

R&D Status of IMT-2020 (5G) Promotion Group

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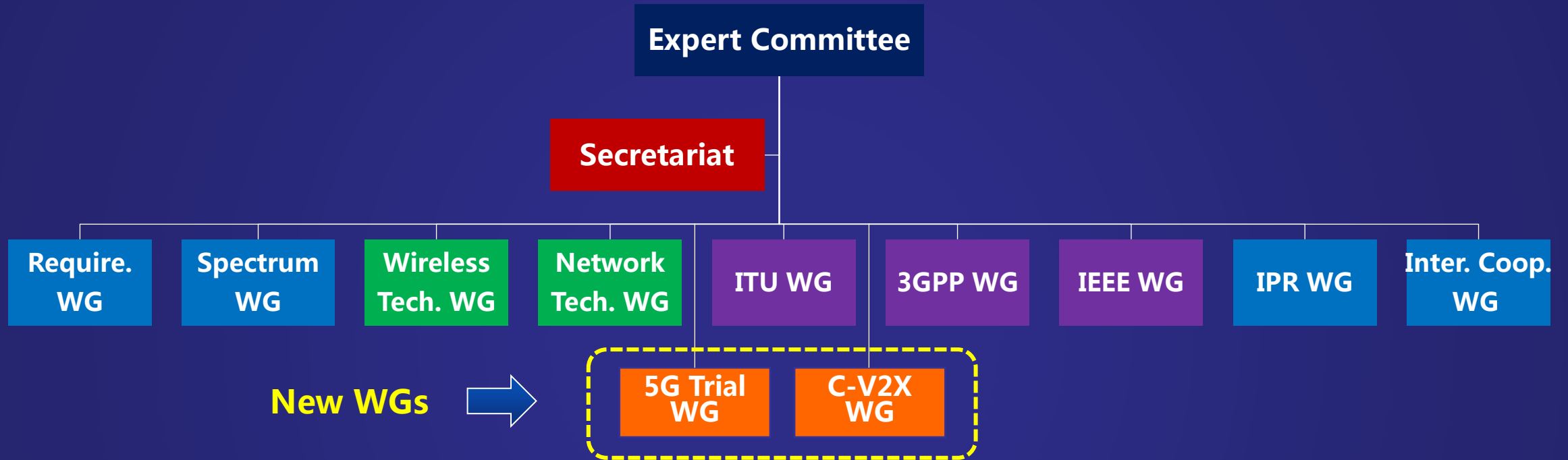
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General Aspects of IMT-2020 PG

