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New Architectures for Service Delivery

An Approach to Expose M2M Services over OMA Next Generation Service Interface

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Outline

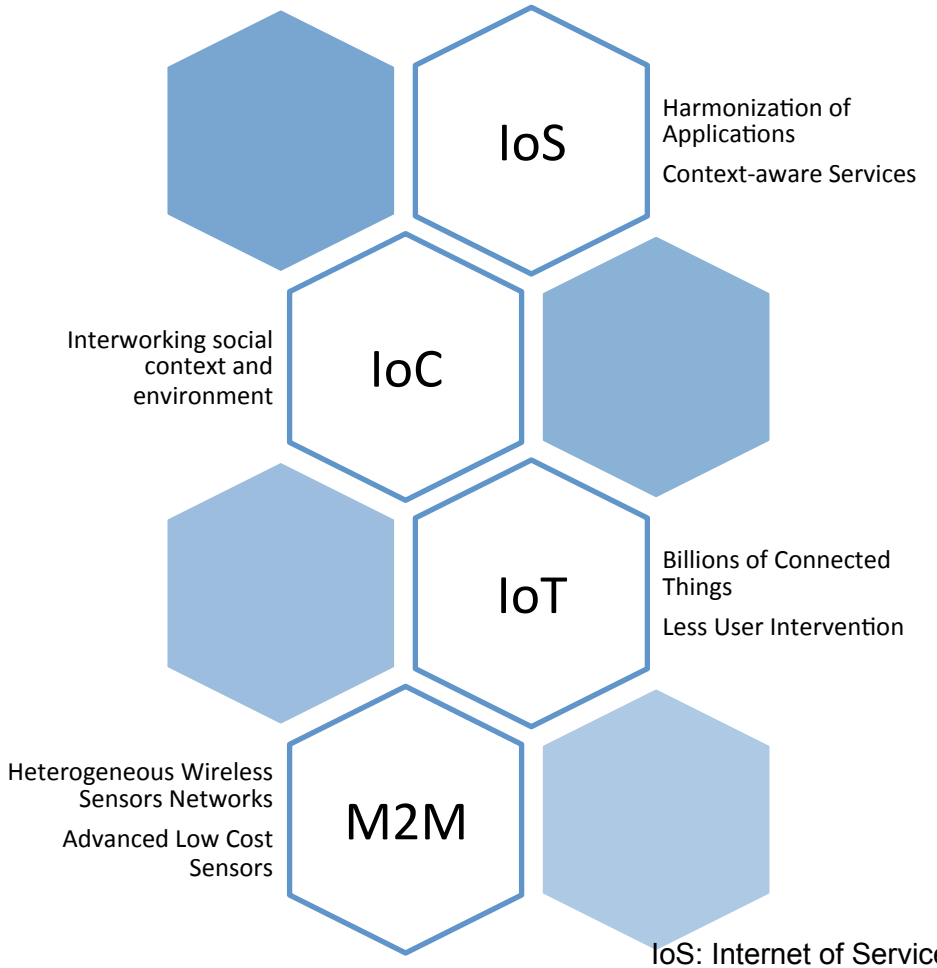
- Context-aware Systems
- Future of Machine-to-Machine (M2M)
- M2M Standards Activities
- OMA NGSI Standards
- OpenMTC: a Context Management framework
- OpenMTC @ Fi-ware

Motivation: Context-aware Systems

- Enable Smart systems to anticipate users' needs and to act in advance.
- Adapt operations to the current context without explicit user intervention.
- Increasing usability and effectiveness by taking environmental context into account.

