# FOCUS DEVELOPMENT TO IMPROVE QUALITY AND EFFICIENCY

Quality is the core competitiveness of an enterprise. China Unicom is dedicated to providing quality network and product offerings. In 2016, we focused on the construction of 4G premium network and "all fibre network" cities, and intensively developed our high-bandwidth video business striving to enhance customer experience. We made joint efforts to facilitate sales and marketing of high-quality terminals, optimised multi-channel development on an ongoing basis, actively participated in the "Belt and Road Initiative" to expand overseas markets, and provided better information communication services to customers with craftsmanship quality, thereby contributing to the rapid development of the industry.
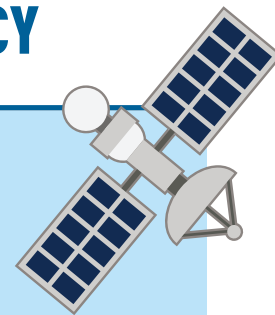
Measures adopted in 2016

- Had a total number of 740,000 4G base stations, achieved 4G network speed and latency which were on par with the industry average, accelerated fibre network upgrade, and achieved all fibre network in all ten provinces in Northern China;

- Successfully completed significant events such as the launch of Shenzhou Spaceship, G20 Summit, and Internet of Things Conference, and provided emergency communication services at the time of natural disasters such as typhoon and flood;

- Intensively carried out specialised actions for the prevention of and fighting against communication information fraud, prevented junk SMS, nuisance calls and fraudulent information, strengthened the management of wholesale phone numbers, and prevented to the fullest extent users suffering from property loss;

- Launched "WO+ TV", a 4K video-based family video application product, optimised tariff policy with the average fixed-line broadband tariff down by 67%, and the average mobile handset data tariff down by 47%.

- Carried out terminal "Crowd Funding" events, held Crowd Funding Conferences 3.0 and 4.0, and sold about 70 million terminals through crowd funding.

- Optimised the construction of diversified channels, strengthened Internet e-services, promoted professional e-commerce operation, built digital stores, carried out specialised actions to "shorten over-the-counter servicing time in stores" with the average servicing time shortened to 6.2 minutes for ordinary services and no more than 13 minutes for integrated services.

- Set up a "listing/delisting" mechanism to effectively improve complaint resolution capability, pushed forward self-improvement in business, network and services with customer word-of-mouth NPS as the benchmark, achieving a sustained improvement in customer satisfaction.

Actions in 2017

- Focus on business demand in order to precisely improve mobile network capacity, accelerate the increase of the resource utilisation rate for broadband access network, and achieve excellent customer network experience in focus areas;

- Implement autonomous reform in operation and maintenance, create an extremely convenient service response system, better serve customers and front line staff to safeguard smooth communication;

- Improve information security management system, and intensively carry out specialised actions for the prevention of and fighting against communication information fraud;

- Enrich family Internet contents, popularise 4K ultra high definition video, introduce consumer financial service and service contents which resolve the difficulties encountered by the customers and improve customer perception;

- Improve channel capacity and expand into new touchpoints to provide new experience to customers, build O2O operation system, promote paperless service sign-up and "mobile APP + sales tools" light touchpoint services, establish eSIM service system, and realise a single-point access to full network service;

- Continuously carry out the NPS customer satisfaction evaluations and Internet service surveys, strengthen the improvement of touchpoint services, intensively develop the "listing/delisting" mechanism, and improve customer perception by means of encouraging the solution of key issues;
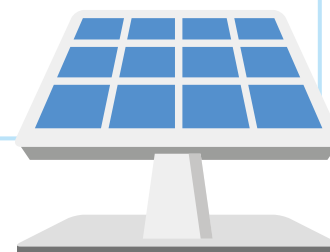
DEPLOY QUALITY NETWORK

Build a 4G premium network

China Unicom proactively implements the network superpower national strategy and speeds up the building of a high quality 4G network with emphasis on customer perception and market demand. By focusing on key businesses, key regions and indoor coverage, we strive to build a quality network with "faster speed, more extensive coverage and better perception", so as to let our customers enjoy more pleasant experience, more relieved consumption and more dedicated services. In 2016, China Unicom invested RMB25.9 billion in its 4G network with a net increase of 340,000 4G base stations, bringing the total number of 4G base stations to 740,000. We completed coverage construction in the urban and county areas. Our campus coverage rate reached 95%. Our coverage over the towns and villages in Eastern China reached 95% and that over transport lines such as trans-provincial high-speed railways and airport expressways reached approximately 90%.

