oneM2M Value and Status

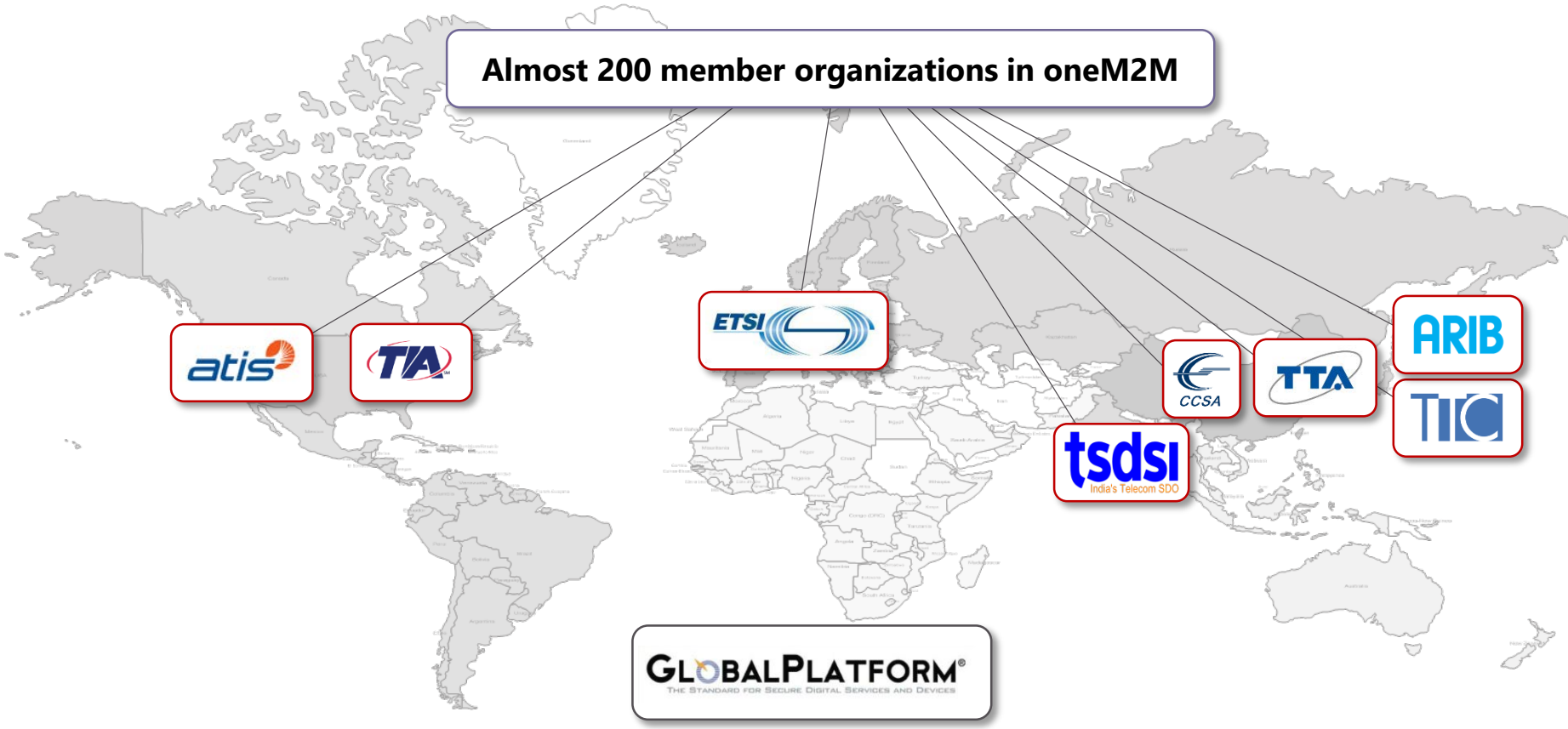
Roland Hechwartner, oneM2M TP Chair

ETSI IoT Week

October 22, 2019

oneM2M Partnership Project

www.oneM2M.org **All documents and specifications are publically available**



founded[1] July, 24th 2012
TP#1: Sep 24th-29th 2012

[1] Partnership Agreement V 2.0 (Approved March 2013)

Join forces
=> reduce fragmentation

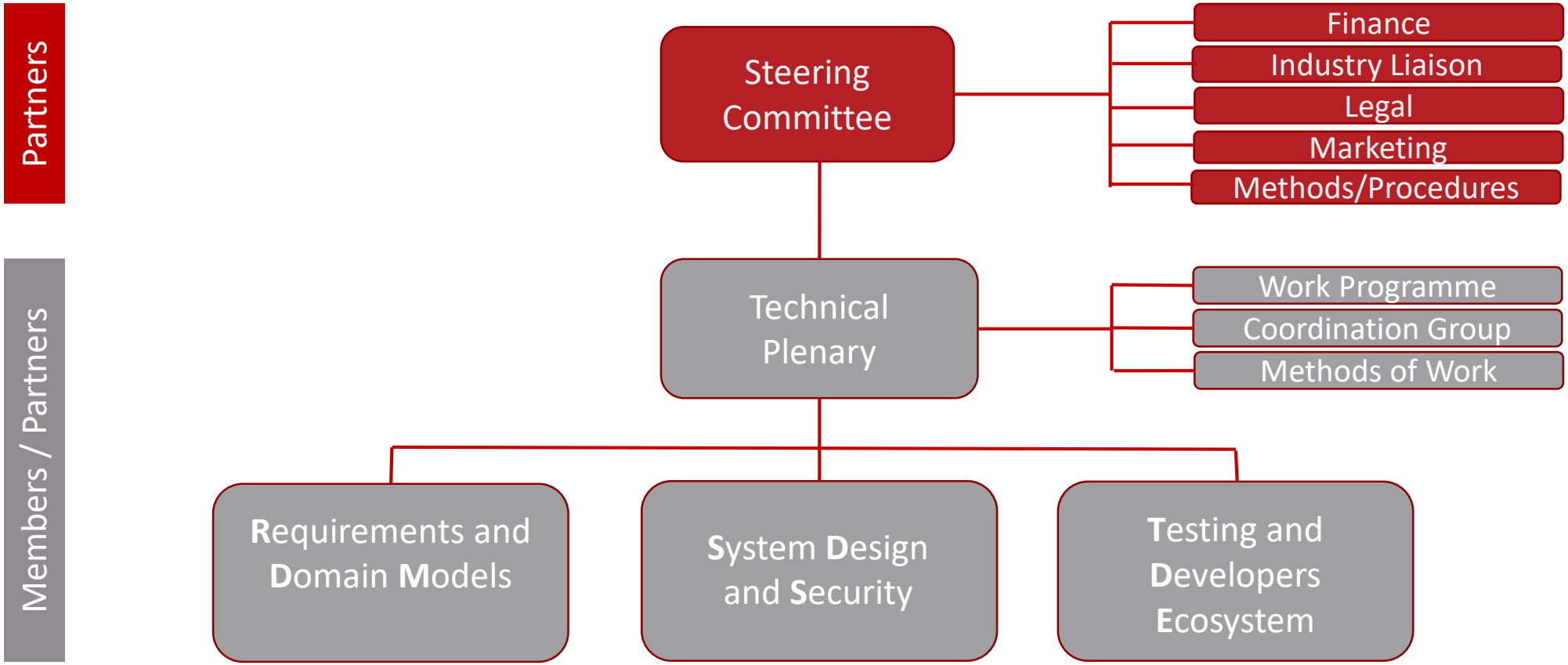
Partner transpositions
⇒ De jure Standard
⇒ focus on interoperability
⇒ *"collaborate on standard - compete in implementation"*

