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National Telecom Regularity Authority  
الجهـاز القـومـي لتنظيم الإتصالات



# IMT 2020 Standardization:- Pave the Way for 5G and Igniting Mobile Broadband

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# 5G

# Outline

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- 5G Standardization Process
- Enhancing Mobile Broadband
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- IMT 2020 Requirements
- 5G Use Cases
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- 5G Future
- Conclusion

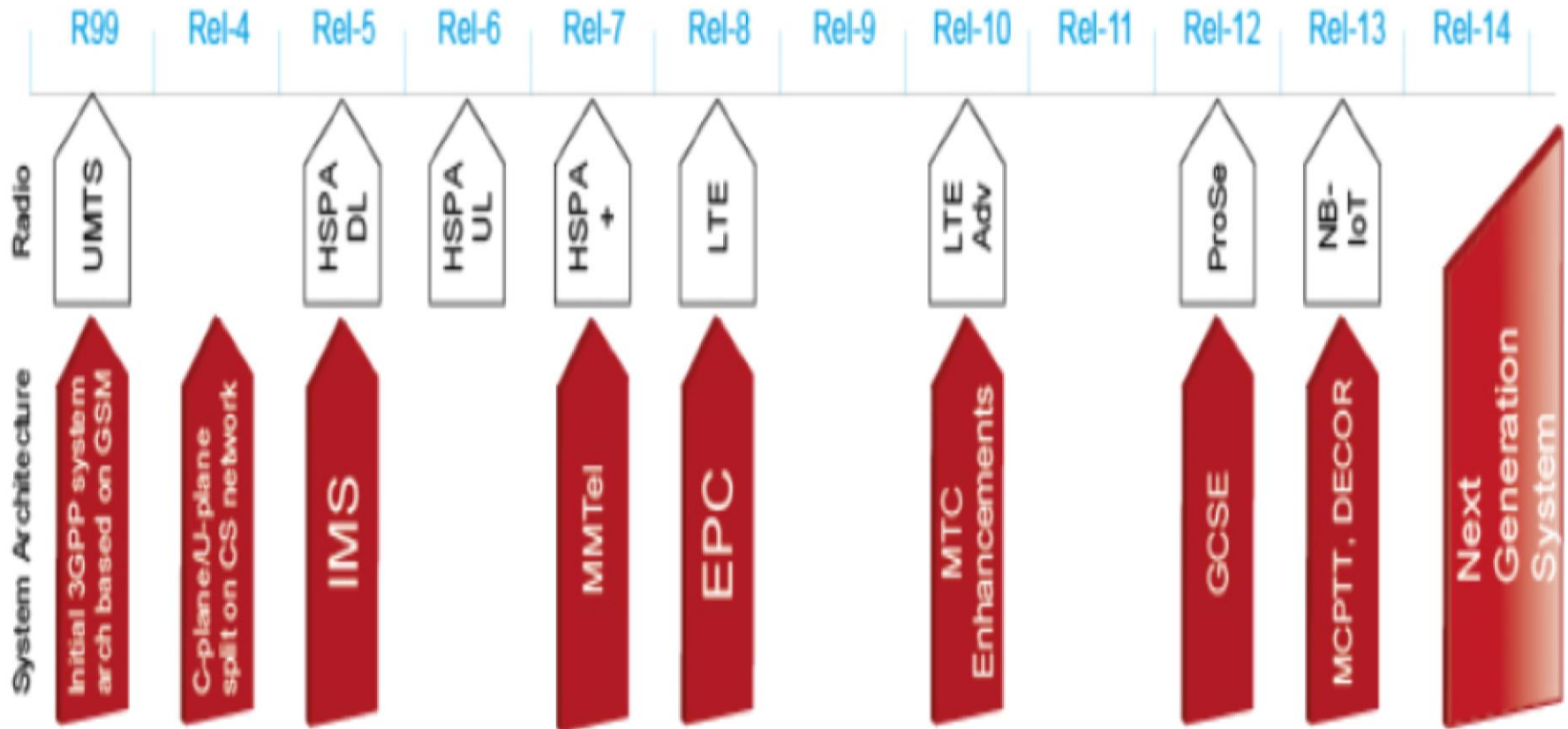
# Introduction

- 5G is considered as a unique opportunity that incorporates recent technological advancements for maximizing wireless capacity and adaptability.
- Also 5G will move beyond networks that are mainly deployed for mobile broadband and also to connect far more different types of devices at much higher speeds.
- Different Stakeholders including Industry, academia, and governments worldwide are currently doing a tremendous effort to develop 5G Standards.

# 5G Standardization Process

- The ITU-R Working Party 5D is responsible for shaping the standard for “Future Mobile Technologies” to support International Mobile Telecommunications (IMT) for 2020 and beyond Which is known as “IMT-2020.”
- The ITU-T SG13 Is responsible for Future Networks Standardization including IMT-2020 and Focus Group-IMT2020 has been created to handle 5G Standardization issues.

