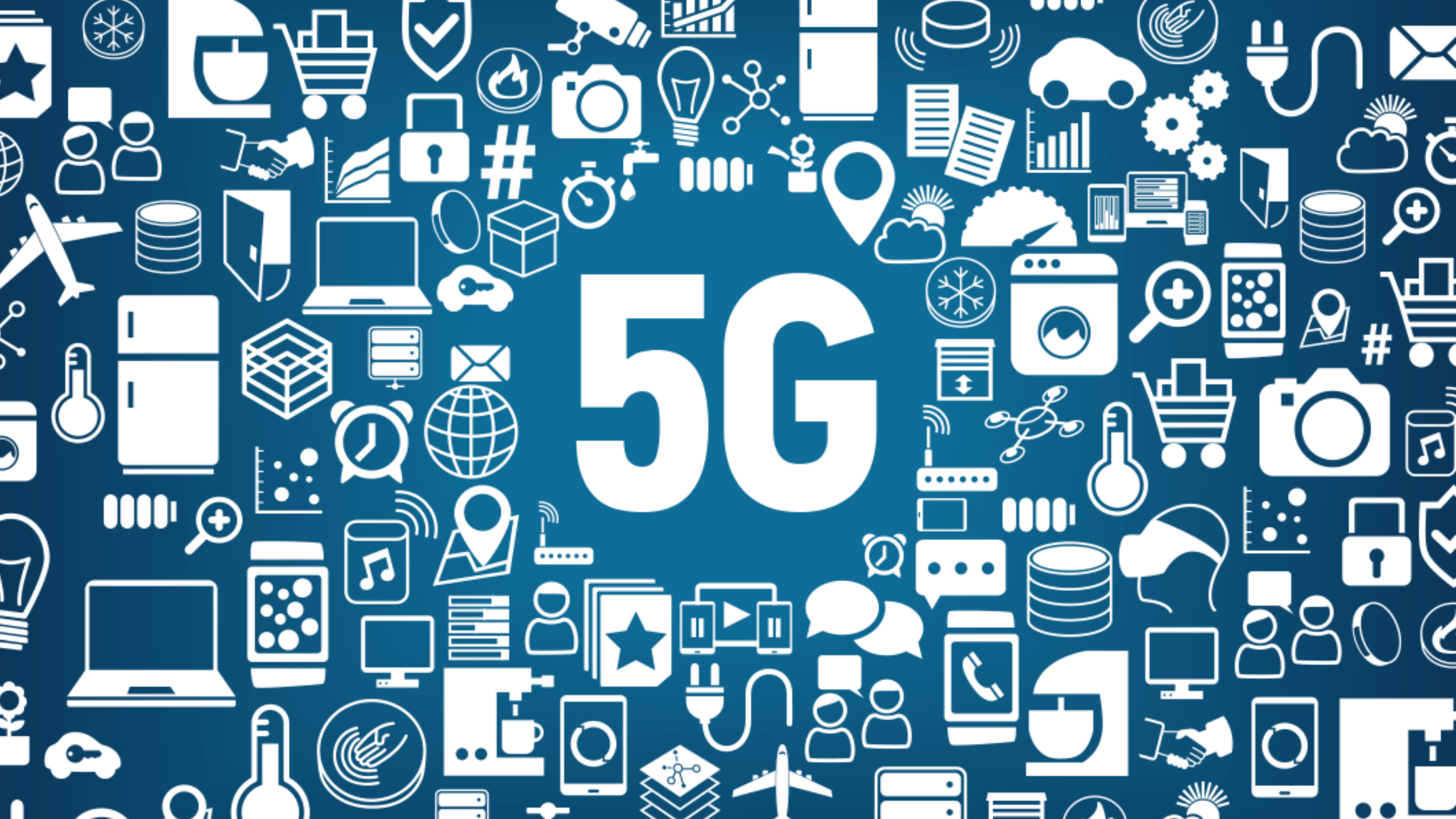

5G


ITU

IMT-2020 NETWORK HIGH LEVEL REQUIREMENTS, HOW AFRICAN COUNTRIES CAN COPE

Draft ITU-T Rec. Y.IMT2020-reqts

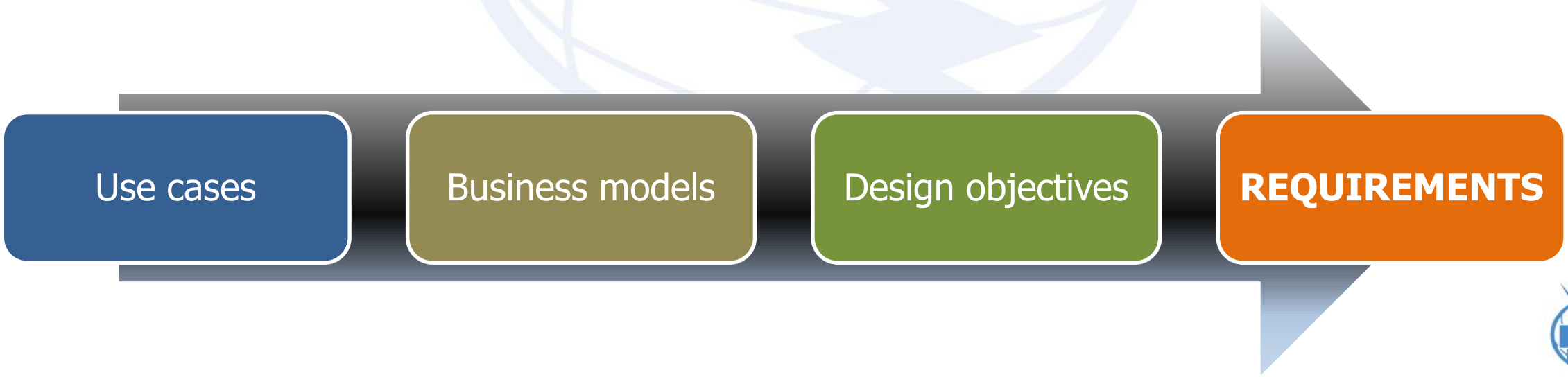
Brice MURARA,
ITU-T SG 13 Vice-chairman

Agenda

- Background
- IMT Systems evolution towards 5G
- IMT-2020 Overview
- IMT-2020 General Requirements

Presentation Objectives

- To discuss the vision for IMT for 2020 and beyond
- Highlight the **requirements** and **capabilities** to support emerging services and applications in IMT-2020.



