

# Introduction on IMT-2030(6G) Promotion Group in China

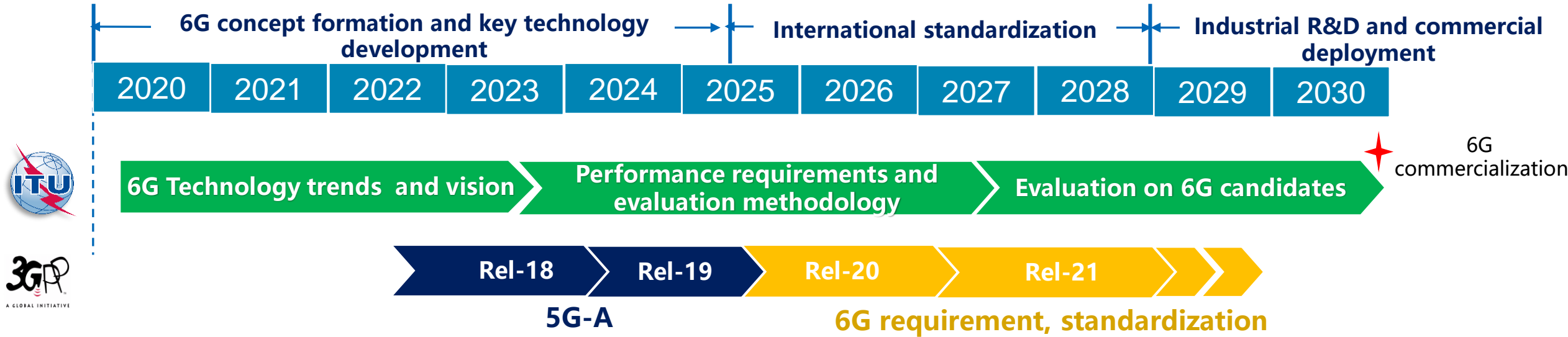
Sun Shaohui

February 13<sup>th</sup> 2024

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CICT Mobile

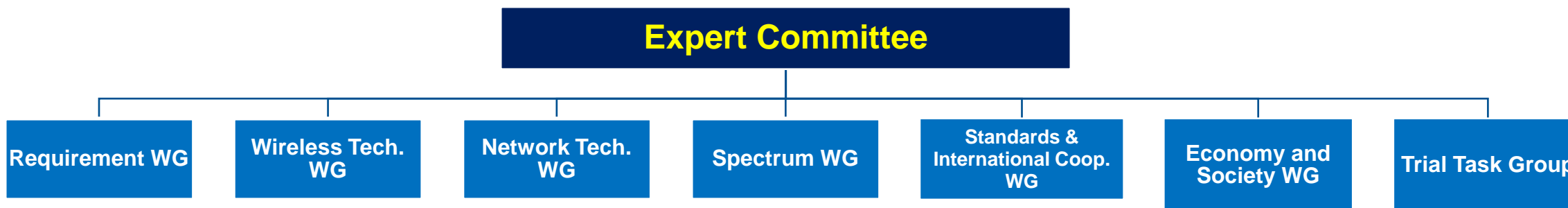
# Key Stages of 6G Development




- **2020-2024 (6G concept formation and key technology breakthrough):** Forming vision, requirements, and concepts, conducting research into the basic theory of mobile communication, collecting potential 6G technologies and doing evaluation, realizing breakthroughs in key technologies, and laying a solid technological foundation for 6G international standardization.
- **2025-2029 (International standardization):** Developing 6G technological scheme and architecture, reaching a consensus on key technologies, developing a global unified 6G international standard.
- **2026-2030 (Industrial R&D):** Promoting industrial R&D and development of a complete industrial ecology, accelerating maturity of the industry and supporting 6G commercial use.

# Introduction on IMT-2030(6G) Promotion Group

- MIIT and MOST in China have deployed 6G research and development projects.
- IMT-2030(6G) PG represents the frontier progress of 6G technology and industry development in China.
- Initiates industry-university-research cooperation to promote 6G researches, including vision and requirements, wireless and network technologies, spectrum, standardization, trials, study on social and economic impact, and international collaborations.