# 5G Standardization Process-3GPP Releases



Source: 3GPP

# Enhancing Mobile Broadband



3D/UHD video telepresence



Tactile Internet



UHD video streaming



Demanding conditions, e.g. venues



Broadband 'fiber' to the home



Virtual reality



Autonomous vehicles



Robotics



Energy / Smart grid



Industrial automation



Aviation



Medical



Smart cities



Smart homes



Utility metering



Wearables / Fitness



Remote sensors / Actuators



Object tracking

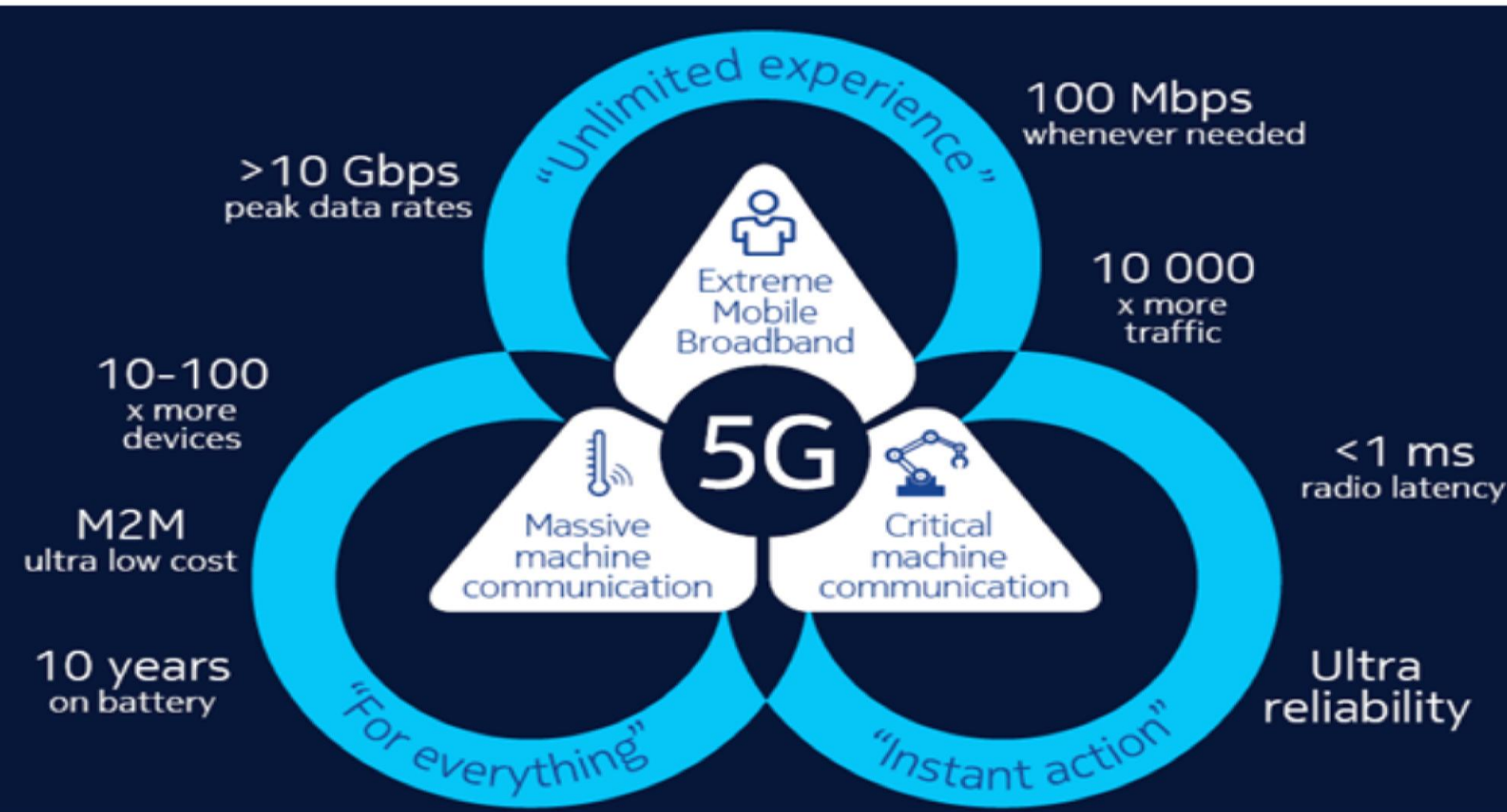
Source :Qualcomm

# Enhancing Mobile Broadband-How?

- 5G Technology is crucial for mobile broadband igniting and its enhancement to address the following issues:-
  1. Extreme throughput (Multi-gigabits per Second)
  2. Ultra Low Latency ( 1 ms end to end latency)
  3. Uniform Experience with higher Capacity
  4. High Reliability
  5. High Availability



# 5G Technology



Source: Nokia

# What is 5G?- GSMA Vision

**Perspective 1:- Hyper Connected Vision :** This Approach defines 5G as a new radio technology to enable low power, low throughput field devices with long duty cycles of ten years or more.

**Perspective 2:- Next-Generation Radio Access Technology:** This Approach defines 5G radio technology with specific targets for data rates and latency being identified, such that new radio interfaces can be assessed .

# 5G Technology-ITU-T Vision

- ITU-T Study Group 13 (SG13) established an ITU-T Focus Group on IMT-2020 (FG IMT-2020) in May 2015 to identify wireline standards gaps to be filled in the development of International Mobile Telecommunications (IMT) for 2020 and beyond – ‘5G’ and the following topics have been addressed:-
  1. High level network architecture and fixed-mobile convergence
  2. Network softwarization
  3. End-to-end network management
  4. Information centric networking (ICN)

