4th UCAAT User Conference on Advanced Automated Testing

ETSI World Class Standards

TESTING ONEM2M COMPLIANT IMPLEMENTATIONS

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KETI ERICSSON

Who we are?

- Ting Martin Miao, Korea Electronic Technology Institute (KETI)
- György Réthy, Test Competence Center, Ericsson

On behalf of the oneM2M Tester project members:
Korea Electronic Technology Institute (KETI), Sejong University (SJU), Ericsson, Korea Telecommunications Technology Association (TTA), Easy Global Market (EGM), European Telecommunications Standards Institute (ETSI), Sensinov, InterDigital, LAAS-CNRS, InnoWireless, and DTNC

Content

- Why to standardize Internet of Things?
- oneM2M – Standardized M2M communication and Internet of Things
- Testing Landscape in oneM2M

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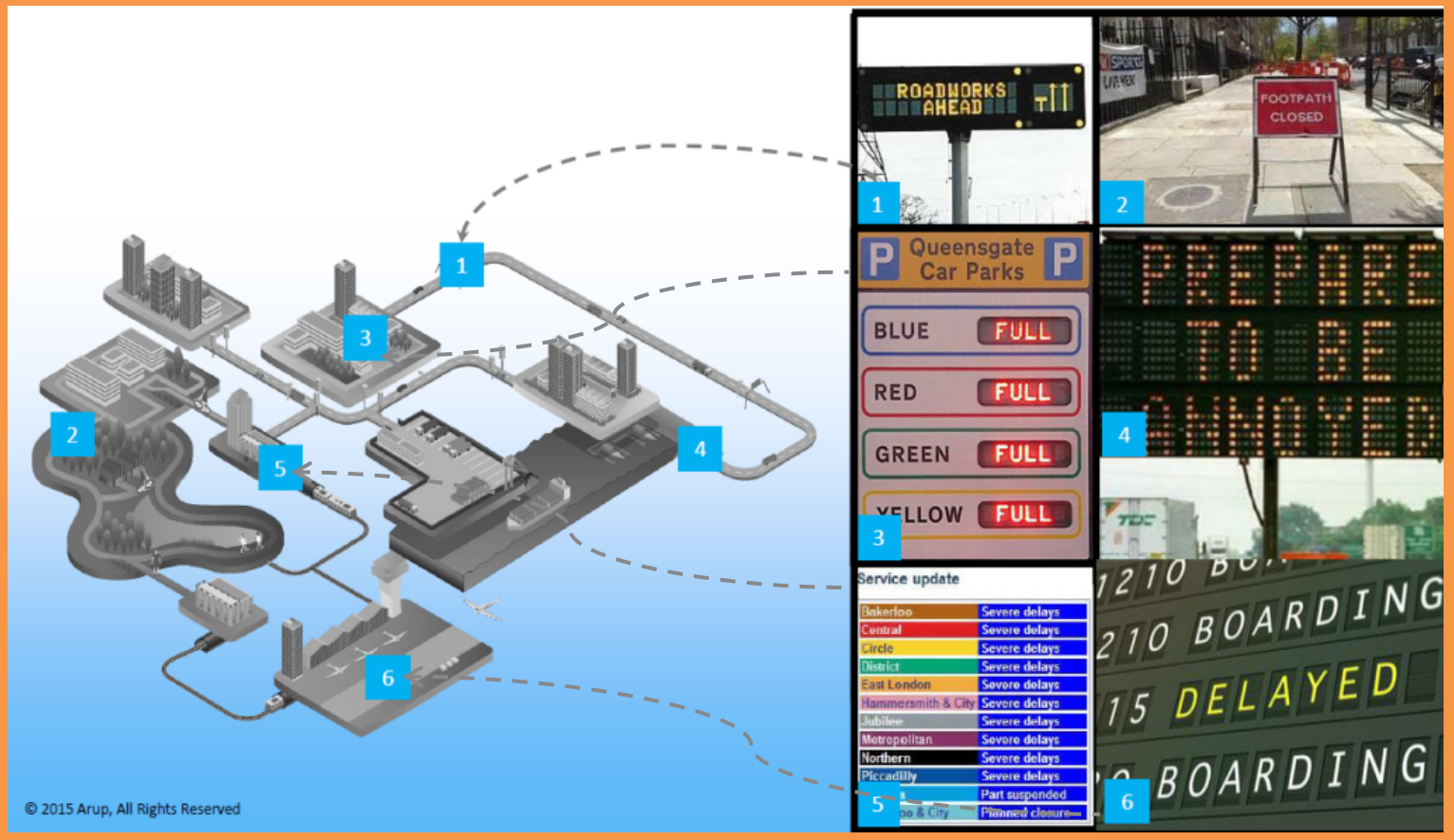
User experience of machine to machine (M2M) communication today: A transportation example



Source: Use of the oneM2M standard in the oneTRANSPORT field (https://www.brighttalk.com/webcast/11949/190241)

