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VIP Voices

Telia: Bringing the World Closer through Technology

Tech Forum

M-ICT 2.0: VOICE for a Digital Future

Special Topic

Operation Transformation

Building Complete CEM Capabilities for Operation Transformation

Hans Dahlberg, vice president of Telia and head of Telia Global IoT Solutions

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A technical magazine that keeps up with the latest industry trends, communicates leading technologies and solutions, and shares stories of our customer success

ZTE Revenue and Net Profit Increase in 9 Months, with Net Profit at RMB 2,859 Million

27 October 2016, Shenzhen, China — ZTE Corporation (0763.HK / 000063.SZ), a major international provider of telecommunications, enterprise and consumer technology solutions for the mobile internet, announced its Q3 results as of 30 September, 2016.

For the nine months ended 30 September 2016, ZTE reported operating revenue of RMB 71,564 million, representing a year-on-year growth of 4.44 percent. This primarily reflects year-on-year growth in operating revenue from 4G system products and optical transmission products in the domestic and international markets, as well as handset products and family terminal products in the domestic market. ZTE's net profit, attributable to holders of ordinary shares of the listed company, amounted to RMB 2,859 million, representing a year-on-year growth of 9.78 percent. Basic earnings per share amounted to RMB 0.69.

The global average macro-economic values are still weak for the last three quarters in 2016. As a whole, the telecommunications industry is under pressure. In addition, "Internet+" is significantly affecting the format and mode of all kinds of businesses, triggering the upgrade of traditional industries and services. The company continues to adopt a set of development strategies including steady operation, major breakthroughs and pushing new frontiers. The company actively strengthens the application of products and technologies in the mainland market, maintaining its dominant position. For the international market, the company aims to increase its competitiveness through technology and product innovation, helping customers meet business demands and promote market value. Based on this, the company insists on implementing independent research and development (R&D) strategies and continues to significantly increase investments in R&D. The company has invested RMB 9,888 million in R&D in the first three quarters, strongly protecting the its sustainable development.

ZTE's Industry-Leading Cloud UniCore vEPC Solution Certified by VMware

24 October 2016, Shenzhen, China — ZTE announced the successful completion of the technical certification for "VMware Ready for NFV", confirming that ZTE is now one of the VMware ready network functions virtualization (NFV) certified partners and that its industry leading Cloud UniCore vEPC solution is fully compatible with VMware.

ZTE's virtual evolved packet core (vEPC) solution uses an open virtual core network (vCN) architecture to decouple hardware and software, allowing operators to quickly implement mobile broadband services on a cloud platform, and most importantly, effectively reduce deployment and O&M costs. Currently, OpenStack and VMware are the two major platforms for virtualization. In addition to the ZTE vCN, which is developed based on OpenStack, the VMware certified vEPC solution demonstrates ZTE's openness and compatibility of the company's Cloud UniCore product series.

With the advancement of virtualization technology, three-tier decoupling (i.e. hardware, virtualization and application) has become the industry consensus for both domestic and overseas operators with recent decoupling tests conducted by Deutsche Telekom AG, China Mobile, China Telecom and China Unicom.

The integration capability of ZTE's Cloud UniCore products is proven as a result of the VMware Ready for NFV certification. Moving forward, ZTE will be focusing more on NFV certified solutions as well as the integration of virtualization solutions.

ZTE Wins Best Wireless Broadband Innovation Award for Pre5G Massive MIMO

20 October 2016, Shenzhen, China — ZTE announced that it has won the Best Wireless Broadband Innovation award for its Pre5G MIMO at Broadband World Forum (BBWF) in London.

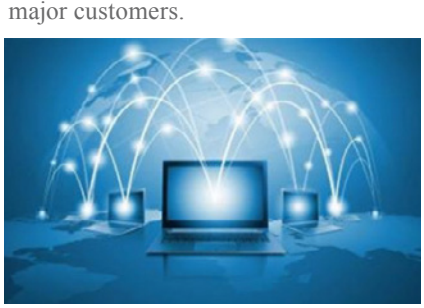
Sponsored by Informa, the global business media company, BBWF is an important event in the broadband industry and this award further recognizes ZTE's innovation in Pre5G massive MIMO technology.