=> Reuse *e.g.*
broadband forum oma Open Mobile Alliance HGI

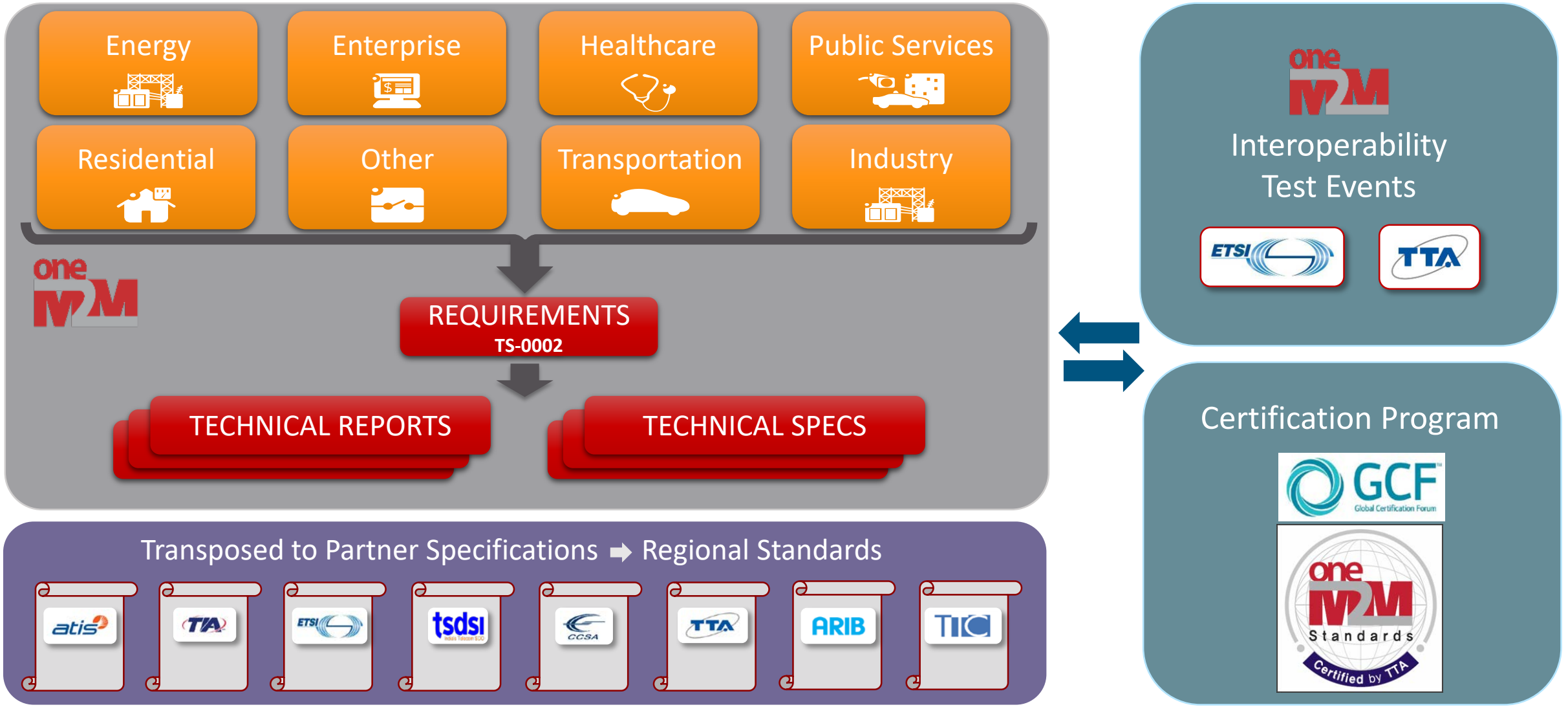
ITU Release 2 transposition
ITU-T SG20 Y.4500.x

oneM2M New Structure

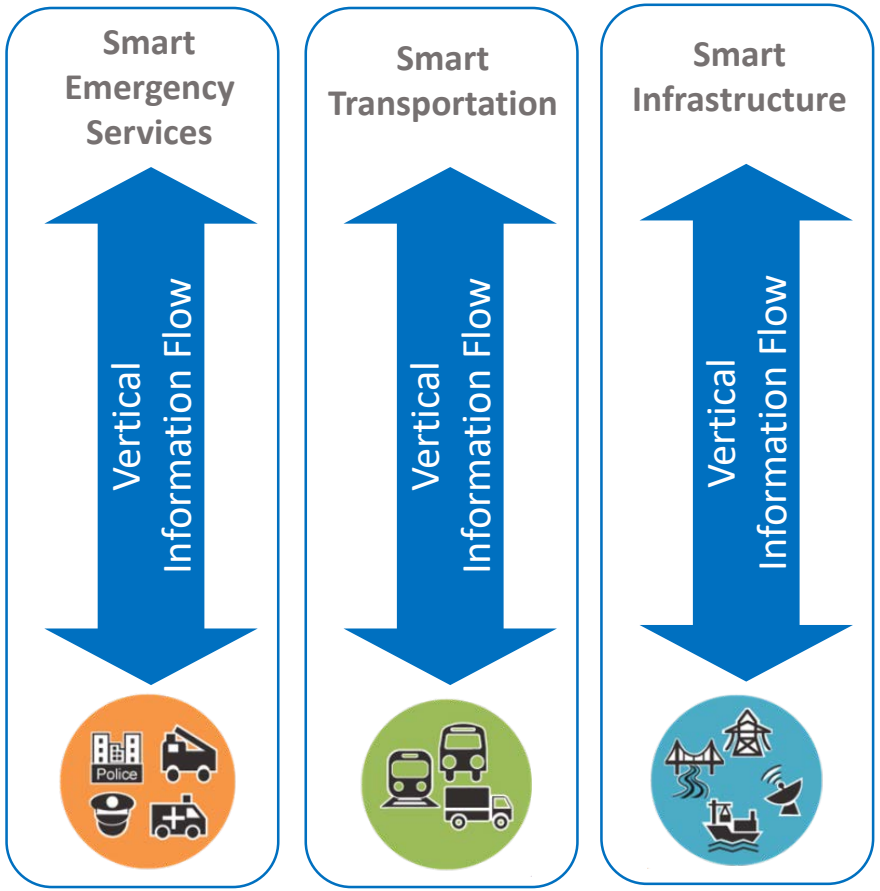
http://onem2m.org/about-onem2m/organisation-and-structure