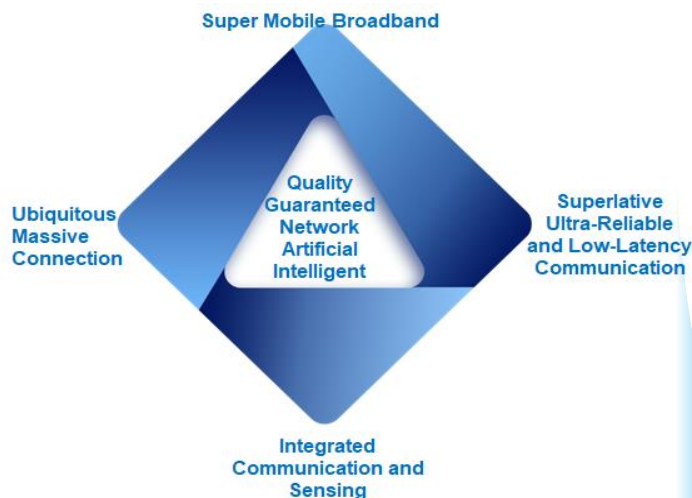


**IMT-2030(6G) promotion group has more than 100 members, and is open to the world.**

Research institution	Operator	System equipment provider	Chipset, terminal provider and instrument	Internet and technology company	University
					

# Promoting Formation of 6G Vision

Support ITU activities in developing “Framework and overall objectives of the future development of IMT for 2030 and beyond”, which builds global 6G development concepts



## 6G Usage scenarios

### 5G evolution scenarios

#### New usage scenarios

- Integrated Sensing and Communication
- AI and Communication
- Ubiquitous Connectivity

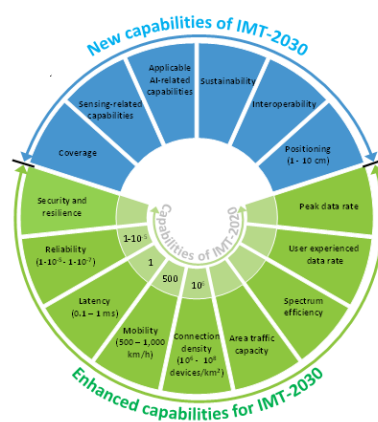
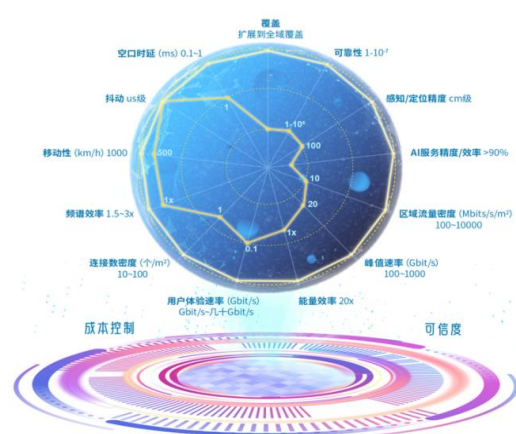
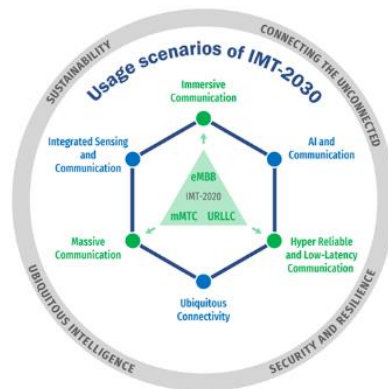
## 6G key capability indicators

