



On Management, Abstraction & Semantics

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oneM2M www.onem2m.org

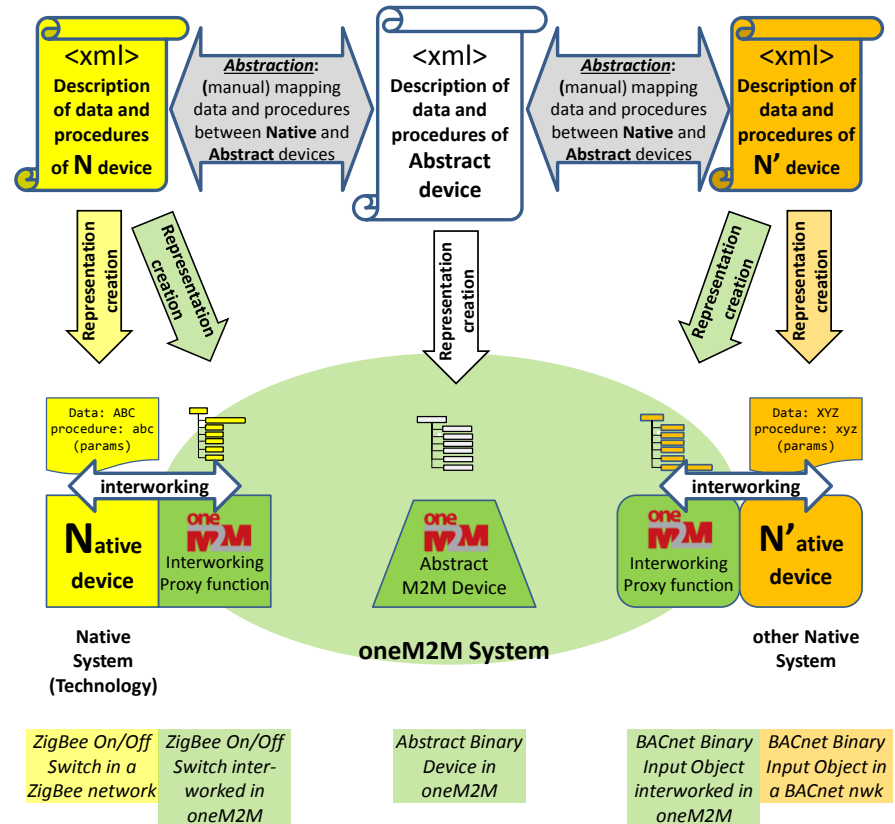
Agenda



- Concepts about M.A.S.
- The Management Capabilities in oneM2M
 - Architecture
 - Resource modeling
 - Protocol mapping
- The Generic Abstraction & Semantic Capabilities in oneM2M
 - Resource modeling
 - Interworking framework
 - Semantic enhancement
 - Evolution roadmap
- Conclusion

Concepts - Abstraction

- **Abstraction:** generalizing the information model
 - → to hide the complexity of the specific technologies by providing a single format to represent devices and unified methods directly usable by the applications.
- **Interworking:** mapping between two specific technologies
 - → to enable the information exchange between heterogeneous systems
 - Applications may still need to understand the native information model (e.g. Zigbee profile)

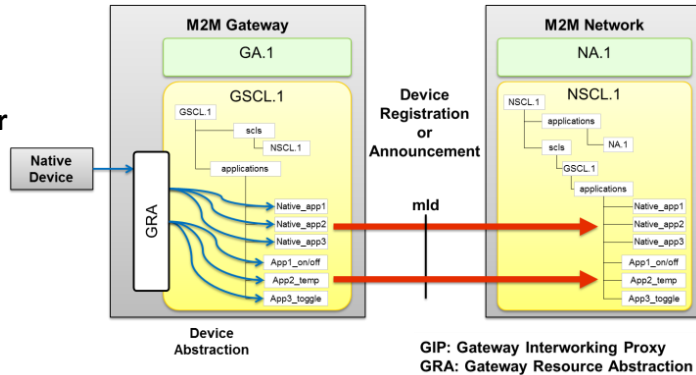


Interworking is the basis for Abstraction

Concepts - Abstraction

- Examples of existing work study:
 - ETSI M2M ZigBee Interworking

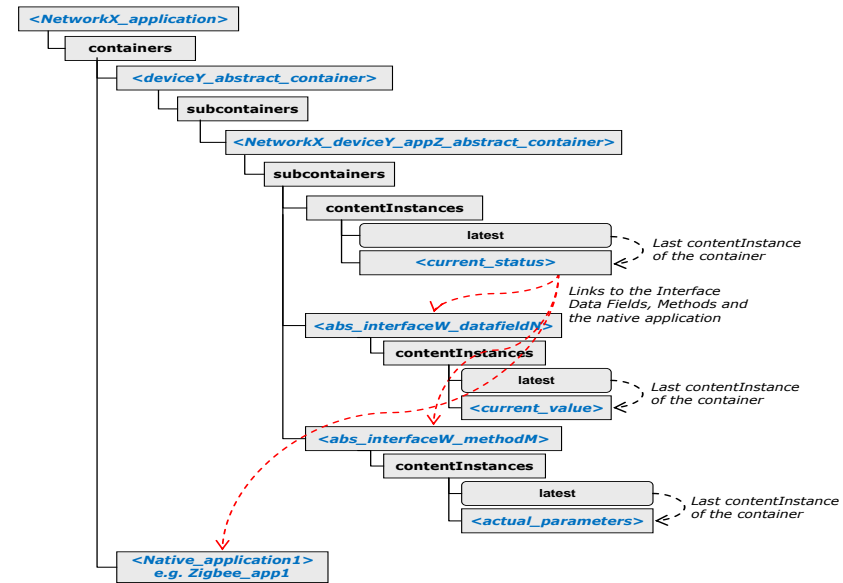
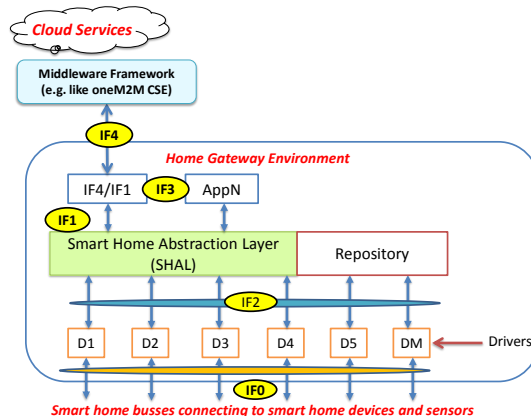
High-level architecture for supporting device abstraction



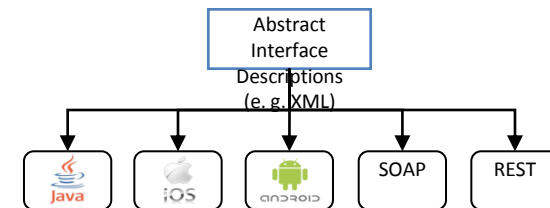
(Ref: ETSI TS 102 690: "Machine-to-Machine communications (M2M); Functional architecture".)

