

Roadmap for 5G

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Chair, Steering Committee, 5G Forum



Contents

- Wireless Communication in Korea
 - 5G R&D Plan
 - Traffic, Systems and Spectrum
 - Development Schedule
- 5G Technology
 - System requirement
 - Key technologies under consideration
- 5G Forum
- Conclusions

5G Promotion Activities in Korea

‘Creative 5G Mobile Strategy’ (Jan. 22, 2014)
by Korean Government (MSIP) to roll out 5G Services

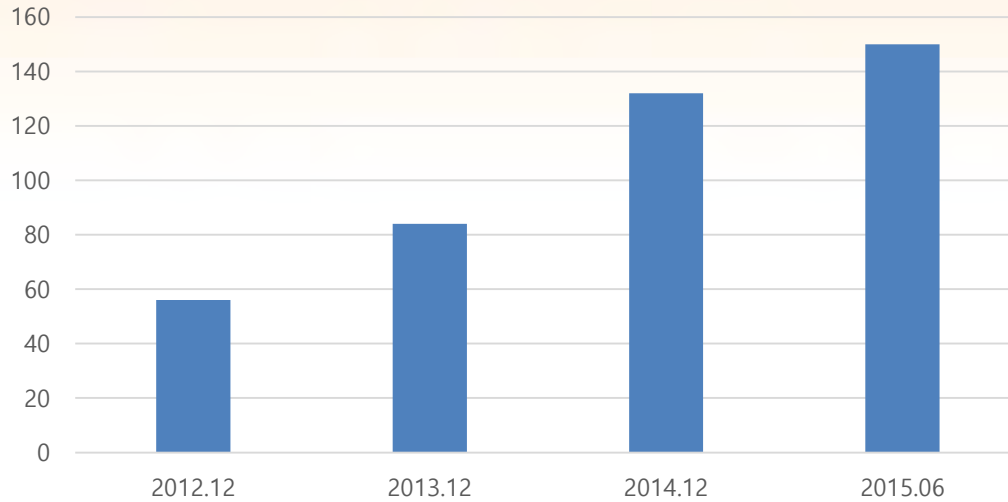


- **Period: ‘14~’20 (7 years)**
- **Budget: Up to 1.6 Trillion Won (US 1.5 Billion \$) joint investment by the government and private sector**

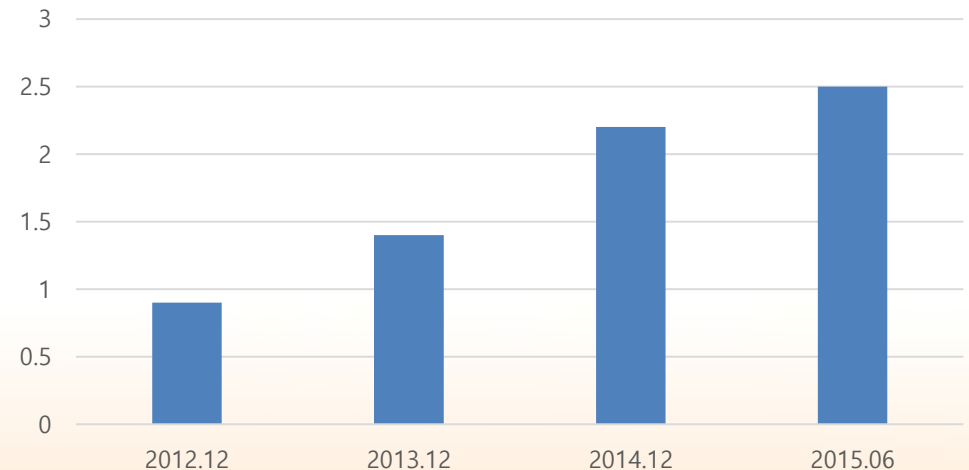


Wireless Communication: Mobile Traffic

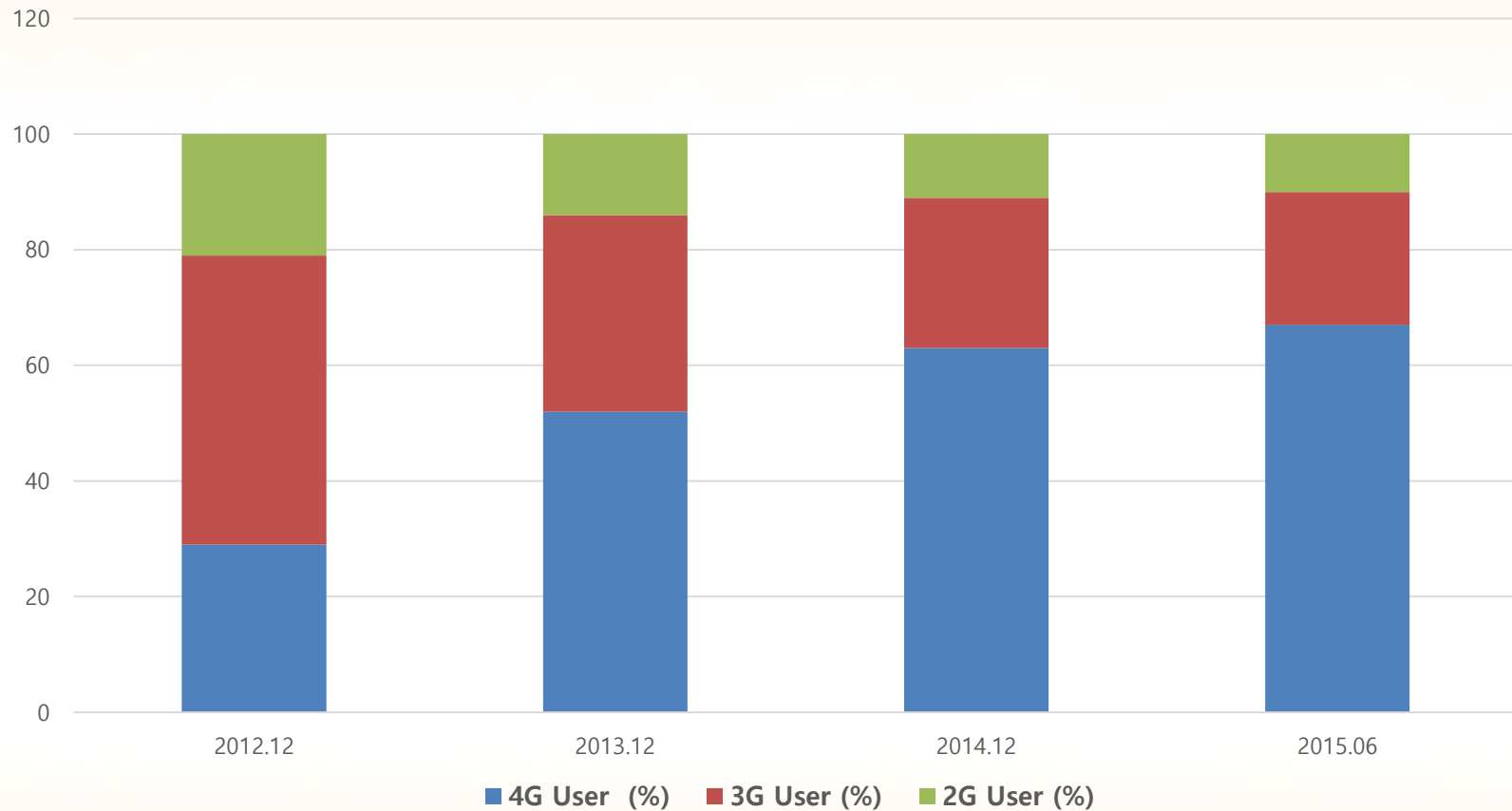
Total Monthly Traffic (PB)