### 9 enhanced capabilities:

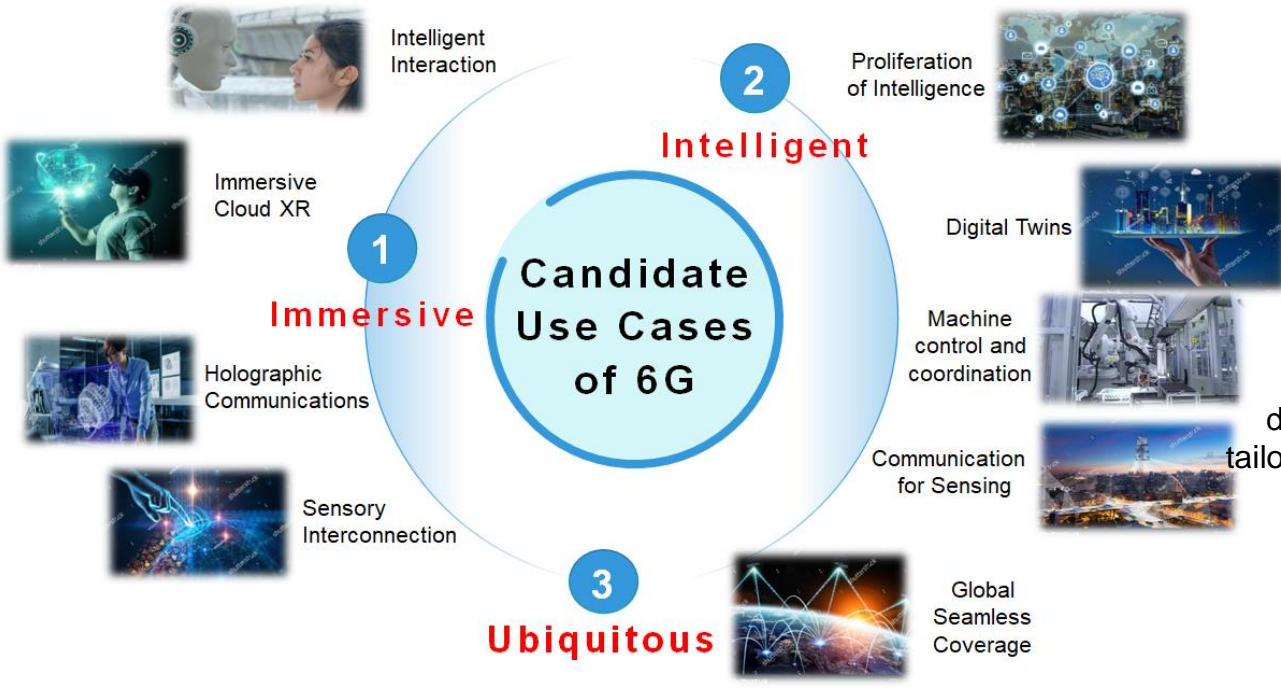
Peak data rate, User experienced data rate, Spectrum efficiency, Area traffic capacity, Connection density, Mobility, Latency, Reliability, Security and resilience

### 6 new capabilities:

- Coverage, Positioning, Sensing-related capabilities, Applicable AI-related capabilities, Sustainability, Interoperability

