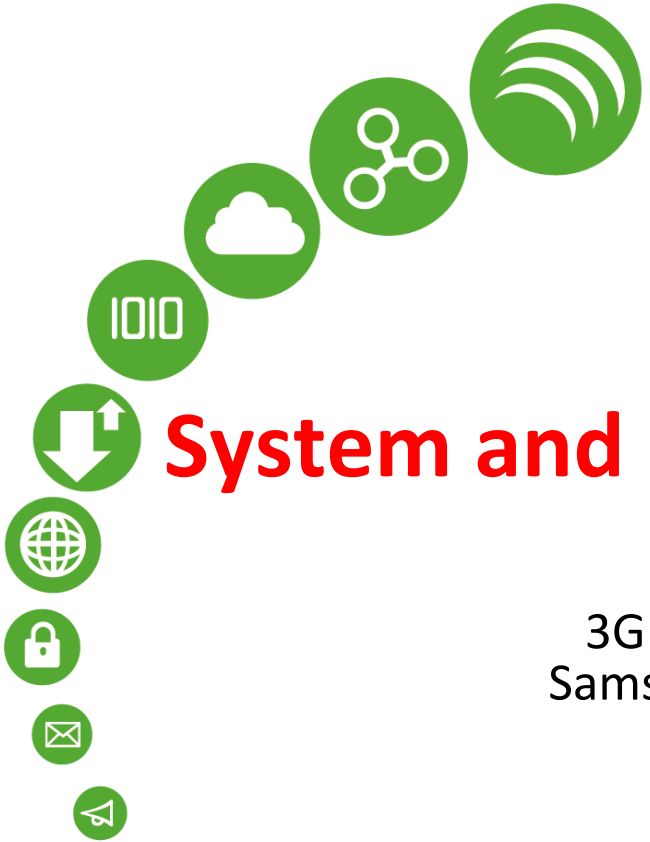
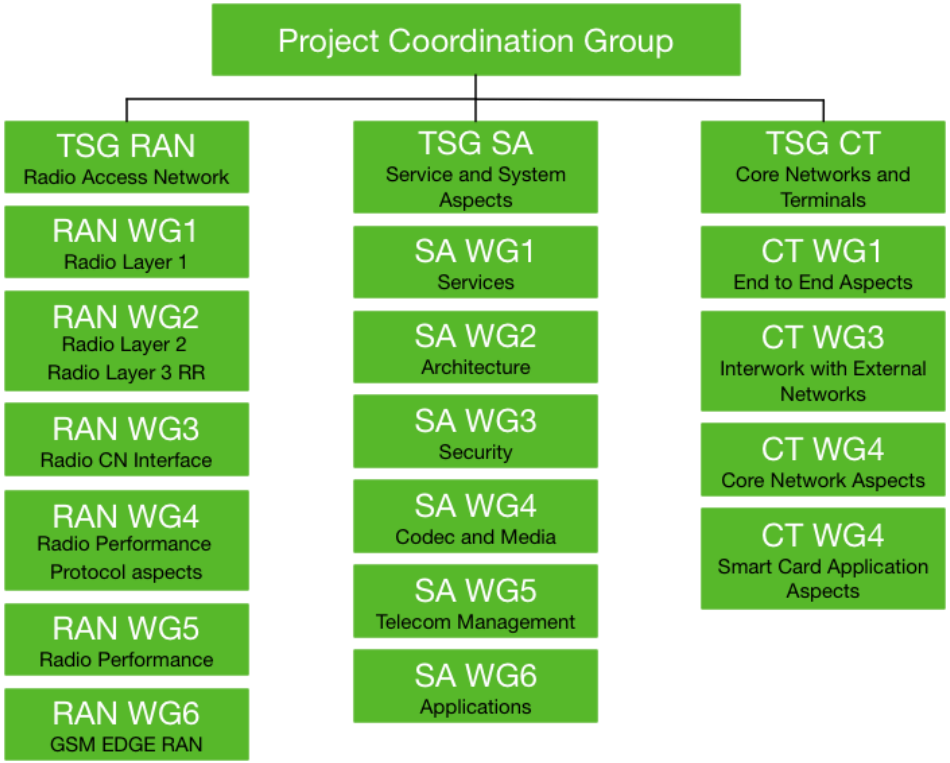
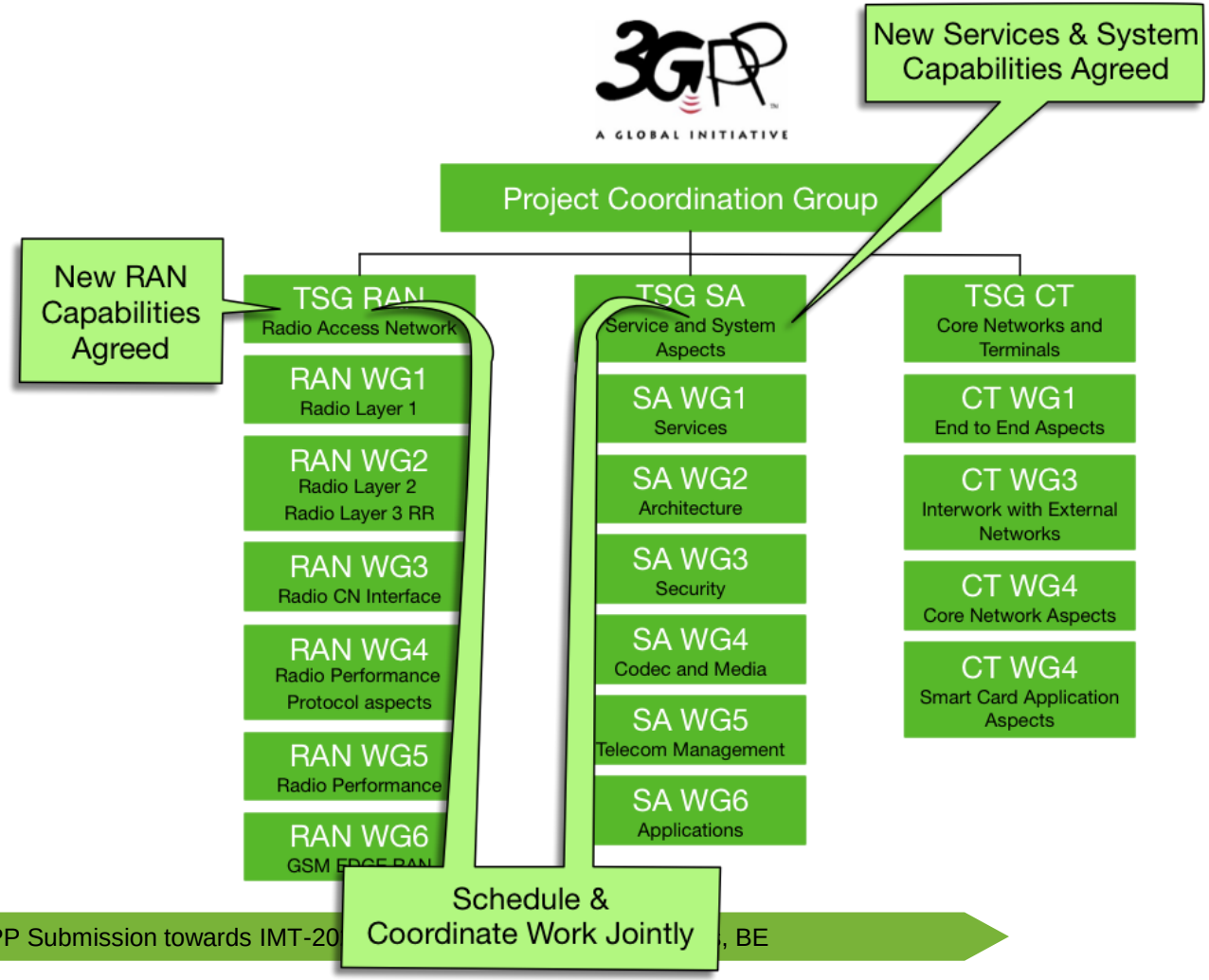


