oneM2M Interworking Architecture

Service Layer
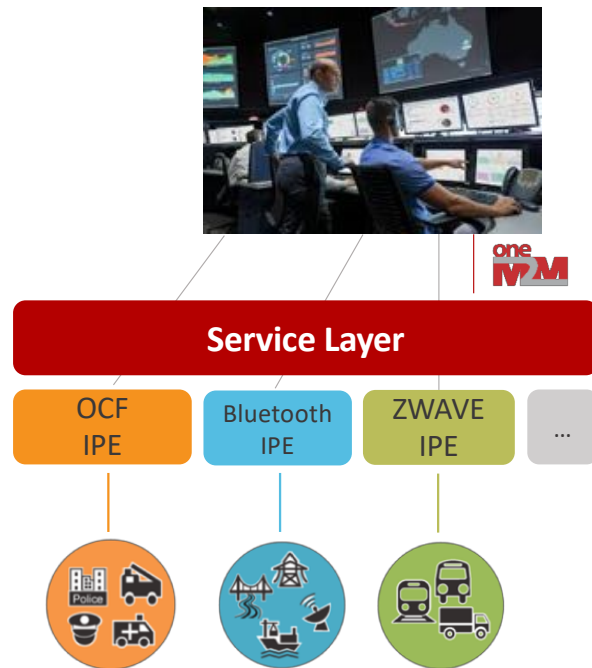
OCF IPE

- oneM2M defines an Interworking Proxy Entity (IPE) for interworking different IoT device technologies (e.g. OCF, …) to the oneM2M service layer
  - IPE functions as an adapter that translates non-oneM2M protocols and data models to oneM2M
    - E.g. OCF ←→ oneM2M translation

oneM2M Interworking Architecture

- oneM2M interworking framework can simultaneously interwork different IoT device technologies with one another
  - E.g. OCF, ZWAVE, Bluetooth, ZigBee, …
- 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.

