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**DEMONSTRATE  
NEW ACHIEVEMENTS  
AND EMPOWER  
THE NEW DEVELOPMENT  
OF MODERN INDUSTRIES**

**Resolutely Serve as the “Pillar” to Build a Solid Digital Base**  
**Strive to Become the “Leader” in Supporting Modern Industries**  
**Make Every Effort to Become the “Frontline Troop” of Innovation-driven Development**  
**Committed to Serving as the “Escort” of Network Security**  
**Actively Building a Win-win “New Ecosystem” for the Digital Industry**



China’s modernisation needs to further smoothen the information “artery” of economic and social development, and continuously accelerate digital economy, digital society and digital government construction through the integration and innovation of digital, network-based and intelligent transformation. China Unicom unwaveringly strengthens the construction of digital information infrastructure, accelerates the promotion of the integrated development of the digital economy and the real economy, regards innovation as the primary driving force for development, improves the core capability of network security, and works with all parties in the industry to win the “Group Competition” for digital, network-based and intelligent development.



**Measures adopted in 2022**

- Through in-depth development of co-build co-share, the Company maintained its leading position in the industry in the premium network for government and enterprises, with the total computing power of the entire network reaching 525 PFLOPS, and achieved new results in network quality.
- Based on the core capabilities of cloud, big data, IoT, AI, blockchain and security, the Company built over 16,000 “commodity flat” 5G-scale applications, and typical application scenarios covered 52 categories of the national economy, promoting the integration of digital economy and real economy.
- Implemented critical technology research in order to accelerate in fields of 5G enhanced technology, cloud computing and Big Data.
- The Company adhered to its role as a telecommunications operator during communications support for major events, rescue and disaster relief, and epidemic prevention and control, and launched products such as Unicom Mogong, Unicom Cloud Shield, and network situational awareness to continuously promote the secure and stable development of the industry chain.
- Integrating the advantages of various parties such as industry peers, equipment and terminal suppliers, channel partners, and strategic investors, China Unicom strived to win “team competition”.



**Actions to be taken in 2023**

- Continuing to increase investment in digital information infrastructure to bring the network quality to a new level.
- Continually enhancing solution capabilities for individuals, families, government and enterprise customers and commercial enterprise customers.
- Adhering to innovation-driven development, focusing on improving scientific and technological innovation capabilities, and addressing technological innovation as a “key variable”.
- Coordinating development and security to create more independent innovation achievements, and continuously improving the resilience and security level of the industrial chain and supply chain.
- Deepening cooperation with strategic investors and industry leaders, achieving win-win cooperation in terms of business, products and capital.

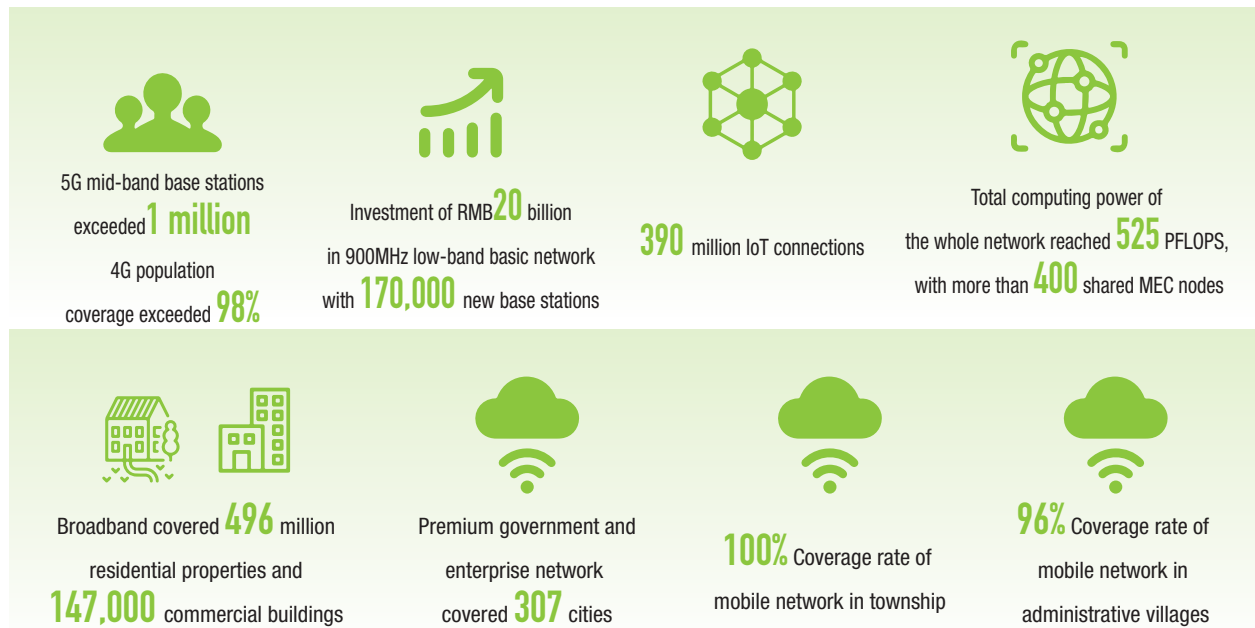
## Resolutely Serve as the “Pillar” to Build a Solid Digital Base

China Unicom accelerated the construction of intelligent comprehensive digital information infrastructure with the characteristics of “high-speed and ubiquitous, air-space-ground integration, cloud-network integration, intelligent agility, green and low-carbon, and secure and controllable”, to build a solid digital base for economic and social development.

### Construction of New Infrastructure

China Unicom pursued moderate advancement, promoted use through construction and combined construction with use, unwaveringly increased investment and made every effort to make a leap from “basic connection” to “connection of all things”.

#### Accelerating the construction of four premium networks



#### Accelerating the construction of premium 5G network

China Unicom fully promoted the construction of premium 5G networks, so that more and more customers can enjoy China Unicom’s premium network services from prosperous cities to tranquil villages, from the roof of the world to islands of South China Sea.

- The Company joined hands with China Telecom for further co-build co-share, and worked together to create a premium 5G network with wider coverage, stronger capabilities, better quality and better experience, so as to achieve continuous 5G network coverage in rural areas and above with faster speed, higher reliability and more extensive scenarios. China Unicom’s 5G base stations accounted for around 30% of the world’s total.
- The Company accelerated the construction of the 900MHz low-band basic network, and effectively improved the network coverage in rural areas and remote areas.
- The Company accelerated the promotion of the ubiquitous interconnection of human, machines and devices. In April, the Company was the first to achieve IoT connections exceeding human connections, that is, the number of mobile IoT connections exceeded the number of mobile phone users. Relying on the capabilities of its independently developed Yanfei-zhilian Intelligent Connection Management Platform and Yanfei-gewu Device Management Platform, the Company provided secure and reliable terminal, network and cloud integrated services for industries such as financial payments, smart buildings, intelligent operation and maintenance of industrial equipment.

China Unicom in Yantai Shandong made use of 5G + microwave technology to open up the offshore 5G channel from Yantai to Dalian, solving the problem of no mobile phone signal in 150 kilometres offshore, which was widely praised.



5G + microwave technology to open up offshore 5G channels



**Accelerating the construction of premium gigabit broadband network**

The Company created a premium gigabit broadband network that connects thousands of households driven by the “dual gigabit” strategy.

- The gigabit fibre network coverage doubled to more than 200 million households, securing a leading position in the northern region and precise coverage in the southern region.
- The Company carried out cooperation for construction of broadband network. Through social cooperation with China Broadnet and private capital partners, it built 51.37 million broadband ports, accounting for 21% of the total.
- The Company launched a broadband network digital operation platform to provide a variety of convenient network diagnosis services for China Unicom’s broadband subscribers, letting them fully understand the status of the network.



**Accelerating the construction of premium government and enterprise network**

The Company launched premium government and enterprise networks with wide coverage, low-latency and high-reliability, providing intelligent, secure and high-quality dedicated line services, and continued to maintain the industry-leading position in terms of premium dedicated line brands. The coverage extended to additional 59 new cities and reached 307 cities in total, accelerating the digital transformation and upgrading of government and enterprise customers.



**Ultra-wide coverage**

300+ cities

Hundreds of thousands of commercial buildings



**Ultra-large bandwidth**

Direct access to dedicated channel

100 G bandwidth

readily available



**Ultra-low latency**

Urban latency circle

Minimum 1ms



**Ultra-high reliability**

1+1 Hard pipes

Up to 99.999%



**Intelligent experience**

Intelligent provisioning

Visible routing

**Accelerating the establishment of new advantages of computing-network integration**

The Company implemented the national strategy of “Eastern Data and Western Computing” to build a high-quality computing power network, build a solid base and establish a cloud-network-edge integrated scheduling system. It improved its international network capabilities, and continuously enhanced its integrated computing-network service capabilities featuring “connection + perception + computing + intelligence”.

- The Company allocated cloud resource pools in accordance with the three-level structure of “5 + 4 (core) + 31 (provincial) + X (local/edge)” to accelerate the deployment of eight national hub nodes of “Eastern Data and Western Computing” in Beijing-Tianjin-Hebei, Yangtze River Delta, Guangdong-Hong Kong-Macao Greater Bay Area, Chengdu-Chongqing, Inner Mongolia, Guizhou, Gansu and Ningxia.
- The Company built a full-area all-optical network with ultra-wide coverage, ultra-large bandwidth, ultra-low latency and intelligent scheduling, created a high-quality public Internet centred on subscribers and computing power, established a smart metropolitan network with the integration of multiple businesses, and formed a layout of 13 core nodes of computing power, leading the industry in terms of network latency.
- The Company built a premium industrial Internet integrating computing and network, to provide high-quality and differentiated services for 2B subscribers.

The “Fujian-Ningxia Cloud” project of China Unicom Zhongwei Cloud Data Center was launched. As a demonstration project of “Eastern Data and Western Computing”, it will create a computing power network with excellent structure, strong capacity and good experience through ecosystem integration, computing power enhancement and network speed acceleration, to support the construction of the “Western Digital Valley”.



