INNOVATION-DRIVEN:
HEADING TOWARDS GOOD SMART LIVING

INNOVATION-DRIVEN: HEADING TOWARDS GOOD SMART LIVING

Innovation is an indispensable driving force for maintaining corporate vibrancy. It is the primary power for development and provides strategic support for building a modernised economy. China Unicom persists in bringing quality smart living to its customers through innovation. In 2017, the Company actively advanced the construction of intelligent networks, as it stepped up with deployment in areas such as cloud computing, Big Data and Internet of Things while making proactive explorations in AI. The Company rolled out a diverse range of "Smart+" applications to foster a smart brand and facilitate smart living and smart industry development, in a bid to enhance customer services generally via multiple channels and realise innovation-driven development.

Measures adopted in 2017	Actions in 2018
• Carried out futuristic network technology research, introduced SDN/NFV to gradually build smarter networks, and completed scale 5G pre-commercial tests and validation.	• To carry on with the R&D and application of SDN/NFV technologies, and accelerate 5G technologies R&D and trial deployment.
• Sped up deployment in cloud computing, Internet of Things, Big Data and AI, etc. and initiated innovation in business and services.	• To further enhance our capabilities in new Internet-related technologies such as cloud computing, Internet of Things and Big Data, and develop more diverse informatisation application services.
• Rolled out a diverse range of "Smart+" applications using new technologies; built our brand system to forge comprehensive information service solutions for family, and completed a number of "Internet+" projects concentrated in key industries.	• To continue with our NPS surveys and make further improvements on our service delivery and channels in order to enhance customer perception and the word-of-mouth.
• Used new technologies and channels to improve our customer service. Our Internet channels served 60 million users and completed 201 million service items.	

BUILDING SMART NETWORKS

High-speed smart networks are the basis for the network superpower strategy. China Unicom is committed to providing quality network service through continuous network optimisation and evolution as well as network speed upgrade. We strive to build smart networks to provide more intelligent services for our clients.

Intelligent evolution of network

China Unicom comprehensively explores the future overall network topology and evolution strategies to forge a network structure for the next generation. We will improve our network's core competitiveness and our business innovation capabilities based on SDN/NFV, cloud technology and mega-broadband technology which help make our network more flexible and intelligent. Users will be offered an agile, customised and personalised network experience, which will support rapid rollout and development of our different innovative businesses.

- Advance network evolution and upgrades based on user and business demand, promote the transformation towards an Internet-oriented operation model, and centralise the planning for the construction of DC-oriented cloud-based communications facilities.

- Develop an integrated Industrial Internet business to gradually enable end-to-end automatic service provisioning and achieve cloud-network collaboration and synchronisation.

- To complete the construction of SDN-OTN (software-defined network — optic-transmitted network)-based premium transmission network.

- Begin virtualisation of mobile network in anticipation for transitioning to 5G.

- Make further progress in virtualisation and restructuring of Metropolitan Area Networks in tandem with the gradual maturity of virtualisation technologies.

For the development of the backbone network China169, we actively introduced SDN technology for international outbound traffic, optimised and adjusted international traffic using SDN controllers, and maximised the use of international gateway resources. Routing was optimised with respect to latency and other factors to enhance network quality for cross-border Internet access. As at the end of 2017, domestic backbone network capacity amounted to 200T, and international outbound bandwidth amounted to 2460G.

For Industrial Internet development, based on our original IP carrier A Network, we combined iterative proprietary R&D and synthesised innovation to deploy SDN technology. CloudBond, our proprietary integrated cloud-network product, already had cross-DC (data centre) private line networking capabilities in key cities covering 21 provinces where it offered cloud service providers with online application, automatic service provisioning and self-services. The Industrial Internet is the first large DC network ready for scale commercial deployment among operators across the country.

For digitisation of communication networks, China Unicom actively engaged in CORD, an important international open-source project in the field of SDN. We led in the E-CORD architecture (Enterprise-Central Office Re-architected as a Datacentre) and took part in the works of M-CORD (Mobile Network-Central Office Re-architected as a Datacentre). We established China Unicom CORD Industry Alliance to lobby for the introduction of open-source CORD projects in the country which would enhance the international influence of China Unicom in the SDN/NFV open-source field.

On 30 August 2017, China Unicom's Hengqin Research Centre of the "National Engineering Laboratory for the Business Use Cases of the Next-Generation Internet Broadband" was founded in Hengqin New District, Zhuhai. The National Engineering Laboratory Hengqin Research Centre covers such research areas as next-generation networks (5G, SDN/NFV, and IPv6), broadband videos, household Internet, Industrial Internet, Big Data, Internet of Things, Internet of vehicles, network and information security and AI. It has become the supporting hub for China Unicom's network upgrades and business innovation as well as the entity for external technical collaboration.

