

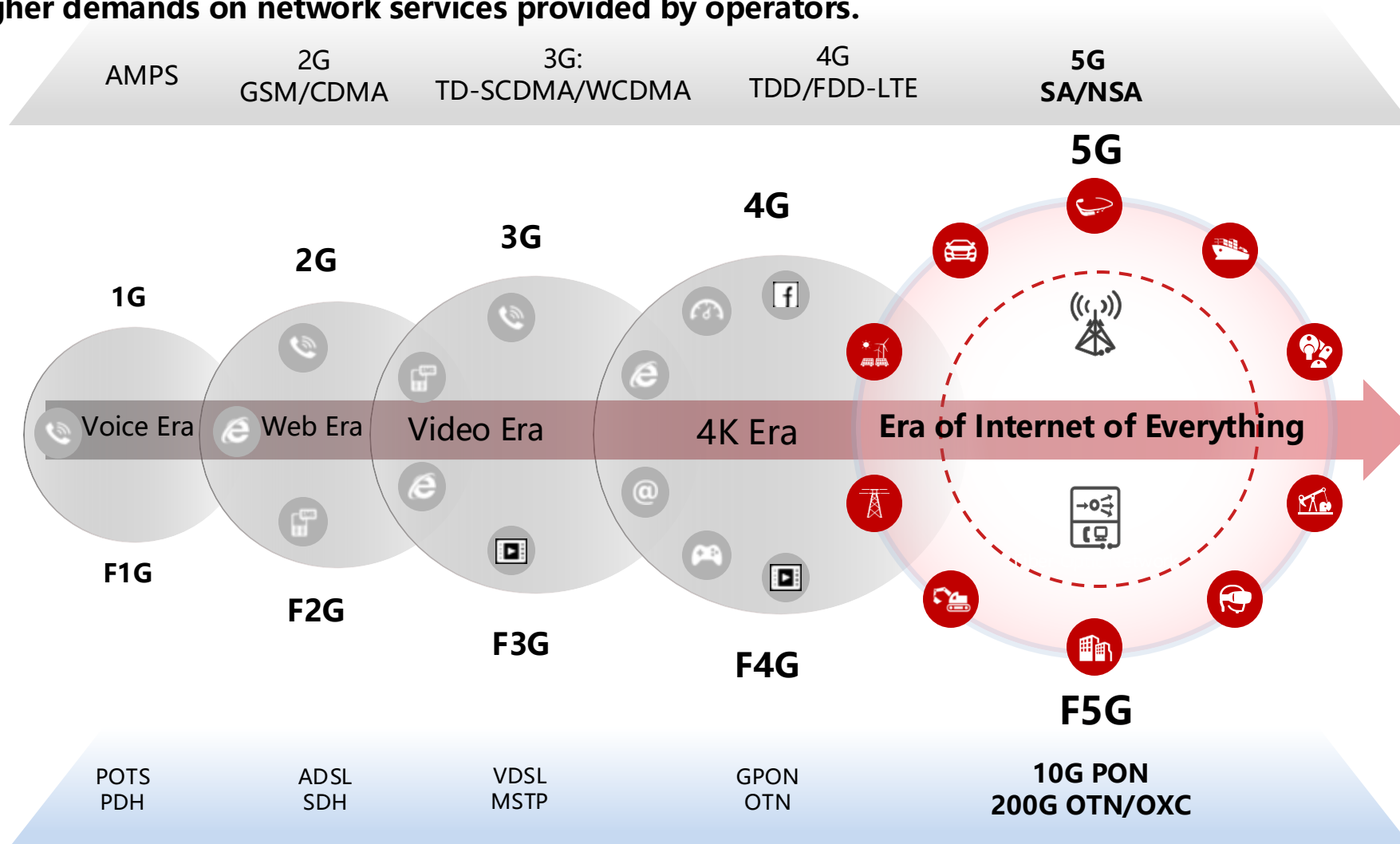
Converged technologies exploration for AI-FTTR

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Evolution of Home Broadband Network Technology

- With the rapid development of the social economy, household users have higher demands for smart living. From the initial phone calls to today's immersive large video applications, there has been a revolutionary upgrade every 8-10 years, which also places higher demands on network services provided by operators.



