SWS-240014

6G Forum's View on IMT-2030 Use Cases

Namseok Ko, Ph.D.

Chair of Network Technology WG in 6G Forum

Director of ETRI

3GPP Stage 1 Workshop on IMT2030 Use Cases

Rotterdam, NL
08 - 10 May 2024

6G Forum

Establishment

A system to secure Global 6G Leadership

In line with the K-Network 2030 strategy of the Ministry of Science and ICT (May 30, 2023)

After 10 years of successful 5G Forum activities since its inception on May. 30, 2013.

- **A public-private cooperation system to build an industrial ecosystem foundation**
  - Establishment of a public-private joint 6G strategy to proactively respond to the rapidly changing mobile environment and secure global leadership
  - Promoting enhanced international cooperation with global 5G/6G-related organizations and supporting leadership in international standardization.
  - Support the identification of new services to accelerate the convergence of heterogeneous industries with 5G/6G

Vision & Target

> Support in expanding 5G into verticals & achieving global leadership in 6G

5G Evolution

5G Expansion into Verticals (~Y2026)

5G

Building a Platform for Expanding 5G **into Verticals**

Showcasing Exemplary Cases of 5G Verticals

B5G/6G Revolution

Achieving Global 6G Leadership (~Y2030)

Global Cooperation System Set-up for 6G

World Best Communication Support for 6G

6G

Experience and Lessons from 5G Commercialization

→ Accelerate Innovation in 6G

Organization

Advisory, Executive, 9 Technical Committees (9 WGs) + 2 Teams

General Assembly

BoG

Sang-Yup Lee
(CTO, LGU+)

Co-Chair

Chang-Seok Seo (Senior Executive Vice President, KT)
Jung-Hwan Ryu (Vice President, SKT)
Jun-hee Lee (Vice President, Samsung Electronics)
Byung-hoon Kim (Vice President, LG Electronics)
Hyung-jun Koo (Vice President, Samsung SDS
Hannes Ekström (CEO, Ericsson LG)
Duk-Yong Kim (CEO, KMW)
Yongsoon Baek (Senior Vice President, ETRI)
Youngsoo Kwak, (CEO, Innowireless)

Advisory Counsel

Wonki Min
(Chairman,
Stage Five ESG Committee)

Auditor

Dongku Kim
(Professor,
Yonsei University)

KyungHi Chang
(Professor,
Inha University)

Executive Committee

Strategy/Global Team

Seung-Hwan Lee
(Assistant Vice President,
ETRI)

Secretariat

Functional

6G Tech.
- CN WG
- RAN WG

Young-Jo Ko
(Director,
ETRI)

Service
- Big Data/AI WG

Howon Lee
(Professor,
Hankyung Univ.)

Spectrum

Seung-Hoon Hwang
(Professor,
Dongguk Univ.)

Hyper-space

Moon-Sik Lee
(Assistant Vice
President, ETRI)

Ecosystem
- Small Cell WG
- Test & Certi. WG

Dongjoo Park
(Professor,
Dankook Univ.)

Vertical

NG Mobility
- UAM WG
- Traffic Eff. WG

Duk Kyung Kim
(Professor,
Inha Univ.)

Smart City

Jae-Hyun Kim
(Professor,
Ajou Univ.)

Smart Manuf.

Kyusoon Hwang
(Director,
Wizcore)

Public Srvc.
- Open Platform WG
- Network Security WG

Kyung-ju Lee
(Executive Director,
NIA)

Members

Domestic Telcos, Vendors, Solution Providers, SMEs, Gov. Agencies & Global Companies (Total 47 companies)

Chair Companies (10)

LG U+, SK telecom, kt, SAMSUNG, LG전자, ERICSSON LG, KMW, ETRI 한국전자통신연구원, Innowireless, SAMSUNG SDS

Member Companies (37)

ktl 한국산업기술시험원 Korea Testing Laboratory, DGTP 대구테크노파크, GERI 구미전자정보기술원, NIA 한국지능정보사회진흥원, KETI Korea Electronics Technology Institute, HUAWEI, Qualcomm, intel, NOKIA, VIAVI, KEYSIGHT TECHNOLOGIES, ITL Innovative Technology Lab 주식회사 아이티엘, Contela 콘텔라(주), WILUS, EUCAST, iTtelecom, RANiX, HFR,Inc. for Mobile Internet, KIAN TELECOM, FRTek Fiber Radio Technologies, soom 숨비, ettifos Connected-in-Motion, MetaCamp, WIZCORE, CRANGTEK, MORAI, 아이페이지온, CS corporation, GDIN GLOBAL DIGITAL INNOVATION NETWORK, PANTECH C&I ENGINEERING, funzin, Total Wings, KTC 한국기계전기전자시험연구원, RAPA 한국전파진흥협회 Korea Radio Promotion Association, ROHDE&SCHWARZ, SOLiD, NETLOX

Activities by Number

- USA : 5G Americas, Next G Alliance
- China : IMT-2020, IMT-2030
- Japan : 5GMF
- Taiwan : 5G Alliance-CHT Pilot Team
- EU : 5G PPP, UK 5G IN, WWRF
  5G ACIA, 5G AA, 6G-IA , one6G
- Turkiye : 5GTR
- Indonesia : i5G Forum
- India : TSDSI
- Malaysia : MTSFB
- GSMA

Global Coop.
(MoU +)

20

- Executive Committee
- Advisory Committee
- Strategy/International Collaboration Team
- 9 Technical Committees
- 9 Working Groups (WGs)

Committee/WG Meetings

110 (Year Av.)

- Global 5G Events: 10
- 5G Vertical Summit: 8
- Regional Workshops: 7
- 6G Global Events: 4
- 5G Open Symposiums: 9

Promotion

38

Member Companies

47

- Chairs : 10
  LGU+(Chair Company), SKT, KT, Samsung Electronics, LG Electronics,
  Ericsson LG, KMW, ETRI, Innowireless, Samsung SDS
- SMEs : 23
- Gov. : 7
- Global : 7

White Paper / Issue Report

64

- White Paper : 46
  - ✓ 5G and its ecosystem, smart factories, autonomous driving, smart cities, disaster safety, dedicated networks, small cells, fronthaul, OpenRAN, UAM, converged services, etc.
- Issue Report : 16
  - ✓ wireless technology and frequency trends, V2X, vertical service standard trends, dedicated networks, network power efficiency, enterprise 5G wireless trends, etc.
- 6G Report : 6G Vision, 6G FTT

Projects & Policy Supports

41

- Projects
  - ✓ TTA ICT Standardization Forum Support Program: 10 years
  - ✓ Study on 5G Smart City Convergence Technologies.
  - ✓ Study on 5G Smart Factories and Convergence Services.
  - ✓ Study on Open 5G Fronthaul and Small Cell Technologies.
  - ✓ Study on 5G Private Networks and 5G+ Convergence Services
- Policy Supports
  - ✓ 5G/5G+ Strategy and Working Committees
  - ✓ Support for 5G Convergence Service Pilot Projects
  - ✓ 6G R&D Strategy Committee
  - ✓ Advisory Activities on C-ITS Technology and Demo

