

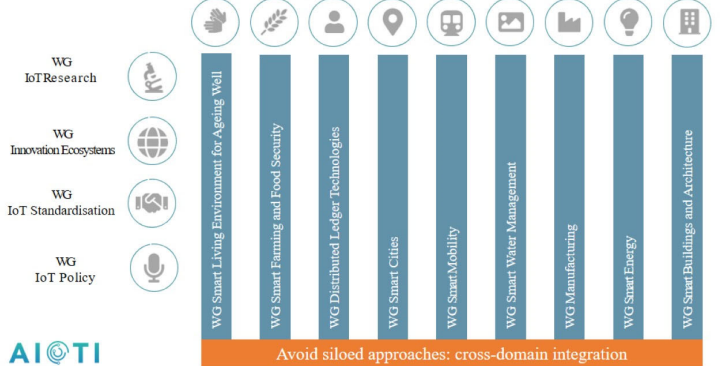
Alliance for Internet of Things Innovation

Stakeholder Workshop • 04th July 2019, Brussels

Next Generation IoT

Ovidiu Vermesan, Chief Scientist SINTEF, Norway
Chair AIOTI WG01 – IoT Research

AIOTI Structure



WG IoT Research

WG Innovation Ecosystems

WG IoT Standardisation

WG IoT Policy

WG Smart Living Environment for Ageing Well

WG Smart Farming and Food Security

WG Distributed Ledger Technologies

WG Smart Cities

WG Smart Mobility

WG Smart Water Management

WG Manufacturing

WG Smart Energy

WG Smart Buildings and Architecture

AIOTI

Avoid siloed approaches: cross-domain integration

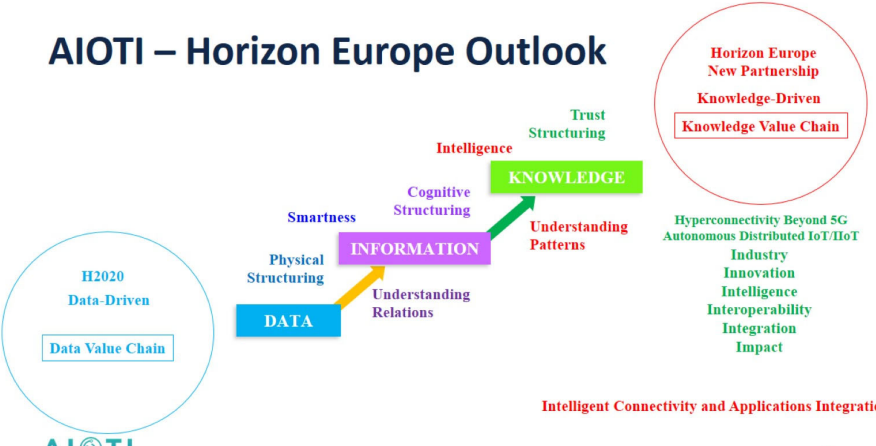
2

IoT/IIoT - Industrial, Business and Consumer

- Configuration, Orchestration and Open Device Management
- Edge, Mobile Edge Computing and Processing
- IoT Platforms
- IoT Distributed and Federated Architectures integrated with the 5G architecture and AI
- Digital Twins for IoT
- Tactile and Industrial-Tactile IoT
- IoT and Distributed Ledger Technologies (DLTs)
- IoT and Artificial Intelligence (AI) Methods and Techniques
- IoT Privacy, Safety, Security, and Trust