Definition of Context-aware System

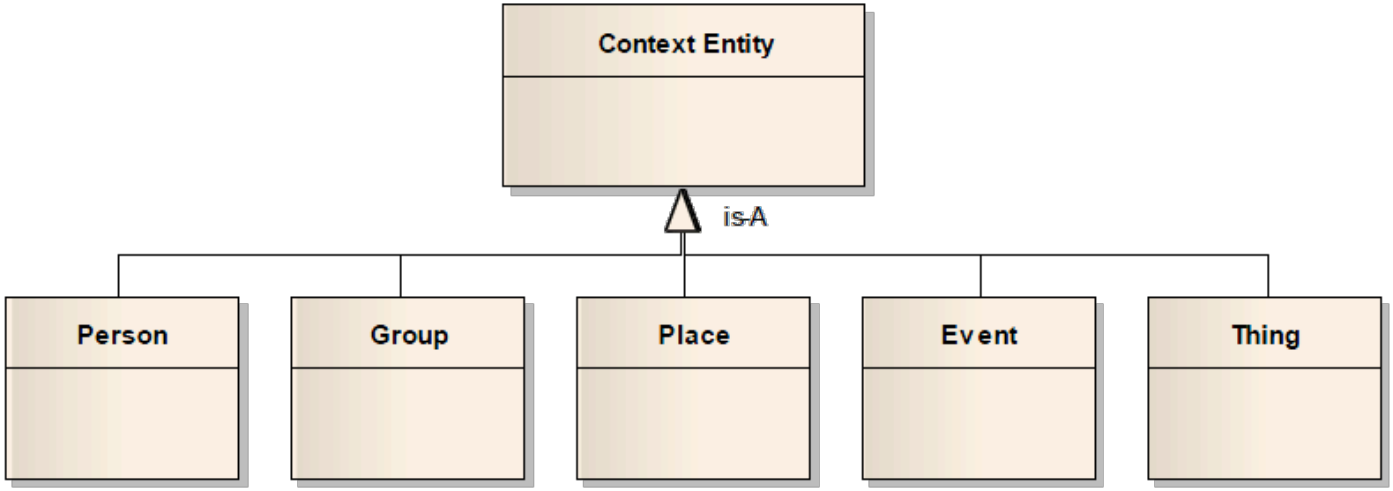
- A system uses context to provide relevant information and/or services to the user, where relevancy depends on the user's task [DeyAbowd2000]



IoS: Internet of Services
IoC: Internet of Content
IoT : Internet of Things
M2M: Machine-to-Machine

Definition of Context

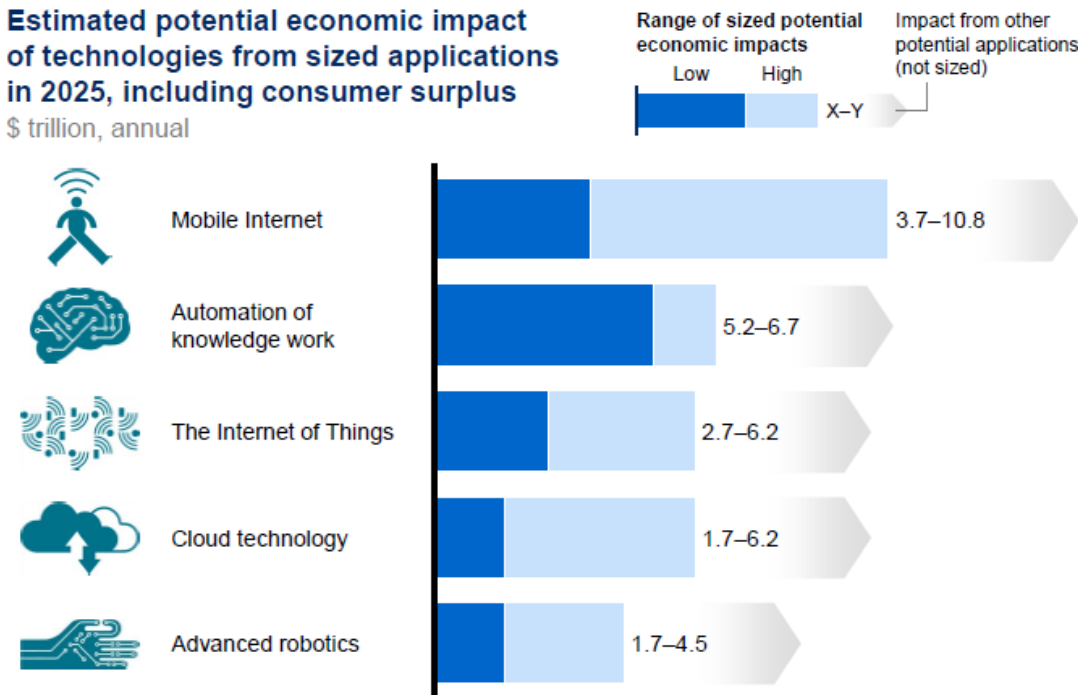
- Any information that can be used to characterize the situation of entities (i.e. whether a person, place or object) that are considered relevant to the interaction between a user and an application, including the user and the application themselves [DeyAbowd2000]



