TESTING ONEM2M COMPLIANT IMPLEMENTATIONS

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Who we are?

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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 needed?

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
  - > 200 member organizations
  - 8 regional SDOs-> endorsing oneM2M specifications
  - Partnership with 6 international fora/standards bodies
Architecture – “Node” view

- Appl. Service Node
- Middle Node
- Infrastructure Node
- Infra. Node

Underlying Network
oneM2M architecture consists of entities and reference points through which communications between any two entities can be achieved.
**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
  • oneTRANSPORT
    (UK)
  • Smart City BUSAN
    (South Korea)
  • ARMOUR
    (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

- REQ: Use Cases & Requirements
- MAS: Management, Abstraction & Semantics
- ARC: Architecture
- PRO: Protocols
- SEC: Security
- TST: Testing

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
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

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

* - 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

Platforms (CSE) as SUT

- HTTP binding, XML & JSON serializations
  - 2016 Sep

- MQTT and CoAP bindings
  - 2017 Mar

- ADN-AE testing
  - 2017 June

- Security testing
  - 2017 Sep

Devices (ADN-AE) as SUT

- ADN-AE testing
  - 2017 May

- Security testing
  - 2017 Sep
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
ADDITIONAL INFORMATION

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

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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
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