About the ITU

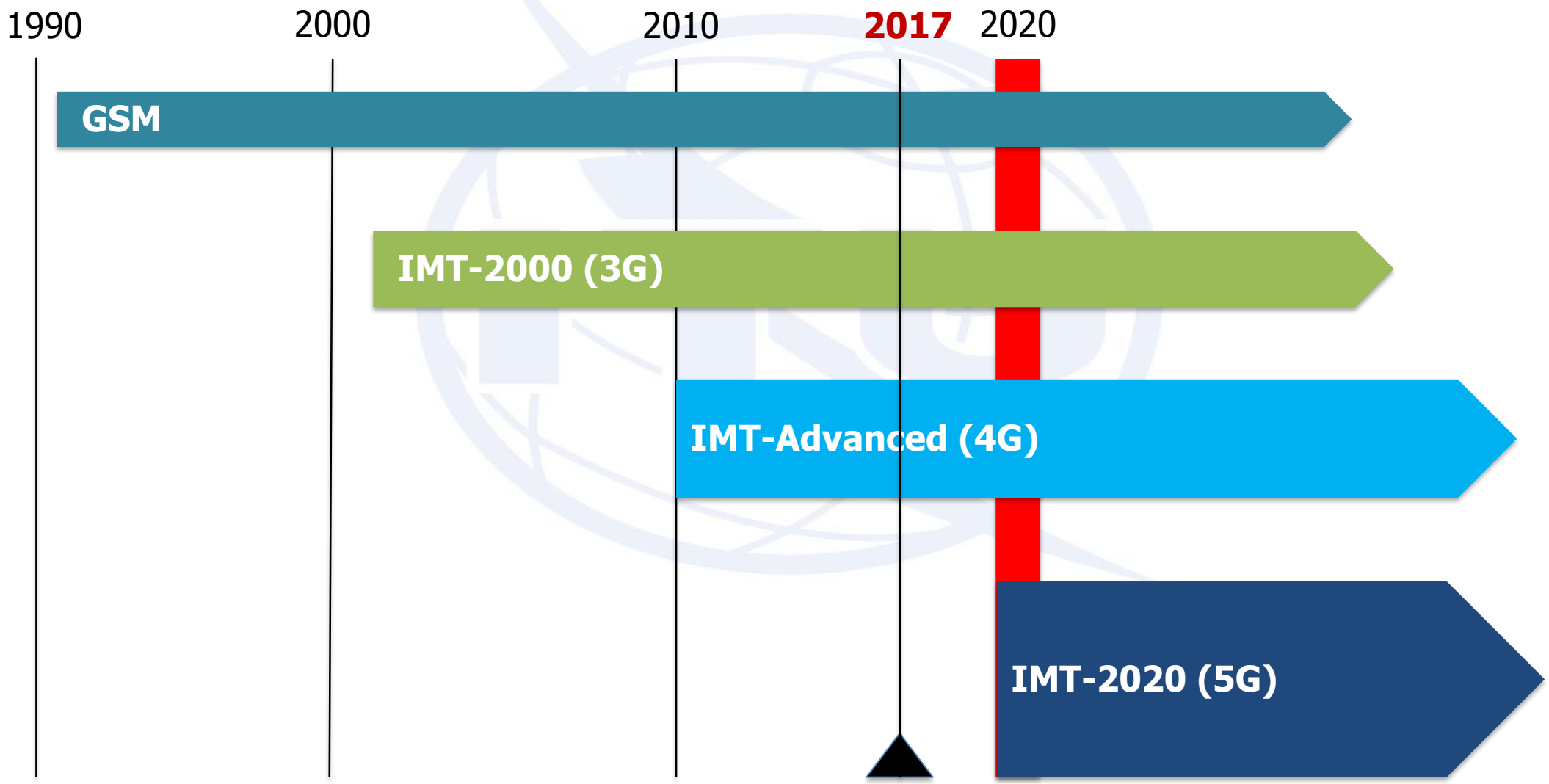
- The ITU – International Telecommunications Union
  - specialized UN agency responsible for issues that concern ICTs
  - coordinates global use of the radio spectrum
  - Assists in the development of worldwide ICT technical standards
  - Technologies include: broadband internet, latest-generation wireless technology, internet access, data, voice, TV broadcasting, next-Generation networks, …
- The ITU has contributed to global standardization and harmonized use of IMT.