3

AIOTI – Horizon Europe Outlook



H2020 Data-Driven

Data Value Chain

DATA

Physical Structuring

Smartness

Understanding Relations

INFORMATION

Cognitive Structuring

Intelligence

Trust Structuring

KNOWLEDGE

Understanding Patterns

Intelligence

Trust Structuring

Horizon Europe New Partnership

Knowledge-Driven

Knowledge Value Chain

Hyperconnectivity Beyond 5G

Autonomous Distributed IoT/IIoT

Industry Innovation

Intelligence

Interoperability

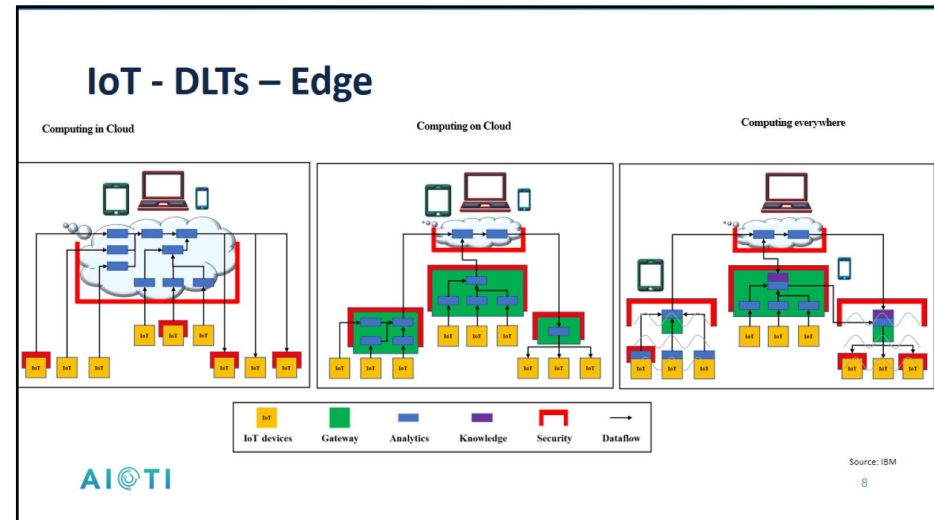
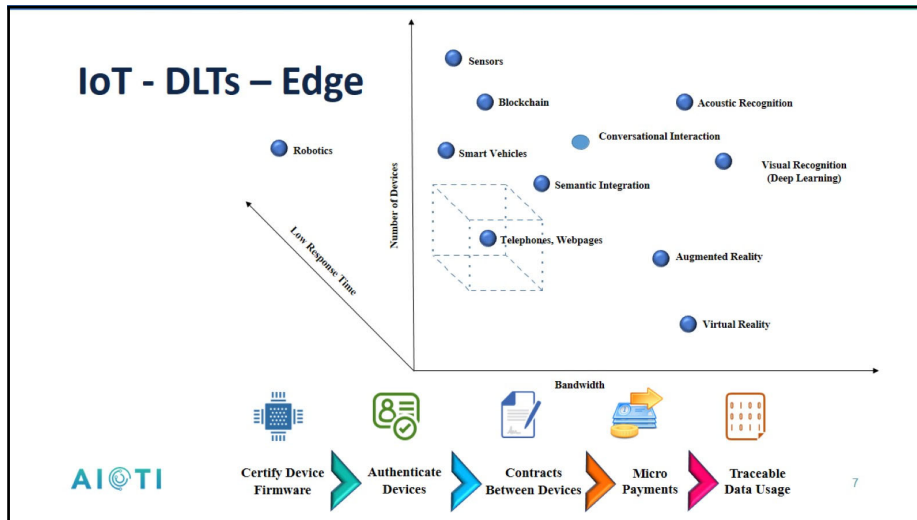
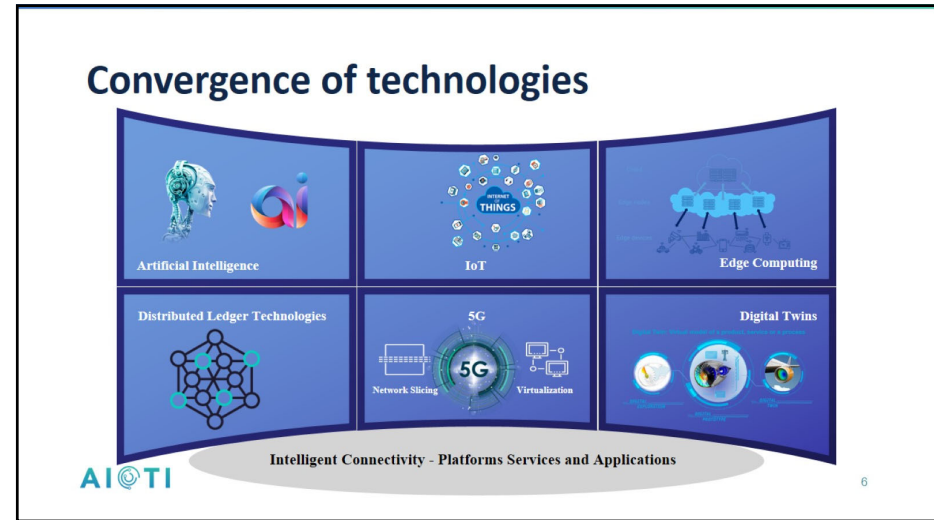
Integration