China Unicom Zhongwei Cloud Data Center

### Continuous deepening of co-build co-share

China Unicom cooperated with China Telecom to comprehensively deepen the co-build co-share in 5G, 4G and basic network resources, which improved the efficiency of resource utilisation, formed leading network capabilities and promoted the high-quality, healthy and green development of digital information infrastructure.

- The scale and coverage of 5G network continued to remain comparable to the industry. The Company basically achieved continuous mid-band coverage of hotspot rural areas, towns and above. 200M capability was fully deployed in key scenarios across the country and major cities such as Beijing, Shanghai, Hangzhou and Chengdu, among which, Beijing became the first city in the world with city-wide 200M continuous coverage.

- The two parties put in service an additional 450,000 4G shared base stations, reaching 1.1 million in total. The 4G network coverage of China Unicom increased by 29.5%, with one 4G network covering indoor and outdoor in Beijing and Guizhou. Based on the remarkable results achieved with 4G co-build co-share, both parties reached a consensus to accelerate the consolidation of one 4G network.

- The Company expanded the scope of cooperation in infrastructure co-build co-share and co-maintenance, and actively promoted the cooperation in connection with trunk lines, local resources and IDC dual-line access, with the co-build co-share rate of 100% for trunk lines and over 95% for local optical cables. The two parties negotiated to formulate IDC access technology solutions, carried out dual-line access pilot projects for more than 20 provincial companies, and further promoted the cooperation in cloud-network integration, communication equipment rooms, international submarine cables, emergency support and other aspects to realise the synergy potential.

- The Company optimised the joint management mechanism and jointly developed a co-build co-share blockchain scheduling platform to strengthen the perceptual reciprocal monitoring and ensure network quality and smooth coordination.

Cumulative saved more than

RMB **270 billion**  
of investment for the country  
through co-build co-share

Reduced operating costs by more than

RMB **30 billion**  
per year

Carbon emissions reduced by more than

**10 million** tons/year

### Application of new technologies to improve quality

Through the adoption of innovative technologies, digital-driven precision construction, enhancement of intelligent operation capabilities, and improvement of operation mechanism and process, China Unicom has continuously improved the network quality.

#### Application of new technologies and new equipment of network

- The Company improved the high-speed mobile coverage of 5G high-speed railways, continued to promote network cloudification and centralisation of core networks, and its 5G technology won the first prize of the Science and Technology Award of the Radio Association of China in 2022.

- The Company completed the IPv6 upgrade of 4G network and simultaneously deployed IPv6 for gigabit optical network, 5G and new direct links. The Company built the industry's first security function chain (SFC) and 5G IoT IPv6 single stack pilot, and became the first in China to receive the "IPv6 +" Ready1.0 certificate.

- The Company optimised the China169 backbone network in key directions, and newly opened 22 inter-provincial direct connection directions, with the average latency of the entire network below 29ms, maintaining its leading position in the industry.

#### Network and business collaboration to improve subscribers' perception

- The Company became the first in the industry to realise nationwide centralised application, end-to-end automatic scheduling and activation, and centralised monitoring and operation of 5G slicing business. The time needed for business activation was shortened from the industry average of one week to a few minutes.

- The Company carried out precise construction based on subscriber demand and combined with Big Data means, and handled a total of 7,679 cases through complaint-driven construction, resulting in 99.5% decrease in customer complaints and a significant improvement in network quality.

#### Building smart operation service capabilities with computing network

- The Company continued to promote resource visualisation and improve Big Data operation capability and intelligent operation capability. According to the evaluation of the National Mobile Network Quality Report (22Q3) issued by the China Academy of Information and Communications Technology (CAICT), the Company ranked first in the proportion of 5G network with downlink access speed above 100Mbps, with the highest 4G network average downlink access speed of 45.79Mbps.

- The Company continued to improve the independent implementation capability of network ICT and 5G private network business, as well as the operation capability of digital delivery to ensure the quality of services delivered.



Average broadband access speed up by **35.6%**

Best basic telecom operator for **82** consecutive months

in terms of China169 network latency



Mobile IPv6 traffic accounted for **47.21%**

Fixed-line IPv6 traffic accounted for **13.5%**



Feedback from subscribers that **“China Unicom’s network is getting better”**



**40%** decrease in complaints about **the quality of China Unicom’s network**

## 🏆 Demonstrating Responsibility in Major Events

China Unicom firmly ensured the implementation of major national strategies and continuously polished China Unicom’s reputation of “first choice of the country, government and people” in major battles such as communication support for major events, rescue and disaster relief, and epidemic prevention and control.

### Supporting major events

Adhering to the philosophy of “carefulness, focus, trust, excellence and intelligence”, China Unicom provided 131 communication support for major national conferences and events such as the “Two Sessions”, the Beijing Winter Olympics and Paralympic Winter Games, the Shanghai Cooperation Organisation Conference, the Shanghai International Import Expo, and the Launch and Recovery of Shenzhou-series Launch Vehicle in 2022. The Company achieved zero occurrence of major network security incidents, zero tampering of important websites, zero leakage of important data, and meeting people’s expectations.

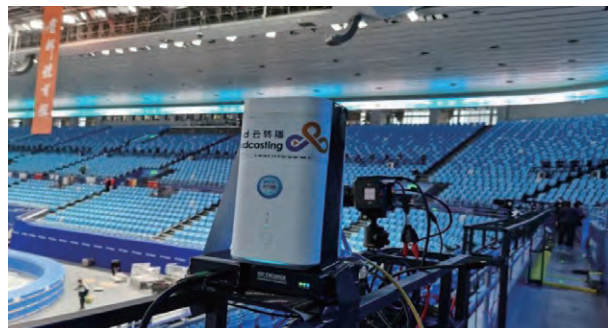
### Communication support for the Beijing Winter Olympics Games and Winter Paralympic Games

In 2022, the world watched as the Olympic Games were held in Beijing. As the sole official telecommunication services partner of the Beijing 2022 Winter Olympics Games and Winter Paralympic Games, China Unicom has achieved more than 20 “global firsts” and “historical breakthroughs” in fields such as “smart event management, smart spectator experience, and smart athlete participation, building the most advanced digital base for a high-tech Winter Olympics.

- The Company dispatched a total of 377,800 support personnel and 166,100 vehicles, and formed 42 on-site support teams composed of 1,503 people to provide 95,000 services for the Winter Olympics Games and Winter Paralympic Games.
- The Company compiled the Winter Olympics Legacy Report and Case Collection of China Unicom to promote the replication and promotion of the technological achievements of the Winter Olympics and facilitate the digital transformation and development of various industries.



The world’s first 5G HD high-speed railway studio



5G + cloud broadcast brought audience a viewing experience of 8K ultra-HD

### Participating in disaster relief

In 2022, natural disasters occurred frequently in China. China Unicom made early deployment, revised its emergency communication support plans, investigated hidden dangers, carried out emergency drills, responded quickly, and took up various emergency rescue and communications support tasks. Natural disasters such as typhoon “Xianba”, “Mulan”, “Ma-an”, “Xuanlannuo” and “Meifa”, as well as the mountain torrents in Datong, Qinghai, and the 6.8-magnitude earthquake in Luding, Ganzi, Sichuan, all resulted in local communication interruptions. All units of the Company responded quickly and worked together to repair and restore damaged communication facilities in a timely manner, while meeting the urgent communication needs of the people. Throughout the year, the Company invested a total of approximately RMB55.53 million, dispatched 65,739 person-times and 23,183 rescue vehicles, and provided 3,641 emergency equipment and 14,982 emergency fuel generators for disaster relief. Through early deployment, early implementation and early prevention, there were no large-scale base station shutdowns or widespread communication interruptions in 2022, leading to a reduction of RMB375 million in direct economic losses as compared with 2021.

Personnel participating in disaster relief

**65,739**  
person-times

### Supporting scientific and technological pandemic prevention

In the face of the pandemic, China Unicom's cadres and employees devoted themselves to the front line without fear of difficulties and challenges, dedicatedly served the pandemic prevention and control to ensure the safety and smooth operation of the whole network during the pandemic, ensure the stable operation of various pandemic prevention systems, and ensure the uninterrupted customer service. The Company launched more than 20 scientific and technological anti-pandemic products represented by Digital Sentinel and Cloud Cabin, and properly conducted the communication big data digital travel record service and the protection of user privacy after they went offline, contributing China Unicom's strength to the prevention and control of the pandemic.

China Unicom's Digital Sentinel is a digital and intelligent access management product that was applied to routine pandemic prevention and control, and has served more than 20 provinces across China. In Nanshan District, Shenzhen, through the one-code verification platform, it connected with 2,000 sets of electronic sentinel information, enabled sharing of pandemic verification data, and provided services for 7 million residents in Nanshan. In Ningde, Fujian, the Digital Sentinel provided digital access management services for the government, communities, properties, schools, office buildings and construction sites.



Digital Sentinel provides safety services for mass transit

In the spring of 2022, the pandemic in Shanghai was severe and complex. While protecting the health of employees, China Unicom Shanghai team made every effort to provide communication support and volunteer services for epidemic prevention and control, and provided material assistance to make a positive contribution to the fight against the epidemic in Shanghai.



China Unicom Shanghai Branch helped win the battle against the pandemic

China Unicom Nankai Tianjin Branch joined hands with the communities to fight against the pandemic. The volunteer team of 91 people led by the "top leader" provided volunteer services for pandemic prevention in the community for many times, and supported the nucleic acid screening work in the communities for more than 100 times in total, serving tens of thousands of residents.



Staff of China Unicom Tianjin Branch fought against the pandemic



## Strive to Become the “Leader” in Supporting Modern Industries

China Unicom gave full play to its advantages of information and communication network technology, accelerated the development of modern industrial system, facilitated the deep integration of digital economy and real economy, promoted the development of digital economy and the upgrading of information consumption, and made full efforts in the field of digital economy, so as for the whole society to further share the new achievements brought by the development of information communication.

### Empowering the Construction of Modern Industries

By leveraging the advantages of cloud, Big Data, IoT, AI, blockchain and security integration, China Unicom unleashed the value of data, deeply supported modern industrial data governance and data security services. It also helped to strengthen and expand industrial Internet application products for some key industries, and supported the development of digital economy, digital society and digital government.