oneM2M Interworking Example #1

oneM2M Interworking Example #1

oneM2M Interworking Example #1

oneM2M Interworking Example #1

oneM2M Interworking Example #1

oneM2M Interworking Example #1

oneM2M Response to switch light on

Service Layer

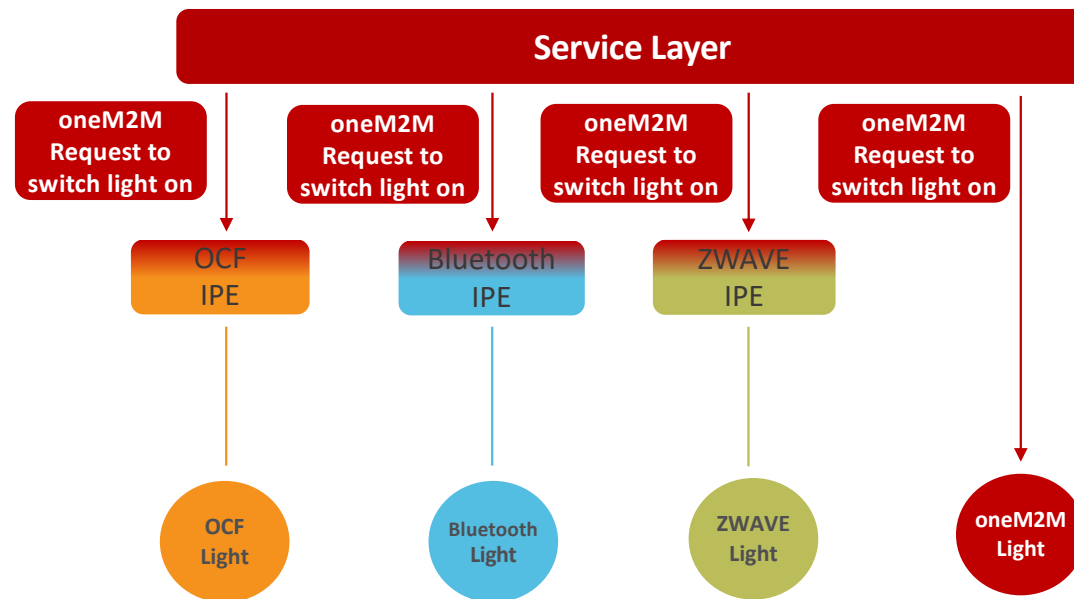| OCF IPE	Bluetooth IPE	ZWAVE IPE

OCF Light

Bluetooth Light

ZWAVE Light

oneM2M Light

oneM2M Interworking Example #2

oneM2M Interworking Example #2

Service Layer

oneM2M Request to switch lights on

OCF Light Switch

OCF IPE

Bluetooth IPE

ZWAVE IPE

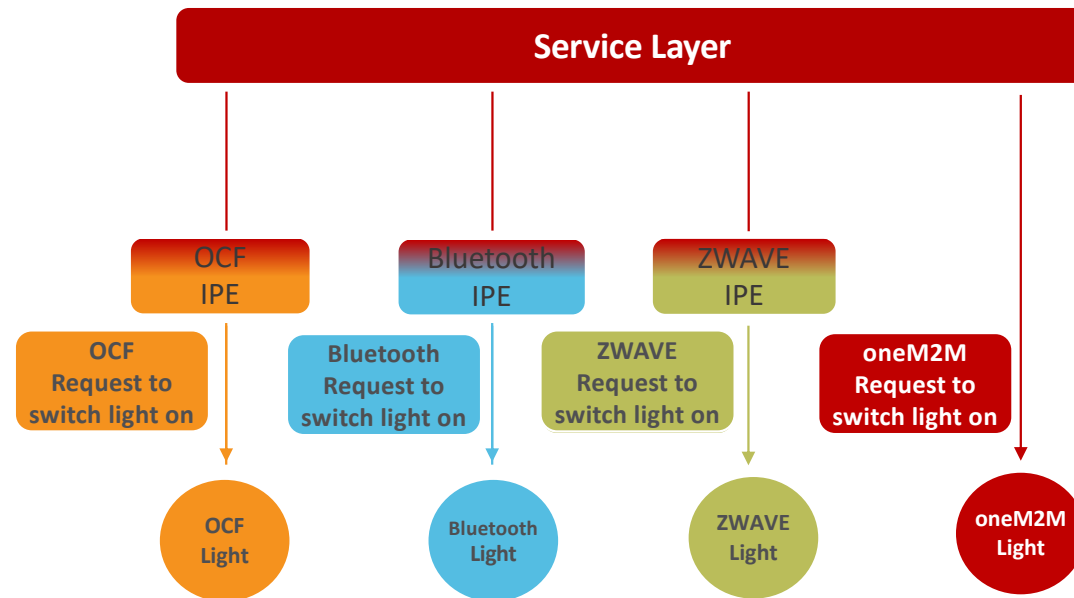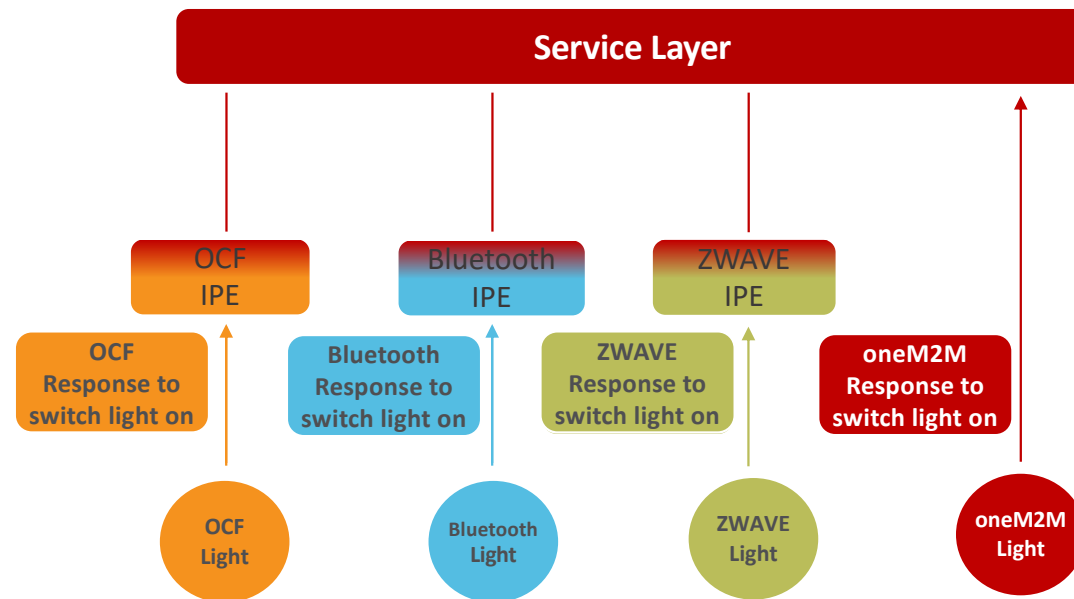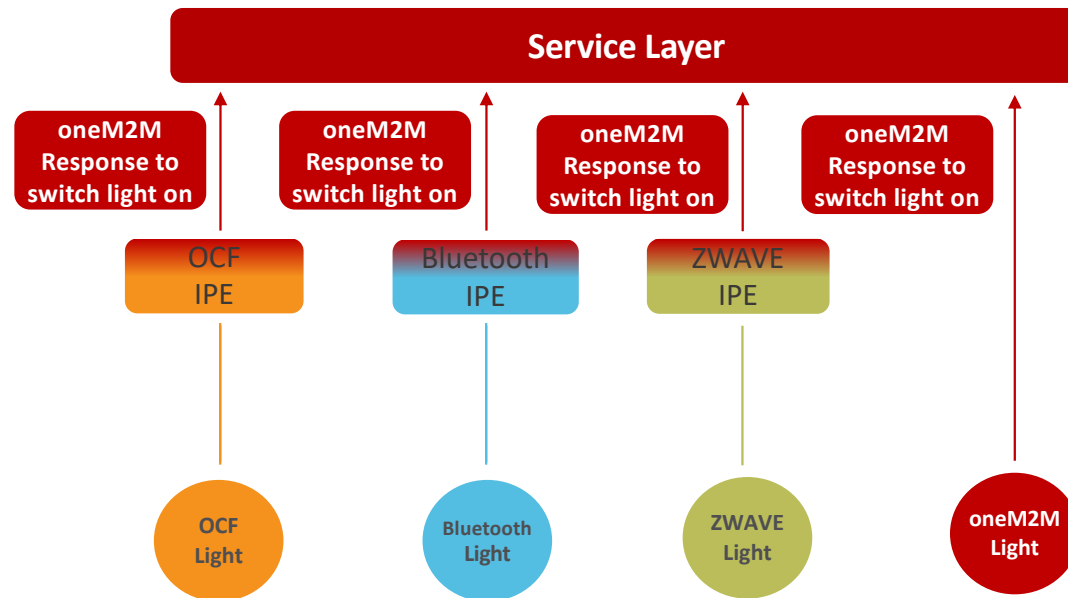OCF Light

