



Digitally Strengthened the Foundation of Cyber Superpower to Enhance Value

Solidifying the foundation of a digital economy
Implementing universal service projects
Cementing the defense of network security

DIGITALLY STRENGTHENED THE FOUNDATION OF CYBER SUPERPOWER TO ENHANCE VALUE

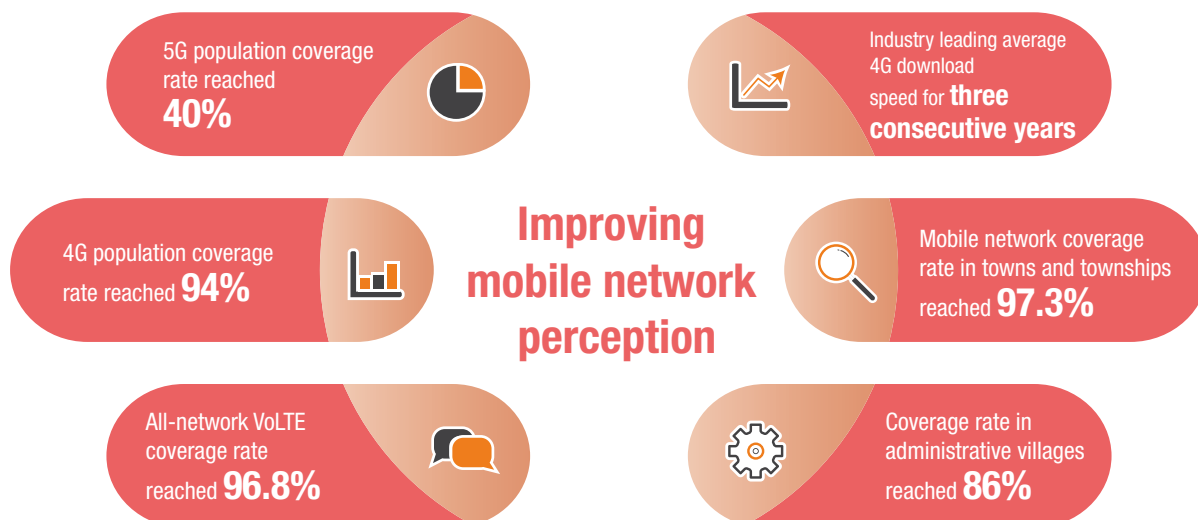
Building new digital infrastructure and strengthening security. Adhering to the people-oriented value and fundamental logic, China Unicom accelerated the construction of high-speed, mobile, safe, and ubiquitous new infrastructure, improved the network quality and operational efficiency using digital operations, speeded up network construction in remote areas, and persisted to maintain network information security, while continuously consolidated the foundation of the digital economy and striving to build the nation into a cyber superpower and digital China.

Measures adopted in 2020

- The cumulative scale of 5G base stations reached 380,000, with 5G population coverage rate reached 40%, the 4G population coverage rate reached 94%, and the all-network VoLTE coverage rate reached 96.8%.
- The total number of broadband ports reached 225 million, and the average access speed reached 185Mbps.
- The construction of integrated cloud and network capabilities was accelerated, building intelligent network capabilities facing the future.
- Unified digital base and Smart middle platform built to create digital operation capabilities.
- The fifth batch of universal services was completed, comprising of 2,857 administrative villages, 3,073 4G base stations and 176 border base stations were built, and such projects were completed with an investment of RMB624 million. In 2020, RMB330 million was invested in network poverty alleviation.
- A total of 140 million fraudulent and harassing calls were intercepted, and 1.28 billion spam messages were blocked.

Actions to be taken in 2021

- To push forward network evolution and applications, vigorously promoting the commercialization of slicing, uRLLC, dedicated networks, and MEC, deploying VoNR on a trial basis, and accelerating the deployment of 10G PON.
- To promote precise planning and improve network quality through the integration of planning, construction, maintenance, optimization, and business, further enhancing user perception.
- To accelerate the integration of cloud and network and promoting the construction of intelligent operation support system to improve the efficiency of network industry collaboration.
- To continue to build an agile digital base and to accelerate the construction of core capabilities in middle platforms, to creating a brain for Smart operations.
- To actively participate in delivering universal telecommunications services and speeding up network construction in remote areas.
- To build a network information security system focusing on security operations, security capabilities, security technology innovation, security talents and security systems, maintaining national network information security.