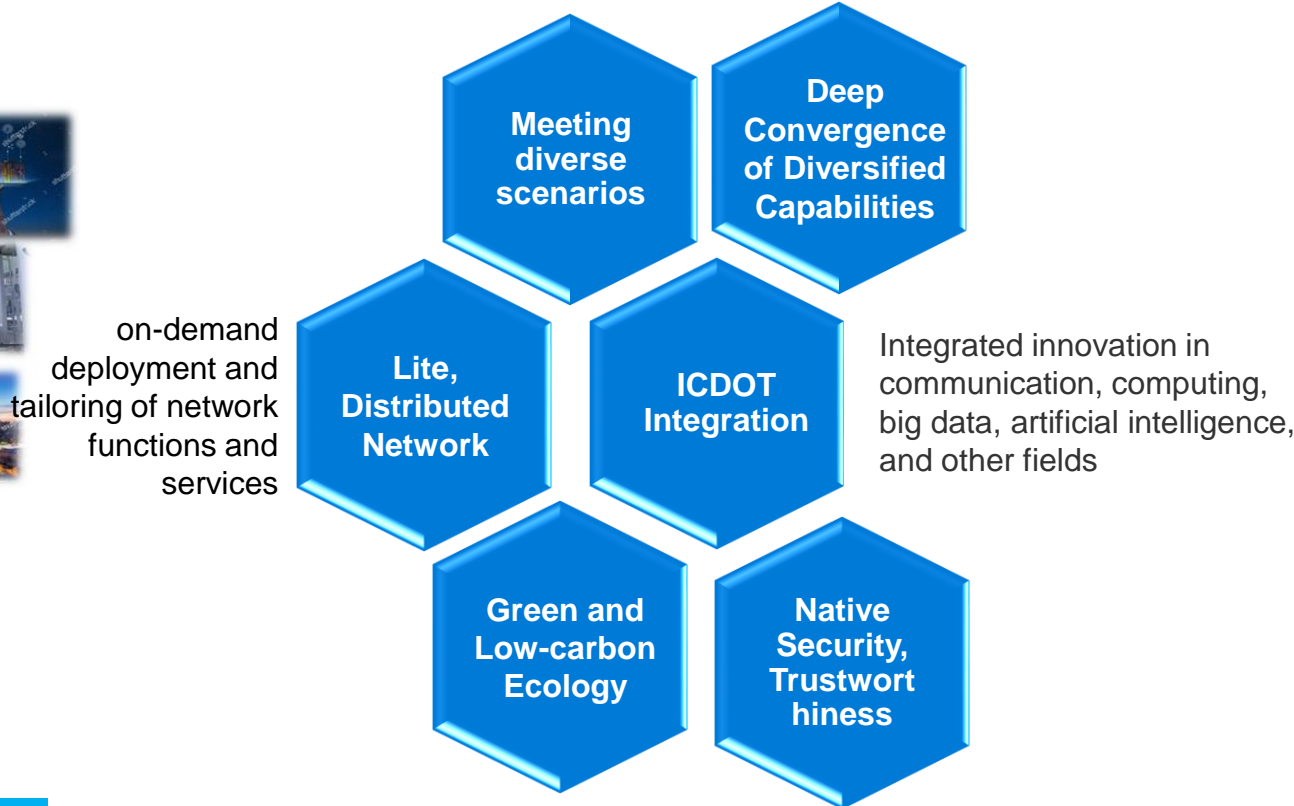


## Information Network with Multiple Service Capabilities Beyond Connection



### Typical characteristics

- Ubiquitous Connectivity
- Seamless Coverage
- Universal Intelligence
- Security and Trustworthiness
- Multi-dimensional Sensing
- Green and Low Carbon



Realizing energy conservation and emission reduction, from network construction to operation and maintenance, and contributing to sustainable development

\*Source: 6G Vision and Candidate Technologies White Paper, IMT-2030(6G) PG

\*Source: 6G Usage Scenarios and Key Capabilities White Paper, IMT-2030(6G) PG

Provide directional guidance for 6G system and technology research.



## © Conducting research on 6G typical use cases and technical performance requirement

- **6G AlaaS requirements**
- Integrated Sensing and Communication requirement
- 6G immersive service requirements
- 6G verticals services requirements
- Need for extremely low power consumption IoT
- Need for 6G wireless energy supply service
- .....

6G AlaaS adopts the 6G mobile network to offer ubiquitous intelligent services. 6G AlaaS will help build efficient, energy-saving, and secure distributed AI services and open ecosystems by leveraging functions and resources such as connections, computing, data, and models of the network.

### 2.2 6G AlaaS Typical Usage Scenarios

- 2.2.1 Smart City
- 2.2.2 Smart Home
- 2.2.3 Smart Industry
- 2.2.4 Smart Agriculture
- 2.2.5 Precision Healthcare
- 2.2.6 Smart Education
- 2.2.7 Smart Energy
- 2.2.8 Super Transportation
- 2.2.9 Internet Finance

### 2.3 6G AlaaS Typical Applications

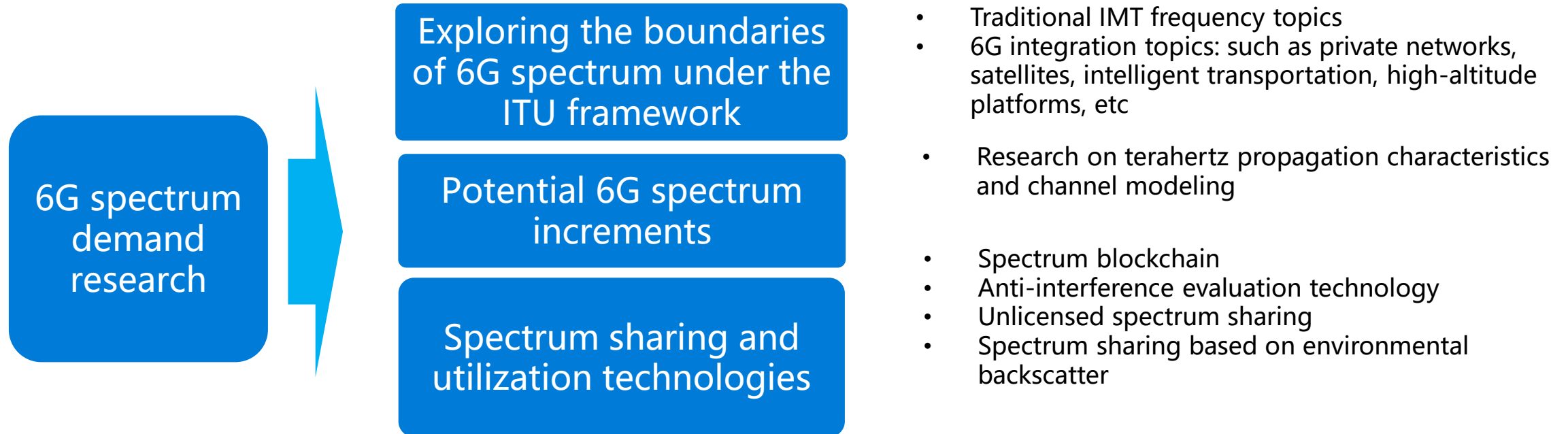
- 2.3.1 Unmanned Taxi
- 2.3.2 Industrial Robot
- 2.3.3 Food Cycle Network
- 2.3.4 Home Health
- 2.3.5 Unmanned Grazing
- 2.3.6 Disease Diagnosis
- 2.3.7 Virtual Class
- 2.3.8 Intelligent Inspection on Power Grids