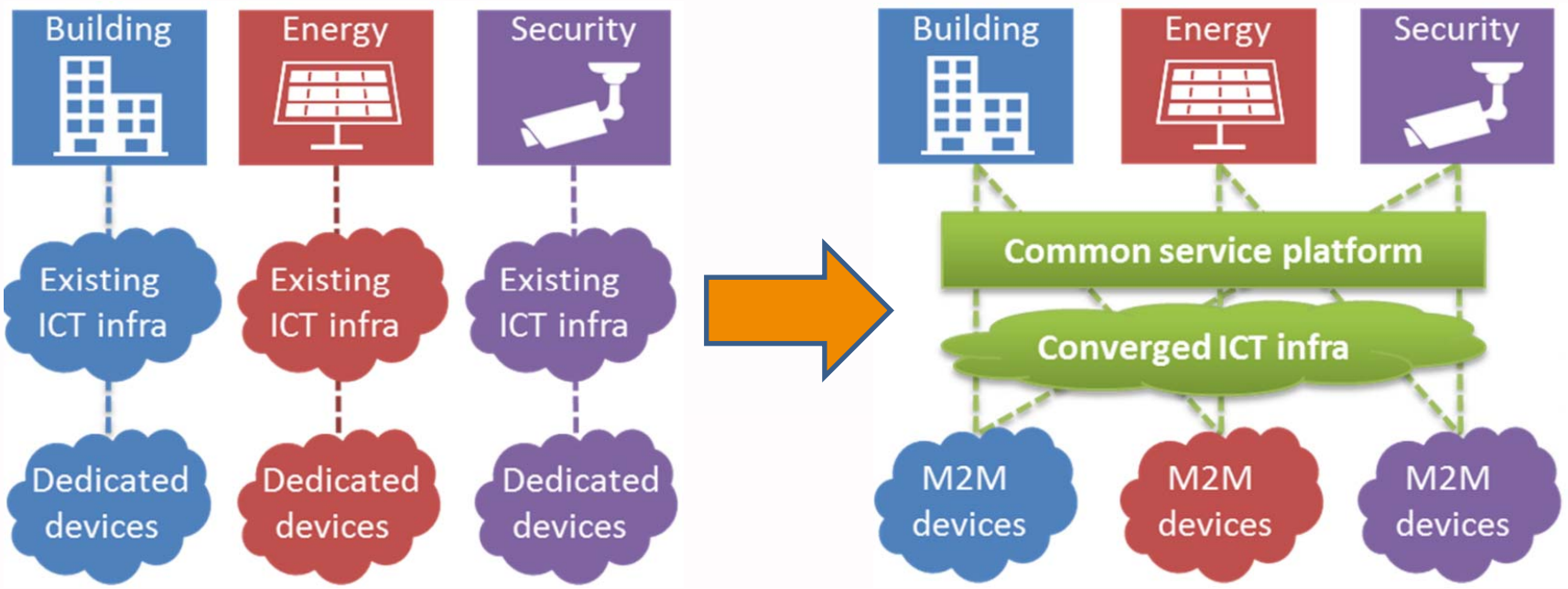
Why Horizontalization is urgently need?

Current situation

- Silo effect
- Inefficient

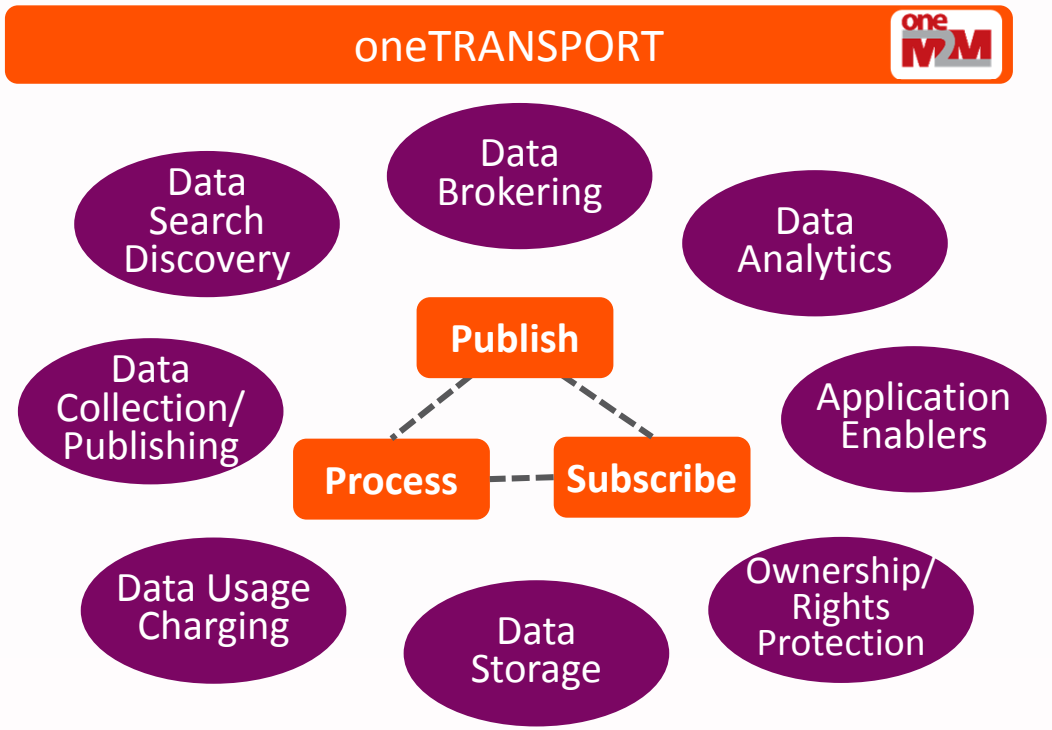
Target position

- Interoperability at the level of communications and data
- Efficient common services implement.
- Seamless interaction between heterogeneous applications and devices



Back to the transportation example: A Holistic Approach can deliver advanced services

- **oneTRANSPORT project:**
  an open market for travel data
  - Buckinghamshire County, UK
  - 11 Multi-sector partners
  - 200+ data assets
- **Right information at the right time!**



