Perspectives and research progress on 5G standard
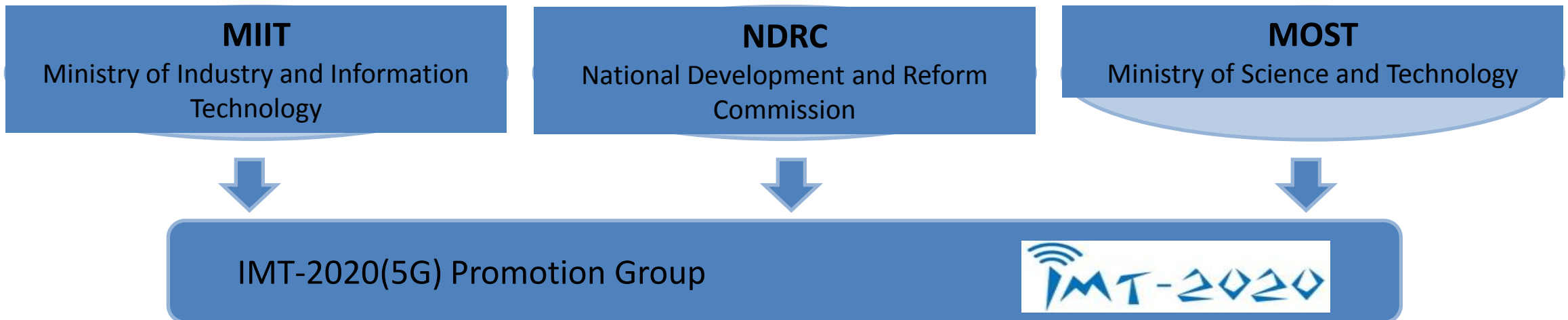
MIIT, CHINA

October 20, 2015

5G Promotion Principles of Chinese Government

- Strengthen the cooperation between vendors, operators, universities, and research institutes to jointly promote the R&D of 5G.

- Facilitate international collaboration and promote the consensus in 5G technology and industry.

- With the principle of integrating into international mainstream, jointly promote the GLOBAL standardization of 5G.

5G Promotion Policies - Platform

- In February 2013, three ministries (MIIT, NDRC and MOST) jointly established "IMT-2020 (5G) Promotion Group" in China
- Objectives
  - To promote the research and development of 5G
  - To facilitate global cooperation on 5G R&D

| **MIIT**
Ministry of Industry and Information Technology | **NDRC**
National Development and Reform Commission | **MOST**
Ministry of Science and Technology |

IMT-2020(5G) Promotion Group

IMT-2020 (5G) Promotion Group Activities

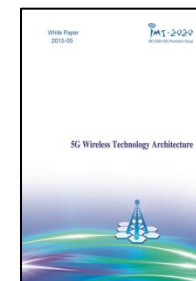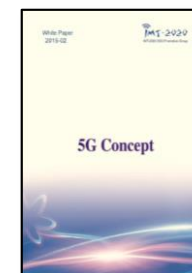## IMT-2020 (5G) Summits
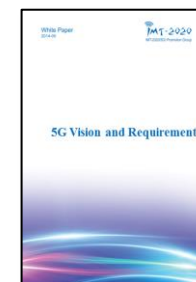
- 2013: 5G Vision