In a commercial network, the single-carrier peak rate of Pre5G massive MIMO exceeds 400 Mbps, increasing spectral efficiency by four to six times as compared with that of existing 4G networks. Pre5G massive MIMO is also compatible with existing 4G terminals so that users can enjoy a high-speed broadband experience without changing their terminals. Pre5G massive MIMO solves the internet's last mile problem by improving internet access and therefore enhancing the user experience. Compared with xDSL and VDSL, massive MIMO can provide a more competitive access rate without the expense of fibre to the home. In fact, this is highly practical for both mobile carriers and fixed network carriers.

Earlier this year at MWC in Barcelona, ZTE's Pre5G massive MIMO base station, described as a "disruptive innovation", won both the Best Mobile Technology Breakthrough and the Outstanding Overall Mobile Technology—The CTO's Choice 2016 awards.

ZTE Delivers Telefonica Moviles Mexico 100G Project

20 October 2016, Shenzhen, China — ZTE announced that 100G OTN project has been completed and delivered to Telefonica Moviles Mexico. 100G OTN is deployed across six sites in the capital of Queretaro to satisfy customer demand for long term wireless services. It provides rigid channels with high rate and low delay to guarantee QoS of private line services for large enterprises and major customers.



ZTE Proposes Channel Model Preliminarily Accepted in ITU-R WP 5D for IMT-2020 Technology Evaluation

4 November 2016, Shenzhen, China — ZTE announced that its map-based hybrid channel model has been preliminarily accepted by IMT-2020 technology evaluation report.

Channel model plays fundamental role in both physical layer design and technology evaluation. The inclusion of channel model proposed by ZTE within the ITU IMT-2020 Evaluation Report at ITU-R WP 5D#25 meeting in Geneva demonstrates the willingness of collaboration among industrial stakeholders to further facilitate the 5G standardization process in term of radio propagation characteristics with ZTE's R&D capabilities and technical strength be devoted.

The ITU-R, an specialized agency of United Nations, acts vitally in the global management of radio-frequency spectrum aiming to create the conditions for harmonized development and efficient operation of existing and new radio communication systems (5G), taking due account of all parties concerned.

The global IMT-2020 (5G) technology evaluation will commence in 2018 in accordance with the IMT-2020 (5G) work plan published by the ITU-R. Before the evaluation, the ITU-R needs to define key technical indexes and determine evaluation methodology. Channel model identification is essential to determining the evaluation methodology and directly affects the evaluation results and the ITU-R's acceptance of new 5G air interface technologies in the future.

Telia: Bringing the World Closer through Technology

Reporter: Zhang Ying

Hans Dahlberg, vice president of Telia and head of Telia Global IoT Solutions

Telia is the leading telephone company and mobile network operator in Sweden and Finland. It has operations in all of the Nordic and Baltic contries, and in Central Asia and South Asia, with more than 182.1 million mobile customers. Recently, *ZTE Technologies* interviewed Hans Dahlberg, vice president of Telia and head of Telia Global IoT Solutions. He shared with us Telia's latest development of IoT, new solutions and projects, challenges and strategies, and the current status of IoT in Sweden. He also talked about his expectations for ZTE.

What can you tell us about Telia's latest developments of IoT?

The latest development when it comes to IoT within Telia is that we are actually fulfilling our strategy that we outlined a couple of years back.

The first development is connectivity. Connectivity is at the heart of IoT. We connect products and services across industries and enable customers to reach multiple markets with the same connectivity solution, including SIM, integration and price plan. In addition, we have a dedicated production platform for connectivity, which enables us to deliver the next generation of IoT services. The platform provides automated activation and management of subscriptions, as well as real-time SIM diagnostics and tools to manage costs. What's more, we powered up an international alliance—the Global M2M Association (GMA), which is a cooperation between the leading international tier-one operators.

The second development is that we are in the phase of launching a new product called Telia Sense, which improves car ownerships and makes it easier to check the health of the car, and get traffic information and additional offers from partners joined to the service. Telia Sense consists of hardware to put in the car, an app and a cloud service. It enables owners of old and new cars to connect the car to WiFi and get access to the same smart services. Not only is it easier to check the health of the car, car owners can also get offers from suppliers joined to the service, such as maintenance, car diagnosis and insurance services. This adds value for car owners, drivers, passengers as well as suppliers who join this platform, and creates a whole new eco-system for IoT-services.

The third development is that we created a digital ecosystem. With a strong connectivity base, we're the hub in the digital ecosystem, empowering people, companies and societies to stay in touch with everything that matters. Establishing a digital ecosystem means that it is the first time we create value on data, and I think that's a very important milestone. Normally, we only offer services and send information from point A to point B, but the digital ecosystem is much more than that.