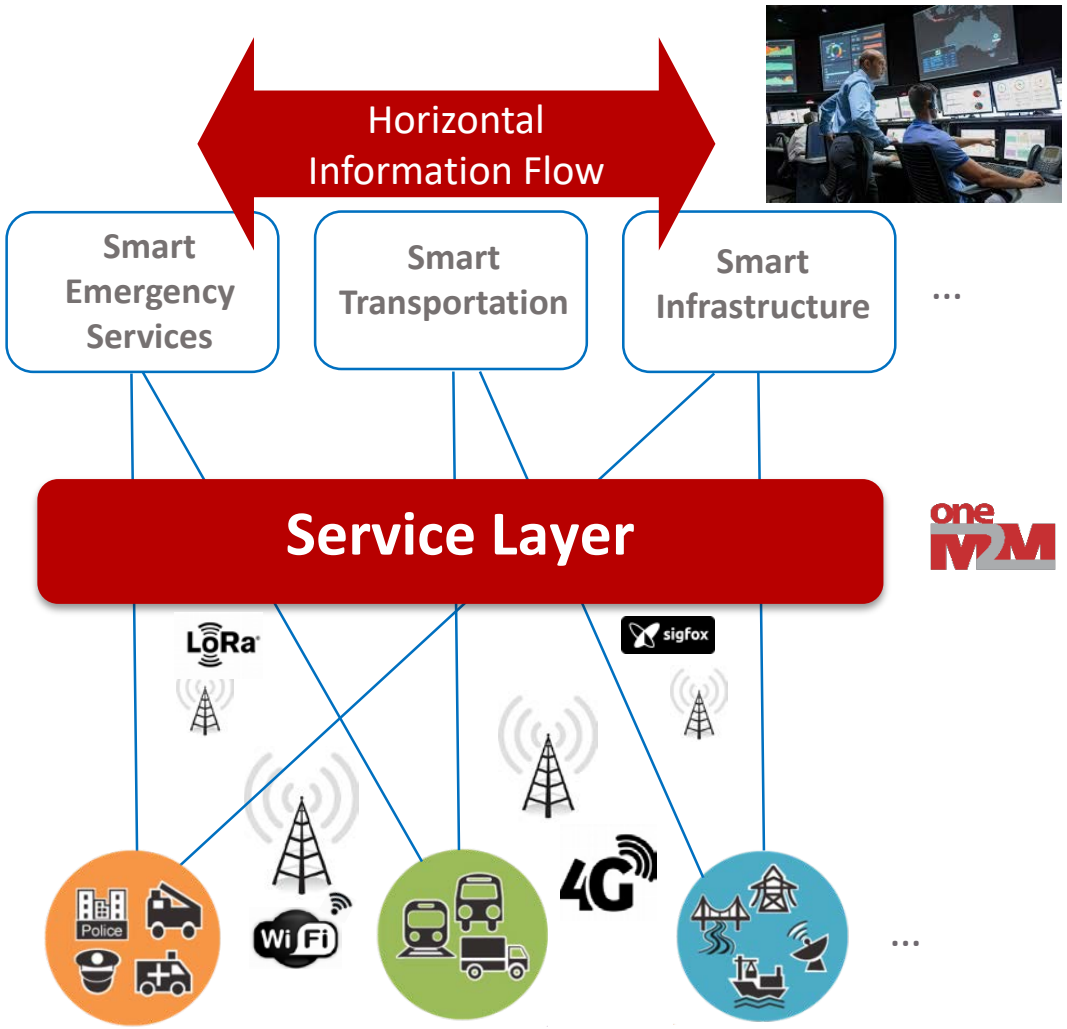


oneM2M Work Process
Standard – Testing – Certification Program

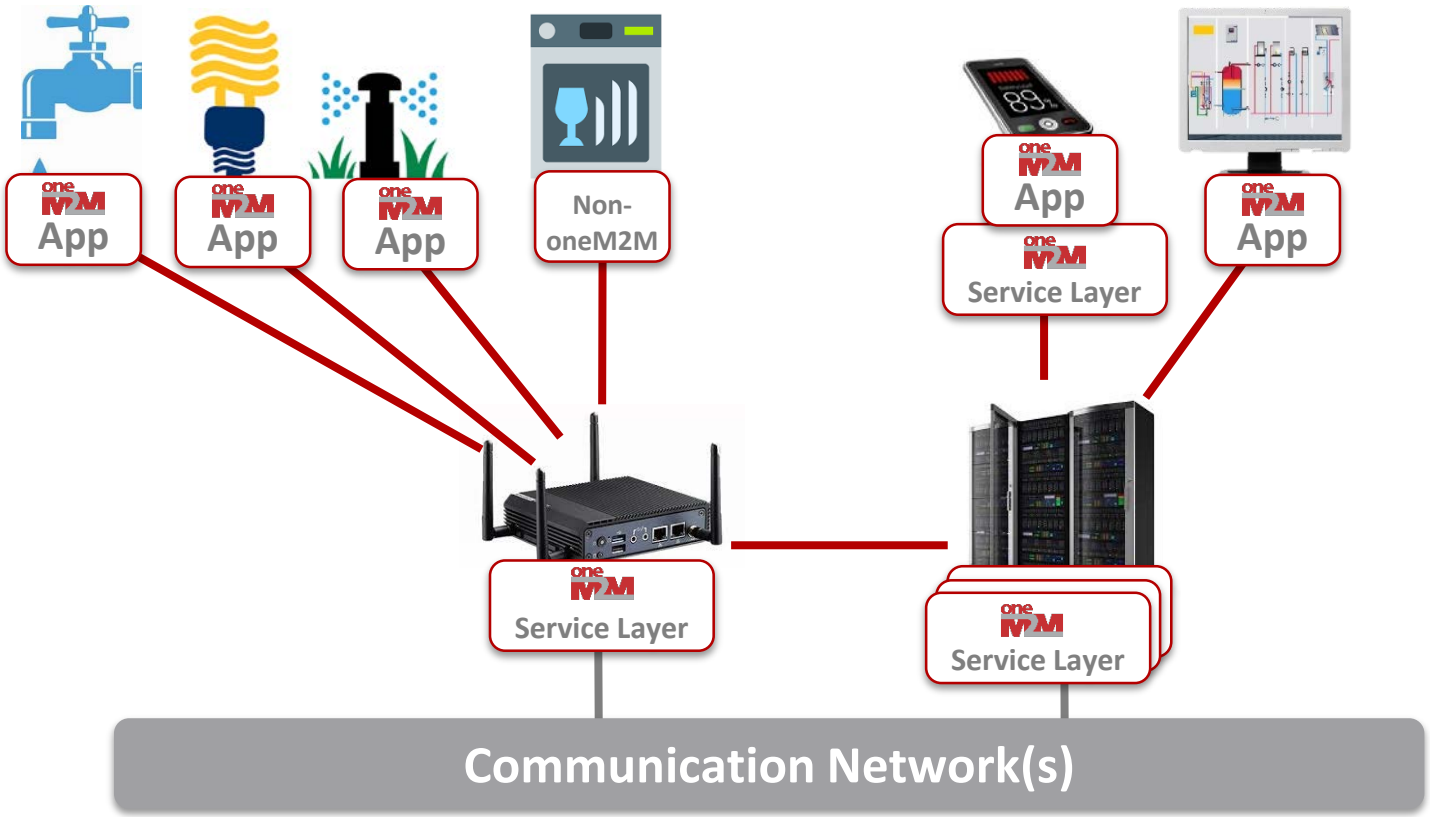


oneM2M Breaks Down the Silos





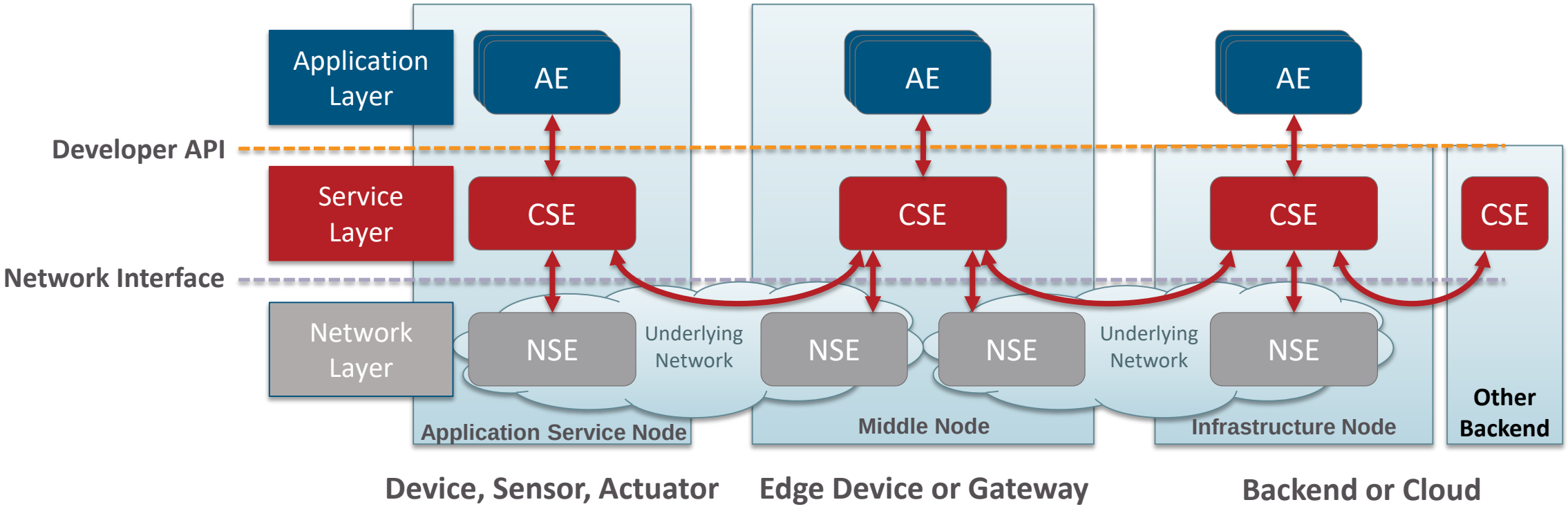
oneM2M is an End-to-End IoT Technology



Flexible Deployment Options

- IoT Cloud / Enterprise
- IoT Gateway
- IoT Edge Device
- IoT User Devices

oneM2M Architecture



Application Entity (AE)	Provides application logic for the end-to-end M2M solutions
Common Services Entity (CSE)	Provides the set of "service functions" that are common to the M2M environments
Network Services Entity (NSE)	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

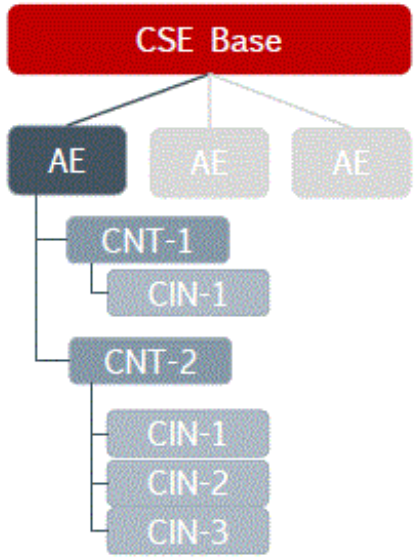
oneM2M is Resource Oriented

Based on REST architecture style (representational state transfer)