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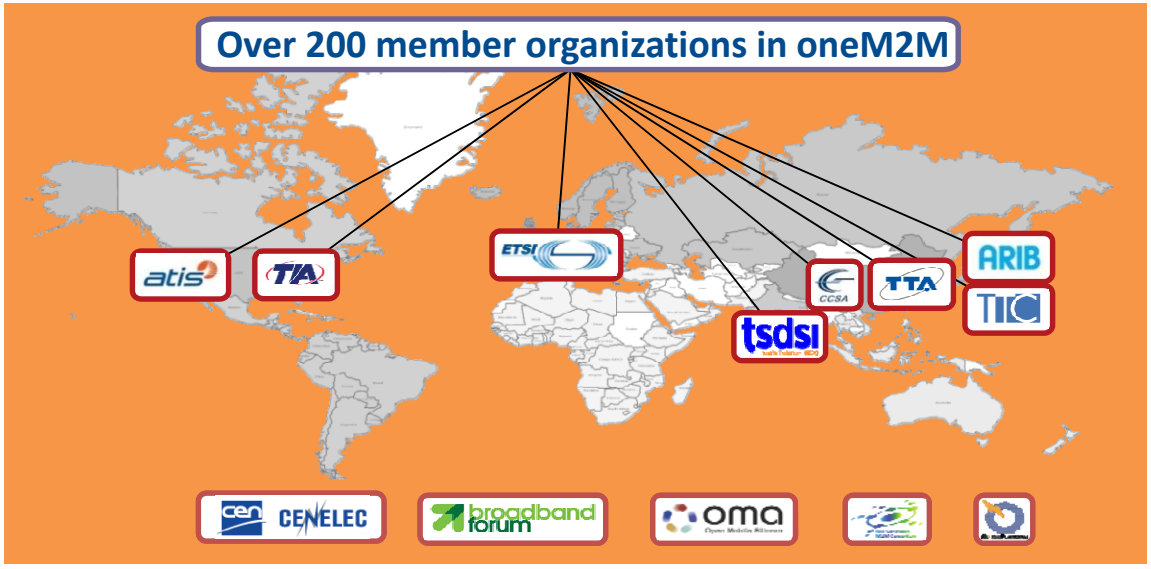
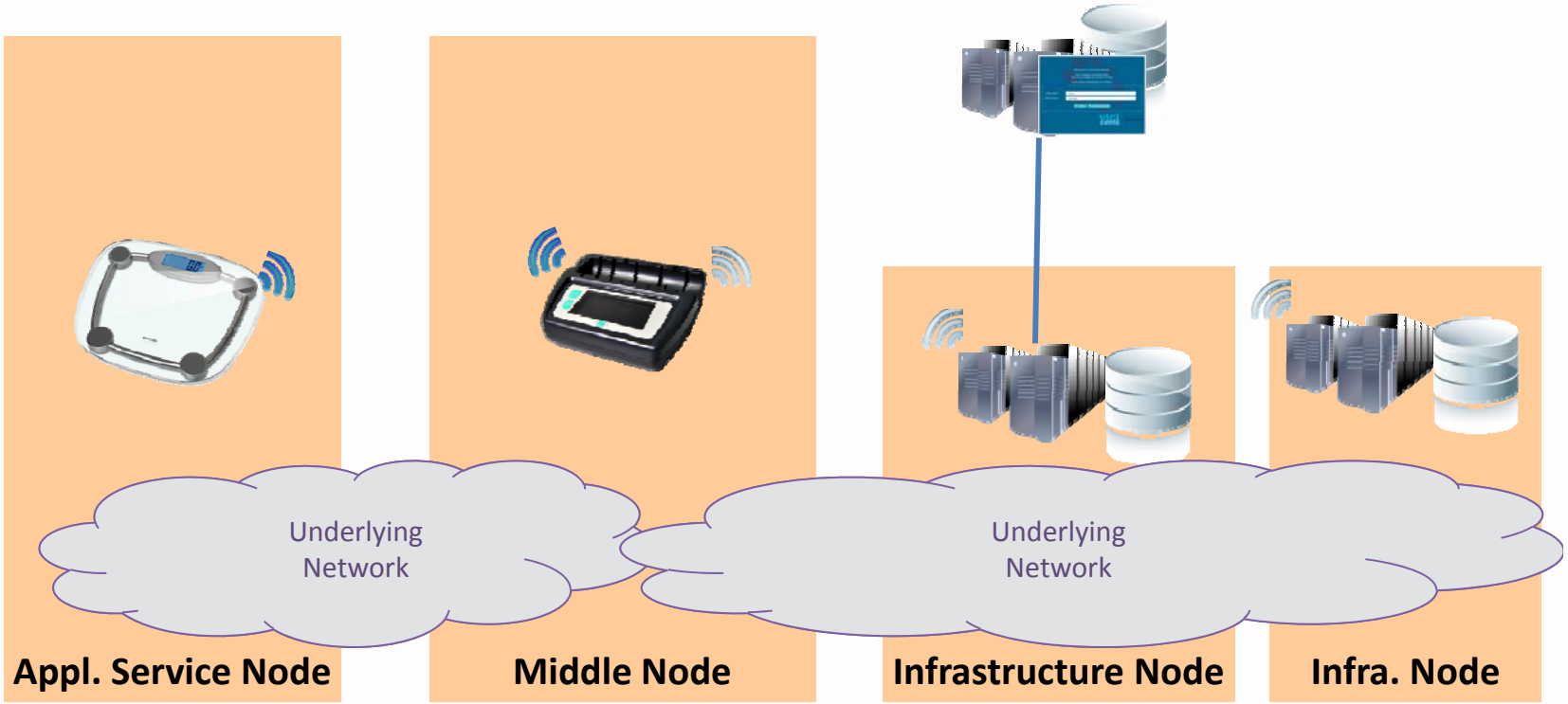
Do You Know oneM2M?

- **A global standards initiative for M2M communication and IoT**
  - Delivers Technical Reports and Technical Specifications
  - Release 1: January 2015, Release 2: August 2016
- **Member~ and partnership**
  - **>** 2oo member organizations
  - 8 regional SDOs-> endorsing oneM2M specifications
  - Partnership with 6 international fora/standards bodies



