On Management, Abstraction & Semantics

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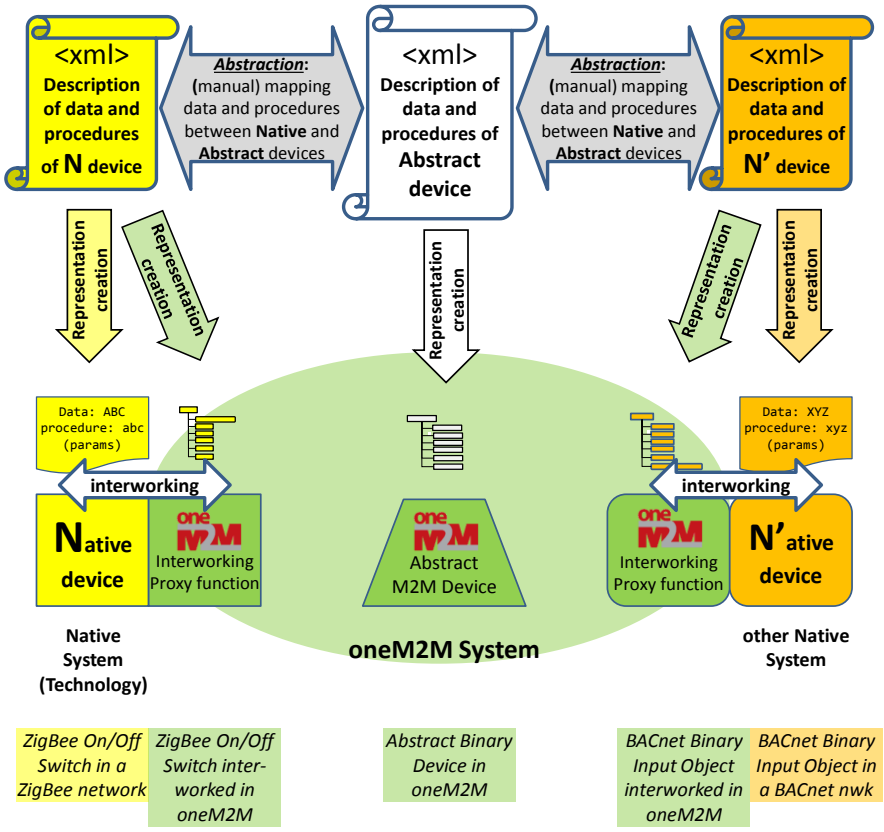
Agenda

- 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)

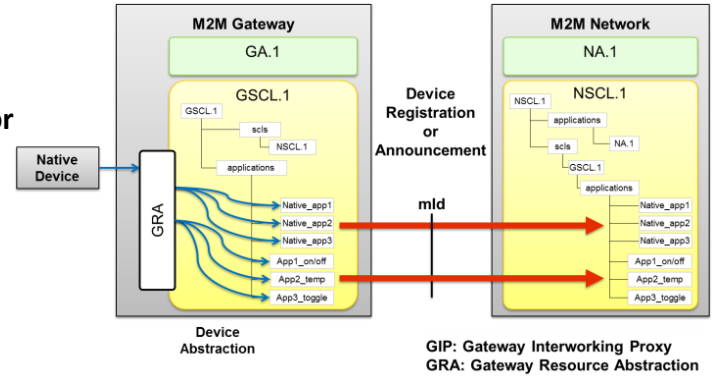


Interworking is the basis for Abstraction

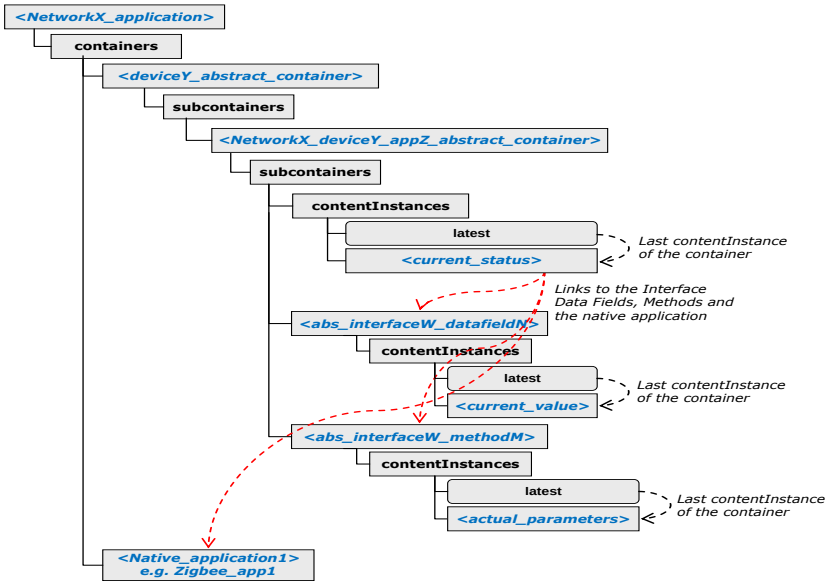
Concepts - Abstraction

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

High-level architecture for supporting device abstraction



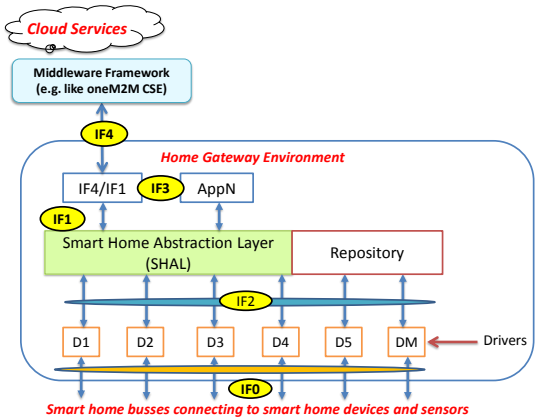
(Ref: ETSI TS 102 690: "Machine-to-Machine communications (M2M); Functional architecture".)

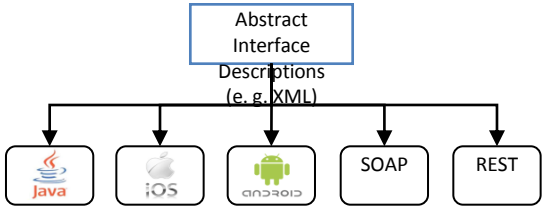


Mapping of an abstract device to the ETSI M2M resource architecture using the <*subcontainer*> resource

  - HGI Smart Home Abstraction Layer (SHAL)

A high-level conceptual HGI architecture



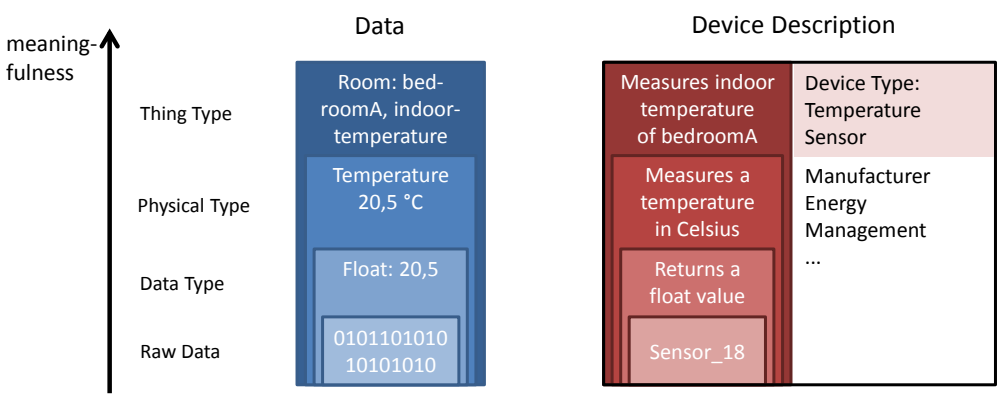


The abstract appliance interface descriptions should be mappable to various environments