System and Core Network Aspects

Erik Guttman
3GPP TSG SA Chairman
Samsung R&D Institute UK


Project Coordination Group
TSG RAN
Radio Access Network
RAN WG1
Radio Layer 1
RAN WG2
Radio Layer 2
Radio Layer 3 RR
RAN WG3
Radio CN Interface
RAN WG4
Radio Performance
Protocol aspects
RAN WG5
Radio Performance
RAN WG6
GSM EDGE RAN
TSG SA
Service and System Aspects
SA WG1
Services
SA WG2
Architecture
SA WG3
Security
SA WG4
Codec and Media
SA WG5
Telecom Management
SA WG6
Applications
TSG CT
Core Networks and Terminals
CT WG1
End to End Aspects
CT WG3
Interwork with External Networks
CT WG4
Core Network Aspects
CT WG4
Smart Card Application Aspects


New Services & System Capabilities Agreed
Project Coordination Group
New RAN Capabilities Agreed
TSG RAN
Radio Access Network
RAN WG1
Radio Layer 1
RAN WG2
Radio Layer 2
Radio Layer 3 RR
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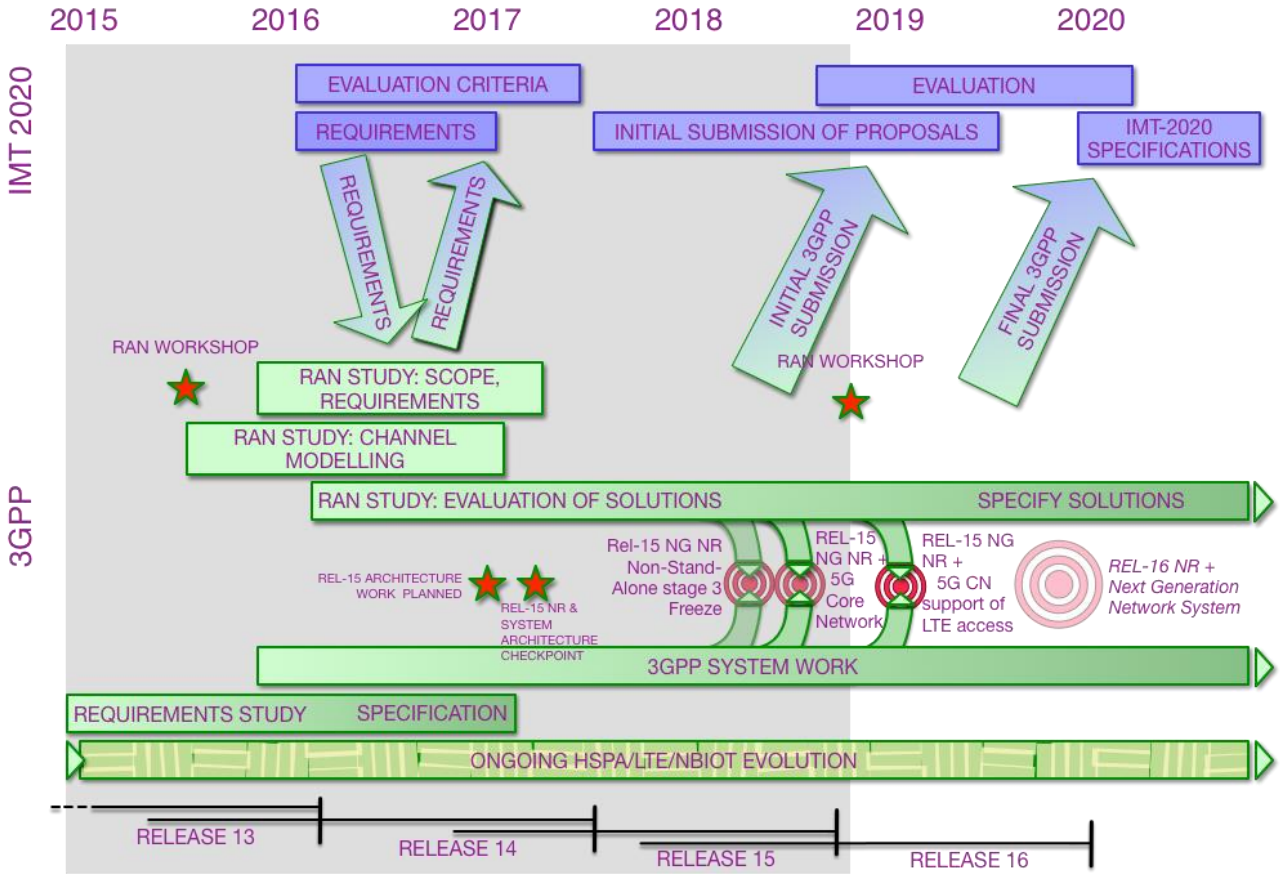