SOLIDIFYING THE FOUNDATION OF A DIGITAL ECONOMY

China Unicom firmly grasped the trend of information technology changes, accelerated the construction of information infrastructure, consolidated the network foundation of the digital society, and opened up the “main artery” of information for the development of the digital society.

Accelerating New 5G Infrastructure

China Unicom vigorously promoted the construction of 5G infrastructure, and co-built with China Telecom the world's first and largest scale co-sharing 5G network. The 5G network reached a cumulative scale of 380,000 base stations, achieved 5G outdoor coverage in all prefecture-level cities, key counties and developed towns, and realizing the world's first large-scale commercialization of SA network.

In the process of 5G construction, numbers of models and industry benchmarks have emerged. In Wuhan, the co-sharing 5G base station in the Huoshenshan Hospital was opened up in 36 hours, making a record construction speed. The 5G base stations built at the observation deck of Mount Everest (at an altitude of 5,000 meters above sea level) and Camp No. 1 (at an altitude of 5,200 meters above sea level) broke new record in heights in construction. In Jiangsu, the 4G/5G coverage of the Shanghai–Suzhou–Nantong Yangtze River Bridge, the largest cable-stayed dual road-rail bridge in the world, was jointly completed.



China Unicom rolled out 5G network connection at Mount Everest and conducted an 24-hour online live broadcast

China Unicom accelerated the construction of cloud data center, focusing on the five key areas of Beijing–Tianjin–Hebei, Yangtze River Delta, Pearl River Delta, Sichuan–Shaanxi–Chongqing and Shandong–Henan to create a “5+2+31+X” system. The Company formed and established China Unicom’s “Smart Cloud” data center brand, and promoted the IDC value management through customer segmentation, precise planning and marketing with brand new image and differentiated product services.

The Company constructed and deployed directly affiliated data centers in Langfang, Guian, Hohhot, Harbin, Deqing and other cities, and built 10 data room buildings with a total construction area of 326,000 square meters, delivered 23,336 racks, and opened up a bandwidth of 3.9T, which aimed to provide users in various industries with rental of a series of basic IDC products such as racks, machine space, broadband, IP addresses and additional power, as well as a full set of IDC value-added product services such as security services, application services, and key security services.

Promoting the Integration of Cloud and Network

China Unicom closely followed the trend of future network evolution, strengthened cloud-network integration, accelerated the construction of cloud-network integration capabilities, continued to explore cloudification and intelligent network structure and evolution strategies, to build a future-oriented intelligent network.

Speeding up cloud-network layout



China Unicom realized intensive construction in cloud resource pool, completed the delivery of more than 10,000 server resources, and promoted the construction and application of a unified monitoring platform for the cloud resource pool.

- The communication Cloud completed the DC layout of the “6+2” greater regions, meeting the cloud platform deployment requirements of innovative services such as 5GC control plane network elements, VoLTE ringtones, and 5G messaging, as well as the requirements of MEC layout services.
- The IT Cloud followed the “4+2” data center layout, meeting the needs of various IT system construction within the enterprise.

Promoting network development to SDN



The IP backbone, smart metropolitan area network and OTN (optical transport network) basically realized 100% SDN (software-defined network), which supported the automatic opening up of cloud unified networking, 5G base station access, and premium network for government and enterprises customers.

Building low-latency networks



The Company continuously optimized the latency of China169 backbone network to provide better user perception. During the year, the latency index was optimized for more than 1.5ms, and the average latency of the overall network was below 31ms, maintaining the leading position in the industry.

China Unicom and Huawei jointly released the “White Paper on All-optical Bases in the Cloud Era”(《雲時代的全光底座白皮書》), proposing for the first time an all-optical base with comprehensive carrying capacity for digital transformation, which fully supported the industry’s digital transformation and the development needs of new cloud services, providing customers with customization and differentiation telecom services.