Source: OMA-TS-NGSI_Context_Management-V1

Estimated Economic Impact

- IoT Offers potential to drive productivity across $36 trillion in operating costs of key affected industries: manufacturing, health care, and mining
- Potential economic impact in 2025 across sized applications of$2.7 trillion —$6.2 trillion

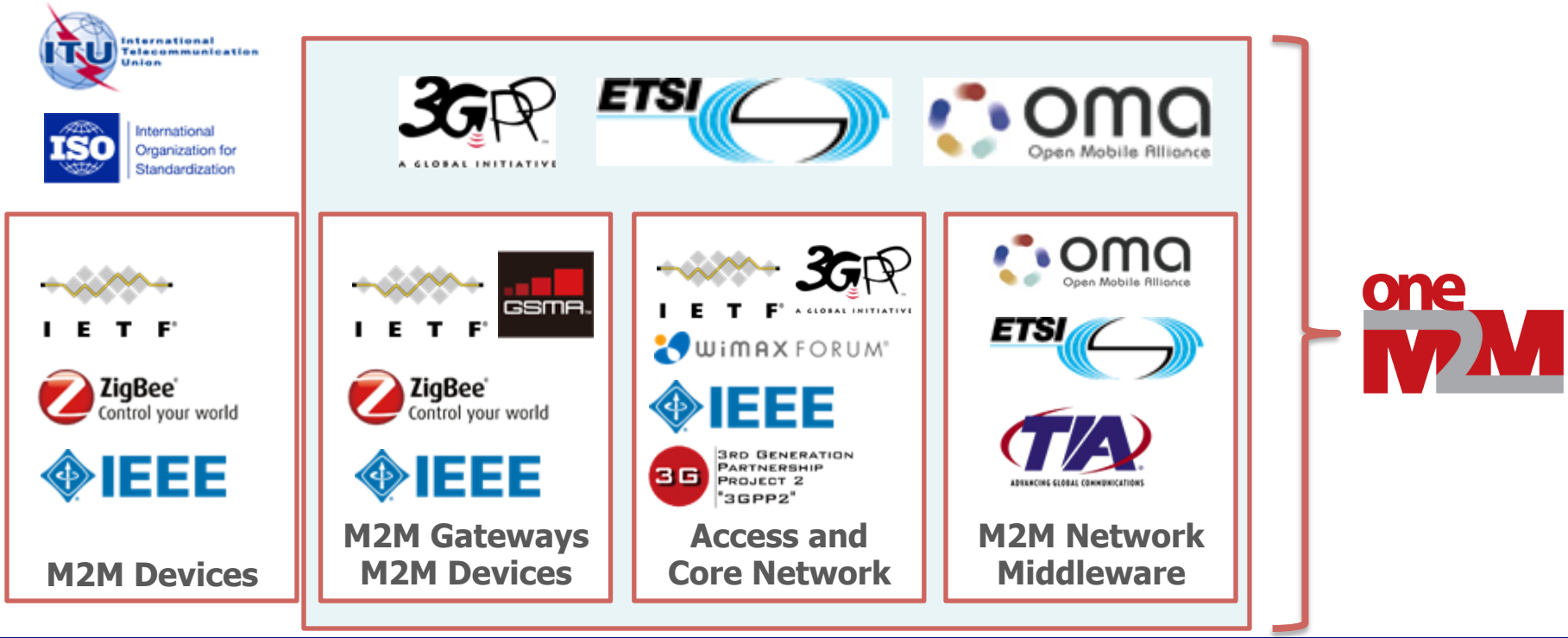


SOURCE: McKinsey Global Institute analysis

- Major applications enabled by advanced technology infrastructure, e.g., advanced supply chain systems

M2M Standard Landscape

- ETSI, OMA & 3GPP standards together develop a complete network oriented M2M communication architecture.
- oneM2M cooperate in the production of globally applicable, access-independent M2M Service Layer specifications, including Technical Specifications and Technical Reports related to M2M Solutions.

