



# On Management, Abstraction & Semantics

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oneM2M [www.onem2m.org](http://www.onem2m.org)

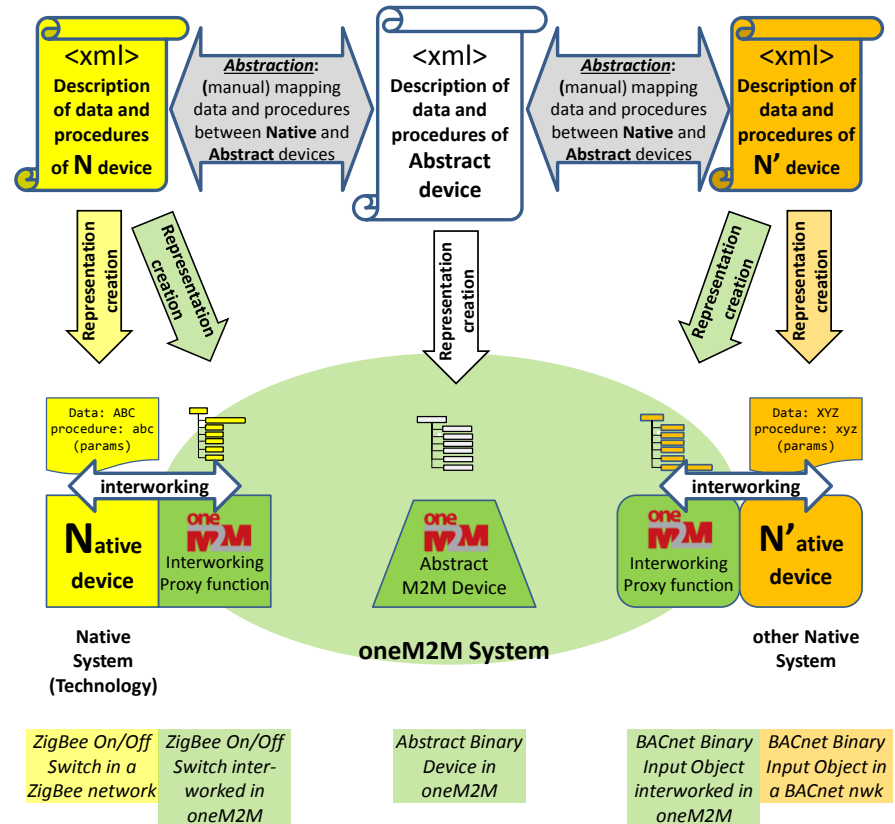
# Agenda



- 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 interface

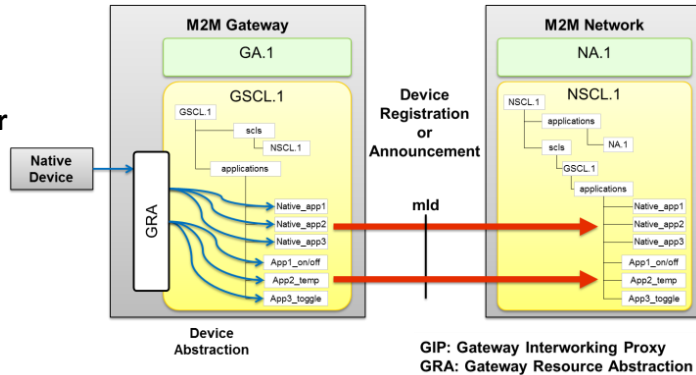


**Interworking is the basis for Abstraction**

# Concepts - Abstraction

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

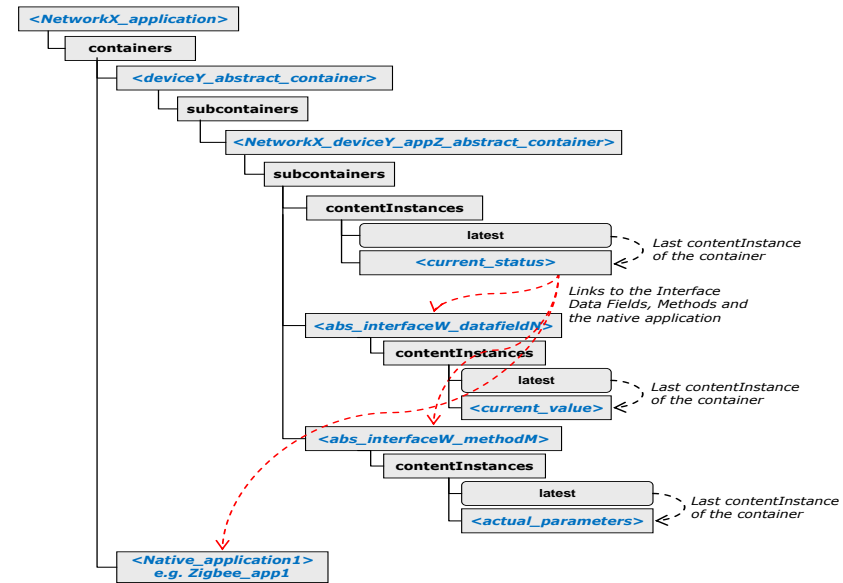
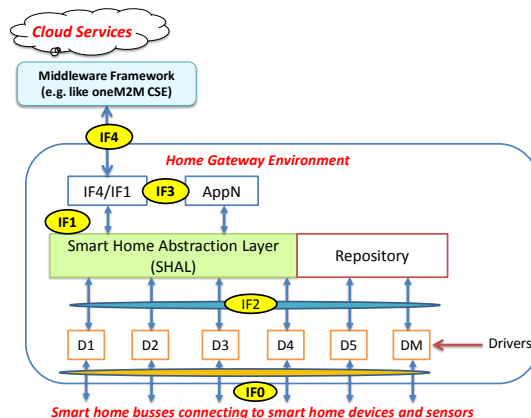
High-level architecture for supporting device abstraction



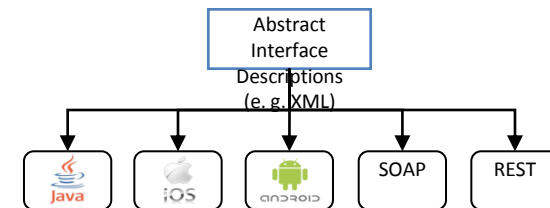
(Ref: ETSI TS 102 690: "Machine-to-Machine communications (M2M); Functional architecture".)