6G Vision & Use Cases

6G FORUM

6G Vision

Advancing Human Happiness, Prosperity, and Sustainability through 6G Technology

CLEAN & SAFE SOCIETY

SUSTAINABLE SOCIETY

FAIR & TRANSPARENT SOCIETY

Social Vision

- Delivery of Truly Immersive Experience
- Distributed Infrastructure for Connected Intelligence
- Real-time Interaction between Physical and Digital Worlds

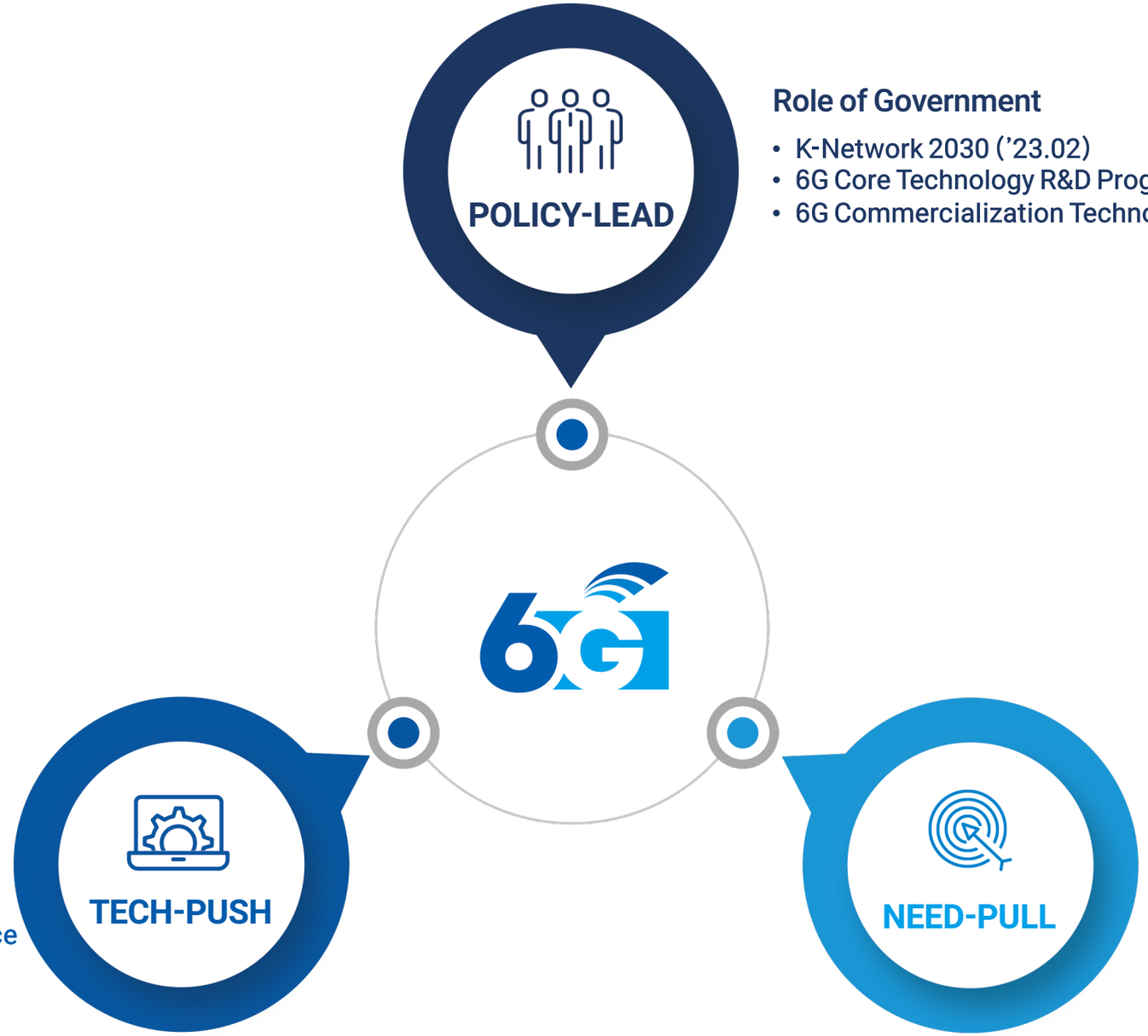
Technical Vision

FUTURE 6G SOCIETY

PERSON • HOUSEHOLD • CITY • COUNTRY • EXTENDED SPACE

EDUCATION	LABOR	HEALTH & WELFARE	TRANSPORT	CULTURE & ARTS	SAFETY
Provisioning equal educational opportunities	Resolving the solidification of the working classes	Bridging the medical gap between classes	Relieving traffic congestion & concentration	Bridging the gap in cultural consumption level	Coping with human-made and natural disasters

Three Drivers of 6G



Role of Government

- K-Network 2030 ('23.02)
- 6G Core Technology R&D Program('21~'25)
- 6G Commercialization Technology R&D Program('24~'28)

Technological Advancement

- Coverage and network topology beyond cellular
- New spectrum and antenna, and new radio technologies
- Native AI for Connected Intelligence

