oneM2M Overview

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Outline

- oneM2M with ITU-T
  - oneM2M to deliver global standards
  - Now, oneM2M as ITU-T Recommendations
- Why, How and What?
  - Why oneM2M?
  - How oneM2M?
  - What oneM2M?
- oneM2M Standards
- Open Sources and Market Adoptions
  - OCEAN from KETI
  - Smart City

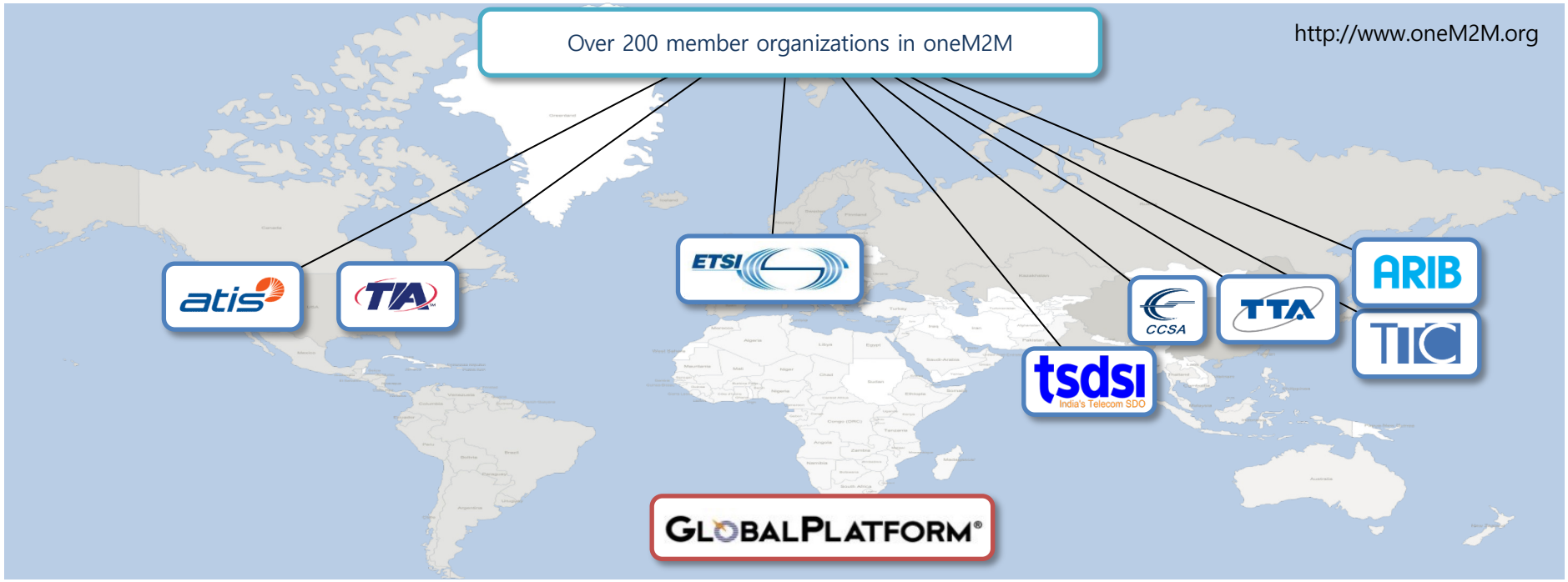
oneM2M with ITU-T

oneM2M to deliver global standards

- Partnership project among regional standard development organizations(SDO)
  - SDOs of North America, Europe, Korea, Japan, China and India
  - Global, but still the industry standards while missing several regions

https://tec.gov.in/onem2m

Now oneM2M is the India's IoT National Standard!



Now, oneM2M as ITU-T Recommendations

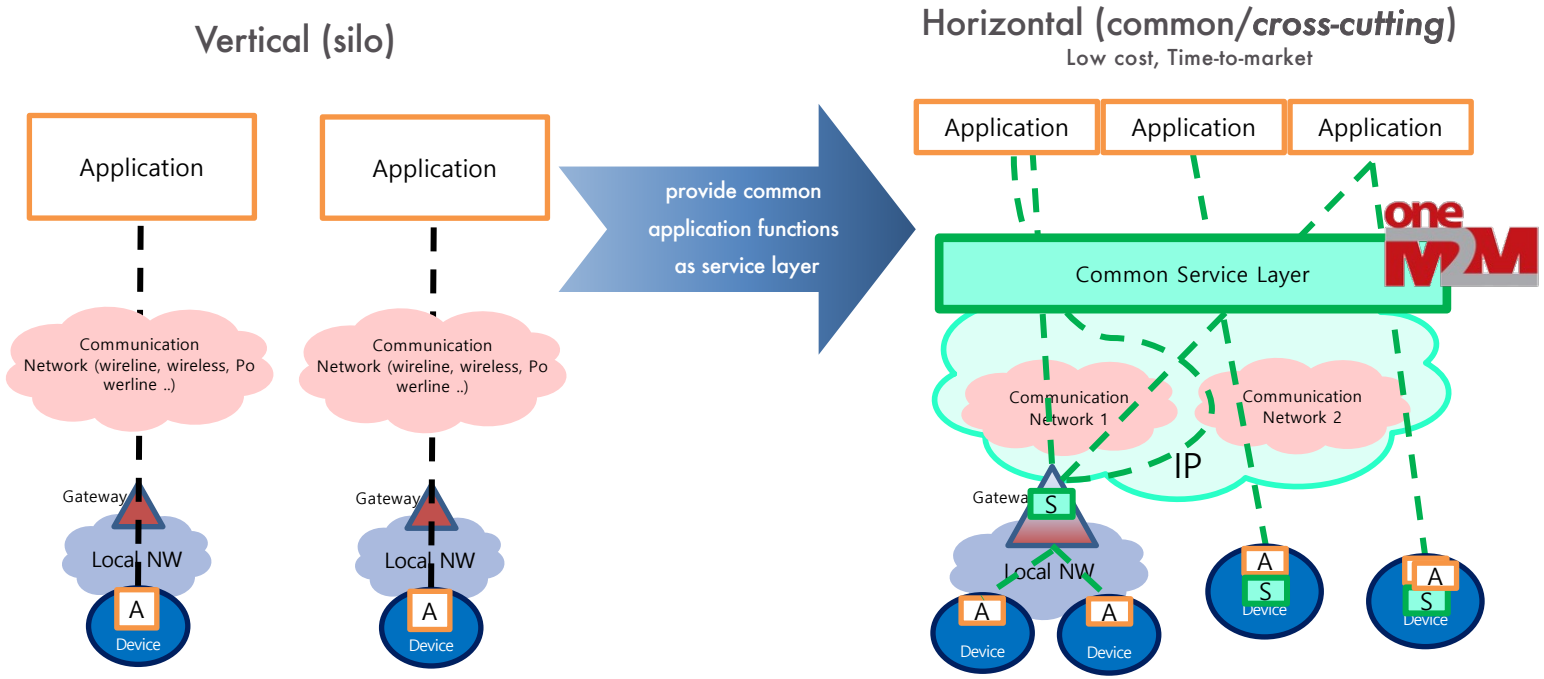
- Technical specifications and reports have been transposed
- oneM2M will have better visibility and wider adoption globally

Recommendation	Title	oneM2M TS
Y.4500.1	Functional Architecture	TS-0001
Y.4500.2	Requirements	TS-0002
Y.4500.3	Security Solutions	TS-0003
Y.4500.4	Core Protocol	TS-0004
Y.4500.5	Management Enablement (OMA)	TS-0005
Y.4500.6	Management Enablement (BBF)	TS-0006
Y.4500.8	CoAP Protocol Binding	TS-0008
Y.4500.9	HTTP Protocol Binding	TS-0009
Y.4500.10	MQTT Protocol Binding	TS-0010
Y.4500.11	Common Terminology	TS-0011
Y.4500.12	Base Ontology	TS-0012
Y.4500.13	Interoperability Testing	TS-0013
Y.4500.14	LwM2M Interworking	TS-0014
Y.4500.15	Testing Framework	TS-0015
Y.4500.20	WebSocket Protocol Binding	TS-0020
Y.4500.22	Field Device Configuration	TS-0022
Y.4500.23	Home Appliances Information Model and Mapping	TS-0023
Y.4500.32	MAF and MEF Interface Specification	TS-0032

Why, How and What?