- 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

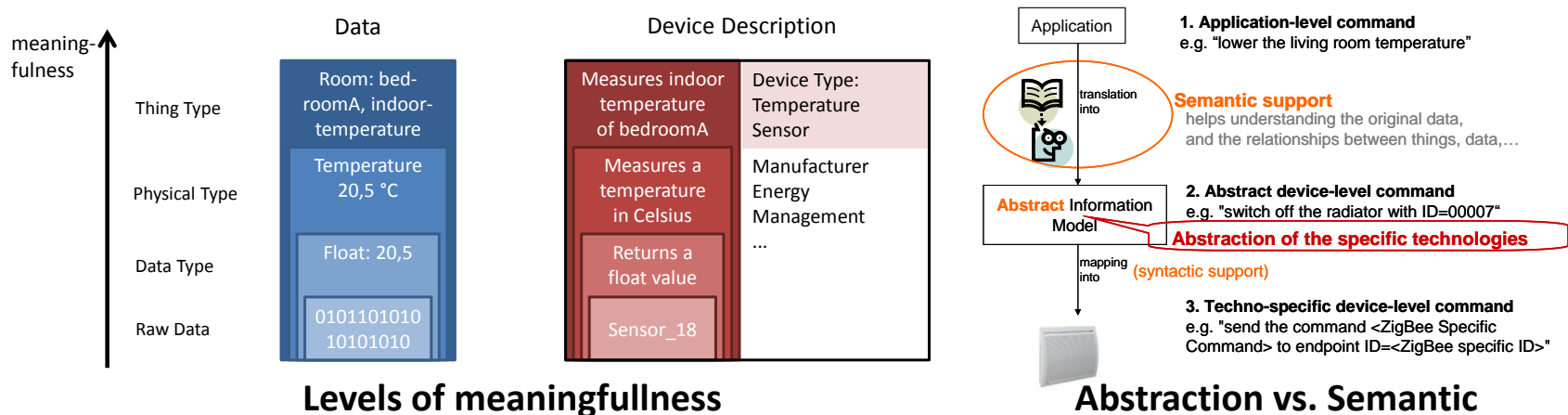


The abstract appliance interface descriptions should be mappable to various environments

(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.

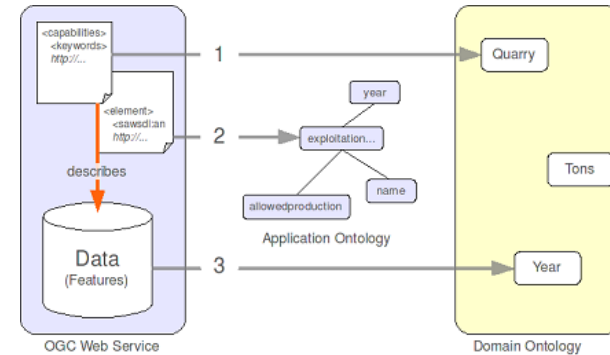


**Semantics is the evolution of Abstraction**

# Concepts - Semantics

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

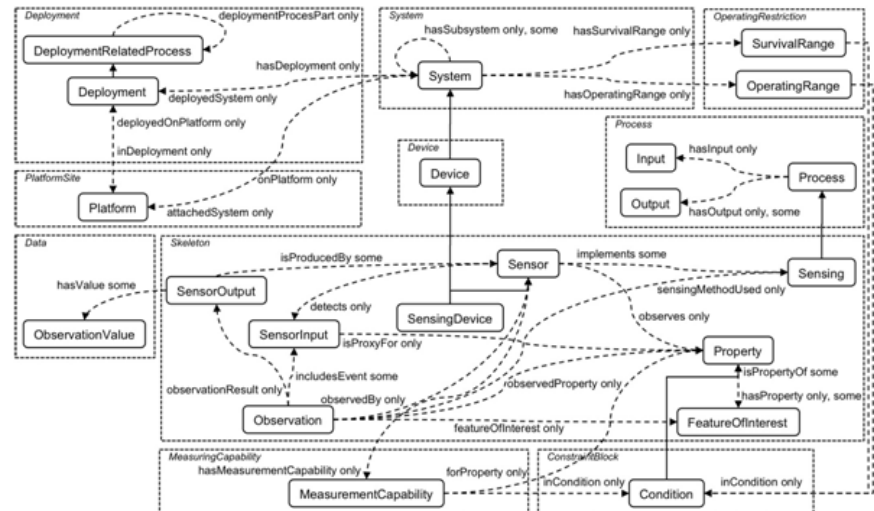
(Ref: Open Geospatial Consortium Best Practice, Semantic annotations in OGC standards.)



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.)