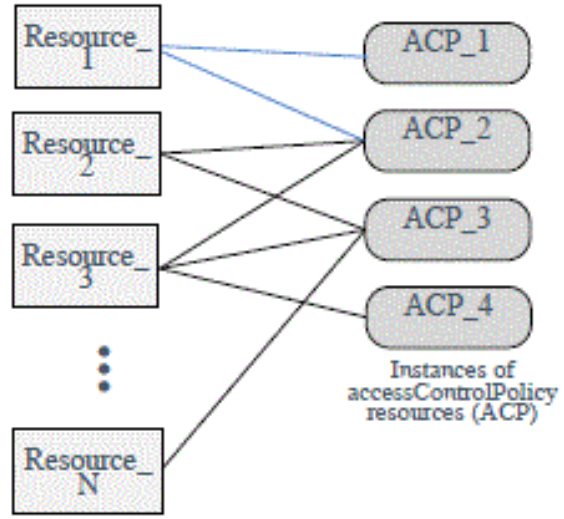
- Access to resources by using an URI http://www.example.com/wiki/rest
- Representation format: XML, JSON, BSON, …
- Dependencies, hierarchy is represented by link in resource representation

Basic Resources

- Common Service Entity *(CSE)*
- Container *(CNT)*
- Application Entity *(AE)*
- Container *(CNT)*
- Content Instance *(CIN)*
- ….



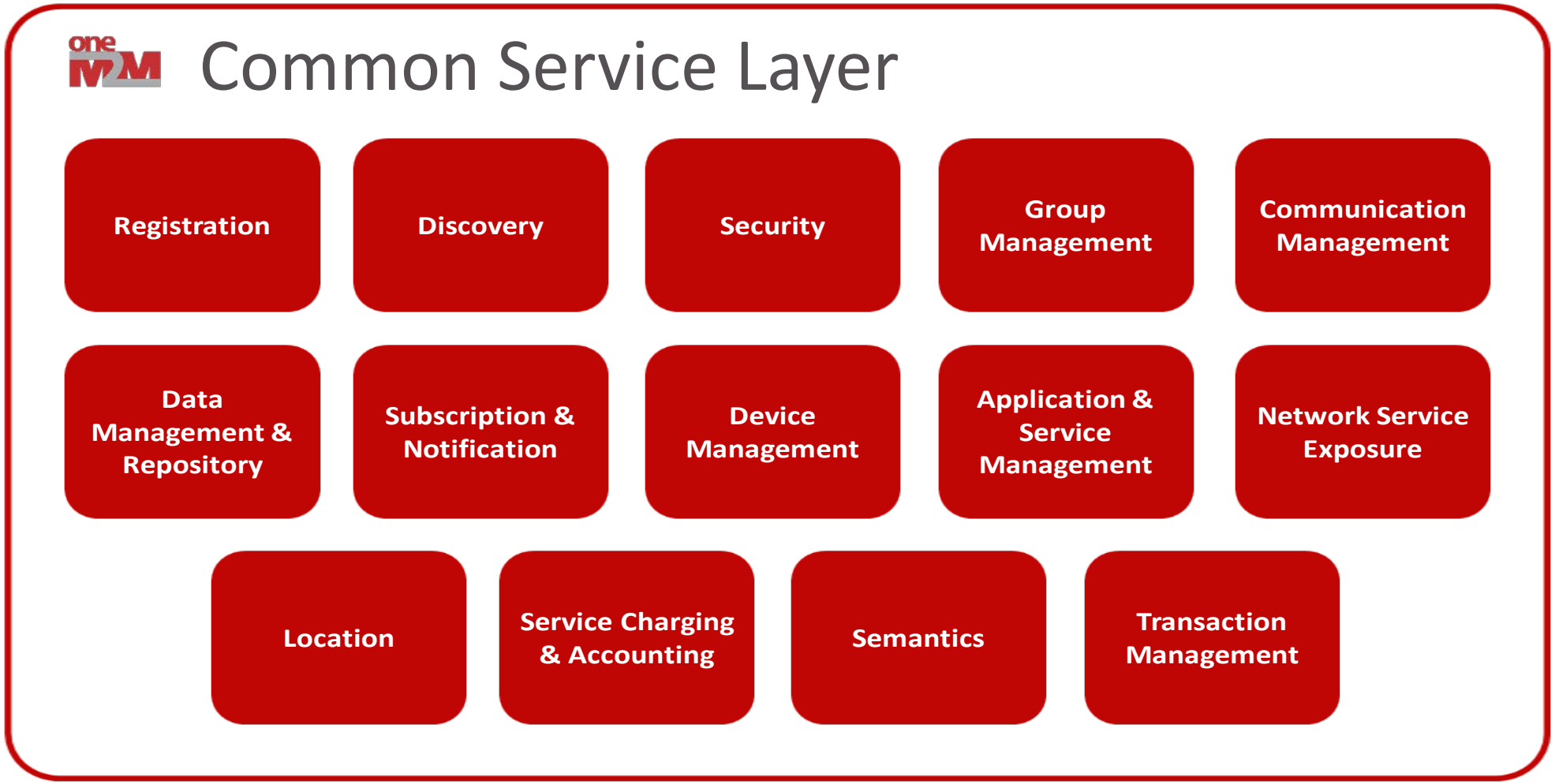
Resource Access Control Policy (ACP)



