Standardization for Future IOT Ecosystem -ITU IoT Programme, Bangkok, Thailand

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To fully capitalize the Internet of Things opportunity, five main challenges have to be addressed

Robust connectivity: Latency, availability, coverage Standardization: Standard connectivity for billions of things Interoperability and open interfaces: Enabling platforms to talk with each other

Privacy and security: Prevent malware injection and data misuse

Domain knowledge: Deep, vertical-specific insights



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Many Standardization Organizations & Alliances working on IoT

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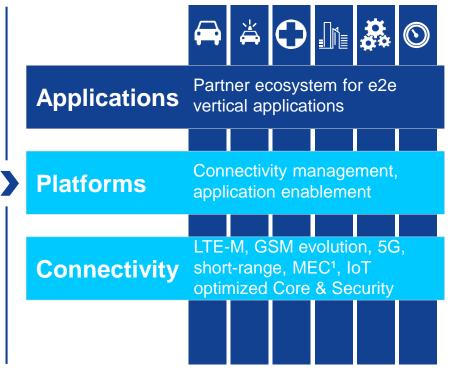


Nokia aspires to shape the programmable world with IoT-optimized networks and applications in selected verticals

Improves people's lives and business results with the Internet of Things ...

... and optimizes and designs networks for the Internet of Things

- Human
- Trusted
- Open
- Insightful
- Impactful
- Scalable
- Flexible
- Cloudified
- Efficient
- Secure





1. Connectivity for IoT Multiple communication technologies for different scenarios



Massive IoT connectivity • Simple cheap devices • Low energy consumption

- Massive number of devices
- Full coverage, low data rate

Critical IoT connectivity • Always available

- Very low latency
- Resiliency

Internet of Things

- 3GPP RAN (Rel-12/13)
 - LTE evolution for MTC (LTE-M 1.4MHz)
 - NB-IoT (200kHz)
- 3GPP GERAN (Rel-13)
 - Enhanced Coverage GSM (EC-GSM/EC-EGPRS)
- 3GPP RAN (Rel-15/16)
 - 5G Massive MTC and Reliable Low Latency Communication Licensed Spectrum

• Short range

- Bluetooth Low Energy
- Wi-Fi, IEEE802.11ah
- ZigBee
- Z-wave

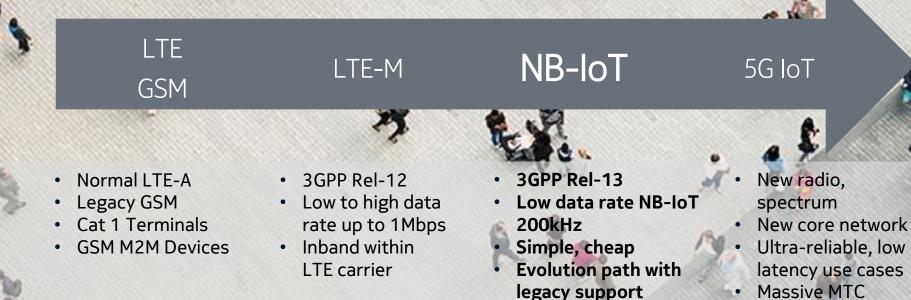
- Long range
- MuLTEfire
- Sigfox
- OnRamp
- LoRa

Unlicensed Spectrum



IoT Radio Evolution

3GPP Landscape

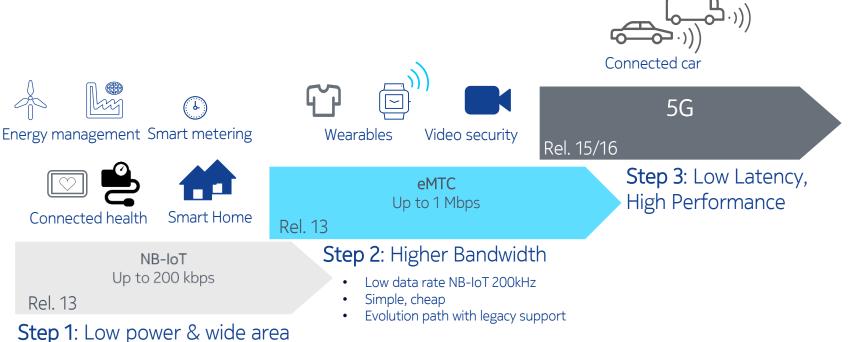


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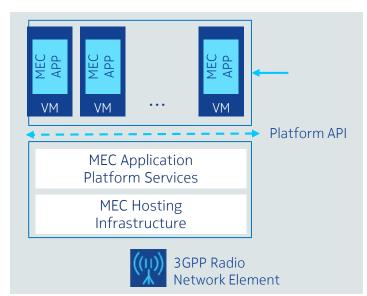
Public

Why NB-IoT ?

