Standardization for Future IoT Ecosystem

-ITU IoT Programme, Bangkok, Thailand

Shane HE

Bell Labs & CTO, Nokia

NOKIA

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

Robust connectivity: Latency, availability, coverage

1

Standardization: Standard connectivity for billions of things

2

Interoperability and open interfaces: Enabling platforms to talk with each other

3

Privacy and security: Prevent malware injection and data misuse

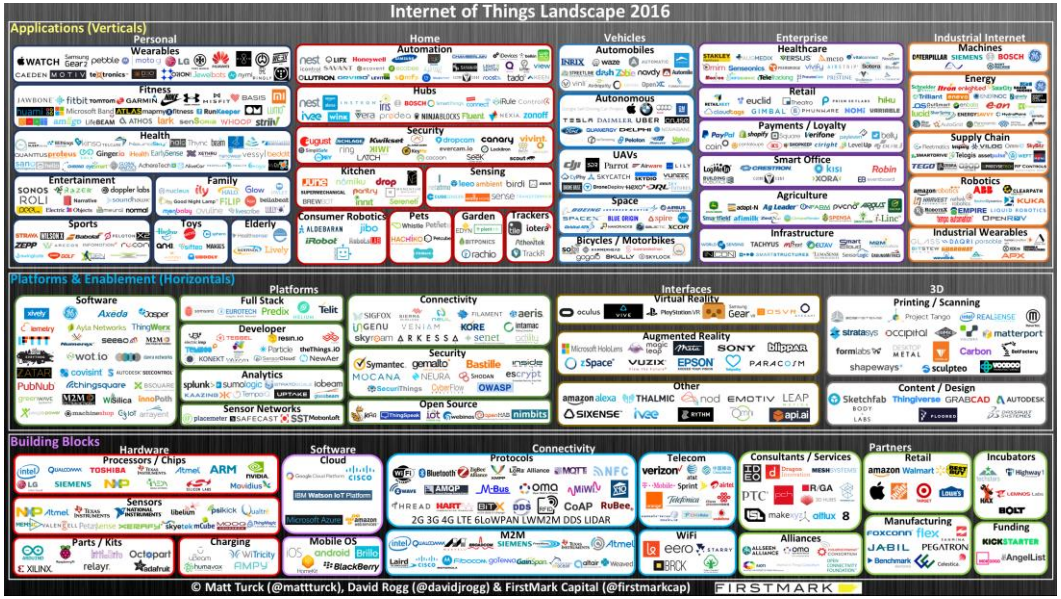
4

Domain knowledge: Deep, vertical-specific insights

5

NOKIA

Many Standardization Organizations & Alliances working on IoT



NOKIA

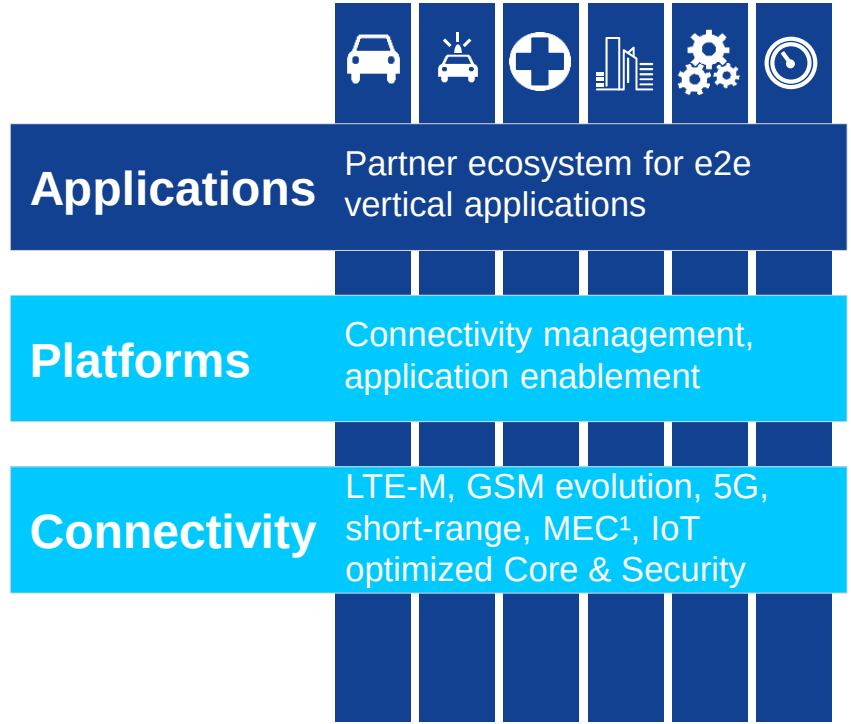
Nokia aspires to shape the programmable world with IoT-optimized networks and applications in selected verticals