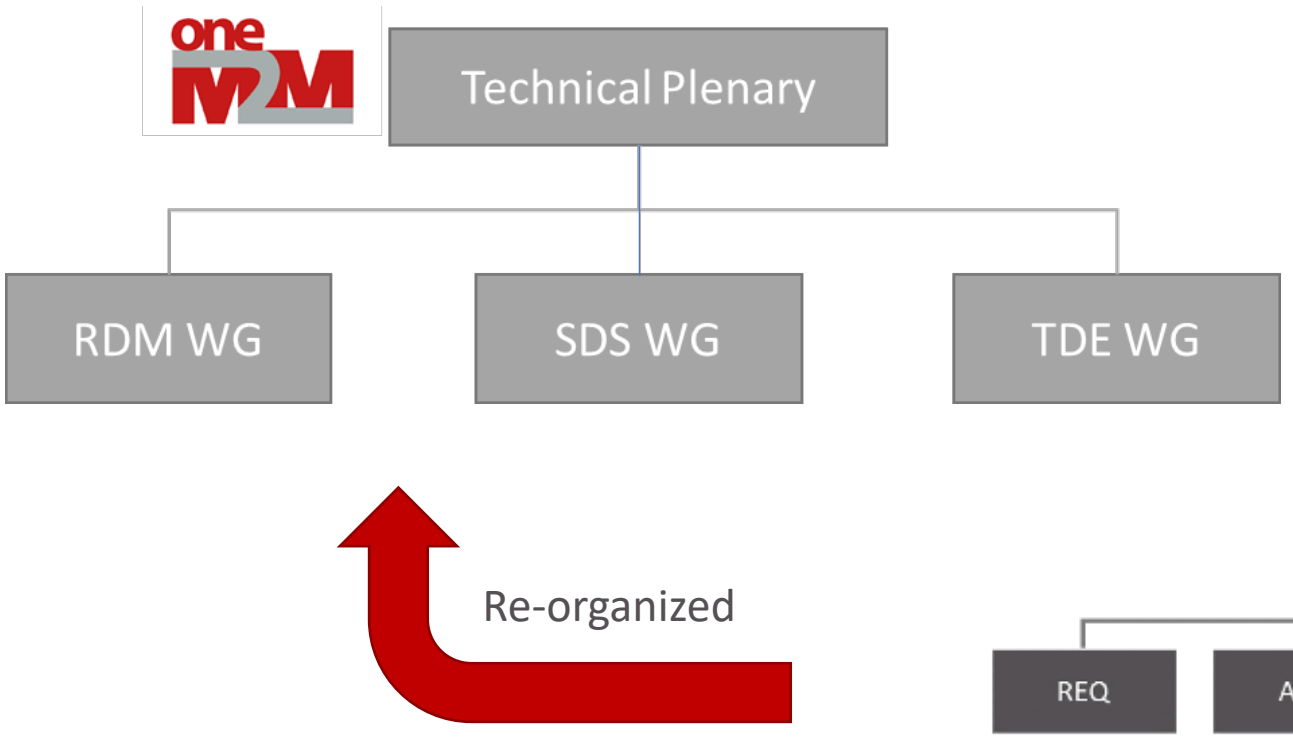
Why oneM2M?

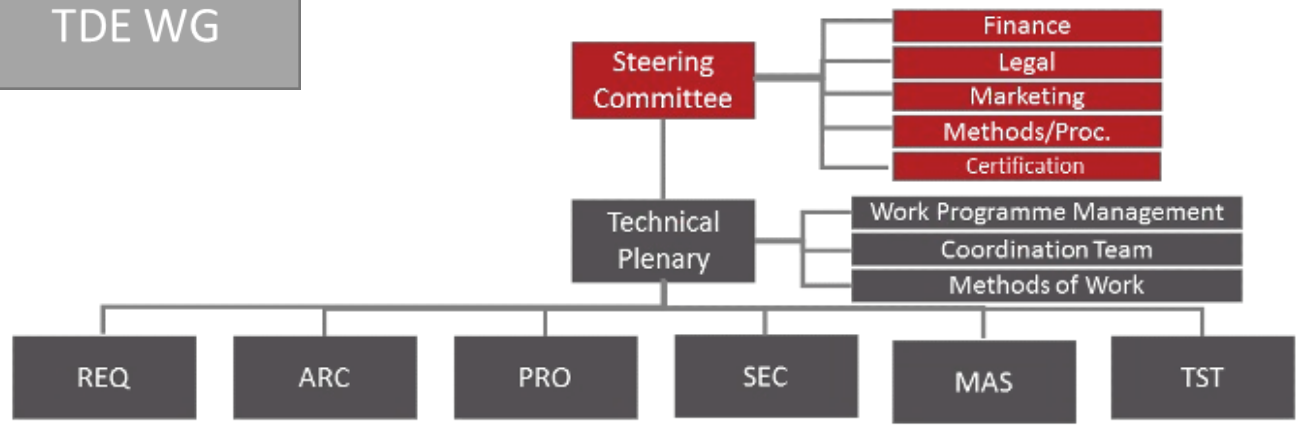
- Provides common ***standard*** M2M/IoT platform
  - that can be applied to different IoT service domains
  - so the different domains can converge
  - and the IoT markets can grow with interoperability



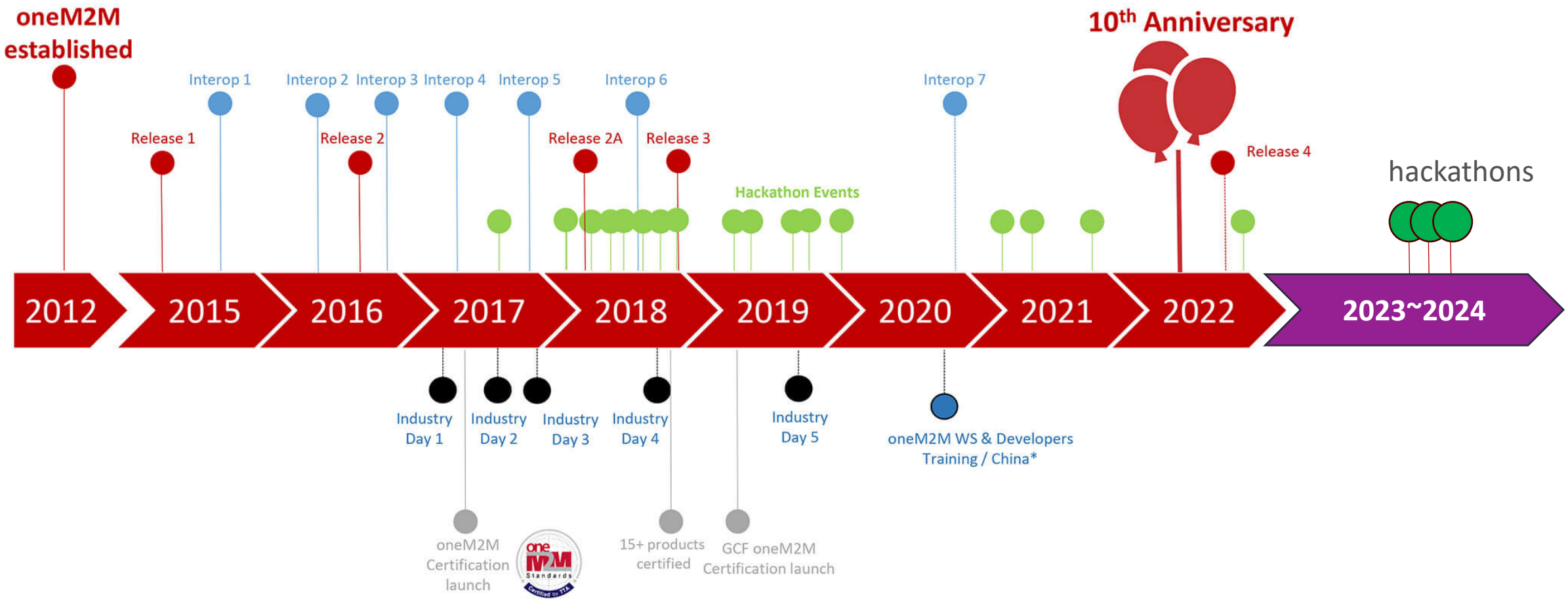
How oneM2M?

