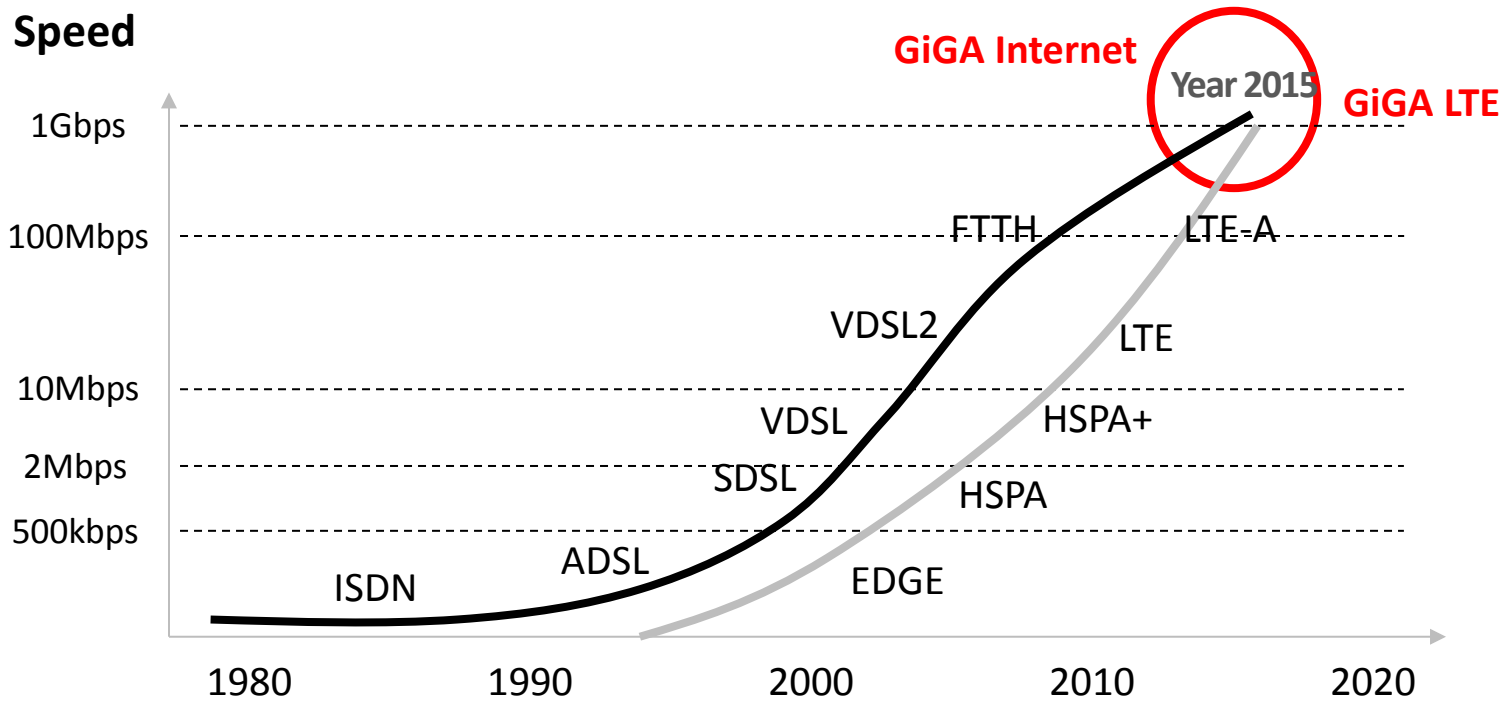
KT's 5G Vison and QoS in 5G

Hyung-Soo (Hans) KIM | 11/05/2016

01 Beyond LTE

- GiGA internet & GiGA LTE (GiGA; Service brand name)