Jos)

IMT-2000, IMT-Advanced

- IMT – International Mobile Telecommunications
- IMT-2000 technologies (Marketed as **3G**):
  - 3GPP Family: UMTS – WCDMA (GSM Evolution)
  - 3GPP2 Family: CDMA2000 (1xEV-DO Rev A, EV-DO Rev B)
- IMT-Advanced technologies (Marketed as **4G**):
  - 3GPP Family: LTE Advanced (E-UTRA)
  - IEEE Family: WiMAX (802.16m)

IMT Standards Evolution towards 5G



WHY WE NEED IMT-2020? – TRENDS!

- User and application trends
- Very low latency and high reliability
  - human-centric communication
  - machine-centric communication
- High user density- Cell size is being reduced (e.g. some tens of meters)
- High quality at high mobility (UHD)
- Enhanced multimedia services
- Internet of Things
- Convergence of applications (e-Gov, e-health,…)- New mrkts segments
- Ultra-accurate positioning applications
- Global operation and economies of scale

IMT-2020 Network Overview

- **IMT-2020** [ITU-R M-2083-0]: systems, system components, and related aspects that support to provide far more enhanced capabilities than those described in Recommendation ITU-R M.1645.
- **IMT-2020 Radio**:= IMT evolution + new RAT revolution
- **IMT-2020 Network**:= flat architecture + white-box-hardware + Virtualization + LINP/ Slices + Softwarization + MEC + DAN (ICN/ CCN) + e-2-e VoLTE enabling + …

IMT-2020 Terms & Definition

- **Slice:** Logically isolated set of programmable infrastructure resources (i.e., physical and/or logical resources) to enable functions and services of IMT-2020 network.
- **Network Softwarization:** Automation mechanism for the configuration deploying, managing and maintaining of network equipment and network components.
- **FMC:** Capabilities that provide services and application to the end user regardless of the fixed or mobile access technologies being used and independent of the user's location.

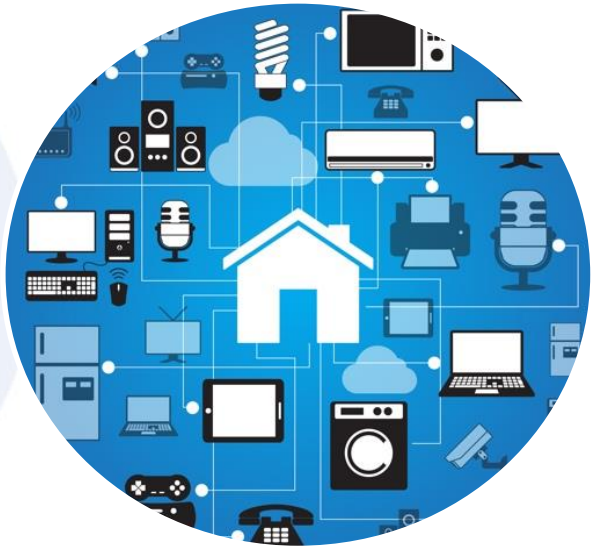
EVOLUTION or CHANGE?