- oneM2M delivers the complete set of specifications





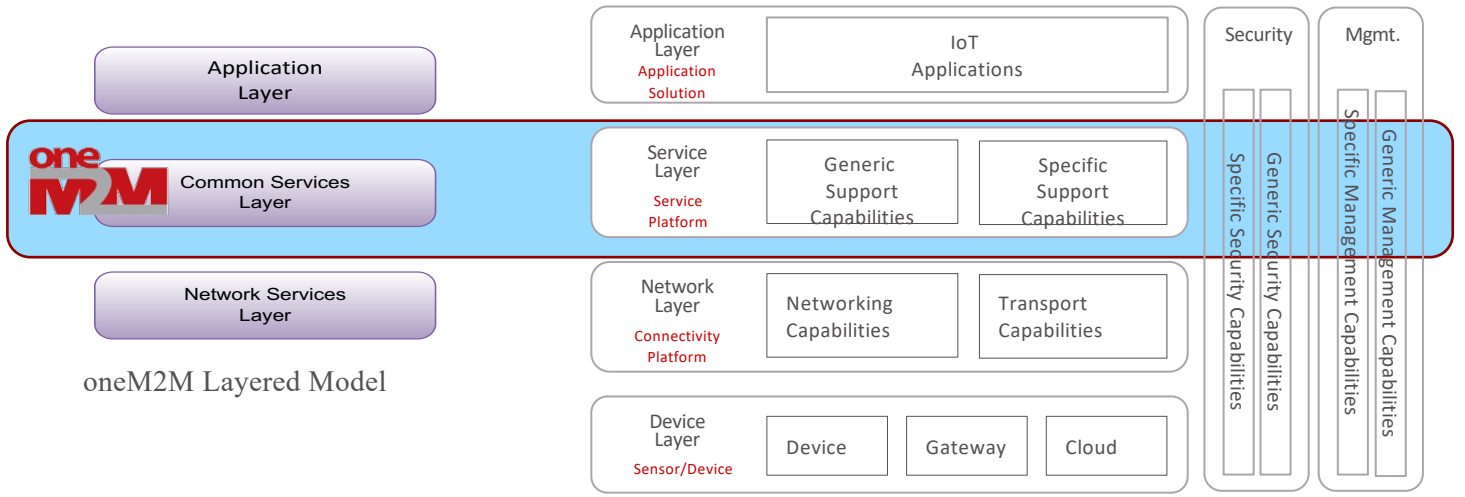
What has been done?



source: JaeSeung Song (Sejong Univ. / TP Vice-chairman)

What oneM2M?

- oneM2M provides IoT middleware and its APIs
  - so application developers focus on service logics
  - while they use oneM2M APIs instead of implementing those common functions by themselves
    - e.g. data management, group access, device management, location
  - and is transport agnostic over IP covering HTTP, CoAP, MQTT and WebSocket

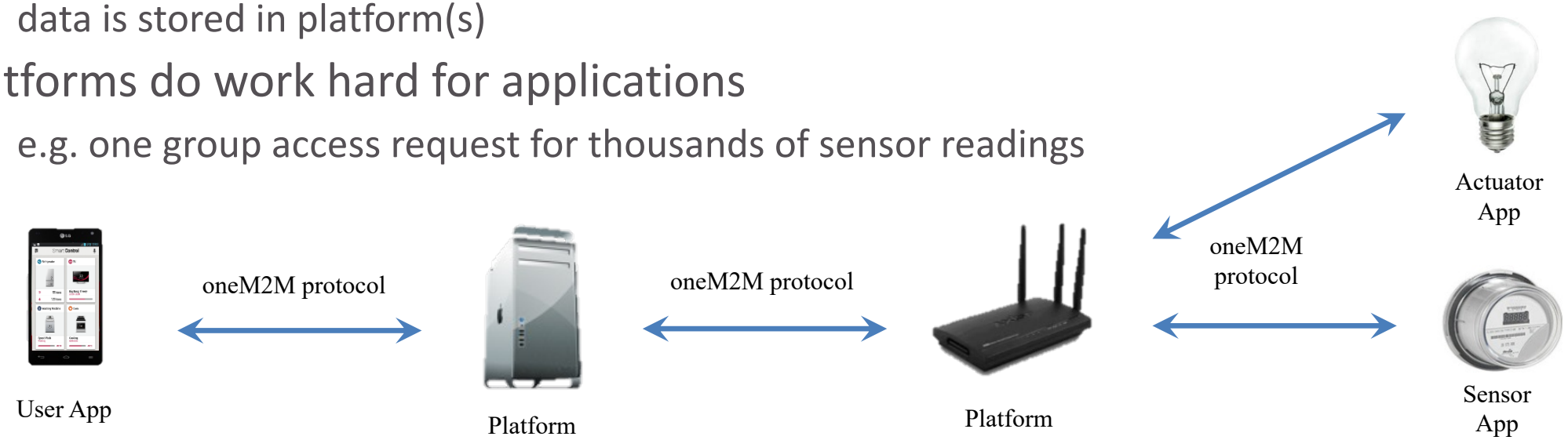


oneM2M Layered Model

ITU-T Y.4000 IoT Reference Model

What oneM2M?

- In oneM2M, platforms do help applications
  - one or more server/gateway/device server(s) deployed
    - cloud vs. edge/fog
  - applications can exchange data via platform with rich functionalities
    - data is stored in platform(s)
  - platforms do work hard for applications
    - e.g. one group access request for thousands of sensor readings



< An example of oneM2M system >

oneM2M Standards

oneM2M releases at glance

- Foundation, Extension and Adoption

Minimum Deployable Solution
- Common Service Functions (Data mgmt., Device mgmt., Group, etc.)
- Security
- Protocol Binding (HTTP, CoAP, MQTT)

Interworking
- AllJoyn
- OCF
- OMA LWM2M
- 3GPP Rel-13

Enhanced Security
- End-to-end Security
- Dynamic Authorization

Semantic Support
- Base Ontology
- Semantic Discovery

Protocol Binding
- WebSocket

Information Model
- Home Appliances Model

Market Adoption
- Developer Guide Series
- Product Profiles
- Feature Catalog
- Smart City

Interworking
- 3GPP Rel-13/14
- Interworking Framework
- OPC-UA, Modbus

Enhancements
- Distributed Authorization
- Semantic Query, Mashup, Validation
- LwM2M Interworking

Testing Spec.
- Security Conformance
- Rel-2 Interoperability

Feature Additions (e.g. Geo-Query)

