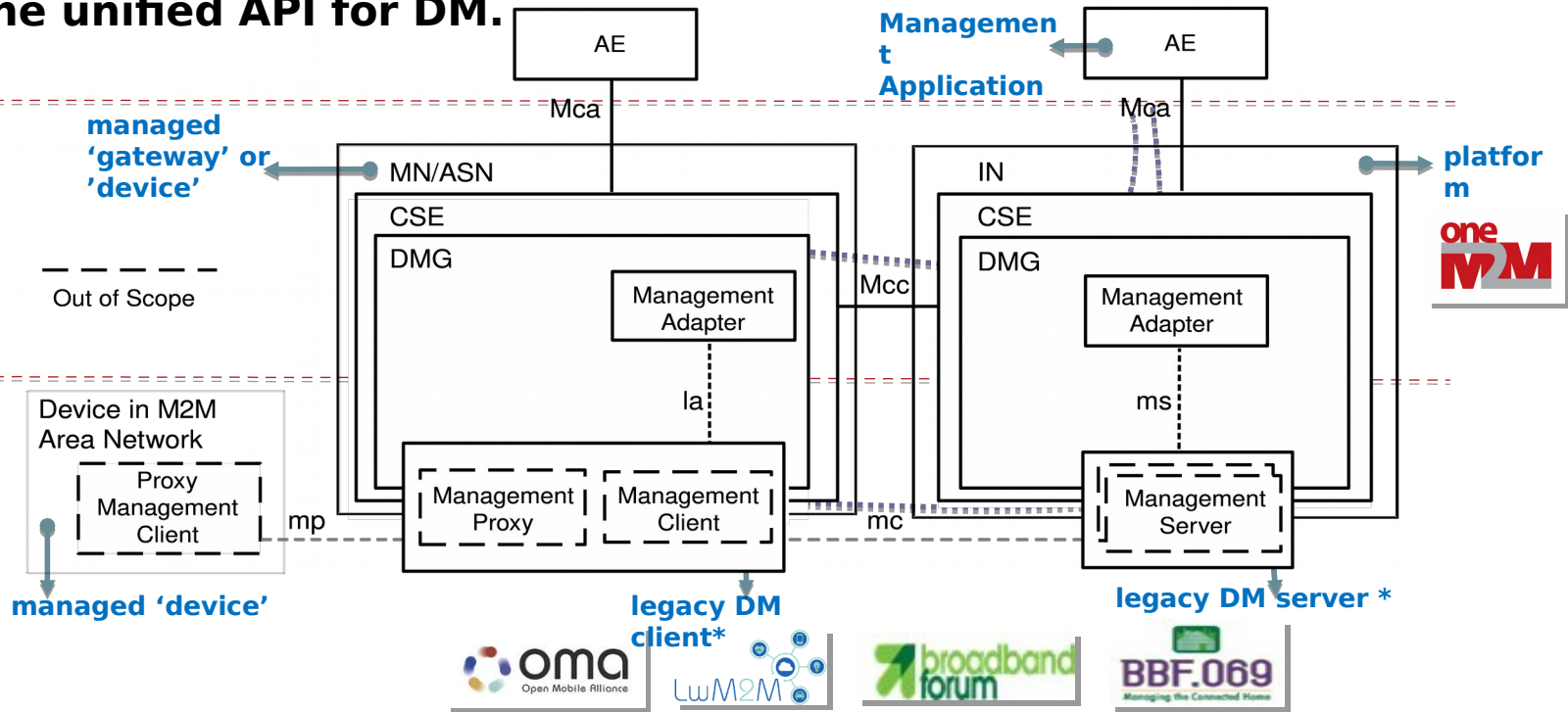
1. re-use existing technologies: OMA DM 1.X/2.0, LwM2M, BBF TR069/TR-181

2. hide the heterogeneity: oneM2M <mgmtObj> resources as the unified API for DM.