IMT-2020 is not just an increase in BW from the previous releases of IMT systems; but rather a fundamental change to support new emerging capabilities

Potential Uses of 5G

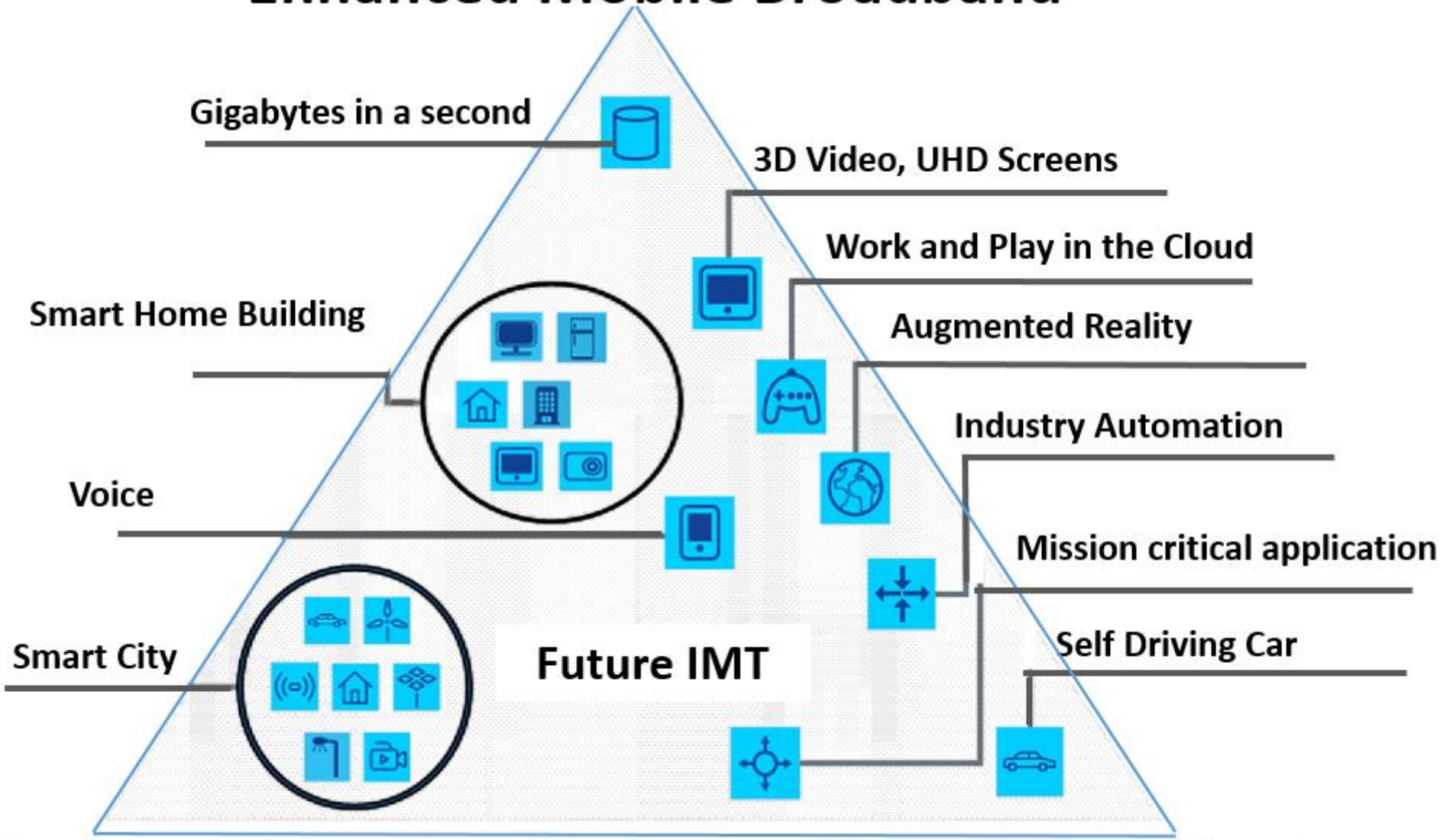
