ETSI Seminar 2023

Introduction to oneM2M

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ETSI
The Standards People

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About the oneM2M global partnership

A global partnership among SDOs and Industry Associations/Fora

<u>Main goal:</u> create consistency in how devices, servers and applications communicate through a standardized M2M Service Layer

- Interoperability
- Cost-effectiveness / economies of scale
- Reduced fragmentation
- Larger market

Open and transparent: all working documents are public.
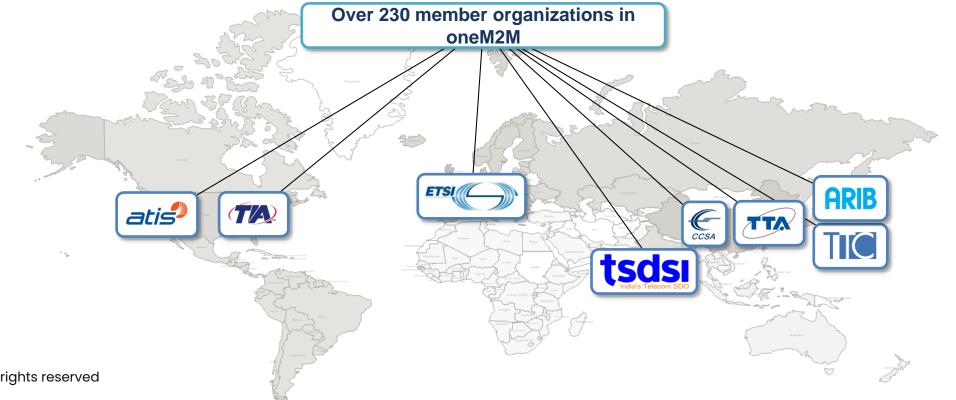All deliverables available free of charge

Detailed scope at http://www.onem2m.org/

Global Participants, Global Footprint

- Global footprint established through regional presence
- ETSI is the partner in Europe, your contact point to get involved in oneM2M
- Formal International recognition with transposition by ITU-T under the Y.4500 series
  - National adoptions in India and Korea

Over 230 member organizations in oneM2M

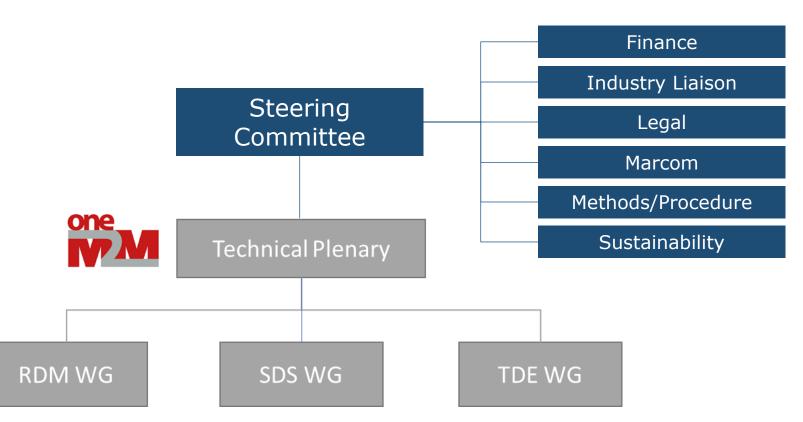# Partnership Project Structure
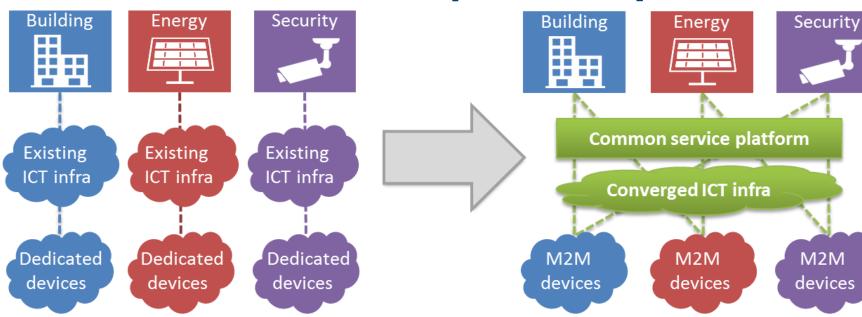