- HGI Smart Home Abstraction Layer (SHAL)

A high-level conceptual HGI architecture



Mapping of an abstract device to the ETSI M2M resource architecture using the <subcontainer> resource

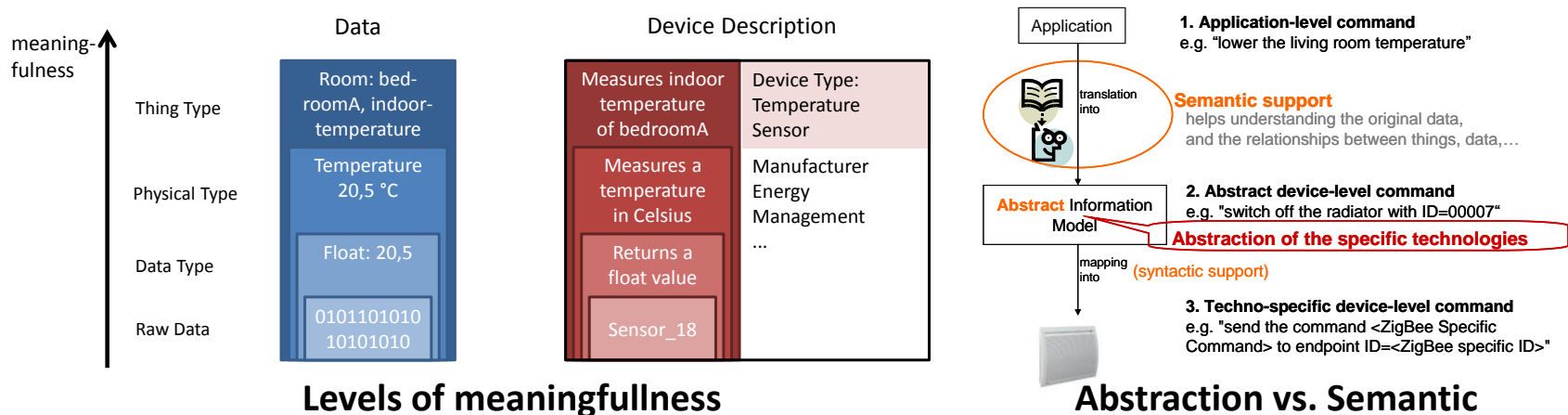


The abstract appliance interface descriptions should be mappable to various environments

(Ref: HGI02029: "Smart Home Architecture and System Requirements")

Concepts - Semantics

- **Semantics:** adding the meaning and relationships between concepts (e.g. data, devices, things) and their instances
 - → to enable machine understandable interoperability without a-priori agreement or configuration between communication parties
 - the formal specification of a conceptualization is done by 'ontology', which provides unambiguous vocabulary and model about objects, measurands, their properties and relationships.

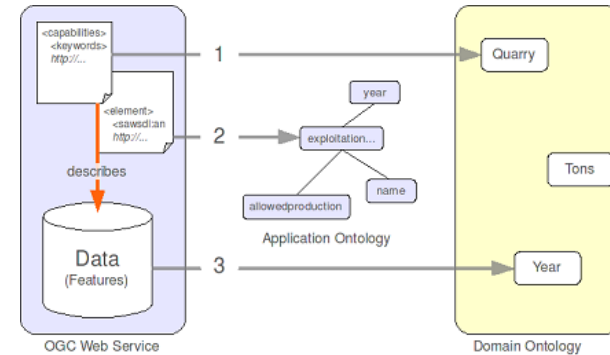


Semantics is the evolution of Abstraction

Concepts - Semantics

- Examples of existing work study:
 - OGC Best Practice for semantic annotation

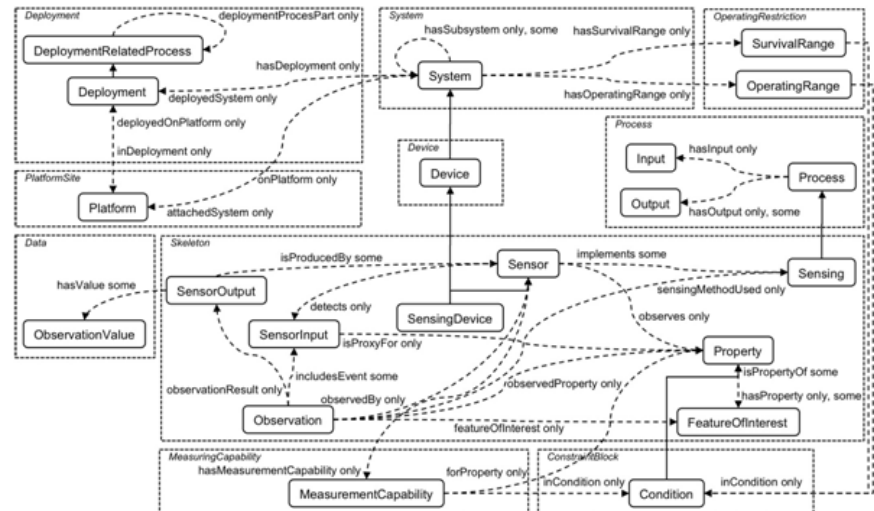
(Ref: Open Geospatial Consortium Best Practice, Semantic annotations in OGC standards.)



Semantic annotations at levels of: service metadata, data model & data entities.

- W3C Semantic Sensor Network (SSN) Ontology based on OGC SWE information model

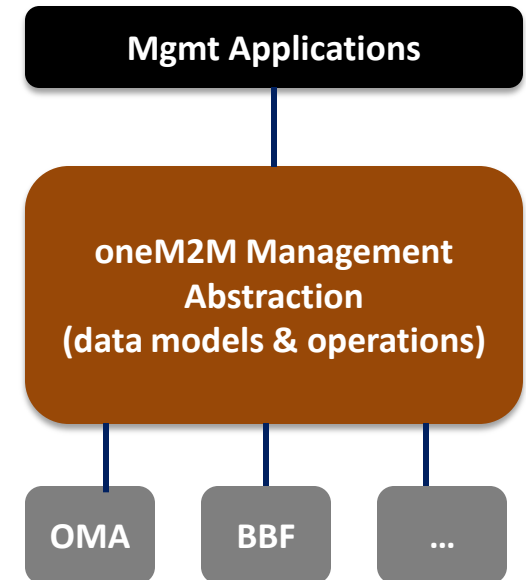
(Ref: Semantic Sensor Network XG Final Report, W3C Incubator Group Report 28 June 2011.)