Business Trend: From Uniformity to Personalization, AI Brings Three Major Transformations



Family Health and Wellness

Elderly Population >270 million



Interactive Fitness

Fitness Population >400 million



Cloud Gaming Cloud XR

Gaming Population >478 million



Child Education

Education Population >350 million

Huge market potential

Scenario-based service = Customer group × Time × Space × Terminal × Cloud service

Building AI + Service Architecture to meet users' potential needs

Uniform Experience

(Network | Service Provider)

Personalized Experience

(AI Service Provider)

Challenges : Long-Tail Applications | Fragmented Market | Multi-Service Overlap

Three major transformations to address challenges

Intelligent Services

- Customization: Intelligent services tailored to different members' needs
- Scenario Integration: Services for different scenarios within various business combinations

Computing Power Cloudification

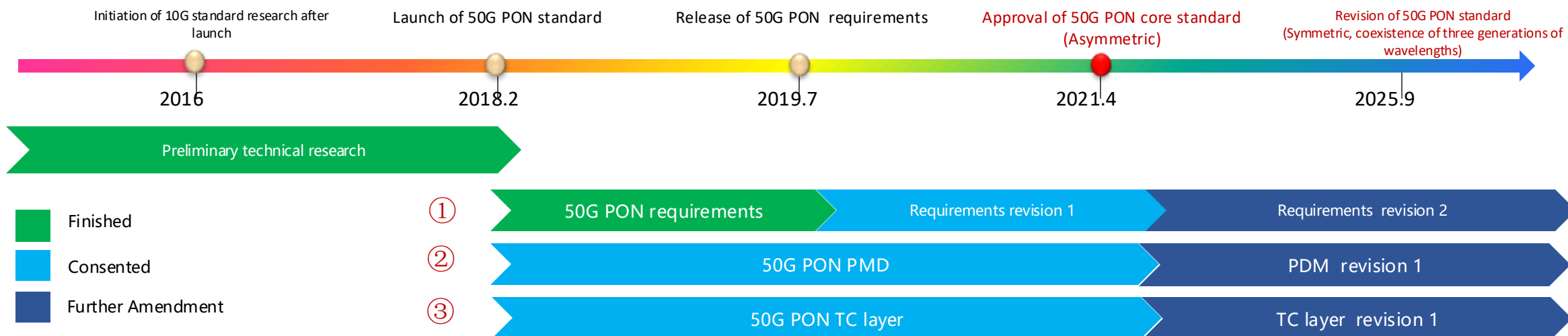
- Ecosystem Aggregation: Aggregating High-Quality Applications, Atomized Service Capabilities
- Unified Platform: Unified Data Management/AI Empowerment

Business Agility

- Continuous Interaction: Rapid Interaction Between Cloud and Users/Terminals
- Minimalist Terminal: Unified terminal for rapid business delivery

The capabilities of the 50G PON access network are already

- ITU and IEEE jointly developed the 50G PON standard, increasing speed by five times, fully released; multiple OLT manufacturers have already launched products



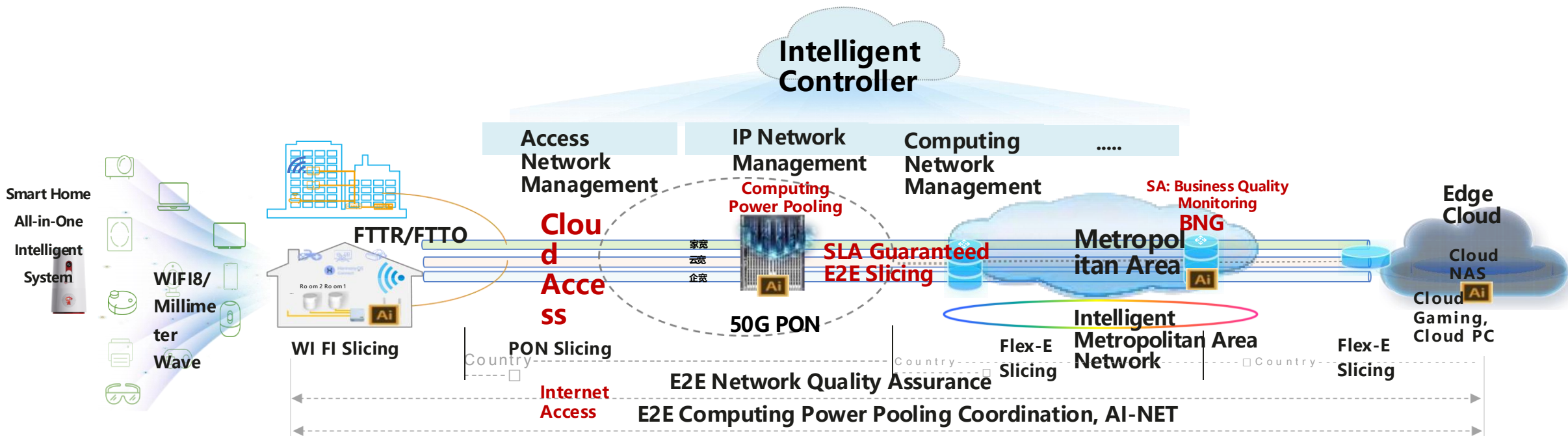
Progress of equipment vendors

- 2021-2023: Mainstream OLT manufacturers, chip manufacturers, and optical module manufacturers actively conduct pre-research
- 2023-2024: Prototype launch, laboratory testing with good results
- 2025-: Establishment of a foundation for large-scale commercial use, promoting pilot applications in existing networks