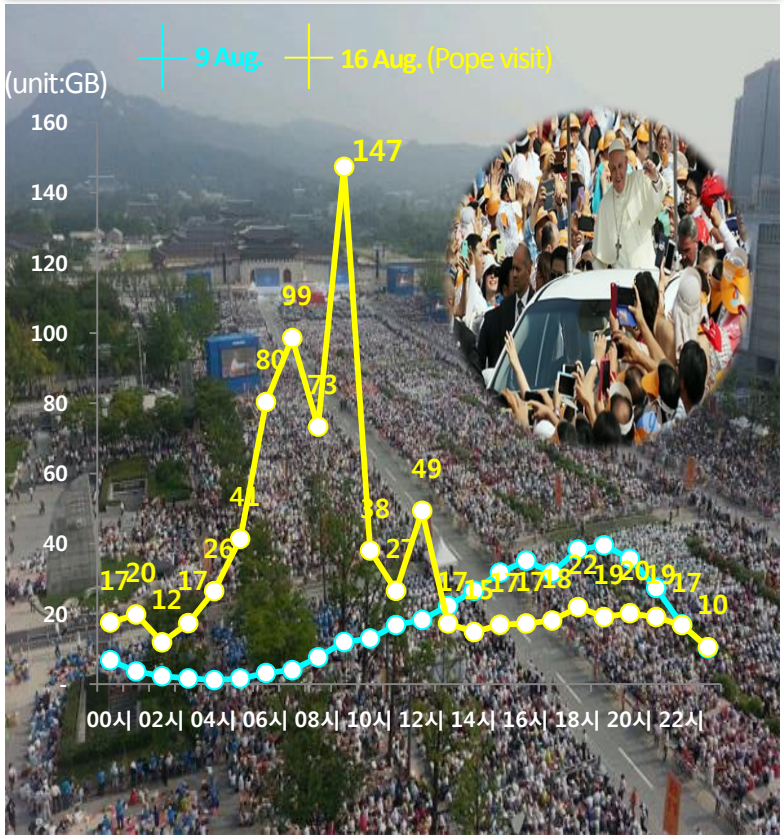
<KT Commercialization History>



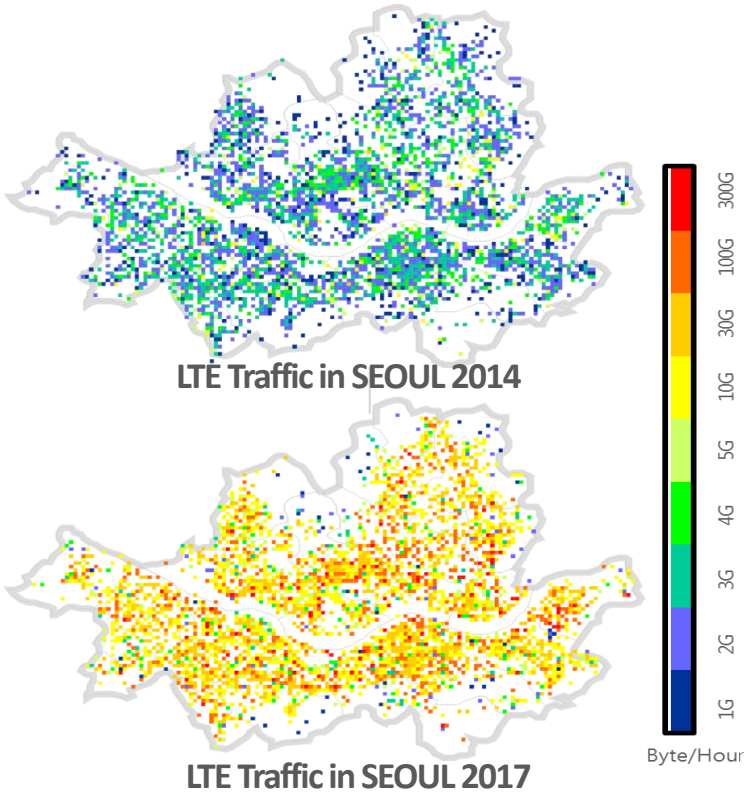
02 New Challenge

- unpredictable and uneven traffic in hot spot areas

Traffic in Hot Spot