Accelerating 5G research and development

Through key technology researches, standardisation, development of prototype devices, and trials and testing, China Unicom keep driving the advancement of 5G end-to-end technology.

- China Unicom develops a unified business capability platform which provides support and control to different business lines. We open up our network capabilities to improve operational efficiency.

- China Unicom explores new collaboration models such as technological research collaboration, product development collaboration, business innovation collaboration and capital operation collaboration.

- China Unicom completes its planning for seamless 4G/5G business integration as well as related technology evolution paths. Our 5G network requirements are based on 3GPP standards, and we promote the formulation of industry and enterprise standards.

- China Unicom conducts research into 5G system solutions and network deployment planning. We have completed phase one of the technological requirements of our 5G base station prototype, 5G field test planning and trial proposal, as well as trial and validation of scale 5G pre-commercial use.

DEVELOPING SMART TECHNOLOGIES

China Unicom persists in its innovation-driven development, steps up its efforts in new technologies and promotes the integration of new technologies and mobile communications, while driving business development and service innovation.

China Unicom and Alibaba Cloud launched hybrid cloud products

Enhancing cloud service capabilities

In 2017, China Unicom's cloud computing business was focused on the enhancement of platform and key capabilities. Greater emphasis was placed on WO Cloud's advantages in self-controllability and cloud-network integration. We targeted at the public administration market and made intense efforts in developing vertically industries such as education, medical care, environmental protection and tourism to provide customers with professional operation support services.

China Unicom has altogether deployed 41 public resource pools and 44 dedicated private resource pools across the country, with 237,000 cores of computational power, 22.7PB of storage and 1050G of network bandwidth in operation. WO Cloud is now capable of servicing 16 products with 258 function spots. Compared to the international practice of adopting mainstream open-source technologies, China Unicom WO Cloud insists on proprietary research and development to ensure safety, controllability and upgradability. It offers advantages such as the high cost-to-performance ratio of cloud-network integration, support by local operation and maintenance teams, as well as professional and reliable services.

WO Cloud Platform serves over

2,000 clients

Registered users of WO+ Cloud Disk exceed

70 million

China Unicom launched a hybrid cloud solution in cooperation with Alibaba Cloud to mutually share cloud resources. We entered into intensive collaboration with Alibaba and Tencent with respect to public cloud, hybrid cloud, and industry cloud. We also engaged in in-depth cooperation with New H3C and Tsinghua Uniudc with respect to exchange and sharing of public service data. We set up a joint innovation laboratory in conjunction with Intel and launched 5 new products, enhancing the differentiated competitiveness and service quality of WO Cloud products.

In 2017, China Unicom Cloud Data Company was awarded Cloud Sail Award of Cloud China 2017 by MIIT, Best Manager of IT Risks by CAICT and "SDN Best Industry Solutions" by Posts & Telecom Press, among others. It was also elected as a Gold Member of OpenStack Foundation.

China Unicom's Hebei Langfang branch capitalised on its geographical advantage to construct cloud platforms for SMEs in Langfang to help them migrate to the cloud. Such efforts effectively enhanced resources utilisation rate and reduced the IT costs for SMEs. Currently Langfang Enterprise Cloud Platform serves 1,765 enterprises and has provided services for a total of 2,593 times. Companies in manufacturing, service, legal consultation, financial service and other industries actively joined the Enterprise Cloud Platform which turns into a business exchange platform for enterprise resources. It made a positive impact on the development of enterprises and the local economy.

Building Big Data paradigm

China Unicom established China Unicom Big Data Company in adherence to the national Big Data strategy. The company concentrated the massive data resources of China Unicom, enabling three product offering capabilities with respect to basic use, standard application and platform-scale industry solutions, and offering eight products ranging from labelling system, open capability platform, WO indices, risk management platform, digital marketing, Smart Steps, public service Big Data and tourism Big Data. China Unicom regards the Big Data Company as the major operating entity for external commercial Big Data applications and the single gateway for the Big Data across the whole network, as well as a platform for pooling in capital and collaboration projects for expansion in the Big Data industry. The company utilises Big Data to make continuous upgrades to its own network and services, and promotes the use of Big Data for modern city administration, industry upgrades, rollout of commercial intelligence and improvements in civil services, etc. It strives to establish a full value chain Big Data ecosystem and to provide comprehensive Big Data services for the whole society.

- **Integration of data assets:** Based on the key areas and demands for "data" and "smart" technology from different industry, through data collection, mining, analysis and application, we optimised and improved our Big Data product service system for corporate and individual clients. Based on open platforms, we increasingly opened up our Big Data service capabilities and deepened cooperative operation to commoditise, standardise and scale up our external businesses in order to continuously enhance our data asset value.