Progress of operators

- 2021-2023: Actively tracking and preparing in advance
- 2023-2024: Collaborate with equipment manufacturers for laboratory testing, initiate enterprise standard formulation
- 2025-: Respond to national strategy, fully promote pilot applications in existing networks

10G Full Optical Broadband Network Architecture



① True End-to-End 10G

- 10G Terminals, 10G WiFi/Millimeter Wave
- 50G COMBO PON OLT, Coexistence of Three Generations and Five Modes
- 100G Uplink, 100G Link Carrying

② E2E Sliced Network Assurance

- FTTR Intelligent Wi-Fi, Traffic Splitting by Terminal or Application
- OLT slicing forwarding, Coordination with BNG with Flex-E
- BNG metro Network Flex-E Slicing

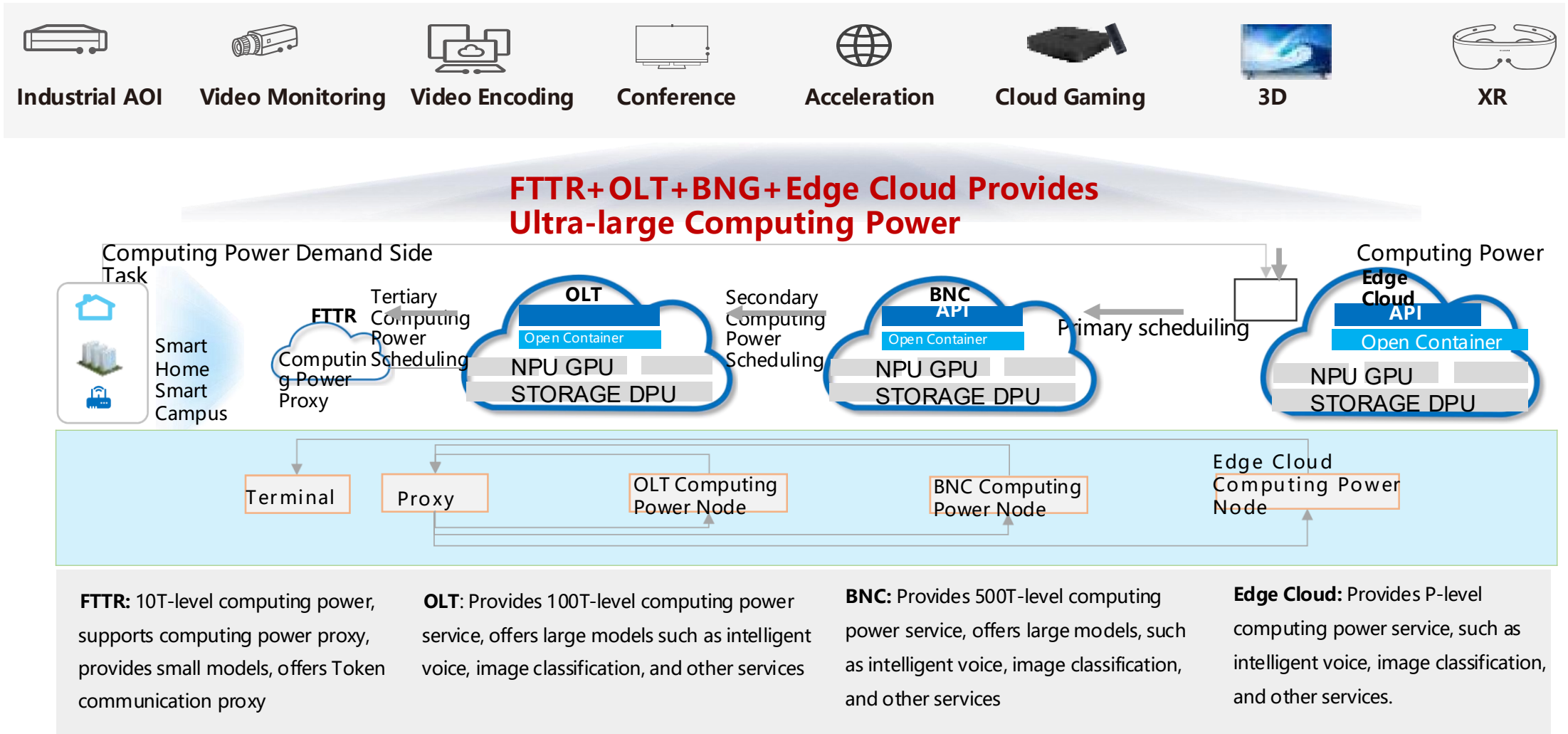
③ Computing Power Networking

- Computing Power Scheduled by Latency, Bandwidth, Privacy, etc., Unified Dispatch, Global Load Balancing
- Unified Architecture (OS/Docker/AI Framework), Multi-application Operation
- AI for NET, NET for AI

④ Intelligent Computing Network Controller

- Global Visibility of Entire Network Resources, Dynamic modification
- Unified Management and Coordinated Scheduling, Application-level Flow Slicing Scheduling, Computing Power Scheduling, Flow Detection