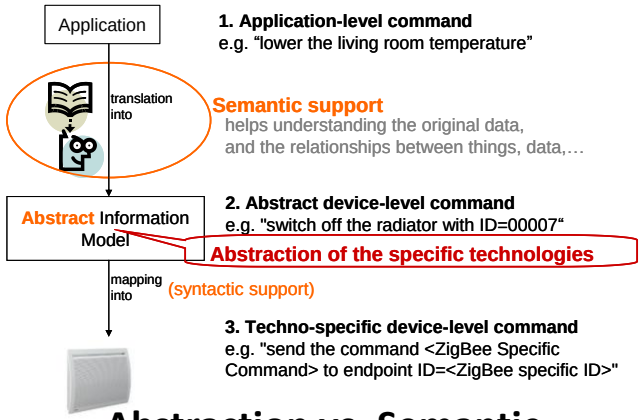
(Ref: HGI02029: "Smart Home Architecture and System Requirements")

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.



Levels of meaningfullness



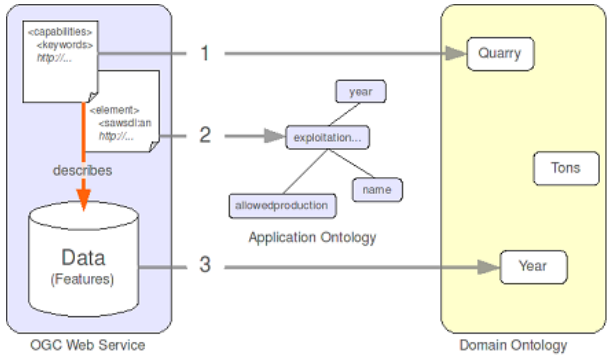
Abstraction vs. Semantic

Semantics is the evolution of Abstraction

Concepts - Semantics

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

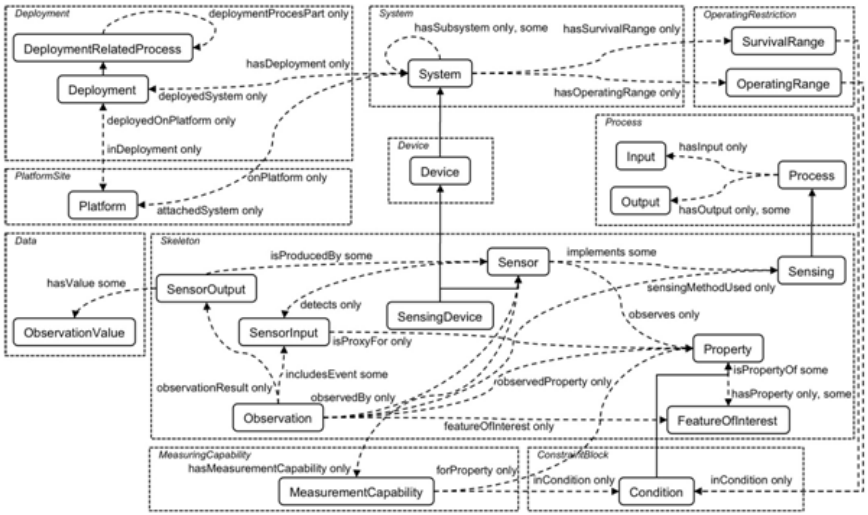
(Ref: Open Geospatial Consortium Best Practice, Semantic annotations in OGC standards.)



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.)

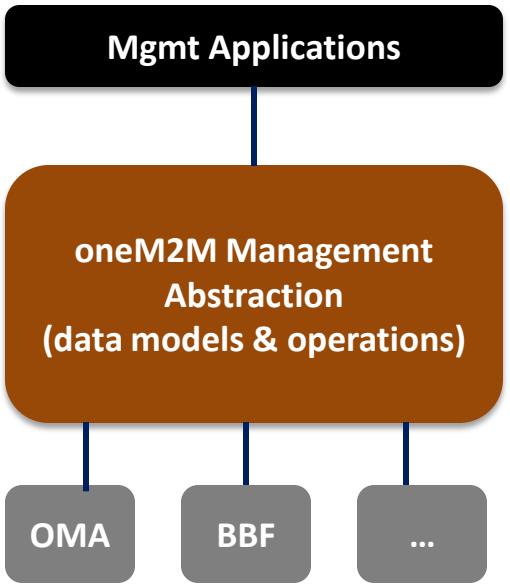


Overview of the Semantic Sensor Network ontology classes and properties

Concepts - Management

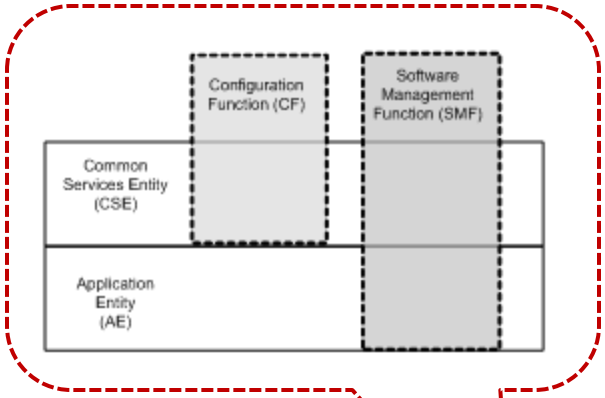
- **Management:** the management (configuration, monitoring, trouble shooting, upgrade, etc.) of devices (ADN/ASN/NoDN), applications (AEs) and common service entities (CSEs)
  - to provid '**Abstracted**' unified & simplified management APIs for M2M applications.

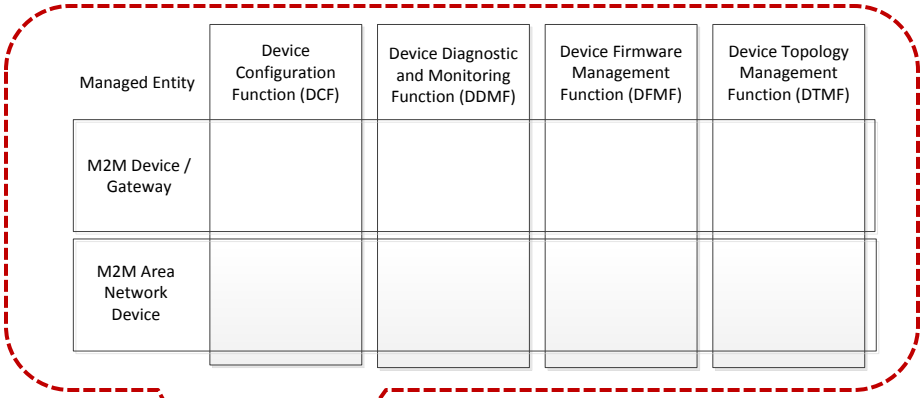
- Management is essentially a specific aspect of oneM2M Abstraction framework:
  - **Data models:** the resources describing the mgmt capabilities, properties and status
  - **Operations:** the actions performing mgmt tasks, e.g. download (firmware), get (status) or set (properties), execute (software installation)