Bluetooth Light

ZWAVE Light

oneM2M Light

oneM2M Interworking Example #2

oneM2M Interworking Example #2

oneM2M Interworking Example #2

oneM2M Interworking Example #2

oneM2M Interworking Example #2

Service Layer

oneM2M Response to switch light on

OCF Light Switch
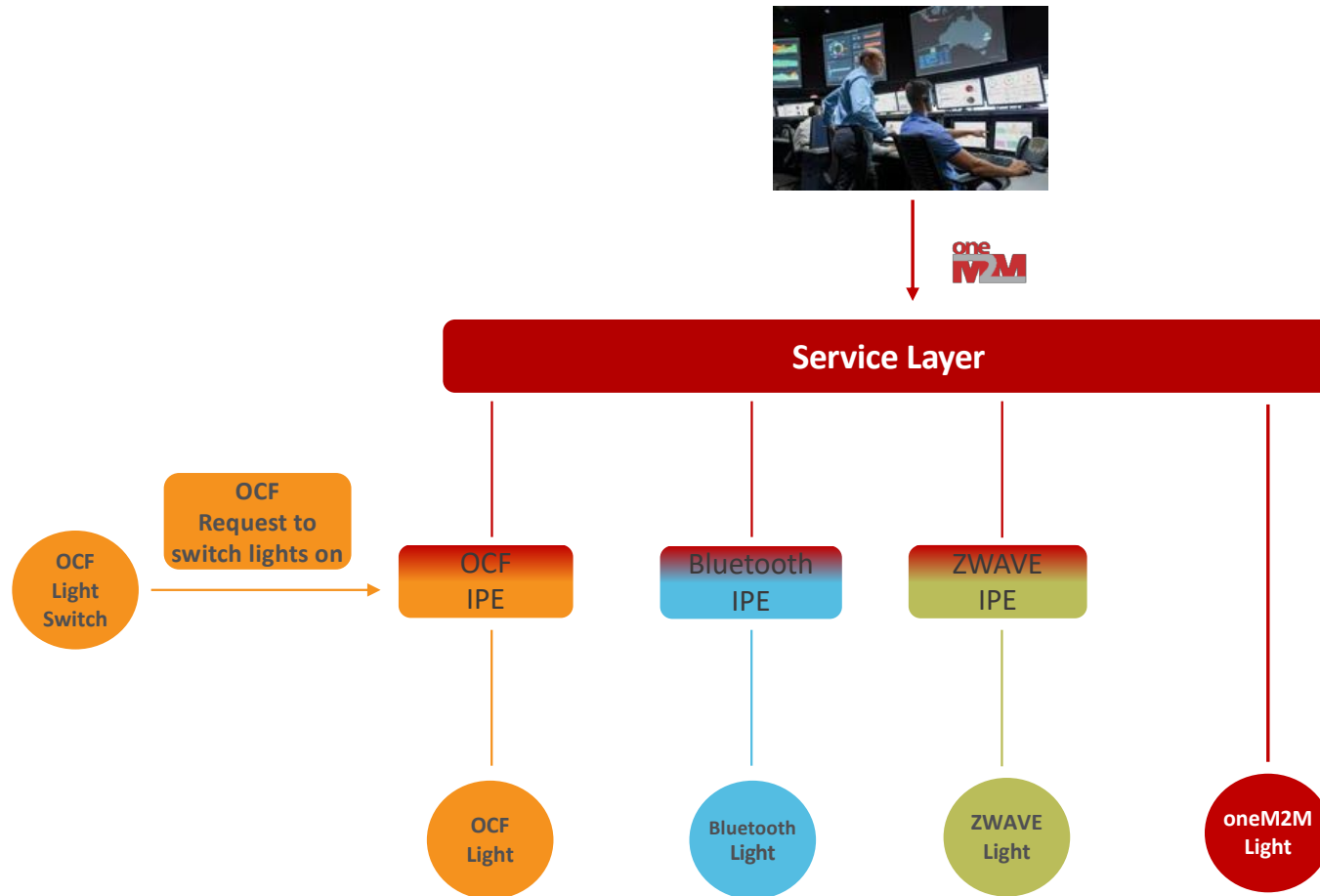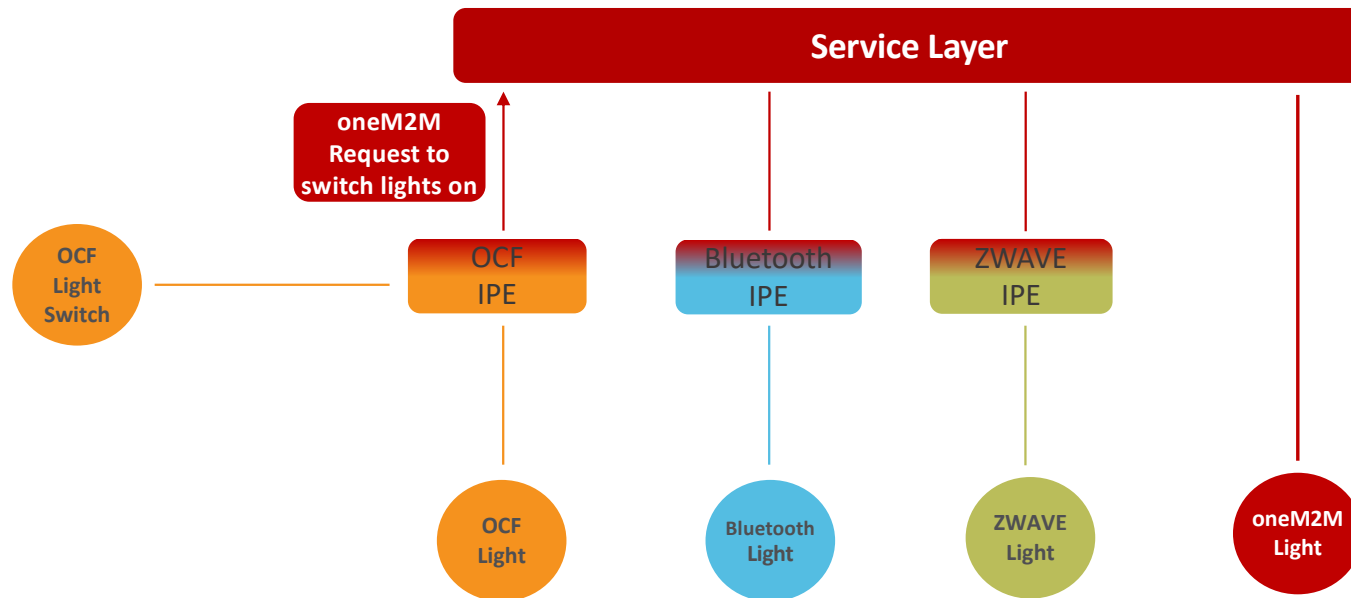
OCF IPE