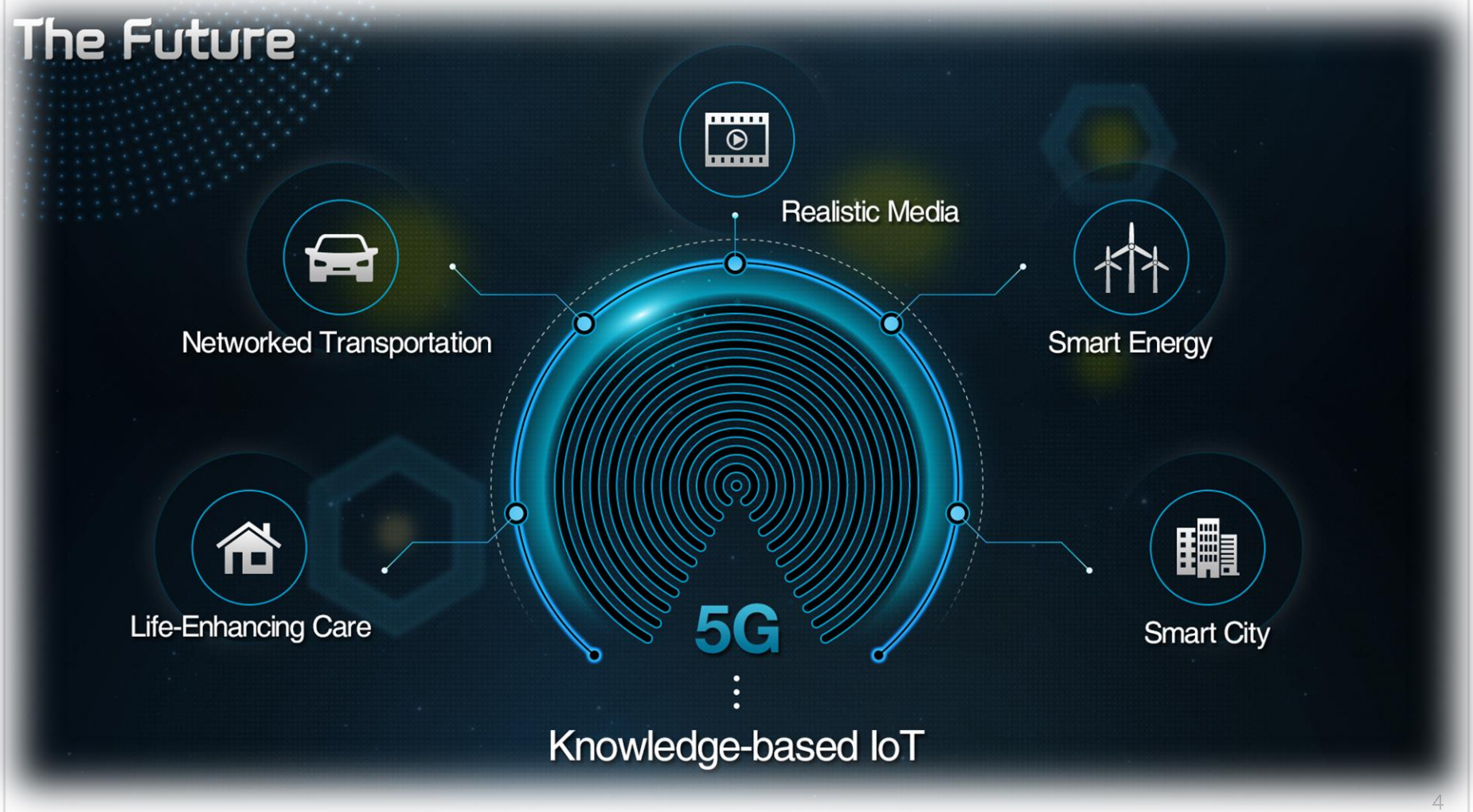


Traffic forecasting in Seoul



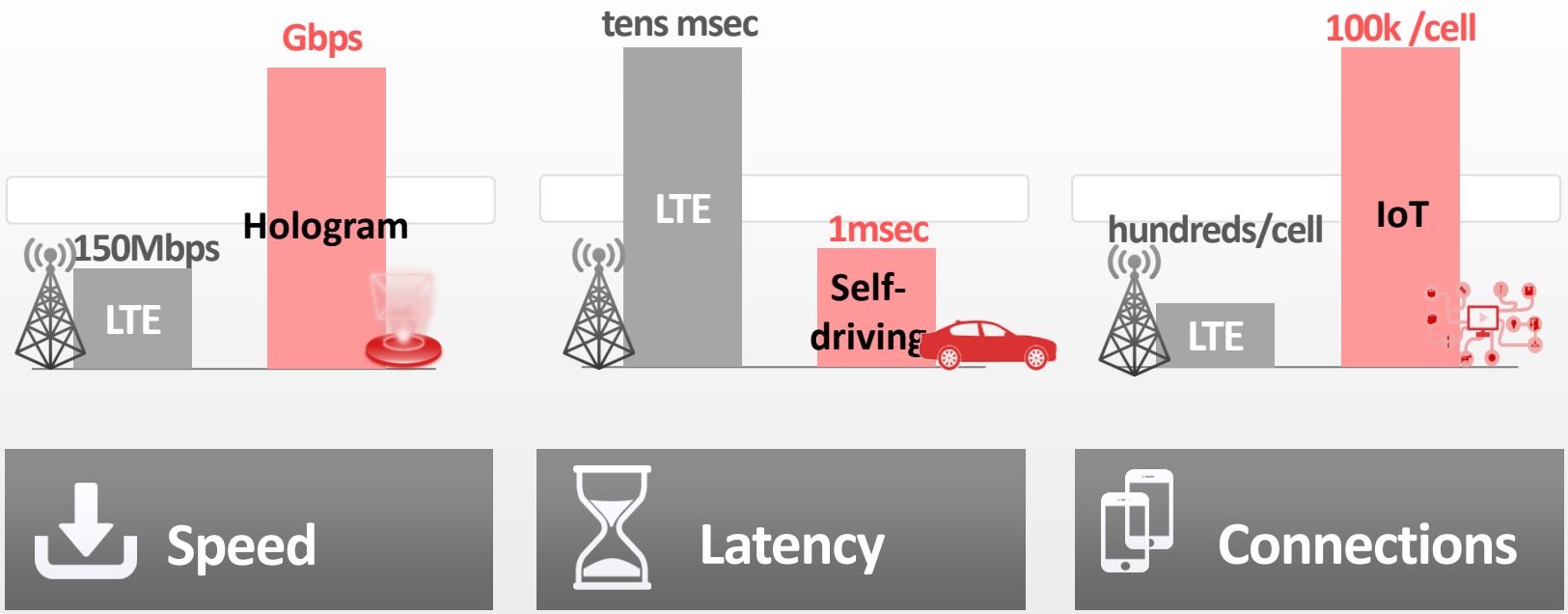
03 IoT

- New growth engine for the future of telecom industry



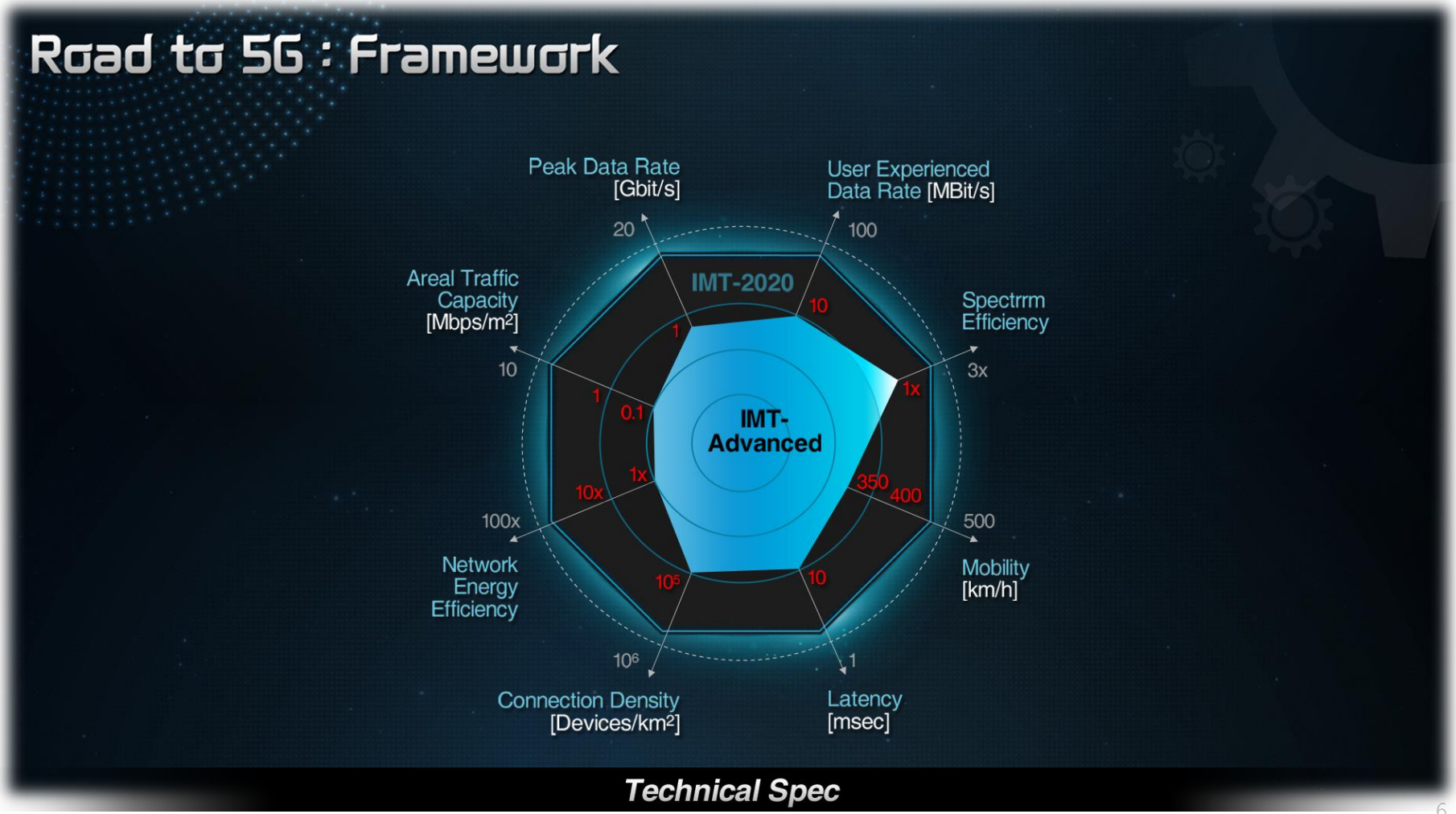