Enhanced mobile broadband service

Ultra-reliable/low-latency communications

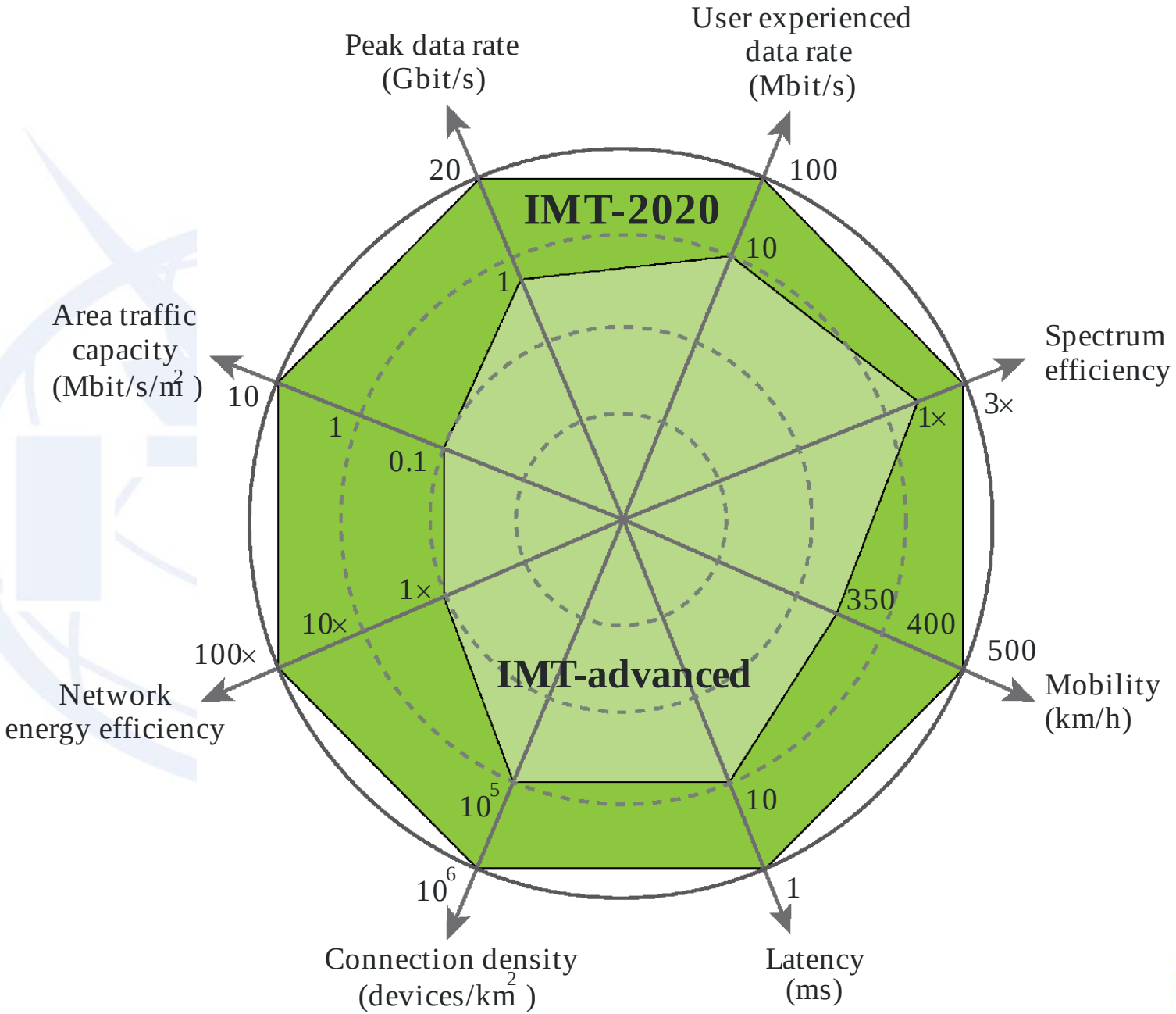


Massive machine type communications

Enhanced Mobile Broadband