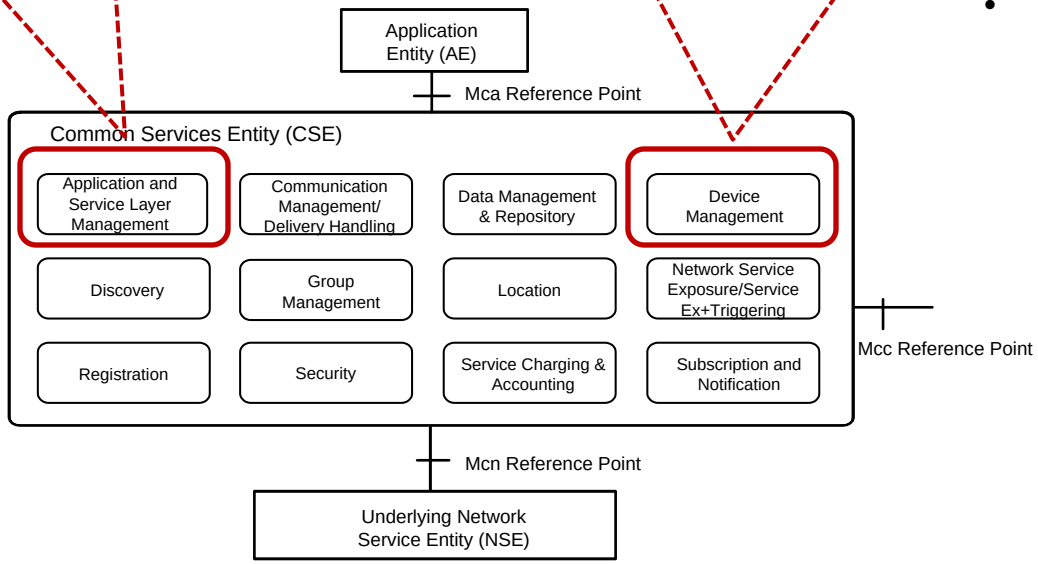
Management is a specific aspect of Abstraction

Management Capabilities



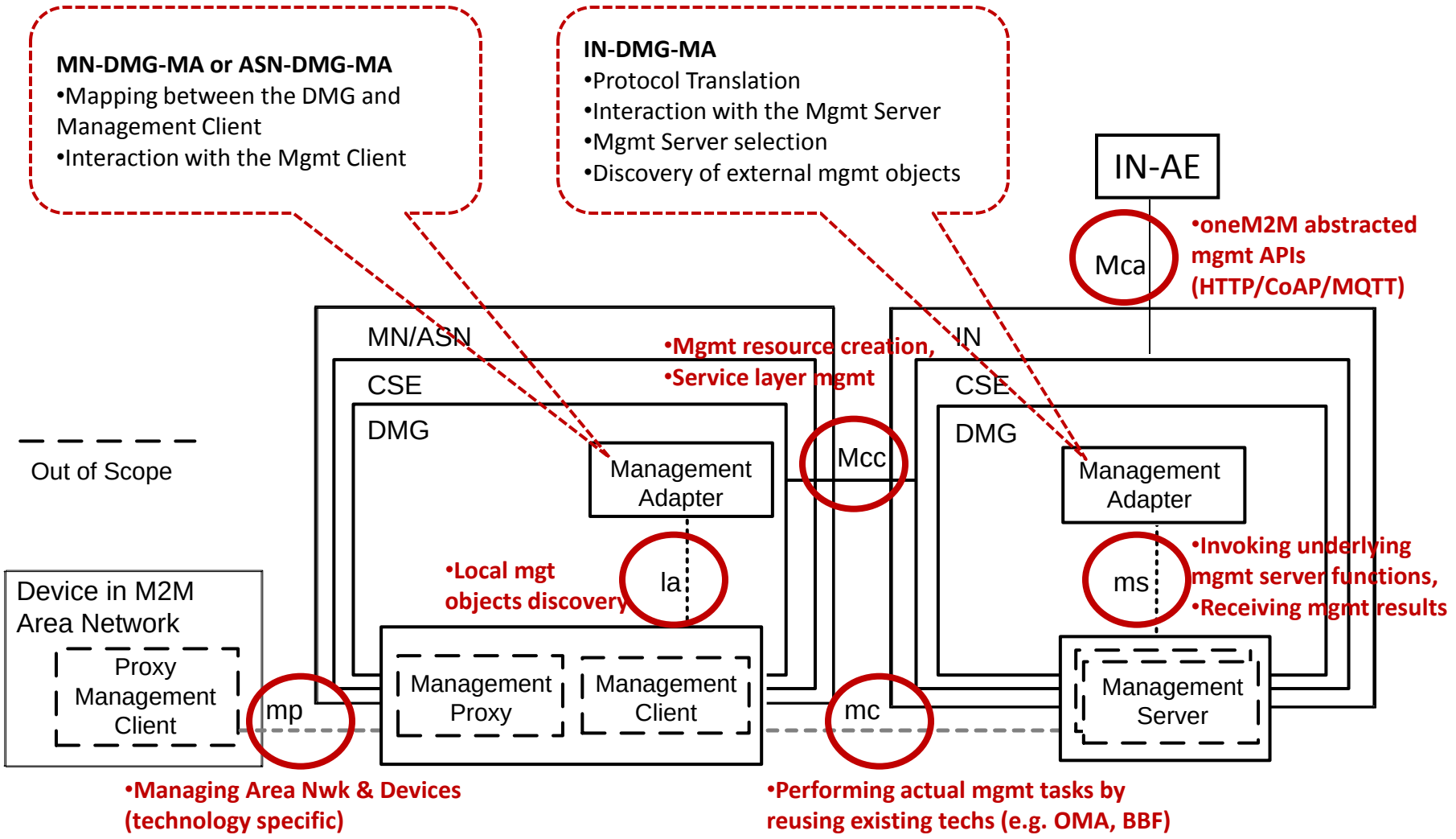


- Application and Service Layer Management (ASM CSF)
  - Configuration Function (e.g. CMDH Policy configuration)
  - Software Management Function (e.g. software download/install/activation):