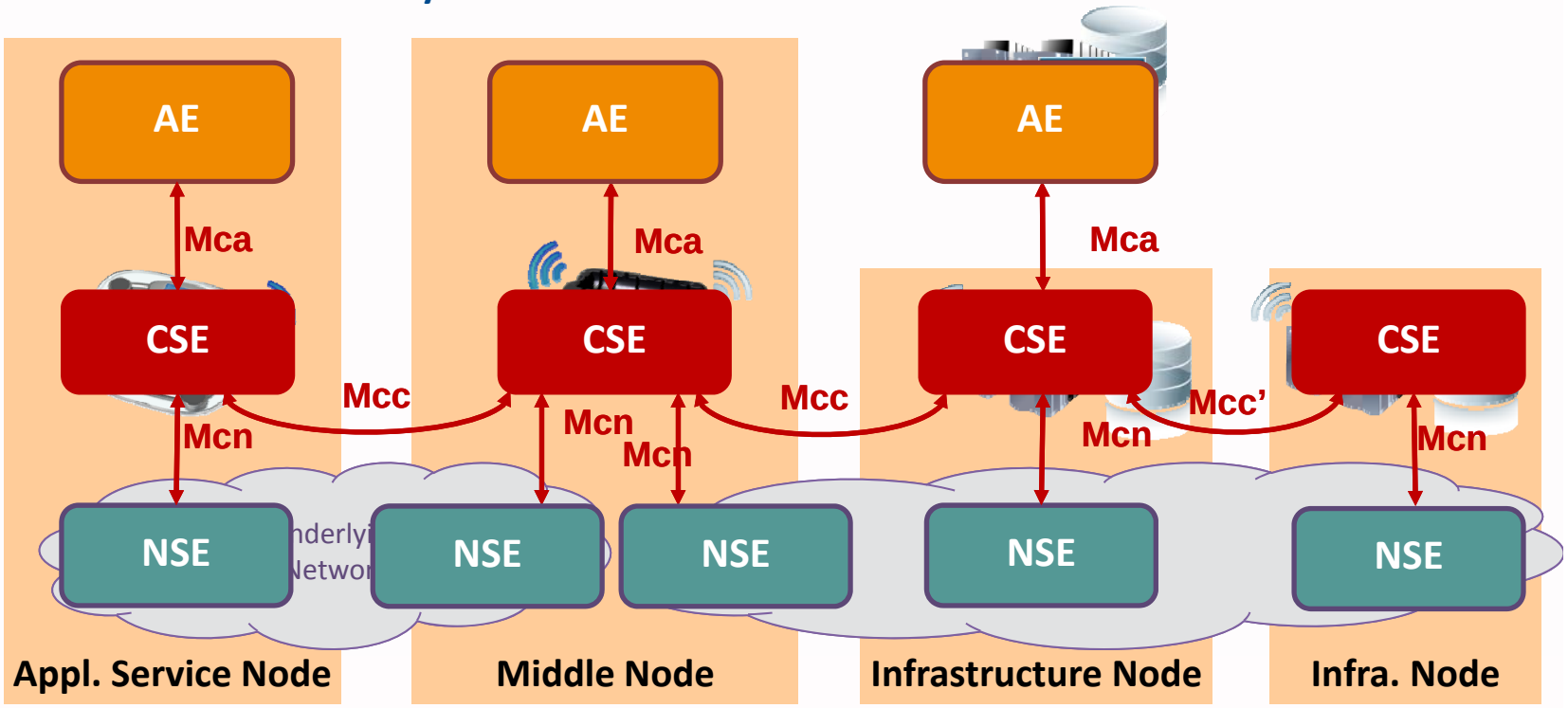
M2M: Machine-to-Machine
IoT: Internet of Things

Architecture – "Node" view



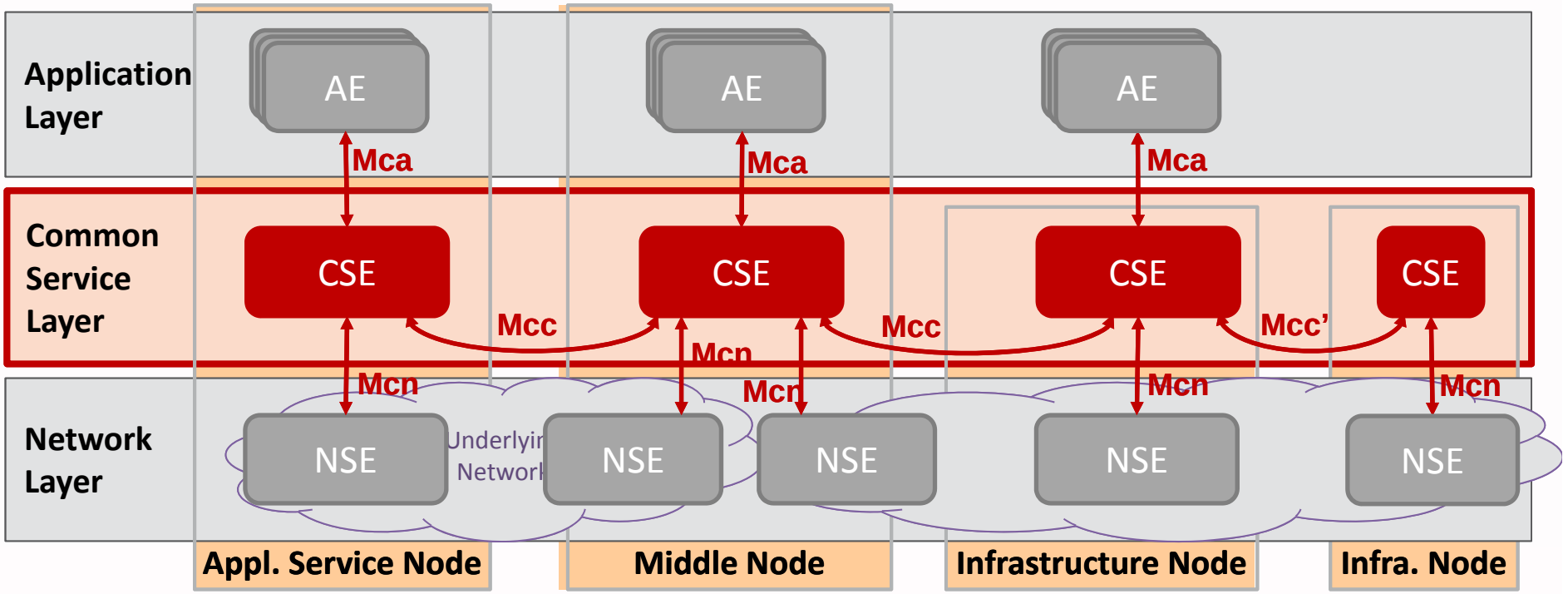
oneM2M Architecture – functional view

oneM2M architecture consists of entities and reference points through which communications between any two entities can be achieved



- AE: Application entity
- CSE: Common service entity
- NSE: Network service node