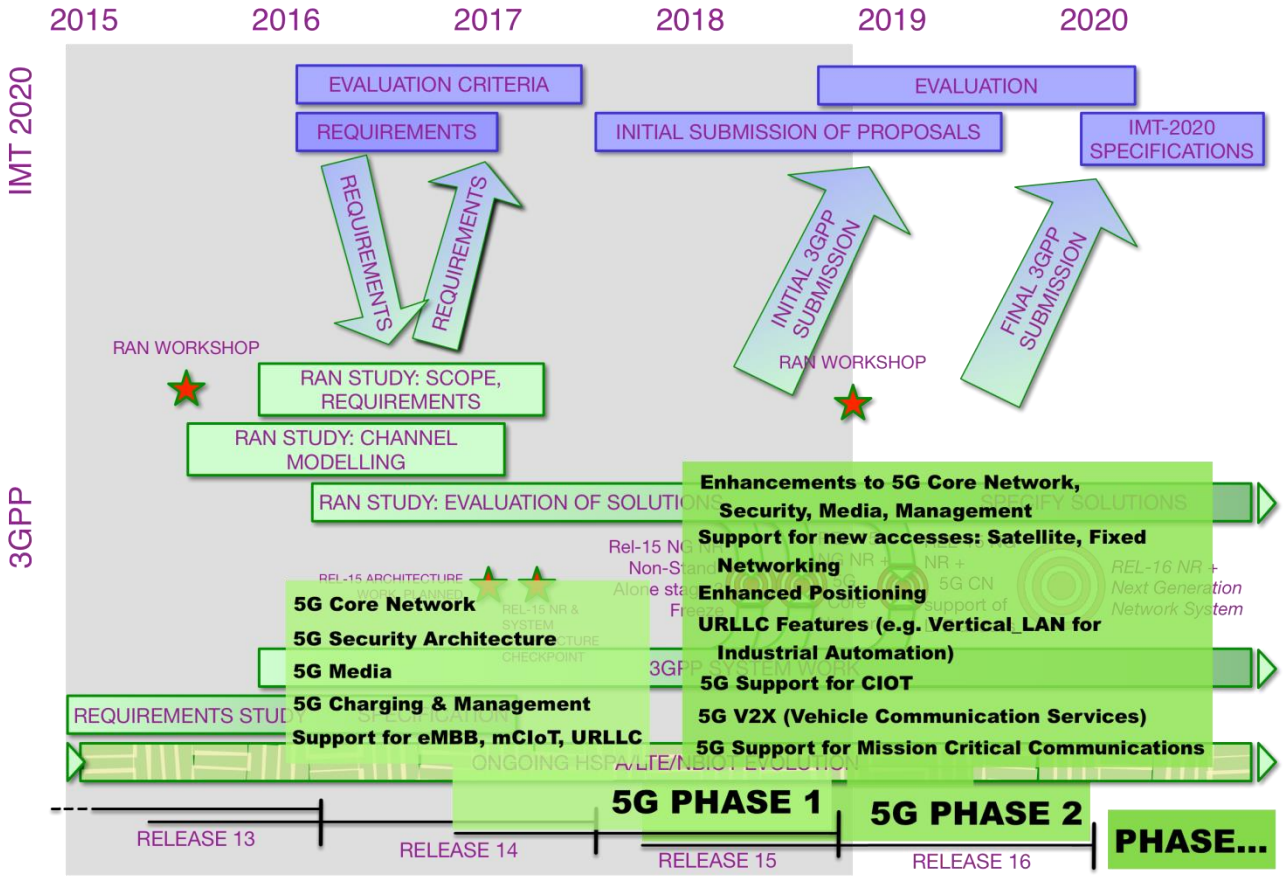
TSG CT
Core Networks and Terminals
CT WG1
End to End Aspects
CT WG3
Interwork with External Networks
CT WG4
Core Network Aspects
CT WG4
Smart Card Application Aspects
Schedule & Coordinate Work Jointly


2015
2016
2017
2018
2019
2020
IMT 2020
EVALUATION CRITERIA
EVALUATION
REQUIREMENTS
INITIAL SUBMISSION OF PROPOSALS
IMT-2020 SPECIFICATIONS
REQUIREMENTS
REQUIREMENTS
INITIAL 3GPP SUBMISSION
FINAL 3GPP SUBMISSION
RAN WORKSHOP
RAN WORKSHOP
RAN STUDY: SCOPE, REQUIREMENTS
RAN STUDY: CHANNEL MODELLING
3GPP
RAN STUDY: EVALUATION OF SOLUTIONS
SPECIFY SOLUTIONS
REL-15 ARCHITECTURE WORK PLANNED
REL-15 NR & SYSTEM ARCHITECTURE CHECKPOINT
Rel-15 NG NR Non-Stand-Alone stage 3 Freeze
REL-15 NG NR + 5G Core Network
REL-15 NG NR + 5G CN support of LTE access
REL-16 NR + Next Generation Network System
3GPP SYSTEM WORK
REQUIREMENTS STUDY
SPECIFICATION
ONGOING HSPA/LTE/NBIOT EVOLUTION
RELEASE 13
RELEASE 14
RELEASE 15
RELEASE 16