#### Supporting the construction of digital government and smart cities

##### Digital Government

In accordance with national policies such as the “Guiding Opinions of the State Council on Promoting the Construction of Digital Governments” and the “Guidelines for the Construction of the National Integrated Government Big Data System”, China Unicom was comprehensively building its integrated digital government capabilities and product system. In 2022, the Company newly launched 44 self-developed products in the digital government field, with a total of 151 products.

The Company upgraded and created more than 300 integrated solutions, including the “China Unicom Digital Government Industry Comprehensive Solution”, “China Unicom Government Service Baseline Solution” and “China Unicom Government Service Big Data Solution”. With a total of more than 1,100 solutions, the Company provided full-chain digital government services from top-level design, integrated solutions, integrated delivery to operation services, which covered cloud, network, data, applications and security, with efforts to build the No.1 brand of “Unicom Service” for digital government.

At the First Digital Government Summit, China Unicom, was the sole operator working with the Guangdong Provincial Bureau of Government Statistics and the Research Institute of Digital Government to jointly release the theoretical report of “unified management with one network” for the provincial digital government of Guangdong Province, and launched the Guangdong Smart Governance Platform to help the government create multiple provincial-level topics such as economy, emergency response, agriculture and energy. China Unicom contributed to the construction of the digital government in Guangdong Province, and comprehensively helped to build the country’s first “provincial governance” demonstration province.



Guangdong Digital Government Provincial Governance “unified management with one network” Guangdong Smart Governance Platform

As the main force participating in Zhejiang’s digital reform, China Unicom supported Zhejiang Province to build the country’s first intranet big data platform for government affairs, and promoted government data to be visible, well-managed and well-used.

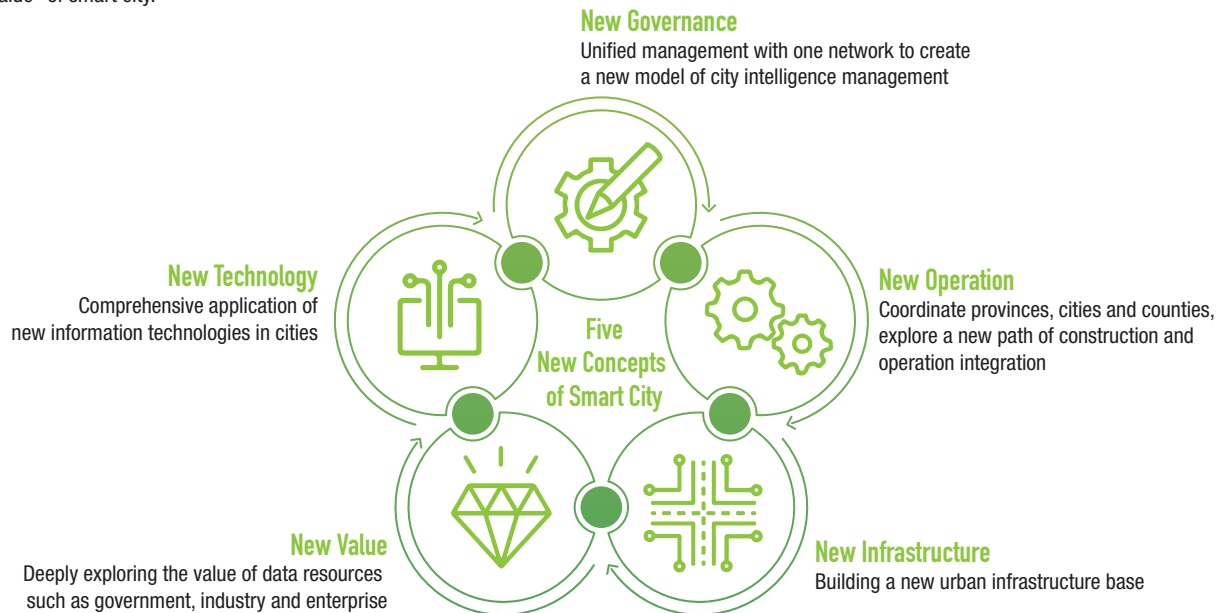


Zhejiang Provincial Government Intranet Big Data Platform



## Smart city

China Unicom has upgraded its new smart city capability system called “CityNext” which focused on key areas such as city governance, social governance, economic governance and grassroots governance. It launched 14 key solutions, including new smart city comprehensive solutions, county-level smart city public service platform operation, “unified management with one network” for city operation, all-round integrated governance, urban economic operation services and smart community, and provided services for more than 700 projects across the country. Based on the insight into the five new changes in smart city in refined governance, platform operation, new infrastructure, data and technology application, China Unicom proposed the “five new” concepts and capability system of “new infrastructure”, “new technology”, “new governance”, “new operation” and “new value” of smart city.



China Unicom's “Five New” Concepts in Smart City

China Unicom South District Qingdao Shandong Branch and China Unicom Digital Technology Co., Ltd. worked together efficiently to build a digital twin model for the whole-process city operation in the city's South District by using digital twin technology covering time and space data aggregation, integrated management, extraction and analysis, etc., and realised the digital management of the whole life cycle of social governance events. The platform was selected as an excellent case in the fields of grassroots governance and social governance of new smart cities in Shandong Province.



## Building the No.1 brand of “5G + Industrial Internet”

Focusing on 11 key industries, China Unicom created 30 key self-developed products and 11 baseline solutions. Based on the independent innovation capabilities of 5G, cloud, Big Data, IoT, AI, blockchain and security, China Unicom integrated the independent capabilities with industrial characteristics such as identification resolution, industrial AI, 5G high-precision positioning and industrial external network, and formed comprehensive solutions with China Unicom characteristics in typical industrial scenarios such as product traceability, unmanned inspection in power plants, and one network coverage for above-ground and underground facilities. The Company established legion groups for equipment, mining, steel, automobile and clothing, integrating CT, IT, DT and OT capabilities, to accelerate the extension of industrial internet from auxiliary production to core production processes.

In the 5th “Blooming Cup” 5G Application Competition held by the Ministry of Industry and Information Technology (MIIT), the number of projects submitted by China Unicom accounted for more than 40% of the total, and the application scenarios covered 52 categories of the national economy. The Company won 5 first prizes, 13 second prizes and 20 third prizes, and the total number of first, second and third prizes ranked first in the industry.



The Company winning first prizes in the 5th “Blooming Cup” 5G Application Competition

The “Maotai Cloud” jointly created by China Unicom Digital Technology Co., Ltd. and Guizhou Moutai effectively considered the characteristics of Maotai digital marketing APP, gave full play to the advantages of China Unicom’s self-developed cloud platform and localised services, solved the problems of high elasticity of resources, high reliability of business, high concurrency of heavy traffic and high growth of data, and fully supported “iMaotai” to cope with the peak traffic test.

On the day of the launch of “iMaotai”, the number of purchases exceeded 6,200,000 within one hour, and the number of instant active concurrent traffic reached 1,600,000. Wang Li, the chief engineer of Maotai Group, expressed gratitude to China Unicom, and highly praised the efforts made by China Unicom in the “iMaotai Digital Marketing Platform” for their quiet, dedicated and diligent work.



iMaotai Digital Marketing Platform

By utilising innovative technologies such as industrial Internet, identification resolution, cloud computing and Big Data, and based on the typical common needs of discrete and process-based manufacturing industries, China Unicom Jiangxi branch realised the identification resolution application model based on the industrial Internet platform, thereby meeting the deep needs of enterprises in three aspects, namely production execution, status monitoring and the integration of Big Data intelligent platform.



Industrial Internet Identification Resolution System

China Unicom Tianjin Branch undertook the 5G-empowered offshore oil project, built the first “smart factory” project for offshore oil and gas equipment manufacturing, and used 5G + smart production to enable the mutual real-time communication between the industrial brain and the underlying equipment of the smart production line, thereby realising the visualisation of the production process.



DIMS system for 5G smart factories in offshore engineering

China Unicom Jilin Branch cooperated with FAW Group, used 5G + digital twin and MR hybrid technologies combined with 3D digital sand table, to enable digital display of FAW NBD park, Hongqi production plant and Hongqi high-end vehicles. It provided the “5G + MEC + slicing” technology for the new energy factory of FAW Hongqi to meet the network requirements of diversified connection, performance differentiation and diversified communication in the automobile manufacturing process, and significantly enhanced the industrial supply capacity.



Provision of “5G + MEC + slicing” technology for the new energy factory of FAW Hongqi

### Digital empowerment of livelihood services

#### Smart medical care

China Unicom leveraged its advantages of digital health integration and innovation, continued to further penetrate the medical and health industry, fulfilling the mission of “serving medical reform and benefiting people’s livelihood”, and bringing new momentum to “Healthy China”. Having built a number of national, provincial and municipal demonstration projects in the fields of medical cloud, smart medical applications and health care big data, the Company used next-generation technologies such as Big Data, AI and 5G to build city-level health brain base and capabilities, and provide intelligent medical and health data services to the governments, medical institutions and industries.

China Unicom Guizhou Branch actively worked with the Affiliated Hospital of Guizhou Medical University to explore in-depth innovation in health management methods and carried out multi-level and multi-type cooperation. By deploying 5G health management terminals, including micro clinics, health check-up vehicles and health bracelets, real-time collection and remote monitoring of health data were achieved. It cooperated with Guiyang Second People’s Hospital to build digital platforms such as 5G medical surgery demonstration and education platform, 5G remote ultrasound guidance system, 5G remote imaging diagnosis system, and 5G remote teaching and management platform.



Smart Medical System of China Unicom Guizhou Branch

#### Smart transportation

China Unicom has formed a top-level architecture of “Intelligent Vehicle-Road Collaborative System” by focusing on six key issues, including 5G private network capabilities, edge collaborative computing, secure and reliable terminals, common ability aggregation, open service capabilities, and pan-scene operation. After two years of independent research and development, the Company launched the 5G vehicle-road collaboration service platform which supports six major scenario modules including vehicle-road collaboration, remote driving and holographic perception. The platform has opened more than 300 API interfaces to meet the independent management and application innovation of multiple users and tenants.