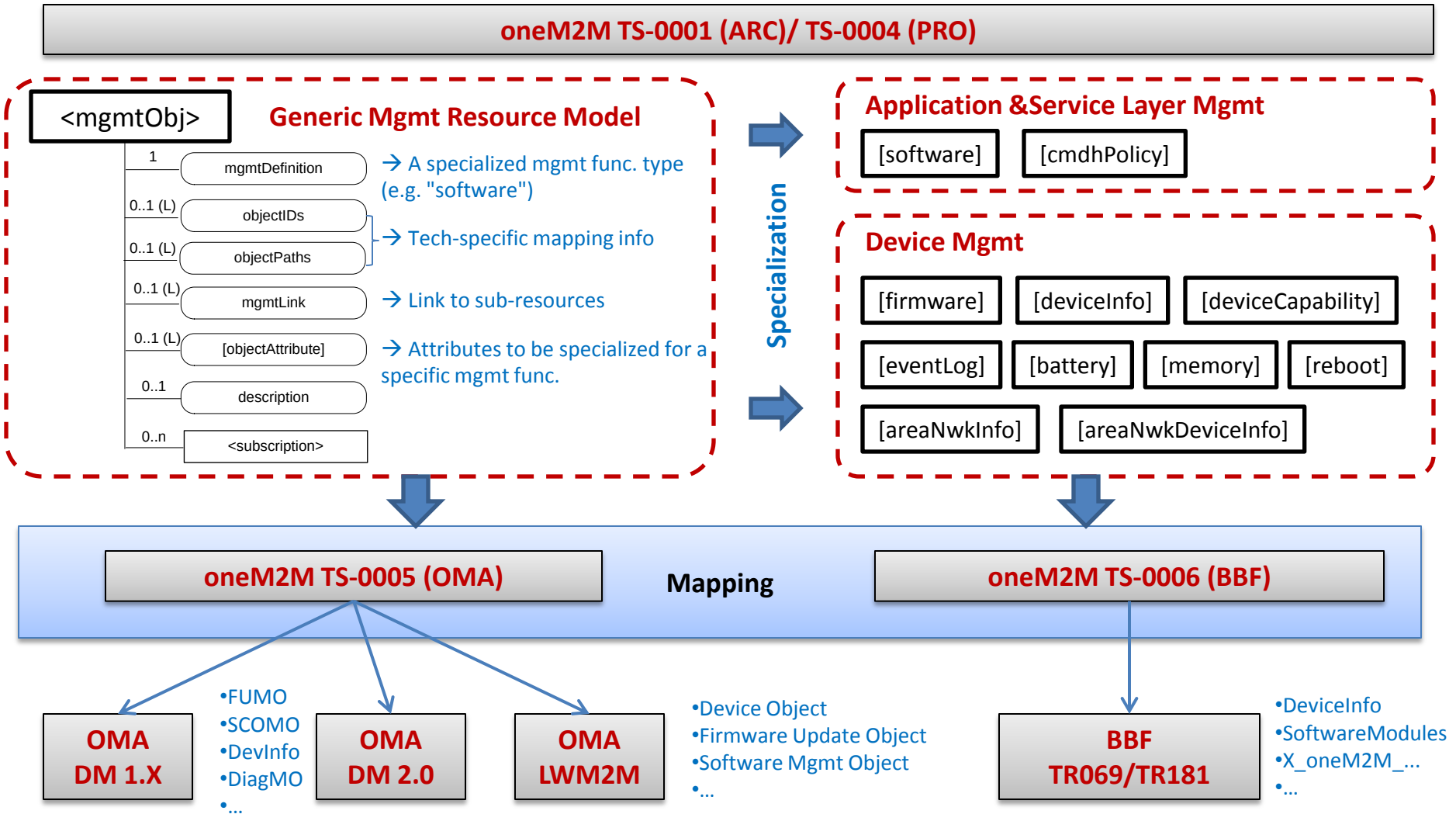


- Device Management (DMG CSF)
  - Device Configuration Function (e.g. enable/ disable capabilities, provisioning)
  - Device Diagnostics and Monitoring Function (e.g. memory, battery, event logs, reboot)
  - Device Firmware Management Function
  - Device Topology Management Function (e.g. Area Network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