Press conference of the “White Paper on All-optical Bases in the Cloud Era”

Optimizing Network Experience

China Unicom has been committed to building a premium network with leading perceptions by continuously improving network coverage, enhancing network quality, precise construction and increasing network resource efficiency, so as to provide high-quality network service support for a variety of business applications.

Improving mobile network awareness

In 2020, the 5G population coverage reached 40%, the 4G population coverage rate reached 94%, and the all-network VoLTE coverage reached 96.8%. The average 4G download speed maintained a leading position in the industry for three consecutive years. The mobile network coverage reached 97.3% in towns and townships, and 86% in administrative villages.

Based on the technical characteristics of 5G and supplemented by new technologies such as “AI and big data”, Qingdao Unicom provided customized, agile and convenient enterprise-specific mobile networks to ensure a good network experience.

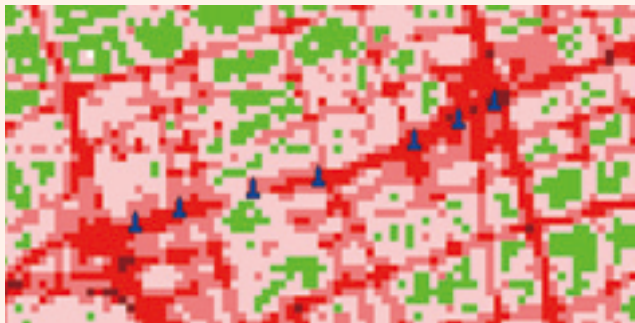
Expanding broadband network coverage

In 2020, the investment in broadband access amounted to RMB2.05 billion, and 8.47 million broadband ports were built. The total number of ports reached 225 million, covering 380 million broadband residential units and 69,000 commercial buildings. The average network access speed reached 185Mbps, representing an increase of 24% year-on-year.

Carrying out precise network construction

Based on O+B big data analysis, China Unicom made precise and efficient investment. In key cities and key areas, through multi-dimensional data overlay analysis, the Company accurately identified the areas with problems, and effectively improved network quality and user perception. In 2020, a total of 2,229 complaint-driven construction tasks have kicked off, and a total of 2,137 construction tasks were completed, with a completion rate of 96%. In other cities and other areas, focusing on 5G terminals and business clusters, the Company carried out precise construction to continuously improve the internet access rate of 5G users. By the end of 2020, the internet access rate of 5G users exceeded 50%.

In 2020, Shanghai Unicom carried out the comprehensive transformation of the Nanjing East Road Smart City Information Project. The new 5G transformation project adopted MDT traffic big data and accurately pinpointed. The wireless communication signal coverage along Nanjing East Road was greatly improved, and the 5G coverage reached above 95%.



5G points based on MDT planning



Illustration of the 5G Rubik's Cube Tower on Nanjing East Road

Carrying out Digital Operations

In 2020, China Unicom further advanced its digital transformation strategy, built a unified digital base and Smart middle platform, formed digital operation capabilities, significantly improved the Company’s operational efficiency, and served customers faster and more conveniently.

Building a unified digital base

Based on the advantages of proprietary IT research and development, China Unicom completed the integration of B/M/D domains, and initially formed an agile digital base of “shared platforms, shared capabilities, shared technology stacks and shared R&D systems” to achieve one-stop resource acceptance, unified monitoring and unified operations.

- Providing application solutions: The cloud platform provided 183 components in 8 categories, internally serving the headquarters and more than 40 subsidiaries and branch companies, and supporting more than 380 applications.
- Actively carrying out external empowerment: The Company exported PaaS products and privatization deployment plans to “WO Cloud”, providing supports to government and enterprise customers such as Zhongshan Perfect, National University of Defense Technology, HIT Zhengyuan, Shandong Hi-speed and others.

Building Smart middle platform capabilities

China Unicom built five smart middle platforms to create the Company’s new digital IT core engines, to agilely empower for business, management and network, and accelerated product innovation, optimized customer experience, improve operational efficiency and prosperous ecological cooperation.

