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ZTE TECHNOLOGIES

VIP Voices

Orange Spain: Meeting Customer Needs with Best Connection Experience

Expert Views

How Big Data Empowers 5G Value-Based Network O&M

Special Topic

Digital Network Deployment

Cover Figure | *Miguel Ángel Almonacid, Network Strategy and Transformation Director at Orange Spain*

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CONTENTS

VIP Voices

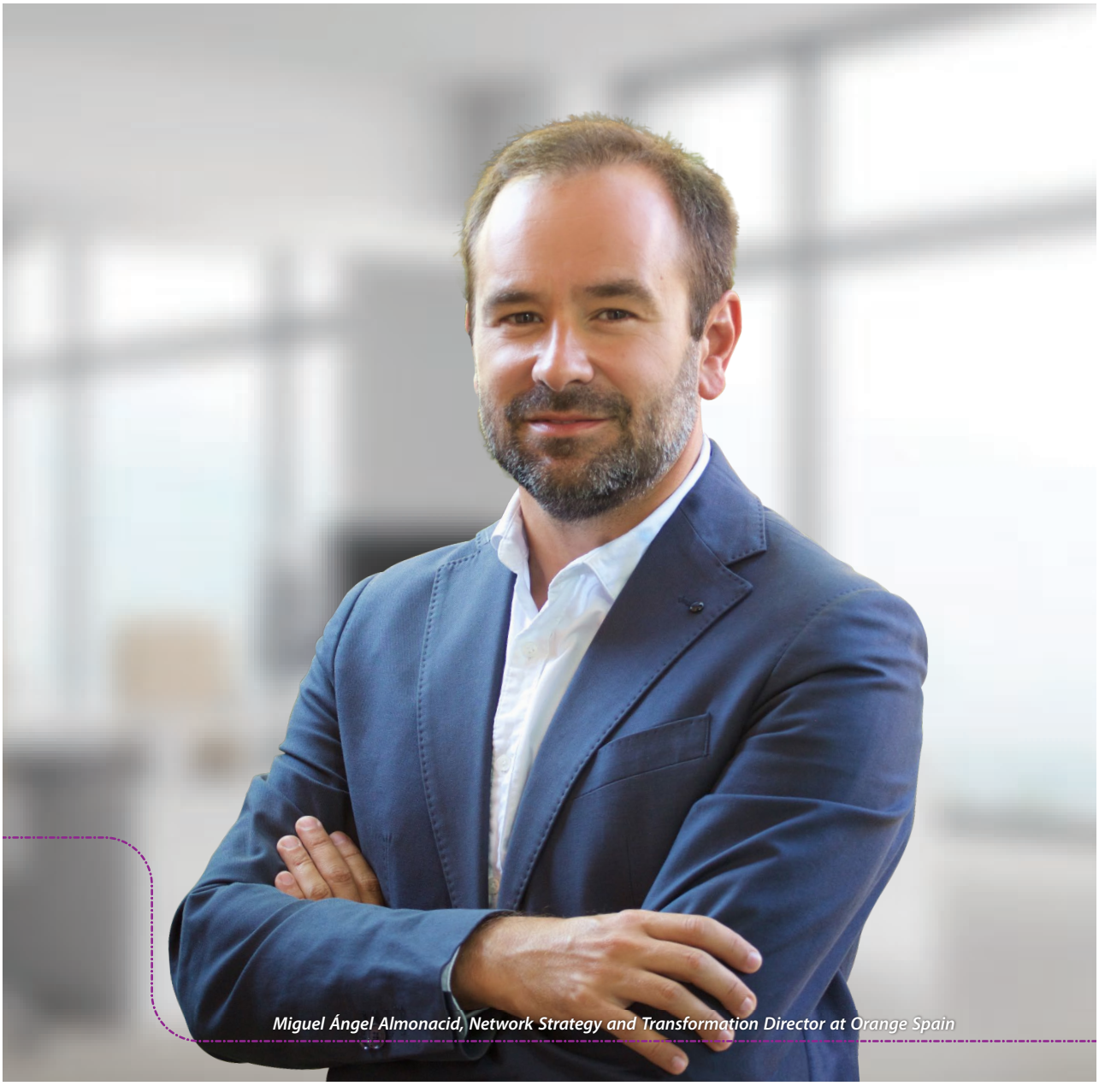
Expert Views

Special Topic: Digital Network Deployment

Success Stories

Orange Spain: Meeting Customer Needs with Best Connection Experience

Reporter: Jose Luis Ortiz Grande



Miguel Ángel Almonacid, Network Strategy and Transformation Director at Orange Spain

As a convergent operator, Orange Spain has been investing heavily in the extension of fiber and 5G networks. The operator has planned to launch commercial 10 Gbps XGS-PON services in five Spanish cities in partnership with ZTE. It is Orange's first attempt at delivering 10 Gbps broadband to retail users and follows a successful trial in October 2021 when Orange Spain demonstrated a live test of ZTE's F8648P XGS-PON ONT on its network.

Miguel Ángel Almonacid, Network Strategy and Transformation Director at Orange Spain, talked about the company's fiber transformation journey, emphasizing that they will continue working to extend their XGS-PON deployment. He also shed lights on the company's plan to build a massive 700 MHz 5G network.

OSP is accelerating fiber rollout in Spain. What are the driving forces behind this accelerated transformation from copper to fiber?

In fact, we have been committed to the fiber deployment for years. The best sign of it is that Orange closed 2021 with a fiber deployment that already reaches more than 16 million households, while the number of customers with an adsl access contract (over the copper network) is decreasing. Fiber customers already account for 87% of fixed broadband portfolio.

The advantage of fiber is clear, higher speed without interferences, which means a better customer experience: while an adsl access cannot exceed 20 Mbps, Orange's XG-PON network offers 1 Gbps at the customer's premises.

How far did you reach in the fiber transformation journey and what is your roadmap in this area?

In the last two years our fiber rollout has been extended to almost one million more households. Our fiber now reaches 1,437 municipalities. And during this year, our target is to reach 16.8 million homes with our fiber network.

It is important to stress that, we continue working to extend our XGS-PON deployment, unique in the five most populated cities in Spain (Madrid, Barcelona, Seville, Valencia and Zaragoza), where Orange can also offer 10 Gbps connectivity using ZTE's ONT. Test data showed that terminals in the XGS-PON network achieved an upstream/downstream speed of 8.6 Gbps, which is close to the theoretical peak rate of XGS-PON. This meets Orange's network planning and bandwidth deployment requirements and can serve as a reference for other European operators in their fiber transformation.

And as a leading telecom operator, Orange actively participates in the formulation of standards by international standardization organizations such as the ITU-T. As a trend-setter in the industry, Orange pays close attention to the technical evolution, standardization progress and industry chain development of PON technologies. Orange will continue to work with industry chain partners to advance the standardization and industrialization of 50G PON, promote the development and maturation of the next-generation optical access network, and meet the access requirements of various intelligent applications. Orange will also closely follow the improvement of the 50G PON standard and the related industry.

How will you leverage fiber technology to increase customer engagement and ROI?

At Orange, we have not slowed down investment in the face of the current crisis. Our investments have been increasing to reach 980 million € in 2021, which means that we have allocated almost 21% of revenues to growth projects, such as the extension of fiber and 5G networks. This investment has paid off as Orange has managed to maintain our dynamism in fiber optic services, having ended the year with 3.5 million customers, 4.5% more than the previous year.

As an operator with fixed and mobile services, what's your take on the fiber + 5G synergy?

Fiber, 5G and 4G as well are complementary access technologies. Our 4G and 5G networks already cover 98.4% and almost 59% of the Spanish population, respectively. Orange ended 2021 with 20,357,000 customers, of which 16,325,000 are mobile (10,720,000 4G and 886,000 5G) and 4,032,000 are fixed broadband (with 3,507,000 using fiber services). As a convergent operator, Orange is committed to having the best network, fixed and mobile, offering connectivity solutions that meet customer needs, always with the best connection experience.

In 2022 and beyond, how do you plan to tackle challenges and develop new opportunities?

Regarding 5G technology, we have recently announced the largest network roll-out plan in the 700 MHz band by an operator in Spain, confirming our firm commitment to the extension of the fifth generation, with the aim of boosting the recovery of the economy through the digital transformation of society and the country's economic recovery, as well as reducing the territorial digital divide in Spain.

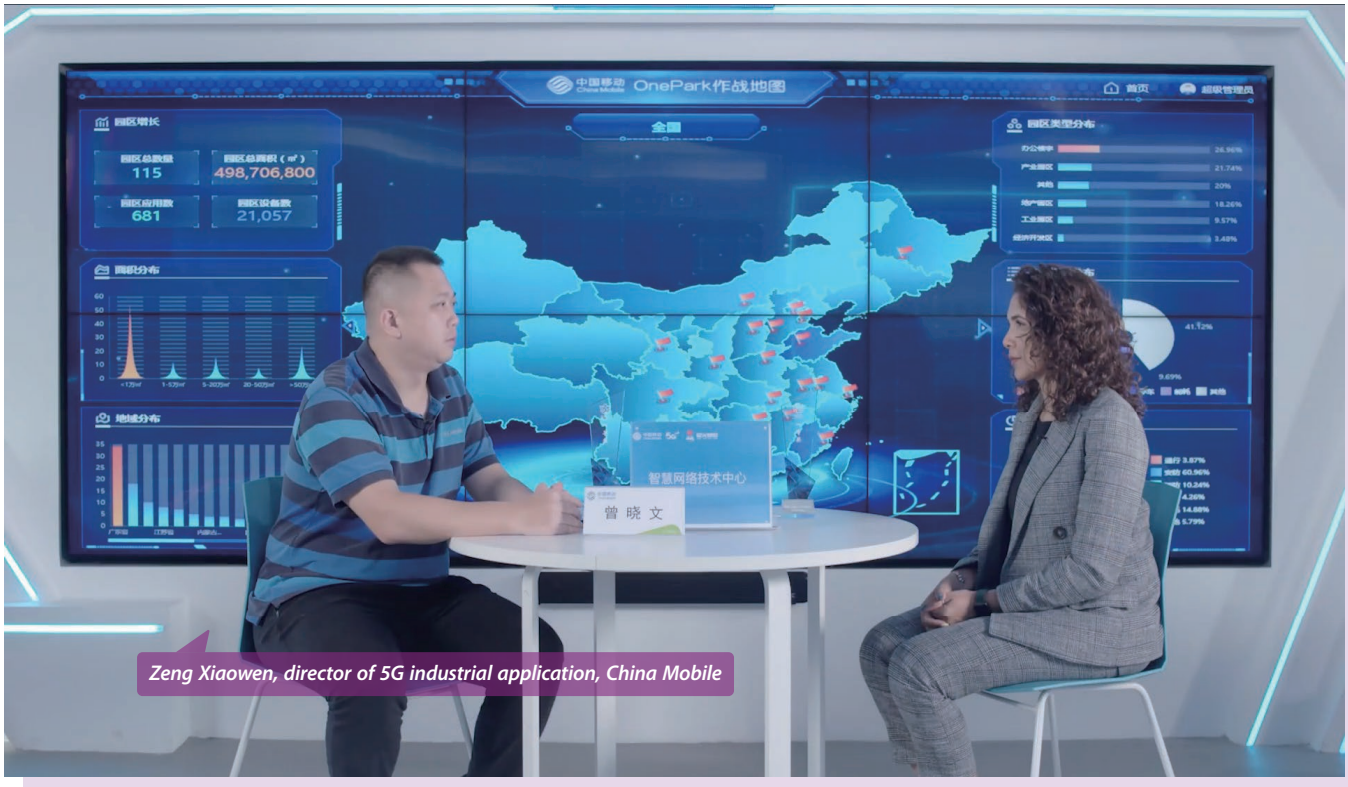
Throughout 2022 and progressively, the company will offer the new mobile technology on this band (essential to obtain the greatest benefits of the 5G network, including inside buildings and in rural areas) to our customers in more than 1,100 municipalities in Spain. Taking into account all the frequency bands currently available to Orange for 5G, Orange's 5G network will reach more than 1,500 municipalities by 2022.

And in parallel to network deployment, we continue to work closely with key industry players to develop 5G use cases in virtually all verticals (Industry, Tourism, Healthcare, Agriculture, Leisure, etc.). ZTE TECHNOLOGIES

China Mobile: Towards 5G Industrial Success

Reporter: Radhika Devi

Today, operators worldwide are exploring 5G's industrial opportunities. Zeng Xiaowen, director of 5G industrial application, China Mobile, shared with us the company's achievements and experience in integrating 5G with various industries at ZTE's 5G Summit & User Congress held in November 2021, which illustrates the strategic success the industry has had so far in the entire 5G ecosystem.



Zeng Xiaowen, director of 5G industrial application, China Mobile

How has China Mobile progressed in integrating 5G with vertical industries so far?