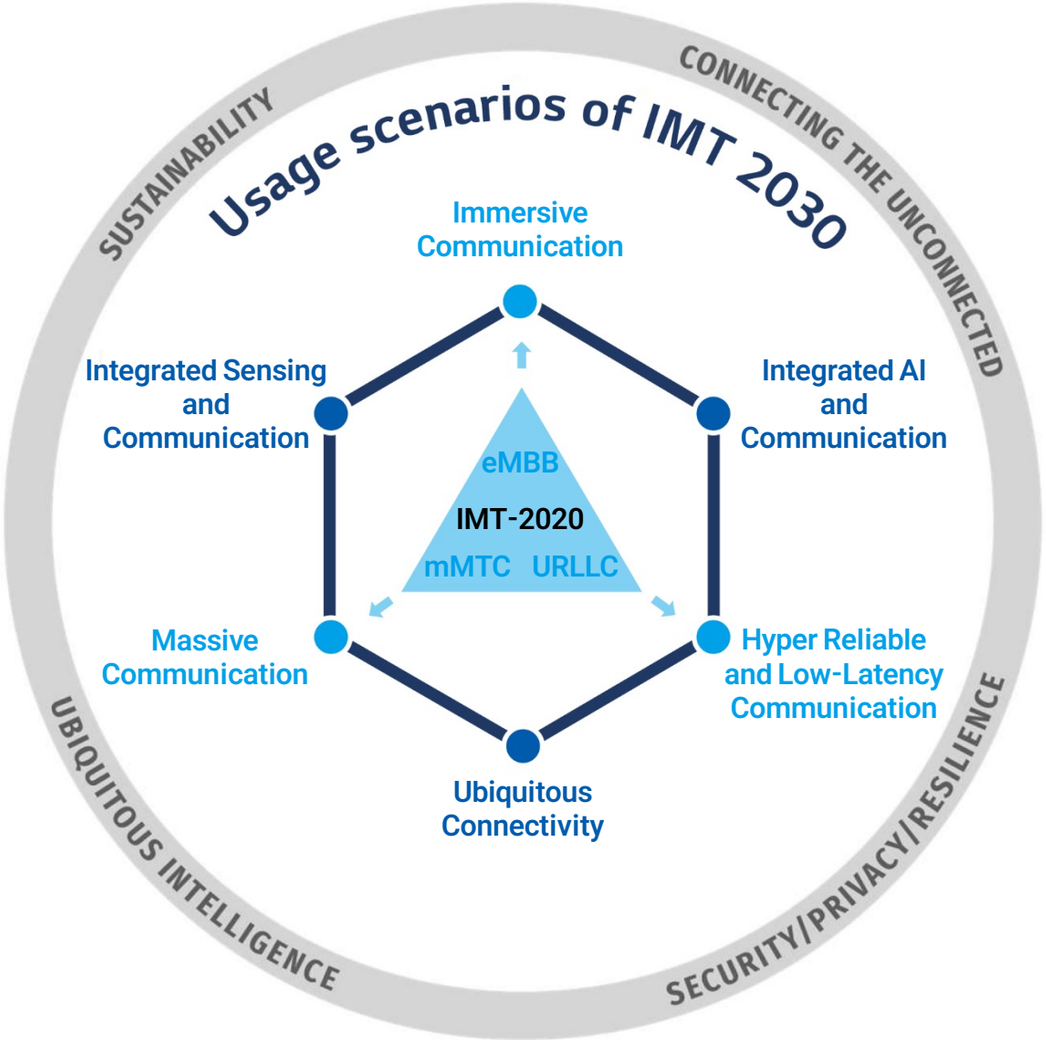
Societal Requirement

- Clean and safe society
- Sustainable society
- Fair and transparent society

Usage Scenarios

The usage scenarios from ITU-R's Framework of IMT-2030

Extension from 5G usage scenarios	eMBB → Immersive Communication URLLC → HRLLC (Hyper Reliable and Low-Latency Communication) mMTC → Massive Communication
New usage scenarios	Ubiquitous Connectivity Integrated AI and Communication Integrated Sensing and Communication
4 overarching aspects: design Principles for scenarios	Sustainability Connecting the unconnected Ubiquitous intelligence Security, Privacy, Resilience



Immersive Communication

- **Extension of the eMBB for rich and interactive immersive experience**

Use Cases

- **Telepresence & Holographic communications**
  - ✓ Remote collaboration, education
  - ✓ Social interaction
- **Remote multi-sensory telepresence**
- **Hyper-realistic metaverse**
  - ✓ Immersive gaming and entertainment
  - ✓ Industrial training & maintenance
- **Remote healthcare - telesurgery**

Capabilities

- **Enhanced spectrum efficiency**
- **Higher data rates**
- **High reliability**
- **Low latency**

Massive Communication

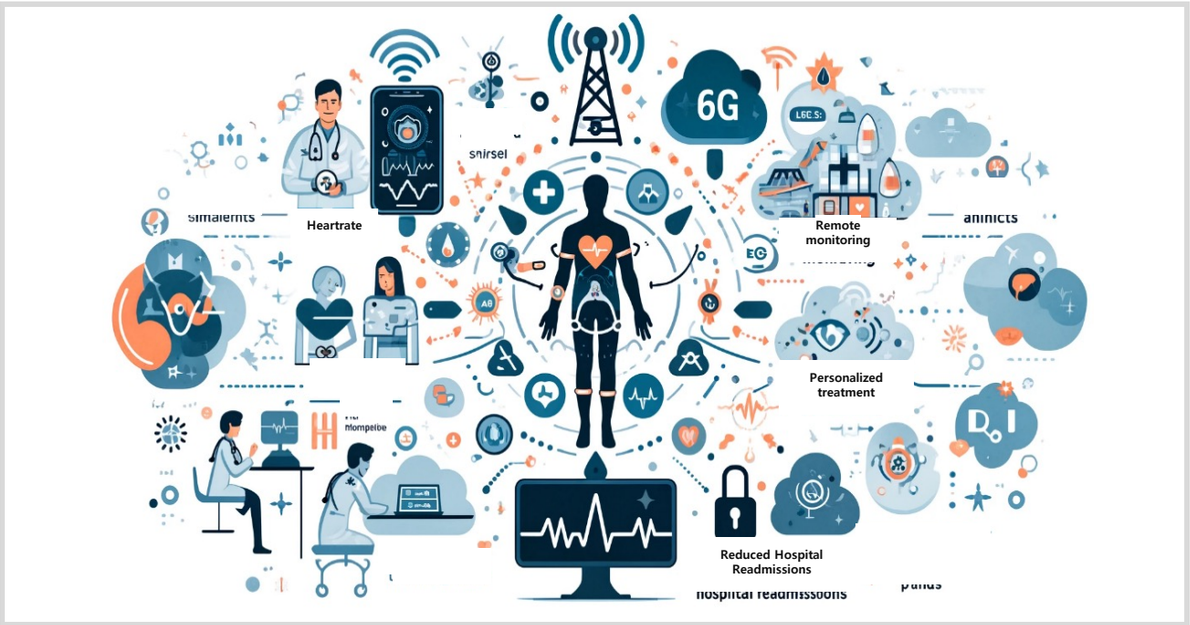
- **Extension of the mMTC to support connectivity of a huge number of devices**

Use Cases

- **Massive Internet of Things**
  - ✓ Industrial automation and monitoring
  - ✓ Smart cities and infrastructure
  - ✓ Precision Agriculture
  - ✓ Smart manufacturing and logistics
- **Metaverse**
- **Ubiquitous personal connectivity**

Capabilities

- **High connection density**
- **Low power consumption**
- **Mobility**
- **Extended coverage**
- **High security and reliability**



Hyper Reliable & Low-Latency Communication

- **Extending the boundary of URLLC by covering more stringent requirements on reliability and latency**

Use Cases

- **Industry and automation**
  - ✓ Collaborative robots (Cobots)
  - ✓ Precision manufacturing
- **Healthcare**
  - ✓ Tele-surgery
  - ✓ Remote diagnostics and monitoring
- **Fully autonomous driving**
- **XR and Tactile Internet**

Capabilities

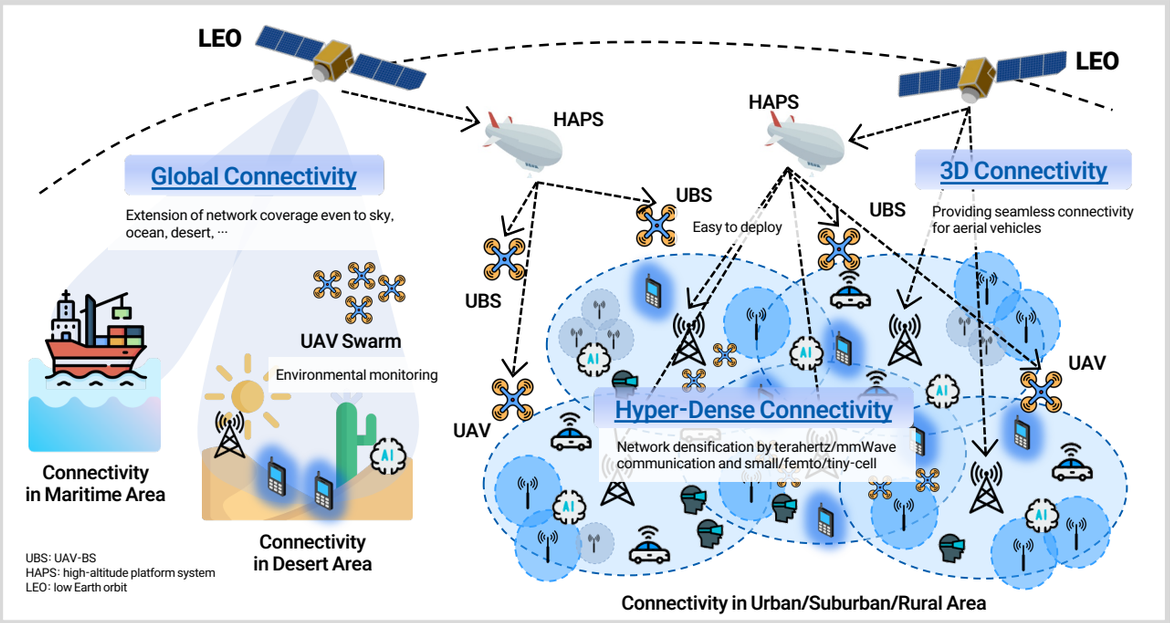
- **Enhanced reliability**
- **Enhanced low latency**
- **Precise positioning**
- **Connection density**