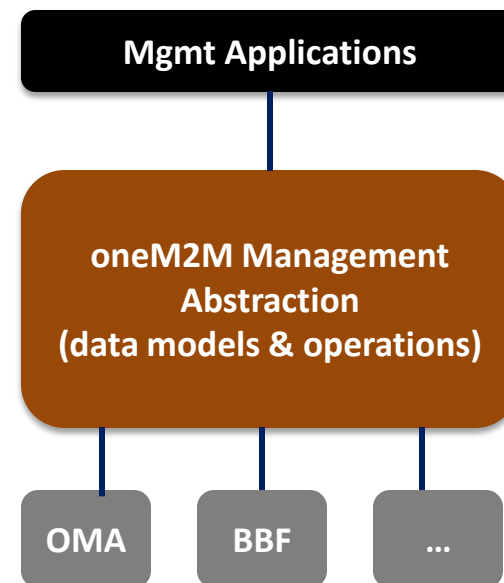


Overview of the Semantic Sensor Network ontology classes and properties

# Concepts - Management

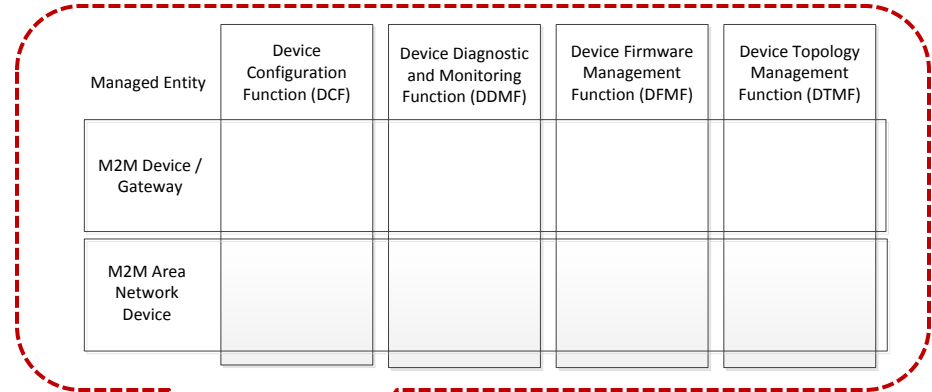
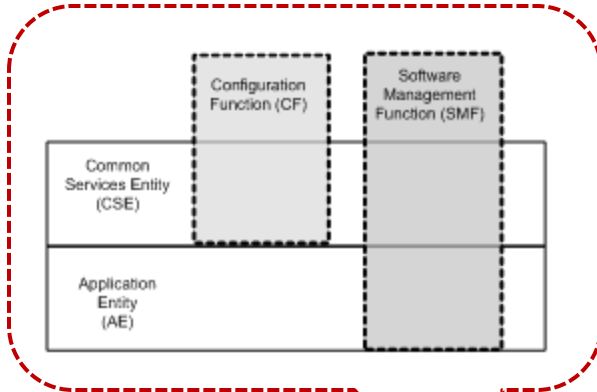


- **Management:** the management (configuration, monitoring, trouble shooting, upgrade, etc.) of devices (ADN/ASN/IN/NoDN), applications (AEs) and common service entities (CSEs)
  - to provide '**Abstracted**' unified & simplified management APIs for M2M applications.
- Management is essentially a specific 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

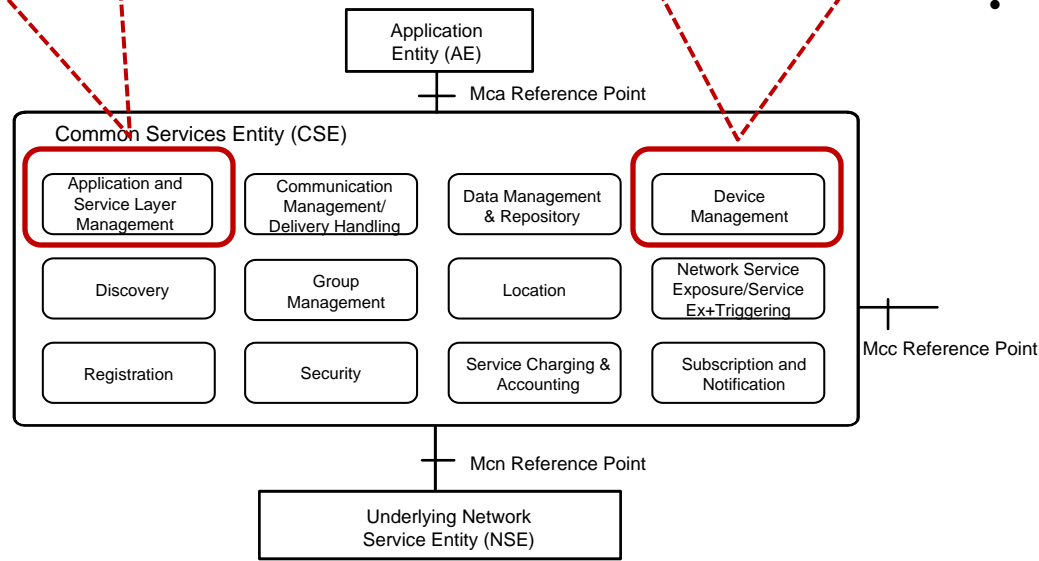


## Application and Service Layer Management (ASM CSF)

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

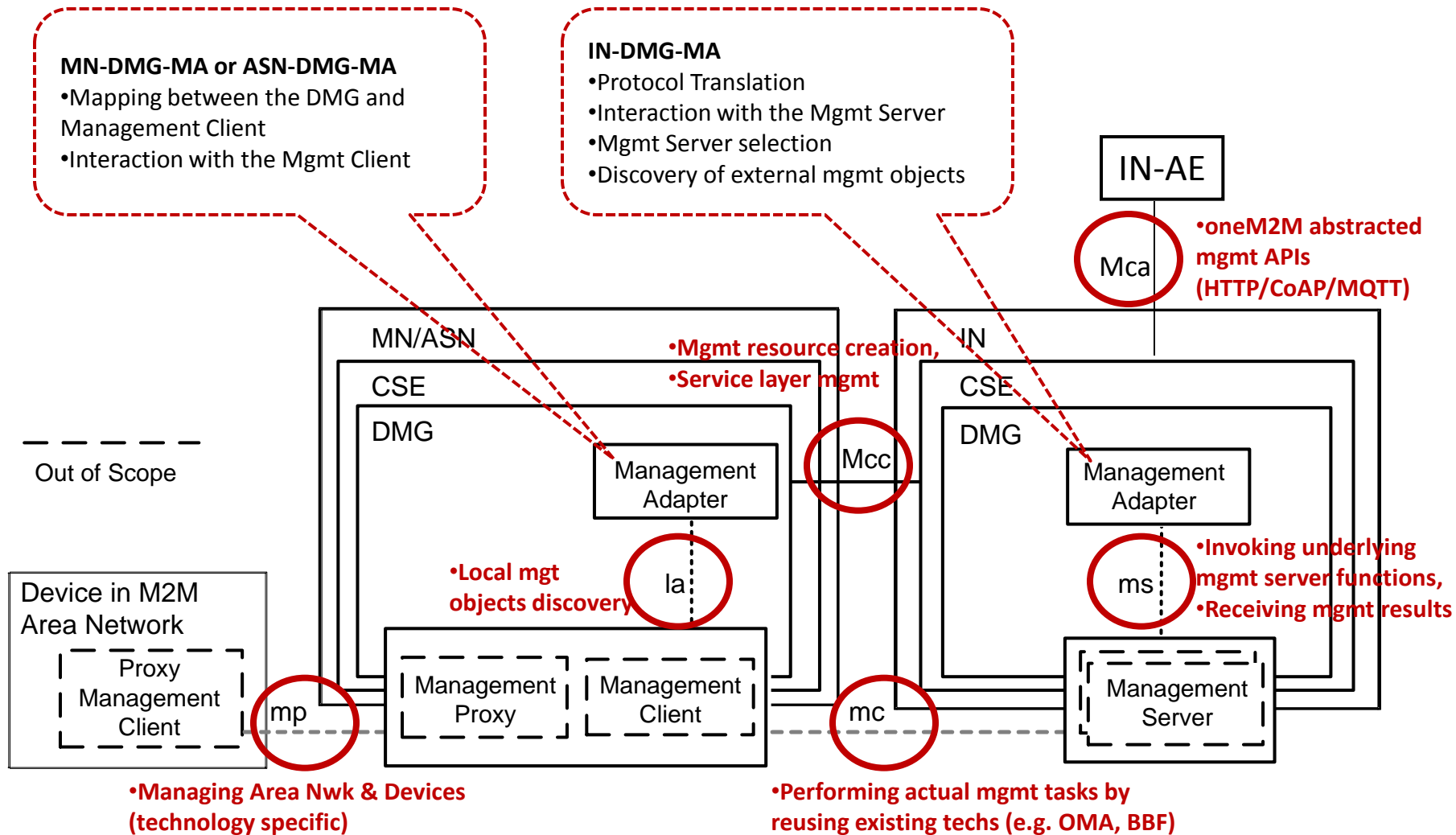
## Device Management (DMG CSF)