	Name	Definition	Unit
AI service key performance indicators	Service accuracy	AI service accuracy experienced by user	%
	Service coverage rate	Proportion of areas that meet service accuracy requirements under a given link budget	%
	Service response latency	E2E AI service response latency	ms
	System energy efficiency	Amount of data that can be processed per unit of energy consumption	bit/J
	Service density	Service rate per unit area	bps/km <sup>2</sup>
	Service integrity	Integrity of data services	%
	Service redundancy	Redundancy of data services	% or bit

AI service KPIs

\*Source: 6G AlaaS requirements report, IMT-2030(6G) PG

## Research on 6G spectrum demand, propagation characteristics on mmwave and terahertz, new spectrum utilization technologies



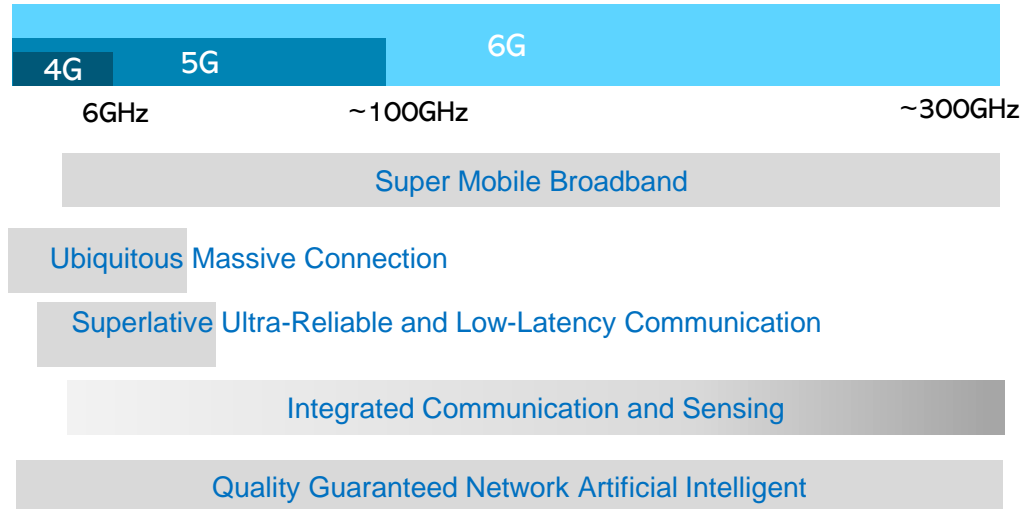
- Low, medium, and high frequency bands are needed to meet the application requirements in different scenarios
- The bands below 15/24GHz will be the core part of 6G.