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

- Human
- Trusted
- Open
- Insightful
- Impactful

… and optimizes and designs networks for the Internet of Things

- Scalable
- Flexible
- Cloudified
- Efficient
- Secure



NOKIA

1. MEC: Mobile Edge Computing

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

NOKIA

IoT Radio Evolution

3GPP Landscape

- Normal LTE-A
- Legacy GSM
- Cat 1 Terminals
- GSM M2M Devices

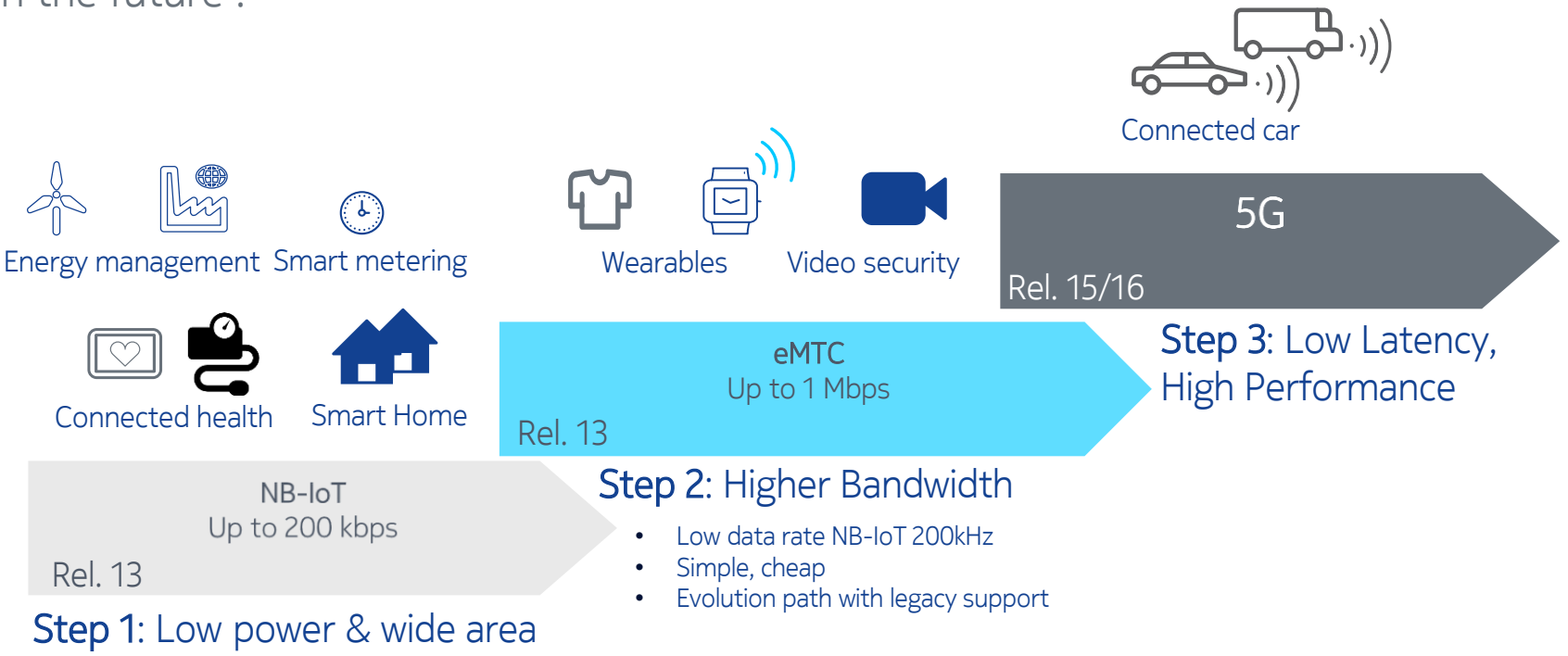
- 3GPP Rel-12
- Low to high data rate up to 1Mbps
- Inband within LTE carrier

- **3GPP Rel-13**
- **Low data rate NB-IoT 200kHz**
- **Simple, cheap**
- **Evolution path with legacy support**

- New radio, spectrum
- New core network
- Ultra-reliable, low latency use cases
- Massive MTC