Overview of the Semantic Sensor Network ontology classes and properties

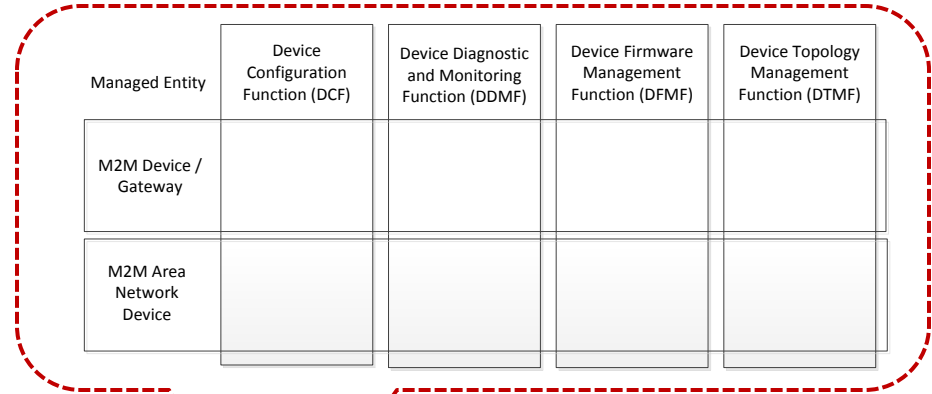
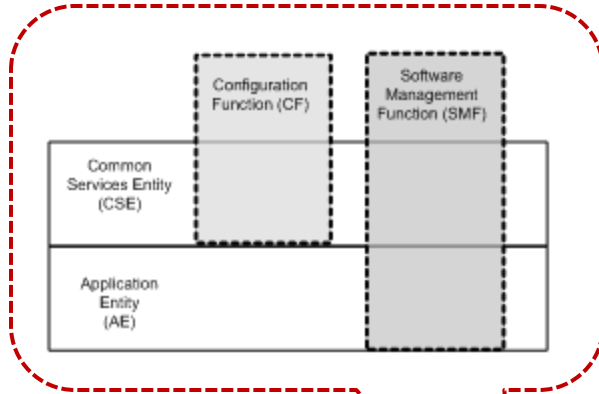
Concepts - Management

- **Management:** the management (configuration, monitoring, trouble shooting, upgrade, etc.) of devices (ADN/ASN/NoDN), applications (AEs) and common service entities (CSEs)
 - to provide '**Abstracted**' unified & simplified management APIs for M2M applications.
- Management is essentially a specific aspect of oneM2M Abstraction framework:
 - **Data models:** the resources describing the mgmt capabilities, properties and status
 - **Operations:** the actions performing mgmt tasks, e.g. download (firmware), get (status) or set (properties), execute (software installation)



Management is a specific aspect of Abstraction

Management Capabilities

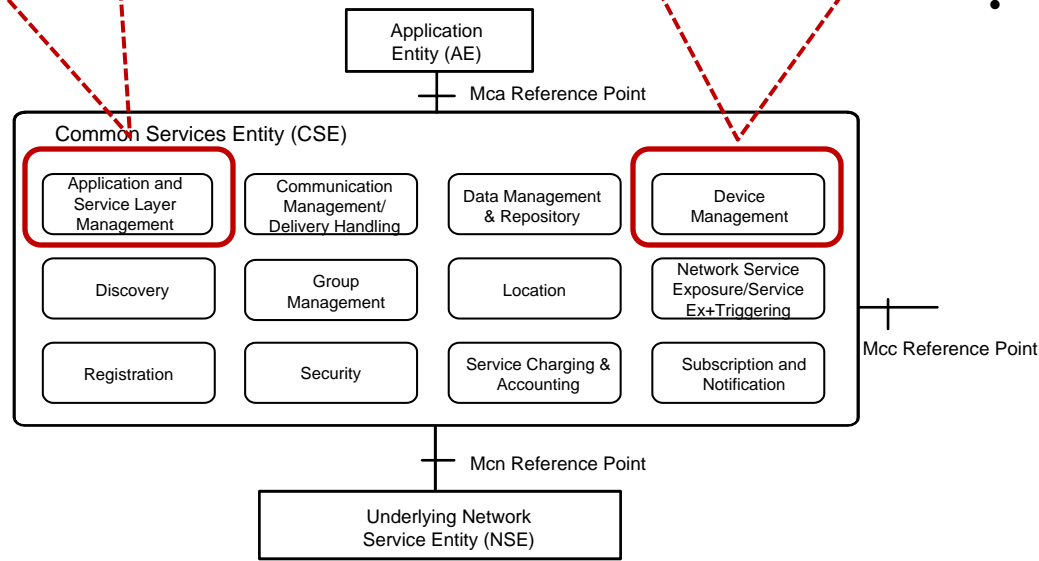


Application and Service Layer Management (ASM CSF)

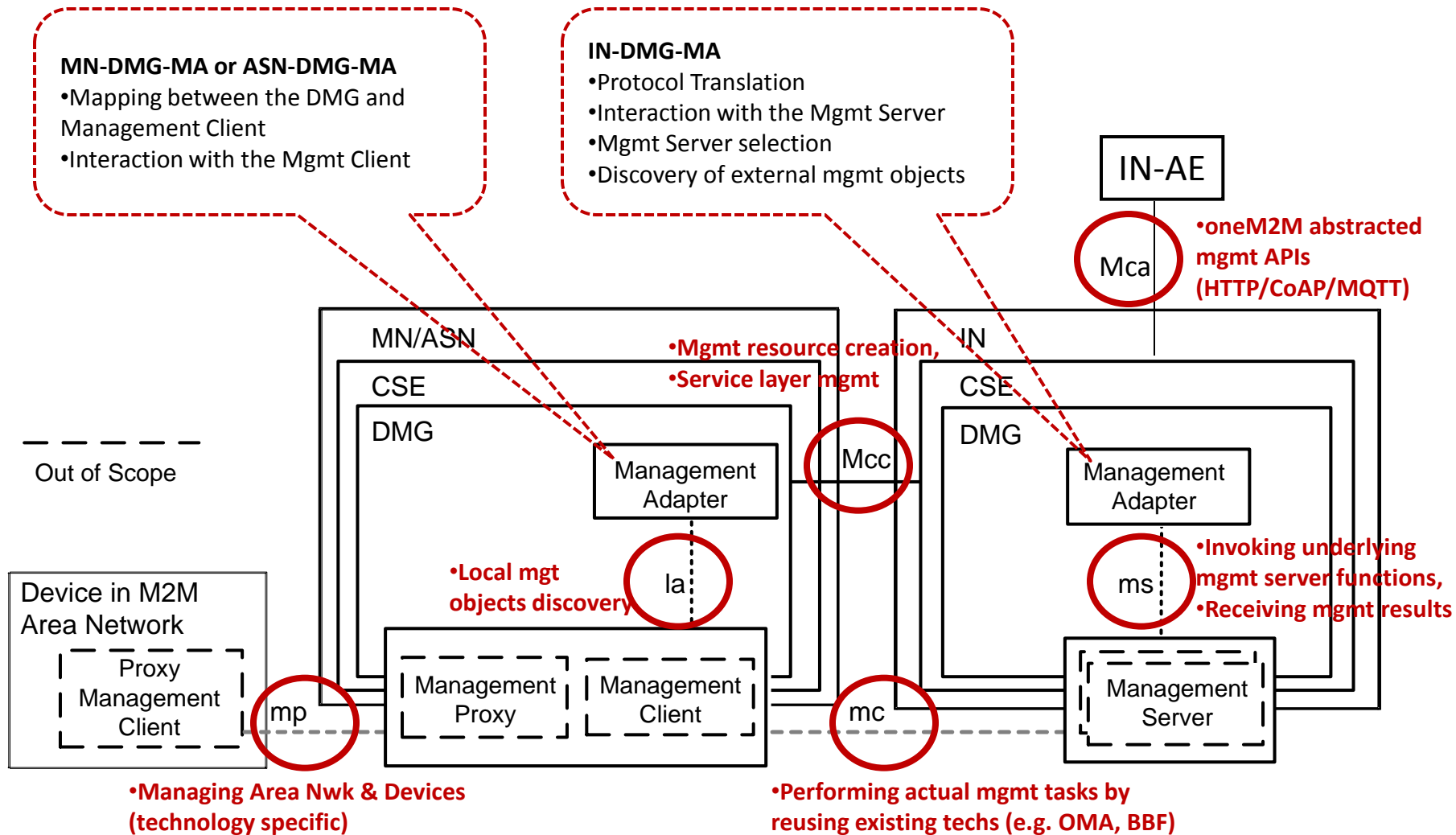
- Configuration Function (e.g. CMDH Policy configuration)
- Software Management Function (e.g. software download/install/activation):

