IoT service layer evolution

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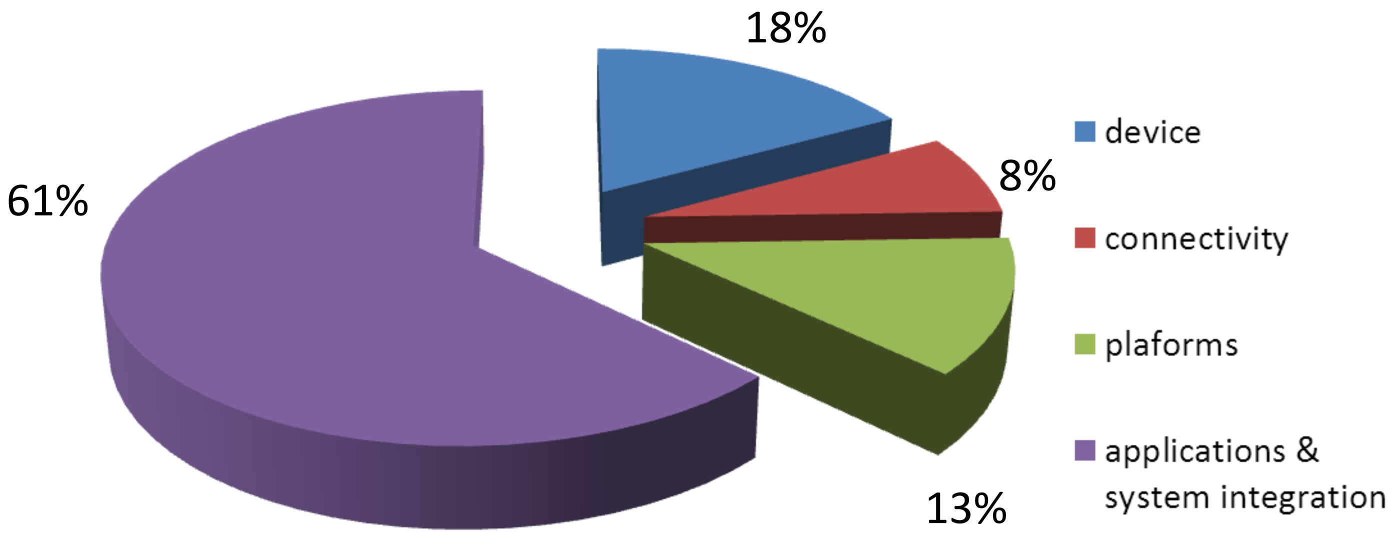
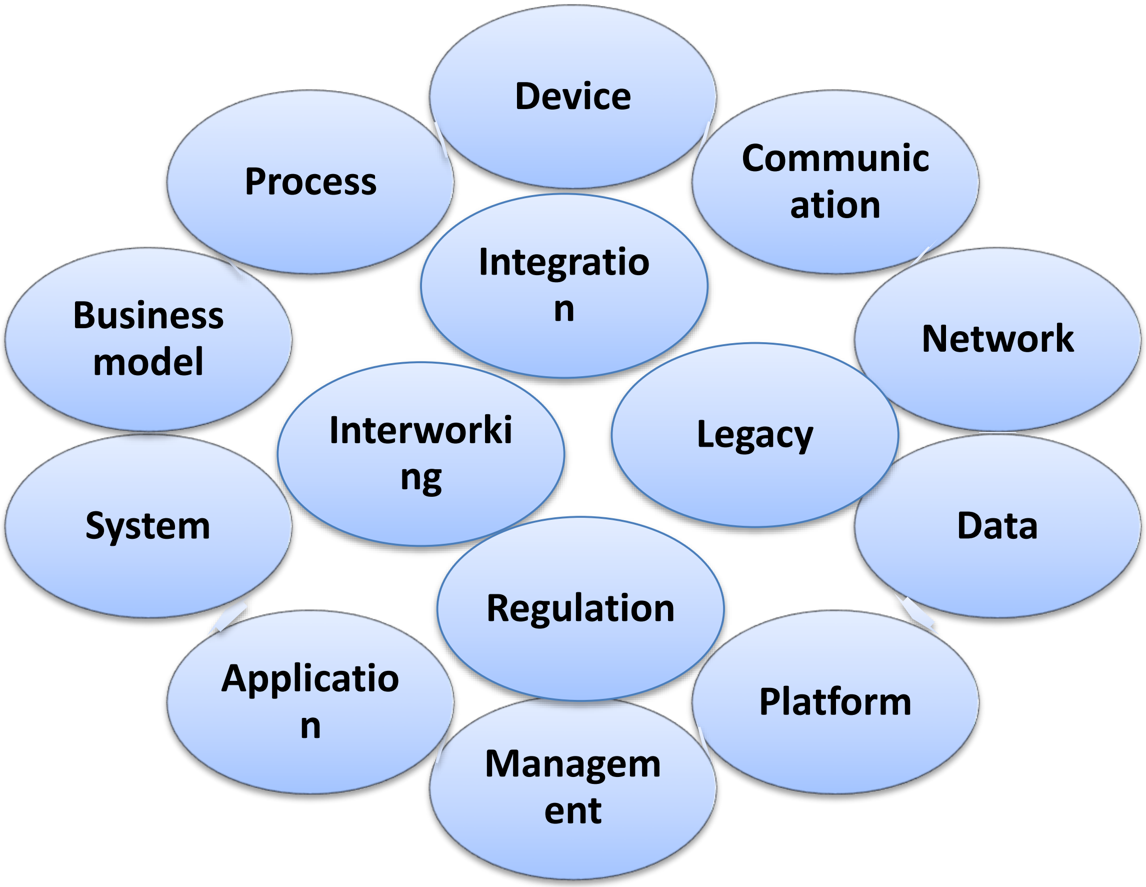
IoT Value chain