- 2014: 5G Objective & Capability

- 2015: 5G Technology Architecture

5G White Papers

- May 2014: 5G Vision and Requirements

- Feb. 2015: 5G Concept

- May 2015: 5G Wireless Architecture

- May 2015: 5G Network Architecture

International Cooperation

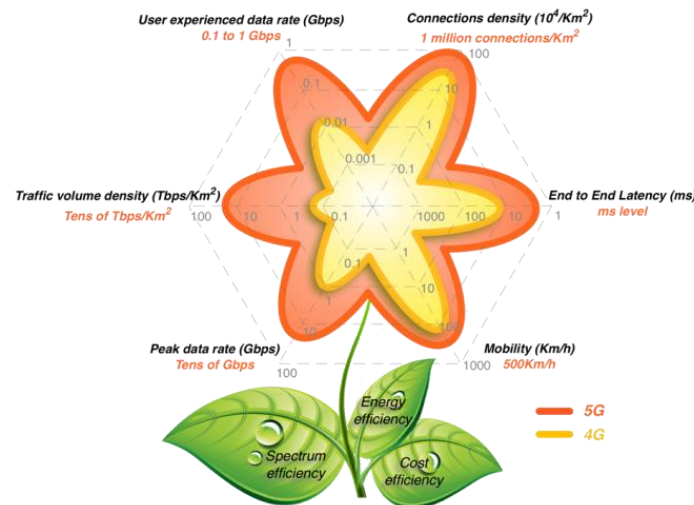IMT-2020 PG will be more open to co-work with the global industry

Research Progress: 5G Vision and Requirements

Identified 5G vision and requirements

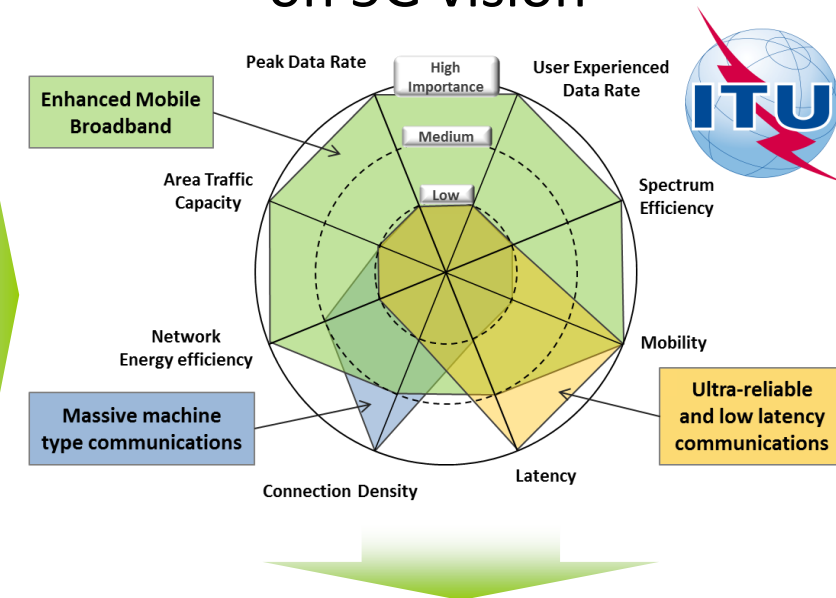**Main Drivers: Mobile internet and Internet of Things**

Promote global consensus on 5G vision

5G Vision: Information a finger away, everything in touch

5G Key Capability ---- 5G Flower

ITU IMT-2020 vision was completed in June 2015.

5G Scenarios & Challenges

Mainly for Mobile Internet

Mainly for IoT (new scenarios)

Seamless Wide-Area Coverage

- User experienced data rate: 100 Mbps

Low-Latency High-Reliability

- Air interface latency: 1 ms
- End-to-end latency: ms level
- Reliability: nearly 100%

High-Capacity Hot-Spot

- User experienced data rate: 1 Gbps
- Peak data rate: Tens of Gbps
- Traffic volume density: Tens of Tbps/km^2