Device Management (DMG CSF)

- Device Configuration Function (e.g. enable/disable capabilities, provisioning)
- Device Diagnostics and Monitoring Function (e.g. memory, battery, event logs, reboot)
- Device Firmware Management Function
- Device Topology Management Function (e.g. Area Network topology & characteristics)



Management Architecture

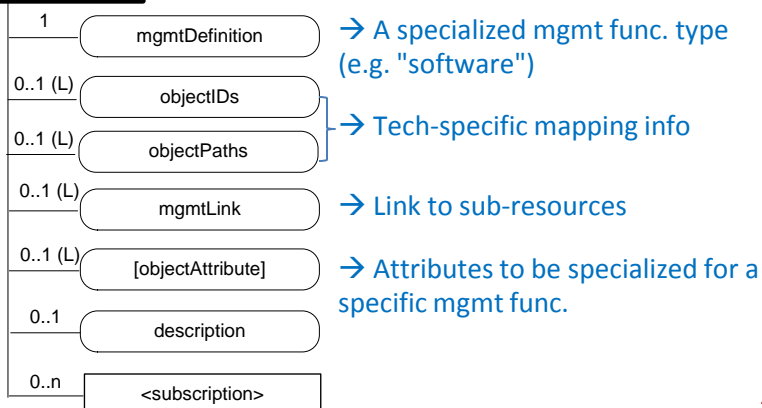


Management Abstraction

oneM2M TS-0001 (ARC)/ TS-0004 (PRO)

<mgmtObj>

Generic Mgmt Resource Model



Specialization

Application & Service Layer Mgmt

[software]

[cmdhPolicy]

Device Mgmt

[firmware]

[deviceInfo]

[deviceCapability]

[eventLog]

[battery]

[memory]

[reboot]

[areaNwkInfo]

[areaNwkDeviceInfo]

oneM2M TS-0005 (OMA)

Mapping

oneM2M TS-0006 (BBF)

OMA
DM 1.X

- FUMO
- SCOMO
- DevInfo
- DiagMO
- ...

OMA
DM 2.0

OMA
LWM2M

- Device Object
- Firmware Update Object
- Software Mgmt Object
- ...

BBF
TR069/TR181

- DeviceInfo
- SoftwareModules
- X_oneM2M_...
- ...

Management Abstraction

oneM2M TS-0001 (ARC)/ TS-0004 (PRO)

Generic Resource Model for RPC-like mgmt commands (BBF TR069)

<mgmtCmd>

0..1	description	
1	cmdType	→ RPC cmd type (e.g. "download")
0..1	execReqArgs	→ Cmd arguments (opaque)
1	execEnable	→ <u>Trigger of execution (by 'UPDATE')</u>
1	execTarget	→ Target device(s) (<node> or <group> URI)
0..1	execMode	→ Execution mode(e.g. 'repeated')
0..1	execFrequency	→ In association with execution mode
0..1	execDelay	
0..1	execNumber	
0..n	<subscription>	
1	<execInstance>	

<execInstance>

1	execStatus	
1	execResult	
0..1	execDisable	→ Cancel a pending cmd
1	execTarget	→ Inherit from the parent <mgmtCmd>
0..1	execMode	
0..1	execFrequency	
0..1	execDelay	
0..1	execNumber	
0..1 (L)	execReqArgs	
0..n	<subscription>	

* Each execution creates a <execInstance> to maintain the execution status and result