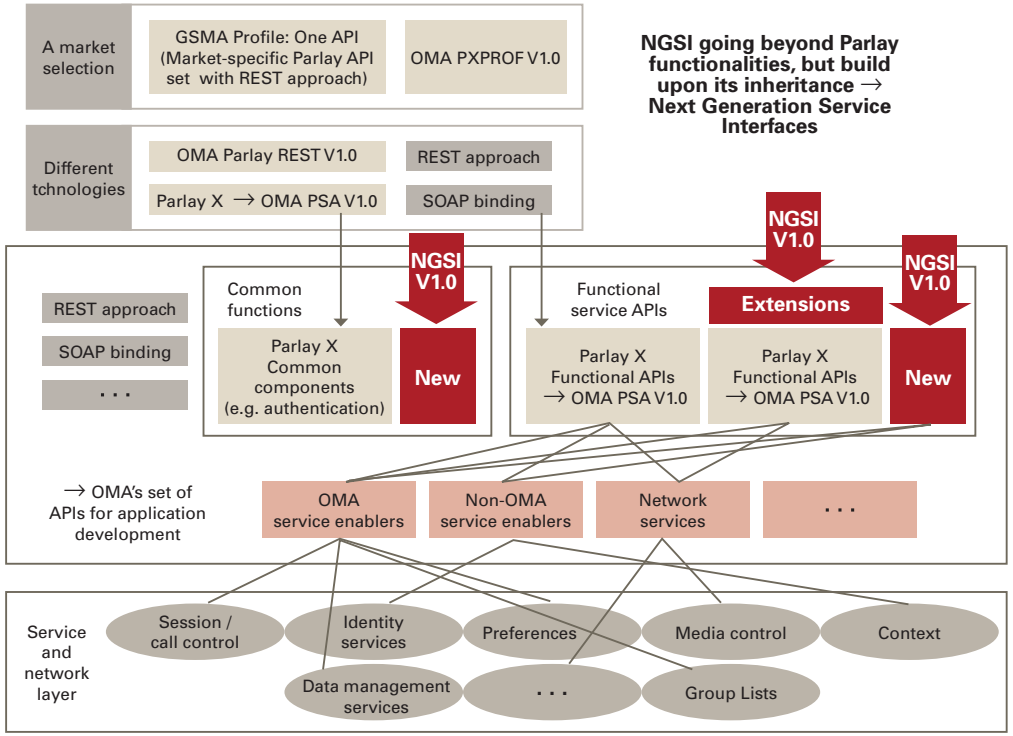


OMA Next Generation Service Interface

- **Objectives**
  - Extensions for personal communication services, including
    - Rich multimedia services
    - Access to media/data storages and related control mechanism
  - Related Context and Personalization within focus for multimedia services
- The scope of the NGSI v1.0 is the standardization of new functional APIs for:
  - Data Configuration and Management
  - Call Control and Configuration
  - Multimedia List Handling Extensions
  - Context Management
  - Identity Control
  - Registration and Discovery functions

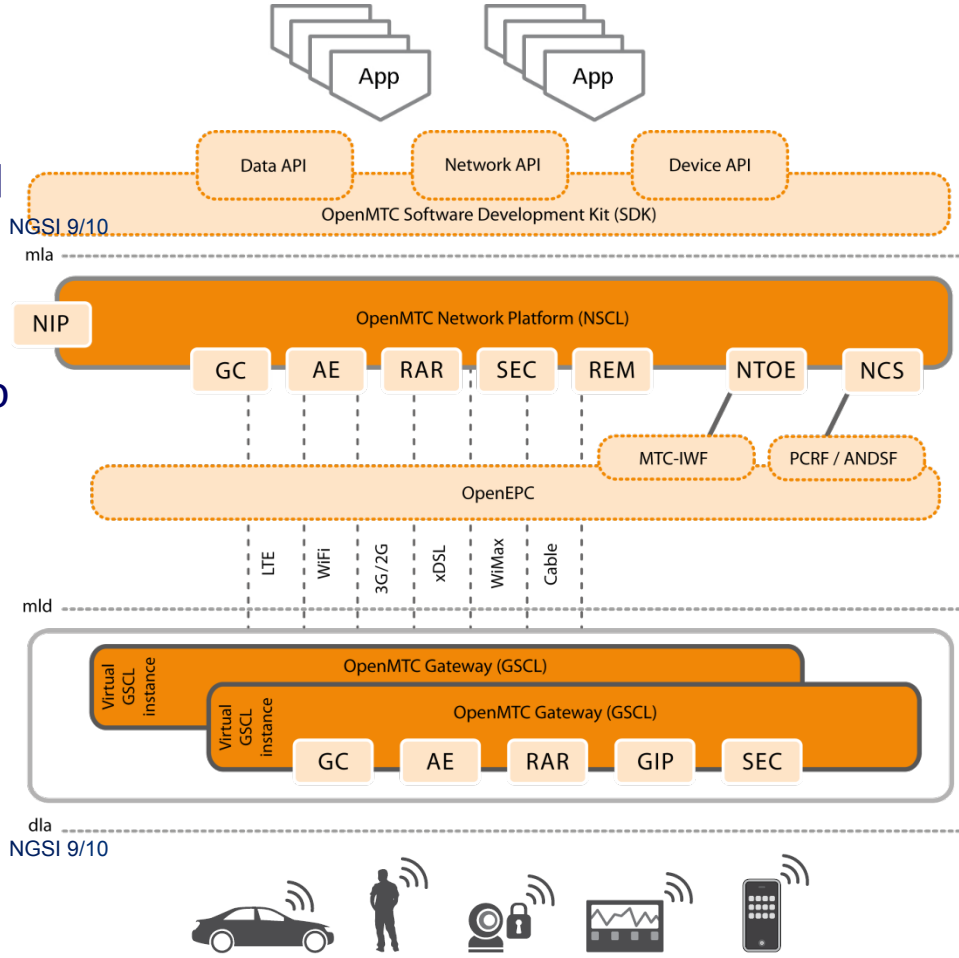
Extension of OMA Next Generation Interfaces for M2M