Ubiquitous Connectivity

To enhance connectivity to bridge the digital divide

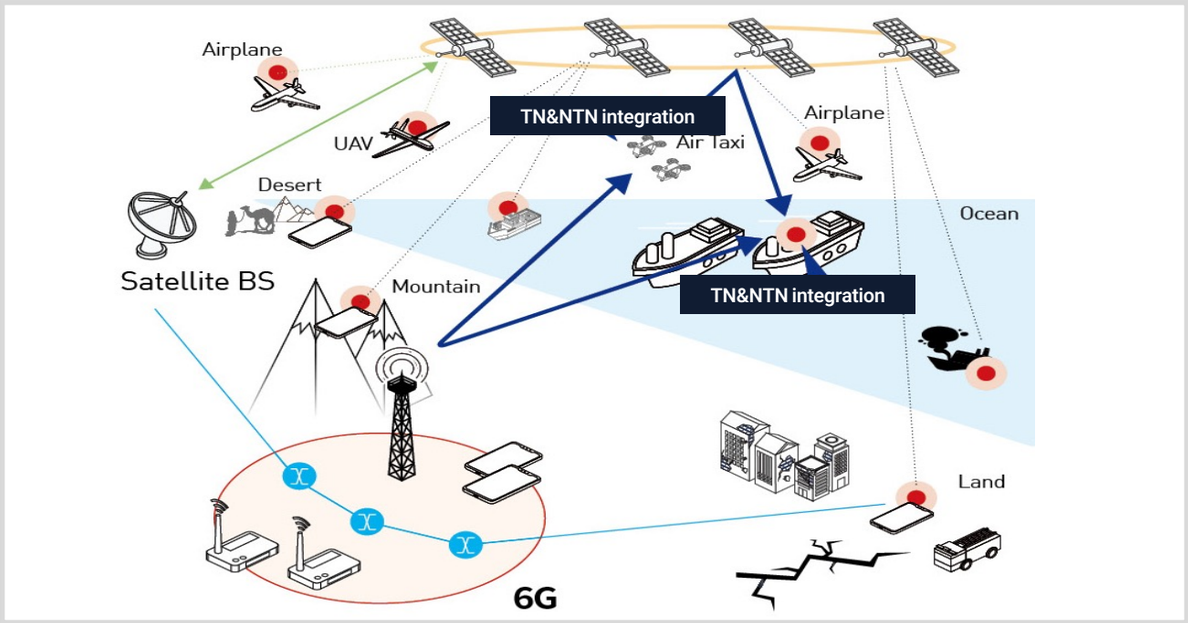
Use Cases

- **Global Internet connectivity**
  - ✓ Remote and underserved areas
  - ✓ Seamless rural coverage – smart agriculture, education, ···
  - ✓ Aerial node connectivity, e.g., UAM, etc.
- **IoT networks**
  - ✓ Smart cities
  - ✓ Environmental monitoring, etc.



Capabilities

- **TN & NTN Integration**
- **New spectrum and frequency bands**
- **RIS**
- **AI/ML**



Integrated AI and Communication

- To support distributed computing and AI (especially LLM) applications

Use Cases

- Autonomous collaboration between connected AI robots (smart city, manufacturing plant, rescue missions, etc.)
- Offloading of heavy computation operations across devices and networks
- 6G-assisted automated driving

Capabilities

- High area traffic capacity
- Low latency and high reliability
- Capabilities related to the integration of AI and compute functionalities in 6G
  - ✓ Data acquisition, processing, model training, sharing, etc.

Integrated Sensing and Communication

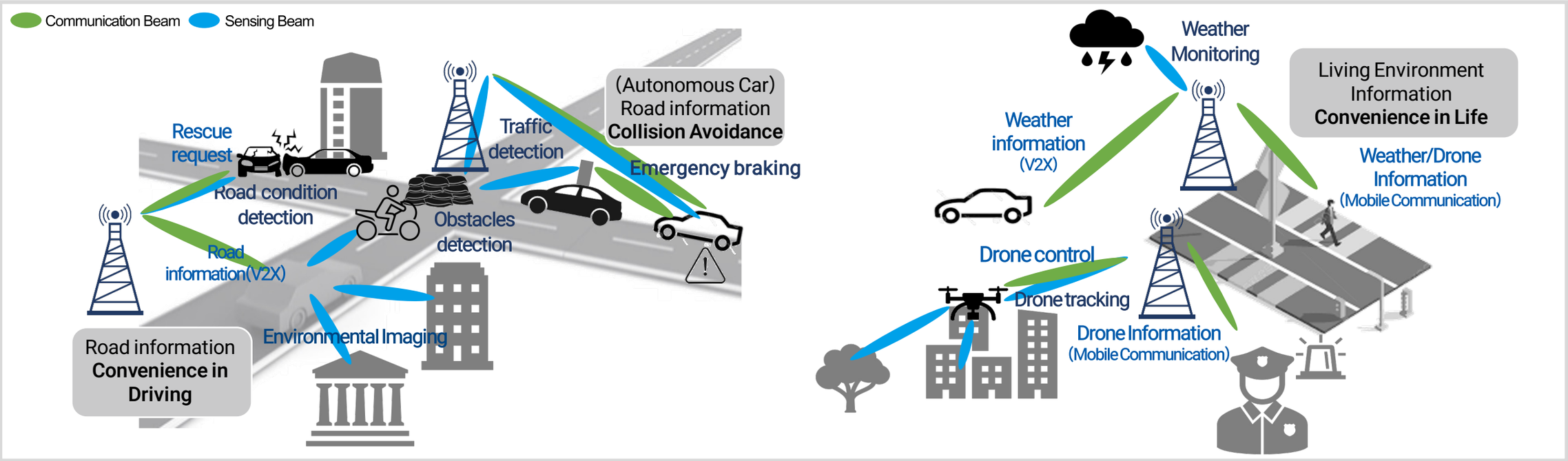
- To offer new possibilities for smart applications, enabling enhanced sensing capabilities, efficient resource utilization

Use Cases

- 6G-assisted navigation
- Environmental monitoring (e.g. rain/pollution detection)
- Object detection and tracking
- Motion monitoring

Capabilities

- Sensing-enabled communications
- Data fusion for distributed sensing
- Multi-modal sensing
- Intelligent sensing and communication coexistence