- Public middle platform: to empower the front end, connect core processes and data, and improve sharing and reuse capabilities. The middle platform made 970 million recommendations for the all customer value operation strategy and accumulated 9.41 million orders.
- Government-enterprise middle platform: For customers, it was designed to complete the launch of online portals of government and enterprises; for the frontline, it optimized innovation headlines and government-enterprise assistants, collecting 267,000 business opportunities; for the market, it achieved the BO connection of dual-line business in 31 provinces; for ecological construction, it provided partners with one-stop services, bringing in together 1,152 partners.
- Network middle platform: to carry out the decoupling and construction of 10 major competence centers; the resource scheduling system provided more than 300 API services, 51 AI models and 178 network data services to achieving 5-day dual-line business access.
- Management middle platform: the user center and process center completed 1,170 access application certifications, 2,383 process template accesses, 35 open capabilities; to break through the breakpoints of contracts and business opportunities, and empowering all go-online of government and enterprises.
- Data middle platform: to optimize and integrate the basic capabilities of data centers and strengthen Big data empowerment. The data service to API had been in service for more than 29 billion times, empowering 78 scenarios and terminal sales in digital business outlets, and weekly sales volume increased by 259%.

Hainan Unicom expanded and strengthened its Big data platform, enhanced its real-time processing capabilities, supported real-time data viewing and real-time scenario-based marketing, optimized Smart decision-making systems, business decision-making APPs and interactive platforms, and built digital Internet map capabilities. It also realized the data collection and distribution of various resource information in the map customized marketing area through the electronic filtering function of IDS Smart decision-making system.



IMPLEMENTING UNIVERSAL SERVICE PROJECTS

China Unicom has always adhered to the people-oriented development philosophy, taking the improvement of people’s well-being as the starting point and goal of digital development, while serving nation’s major strategies and the overall layout of local economic and social development, which speeding up the construction of information infrastructure in rural and remote areas, and realizing information to benefit the people.

China Unicom completed the fifth batch of universal services, involving 2,857 administrative villages, completed the build-out of 3,073 4G base stations and 176 border base stations, with an investment of RMB624 million. The Company further promoted the bidding and implementation of the sixth batch of Unicom Telecommunications Universal Service Pilot Projects, involving approximately 1,122 administrative villages. After the first to sixth batches of universal service rural pilot projects and the 4G construction of China Unicom’s special poverty alleviation network projects, our 4G networks have covered remote rural areas in 139 cities of 24 provinces, and the construction and coverage involving 8,275 administrative villages. The planned construction scale of 4G base stations in administrative villages is 14,669, and broadband coverage achieved in 306,000 administrative villages, vigorously promoting and revitalizing the construction of the rural network.

In line with the intention of benefiting the people’s livelihood and doing practical things for the people, Xinjiang Ili Unicom launched the “Rural Broadband Universal Service” project to undertake the task of broadband construction in rural areas and remote villages in the Ili Prefecture. Since 2017, construction has been completed in 70 administrative villages and 3,136 optical network ports have been built, enabling more than 3,000 users to enjoy broadband networks with a bandwidth of 50M or above, realizing the “optical network Ili”.



Hunan Unicom further promoted telecommunication universal services and continuously improved network coverage in rural and remote areas. A total of 626 rural sites were built, and wireless network coverage was added in 592 administrative villages. This has enabled rural users in six cities of Zhuzhou, Xiangtan, Zhangjiajie, Yueyang, Hengyang and Yiyang to enjoy stable and high-quality broadband network services, building a bridge to communicate with the outside world.



CEMENTING THE DEFENSE OF NETWORK SECURITY

Without network security, there will be no national security, social stability, and the safety of the interests of the people. China Unicom takes the maintenance of national network security as its mission, accelerates the construction of an information infrastructure security system, improves network security governance capabilities, perceives the network security situation in all directions, prevents network ideological risks, and strengthens the “firewall” for economic and social development using digital technology, and to escort high-quality development and people’s happy life, all as assistance to building a higher level of security China.