Bluetooth IPE

ZWAVE IPE

OCF Light

Bluetooth Light

ZWAVE Light

oneM2M Light
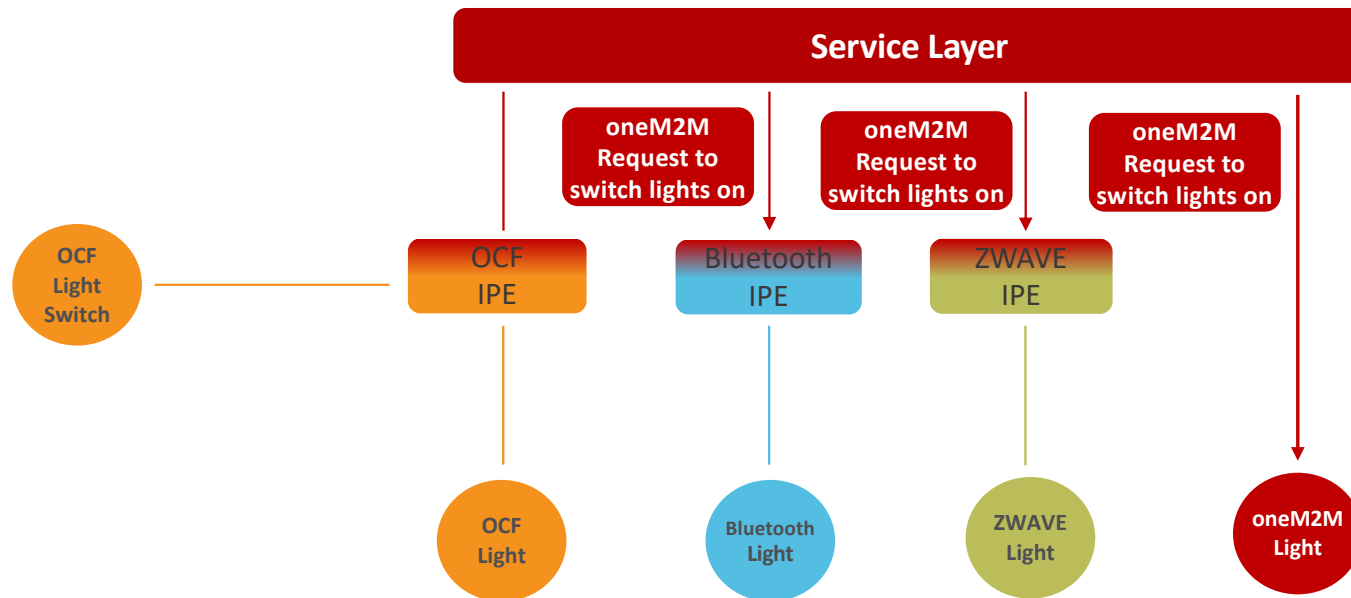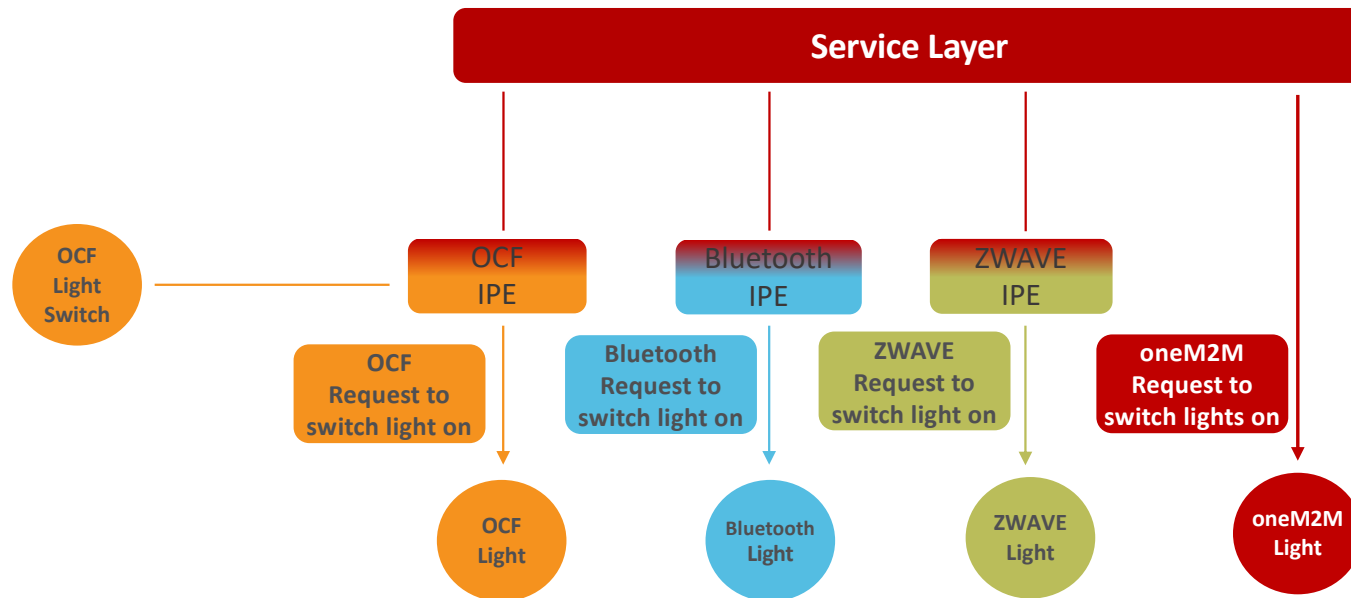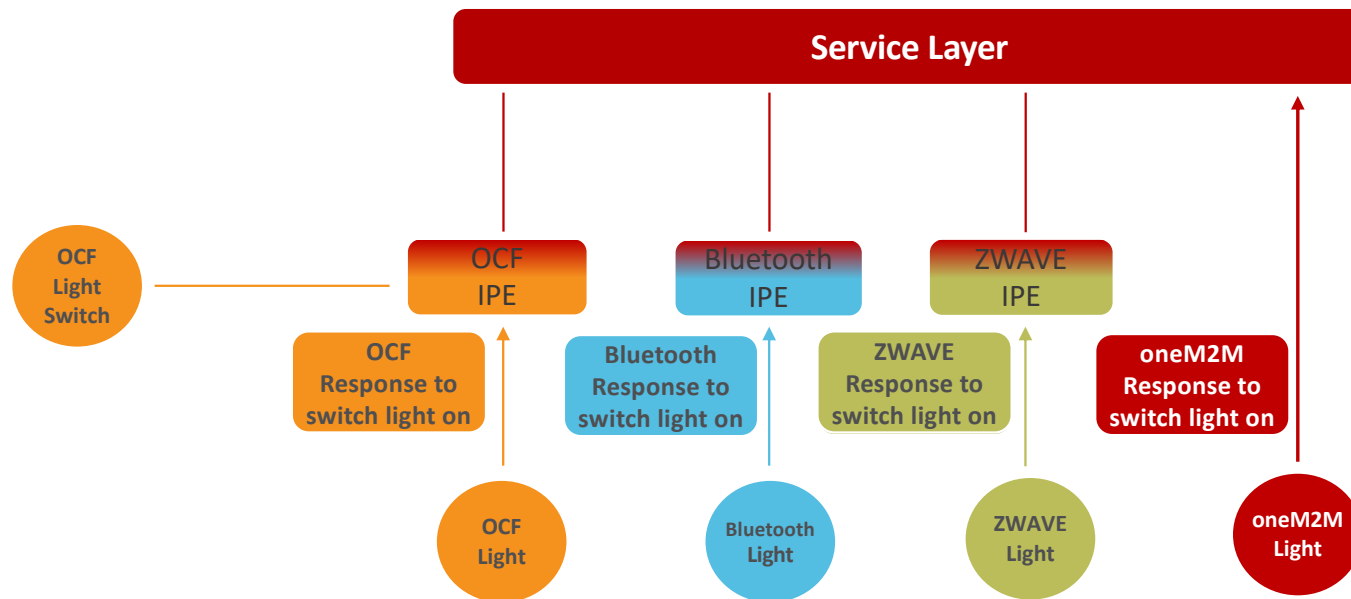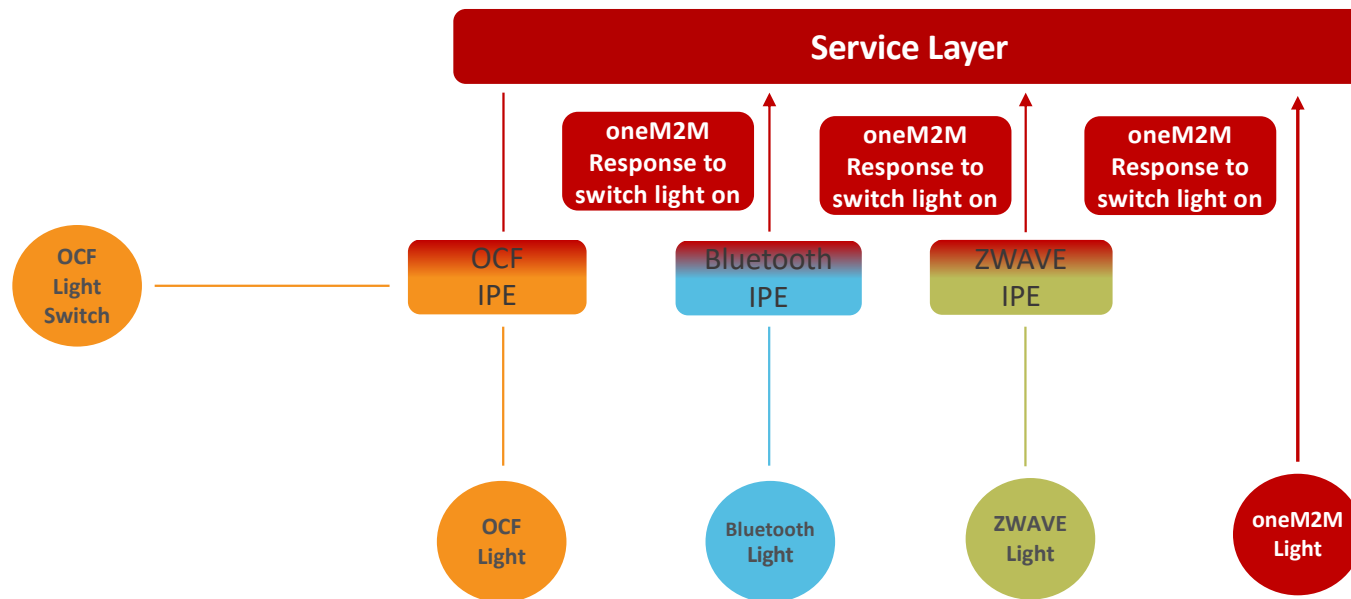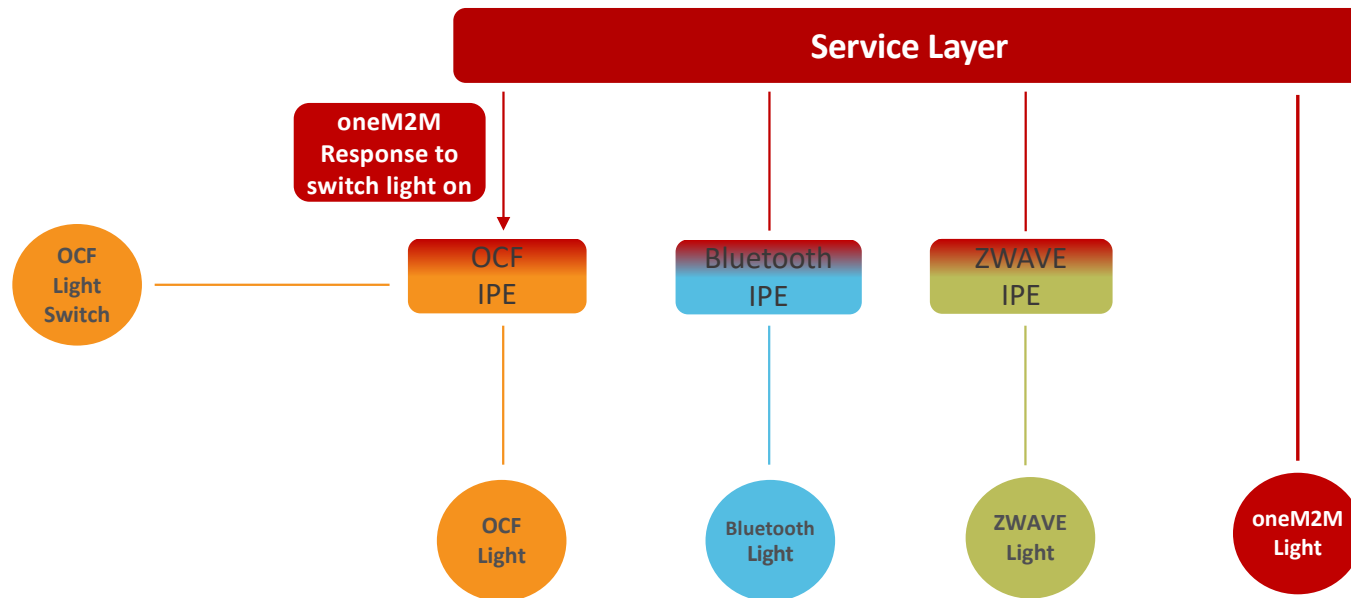
oneM2M Interworking Example #2