Monthly Traffic/user (GB)

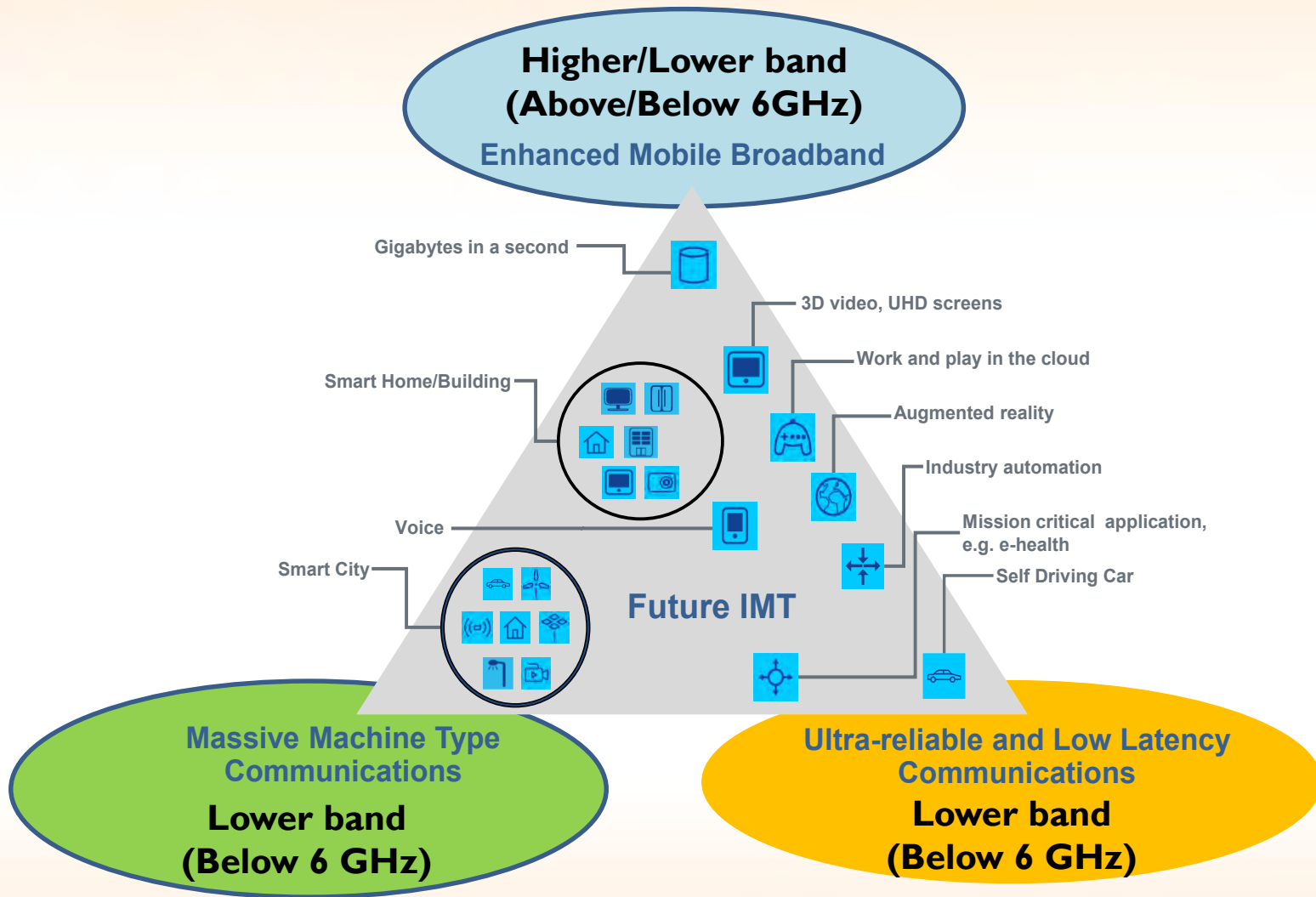


Wireless Communication: Systems

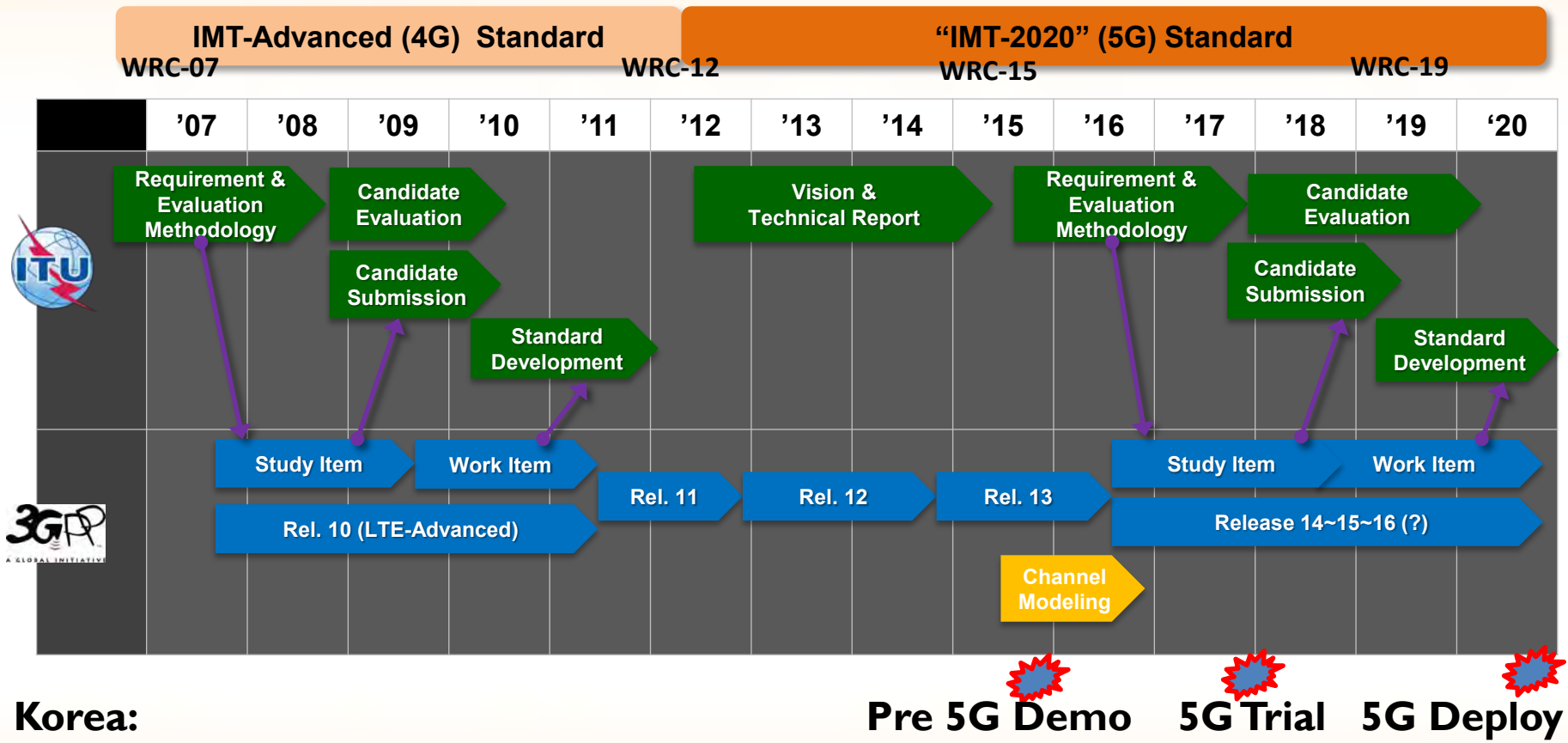


Source: Monthly Mobile Statistics, MSIP, Korea, 2015.8

5G Service impact on Spectrum



Schedule



Korea:

Pre 5G Demo 5G Trial 5G Deploy

5G Technology Visions

1 Gbps/user anytime anywhere
with hyper-connectivity in 2020s

Gigabit Anytime Anywhere



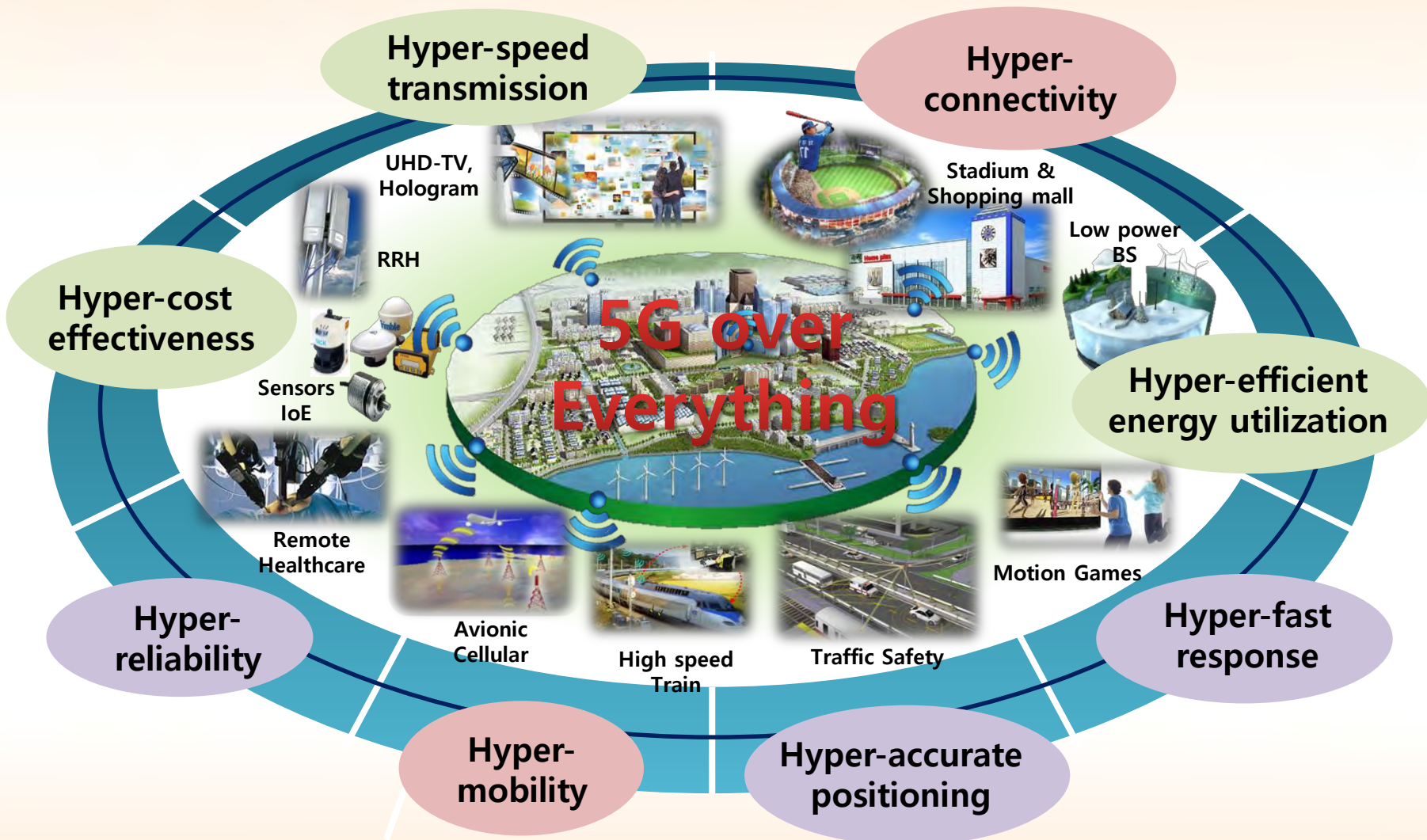
Pervasive Wireless



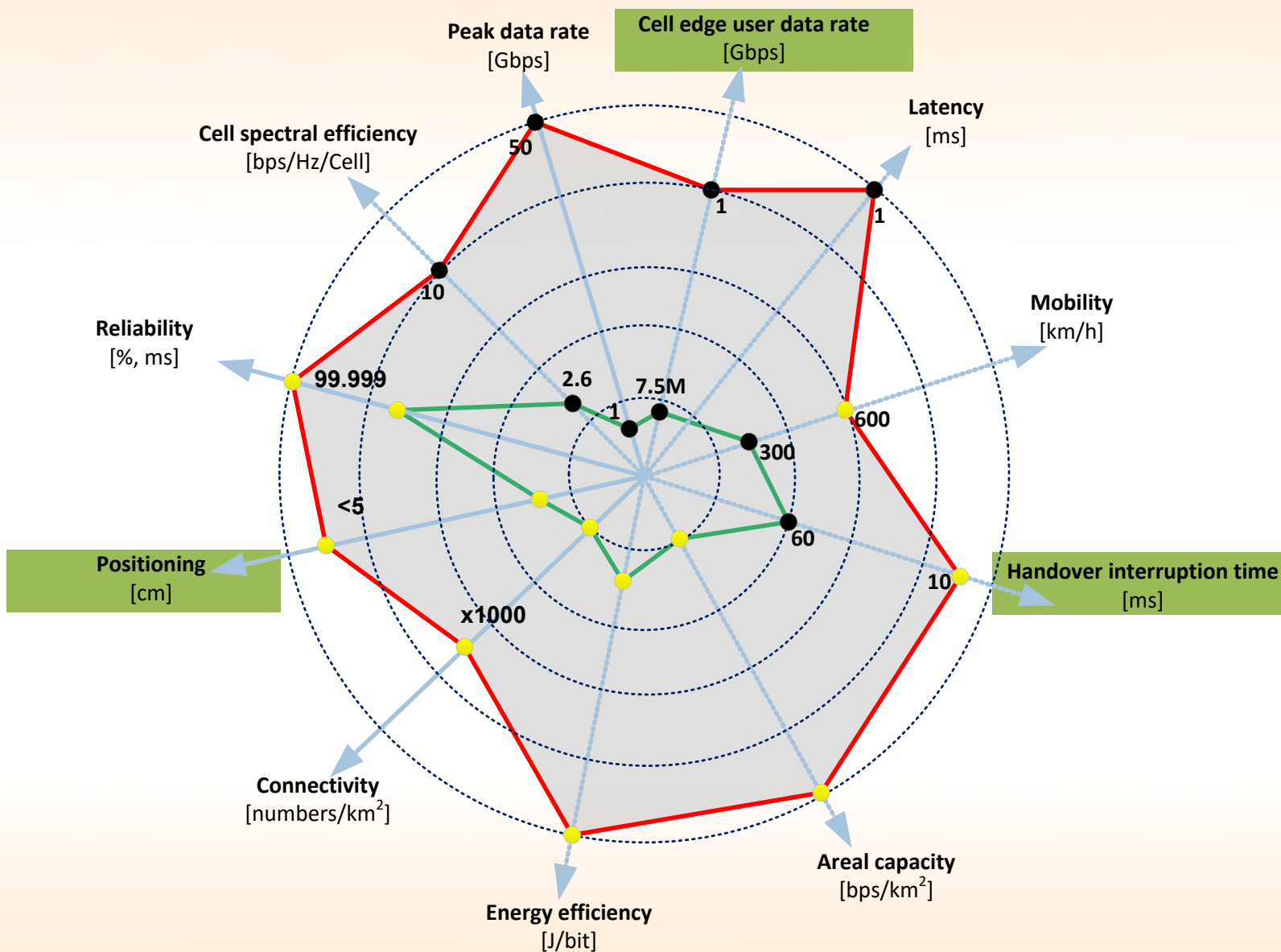
Realistic Experience



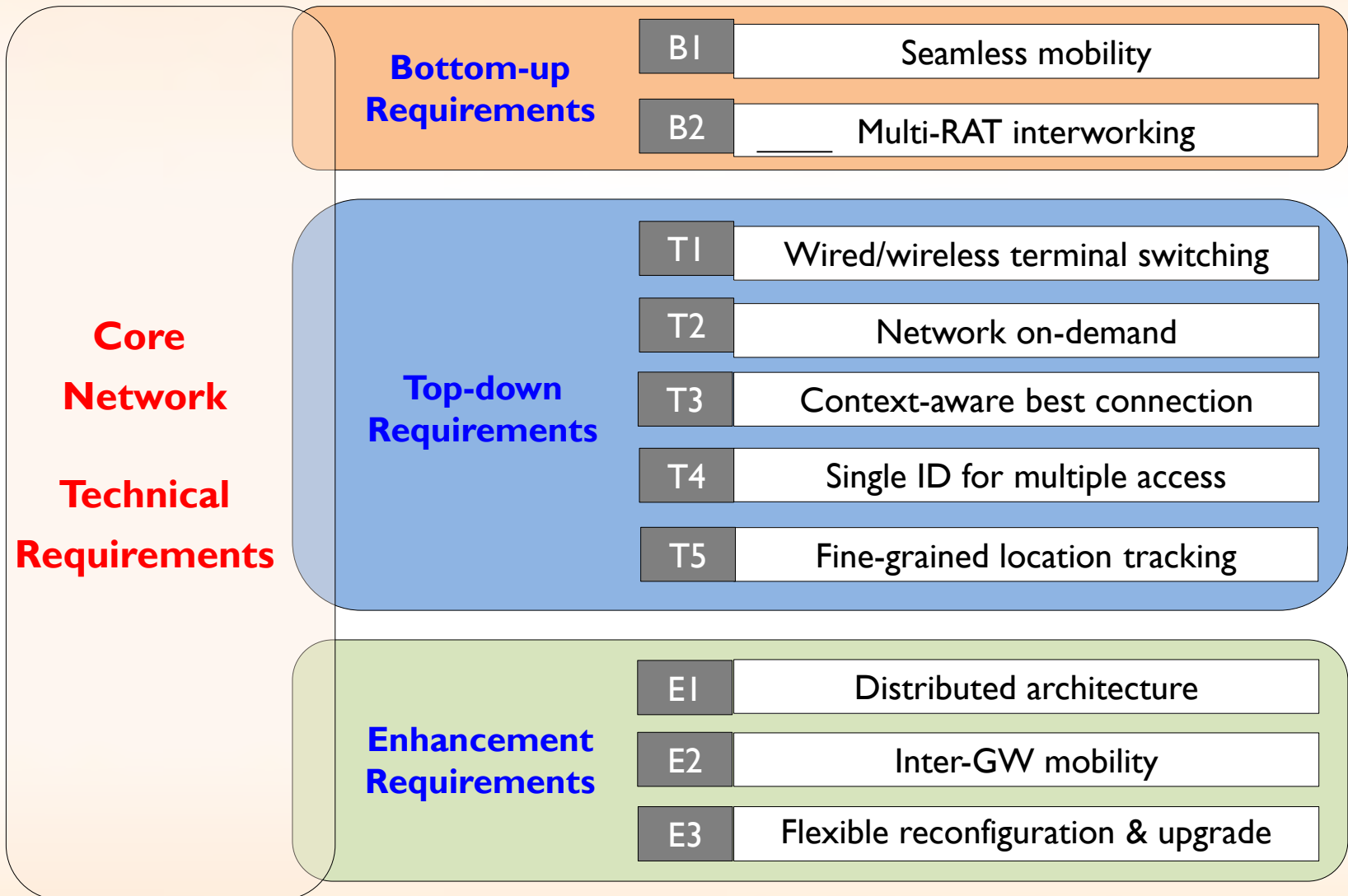
5G Service Requirements



Key Requirements



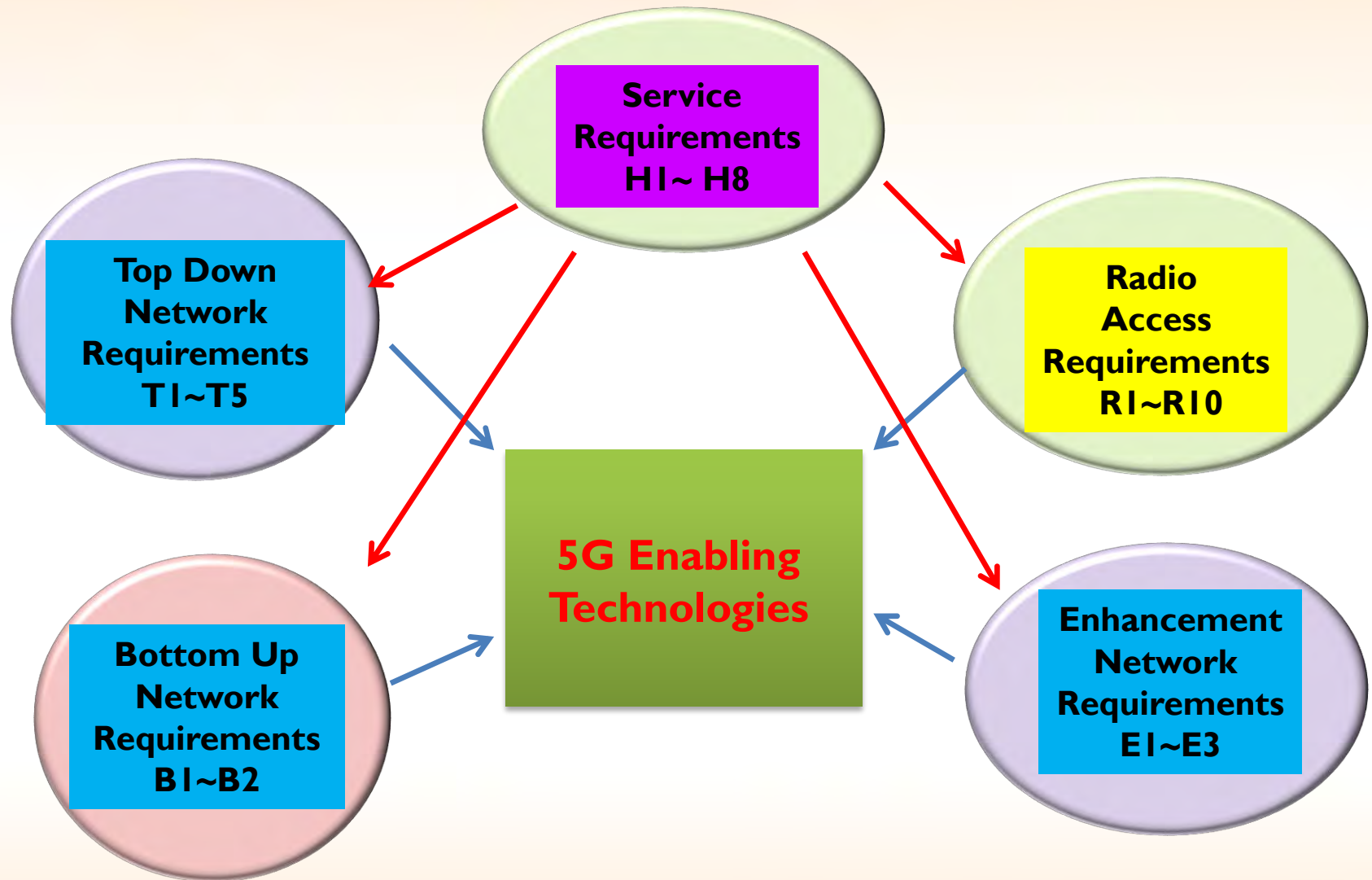
Technical Requirements: Core Network