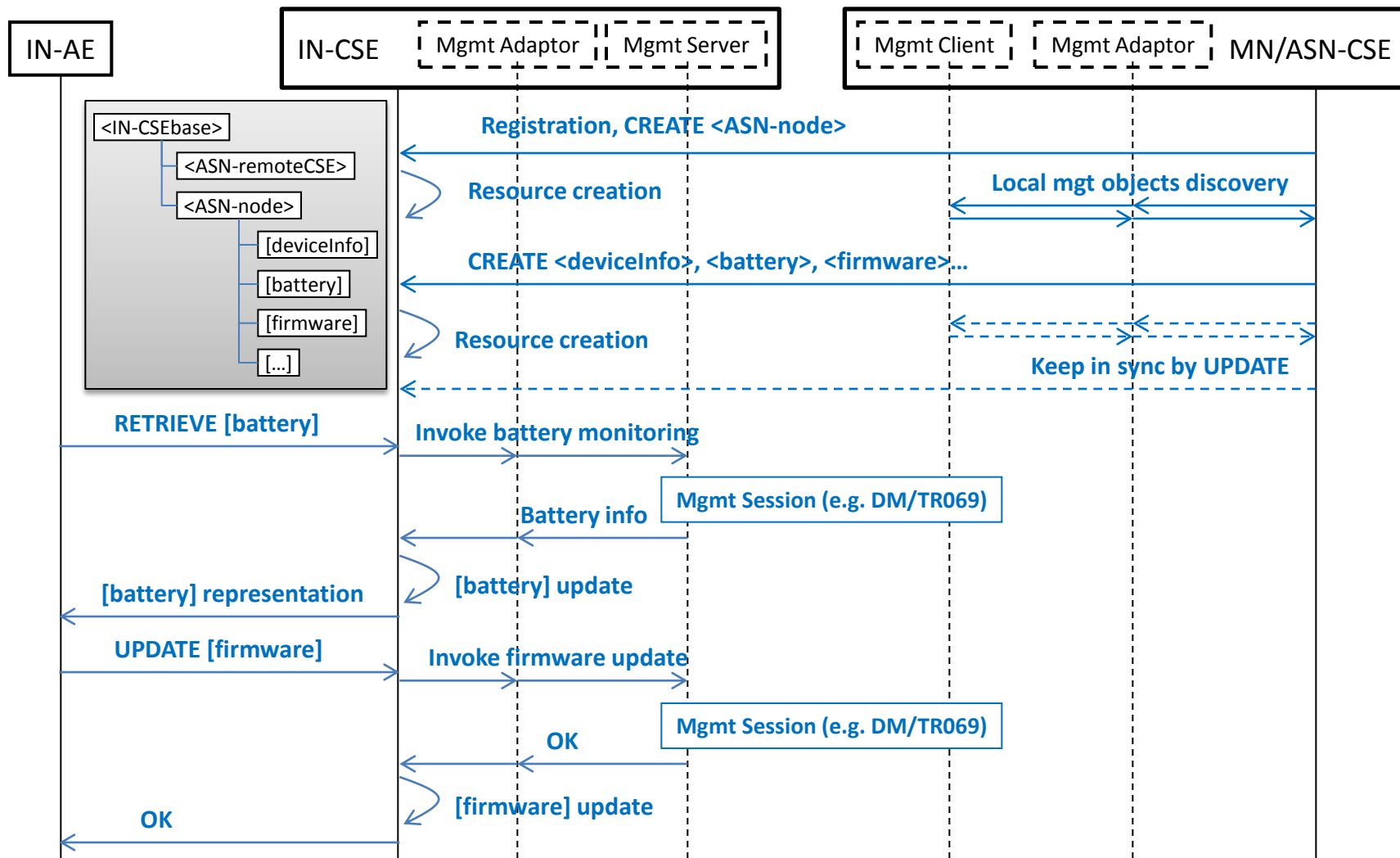
Mapping

oneM2M TS-0006 (BBF)

BBF TR069

•RESET
•REBOOT
•UPLOAD
•DOWNLOAD
•SOFTWAREINSTALL
•SOFTWAREUNINSTALL

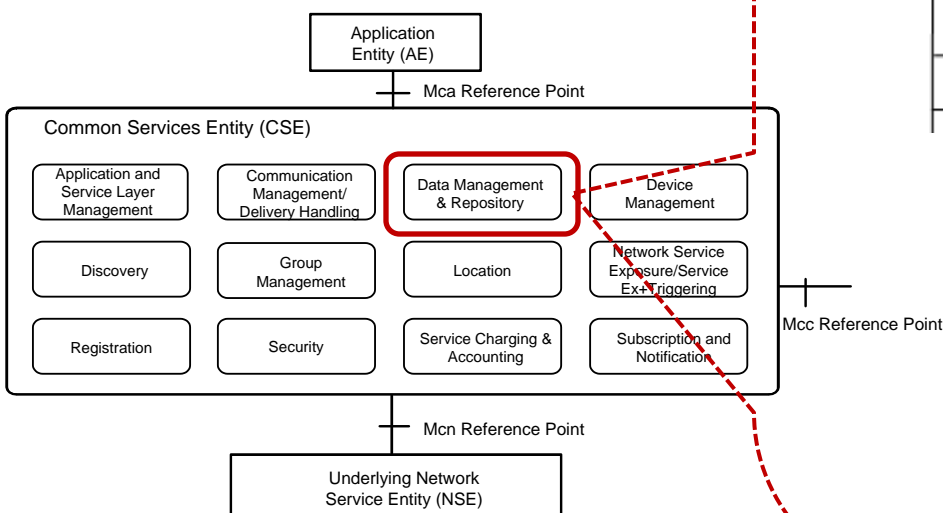
Management Example Flow



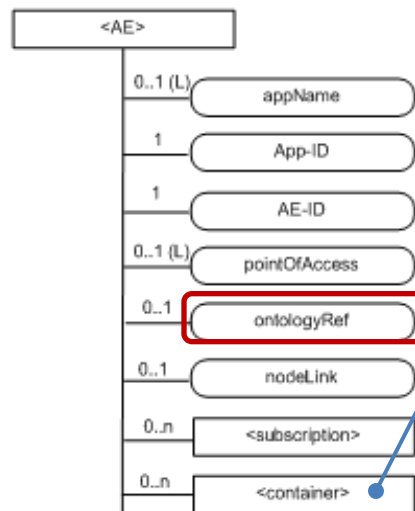
Generic Abstraction/Semantics

✓ Resource types **<AE>**, **<container>** & **<contentInstance>** are used for the abstraction of M2M applications, data collection and instances.

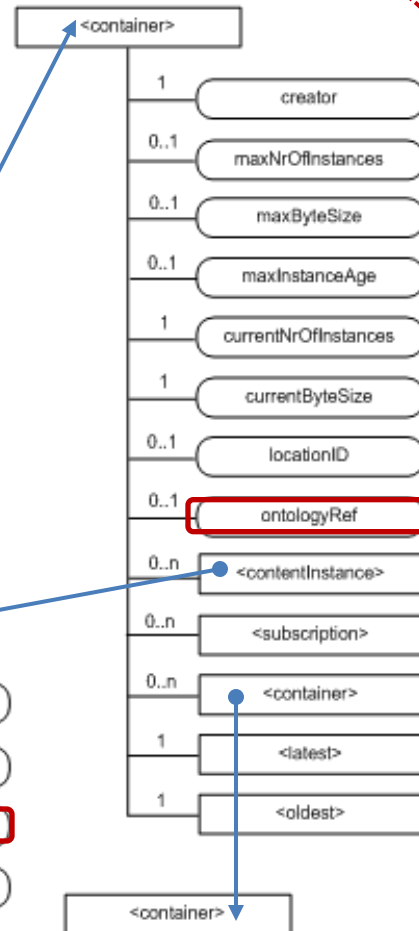
✓ Attribute '**ontologyRef**' is to provide the semantic annotation (meaning) for application and data. It's the rudimentary step towards semantic capability enablement.