There are several analysis with slightly different numbers……

All showing that TODAY the integration activities are the greater part of the business

Deploy an IoT service today is a complex exercise



Device

Process

Communication

Integration

Business model

Network

Interworking

Legacy

System

Data

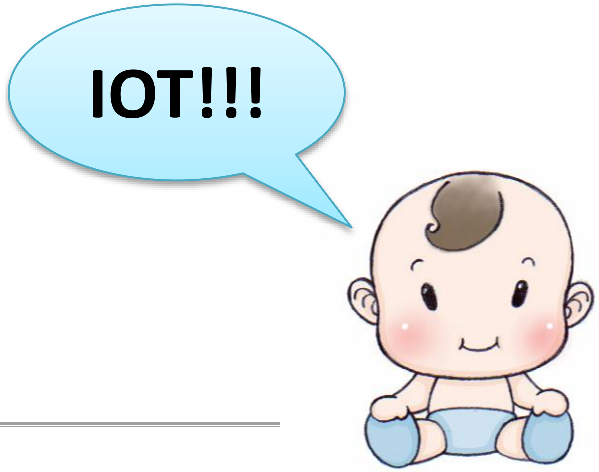
Regulation

Application

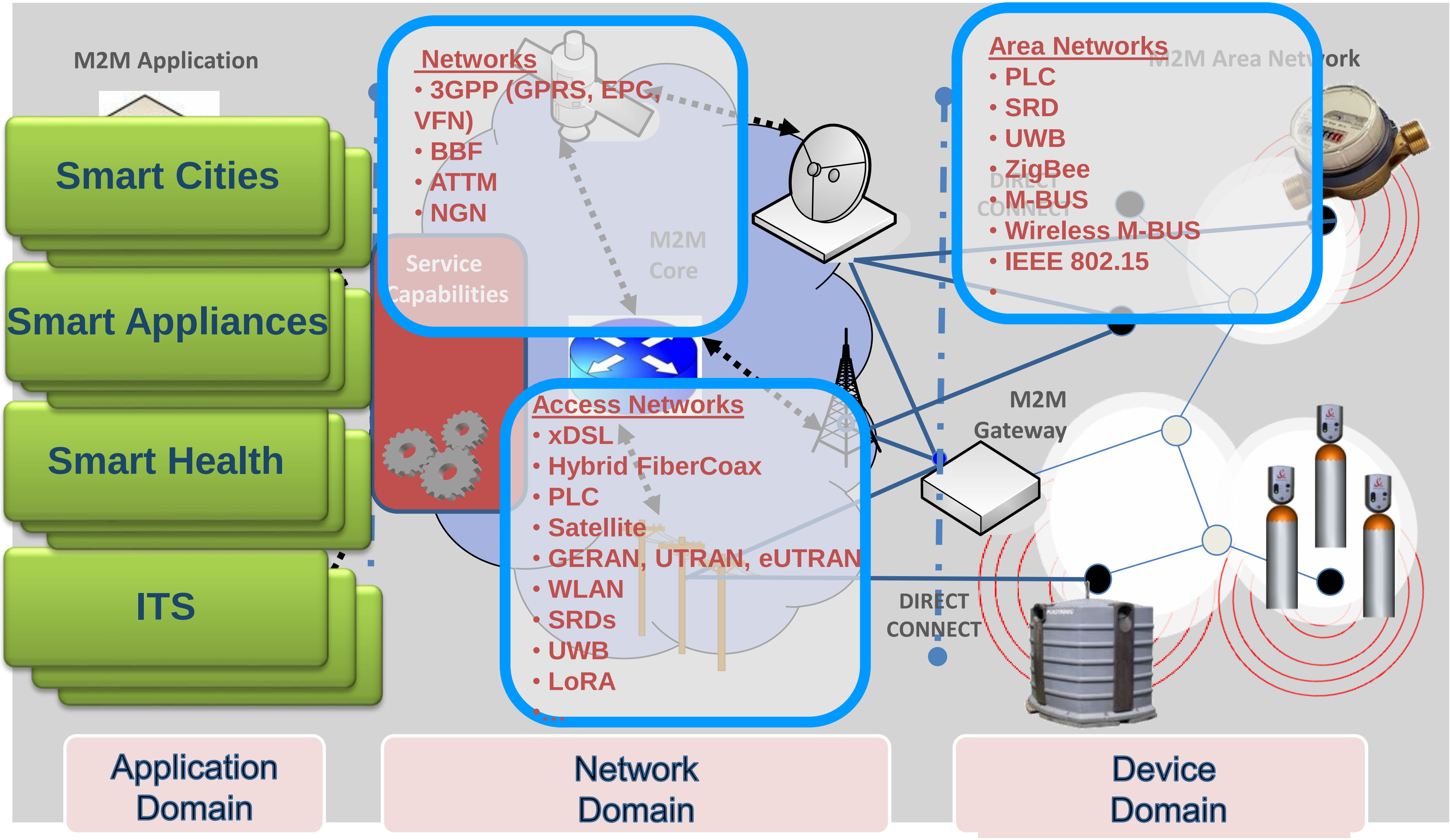
Platform

Management

And is not a mature business.... So solutions, approaches and expertize are not consolidated



IoT is a multiservice and multitechnology environment



Smart Cities

Smart Appliances

Smart Health

ITS

Networks
- 3GPP (GPRS, EPC, VFN)
- BBF
- ATTM
- NGN

Access Networks
- xDSL
- Hybrid FiberCoax
- PLC
- Satellite
- GERAN, UTRAN, eUTRAN
- WLAN
- SRDs
- UWB
- LoRA
- …

Area Networks
- PLC
- SRD
- UWB
- ZigBee
- M-BUS
- Wireless M-BUS
- IEEE 802.15
- …

Application Domain

Network Domain

Device Domain

The union of all this…..

- Car incident in a Smart City:
  - The incident is detected by the Car and by the road side sensors.
  - Traffic is rerouted controlling traffic lights and electronic signals
  - The ambulance and the emergency team are sent to the accident place.
  - The persons are rescued and their medical conditions are evaluated.
  - E-health consultation with the medical experts in the hospital took place.
  - The best hospital is selected based on availabilities, traffic conditions, position and expertise, and the patient(s) are transported
  - Again the overall traffic is controlled giving priority to the ambulance
  - During the transportation an initial set of examination are done
  - The relatives of the patient are alerted using the municipality information
  - …………..
  - ………….

Opportunities and problems

- Diversity is the richness that allows evolution and innovation: combination of services is the biggest opportunity for the future
- But fragmentation of solutions and technologies is the enemy that is delaying and blocking the developments

- **Simplify the environment, removing the unnecessary duplicated solutions (economy of scale), preserve the necessary/opportune solution specialization by interwoking**