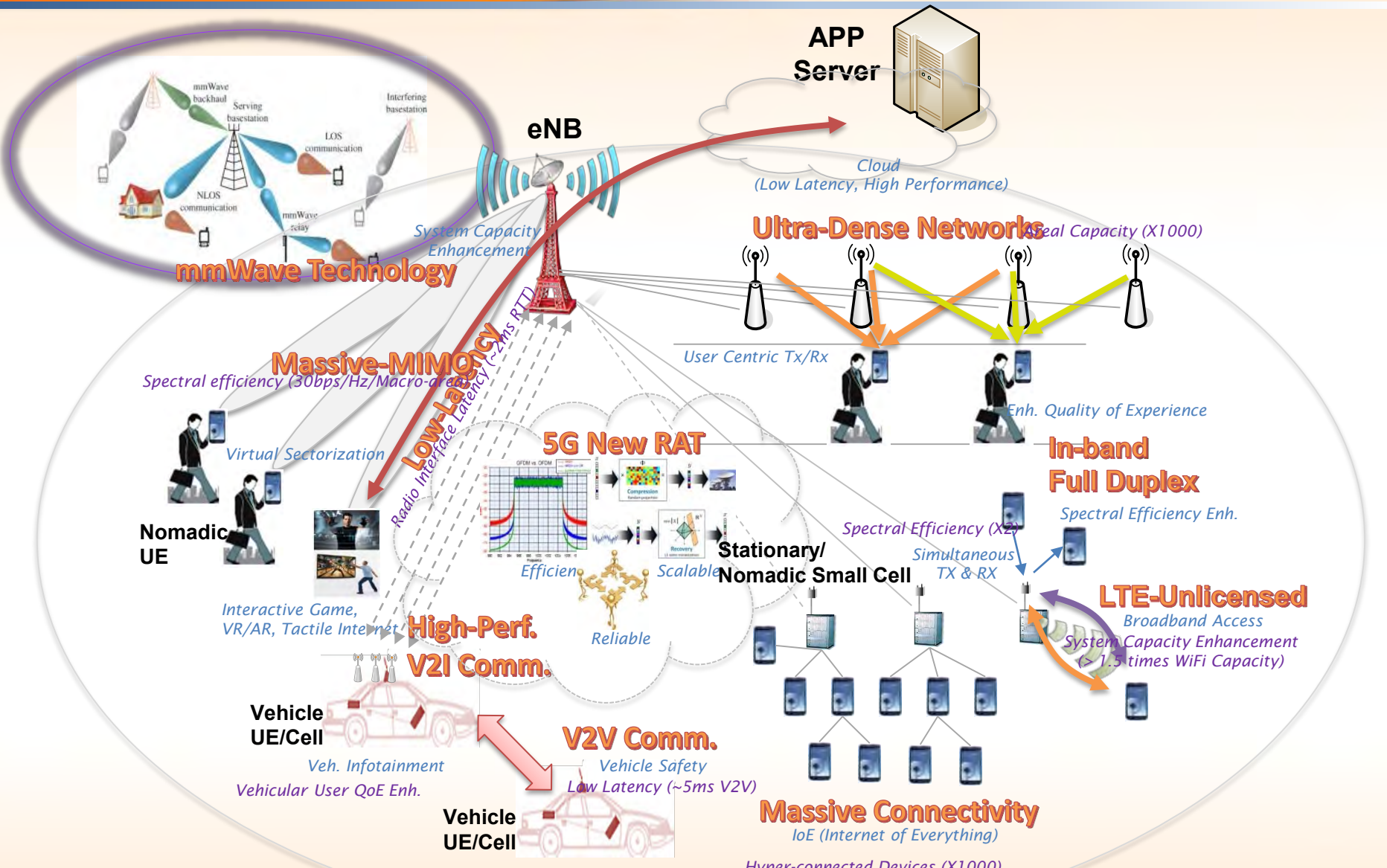
Technical Requirements: Radio Access

Index	Requirement	Value
R1	Cell spectral efficiency	DL: 10 bps/Hz/cell UL: 5 bps/Hz/cell
R2	Peak data rate	DL: 50 Gbps UL: 25 Gbps
R3	Cell edge user data rate	DL: 1 Gbps UL: 0.5 Gbps
R4	Latency	Control plane: 50 ms User plane: 1 ms
R5	Mobility	500 km/h
R6	Handover interruption time	10 ms
R7	Areal capacity	[TBD]