- **Monetisation of data:** Opening up products and applications to provide diverse Big Data application services for the public. We have developed over 200 clients and partners in 8 industries including finance, insurance, tourism, government and the Internet.

- **Operational capabilities of data platform:** we have established the largest cloud-based Big Data platform second to BAT with a storage capacity of 85PB and Hadoop computing power of nearly 4,500 nodes. The platform amassed a tremendous amount of data across the country and can easily identify 200,000 Internet products, approximately 4,200 cell phone brands and 105,000 models of terminals. It has a daily online data processing capacity of 710 billion entries, and daily phone bill data processing capacity of 33 billion entries.

11 Big Data open application capabilities

More than 200 clients and partners developed

Over 70 million IoT connections

Serving over 12,000 corporate clients

Fostering Internet of things (IoT) ecology

With an IoT foundation platform as its core, China Unicom IoT services make use of services such as connections, components, applications and integrated solutions as its key elements to construct an ecosystem covering the whole IoT value chain including cloud, pipelines, terminals and chipsets. It can effectively help enterprises collaborate and innovate and effect the transformation from one-off product sales to continuous improvement of service. As at the end of 2017, China Unicom had over 70 million IoT connections, including 57 million connections on the IoT foundation platforms. We serve over 12,000 corporate clients from key industries including industry, agriculture, transportation and logistics, healthcare, retail and commerce, Internet of Vehicles, consumer electronics, energy and public sector, and public security.

China Unicom continues its "dual-engine" IoT strategy driven by capability development and ecology formation. During the International Partnership Conference, it published a "Global IoT Connection" collaboration proposal with a goal to speed up global IoT deployment and collectively forge the new values of the "Everything Connects" era. It garnered positive responses from a dozen international operator groups and leading regional operators. In August 2017, China Unicom convened the IoT Ecology Conference and published the "Platform+" strategy, established the China Unicom IoT Industry Alliance with over 30 well-known companies or organisations joining as its co-founders.

Inaugural Conference of China Unicom IoT Industry Alliance

- **Network Capability:**
  China Unicom built a diversified and customised IoT network adaptable to complex situations. It pushed forward nationwide NB-IoT commercial use and eMTC pre-commercial use. Dozens of cities have already launched NB-IoT for pre-commercial use. Over 300 cities are ready to quickly enable NB-IoT network functionality. In a number of places including Beijing and Guangdong, the eMTC trial networks are ready for pre-commercial use.

- **Platform Capability:**
  China Unicom launched a new version of its IoT connectivity management platform which features better data analysis and automation capabilities, more reliable safety protection measures, more flexible operations for business partnership, and seamless support for massive low power wide area networks. The platform aggregates powerful secondary operation capabilities and provides comprehensive open capabilities and resource support for application developers, helping SMEs customise and develop innovative products and creating a new business model.

As one of the first pilot cities, China Unicom's Tianjin branch fully completed its NB-IoT deployment in 2017. Collaborating with IoT industry partners including Huawei, ZTE and 360, it established Tianjin NB-IoT Association to facilitate faster, better development of the IoT industry in Tianjin, providing a more intelligent working and living environment for businesses and citizens.

China Unicom's Zhengzhou branch established, together with other upstream and downstream companies in the IoT industry, the Zhongyuan IoT Experience Centre Platform, which incorporates exhibitions and displays, experiential interactions, education and training, and advertising and promotion, providing the soil for future innovation. It worked with cooperative partners to foster a positive industry ecology. Combining the power of different parties, it is on full swing to promote the development of IoT industry.

Embracing Artificial Intelligence (AI)

China Unicom kept close track of the latest development of artificial intelligence technologies at home or abroad. Leveraging on our great prowess of information and communication technologies, we constantly expanded our deployment in artificial intelligence businesses. We actively pursued collaboration within the industry, and explored the application and development of artificial intelligence.

On 13 October 2017, the Artificial Intelligence Industry Development Alliance of China held its inaugural conference in Beijing, at which China Unicom was elected as the deputy directing unit of the Alliance. As the sole representative from telecommunication industry, China Unicom organised the Artificial Intelligence Industry Development Alliance of China Tournament. We rode on the tournament to explore the combined application of artificial intelligence and telecommunication networks, drive the intelligent transformation of our network and reform our operation management with the use of AI, in search of the future pathway for China Unicom's intelligent operation. We will also actively identify competent partners in the AI industry chain.