- 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

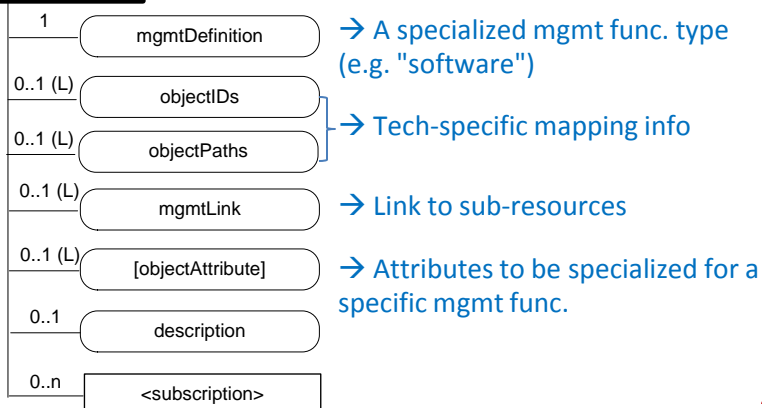


# Management Abstraction

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

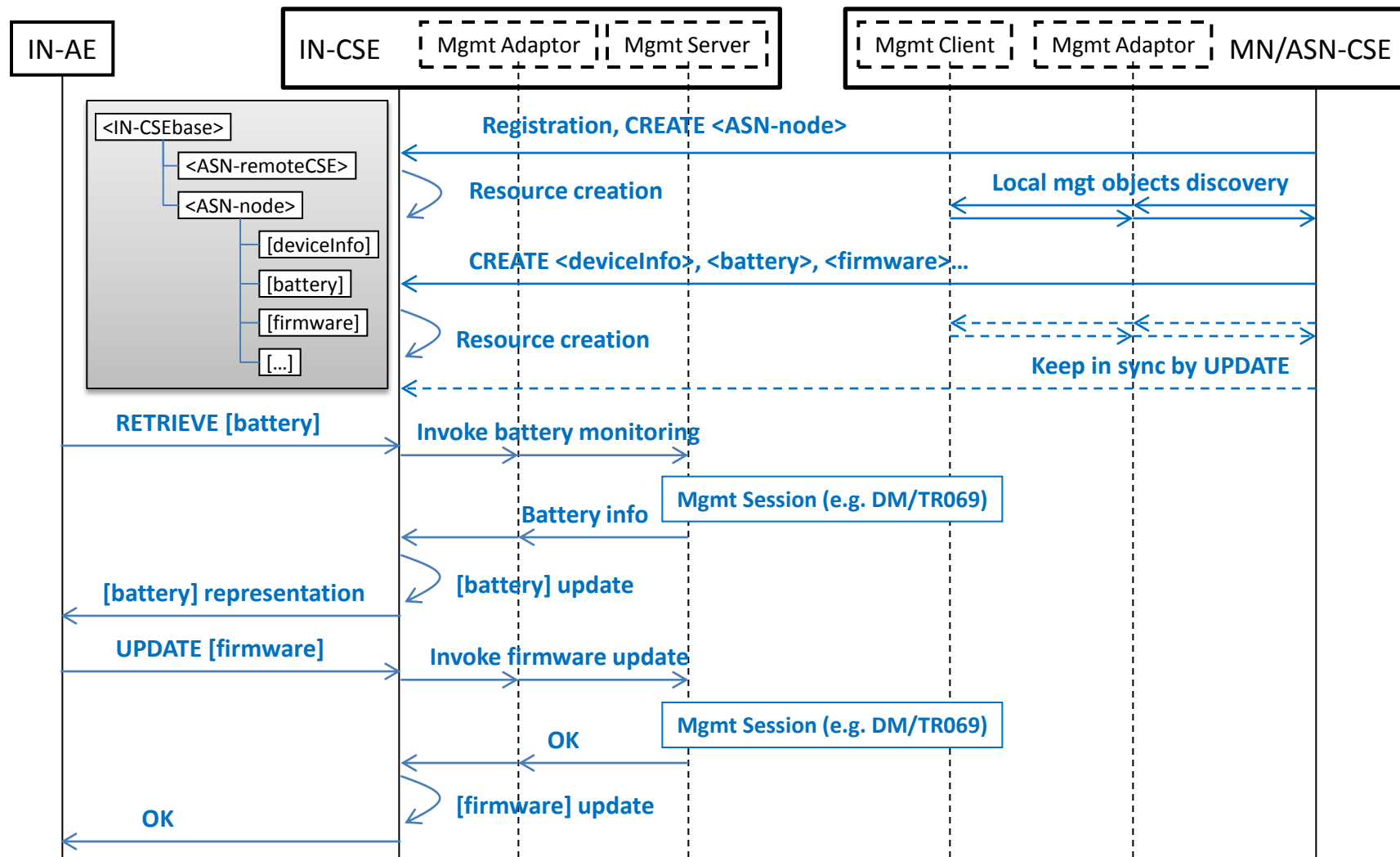
**Mapping**

**oneM2M TS-0006 (BBF)**

**BBF TR069**

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

# Management Example Flow

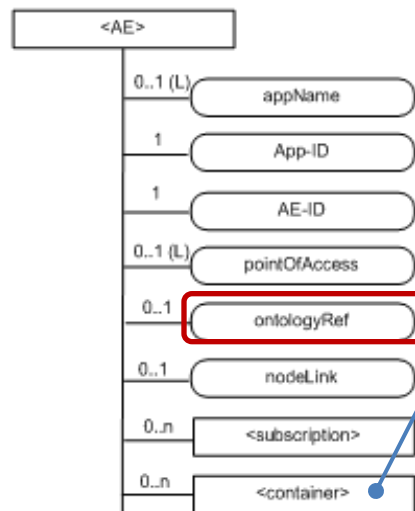


# Generic Abstraction/Semantics

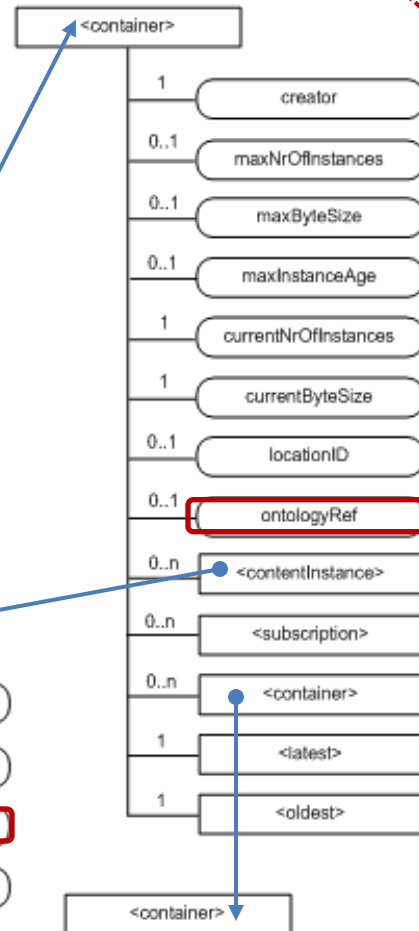
✓ Resource types **<AE>**, **<container>** & **<contentInstance>** are used for the abstraction of M2M applications, data collection and instances.