R8	Energy efficiency	[TBD]
R9	Connectivity	[1000 times]
R10	Positioning	[a few cm]

5G Requirements Derivation Flows



5G Enabling Technologies – Overview



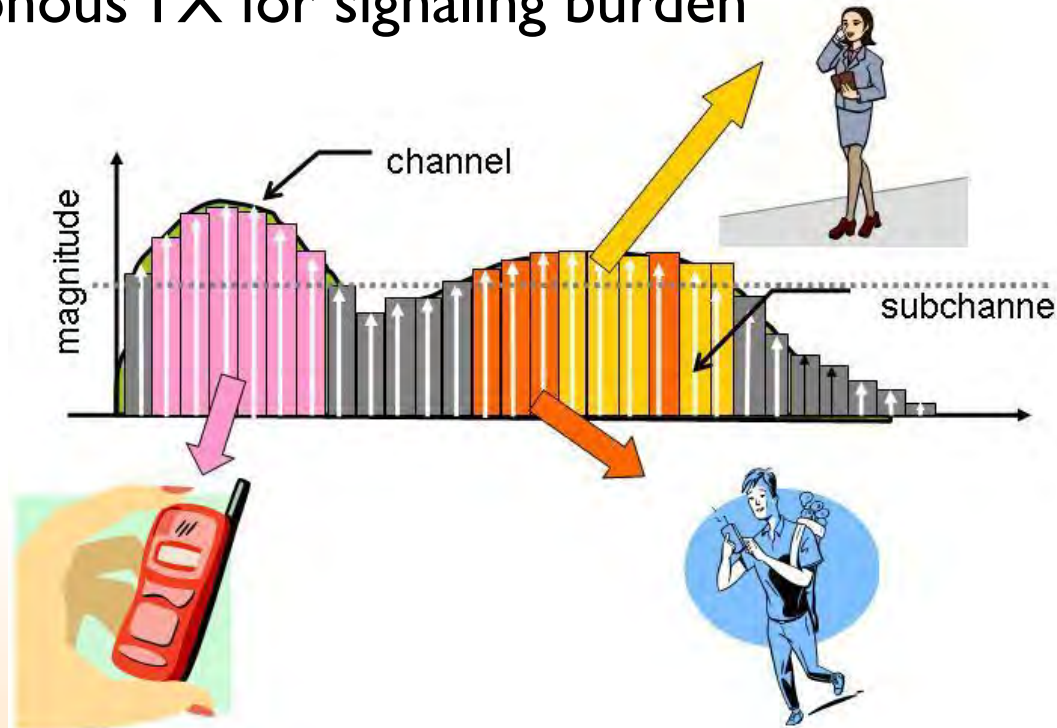
Source: ETRI

Enabling Technologies

- Capacity Enhancement
 - Massive MIMO
 - Beamforming
 - Fast beam switching
 - RLF Recovery
 - Beam Scheduling: Centralized/Distributed
 - Ultra Dense Network (UDN)
 - Licensed-Assisted Access