Expediting technology research

China Unicom is one of the first innovative enterprises as recognised by MOST, SASAC and ACFTU. Technological innovation is always our top priority, and we have established a strong base for technological innovation as well as a comprehensive technological innovation system. The headquarter department of technology is the designated department for technological innovation. Our research and development institutions include four main R&D bases, namely China Unicom Research Institute, Network Technology Research Institute, Software Research Institute, and IoT Research Institute, as well as various professional subsidiaries and provincial branches. In 2017, we made a rich portfolio of research achievements:

Inaugural ceremony for AI tournament and AI Park shortlisting

- "Standardisation and deployment plan for six-mode all-network-access handset series", "Study on SDN/NFV network evolution and applications", "cBSS1.0 — cloudification innovation of tariff billing applications", and "Proprietary cloud-based and centralised phone card resources management system", etc. were awarded first prizes for technological advancement.

- 5 out of 51 national research projects assigned to us have been qualified for acceptance, including the "Next-generation wireless broadband mobile communication network project 03" commissioned by MIIT, and MOST's national key research projects and NDRC's "TD-LTE" project, among others.

- Led and participated in the formulation of 209 sets of industry standards. 5 employees worked as telecommunication chairpersons or vice chairpersons and 24 employees worked as unit leaders or vice leaders in China Communications Standards Association (CCSA), possessing important influential power.

- Participated in the tracking studies of 11 international standard associations and 5 international open-source communities. Submitted 649 essays written on international standards. Took up leading position for the drafting of 29 new standards (among which 16 were related to ITU-T). Led the release of 21 standards (among which 13 were related to ITU-T). Assumed numerous positions in important international associations such as ITU-T, GSMA, ONF (ONOS), etc.

- Annual investment in technological innovation amounted to RMB5.81 billion. 648 patent applications were made and 346 patents were granted.

649 essays written on international standards submitted

228 industry standards published

648 patent applications made

346 patents granted

ENRICHING SMART APPLICATIONS

As the development of innovative modern industry system in China sped up in 2017, newly emergent industries flourished, with new technologies, industries and business norms such as digital economy and sharing economy growing fast. China Unicom leverages on its basic telecommunication network and makes good use of edges in cloud computation, IoT, Big Data, artificial intelligence, and other new technologies, making strenuous efforts in expanding into smart living and smart industry. Rich and diverse "Smart+" applications were rolled out so that the public can enjoy more convenient and smarter living.

Building smart brand

In 2017, China Unicom conducted intense analysis on industry trends and the demands of government and commercial clients as well as those of individual consumers with a view to optimise its brand system and win admission into the national branding programme.

Brand system of China Unicom

China Unicom forged a comprehensive strategic partnership with the national table tennis team, and launched "Xialü", a promotional campaign for table tennis culture. "WO's Table Tennis", a public table tennis tournament, was organised to perfectly bring together table tennis culture, sport event culture, corporate culture and mass sports, setting a great standard for corporate support for public fitness sports.

5th China Unicom Table Tennis Tournament National Final

A player competing with national athlete Fan Zhendong

Enjoying smart living

Care for Customer Experience

In 2017, China Unicom strengthened regulatory management on operational practices. We established a system to evaluate and survey user experience with a view to continue improving our products and services as well as to gain better insights into customer needs.

- Formulated "China Unicom's evaluation standards and management regulations for end-to-end customer experience". Starting from the very beginning of product design, customer experience indicators were already optimised. We take user experience into consideration in major production phases such as product design, development, testing and launch, etc. in order to keep track of customer experience and to ensure customer satisfaction in a systemic approach.

- Established a targeted customer marketing model based on Big Data. We precisely conducted our marketing activities based on customers' consumption and behavioral patterns. We offered more appropriate packages, more convenient services and better experience according to customer preferences. Our scenario-based marketing capability is available in 30 provinces and the model covers 255 different scenarios.

- Established direct communication with the marketing front-line. Through Weixin groups, phone calls and video conferences, user feedback can be directly fed to product management departments to make timely evaluation and optimisation. This ensures constant improvement of product experience.

Innovative 4G products

In 2017, China Unicom made full efforts to build an Internet-oriented product system and establish a data-based product system. It was the first in the industry to offer unlimited data packages called "Ice-cream packages" to gradually optimise customer mix and increase both the proportion of mid- to high-end customers and customer value. We entered into collaboration with 35 Internet companies including Tencent, Alibaba, Baidu and Didi to engage in 2I2C projects. We departed from the marketing model of traditional operators by offering experiential customised products with low entry barrier and large data allowance. We carried out deep product integration leveraging the resources of both parties to build a comprehensive and flexible 2I2C applications and privileges system so as to provide users with products of greater value and service of better quality.

- Simplified 4G package offerings to encourage users to switch from contract-based packages to data-based packages.

- Launched 95 2I2C products including Tencent King Card, Didi King Card, and Baidu Super Card, to satisfy customers' diversified needs.