The Company has completed more than 20 key projects, including Boao Dongyu Island Internet of Vehicles Demonstration Project, Xiongan New District Intelligent Transportation Pilot Demonstration Project, High-Tech Winter Olympics-Shougang 5G/V2X Intelligent Connected Park, Xiamen BRT5G Intelligent Connected Vehicles-Road Collaboration Project, Xining Garden Expo Park Unmanned Driving Project, Yangquan Jidong Cement 5G Intelligent Mine Unmanned Driving Project, Zibo High-tech Zone Eastern Mountain Park Intelligent Connected Project. China Unicom took the lead in building a national leading “5G + Internet of Vehicles” application demonstration base in Tianjin Haihe Education Park, Beijing Yizhuang Park and other places.





Boao Internet of Vehicles Cloud Control Platform

### Ecological environment

Focusing on key areas such as water conservancy and environmental protection, China Unicom created a number of solutions such as Unicom Smart Water Conservancy and Smart Ecological Environment. It promoted the modernisation of ecological environment governance system and governance capabilities with digital technology integration and innovation, and empowered the construction of China's modernisation that promotes the harmonious coexistence of human and nature.

- With the advantages of 5G and cloud-network capabilities, the Company built a diversified and integrated water conservancy perception network, provided secure and reliable data and computing power support for smart water conservancy construction, and served the construction of digital twin water network, digital twin watershed and digital twin engineering, so as to promote the construction of the “2+N” smart water conservancy business application system, thus promoting the high-quality development of water conservancy in the new stage.
- By comprehensively utilising its core capabilities such as 5G, Unicom Cloud, Big Data, AI and blockchain, the Company built a smart ecological management platform to support scientific decision-making, systematic management, precise pollution control and convenient services in areas such as water environment, atmospheric environment, pollution sources and hazardous solid waste. This promoted digital empowerment to improve the quality of ecological environment.

China Unicom Chongqing branch expanded into the market of safety monitoring of small and medium-sized reservoirs, which is regarded as a key market. At present, it has undertaken reservoir projects in six districts and counties, namely Fengjie, Beibei, Tongnan, Rongchang, Changshou and Fengdu. By making full use of the existing conditions and taking into consideration the reservoir dam type, scale, dam height, dam length, downstream impact, communication conditions, etc., it reasonably set up monitoring facilities in accordance with relevant technical standards, properly connected with existing monitoring facilities and those constructed under reinforcement projects. This has promoted the construction of water conservancy informatisation, and played an extremely important role in the industry and agriculture, flood control, residential water use and ecological environment in various districts and counties.

### Culture and tourism

On 15 December 2022, the Department of Resources Development of the Ministry of Culture and Tourism announced 10 elderly-friendly smart tourism demonstration cases. The “Travel Guizhou with One Code” and “Travel Xinjiang with One Mobile Phone” platforms built by China Unicom were both successfully selected, making it No.1 in the industry in terms of the number of selected cases. The One Code Tour platform has been launched in many provinces and cities across the country, becoming a new tool to promote the industrialisation and high-quality development of regional tourism. It has been highly recognised by cultural and tourism management institutions at all levels and tourists, creating a benchmark and model for the tourism industry to provide more elderly-friendly intelligent service products with digital empowerment.



“Travel Xinjiang with One Mobile Phone”  
incisive commentary and hand-drawn map functions



“Travel Guizhou with One Code” mini program and  
recommendation page

### Smart education

With “Education Smart Brain” as the foundation of digital capabilities, China Unicom created a 5G smart education model integrating cloud, network and terminals, with dedicated efforts to promote “5G + smart education”. With 15 self-developed smart education products, the Company has built smart education applications such as 5G campus network, smart classroom, educational big data (including Education Smart Brain) and campus management platform. More than 200 benchmarks for smart education application have been established, such as the digital base of Shanghai Municipal Education Commission, smart examination platform of Zhejiang Province, Harbin Institute of Technology Supercomputing Centre, and Xi’an Electronic and Technology University smart campus operation platform, to facilitate the development of education in a fair, personalised and intelligent manner.

China Unicom’s “Interactive Class for Luwan High School in Shanghai and Zunyi No.5 Middle School, based on 5G + Holographic Technology” and “China Unicom IOC Platform Supports ‘5G+Green Campus’ of Xi’an Electronic and Technology University” were selected as the annual typical cases of “5G + Smart Education” at the China 5G Development Conference 2022. With the help of 5G and holographic technology, students from Luwan High School in Shanghai and No. 5 Middle School in Zunyi, Guizhou Province attended the same class through the Internet.



5G Holographic Smart Classroom at Luwan High School, Shanghai

China Unicom Zhejiang Branch collaborated with China Unicom (Zhejiang) Industry Internet Company Limited to build a city-level education brain and a “dual-reduction” platform with the integration of Big Data governance system and AI algorithm as the core, empowering the “dual-reduction” reform with digital intelligence.

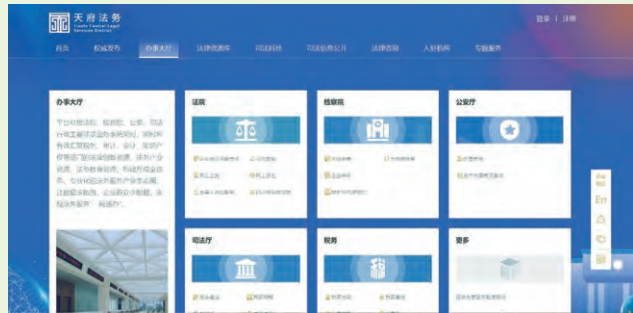


The application of smart pick-up and drop-off at  
the Jindong District Second Experimental Primary School

### Smart legal services

China Unicom is committed to serving the rule of law in China with data-based, network-based and intelligent technologies. It integrated the next generation of information technologies including 5G, IoT, cloud computing, Big Data and blockchain to provide full-chain applications and services such as new legal infrastructure, political and legal data security and digital legal services for political and legal institutions and industries, and to provide the public with convenient and efficient notary services.

On 22 April 2022, China Unicom, together with the Political and Legal Committee of Sichuan Provincial Party Committee, Sichuan High People’s Court, Sichuan Provincial Department of Justice, Sichuan Tianfu New District Management Committee and other units, officially launched the smart judicial science and technology innovation centre, and simultaneously released the “Tianfu Central Legal Cloud” and “Tianfu Central Legal Chain”. The smart service platform of Tianfu legal services has become an important window for publicity and display of the central legal area of Tianfu. The smart service exhibition hall has held more than 300 events for visitors from all over the country.



Smart service platform of Tianfu legal services, Sichuan

### Smart emergency response

China Unicom focused on building a digital capability matrix for emergency response covering the whole country with new mechanisms and new models, and continued to explore and practise in the informatisation of emergency management. The Company focused on five key directions, namely emergency command and rescue, safe production, natural disaster prevention and mitigation, smart fire protection, and urban safety risk monitoring and early warning, to build China Unicom’s smart emergency products and capabilities system, and promote the deep integration of digital technology with the national needs for emergency management business and secure development of cities.

- The Company has applied satellite remote sensing, Big Data, AI and other technologies in Anhui province, Nanchong Sichuan province, Lianyungang Jiangsu province and other provinces and cities to assist the emergency management department to build disaster risk monitoring and early warning systems, emergency coordination and command systems, comprehensive application systems and supporting systems, so as to improve the capabilities of monitoring and early warning of major disasters, emergency command and rescue and comprehensive disaster prevention and mitigation.
- The Company provided emergency management departments with analysis and data services in relation to population transfer, centralised resettlement and personnel return under flood and typhoon disasters.

## Unicom Cloud Empowers Industry Transformation

Unicom Cloud continued to promote product breakthrough, comprehensively upgraded to the next generation of cloud computing platform, and launched three different versions of Unicom Cloud version 7.0, namely “Unicom Cloud 7.0 Industry Cloud”, “Unicom Cloud 7.0 Private Cloud” and “Unicom Cloud 7.0 Information Technology Innovation Cloud”. With the unique advantages of “security and reliability, cloud-network integration, tailored customisation, affordability and practicability, and multi-cloud collaboration”, “Unicom Cloud 7.0” has achieved four major technological breakthroughs.

<p><b>1 Further upgrade of dual-engine structure</b></p> <p>Achieved One-Cloud Polymorphism with unified structure, CULinux operating system and IPv6 + integrated into the dual-engine internal core</p>	<p><b>2 New breakthrough in performance</b></p> <p>The number of single-cluster concurrent computation exceeded 10-million-level QPS, and the cloud-native container platform was the first to pass the excellent certification in China</p>	<p><b>3 Independent and controllable security and reliability</b></p> <p>100% self-developed full-stack products to fully meet the requirements of information technology application innovation</p>	<p><b>4 Further expansion of industry capacity</b></p> <p>Accumulated more than 100 industry PaaS modules, and formed a rich variety of scenario-based solutions around seven scenarios cloud to fully empower the digital transformation of industries</p>
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Unicom Cloud drove the rapid growth of “Big Computing” and established the brand image and good reputation of “Secure Digital Intelligent Cloud”. Its public cloud recorded the highest growth rate, and the national government cloud platform constructed was rated the first by relevant institutions. The cloud-native container platform was rated as an advanced level in the first batch of cloud-network integration comprehensive capacity assessment of CAICT, and was the first operator awarded with excellent level certification by CAICT, and passed the zero-trust security certification of CAICT.



At the 2022 China Unicom Partnership Conference with the theme of “Digital and Intelligent Connectivity for All”, Mr Liang Baojun, Senior Vice President of China Unicom, officially released the brand-new and upgraded Unicom Cloud version 7, which formed a wide range of scenario-based solutions based on seven major scenario cloud, fully empowering the digital transformation across various industries.