04 Next technology; 5G

- to overcome technical limitation for future services



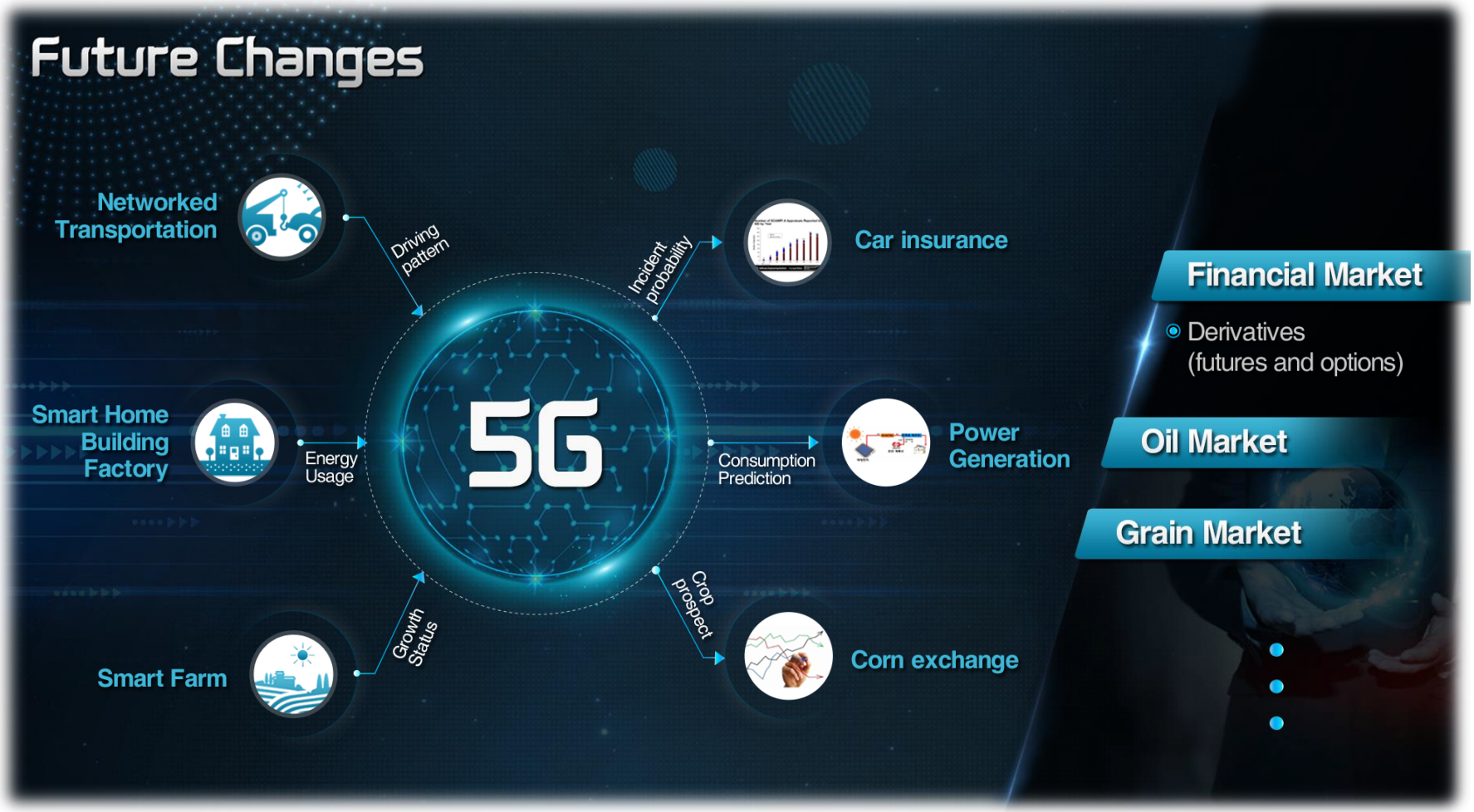
05 Technical requirements for 5G

- ITU-R Rec. M.2083 (formerly, M.Vision) : Framework and overall objectives of the future development of IMT for 2020 and beyond



06 Broader and wider business models & markets

- Collaboration with other industries ; automobile, energy, agriculture, insurance, etc.