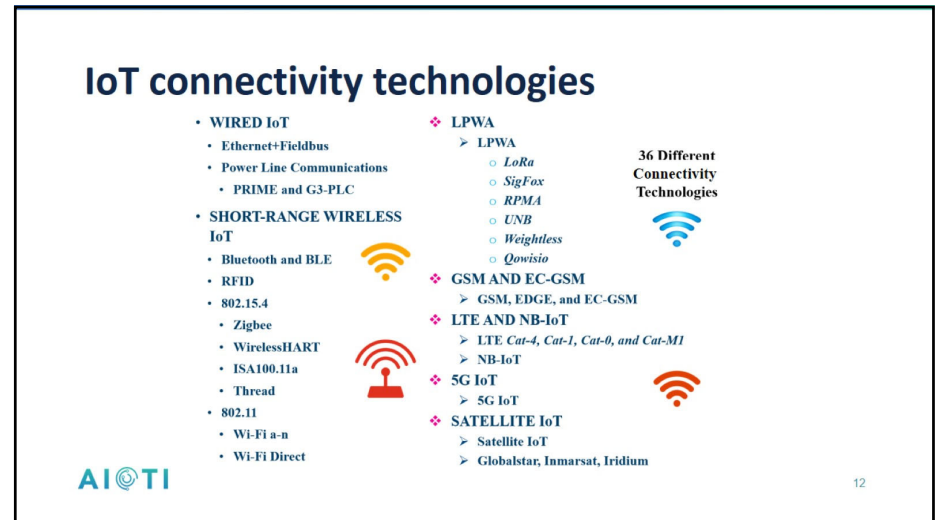
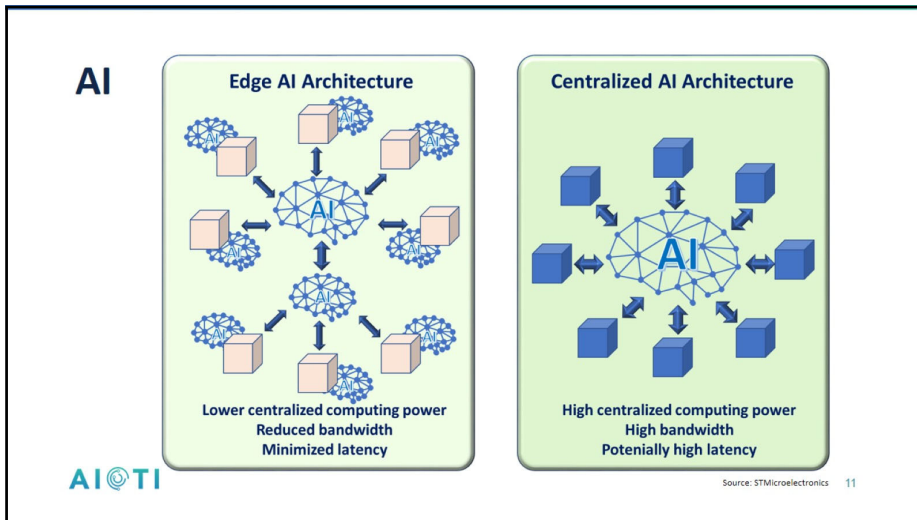
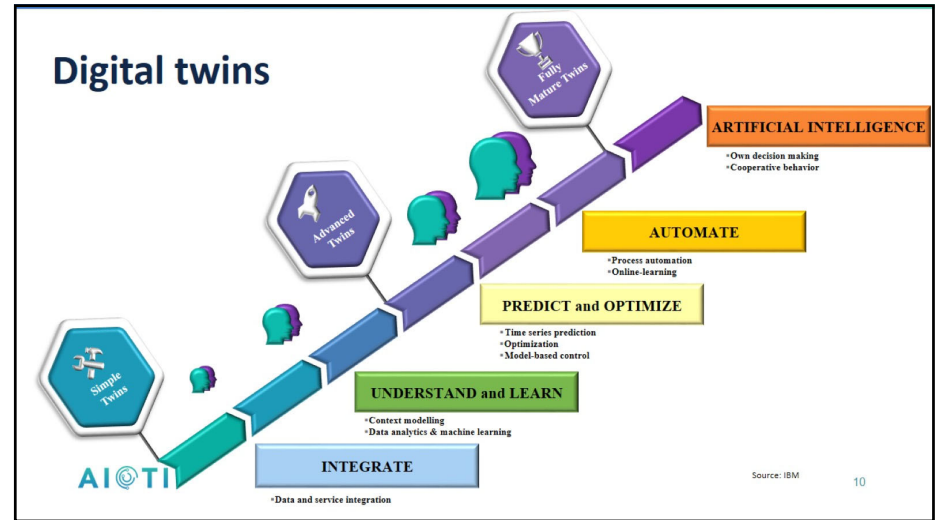
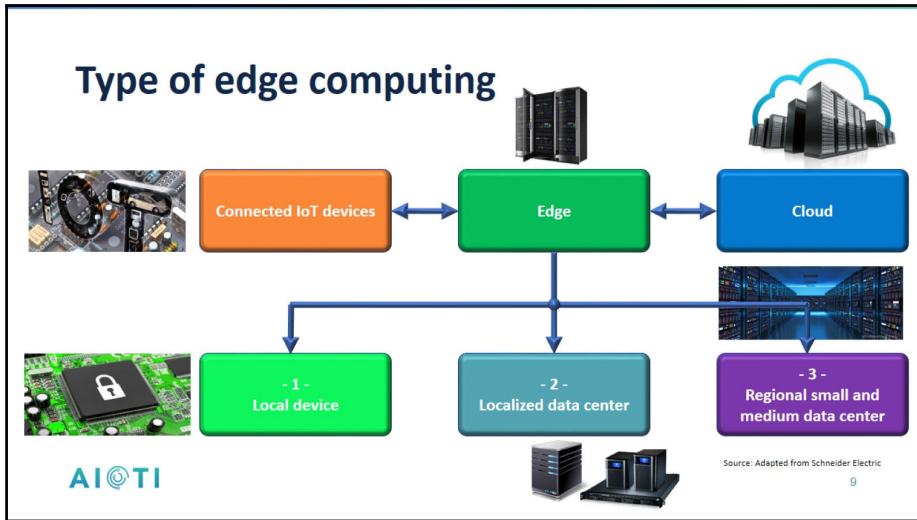
Impact