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

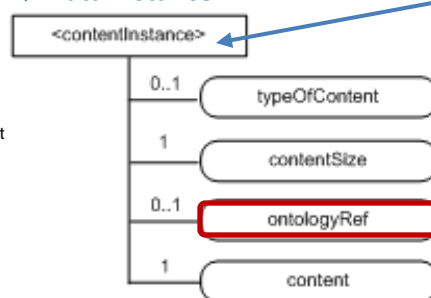
## Application



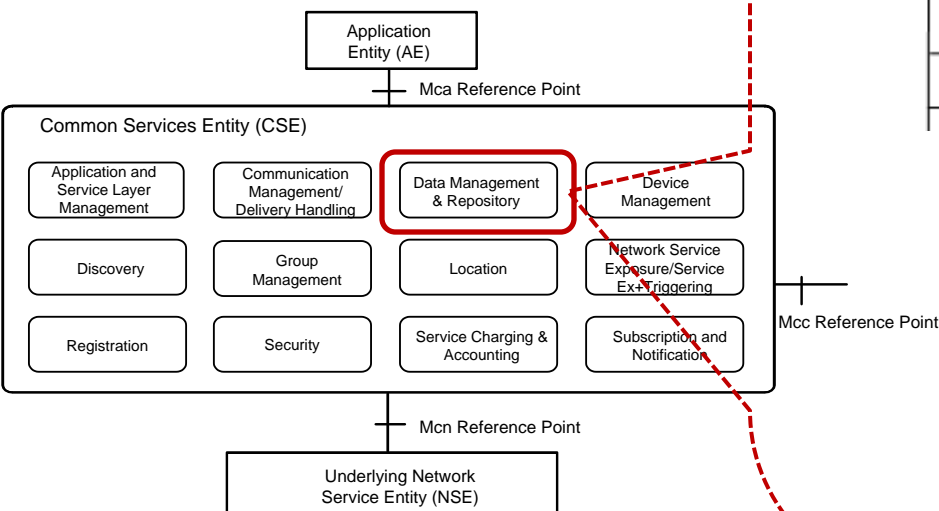
## Data collection



## Data instance



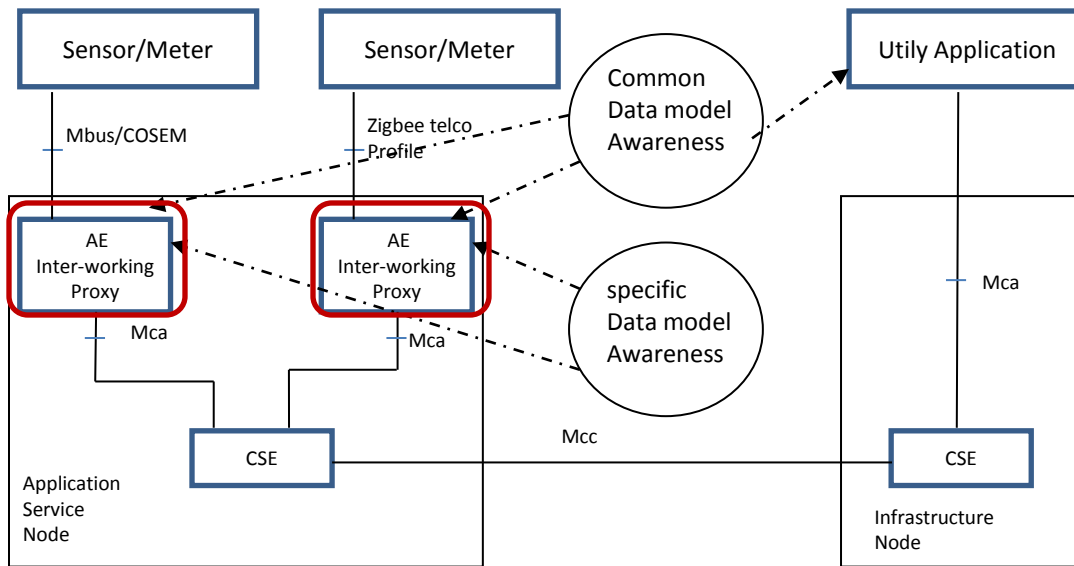
## Hierarchical data collection



# Interworking with non-oneM2M

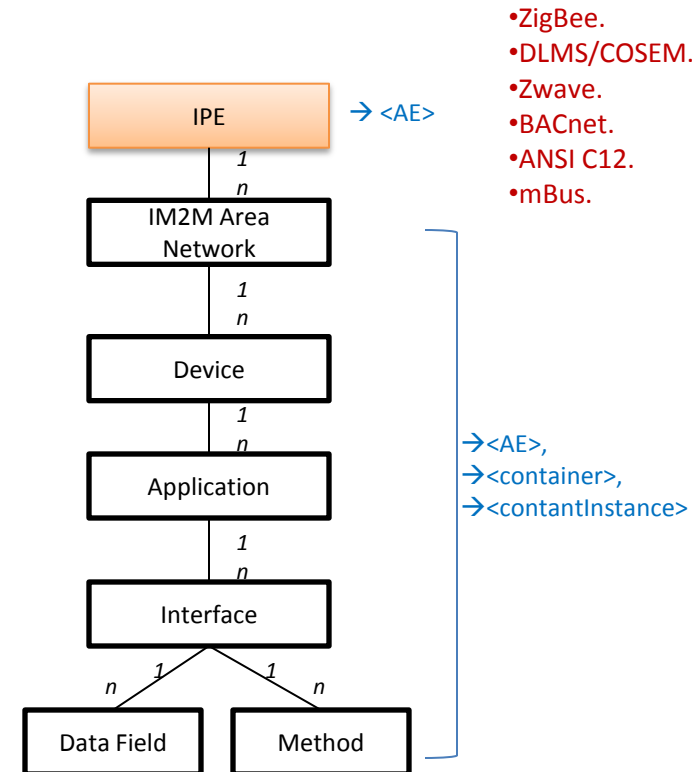
