

Digitalization, Mobilization and Automation of Maritime Communication Services over 3GPP Systems (LTE, 5G)

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3GPP standards eco-system



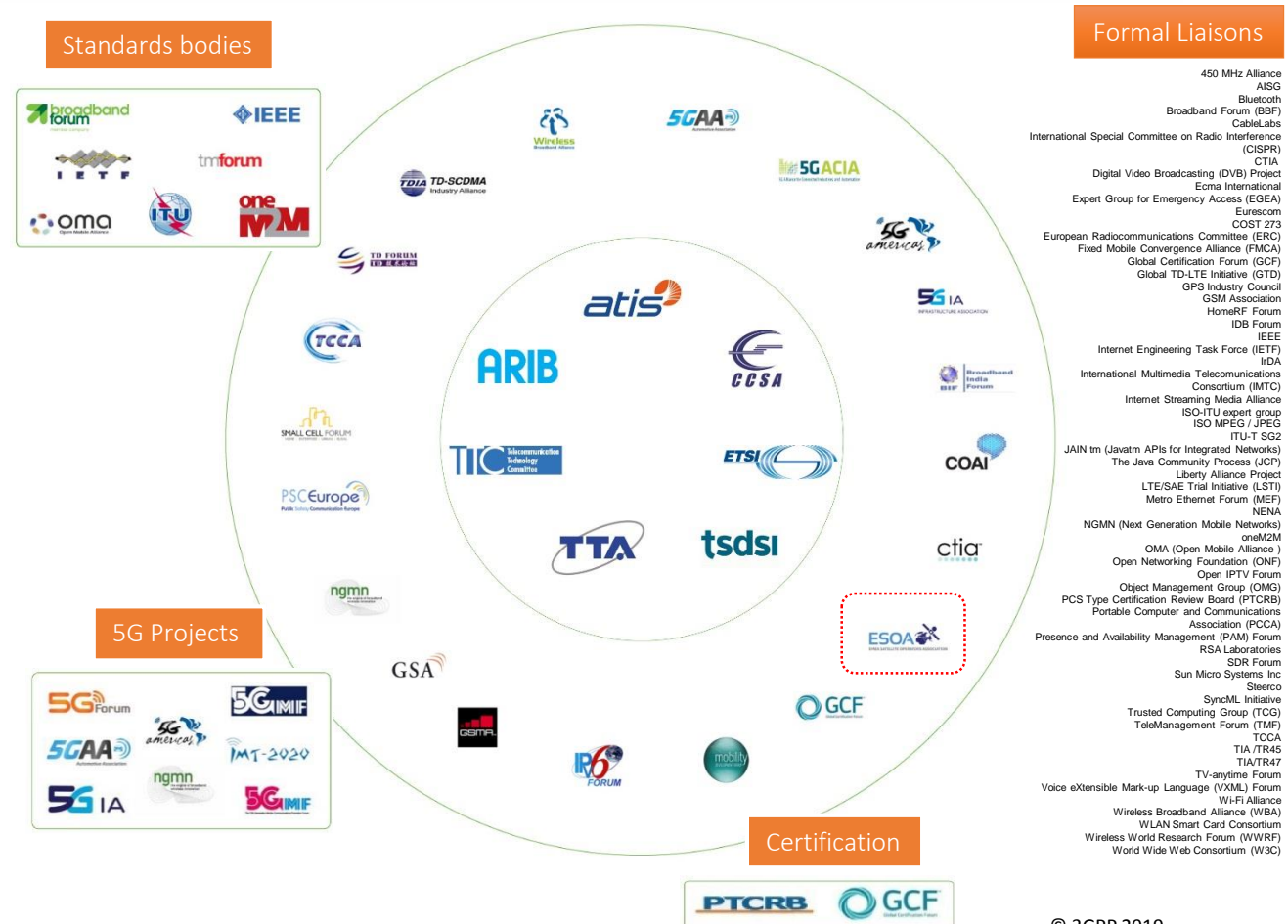
Participation in 3GPP is made possible by companies and organizations becoming members of one of the 3GPP **Organizational Partners**, who are the seven Standards Developing Organizations (SDOs) - from China, Europe, India, Japan, Korea and the United States.

- 646 Individual Members, 24 Guest Members (updated in March 2019)

Specific inputs, in the form of market requirements may also come in to the Project via any of the twenty **Market Representation Partners** in 3GPP. These organizations have all signed up to the 3GPP Project scope and objectives.

- **PCG-Approval** is required to be a Market Representation Partner(MRP).
- PCG approved the MRP membership of **ESOA (EMEA Satellite Operator's Association)** in **October 2018**.

There is also a lot of external cooperation with other standards bodies and a broad variety of other groups, by way of formal Liaisons.



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3GPP – How It Works & Why 3GPP?