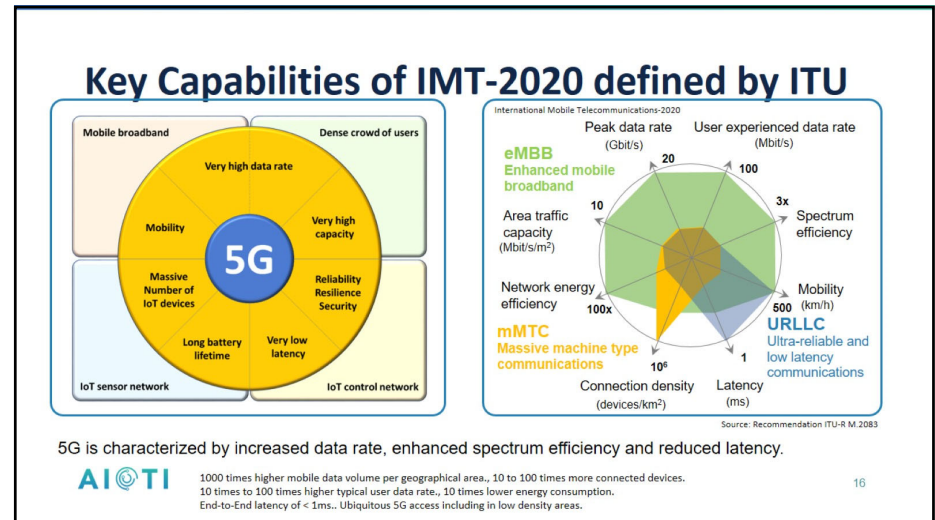
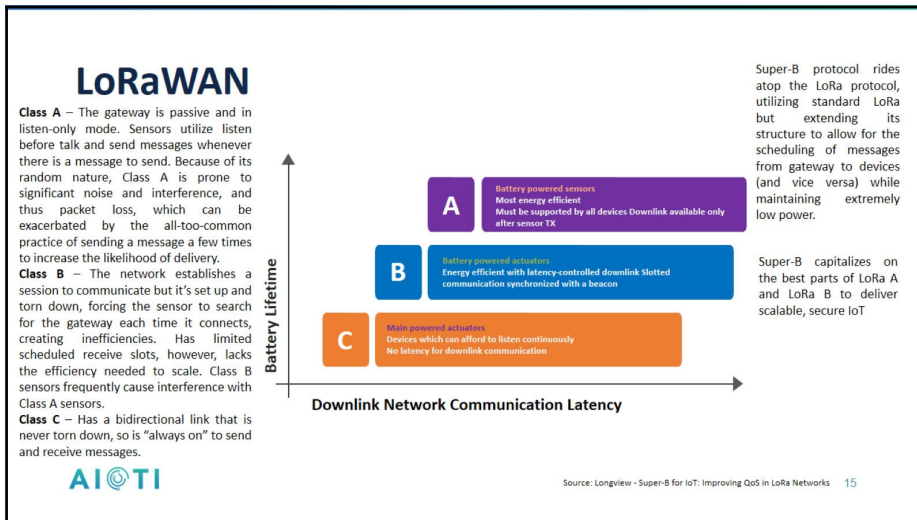
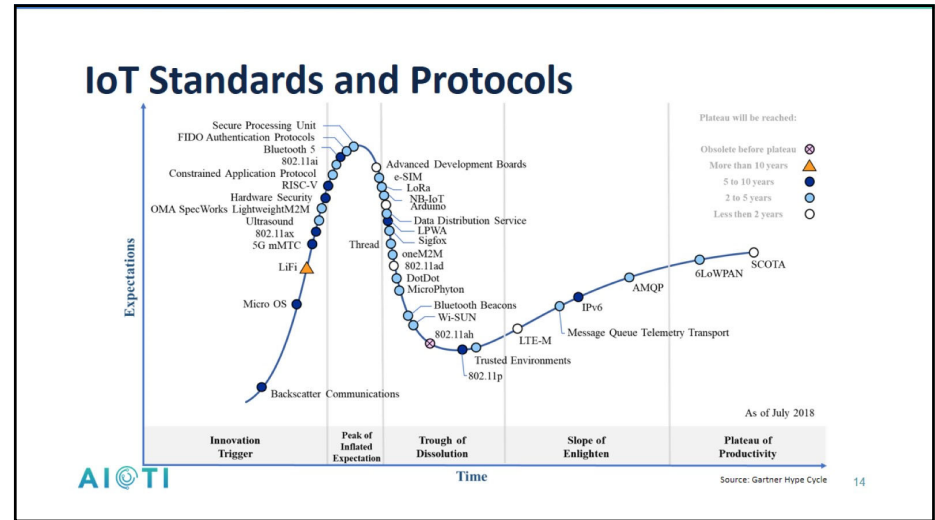