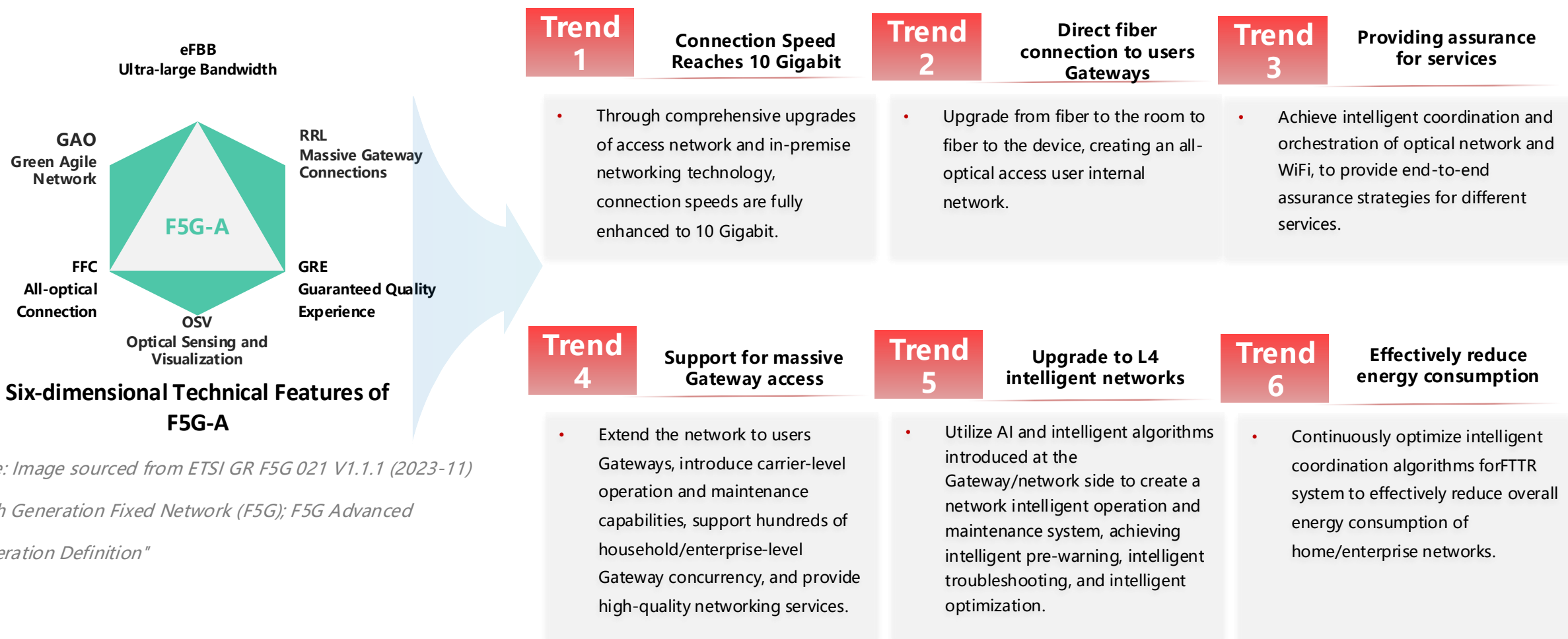
Cloud-Edge-End Computing Power Networking, Multi-level Coordination



Integrate access network computing power, connect computing power into a network based on FTTR computing power modules, BNC/OLT intelligent boards, edge cloud computing power nodes, and simultaneously build a multi-level computing power scheduling mechanism to achieve efficient utilization of computing power, providing effective computing power assurance for business scenarios.

Demand for In-premise Gateways in the Era of 10G

- The gateway will comprehensively upgrade connection technology, Gateway type, and operation and maintenance technology to create a brand-new F5G-A in-premise network. This will continue to meet the requirements of 10 Gigabit services, extending high-quality 10 Gigabit networks into homes and businesses.



Future Outlook for Gateways in the Era of 10G

- Combining current network experiences and trends in technological industry development, has proposed the next-generation evolution direction for access Gateways in the 10 Gigabit era.



Advancing Comprehensive 10G Connectivity

In line with the 50G PON network upgrade plan, propose a low-cost upgrade coexistence solution, and promote large-scale 10 Gigabit applications based on WiFi/G.fan/Ethernet technology.



Diversified type of device to Expand Service Scenarios

Integrate hardware modules to create new types of Gateways, providing high-quality networking services and integrated applications for homes, and extending application scenarios to small enterprises, factories, and campuses.



Software and Hardware Upgrades to Build a Technological Foundation

Comprehensive hardware upgrades and intelligent software enhancements to promote the construction of AI capabilities of access network and in-premises network, building the technological foundation for smart homes.