3GPP works based on

- Participation in face-to-face meetings
- Pro-activity & Contributions – you need written proposals to get attention
- Consensus – nobody says “no” in order to progress

Work organization

- Work Items
- Releases with fixed time-lines, which are partially overlapping

3 stages, often overlapping

- Stage 1: Requirements
- Stage 2: Architecture
- Stage 3: Protocols

362 Companies actively participate in the 3GPP work

- From all over the world
- All major telecommunication companies – operators, network/device/chipset vendors
- More and more vertical industry representatives bring their work directly to 3GPP

Amazing Track Record

- 3GPP started 1998, since then all major standards projects were deployed
- E.g. 3G/UMTS, 4G/LTE, VoLTE/IMS, NB-IoT
- Seamless migration from “old” to “new” technology generations

A new Release every 15 to 24 months

- Allows for reasonably fast standardization & deployment of new ideas
- Strong commitment to time-lines guarantees reliable planning and time-to-market
- New technologies get easily introduced (IP, IoT, AI ...)

Basic characteristics from LTE to 5G



YEAR

2008 ~

2012 ~

2015 ~

2018 ~

3GPP Release

8 & 9

10 to 12

13 & 14

15 & 16

**Theoretical
maximum DL speed**

300 Mbps

>1Gbps

>3Gbps

>10Gbps

Latency

≈50ms

10ms

2ms

1ms

Channel Bandwidth

Up to 20 MHz

Up to 20 MHz

Up to 20 MHz

Up to 500 MHz

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Where are we now on 5G?



- 3GPP continues to expand the LTE platform to improve its efficiency to meet the mobile broadband demand
- 3GPP is on schedule with the standardization of 5G, addressing the expanded connectivity needs of the future
- Two phases for the normative 5G work
 - Phase 1 (Rel-15): Addresses the more urgent subset for commercial deployments
 - Phase 2 (Rel-16): Completes the IMT 2020 submission, addresses all identified use cases & requirements

- 3GPP Release 16 Stage 1 MARCOM work item completed in Dec. 2018
- “Maritime” officially in 3GPP scope from 3GPP Release 16



5G: Connecting Vertical Industries

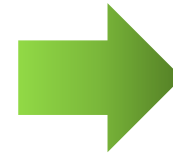


New Stakeholders ...

- Critical Communications (MCC)
- Internet of Things (IoT)
- Tactile Internet, Ultra-HD Media
- Automotive (e.g. 5GAA),
- Railways (e.g. UIC), Maritime
- Autonomous Systems (robots, drones, ...)
- Smart Cities, Smart Factories, ...
- Water & Energy Providers,
- Broadcast Agencies,
- Satellites, ...

... require a flexible enabler platform

- Exposure of Core capabilities to 3rd parties
- On-demand resource allocation – local and end-2-end
- Core Architecture needs to be service centric
- Guarantee certain capabilities exclusively
- Ultra low latency & high reliability