What is the current status of IoT in Sweden?

Sweden is at the forefront of IoT, and I should say that our IoT services are on the foredeck. There is tremendous market growth happening right now in IoT.

There are several factors that have helped Sweden become a mature mobile and internet country. Sweden is the country that helped develop mobile telephones with excellent performance and that built the base for constructing mobile networks. The Nordics is the birth place of Ericsson and Nokia. Mobile broadband has developed rapidly, and mobile phone penetration is very high in the Nordic region. We have quite a long history in telecommunication, and our customers are highly experienced in using internet and mobile phones.

Second, regulatory push is a key factor. The Swedish government and the Europe Union have implemented clear and strict regulations for the telecom sector, and Sweden was the first country to deploy these regulations. Thanks to the regulatory push, we have a very high mobile phone penetration, and a significantly large M2M and IoT market share.

Third, we maintain a good relationship with both big companies and small start-ups. The collaboration between them is the key that has real effect on new technologies and solutions.

What new solutions and projects are you currently working on?

Telia Sense, as I explained it earlier, is one of our new solutions. In addidion to Telia Sense, we are continuously looking into new emerging technologies and possibilities in the field of IoT. Presently, we are focusing on how

new technologies can help our customers shift their business models.

For instance, in a digital world our customters are moving from products to services. With good networks and access, our customers have profound knowledge about billing. Then we could help our customers with billing solutions, so they can increase their revenue through services.

We are also continuously working on digitalization. We believe the digital society is a global movement. When our customers delve into digitalization, they digitalize their companies and shift their business models.

Other new solutions include connected vehicles, connected buildings, connected people, connected money, connected consumer gadgets, connected industrial processes, and connected infrastructure. We are actively working in these verticals.

What are the key challenges you face in promoting IoT?

I think the first challenge is customer awareness. There are so many technologies, but customers need to understand that they have to change their business. In fact, they don't really know how many technologies there are and what kinds of solutions they need. The first thing for our customers to do is a business assessment. How could they change their business based on technologies? I think from our side, what we can do is helping them in this area, because we understand these technologies very well. We have a highly experienced specialist team and management consultancy, and they stay relevant to our customers, to be their window to the connected world.

Second, the challenge is always between new technologies, new business models and opportunities, so I think we are in the phase that we need sales representatives, and they should be able to have business development discussions with our customers. That needs to have, maybe, a different profile.

The third challenge is to have enough resources that could help our customers with this kind of business reengineering. The resource is not only for the telecom industry, but also for the whole ICT sector. In terms of IoT, we need to have data scientists. If we are going to aggregate and analyze data, and do something worthy with it, we need to have these kind of resources. I think we have two major obstacles when it comes to resources, which are management reengineering profiles and data scientists. Now the technology is already there, and we have customers with business set up, so we need to tackle these two obstacles.

What is your strategy to ensure the security of IoT?

Well, our strategy is based on what we need to do when we release our own services. One thing is that we need to do audits in all parts of operations. Another thing is we have strategic partners like ZTE, and we rely on our partners to help us do inventory of the security. We would like to have different partners for various

ZTE is an important partner for Telia, and it is participating in one of our biggest projects now. With ZTE's support, we have delivered various services in different markets.

services, but we form a unified process and optimize it as needed.

I think the security of all systems is very important. We will use all the new technologies we have to ensure security. Sometimes, we even need to invite hackers to test our products. Therefore, we can see that we work in a really secure environment and the products we are selling are really safe.

However, we can't always take full responsibility for all the things our customers do with our products.

How will IoT affect Telia's business?

In my opinion, there are a couple of things affect Telia's business. First of all, IoT is what we call "close to the core". It means that there is a slight difference between IoT services and the typical core services. However, as we all know, IoT ignites possibility and growth. The vast majority of operators are struggling for growth in their current business models, so IoT is of course a growth engine. It begins with rather low figures, but the progression is growing considerably year by year. I believe that IoT will have an effect on our business chain, and help us create value and growth.

Second, IoT ignites innovation, which affects our business in a dynamic way. If we have good IoT solutions, we will have huge advantages as an innovator. With innovative solutions, we can venture into areas close to our core business.