Scope of oneM2M specifications



- AE: Application entity (provides application logic for end-to-end solutions)
- CSE: Common service entity (provides service functions that are common to M2M solutions)
- NSE: Network service node (provides data transport and network services to CSEs)
- Reference point: Communication interface between the entities

Why to Standardize Testing?
oneM2M Implementation Examples

- **Implementations based on oneM2M Release 1**
  - **Open Source**

  - **Commercial** (non-open source)

Most of implementations are **CSE based** and very few are ADN-AE implementations

- **Projects**

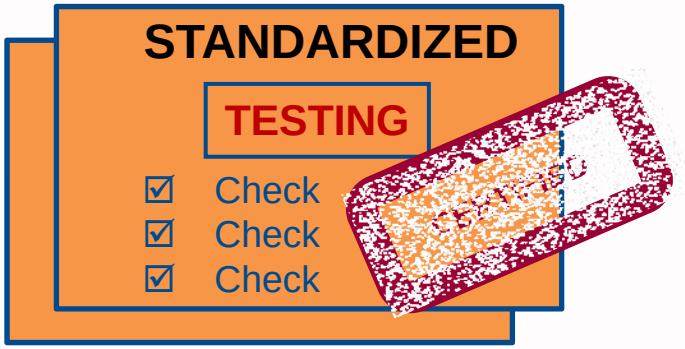
(UK)

(South Korea)

(EU)

Why to Standardize Testing?

- **To secure seamless end-to-end working**
  - Applications are most often multi-vendor
  - IoT services and applications shall interoperate
- **Evaluation and certification**
  - Especially for industrial IoT services is greatly required
  - At some safety critical areas is a must



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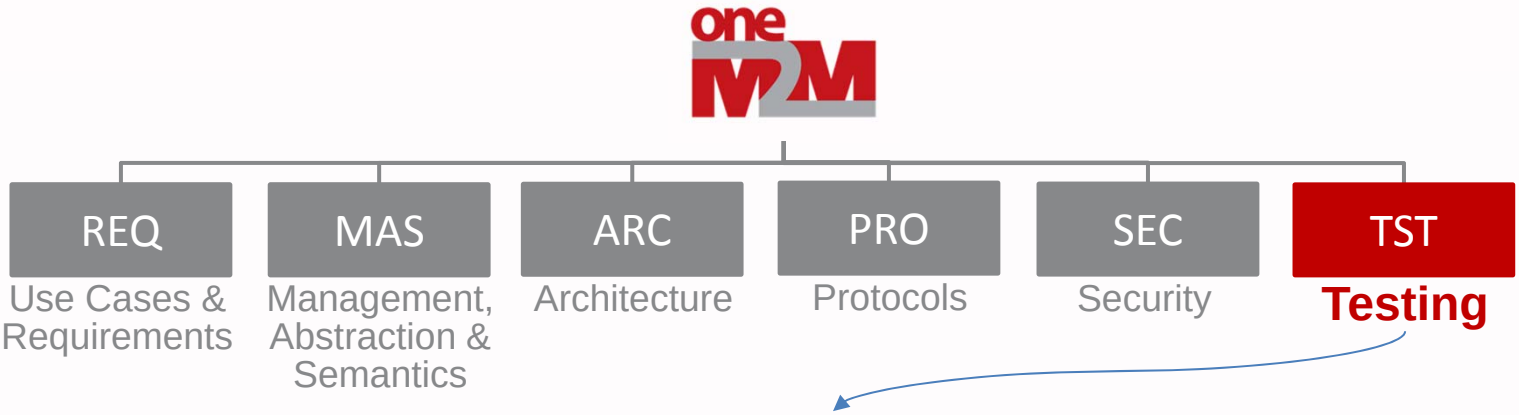
oneM2M Working Groups



Goals

- To develop and publish oneM2M Testing Specifications
- Testing related activities
  - Testing Events
  - Test Tool development
- Create oneM2M Certification Program

Conformance Testing

- **Scope**
  - Checking conformance with oneM2M **interface specs**
  - Interfaces: oneM2M Mca and Mcc Reference Points
- **Methodology**
  - Follows ISO/IEC 9646 methodology
  - Developed in the standardized test language TTCN-3
- **Test Execution**
  - For CSE is fully automatic
  - For ADN-AE (future work) may be semi-automatic: operator interaction may be needed

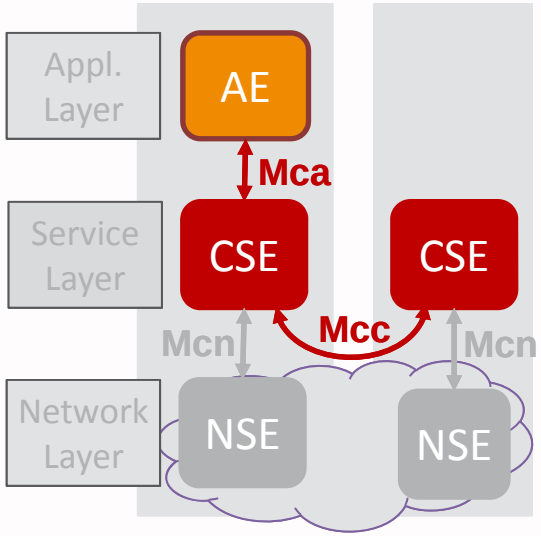


Image from http://www.guru99.com/conformance-testing.html

Interoperability Testing

- **Scope**
  - Check **end-to-end functionality** between application entities and common service entities
  - Interfaces: oneM2M Mca and Mcc Reference Points
- **Methodology**
  - Interoperability Testing Specification (TS-0013)
  - Complementary with conformance testing
- **Test Execution**
  - Manual