As a leading company in the telecommunications industry, China Mobile has built the world's leading 5G SA network, opened more than 560,000 5G base stations, and developed more than 360 million 5G subscribers. The company has expanded over 1,500 5G private network projects, deployed nine major industry platforms and over 100 5G application scenarios, created 200 5G demonstration projects, and accumulatively signed over 5,000 5G commercial agreements.

China Mobile has implemented the "5G+" plan comprehensively and coordinated with ZTE and other industrial partners to promote the integration and innovation of 5G and AI, IoT, cloud computing, big data and edge (AICDE) as well as other emerging information technologies, enabling 5G to serve the public and integrate into all major industries systematically. In the process of deeply integrating 5G and vertical industries, China Mobile has created many industry-first innovation cases.

We opened the world's highest 5G base station at the 6500-meter elevation camp on Mount Everest to achieve 5G signal coverage of the mountain climbing route and peak of the north slope of Mount Everest.

We installed the deepest 5G base station (808 meters underground) in the Guotun Coal Mine in Heze, Shandong, reducing unsafe positions by 10 persons/shift and reducing inspections by 5-6 kilometers per day.

We enabled the farthest medical treatment. Peking Union Medical College Hospital has implemented remote surgery on patients 3,700 kilometers away in Xinjiang. Involving multiple provinces, it has become a normalized service.

We built the smartest port—the world's largest 5G gantry crane in Mawan Port, Shenzhen, which enables one remote control personnel to control four gantry cranes. In addition, 5G backhaul HD images and AI technology have been used to achieve a recognition rate of more than 95% for damaged boxes.

We helped Zhejiang Hengdian East Magnetics build the smartest factory—a 5G fully connected factory with 320 gateways, 841 machine tools and 206 AGVs for full production line data networking, improving management efficiency and reducing employee numbers by 70%.

5G replication and promotion have entered a new stage from concept to demonstration, from program to product, individuality to replication, exploration to system, and periphery to production.

What progress has China Mobile made in building a 5G private

network product system and supporting capabilities?

China Mobile continues to improve the 5G industry capability system. In October 2021, we released the 5G private network product system 2.0. By adding dual-domain connection, computing and network integration as well as active and standby protection, it has enriched the BAF business model (basic network + advanced value-added functions + flexible personalized services). An easy-to-use and user-friendly 5G private network allows the use of it to expand from the peripheral links of enterprise production to the core production links.

China Mobile is committed to building a 5G private network + AI "diamond closed-loop" based on the three (superior/exclusive/privileged) service modes of private network, using network guarantees in large uplink bandwidth and low downlink latency, and combined with edge AI computing capabilities. With it, we can achieve intelligent analysis of enterprise production data, closed-loop processing of local businesses, and build an eco-friendly service network at the edge of the network.

To promote the 5G private network on a large scale, we have promoted the online business process of the entire network and the template for the 5G private network. First, we establish an online support system to facilitate the online intelligence of business processes, create hierarchical SLA levels to ensure the safe and reliable operations of customer businesses, create network digital twin capabilities, and offer industry customers one-stop operating services. The second step is to establish a dedicated network template for different industries, create end-to-end solutions covering pre-sales, in-sales and after-sales, establish a rapid response mechanism, and realize rapid scale expansion.

Based on our self-developed AI computing platform and underlying algorithms with our independent intellectual property rights, we utilize

the construction of 5G high-quality private networks to develop 9 "One" platforms bringing together common features for nine key industries, including smart city, smart medical, IoT and smart campus. OnePower Industrial Internet platform has already provided six million label queries to create a fully automated intelligent analysis platform. The Onehealth Smart Medical Cloud Platform is used in more than 300 hospitals to meet the needs of in-hospital, inter-hospital and out-of-hospitals customers.

At the same time, we build a 5G "private network + platform + application + terminal" capability system, break through industry barriers with "platform + ecology", and realize replicable applications and customizable functions. We actively promote the standardization of industry solutions and provide businesses with a one-stop solution of 5G "private network + platform + application + terminal" to help them quickly implement 5G applications.

What are your views on integrating 5G private networks with industry needs?

Today, 5G has entered a critical phase of going from applications of individual industries and scenarios to an overall penetration into the whole process of various industries. In the process of establishing benchmark projects and developing industry demonstrations, China Mobile's 5G industry applications have progressed from fragmented demonstration trials to large-scale applications. China Mobile has started its 5G application scale development road by choosing 18 key industries, including autonomous driving, smart medical care, smart factory, and smart metallurgy. Our short-term goal is to continue to build 200 high-quality demonstration sites this year, and replicating the 5G applications to 2,000 high-quality projects.

What industries can lead the way in 5G scale applications? China Mobile believes that a diamond closed-loop like "5G + AI" is not only a closed loop of capabilities but also a closed loop of screening. If the demand for network capacity in the production chain of an industry can form a "diamond closed-loop" like "5G + AI", that industry can be deeply integrated with 5G and has the possibility of scale replication. For a 5G application to be replicated on a real scale in an industry, the industry must also comply with four requirements: clear typical applications, end-to-end product standards, business model development, and leading role models.

In the innovative exploration of combining 5G private network and vertical industry applications, China Mobile and ZTE have designed a 5G+ smart high-speed railway 2B2C integrated solution and application, solving the issues of weak signal coverage, concurrent congestion and interference delay in high-speed railway application scenarios through the vehicle-mounted small base station solution that increases by 100% the coverage of the 5G signals of moving train sets. The wireless bandwidth capacity can be increased by up to 10 times, allowing passengers to enjoy a high-quality 5G network and colorful Internet applications during the journey.

In the future, China Mobile will further collaborate with industry partners such as ZTE to tackle challenging problems, solve common issues of industry-scale replication, promote replication in different industry categories, jointly promote 5G development and make more and new significant contributions to construct a new Digital China. ZTE TECHNOLOGIES

How Big Data Empowers 5G Value-Based Network O&M

Han Song
Senior System Architect of ZTE Wireless Products

Entering the era of 5G+AICDE, telecom operators have higher demands on how to make full use of network resources and give full play to network efficiency. They expect to achieve the goal of value-based network operation and maintenance (O&M) by reducing costs, increasing efficiency, improving quality and generating revenue. In the current digital environment, almost all O&M measures are based on data, and the performance of an operator's network is also reflected by the most basic network data and various service data carried in the network. Therefore, network and service data, as the exclusive "energy gold mine" of operators, have become the key force to empower value-based O&M of 5G networks.

Value Enhancement: From Massive Data to Big Data Analysis

Operators have a large amount of data to support daily network O&M such as performance monitoring, service development, network coverage rendering visualization, registration success rate monitoring, and video user base development analysis. These capabilities are basic value support that can be achieved through a large amount of data.

For operators, in addition to the basic value of data, satisfying higher-order requirements is the most effective way to increase operational value. These high-order requirements include deep insight into traffic type in the network pipe for targeted operation, end-to-end network and service analysis to carry out O&M from a global perspective, perception evalution system design and perception-driven O&M, building network and user profiles to dig high-potential areas and users, and using historical data and AI to analyze and predict future trends (Fig. 1). By continuously mining and satisfying high-order requirements, we can bring high-value injection to operators. This is the key issue that big data analysis needs to face in order to give full play to the role of data energy.

Differentiated Capability Set and Practical Effect of Big Data

Based on decades of practical experience

in VMAX intelligent big data platform, ZTE has summed up five differentiated capabilities of big data in the telecom field, including data production capability, data connectivity capability, data judgment capability, data monetization capability and data prediction capability.

Data Production Capability

Data production is the beginning of operation and maintenance. End-pipe-cloud is a conceptual model that began in the mobile Internet era. Diverse access terminals, 5G network pipes, and Internet cloud are the most basic elements for connection in 5G networks and also have profound data value. The meaning of traffic analysis, translation and insight in the terminals, wireless networks, core networks, transport networks and Internet SP is the only way to accumulate raw data.

At the network pipe side, ZTE VMAX intelligent big data platform performs in-depth analysis of traffic data of the control plane and user plane according to the operator's unified DPI collection and analysis specifications, and generates XDRs, which give the actual meanings to the traffic data. At the terminal side, its access to some terminal SDK data enriches the end-side data sources for joint analysis.

In the first phase of China Mobile's 5G DPI tender, VMAX DPI occupied DPI projects in more than 20 provinces with a 70 per cent share. With over 15,000 services identification capability, the VMAX platform takes a leading position in the industry, supporting development and quality analysis of abundant service types in the 5G era, such as payment, instant messaging, short video, VR/AR and cloud game. The platform can identify encrypted services in the network with an accuracy of 95%. It identifies some HTTPS services and provides a more thorough insight into

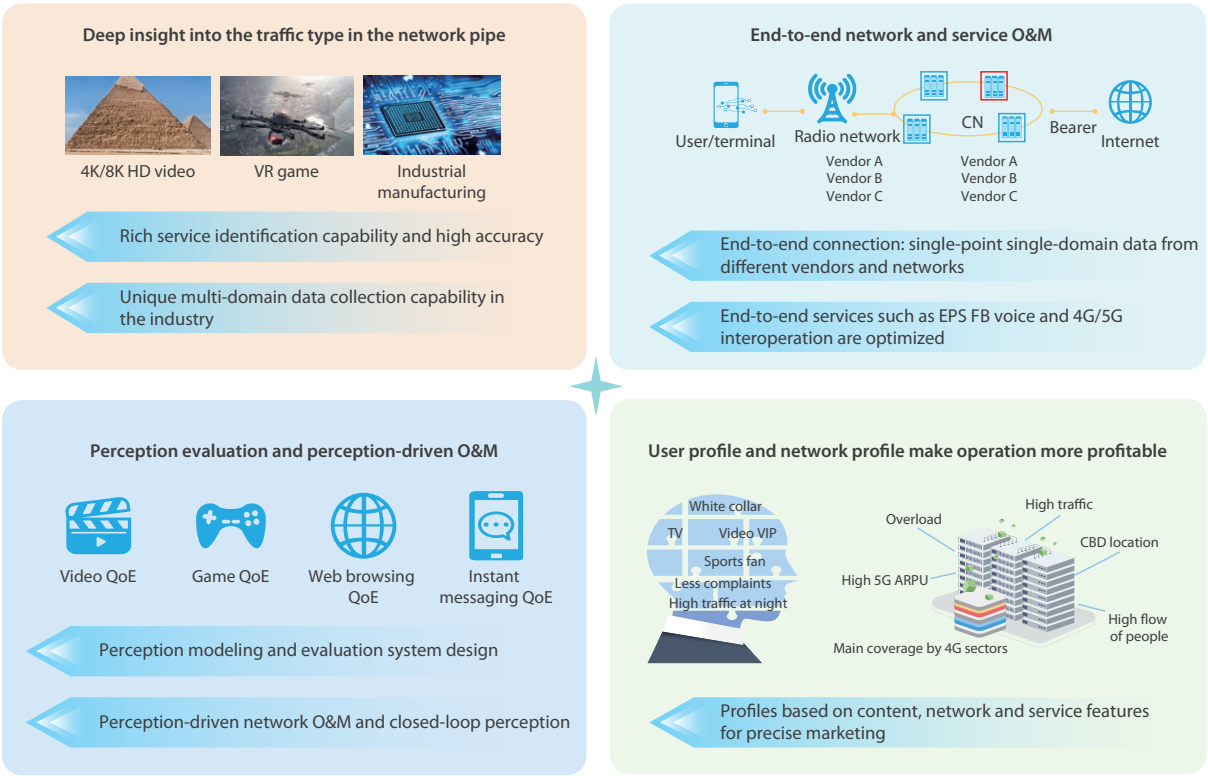


Fig. 1. Key support capabilities of big data in network O&M.

network traffic. Driven by diverse markets, the data consumption and production ecosystem is gradually expanding, which promotes powerful data production capability of the VMAX platform and brings infinite possibilities for the value of the data application layer.

Data Connectivity Capability

Data connectivity can eliminate data islands, and is also a prerequisite for end-to-end service connectivity in the data dimension. End-to-end is a basic way of viewing problems from a global perspective, and end-to-end O&M is a key capability that operators pay close attention to for a long time. In general, the global analysis of the terminal-wireless-bearer-core network-Internet SP link can achieve major end-to-end O&M analysis for operators. In the terminal-wireless sublink, the data connectivity takes the terminal ID such as IMEI, IMSI, and UE IP as the connection point; in the wireless-bearer sublink, it takes the base station ID such as eNB IP and gNB IP as the connection point; in the bearer-core network sublink, it takes the core network device ID such as UPF ID, AMF ID and MME ID as the connection point; and in the core network-Internet SP sublink, it takes the Internet SP ID such as DNS IP and target server IP as the connection point. Monitoring the data of these connection points ensures end-to-end big data connectivity and prepares the data for the next step of global O&M analysis. The data involved in these connection points spans not only different professional fields, but even different manufacturers, thus promoting the key differentiated O&M capabilities of big data products that are different from those in other professional fields.