China Unicom has built a sizable 4G+ network. Downlink and uplink network speeds are 1.4 times and 5 times of the industry average respectively. Communication latency has been lowered to 10ms-ish level, and the quality of voice calls is on par with the industry average. China Unicom ranked top in the performance tests conducted by China Broadband Development Alliance, Deutsche Bank, SOHO China, Thunder and China Railway, etc.

A TOTAL OF 740,000 4G BASE STATIONS IN OPERATION

China Unicom Shijiazhuang Branch conducted independent research and development of APP and cloud application system and built a network optimisation system platform for crowd funding. Customers sent their feedback on the network experience and quality to a cloud database via the client APP. Through the system, the company could collect information about network utilisation, data and voice service quality, etc. with accuracy up to within 10 meters. With the information, the company carried out in-depth and detailed evaluation on the quality of network, to optimise network in a timely fashion and to enhance the perception of the mobile customers.

China Unicom Shandong Branch continuously explores new opportunities for network planning and construction. It adopted the most advanced 6D-ASP accurate planning method in the industry, and used big data analysis to accurately locate the indoor and outdoor service demand within the network. It also adopted high-precision 3D digital maps to carry out planning, calibration and simulation of wireless propagation model, which substantially improved the matching between network deployment and user demand. While fully ensuring network quality with a downlink rate of 300M and uplink rate of 75M, it further brought the 4G speed to a new record of 375M via frequency and capacity reduction, three-carrier aggregation and other technologies.
(Note: 6D-ASP is a method for accurate base station planning based on a six-dimensional data evaluation of capacity distribution, user distribution, terminal distribution, income distribution, complaint distribution and coverage distribution).

In recent years, the scale of Beijing subway has been expanding. The present network covers an aggregate of 18 lines, involving 341 stations with a total tunnel length of 555 kilometers, and its daily average passenger traffic amounts to 12.21 million person-time. In order to further improve the 4G network download speed along the subway, China Unicom Beijing Branch conducted a series of 4G network speed enhancements based on different scenarios such as subway entrances, tunnels, platforms and station halls so as to address issues such as high passenger traffic density and limited troubleshooting time for indoor distribution systems in subway, and comprehensively applied artificial intelligent network and big data to increase the 4G network speed of Beijing subway to 35.8Mbps.

Accelerate the construction of fixed-line network

China Unicom upholds the craftsman spirits and strives to create a high-quality broadband network for customers with good coverage and fast connection speed. It implements differentiated broadband construction strategies for Southern and Northern China, strengthens social cooperation and pays attention to the improvement of the port utilisation rate. The quality and capability of its broadband network have improved through meticulous construction and optimisation.

Speed up "all fibre network" construction

In 2016, the Company recorded a net increase of broadband access ports of 15.27 million, and achieved "all fibre network" in all 10 provinces in Northern China, with the number of "all fibre network" cities reaching 139. 89% of ports in urban areas have access speed of 20M or above and 99% of ports in rural areas have access speed of 4M or above. There was a significant improvement in customer perception.

We also accelerated free broadband speed upgrade. The nationwide average fixed-line broadband access speed amounted to approximately 30Mbps, and broadband users with an access speed of 20M or above accounted for 75% of the total number of broadband users and the proportion of broadband users with an access speed of 50M or above reached 36%. More than 20 million users enjoyed free speed upgrade.

A NET INCREASE OF **15.27** MILLION
BROADBAND ACCESS PORTS

NUMBER OF "ALL FIBRE NETWORK" CITIES REACHED **139**

PERCENTAGE OF BROADBAND USERS WITH AN ACCESS SPEED OF 20M OR ABOVE REACHED **75%**

NUMBER OF USERS ENJOYED FREE SPEED UPGRADE MORE THAN **20** MILLION

Strengthen backbone network construction

The Company deployed in scale 400G platform routers and 100G high-bandwidth circuits, continuously pushed forward the construction of directly-connected nodes in the backbone network to enhance interconnection, and proactively expanded its broadband capacity. In 2016, the Company's domestic backbone bandwidth reached 170T, its domestic interconnection bandwidth reached 2,881G, and its international gateway bandwidth reached 1,711G.