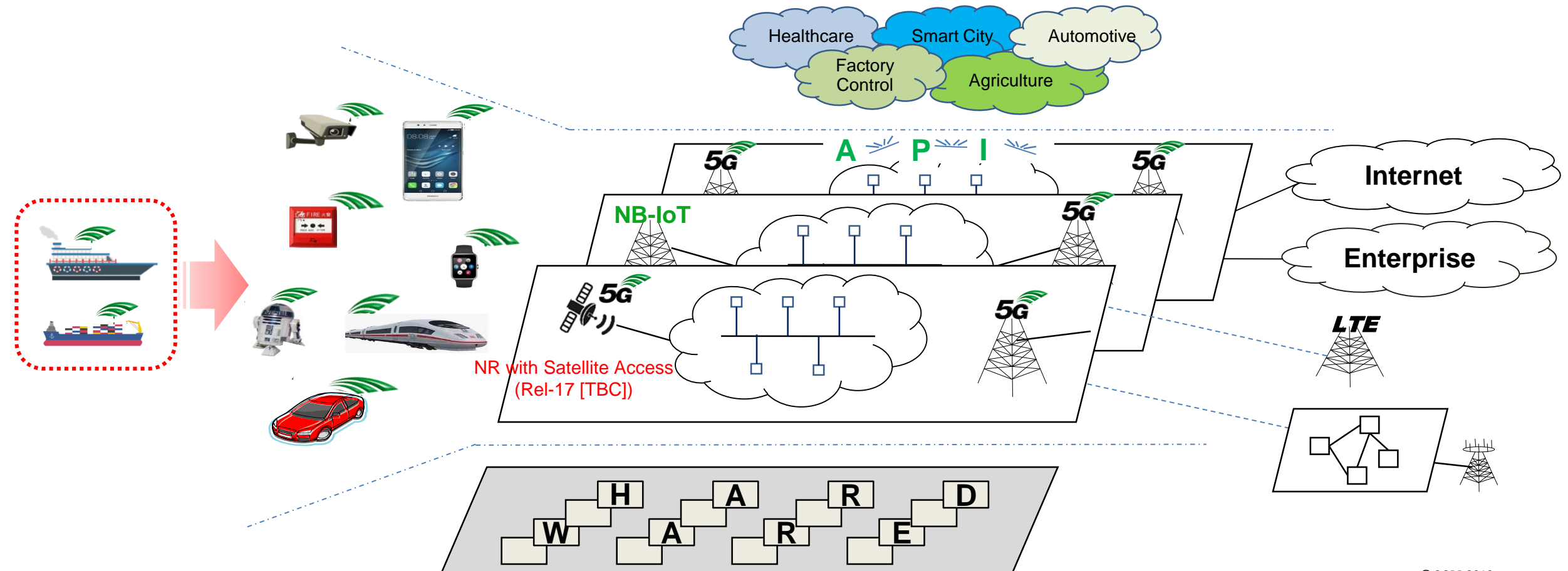


Software & Service Centric Transformation By 5G as a Flexible Enabler

One Network fits all	→	Open & Flexible Enabler
Telecom Operators	→	Multiple Stakeholders
Phones	→	Things
Procedures	→	Services
Static Topology	→	On-demand Resources
Dedicated Hardware	→	Orchestrated Resources
Network Function	→	Virtualization
Single Network	→	Slice

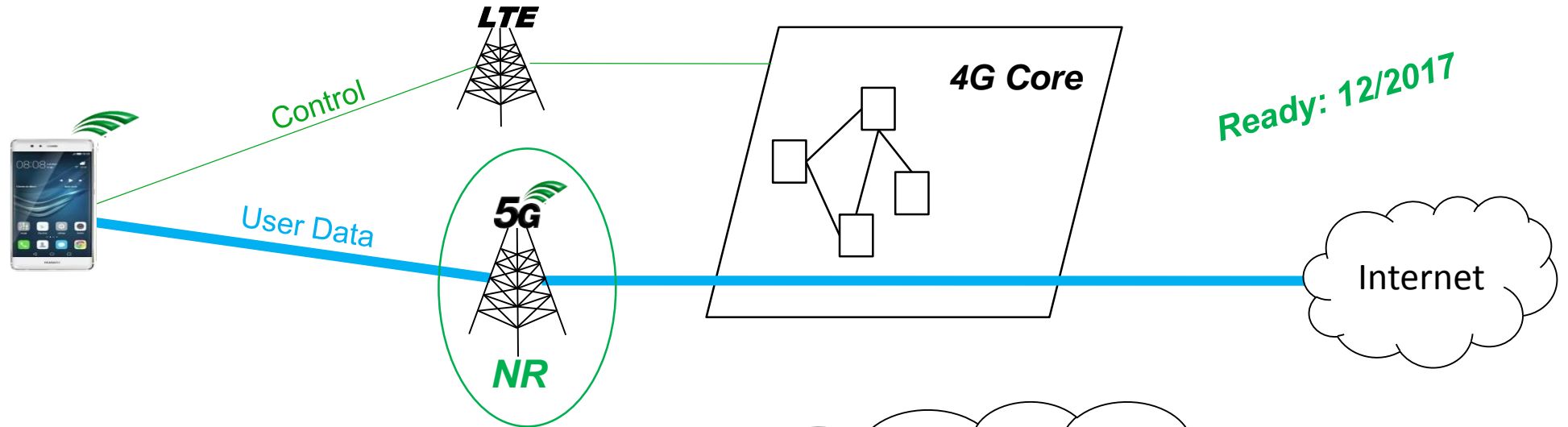
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5G Landscape