- Launched "Videostorm", Smooth Watching Plan and WO Videos under an innovative mobile video product system and marketing model.

- Developed a first-tier privilege operation system. A proprietary privilege centre went online in our mobile app with privileges offered by 31 partners. 45 privilege activities exclusive to China Unicom were available. The privilege centre covers 19.30 million users, representing a penetration rate of close to 7%.

China Unicom's Beijing branch continued to enrich its basic TV and VOD services. Meanwhile, it also created specialised products and channels targeting different family user groups to satisfy their diverse and personalised viewing needs. The IPTV products have integrated different industry applications including education, healthcare, games, HD video communication and convenience services, etc. Users can enjoy a variety of convenient daily-life services through a single service sign-up.

Rich integrated services

In 2017, China Unicom advocated the business strategy of "Great Bandwidth, Great Data Traffic, Great Integration, Great Videos". We constantly enriched the integrated products of Smart WO Family service. Focusing on high-speed broadband, high data traffic, sharing among all services and rich video contents, we offered comprehensive family information service solutions to facilitate the commercialisation of smart family services.

China Unicom actively plans on and tracks the development of family Internet. We provides services such as home Internet gateways, WO Family Housekeeper and Intelligent Speed-up, and keeps track of the latest market and technology development. Using our home Internet gateways, we can offer home network design solutions. Leveraging our mixed-ownership reform, we worked with Internet companies to explore integration of communications and Internet products as well as sales channels sharing, trying out new operating models.

We centralised nationwide value-added TV services operation and offered innovative value-added TV applications including 4K UHD, videos, gaming, education, music, shopping, healthcare, and video chats. Currently, we extensively cooperates with over 200 content and application partners in our value-added TV businesses offering over 1,000 TV applications to fully satisfy the living and entertainment needs of different family members.

Over
200 value-added TV business partners

Over
1000 TV applications available

In September 2017, China Unicom's Guangdong branch established the innovative alliance "Internet Home" with its industry chain partners to jointly create as an industry standard "Internet Home — Family Cloud Platform" which serves as a one-stop, online and intelligent family smart living portal. It offers family users with 4K UHD contents, smart family control services, smart healthy lifestyle service and smart community services, providing comprehensive family informatisation service solutions and leading the upgrade from "Family Internet" to "Internet Home".

China Unicom's Guangdong branch announcing "Internet Home"

Internet Home — Family Cloud Platform

Supporting smart industries

China Unicom has promoted smart city upgrade and supported the "Internet+" industrial transformation focusing on public administration, education, medical care, tourism, manufacturing, environmental protection, agriculture and finance, etc. by leveraging its leading advantages in cloud computing, Big Data, Internet of Things and artificial intelligence, with an aim to provide the general public with convenient living enabled by "Internet+". China Unicom has continued to build an innovative businesses system focused on enhancing innovation capability, strengthened the top-down design for industrial Internet innovative businesses and the coordination and allocation of resources and capabilities across the whole network, consolidated the support and service capabilities for innovative businesses and built separate system and mechanism for innovative businesses distinct from fundamental businesses, in order to facilitate rapid development of innovative businesses.

Smart Public Administration

China Unicom cooperates with over 20 provincial governments in relation to the provision of an electronic platform for public administration services in promotion of "Internet + Public Administration". It enables highly effective operation of administrative bodies, interoperability of data and better livelihood of the general public, facilitating the transformation of traditional administration management to smart management.

On 31 March 2017, China Unicom officially launched its electronic public administration product system and public administration cloud whitepaper. The product system covers informatisation infrastructure resources services, electronic public administration cloud, Big Data for public administration, intelligent applications for public administration and support services for informatisation operation, etc. It provides our government clients with end-to-end and integrated informatisation products and services across the entire life cycle.

China Unicom's Henan branch has migrated the administration system of the provincial industry & commerce bureau to its dedicated public administration cloud platform, connecting it with the police, taxation and finance authorities, etc. and achieve mutual data sharing. The platform breaks down the information barrier, built a paradigm of joint regulation, system integration, Big Data-driven governance, convenient services for the general public and a robust support platform. Company registration in the whole province has been fully digitised, enabling service targets such as enterprises, industrial and commercial proprietorships, farmers' professional cooperatives and other market participants may complete company registration online without any hassle.

Smart Education

China Unicom has launched "All Class Access" and "3ikids" and other products for nursery, primary and secondary education by leveraging its integrated technological advantages in cloud computing, Internet of Things, Big Data and mobile Internet. With the nationwide "Three Accesses and Two Platforms" project, 68,000 primary and middle schools were connected with broadband, nearly 500,000 classes signed up for All Class Access and 120,600 kindergartens participated in the collaboration. In 2017, China Unicom focused on developing interactive learning cards in its expansion of "Internet + Smart School" business. We vigorously acquired mobile subscribers with "everyone-access" cards. K12 students and teachers using "everyone-access" cards reached nearly 5 million. We made significant contribution to the promotion of education fairness, facilitation of education reform, and the development of a society with education accessible to anyone, anywhere and anytime.