2015
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IMT 2020
3GPP
EVALUATION CRITERIA
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EVALUATION
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RAN WORKSHOP
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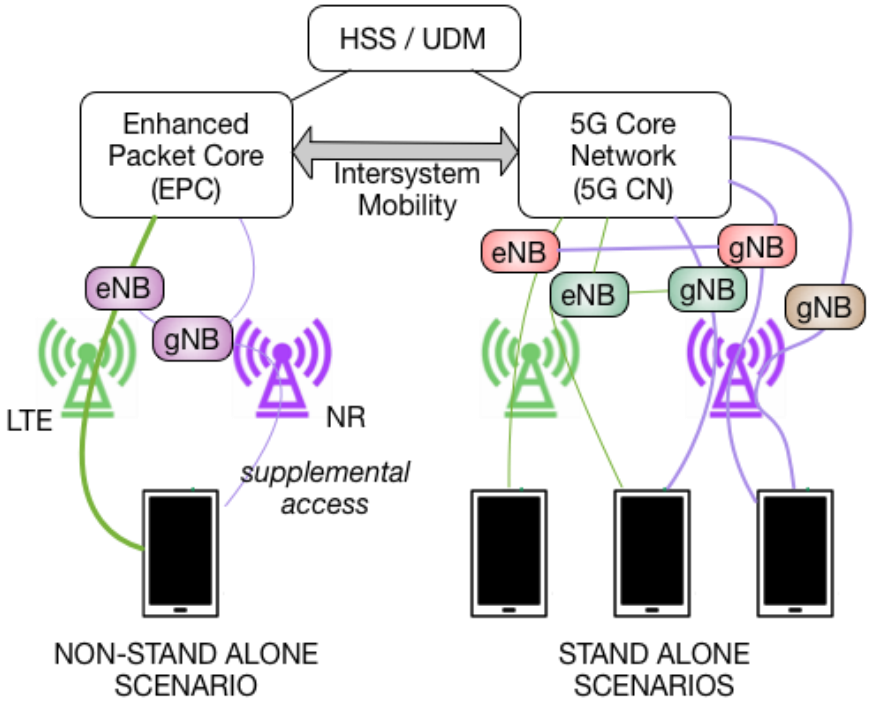
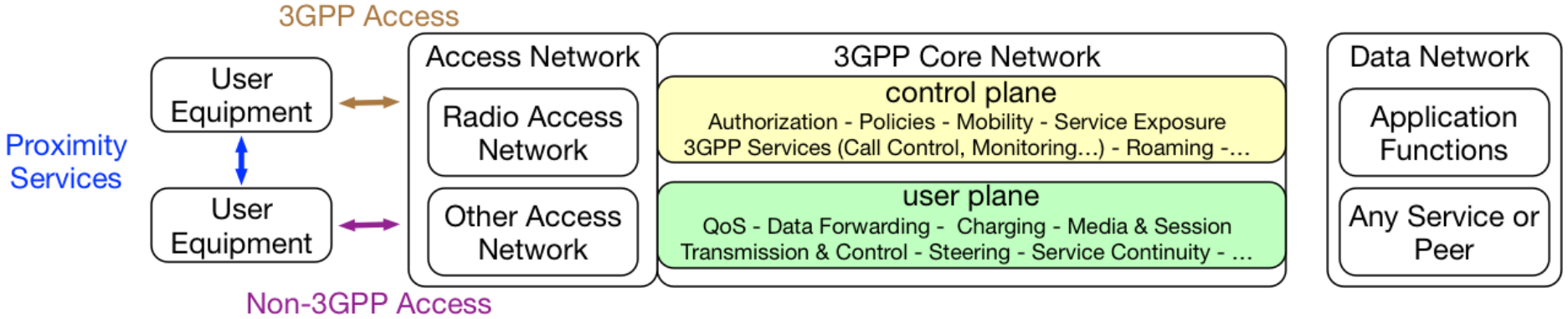
RAN STUDY: SCOPE, REQUIREMENTS
RAN STUDY: CHANNEL MODELLING
RAN STUDY: EVALUATION OF SOLUTIONS
5G Core Network
5G Security Architecture
5G Media
5G Charging & Management
Support for eMBB, mCIoT, URLLC
Enhancements to 5G Core Network, Security, Media, Management
Support for new accesses: Satellite, Fixed Networking
Enhanced Positioning
URLLC Features (e.g. Vertical_LAN for Industrial Automation)
5G Support for CIOT
5G V2X (Vehicle Communication Services)
5G Support for Mission Critical Communications
REQUIREMENTS STUD
ONGOING HSPA/LTE/NBIOT EVOLUTION
5G PHASE 1
5G PHASE 2
PHASE...
RELEASE 13
RELEASE 14
RELEASE 15
RELEASE 16