### ❑ China takes the lead in allocating 6GHz (6425-7 125MHz) frequency band for 5G/6G systems

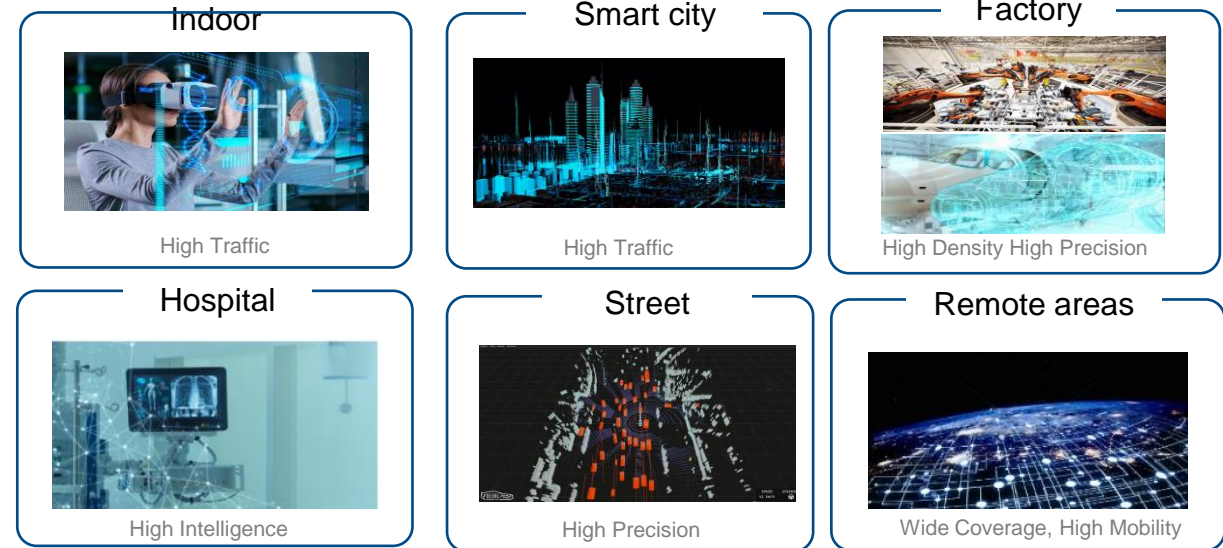
- The newest version of the Regulations of the People' s Republic of China on Radio Frequency Allocation by the Ministry of Industry and Information Technology came into force on July 1,2023.

# Overview on 6G System

## Full frequency



## Full coverage



### Multi-band RAN

- Multi-band collaboration
- Collaboration with 5G/4G

### Multiple access and flexible networking

- Various access nodes and links
- Multiple control mode

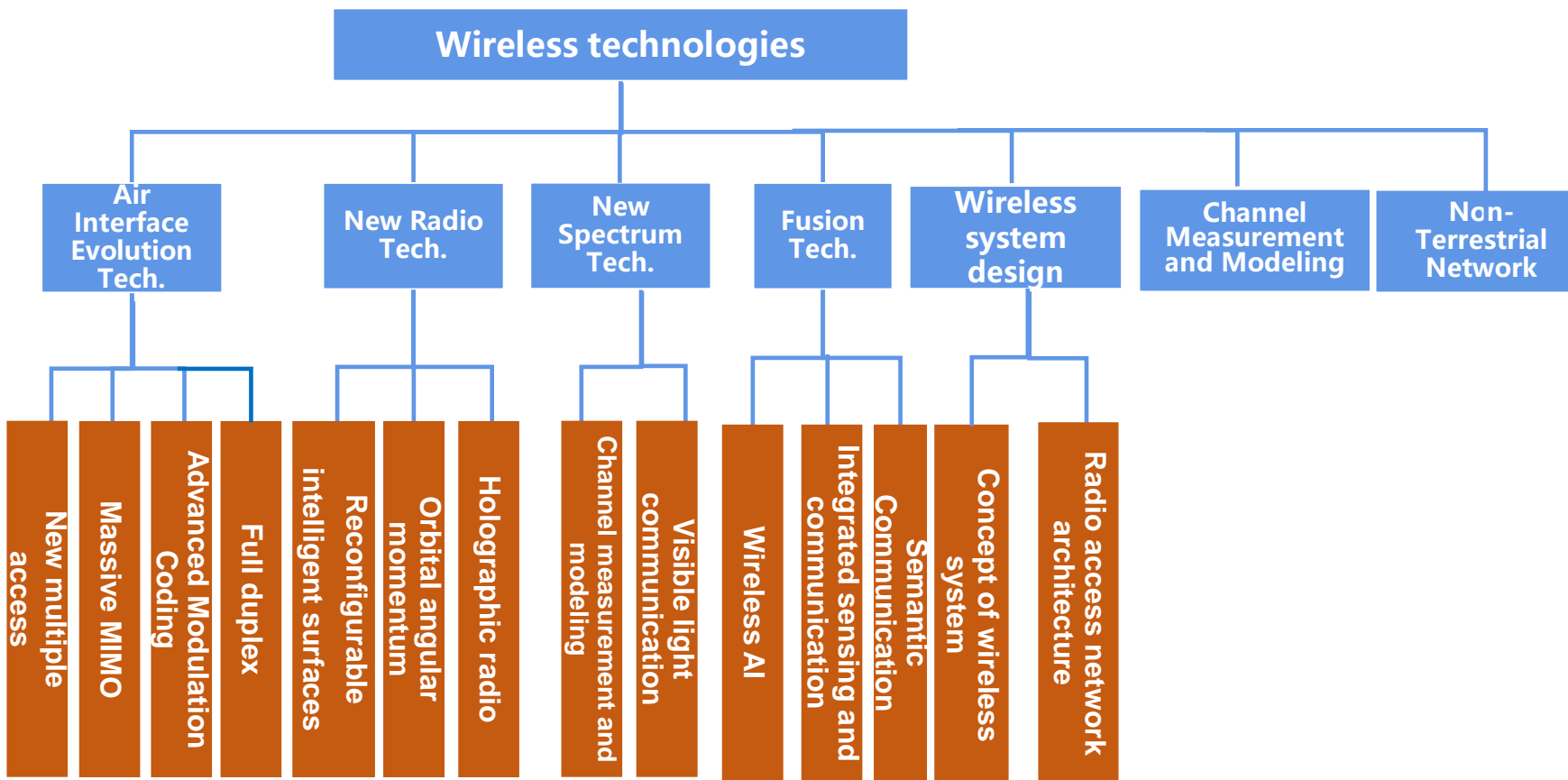
### On demand orchestration, consistent service