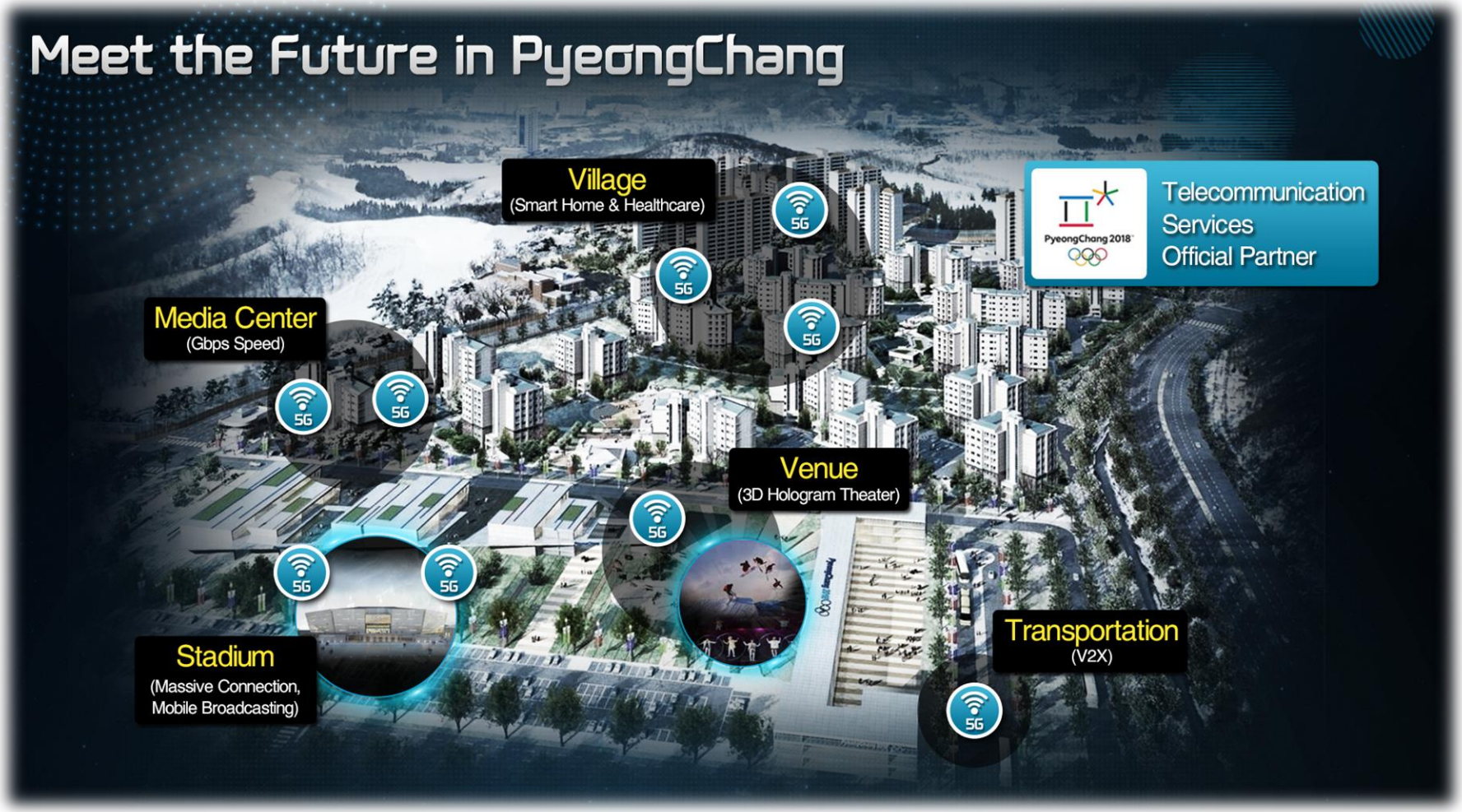
07 5G Innovation Lab

- Open ecosystem with global vendors

08 Announced timeline

- Commercial service in 2020

09 5G deployment in Winter Olympic Game 2018



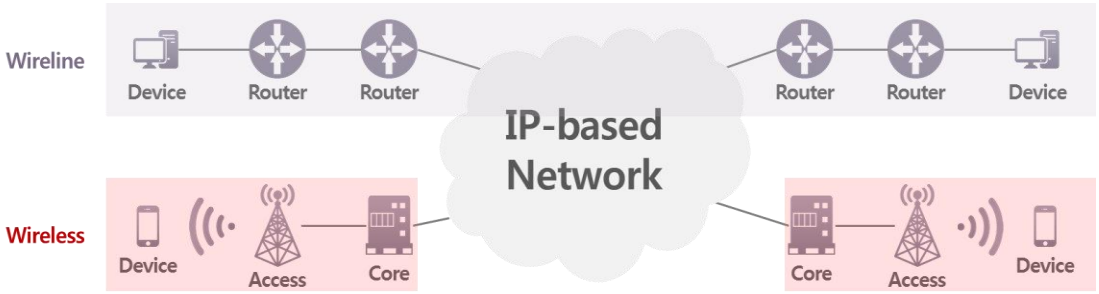
10 Progress on 5G QoS standardization in ITU-T (1)

- End-to-end QoS for IMT-2020 WG (ITU-T Focus Group on IMT-2020)

* 9 standardization gaps and recommendations to Study Groups

- how the wireline network together with the wireless network can provide E2E QoS.
- A survey of various white papers on the subject and identifies differences in how QoS is defined/measured etc. across the different organizations.
- IMT-2020-specific use cases need new approaches in areas of definition of end-to-end connectivity supervision and integrity, QoS parameters, performance objectives, QoS classification, budget allocation, measurement/monitoring methodology, etc.

These gaps identify device-to-device/device-to-network QoS requiring additional standardization.



<The scope end-to-end QoS standardization for 3GPP (Red) and ITU-T Standards (Purple)>

11 Standardization Gaps (1)

Gap C.7.3-1. Definition of end-to-end	Priority: High
Description: 3GPP's concept of "end-to-end" comprehensively covers the whole network from a user's device to another user's device. However, its UMTS bearer concept is limited to an interval starting from user's device to PDN gateway (a gateway in wireless core network) for the sake of practicality (i.e., a network operator can influence only its