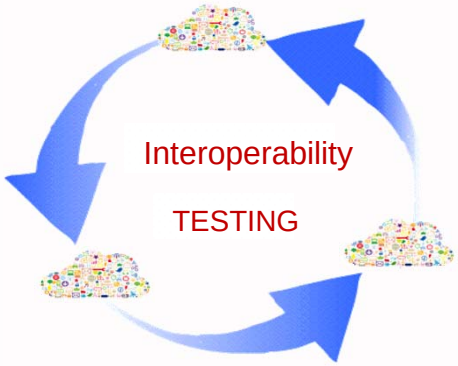


Image from http://www.guru99.com/conformance-testing.html

Testing Events

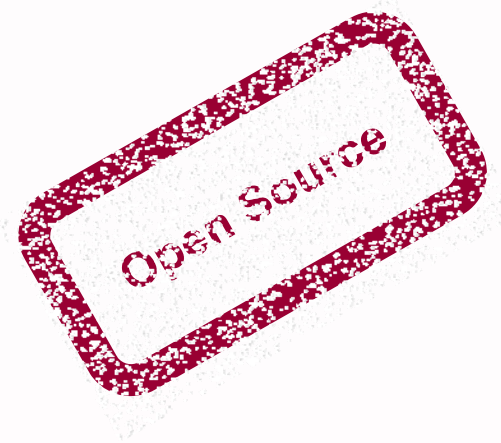
- **oneM2M Plugtest Events**
  - **1st event (14-16 September 2015 in France)**
    - Focus on interoperability testing
  - **2nd event (10-13 May 2016 in South Korea)***
    - Interoperability and conformance testing
  - **3rd event (29th November ~ 2nd December 2016 in Kobe, Japan)**
    - Planned to cover interoperability and conformance testing

On schedule

* - 20 participating companies,
77 IoP test descriptions, 84 testing sessions,
15 conformance test cases, 38 conformance testing sessions

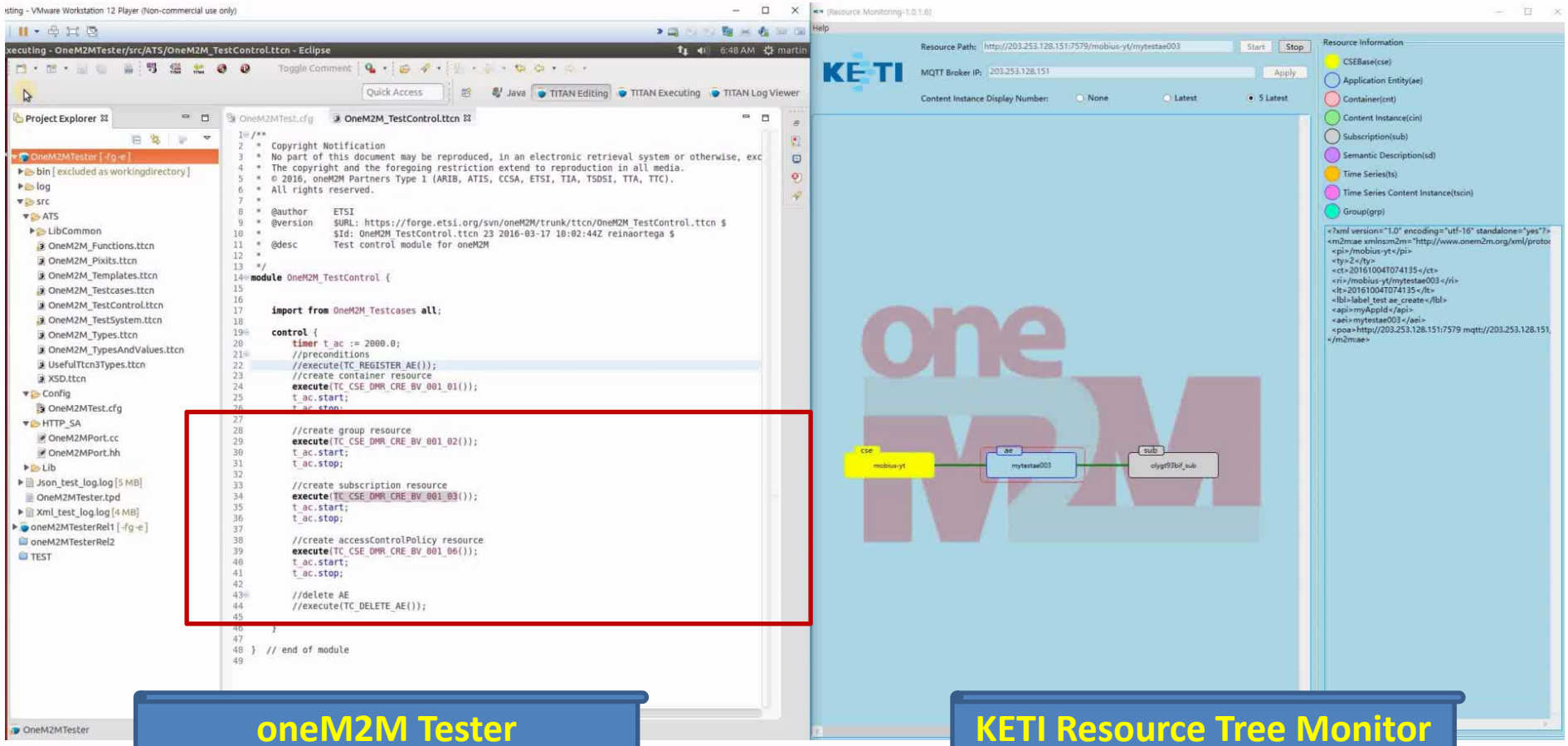
Tools

- **Conformance Testing tool development – oneM2M Tester**
  - **In parallel with the test code development**
    - Allows executing the conformance tests
    - Based on the open source TTCN-3 tool Titan
    - oneM2M Tester will be open sourced
  - **Evaluation**
    - At oneM2M plugtest events
  - **Demos and dissemination**
    - At IoT Week Korea 2016
    - At international conferences and events
      - UCAAT 2016, HUSTEF 2016, ECS 2016, etc.
    - Tutorials in the oneM2M webinar series