RDM: Requirements and Domain Models
SDS: System Design and Security
TDE: Testing and Developers Ecosystem
+ recently oneM2M Academic Relationship ad-Hoc Group（ACR AHG）

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Breaking barriers: cross-domain interoperability
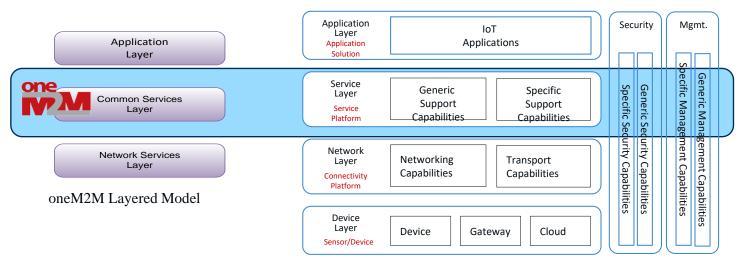

- Highly fragmented market with small vendor-specific applications.
- Reinventing the wheel: Same services developed again and again.
- Each silo with its own technologies without interoperability.

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

oneM2M technical approach 1/5

- 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

oneM2M technical approach 2/5

- oneM2M provides a Common Services "Toolkit"

Common Service Entity

| IoT Application Layer | Registration | Communication Management | Security | Discovery | Data Management & Repository | Semantics |

oneM2M Common Services Layer

IoT Devices and Connectivity Layer

Device Management | Subscription & Notification | Group Management | Application & Service Management | Location | Service Charging & Accounting

Network Service Exposure | Transaction Management | Time Management | Session Management | Process Management

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oneM2M technical approach 3/5

- ## 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
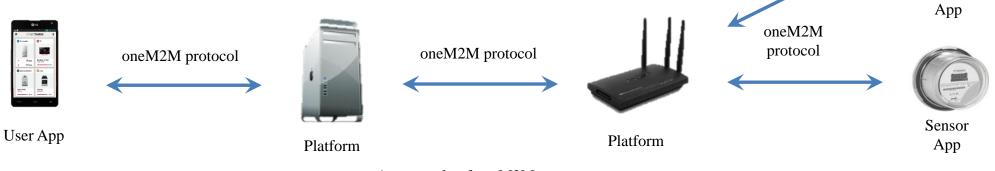   - e.g. one group access request for thousands of sensor readings

< An example of oneM2M system >

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oneM2M technical approach 4/5

Keeping up with real life thanks to Interworking Architecture:

Service Layer

OCF IPE | Bluetooth IPE | ZWAVE IPE | …

- oneM2M interworking framework enables interwork different IoT device technologies interworking
  - E.g. OCF, ZWAVE, Bluetooth, ZigBee, NGSI-LD…

- oneM2M provides an abstracted & simplified API for applications to communicate with devices
  - All devices are represented as oneM2M devices regardless of the technology they use
  - Via standardized oneM2M API, App developers can manage devices in a simpler and uniform manner

- Once abstracted into oneM2M, App Developers can sense/control all IoT devices in a common and uniform manner
  - Turn switch on/off, sample sensor reading, etc.
  - No need to modify applications in case of change

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oneM2M technical approach 5/5

Connected Street Lights

Dashboard

Control

Non-oneM2M

oneM2M Service Layer

Cloud / Edge IoT Platform

Non-oneM2M

Analytics/ AI / ML as a Service

★ Data

oneM2M releases at a glance

Release 1
(2015)