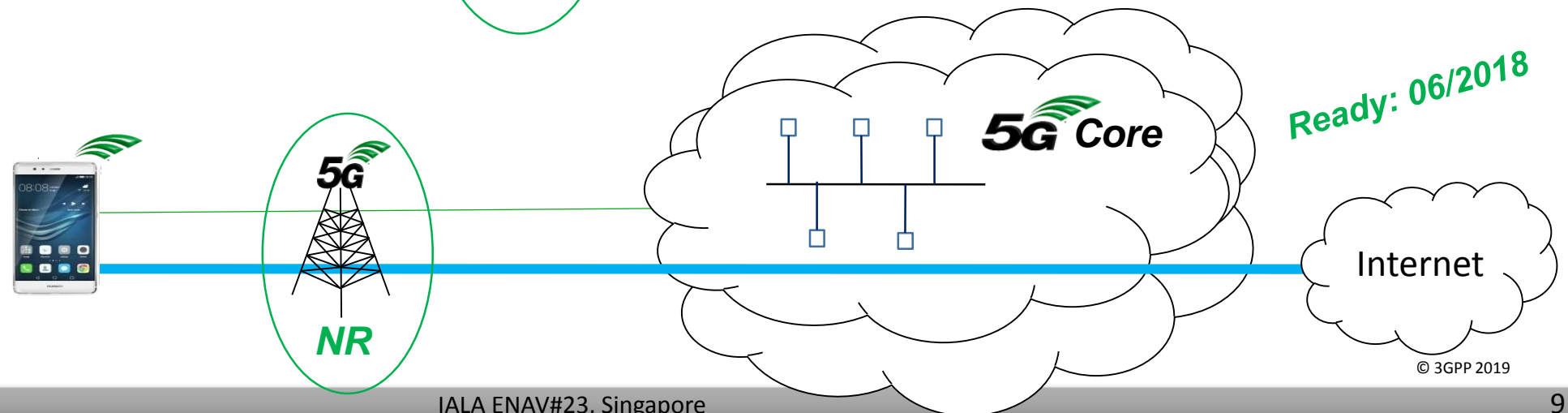


5G Deployment Options

Non Stand Alone (NSA)



Stand Alone (SA)



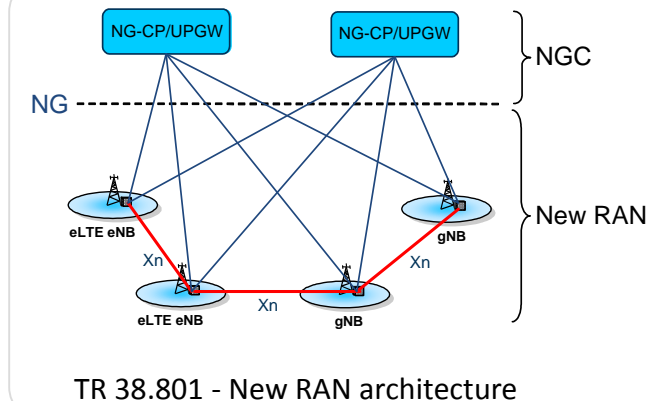
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What is 5G NR ?



- Operation from low to very high bands: 0.4 – 100GHz
 - Including standalone operation in unlicensed bands
- Ultra wide bandwidth
 - Up to 100MHz in <6GHz
 - Up to 400MHz in >6GHz
- Set of different numerologies for optimal operation in different frequency ranges
- Native forward compatibility mechanisms
- New channel coding
 - LDPC for data channel, Polar coding for control channel
- Native support for Low Latency and Ultra Reliability
- Flexible and modular RAN architecture: split fronthaul, split control- and user-plane
- Native end-to-end support for Network Slicing

3GPP will standardize the Radio Access Architecture and Interfaces for a New Radio Technology for 5G.



Deep Integration & Soft Migration



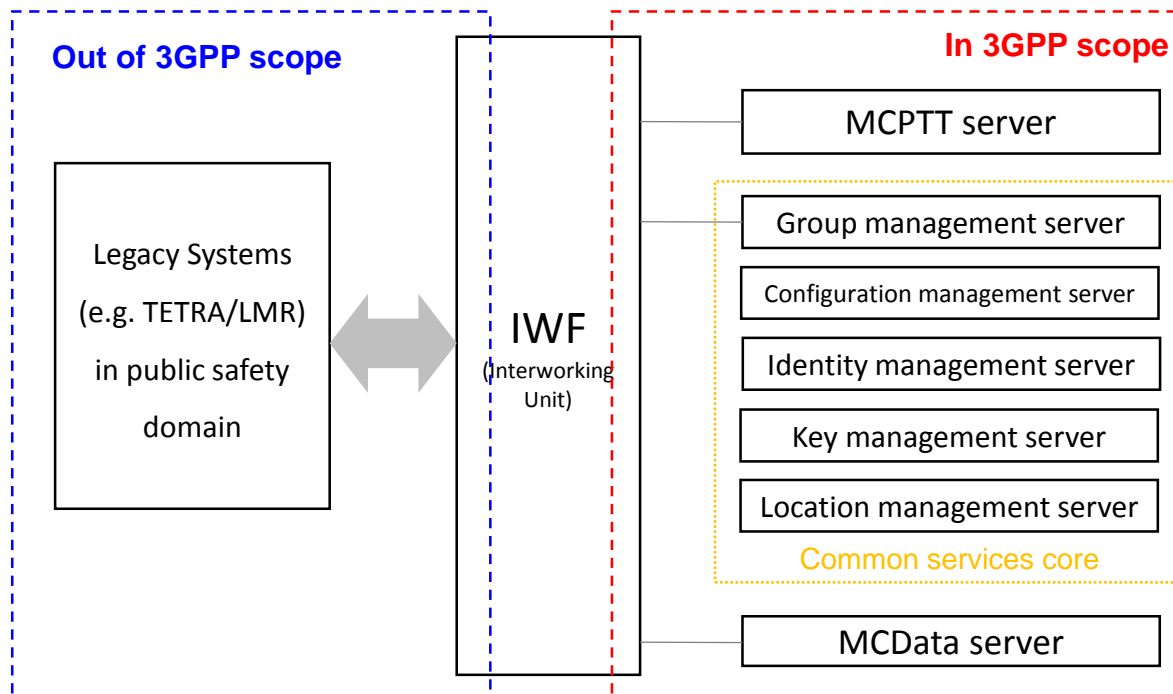
➤ **5G can also offer a softer migration path by defining interworking towards legacy systems.** This allows an installed tech to provide revenue for its full intended life-cycle whilst the new 5G-based technology can be introduced step-by-step though **early adopters to 5G can gain benefit from deep-integration** of their services into the 5G eco system, which is shared between a broad variety of industries and end-users.