China Unicom's Hunan branch has provided assistance to Hunan Education Department with education informatisation. Under the brand of "WO Education Access", it provided services to 703 schools in the province, among which 78.1% was those schools in rural or impoverished mountain region. It offered the schools multi-dimensional informatisation services and products for free, covering education, teaching, management, joint education and elite nurturing, so as to narrow the differences between urban and rural areas in the teaching quality and schooling environment of primary and secondary schools.

Smart Tourism

To practically fulfil the national requirements in relation to the development of smart tourism, China Unicom fully leverages the conducive effect of smart tourism informatisation platform development to the transformation and upgrade of tourism, and comprehensively enhances the development level of modern tourism services primarily through informatisation. The tourism Big Data platform of China Unicom has connected to the platform for industry monitoring and emergency command of China National Tourism Administration to provide key support for visitor traffic flow warning, traffic diversion and emergency command. At present, China Unicom has teamed up with more than 20 provincial tourism administrations or tourist destinations in connection with informatisation and Big Data, striving to contribute to total tourism development with the application of information technology.

China Unicom's Heilongjiang Yichun branch has launched a composite index for tourism Big Data to provide government authorities with a basis for tourism management and tourists with reference for choosing their destinations.

Smart Tourism Platform
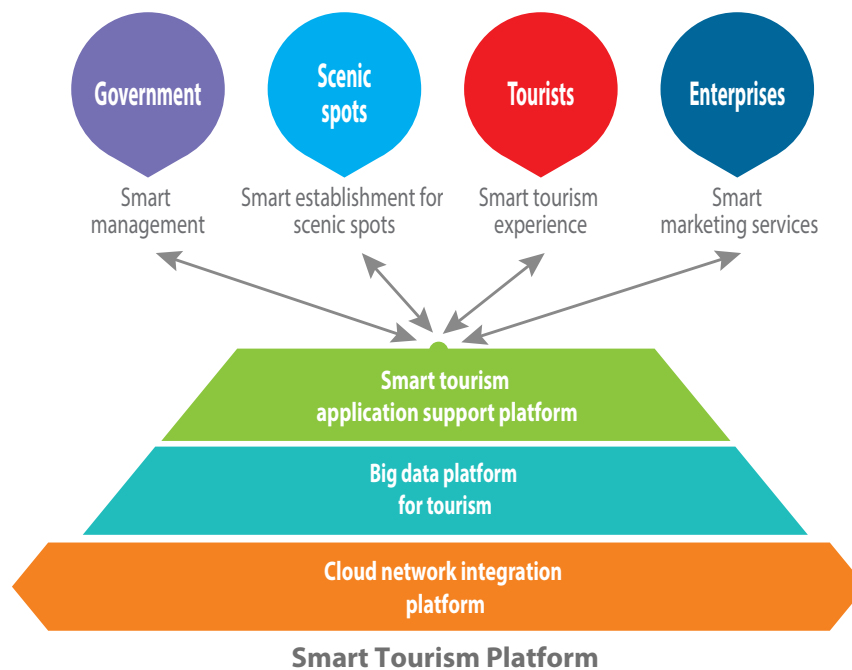
Smart medical care

With wider application of new-generation information technology and the Internet, facing the new development of medical care and health industry, China Unicom has consolidated its resources to provide cloud technology and Big Data services. The medical cloud products of China Unicom are built on its solid cloud capabilities. They leverage two major medical bases and are focused on the two key segments of hospital informatisation and regional medical informatisation. The products aim to drive the "Internet + medical care" sharing model with cloud technology and enable highly effective operation of medical organisations, interoperability of data, ancillary support to medial research, service for individual health, facilitating the transformation to smart medical care from traditional medical care.

China Unicom's Henan branch has launched a remote medical service project called "Wanjia eMedical Video". With WO TV as the carrier, it provides an online and interactive medical exchange platform via video calls, complementing medical resources. At Xuchang city, the first trial region of the "Wanjia eMedical Video" project, 1074 primary medical organisations, including health clinics in towns, community health service centres and some standardised village clinics, have joined the project since its launch in July 2017. More than 600 village doctors have conducted over 1000 remote diagnoses via "Wanjia eMedical".

Smart manufacturing

To respond positively to the call of the State for transformation and upgrade of industrial manufacturing, China Unicom has launched the "Internet + Manufacturing" service model with its technological expertise and network resources, targeting a number of pain points of the manufacturing sector in the nation, so as to develop vigorously smart manufacturing.