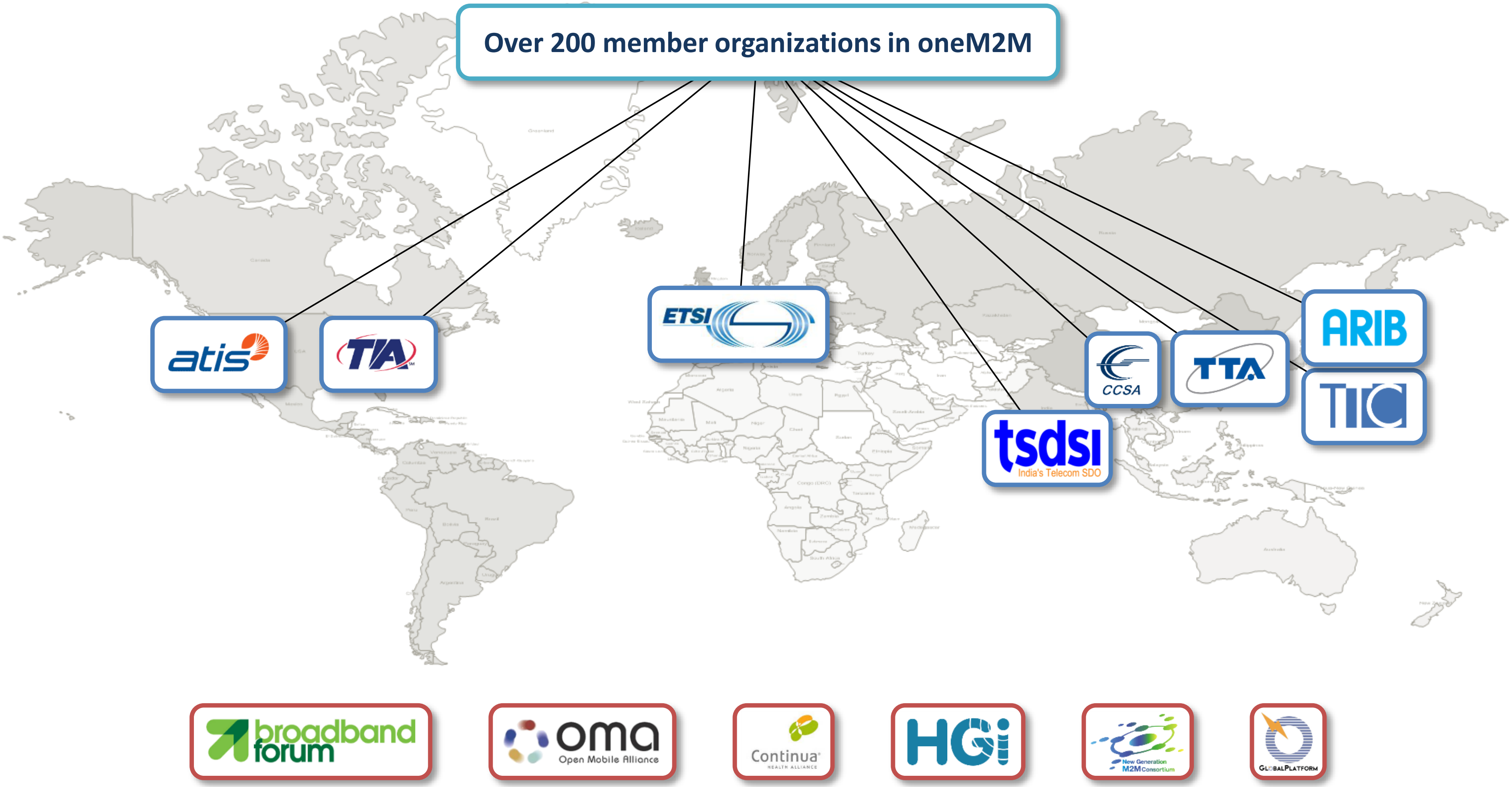
The role of Standardization

- Support the developers community accelerating the development of IoT
- Transfer the competition from integration and platforms to services unlocking the market
- Reduce the cost of due to creation and management of silos
- Enable Inter-technology and inter-domain data sharing generating new services and new business opportunity