- An interworking unit is currently defined e.g. for mission critical services (see 3GPP TR 24.885).
- 3GPP does usually not define the protocol between the interworking unit and the legacy system.
- Interworking can only be defined if the 5G-based service is fully specified and offers at least the same functionality as the legacy system.
- Therefore it is essential for organizations who look for a long-term migration to 5G to participate in 3GPP standardization efforts, to guarantee full compatibility (and interoperability) of their installed base and the upcoming 5G standard.

Deep Integration & Soft Migration

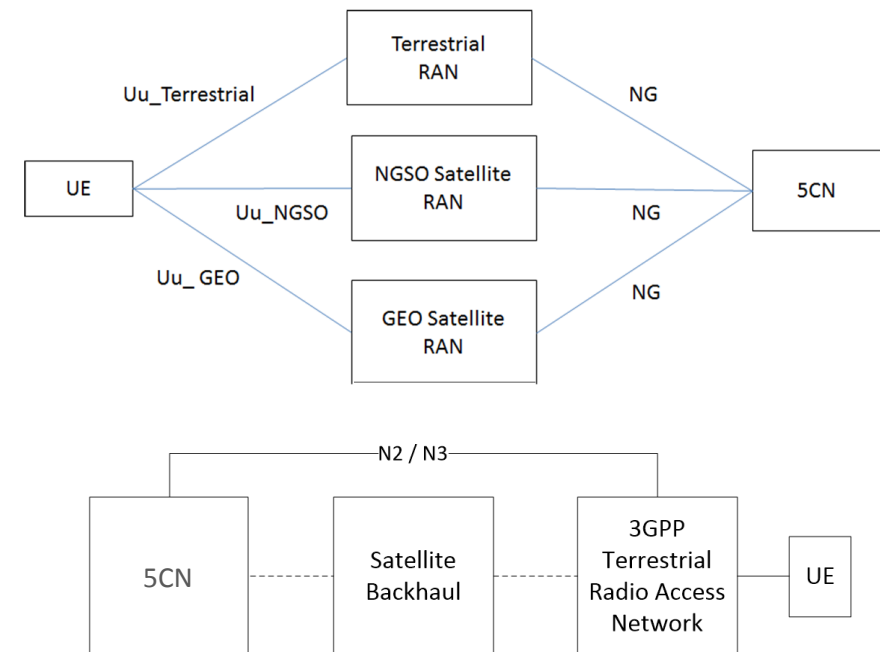
Example on Soft Migration (Public Safety)

- Standardization of interfaces between 3GPP system and Interworking unit connecting to legacy system



Example on Deep Integration (Satellite)

- Standardization of interfaces and protocols for deep integration of their services into the 5G eco system



Some Use Cases

Internet of Things (IoT)

Internet of Things

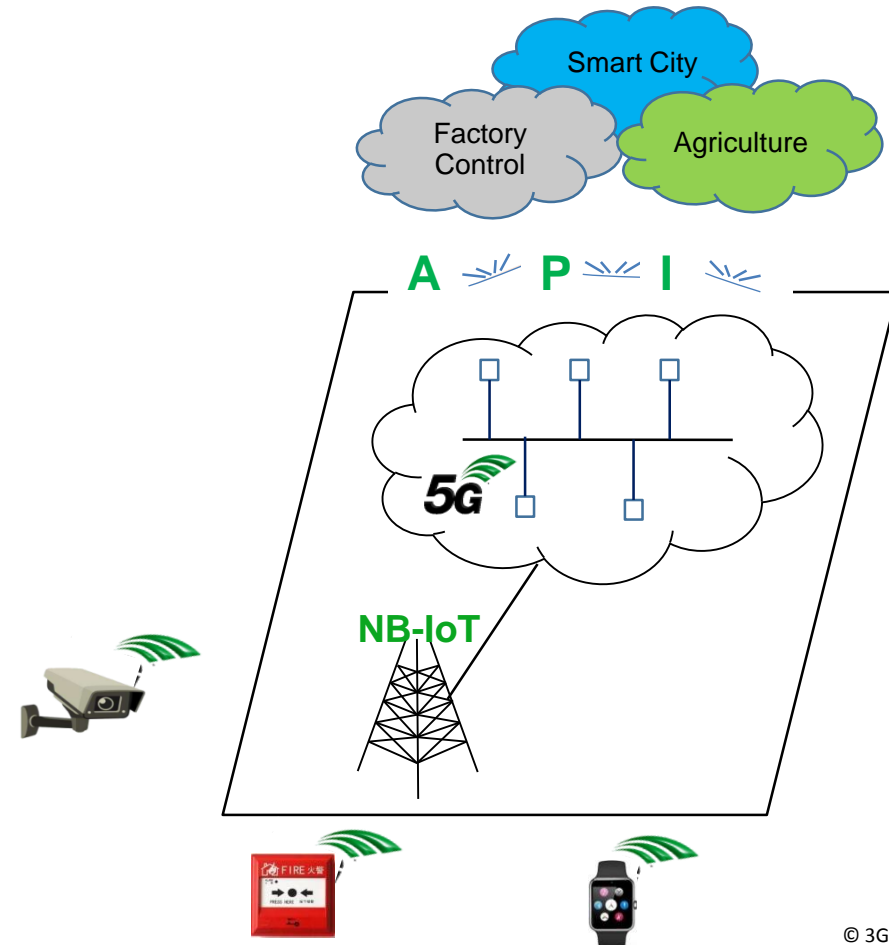
- Low Power, Wide Area (LPWA) devices
- E.g. smart meter in cellar, water level sensor, ...
- LTE/5G not suited for this type of communication