Unified API

Common Service Layer

Tech. specific



oneM2M Semantic Capabilities

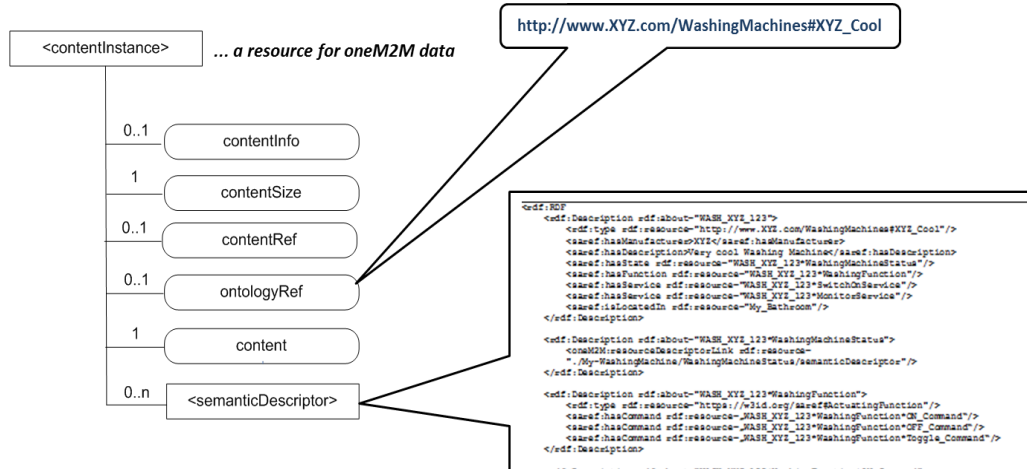
– enrich the data intelligence



• Semantic Annotation

– Annotate oneM2M data with

- ✓ A reference an ontology (= formal description of semantic information) that explains the meaning of the data

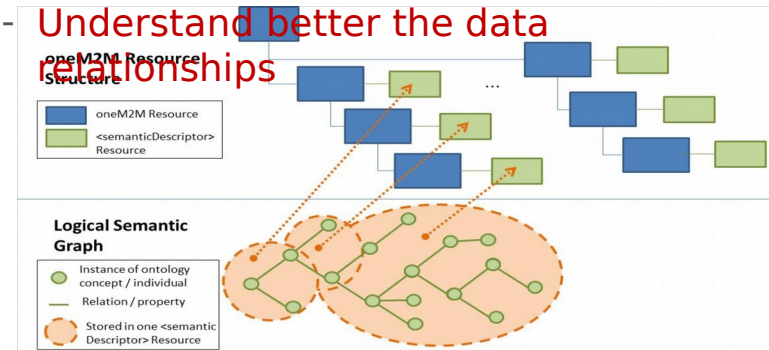


- ✓ A description of the data itself and its relation to other data

... annotations can be done for several oneM2M resource types

• Semantic Discovery/Query

- Find the data more accurately and completely
- Understand better the data relationships



Example: Discover all resources representing devices that measure

```

SELECT ?device
WHERE {
  ?device rdf:type base:Device .
  ?device base:hasService ?service .
  ?service base:hasFunctionality ?functionality .
  ?functionality rdf:type base:Measuring .
  ?functionality base:refersTo ?aspect .
  ?aspect rdf:type instance:Temperature }
  
```

HTTP GET /CSE1234/RCSE78?smf={SPARQL query}

› More to come: semantic validation, reasoning, mashup, rules, automation ...

A perfect fit for Smart City IoT Platform

Horizontal platform for new deployments

- Smart city is an **incremental and participatory** journey
- New deployments should, where possible, **leverage a converged networks and an horizontal service platform**
- **Open standards** are key to avoid lock-in and master the total cost of ownership

Existing deployments

- **Do not disrupt** existing “vertical deployment” but seek opportunities for an integration path with an horizontal approach
- **Build value** through smash-ups and open data

Participatory and innovative approach

- Surveys
- Address **needs for innovation** through app development:
 - **APIs**
 - **Access to, eventually semantically enriched, Open data** (where feasible and subject to privacy legislation/citizen consent)