- FOKUS uses and adapts NGSI for hybrid M2M & H2H service access and exposure
- NGSI Context API extended for M2M device, network and data handling.
- OMA NGSI provide standardized APIs for communication services.



OpenMTC Platform As A Context Management Framework

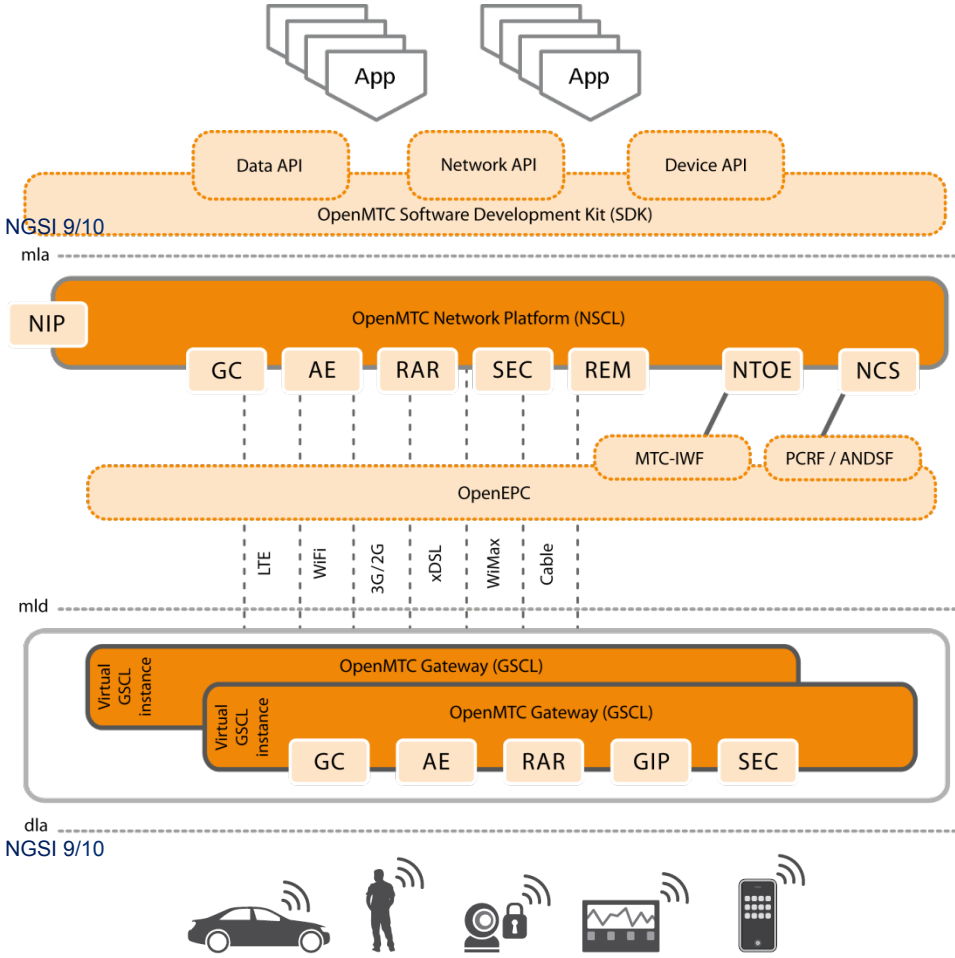
- A middleware platform for M2M oriented applications and services.
- A prototype implementation of ETSI M2M standards.
- M2M Service Capabilities
  - Providing a set of M2M functions to applications in both network and device domains.
  - Expose functions through specified open interfaces.
  - Use Core Network functionalities.
  - Simplify and optimize application development and deployment through hiding of network specificities.