NB-IoT – Narrowband IoT, “LTE-M”

- Already in LTE: dedicated IoT radio access technologies
- Narrow-Band IoT – 250kb/s, latency up to 10s

5G: mIoT – massive IoT

- Millions & billions of devices, high density
- IoT specific slice definition
- Exposure – Northbound APIs
- Sensor networks



Public Safety

🌿 Mission Critical Push to Talk (MCPTT)

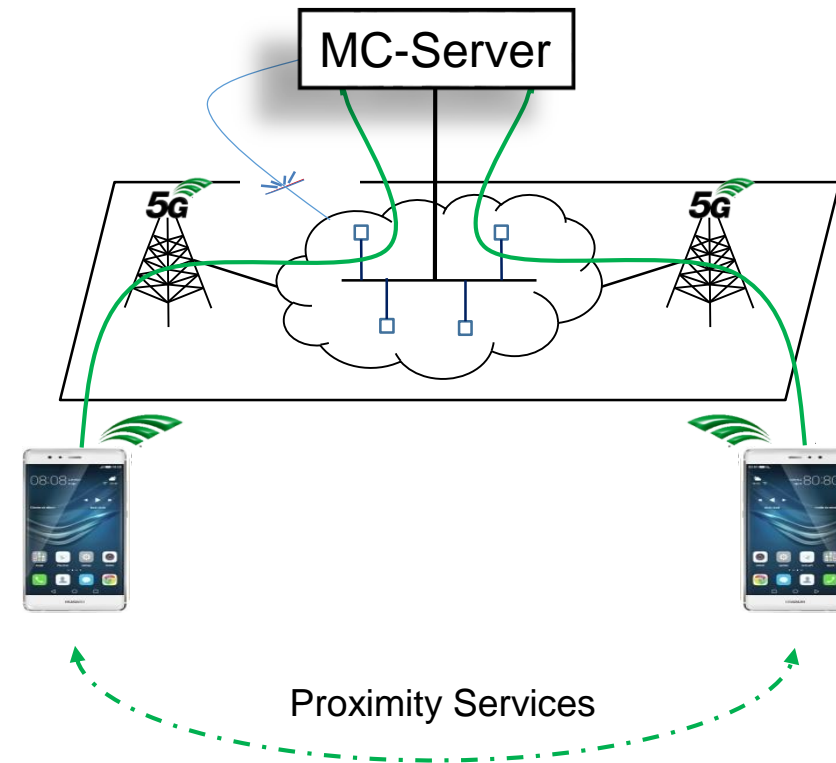
- Walky-Talky but on mobile network
- Group (specific) communications
- Police, Firemen, Rescue Services