Capturing smart mining opportunities, China Unicom's Anhui Ma'anshan branch has initiated the "Internet + Mining" service management model to develop "smart mining" systems for its customers. It features, among others, attendance taking, underground positioning as well as above-ground and underground communications, facilitating the transformation and upgrade of traditional mining companies and enabling safe, efficient and clean smart mining.

Smart environmental protection

China Unicom has built the "Smart River Chief" platform based on the characteristics of different regions and in accordance with the requirements of "the Opinion on Comprehensively Promoting the River Chief System". The platform serves as an integrated informatisation solution of the river chief system, providing technical support for the formulation of water resources management measures, prevention and remedial planning for water pollution, early warnings about water environment and health assessment of aquatic ecology. It realises the centralization of all data, the coordination of the whole society and intelligent businesses. "Smart River Chief" platform has been in operation in, among others, Zhejiang, Fujian, Anhui and Guangdong.

China Unicom's Guangdong branch used a foundation platform and system comprised of video monitoring system, transmission system and video monitoring application system to enhance the informatisation capabilities of river monitoring and inspection, etc. with an aim to pave the way for subsequent development of the national river chief system.

Smart agriculture

China Unicom has actively engaged in agriculture-related informatisation applications, such as the "Smart Party Establishment" in rural villages, ULAND agriculture IoT platform, agricultural drones, NB-IoT for agriculture, and "Unicom Work" innovative business platform, etc. It significantly improved agricultural production, rural livelihood and farmers' living standards, effectively enhanced agricultural productivity, raised the level of modern agricultural management, allowing rural villages and the agriculture sector to enjoy the fruitful results yielded by the development of informatisation, thus speeding up the growth in modern agriculture with "Internet +".

China Unicom's Shuangyashan, Heilongjiang branch has established a preliminary integrated agriculture platform with the technologies of Internet of Things and network bridges, for monitoring, regional weather sampling, soil content analysis, spore trap analysis, online consultation on agricultural knowledge and disasters, etc. The platform is able to monitor the crop growth on farmland and substantially increase crop production and quality, hence generating higher income for farmers. Since the launch of high-standard monitoring on the demonstration farmland in Raohe county in 2017, 119 cases have been detected and pre-warned, 2 pest disasters have been effectively discovered in advance and 189 sessions of online consultation services have been provided by agricultural experts. It has been highly recognised by Raohe County Agriculture Commission and the local farmers.

Smart finance

China Unicom has actively sought external financial collaborations through Unicompay Company Limited to expand "Internet + Finance" services. In 2017, Unicompay Company Limited entered into strategic cooperation agreement with Suning Finance/Suning Bank, Star48 Culture & Media, Taiping E-commerce and Lakala, and completed the connection with the three major clearing and transfer organisations, i.e. China UnionPay, China Nets Union Clearing Corporation and Rural Credit Banks Funds Clearing Centre. The number of directly connected partner banks increased to 19, strengthening the capability of financing channels in a rapid manner. In addition, Unicompay Company Limited has cooperated with Unicom Finance and China Life Pension Company on supply chain finance, with ZhongAn Online Insurance on insurance business. Unicompay Company Limited has also launched a number of financial businesses/products to provide convenient financial services to its customers, such as interoperability of accounts, aggregated payments, WO Easy Financing, WO Easy Loan, WO Insurance, platform for Communist Party membership fee, credit card bill payment and cash reload for public transport.

Merchants Union Consumer Finance Co., Ltd. continues to facilitate innovation of financial technology. It has established a "WO Credit Score" model, and selected and granted credit in advance to close to 100 million whitelist customers. Meanwhile, the "Wo Credit Score" has successfully been applied to post-paid services, such as cash instalment, handset purchase instalment and mobile tariff reload, providing consumers with more convenient financial services. In 2017, Merchants Union Consumer Finance Co., Ltd. ranked the first among licensed consumer finance institutions in terms of the number of customers and growth in balance of loans, and its major business indicators ranked top in the industry. The development of the company is highly recognised by regulatory bodies, local governments and mass media.

UPGRADING SMART SERVICES

China Unicom adheres to the principle of "Putting customers first". We serve our customers through our nationwide physical store network, customer service hotline "10010", online store, short message service, mobile app, self-service terminals, official Weibo and Weixin customer service. Meanwhile, we keep enhancing the standard of customer service by improving service system and its operation as well as service delivery.

Upgrading customers services

In 2017, China Unicom continued to upgrade level of customer services and enhance the efficiency of its self-owned stores.

- Initiated the "dual enhancement" of in-store service perception and sales performance. We optimised store operation workflow leveraging the pilot stores in Beijing and Hebei. The new operation workflow has been implemented at over 1,000 stores.