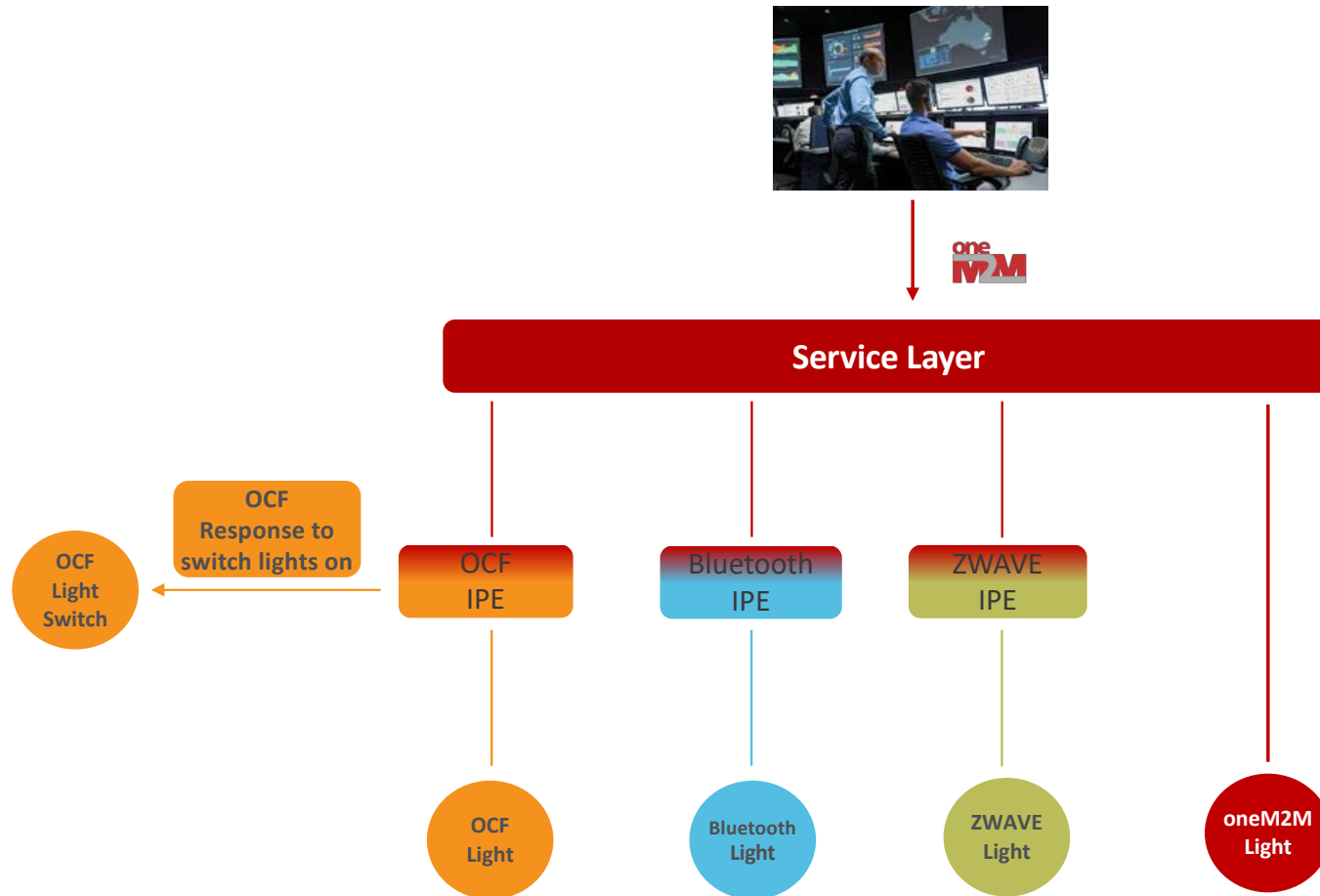
Example: Semantic Mash-up Use Case Smart Car parking
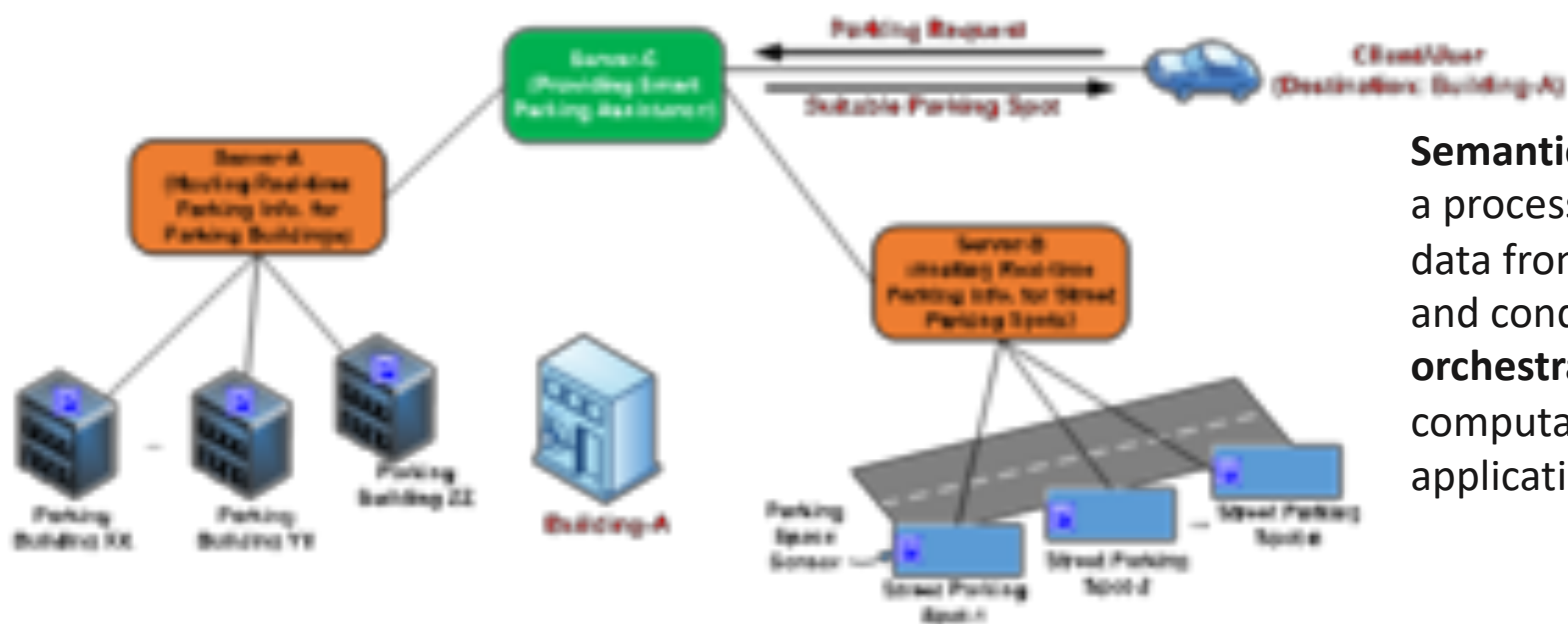
Semantic Mashup
a process to discover and collect data from **more than one source**, and conduct **semantic data orchestration** (integration/computation) on behalf of an application.

