Standard Open Source Cloud APIs for the Smart Home

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Smart Home: A new world of services
The Smart Home infrastructure, a typical infrastructure in the Internet of Things

services and applications

Smart Home infrastructure

devices
One main technical challenge

Deliver interoperable APIs and data models for infrastructure operators, service and device providers
Together, we push forward open standard cloud APIs

Orange Labs and T-Labs share open source outcomes with the community
- Common reference implementation → integration by platform operators
- Application templates and examples → integration with service providers
- Repository of cloud connectors → integration with device providers
Why choosing standards in the Internet of Things?

Propose a universal approach
Use an emerging standard backed by a large organization and set of partners.

Scale up
Leverage available open source implementations and communities.

Go fast
Capitalize on available specifications covering all technical aspects
oneM2M in a nutshell

An international standard
A partnership project gathering 8 major regional organizations, e.g., ETSI
An analog partnership project to 3GPP for the service layer with the same global reach
A cross-vertical layer for IoT addressing multiple domains: home, city, industry, vehicle.

Available specifications
An end-to-end IoT reference architecture
10 common service functions (communication, data, device management, ...)
RESTful access to a resource data tree, with sophisticated features; e.g., filter, search, subscription, access rights

Available open source platforms
eclipse OM2M, Cisco IoTDM, Fokus
OpenMTC, Keti Ocean today

Available commercial platforms
Cisco, Huawei, HP Enterprise, Ericsson,
Sierra Wireless, Actility, ...
Operators: SK Telecom, LGU+, ...

Device abstraction, semantics
Smart Device Template: Abstraction of devices and functions
Smart Home enablement with data models
Base ontology, semantic descriptions

An interworking framework with existing technology
Advanced protocol bindings: HTTP, CoAP, MQTT, WebSockets
Interworking with various technologies, Iotivity, AllJoyn, OMA LW M2M...
oneM2M set of Common Service Functions cover all the interfaces to platform, service, device providers
oneM2M Smart Device Template to model devices and functions

Description of devices with 3 levels

- devices
- functions
- data, actions, events
oneM2M Home Appliances Information Model and Mapping (TS-0023)

Home Appliances described as SDT devices and modules

- Light
- Motion Sensor
- Thermostat
- Thermometer
- Humidity sensor
- Smoke Sensor
- Meter
- Battery
- Oven
- Refrigerator
- Television
- Air Conditioner
- Water Heater
- Clothes washer
- Robot Cleaner
- ...

External organizations are contributing data models to oneM2M, too

e.g., Open Connectivity Consortium, Echonet
Showcase: Make oneM2M applications run simultaneously with both operator platforms without any code change

Partners’ apps, e.g.,

oneM2M Home cloud APIs
Datavenue / eclipse OM2M

Orange LiveBox

Virtual and local devices

oneM2M Home cloud APIs
Qivicon / eclipse OM2M

Virtual and local devices

Deutsche Telekom Speedport

Meet us on Booth n° 6
Contributions to the community beyond the demo

Open source contributions to Eclipse OM2M project
oneM2M end-to-end implementation available in new OM2M 1.1.0 release. With ‘SDT Viewer’ tool, applications and Java connectors for various devices.

An online oneM2M Smart Home platform for experiments
Orange Data Share is exposed in a oneM2M version for experimental purposes. Developers can connect devices and play with a live infrastructure.

A bridge between Eclipse SmartHome embedded middleware and Eclipse OM2M infrastructure
Eclipse OM2M release 1.1.0

- Features implemented in Eclipse OM2M last release (1.1.0)
  - oneM2M release 2 support
  - FlexContainer resource
  - Smart Device Template (SDT)
  - MQTT communication binding
  - NoSQL MongoDB storage
  - Dynamic Authorization
  - Resource Announcement
  - Enocean interworking
  - Hue interworking
  - Netatmo interworking
  - SmarterCoffee interworking
  - LIFX interworking
  - OSGi DAL (Device Abstraction Layer) interworking
  - Several test suites

Eclipse OM2M 1.1.0 has been released in October 2017 for EclipseCon Europe
Current version is 1.2.0
Online oneM2M server for experiments

- Orange Data Share: [datashare.orange.com](https://datashare.orange.com)
  a user dashboard for objects, services & user consents

- Connect your things and play with oneM2M APIs
  e.g., Philips, OSRAM, NetAtmo devices
  Swagger documentation
  (will move to Orange Partner: [https://developer.orange.com/apis/datashare](https://developer.orange.com/apis/datashare))
Bridging Eclipse OM2M infrastructure with Eclipse SmartHome (ESH) embedded middleware

- **Objectives**
  - Benefit from ESH bindings with dozens of devices
  - Benefit from OM2M balanced infrastructure between a local box and the cloud.

- **Implementation**
  - Specify the conversion between oneM2M and ESH device abstraction layers
  - Implement an interworking proxy representing ESH devices into oneM2M resource data tree with oneM2M device data models.

- **Availability**: soon on Eclipse SmartHome and OM2M
Where do we go from here?

- OM2M and SmartHome:
  - RESTful device connector concept,
  - hands-on sessions with the community,
  - 5-step guide for application developers and device connector developers
  - oneM2M base ontology implementation, to welcome easily other abstraction layers
  - device management protocols implementation, e.g., BBF TR-069, OMA Lightweight M2M

- oneM2M
  - Addition of semantic descriptors in Smart Device Template
  - Serialization of semantic descriptors in JSON-LD, next to current RDF-XML descriptors
  - Abstraction of device management features
Thanks
Temperature module class example

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Readable</th>
<th>Writable</th>
<th>Optional</th>
<th>Documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>currentTemperature</td>
<td>xs:float</td>
<td>true</td>
<td>false</td>
<td>false</td>
<td>The current temperature.</td>
</tr>
<tr>
<td>targetTemperature</td>
<td>xs:float</td>
<td>true</td>
<td>true</td>
<td>true</td>
<td>The desired temperature to reach.</td>
</tr>
<tr>
<td>unit</td>
<td>xs:string</td>
<td>true</td>
<td>false</td>
<td>true</td>
<td>The unit for the temperature values. The default is celsius (°C).</td>
</tr>
<tr>
<td>minValue</td>
<td>xs:float</td>
<td>true</td>
<td>false</td>
<td>true</td>
<td>Minimum value of targetTemperature.</td>
</tr>
<tr>
<td>maxValue</td>
<td>xs:float</td>
<td>true</td>
<td>false</td>
<td>true</td>
<td>Maximum value of targetTemperature.</td>
</tr>
<tr>
<td>stepValue</td>
<td>xs:float</td>
<td>true</td>
<td>false</td>
<td>true</td>
<td>Step value allowed for targetTemperature.</td>
</tr>
</tbody>
</table>

A temperature sensor may implement the module class with only currentTemperature data attribute.

An Air Conditioner may implement the module class with all optional data attributes.