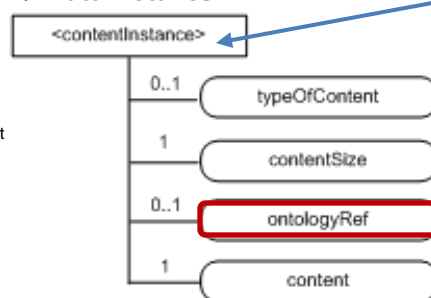
Application



Data collection



Data instance

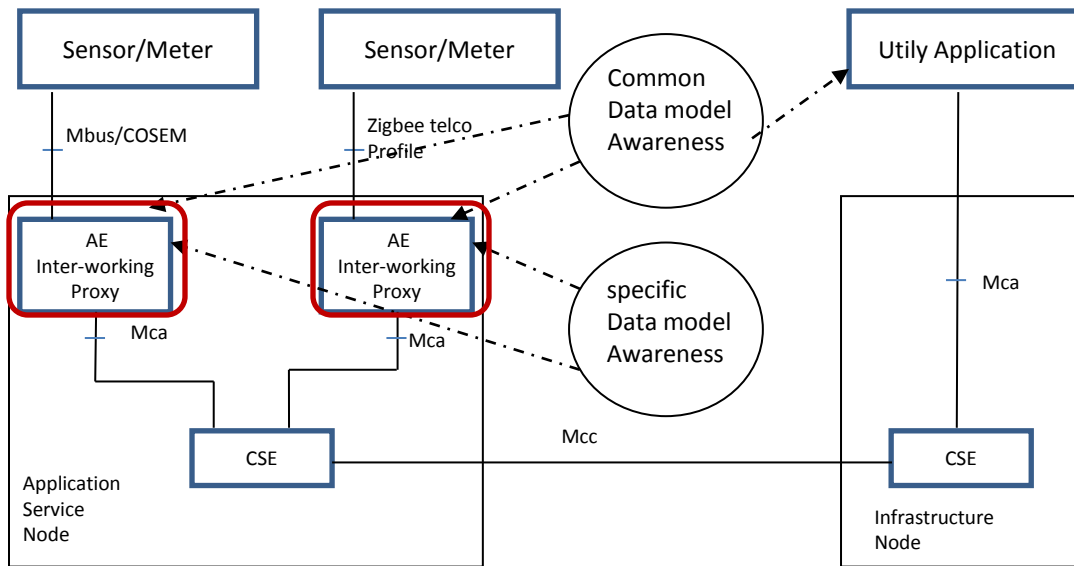


Hierarchical data collection

Interworking with non-oneM2M

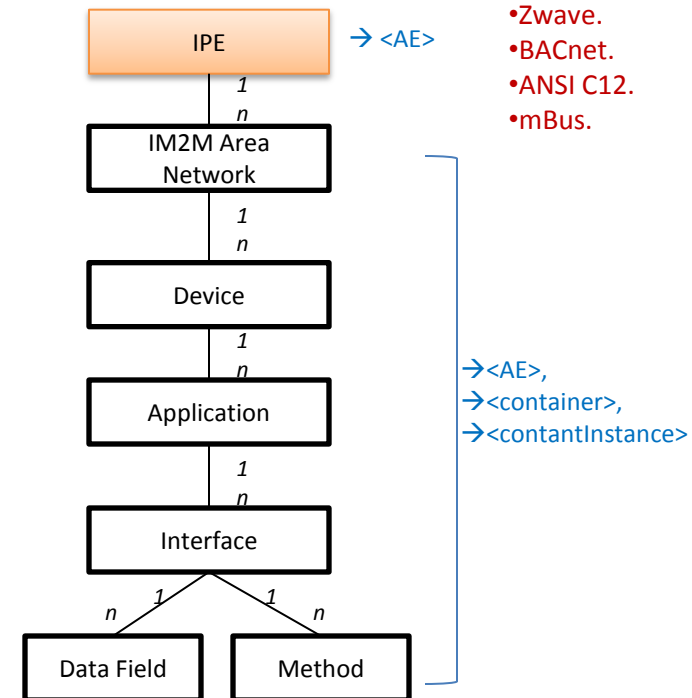
(Informative)

- ✓ The **Inter-working Proxy Application Entity (IPE)** abstracts and maps the non-oneM2M data model to the oneM2M resources exposed via the Mca reference point



Translation of non-oneM2M Data Model to oneM2M Specific Data Model

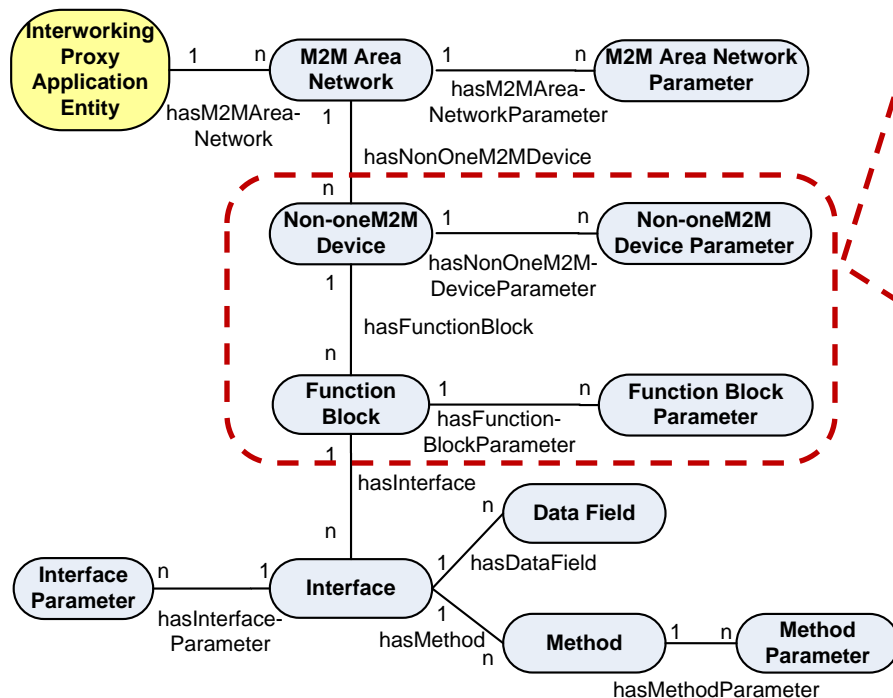
- ✓ A common abstracted data model for multiple M2M Area Networks:



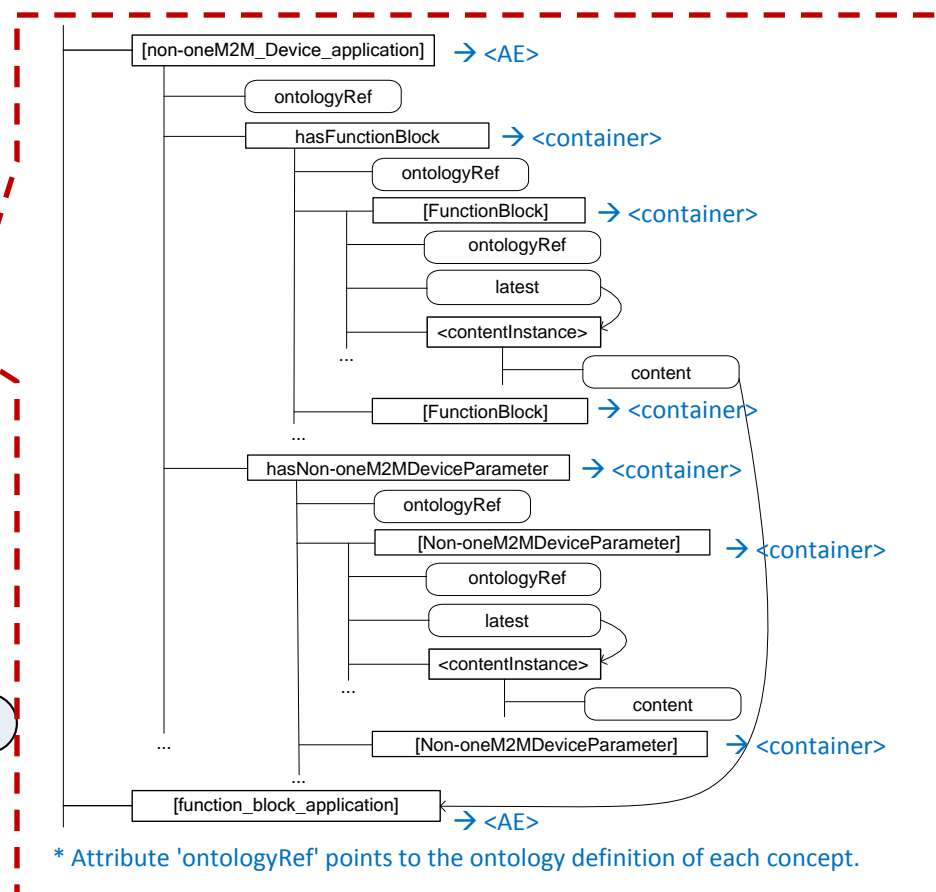
Generic data modeling of interworking

Interworking Enhancement with Semantics

(Informative)

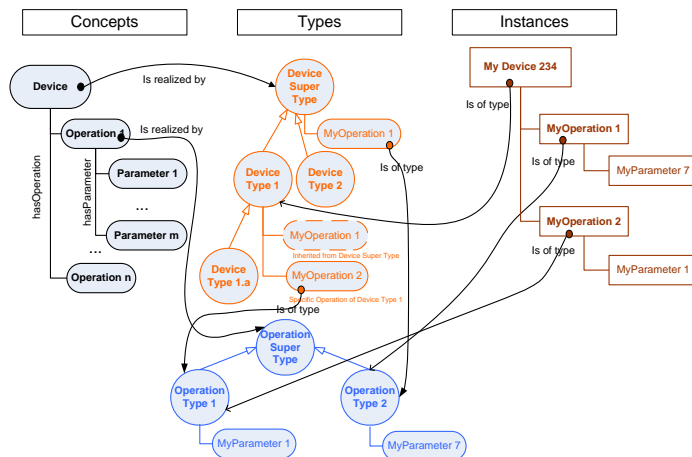


**A generic semantic concept model (ontology)
representing an Area Network**

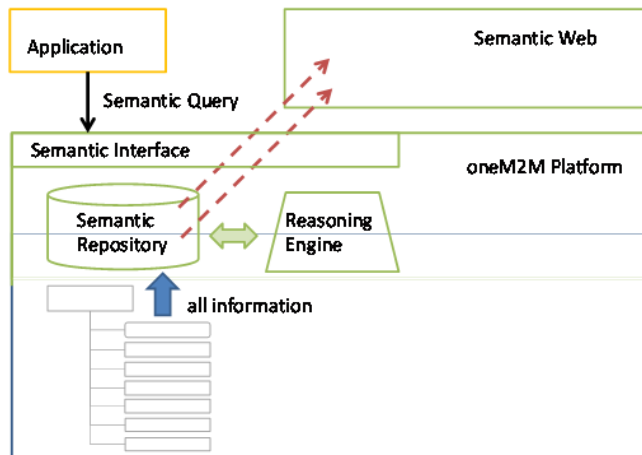


An example of mapping to oneM2M resources

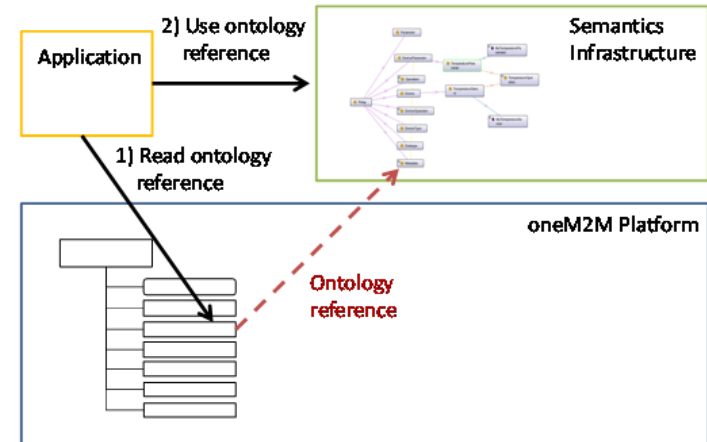
Roadmap to Semantic Enablement (Informative)



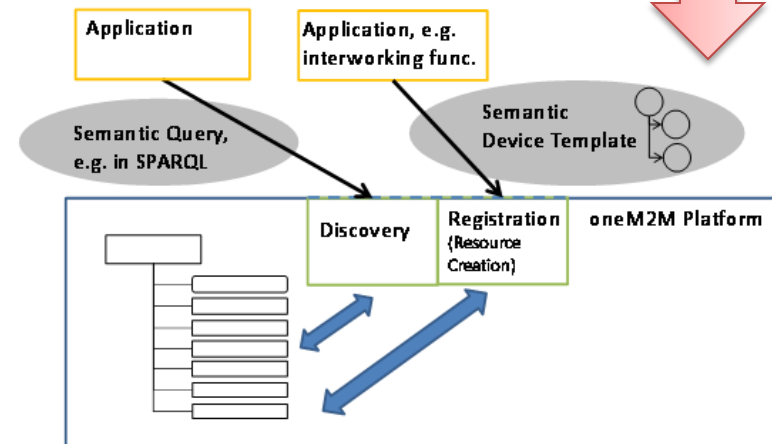
1. Semantic Modeling (Ontology)