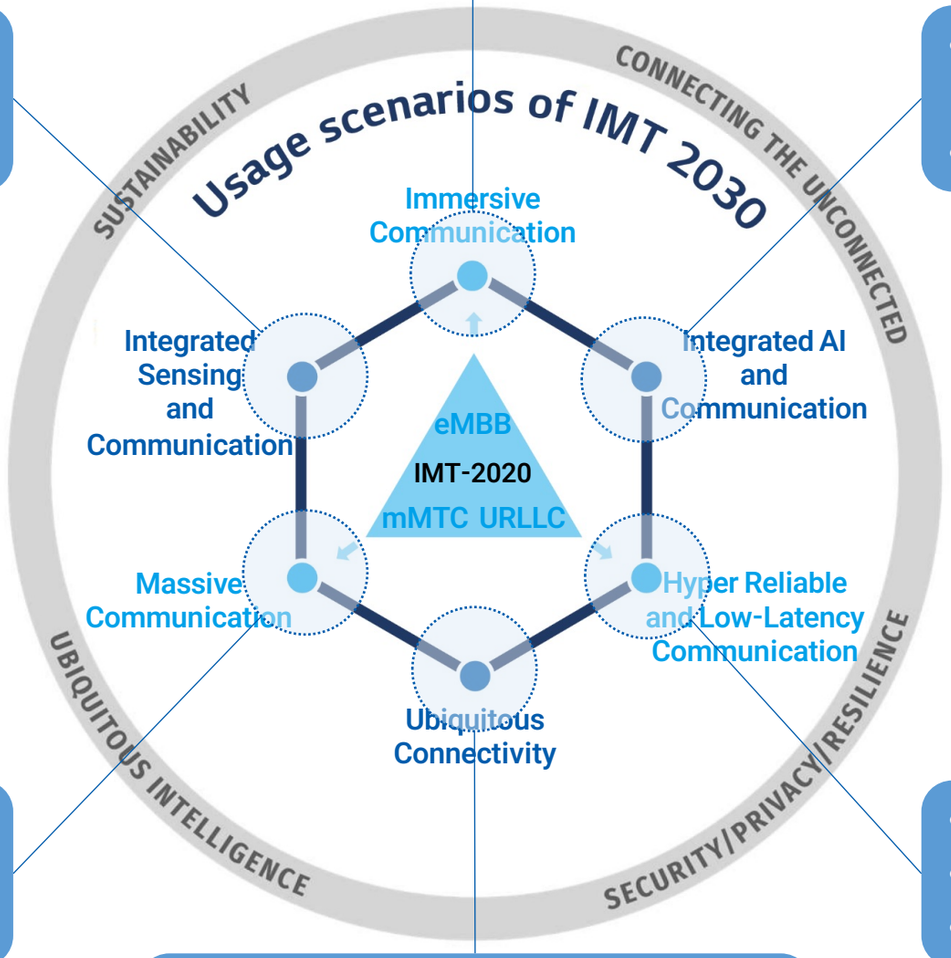


6G Day-1 Use Cases

- Hyper-realistic metaverse

- 6G-assisted navigation
- Environmental monitoring

- Autonomous collaboration between connected AI robots
- Automated driving



- Smart cities
- Transportation, Agriculture
- Supply Chain Management

- Industrial control and operation
- Fully autonomous driving
- Remote tele-surgery

- Non-terrestrial networks
- Air mobility, e.g., UAM
- IoT networks, e.g., smart city

6G Regional Specific Use Case

- **Korea's rapid entry into super-aging society（Elderly over 65：>30.1% in 2035, >43% in 2050）**

Increased need to pursue welfare and safety for the elderly

→ Realization of the elderly care service utilizing 6G Sensing & AI

6G Sensing

- Health & Behaviors monitoring

6G AI & robot mobility

- Connected AI robots
- AI/LLM-based health diagnosis/prescription

6G Day-1 R&D in Korea

6G FORUM

R&D Direction in Korea

To overcome the limitations of 5G reflecting the future technology trends

Advanced Wireless Technology
- Upper Mid-Band
- Coverage Expansion

SW-Centric, Network Evolution
- Open-RAN
- Cloud-Native
- AI-Native

Beyond Communication
- Computing + Communications
- Sensing + Communications

Energy-Saving Technologies
- AI Low-Power Technology
- Energy Efficient Low-Power Components

Supply Chain Enhancement
- UE/Base Station Components
- Optical Comm. Devices & Components

6G Commercialization Technology R&D Program launched (USD 327m, 2024-2028)

6G Day-1 R&D Direction in Korea

11 Strategic technologies across 4 Major Sectors

4 Major Sectors	11 Strategic Technologies
01 RAN	① E-MIMO systems
	② E-MIMO base station component
	③ 6G upper mid-band terminal component
	④ 6G coverage expansion
02 Mobile Core Network	⑤ Mobile core network architecture and framework
	⑥ AI-Native mobile core network automation/optimization
03 Wired Network	⑦ 6G Fronthaul optical link and transmission system
	⑧ Integrated wireless and wired optical system
	⑨ 6G networking transmission component
04 System	⑩ End-to-end service performance assurance framework
	⑪ 6G system supporting AI-Native application services

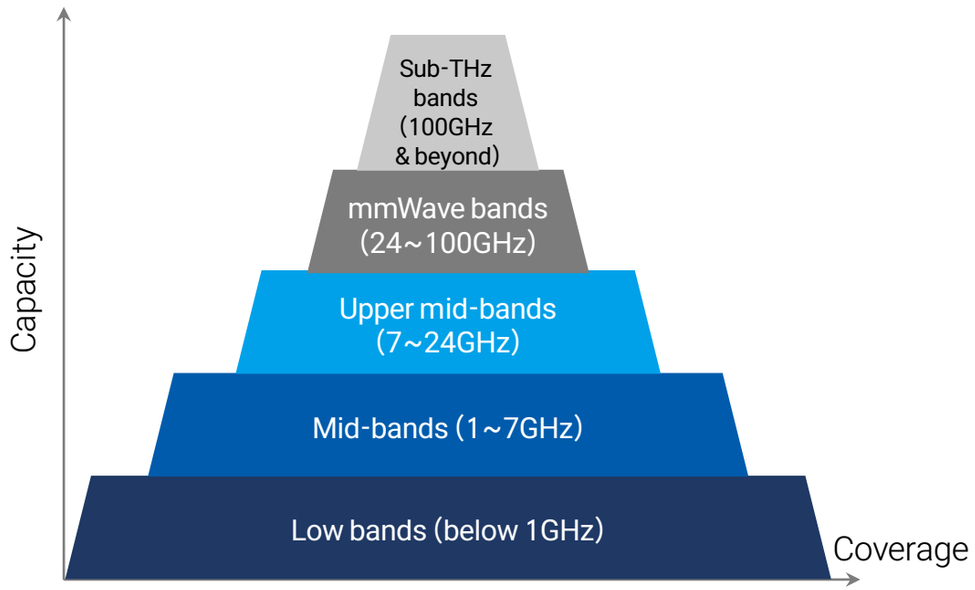
Sustainability (Low power consumption Security Reliability)

6G Spectrum

More diverse usage scenarios -> more spectrum & layered approach

Mobile Communication Integrated into the whole industry

- High Band (mmWave + Sub-THz) → Sensing & Ultra Capacity
- Upper Mid-Band (7-24GHz) → Coverage & Extreme Capacity
- Mid Band (1-7GHz) → Coverage & Capacity
- Low Band (below 1GHz) → Extended Coverage