- Diverse bandwidth
- Scalability



# Research on 6G Wireless Technologies

- Call for potential 6G wireless innovation technologies, setting up task groups for key directions, and continuing to explore new technical directions and areas
- Promote consensus formation



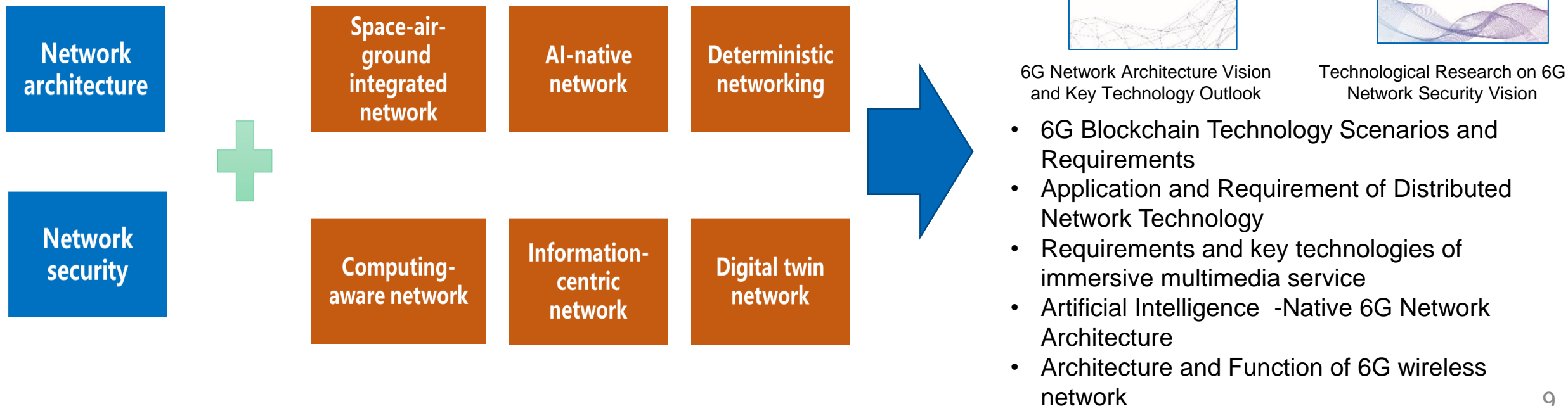
## Research reports released

- Integrated sensing and communication
- Wireless AI
- Terahertz communication
- Reconfigurable intelligent surfaces
- Massive MIMO
- Research Report on Missive-MIMO
- Research Report on Channel Measurement and Modeling
- Research Report on Holographic Radio Technology
- Research Report on Visible Light Communication Technology
- Research Report on Advanced Coding and Modulation Technology
- Research Report on Full Duplex Technology
- Research Report on Orbital Angular Momentum Technology .....