5G Deployment Scenarios

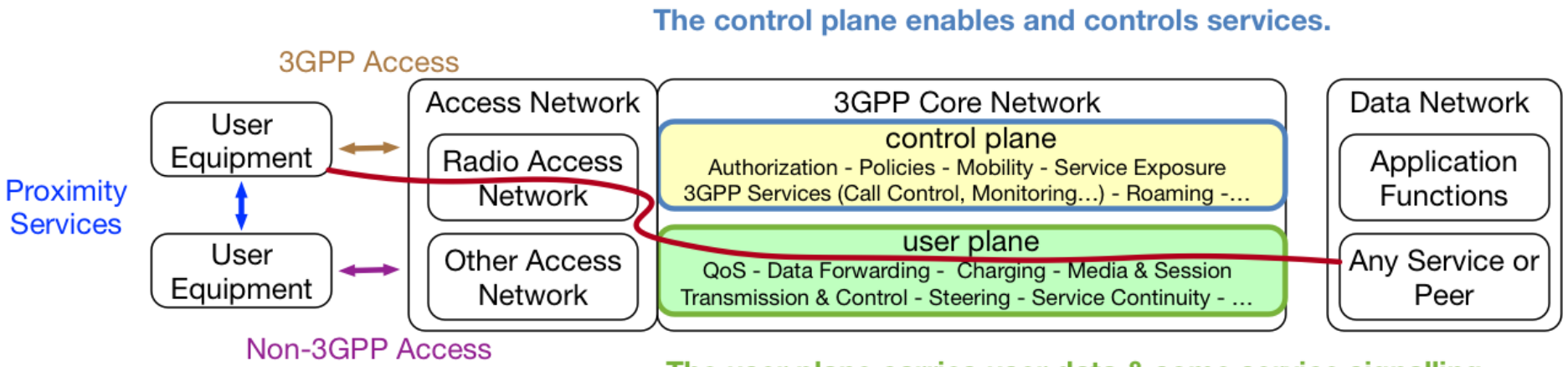


Stage 3 freeze:	12.17	12.18	12.18	06.18
Option [see 38.801):	3	7	4	2

3GPP System

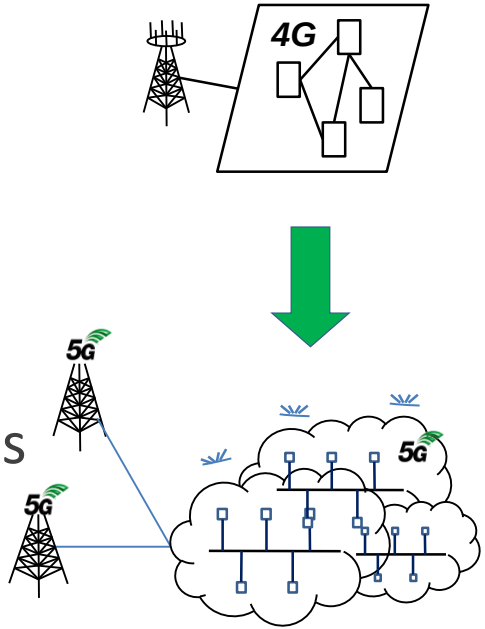


3GPP System

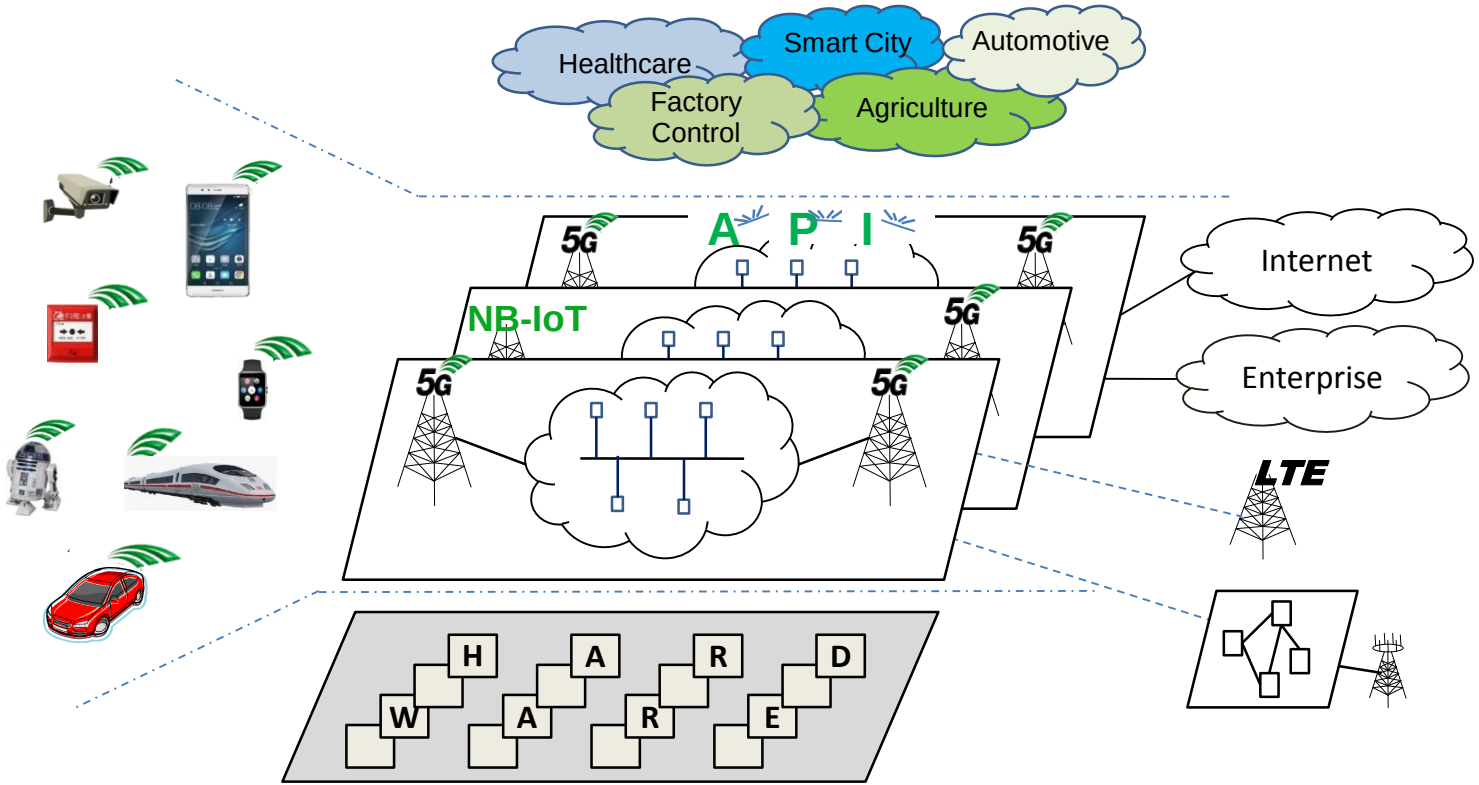


Software- and Service-centric Transformation

- One CoreNetwork 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



5G System Service Perspective



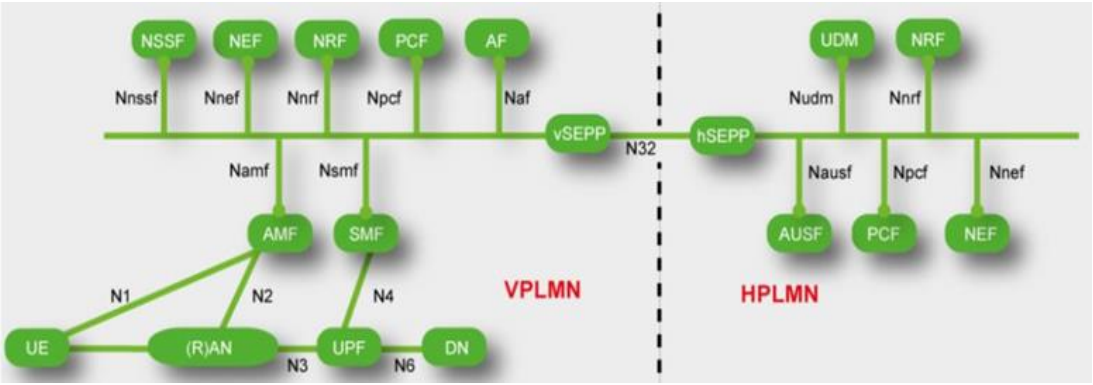
5G Core Technologies

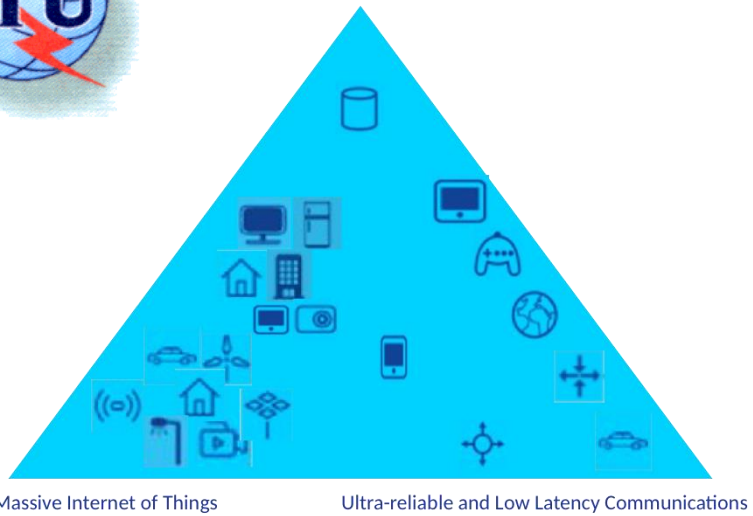
- **Orchestration and Virtualization (NFV)** – de-couple logical function from hardware
- **Slicing** – logical end-2-end networks tailed to customer needs
- **Edge Computing (MEC)** – resources where they are needed (URLLC)

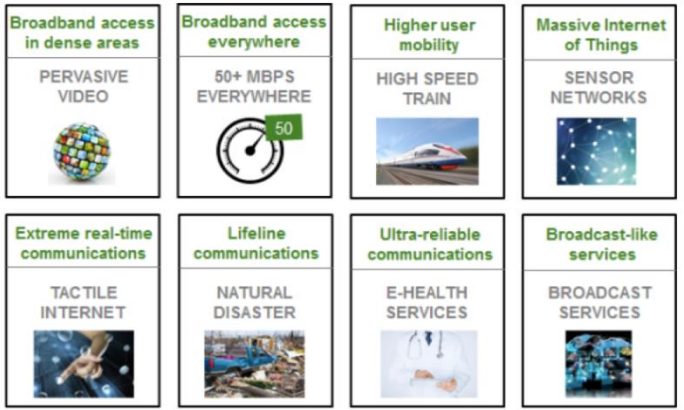
- **Exposure (API)** – 3rd party access to 5G services
- **Service Based Architecture (SBA)** – stateless, open, flexible
- Harmonized Protocols & Access Agnostic – generic solutions

Control Plane Feature – Service Based Architecture

- Each NF as a combination of mono-functional NF services.
  - NFs provide and consume services to and from each other using a unified protocol.
  - Stateless NF was specified for AMF.
- In Rel-16 NF service granularity will diminish and more NFs will become stateless.