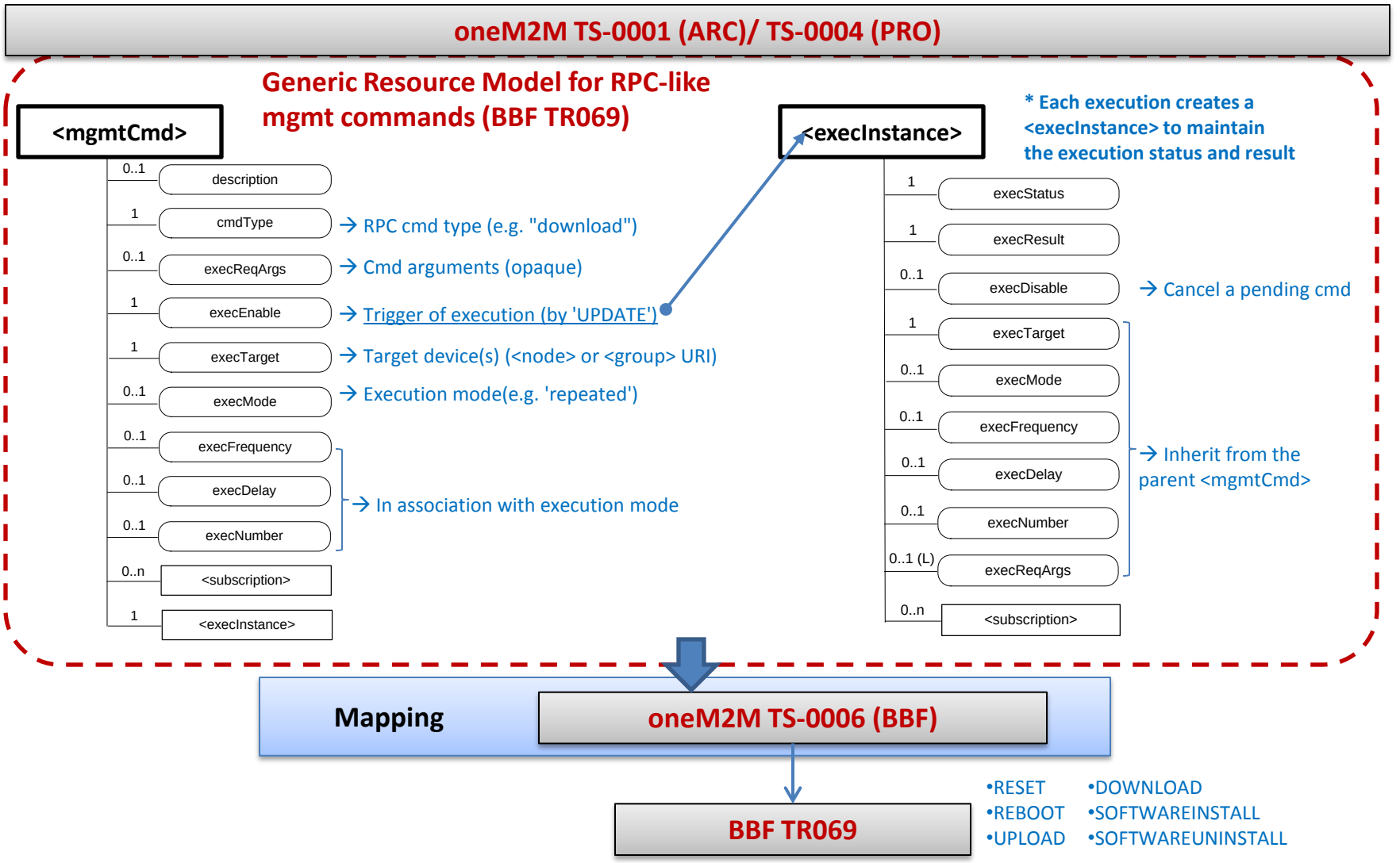
Management Architecture



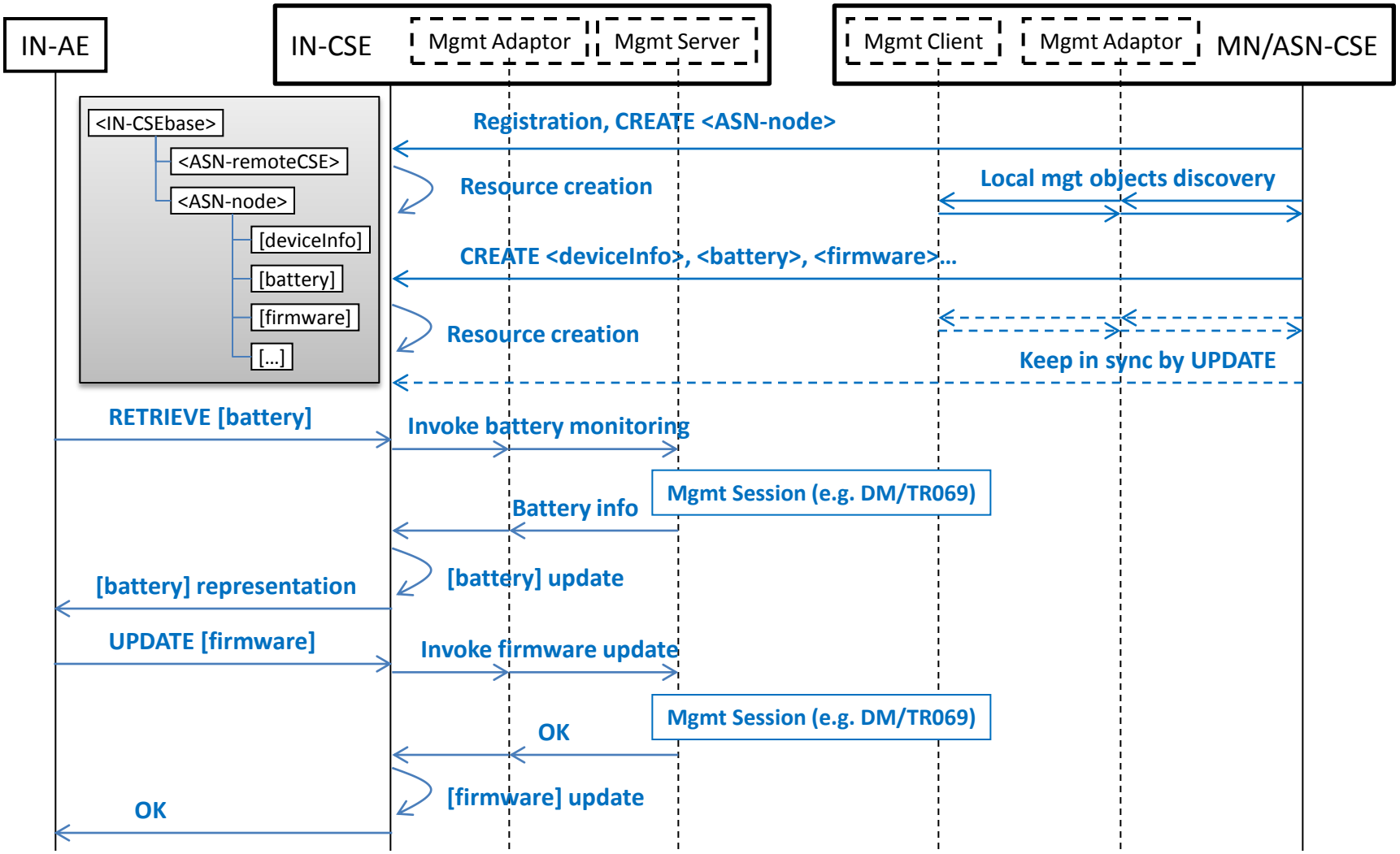
Management Abstraction



Management Abstraction

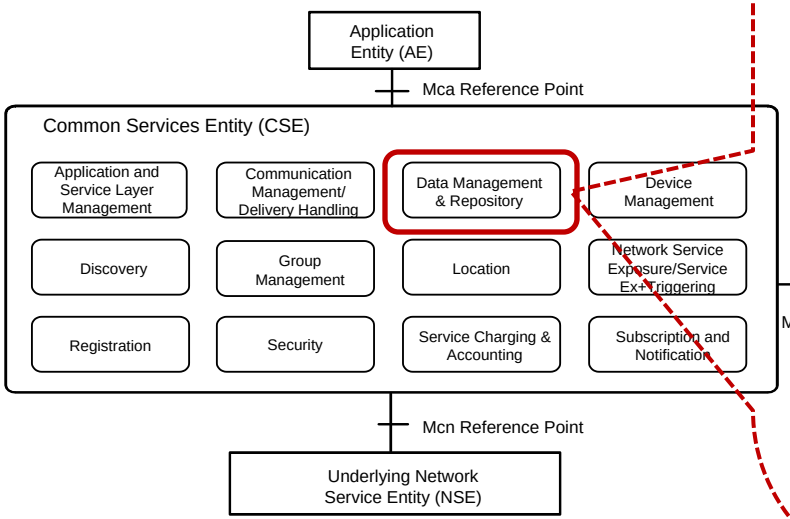


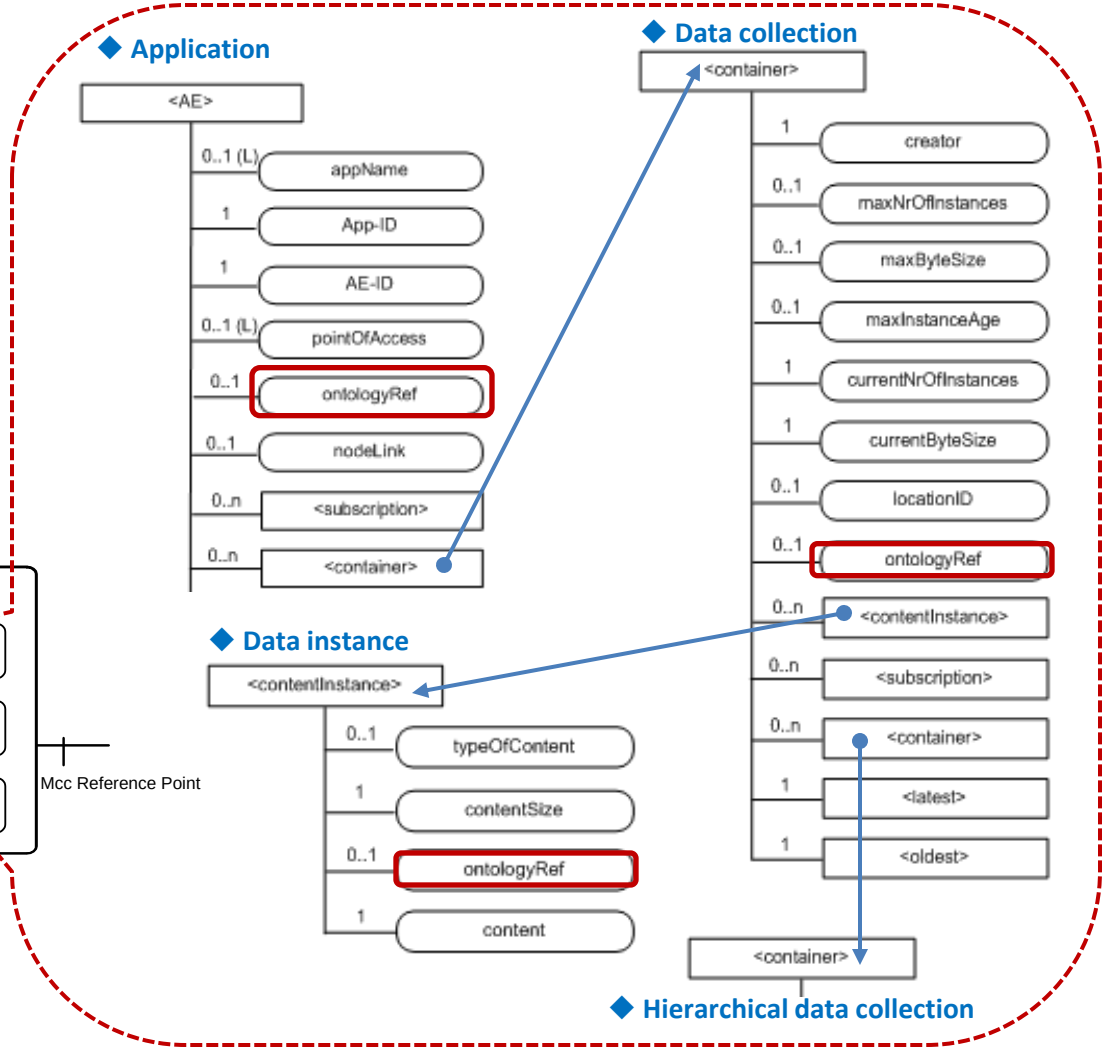
Management Example Flow



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.