5G R&D Progress of IMT-2020 PG

- Technology & Standards
- Network & Security
- Technology R&D Trial

IMT-2020(5G) PG Structure Update



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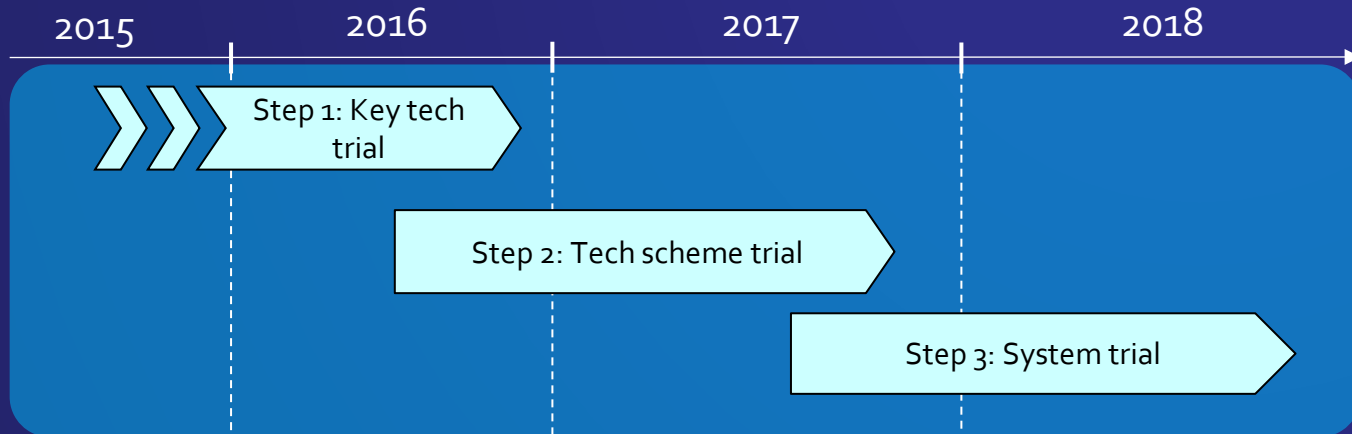
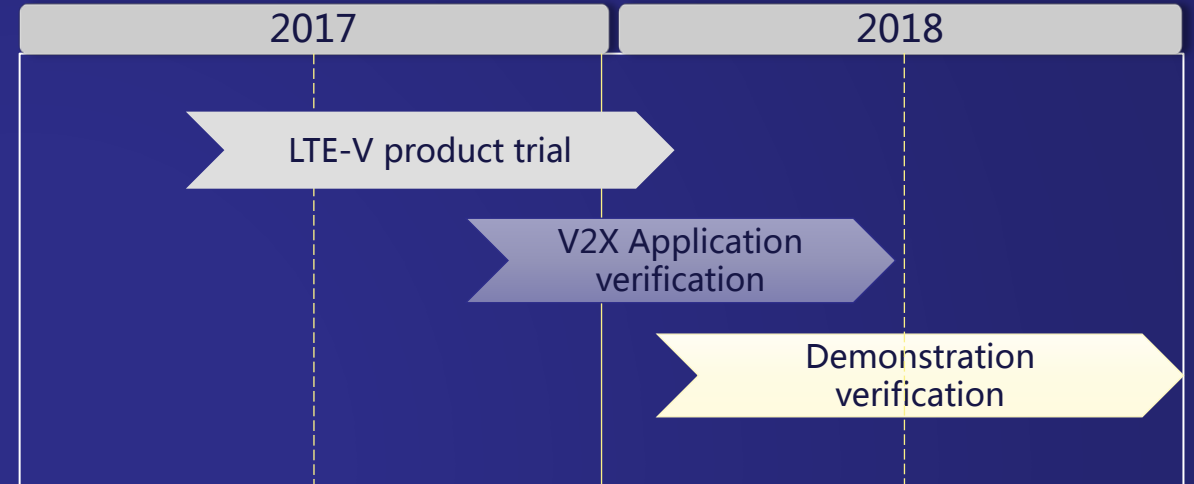

东南大学


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Responsibilities of the New WGs

C-V2X WG

- Study cellular V2X solutions
- Accelerate C-V2X R&D via trials
- Promote C-V2X industrialization and application