network and its radio interface). (3GPP TS 23.107, TS 23.401 Rel.12) ITU-T, on the other hand, attempts to identify network QoS from end-user to end-user by defining UNI to UNI objectives in Y.1541. However, the concept is usually applied to wireline IP-based services without any specific discretion on technologies of lower layers. IMT-2020 QoS standard should define a common single end-to-end definition.	
Related work: ITU-T Y.1540, Y.1541, Y.1542, 3GPP TS23.107, TS23.401	

12 Standardization Gaps (2)

End-to-end connectivity for D2D/D2N – integrity and supervision	Priority: High
Description: Existing standards for mobile (e.g. 3GPP) and fixed (e.g., ITU-T) networks have been developed for human-to-human and human-to-machine connectivity which is concatenated through the device, access network, core network and server and vice versa. IMT-2020 QoS standard should study device-to-device and device-to-(edge) network connectivity cases, which are generally shorter than conventional connectivity	
Related work: ITU-T I.350, I.356, Y.1540, Y.1561, Y.1563	

Gap C.7.3-3. Different QoS classification among mobile and fixed networks	Priority: Medium
Description: While mobile network-related standards (e.g. 3GPP) specify 13 QoS Classification Indicators (QCI), fixed network-related standards (e.g., ITU-T) introduce 6 QoS classes with different parameters and performance objectives. IMT-2020 QoS standards should study the way to be applicable for both networks.	
Related work: ITU-T I.356, Y.1541, 3GPP TS 23.107	