Enhancement of key capabilities from IMT-Advanced to IMT-2020



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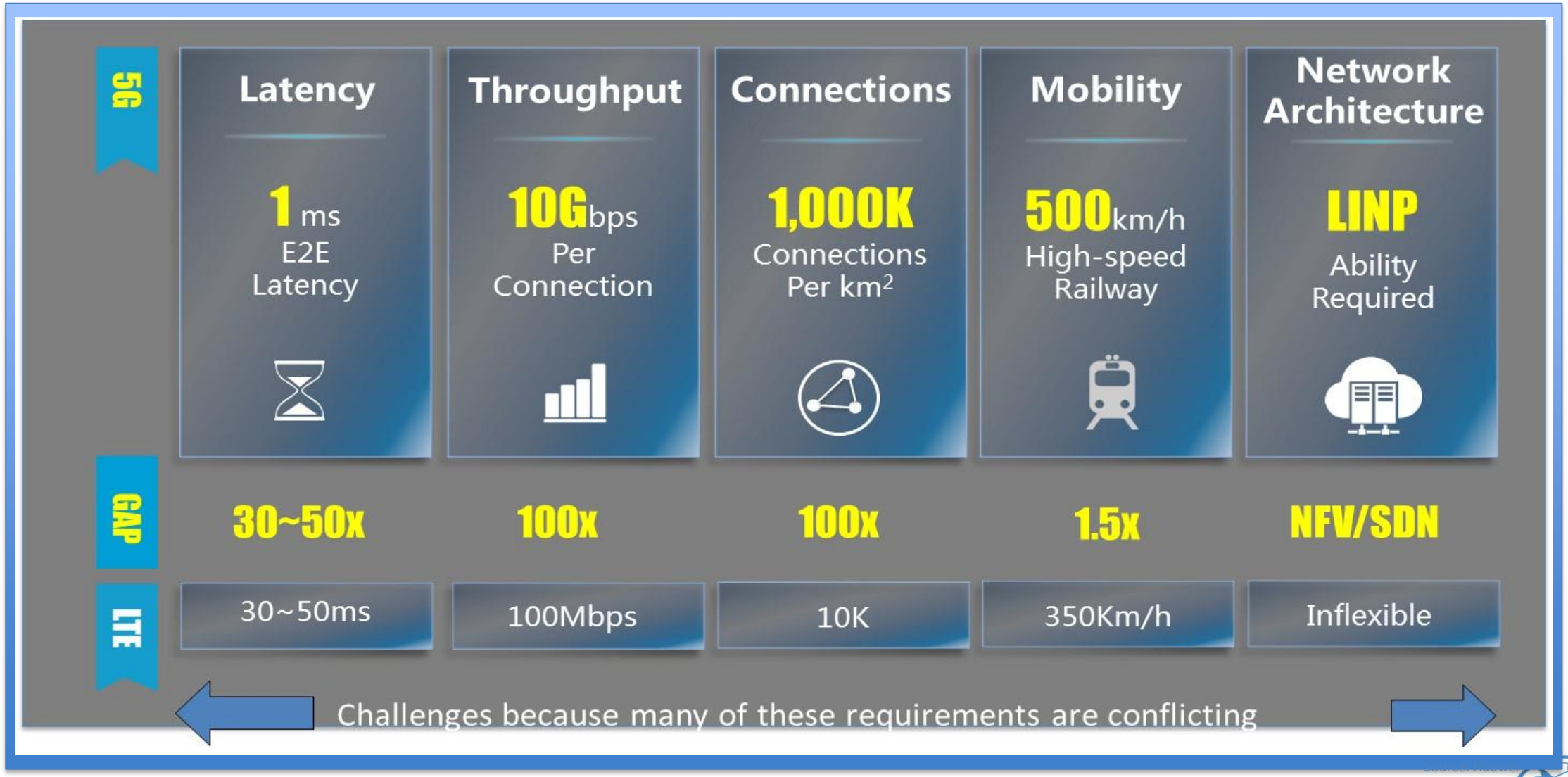
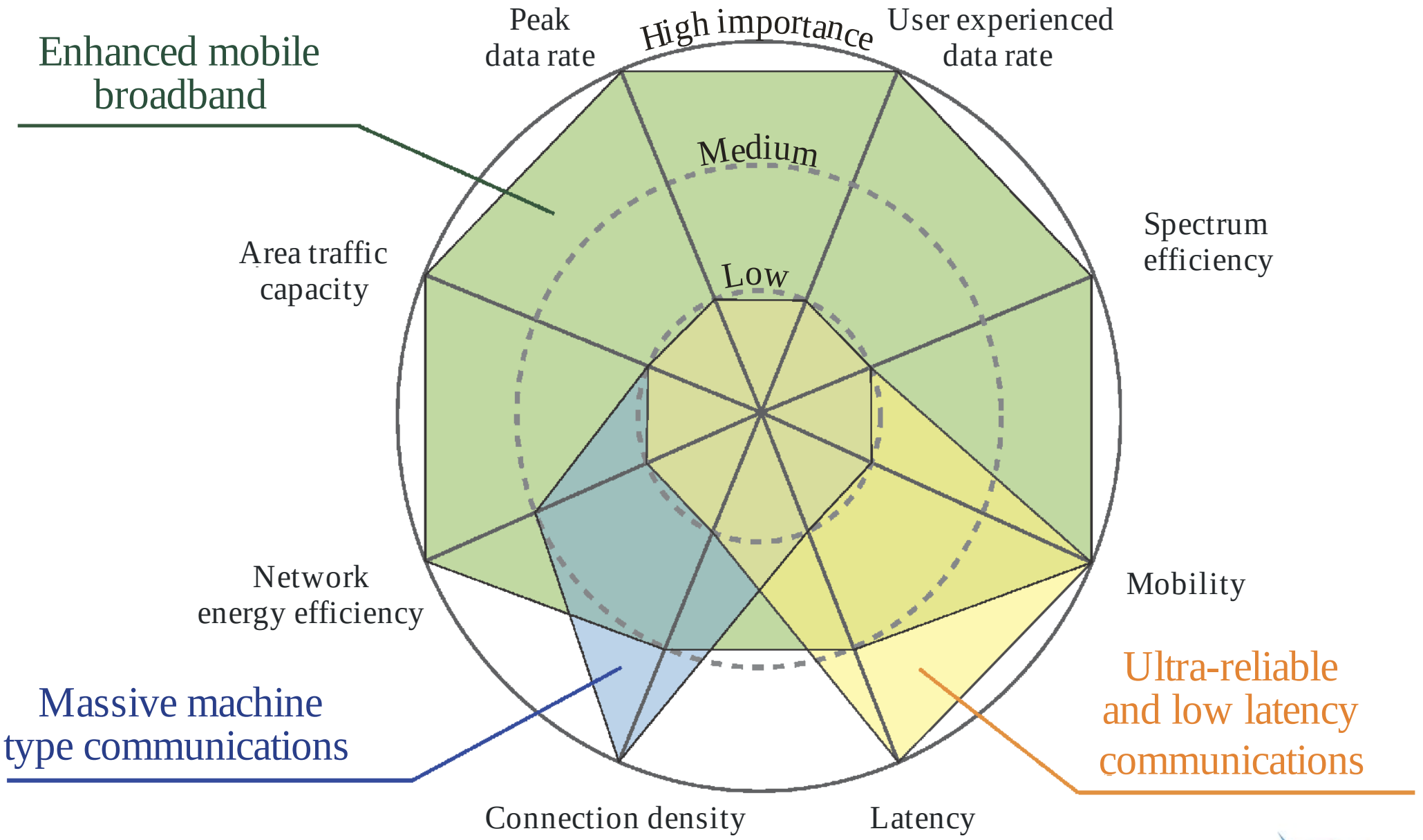
Challenges & Gaps