Unicom Cloud version 7 was officially released

## Building a Systematic Capability System

Focusing on the key direction of industrial digitalisation, China Unicom has established nine industry forces, namely equipment manufacturing, smart mining, smart steel, apparel manufacturing, automobile manufacturing, smart medical care, smart legal services, smart emergency response and smart transportation. Based on its independent capabilities such as 5G, cloud, Big Data, IoT, AI, blockchain and security, the Company independently developed 26 industry-specific products and created more than 150 industry solutions. The Company set up more industrial Internet companies in 8 provinces including Beijing, Hunan and Hainan, and together with the original 11 industrial Internet companies, basically realised the Company’s deployment in the eastern provinces of the Heihe-Tengchong Line. Taking the opportunity of establishing industrial Internet companies, the Company took part in the local digital economy construction.



## Make Every Effort to Become the “Frontline Troop” of Innovation-driven Development

China Unicom adhered to the innovation-driven development to serve the national strategy, adhered to the “two-wheel drive” of market and innovation, firmly grasped the direction of digital, network-based and intelligent transformation, and accelerated the construction of a technology engine to drive the high-quality development of the Company in the new era, becoming an essential part of the national strategic scientific and technological strength.

### Deepening the Innovation of Scientific and Technological Innovation Mechanism

China Unicom further deepened the reform of the scientific and technological system, improved the scientific and technological innovation system, built an efficient scientific research and development system, optimised the scientific and technological innovation organisation, improved the efficiency of the innovation system, and strived to stimulate the innovation vitality. In 2022, the Company strengthened the basic management of scientific and technological innovation, promoted the overall management and transformation of the entire process of scientific and technological achievements, increased investment in research and development, and strengthened the protection of intellectual property rights.



In 2022, the total R&D investment was **RMB14,380 million**, accounting for **4.03%** of the revenue.



In 2022, **2,672** patent applications were filed and **1,666** patents were granted, with **5,726** patents valid in China.



There were **18,905** R&D personnel in total, with **one** academician.

- The Company established the China Unicom Science and Technology Association to build a warm home for scientific and technological workers, and 16 academicians were appointed as special consultants.
- The National Engineering Research Centre was included in the national new sequence management.
- The Company launched the second phase of platform for the transformation of scientific and technological achievements, organised recommendation and training for China Unicom’s scientific and technological achievements of the incubation period, promoted the achievements of the incubation period to mature as soon as possible, and finally achieved net benefits through transformation.
- The Company attached great importance to and strengthened the protection of intellectual property rights, continuously improved the intellectual property management system related to the creation, application and protection of patents, and increased the capital and human resources investment in intellectual property rights. Both the quantity and quality of intellectual property rights have been greatly improved.



Establishment of China Unicom Association for Science and Technology

## Strengthening Core Technology Research

China Unicom played a leading role in the technological innovation of central state-owned enterprises, actively served as the “source” of original technologies, bravely broke through the “no man’s land” of science and technology, and accelerated the breakthrough of “bottleneck” technologies in important fields.

### Undertaking major national scientific research projects

The Company continued to take the initiative to undertake national science and technology projects. In 2022, the Company was awarded 30 national science and technology projects, taking charge in 2 leading projects and 9 topics. The Company took the initiative to undertake the high-quality development project of the Ministry of Industry and Information Technology, and has been approved for 9 industrial chain collaborative innovation projects, including taking the lead in 1 project, mainly involving 5G LAN core network, industrial Internet edge intelligence, domestic artificial intelligence development and network security.

China Unicom Research Institute took the lead in applying for the “High-level Self-Intelligent Network Architecture and Key Technology Verification” project, and was successfully selected for the open test project of the National Major Technology Infrastructure Future Network Test Facility (CENI), which is the first national major science and technology infrastructure in the field of networks and information in China. China Unicom has implemented innovative practices in self-intelligent networks in a number of areas, covering five process domains: planning, construction, maintenance, optimisation and marketing.

### Overcoming the “bottleneck” technologies

China Unicom has organised and implemented critical technology research in order to accelerate the advantages in new generation network, 5G enhancement technology, cloud computing and Big Data.

#### CUBE-Net3.0 accelerated its implementation

CUBE-Net3.0, based on 5G and looking at 6G, integrates new technological elements such as cloud-native and edge computing into the development of the network, strengthens the deep integration of different technologies and industrial elements, and is a new generation of digital infrastructure based on the network. Focusing on the CUBE-Net3.0 network architecture, the Company made breakthroughs in core technologies in transmission, IP carrier, core network, edge industrial computing network, computing network brain and credible computing power trading, and achieved a number of results.

- The key technological innovation achievements of “IPv6 +” reached the international advanced level and won the “2022 World Internet Leading Scientific and Technological Achievement” award, one of the only 15 awards worldwide.
- The innovation results of the all-optical self-intelligence network have become the first systematic innovation of the technology system for the whole-optical business network intelligence and security in the industry.

#### Evolution of 5G enhancement technology

China Unicom promoted the innovation of its “CUBE-FLEX AIR” technology system and solutions, and led a number of major special projects, such as “Constructing Reliable 5G Communication and Advanced Network Demonstration in Complex and Extreme Conditions” and “CUBE-FLEX AIR Technology System, Key Technology Research and Application Demonstration for 5.5G Evolution”. The Company formulated the introduction strategy and deployment plan of 5GC enhancement capability to support the Group to promote the introduction of some high-priority 5GC enhancement capability and continued to build the competitive advantages of China Unicom’s 5GC network differentiation capability, so as to facilitate the evolution of the Group’s 5G network and the implementation of the 5G Application Sailing Action Plan.



“IPv6 +” standard formulation, equipment development, networking design and large-scale application project won the “2022 World Internet Leading Scientific and Technological Achievement” award

The live broadcast event “Add a little bit to China in 2023 - Live streaming of ‘professional island builder’ to reclaim the sea and expand the land for our motherland” was exclusively provided by China Unicom with 5G technical support and communication service support. The Company achieved high-quality 5G network coverage in the sea areas and land reclamation areas near the route of the Sky Whale, providing low-latency and zero-lag 5G network experience for global netizens to closely watch the live broadcast of the powerful vessel, which further demonstrated the advanced strength of China’s 5G network and reflected the effective integration and synergy of 5G new infrastructure and traditional infrastructure.



Global live streaming of Sky Whale, the “professional island builder”, with 5G empowerment by China Unicom

#### **Breakthrough in Big Computing technology**

Through key technology research for computing-network integration, the Company designed and developed computing-network integration and scheduling technology, wide-area distributed storage technology and cloud-based network hardware unloading technology, and launched cloud products that support computing-network integration and scheduling, ultra-high performance ECS products, and Unicom Cloud smart operation and maintenance platform. The Company has mastered the computing-network integration and scheduling technology and wide-area distributed storage technology based on latency circle or geographical location, solved the problem of terminal access to distributed services or data in the vicinity, and realised the first breakthrough of virtualised cloud products and cloud-native products that support latency circle scheduling in the industry.

#### **Increasing influence of Big Data**

The Company carried out research on key technologies for trusted data resource space, and overcame the cutting-edge key technologies in the fields of massive data intelligent governance and services, multi-party data mutual trust and exchange, and security monitoring. It solved the data transfer service problems among data value parties, regulators, operators and auditors, made up for the shortcomings of data sharing security, realised the maximum value of the whole life cycle of data generation, transmission, transformation and creation, and improved the technical capabilities and influence of the big data industry.

#### **Tracking the trend of forward-looking technology evolution**

##### **Quantum information technology research**

China Unicom actively participated in the standardisation of quantum information in domestic and foreign standard organisations, served as the deputy leader of Quantum Communication Special Task Force (ST7) of China Communications Standards Association, and participated in scientific and technological innovation research organisations such as Quantum Internet Industry Alliance (QIIA) and Quantum Technology Industry-University-Research Innovation Alliance (QIC), to promote the development and application of quantum technology. The Company focused on the research on the practical application of quantum communication, proposed a low-cost end-to-end physical layer hybrid networking architecture, promoted the implementation of the quantum key cloud platform in new business applications, continued to follow up the miniaturisation development of the quantum key distribution (QKD) equipment, carried out the development of equipment integrating quantum and classic communication, and combined the quantum random number generator (QRNG) with the post-quantum cryptography (PQC) to provide quantum secure communication solutions with high security level and low cost, thus empowering the endogenous security of the optical networks.

##### **Exploring 6G network technology**

Through the research and analysis of the vision, needs and potential challenges of 6G network, China Unicom refined the key capability requirements of 6G core network, and further carried out targeted follow-up research and capacity reserve for 6G network architecture and key technologies such as 6G distributed autonomous architecture, network endogenous intelligence, air-ground-sea integration and digital twin, laying the foundation for subsequent standardised research and application deployment of 6G. The Company promoted the pilot test of 6G technology, completed the industry’s first liquid crystal-based reconfigurable intelligent surface prototype verification and application demonstration, the world’s first integrated AAU sensing application demonstration, and the industry’s first terahertz real-time system verification and application demonstration based on real business scenarios.

##### **Participating in the formulation of international and industry standards**

In 2022, in the context of complex international environment, China Unicom overcame the impact of the pandemic and continued to strengthen cooperation with international organisations, further enhancing its influence in the international network space.

- The Company led the establishment of 35 international standards, concluded 29 projects, and was newly elected as the deputy rapporteur of an ITU-T research group.
- The Company organised and completed the development and testing of the Group-level R&D project “Open Source Custody Platform and Developer Community” and passed the project acceptance.
- The Company organised and recommended the object storage project self-developed by China Unicom’s production system, YIG, to be included in the “Innovation China” Open Source Innovation List 2021 of China Association for Science and Technology.



Responsibility performance indicators	2020	2021	2022
Number of patents applied (item)	1,734	2,224	2,672
Number of patents granted (item)	518	1,128	1,666
Number of newly added completed items for leading international standards(article)	23	25	29
Number of newly added completed items for leading industry standards (article)	37	38	71

China Unicom won 1 Silver Award and 1 Excellence Award in the 23rd China Patent Award, achieving new breakthroughs in national patent awards. The Silver Award Patent “Method and Device for Isolating Bandwidth of Convergers” is a basic type of patent in broadband communication system, and has achieved significant social benefits in terms of spectrum utilisation, co-build co-share, and other areas.