# IMT 2020 Requirements



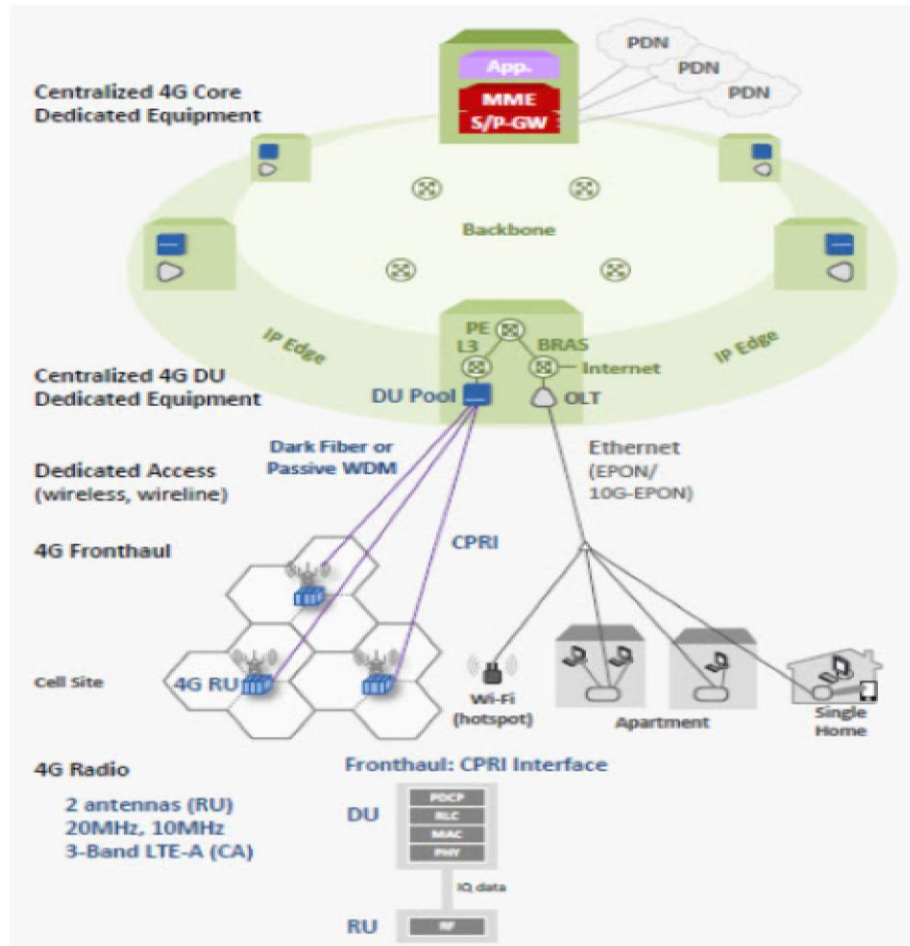
Source: GSMA Intelligence

# IMT 2020 Requirements

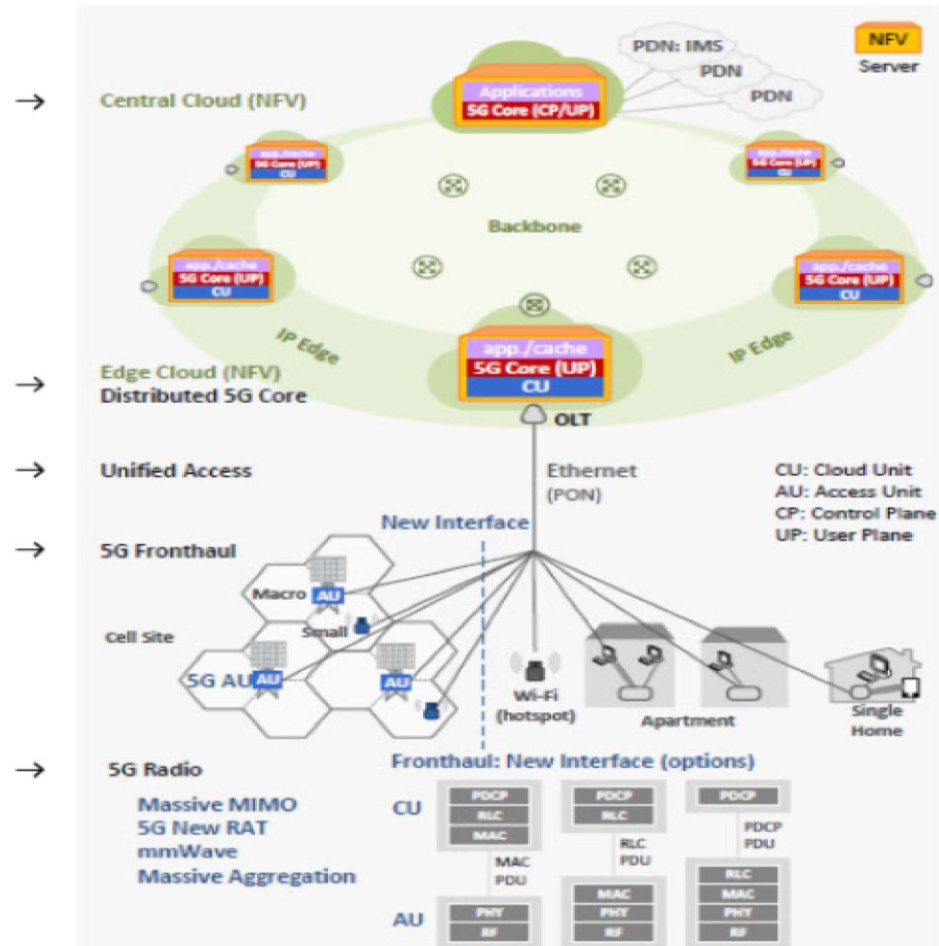
- 10Gbps connections to end points in the field
- 1 millisecond end-to-end round trip delay
- One thousand multiples of bandwidth per unit area
- Increased number of connected devices
- Up to 99.999% availability
- Maintaining almost 100% coverage
- Up to 90% reduction in network energy usage
- Up to ten year battery life for low power, machine-type devices