The third aspect is about market decision. If we can help our end customers with their business, they will be more loyal to us, because it is not only about selling subscription and terminals, but also about their business development. We actually help them improve their core business and create new value. By doing this, we create partnership with our end customers, and that is beneficial for both them and for us.

How would you assess ZTE's IoT solutions? What are your expectations for ZTE in the future?

ZTE is an important partner for Telia, and it is participating in one of our biggest projects now. With ZTE's support, we have delivered various services in different markets. This goes to prove that ZTE is a very important partner to us and we can trust ZTE's team. I would like to say that ZTE has done well in Sweden.

Telia and ZTE have a young partnership, we are both entrants in a new market of IoT, and we have an understanding from both sides that there will be a number of challenges. Therefore, we can cooperate with each other to bring new features to our services, and develop new IoT technologies. Together we can deliver cutting-edge IoT solutions with seamless quality to our customers; I think that's maybe the most important thing.

My expectation for the future is that we should explore even more areas. We have a very good roadmap, and our partnerships cover everything from IT consultancy to software development and security. Now we are on a mission to take Telia to the next level and create a new generation telco. To achieve this goal, I hope ZTE can work in close cooperation with us on the next generation products. I truly believe that we are well on our way to achieving this mission.

ZTE TECHNOLOGIES

Airtel is Committed to Network Transformation

Reporter: Zhang Ying

Varaprasad, senior vice president of Airtel

Bharti Airtel Limited (hereafter referred to as "Airtel") is an Indian global telecommunications services company based in New Delhi, India. It operates in 18 countries across South Asia, Africa, and the Channel Islands. Airtel provides GSM, 3G and 4G LTE mobile services, fixed line broadband and voice services depending upon the country of operation. It is the largest mobile network operator in India and the third largest in the world. Recently, *ZTE Technologies* interviewed Varaprasad, senior vice president of Airtel. He shared with us his responsibilities in Airtel, Airtel's contributions to India, the characteristics of Airtel, and his thoughts on NFV, M2M, IOT and 5G. He also talked about his expectations for Airtel in 2016.

Could you introduce to us your role and responsibilities in Airtel?

I'm senior vice president in Airtel, looking after the strategy of core network, planning and engineering. My responsibilities include making strategy, launching new services of core network, and finalizing technology and solutions. I'm also responsible for small cells, indoor solutions, carrier aggregation, data services, and transmission technologies.

As India's second most valuable brand, how does Airtel contribute to the economic growth of India?

In India, the telecom sector is one of the most important sectors to promote the development of GDP. As the largest mobile network operator in India, Airtel has the biggest market share. It contributes immensely to Indian economic growth through its high wired and mobile penetration.

Airtel started its journey in 1995. At that time, India opened its market for wireless, but the telecom penetration was only about one to two percent. Today, our mobile penetration has reached 80 to 90 percent. Therefore, we can say that Airtel is really a big contributor to the Indian society and economy.

What differentiates Airtel from other operators? How do you maintain your competitiveness?

In my view, Airtel has three distinct differentiators. The first differentiator is innovation. Airtel is an innovator in the telecom market from the very beginning. It was the first operator that initiated sharing services in India. It has also initiated Open Network, which is a national network transformation initiative. Moreover, Airtel has opened up its entire mobile network information to its customers through an interactive online interface. The new interface will display Airtel's mobile network coverage and signal strength across India in addition to network site deployment status. Airtel has created a very successful business model, and other telcos are trying to copy our model and rolling out similar products and services.

The second differentiator is our efficiency. One of Airtel's strong points is that we execute projects in a very fast way. For instance, we have completed a very large network project within nine months, so we can deliver services to customers rapidly.

The third differentiator is our business model. We operate networks with a low cost model, which enables us to deliver voice services at the cheapest price. With the rapid increase of data, we provide our subscribers with data services at a low price to win more customers.

Could you tell us about the application of NFV in India?

Actually, we have started doing a series of trials on NFV with wired and wireless solutions. We are also making a few plans on NFV commercial trials. We do believe that as a long-term strategy, NFV will reduce our capital expenditures and is good for the finance of operators. However, we are a little cautious of trying to do it heavily, because we want to see the test results before pushing for large-scale application.

We also see the long range of using virtualized RAN, which regularizes the biggest beamform in core networks. There are some challenges in terms

of transferring it in core networks. However, we firmly believe that in a couple of years, we will be able to achieve the transformation.

We have found that IMS is good to network evolution. We have started to deploy it, and the final stage is going on now. In a couple of months, it will be able to go-life. There is also EPC; we are going to launch it in a couple of weeks.