Reduce the costs, enlarge the market,

enable real competition on services

oneM2M Partnership Project



Over 200 member organizations in oneM2M

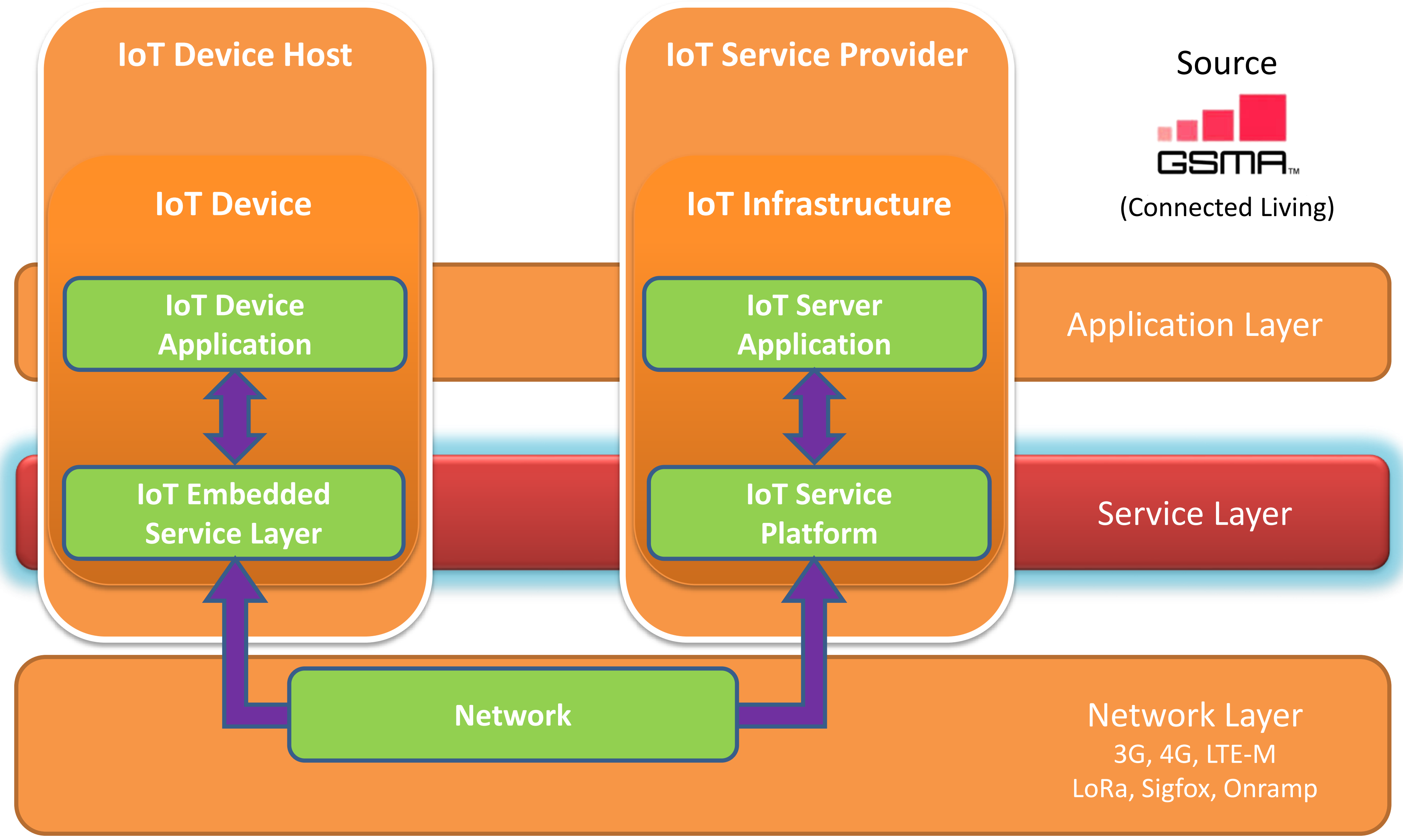
www.oneM2M.org

All document are publically available

Scope & Objectives

- **To develop:** Global M2M/IoT specifications - using common use cases and architecture principles across multiple M2M/IoT applications to connect devices and application servers worldwide with an access independent view of end-to-end services
- **To define:** Service Layer platform supporting a service architecture including:
  - Protocols/APIs/standard objects (open interfaces & protocols)
  - Interoperability, test and conformance specifications
  - Service Layer interfaces/APIs for:
    - **Applications and service semantics/ontologies**
    - **Communication and data sharing**
    - **Security and privacy aspects**
    - **Authentication, encryption, integrity verification**

oneM2M – The Service Layer

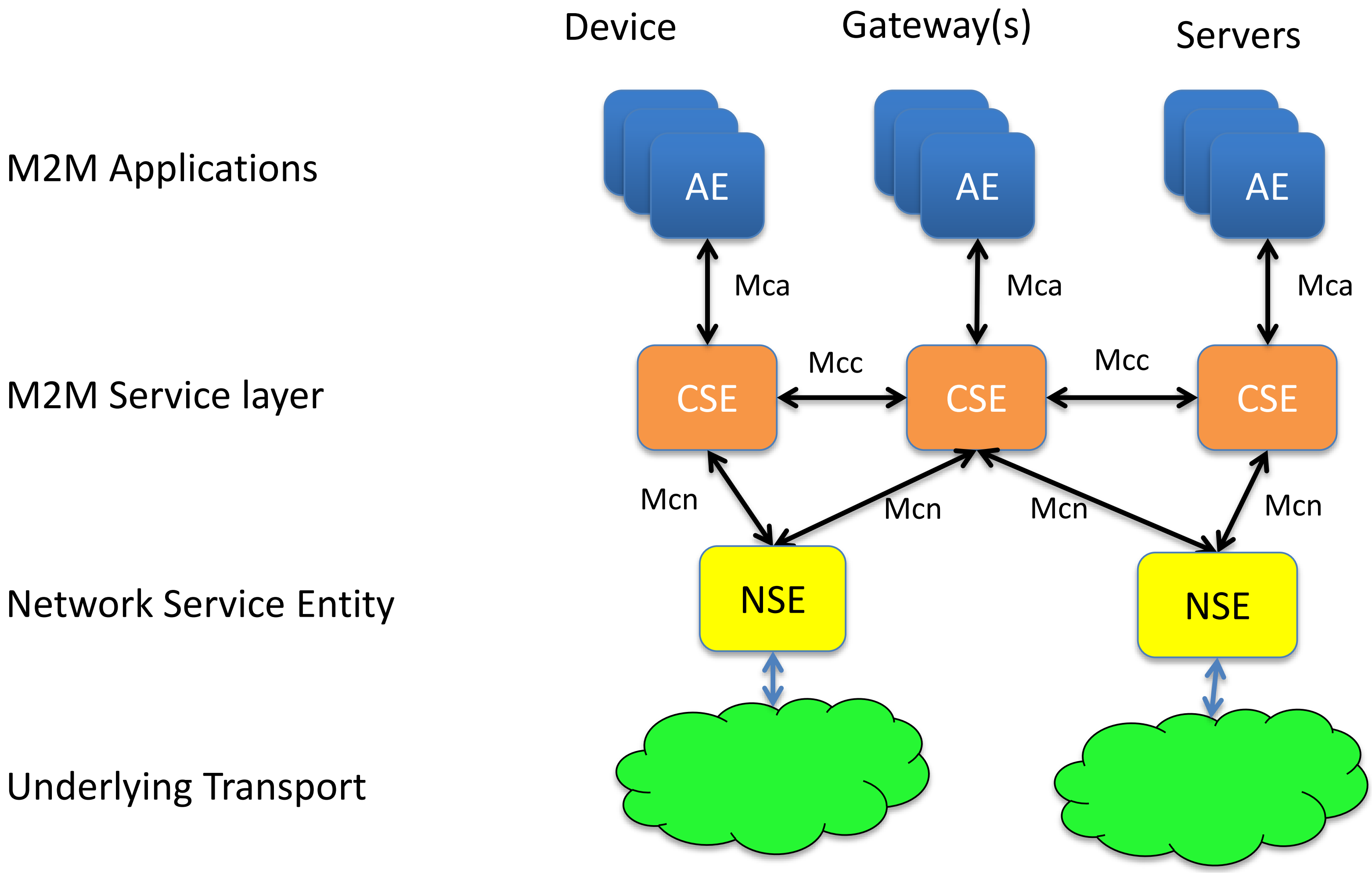


Source

GSMA

(Connected Living)

oneM2M simplified Architecture



Device

Gateway(s)