## Further Promoting the Digital and Intelligent Transformation

With the targets of improving efficiency, quality, perception and return, controlling risks, while strengthening innovation, China Unicom has built a new digital and intelligent operating system featuring “one-network management, integrated operation and one-screen handling”. The Company systematically promoted the digital transformation and reform throughout the entire production, operation, service, and management process for all customers, including To C, To H, To B, and To G, as well as headquarters, provinces, cities, districts, and counties. With the goal of creating ten landmark achievements, China Unicom accelerated the construction of a “one Unicom, integrated capability aggregation, and integrated operation services” feature capability matrix to significantly improve frontline work efficiency internally and enhance digital service capabilities externally. The company has received full recognition from supervisory authorities, international organisations, and industry alliances, further highlighting its role as a “toolbox” and “booster” for high-quality development.

### Creating an intelligent operating system

China Unicom has built an intelligent operating system focusing on five elements, including scenes, tools, platforms, data, and processes. By empowering intelligent operations with technologies and data factors, China Unicom has comprehensively achieved its goal of “improving efficiency, quality, perception, return, and controlling risks while strengthening innovation”, which has helped the Company’s business development to continuously improve.



#### Improving efficiency

Significant improvement in intensive operation capabilities for all customers, with ‘Headquarters + Provinces’ centralised operation rate exceeding **50%**, significant increase in broadband online and offline conversion rate



#### Improving quality

Integration and collaboration of customer, network, business, and service data, with significant improvement in the precise services provided to customers by the four premium networks



#### Improving perception

The mobile terminal-network-business alignment rate increased by **10.3 pp** year-on-year, and the broadband terminal business alignment rate increased by **11.4 pp** year-on-year



#### Improving return

The utilisation rate of existing broadband ports increased by **4.8%** year-on-year



#### Controlling risks

The data security reached the level of “excellent” in the assessment of data security governance capability



#### Strengthening innovation

The self-developed rate of core systems increased by **6.4 pp** year-on-year, and the proportion of digital talents increased by **1.2 pp**

### Consolidating digital capabilities advantage

China Unicom adhered to independent research and development to build digital intensive capabilities, The top-level planning and front-line innovation were organically combined to maximise the value of common capabilities. China Unicom developed the Unicom Intelligence Brain as the core engine for comprehensive digital transformation.

Newly released China Unicom Intelligent Brain 2.0

In the five areas of core communication service systems, centralised smart customer service, intelligent middle platform, big data base, and digital foundation, on the basis of 100% centralisation, cloudification, integration, and empowerment the brand new Unicom Intelligence Brain 2.0 has been launched. Unicom Intelligence Brain 2.0 is a brain-like decision-making and command center that combines AI technology, cloud computing, big data capabilities with business, network, service, and management. It is supported by five major APPs, five major operating platforms, and five major middle platforms, and brings together the capabilities of large-screen “one-network management”, medium-screen “integrated operation”, and small-screen “one-screen handling”. It connects with hundreds of thousands of employees, millions of channels, tens of millions of network element nodes, and billions of customers in a digitalised manner, and the digital capabilities have shifted from “usable” to “easy to use”.

Enhancing technological innovation capability in data.

China Unicom adhered to technology innovation as the driving force. The Company has improved its independent control over core technologies and achieved a dual increase in R&D capacity and the proportion of self-developed technologies. The Company has solidified its unified digital R&D platform, supporting cloud-based R&D by 32,000 employees, 2.67 billion lines of cloud code, 8,000+ shared cloud capabilities, and an average of 1.4 billion capability calls per day. The Company has achieved deep application of artificial intelligence and big data, with a smart customer service ratio of 83%, a 61.2% intelligent diagnosis rate for core digital system faults, and 30,000 network operation and maintenance fault tickets automatically dispatched by AI every day, improving network maintenance efficiency by 145%.

### Activating the value of data factors

Data factors are the core foundation of enterprise digital transformation. China Unicom attached great importance to the construction of data infrastructure and systems, activated the vitality of data factors, empowered intelligent operations, and initially formed a new data governance ecosystem of “everyone for me, I for everyone” in China Unicom.

#### Further improvement of data governance system

The Company proposed to adopt the principle of “one set of system standards, one data middle platform, and one set of governance methods,” and to innovate the “seven-step work method” for data governance. The Company established a data governance working group consisting of the Group and all 31 provinces, completed full data accountability. China Unicom participated as a deputy leader in the SASAC’s data sharing project, and was awarded the “Top 10 Famous Chinese Data Management Enterprises” by the China Electronic Information Industry Federation.



**Continuously enhancing data supply capacity**

The Company cracked the BO bottleneck problem. The data middle platform aggregated BOM all-domain data, which doubled in scale. The Company upgraded its data development and utilisation capabilities, greatly improving the activity rate of common labels and the usage rate of high-quality labels. Compliant circulation of data sharing achieved a 20% increase in availability due to significant improvements in the quality of key scenario data.

**Outstanding results in scenario-based data empowerment**

The Company promoted the deep integration of Big Data and smart operations, drove the flow of data into various intelligent operation scenarios such as value operations for all customers, government and enterprise customer value operations, network resource visualisation, and management efficiency improvement, fully leveraging the multiplier effect of data.

China Unicom Liaoning Branch actively adapted to the trend of digital transformation of the economy and society and fully released the benefits of digital development. The Chaoyang City Brain Project built a “horizontally to the edge and vertically to the bottom” architecture system which connects not only applications of digital government platforms at the provincial level, but also the applications and data resources of digital government at the county level and town level, as well as various ministries and commissions at the municipal level, realising the unified construction and coordinated promotion of key information infrastructure and core applications.



City Brain Data Intelligent Management Platform of Chaoyang, Liaoning Province

**Improving process governance efficiency**

China Unicom focused on empowering smart operations, promoted the transformation of traditional processes centred on management and control to customer-centric digital processes, forced the reform and organisational optimisation of smart operation processes, and created a streamlined and efficient digital process, achieving significant improvement in front-line perception, management efficiency, and convenient business handling.

**Optimising process governance system.**

The Company published the “China Unicom Process Management Measures” and established a process management platform based on the closed-loop management of “management elements”. It was recognised twice as a classic case of process governance in the “Three-Year Action Briefing on State-owned Enterprise Reform” by the State-owned Assets Supervision and Administration Commission of the State Council. The Company participated deeply in the development of industry standards for process governance maturity by the Ministry of Industry and Information Technology.

**Deepening the transformation of intelligent operation process**

In 2022, the Company completed the transformation of key intelligent operation scenarios, and the end-to-end operational steps for core public services from sign-up to fulfilment were streamlined by 29%, improving the perception experience. The entire process of the government-enterprise dual-line business BOM is now visible and integrated, and the centralized business operations released more than 50% of non-sales manpower for government-enterprise frontline customer managers, improving production efficiency. The process governance drove the solution of critical problems for frontline staff and customers, with a resolution rate of 87.5%, and a satisfaction rate of 88.2% for process improvements at the frontline.



## Committed to Serving as the “Escort” of Network Security

Adhering to the overall national security concept, China Unicom has identified “Big Security” as its main responsibility and main business, took practical actions to fulfill its responsibility as the “national team, key force and frontline troop”, and built the “No. 1 security shield of the country, government and people” for the digital economy.

### Improving core security capabilities

China Unicom focused on improving its core capabilities of network security and strengthening its strategic deployment. By sorting out more than 200 key points of network security technology, the Company drew a “product map of the modern industrial chain of network security (based on new digital information infrastructure)”, which has included more than 150 security products in total and 73 of which were put into commercial use. The Company launched products such as Unicom Mogong, Unicom Cloud Shield and network situation awareness, making ten milestone achievements, and building the “No. 1 security shield of the country, government and people” for the digital economy.

#### Actively promoting and forming scientific and technological innovation achievements

China Unicom actively responded to the strategic needs of national scientific and technological innovation, took the responsibility of building a Cyber Superpower and scientific and technological innovation, strived to break through the key core technologies of network security, cultivated international standards, and continued to lead the technological development direction in the field of network security. The mutual recognition of products was completed with more than 160 certificates of mutual recognition. The Company vigorously promoted the formulation of standards in the field of network security, and completed the establishment of 3 international standards and published 4 concluded projects.

China Unicom continued to strengthen the security capability reserve of new technologies and new business forms such as 5G, Big Data, AI, blockchain and industrial Internet, and strived to build the basic security capability of cloud, network, Big Data, AI, blockchain and security integration. Unicom Cloud was fully upgraded to a secure digital and intelligent cloud, and a new proprietary and controllable Unicom Cloud Operating System version 3.0 was launched, fully adapted to more than 90% of mainstream software and hardware products. Unicom Cloud Shield, developed by China Unicom, provides integrated high-quality security services for top customers such as national ministries, banks and the Internet companies as well as small and medium-sized enterprises.

#### Strive to create high-quality products and core capabilities

China Unicom strengthened the construction of network security system, promoted the development of basic network security platform, opened security scenarios, improved product systems, led the industrial ecosystem, built cloud-based and intelligent core security product capabilities, and accelerated the marketing of innovative products. The Company promoted the development of basic network security platform and completed the platform development of five capabilities, namely asset mapping, threat monitoring, threat warning, threat intelligence and attack traceability. The Company initially established a threat intelligence centre platform and its own intelligence production system to build a safe and reliable ecosystem for governance of black and grey industries. The Company cooperated with 12 enterprises to create the “Security Cloud Market” and launched 50 products.

#### Strive to win the “team competition” of industry collaboration

China Unicom adheres to “bringing in” and “going out” to create a good industrial ecosystem through alliance operations, seminars and exchanges, and industrial fund operations. The Company communicated with nearly 50 enterprises and colleges in key technology research, work organisation form, construction of security laboratory, construction of industrial park, talent training and enterprise cooperation.

#### Using industrial innovation funds

The Company gave full play to its role in supporting and promoting the modern cybersecurity industry, gathered various innovation elements and resources to promote the coordinated development of the industrial chain. At present, the Company has established relevant industrial innovation funds, and will continue to increase investment in the future to continuously promote the secure and stable development of the industrial chain.