Low-Power Massive-Connections

- Connection density: 10^6 / km^2
- Ultra-low power consumption
- Ultra-low cost

5G Wireless Technology Roadmap

5G Wireless Technology Roadmap

Main Scenarios

6-100 GHz

5G High-Frequency New AI

<6GHz

5G Low-Frequency New AI

4G AI

4G Evolution AI

2016 2017 2018 2019 2020

Seamless Wide-Area Coverage

High-Capacity Hot-Spot

Low-Latency High-Reliability

Low-Power Massive-Connection
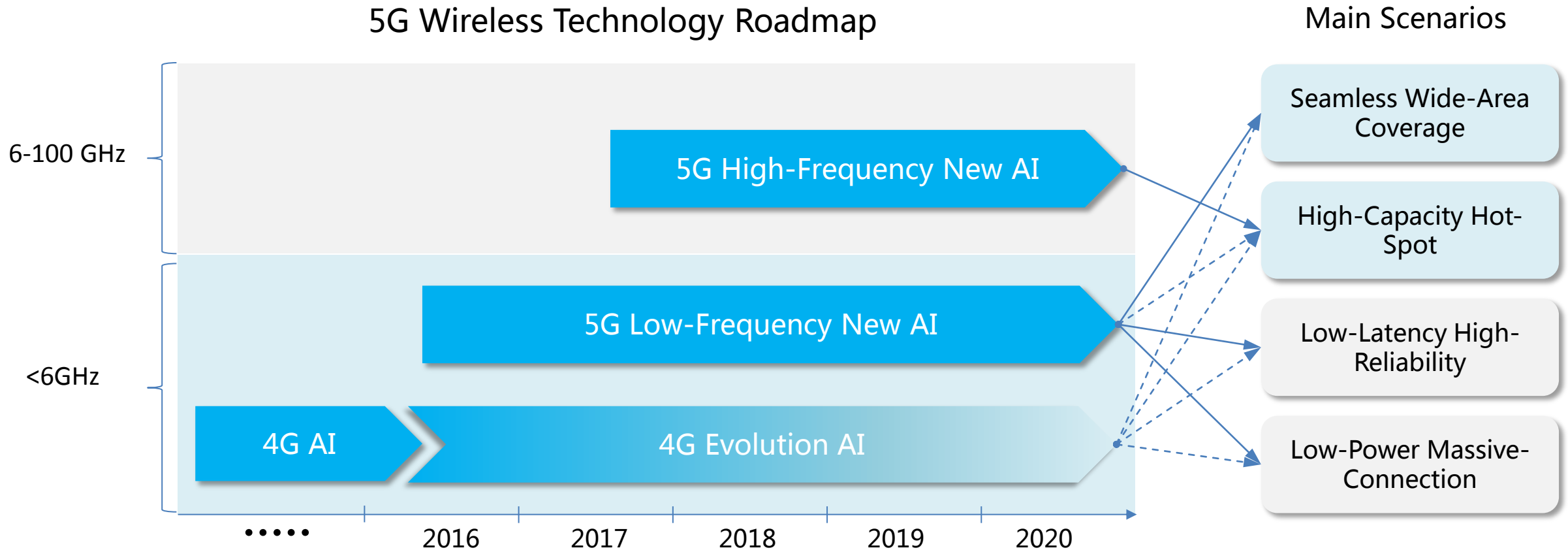
- The 5G wireless technology roadmap consists of **the new air interface** (AI) and **4G evolution AI**.
- The new AI has two branches: **low-frequency** new AI (main body) and **high-frequency** new AI (supplement).

5G Research Projects in China

国家高技术研究发展计划（863计划）

National 863 Program

2014	2015
• General Technology • Wireless Key Technology • Network Architecture & Key Tech. • Evaluation & Test Methodologies	• Soft Base Station Test Bed • mmWave Indoor Access • Wireless Network Virtualization • RAN and System Security • Advanced Modulation and Coding

国家科技重大专项
National Science and Technology Major Project

National Science and Technology Major Project

2015		2016		
Overall	**Technology**	**Overall & Component**	**Wireless Technology**	**Network & Service**
• Network Architecture • Standard Evaluation Platform • Analysis and Evaluation on Candidate Bands	• mmWave Key Technologies • Low-Latency High-Reliability Solution • Next Generation WLAN	• 5G Standardization • AD/DA for Base Station • High-Freq PA for Base Station • High-Freq Filter for Base Station	• Wide-Area Coverage • Low-Power Massive-Connections • High-Freq. Comm. • Ultra-Dense Network • Novel Multiple Access	• RAN Architecture • 5G Indoor Positioning • Key Technology for Self-Driving Cars

■ **Open to all the companies registered in China, including domestic and foreign companies**