Servers

M2M Applications

AE

AE

AE

Mca

Mca

Mca

M2M Service layer

CSE

Mcc

CSE

Mcc

CSE

Mcn

Mcn

Mcn

Mcn

Network Service Entity

NSE

NSE

Underlying Transport

Break the silos and simplify the environment

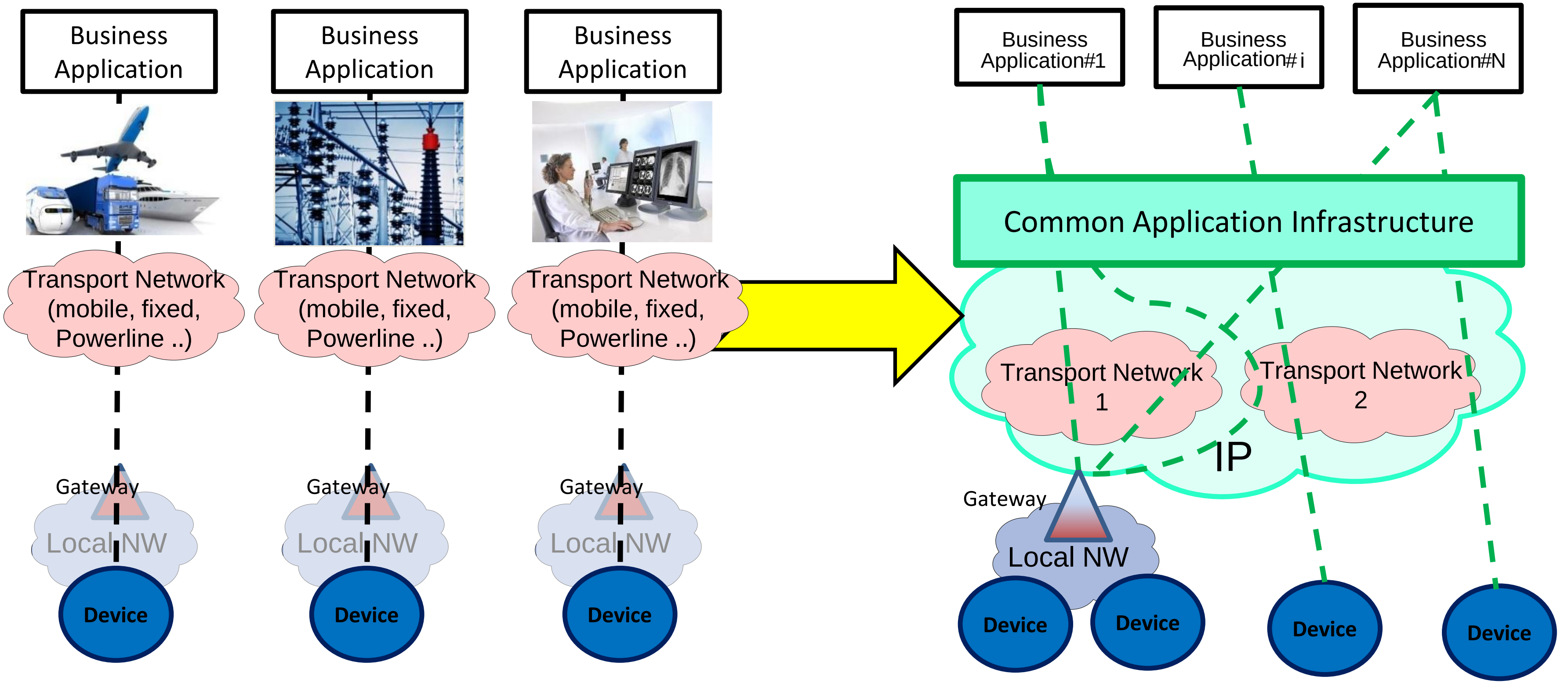
Pipe#1
1 Application,
1 Network
1 (or few) types of Device

Pipe#2
1 Application,
1 Network
1 (or few) types of Device

Pipe#N
1 Application,
1 Network
1 (or few) types of Device

Horizontal (based on common Layer)

Applications share common infrastructure, environments and network elements



Business Application

Business Application

Business Application

Transport Network (mobile, fixed, Powerline ..)

Transport Network (mobile, fixed, Powerline ..)

Transport Network (mobile, fixed, Powerline ..)