See TR-0033 Study on Enhanced Semantic Enablement: Smart Parking Assistance Realized Through Semantic Mashup

oneM2M – LoRa Interworking Use Cases

Smart city Busan use case

Safety service for Children and the old

✓ A Smart location management and a service of smart education supporting which are based on the free communications for the disadvantaged people such as the demented elderly, disabled people, children, infants
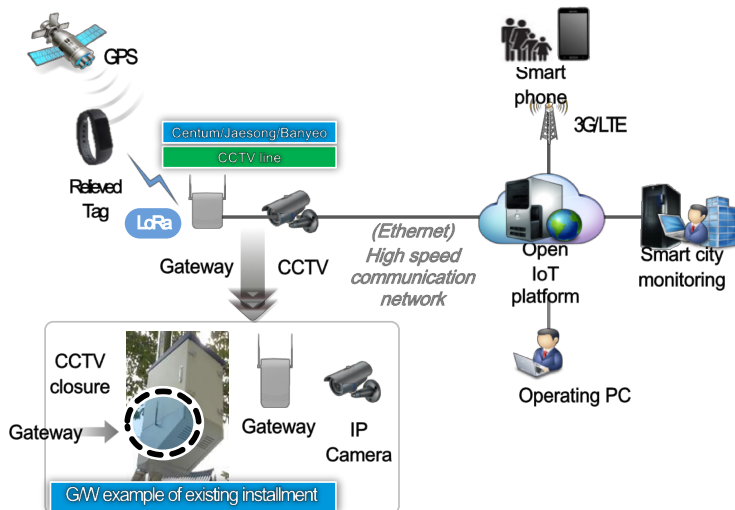
- EU-KR Wise-IoT Smart Cities Interworking Project
  - LoRa Trackers and gateways are deployed at Pyeongchang Olympic Stadium for Asset Tracking services
  - The same device and gateways are deployed at Chamrousse Ski Station in France for Skier performance measurement services
- SKT deploys LoRa network and oneM2M platform for their IoT services
  - SKT has deployed the nationwide LoRa Nationwide LoRa network in June, 2016
  - SKT has acquired global standard authentication (TTA verified for oneM2M) in May 2016 for their ThingPlug oneM2M based IoT service platform
  - http://www.koreatimes.co.kr/www/tech/2018/10/133_204548.html

LoRa Device	LoRa Gateway	LoRa-oneM2M IPE	IoT Platform	Customer App. Server
Data Transmission	LoRa Transmission	Subscriber/Session Management	Service Link	Service Management

Takeaways

→ Many IoT deployments can have **diverse types of IoT sub-systems and platforms** that require interworking devices, apps and data all to one another