Implement transmission system capacity expansion

During the year, the Company expanded the capacity of the transmission system by 100T and accordingly added 490 new 100G end-to-end circuits to support the high speed service for our customers. The network speed and other technical performance indicators of the 169 Backbone Network were further improved with intra-network latency ranking the first among operators in an evaluation by MIIT. The 600G expansion for the International inbound and outbound capacity has been completed, resulting in a significant improvement in the international inbound and outbound network capability. The Company pushed forward the construction of international data cache system and became the first among the three operators to complete the construction, take delivery and commence operation of the system. As a result, it achieved an international data cache capacity of over 180G.

China Unicom Shangqiu Branch invested over RMB900 million to build the first GB "all fibre network" in China. 177 nodes at the township level, 4,338 administrative villages, 1,790 communities and 8,121 private lines of enterprises and major customers received fibre upgrade. More than 500,000 broadband users are fully covered by fibre. Based on its fibre network, China Unicom Shangqiu Branch worked in conjunction with the municipal government of Shangqiu and Alibaba Group to jointly build the Alibaba (Shangqiu) Industrial Belt with an aim to promoting and selling the featured products of Shangqiu online. 1,206 enterprises have joined the Alibaba (Shangqiu) Industrial Belt, and the online trading volume has exceeded RMB1.6 billion.

Government
Advantages in terms of industry resources

Alibaba
Advantages in terms of platform and brand

China Unicom
Advantages in terms of technology and service

Smooth emergency communication support

In 2016, China Unicom established three key emergency communication support principles of "quality network, innovative support and focused cooperation", formulated and implemented an emergency communication big data mining plan and also a communication emergency scenario protection plan. By promoting the emergency communication in an innovative manner, all emergency communication support tasks were completed successfully.

Communication support for Shenzhou Spaceship launch

On October 17, 2016, "Shenzhou XI" manned spaceship was launched successfully. China Unicom initiated a joint communication support programme involving four provincial branches, inspected optical cables, node machine room and equipment, conducted real-time network monitoring, and constantly inspected underground pipelines. Nearly 400 technicians and over 200 communication vehicles provided peripheral support and a number of supporting officers were stationed on site at Jiuquan. The communication support task was completed successfully.

Communication support for Internet of Things Conference

In October 2016, World Internet of Things Exposition, the most prominent and largest national conference in the field of Internet of Things – was held in Wuxi, Jiangsu Province. China Unicom Jiangsu Branch entered into a 7*24h standby mode, sent over 100 persons to inspect power, cable lines, machine rooms and equipment on a daily basis and to carry out troubleshooting. Over 50 staff members were despatched to test, optimise, regulate, build and maintain both the expo venue and surrounding area as well as the traffic lines. Two emergency communication vehicles were used to provide on-site support. Jiangsu Branch fulfilled the tasks of ensuring smooth network, full coverage and failure-free maintenance, and ensured a perfect network experience during the conference.

Communication support for G20 Summit

In September 2016, the 11th Group of Twenty Summit (G20 Summit) was solemnly held in Hangzhou, Zhejiang Province. In order to ensure the smooth communication during G20 Summit, China Unicom invested RMB330 million to build 497 new 4G base stations for G20 Summit, despatched maintenance personnel for 8,652 person-time and mobilised emergency vehicles for 1,731 vehicle-time. During the Summit, Zhejiang Unicom set up dedicated service zones for the Summit in stores, service hotlines and online stores, and created dedicated G20 service support hotlines under the 10010 and 116114 hotlines to provide bilingual service for international roaming users and domestic roaming users in China. A featured section for G20 Summit was added in e-service channels to allow users to easily check the agenda of G20 Summit, nearby scenic spot and gourmet recommendations, and travel information so as to let foreign guests appreciate the beauty of Hangzhou with just a click.