OpenMTC Platform As A Context Management Framework

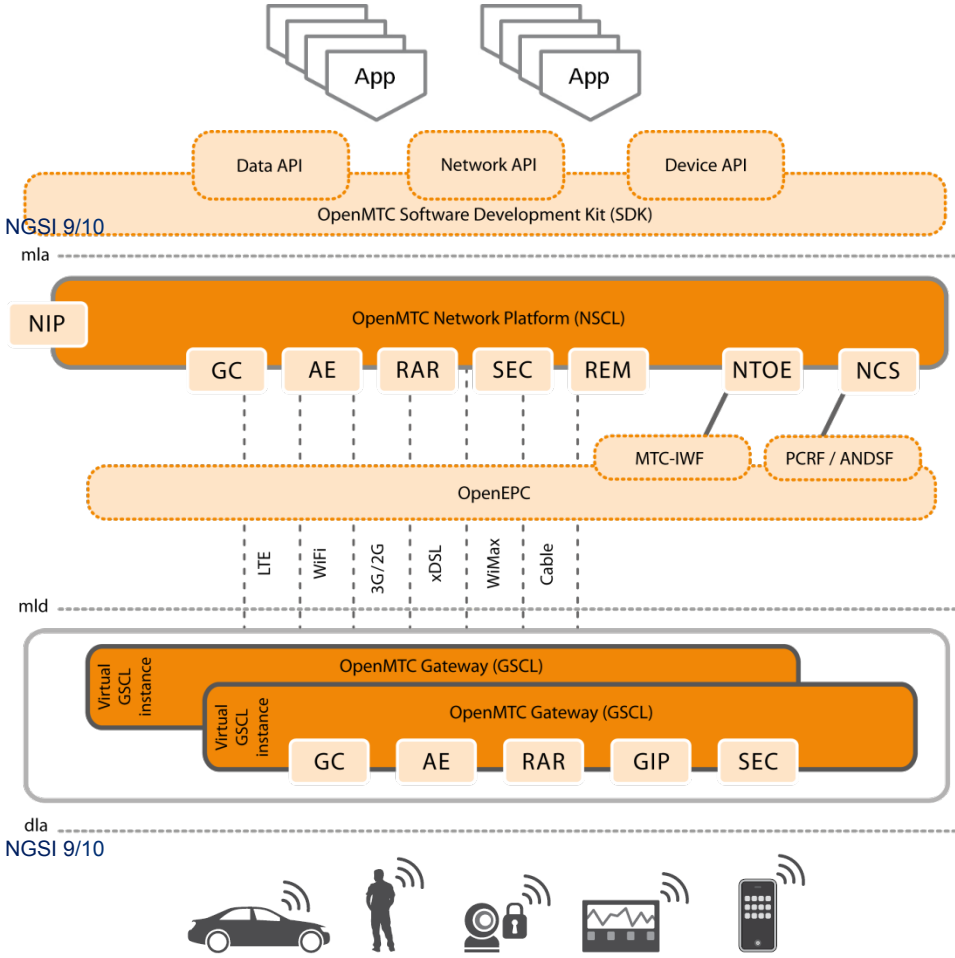
Standard-based APIs

- Enable sharing of M2M data between heterogeneous context management platforms via standards interface points.
- Allow 3rd party application developers
  - Build new services.
  - Control access of network capabilities.
  - Enhance existing services.