Fog/Edge Computing
- Service Provisioning and Pooling

3GPP Interworking Enhancements
- Session QoS, NIDD, V2X

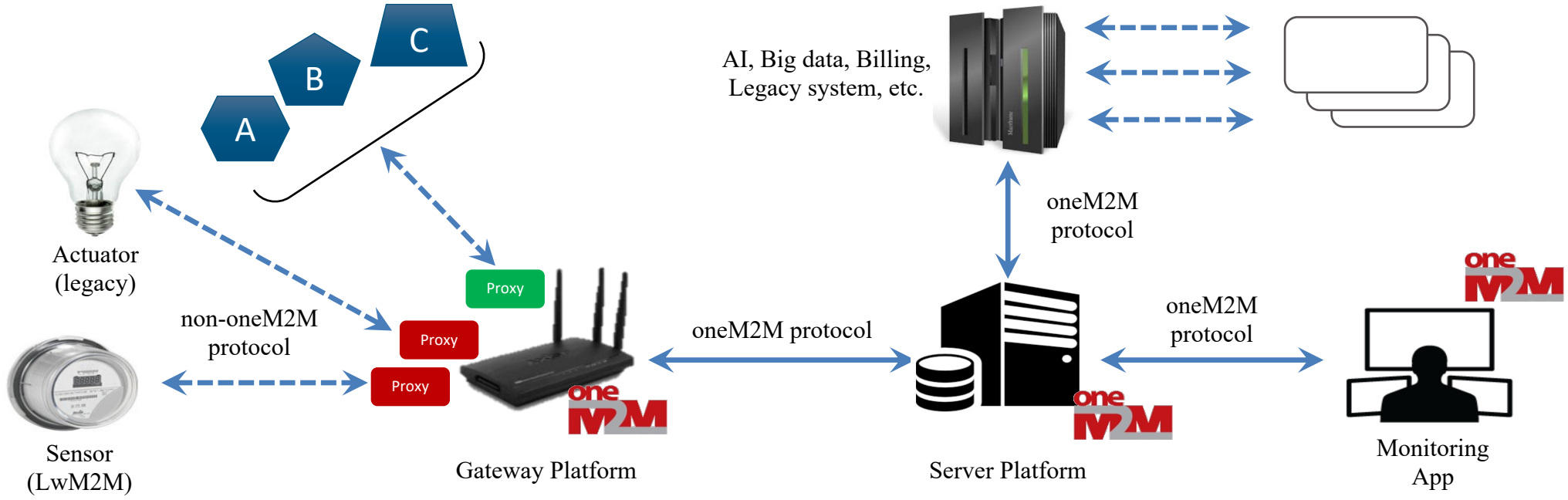
Semantic Enhancements
- Reasoning, Ontology Mapping

Security Enhancements
- User/Data Privacy (e.g. GDPR)

SDT 4.0 and Domain Information Models

Embrace the others

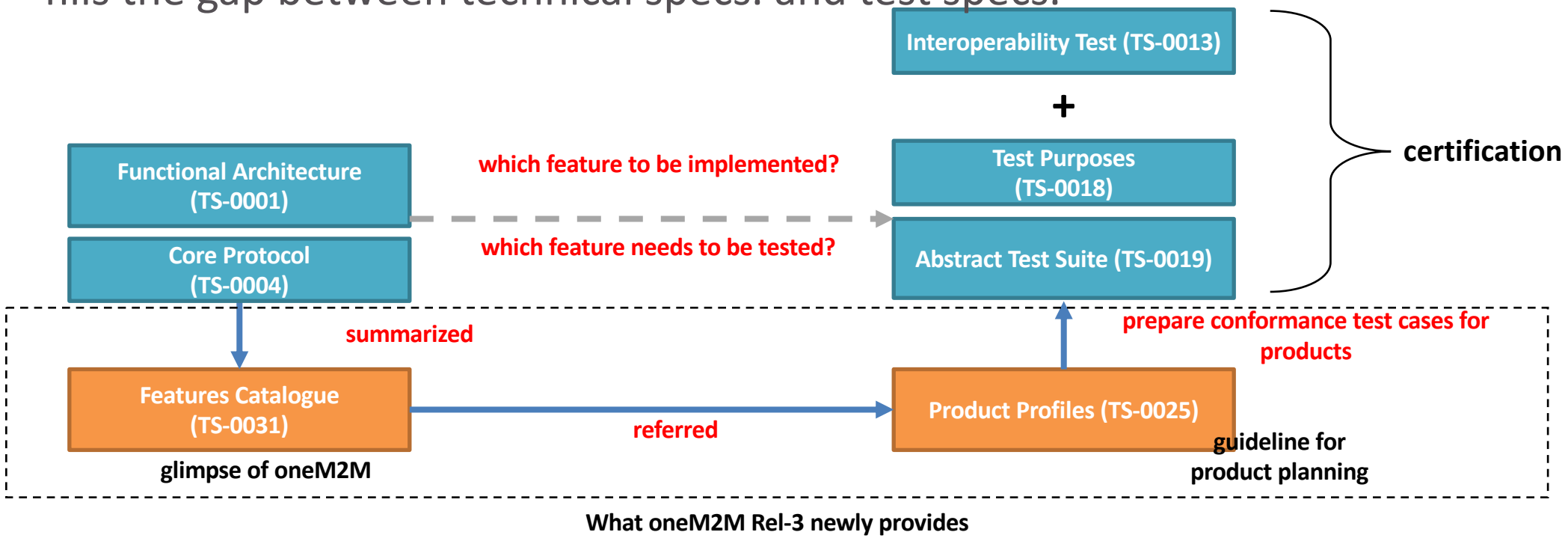
- Interworking is evolving as the interworking framework
  - to avoid specifying new interworking schemes for new ones
- Integration with IoT backend solutions
  - to have different applications for enhanced services and external APIs



< Another example of oneM2M system >

Planning, implementation, testing and certification

- Feature catalogue and product profiles
  - summary to oneM2M features
  - guide to product planning with interested features
  - fills the gap between technical specs. and test specs.



oneM2M certification program

- oneM2M certification was founded by TTA and handed over to GCF
- Chordant, InterDigital, is certified as the first product performing conformance test
- Mobius is the first certified open source oneM2M platform

https://onem2m.globalcertificationforum.org/

Certified Products (Not limited to)

Product	Webpage	Vendor	Product Type
Chordant™ Platform	https://www.chordant.io	Chordant™	End product(IN-CSE)
SysOne	http://www.c3systems.com	C3SYSTEMS	End product(IN-CSE)
Universal IoT Gateway	http://web.modacom.co.kr	Moda Inc.	End product(IN-CSE)
HuRa IoT Platform	http://www.herit.net	HERIT	End product(IN-CSE)
GWP	http://www.irexnet.co.kr	IREXNET	End product(IN-CSE)
AiSOP	http://www.irexnet.co.kr	IREXNET	End product(IN-CSE)
Insator™	https://www.samsungsds.com	SAMSUNG SDS	End product(IN-CSE)
HANDYPIA IoT Platform	http://www.handysoft.co.kr	HANDYSOFT, Inc.	End product(IN-CSE)
IoT Healthcare Platform	http://www.hconnect.co.kr	HealthConnect Co., Ltd	End product
ThingPlug	https://www.thingplug.net	SK Telecom	Software component
N-MAS	http://www.ntels.com	nTels	End product
IoTMakers Middleware	http://iotmakers.olleh.com	KT	Software component
IoTMakers	http://iotmakers.olleh.com	KT	Software component
e-IoT Energy Platform	https://spin.kepco.co.kr	KEPCO	End product
e-IoT Energy Gateway	https://spin.kepco.co.kr	KEPCO	End product

Open Sources and Market Adoption

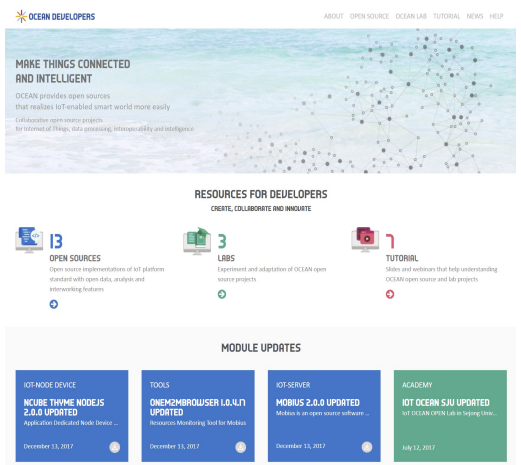
Open-Source S/W

- Members support different projects for different dev. environments
  - Different open sources gives better opportunity for standard adoption