# IMT 2020 Requirements-4G VS 5G

## 4G Network

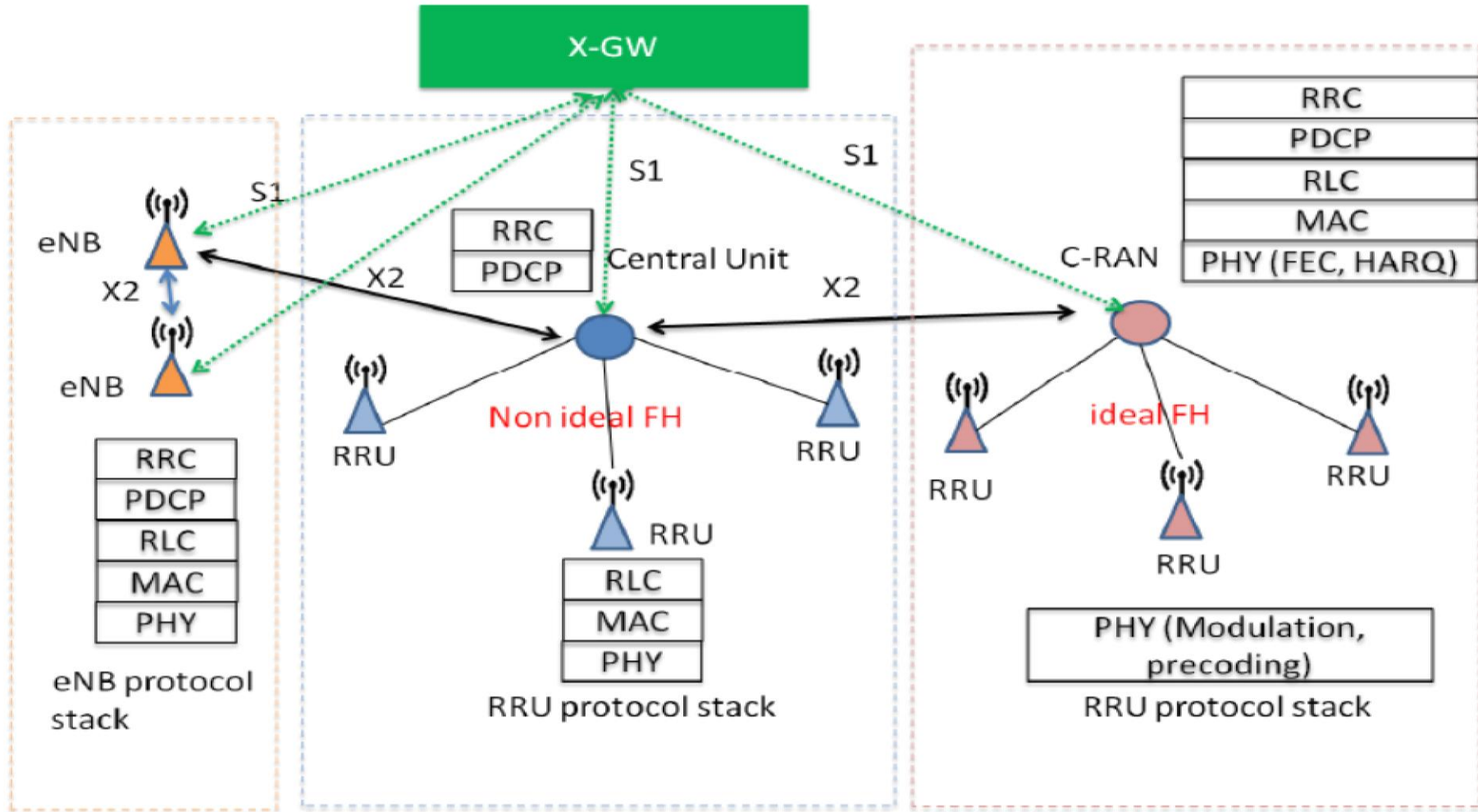


## 5G Network



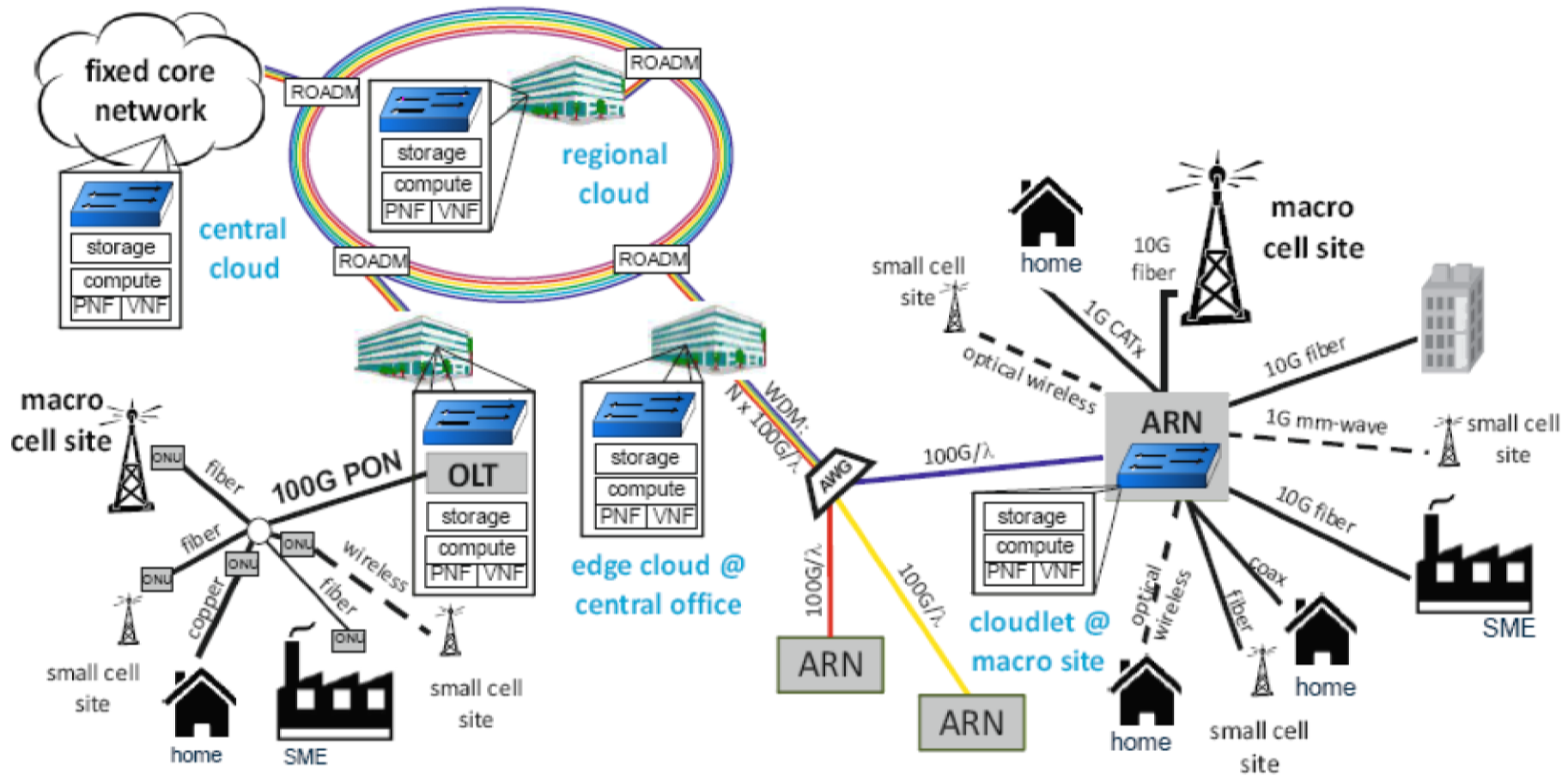
Source: Netmanias

# IMT 2020 Requirements-RAN



Source: 5G PPP Architecture Working Group

# IMT 2020 Requirements- Architecture

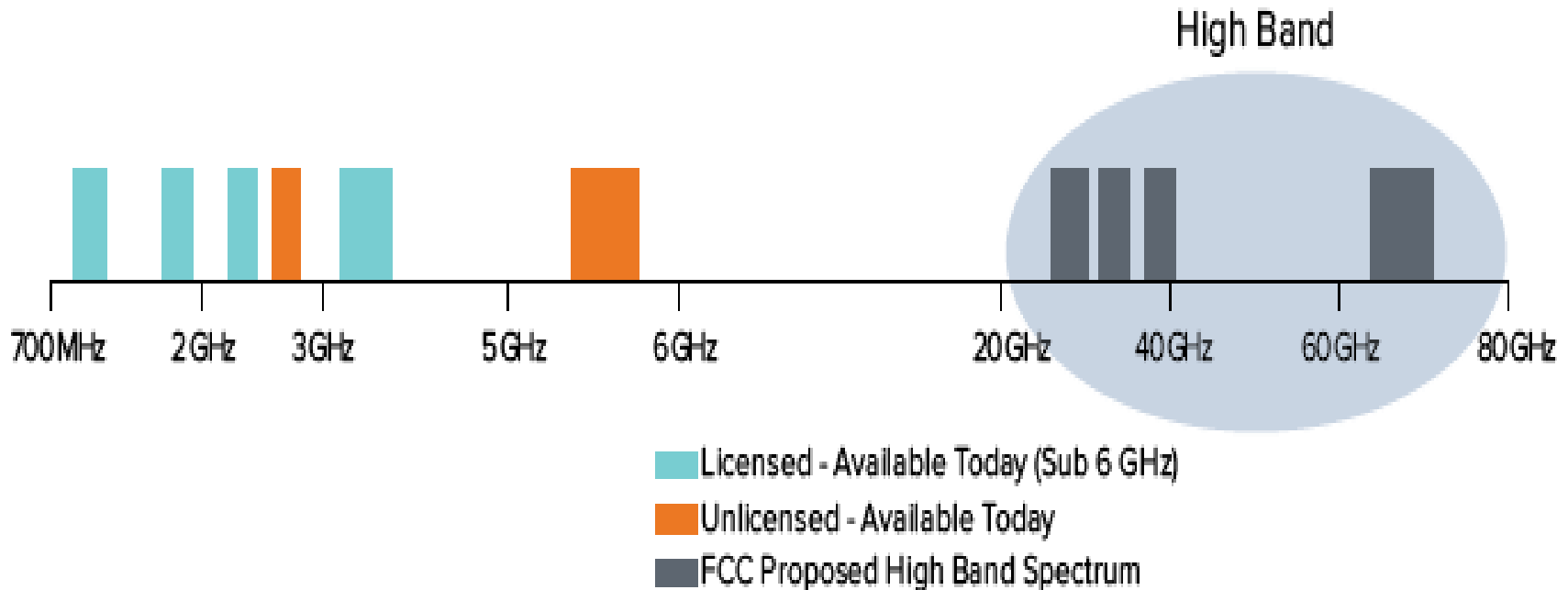