🌿 Off-Network

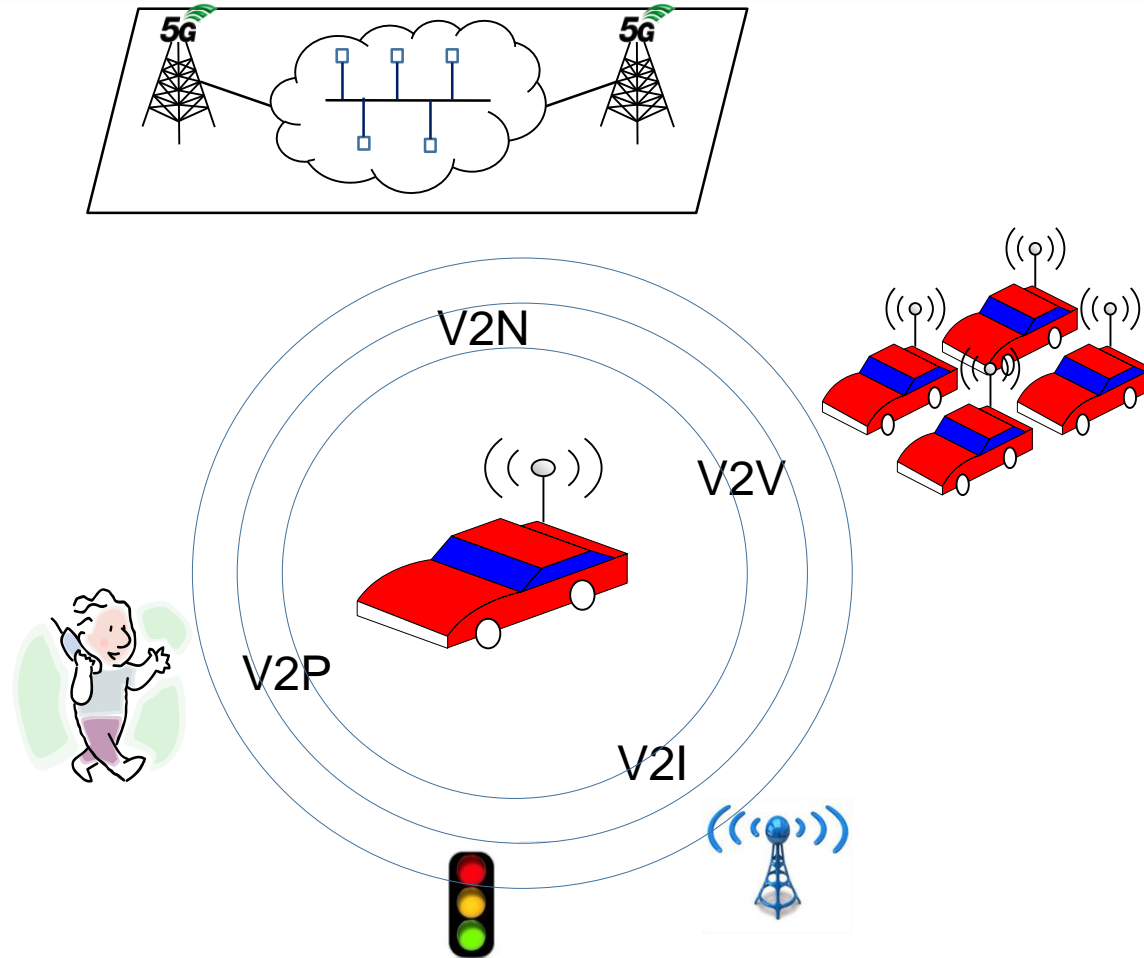
- Infrastructure breakdown during emergency
- MC communication without mobile network
- Proximity Services (ProSe) aka “PC5”

🌿 5G & MC

- MC-Specific Network Slice with flexible resources
- Functionality Exposure of CoreNetwork via APIs
- New Services: MC-Video, MC-Data
- New Use-Cases: Railways, Maritime



Automotive – V2X



Vehicle to Vehicle (V2V)

- “Traffic Jam”, “Pedestrians”, ...
- Platooning
- Off-network (Proximity Services, PC5)

Vehicle to Infrastructure (V2I)

- Traffic Lights, Road-Side-Units

Vehicle to Pedestrian (V2P)

Vehicle to Network (V2N)