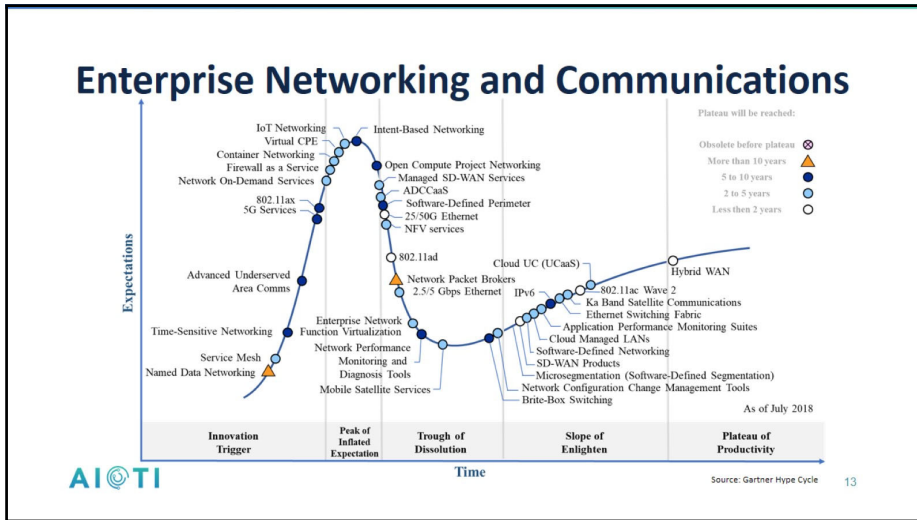
Intelligent Connectivity and Applications Integration