- Low Latency
 - Shorter TTI
 - V2X, V2V
- K3 Massive Connectivity
 - Cellular-based Massive Connectivity

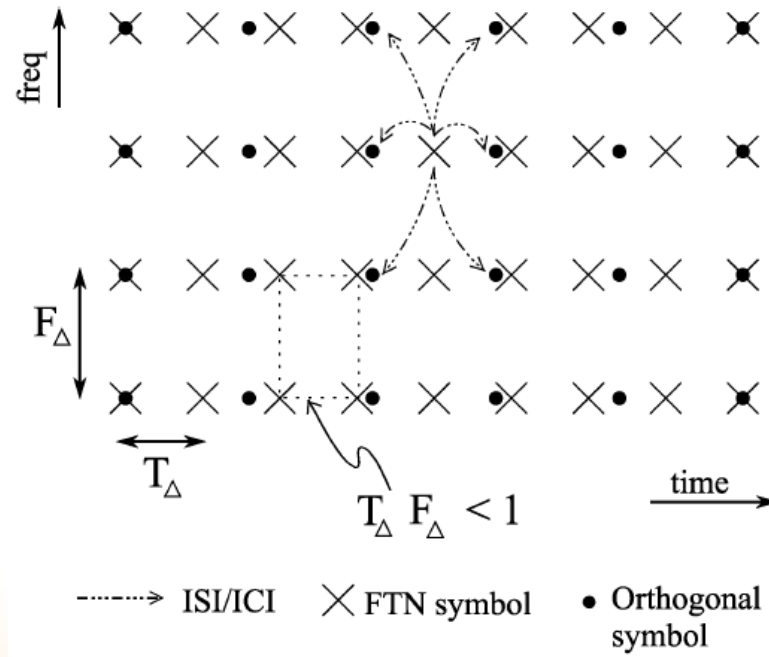
New RAT (I)

- Waveform Design for system requirement
 - Enhancements of OFDM
 - FBMC (Filter-bank Multi-carrier), UFMC (Universal Filter MC), and GFDM (Generalized Frequency Division Mux)
 - Adaptive filter design to system environment with Asynchronous TX for signaling burden