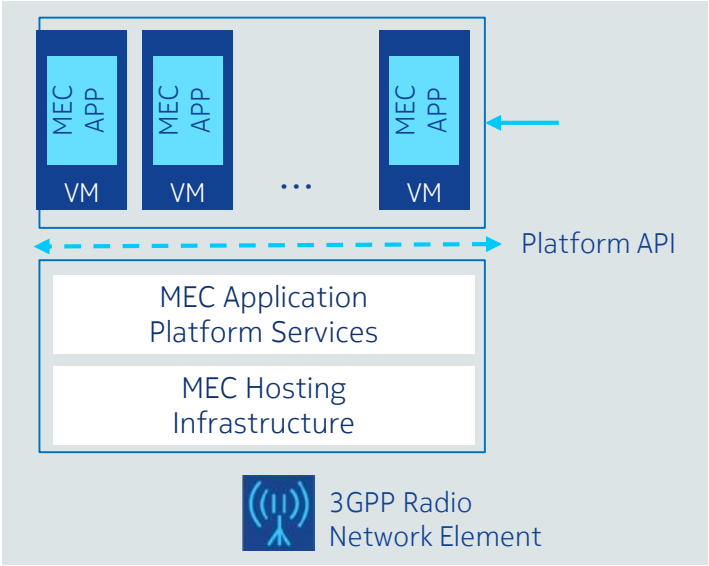
Why NB-IoT ?

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



NOKIA

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.

ISG Mobile Edge Computing

- •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

NOKIA

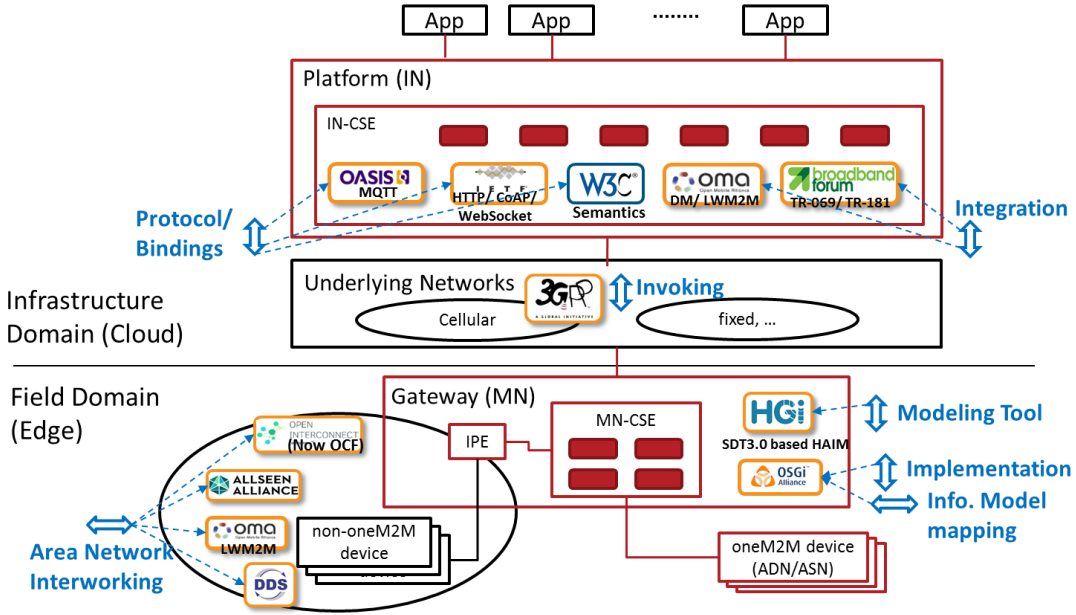
oneM2M Introduction

- 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:



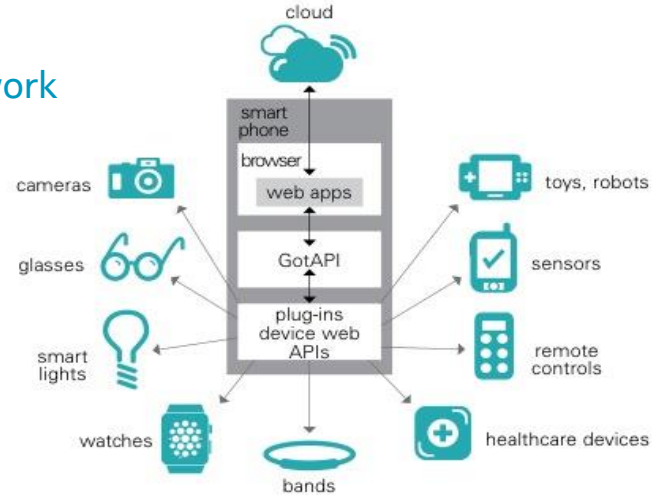
Source: oneM2M

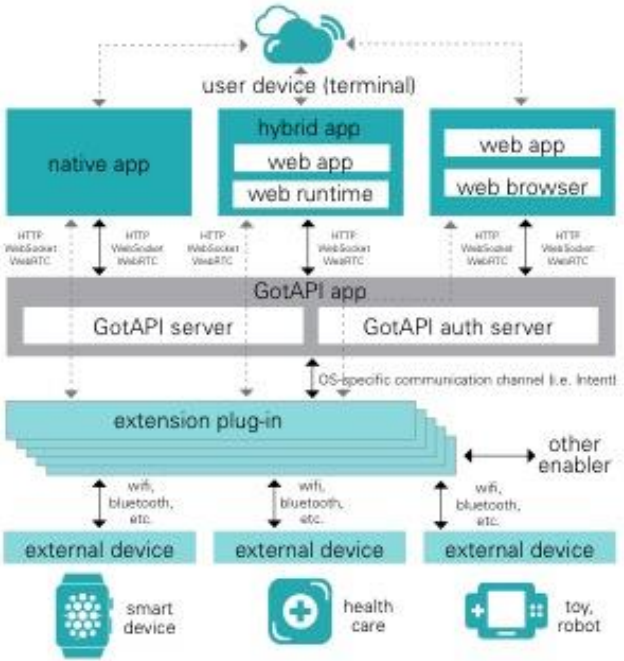
NOKIA

OMA: Open Mobile Alliance

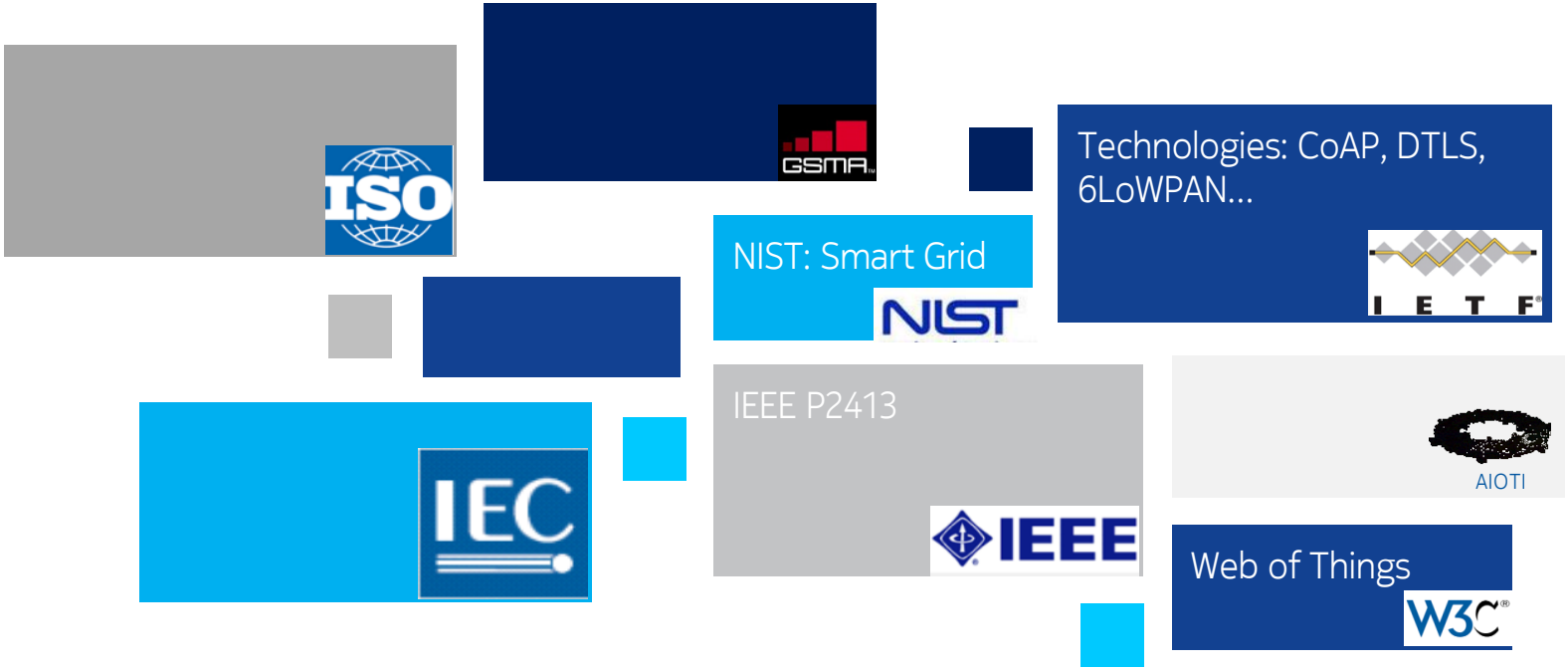
Objective:
To provide interoperable service enablers working across countries, operators and mobile terminals
Members:
Members include traditional wireless industry players such as equipment and mobile systems manufacturers and mobile operators and also software vendors.
Standard Spec (partial):
OMA LWM2M Specifications for Lightweight M2M functionality.
OMA DM specification for Device Management using SyncML.

OMA Generic Open Terminal API Framework (GotAPI)





3. Other Activities (TBD)



NOKIA

Summary

Diversity Uniformity

NOKIA