End-to-end connectivity is a rigid requirement in some typical application scenarios, such as EPS FB voice delay and quality analysis, and user complaint analysis. The EPS FB voice delay and quality analysis involves five domains: 5GC, EPC, IMS, NR and LTE. The connectivity of more than 20 interfaces is an end-to-end analysis request that cannot be fulfilled in a certain field. In the 5G SA network O&M task of an operator, the VMAX platform interconnects with the interface data of the other two vendors based on DPI data, and provides connectivity throughtout the whole EPS FB process. It demarcates the problems in various fields involved in the process and gives a preliminary root cause location, helping the operator increase the EPS fallback success rate to above 98% and shorten the call delay to less than 4 seconds. User complaint analysis is a typical capability that operators pay close attention to. The practice in an operator project shows that the “one-click complaint analysis” function of the VMAX platform helps to demarcate and locate the problem, and the processing efficiency is improved by more than three times. Compared with the actual results, the accuracy of automatic demarcation and location is up to 80%.

Data Judgment Capability

Management master Peter Drucker said that if there is no measurement, there is no management, which illustrates the importance of measurement. Specifically in network O&M, user percetion is an abstract and comprehensive concept and topic that operators have been concerned about for a long time. Perception can be measured by big data in preparation for better perception. User perception evalution, which combines user experience of using different services, needs to complete the modeling process of KPI and KQI that affect user perception, such as classification and validity filtering, weight setting, and excellent/bad threshold definition, in order to objectively evaluate perception. This needs to be supported by indicator data and distribution data of different service types. Therefore, perception measurement and improvement are important scenarios

to reflect data judgment capability.

Based on VMAX DPI data, KPI and KQI selection and weight settings are made for the perception of web page browsing, videos, games, instant messaging and voice services. In addition, comprehensive perception scores are given based on the poor and excellent quality thresholds of existing network indicators. Specific service categories or APP perception scores can also be evaluated by service, user and region. Big data acts as a referee to provide methods for value-based O&M. The implementation results of an operator project show that more than 40% of the perception problems have been identified and resolved before KPI indicators deteriorate significantly.

Data Monetization Capability

Data asset monetization is the ultimate form of business models in the digital economy era. With big data, users and networks can be fully presented. Its application scenarios include precise marketing for different users, high-value user mining, ARPU value increase, as well as precise network planning for high-value areas. This helps operators save Capex while guaranteeing network coverage.

By analyzing and labeling the traffic, the VMAX platform makes a comprehensive analysis of user behaviors such as preference for watching videos, user attributes, and user traffic package, so as to customize the traffic and member packages and precisely push them and reach users. In the practice of an operator project, two months after the rights promotion function went online, the conversion rate of video rights users is 4.7 times that of the traditional method.

Data Prediction Capability

The most important feature of big data is its ability to make appropriate predictions for the future based on historical data. The current capacity utilization and development predictability are the indicators of whether telecom network resources are sufficient or not, and are the content that operators pay close attention to.

In the practice of an operator project, based on the feature extraction and modeling of the historical development law of wireless data such as PRB, traffic and user base, the regression algorithm is used to predict peak traffic, number of peak users and peak PRB in a certain period in the future. The predicted mean absolute percentage error (MAPE) is lower than 12%, which is at a high level in the industry. The predicted results can help operators make capacity planning decisions.

Big Data Capabilities in Evolution

In the evolution of operators' different market segments, virtualized network O&M and autonomous networks, big data as the core support has penetrated into specific service scenarios, continuously looking for focus and releasing data value.

All-Round Operation Support for CHBN

With the strong evolution of network digitization and intelligence, operators' planning for big data O&M system is gradually approaching to architecture decoupling, capability sharing, data unification and AI empowerment. Big data platform management covers consumer, home, business and new (CHBN) markets. The five major capabilities of big data including production, connectivity, judgment, monetization, and prediction will continue to unleash their unique value, whether in the areas closely related to daily life such as consumer and home markets, in the government and

enterprise markets using 5G in vertical industries, or in newly emerging markets.

O&M Support for Virtualized Networks

Virtualization and cloudization are the characteristics of the 5G era. NFV/SDN brings the advantages of high resource utilization, high capability coordination and on-demand customization to 5G networks, and also increases the complexity of network O&M. With the big data technology, the service process can be connected from the data dimension, network indicators are evaluated quantitatively, and the AI technology can be used in virtualized networks for failure monitoring, cross-layer root cause analysis, and fault prevention and prediction. The capacity of the virtualized network resource pool can also be monitored and analyzed in real time, and data-based suggestions on the threshold for capacity expansion can be given. To sum up, big data needs to give full play to its differentiated capabilities and thus injects value into O&M of virtualized networks in terms of service continuity guarantee, perception guarantee, and capacity efficiency management.

Evolution Support for Autonomous Networks

Operators and standardization organizations around the world have issued visions and goals for the evolution direction and steps of autonomous networks (AN). According to the visions of mainstream operators, the evolution requires strong data empowerment. China Mobile has put forward the concept of self-intelligence network, which plans to reach highly autonomous L4 level by 2025, and has made it clear in the goal that it will continue to improve big data capabilities of the data sharing platform under the NM "2+5+N" architecture and promote end-to-end cross-domain service coordination. With the basic idea of intelligence after data connectivity, Vodafone has proposed to add AI capabilities on existing O&M functions and change to unmanned zero-contact network O&M. China telecom has created a digital platform to support its overall cloud-to-digital transformation strategy, and has combined the strategy with its vision of automatic driving network to promote intelligent cloud-network operation and empower new development in the digital economy. China Unicom has built five core capabilities under the intelligent network platform to support the evolution of automatic driving networks, in which the collection of network data plays an important role.

The mainstream operators have reached a consensus on the idea of planning and building intelligent network O&M capabilities based on big data. This fully reflects the supporting significance of big data's application value to the improvement of network intelligence, and also reflects operators' rigid demands for the value injected into O&M by big data.

Conclusion

Data empowerment maximizes value and helps operators lead the 5G era. ZTE VMAX intelligent big data platform will continue to rely on big data's irreplaceable advantage of "new energy". Facing the challenges of increasingly complex network structure, diverse services and high-quality experience, the platform will fully release its unique data value and support the automation and intelligence of the whole life cycle of the network, including planning, construction, maintenance, optimization and operation. ZTE TECHNOLOGIES

ZTE's Superb Network Construction Solution Boosts Value for CSPs

Andrea Zampagli
Technical Engineering Director of ZTE

During the MWC 2022, ZTE together with Light Reading, has held the webinar themed on "How Superb Networks Boost Value for CSPs". At the webinar, Andrea Zampagli, Technical Engineering Director of ZTE, talks about ZTE's approach to build a superb network and some latest success cases around the world.

Challenges Faced by Telecom Operators

Our experience is accrued by supporting hundreds of operators around the world and learning through the difficulties and challenges they face in the overall process starting from network plan, design, deployment and ending up with the day-to-day network operation. With network evolution the difficulties grow up with the complexity of network structure and the multi-system coexistence, but this complexity also leads to an opportunity with the possibility of layers interworking to harvest the maximum efficiency of spectrum for capacity and user performance improvement, and our goal is to provide technology, tools, equipment and services for supporting that.

Another big challenge faced by operators is the high construction and O&M cost, and the way we support them is facilitating virtualized transformation, building an overall operation mechanism, improving efficiency and quality of test and maintenance with automatic tools and cloud-based network services, which has been particularly strategic during the Covid-19 outbreak.

How to Build Superb Networks

Our approach to Superb Network Construction to meet all these challenges is articulated in four phases.

The first one is the construction of network infrastructure with the possibility to cover E2E from Core Network to RAN, through Transmission and Fixed network plus Mobile and FWA user equipment.

The second one is making constant improvements with new features and functionalities.

The third one is supporting network optimization to guarantee user experience improvement. In several projects these results have been recognized by third external benchmarking companies through performance tests oriented on user experience such as Umlaut (formerly P3) and Ookla test.

And the final step is supporting operator's growing business through OPEX cost reduction and profit increasing.

Tools Supporting Superb Network Construction

The Superb Network Construction is strongly supported by three big-data intelligent tool platforms iEPMS, UniSeer and uSmart-RNIA (Fig. 1).

iEPMS is an "Intelligent Engineering Project Management System". It runs through the whole process of contract, supply chain, procurement, engineering, services and finance, and takes the lead in realizing the automation, intelligence and digitalization of network deployment in the industry. With abundant visual data, the costs, materials, outsourcing, problems and risks of the projects can be effectively managed and controlled, which greatly improves the efficiency of engineering delivery and project management. ZTE iEPMS has been widely used in over 40,000 projects around the world.

UniSeer is an intelligent O&M solution that provides integrated O&M services oriented to networks, services and user experience. As our usual approach we try to build solutions to answer the operator's concerns. With UniSeer we introduced an "AAA" Intelligent Operation and Maintenance Capability to be proActive, Automated and Agile. Let's see how that answers the main concerns of operators.

One of the main problems is the weak visibility with delay in network management and difficulties in identifying in real time faults distribution not traced by alarms but exerting an impact on customers. With a proactive approach, it's possible to build a prediction and prevention system, covering networks, services and users. This gives also the possibility of solving potential problems in advance, and evolving from passive O&M to active O&M.

The second concern is the huge effort required for manual work and onsite job, and the answer is automation. Creating an automatic closed loop in the full lifecycle of O&M and establishing a grading system for automatic O&M, which can be improved continuously with Machine Learning and AI.

Finally, the lack of capability in using the large amount of available data to increase the intelligence level of operations. The answer to this concern through UniSeer is being agile using a unified analysis and view based on B/M/O data which helps to enrich information identifying geographical area with higher value, services with high customer impact that need a high level of performance and retainability and driving operation decisions and activities contributing to creating commercial value. Focusing on user quality and user experience increases the reactivity in troubleshooting and performance optimization.

uSmart-RNIA is an E2E comprehensive solution based on AI focalized on wireless network. It provides a variety of tools covering all the project phases.

Based on this approach currently ZTE has constructed high-performance superb networks in over 100 countries and regions, helping operators improve the network quality, user perception and network value. In the following paragraphs we describe some success stories in superb network construction.

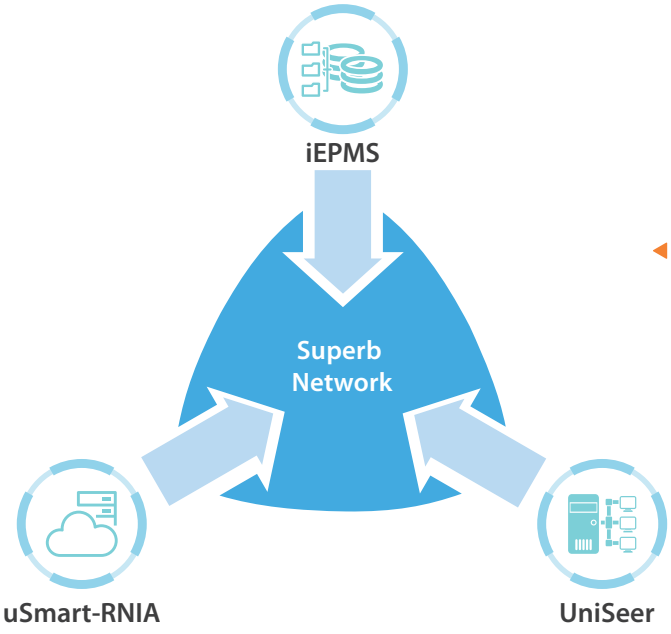


Fig. 1. Three big-data intelligent tool platforms of ZTE.

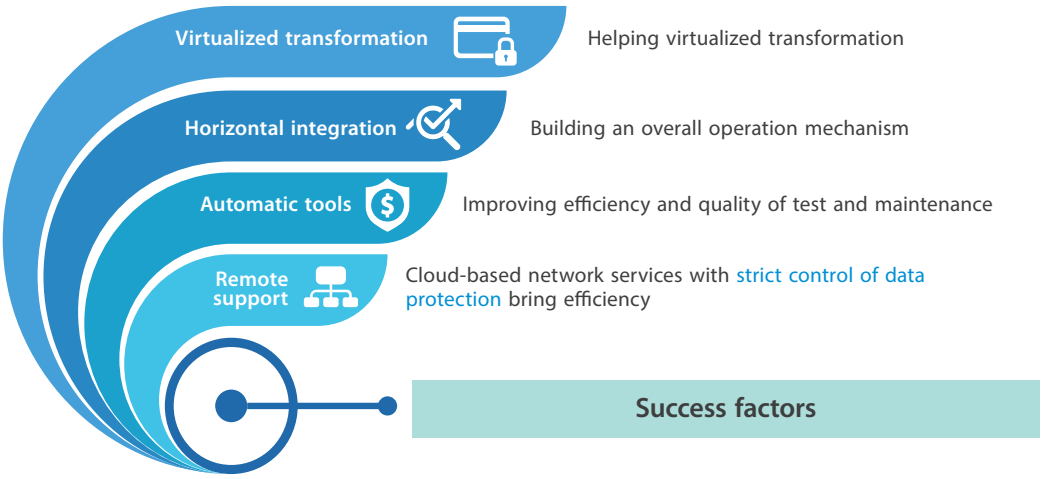


Fig. 2. Technical delivery model in H3A project.