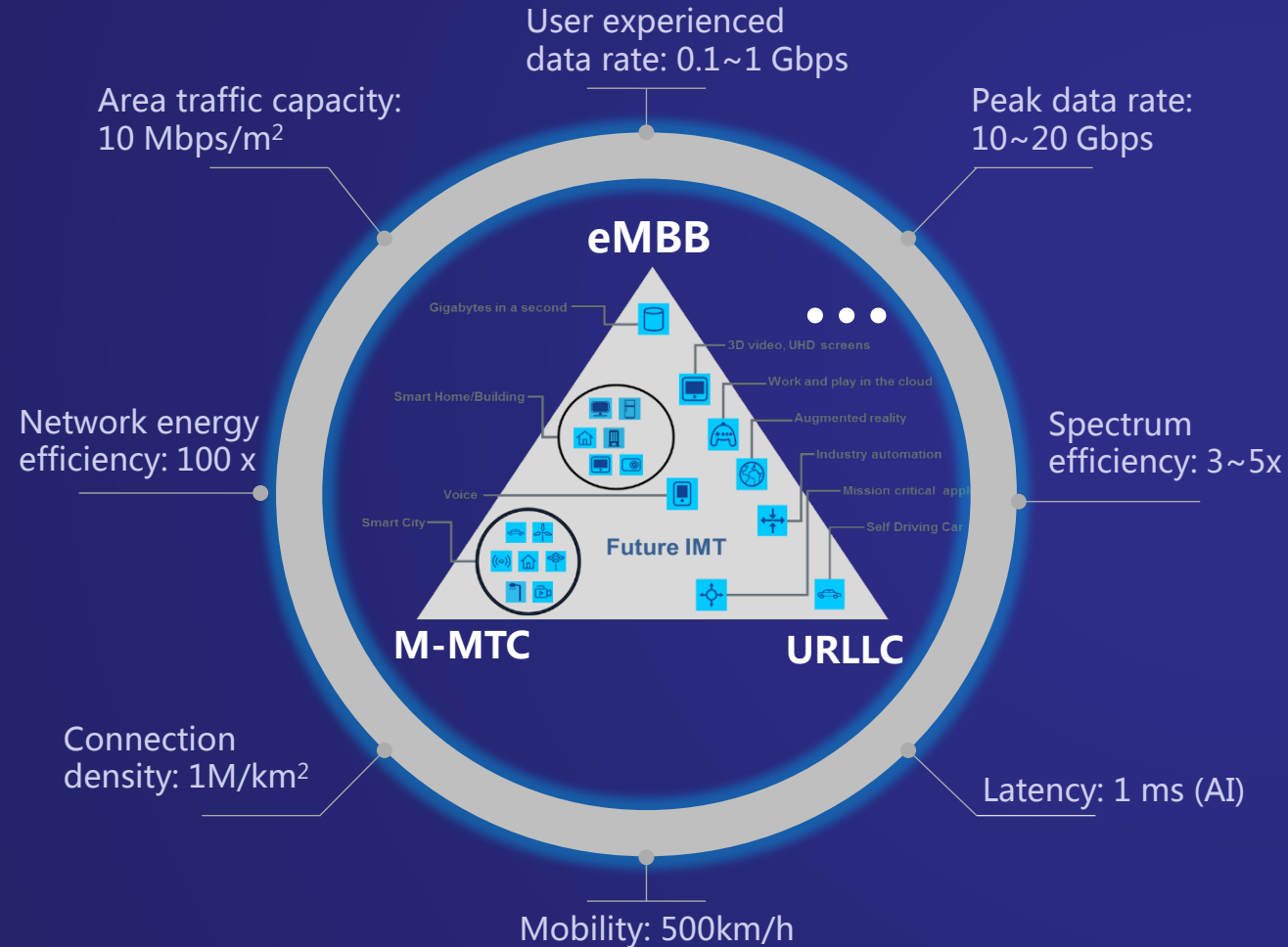


5G Trial WG

- Organize 5G Technology R&D Trials, including define test specifications, carry out test tasks, analyzing and summarizing test results

5G : From Vision to Standard Innovation

ITU IMT-2020 Vision



5G Innovative Technologies

Unified Air interface framework

Flexible
System Design

NR
Technologies

Massive MIMO



Novel Network Architecture

Service
Based
Architecture

Network
Slicing

Edge
Computing

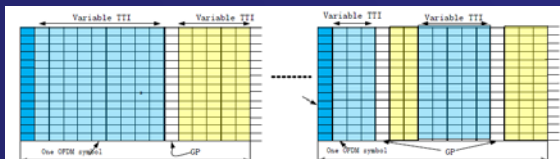
Security
Algorithm



Enabling Technologies for 5G Radio Interface Standard

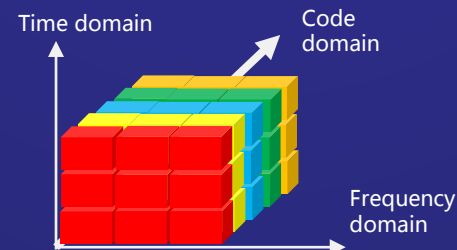
Flexible System Design

- **Flexible Frame Structure** to support Self-contained and variable length TTI
- **Flexible Waveform** to provide forward compatibility
- **Flexible Duplex with Symmetric TX/RX Design** to realize cross link unified design and interference mitigation



Innovative technologies for NR

- NOMA
 - SCMA
 - PDMA
 - MUSA
 -
- New coding schemes
 - Polar code
 - LDPC



Massive MIMO

- **Unified MIMO framework** for control and data
- Control signaling and feedback enhancement for MU-MIMO
- More accurate CSI reporting
- More robust open-loop schemes
- **Beamforming enhancement**
 - Self contained beam
 - Hybrid beamforming in baseband and analog domain



Further Consideration on R15 & R16

NOMA

- R15 study item: Identify and evaluate generic NOMA schemes
- R15/R16 work item: Enhancement for eMBB/URLLC/mMTC