5G / IMT-2020 VISION

- Address demands and business contexts of 2020 and beyond.
- Enable a fully mobile and connected society.
- Empower socio-economic transformations in countless ways.

Enhanced Mobile Broadband

Use Cases


Higher Data Rates


Higher User Mobility


Highly variable data rates


Diverse Deployments


Improved Coverage

Overall Goals

- Enable new business
- Greater Efficiency (lower cost per bit for capital investment, operations & energy)
- Flexibility (not one-size fits all system)

Enhanced Mobile Broadband

Use Cases

Higher Data Rates ULTRA HD Virtual Reality Augmented Reality Tactile Internet

Higher User Mobility

Highly variable data rates

Diverse Deployments

Improved Coverage

Enhanced Mobile Broadband

Use Cases

Higher Data Rates

Higher User Mobility

Pedestrian

Automotive / Urban

High Speed

Highly variable data rates

Diverse Deployments

Improved Coverage

Enhanced Mobile Broadband

Use Cases

- Higher Data Rates
- Higher User Mobility
- **Highly variable data rates** — IoT Sensors (Low) → New Media (Very High)
- Diverse Deployments
- Improved Coverage

Enhanced Mobile Broadband

Use Cases

- Higher Data Rates
- Higher User Mobility
- Highly variable data rates
- **Diverse Deployments**: Interior, Urban, Remote Areas
- Improved Coverage