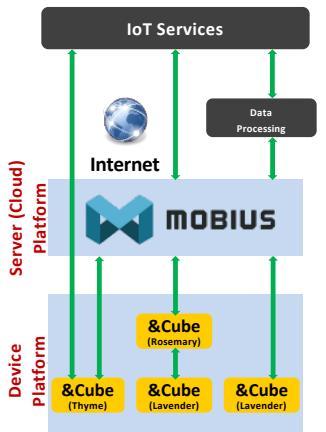
	OM2M	ACME	OCEAN	OS IoT	tinyIoT
Lead	LAAS-CNRS	Andreas Kraft	KETI	atis	세종대학교 SEJONG UNIVERSITY
Homepage	www.eclipse.org/om2m	github.com/ankraft/ACME-oneM2M-CSE/	developers.iotocean.org	os-iot.org	TBD
License	EPL 1.0	BSD 3-Clause	BSD 3-Clause	BSD 3-Clause	BSD 3-Clause
Offering	Platform	Platform	Platform, Dev Tools	Lightweight Dev API	Platform & Edge
Binding	HTTP, CoAP	HTTP, MQTT	HTTP, CoAP, MQTT, WebSocket	HTTP	HTTP, MQTT, CoAP (under dev.)
Format	XML, JSON	JSON, CBOR	XML, JSON, CBOR	XML, JSON	JSON
Language, Framework	Java / OSGi	Python	Node.js, Java	C++	C
Interworking	KNX, ZigBee, HUE, LoRa, SigFox, etc.	-	OCF, Nest, ZigBee, FIWARE, JawBone	-	Modbus

OCEAN from KETI

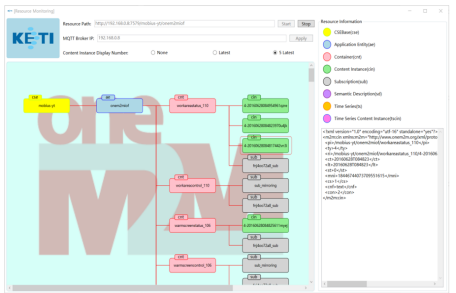
- OCEAN as IoT open-source community
  - offers oneM2M server/gateway/device platforms and interworking for OCF, etc.
  - provides dev tools oneM2M resource browser and conformance testing tool
  - Mobius server platform was certified firstly as the open-source
  - BSD 3-Clause license
  - http://developers.iotocean.org