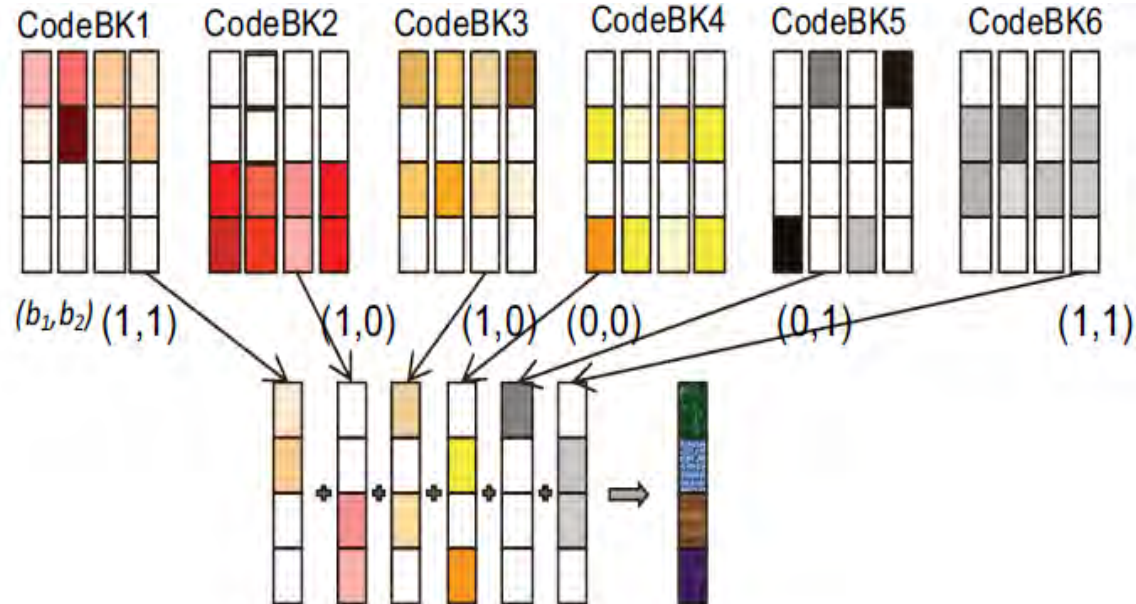
New RAT (II)

- Modulation/Coding for spectral efficiency
 - FTN (Faster Than Nyquist) receiver complexity reduction
 - Extension to MIMO application



New RAT (III)

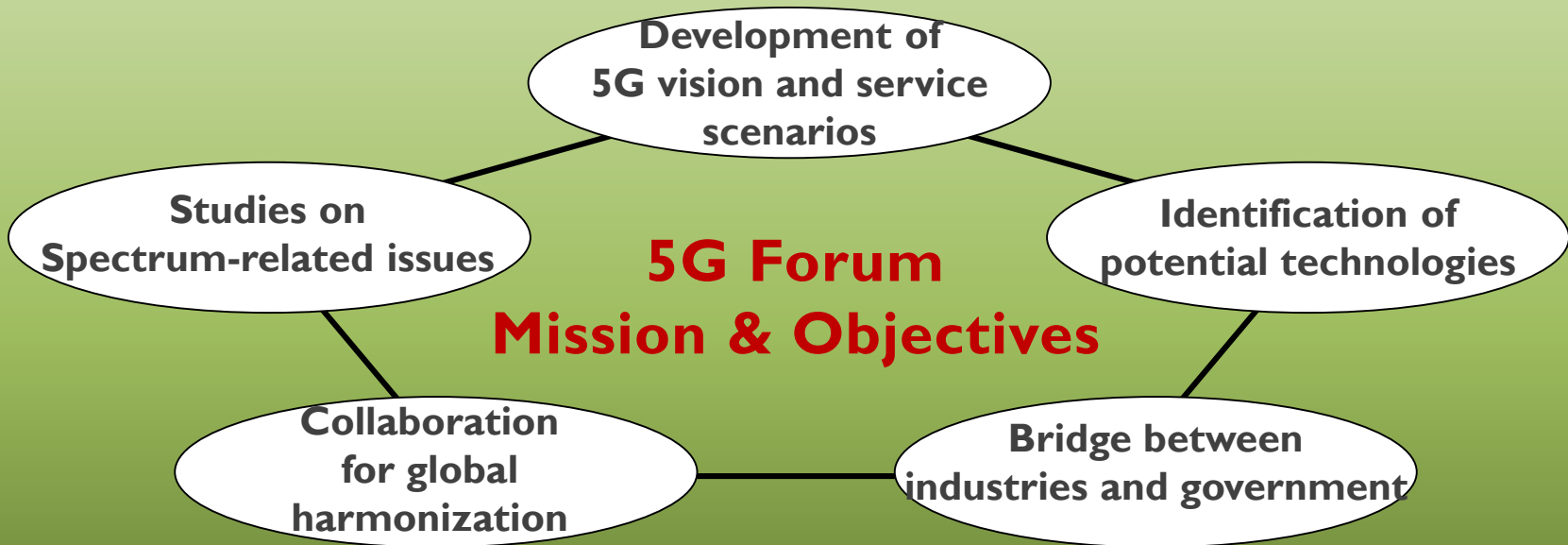
- SCMA (Sparse Code Multiple Access) codebook design
 - Flexible support of various use cases
 - Massive connectivity