Source: 5G PPP Architecture Working Group



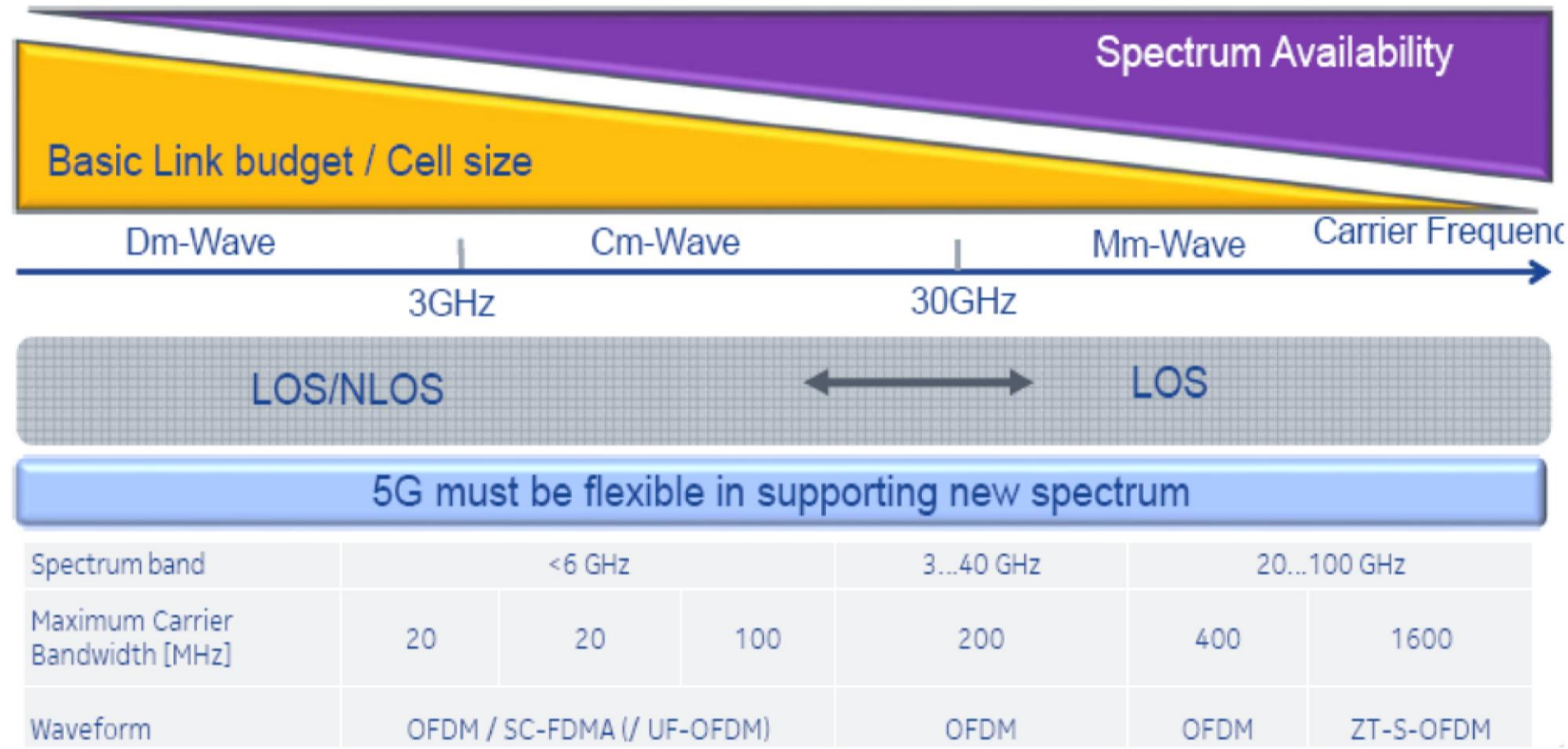
# IMT 2020 Requirements-Spectrum

- High Spectrum Band is crucial to be introduced as a true asset for 5G deployments



Source: CTIA

# IMT 2020 Requirements-mm Wave



Source: Nokia

# 5G Use Cases



# 5G Use Cases- Massive IoT

- One of the major 5G use cases is connecting the massive Internet of Things for connecting ubiquitous things communicating with each other with the following pros:-
  1. Higher Power efficiency (Multi year battery life)
  2. Lower complexity of network elements
  3. Lower cost
  4. Long/ Deep Range