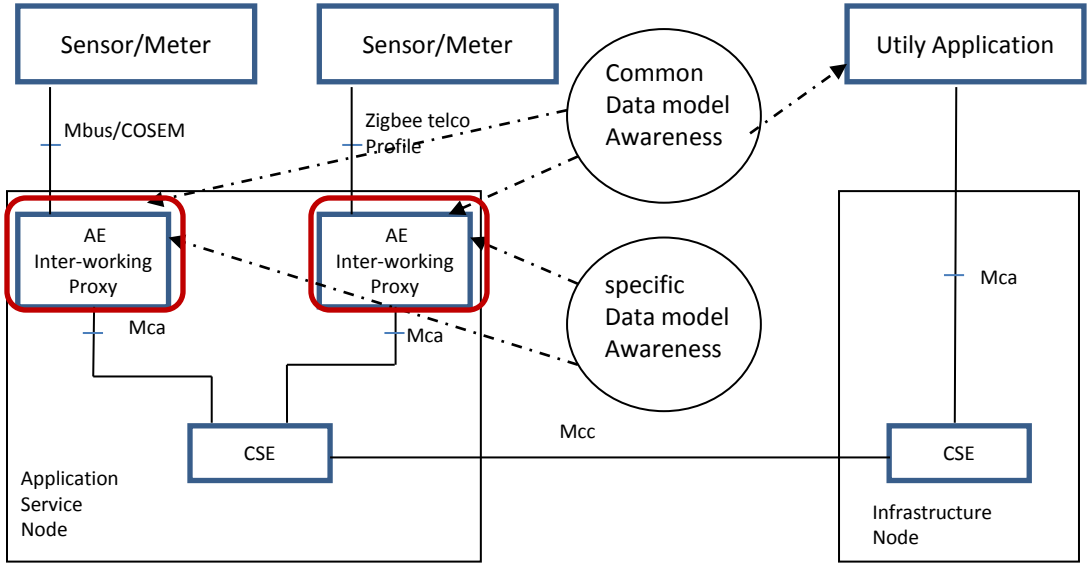




Interworking with non-oneM2M

(*Informative*)

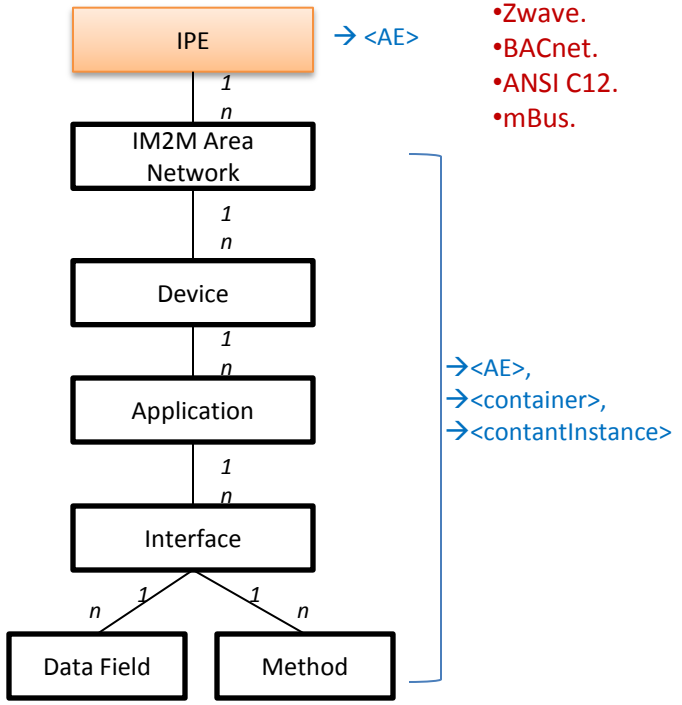
✓ The **Inter-working Proxy Application Entity (IPE)** abstracts and maps the non-oneM2M data model to the oneM2M resources exposed via the Mca reference point



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

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

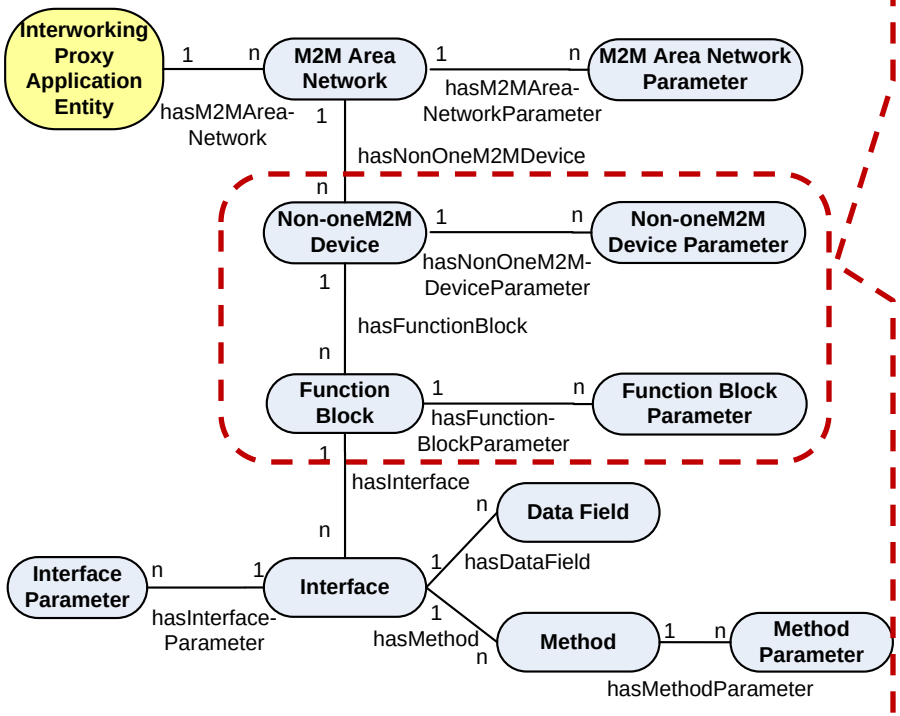
- ZigBee.
- DLMS/COSEM.
- Zwave.
- BACnet.
- ANSI C12.
- mBus.