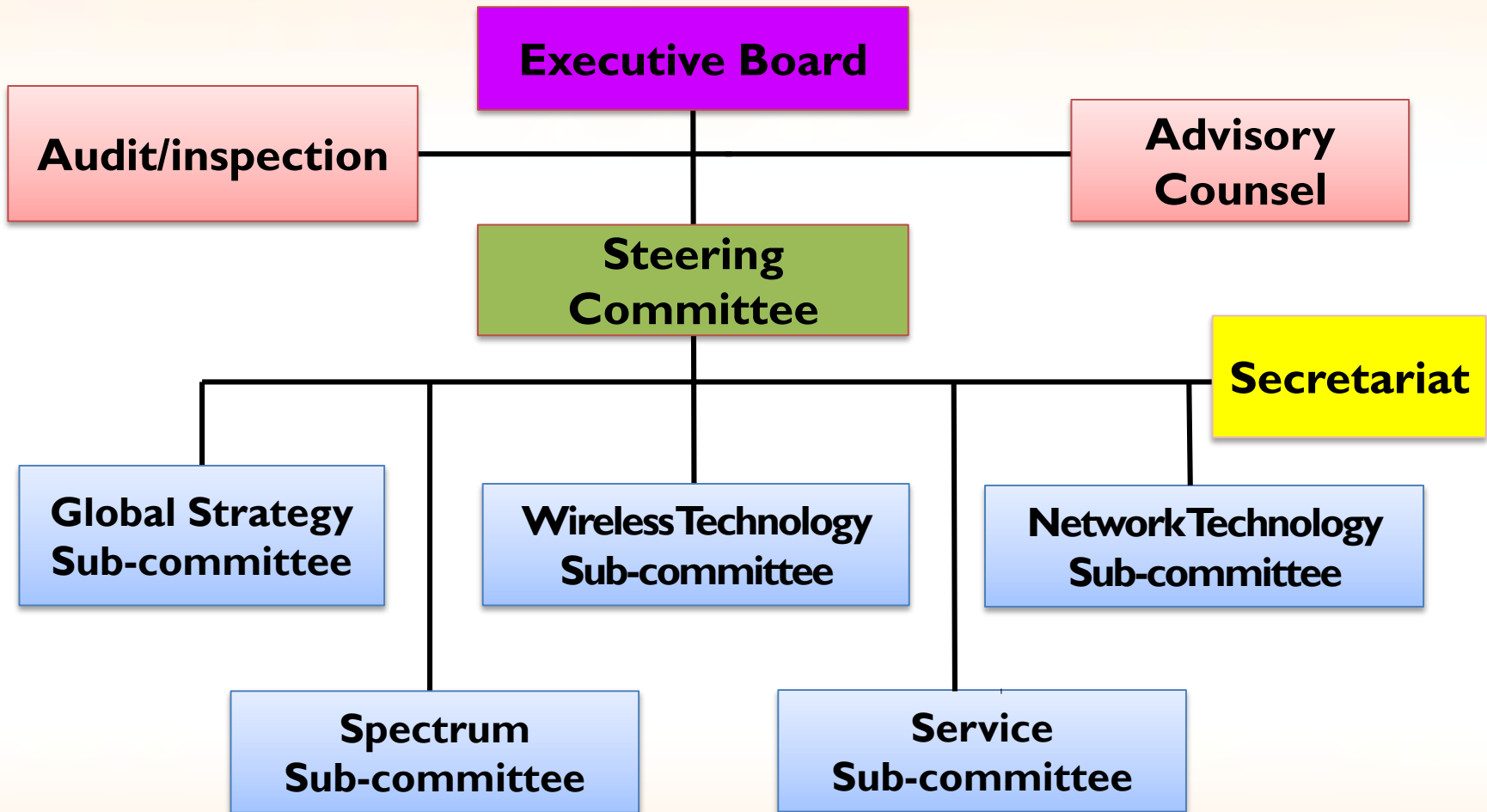
5G Forum in Korea

Global Leadership and Promotion in 5G Mobile Communication toward 2020

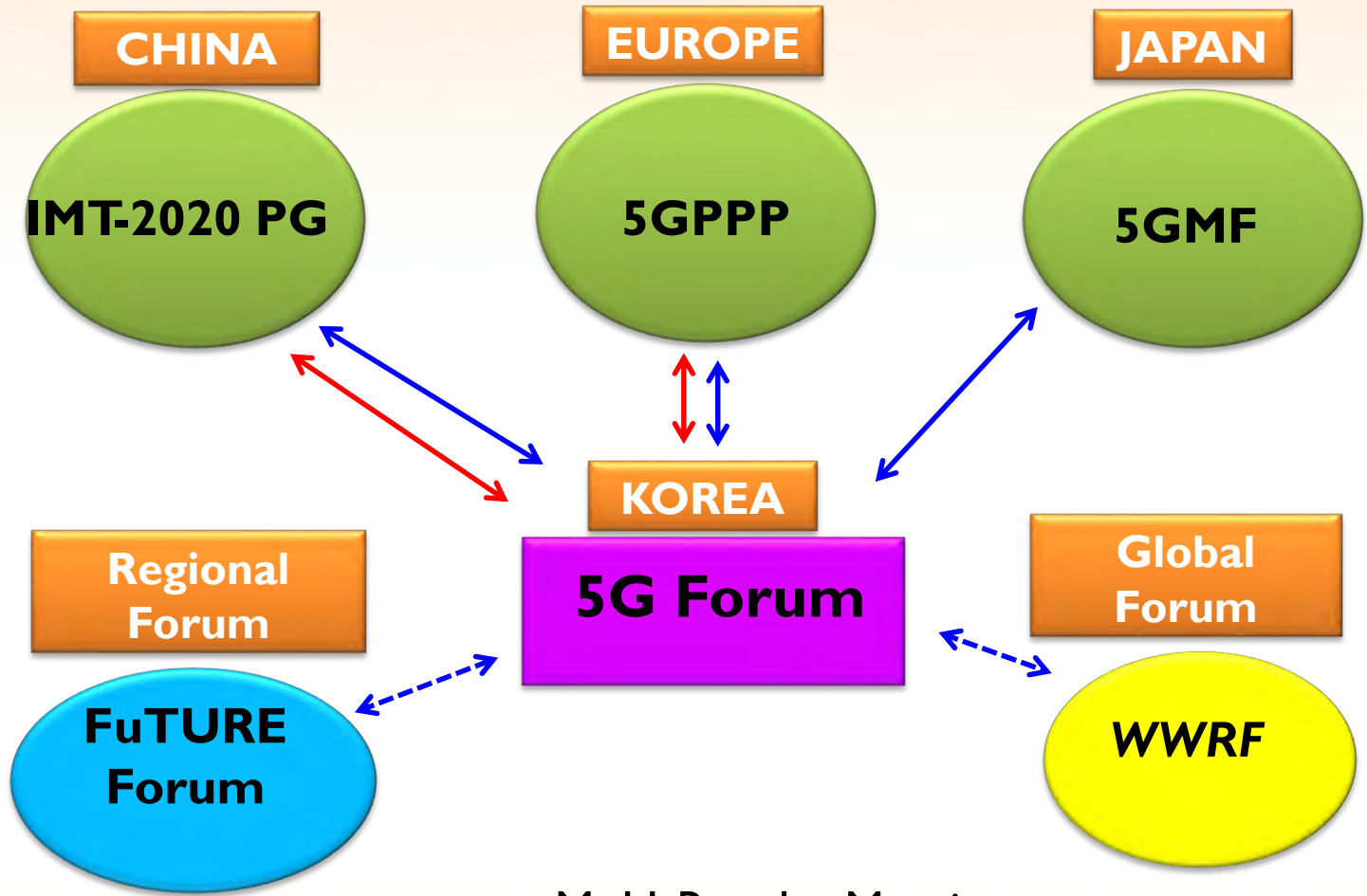
Private – Public Organization



Organization



Global Collaboration



- ↔ MoU, Regular Meetings
- ↔ Joint R&D
- ⋯ Discussions

Publications: 5G White Papers

**5G Vision,
Requirements &
Enabling
Technologies
(in English)**

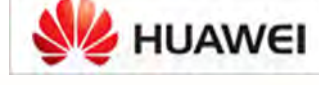
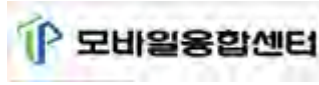
**5G Global
Collaborations
Toward 2020
(in Korean)**

**5G Spectrum
Requirements
(in English)**

**5G NEW WAVE
Towards Future
Societies in 2020
(in English)**

Members

- Industries: mobile network operators & manufacturers
- Research institutes and Public Organizations
- Global Players



Conclusions

- Driving forces
 - Market Demand
 - Communication with Vertical industries
 - Events
 - '18 Winter Olympic, '20 Summer Olympic
 - Technology
 - Wireless Technology : Exhausted
 - Breakthrough: destructive ?
- Global Collaboration for ICT Olympics

Thank You !!