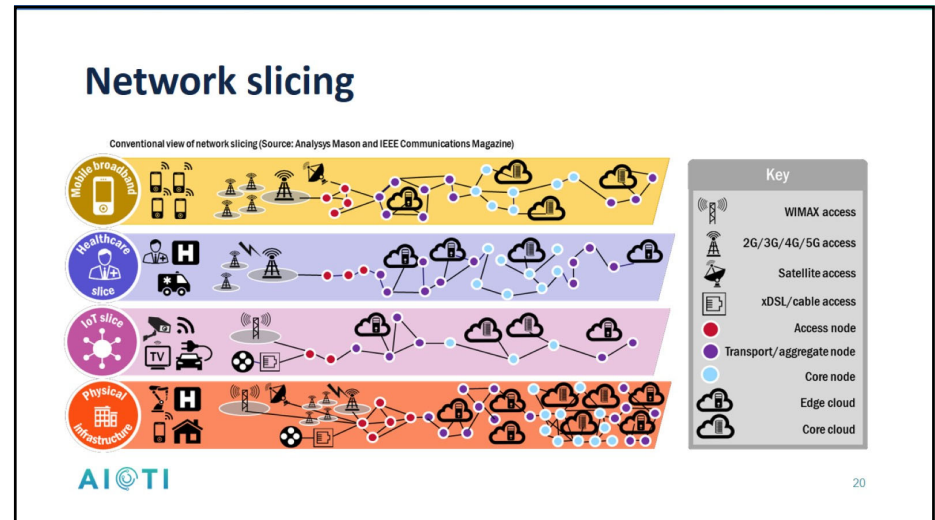
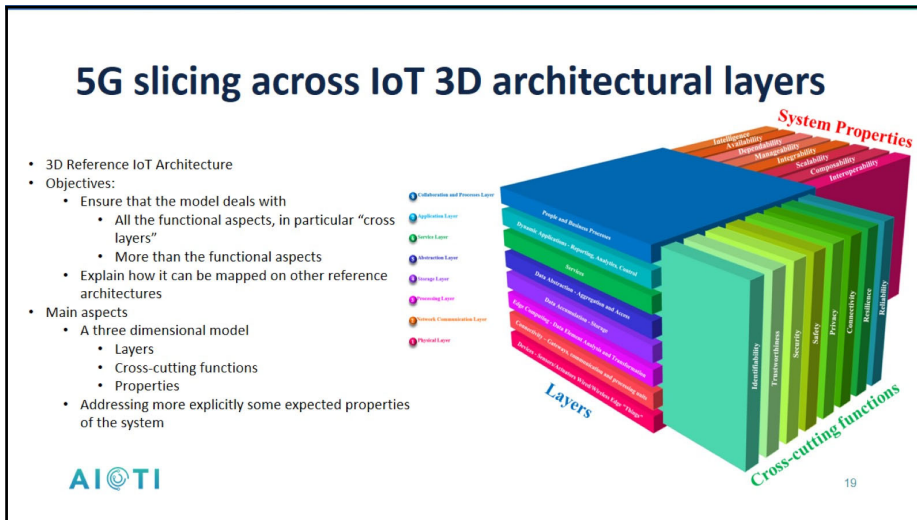
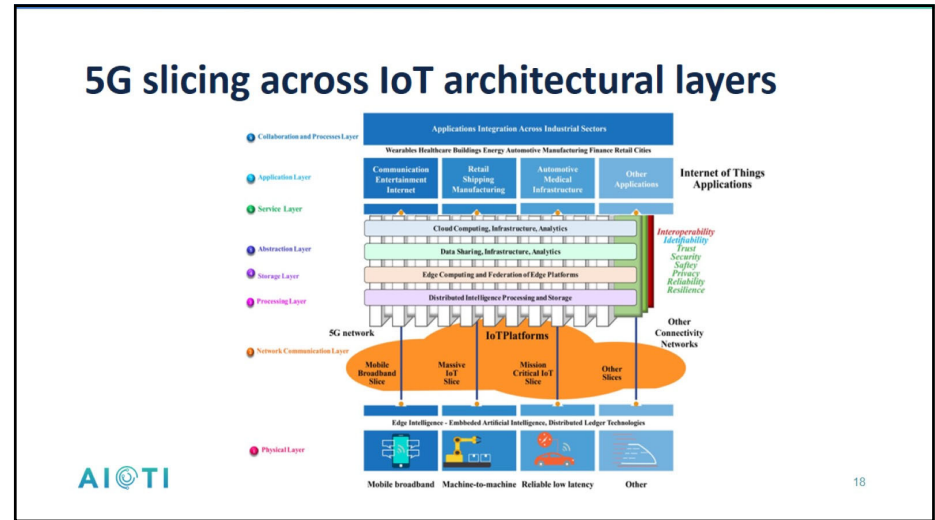
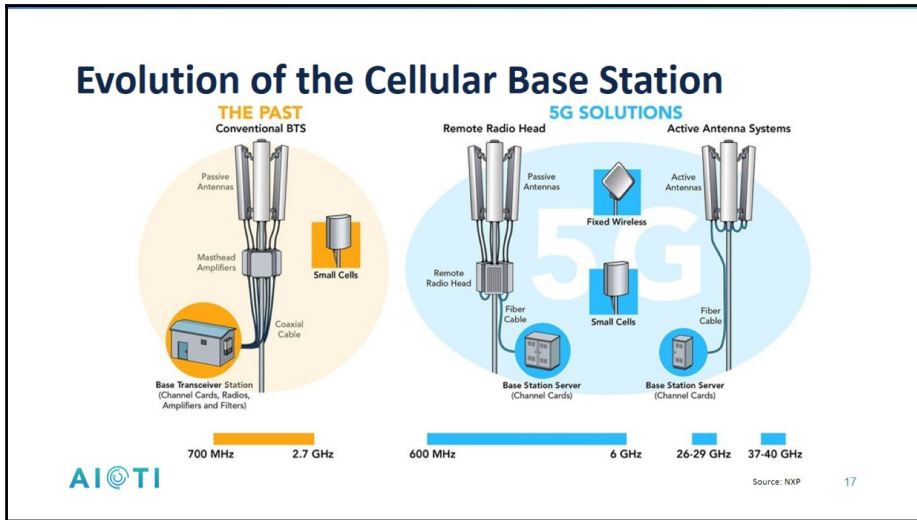
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4