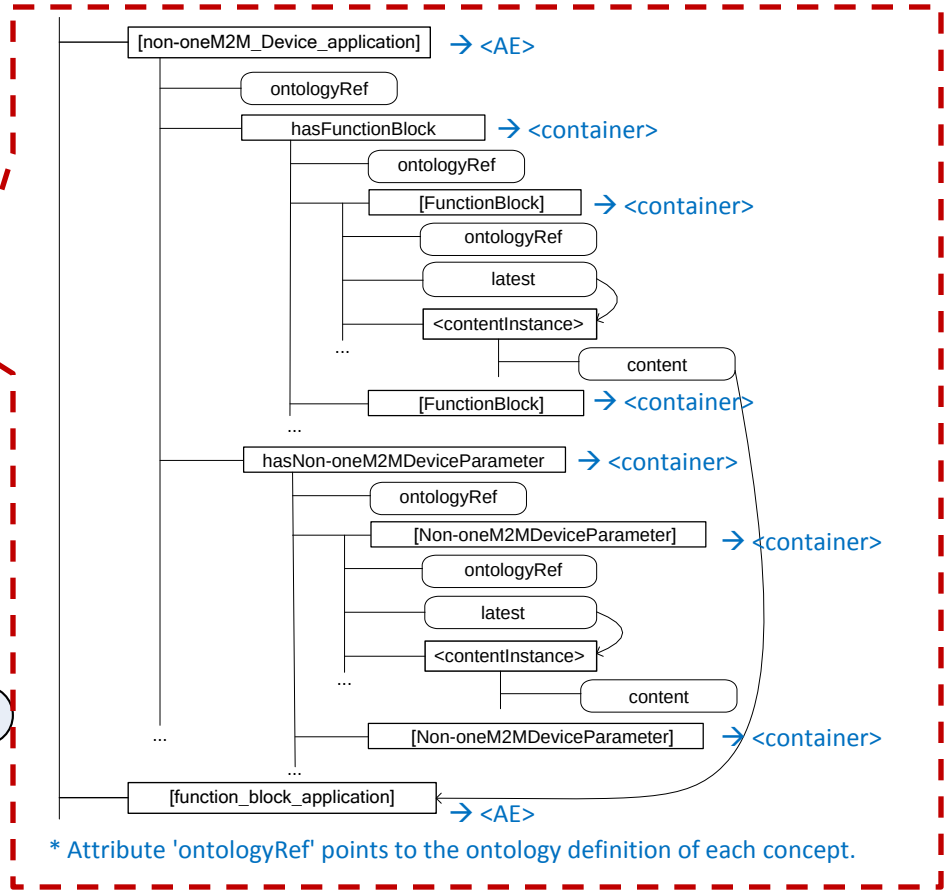
Generic data modeling of interworking

Interworking Enhancement with Semantics

(*Informative*)



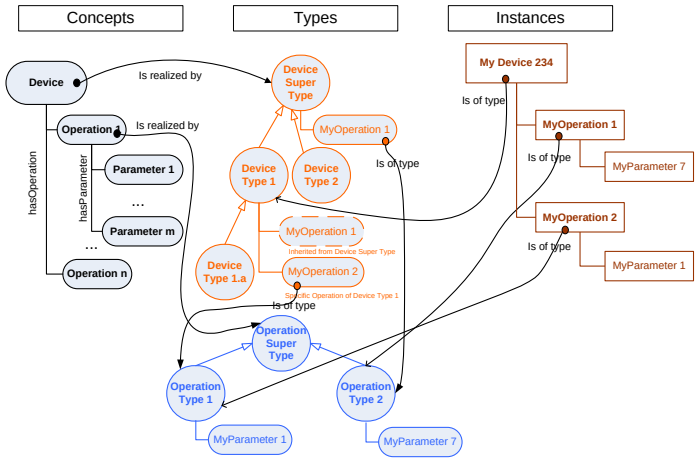
A generic semantic concept model (ontology) representing an Area Network



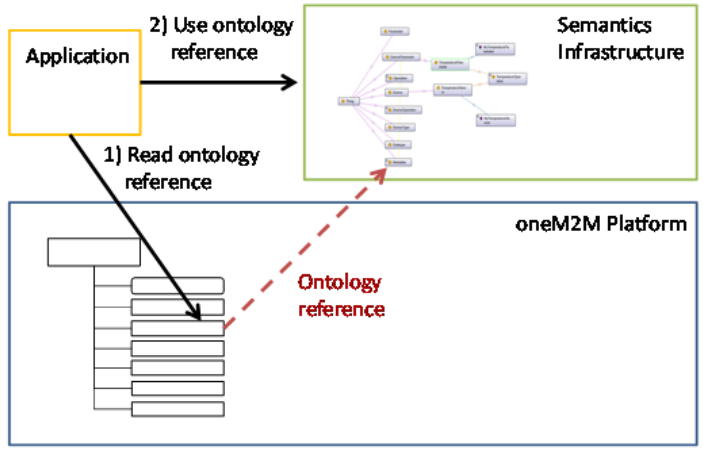
An example of mapping to oneM2M resources

Roadmap to Semantic Enablement

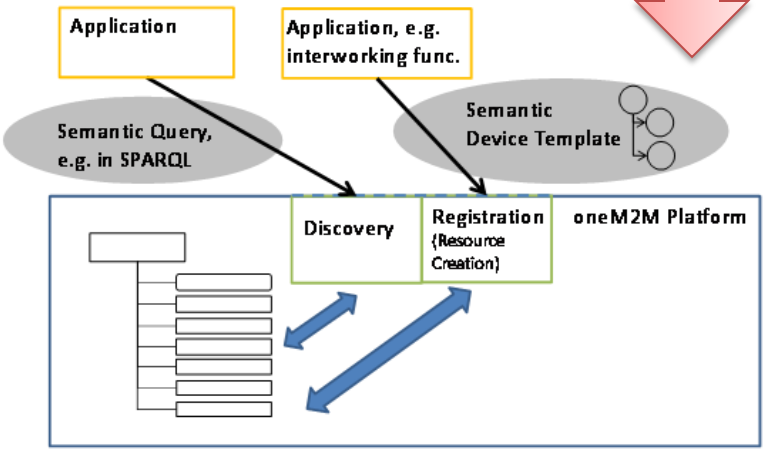
(*Informative*)



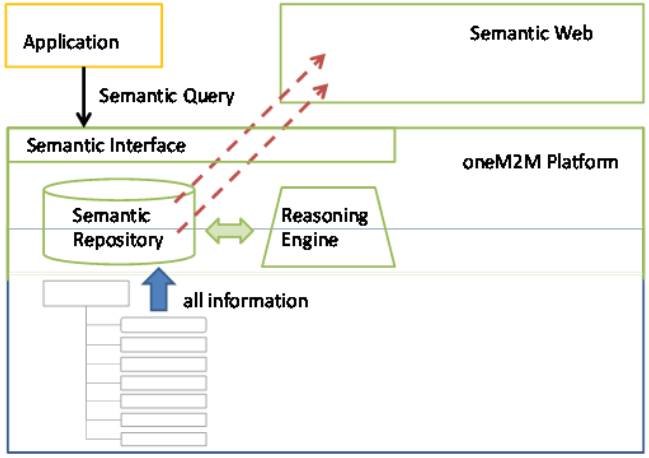
1. Semantic Modeling (Ontology)