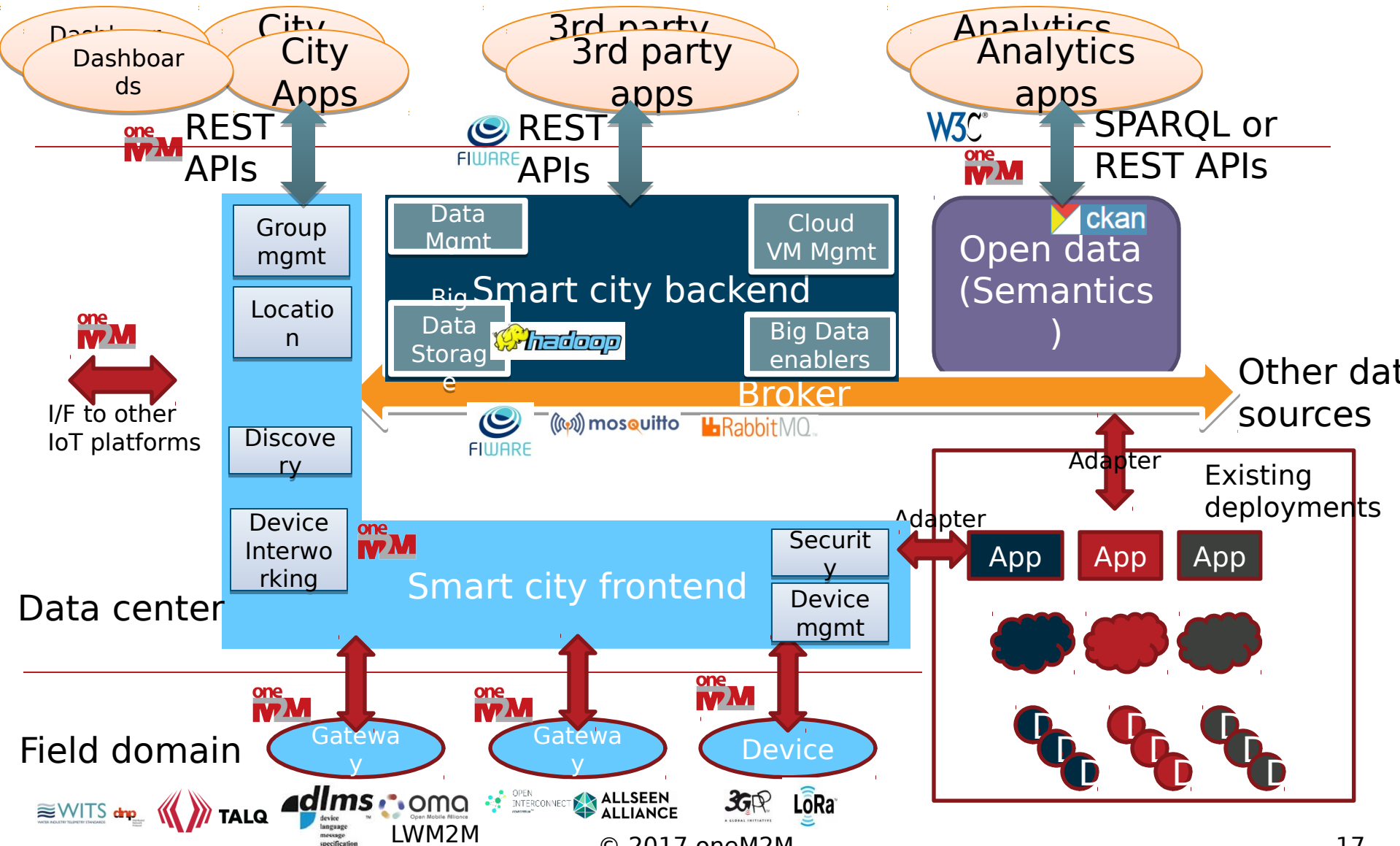
Security and (device) management are key

- Despite initial focus on IoT data, there is an increased interest in security and device management (which go hand in hand).
- Need arises from security threat analysis conducted recently: e.g. **“Two researchers analyzed Smart meters widely used in Spain and discovered that can be hacked by attackers to harm the overall National power network.”**, source: <http://securityaffairs.co/wordpress/29353/security/smart-meters-hacking.html>