- Upgraded the perception of customer hotline service. 15-second manual call-through rate of the service hotline stood at 87%.

- Transformed stores into merchandise outlets and chain stores, and sought cooperation with mainstream terminal manufacturers to offer comprehensive information consumption merchandise retailing and experience to enhance service variety and quality.

- Starting with optimisation of store operation, established an operation system suitable for retail chain stores, with an aim to enhance store service efficiency.

Smart Living Experience Stores jointly built by China Unicom, JD.com and Alibaba opened in Guangzhou and Shanghai respectively.
The consumer-oriented smart living experience stores redesign merchandise offerings and consumption scenarios by applying new technologies, such as Big Data,
cloud computing and artificial intelligence. It improves the operation capability of China Unicom's stores and community cooperative stores,
better meets the increasing aspiration of China Unicom's customers for a wonderful information life and further enhances consumers' O2O consumption experience.

China Unicom Smart Living Experience Stores

Interior of China Unicom Smart Living Experience Stores

Expanding online services

China Unicom has actively developed and enhanced Internet-based customer service and encouraged users to shift to online self-service from conventional channels. Internet service channel user penetration rate increased by 2.8 pp. In 2017, Over 60 million customers used Internet channel services with 201 million counts of service provision.

- Building new service model based on human-machine integration and precise profiling by using artificial intelligence. Trial operation of artificial intelligence voice assistant has reduced the total manned service hours by 12.4 pp.

- Adding online payment function to provide customers with a one-stop payment platform, enhancing the online processing capability.

- Launching various marketing and promotion tools, such as barcode shopping, 52Shangou and online shopping, with an aim to expand service channels for users and provide innovative services to users.

Over

60 million customers served by the Internet channel with

201 million counts of service provision

Customer service call centre of China Unicom Tianjin Branch has launched an innovative service model of human-machine integration by applying Baidu's artificial intelligence. It used an "AI robot" to provide users with convenient and efficient services with 93% recognition accuracy. The intelligent customer services can handle enquiry, consultation, application and problem reporting in relation to five major issues, namely "bill enquiry, data traffic, network problems, credit points and international service". It reduces the waiting time for human response, increases business efficiency, lowers the burden of call centres' operators significantly while enhancing customer satisfaction.

Strengthening management of complaints

In 2017, China Unicom set up a matrix management system on complaints with an aim to reinforce complaint management. As at December 2017, China Unicom received in aggregate 13,500 complaints with a complaint rate of 32.4 times/million users, in which 327 were complaints on unclear charges with the complaint rate of unclear charges of 0.78 times/million users. No complaints on deliberate overcharging have been reported. Complaints management has achieved remarkable results. In 2017, China Unicom had the lowest complaint rate of unclear charges among the peers.

Committed to transparent service

China Unicom strictly conforms to the laws and regulations regarding consumer rights and interests such as *Law of the People's Republic of China on Protection of Consumer Rights and Interests*, strictly regulates tariff billing, protects its customers' right to information and educates consumers on information about products and services.

- Optimising and enhancing functions of billing system. The total number of calls and data bills decreased by 34% and the number of bills processed within 15 minutes accounted for over 96%.

- Reinforcing management of intelligent terminal application software. Testing and reviews on over 10,000 fee-charging APPs in aggregate have been completed and 692 non-compliant APPs were suspended and reported to regulatory authorities.

- Enhancing billing management of value-added services. Value-added Service Management Measures have been amended to tighten punishments on non-compliant behaviours.

- Providing relevant information and description to users in self-owned stores and social channels pursuant to the requirements of the Company. In-store promotion of products and services to users are conducted through various formats, such as tent cards, posters and leaflets. Sales personnel's answers to customer enquiries are also regulated.

Improving customer perception

China Unicom is committed to enhancing customers' perception and customers' word-of-mouth reputation. It undertakes Net Promoter Score (NPS) evaluation to comprehensively monitor each specialised business and each level of units of the Company so as to allow the Company to understand and respond to its customers' needs and make improvement in each specialised business.

- Taking customer satisfaction as the benchmark of the service quality of the Company, customers' comments were broken down to each branch and specialised business unit of the Company through the evaluation indicators of the system, in order to drive customer-centric internal operation.

- Continued to conduct NPS customer satisfaction evaluation. As at the fourth quarter of 2017, the NPSs of the mobile and broadband networks of China Unicom reached record high.

- Optimised promotion mechanism and simplify package tariffs, focusing on customers' perception and market orientation and taking uniformity and flexibility into consideration.

- Initiated "targeted measures for customers' perception". On a problem-oriented basis, we drove improvement and optimisation of internal procedures with a flagging and de-flagging system for key service issues to address key problems at their root.