2. Semantic Annotation

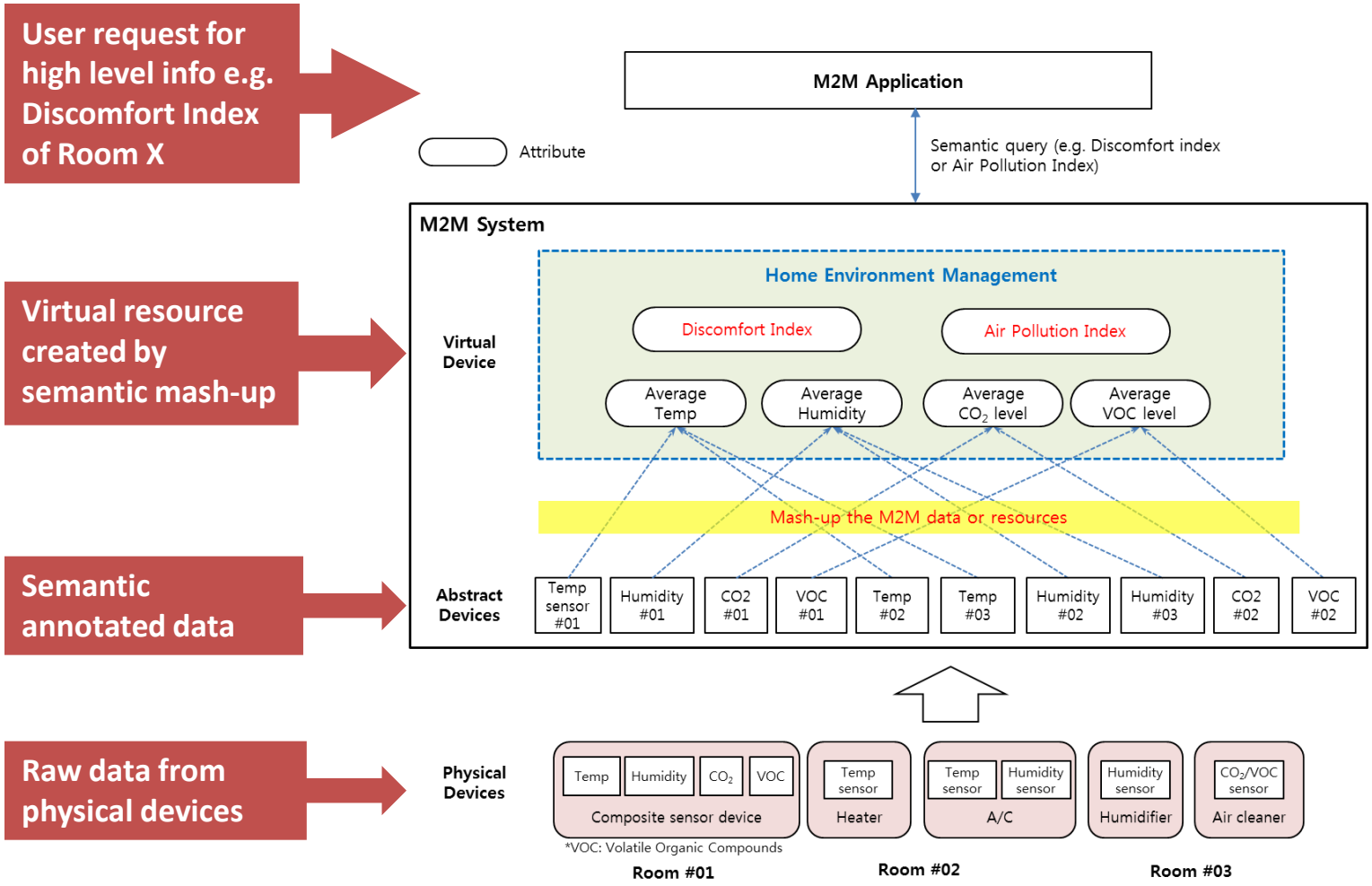


3. Use of Semantic Technologies for specific Platform Functionalities



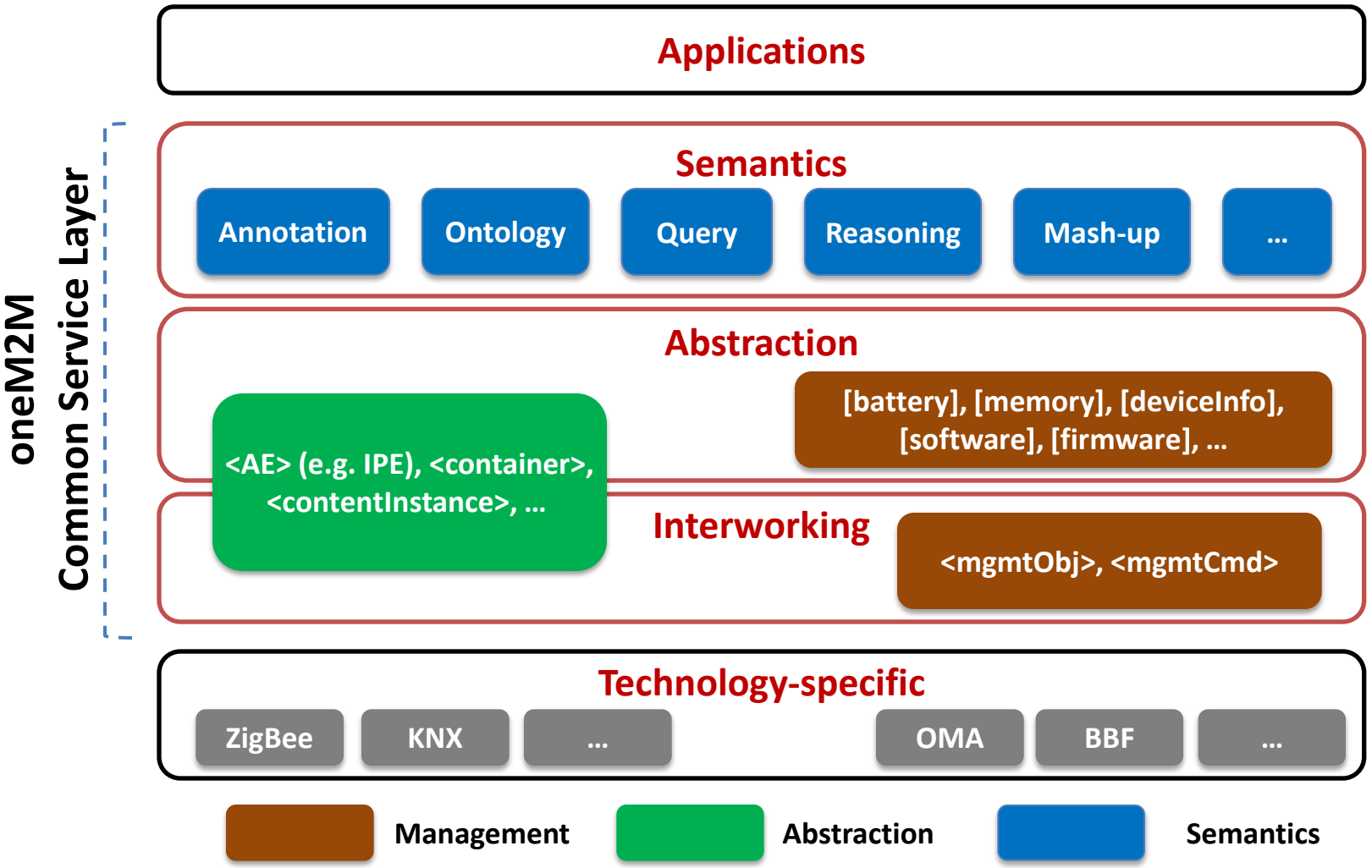
4. Full Semantic Platform

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