Gateway

Local NW

Device

Gateway

Local NW

Device

Gateway

Local NW

Device

Business Application#1

Business Application# i

Business Application#N

Common Application Infrastructure

Transport Network 1

Transport Network 2

IP

Gateway

Local NW

Device

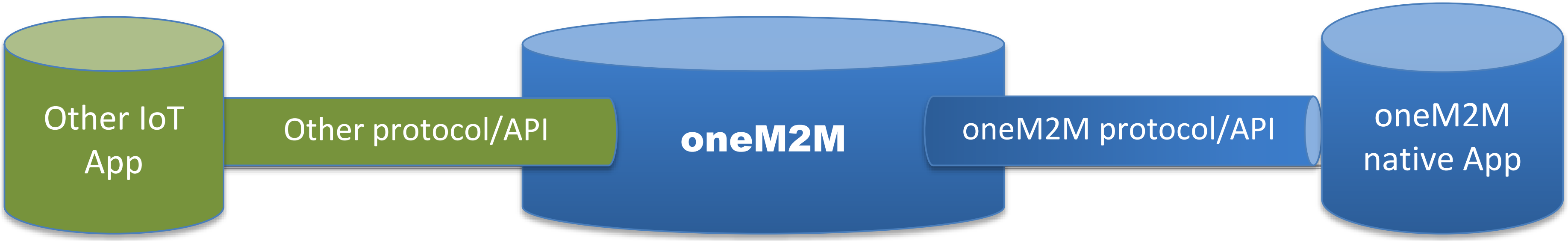
Device

Device

Device

OneM2M as Interworking framework: Simplification does not means one solution!

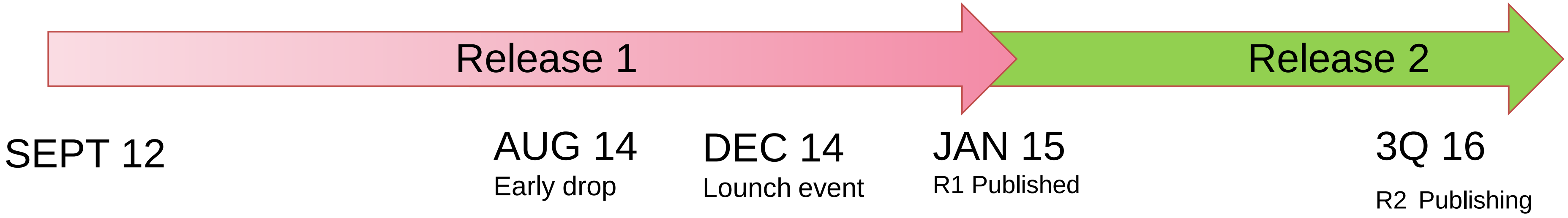
- Legacy technologies will continue to exist and needs to be integrated
- Specific technologies will be required in several sectors, for technical and commercial reasons
- In case of interworking, the real problem are not the communication protocols, but the information semantics and ontologies
- oneM2M solution acts as interworking framework by means of a strict separation between communication and semantics aspects



oneM2M status highlights

- **Release 1 has been released in January 2015**
  - Are significantly based on Release 2 of ETSI M2M Specification developed between 2009-2012. **OneM2M standard is stable.**
  - It includes interworking communication support, but limited semantic support
- **Launch event** took place on December 2014 in ETSI with more than 10 multivendor demos
- There are several **Open Source** projects (e.g. in Ocean and Eclipse, etc…)
- **First commercial service launched in May 2015 in Korea**
- **Interoperability** test events was successfully run in September 2015
- Next major event is ETSI WS in December 9-10-11 2015 (No participation fee)

- **Release 2 is planned May-July 2016, focused on Semantic Interoperability, and the inclusion of testing specifications**