Success Stories of Superb Network Construction

WindTre (Italy)

ZTE started the modernization construction upon the WindTre network in Italy since early 2017, and in 2019 we completed the construction of more than 11,000 physical base stations for major cities including Rome, Milan and Naples, covering more than 60% of area nationwide.

With the modernization of the WindTre network, the customer was confronted with the situation that the two network management systems, U31 for legacy 2/3/4G and UME for 5G, were both in use. To simplify operation and maintenance ZTE proposed a solution in early 2020, that was, to migrate over 20,000 logical NEs in the network to the UME systems.

Until then, the challenge for ZTE was to upgrade over 20,000 NEs and migrate them to the new EMS within three months. While for troubleshooting faults we were also faced with the test of GDPR compliance in cross-border data transfer.

After rounds of discussions with the customer we proposed a rolling promotion solution of “upgrading one batch and cutting over this batch” for all sites in the network. Meanwhile, we reported the GDPR compliance solution to all operations and troubleshooting processes to ZTE and the customer’s legal teams, to avoid potential GDPR compliance risks.

Finally, we successfully achieved milestones as planned. With simplified operation and maintenance, the efficiency of site modernization and reconstruction is greatly improved. At the same time, network performance is improved. After the migration the 5G data traffic of the whole network is increased twice, and in the 2021 Q1-Q2 Ookla speed test, WindTre again won the "Best Mobile Network in Italy" award.

H3A (Austria)

Another example of success story of Superb Network in Europe is referred to Austria. ZTE started to help H3A Austria to build 3G network in 2010, starting to deploy LTE in 2012, and 5G network in 2019. The success factors of project are based on the technical delivery model represented in Fig. 2. ZTE has built a unified virtualized system for the customer. The project implementation process uses the management mode of horizontal integration.

In just two years, through the unified management, planning and resource planning of sub-projects, including third parties, ZTE helped H3A rapidly complete virtualization platform building, PS network capacity expansion, IMS fixed and mobile network integration, 5GC new construction, UME cutover, NetMAX replacement and energy UEDM new construction.

During the COVID-19 outbreak, ZTE used cloud-based network service to support remote commissioning and tests, providing seamless technical support for projects from China to Austria, ensuring that the projects under construction were carried out as originally planned.

As a result of the overall project, in the 2021 Q1-Q2 Ookla speed test H3A won the awards for 5G speed and the CTO highly applauded the successful implementation of this project.

Telkomsel (Indonesia)

The new region of Telkomsel is the largest wireless relocation in the Telkomsel project after the south Sulawesi relocation in 2015/2016 and Puma relocation in 2018/2019. This relocation lasted five months from January to June 2021.

In a tight schedule, the project team overcame the difficulty of serious epidemic in Indonesia and complicated relocation scenario, quickly gathered ZTE's own human resources and partner resources, and completed the delivery within five months. At the peak time, the project team completed the relocation of 1,000 sites each month, setting a new record for the Indonesian relocation project.

The network indicator payload was increased by 20% or above. During the holiday in Ramadan there was no user complaint and the project team finally won written praise from the customer.

U Mobile (Malaysia)

Another great example of success story is in Malaysia. ZTE assisted U Mobile in Malaysia to build the 3G and 4G network. The two parties have been cooperating with each other for over 10 years. ZTE has provided services in the customer's several high-value areas, including the capital Kuala Lumpur and the tourist resort Shamba.

In early 2021, the Malaysian Communication and Multimedia Committee (MCMC) announced that all communication companies would terminate 3G network services to lay the foundation for the introduction of 5G networks.

ZTE assisted U Mobile in deploying the multi-operator core network (MOCN) of four operators for RAN sharing, reducing network construction costs and improving network utilization.

The MOCN involves many difficulties in operator's wireless resource management and transmission resource sharing management. In addition, in the rainy season in Southeast Asia under the COVID-19 outbreak, more uncontrollable factors were introduced such as logistics, distribution, engineering construction and engineering quality.

ZTE established expert teams for technology, logistics, and engineering. The logistics team crossed 1,800 km within a week to ensure timely arrival of equipment and meet the engineering requirements. The engineering team actively coordinated epidemic prevention supplies and carried out installation and commissioning with high standards in any available time fragments.

Finally, ZTE helped U Mobile to build the world's first MOCN network of four operators with excellent experience and completed the rate test and optimization for each operator. ZTE ensured that MCMC and U Mobile successfully completed the demonstration at the press conference, winning high recognition from the organizer.

Conclusion Remarks

As a global leader in telecommunications and information technology, ZTE has set up an end-to-end engineering service system across the globe with its rich experience in the construction of telecommunications.

Over the past 10 years, ZTE has been pushing forward superb network deployments. Moving forward, ZTE will continue to work with customers and partners to provide high-quality networks and efficient services for its global users, so as to contribute to the development of the global digital economy. ZTE TECHNOLOGIES

Transforming Towards Digital Network Deployment in the Digital and Intelligent Era

Hong Gongcun

Vice President of ZTE

While COVID-19 is still ravaging the world, governments have taken mitigation measures, imposing unprecedented demands on mobile networks. According to a GSMA report released in 2021, the global mobile data traffic per subscriber has increased even more in 2020 than ever before, reaching more than 6 GB per month, which doubles that of 2018. This means that consumers participate in online activities more extensively and frequently. As is shown in the statistical results of Analysys Mason, more than 67% enterprises suggest that the ICT industry must change to more appropriate technologies, services and processes to support new working modes.

However, in the global mobile services, the epidemic has postponed network deployment and made on-site engineering service support more difficult, bringing new challenges to base station site survey, quality check, network maintenance, and network performance improvement that originally required high personnel mobility.

At the same time, the construction and O&M of communication networks, represented by 5G networks, also face the problem of digital transformation. It is expected that automatic, intelligent, and agile deployment can be promoted to replace the traditional laborious network construction and O&M that require manual statistics, judgement, and maintenance and are carried out with the traditional deployment tools.

In this digital and intelligent era, ZTE, a driver of digital economy, has launched the digital network deployment solution to make network deployment simplified, efficient, and intelligent by applying digital, automatic, and intelligent methods.

What is the Digital Network Deployment Solution?

With only one mobile phone, an engineer can go to the selected site to take photos of the equipment and base stations, and then complete the site survey job that traditionally requires several engineers to carry

out repeated measurements with a tape measure, a level, a compass, a pen, and paper or even advanced instruments such as the laser rangefinder, electronic compass, and electronic level. This is an actual application scenario of digital network deployment.

Digital network deployment means digitally displaying network deployment data such as flows, processes, and documents, and supporting the automatic and intelligent delivery operations with digital tools, so that highly-efficient and accurate network construction and maintenance management decisions can be made. The whole solution consists of the "real-time, automatic, collaborative and visual" intelligent engineering project management system (iEPMS), "cloud-based, intelligent, simple" technology delivery platform (TDP), and "intelligent, visual, agile and closed-loop" network O&M solutions. It runs through the whole process of network planning, construction, maintenance, optimization and operation.

Intelligent Engineering Project Management System: Real-time, Automatic, Collaborative, and Visual

ZTE's self-developed digital delivery platform supports five major functions: process management, quality management, document management, material management, and outsourcing management. The iEPMS can be rapidly interconnected with different content modules of different customer systems to achieve efficient service coordination among different companies, and it has been interconnected with the systems of multiple operators around the world.

Technology Delivery Platform: Cloud-Based, Intelligent, Simple

ZTE has established an end-to-end intelligent tool system covering all phases including planning, commissioning,

optimization, and maintenance. The big data-based cloud network planning platform Smart Hippo makes 5G coverage and capacity planning more accurate. With the new network optimization drive test tool WNG, an engineer can complete the drive test by simply using a smart phone installed with the WNG App, and output reports automatically through the cloud server, which is portable and efficient. The VMAX, a customer-oriented tool, is introduced with AI capabilities such as intelligent analysis and intent insight. Based on intelligent insights extracted from big data, the VMAX achieves optimization, analysis, and intelligent operation of network quality, service traffic, user experience and terminal applications, thus improving user perception. The auto integration center (AIC) tool, which simplifies complexity, can achieve end-to-end continuous delivery of NFV network deployment. The virtual drive test (VDT) tool allows engineers to customize routes and drive test tasks, automatically extracts and analyzes massive drive test data. With GIS presentation, the VDT provides a wireless network coverage analysis solution with the same effect as the traditional drive test in road wireless coverage, quality and event information, greatly reducing the drive test manpower cost and improving drive test efficiency.

Intelligent O&M Solution: Preventive, Fast, Accurate

Based on the self-developed OSS O&M support platform, ZTE's intelligent O&M solution provides centralized O&M for multiple manufacturers, multiple systems, and multiple types of devices to implement online management of the entire O&M process. Intelligent fault prediction and accurate preventive maintenance can eliminate potential network faults in advance, greatly reducing the probability of site faults. In addition, through automatic fault diagnosis and recovery, remote troubleshooting and quick fault-fixing can be implemented, reducing the number of times that engineers have to go to sites to handle faults and thus reducing the risk of epidemic infection.

Specifically, at the service level, ZTE's digital network deployment covers four parts: market bidding, network delivery, network technology, and network O&M, covering the entire chain of end-to-end network deployment, helping customers achieve "extremely simple" network deployment and "ultimate" user experience in the digital era.

At the technical level, AI, cloud technologies, and micro-services are used to provide more efficient and convenient technical support. The purpose of digital network deployment is to simplify complexity for customers, that is, to implement digital collection, monitoring, and application of data through the big data analysis, processing, and prediction capabilities, thus providing customers with more convenient remote network guidance, diagnosis, and services.

Digital Network Deployment Widely Used Worldwide

By the end of 2021, ZTE has established service networks and branch organizations in over 160 countries and regions worldwide, and has cooperated with more than 500 telecom operators to provide digital network services to over 40,000 projects worldwide. Since pandemic outbreak in 2020, the "zero-touch" cloud-based network

services have effectively reduced the risk of infection to network O&M personnel, increased the number of online users by 45%, and saved OPEX by 15%, benefiting more than 300 networks worldwide and their users.

- In South America, the 5G+ telemedicine system, which was built remotely for an operator, integrated 5G+4K UHD terminal and uninterrupted power supply, and could transmit medical videos and data in real time with high bandwidth and low delay. Through typical scenarios such as remote diagnosis, remote consultation, remote ward inspection, real-time management and supervision, it effectively reduced infection risks to doctors and helped recovery from local pandemic.
- In Africa, with the help of AIC, remote experts completed one-stop automatic delivery from planning and design to deployment and testing within just 7 days in a country severely affected by the pandemic. We not only maximally guaranteed the health and safety of customers and employees, but also rapidly delivered the network for local pandemic control.
- In Europe, in a wireless network construction project, with the help of the digital delivery platform iEPMS, remote experts efficiently made the project data of 10,000+ sites in 15 delivery regions online in real time, and achieved the online sharing of information and documents, finally helping the telecom operator win the award for mobile network speed.
- In China, based on its cloud-based network service solution, ZTE assisted telecom operators in building 4/5G networks for more than 210 hospitals in 82 cities.

On March 31, 2021, at the 2021 Digital Transformation Development Summit held in Beijing, ZTE passed the first batch of "Digital Trusted Service Evaluation" by the China Academy of Information and Communications Technology (CAICT). At PT Expo China 2021, ICT China selected ZTE's cloud network service solution under epidemic as the Outstanding Solution Case, and its intelligent O&M solution as the Excellent Innovative Technology Application Case. ZTE's digital network deployment concept has been increasingly recognized by the industry.

To Be the Main Mode of Future Deployment

The impact of the epidemic on network quality is temporary, while its impact on data use may be permanent. The epidemic highlights the importance of communication networks, and promotes the all-round development of working from home, online education, e-commerce, digitalization and automation. Therefore, operators and network service providers need to continuously respond and improve network capacity.

At present, ZTE has completed the overall planning of intelligent digital network deployment, which will make the future digital network deployment more automatic and intelligent, promoting the change from automatic network to intelligent network.

When changeability, uncertainty, complexity, and fuzziness become the new normal of the communication network environment, digital network deployment will definitely become the main mode of future network deployment. In the digital and intelligent era, ZTE will respond to changes in network deployment with professional, efficient, and intelligent services. ZTE TECHNOLOGIES

End-to-End Intelligent and Efficient Delivery Solution Leads Network Delivery Transformation

Qian Zhengtie

Deputy Director of ZTE Integrated Technology Delivery Dept.

Luo Taotao

Engineer of ZTE Integrated Technology Delivery Dept.