- Registration
- Discovery
- Security
- Group Management
- Data Mgmt. & Repository
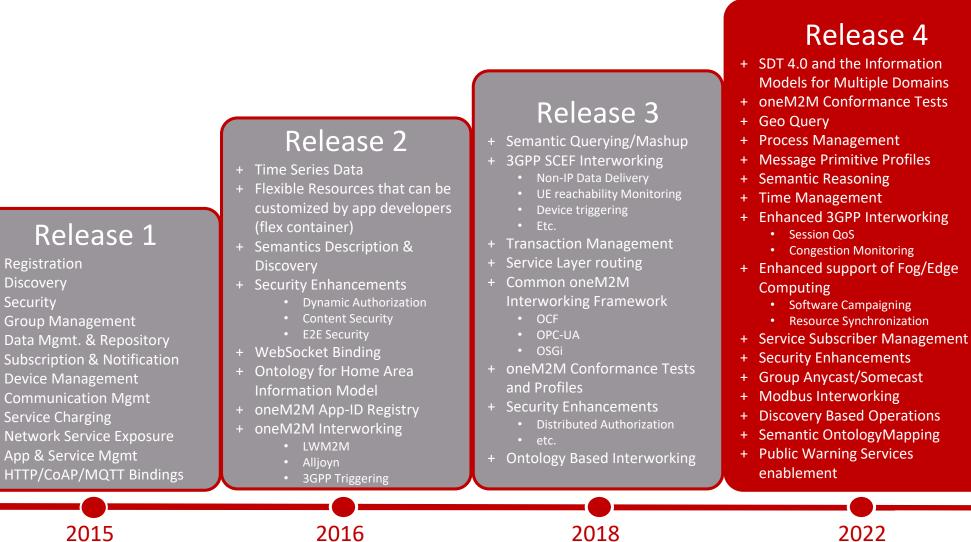- Subscription & Notification
- Device Management
- Communication Mgmt
- Service Charging
- Network Service Exposure
- App & Service Mgmt
- HTTP/CoAP/MQTT Bindings

Release 2
(2016)

- + Time Series Data
- + Flexible Resources that can be customized by app developers (flex container)
- + Semantics Description & Discovery
- + Security Enhancements
  - Dynamic Authorization
  - Content Security
  - E2E Security
- + WebSocket Binding
- + Ontology for Home Area Information Model
- + oneM2M App-ID Registry
- + oneM2M Interworking
  - LWM2M
  - Alljoyn
  - 3GPP Triggering

Release 3
(2018)

- + Semantic Querying/Mashup
- + 3GPP SCEF Interworking
  - Non-IP Data Delivery
  - UE reachability Monitoring
  - Device triggering
  - Etc.
- + Transaction Management
- + Service Layer routing
- + Common oneM2M Interworking Framework
  - OCF
  - OPC-UA
  - OSGi
- + oneM2M Conformance Tests and Profiles
- + Security Enhancements
  - Distributed Authorization
  - etc.
- + Ontology Based Interworking

Release 4
(2022)

- + SDT 4.0 and the Information Models for Multiple Domains
- + oneM2M Conformance Tests
- + Geo Query
- + Process Management
- + Message Primitive Profiles
- + Semantic Reasoning
- + Time Management
- + Enhanced 3GPP Interworking
  - Session QoS
  - Congestion Monitoring
- + Enhanced support of Fog/Edge Computing
  - Software Campaigning
  - Resource Synchronization
- + Service Subscriber Management
- + Security Enhancements
- + Group Anycast/Somecast
- + Modbus Interworking
- + Discovery Based Operations
- + Semantic OntologyMapping
- + Public Warning Services enablement

2015   2016   2018   2022

oneM2M release 5

Studies, Use Case and Requirements development

- AI enablement
- Information Model enhancements – SDT4.0
- Support of Data Protection Regulations
- Support of Data License Management
- Smart City and Enterprise domain enablement enhancement
- Enablement of IoT in the metaverse
- Advanced Semantic Discovery
- Additional Interworkings (e.g. OGC's Sensor Thing API)
- Effective IoT Communication to Protect 3GPP Networks (cont'd)

TECHNICAL REPORTS

REQUIREMENTS
TS-0002

TECHNICAL SPECS

A complete package: from architecture to testing

oneM2M strives to deliver a consistent set of specifications matching the development process:

- Requirements
- Architecture
- Technical Solution
- Testing
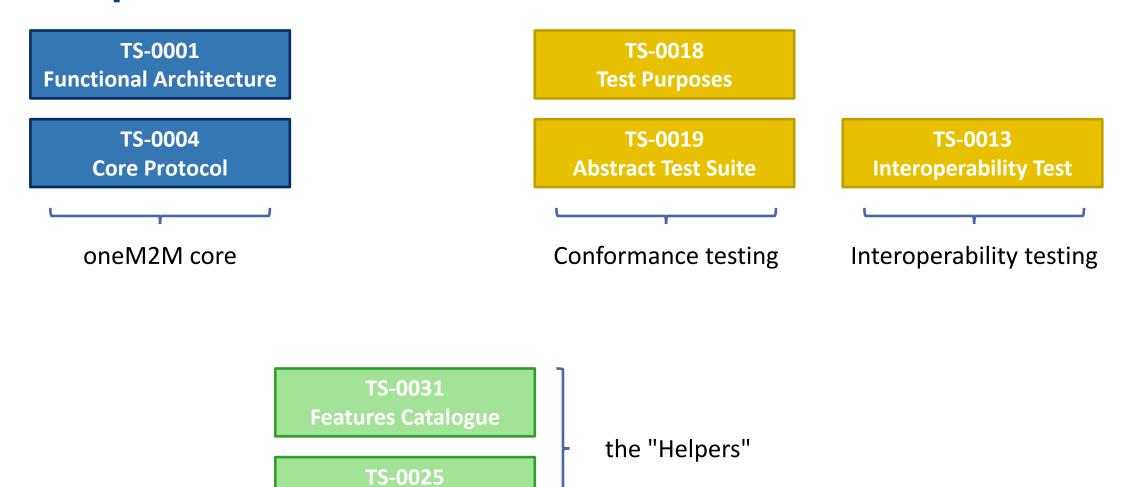- Guides for implementers and developers

About testing:

- Testing is at the core of quality control when developing and deploying a product.
- oneM2M offers two sets of testing specifications:
  - <u>Conformance</u> testing: to verify compliance of an implementation with the specifications
  - <u>Interoperability</u> testing: to verify if and how multiple devices from multiple vendors work together

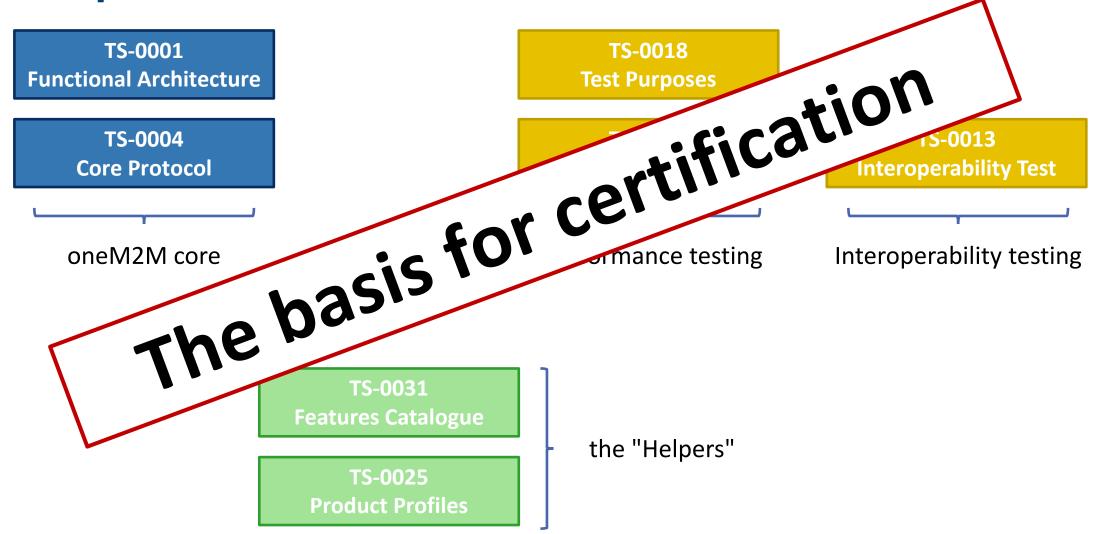# Overview of the oneM2M test specifications