Networks are challenged by a wide range of conflicting requirements

The importance of key capabilities in different usage scenarios



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General requirements

GEN.1 SERVICE DIVERSITY

IMT-2020 NW should support **diversified services** / variety of traffic characteristics and behaviors (UE, Peripheral devices, sensors, IoT/M2M devices, etc……)

- ✓Diversity of QoS requirements
- ✓Diversity of UE mobility and service continuity
- ✓Diversity of user data type
- ✓Diversity of traffic pattern

GEN.2. Functional flexibility and programmability

The IMT-2020 NW should be flexible, resilient and extensible to cope with various/Conflicting service requirements in adaptable ways. The NW architecture should support:

- ✓ programmable function/service/application allocation and configuration
- ✓ dynamic scale-in/-out, etc.
- ✓ Common CN which supports variety of multiple network slices (e.g., converged fixed/mobile network optimized for a particular service)
- ✓ virtualization of resources associated with network functions
- ✓ isolation between network slices

GEN.3. Common CN with minimized access dependency

Traditionally, the introduction of a new mobile technology has been accompanied with a new type of Packet CN, (Interworking btn the new CN and legacy CN - **Technical challenge**).

- ✓ The IMT-2020 NW arch. is envisioned to be Access network-agnostic
- ✓ The CN should have common control mechanisms (decoupled from access technologies).
- ✓ The CN should support newly-defined RATs for IMT-2020, e-IMT-advanced RATs, WLAN, fixed broadband AN, and fixed and mobile (satellite) networks.
- ✓ IMT-2020 CN should support efficient access and management capability for various types of IoT/M2M devices.

GEN.4. Distributed network architecture

- The IMT-2020 network should be flexible enough to handle the explosive increase of traffic from the new emerging bandwidth-hungry services such as ultra-high definition (UHD) TV, augmented reality (AR), video conferencing, remote medical treatment, etc.
- The heavily centralized architecture of existing IMT networks is expected to be changed to cope with the explosion of mobile data traffic.
- This will require the gateways to the core network are expected to be located closer to the cell sites resulting in distributed network architecture.
- The distributed network architecture will bring a significant reduction on backhaul and core network traffic by enabling placing content servers closer to mobile devices and also be beneficial to the latency of the services.

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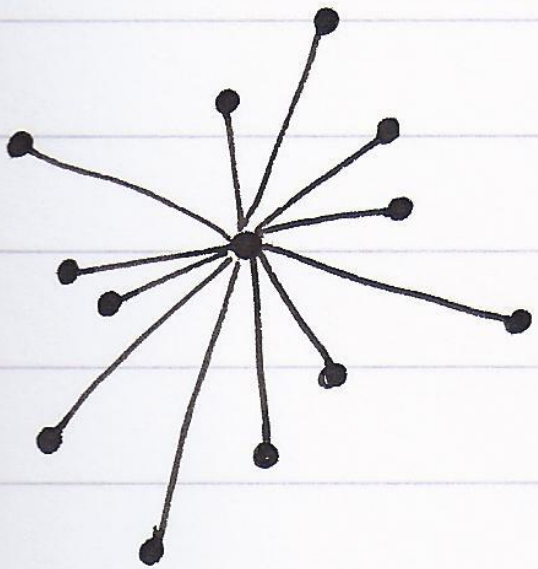