→ **oneM2M interworking and abstraction capabilities**, are able to hide the complexity of interworking from IoT app developers

→ oneM2M is able to help **future proof IoT deployments** by enabling different types of brownfield and greenfield technologies to more seamlessly be deployed together

→ oneM2M is a standard and **mitigates vendor lock-in**

Abstraction

Interworking

Service Layer

W3C TD	SAREF	...
OCF	OMA DM	BBF	LWM2M	...
XML	JSON	CBOR	...
HTTP(s)	CoAP(s)	MQTT(s)	...
TLS/PSK	TLS/PKI	DTLS/PSK	...
Cellular	Fixed	Wi-Fi	...
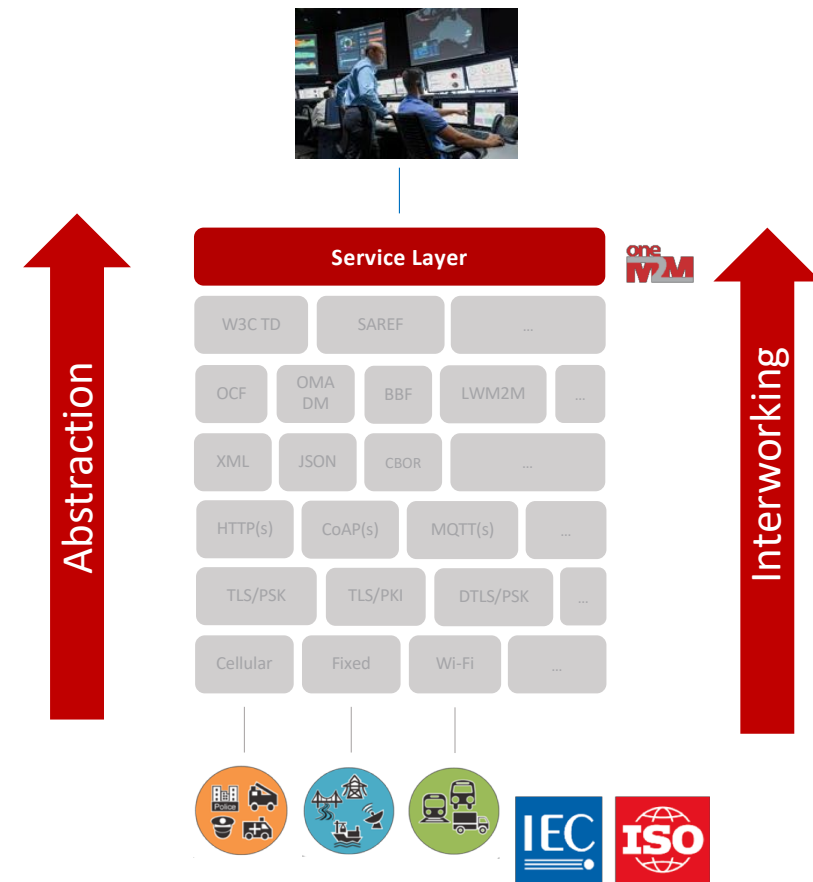
oneM2M Implementation and Deployment Base

A vibrant and healthy ecosystem of oneM2M implementations exists!

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 भारत सरकार का दूरसंचार प्रौद्योगिकी केंद्र C-DOT Centre for Development of Telematics Telecom Technology Centre of Govt. Of India · SIERRA WIRELESS · INTERDIGITAL · QUALCOMM · Deutsche Telekom

kt · HUAWEI · SK telecom · sensinov Global IoT Platform · MODACOM · LG U+ · Hewlett Packard Enterprise

orange · NEC · iREX CSS ATHG IOT STUDIO · SAMSUNG SAMSUNG SDS · DASAN HANDYSOFT · GRIDNET · John Deere

NTT · PILOT THINGS · HEALTHCONNECT · KEPCO · Creative Convergence ntels · TELECOM ITALIA

Certification Test Houses and Test Tool Vendors

SPIRENT Inspired innovation · TTA · DEKRA · Innowireless · KETI · Dt&C · easy global market

Regular Interop Events (6 Held from 2015-2018)

IEC · ISO

oneM2M Adoption

oneM2M has
global adoption

★ oneM2M Open Source Project

● oneM2M Product Offerings

■ oneM2M Trial Deployment

▲ oneM2M Commercial Deployment

Example implementations of oneM2M (I)

http://h41111.www4.hp.com/solutions/iot/index.html

https://www.grid-net.com/technology/introduction/

http://www.eclipse.org/om2m/

http://www.huawei.com/en/news/2016/6/oneM2M-Release3-Standardization

https://sandbox.sktiot.com/?

Source: oneM2M Industry Day #5

http://www.toyota-itc.com/news/img/20150525_release_rev4.pdf

http://www.iotocean.org/main/

http://www.xing-news.com/reader/news/articles/301773?newsletter_id=13620&xng_share_origin=en

Example implementations of oneM2M (II)

Smart Buildings

- **Sensinov** - vendor-neutral solution for monitoring and control over multiple buildings
- **City of Bordeaux** smart street lighting

Smart Cities

- **LG's CityHub platform** for centralized management and data analysis of citywide IoT devices
- **InterDigital's oneTRANSPORT** data marketplace for smart city, transport and large arena management applications
- **Telecom Italia's CityOS** for smart city, transport deployments

Cross domain

- **John Deere** farm machinery interactions with passenger cars to improve road safety
- **PilotThings** - centralized data and device management solution for cross-departmental enterprise networks, including multi-vendor hardware elements
- **Orange & Deutsche Telekom** – remote management of home gateways across telco networks

Bhopal Smart City Development Corporation selects the HPE to create India's first Cloud-Based Integrated Command and Control Centre

- Operating multiple city command centre operations in parallel
- Monitoring and administration of multiple city civic utilities and citizen services
- State-wide monitoring of cities from a central command view
- Adapt and integrate thousands of discrete sensors and applications on the platform

oneM2M Certified Products

17 Certifications from 14 Companies

NAME	VENDOR	PRODUCT TYPE	VERSION	DATE
Mobius	KETI	Software Component	TRSL V1.1	5/18/2018
Chordant™ Platform	Chordant™, an InterDigital business	End product(IN–CSE)	TRSL V1.1	2/21/2018
SysOne	C3SYSTEMS	End product(IN–CSE)	TRSL V1.0	12/7/2017
Universal IoT Gateway	Moda Inc.	End product(MN–CSE)	TRSL V1.0	12/7/2017
HuRa IoT Platform	HERIT	End product(IN–CSE)	TRSL V1.0	12/7/2017
GWP	IREXNET	End product(IN–CSE)	TRSL V1.0	9/7/2017
AiSOP	IREXNET	End product(IN–CSE)	TRSL V1.0	9/7/2017
Insator™	SAMSUNG SDS	End product(IN–CSE)	TRSL V1.0	7/13/2017
HANDYPIA IoT Platform	HANDYSOFT, Inc.	End product(IN–CSE)	TRSL V1.0	3/15/2017
IoT Healthcare Platform	HealthConnect Co., Ltd	End product	TRSL V1.0	3/30/2017
ThingPlug	SK Telecom	Software component	TRSL V1.0	2/9/2017
N–MAS	nTels	End product	TRSL V1.0	2/9/2017
IoTMakers Middleware	KT	Software component	TRSL V1.0	2/9/2017
IoTMakers	KT	Software component	TRSL V1.0	2/9/2017
e–IoT Energy Platform	KEPCO	End product	TRSL V1.0	2/9/2017
e–IoT Energy Gateway	KEPCO	End product	TRSL V1.0	2/9/2017