With the rapid commercial use of 5G networks at home and abroad, the network delivery cycle is getting shorter and shorter, and the delivery scenarios are becoming more and more complex. To improve delivery efficiency and quality, it is imperative to transform into automatic and intelligent network delivery. For this reason, ZTE has proposed an end-to-end intelligent and efficient delivery solution. Combined with ZTE iEPMS project delivery management system, the solution integrates intelligent and digital means into the whole process of network delivery to achieve high-quality and efficient delivery of global networks.

This solution consists of two parts: intelligent and simplified tools, and technology delivery platform.

Intelligent and Simplified Tools

In addition to basic product functions, the intelligent and simplified tools are systematic tools developed to improve product delivery or O&M efficiency, and achieve automatic delivery and O&M. They exist as independent tools or are integrated in the network management system, covering end-to-end products from wireless, wireline, to core network. The following describes network commissioning and configuration tools.

Efficient Wireless Site Commissioning

The commissioning and cutover of wireless networks is a complex process with various scenarios, where the preparation of configuration data is time-consuming and prone to errors. The robot developed by ZTE for automatic site configuration provides automatic template operations in the cutover process and supports multiple functions such as configuration planning, network optimization configuration, and configuration check. A large amount of tedious and repeated work is done by tools, thus reducing the average data preparation time to about 20% of the original.

ZTE has gradually developed remote and mobile-phone plug-and-play (PnP) for site commissioning based on the traditional local maintenance terminal (LMT) mode. In the PnP mode, after a wireless base station is installed and powered on, the network management server allocates preset parameters to the base station by identifying the information reported by the base station without manual intervention, so that the base

station can automatically establish a communication link with the network management server and download versions and configuration files to complete site commissioning. The PnP mode does not require engineers to go to the site and thus saves the commissioning cost.

The mobile-phone PnP mode allows engineers to complete site commissioning and maintenance via a mobile phone APP, which reduces the commissioning time of a single base station by more than 30% compared with the traditional laptop mode. Because the mobile phone is easy to carry and can be connected to the base station through Wi-Fi, this mode reduces the impact of the rainy season and the battery life of the computer upon site commissioning. This allows engineers to focus more on the commissioning itself. At present, the mobile-phone PnP mode has become the mainstream way to commision the site.

Intelligent Wireless Drive Test

Drive test is an important method for checking performance indicators such as wireless network coverage and upload/download rates in wireless network optimization. However, the traditional drive test has high cost and low efficiency, which has always been the pain point of network optimization. ZTE has innovatively developed two new intelligent network optimization solutions: wireless network guardian (WNG) and virtual drive test (VDT).

WNG is an intelligent drive test solution based on cloud service and handheld terminals (Fig. 1). It has the following features:

- **Multi-function and multi-scenario:** WNG supports drive test management, indicator evaluation, perception evaluation, engineering parameter check, and problem analysis. It is applicable to single-site acceptance test, cluster acceptance test, indoor coverage test, outdoor coverage test, and high-speed rail/subway scenarios.
- **Lightweight equipment:** One person in one vehicle with one terminal can get on road easily and execute the test task automatically with just one click.
- **Simplified drive test:** The test is performed by WNG, which is simple and easy to operate. WNG enables efficient drive tests.
- **Dramatic improvement in efficiency:** In traditional drive tests, it takes a lot of time to output reports. However, WNG automatically outputs the reports, which can shorten the reporting time.

WNG distributes test tasks through the cloud. The tasks from data collection to one-click report output are all completed on handheld terminals, greatly improving drive test efficiency.

VDT is a function of the wireless NetMAX/NGI tool. It collects and

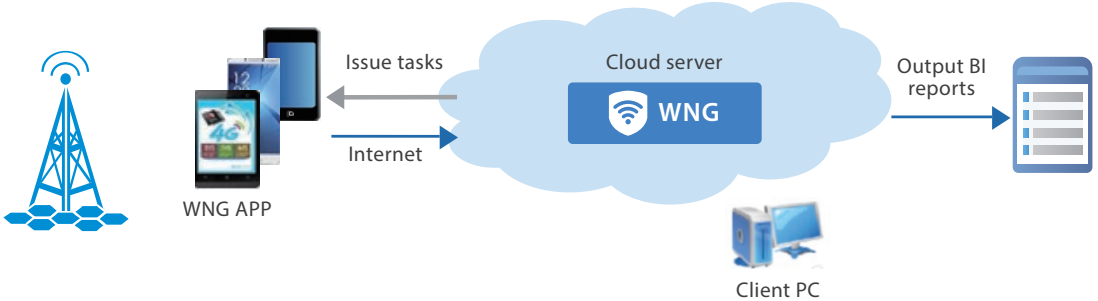


Fig. 1. ZTE's WNG drive test solution.

analyzes massive MR data with longitude and latitude information in the wireless network, associates them with call detail trace (CDT), and presents information about wireless coverage, quality and abnormal events on the road through GIS. Different from traditional drive tests in terms of data sources and technical principles, VDT does not need front-end drive tests and is mainly used for coverage evaluation. Through ZTE's continuous effort in function improvement, promotion and implementation, this new intelligent drive test mode is gradually being used by operators to replace traditional drive tests in network acceptance, which greatly reduces network delivery costs.

Agile Wireline Network Deployment

ZTE has developed the zero touch provisioning (ZTP) solution based on the traditional data communication network (DCN), which is suitable for new or expanded network scenarios. With the ZTP solution, engineers do not have to go to the site, a new site can be automatically connected, and the management and control system automatically generates and verifies scripts as planned and distributes the configuration in one-click mode. ZTP reduces the basic configuration steps and prevents engineers from going to the site, resulting in cost savings. When combined with data planning tools, ZTP can greatly improve the efficiency of network deployment.

In addition, ZTE continues to iteratively develop a bearer configuration translation tool for network replacement scenarios. This translation tool includes online and offline versions. It can translate not only the configuration of old equipment such as M6000 and M8900 switches, but also the equipment of other mainstream manufacturers. The tool accomplishes thousands of data configuration items efficiently and accurately, facilitating efficient project delivery in the replacement scenarios.

Intelligent and Simplified Core Network Delivery

The auto integration center (AIC) developed by ZTE implements automatic design, deployment, and test of hardware, cloud platform, MANO and VNF. The detailed level design (DLD) files automatically generated by the automatic design module

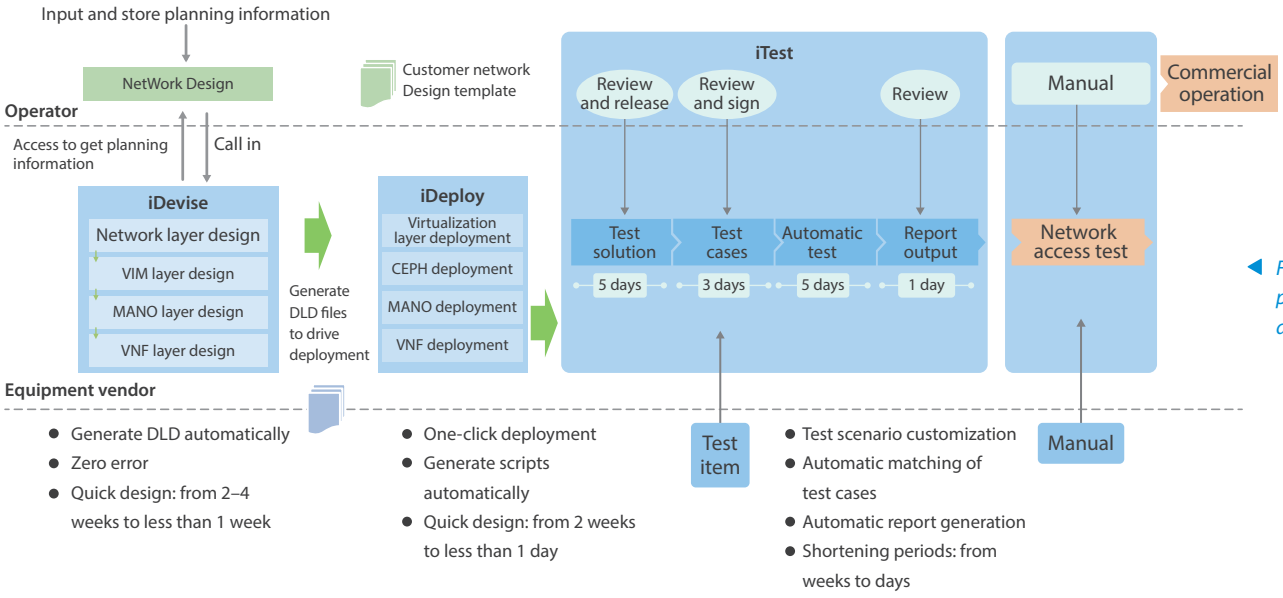


Fig. 2. AIC: auto-planning auto-deployment tool.

(iDevise) can be directly imported into the automatic deployment module (iDeploy). iDeploy automatically deploys NEs such as VIM, NFVO, VNFM, EMS and VNF (Fig. 2). The deployment process is visualized with no user intervention.

ZTE also provides the lightweight server deployment and O&M tool Cloud Unikits, which supports batch provisioning, firmware upgrade, routine inspection and fault location of various types of servers, such as frame servers and rack servers. This can improve the provisioning efficiency and reduce O&M workload.

Technology Delivery Platform

Technology delivery platform (TDP) transforms product tools from isolated applications to a part of digital architecture by rapidly connecting them. In this way, project delivery planning, construction, optimization and acceptance are digitally interconnected, thus achieving the goal of delivery automation, standardization and global collaboration.

TDP consists of two parts: site work platform (iTech) and technology delivery expert system (TDES). As a platform for front-line site work, iTech provides digital collaboration and automatic tool interconnection. TDES is an automatic tool interconnection platform based on technology delivery data and management data flow. iTech has been put into operation, including iTech Web and Apps, and will be gradually deployed in global projects.

The innotive design of TDP empowers front-line site work, automatic deployment, and efficient collaboration through the intelligent digital platform, and also achieves digital connectivity of management and operations.

ZTE's end-to-end intelligent and efficient delivery solution simplifies operations and improves delivery quality, greatly improving delivery efficiency and reducing operators' Opex. This solution has been widely used in telecom networks around the world and gradually recognized by global mainstream operators.

Under the trend of digital transformation, ZTE is committed to being a driver of digital economy. Guided by customer demands, ZTE will accelerate digital innovation, comprehensively promote the digital transformation of network deployment, and become a reliable partner for global operators. ZTE TECHNOLOGIES

UniSeer: An Intelligent MS Solution Orientated to Network, Service and User Experience

Zhang Dayong

General Manager of ZTE Service Delivery

Luo Xiaojiong

Intelligent MS Director of ZTE

With the continuous expansion of mobile communication network and the booming development of digitalization, telecom network is gradually evolving to be virtual and cloud-based, and the complexity of its managed service (MS) is also increasing. At the same time, due to various service scenarios as well as diverse and personlized user experience, telecom carriers are facing new challenges in MS. They urgently need digital transformation to enhance automation and intelligence of their MS, improve efficiency and provide better support for digital operations.

In response to the challenges faced by carriers, ZTE has launched UniSeer, an intelligent MS solution that introduces big data and AI to make MS evolve to zero touch operations and finally achieve the goal of easy MS.

UniSeer: Intelligent MS Solution

The UniSeer intelligent MS solution consists of three parts: intelligent insight, intelligent network MS and intelligent service MS. Intelligent prediction, precise prevention and automatic closed-loop of network faults are embedded in the network MS. In the service MS, the quality of service and user experience can be intelligently demarcated, analyzed and guaranteed, and the centralized presentation and real-time management of the network and services are realized through intelligent insight, as illustrated in Fig. 1.

Intelligent Insight

Intelligent insight presents network, service and experience indicators through more than 20 large screens as well as a dozen screens on mobile phones, and intelligently correlates and analyzes them, so that telecom carriers and the MS teams can learn about changes of the network and services anytime and anywhere.

- **Global information:** Intelligent insight enables combined or separate presenattion of network faults, network performance, quality of serive, and user experience in a full and flexible manner. Network indicators can be presented by area on the GIS map; network performance presented by network elements; and traffic, number of subscribers, key services, and user experience presented globally or hierarchically.
- **Various scenarios:** Large screens can be centrally placed in the network operations center (NOC). The NOC staff can view and check network indicators

via PCs in real time, and execute remote maintenance. They can also quickly and easily view information of the whole network via their mobile phones without working on the site.

- **Efficient and flexible service capabilities:** The UniSeer intelligent MS solution can refresh and present network indicators in near real time and automatically monitor them, and customize dynamic alarm thresholds according to the historical indicators' fluctuation. MS staff can also flexibly configure indicators by the global, area, time period, user group, and service type.

Intelligent Network MS

Intelligent network MS achieves MS automation, simplifies processes and improves efficiency through tools. It introduces the AI algorithm to the core process to enhance precise MS capabilities.