13 Standardization Gaps (3)

Gap C.7.3-4. Additional QoS parameters	Priority: High
Description: Latency is just one of parameters to define QoS aspects. An IMT-2020 QoS standard should study other parameters, such loss ratio, delay variation (jitter), etc. for the delivery performance viewpoint,.New parameters should be considered to support IMT-2020 specific use cases for service execution capability such as remote surgical operation, autonomous driving and virtual reality. Also, the impact of new network architectural aspects should be taken into account ; network softwarization (e.g. slicing), ICN etc.	
Related work: ITU-T I.350, I.356, Y.1540, G.1010, 3GPP TS23.107	

Gap C.7.3-5. Measurement and monitoring	Priority: Medium
Description: For Device-to-Device and Device-to-Network connectivity cases with very low delay (e.g. 1ms) require definition of the methodology of measurement, reference points and monitoring methodology. An approach using OAM technology for intrusive measurements should be also taken into account for this purpose. While Gap C.7.3-2 focuses on the definition itself, this gap is related to how to manage and operate Gap C.7.3-2.	
Related work: ITU-T I.356, O-series, Y.1541	

14 Standardization Gaps (4)

Gap C.7.3-6 QoS budget allocation for mobile and fixed networks	Priority: Medium
Description: Performance objectives in existing standards (ITU-T & 3GPP) were developed focusing on its own network's connectivity (i.e. mobile or fixed). End-to-end performance objectives covering mobile and fixed networks should be allocated into media-dependent way such as fiber optics and radio etc. Device-to-network communication is different from conventional human-to-human communication in aspects such as frequency of communication (periodic) and type of traffic generated (usually more signalling traffic than data). Device-to-device communication also is distinctly different from the conventional communication because the distance will be much shorter and the configuration will be simpler (with smaller number of nodes). In-depth study is necessary to develop QoS budget allocation for these connectivity configurations.	
Related work: ITU-T Y.1541, 3GPP TS23.107, TS23.401	

Standardization Gaps (5)

Gap C.7.3-8. Layered approach	Priority: Low
Description: Realizing QoS requirements must be based on the structure of technologies and protocols in different layers, ITU-T's Y.1540 standard provides a layered model of performance of IP service to illustrate the point aforementioned. The lower layers do not have end-to-end significance (i.e., it transfers packet from one point to another) but the type of technology employed (e.g., Ethernet-based leased lines) may affect the performance. 3GPP's bearer acknowledges the effect of various layers on IP services, but defines the bearer on layer 1 and 2 for the use of higher layers (3GPP TS 23.107 & 23.401). Nevertheless, both 3GPP and ITU-T acknowledge that the frame work must take into account the impact from performance of layer 1 and 2 in both wireline and wireless media. Higher layers implemented in service execution systems (security, mobility, interworking etc) may also affect performance. The IMT-2020 QoS standard development should study the overall layered structure and inter-relationship.	
Related work: ITU-T Y.1540, 3GPP TS 23.107, TS 23.401	

16 Standardization Gaps (6)

Gap C.7.3-7. Performance objectives	Priority: High
Description: The conversational voice application has been considered to have the most stringent performance objectives; end-to-end one way latency of 150ms for human's mouth-to-ear connectivity and 100ms for UNI-to-UNI. Assuming that the revised end-to-end connectivity for device-to-device and device-to-network impose stringent performance objectives, new QoS performance objectives may be required.	
Related work: ITU-T G.1010, ITU-T Y.1541	

Gap C.7.3-9. Overall QoS study applicable to IMT-2020	Priority: High
Description: Since new technologies are required to implement the IMT-2020 network, the operational aspects at the QoS level in the real field, and an understanding of QoS end-to-end require the initiation of study of these new concepts (for example, network softwarization (e.g.slicing) and other areas (including, for example network management/OAM, signalling, network architecture, implementation scenarios, etc.) Moreover, the hybrid mobile and fixed network environment of IMT-2020 calls for a systematic and integrated approach to establish a common framework for QoS standards.	
Related work: SG2, SG11, SG12, SG13, SG20 – related recommendations	

17 Further progress on 5G QoS standardization in ITU-T (2)

- Recommendation to parent group on End-to-end QoS

- Gaps from C.7.3-1 to C.7.3-8 could be delivered to Study Group 12 for further in-depth standardization.
- However, for the purpose of operation and management, development of the overall QoS end-to-end standards from the network point of view should be kept inside SG 13.

- ITU-T SG12 will study for a new work item on a QoS Framework for IMT-2020 under Q.2 (2016.01.)

Thank you