5G V2X

- 5G V2X consists of both LTE V2X and NR V2X
 - LTE V2X enhancement in R15
 - Main works for NR V2X in R16 and beyond
 - Some NR V2X related studies could begin in late R15

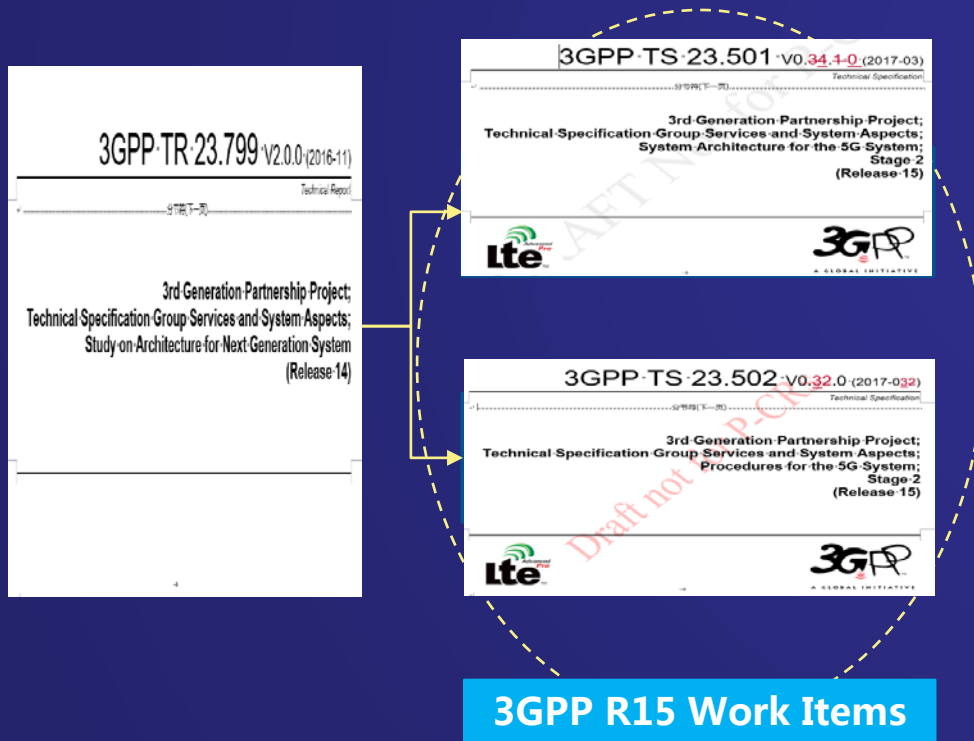
URLLC

- URLLC works in R15 work item to meet IMT-2020 requirement
- Enhancement to meet more vertical industry requirements in R16 and beyond

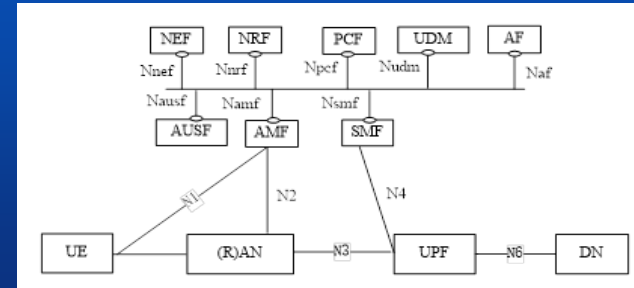
5G Core Network Standard Framework

- In Release 15, 5G system Standardization should comprehensively consider the aspects of **architecture, network function and infrastructure**.
- Service-based Architecture, NFV-based Network Slicing, and Session Management & User Plane Function supporting MEC have high priority.