#### Operating industry innovation development alliance

The Company cooperated with Pengcheng Laboratory to build the first 5G security range in China. Under the guidance of MIIT and SASAC, the Company operated the China Cybersecurity Industry Innovation and Development Alliance and served as the chairman unit, worked with nearly 400 partners to build a strong network “New Great Wall”. The Company initiated the establishment of the China Unicom Information Technology Innovation Alliance and held two sessions of Central State-owned Enterprise Information Technology Innovation Salon and two closed-door technical seminars.

#### Establishment of the Expert Advisory Committee

The Company organised closed-door seminars for industrial experts and advisory committee meetings for experts, and invited representatives from nearly 20 upstream and downstream enterprises in the industrial chain, as well as renowned experts and scholars in the security field to attend the meetings.

## Consolidating the Cybersecurity Lines of Defence

China Unicom unswervingly implemented the overall national security concept, thoroughly implemented the Cyber Security Law, the Data Security Law, the Personal Information Protection Law, the Anti-Telecom Network Fraud Law, the Regulation on Protecting the Security of Critical Information Infrastructure and other laws and regulations, in order to better coordinate development and security, and build a proactive defence and joint defense and control system that is routine, practical, centralised and intelligent. It comprehensively improved the comprehensive support capability of network security, built a defence line for network and information security in the digital era, effectively protected the sovereignty, security and development interests of cyber space, and served as a main “escort” for the protection of China’s modern network security.

### Strive to forge a “protective net” for a strong network

China Unicom continued to build a network security protection system for the entire network. The Company established a network and information security operation centre and an anti-fraud command centre (SOC), which efficiently linked with 52 branch command centres, operated 12 security scenarios on a regular basis, carried out emergency command and dispatch, and implemented 7×24 hours on duty. In 2022, the Company carried out 10 attack and defence drills, 5 whole-process emergency drills and 37 phishing emails drills, and continuously improved the timely handling rate of security incidents.



Emergency Command and Dispatch Centre

### Resolutely protecting data security and user privacy

China Unicom thoroughly implemented the requirements of laws and regulations such as the Data Security Law and the Personal Information Protection Law, carried out data security management in all scenarios, innovatively created a data security operation mechanism with the characteristics of operators, and continuously improved the level of data security governance. The Company improved the data security regulation system, issued the Administrative Measures for Data Security of China Unicom, the Administrative Measures for Personal Information Protection of China Unicom, the Administrative Measures for Data Security of China Unicom’s Partners and other administrative measures and corporate standards, to clarify the requirements for data security protection, personal information rights protection and data life cycle protection, laying a foundation for the construction of a compliance management system for data security and personal information protection.

Continuous efforts were made to strengthen centralised security capabilities. By fully leveraging its advantages in IT and data centralisation, China Unicom accelerated the nationwide coverage of eight data security capabilities, including data encryption, data desensitisation and data traceability. The Company has built a nationwide sensitive data monitoring and operation mechanism covering 31 provinces, established data security situational awareness capabilities, carried out in-depth operation monitoring, and achieved “early detection, early intervention and early treatment” of data security incidents, effectively protecting the security of important data and subscribers’ personal information.

Strive to improve the competency of industry data security talents. Under the guidance of MIIT, the Company solidly promoted the “Talent Strengthening Foundation” programme for the telecommunications and Internet industries, and created a set of industry standard post system, a series of professional excellent course system, a number of top-notch teachers in the industry, and a set of industry-leading knowledge management platform, covering more than 100 enterprises. The Company was recognised as one of the first talent training units under MIIT’s data security “Talent Strengthening Foundation” programme.



China Unicom Digital Technology Co., Ltd. built a data security support system covering the whole life cycle of data, continued to build platform integration capabilities, focused on five centres of “data assets, alarms, capabilities, operations and users”, formed the integration of “assets, risks, behaviours, evaluation, control and operation”. It completed the integration and connection of capability modules, realised the integration and innovation of new technologies such as blockchain and AI with data security, and comprehensively guaranteed the secure and orderly circulation and transmission of data factors. In 2022, the Company was awarded the highest level of “Data Security Governance Capability” (DSG2.0) by the CAICT; four data security products were awarded the first batch of certification of “Trusted Digital Security” by the CAICT. The Company participated in the preparation of local standards, group standards, industry standards and national standards, accumulating a total of more than 70 items; obtained a number of best cases in the industry. The data security support system has served a number of provinces and cities such as Zhejiang, Anhui, Hainan, Guangdong and Sichuan, realising full-network and full-link data security protection at the three levels of “provincial, municipal and county/district”.



Data Security Situational Awareness Platform

### Preventing and combating telecommunications network crimes

China Unicom protected the legitimate rights and interests of subscribers, deeply pushed forward the fight against telecom fraud. The Company strengthened source management and control, regulated operation and development, deepened the construction of two-level anti-fraud special teams, and promoted key tasks such as “card-breaking operation 2.0” and “cat-fighting” operation in an orderly manner. The Company assisted the police to break a large number of criminal bases. The Company carried out in-depth anti-fraud publicity and sent a total of 5,660 million text messages for public welfare and early warning to improve the public awareness of fraud prevention.

The Company launched products such as Mobile Manager and Unicom Assistant to provide subscribers with services such as declining calls, intelligent answering and anti-fraud business cards. The subscriber scale increased by 33% compared with the beginning of the year, effectively improving subscriber perception. The Company continued to improve its Big Data anti-fraud ability and intercepted 100 million international fraudulent calls and 300 million fraudulent messages, with a significant decrease in the number of reported cases and fraud calls, effectively safeguarding people’s property safety.

The Company strengthened the construction of public cybersecurity threat monitoring and handling capabilities, enhanced the nuisance calls management capabilities and malicious messages management and control capabilities, and realised the whole network coverage of monitoring and disposal of fraudulent calls, harassing call and spam messages. The Company improved its basic capability of monitoring, analysing and handling cybersecurity threats, thereby enhancing the security perception and experience of public customers.



China Unicom Hunan Branch promoted the whole chain and built a solid barrier for fraud prevention and control. In response to the new simple networking GOIP that has been rampant this year, the Company formulated the risk control model for simple networking GOIP and cooperated with the police to carry out the cat-fighting actions. We sent more than 400 data clues to the police, and helped them destroy more than 300 fraud-related bases and seize more than 900 GOIP (including simple networking GOIP) devices, which effectively curbed the rampant fraud with GOIP, and won praise and gratitude from public security systems all over the country. The effectiveness of the “cat-fighting action” ranked third in the industry nationwide and achieved remarkable results in proactively fighting telecom network fraud.

### Carrying out cybersecurity and information security publicity and education

Based on activities such as “National Cybersecurity Publicity Week”, “National Security Education Day” and “Anti-fraud Publicity Month”, the Company carried out customised publicity and education activities focusing on cybersecurity, data security, cloud security, 5G + industrial Internet security, personal information security, and prevention and control of telecom network fraud. The Company has carried out more than 300 activities with the theme of “entering communities, villages, campuses, enterprises and families”, and sent 5,660 million text messages for public welfare and early warning to advocate the public awareness of cybersecurity and to create a safe, healthy and civilised network environment.

At the Cybersecurity Expo held in Hefei, Anhui Province, China Unicom comprehensively displayed its innovative applications such as cybersecurity situational awareness, telecom network fraud situation, anti-fraud business cards, Unicom Cloud Shield anti-DDoS pioneer, data security, and Anhui featured products. The Company showed real cases and data to the public to bring a new experience of smart security in the digital era to the participants, which was reported by many mainstream media.



Cyber Security Expo

## Effectively Ensuring Production Safety

The Company strictly abides by the Production Safety Law of the People’s Republic of China and other relevant laws and regulations. China Unicom adhered to the overall national security concept, implemented various important requirements, actively promoted, cooperated with and supervised related aspects of production safety, investigated and rectified various potential risks, prevented and curbed various safety production accidents, and effectively protected and safeguarded the legitimate rights and interests of employees. The overall safety situation was stable, and the safety level continued to improve. While carrying out emergency rescue and disaster relief work, the Company also improved the safety awareness of frontline staffs, strengthened self-protection and effectively ensured the personal safety of emergency rescue and disaster relief personnel.

- During the year, the Company held seven national safety production work meetings, carried out large-scale inspection and rectification of safety production, promoted two rounds of safety production inspections and various special work, and successfully completed the Three-year Action Plan for Special Rectification of Safety Production. A total of more than 122,000 places were investigated, and 21,900 hidden hazards were found, with a zero-fatality rate per thousand people. There were no lost days due to work-related injuries.
- The Company revised and improved basic systems such as the Measures for the Supervision and Administration of Production Safety of China Unicom and the Measures for the Administration of Fire Safety of China Unicom.
- The Company carried out the pilot construction of the “double prevention system” and “safety production standardisation and corporate safety culture”, and has established the “3 systems, 2 lists, 2 pictures, 3 notices” visualised information and 1 information platform for the double prevention system.

**131**  
training sessions held on  
safety production

**100%**  
coverage on safety  
production training

## Actively Building a Win-win “New Ecosystem” for the Digital Industry

China Unicom actively joined hands with its partners to forge ahead with courage and perseverance. Facing the strategic opportunities brought by the simultaneous resonance of China’s modernisation and the new generation of digital revolution, China Unicom made joint efforts to win the “team competition” for the high-quality digital, network-based and intelligent development, and made joint efforts to embark on a new journey of China’s modernisation.

## Cohesion for Win-win Development

China Unicom insisted on taking the sincerest attitude, the most open-minded mindset and the most practical actions to further combine strength with its partners, consolidate consensus, deepen cooperation and achieve mutual success, and make new and greater contributions in the new journey of China's modernisation.

- The Company strengthened the construction of cooperation management system, improved the classification and management of cooperation, formulated the “Administrative Measures for Strategic Cooperation of China Unicom”, promoted the upgrading of strategic cooperation with Tencent, JD.com, Alibaba, Baidu and other enterprises, and built the Company's core competitiveness and sustainable development in a more standardised, orderly and effective manner.

- Held in Beijing, the 2022 China Unicom Global Partnership Conference with the theme of “Digital and Intelligent Connectivity for All” attracted hundreds of operators and partners from various industries around the world to participate in the conference and explore the trend of industrial reform.