OpenMTC Platform As A Context Management Framework

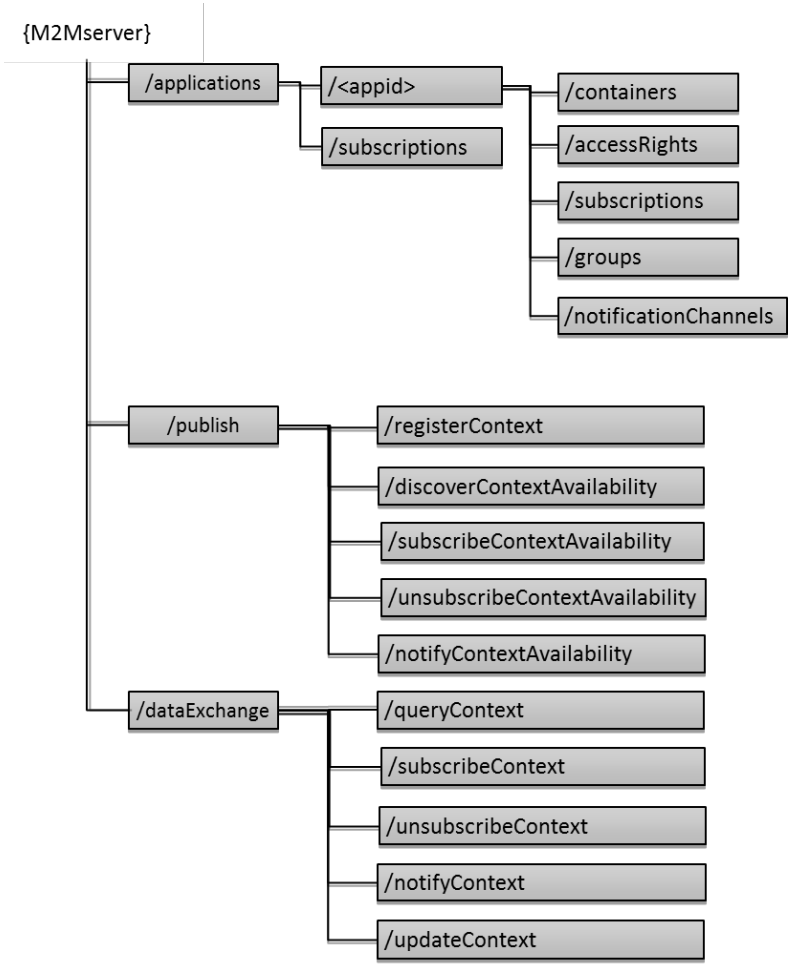
- ETSI specifications define three interfaces: mIa, dIa and mId
- Open M2M APIs from ETSI renders capabilities that enable the implementation of M2M applications at constrained resources devices as well as web servers.
  - Subscription and Notification
  - Grouping
  - Transactions
  - Application Management
  - Compensation (micro-payment)
  - Sessions



OpenMTC APIs to NGSI Specifications

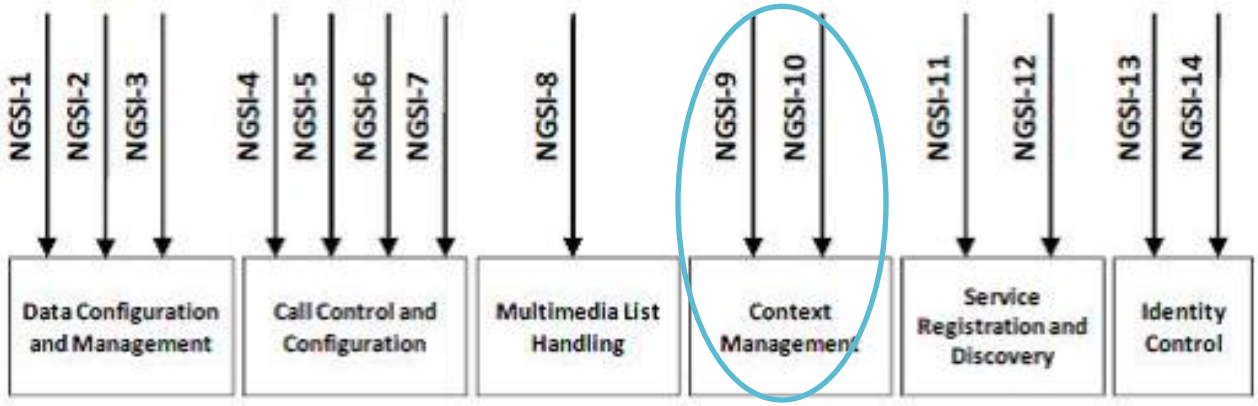
The aim of the MTC APIs is to provide light and abstracted APIs to support the development of M2M applications and make the core assets and service capabilities available to 3rd party developers.

- Network APIs
  - Controlling applications access and usage of service capabilities provided by OpenMTC
- Device APIs
  - Registering and defining device's resources as context providers.
- Data APIs
  - Handling context information from connected devices.