Tools

- **oneM2M Tester in action**

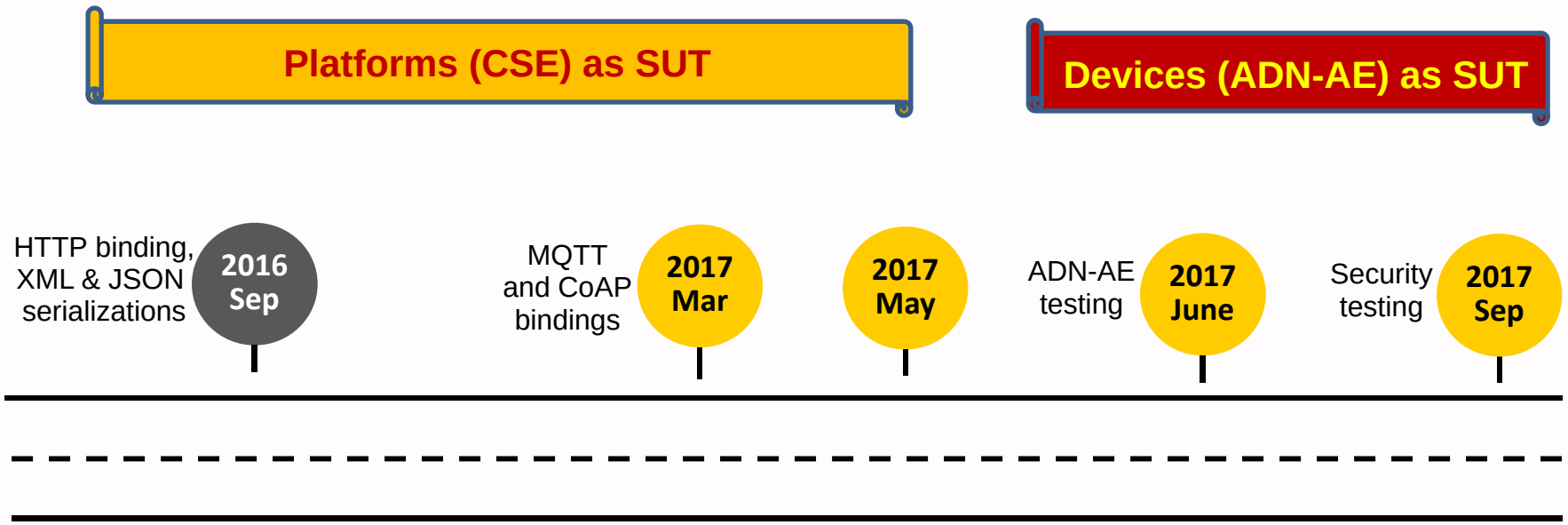


Certification

- **oneM2M Testing for Certification Program**
  - **Scope**
    - Both conformance and interoperability are included
  - **Status**
    - **Current on-going work**
      - Product Category for Certification scope and Certification scheme specification
      - Testing tools are under development
      - Certification body selection
      - oneM2M certification logo design and etc.
- **oneM2M TTA Verified Program (South Korea)**
  - Requirement for certification of oneM2M implementations (CSE) especially from three Telecom Service Providers and key manufacturers in South Korea
  - Satisfy requests of the oneM2M **minimum features** from Telecom Service Providers and key manufacturers to provide **IoT and M2M services**
  - Designed in cooperation with AT4Wireless

Roadmap

- **oneM2M Tester Development**



Key take away-s

- oneM2M is a global standardization initiative for **IoT Platforms**
- oneM2M not only develops **technical specifications**, but
- Also **test specifications, testing events**, **certification program** AND
- **Open source test tool** to execute conformance tests

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ADDITIONAL INFORMATION

Please find more detailed information about some of the topics on the following slides

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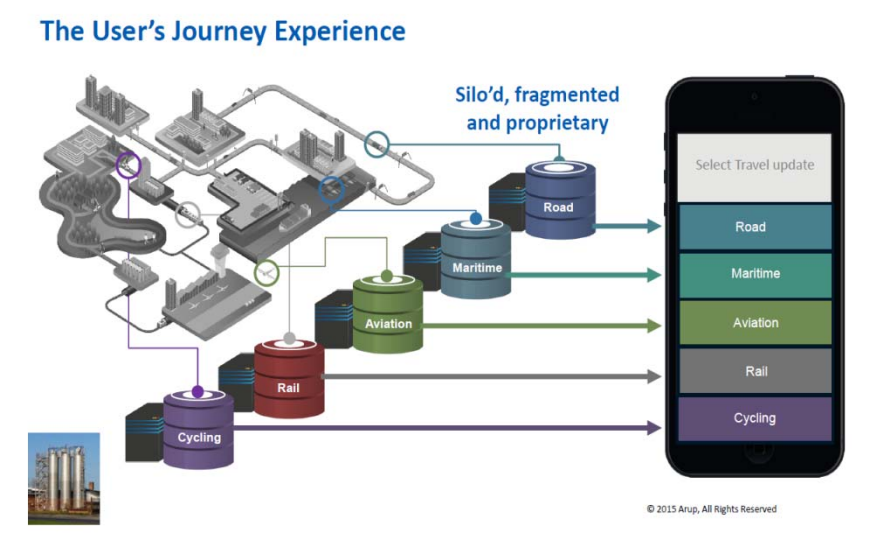
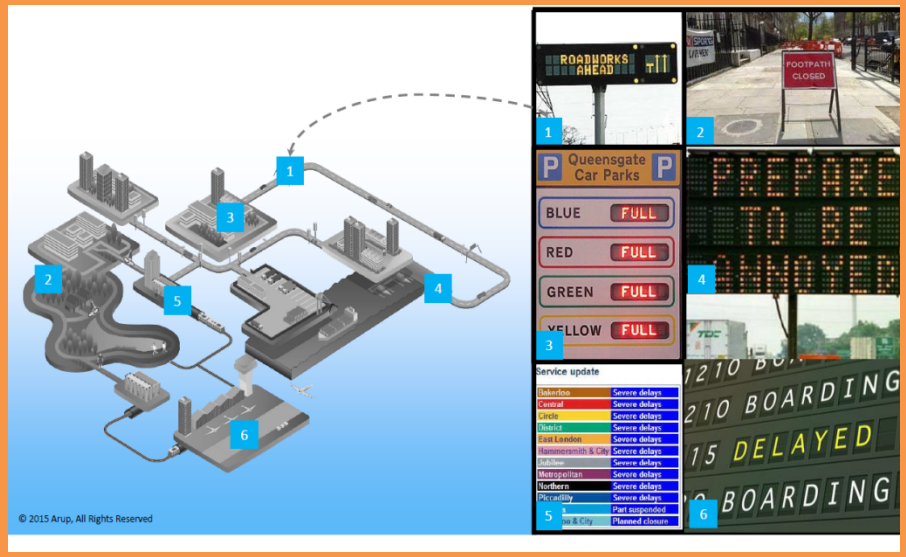
The reality of machine to machine (M2M) communication today: A transportation example