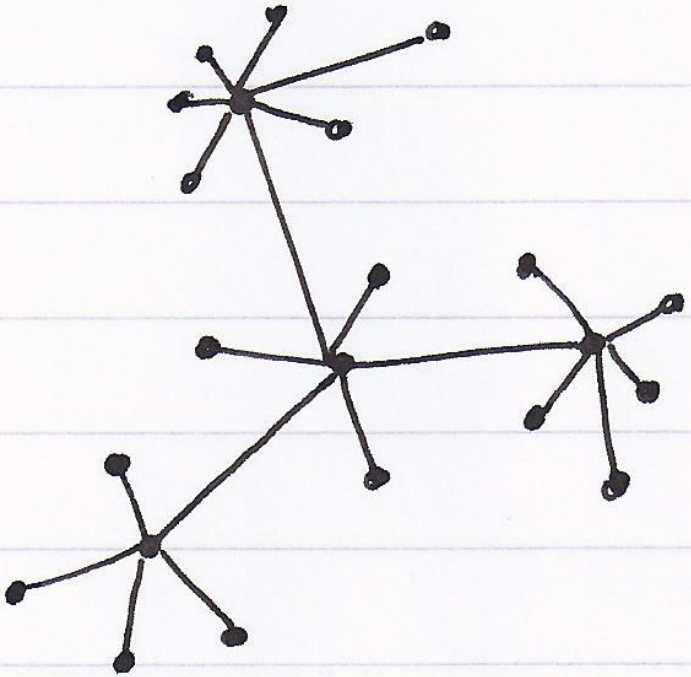

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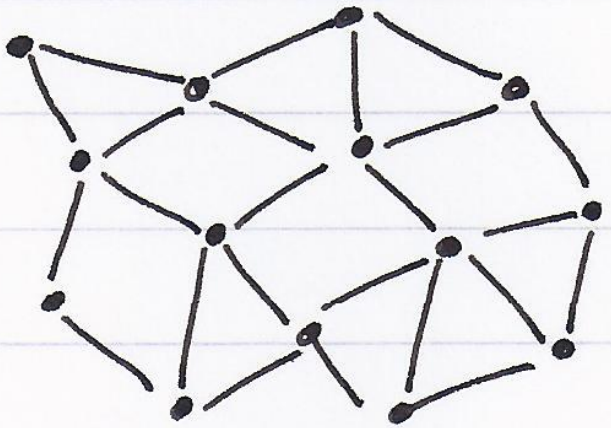

LEAST VULNERABLE TO ATTACK.

GEN.5. Separation of control plane and user plane functions

The clear separation of control and data planes is required to make the IMT-2020 network flexible and extensible.

GEN.6 In-network data processing

- The IMT-2020 NW should be designed and implemented for optimal and efficient handling of huge amounts of data.
- IMT-2020 network nodes, where and when required, should provide data processing and application services, and storage to reduce the network congestion and response time. ICN and edge computing are typical examples of technologies that require in-network processing

GEN.7. Unified intelligent network management

- The IMT-2020 network should be designed to keep simple operations and management of the network whose complexity has been increased due to flexible and extensible network softwarization.
- Procedures should be automated as far as possible, mitigating multi-vendor interworking problems as well as interoperability (roaming) issues.

GEN.8 Optimization

- The IMT-2020 network should provide sufficient performance by optimizing network equipment capacity based on service requirement and user demand.
- The IMT-202 network is recommended to provide dynamic data routing mechanisms that respond to changing conditions of network segments.

GEN.9. Reliability

- The IMT-2020 network should provide sufficient performance by optimizing network equipment capacity based on service requirement and user demand.

GEN.10. Security and Privacy

- The IMT-2020 network should be designed for safety and privacy of their users.

GEN.11 Energy efficiency

- The IMT-2020 network should be designed to reduce UE power consumption and to improve energy efficiency in overall network operation.
- In IMT-2020 network, cooperation among the different components should be provided to achieve network energy savings.

Resulted 5G Operators Benefits

Increased Network Performance

- Increased Capacity & Coverage
- High Speed Mobility
- Low Latency
- High Peak & Cell edge Data rates
- Programmability & Scalability
- Massive Device Connectivity
- Embedded Security
- Service Awareness

Higher Costs Efficiency

- Reduced CAPEX & OPEX
- Energy efficient Network infrastructure
- Sustainability

New Business potential

- New Business Models
- Possibility to differentiate from OTTs
- New Revenue Opportunities
- Effective support of vertical Use cases
- Reduced Time-to-Market
- Uniform user experience anywhere

IMT-2020 Goals of SG13

- Phase I recommendations in July, 2017
- Phase II recommendations in Nov, 2017
- Phase III recommendations in 2018

References

1. Draft Recommendation Y.IMT2020-reqts, “Requirements of IMT-2020 network”
2. Recommendation ITU-R M.2083-0 (09/2015), “IMT Vision – Framework and overall objectives of the future development of IMT for 2020 and beyond”, M Series, Mobile, radiodetermination, amateur and related satellite services
3. Report ITU-R M.2320-0 (11/2014), “Future technology trends of terrestrial IMT systems”, M Series Mobile, radiodetermination, amateur and related satellite services

	3G	4G	5G
SPEED	384 Kbps (2001)	100 Mbps (2009)	10 Gbps (2020)
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