Extension of OMA Next Generation Interfaces for M2M

- The Context Management APIs provides interfaces in order to:
  - Manage the Context Information about Context Entities, for example the lifetime and quality of information.
  - Access (query, subscribe/notify) to the available Context Information about Context Entities.
- NGSI Interface 9/10 are used for human-to-human and M2M communication



Extension of OMA Next Generation Interfaces for M2M

NGSI-9

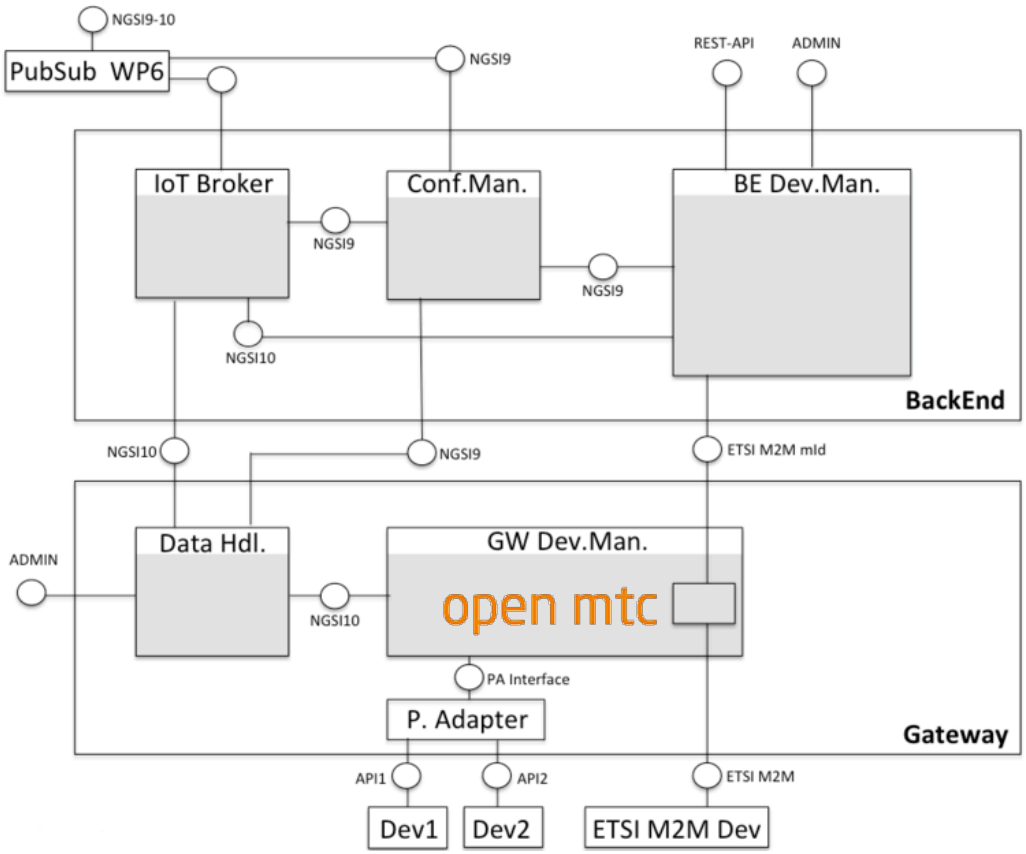
- OpenMTC:
  - Register and update Context Entities, their attributes and their availability.
  - Discover (e.g., by query or notification) Context Entities, their attributes and their availability.
- OpenIMS:
  - Register and update user IDs for location and presence updates
  - Discover user IDs with presence and location information available

NGSI-10

- OpenIMS/OpenMTC:
  - Update Context Information associated with Context Entities.
  - Query for Context Information associated with Context Entities.
  - Subscribe to Context Information associated with Context Entities, including optionally specifying when to be notified (e.g., on change basis, periodically).
  - Notify subscribers about Context Information associated with Context Entities.

OpenMTC @ fi-ware

- European Future Internet Platform FI-Ware for
- General Enabler (GE)
- OpenMTC implements the Gateway Device Management GE of the Internet of Things (IoT) Services Enablement architecture.



Internet of Things (IoT) Services Enablement Architecture

Conclusion

- Context awareness feature in Smart systems allow the adaptation of the environment states and optimizing services.
- M2M communication platforms provide the means to connect objects, and facilities the information exchange.
- Although the adaptation of open APIs in developing Web services increases the portability, it does not ensure the interoperability.
- Standards are needed to unify the communication mechanisms between cooperated services.

Thank you for your attention

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