< OCEAN Website >



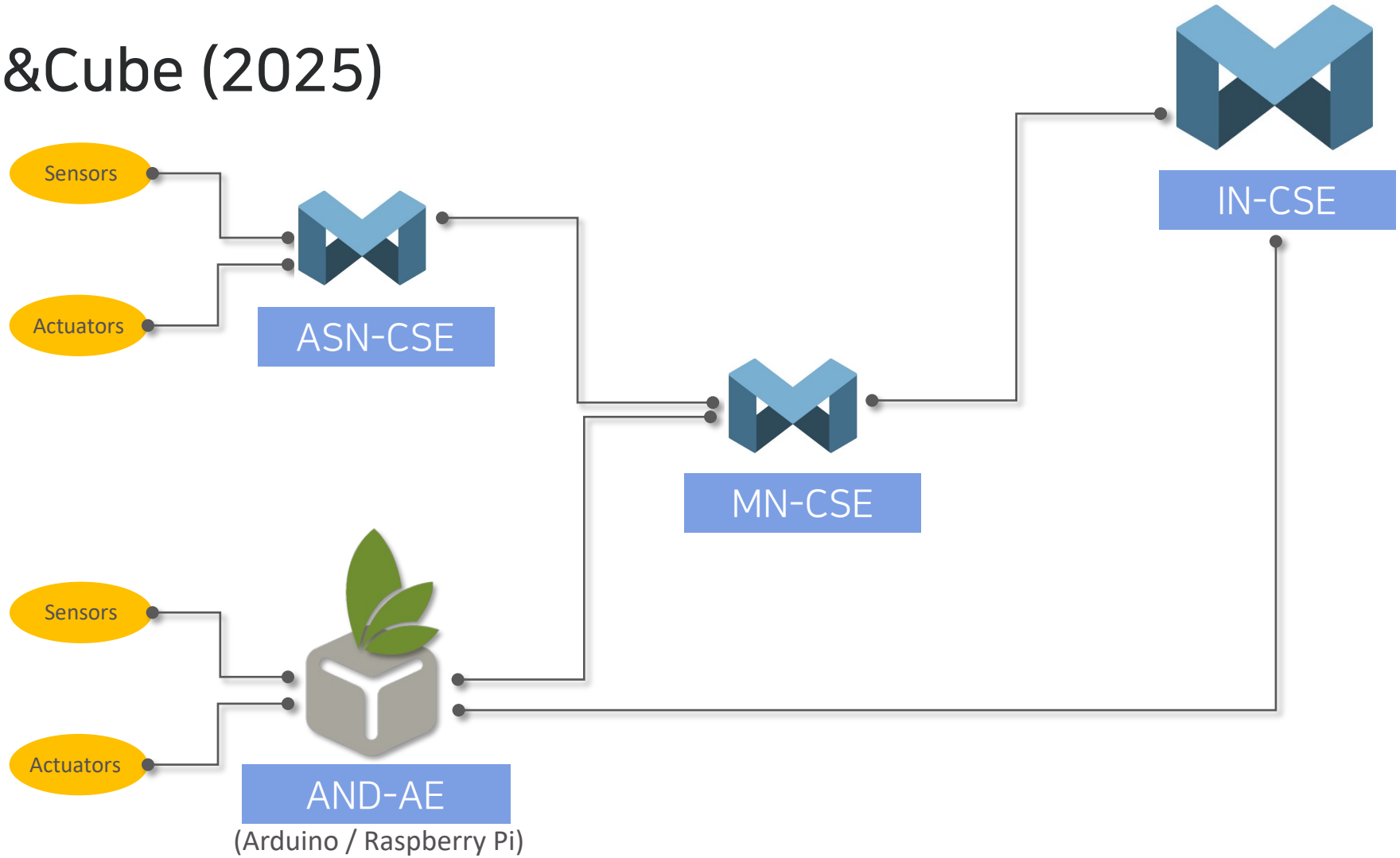
< oneM2M Node Implementations >



< Resource Browser >

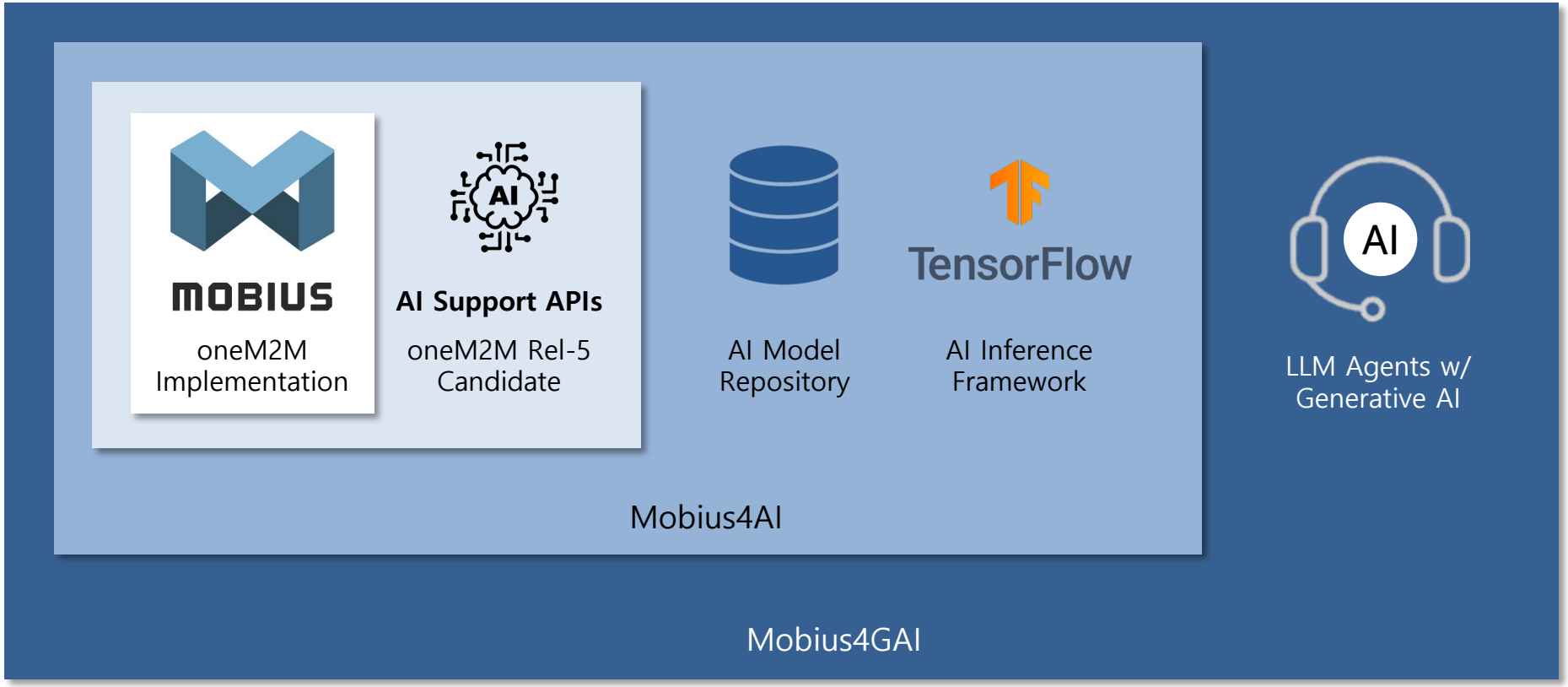
Mobius 4

- Mobius and &Cube (2025)



Mobius 4 AI

- Mobius 4 evolves to support AI and Generative AI



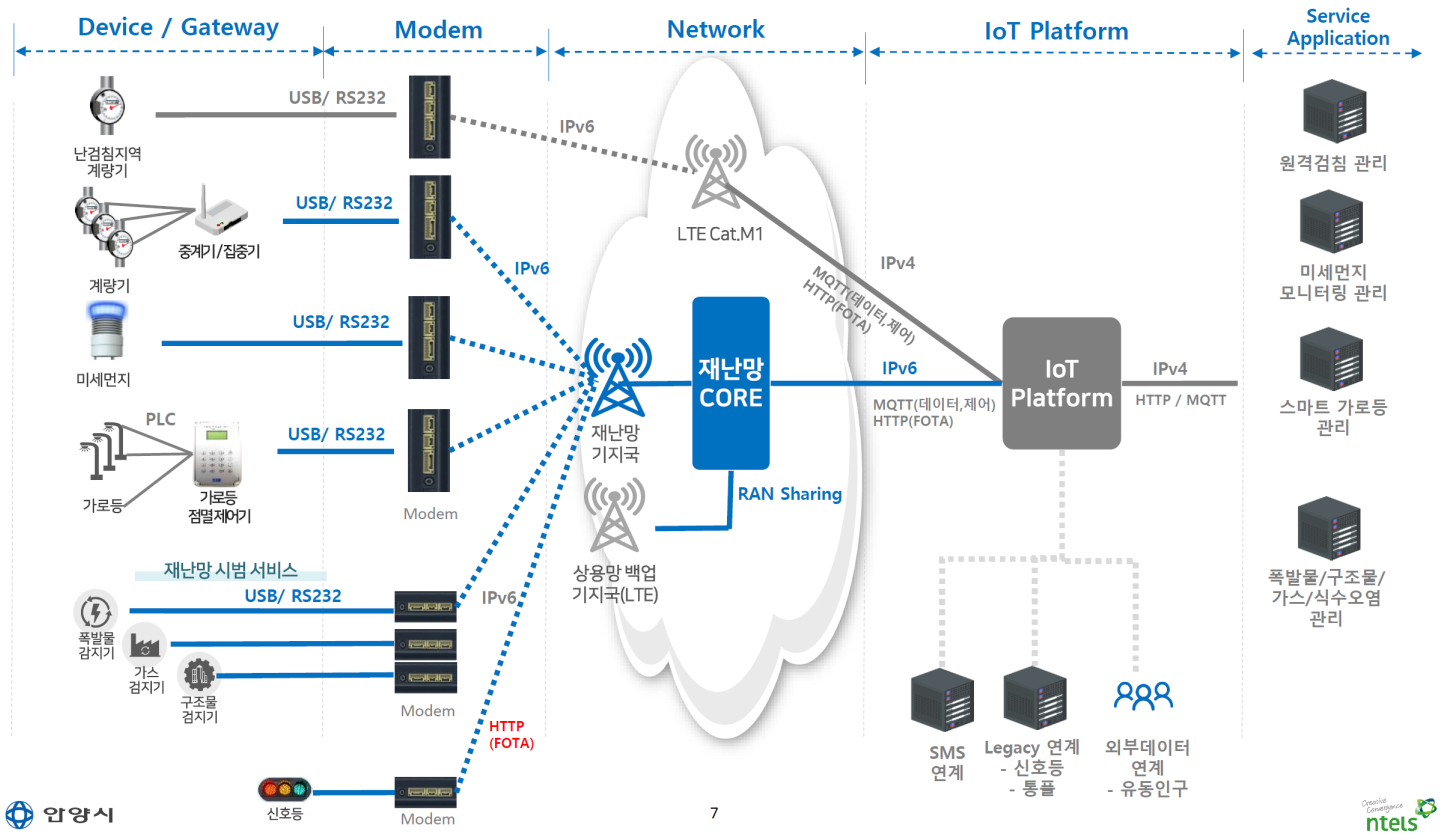
&Cube-Mint

- IoT reference board with LTE Cat-M1 module
  - Low-cost LTE connectivity for field device deployment
  - Cat-M1 has low power consumption (200 mA for data transmission)
  - Zero-configuration (e.g. APN) for communications and it is small size (<-> USB/HAT)
  - &Cube-Mint S/W, which is oneM2M AE, will be available (2025.1Q)

Smart Cities

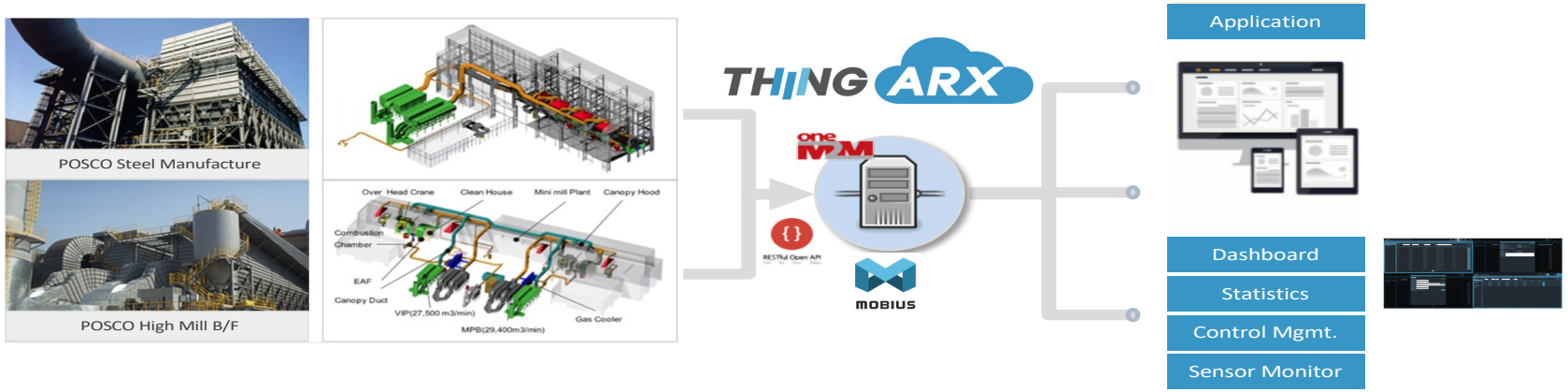
- oneM2M has common IoT platform in smart cities
  - Busan, Goyang, Daegu for pilots and other commercial deployments South Korea
  - oneTransport in England, Turin in Italy and Bordeaux in France