LG CNS INFioT platform also undergoing testing

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

oneM2M Certification from TTA http://onem2mcert.com

oneM2M Timeline
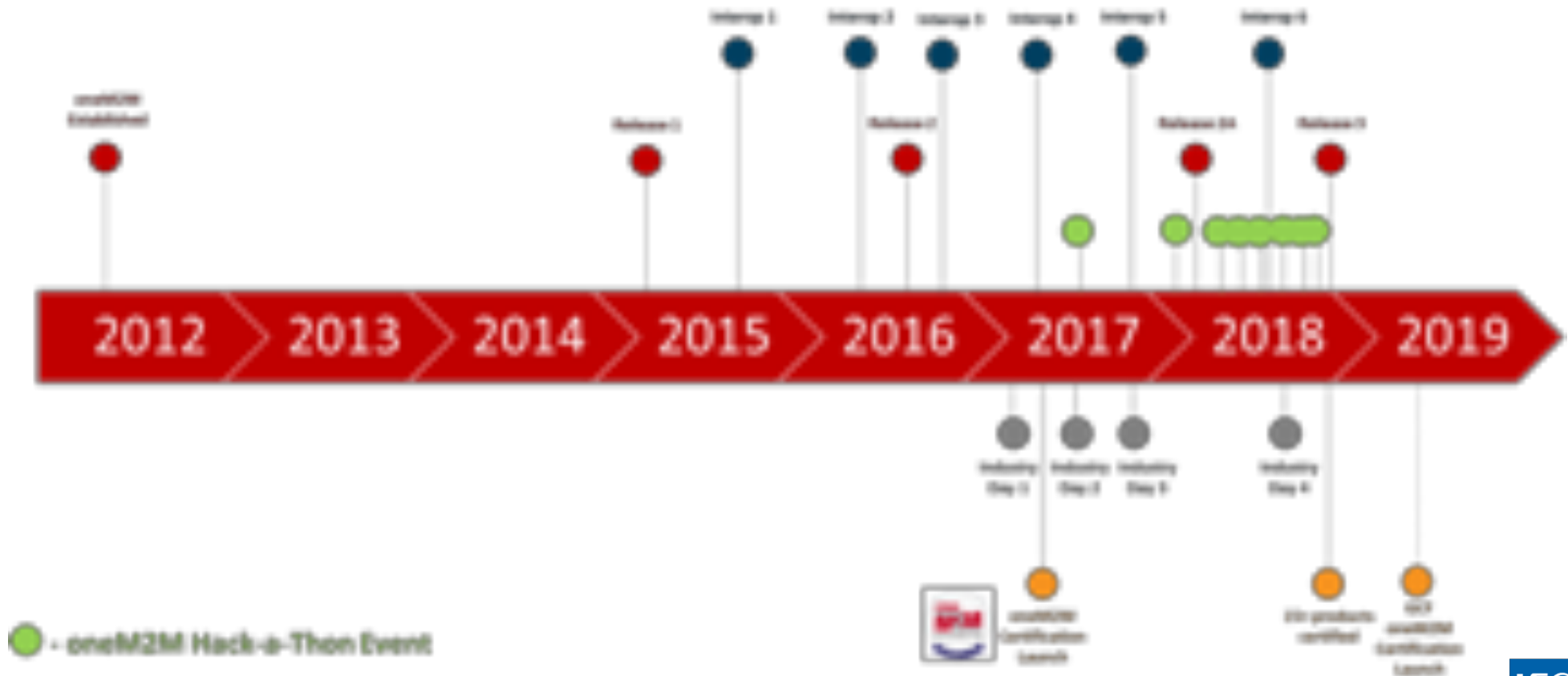
oneM2M Feature Summary by Release

Rel-1 Features

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

Rel-2 Features

- Time Series Data
- Flexible resources that can be customized by app developers
- Semantics Description & Discovery
- Security Enhancements
  - Dynamic Authorisation
  - Content Security
  - E2E Security
- WebSocket Binding
- Ontology for Home Area Information Model
- oneM2M App-ID Registry
- oneM2M Interworking
  - caMGM
  - AllJoyn
  - 3GPP Triggering

Rel-3 Features

- Semantic Querying/Mashups
- 3GPP SCEF Interworking
  - Non IP Data Delivery
  - UE Reachability Monitoring
  - Device Triggering
  - Etc.
- Transaction Management
- Service Layer Routing
- Common oneM2M Interworking Framework
  - OIC, OPC-UA, IPSO, Modbus
- oneM2M Conformance Tests and Profiles
- Security Enhancements
  - Distributed Authorisation, etc.
- Ontology-based Interworking

Rel-4 Features (planned)

- Fog/Edge Computing
  - Service Processing
  - Service Pooling, etc.
- 3GPP Interworking
  - Session QoS
  - V2X
  - WSD Enhancements
  - Charging
- Vehicular Centric Features
  - Mobility, low latency …
- Semantic Reasoning & Ontology Mapping
- Service/User Subscription
- Security Enhancements
  - User/Data Privacy, etc.
- W3C WoT Interworking
- SDT4.0 and the information models for multiple domains
- Streamlining oneM2M protocol
- oneM2M Conformance Tests

Overall Takeaways

- oneM2M provides a common set of horizontal IoT services
- oneM2M interworks existing IoT technologies together with one another and abstracts away the complexity of IoT
- oneM2M has clear value-propositions to the IoT industry
  - Simplify life for IoT stakeholders - App developers, device manufactures, service providers, operators,...
  - Minimize development, deployment and maintenance costs
- oneM2M is a mature and commercially deployed technology
- oneM2M has a certification program to ensure conformance and interop between oneM2M solutions

Where to Find More Details

http://www.onem2m.org

oneM2M
Standards for M2M and the Internet of Things

Member Login

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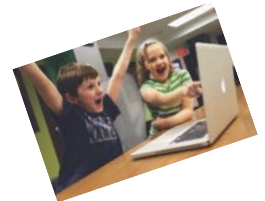
Hewlett Packard Enterprise

HUAWEI

oneM2M Device/Cloud Integrators

oneM2M IoT Application Developers

OM2M Connecting things

OCEAN

For globally certified products refer to: http://www.onem2mcert.com/main/main.php