Enhanced Mobile Broadband

Use Cases

Higher Data Rates

Higher User Mobility

Highly variable data rates

Diverse Deployments

Improved Coverage

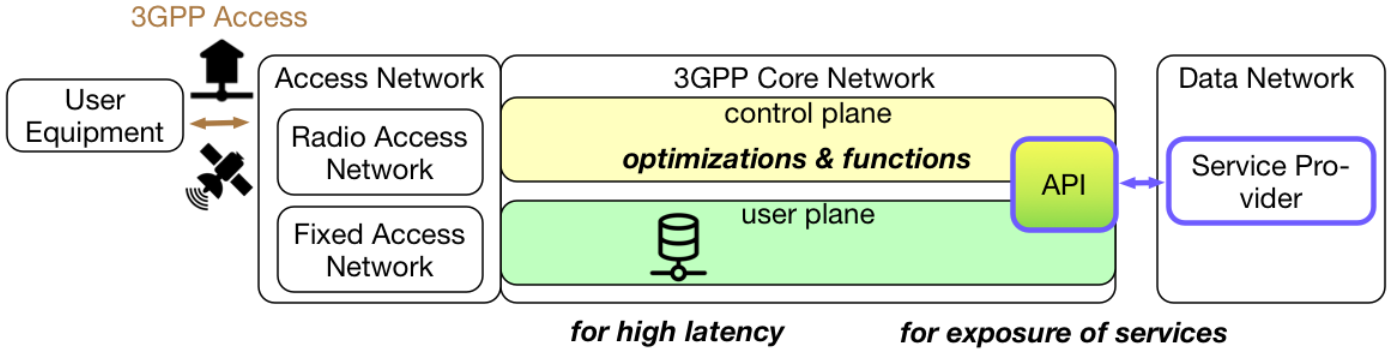
Interior

Urban

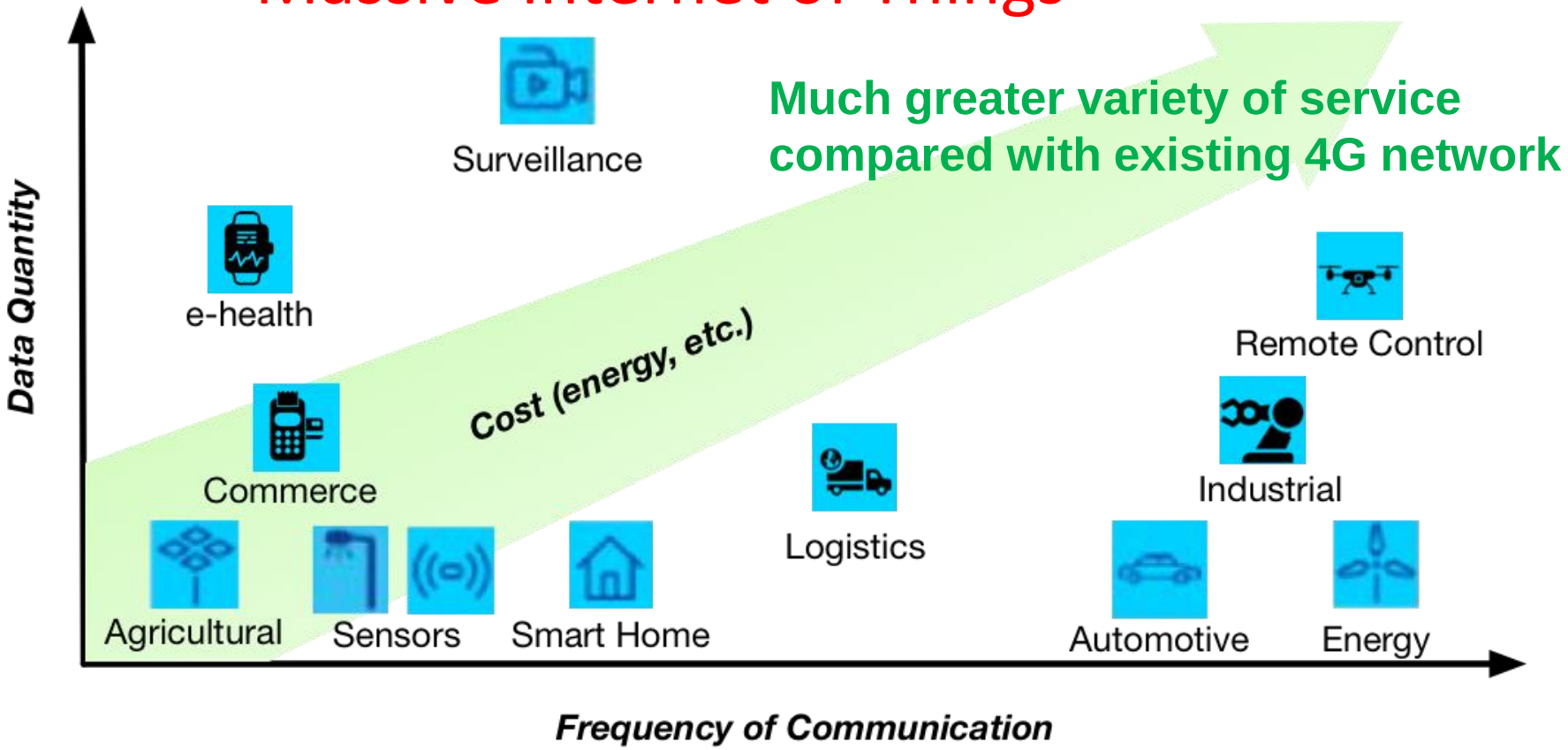
Remote Areas

Enablers of 5G eMBB

- Specific enhancements of the user plane
  - Small / infrequent data communication, high latency communication, power savings mode…
  - Exposure Functions, APIs, Common API Framework – to enable external interworking with 3GPP.
- Support for diverse deployments, improved coverage
  - Control and operation support small cell deployments
  - New 3GPP accesses: wire line-wireless convergence, satellite access
- Improved QoS model: Packet flows & related policies



Massive Internet of Things



Massive Internet of Things

Enablers of mIoT

- Network virtualization and Orchestration
  - Network automation enables MNO to provide NW services much faster than existing system
    ->TTM for customers
  - NFV enables OPEX reduction by network automation
    ->Enables automated service with selected NW functions based on SLA (with NW slicing)

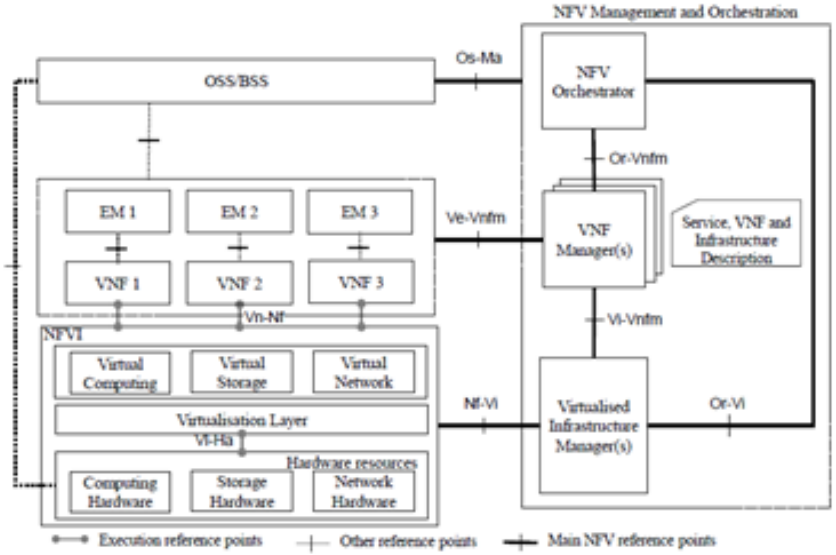


Figure 4: NFV reference architectural framework

Source: ETSI GS NFV 002 V1.2.1

Ultra-reliable and Low Latency Communications

- Examples of Use cases to be covered by 3GPP 5G system

Ultra-reliable

- Factory of the future
- eHealth
- Building automation
- Connected car
- Smart city
- Electrical power distribution
- Rail-bound mass transit