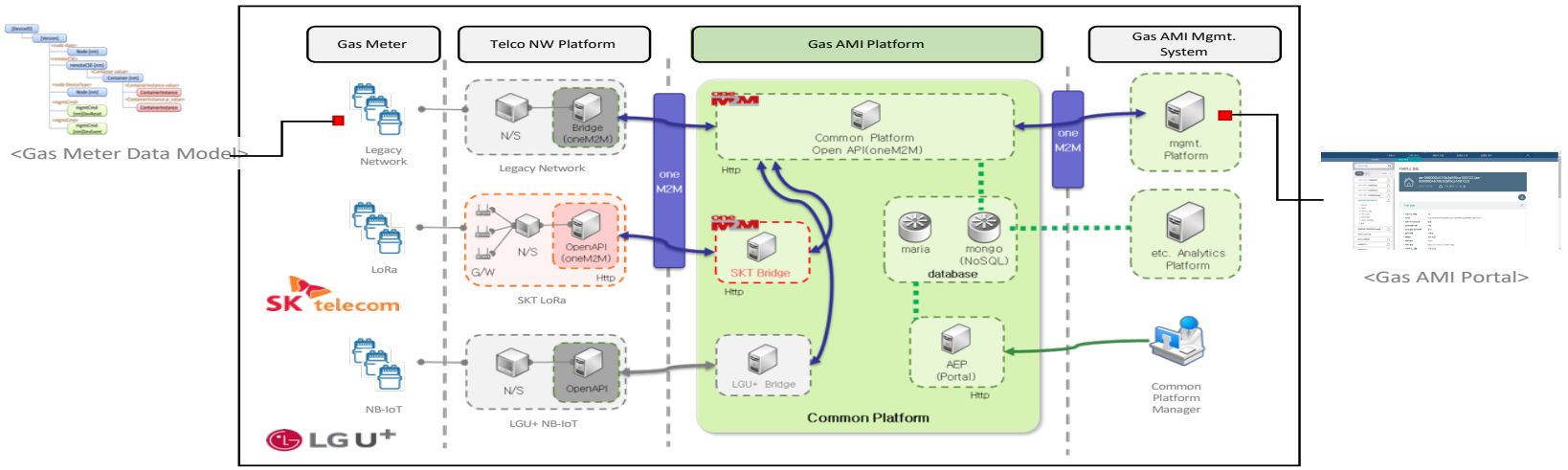
Anyang Smart City (‘21) -
oneM2M commercial deployment



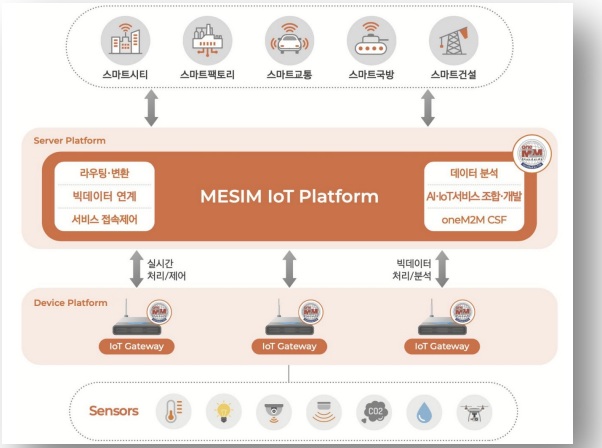
Industrial IoT

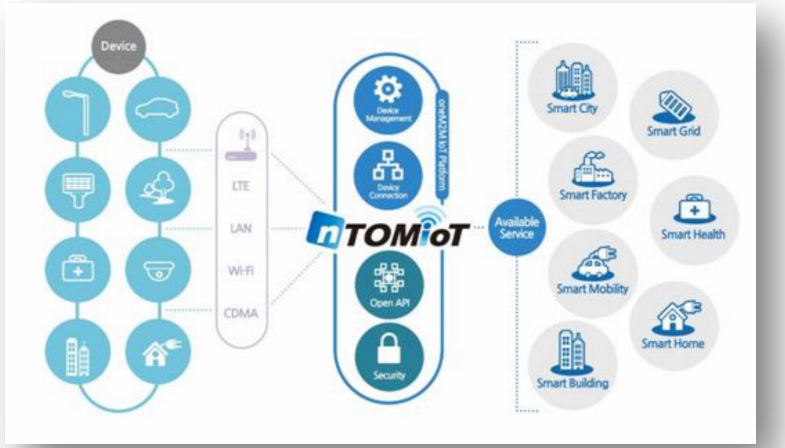
- Smart Dust Collector and Gas Metering Solution



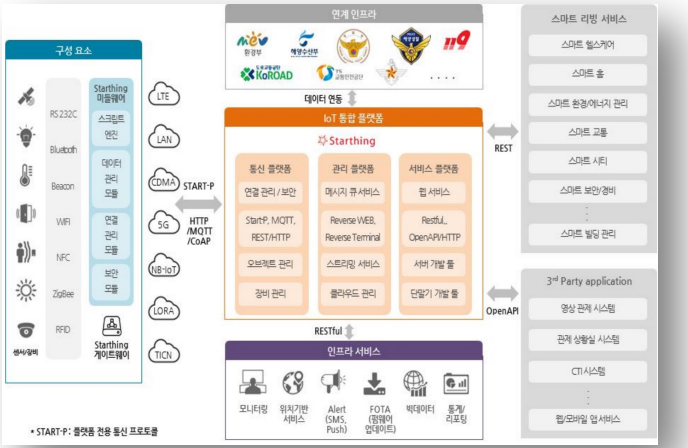


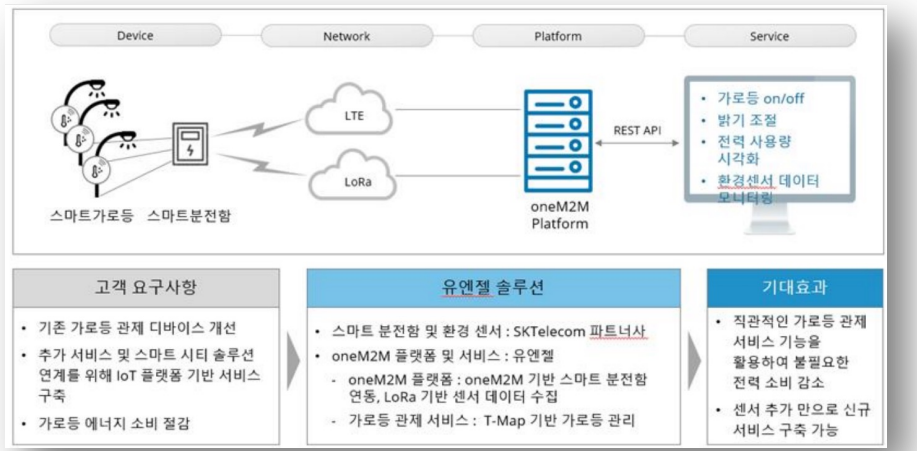
oneM2M Products (in KR)