It is for low power, wide area use cases and complementary to other IoT use cases in the future !



What is Mobile Edge Computing?



- ✓ Analytics: bring computing capabilities for direct communication over cellular network via MEC server
- ✓ Flexibility: MEC scope focuses on enabling third-party applications to be hosted in the mobile network edge.



•White Paper published Sep. 2014 •Requirement document completed •ETSI MEC phase 1 is currently in stage 3 •ETSI MEC phase 2 work commences beginning of 2017 with the main theme of Multi-Access.







MEC is a key feature of IMT-2020 •MEC section in FG IMT-2020 phase 1 •Under development in FG IMT-2020 phase 2



2. Platforms for IoT Interoperability, flexibility, cross domain applications

Applications Partner ecosystem for e2e vertical applications

Platforms

Connectivity management, application enablement

Connectivity LTE-M, GSM evolution, 5G, short-range, MEC¹, IoT optimized Core & Security

Semantic Common services OS interworking Aligned procedures Security Solutions Access management Device management Interfaces interoperability Equipment integration



oneM2M Introduction

oneM2M is the global standards initiative for M2M Communications and the Internet of Things

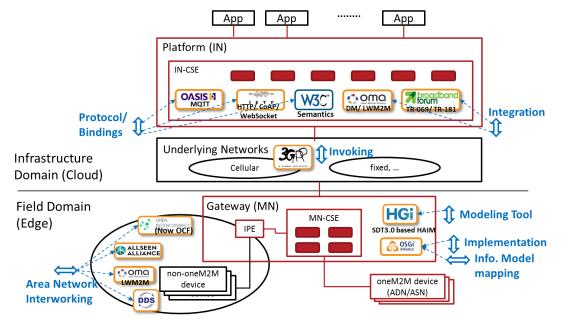


> Industry-driven Open source implementations



> Examples of Commercial implementations /demos

> Release 1.0 published in 01/2015, Release 2.0 published in 09/2016:



Source: oneM2M

OMA: Open Mobile Alliance

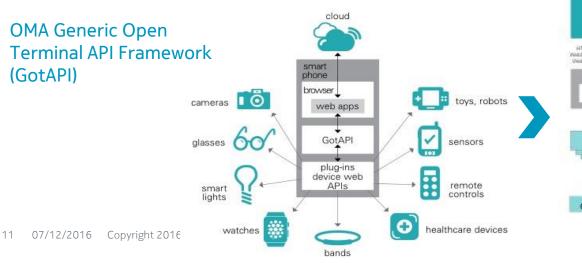
Objective:

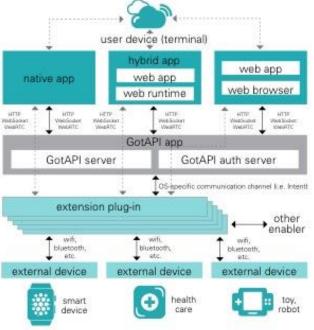
To provide <u>interoperable</u> service enablers working across countries, operators and mobile terminals **Members**:

Members include traditional wireless industry players such as equipment and mobile systems manufacturers and mobile operators and also software vendors.

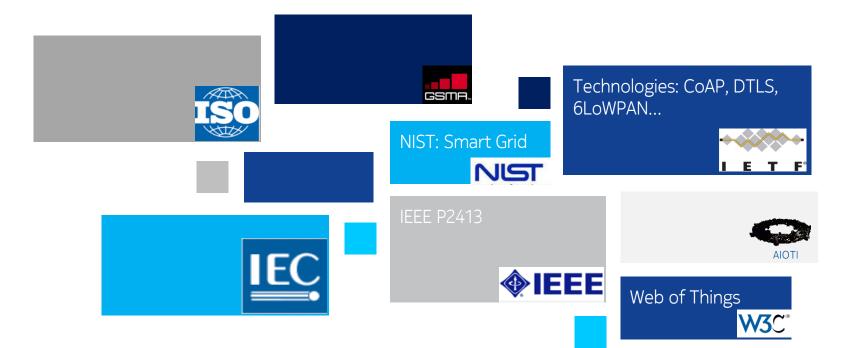
Standard Spec (partial):

<u>OMA LWM2M</u> Specifications for Lightweight M2M functionality. <u>OMA DM</u> specification for <u>Device Management</u> using <u>SyncML</u>.





3. Other Activities (TBD)





Summary



Diversity Uniformity

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