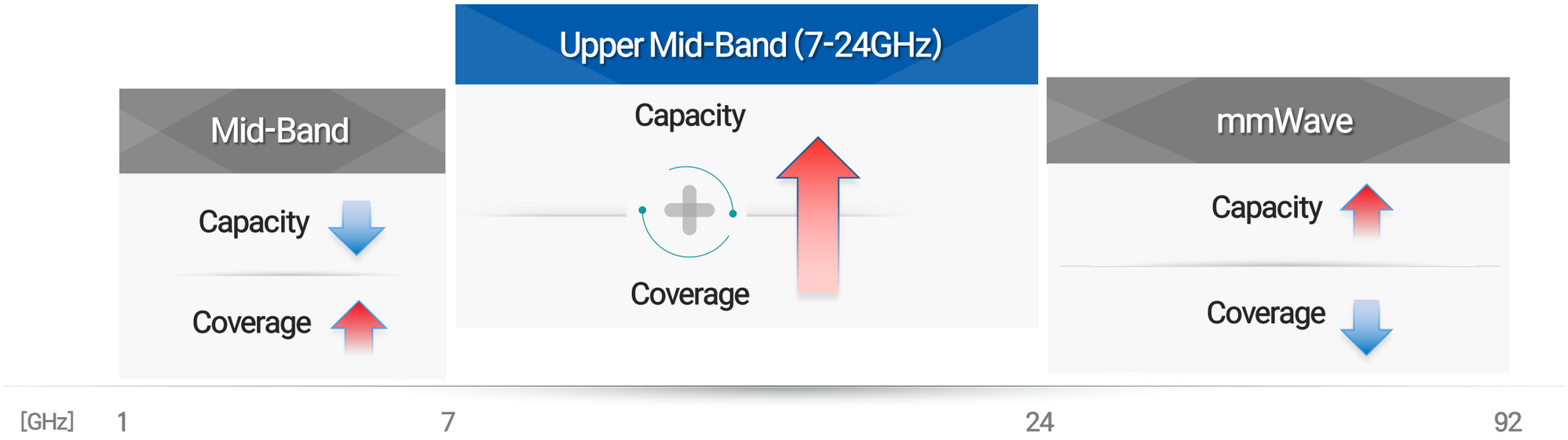


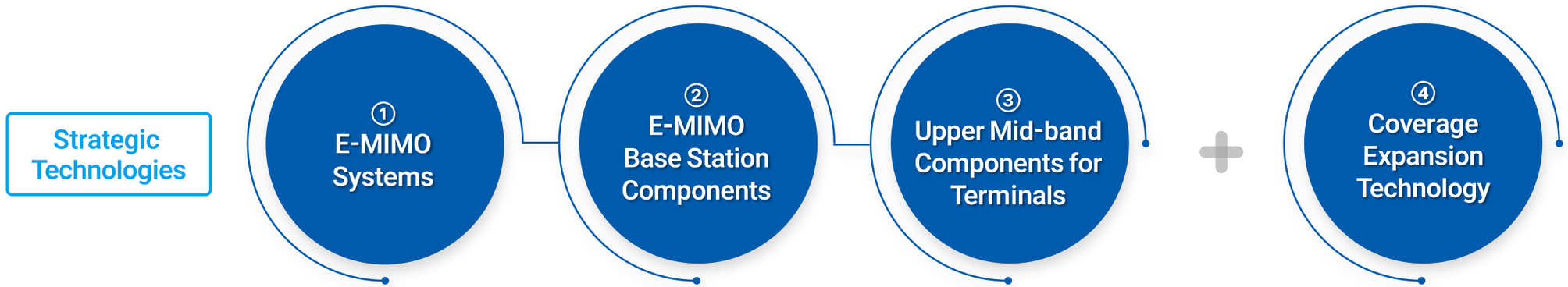
- KOREA 6G Candidate Upper Mid band | 7.125 ~ 8.4, 12.75 ~ 13.25, 14.8 ~ 15.35GHz
- APT view | 7.125 ~ 15.35GHz for IMT spectrum in WRC-23
- Wider Channel Bandwidth | 400MHz in the Upper Mid Band
- Spectrum Technology
  - 4G: Carrier Aggregation
  - 5G: Dual Connectivity
  - 6G: Advanced Duplex

APT: Asia-Pacific Telecommunity

Upper-mid Band Spectrum (7-24 GHz)

Extreme MIMO and coverage expansion (RIS, NCR, advanced duplex, etc.) technologies in Upper-mid band



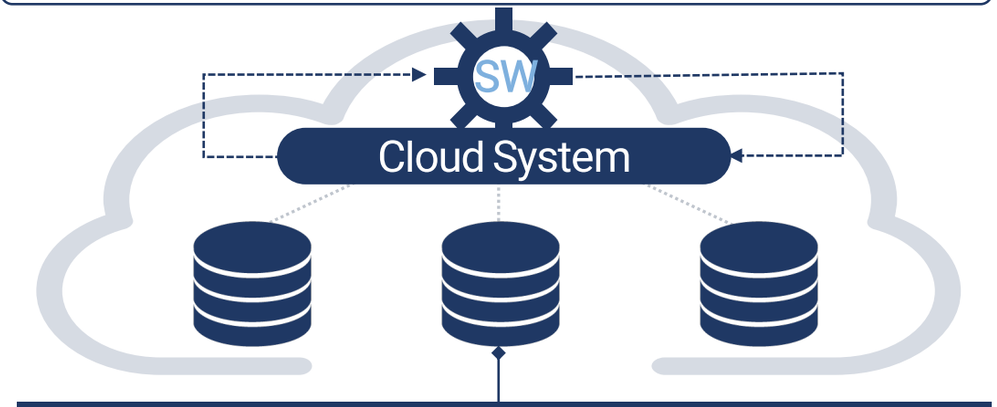


Cloud-native & AI-native Mobile Network

Cloud-Native CN Technologies, AI-Native RAN & CN Technologies

Cloud-Native

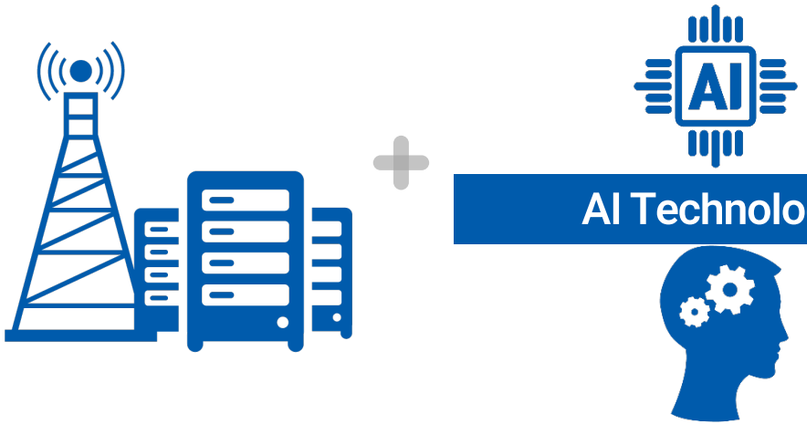
Virtual + Autonomous + Modular + Lightweight