Transport today: a fragmented user experience



Wrong information, wrong time, wrong place



- **Each provider has a proprietary data collection and delivery service -> incomplete value chain**
- **User receives pieces of information in different applications**

Source: Use of the oneM2M standard in the oneTRANSPORT field (https://www.brighttalk.com/webcast/11949/190241)

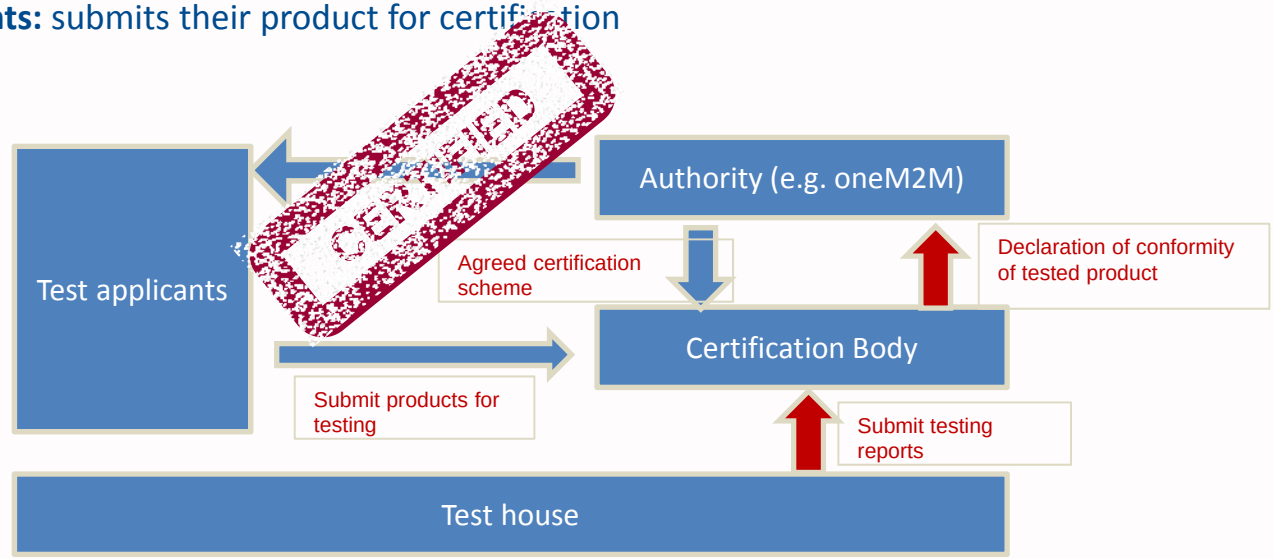
oneM2M Implementation Examples

- **Open source and commercial oneM2M implementations based on oneM2M Release 1**
  - **OCEAN**: Open allianCE for iot stANdard releases Blue Octopus (Spring Framework version) and Mobius-Yellow Turtle (Node.js version) by Korea Electronics Technology Institute (KETI)
  - **OM2M**: Eclipse OM2M Open Source standard-based IoT platform by LAAS-CNRS
  - **IoTDM**: Daylight Open Source oneM2M compliant IoT data broker by Cisco, ETRI and Echelon
  - **OPENMTC**: (not open source) OPEN Machine-Type Communication by Fraunhofer FOKUS
  - **ThingPlug**: (not open source) Mobius-based commercial IoT platform by SK Telecom

  Most of implementations are **CSE based** and very few are ADN-AE implementations
- **Projects**
  - **oneTRANSPORT** (Buckinghamshire County, UK): to address transport issues and provide a better travel experience meanwhile improve the delivery of public transport services etc.
  - **Smart City** (Busan, South Korea) : to establish a transportation and tourism infrastructure, a disaster management system, and energy saving system etc.
  - **ARMOUR** (Armour Consortium, Europe; receives EU funding): to address security issues on IoT by providing certified security & trust solutions to enhance security, privacy and safety in large scale IoT

Generic Certification Flow

- **Roles in certification process**
  - **Authority:** delivery certificate to an entity who got certified in its conformity to a standard or other references
  - **Certification body:** receives certification requests and testing reports from test applicants and test house, respectively. Also in charges of sending test reports to authority.
  - **Test house:** carries out tests and evaluation progress and generates test reports
  - **Test applicants:** submits their product for certification



Generic certification flow

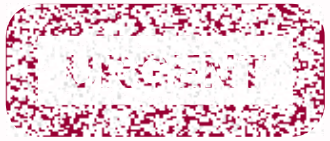
Challenges for oneM2M Certification Program

- No detailed information on minimum features set in oneM2M specs
- No approved functional testing methodology for ADN entities (current testing specs are designed only for ASN/MN/IN entities), which in fact are seen as the main testing product type in certification program

When it comes to security testing, work becomes more complex

- No security testing spec including security testing methodology and ICS (in fact it has been put on oneM2M Security & Testing WG schedule)
- No Test Suite Structure & Test Purposes spec until now

The Future work in high priority is to specify



- Product category for testing
- Testing methodology for testing ADN entity
- ICS functional testing spec with information of minimum feature set and additional feature set for ADN entity
- ICS security testing spec for ADN entity including abstracted security testing requirements prior to write test purposes for each single requirement
- Security testing flow for security authentication and authorization including access control policy mechanisms