## (Informative)

✓ 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:

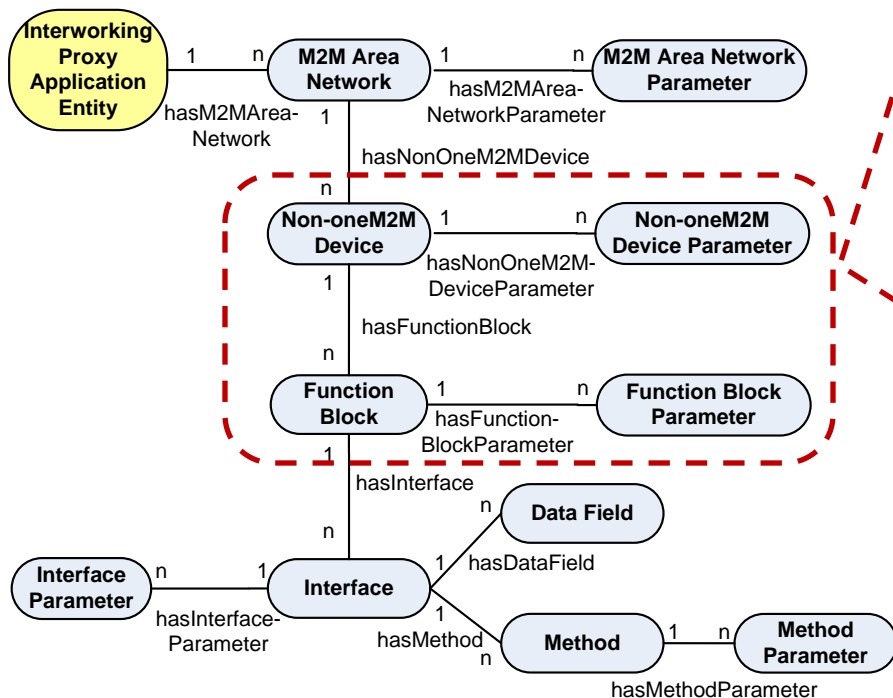


- ZigBee.
- DLMS/COSEM.
- Zwave.
- BACnet.
- ANSI C12.
- mBus.

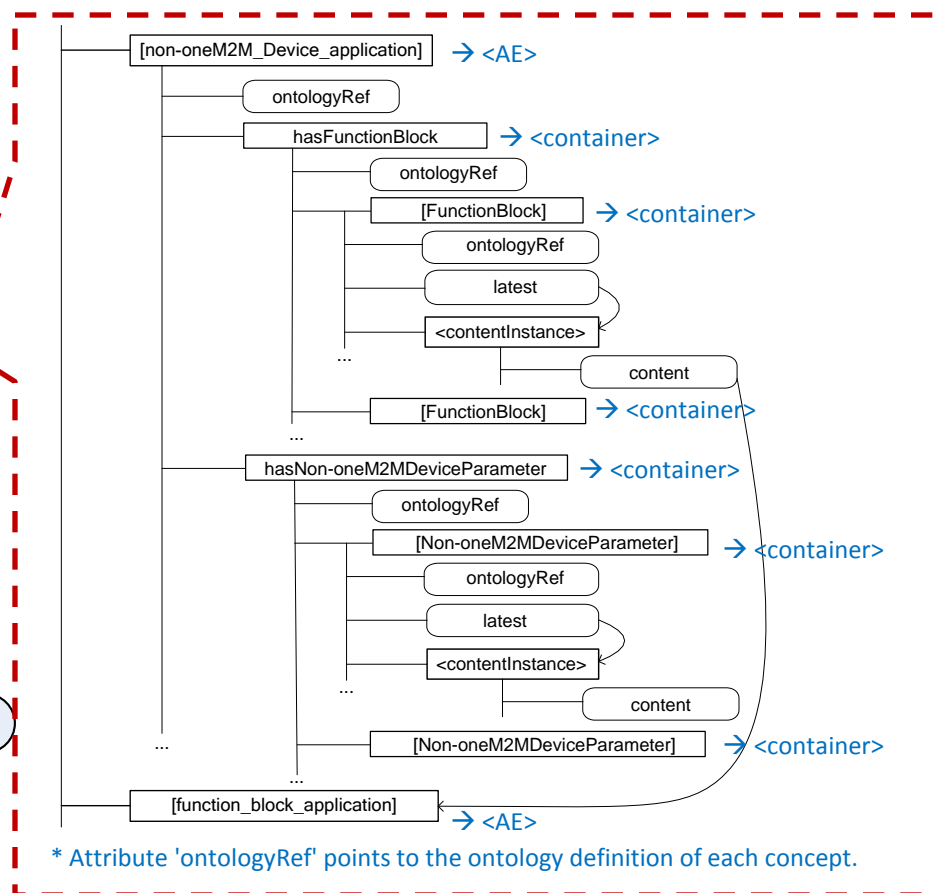
**Generic data modeling of interworking**