Mobile CN

AI-Native

AI Semiconductor



AI Technology

RAN + Mobile CN

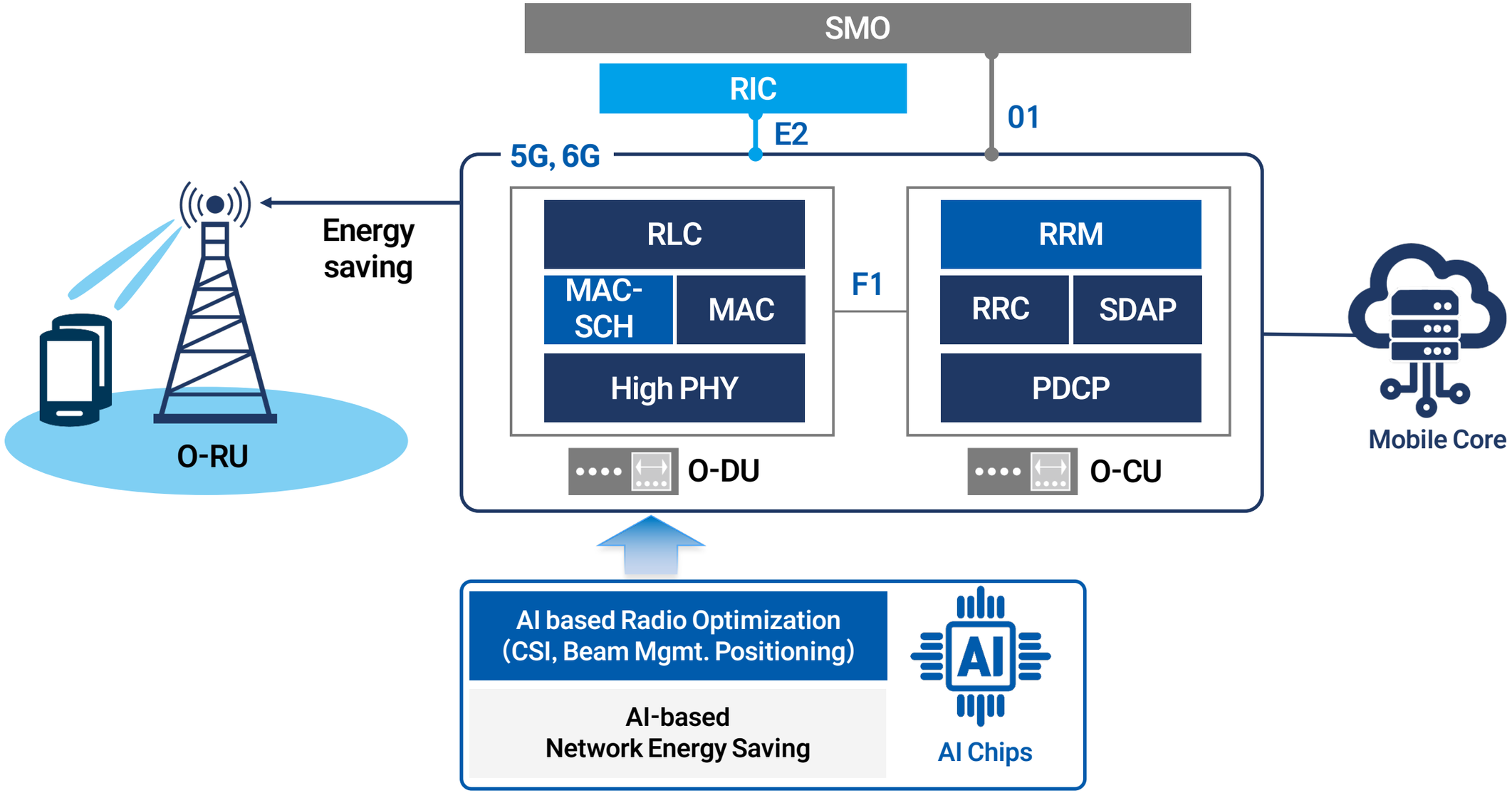
Strategic Technologies

⑤ Cloud-native CN

⑥ AI-Native 6G RAN & CN

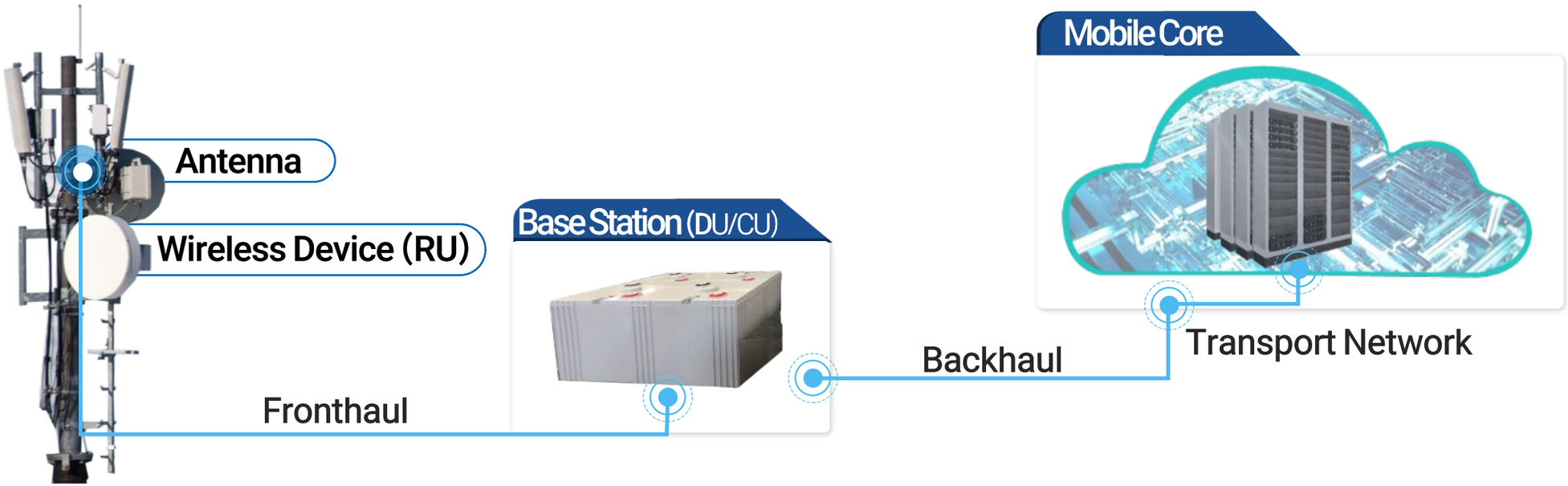
AI-based Energy Efficient Network

- AI-based RAN technologies for energy saving and radio resource optimization of RAN



Wired Network

Ultra-high Speed/Capacity Optical Transmission System & Component Tech. for 6G Front/Back-haul