Machine-to-machine (M2M) and internet of things (IoT) are emerging trends in the industry. What activities is Airtel undertaking to boost them?

M2M and IoT are our main focuses, and we put a lot of emphasis on them. First, because there are a lot of devices that access from one point to more places, M2M is one of the major areas that are related to customer lifecycle management and product lifecycle management. IoT is an area that will help us connect everything, so it is very important for improving customer experience. Currently, our core network access has been successfully transformed, and the process of new services has been simplified. Rather than operators doing customer lifecycle management, we give the flexibility to our customers.

Second, we have simplified tariff management. Since India is a federation that comprises the bulk of the Indian subcontinent and lies atop the Indian tectonic plate, there are many provinces with diverse geographical features. Each signal going into a different geography will be in a roaming site, so it is difficult for us to manage tariff. To overcome this challenge, we try to upgrade the network and simplify the tariff management. By doing this, customers can use any services anywhere in India, and we can also make a lot of benefits.

The third thing what we are trying to do is developing new technologies to ensure future growth. We are deploying a range of innovative solutions including small cells, indoor solutions, Wi-Fi hotspots, and carrier aggregation to improve customer experience. Over the next three years, Airtel plans to deploy over 100,000 such solutions.

5G is a hot topic. What will you do to enable the evolution of 5G?

5G is a breakthrough technology. Whether 2G, 3G or 4G, it was Airtel who brought these technologies to India. In terms of 5G, we are actually looking at it closely.

Currently, we are working on the key technologies

As the largest mobile network operator in India, Airtel has the biggest market share. It contributes immensely to Indian economic growth through its high wired and mobile penetration.

of 5G. We have done a few preliminary trials on 5G technologies. We demonstrated the carrier aggregation from 200 Mbps to 400 Mbps, and tested it in two markets in India. In the future, Airtel will focus on standards and products development, and promote the ecosystem to accelerate commercialization of 4.5G and 5G technologies. What's more, we will work for validation practices including network equipment, features and new releases, and conduct the proof of concepts as well as trials.

What are your expectations for Airtel?

In the last few years, Airtel has captured the biggest market share in India, investing over INR 15,000 crores across India in deploying over 88,000 sites. This is the largest network deployment anywhere in the world outside of China. What's more, we transformed our core network last year.

My expectations for Airtel are: first, we are going to further consolidate the core network in the market. As there are a lot of unsaturated markets, we will try to consolidate more networks, being the leader in India.

Second, we will further invest in a lot of mobile networks and core networks, with the aim of expanding coverage and enhancing capacity of 3G and 4G networks in Asia and Africa.

Third, we will continue to work on our network transformation program—Project Leap. It is a strategic company initiative aimed at perceptibly improving our network quality and delivering the best customer experience.

Hatif Libya:

Creating a Communication Environment with Advanced Services and Technologies

Reporter: Zhang Ying

Dr. Mohmoud Aujali, chairman of Hatif Libya

Hatif Libya has been established upon a decision from the Secretary of the Board of Directors of LPTIC since 2008, for purposes of operation and maintenance of the State systems and the development of a national phone network. It includes local systems represented in the transit switchboards, secondary switchboards, connection parameters within cities, providing all services to subscribers. Recently, *ZTE Technologies* interviewed Dr. Mohmoud Aujali, chairman of Hatif Libya. He shared with us Hatif Libya's focuses, his thoughts on FTTX and LFON projects, and future plans. He also talked about his expectations for ZTE.

How would you describe Hatif Libya's focuses today?

Today, Hatif Libya focuses on network performance, network capacity and network stability. These are the most important issues for us. The strategy of Hatif Libya is raising the performance level to meet the international standards, so network performance is always our priority. Network capacity is a key issue that impacts data center, and network stability affects network performance. By improving network performance, increasing network capacity, and enhancing network stability, we can deliver high quality services to our customers.

What's the significance of national FTTX and LFON projects?

The LFON project has existed in Libya for more than 10 years. It is a key telecom project, and its main function is to protect Libyan phone networks. In my view, this project provides Libya with one of Africa's most widespread fibre optic backbones, which enables Libya to interface with neighboring countries. In addition, it supports the economic growth and social development of Libya.