# Interworking Enhancement with Semantics

*(Informative)*

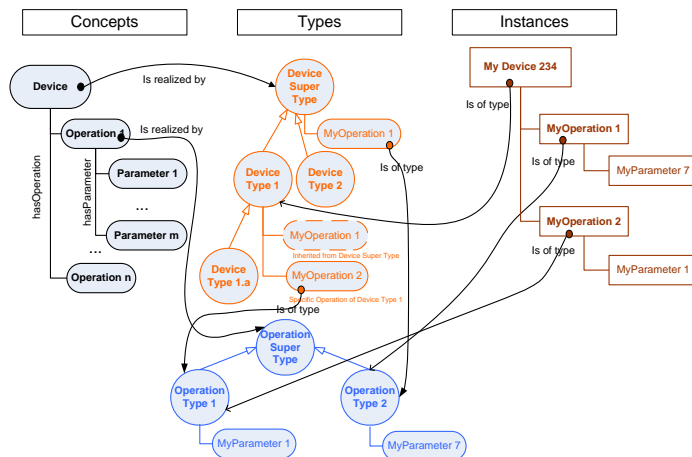


**A generic semantic concept model (ontology)  
representing an Area Network**

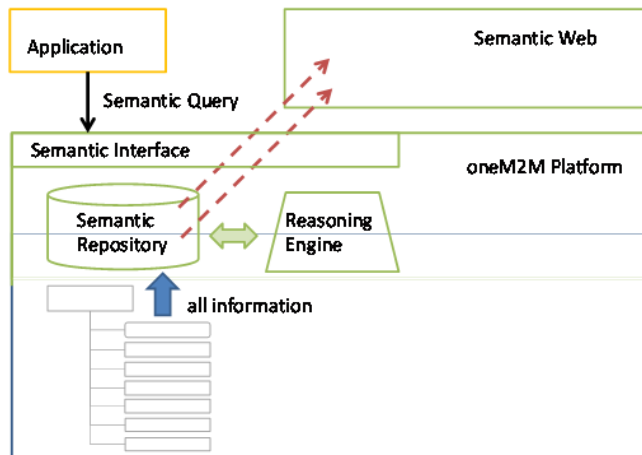


**An example of mapping to oneM2M resources**

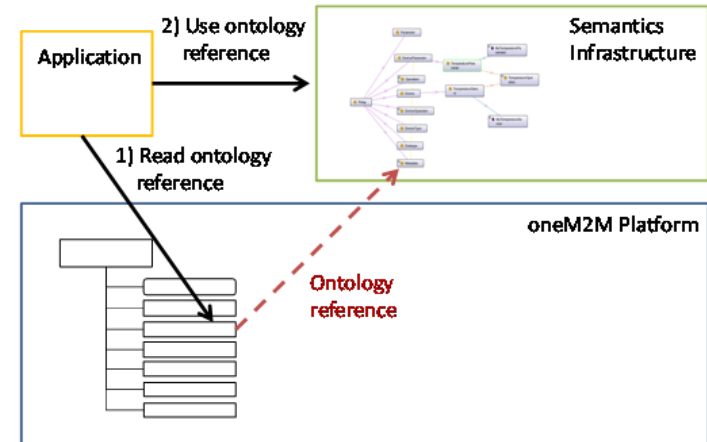
# Roadmap to Semantic Enablement (Informative)



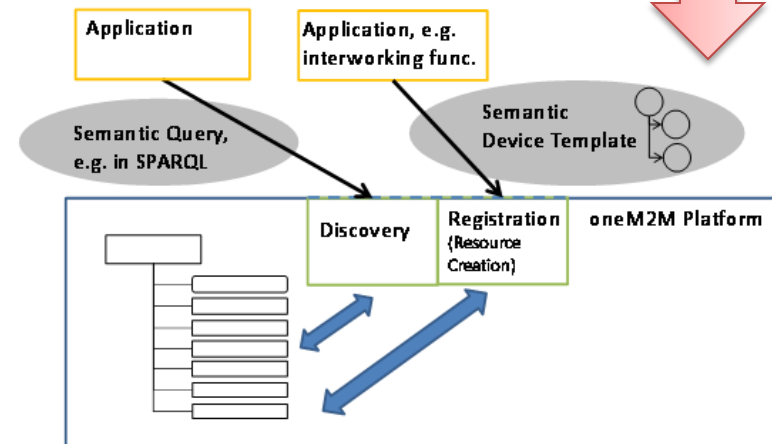
## 1. Semantic Modeling (Ontology)