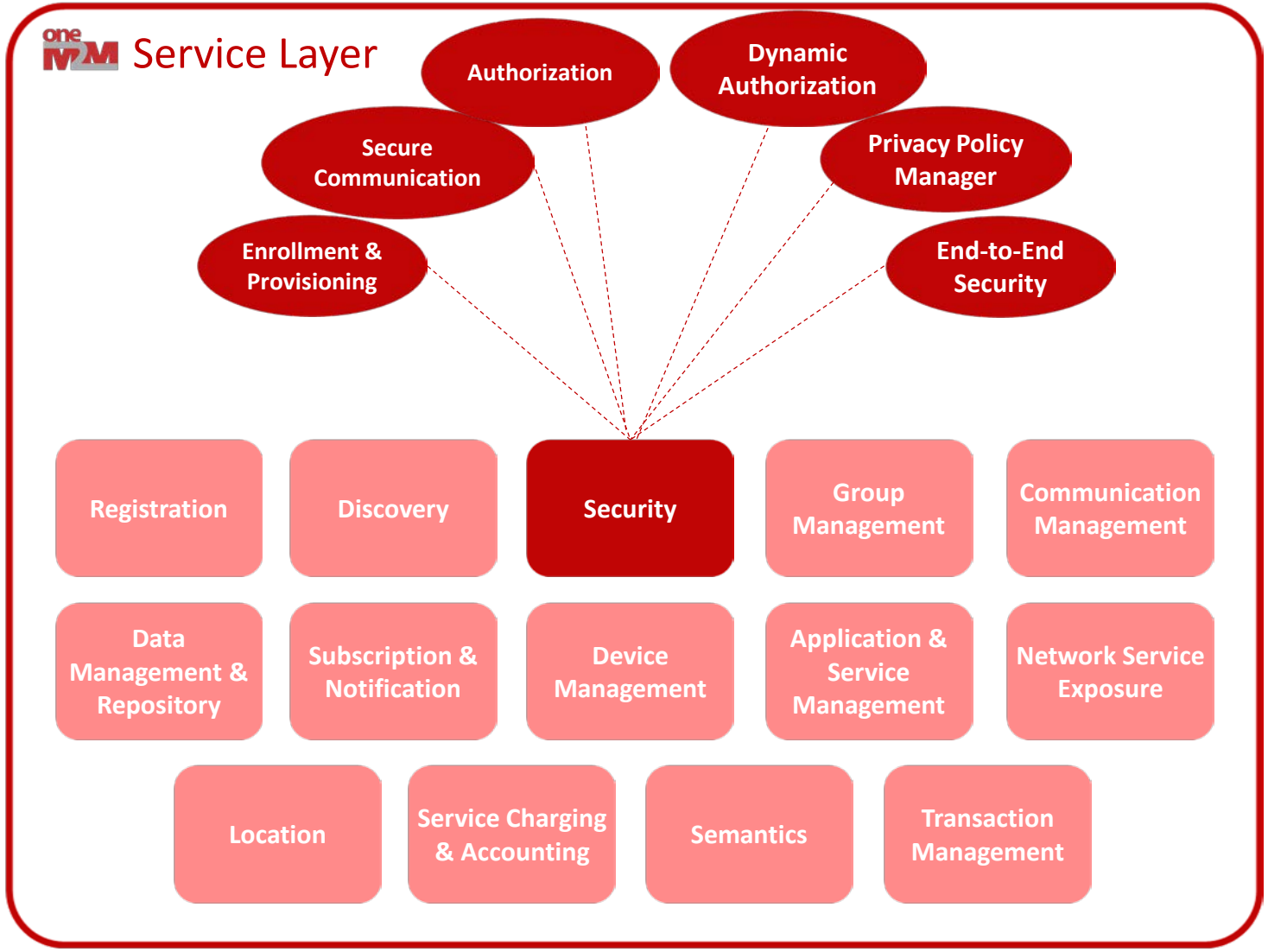
Source: oneM2M TS-0003

onem2m.org, TS-0001 Functional Architecture

oneM2M functions provided to applications



oneM2M Security Framework

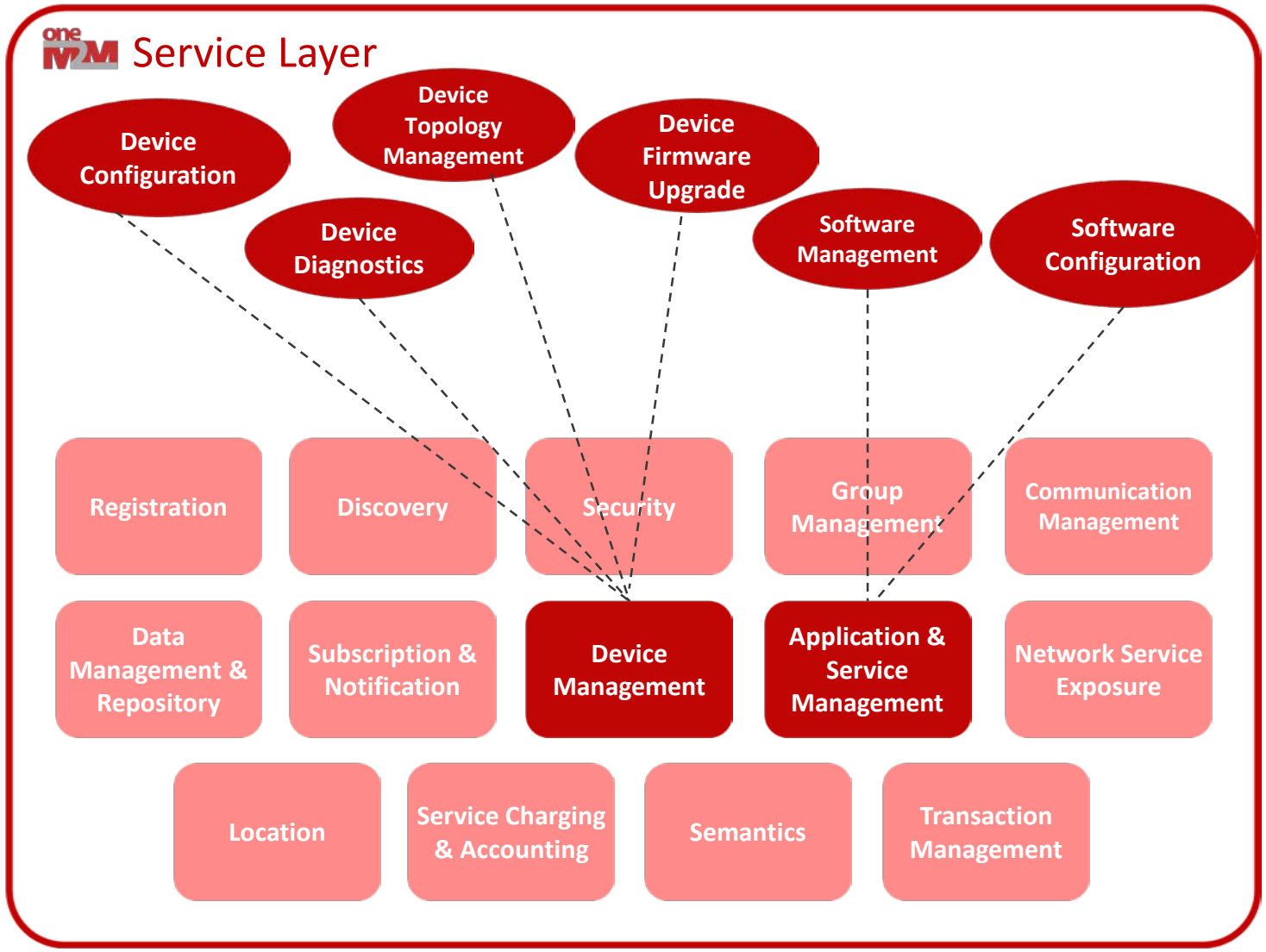


- oneM2M complements existing proven security technologies to address IoT security challenges
- oneM2M provides a common set of security capabilities to secure IoT devices and applications and prevent/ mitigate attacks
  - Enrollment (on-boarding, provisioning and configuration phases)
  - Remote Security Provisioning Frameworks
  - Secure single-hop and multi-hop service layer communication
  - Authorization to access service layer data
  - Privacy framework to guard personal information
- oneM2M exposes an abstracted set of security related APIs to help simplify security for IoT devices and applications

onem2m.org. TS-0003 Security Solutions, TS-0022 Field Device Configuration, TS-0032 MAF and MEF Interface Specification

Source: Dale Seed, oneM2M Overview 2019

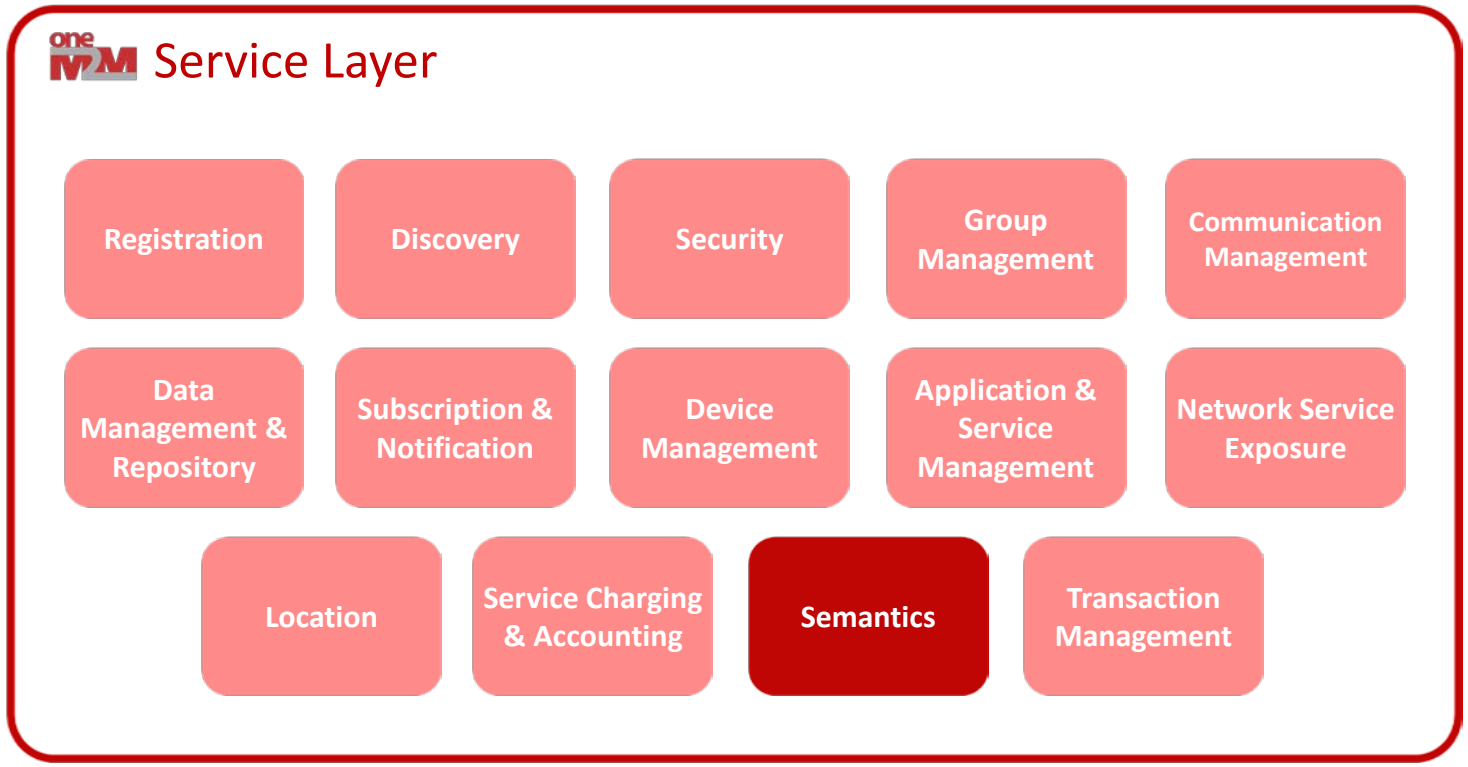
oneM2M Device Management Framework



- oneM2M provides a common set of management capabilities to manage IoT devices, applications and the service layer
- Device Management
  - Device Configuration (e.g. enable/ disable capabilities, provisioning)
  - Device Diagnostics and Monitoring (e.g. memory, battery, event logs, reboot)
  - Device Firmware Management
  - Device Topology Management (e.g. Area Network topology & characteristics)
- Application & Service Layer Management
  - Policy Configuration
  - Software Management (e.g. download/ install/ activation)
- Interwork to existing device management technologies
  - e.g. OMA DM, OMA LWM2M, BBF, …
  - can manage both oneM2M and non-oneM2M based devices