Strategic Technologies

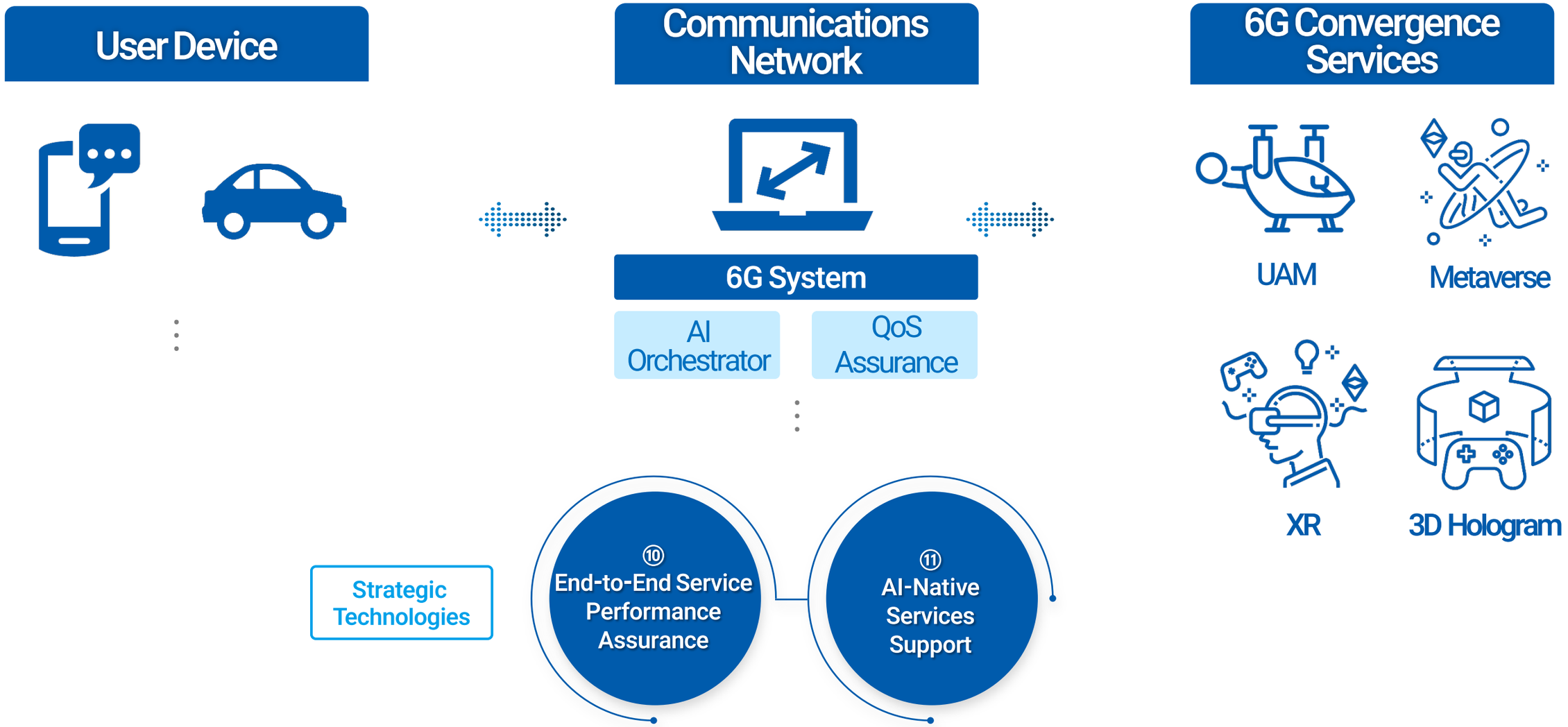
⑦ 6G Fronthaul Optical Link & Optical Transmission System

⑧ Integrated Wireless & Wired Optical Access System & Components

⑨ 6G Transport Network Equipment & Components

Orchestration & Management Systems

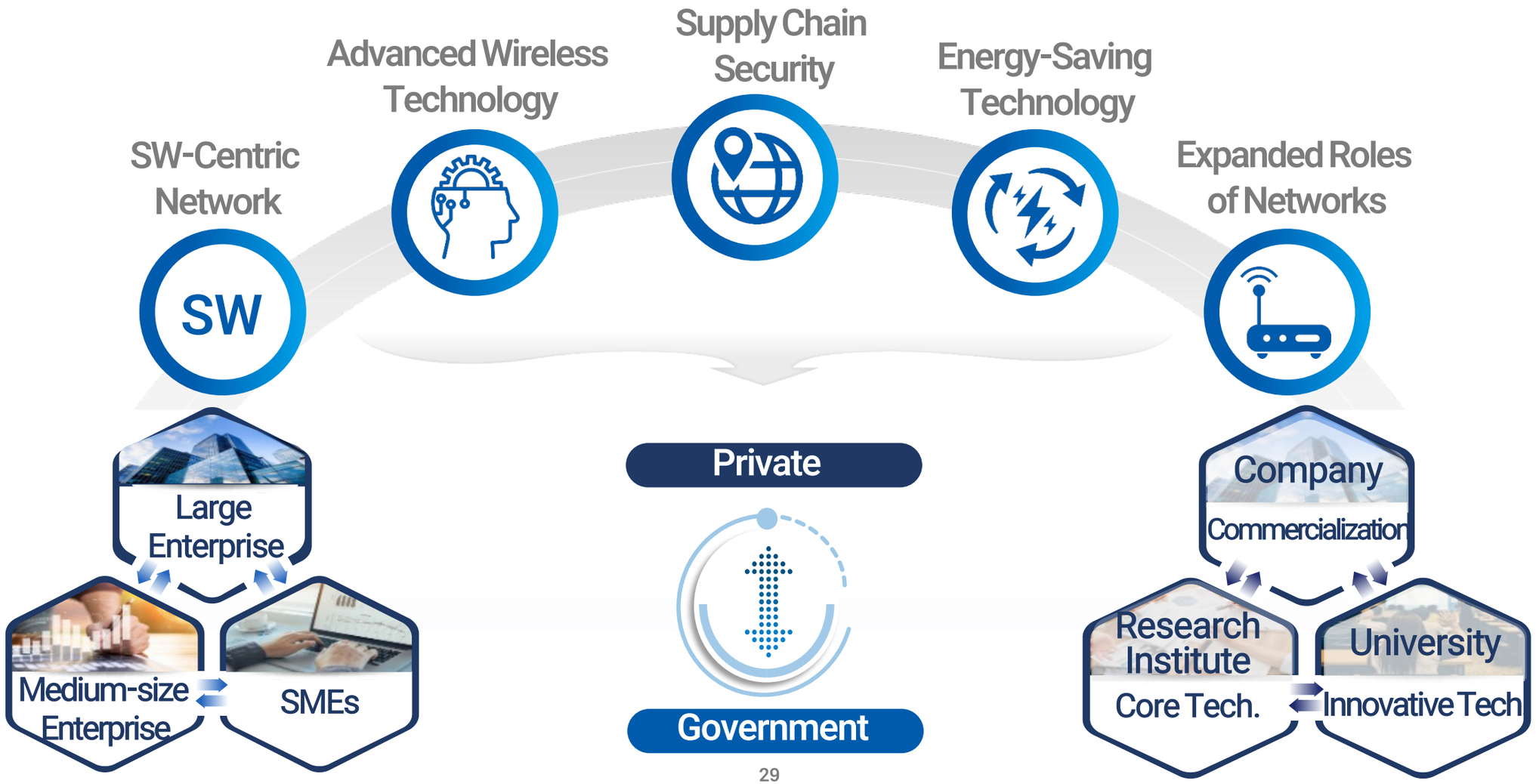
- To ensure diverse QoS requirements of 6G convergence services



Pre-6G Vision Fest 2026

- To secure the initiative in 6G commercialization by Tech. Innovation & Large-scale PP Joint Investment

Demo of 47 Core Technologies in 11 Strategic Technology Areas



감사합니다.

Thank you.