## 4. Full Semantic Platform



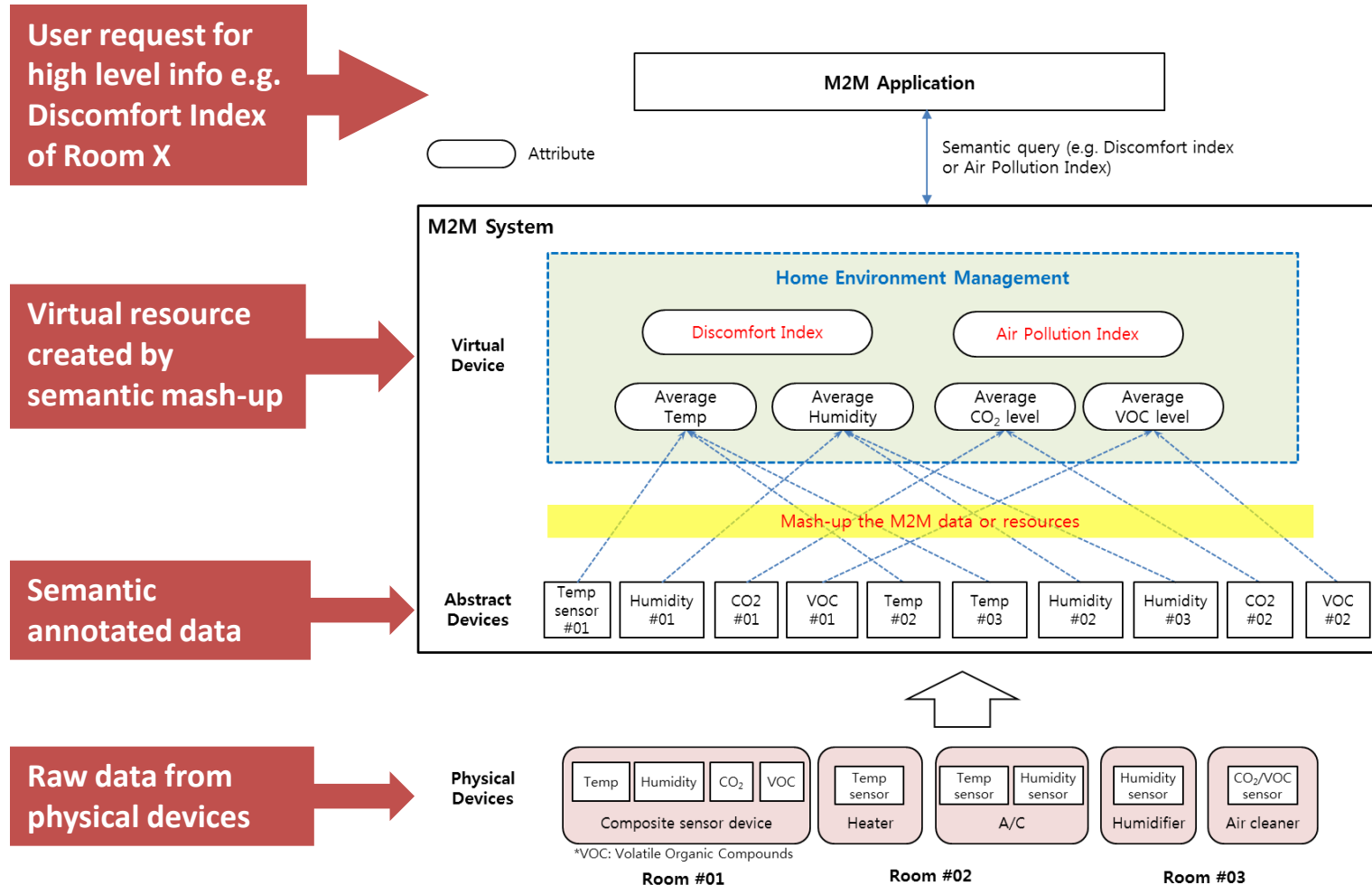
## 2. Semantic Annotation



## 3. Use of Semantic Technologies for specific Platform Functionalities

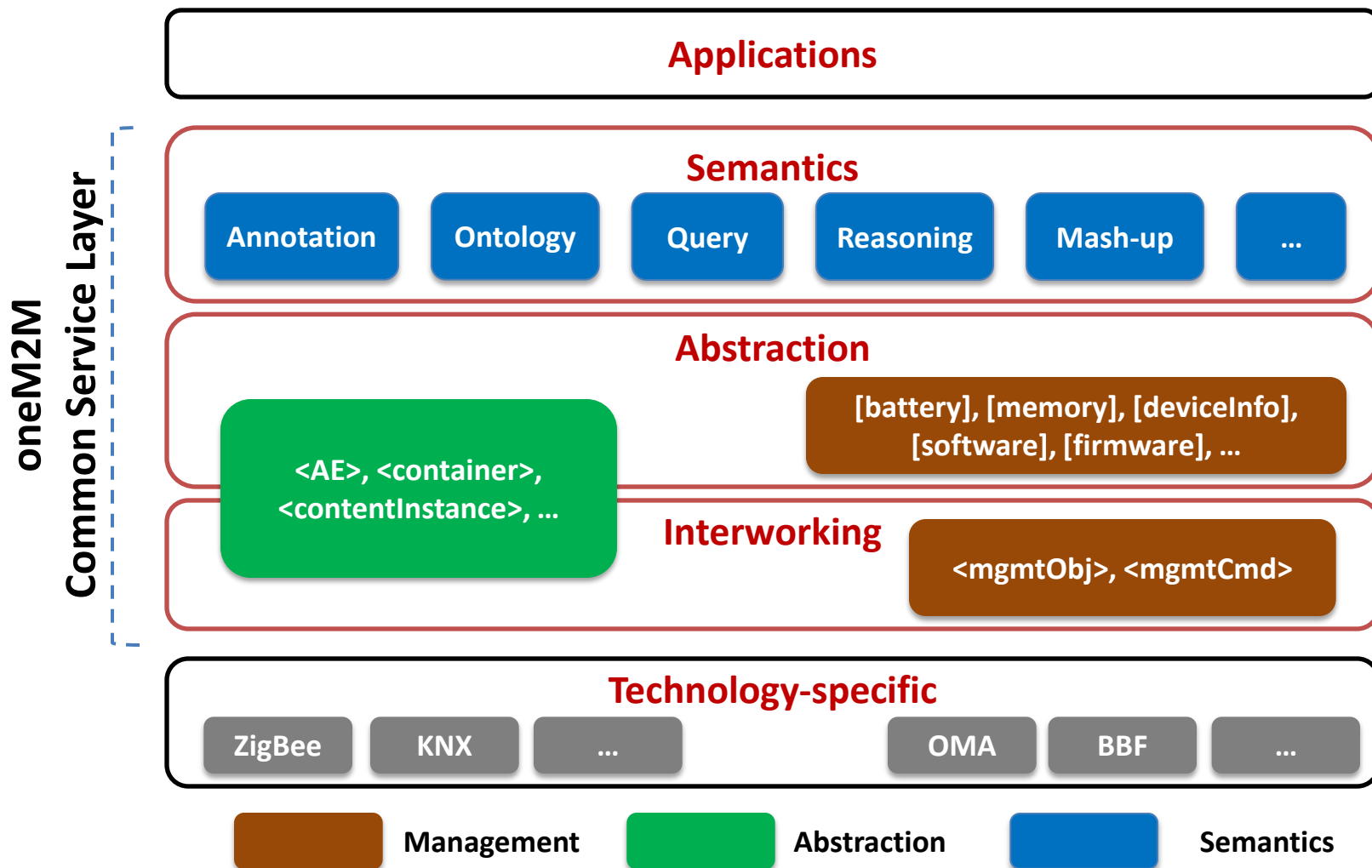


# An Example Case using Semantics



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