Transition from Connection Center to Services Center

Leverage the advantages of all-optical connectivity and carrier-level operation and maintenance services to support a rich array of computing, intelligent applications based on network services, creating a user service center.

Innovative Connections for in-premises Gateways

- The next-generation in-premise network will comprehensively upgrade from large network connection capabilities, internal network connection capabilities, and heterogeneous network integration capabilities to achieve 10G high-quality network connection capabilities.

Enhancement of Large Network Connection Capabilities

Fully match the 50G PON upgrade plan, deploy as needed, support building network with different vendors' OLTs and Gateways, and provide users with 10G symmetrical access capabilities.

- **50G PON Gateway Development:** Quickly promote the research and application of 50G PON gateway ASIC chips to rapidly reduce Gateway costs and drive large-scale deployment applications.
- **Coexistence Evolution of Existing Gateways:** Consider the coexistence strategy of 2 generation Gateways based on the actual situation of each operator's existing network.

Enhancement of Internal Network Connection Capabilities

Fully upgrade FTTR/O to 10G, introducing high-speed Ethernet, WiFi, and other internal network connection technologies to provide users with indoor 10G networking capabilities.

- **Wired Connection Technology:** Fully popularize 2.5G symmetrical PON/Ethernet networking technology and gradually popularize 10G electrical/optical port technology.
- **Wireless Connection Technology:** Accelerate the implementation of WiFi7 technology, reserve WiFi8 technology, and continue researching the application of Star Flash, millimeter wave, and wireless communication technologies in home integrated networking.

Enhancement of Heterogeneous Network Integration Capabilities

Make Gateways as a leverage point to achieve the underlying integration of various network technologies within the home, thereby effectively improving efficiency and quality of network.

- **Indoor Optical and Short-Range Wireless Integration:** Develop new protocols like WMCI based on FTTR Gateways to achieve integration of optical, WiFi, mobile networks, and other heterogeneous networks.
- **Integration of FTTR and FTTH Protocols:** Explore the expansion of PON protocols to enable network monitoring, performance quality monitoring, and roaming optimization among multiple FTTR systems.

Innovation in in-premises Gateway Forms

- ❑ Leverage the access point advantage of Gateways to achieve multi-Gateway innovation and create new types of Gateways for the 10G era, targeting industrial applications.

Innovation in Multi-Gateway Integration Forms



FTTR+ NAS

Build a high-speed, secure, and easy-to-use home storage center

联通云
Unicom Cloud

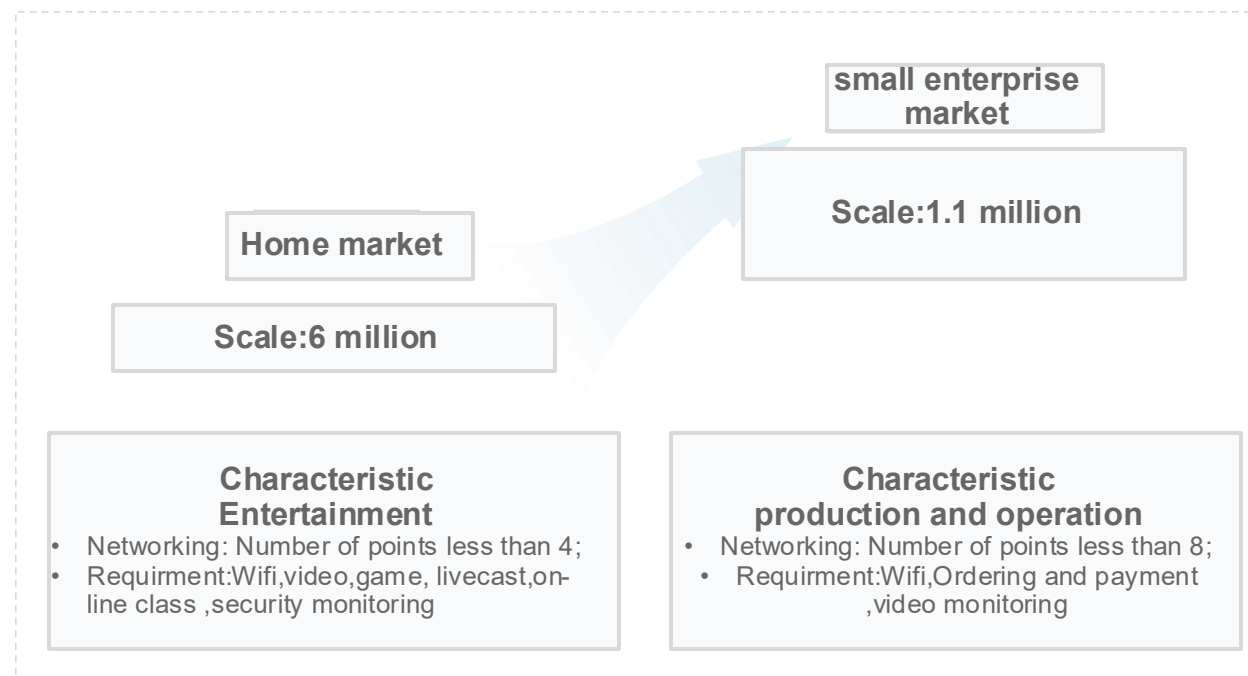
Local NAS
+
Cloud NAS
+
China APP
Unicom