Communication support during natural disasters

In 2016, while serious floods occurred in some areas in China, and there were torrential flood, debris flow and landslide in certain areas. Typhoons "Nepartak", "Nida", "Meranti" and "Megi" landed in mainland China one after another. Facing the serious disasters, all employees of China Unicom took full responsibilities, overcame dangers and difficulties to provide full support for the communication of important customers such as the Party, government and the military as well as flood control and drought relief command departments and to reduce loss of the Company to the minimum. During the flood season, China Unicom contributed RMB282.06 million in total for disaster relief and mobilised rescue personnel for 272,620 person-time, rescue vehicles for 100,701 vehicle-time, emergency equipment 23,648 unit-time, emergency oil engines 119,696 unit-time, and sent 541.33 million community care and emergency SMS.

Maintain the security of network information

Protect the security of network operation

China Unicom focuses on national security and long-term development, always bears in mind the importance and significance of network security and its responsibilities in safeguarding it, and sturdily assures network security. A series of measures were adopted to further improve the capability of our network infrastructure and business systems to defend such threats as cyber attacks, viruses, network invasion, network meltdown and information thefts so as to safeguard the security of our network infrastructure and important business systems.

- Carried out control measures such as network safety protection management, communication network unit grading registration, conformance (benchmark) evaluation, risk assessment, network data security and user information protection;
- Increased investment in network security technology, reinforced the network security protection foundation by following the principle of "simultaneous planning, phased construction, operational feasibility and self-controllability", and achieved the objective of "network-wide perception, intelligent analysis, centralised control and open network capacity";
- Strengthened the building of network security protection and supporting team, conducted over 50 sessions of network safety protection training in various forms with more than 1,000 participants so as to improve technical capability of our network security protection personnel;
- Built an security and emergency work system for the entire network, formulated an Internet emergency plan, set up network security emergency team, and handled over 56,000 security incidents of various types throughout the year.

China Unicom Network Technology Institute launched the "Enterprise User-oriented Security Integrated Protection Platform", which is a set of product solutions which are equipped with highly integrated features, resource flexibility calculation, customisable services, flexible and open interface, and are developed by combining the technologies of SDN/NFV and cloud computing to accommodate the security protection needs of enterprise users. Meanwhile, by leveraging on the relevant capabilities of the platform, the Company created a series of security value-added service products such as China Unicom dedicated security lines, security data centres and security ICT products to provide more efficient and convenient security protection support to users. The project is selected as "Telecommunication Industry Network Security Pilot Demonstration Project" of MIIT.
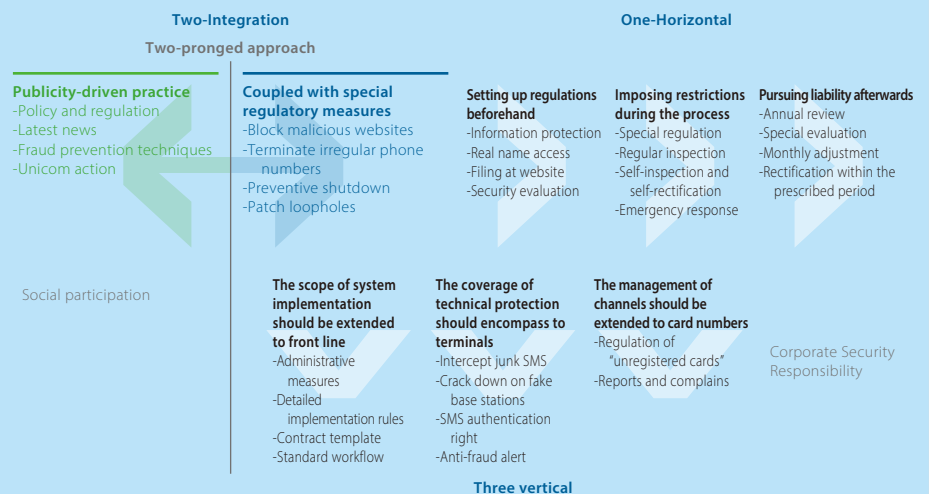
Ensure a stable information system

- Strengthened information system security construction; deepened transformation from security control to security service; centering around data security and business security, carried out security protection of centralised system, integrated and perfected the security system and ensured the security of information system and information assets;

- Strengthened control over information security risks; strengthened security system construction, and ensured that all safety risks are identifiable, controllable and manageable, and that the results of the security efforts are assessable; enhanced security management regulations and safe operation guidance of the proprietary systems of provincial branches. No serious security incident occurred in head office and provincial branch system during 2016.