2022 China Unicom Partnership Conference

## Working Together with Partners

China Unicom has carried out extensive cooperation with industrial chain partners to promote the rapid and high-quality development of the industry, achieve upstream and downstream coordination in the supply chain, and build a new ecosystem of “cooperation, sharing, win-win, synergy and green” Internet-oriented operation to facilitate the stable and sustainable development of the industry chain.

### Joining hands with strategic investors

In 2022, China Unicom started a new round of strategic cooperation renewal with strategic investors to deepen cooperation in an all-round way, jointly contribute to the construction of Cyber Superpower, Digital China and Smart Society, jointly cultivate new advantages of innovation and development, and together win the new future of digital economy.

- The Company renewed strategic cooperation agreements with strategic investors such as Tencent, Alibaba, Baidu and JD.com to lay a solid foundation for further cooperation in the future and help create a new strategic cooperation ecosystem for win-win cooperation.

- The Unicom Cloud series products launched in cooperation with strategic investors achieved large-scale development and realised a win-win development paradigm since its launch.



Signing ceremony for cooperation with strategic investors

### Cooperating with equipment suppliers

China Unicom improved the supplier management system and revised the “China Unicom Supplier Management Measures” to appropriately select, manage and guide suppliers to improve the resilience and security level of the supply chain.

- The Company relied on the whole-process data analysis capabilities of the supply chain platform to improve resource utilisation efficiency. The e-commerce platform has 84,000 registered vendors and 13,000 vendors were newly registered during 2022.

- The Company activated the intelligent supply chain open platform, conducted risk identification and analysis through the entire process of supply chain, effectively realised automatic risk identification, early warning and control, advocated honesty and trustworthiness, provided convenient services for suppliers, and settled payments as soon as possible.

- The Company developed 235 digital risk control models embedded in the supply chain platform to intercept illegal operations and effectively prevent illegal operations such as blacklisted supplier transactions and bid-rigging.

- The Company insisted on fair trading. By widely adopting the product technology qualification system and unifying supplier entry barrier, it let small-scale suppliers participate in procurement activities in a fair manner.

Region	Eastern China	Northern China	Central China	Southern China	Southwest China	Northwest China	Northeast China
Number of suppliers	28,722	11,234	10,807	11,141	6,704	5,458	9,705

### Cooperating with terminal suppliers

China Unicom vigorously promoted actions such as “5G-led Development” and “Broadband and Smart Home Development”, built a new terminal ecosystem with China Unicom characteristics, expanded the operational boundaries, enriched product categories, and strengthened the integrated operation of terminals and channels. The Company has cooperated with a total of 1,164 suppliers to achieve common development.

#### Establishing strategic sharing mechanism and platform

- Relying on the service portal of terminal partners, the Company provided partners with one-stop services such as technical specifications, access guidelines, performance testing and product display.
- Through open cooperation, the Company integrated upstream and downstream resources in the industrial chain, promoted the new integration of business, channels, terminal and finance, built a ubiquitous intelligent alliance cloud platform, and centralised resource allocation, so as to promote the innovation and prosperity of the entire industrial chain.

#### Strengthening corporate responsibility and image requirements

- In order to regulate external cooperation and communication, build fair, reciprocal and mutually beneficial cooperations between the Company and suppliers and partners, the Company has established a “blacklist” system to regulate the cooperation behaviour of its partners, govern the behaviour of its employees and partners, prevent partners from seeking illegal benefits through illegal means, and actively guide terminal suppliers to fulfil their responsibilities.
- The Company actively communicated with terminal suppliers who have negative news, and set up a special team to quickly handle customer complaints, information verification, customer comfort and other work, so as to protect the rights and interests of subscribers and effectively address public opinion risks.

#### Facilitating the development of terminal industry with multiple measures

- The Company implemented the “Special Action for Scientific Research and Innovation and Optimisation of Digital Talent Structure”. In terms of system and mechanism, the Company has basically formed its scientific and technological innovation strengths in three professional sectors, namely terminal intelligent supply chain research and development, terminal self-development and smart cards. In terms of independent research and development, it has launched 12 pan-intelligent products in 5 categories. In terms of terminal and network coordinated development, it promoted 220 5G mobile phones to support VoNR and 245 hardware to support NR900M.

#### Continuous promoting pan-intelligent terminal cooperation

- Focusing on scenarios such as digital villages, smart communities, pandemic prevention and control, and caring for the elderly and children, the Company strengthened its cooperation with the TOP brands in the industry and continued to enrich terminal categories.

#### To be the leader in the field of eSIM applications

- The Company maintained its innovation advantages in eSIM applications, continued to expand the application of wearable and IoT related eSIM products, and took the lead in launching 5G + eSIM consumer products and services in the industry to provide more subscribers with smart experience, which contributed to a 50% increase in the number of eSIM users.





### Cooperating with channel partners

China Unicom actively worked with a large number of channel partners, continued to innovate sales channels and methods, encouraged channel partners to fulfill social responsibilities, and provided customers with comprehensive quality services to achieve mutual benefit and win-win situations. In 2022, the number of China Unicom's cooperative channel partners reached 200,000.

#### Boosting channel productivity through digitalisation

China Unicom empowered the transformation and development of channel partners through digital transformation.

- The Company continued to build a customer-centric "platform-based, digitalised, intelligent and ecological" OMO new channel marketing service system, and strengthened channel touchpoints for targeted markets such as communities, villages, teenagers and small and medium-sized enterprises, so that services can be accessible and closer to the people's living circle.

#### Smooth sales channels with Big Data

China Unicom joined hands with channel partners to create online and offline borderless sales scenarios.

- Integrating the entire process of broadband e-commerce. The Company has fully established the online minimalist order acquisition, double-line quick-response acceptance capabilities, and broadband online and offline integrated marketing model with smart home delivery, and operated the front and back ends separately from business operations.
- Establishing integrated number marketing capabilities. The Company integrated the omni-channel number resources to form a full number resource pool and connected the online and offline number registration process.
- Fully empowering offline channels with online digital marketing capabilities. Big Data capabilities, precise customer attraction capabilities, intelligent recommendation, smart dashboard, live broadcast and other digital means were fully applied in offline channels.

#### Promoting delivery and conversion through network-based transformation

China Unicom continued to promote the empowerment of its partners and improve the empowerment of channels and their marketing activities.

- The Company standardised the management of online channels and the organisation process of online marketing activities to improve the circulation efficiency.
- The Company continued to improve the capability of the unified marketing platform, gave full play to the advantages of centralised operation, empowered branches and partners, and provided subscribers with high-quality delivery services.

#### Shouldering social responsibility with commitment

- China Unicom actively promoted channel partners to fulfil their social responsibilities, standardised service standards through training and other means, and reached a consensus on sustainable development to help partners achieve high-quality development.
- The Company cooperated with channel partners to carry out online and offline anti-fraud welfare publicity activities to educate the public, comprehensively preventing illegal and criminal activities such as telecom and online fraud.
- Relying on the IT Big Data capabilities, the Company analysed and investigated abnormal data to strictly prevent non-compliant operational risks.

### Cooperating with MVNOs

China Unicom assisted in deepening the reform of the telecommunications industry, supported the business service innovation of resale enterprises, continued to innovatively empower resale enterprises, and improved the business experience of resale subscribers. Through concerted efforts with resale companies, it provided more considerate, attentive and heart-warming high-quality services for the people.

• The Company took the lead in offering 5G-SA high-speed network service to the resale enterprises, and made available a total of 16 innovative products and network capabilities to expand the innovation space of the resale enterprises, helping to improve the service level of the resale enterprises and the business experience of the resale subscribers.

• The Company strengthened the information security management and control of mobile resale business, and provided management and control means for resale enterprises. In 2022, the complaint rate of harassing call and spam messages was lower than the indicators required by the regulatory authorities.

In 2022, more than **2,600** illegal links were cleaned up with various Internet platforms

At the 2022 Global Development Summit for Mobile Resale Business, China Unicom stated that it would work together with resellers to provide people with more considerate, attentive and heart-warming high-quality services, to empower the digital transformation of various industries, and promote China to become the world's largest and most active resale business market.



Mobile Resale Business Summit 2022

## Precise Development through Capital Cooperation

Innovation is the primary driving force for development. China Unicom extensively cooperated with various high-tech enterprises to empower all industries with digitalization, injecting new impetus into technological innovation, and promoting the coordinated development of the industry.

### Strategic investment-driven cooperation

China Unicom actively carried out multi-dimensional cooperation in capital, products and projects with strategic partners such as strategic investors, central state-owned enterprises providing digital services and leading enterprises in industries. Currently, it has established 7 joint ventures with 10 strategic partners, covering areas such as digital government, ecological and environmental protection, education, culture and tourism, industrial Internet, radio and media, population Big Data and network security. Through unremitting efforts, the joint venture companies' "specialised, niche, special and novel" capabilities and product supply capabilities have been significantly improved. The market feedback of joint ventures' key self-developed products was good, and at the same time, they have achieved positive and effective synergistic development.

Relying on Unicom Innovation Investment Company Limited, the Company actively promoted the establishment of a new joint venture with Tencent. Based on independent research and development, the joint venture will form complete CDN/MEC platform capability, operation capability and product innovation capability to provide a new generation of CDN and edge computing services for high-definition video industry and artificial intelligence field. Through this cooperation, subscribers of both China Unicom and Tencent can greatly reduce the number of network routing, improve the content download speed, shorten the file transmission time, and further optimise the subscribers' experience of network surfing.

### Capital investment-driven cooperation

Adhering to the principle of "diversified, specialised and market-oriented", China Unicom continued to build an investment platform of "direct investment + fund + incubation". Focusing on its strategy and five main responsibilities and main businesses and with the goal of consolidating, supplementing, strengthening and shaping the industrial chain, the Company actively promoted the market-oriented reform and capital operation of professional and innovative subsidiaries in the fields of Internet of Vehicles and communication engineering design, and built a group of "specialised, niche, special and novel" enterprises with innovation capabilities and competitive strength, and "made up for shortcomings and built long-term advantages" through capital.