Intelligent network MS runs through prediction, prevention and handling of network faults, and can greatly reduce faults, handling time and manual work. Its typical services include:

- **Fault prediction and precise preventive maintenance:** To predict potential network faults and eliminate them in their infancy, ZTE has introduced automatic fault prediction to predict the time, type and probability of possible faults at each site, give early warnings in time and provide the best troubleshooting suggestions. According to the predicted results, combined with site sub-health status, major guarantee arrangements and resource distribution, the preventive maintenance sites are prioritized to troubleshoot and repair the sites with high fault probability as soon as possible.
- **Intelligent root cause analysis:** Through the intelligent analysis of network

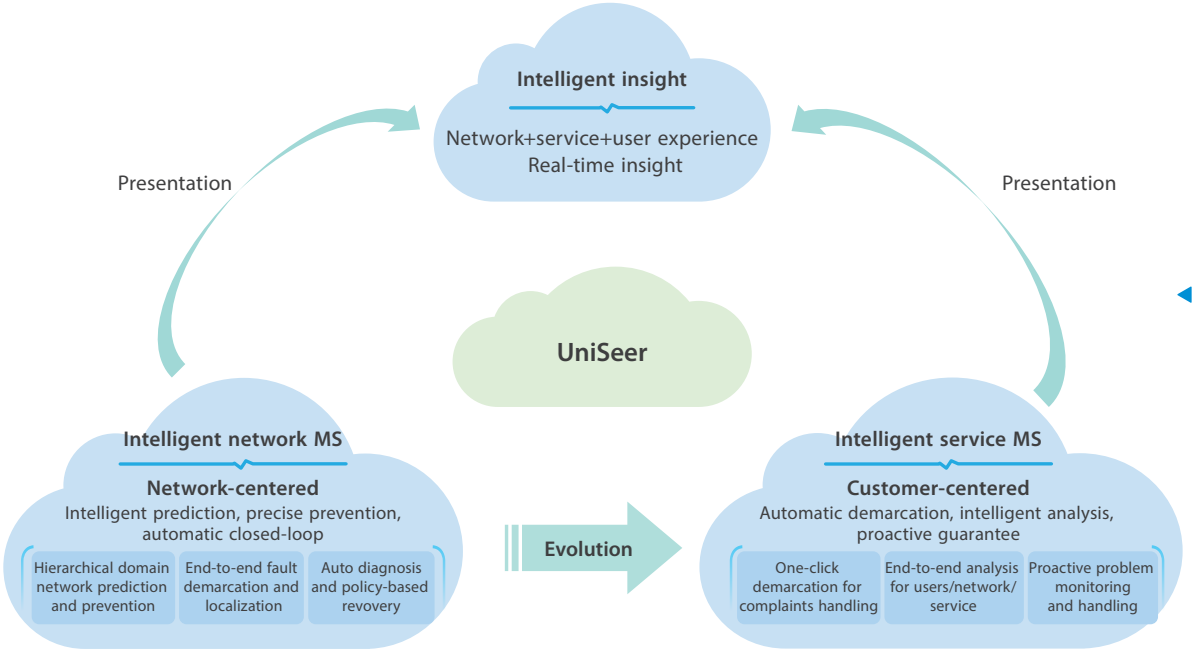


Fig. 1. ZTE's UniSeer intelligent MS solution.

topology and historical faults as well as the correlation of fault types among a variety of devices, faulty network elements and root cause alarms can be found accurately, and then through automatic work order assignment, trouble tickets can be quickly transferred to proper handlers.

- **Automatic fault diagnosis and recovery:** The automatic fault diagnosis and recovery function provides big data analysis and self-learning, which can dignose quickly and accurately and automatically issue the repair instructions according to the established strategy, and quickly recover complex faults.

Intelligent Service MS

Intelligent service MS evaluates and analyzes the quality of services carried by the telecom network such as games, videos and web browsing, and forms a service guarantee centered on user experience.

To evaluate the quality of user experience, a set of service quality indicators such as video throughput, game latency and the web page opening time are needed, and then each service is weighted and combined into a user experience score. Based on such an index system, intelligent service MS implements intelligent analysis and active handling of user experience issues. Typical service scenarios include:

- **Service quality guarantee:** The UniSeer intelligent MS solution actively monitors service quality indicators. When these indicators deteriorate or the associated network indicators are abnormal, the system will automatically generate alarms and trigger work orders to the MS staff for handling. Therefore, the MS staff can locate the problems in time and eliminate the impact.
- **User experience guarantee:** By automatically filtering and analyzing subscriber distribution, residence time and service usage, the UniSeer intelligent MS solution identifies high-value user groups and areas, actively detects changes in their user experience and finds the problems.
- **Precise marketing:** Based on network features, service status and user behaviors, the UniSeer intelligent MS solution provides precise marketing suggestions for the marketing team of carriers. For example, it provides analysis reports on terminals and shared hotspots to help carriers migrate value users. It also makes APP time domain/region analysis reports to provide data for precise marketing of high-value APPs.

Digital Transformation to Boost Operations

In a project in South Asia, ZTE's UniSeer solution helped the operator achieve digital transformation, greatly improving network availability and user experience. With the introduction of automatic tools, the operator's Opex was significantly reduced by 30%. With the help of user experience improvement and precise development strategy, the operator doubled its traffic and increased its subscriber base by 40%.

ZTE always adheres to the service tenet of "easy MS, ultimate experience, and great value". Being customer-centered, through integrated MS, it carries out multi-dimensional insight, improves user experience and thus focuses on service value. And through cost modeling, ZTE maximizes the return on investment and achieves ultimate operations. ZTE TECHNOLOGIES

Digital Delivery Platform: Building a Highway for Global Network Deployment

With the large-scale commercial use of 5G, both network operators and service providers face the challenge of high-quality network delivery. To enable agile, efficient, low-cost and high-quality network project delivery, ZTE has launched its self-developed intelligent engineering project management system (iEPMS). iEPMS runs through the whole process of contracting, supply chain, procurement, engineering, service and finance, and takes the lead in realizing the automation, intelligence and digitalization of network deployment.

Based on ZTE's digital delivery platform iEPMS, the customer, partner and ZTE employee can manage the plan, progress, documents and quality of the project through mobile phone or web. With rich data and visual reports, the costs, materials, outsourcing, problems and risks of the project are effectively managed and controlled, which greatly improves the efficiency of engineering delivery and project management. Fig. 1 shows the panorama of ZTE's global services.

In the global service field, ZTE builds the project management system based on standardized and structured data, and implements remote real-time, mobile and intelligent delivery of sites via iEPMS mobile app. The system is interconnected with the automatic intelligent tool system and intelligent network O&M platform of ZTE, and efficiently meets the complex challenges in the delivery of network projects with its visualization, interaction and customization capabilities.

Standardized and Structured Data

iEPMS digital delivery platform assists the digital transformation of global network project delivery, standardizes delivery management with standardized and structured design concept, and ensures professional and consistent engineering delivery.

- **Middle platform of the iSite:** Realizes online management of customers' sites from the only source, and supports multi-dimensional site management (from physical sites to NEs and logical sites).
- **Standard product model:** Covers Bearer, wireless, transmission, core network, OSP, and other products.
- **Standard operation process:** Supports compilation of multi-level plans (from milestones, master plans to site rolling plans) as well as progress management; and provides data for efficient budget compilation, cost control ledger management, and visualization of diversified reports.
- **Standard service fields:** After the data for engineering survey and quality inspection is collected, the data will be automatically converged into customized document templates to generate structured documents for the approval of service managers and customers. The locked standard data information can be invoked across systems to continuously transfer data and generate value.

Yang Yahan

Director of ZTE Global Service Digitalization Project

Data Mobility

In 2015, ZTE built the industry-leading mobile site delivery app iEPMS. With the increasing demands for mobile office, ZTE has developed a series of remote site mobile delivery functions.

- **Quality and EHS self-check:** iEPMS generates quality/EHS self-check reports in real-time by customizing structured quality criteria and checkpoint templates, greatly improving the remote acceptance capability. It also provides online demonstration photos and operation guides to ensure construction quality and safety.
- **Electronic survey (e-TSS):** iEPMS can customize rich multi-dimensional engineering survey templates, configure a multi-level and flexible approval flow, and issue the electronic engineering survey task to the site survey engineer who can then fill in the data to complete the online review.
- **Sign in/out:** With location-based restrictions enabled, the authenticity of sign-in/out records can be ensured, and the remote management costs of site engineers can be reduced.
- **Material code scanning at receipt and material management:** End-to-end management of engineering materials from leaving the warehouse to site installation and acceptance is achieved. The subcontractor's construction team can scan the codes for the materials in the subcontractor's warehouse for warehousing, site arrival, transfer, and return operations to ensure that the accounts are consistent with the assets during the engineering delivery phase.
- **Document query:** The construction team can query the archived site documents and general documents, and their version status in the system at any time, to obtain effective guidance and improve the site delivery efficiency.
- **Remote site commissioning:** The iEPMS is interconnected with the ZTE UniDeploy intelligent site commissioning tool to record the remote site commissioning script in real time. The mobile phone is connected to the BTS equipment for real-time joint commissioning, and the commissioning data analysis is completed in real time with the output of commissioning documents. The commissioning efficiency is improved through real-time interactive data visualization.

Real-Time Data

In addition to bringing a series of efficiency improvement functions (real-time data interaction and progress reporting at sites) through its mobile app, iEPMS can improve the overall project efficiency with its real-time online data processing capability used in project management, outsourcing service management, document management and acceptance management. By November 2021, ZTE's engineering acceptance duration had been reduced by over 15% compared with that at the end of 2020.

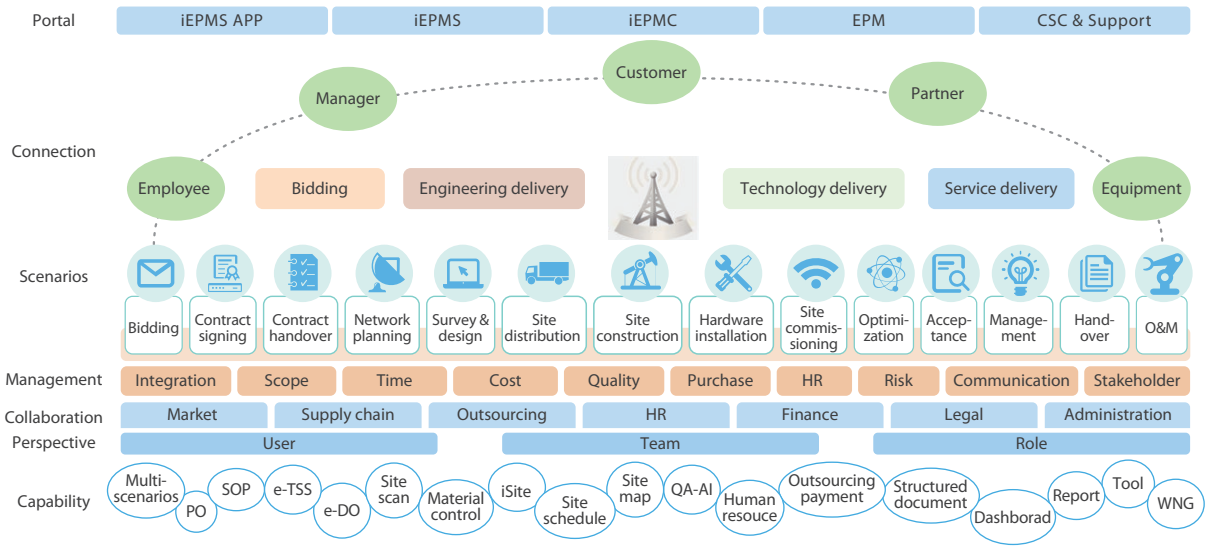


Fig. 1. ZTE global service digitalization panorama.

- **Progress management:** Reduces the time for synchronizing the progress and cost report data from 24 hours to 2 hours, so as to make the plan more intelligent, the process more transparent and the control easier.
- **Outsourcing management:** The outsourcing service automation, outsourcing paperless workload confirmation and outsourcing settlement automation are realized. In 2021, with the automatic issuance of outsourcing service work orders, the average dispatch period has been shortened by 90%, and the work order accuracy was 100%, greatly improving the partner satisfaction.
- **Document management:** Based on the document template and delivery plan, the site completion document is bound to the site task workflow. The subcontractor can automatically generate a document through the iEPMS structured document generation function. The site acceptance report can be created within two hours to improve efficiency by 60%.

Data Intelligence

The ZTE iEPMS digital delivery platform is evolving towards intelligent online applications. With the development of 5G products, a series of intelligent data applications are being iterated and applied in front-line projects.

iEPMS integrates the deep learning capability based on massive samples of 5G products and EHS security facilities to realize AI-based automatic review of quality/EHS work orders. AI verification can be configured for check items such as safety helmet, face coding, tool kit, 5G BBU/RRU, color ring and GPS of the construction personnel in the work order template. The construction personnel take photos of the self-check items to obtain the AI approval conclusion in real time, thus achieving the goal of "acceptance upon completion".