Striving to Ensure Network Security

China Unicom regards the maintenance of network information security as an important mission of conscientiousness and responsibility. The Company adheres to top-level design to build a “five-complete” network information security system and also optimizes network security products, integrates security development throughout all fields and the entire process of the Company’s development, striving to improve security protection capabilities.

Enhancing active defense capabilities

- The Company pushed forward the improvement of public Internet network security threat management capabilities, and the monitoring and handling capabilities at mobile Internet level reached 39Tbps, achieving full coverage of 3/4/5G mobile core network monitoring. It also has the capability of two-way traffic monitoring, handling with 20T link bandwidth at the broadband Internet level.
- A comprehensive system for monitoring and handling capabilities for malicious network resources, malicious programs, Trojan horses viruses and botnets is formed, effectively reduced the attacks and influence of botnets, Trojan horse viruses, and malicious programs.

Building safe product capabilities

- The development, construction and deployment of DDoS protection capabilities were actively promoted, with the protection capability of the all network reaching over 5T, effectively improving the strengths of the large network and internal systems.
- The Company carried out the construction of the expansion of the basic network 4A platforms, realized the unified management of 691 network resource domains and 8,521 operation and maintenance accounts nationwide, effectively supporting basic network security management.
- The development, construction and deployment of the unified security capability management platforms such as DDoS protection, domain name protection, website security monitoring, website firewall (cloud WAF), vulnerability scanning, traffic intelligent filtering, and five security resource pools were completed.

China Unicom held the 2020 Network Security Skills Competition and the National Industrial Internet Security Technology Skills Contest Trial. The Company leveraged competitions to promote training and by training to promote learning. Through the competitions, China Unicom’s network security protection capabilities were further enhanced, and the skill level of network security professional and technical personnel was greatly improved.

Combating Communication Fraud

China Unicom resolutely implemented the state’s efforts to prevent and combated communication information fraud, to maintain normal communication order, protect personal data privacy, and safeguard the legitimate rights and interests of users.

- Actively implemented the requirements of the Cyberspace Administration of China and the Ministry of Industry and Information Technology on the collection and use of users’ personal information in compliance with laws and regulations, and completed the supplementary revisions to the “China Unicom User Privacy Policy” and “China Unicom Customer Access Service Agreement”, to fully protect user privacy.
- Improved the data security management level, carried out special investigations on personal information protection in joint pandemic prevention and control, completed special rectification of APP infringement of users’ rights and interests, conducted offline processing of 2 APPs, and ordered rectification of 9 APPs within the limited period.
- Carried out in-depth control of fraudulent calls, harassment calls and spam messages, and conducted intensive deployment of fraud and harassment call monitoring and handling systems. According to the user’s willingness to answer, the Company provided customers with spam call prevention services, which was widely recognized by customers. In 2020, a total of 140 million fraud and harassing calls as well as 1.28 billion spam messages were intercepted, 25,000 fraud calls, 157,000 harassment calls and 56,000 spam messages reported were handled accumulatively.
- Increased promotion guidance on customer security awareness, made full use of traditional media, new media, SMS and other promotional channels to promptly market and remind users of various information security, and timely provided customers with overseas call reminder services, with an average of more than 42.37 million reminders per month.

China Unicom’s Big data anti-fraud capabilities have made breakthrough progress. The “Big data anti-fraud system” was awarded the “Network Security Technology Application Pilot and Demonstration Project” by the Ministry of Industry and Information Technology. The Company has established an anti-fraud joint laboratory with CAICT to enhance its influence in the industry.

Sichuan Unicom built its intelligent anti-fraud monitoring and handling platform and tools, strengthened the province’s ability to analyze and early-warn suspected fraudulent calls based on Big data, improved the accuracy of fraudulent phone recognition, and achieved outstanding results in precise fraud prevention. In 2020, more than 5,000 fraudulent and suspected phone numbers were shut down every month, and more than 500 channels were punished and rectified. These measures effectively curbed the proliferation of fraudulent calling cards, and Sichuan Unicom maintained the lowest rate of suspected criminal phone numbers among operators in the province according to the Ministry of Public Security.