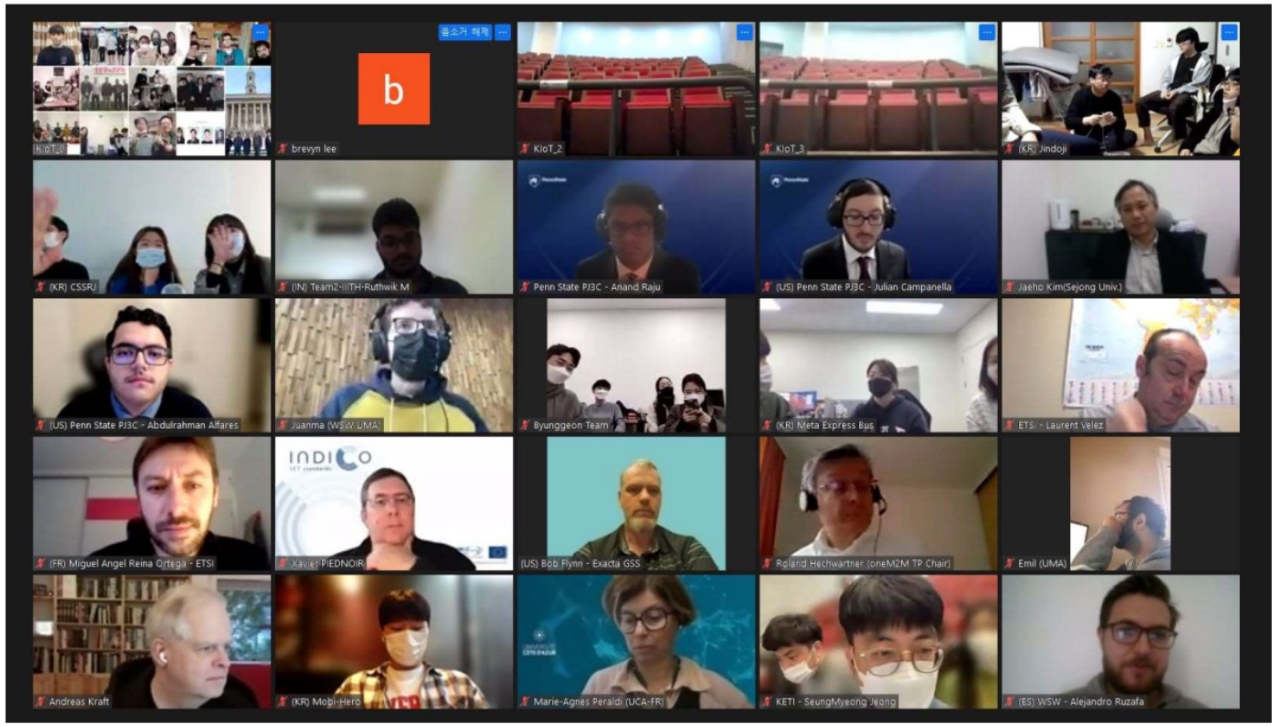
and many other products…





KETI Korea Electronics Technology Institute TTA

oneM2M International Hackathon (2021)



Winners

1st Prize: oneM2M Autonomous cooperative smart delivery system (KR)

2nd Prizes: Cellular IoT Irrigation System (US)

A smart automatic pet feeder (CN)

<= Video of the Hackathon Awards Ceremony

oneM2M International Hackathon (2022)

<= Video of the Hackathon Awards Ceremony

Winners

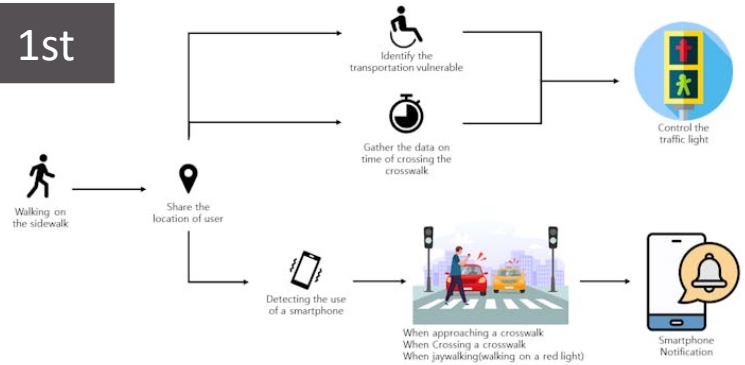
1st Prize: Fire Situation Monitoring System (KR)
2nd Prizes: Air quality monitoring system (AT)
Smart School Bus (KR)

oneM2M International Hackathon (2023)

- More oneM2M APIs implemented, and more participations from SMEs

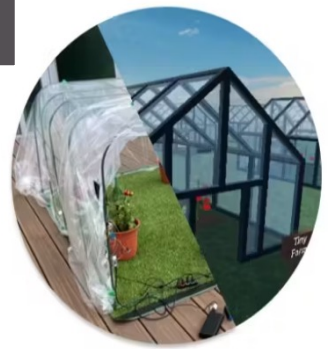
Awards Ceremony (2023)

1st



Smart Traffic Light Alarm App

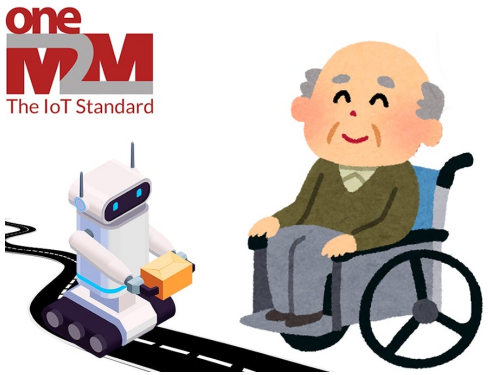
2nd



oneM2M X ROBLOX

Smart Farm Infrastructure with Metaverse

2nd

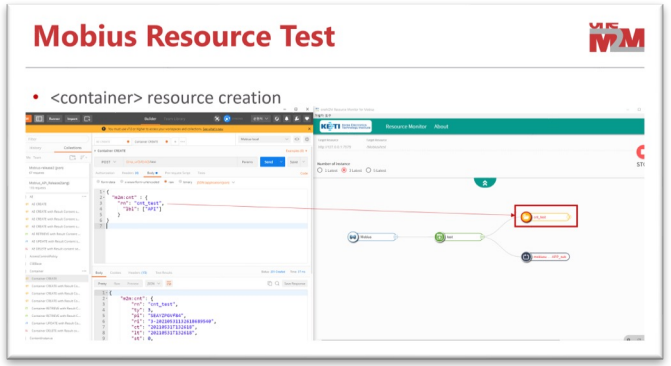


Remotely Operated AI Enabled Robot Using oneM2M

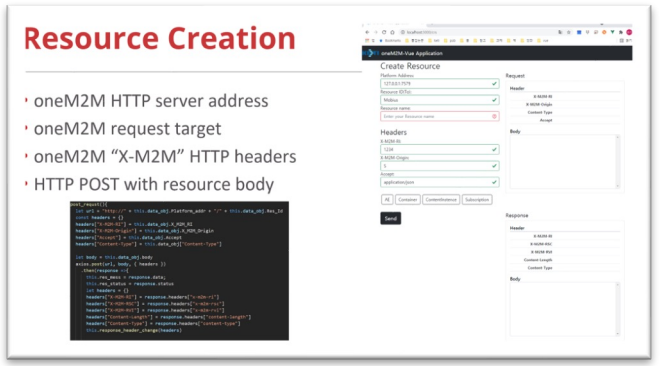
Doc Demo | Doc Demo | Doc Demo

Developer Tutorials

- oneM2M Overview
- oneM2M Platform and Tools
- oneM2M Architecture and APIs
- oneM2M Protocols
- oneM2M Practice (HTTP and MQTT)
- oneM2M Virtual Devices
- oneM2M Access Control
- oneM2M Dashboard
- oneM2M – ZigBee Interworking
- oneM2M – LoRaWAN Interworking
- oneM2M Node-RED Application
- oneM2M Vue.js Application
- oneM2M – Digital Twin Interworking
- oneM2M Drone GCS
- oneM2M AIoT Applications
- oneM2M LLM Agents



oneM2M Developers Tutorial 2020 (ENG, KETI)



oneM2M Developers Tutorial 2021 (KOR, KETI)

oneM2M Developers Tutorial 2022 (basics and advanced courses) (KOR, KETI)

QnA