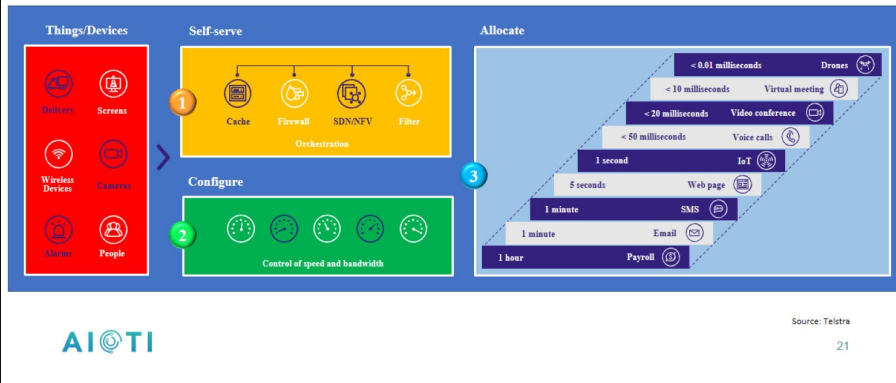




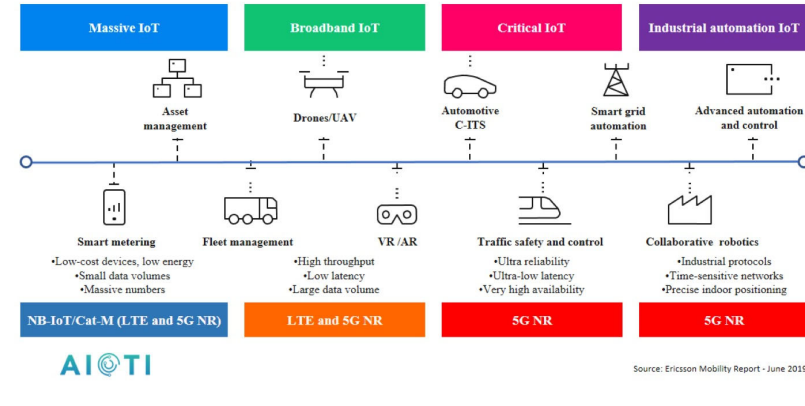




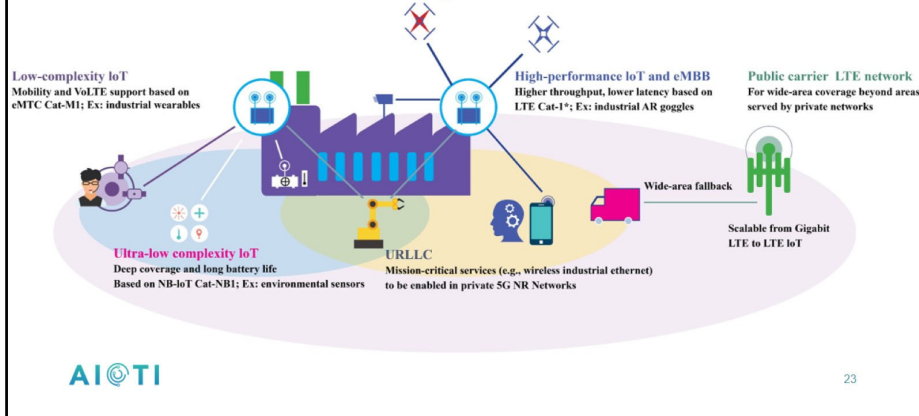
Network programmability and slicing



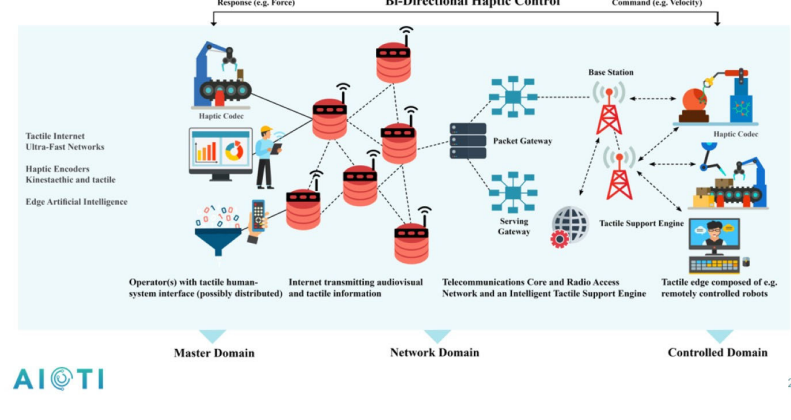
Cellular IoT use case segments



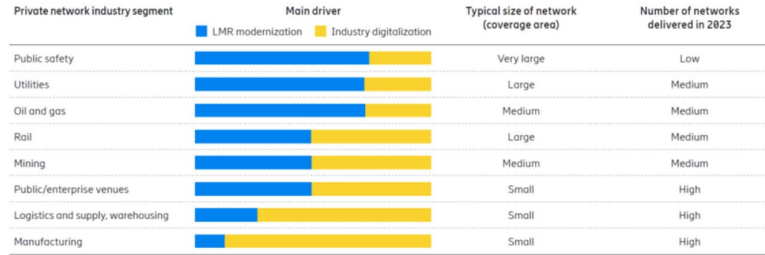
IoT - 5G Industrial applications



Tactile IIoT and 5G



Industry segments evaluating private LTE/5G networks



Land Mobile Radio (LMR)
 1 Public safety is the main segment within the public protection and disaster relief area
 2 For example, Citizens Broadband Radio Service (CBRS), 3550MHz to 3700MHz on the 3.5GHz band, will be available with a three-tiered sharing model for wireless carriers and enterprises in the US