# 5G Use Cases- MTC

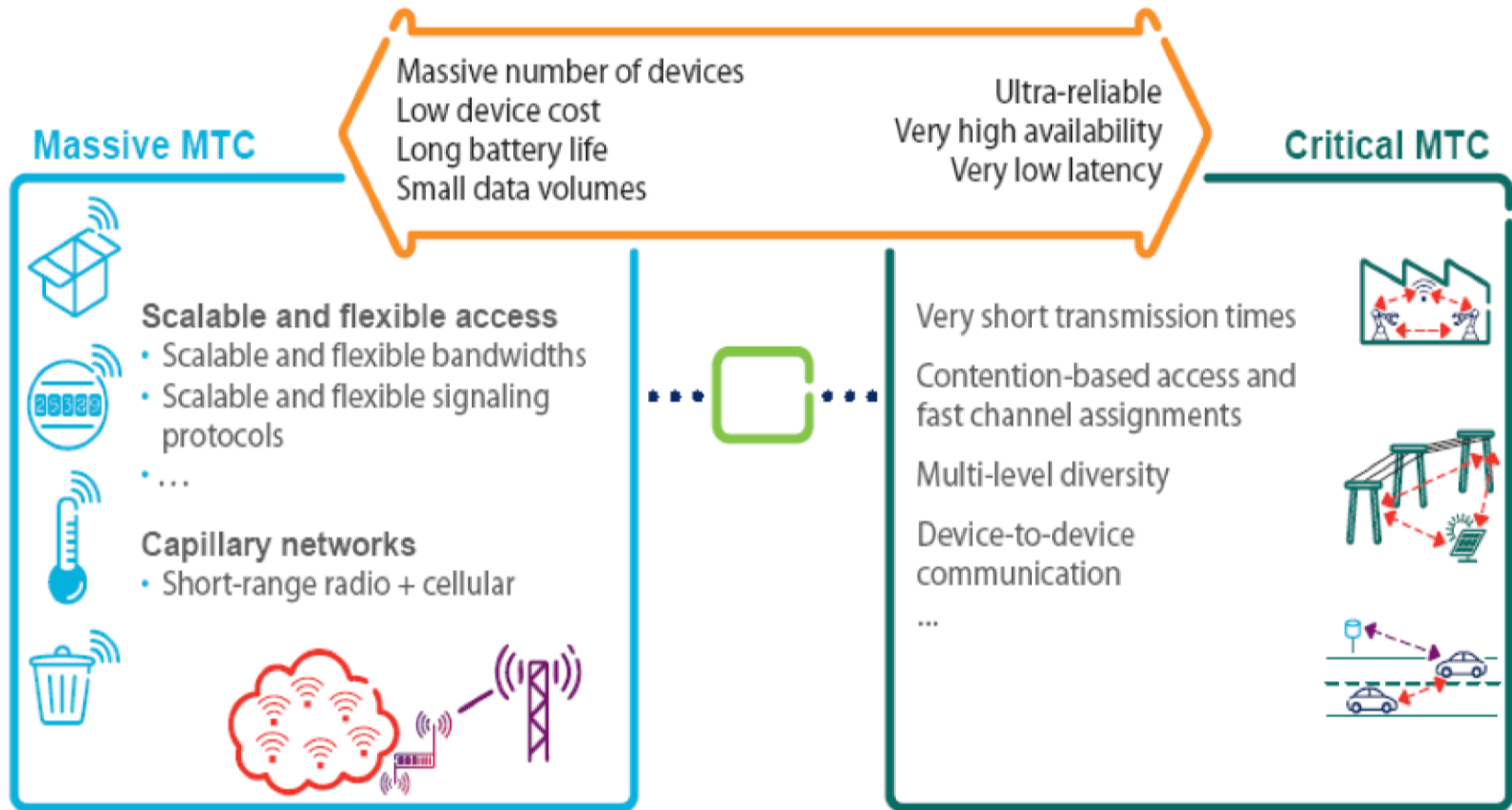
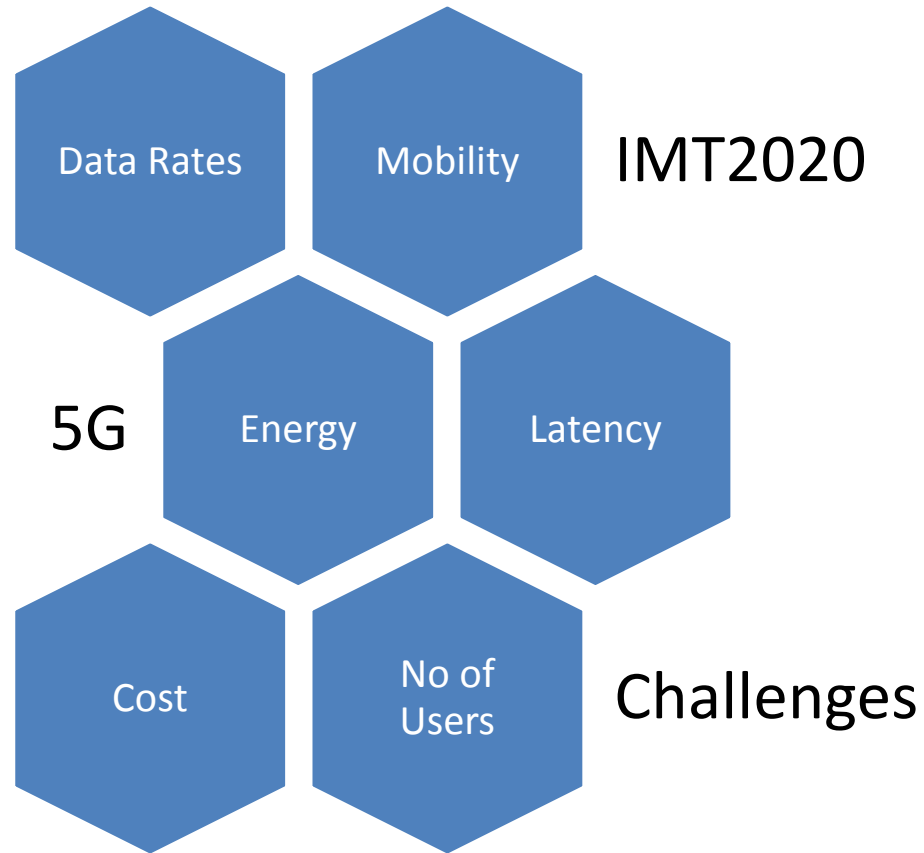


Figure 2: Massive MTC and critical MTC.

Source: Ericsson

# 5G Challenges



# 5G Security/ Privacy

- **New business and trust models**

1. Penetration of new devices (tablets, machines, sensors, smart meters, cars, etc...)
2. Higher bitrate versus lower latency
3. Connecting industries: manufacturing, transport, smart grid, e-health

- **New Services delivery models**

1. Virtualization will Increase dependency on secure software
2. Decoupling software and hardware → software can no longer rely on the security attributes of dedicated hardware
3. Application Programming Interfaces (APIs)
4. Mixing of provider with third-party applications
5. Shared and dedicated hardware platforms