Source: Dale Seed, oneM2M Overview 2019

oneM2M Semantic Functionalities

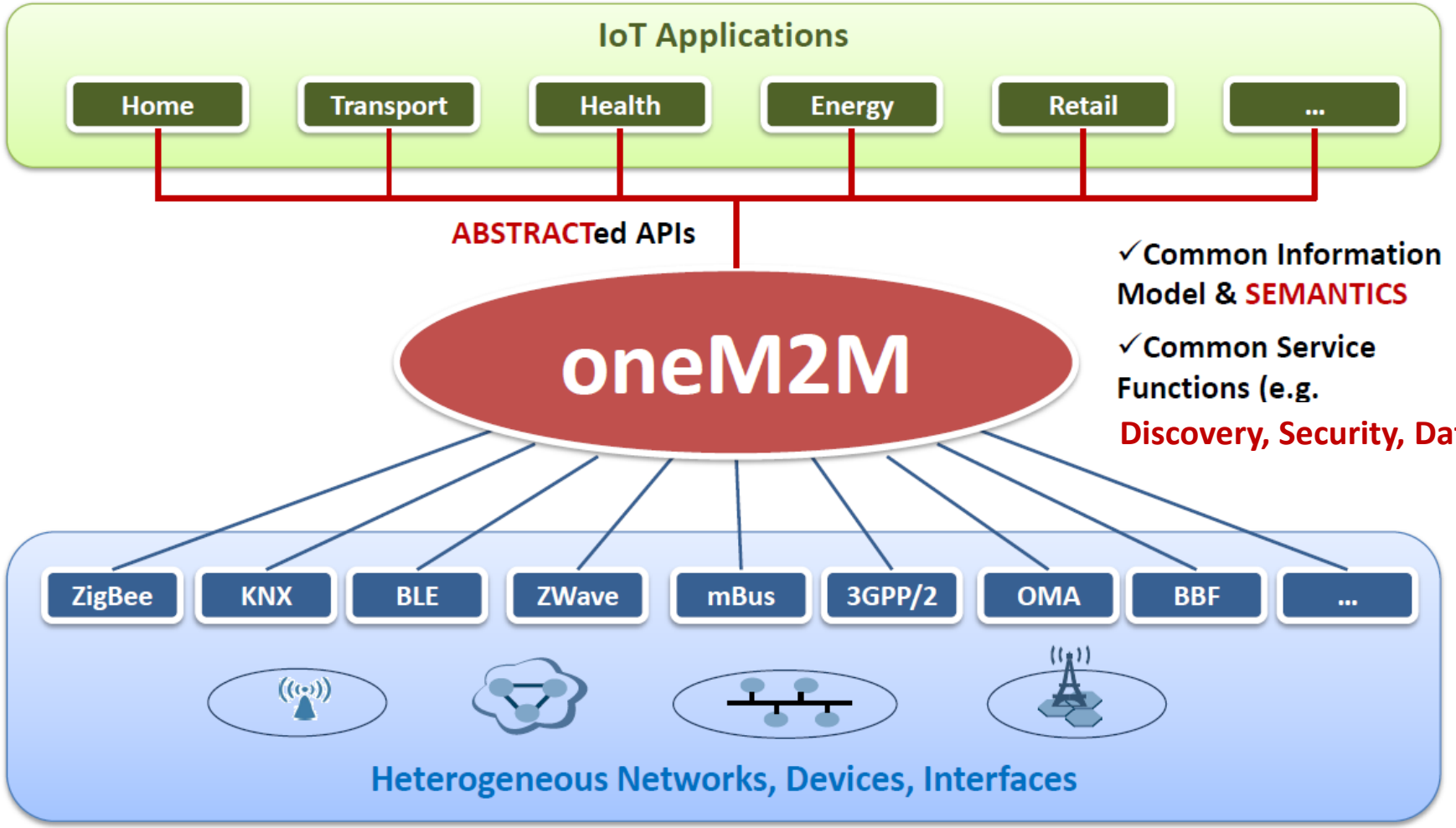


- **Semantic enables Applications to directly interact with real-world entities**, through their virtual annotated representation
- Semantic support for **interworking between various applications**
  - TS-0030-Ontology based Interworking
- Functionalities
  - Semantic Queries (e.g. Discovery)
  - Support for Semantic Mash-ups
- Required Foundations
  - Semantic Annotation
  - Ontology
  - Semantic Reasoning

- Resources (TS-0034)
  - semanticDescriptor: store a semantic description of a resource
  - semanticFanOutPoint: a virtual resource for semantic discovery or query
  - Resources for mashup operation, ontology repository, queries, validation, Access Control Ontology

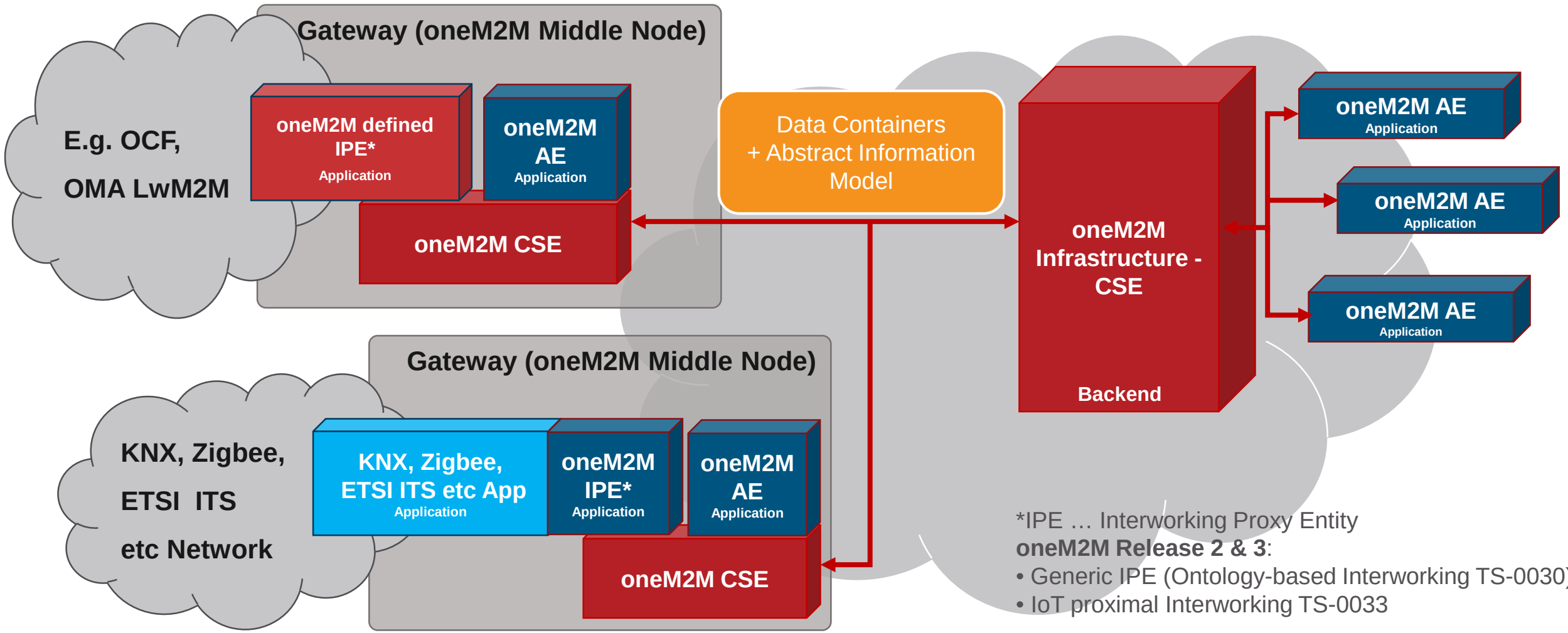
Source: Onem2m.org, TS-0012 Base ontology

oneM2M Interworking Framework



Source: oneM2M MAS Webinar

oneM2M Interworking towards Domain-specific Technologies



*IPE … Interworking Proxy Entity

oneM2M Release 2 & 3:

- Generic IPE (Ontology-based Interworking TS-0030)
- IoT proximal Interworking TS-0033

Based on a slide provided by: Dr. Josef J. Blanz . Industry Day Bangalore, September 20th 2017

oneM2M Specifications & Release 4

Current Specifications

- **Requirements**
- **Functional Architecture**
- **Security**
- **Service Layer Protocols**
- **Protocol Bindings**
  e.g. HTTP, CoAP, MQTT, WebSockets
- **Base Ontology & Semantics**
- **Remote Management Enablement**
  e.g. for OMA, BBF
- **Vertical Domain Support**
  e.g. Smart Home;
  Home Appliances Information Model SDT*3.0
- **Interworking Support**
  e.g. LwM2M, OCF, 3GPP, OSGi
- **Tests & Certifications**

Release 4 - More Smart City & Vertical Domain Support

- **Smart City,** e.g. Ontologies for Smart City Services
- **Public Warning Service Enabling**
- **Vehicular Domain Enabling,** incl. 3GPP V2X interworking
- **Industrial Domain Enabling**, e.g. OPC-UA model mapping
- **Railway Domain Enabling**
- **Interworking** e.g. ZigBee, Modbus

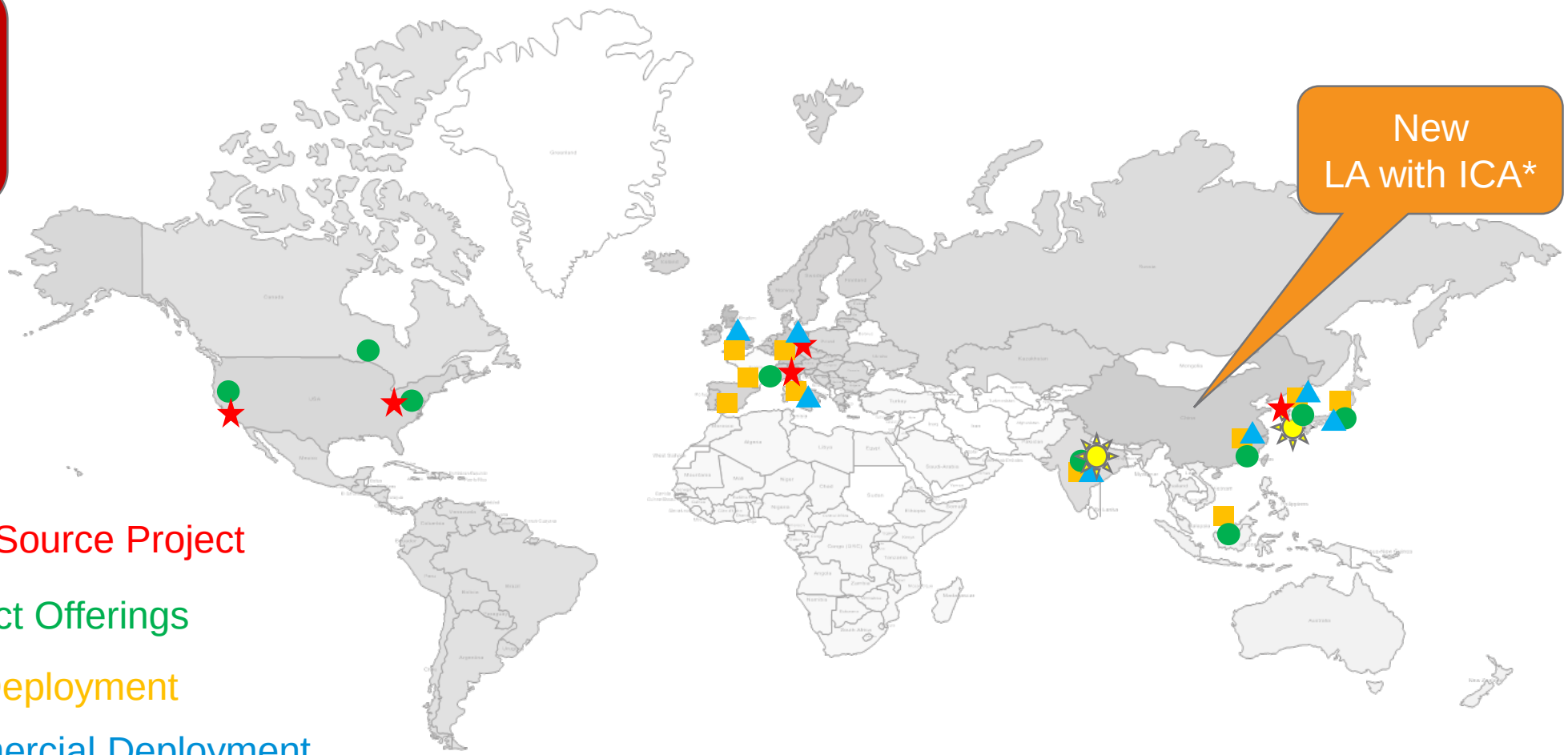
Release 4 - Feature Enhancement & Optimization

- **SDT*4.0 & Data Model extension**, e.g. City, Railway
- **Semantic Enhancement**, e.g. reasoning, ontology mapping
- **Security Enhancement**, e.g. user/data privacy
- **Edge & Fog Computing support**, e.g. service provisioning, service pooling
- **System Optimizations**, e.g. lightweight services, platform discovery, rule engine, users, …
- **3GPP Interworking**, e.g. session QoS, V2X, charging..
- **Testing Specifications & Developer Guides**

* SDT – Smart Device Template: Technology-independent methodology to specify functionalities and devices

oneM2M Adoption is Global

oneM2M adoption expanding



- oneM2M Open Source Project
- oneM2M Product Offerings
- oneM2M Trial Deployment
- oneM2M Commercial Deployment
- Use of oneM2M recommended (Smart Cities)

*ICA .. IoT Connectivity Alliance

oneM2M Implementation and Deployment Base

A vibrant and healthy oneM2M ecosystem continues to build

Industry-driven Open source implementations

LAAS-CNRS, OM2M Connecting things, Fraunhofer FOKUS, open mtc, KETI, OCEAN, CISCO, OPEN DAYLIGHT, IotDM, atis, OS-IoT

Examples of Commercial implementations, Prototypes, Trials

LG, सेंटर फॉर डेवलपमेंट ऑफ टेलीमैटिक्स, Centre for Development of Telematics, SIERRA WIRELESS, INTERDIGITAL, QUALCOMM, Deutsche Telekom, kt, HUAWEI, SK telecom, sensinov, MODACOM, LG U+, Hewlett Packard Enterprise, orange, NEC, iREX, SAMSUNG, SAMSUNG SDS, DASAN, HANDYSOFT, GRIDNET, JOHN DEERE, NTT, PILOT THINGS, HEALTHCONNECT, KEPCO, ntels, TELECOM ITALIA

oneM2M.org lists
65
Deployments
List of deployments

Certification Test Houses and Test Tool Vendors

SPIRENT Inspired innovation, TTA, DEKRA, Innowireless, KETI, Dt&C

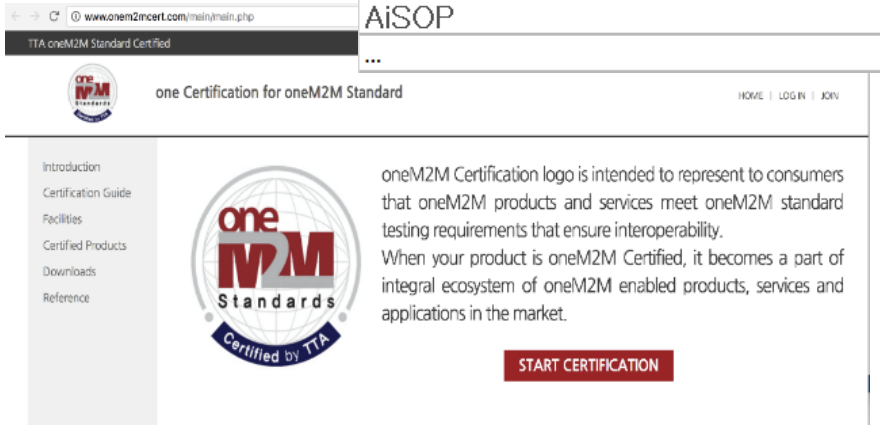
Regular Interop Events (6 Held from 2015-2018)