TS-0001 Functional Architecture	TS-0018 Test Purposes	
TS-0004 Core Protocol	TS-0019 Abstract Test Suite	TS-0013 Interoperability Test
oneM2M core	Conformance testing	Interoperability testing

| TS-0031 Features Catalogue | the "Helpers" |
| TS-0025 Product Profiles | |

Overview of the oneM2M test specifications

TS-0001
Functional Architecture

TS-0004
Core Protocol

TS-0018
Test Purposes

TS-0013
Interoperability Test

oneM2M core

...ormance testing

Interoperability testing

The basis for certification

TS-0031
Features Catalogue

TS-0025
Product Profiles

the "Helpers"

oneM2M certification program

All the oneM2M testing material provides a strong foundation for certification needs

Certification for oneM2M pioneered by TTA in Korea in 2016
- A follow-up to the national adoption of oneM2M
- Certification needed in support of several projects nationally

Certification taken to new levels with partnership with GCF, leveraging the TTA work
- Birth of the oneM2M Certification Program

Certification re-uses the oneM2M testing material
- If new test cases are needed, they are defined in oneM2M, not in GCF
- GCF was instrumental in steering oneM2M to develop the supporting material
    - Example of the Feature Catalogue and Product Profiles

GCF announces availability of oneM2M certification programme

01 Jul 2019

Global Certification Forum (GCF) today announced the immediate availability of its oneM2M certification programme, following on from an official Memorandum of Understanding (MoU) signing earlier this year with the Telecommunications Technology Association (TTA), oneM2M certification through GCF will facilitate interoperability and standardisation for Internet of Things (IoT) applications where performance, reliability and security are critical.

Information available at: https://onem2m.globalcertificationforum.org/

Open Source Implementations

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

	OM2M (IotDM)	OPEN DAYLIGHT IotDM	OCEAN	OS IoT	open mtc	ACME
Lead	LAAS-CNRS	CISCO	KETI	atis	Fraunhofer FOKUS	*Andreas Kraft*
Homepage	www.eclipse.org/om2m	wiki.opendaylight.org/view/IoTDM:Main	developers.iotocean.org	os-iot.org	www.openmtc.org	github.com/ankraft/ACME-oneM2M-CSE
License	EPL 1.0	EPL 1.0	BSD 3-Clause	BSD 3-Clause	EPL 1.0	BSD 3-Clause
Offering	Platform	Platform	Platform, Dev Tools	Lightweight Dev API	Platform	Platform, Dev Tools
Binding	HTTP, CoAP	HTTP, CoAP	HTTP, CoAP, MQTT, WebSocket	HTTP	HTTP, MQTT	HTTP, MQTT
Format	XML, JSON	JSON	XML, JSON, CBOR	XML, JSON	JSON	JSON, CBOR
Language, Framework	Java / OSGi	Java	Node.js, Java	C++	Python	Python 3
Interworking	KNX, ZigBee, HUE, LoRa, SigFox, etc	ZigBee	AllJoyn, OCF, Nest, ZigBee, FIWARE, Jawbone	-	FIWARE, Cul868	AllJoyn, SDT

Support to developers and users

The community strives to ease access to the oneM2M world.
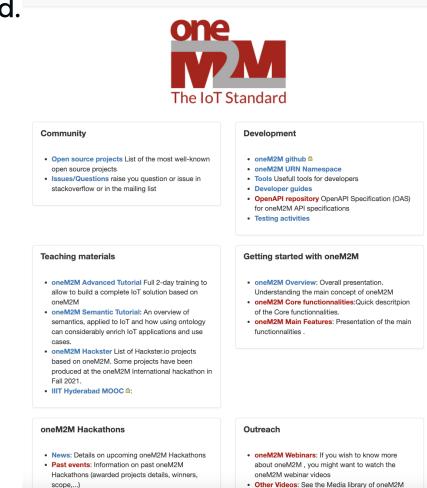It has developed abundant material to that effect:

- Developer Guides
- Video Tutorials
- Wiki

oneM2M also organizes events to support implementers and developers as well as to create awareness in the academic world:

- Tutorials & developer events
- Hackathons
- Interoperability events

This content is freely available at
the oneM2M developer resources page:

https://wiki.onem2m.org/index.php?title=Main_Page

Thank you for your attention

Join us F2F or online at the ETSI IoT Conference and meet the experts!
04-06 July 2023, Sophia Antipolis, France / Free of charge
https://www.etsi.org/events/2208-etsi-iot-conference-2023

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Any further questions?

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