Low Latency

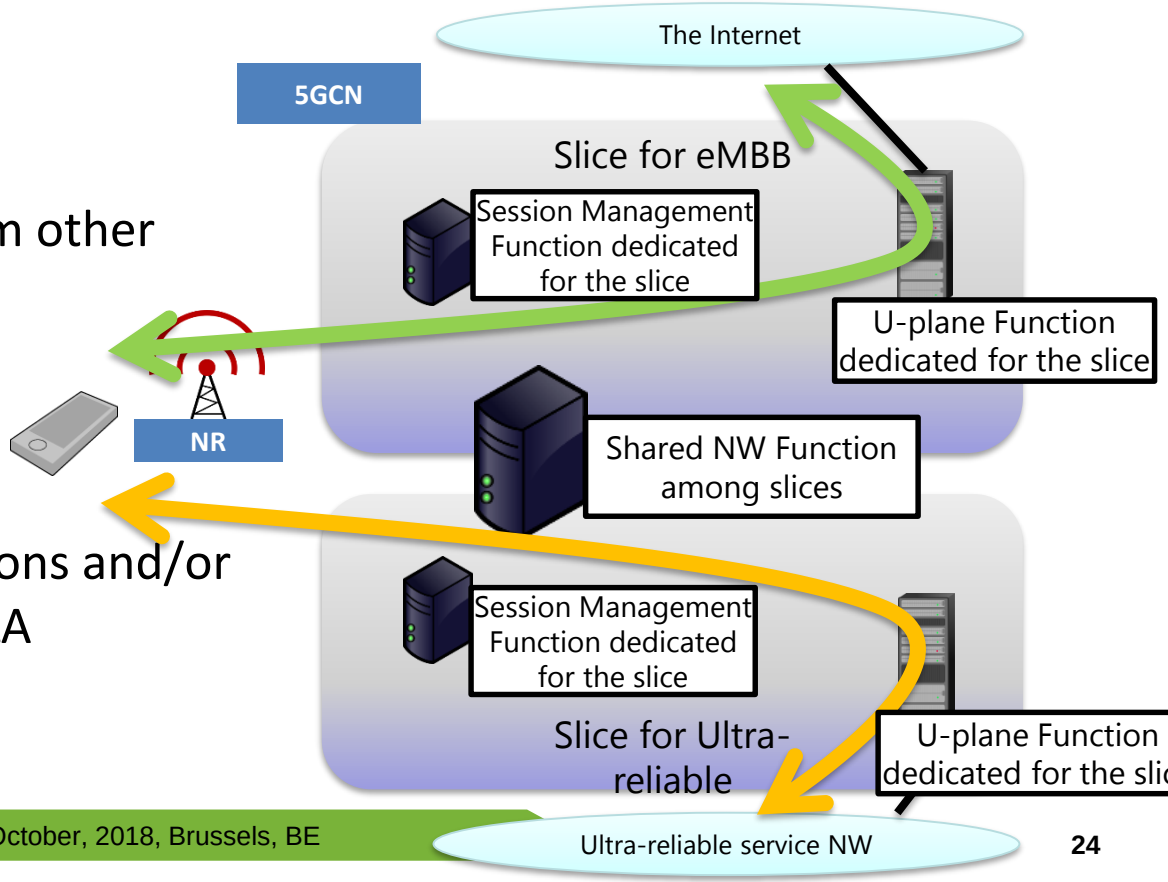
- Factory of the future
- eHealth
- Building automation
- Connected car
- Smart city
- AR/VR
- Program Making and Special Events

Both aspects are critical for a lot of use cases.

Ultra-reliable and Low Latency Communications

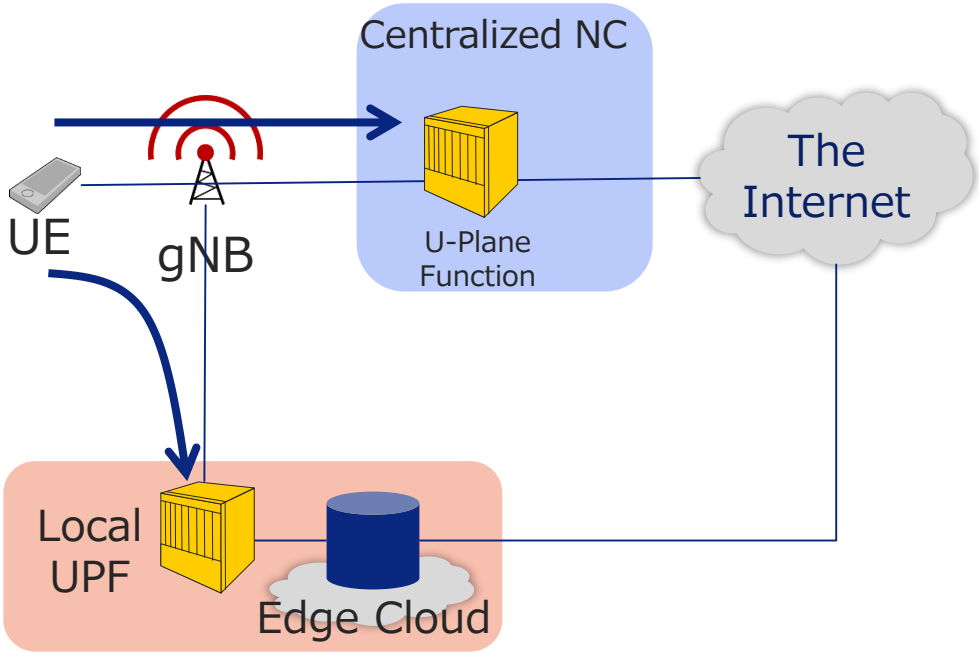
Enablers of URLLC

- Network slicing
  - Resource isolation from other service
    ->No service impact caused by other slices failure
  - Customized NW functions and/or capacities to ensure SLA



Enablers of URLLC

- Edge Computing
  - Applications can be hosted at “Edge-side” ->Low Latency compared with centralized manner



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www.3gpp.org

Search for WIDs at http://www.3gpp.org/specifications/work-plan and http://www.3gpp.org/ftp/Information/WORK_PLAN/ (See excel sheet)

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