FTTR+ IPTV



Innovation in Enterprise/Industry User Forms



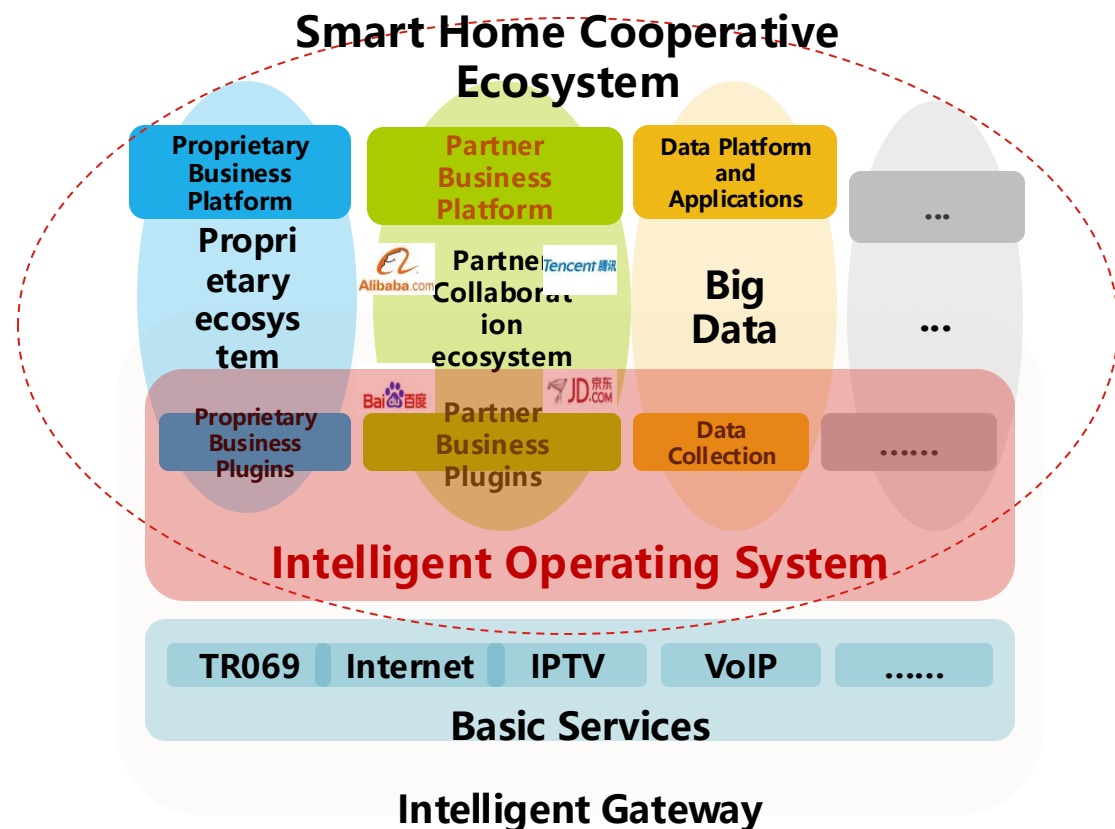
Hardware Innovation for in-premise Gateways

- With chip iterations, service demands, and network upgrades, processing performance continues to enhance, and hardware is being updated based on application-oriented, and AI-driven.

	100M era	1G era	10G era
Access methods	1G PON Primarily GPON/EPON	10G PON Primarily XGPON/10G EPON	50G PON Initiate deployment of 25G/50G Gateways, exploring the demand for 50G/50G Gateways
Processing capability	Single-core Single-core processing chip with a processing capability of 1200 DMIPS	Dual-core Dual-core processing chip with a processing capability exceeding 3000 MHz	Quad-core Quad-core processing chip with processing power exceeding 8000 DMIPS, integrated independent AI chip
Network port specifications	4*100 M ports 4 FE ports become mainstream, starting to promote 1*GE ports	4*1G ports Comprehensive adoption of 4 GE ports	Upgrade Comprehensive upgrade to 2.5GE, gradually upgrading to 10GE; fully promoting indoor all-optical connections, upgrading to 10G G.xfin specifications
WiFi specifications	WiFi3/4 Upgrade from 11b/g to 11n, with speed increasing from 24M to 80M	WiFi5/6 Upgrade to over 1000M with a combination of WiFi5+WiFi6	WiFi 7/8 Fully upgraded to WiFi7, evolving towards WiFi8, with speeds reaching 5000 Mbps, Exploring WiFi millimeter wave technology for 1G speed.
Expansion interfaces	Voice services POTS port supports voice services	USB interface USB supports USB dongle services	IoT + local computing interfaces Supports IoT interfaces like Star Flash and Bluetooth, as well as PCIe/SATA local storage interfaces

Software Innovation of in-premises Gateway

- Gateways will fully integrate intelligent operation systems, upgrading to smart Gateways, laying the foundation for operators to build smart digital service centers.