Consideration on 5G Development Plan

China strives to commercialize 5G in 2020

Ma Kai, Vice Premier of China's State Council, announced that China strives to start the commercialization of 5G networks in year 2020

IoT is the promising development area for 5G
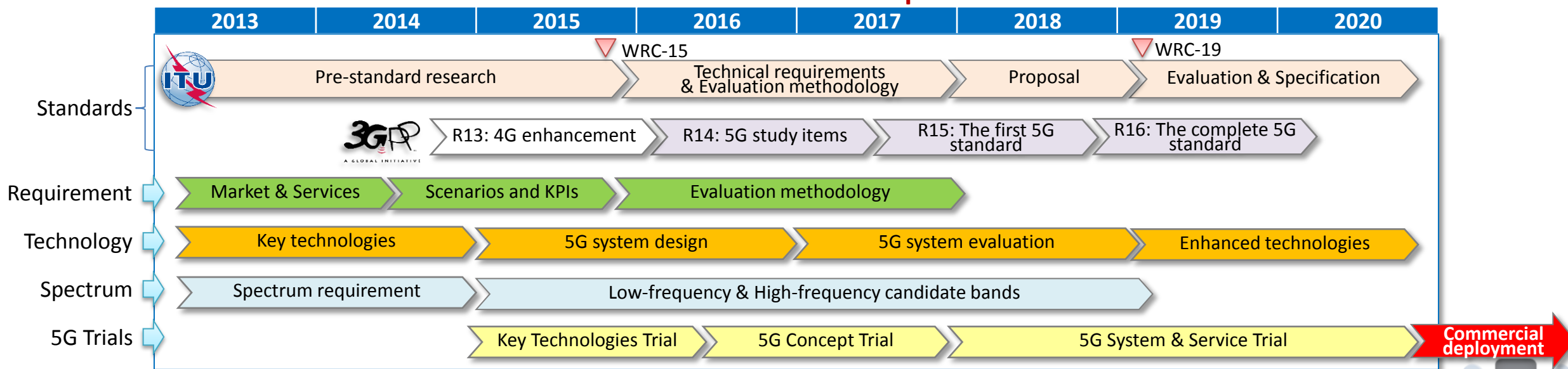
Internet of Vehicles

Industrial Internet

工业和信息化部 浙江省人民政府
关于基于宽带移动互联网的智能汽车
智慧交通应用示范合作框架协议
签约仪式

MIIT and Zhejiang Province recently launched a joint demo program on mobile-based Internet of Vehicles.

Considerations on 5G time plan

	2013	2014	2015	2016	2017	2018	2019	2020
			▽ WRC-15				▽ WRC-19	

Standards

ITU: Pre-standard research → Technical requirements & Evaluation methodology → Proposal → Evaluation & Specification

3GPP: R13: 4G enhancement → R14: 5G study items → R15: The first 5G standard → R16: The complete 5G standard

Requirement: Market & Services → Scenarios and KPIs → Evaluation methodology

Technology: Key technologies → 5G system design → 5G system evaluation → Enhanced technologies

Spectrum: Spectrum requirement → Low-frequency & High-frequency candidate bands

5G Trials: Key Technologies Trial → 5G Concept Trial → 5G System & Service Trial → Commercial deployment

9

Recent Work Plan (2015-2017)

- **Technology Study**
  - System design in 5G RAN and Core networks
  - Evaluation of 5G key technologies & system
- **Standardization**
  - 3GPP
    - 5G standard framework and work plan
    - Requirements on 5G RAN and SA
    - Study items on 5G wireless and network technologies
  - ITU:
    - 5G minimum requirements, evaluation scenarios, and methodology
- **Spectrum**
  - Promote low-frequency bands for IMT systems in WRC-15
  - Identify the potential candidate bands in 6 – 100 GHz
- **5G Trials**
  - Verification of 5G key technologies, concept, and early standards
  - Demos of 5G-based new services and applications, especially in IoT and vertical industries

Thanks for your attention

dongxiaolu@miit.gov.cn