Based on slides by: Dale Seed, oneM2M Overview 2019

oneM2M Certified Products

Telecom Indonesia recently certified

PRODUCT Name	PRODUCT VENDOR	PRODUCT TYPE	LISTING DATE
AiSOP(aThings, 1.4.0)	irexnet	End product (IN-CSE)	8/30/2019
rino IoT(ESE-RINO-IOT)	ESE Co., Ltd.	End product (IN-CSE)	8/30/2019
Government Internet of things Management...	DKI Technology Co., Ltd.	End product (IN-CSE)	8/30/2019
ANTARES	PT Telekomunikasi Indonesia	End product (IN-CSE)	3/28/2019
Wireless Sensor Data Acquisition Device	KEPCO KDN	End product (ADN-AE)	3/28/2019
Every.Things.IoT	Awasoft Inc.	End product (IN-CSE)	2/14/2019
PAS [Platform for device Administration ...	ELSYS Co., Ltd.	End product(IN-CSE)	2/14/2019
UANGEL IoT Platform	UANGEL CORPORATION,	End product(IN-CSE)	6/29/2018
Mobius	KETI	Software Component	5/18/2018
Chordant™ Platform	Chordant™, an InterDigital business	End product(IN-CSE)	2/21/2018
SysOne	C3SYSTEMS	End product(IN-CSE)	12/7/2017
Universal IoT Gateway	Moda Inc.	End product(MN-CSE)	12/7/2017
HuRa IoT Platform	HERIT	End product(IN-CSE)	12/7/2017
GWP	IREXNET	End product(IN-CSE)	9/7/2017
AiSOP	IREXNET	End product(IN-CSE)	9/7/2017
...	...	...	...



oneM2M Certification from TTA http://onem2mcert.com

Source: Dale Seed, oneM2M Industry Day hosted by TSDSI. 2019

Takeaways

oneM2M

- is a global open standard, not controlled by a single private company
- specifies a common set of horizontal IoT services
  - architecture, common services functions, information model
- enables data interoperability
  - Information model, semantics, ontology based interoperability
- interworks with existing IoT technologies
- has interoperability testing and a certification program
- standardized APIs simplify the life for IoT stakeholders
  - minimize development, deployment & maintenance costs
- is a mature and a commercially deployed technology

Work progressing on oneM2M release 4
Expected: Q1 2021

Thank you!

Backup

- Publicly Accessible Links
- oneM2M Feature Summary by Release

oneM2M Feature Summary by Release

Release 1

- 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

+ 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 Mome Area Information Model
+ oneM2M App-ID Registry
+ oneM2M Interworking
  - LWM2M
  - Alljoyn
  - 3GPP Triggering

Release 3

+ 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

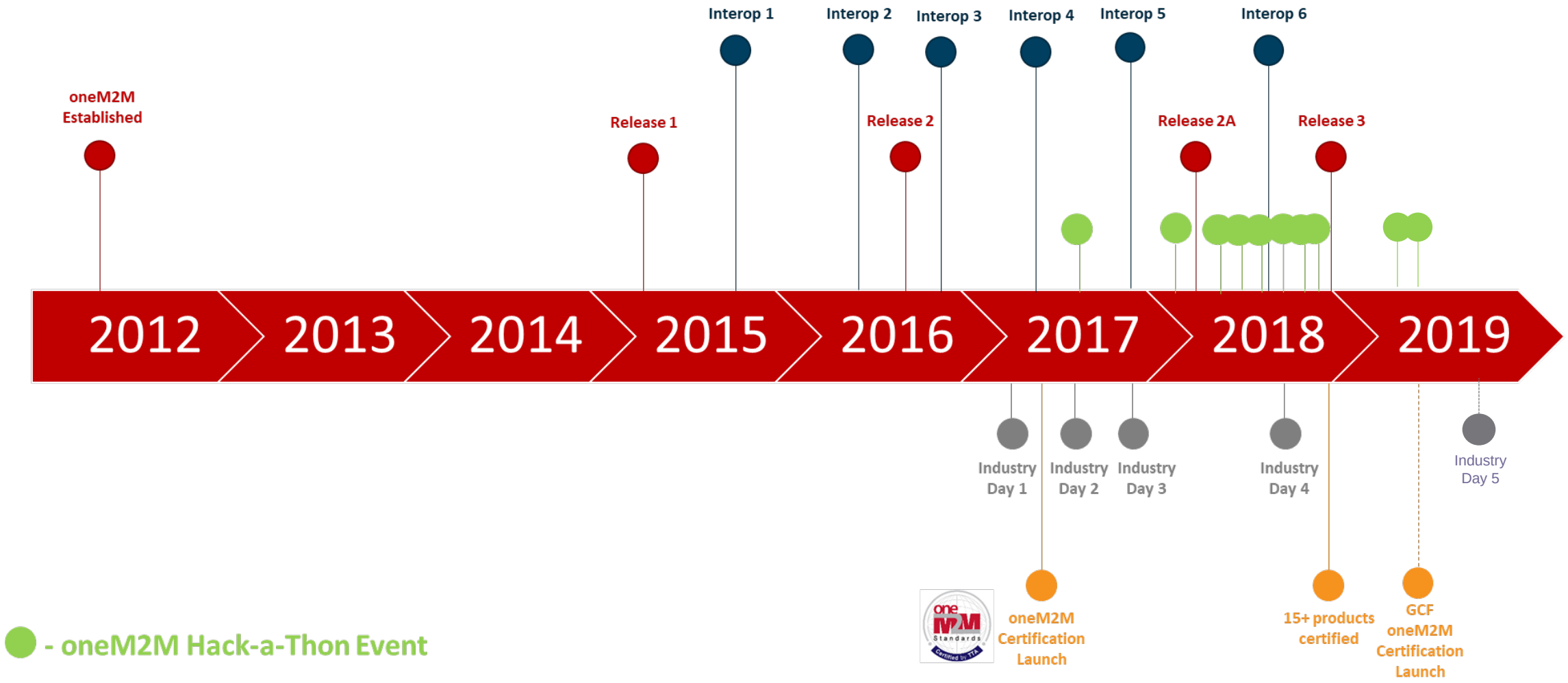
Release 4

(planned)

+ Fog/Edge Computing
  - Service Provisioning
  - Service Pooling, etc.
+ 3GPP Interworking
  - Session QoS
  - V2X
  - NIDD Enhancements
  - Charging
+ Vehicular Centric Features
  - Mobility
  - low latency,..
+ Semantic reasoning & Ontology Mapping
+ Service / User Subscription
+ Security Enhancements
  - User/Data Privacy, etc.
+ ModBus Interworking
+ W3C WoT Interworking
+ SDT 4.0 and the Information Models for Multiple Domains
+ Streamlining oneM2M protocol
+ oneM2M Conformance Tests

2015 2016 2018 2020/21

oneM2M Timeline



Publicly Accessible Links

Web Site
http://www.oneM2M.org

Developer Guides
http://www.onem2m.org/developer-guides

Technical Questions
http://www.onem2m.org/technical/technical-questions

Published Specifications
http://www.onem2m.org/technical/published-documents

Webinars
http://www.onem2m.org/technical/webinars

YouTube Channel
https://www.youtube.com/c/onem2morg

Events
http://www.onem2m.org/news-events/events

Certified Products
http://www.onem2mcert.com/sub/sub04_01.php

Smart Device Template
SDT 3.0 is available under Apache 2 License:
https://git.onem2m.org/MAS/SDT

TS-0023 : SDT based Information Model and Mapping for Vertical Industries
The latest published version of TS-0023 is available:
http://www.onem2m.org/technical/published-drafts

Tools
A utility for converting SDT to other formats is the SDTTool:
https://github.com/Homegateway/SDTTool

Twitter
@oneM2M

Stackoverflow
https://stackoverflow.com/questions/tagged/onem2m