3GPP R15 work items for 5G Core network

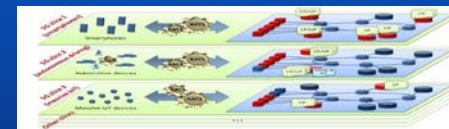


Service based Architecture



- Service based control plane
- Support flexible Network Functions Reconstruction
- Facilitate network functions reuse and capabilities exposure

Network Slicing



- One network, Multiple scenarios
- On demand Mobility
- Programmable User Plane

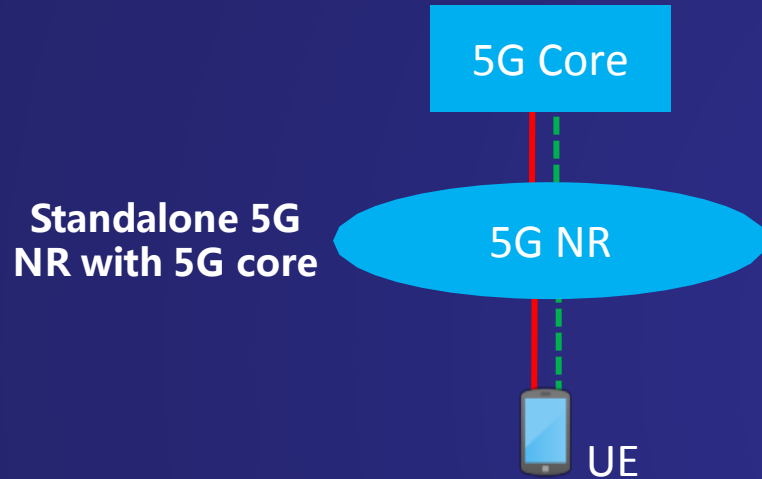
Edge Computing



- Distributed User-Plan with efficient routing
- Session and Service Continuity

View on 5G Network Deployment in China

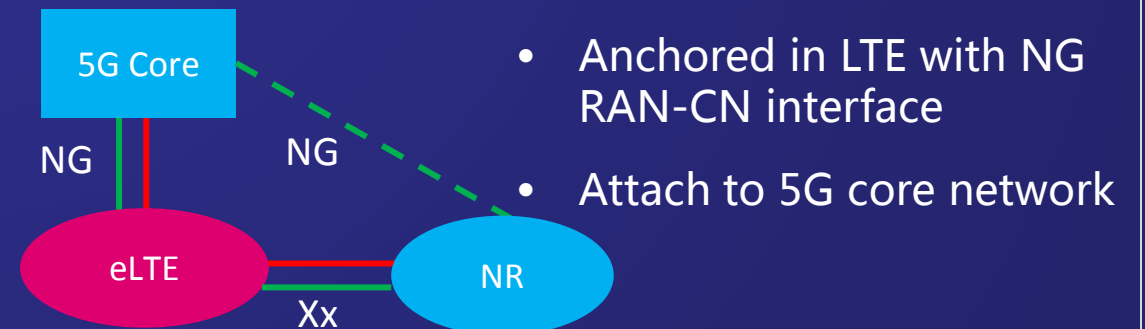
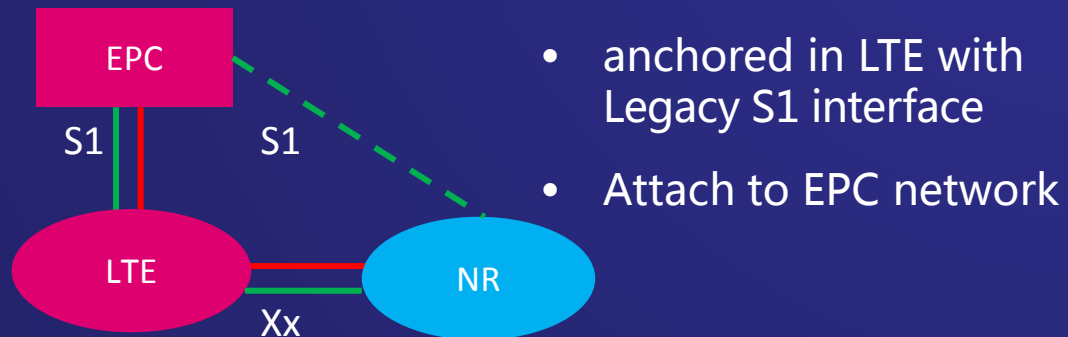
Standalone deployment can guarantee the industrial vitality and sustainable development



Standalone deployment will help :

- Complete globally unified standardization
- Make 5G competitive via novel technologies
- Accelerate the maturity of 5G industry
- Reduce the migration cost from 4G to 5G

Non-standalone deployment is an option to meet early service demand in specific scenarios