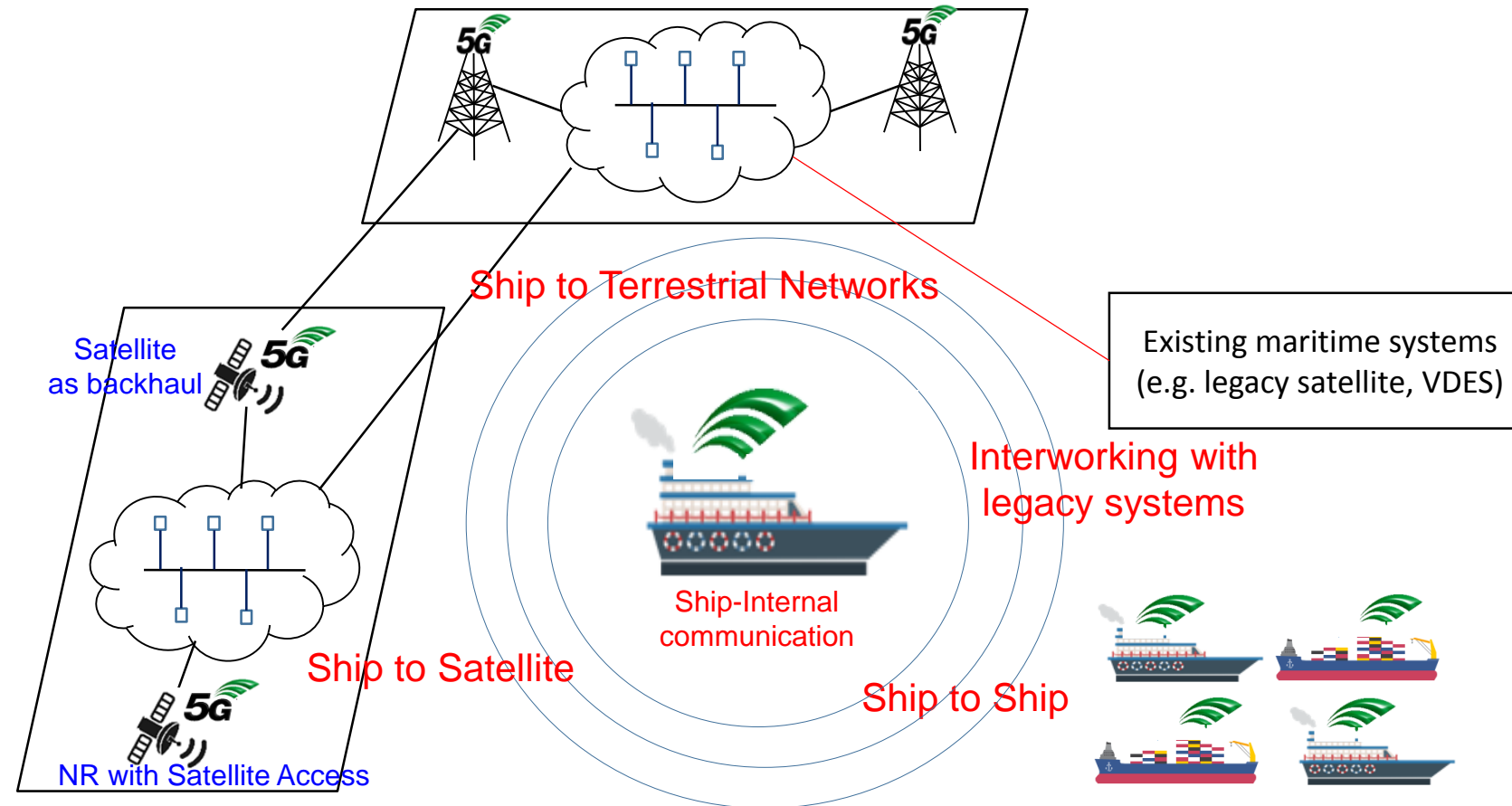
- Fleet control
- Emergency communication

V2X evolution

- V2X phase 1 - Release 14, basic set of requirements - sufficient for basic road safety service. Vehicles can exchange their own status such as position, speed and heading, with vehicles, infrastructure nodes and/or pedestrians.
- V2X phase 2 in Release 15, sidelink updated features include: carrier aggregation, high order modulation, latency reduction, and feasibility study on both transmission diversity and short 'transmission time interval' in sidelink.
- V2X phase 3 – eV2X – in four use case groups:
 - Vehicles Platooning
 - Extended Sensors to increase the perception of the environment for a broad and holistic view of the local situation.
 - Advanced Driving - semi-automated or full-automated driving.
 - Remote Driving
- Both LTE and NR are candidates to support 'eV2X'. TSG RAN has agreed (TR 38.913) that eV2X is to complement LTE V2X for advanced V2X services



Example of future maritime-dedicated works in 3GPP (Release 17 or 18 onwards)



- Ship to Ship (S2S)
- Ship to Terrestrial Networks
- Ship to Satellite
- Interworking with existing maritime systems
- Ship-internal communication

You Can Influence Standards



3GPP works based on:

- participation in face2face meetings
- contributions – you need written proposals to get attention
- consensus – nobody in the room says “no” in order to progress

Means: also small players can influence the work

Many of the vertical industries are not organized yet

- collaborate with your customers, vendors, competitors
- find out common requirements and bring them forward

5G work will progress at least over the next 5 to 10 years

- standards needs your use cases, requirements, existing solutions
- let's communicate!

Summary



- First 5G deployments will be seen soon
- It's not a hype – it's not a vision – it is reality
- Evolution? Revolution? – Transformation!
- 5G system focus is on connecting vertical industries
- Further input from & communication with verticals is needed
- *IALA can influence it now by striving for a common view on what maritime domain want from 3GPP and trying to encourage member companies to push for that view in 3GPP!*
- 5G will be is future proof thanks to open technologies

Further Collaboration with 3GPP



🌿 IALA's becoming Market Representation Partner of 3GPP

- Need to get the approval of 3GPP PCG meeting

🌿 How to collaborate the development of enabling technologies between 3GPP and IALA

- In some point, it may be necessary to have face to face meeting whose participants are representative experts from 3GPP and IALA to understand each area, e.g. the joint workshop between 3GPP and IALA.

🌿 3GPP TSG RAN#84 will trigger discussion on what topics from vertical domains will be prioritized and addressed in 3GPP Release 17 RAN works.

- It is required to provide common voices representing vertical domain on the behalf of true market demands.

Thank You!

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