Comprehensive Enhancement of Innovative Business Capabilities

- Standardized Development Interface:** Provides developers with a rich set of development APIs, effectively reducing the complexity of business R&D.
- Standardized Runtime Environment:** Utilizes container technology to achieve permission isolation and resource allocation, preventing interference between businesses.
- Standardized Deployment Process:** Offers remote product deployment and upgrade capabilities for operations, aiding in the commercial launch of applications.

Comprehensive Promotion of Digital Operation and Maintenance Capabilities

- in-premise network Management and Operations:** Collects indoor fiber and WiFi status, evaluates in-premise network quality, and pioneers a digital twin operation and maintenance system for in-premise networks.
- Business Development Quality Operations:** Analyzes from five dimensions—quantity, quality, structure, efficiency, and risk—to streamline market-network-operation processes and create an automated operation system.
- Comprehensive Enhancement of AI Capabilities:** Based on multi-Gateway AI collaboration and end-cloud AI collaboration architecture, it expands AI computing power as needed, customizes lightweight AI models, and builds an intelligent service system for in-premise networks.

Innovative applications for in-premises Gateways

- ❑ Comprehensive upgrades through 10G+ all-optical + indoor short-distance technology provide a solid network foundation for building an innovative base for smart applications.

AI edge computing applications

➤ Function Description:

- Fully supports AI capabilities, offering features such as traffic recognition, self-intelligent configuration, and video analysis, empowering various applications of the in-premise network.

➤ Application Scenarios:

- Network endogenous optimization: Effectively analyzes interference and concurrency causes, quickly identifies quality bottlenecks, and optimizes network performance in real-time.
- Business Gateway AI collaboration: Collaborates with Gateways like cameras and smart speakers to meet AI computing needs, reducing AI investment and energy consumption in in-premise networks.

Fixed network slicing applications

➤ Function Description:

- By integrating Gateways, achieve low-latency channel setup for home WiFi, home optical networks, and access networks.

➤ Application scenarios:

- WiFi slicing: Provide new WiFi QoS capabilities such as CO-SR.
- in-premise network slicing: Develop the ability to optimize indoor networking and WiFi coordination.
- Access network QoS: Collaborate with OLT to achieve resource, service, and user slice management.

Information Security Applications

➤ Function Description:

- Enhances the information security capabilities of the Gateway itself and introduces security plugins to implement in-premise network security protection services.

➤ Application Scenarios:

- Gateway access security: Supports trusted authentication for a large number of Gateways.
- Business traffic security: Supports interception of more types and larger volumes of attack traffic.
- User behavior security: Supports secure encryption of user behavior and sensitive business activities.

Industry Customized Applications

➤ Function Description:

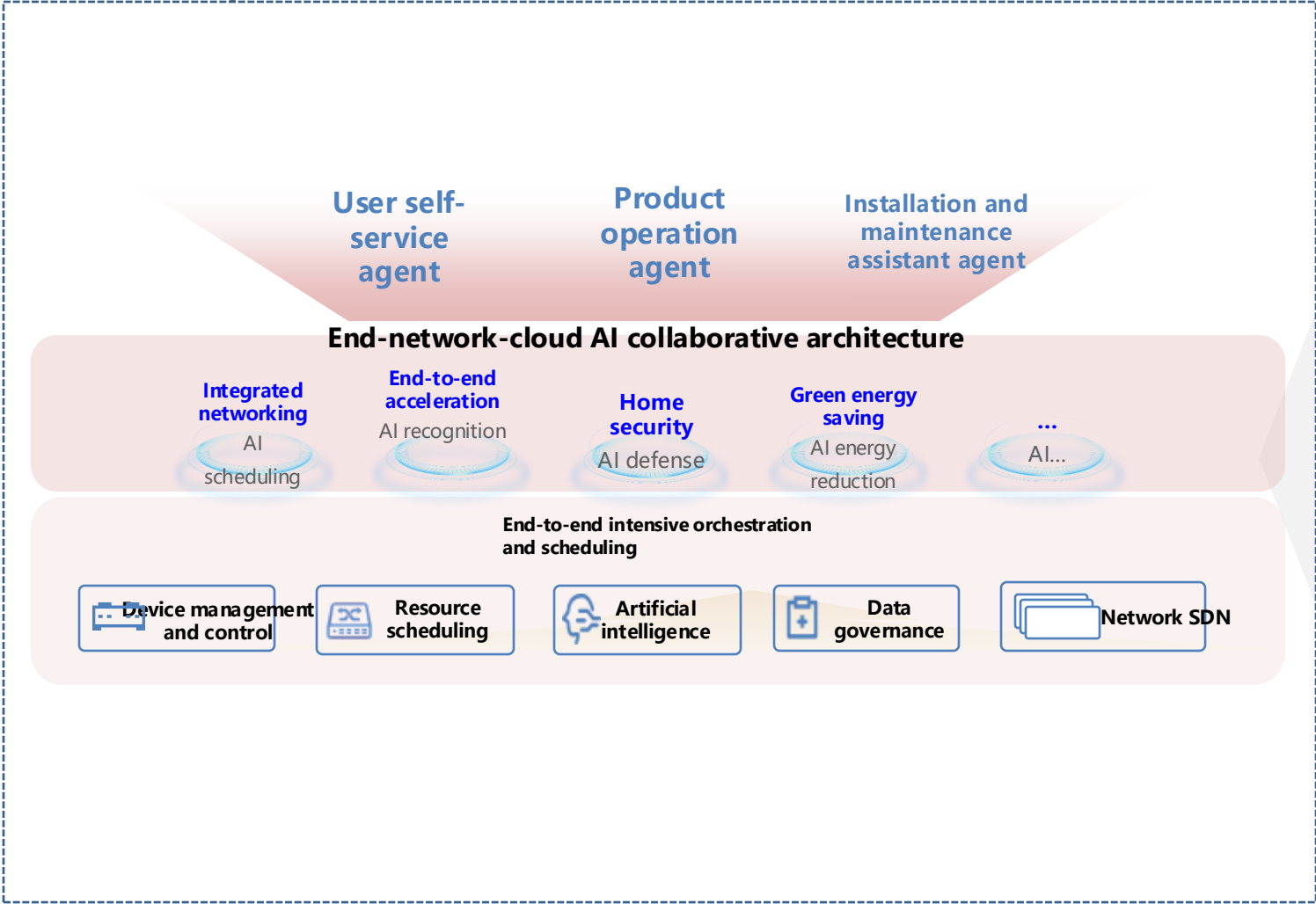
- Relying on FTTO/government-enterprise gateway capabilities, it provides personalized post-investment services for small and micro enterprises, factories, and parks.

➤ Application Scenarios:

- Security audit business: Internet access services in public places.
- Cross-regional roaming services: WiFi roaming and self-organizing network management services between multiple FTTO/multiple PON ports.

AI System Innovation Plan

- Empowered by AI, integrated innovation, promoting comprehensive upgrades of Gateways, networks, systems, and applications to create a new generation communication system, delivering a high-quality communication service experience



Developing intelligent in-premise network agents
User-oriented, enhancing the real interaction experience between products and people

Building an end-network-cloud AI collaborative architecture
Application-oriented, empowering diverse smart home innovative applications

Achieving end-to-end network orchestration
Network-oriented, enhancing service quality and effectiveness

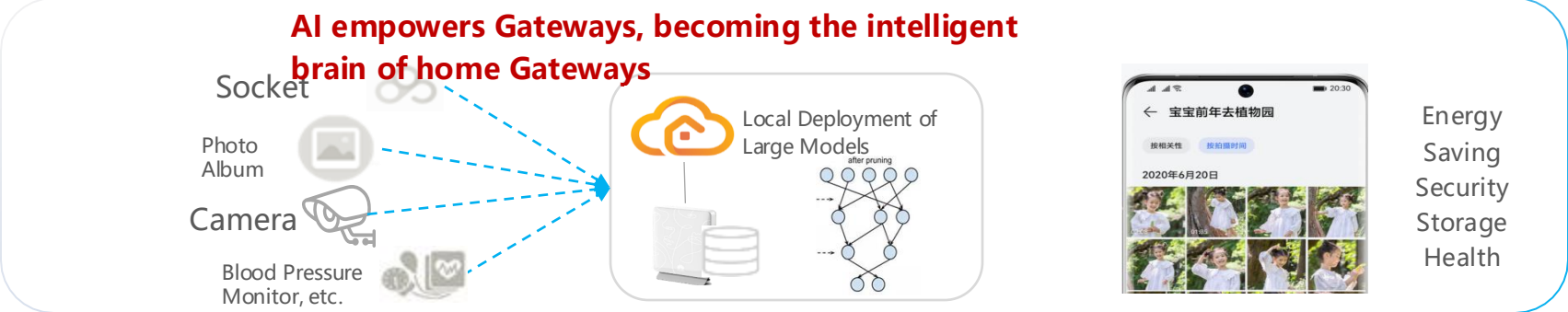
China Unicom's FTTR+AI Fusion Application Innovation



- Utilize FTTR's powerful processing capabilities to develop AI capabilities within smart home Gateways, enabling intelligent collaboration between devices and the cloud, and promoting large-scale application of smart home technologies.



FTTR+AI
AI Empowered Network Services
Continuous Value-added Operations



**Thank you for
listening**