Perfect information security system

- Conducted website security inspection with specialised actions for fraud prevention;

- Took the initiative to assume responsibility, and launched a nationwide nuisance call alert service with 2 million alerts sent per day on average;

- Continuously addressed the issue of junk SMS resulting in a decline in user reporting rate by 41.3% as compared to the beginning of the year;

- Included wholesale numbers into our own system for regulating junk SMS, nuisance calls and communication information fraud;

- Provided anti-fraud public service covering all mobile phone users within the network, which saved users from suffering material economic losses and was granted written recognition by the Joint Office of the State Council.

When technicians of China Unicom Sichuan Yibin Branch carried out routine voice business analysis, they found the daily call volume of two base stations in Guandou Town, Gong County, Yibin City was hundreds of times higher than the normal level. After conducting an in-depth analysis on call signaling and base station environment, technicians deduced that it was very likely due to malicious calls. They helped Yibin Criminal Police Team to precisely locate and proactively crack down on the malicious calls, and successfully seized 14 calling devices and 9 laptops.

China Unicom Beijing Branch established a "one-horizontal, two-integration, three-vertical" communication information fraud prevention system under which the term "one-horizontal" means focusing on "process control" and achieving the goal of "setting up regulations beforehand, imposing restrictions during the process and pursuing liability afterwards"; the term "two-integration" means generating an "overall effect" that results from a "publicity-driven atmosphere coupled with special regulatory measures"; and "three-vertical" means focusing on the "degree of enforcement" and emphasising that "the scope of system implementation should be extended to front line, the coverage of technical protection should encompass terminals and the management of channels should be extended to card numbers". The fraud prevention work of China Unicom Beijing Branch was widely recognised by the society. Followers of its official Weibo account wrote that "fraud prevention is surprisingly complicated"; "good job, Unicom"; "to give China Unicom Beijing Branch a "like""; "thanks for your alert (to fraud)".

Two-Integration

Two-pronged approach

One-Horizontal

Publicity-driven practice
-Policy and regulation
-Latest news
-Fraud prevention techniques
-Unicom action

Coupled with special regulatory measures
-Block malicious websites
-Terminate irregular phone numbers
-Preventive shutdown
-Patch loopholes

Setting up regulations beforehand
-Information protection
-Real name access
-Filing at website
-Security evaluation

Imposing restrictions during the process
-Special regulation
-Regular inspection
-Self-inspection and self-rectification
-Emergency response

Pursuing liability afterwards
-Annual review
-Special evaluation
-Monthly adjustment
-Rectification within the prescribed period

Social participation

The scope of system implementation should be extended to front line
-Administrative measures
-Detailed implementation rules
-Contract template
-Standard workflow

The coverage of technical protection should encompass to terminals
-Intercept junk SMS
-Crack down on fake base stations
-SMS authentication right
-Anti-fraud alert

The management of channels should be extended to card numbers
-Regulation of "unregistered cards"
-Reports and complains

Corporate Security Responsibility

Three vertical

Strictly prevent user information leakage

- Perfected user information protection and management system; implemented the real-name registration system for all users by strictly requiring all new users to use their real names for registration and accelerating the follow-up registration of existing users; while placing close attention to four key areas, i.e. the collection, storage, use and destruction of user information, set up protection initiatives and specific measures which cover the entire course of business operation; strengthened the management of user registration data in various channels such as stores and agents, enhanced user information protection in e-commerce, and implemented a reporting system for incidents relating to the leakage of user information. There was no incident of serious information leakage during the year;

- Regulated the access of user information by mobile APPs; revised "WO store APP Regulations", implemented a full-lifecycle safety verification mechanism on mobile APPs; prohibited the retrieval of personal information unrelated to the features or without the permission of users, and ensured that APPs accessing personal information of mobile users in violation of the regulations cannot be listed; for APPs that have already been listed, increased the frequency of safety reviews to ensure that users were thoroughly protected from APPs which involved illegal and irregular acts such as illegal retrieval of users' personal information, malicious charges and bundled download, etc. The WO store APP platform rejected all the 35 illegal APPs which were found to have violated the regulations, and suspended or terminated the relevant developer accounts to protect the legal interests of users.