In the iEPMS document delivery plan, the "whistleblowing point" flag can be set for key documents. if the document submission task is about to expire, the iEPMS will send a reminder email to the responsible party, and if the task has expired but the document still has not been submitted yet, a trouble ticket will be automatically triggered. This has significantly improved the timeliness of the output of key documents. Taking the documents required for obtaining a site preliminary acceptance certificate (PAC) as an example, the complete document submission period is shortened by 40%.

Interactive and Customizable

With the deepening of digital applications, social networking, interactive, and customization capabilities can rapidly drive cross-service and cross-project communication, and facilitate interaction between personnel and data. iEPMS app integrates ZTE's office application iCenter so that ZTE engineers can perform multi-party (partners and customers) online contact list query and instant messaging management. Business approval documents for multiple scenarios can be converged, billboards for the operational data of multi-service projects provided to support management decision-making and multi-level precise targeted communication.

iEPMS is deeply interconnected with ZTE intelligent tools Unideploy and WNG to realize online application data exchange such as remote commissioning and debugging, and single site verification and optimization as well as automatic return of technical delivery documents to improve acceptance efficiency.

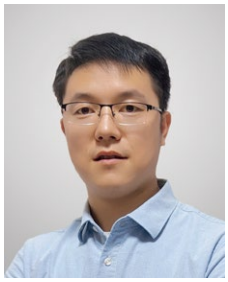
At the same time, the iEPMS supports flexible customized integration, and can be quickly interconnected with different content modules of different operators' systems to achieve efficient coordination of cross-company services. It has been seamlessly interconnected with many operators' systems at home and abroad.

ZTE's digital delivery platform iEPMS has been widely used in global projects, effectively improving the management efficiency of engineering delivery projects. Under the digital transformation trend, ZTE combines process management with advanced tools to continuously improve the digital intelligence level of its engineering project management and respond to the complex challenges of network project delivery, helping operators improve network quality and user perception. ZTE TECHNOLOGIES

Efficient Deployment: One-Stop Data Center Empowering High-Quality Industry Development

Chen Peng

Director of ZTE Service Product Support Dept.



Jing Hangfei

Technical Expert of ZTE IDC

As the foundation of cloud, 5G, big data, IoT and AI applications, data center is the basic guarantee for digitalization. Its deployment speed and quality are directly related to effective digital transformation of society and enterprises. With the booming new infrastructure and fast-growing demands of the data market, China is facing new opportunities and challenges.

Data centers have maintained a growth rate of 30% to 40% since 2010. However, the current construction cycle of a data center with 1000 cabinets is generally about 8 months, which cannot meet the rapid business growth of customers.

Fully Modular and Standardized Data Center

ZTE has been engaged in the data center industry for more than 12 years. Through continuous investment in technology, it is now in the leading position in the industry and is leading deep changes in the industry. The company has been committed to building modular and standardized data centers, advocating prefabricated production, improving delivery efficiency end-to-end, and helping customers shorten time-to-market (TTM).

In building a fully modular data center, ZTE has implemented more than 90% of the integration and installation work in the factory, relying on its technical advantages and practical experience in modularization and standardization. The 1000-cabinet data center can be implemented within 4.5 months from entry to delivery to customers, leading the industry in a 25% delivery cycle. The prefabricated full-module data centers have been widely applied in the industry.

In building a traditional data center, ZTE has shortened the period of a 1000-cabinet data center from entry to delivery to 5.5 months, relying on its reliable delivery teams, powerful digital management tools and integrated global supply chain system. Its delivery cycle leads the industry by more than 40%.

End-to-End Digital Delivery Capability

ZTE provides a full range of end-to-end data center solutions, covering the entire life cycle and full-scenario services of consultation, planning, design, delivery, and O&M management. Its rapid and efficient delivery of data centers mainly benefits from innovative practice and strict control in refined design, material procurement, progress and quality control, and on-site organization and management.

In the refined design phase, ZTE carries out on-site measurement of the original buildings, and uses the building information modeling (BIM) software for three-dimensional modeling. All the equipment and pipelines are precisely imported to achieve in-depth application of BIM software in a full scenario. The layout of integrated pipelines is optimized to completely avoid construction intersections and improve the feasibility of the design. At the same time, according to the integrated pipeline model, a building block model is generated to quickly guide the on-site delivery and installation. ZTE is the first in the industry to make standard factory

prefabrication production of the integrated pipe hanger in the corridor area of a traditional data center, greatly improving process quality, reducing on-site welding difficulty and shortening delivery time.

In the material procurement phase, ZTE adopts material classification and multi-threaded configuration to improve the efficiency, identify materials on critical paths, and schedule production in advance. Through efficient supply chain management and global procurement advantages, ZTE ensures the delivery cycle and product quality of the equipment it produces or purchases, and meets the supply needs of the project.

In the face of multi-professional difficulties in the data center, ZTE applies the intelligent project management system iEPMS to digitally control the project management process. iEPMS generates progress and manpower reports every day, and gives early warnings on the progress and manpower matching problems in time, so that managers can accurately control the progress of the project. In quality management, ZTE appoints special personnel to manage quality issues and strictly implements the work-plane handover scheme and finished product protection measures. Special joint inspections are conducted on the key points involved in the project, and the problems are tracked and alarmed in time by using digital advantages.

In the construction phase, ZTE sets up a team of experts to formulate the construction plan and evaluates the manpower scheme based on years of project delivery experience and project characteristics. In the areas where cross-construction is serious, it adopts the "time sharing+segmentation+layering" mode to avoid the cross-construction and damage to finished products, which improves the construction efficiency by 30%. It also selects professional and high-quality engineers, and uses machinery instead of manpower as much as possible to ensure that its investment in manpower and machinery strictly matches the project schedule and improves efficiency.

Industrial Use Cases

So far, ZTE has more than 330 successful cases worldwide in the data center field, with accumulated experience in deploying over 1.5 million square meters and 140,000 cabinets, and has won more than 40 domestic and foreign awards. This marks the growing technical strength and brand reputation of ZTE in the field of data center design, deployment and O&M management.

In 2017, ZTE realized the practical application of indirect evaporative cooling air conditioners and the first deployment of warehouse full-module data center. In 2020, it deployed the industry's first prefabricated full-module data center on a large scale, and built the first edge data center in the Philippines.

In 2020, ZTE helped a listed large Internet company in China build a new data center. It overcame the impact of COVID-19's epidemic, and completed the refined design within 14 days, the delivery of the first batch of 500 cabinets and large machinery within 3.5 months, and the second batch of 1000 cabinets within 2.5 months. The delivery time far exceeded customer expectations.

In 2020, ZTE won the bid for a centralized procurement project for prefabricated full-module data center of an Internet company in China. Relying on its technical advantages of modularization and standardization, as well as BIM software and digital management and control platform, ZTE implemented a building-block model on site and completed the rapid deployment and delivery of 1000 cabinets within 4.5 months, leading the industry by 25%.

ZTE has won high recognition from customers and partners for its rigorous design demonstration, high-quality factory standardization and integration, and rapid and efficient construction arrangement. It built a first-class international data center in Bangladesh in 2016, which passed the dual-Tier IV certification of design and manufacturing, the highest standard of international data center construction.

In the wave of global digitaliztion, ZTE, as a driver of the digital economy, will continue to develop in the data center industry, lead the change, empower industrial high-quality growth, and help the society and enterprises achieve full digital transformation. ZTE TECHNOLOGIES

Network Service Operations Help to Deliver Ultimate User Experience in Digital Era

Luo Xiaojiong

Director of ZTE Intelligent O&M Delivery

In the digital era, all kinds of smart APPs bring great convenience to people's work and life. They rely more on a variety of APPs and are particularly sensitive to the quality and experience of social media, video entertainment and instant messaging applications. Telecom carriers are facing many challenges in their traditional network-centric operations. For example, network indicators are good, but users still experience slow access to Internet, stuttered videos, and unsmooth gameplay. How can carriers dynamically identify high-value users and ensure their good experience in real time? When there is a bottleneck in network capacity, how can they formulate capacity expansion policies to efficently improve user experience?

To meet the needs of rapid service development in the digital era, telecom carriers must transform from network-centric operations to customer-centric operations. They need to shift from network operations that focus on network quality and performance to service operations that focus on service quality and user experience, so as to improve network quality, service quality and user experience in an all-round way, and manage user experience to improve customer satisfaction through data-driven precise marketing.

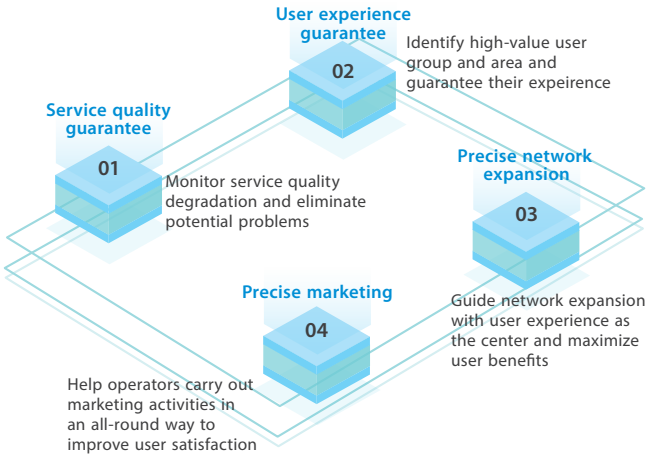


Fig. 1. Highlights of ZTE service operations solution.

Service Operations Solution

ZTE's service operations solution is customer-centric and meets the needs of telecom carriers in the digital era by measuring, evaluating, analyzing and improving user experience and the quality of services carried over the network such as videos, games and web browsing, so that carriers can understand users better, get closer to users, and better serve users (Fig. 1).

Through years of accumulation, ZTE has gained rich experience in its own unique service operations, and has practiced in a number of projects to help carriers make breakthroughs in the 3G and 4G eras and continue to improve market competitiveness in the 5G era.

- **Service quality guarantee:** ZTE's service operations solution actively monitors service quality indicators, such as video throughput and game latency. When service quality deteriorates, the solution automatically generates alarms and triggers and assigns

work orders to O&M staff. In this scenario, the O&M staff can find the service interruption or negative impact caused by non-network failure, and locate and handle the problem in time.

- **User experience guarantee:** The big data analysis tool is used to identify high-value user groups, automatically correlate their distribution in the network, overall resident time and service usage, and find high-value areas. These areas are optimized and guaranteed to ensure a good experience for high-value users. For example, if an industrial park has a large number of high-value users, the O&M staff can actively observe their user experience through some measurable modeling and scoring. If the user experience deteriorates, the O&M staff will analyze the root cause and take corresponding network optimization measures to ensure user experience.
- **Precise network expansion:** The solution can produce an accurate return on investment (ROI) decision and predict the capacity by measuring cell traffic, the number of users and the costs, combined with user experience indicators, site costs and revenue, and network congestion data. In addition, operators can also develop accurate and preventive expansion planning strategies based on the analysis of high-value users and areas to support their precise investment (Fig. 2).
- **Precise marketing:** By using big data tools and considering the factors such as network features, service status and user behaviors, the precise marketing strategy can be made to help telecom carriers better serve their users. The core of precise marketing is how to design more reasonable marketing activities based on these factors, so as to improve customer satisfaction and carrier income. For example, for a popular game, the solution can analyze its traffic and usage time and area to help marketing staff design packages based on traffic and time periods, and identify areas for marketing activities.

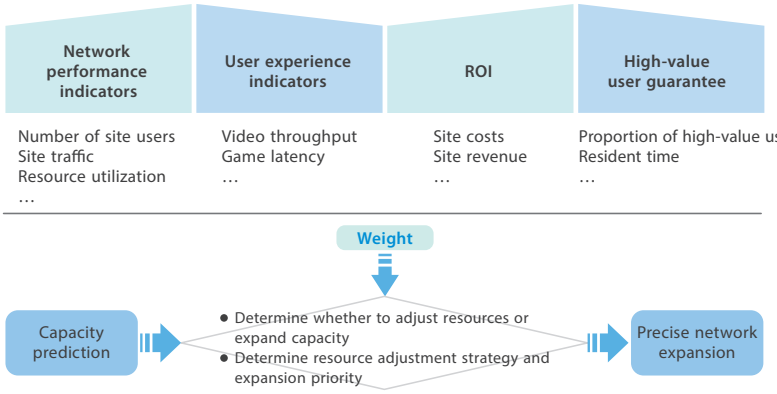


Fig. 2. Precise network expansion.

Shift From Network-Centric to Customer-Centric Operations for Customer Satisfaction and User Growth

In the project cooperated with an operator, ZTE's service operations solution helped the operator succeed in transforming from network-centric to customer-centric operations. The solution proactively guaranteed the experience of more than 1000 VIP users and 3.5 million high-value users. Through active monitoring, the potential problems of users were found and dealt with more than 300 times, the efficiency of handling user complaints was improved by 16%, and the overall user experience indicators rose by over 5%. Finally, it helped the operator increase network traffic by 130%, the number of users by 35%, and customer satisfaction scores by 6%. The operator's Opex was also reduced by 30% through precise capacity expansion.