4. Full Semantic Platform

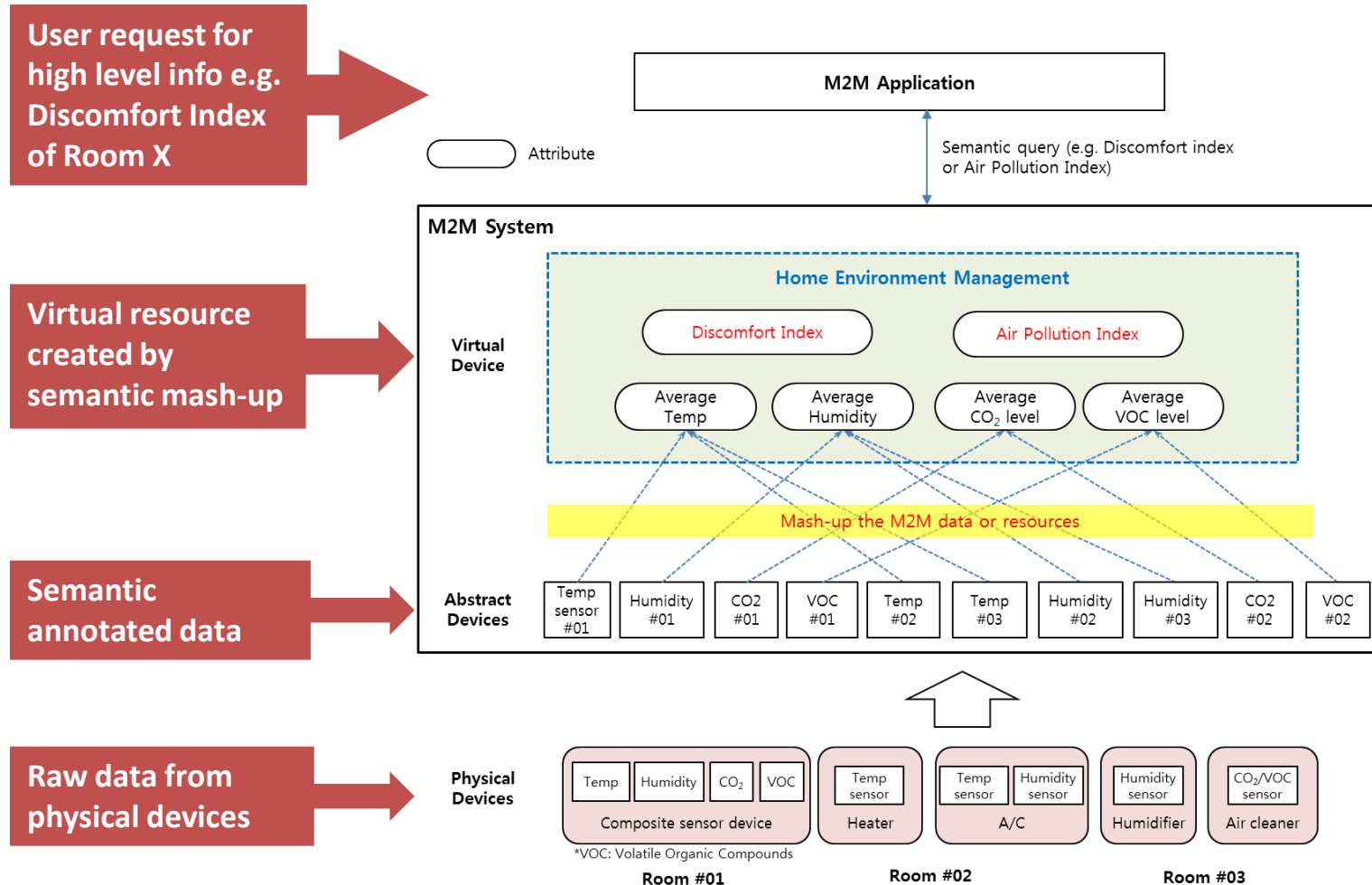


2. Semantic Annotation



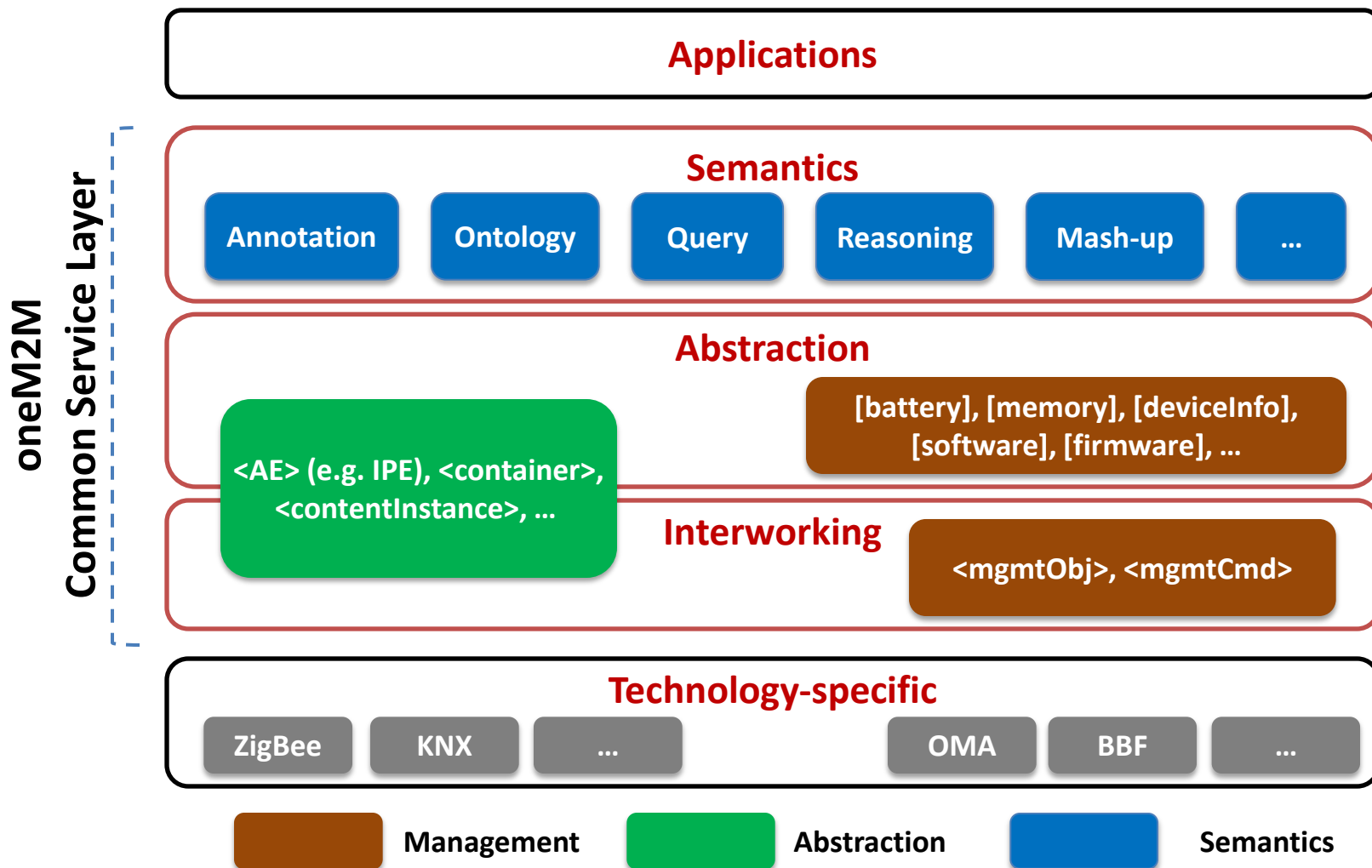
3. Use of Semantic Technologies for specific Platform Functionalities

An Example Case using Semantics



An example of Home Environment Monitoring Service using semantic mash-up

Conclusion



Join us at the oneM2M showcase event

- OneM2M project partners, rationale and goals
- OneM2M Service Layer Specification release
- Showcase demos that demonstrate oneM2M “live”

9 December 2014, Sophia-Antipolis, France

(free of charge, but online registration is required)

<http://www.onem2m.org/Showcase>

Followed by the ETSI M2M workshop

Thank You!



Q&A