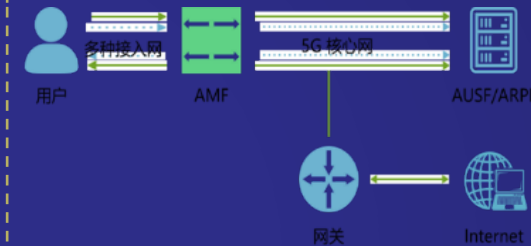


5G Security Requirements and Framework

Challenges & Requirements

- New service scenarios
 - eMBB
 - mMTC
 - uRLLC
- New technology & New feature
 - SDN/NFV
 - MEC
 - Network slicing
- Various types of access technologies & multiple types of devices
- New business models
- Increased privacy concerns

Key Capabilities



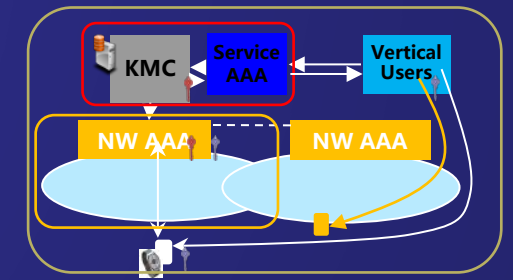
Unified Access Authentication



Security On Demand



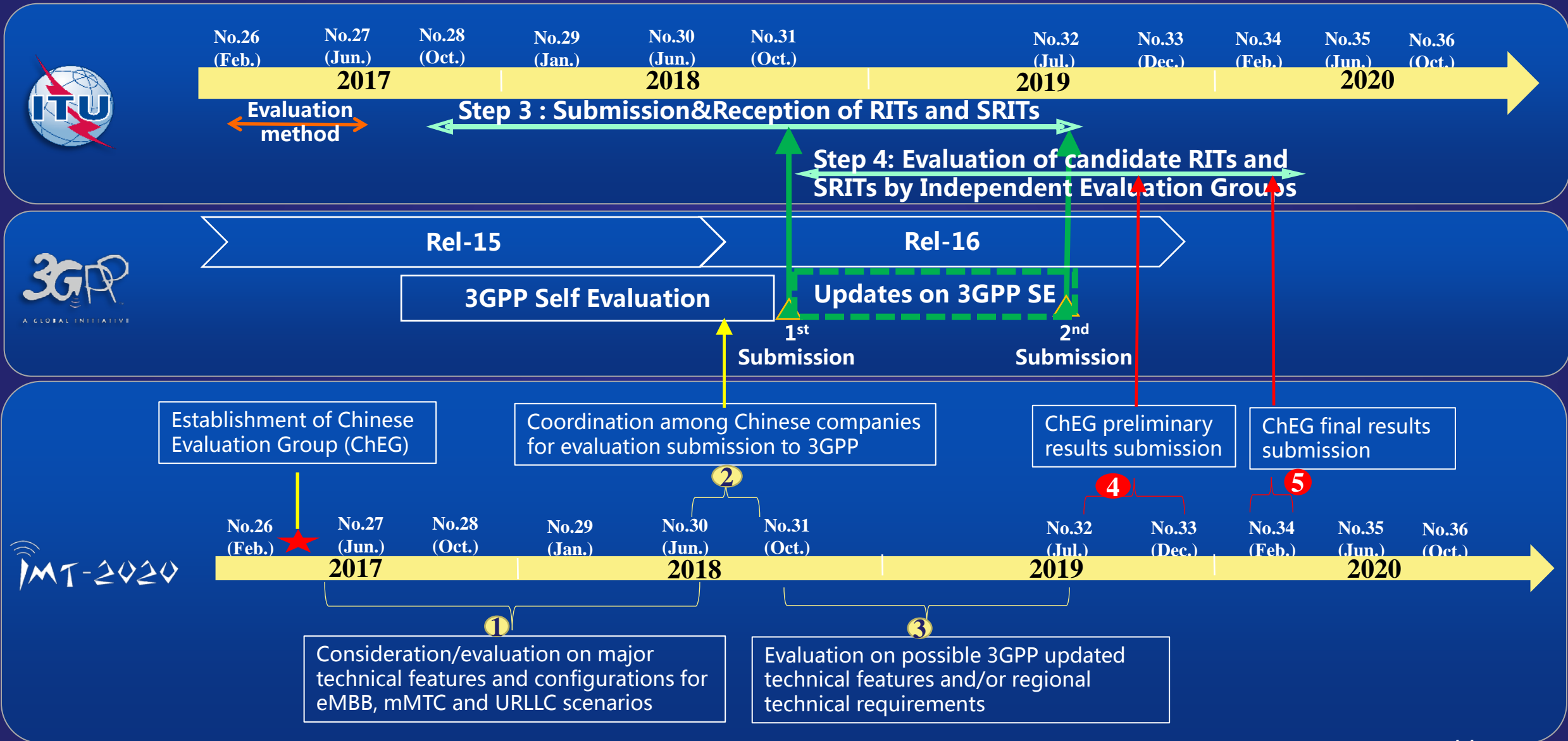
Isolation between network slices



Security capability exposure

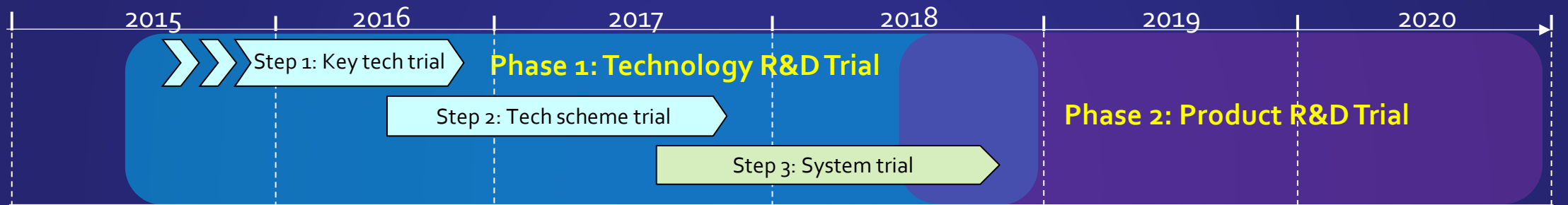
- Upcoming white paper: 5G Security -- Requirements and Framework

China 5G Evaluation Work Plan



5G R&D Trials of China

Promote the R&D of 5G key technologies, technical solutions, and global unified standards, accelerate the development of 5G products, and build 5G ecosystem



Step 1 Trial completed in 2016

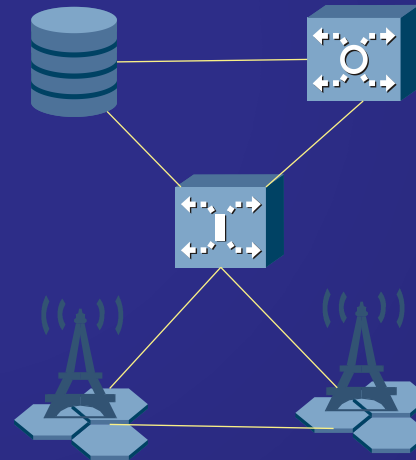
Globally first complete the full verification of main key wireless and network technologies in diverse scenarios, and promote the innovative development of 5G

Wireless Technologies



- Massive MIMO
- Novel multiple access
- New waveform
- Advanced coding
- Ultra-dense network
- High-frequency comm.

Network Technologies



- Network Slicing
- Edge computing
- Network Function Reconstruction
- C/U Plane separation

Current Status of Step 2 Trial

Unified test specifications, spectrum, and platform



Building the world's largest 5G test field



- Completed the test field planning of 30 sites in Huairou, Beijing
- Six system vendors (Huawei, Ericsson, ZTE, Datang, Nokia and ASB, and Samsung) deeply participated in the field trial of Step 2.
- Test instrument and chipset vendors were invited to join the field trial

Summary and Outlook

Building Globally Unified 5G Standards and Ecosystem

- Full support developing globally unified 5G standards in the framework of ITU and 3GPP
- Synchronously study 5G standards for eMBB and IoT, and enhance 5G via technical innovation to meet the requirements of three scenarios
- Strengthen global coordination on 5G spectrum, actively promote low-frequency planning, and strengthen the research of high-frequency planning
- Use 5G trial as a carrier to support 5G technology R&D, standardization, industrialization, and commercialization in 2020



Thanks for your attention