Source: Ericsson Mobility Report - June 2019 25

Spectrum

cm/mm-Wave (24-28 GHz, 40 GHz, 64 GHz)

Hotspot/Fixed Wireless Access
 Main band: 24-28 GHz
 Up to 400 MHz channel bandwidth

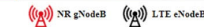
1 GHz to 6 GHz

Dense environment (implies Multi-RAT)
 Main band: 3.5 GHz
 Up to 100 MHz channel bandwidth

Below 1 GHz

Wide coverage, IoT
 Main bands: 600/700 MHz

RAT/Band	Illustrative coverage comparison	Scenario
NR mmWave	NR	Local coverage Peak data rate: 10Gbps
NR 3.5GHz mMIMO LTE 1800 MHz	NR LTE	Reuse of 1800 grid possible for Downlink Peak data rate: 1Gbps
NR 700 MHz LTE 800 MHz	NR LTE	Deep indoor penetration Peak data rate: 100Mbps



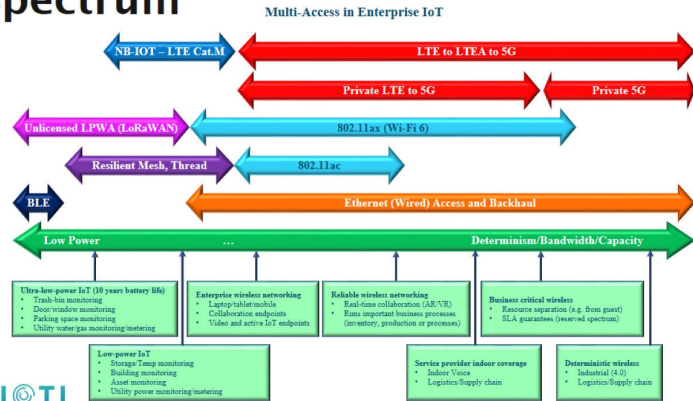
- LTE not suited for deployment in mmWave
- Higher propagation loss at 3.5 GHz compensated by
 - Massive MIMO
 - Beamforming
- Limited availability of spectrum below 1 GHz limits the performances

Source: GSMA



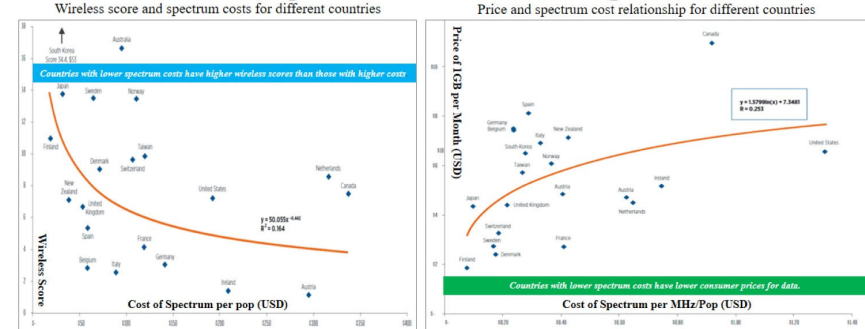
26

Spectrum



Source: GSMA 27

Effective Spectrum Pricing



With the increase in spectrum bandwidth to support high data traffic for 4G and 5G pricing techniques become key to support efficient spectrum allocation, promote investment in networks, encourage sustainable competition to support new services.

28

5G and slicing

Expectations and Opportunities

- Highly demanding Quality-of-Service (QoS) requirements
- Many different use cases with very diverse requirements
- Well-isolated integration of third parties in own infrastructure
- Shift of intelligence to the network
- Remote access/control with well-defined QoS and security
- Application-specific network functions (e.g. mobility management)

Source: Robert Bosch GmbH 2018

29

5G and slicing

Expectations /Requirements from the I4.0 Perspective

Use Case-Specific Slices 	Integration of Existing Technologies End-to-End QoS	Cross-Operator/-Country Slices MNO ¹ MNO ²
"Sub-slicing" MNO ¹ I4.0 Service Provider	Accurate SLA Monitoring <ul style="list-style-type: none"> In real-time Fine granularity Third party I/Fs 	"Deep Slicing" App-to-App Slicing
Highly Dynamic Slicing <10 min for generation and release	Open Interfaces <ul style="list-style-type: none"> Public / private infrastructure Own VNFs² Own equipment 	Simple and Attractive Pricing

Source: Robert Bosch GmbH 2018

30

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