Conclusions 1

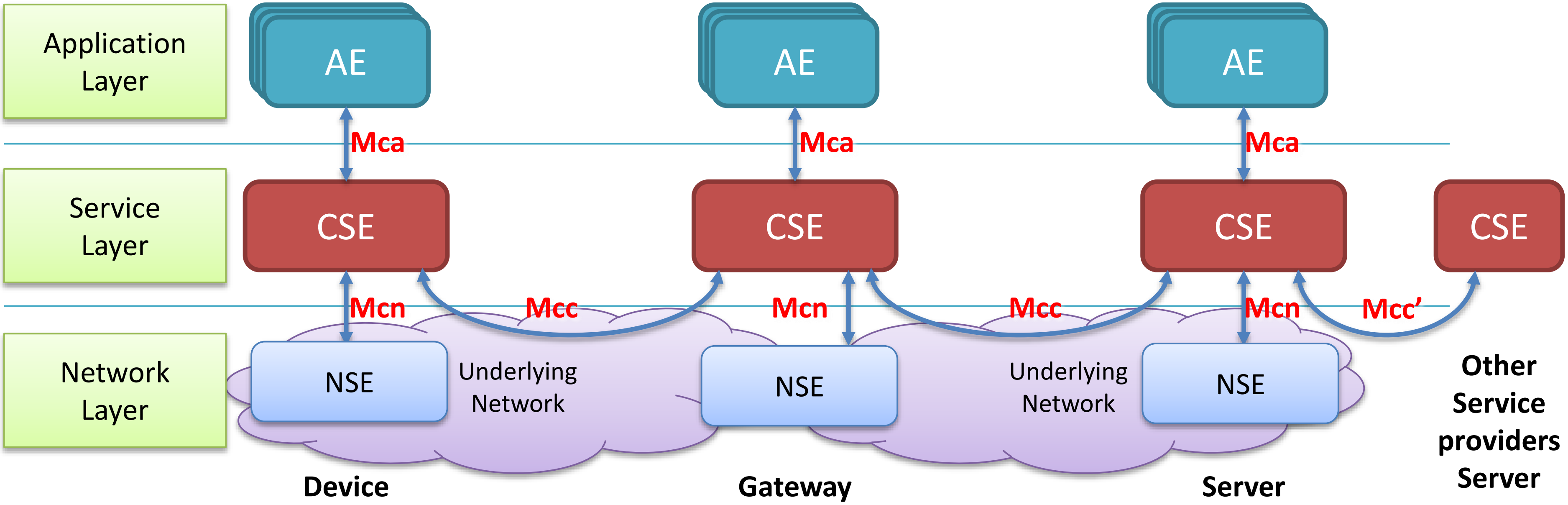
- Despite al lot of M2M installations, the transition to a full connected world is still on its **transition from research and innovation**
- IoT services and systems are **complex** and require a lot of **different in deep know-hows**
- **Fragmentation** is the current major **show-stopper,** it is blocking **evolution** and real **competition**
- Communication protocols and data sharing are the “easier” part of IoT, **information sharing** (i.e. semantic and ontologies) is the **major challenge**

Conclusions 2

- **OneM2M** is currently “**the” standard “de jure”** for the IoT service enablement layer, used as reference by other recognized standard organization
- It is designed as an **interworking framework** among proprietary and industrial groups solutions,
- It is enabling competition at the **service application layer**, without forcing a binding with specific proprietary platform
- It has a **modular security** where the **privacy** is in the control of **who provide the information**

OneM2M Architecture, Principles, & API

oneM2M is Common API



Entities	AE (Application Entity), CSE (Common Services Entity), NSE (Network Service Entity
Reference Point	Mca, Mcn, Mcc and Mcc'

OneM2M architecture entities

- **AE:** Application Entity, containing the application logic of the M2M solution like home management functions, fleet management, blood sugar monitoring
- **CSE:** Common Service Entity containing a set of common service functions (CFE) that are common to a broad range of M2M environment (verticals). This is the main part of the oneM2M specification
- **CSF:** Common Service Functions included in a CSE, CSFs can be mandatory or optional, CSF can contain sub-functions (mandatory or optional)
- **NSE:** Network Service Entity, provides network services to the CSE, like device triggering, device management support, location services. These services are related to the underlying network capabilities

OneM2M architecture Reference points

- **Mca- Reference Points:** the interface point between the AE and the CSE, the Mca point provides the M2M applications access to the common services included in the CSE. The AE and CSE my be co-located in the same physical entity or not

- **Mcc- Reference Points:** This is the reference point between two CSEs. The Mcc reference point shall allow a CSE to use the services of another CSE in order to fulfil needed functionality. Accordingly, the Mcc reference point between two CSEs shall be supported over different M2M physical entities. The services offered via the Mcc reference point are dependent on the functionality supported by the CSEs

- **Mcn- Reference Points:** This is the reference point between a CSE and the Underlying Network Services Entity. The Mcn reference point shall allow a CSE to use the services (other than transport and connectivity services) provided by the Underlying Network Services Entity in order to fulfil the needed functionality.

- **Mcc'- Reference Point:** interface between two M2M service providers, As similar as possible to the Mcc reference point. But due to the nature of inter-M2M Service Provider communications, some differences are anticipated.

oneM2M in a nutshell

OneM2M is an IoT Interworking Framework

- Designed to interwork with legacy, proprietary and sector solution.
  This is based on the separation between protocol interworking and semantic interworking.
- Semantic interworking is already present in oneM2M Release 1, extension to full semantic support will be completed in oneM2M Release 2.

OneM2M is an IoT common Service Enablement layer

- Service independent
- Distributed (Devices, Gateways, Network servers)
- Flexible: AE can have a specific client or connect directly to gateways or network server
- Data can be stored in Devices, gateways or network server almost transparently

Application portability

oneM2M in a nutshell

Main Characteristics

- URI identification (and separation from IP addressing)
- IP based (irrelevant the version, IPv4 or IPV6)
- Network independent (but network aware!)
- REST approach
- Application protability
- Device and subscription management
- Accounting and charging
- HTTP/COAP/MQTT transport

Peculiary functions

- Store and share paradigm
- Data management and historization
- Separation among Security and Privacy
- Flexible deployment (large, small, distributed, centralized)
- Network functionality re-use (Location, Device Management, Security, etc)