A possible smart city blue-print



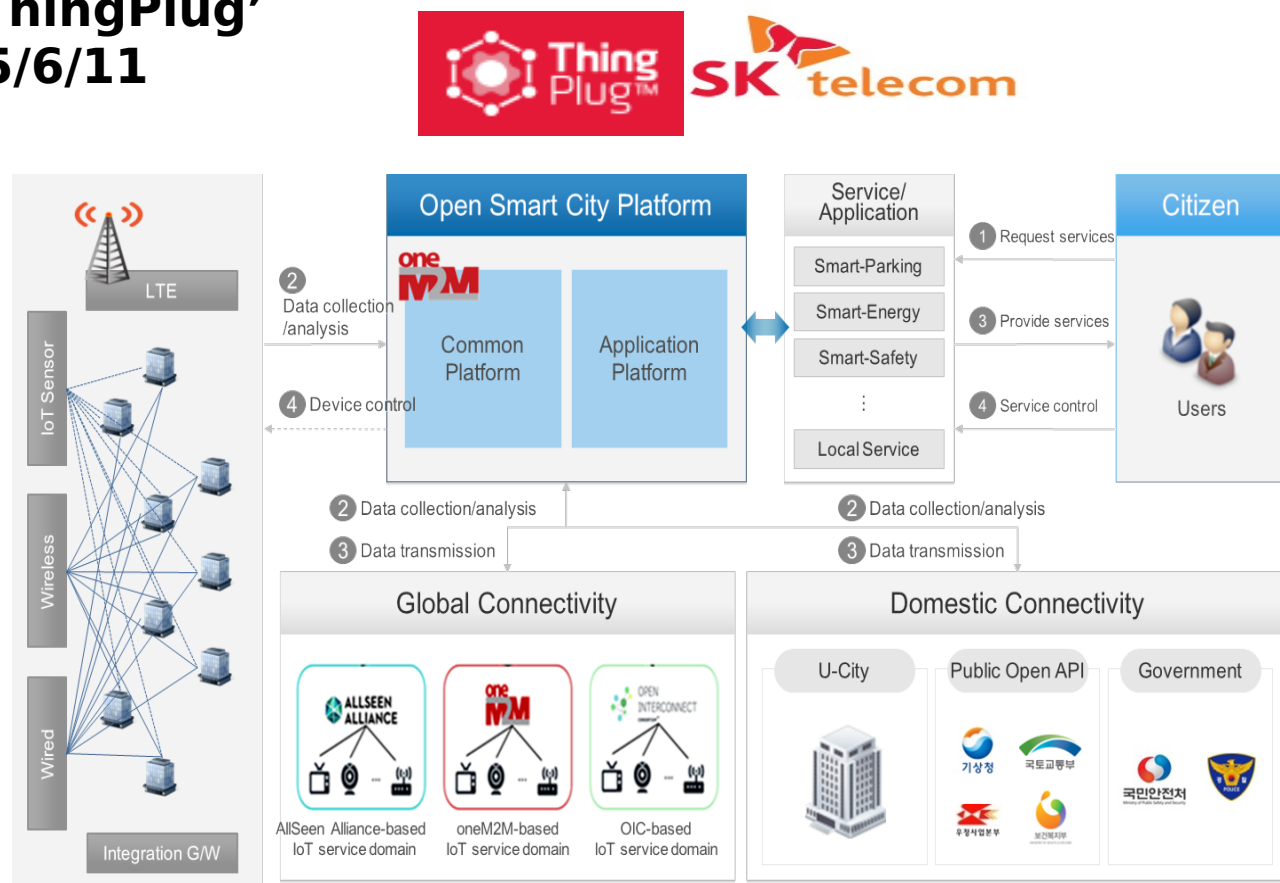
Cloud apps



First oneM2M based Commercialized Platform by SKT in Busan, Korea

SKT Launched 'ThingPlug' platform at 2015/6/11

- Compliant with oneM2M Rel-1
- Starter Kit (publically available @ [Github](https://github.com)),
- Guide book and hackathon events to support oneM2M developers
- Smart city services launched in Busan:
 - Parking management,
 - Building energy management,
 - Safety services for the socially underprivileged,
 - etc.