Service operations have great opportunities for development in terms of service flexibility, process variability and service extensibility in the 5G era. With more than 30 years of experience in network operations, ZTE will continue to improve its network, service and user experience integrated operations to help telecom carriers deliver ultimate network experience to users in the digital era. ZTE TECHNOLOGIES

DITO Joins Hands with ZTE to Create a New Speed in the Philippines' Telecom Industry

Cheng Wei

Project Management Manager of ZTE

Yang Yan

Brand Manager of ZTE Engineering Service

ZTE's engineering project management capability has once again been recognized by the industry authorities. At the PMI (China) Project Management Awards 2021, ZTE grabbed the "Outstanding Project Award" for its performance in the DITO project in the Philippines, and the "PMO of the Year Award" for its Engineering Service PMO (Fig. 1).

In addition, at W.Media's Asia Pacific Cloud & Data Center Awards 2021, DITO data center project constructed by ZTE won the Hyperscale Innovation (Automation) Award (Fig. 2). As an important part of the new-generation network of DITO, the successful deployment of the data center project cluster ensures the fast commercial use of the national 4G/5G network of DITO, which greatly improves the communication service quality of the Philippines.

Behind the honors that follow one after another, great efforts have been paid.

In the Face of Challenges, We are Here All the Time

In Filipino, DITO means "Here". This much-anticipated operator has set the goal to complete the national coverage of 4G mobile services and optical broadband services within three years while speeding up the deployment of 5G mobile network, and to improve the telecom infrastructure of the Philippines by providing world-class telecom services.

DITO will build 4G and 5G networks covering most of the country from scratch. The wireless site construction involves site planning, site construction, optical cable construction, data equipment room commissioning, submarine cable leasing, and core network construction. In addition, communications infrastructure projects, such as site acquisition, ROW acquisition, and mains introduction are also involved.

For a new operator, in a country with thousands of islands and a lot of volcanoes, it is difficult to build a high-quality nationwide mobile network in a short time. After being

Fig. 1. ZTE won the 2021 Outstanding Project Award and the PMO Award of the Year at PMI (China) Project Management Awards 2021.

Fig. 2. ZTE and DITO won Hyperscale Innovation (Automation) Award at the Asia Pacific Cloud & Data Center Awards 2021.

successfully selected as the network equipment and service provider of the largest turnkey project in the Philippine telecommunications history, ZTE worked together with DITO to tackle the huge difficulties in building a new high-quality network within a limited period of time.

- **High standard of engineering quality and progress:** The annual project delivery volume is 2-3 times that of the historical average, and engineering quality is the highest in China and the Philippines.
- **Extremely complex construction environment and engineering interface:** The construction covers over 700 cities and 20 islands. Main business covers more than 20 sub-services in the three major categories of wireless, wireline and data center. In addition, the project involves applying for construction permits from nearly 20 government agencies and over 1000 communities, and electricity use from more than 70 power supply companies.
- **Weak basis for business processes and human resources:** Project personnel, suppliers, service provider partners needed to be appointed, and related services and processes formulated from scratch.
- **Frequent natural disasters such as volcanoes and typhoons:** During the project implementation process, volcanic eruptions, more than 10 earthquakes of magnitude 5 or higher, floods in rainy seasons, and more than 20 typhoons including the world's strongest typhoon "Swan" have occurred, bringing great challenges to the construction safety, progress, and quality of the project.
- **Severe spread of COVID-19 pandemic:** In the Philippines—one of the countries hit hardest by COVID-19 in Southeast Asia, COVID-19 has caused chain reactions that affect local traffic, logistics, transportation, personnel, and construction safety.

With ZTE, DITO has Created a New Speed

To deal with a series of challenges, in the planning of engineering solutions, ZTE fully considers the development path of the DITO network. According to the commercial planning of DITO, ZTE constantly adjusts and optimizes the site commissioning plan of each city, and balances the priorities for the network commercial plan and site commissioning task, guaranteeing the KPI performance of the commercial network to the maximum extent while ensuring the project progress.

During the network deployment process, the digital and intelligent cloud platform and tools are made full use of. ZTE's intelligent engineering project management system (iEPMS) achieves the end-to-end full-process service flow. DITO, ZTE and outsourcing partners can manage the plan, progress, documents, and quality of the project through mobile phone or a web client, which significantly improves the efficiency of the engineering process. In addition, cloud-based network service model improves the efficiency of network deployment during the epidemic.

For milestones of three consecutive half-years from January 2020 to June 2021 set by DITO, ZTE took the lead in achieving its goals (Fig. 3). ZTE completed the commissioning and interconnection of test sites, and successfully made the first call in the third month after project initiation. Finally, it took ZTE only 18 months to complete the construction of over 1,700 turnkey sites, over 5,000 km optical cables, and over 30 IDC data centers. Together with

Fig. 3. ZTE has achieved the milestone targets ahead of the schedule.

Fig. 4. ZTE guarantees the commercial use of DITO network.

ZTE, DITO has created a new speed of network construction in the telecommunications industry in the Philippines.

ZTE's Innovative AMB Project Management Method was Recognized

ZTE's project team has extracted an innovative project management method suitable for overseas large-scale full-turnkey projects, that is, AMB (A for ability building, M for management method innovation, and B for business continuity management). Its core is to rapidly gather internal and external resources to build an excellent project team, and efficiently manage the core services of turnkey projects through digital tools and innovative management methods. Meanwhile, in view of the new normal of the pandemic, the BCM mechanism and innovative cloud-based network service model are used to guarantee business continuity. The essence of AMB is to focus on the elements of "talented team, services and risks" of projects.

Taking risk identification and control as an example, with the BCM emergency plan, ZTE has assessed the impact in the different stages of the epidemic in a timely manner and taken targeted measures. In addition, ZTE has summarized its work methods to institutionalize personnel protection, site check-in, and health monitoring, so as to ensure continuous delivery and safe production in the face of disasters and unfavorable situations. The high-quality delivery of the project exceeded the customer's expectations, and established ZTE's delivery brand, and the ZTE team was praised by the customer's leaders as "an unbeatable team".

To Build High-Quality Network, DITO will Always be "Here"

In March 2021, DITO released the commercial network, and launched differentiated packages to build the DITO brand. It has reached several million subscribers, four months after its commercial launch. With the continuous increase of commercial sites and covered cities, the number of users will continue to increase.

As the number of users increases, the existing network performance cannot accommodate the high-speed traffic growth. ZTE helps the customer improve network performance by providing multi-dimensional solutions (Fig. 4). For example, the network geolocation insight (NGI), an intelligent network optimization platform, facilitates accurate visualized evaluation of network quality. The wireless network guardian (WNG), an automatic innovative drive test solution based on app + cloud architecture, enables fast and efficient data collection and analysis, and the key feature can be deployed according to the evaluation test results, improving user perception and attracting more users to choose the DITO network.

Rodolfo Santiago, DITO's CTO, highly recognizes ZTE's network service capability. In an interview with the media, he said, "ZTE is excellent not only in 5G technologies, but also in optical network construction. We look forward to continuing to work with ZTE to fulfill our commitment to the government and people of the Philippines within five years." ZTE TECHNOLOGIES

AIS: Serving Customers with Elite Network, Leading Future with Intelligence

AIS, the largest telecom service provider in Thailand, has always adhered to the idea of providing users with the best information services, leading the development of wireless network in this country. As Thailand enters the 5G era, to keep its leading position, AIS has newly acquired 2600 MHz and 700 MHz bands to enrich its spectrum resources. However, this makes the network structure of AIS more complicated and poses higher requirements for its network O&M efficiency.

ZTE is AIS's network equipment and solution provider in northeastern Thailand. Adering to the corporate culture of "serving with dedication and being committed to our customers", ZTE is committed to providing customers with the best services and solutions. It has rolled out an end-to-end automatic intelligent tool solution to help AIS improve O&M efficiency while reducing costs. It has also organzied experts to optimize the AIS network and ensure AIS's leading position in network quality in northeastern Thailand.

AIS Uses uSmartNet-RNIA to Improve Efficiency and Reduce Costs

Thailand is a sparsely populated country with high mountains and hills in some areas. Its the population is mainly concentrated in several large cities, and network requirements are extremely uneven. With the spread of Covid-19 in Thailand, AIS is facing greater challenges in its networks O&M. The problem that AIS urgently needs to solve is how to make effective use of spectrum resources to meet the needs of different users while reducing operating costs as much as possible.

AIS adopts ZTE's wireless AI solution uSmartNet-RNIA that provides a variety of automation and intelligence covering the whole process of network planning,

Sun Zhibang

Technical Director of ZTE AIS Project

Ma Rui

Network Optimization Expert of ZTE AIS Project

construction, maintenance, optimization and operation. uSmartNet-RNIA helps AIS improve O&M efficiency and reduce costs.

VMAX-R Precision Planning to Support Network Construction

AIS began to build its 5G network at the beginning of 2020. Its challenge was how to identify 5G value areas and maximize the return on investment. AIS worked with ZTE to deploy VMAX-R intelligent planning platform. By automatically identifying the terminals supporting 5G services in the LTE network, the platform provides a powerful reference for selecting the location of 5G sites. In addition, the platform can analyze the value of LTE and UMTS sites from multiple dimensions such as coverage, load, user experience and competitor analysis, automatically identify the black spots in the network, and cover the blind and weak ones. The introduction of the VMAX-R precisie planning tool greatly improves the efficiency of network planning, and assists in the precise construction of AIS network.

Site Commissioning on Mobile Phone to Improve Efficiency

With the old site commissioning and maintenance mode, engineers must carry laptops to connect to the equipment on site, which is inconvenient and hard to operate in special weather conditions. To solve this problem, ZTE has launched a site commissioning solution through mobile phones, where engineers can complete site commissioning and maintenance by connecting a mobile phone to the site via cable or WiFi. This greatly improves commissioning efficiency. Compared with the traditional site commissioning, the commissioning time of a single site is shortened by 30%.

WNG Intelligent Drive Test Tool to Output Report Automatically

Network optimization drive test (DT) is an important method for checking performance indicators in wireless network optimization, such as wireless network coverage, upload and download rates. However, traditional DT features high costs and low efficiency, which have been the pain points of drive tests in the AIS network. ZTE proposed wireless network guardian (WNG), an intelligent network optimization DT solution based on cloud service and handheld terminal. WNG features lightweight equipment and simplified drive test. The cloud server delivers test tasks ranging from data collection to one-click report output, which are completed on handheld terminals, thus improving the efficiency by more than 30%.

Intelligent Network Optimization Platform to Improve Efficiency and User Experience

In the existing AIS network, there are seven different modes: GSM, UMTS, FDD LTE, TDD LTE, NB-IoT, FDD NR, and TDD NR. The network structure is very complicated, and is difficult to implement optimization. According to the network architecture features of AIS, ZTE has deployed an intelligent network optimization platform together with AIS, including AAX alarm root cause analysis, EFP equipment health

Fig. 1. AIS won the "Fastest 5G Mobile Network" award.

Fig. 2. The demonstration factory built for Thailand's 5G intelligence.

check and prediction, AAPC automatic antenna weight control, NQI automatic interference analysis and TopN poor quality analysis. These functions greatly improve the O&M efficiency of corresponding scenarios.

AIS Builds Fastest 5G Mobile Network

As the largest wireless network operator in Thailand, AIS has always imposed high requirements on network quality. To ensure the leading position of the AIS network, ZTE has established a special network performance improvement team to work together with AIS, analyze network conditions, formulate network deployment policies, and implement performance improvement solutions. With continuous efforts, AIS network has always been the best wireless network among Thai consumers, and the number of users continues to increase. In the 3G, 4G and 5G Speedtest, the scores of AIS have far exceeded those of other operators in the northeastern region. In the latest assessment report of Ookla, AIS won the "Fastest 5G Mobile Network" award (Fig. 1).

Embracing New Technologies to Promote 5G Industry Application

AIS, together with ZTE and Thailand's Suranaree University of Technology (SUT), built a demonstration factory for Thailand's 5G intelligence in May 2021 (Fig. 2). Relying on the overall 5G solution, an ordinary factory is transformed into an intelligent factory integrating technologies such as 5G automated guided vehicle (AGV), 5G AR remote guidance, and real-time VR monitoring, and robot arm, to empower 5G+ industrial application innovation.

ZTE exclusively provides the entire technical solution for the intelligent factory, perfectly integrating 5G technologies with traditional factory production lines. "AIS has developed the solution together with ZTE and the education department of SUT to better meet industrial requirements, aiming to build an intelligent factory model based on the overall 5G solution in the industrial field," said Tanapong Ittisakulchai, Chief Enterprise Business Officer (CEBO) of AIS.

AIS will go further on the road of intelligent networks. As always, ZTE will provide the best and all-round solutions working together with AIS for more success. ZTE TECHNOLOGIES

To enable connectivity and trust everywhere