# 5G Security/ Privacy

- **Increased Privacy Concerns**

1. Increasing Awareness of user privacy
2. Big data analytics push privacy concerns further

- **Evolved Threat Landscape**

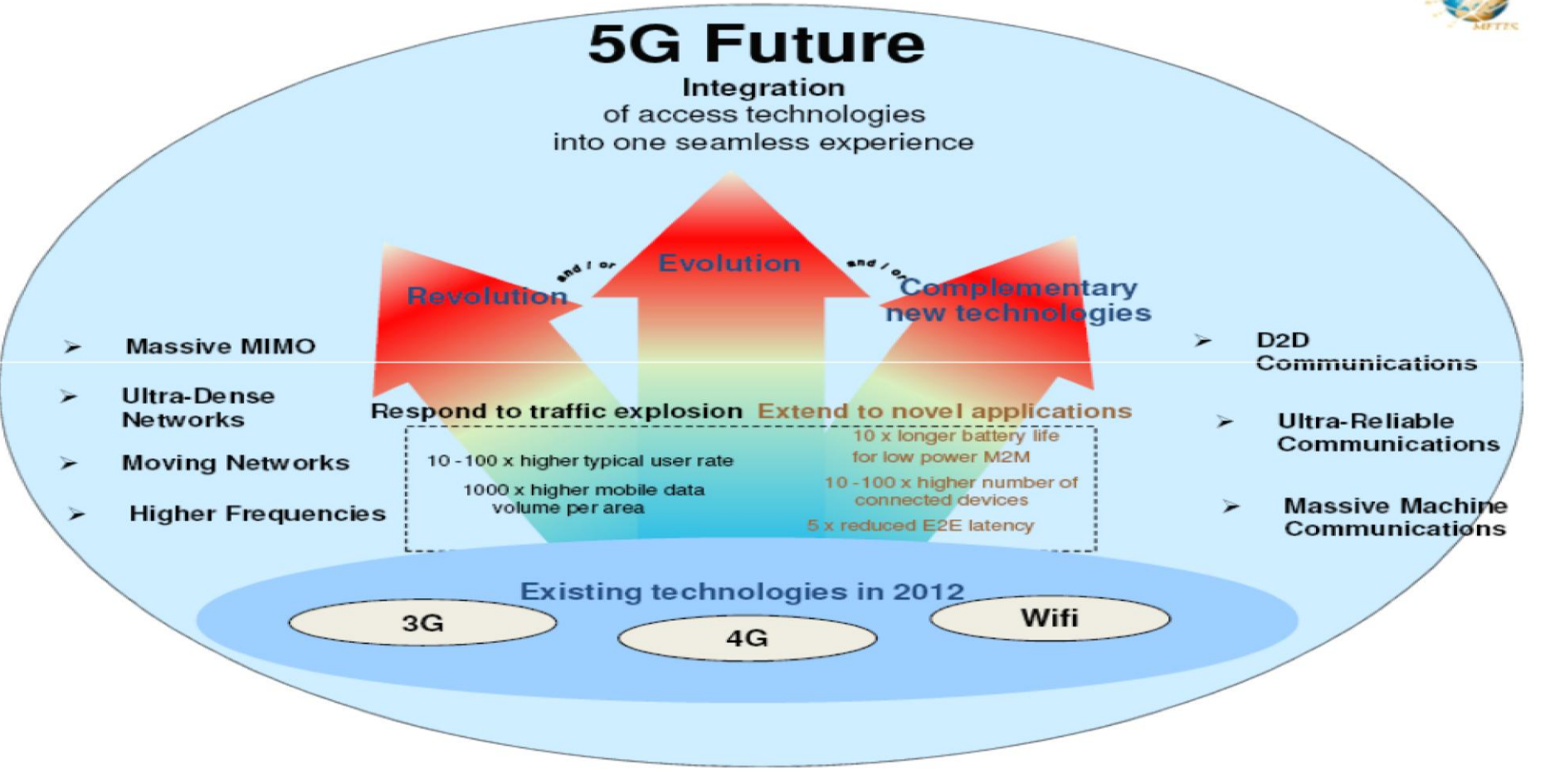
1. 5G will be a Critical Infrastructure itself suffering from cascading effects
2. Data are critical in decision-making and value creation
3. 5G networks will be the carriers of such data, thus adequate protection measures are needed
4. 5G security protocols should be designed with attack resistance in mind while phasing out traditional methods that are not effective anymore (for example username/password authentication)
5. Emphasis should be given to measurable security assurance and compliance due to legal and regulatory concerns



# 5G Security- Network Elements

<ul style="list-style-type: none"><li>• <b>User Equipment</b></li></ul>	<ol style="list-style-type: none"><li>1. UE Security is crucial due to increased transmission in 5G, Adoption of open operating systems ,third-party app stores and Large variety of connectivity options</li><li>2. Mobile malware (Innocent looking applications downloaded from an untrusted app store ,Exploit or steal personal data ,Mount attacks against the same UE or other entities</li><li>3. Mobile botnets(Target many UE at the same time in an automated way)</li></ol>
<ul style="list-style-type: none"><li>• <b>Access Network</b></li></ul>	<ol style="list-style-type: none"><li>1. Femto-cell Attacks<ul style="list-style-type: none"><li>•Configuration attacks</li><li>•Protocol attacks</li><li>•Credential theft (user data and identity privacy attacks from open access nodes)</li><li>•Attacks on radio resources and management to increase handovers</li></ul></li></ol>
<ul style="list-style-type: none"><li>• <b>Core Network</b></li></ul>	<ol style="list-style-type: none"><li>1. Signaling amplification</li><li>2. Home Subscriber Server (HSS)</li></ol>

# 5G Future



Source: ETSI

# Conclusion

- 5G will support the vision of “everything connected”.
- Ultimately, all initiatives and discussions for 5G standardization activities around the world made by governments, vendors, operators and academia demonstrate the continuing of collaboration and innovation across the industry to shape the 5G ecosystem.

# Wrap up

- The major key considerations of IMT 2020 standardizations are as follows:-
  1. 5G Standardization Process
  2. 5G Network Topology
  3. IMT-2020 Requirements
  4. Governmental versus Industry Role
  5. Security Aspects
  6. Future Collaboration

# Thank You

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