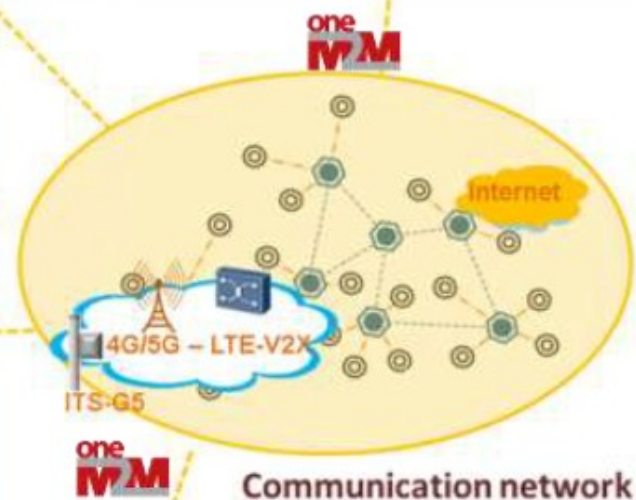
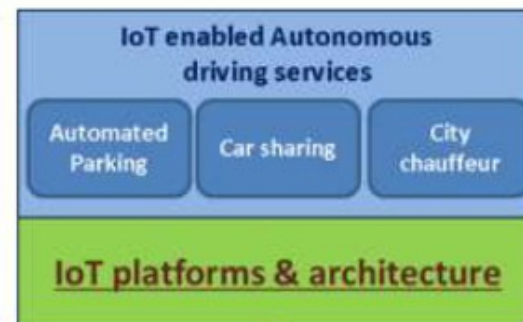
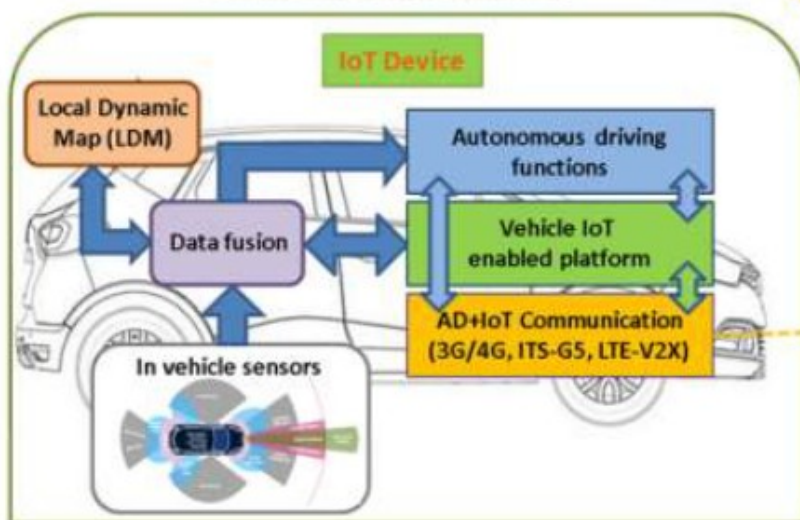


Source: SKT

AUTOPILOT – Large Scale Pilot on „IoT for Autonomous Driving“



Vehicle IoT integration



IoT eco-system



Brainport
Helmond/
Eindhoven

Tampere

Versailles

Florence-
Livorno

Vigo



Take-away

- **Open standards to avoid lock-in** to a platform or a cloud provider
 - It is also a matter of national sovereignty
- **Horizontal platform** provides common service functions that enable multi-domains
 - One investment/deployment serves multiple domains, do not re-invent the wheel
 - Cross-domain service/application innovation with a common framework and consistent APIs
- **Easy interworking/integration** with existing & evolving deployments paves the way to long term evolution and sustainable economy
 - Do not disrupt existing “vertical deployment”, but evolve.
 - Interworking with a rich set of proximal IoT technologies, embracing different ecosystems
 - Take advantage of the operators’ network capabilities and existing management technologies