# Research on Network Technologies

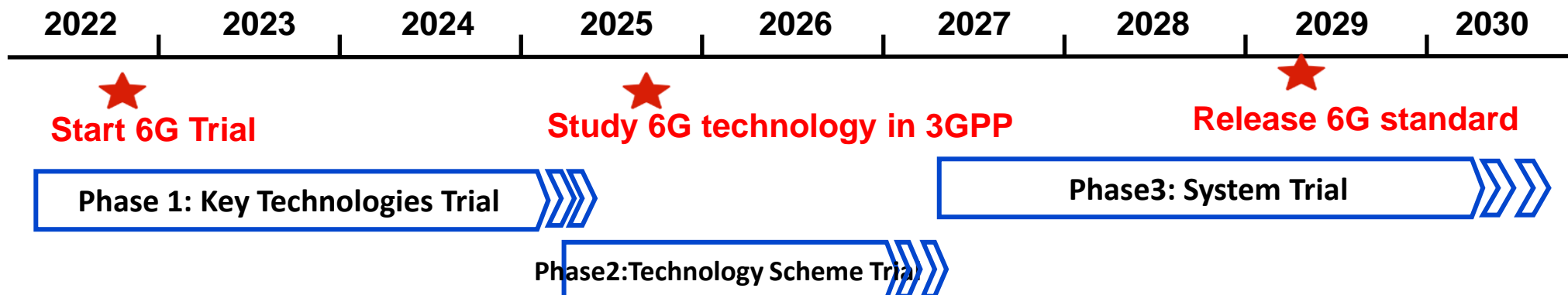
- **Comprehensively promote the layout of key technologies of 6G network**
- **Combine the development trend of network technology and industrial progress**
- **Accelerate the research on 6G network architecture and key technologies, and promote consensus formation**

## Focusing on '2+6' technologies



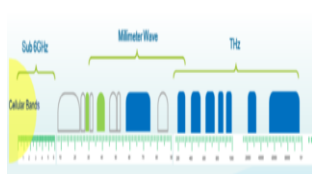
# 6G trial to promote innovation and optimization of key technologies

Aim to deepen technological innovation, support standardization, promote industrial maturity, and form broader consensus.

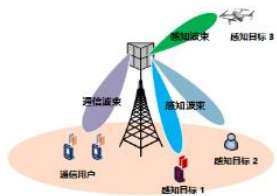


## Key Technology Trial in 2023

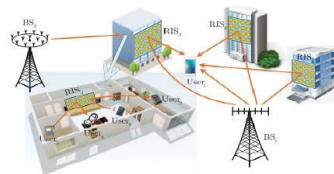
### Wireless Technologies



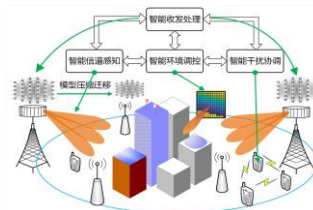
Terahertz communication



Integrated sensing and communication

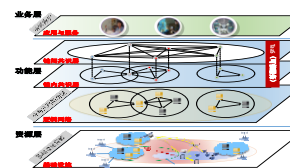


Reconfigurable intelligent surfaces

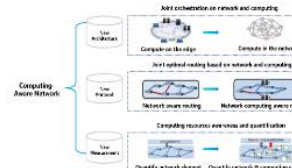


Wireless AI

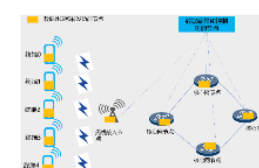
### Network Technologies



Distributed autonomous network



Computing-aware network



Data Service

# Some Considerations on 6G Development

- 1 Deepen research on key technologies and strengthen system scheme design**
  - Strengthen key technology innovations, especially integrated technology innovation in communication and artificial intelligence, sensing, and data;
  - Based on the 6G vision requirements and typical scenarios, carry out system scheme design to form a system scheme for typical 6G scenarios.
- 2 Organize 6G technical trials and accelerate its industrial maturity**
  - Build 6G public test environment and conduct testing and verification for key technical directions;
  - Through 6G technical trials, promote the development of 6G key technology concept prototypes, reach technological consensus, and accelerate its industrial maturity.
- 3 Strengthen 6G spectrum planning and guarantee spectrum resource**
  - Support ITU 6G spectrum research and promote consensus on 6G global spectrum harmonization.
- 4 Strengthen 6G cooperation and achieve win-win international cooperation**
  - Maintain the core position of international standardization organizations such as ITU and 3GPP, and promote the formation of global unified international standards.

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