The FTTX project is in great demand in Libya. With the evolution from voice to data, our customers are demanding more and more data and traffic. As the use of mobile internet devices such as smartphones continues to grow, more and more subscribers want to access high volume data and internet applications such as video. In the future, video-based applications will continue to dominate network bandwidth needs. Therefore, we have to pay more attention to data communications.

FTTX includes FTTN, FTTC, FTTB, FTTH and FTTP. Hatif Libya endeavors to grasp the latest FTTX technologies to satisfy customers' increasing needs for data. Actually, we have wireless solutions, but they are not sufficient to deliver the services that customers look for. In my view, the FTTX project is one of our key strategies; it is not for one or two years, but for a very long time.

Since 5G, IoT and big data are emerging trends, what are Hatif Libya's plans for the next five years?

Yesterday, we deployed 3G network; today, we are working on 4G technologies; tomorrow, we will focus on 5G. This is a mainstream trend.

For Hatif Libya, the first plan is to deploy core networks. Now, we have 10G and 40G. However, with the growth of bandwidth-intensive applications, such as virtualization, video on demand, social networking, and voice over IP, 10G and 40G is no longer enough. Currently, what we are looking for is to upgrade 10G/40G to 100G.

To upgrade our network from 10G/40G to 100G is not easy. There are several aspects that have to be considered. First, the switch clocks need to be synchronized. Second, the latency is required to remain at reasonable levels. Third, the existing network infrastructure has to meet the increasing bandwidth demands.

Our second plan is to upgrade the gateway, because the gateway is the first point to deliver data services to our customers. In fact, we have made many efforts on the gateway, and we have made a concrete plan for the next two years.

The third plan is about the migration from 2G to

ZTE did a very good job in Libya, and we are very appreciated for ZTE's contributions. ZTE provides Hatif Libya with advanced technologies and first-class products and services.

4G LTE. As our society has become data-centric, 4G LTE delivers more capacity for faster and better mobile broadband experience.

The last plan, as I mentioned before, is FTTX project. We plan to deploy it very soon.

What is the biggest challenge you face?

Our biggest challenge is to reconstruct the infrastructure. As you know, considerable telecom infrastructure was destroyed during the civil war in Libya, and the telecom sector was disrupted at that time.

Later, the government made massive investments on infrastructure reconstruction. We hope this challenge can be tackled soon. Of course, Hatif Libya will invest on network equipment. We will focus on access equipment and deploy integrated core networks according to the population of different cities.

How do you comment on ZTE's delivery and O&M capabilities?

We are satisfied with ZTE. As a global leader in telecommunications and information technology, ZTE did a very good job in Libya, and we are very appreciated for ZTE's contributions. ZTE provides Hatif Libya with advanced technologies and first-class products and services. In addition, it has a very extensive delivery capacity that enables us to complete projects smoothly. ZTE's O&M capabilities are very good. ZTE has introduced some innovative O&M solutions to help us improve O&M efficiency.

What are your expectations for ZTE in the future?

ZTE entered Libya's telecom market in 1995. After more than 20 years of hard work, ZTE has laid a solid foundation for further development in Libya. We consider ZTE a long-term strategic partner rather than a vendor for just one or two years. Therefore, we hope ZTE will pay more attention to customer care and knowledge transfer in the future. Because Hatif Libya strives to seize more market share, we need to improve customer experience with ZTE's assistance.

Nowadays, the competition in the telecom market is increasingly fierce, and the information technology is evolving rapidly. We need to struggle and survive in the market, so I hope ZTE can cooperate with us closely, and look at ways to eliminate our pain points. By doing this, I believe we can create a win-win situation together.

Building Complete CEM Capabilities for Operation Transformation

By Zhou Yong, Hu Bing

Smart devices and internet applications are flourishing in the M-ICT era. The traditional network-centric operation model is facing many challenges. In this case, it is particularly important to redefine customer experience from comprehensive user perspectives (full-service and full-channel) in the entire lifecycle of using operator services and to improve user loyalty to and satisfaction with telecom services.

As a trusted partner for many operators, ZTE has put forward its advanced managed services (MS2.0) solution to help them transform operations, enhance user experience, create business opportunities, and maximize revenues.

Building a Complete CEM System

Nowadays, telecom services are rapidly evolving from guaranteeing network performance to guaranteeing service quality and finally to guaranteeing customer experience in the full service lifecycle. After years of operations, telecom operators have reached a high level of network O&M and QoS. They can hardly make significant improvements and have therefore changed their focus from network quality, service quality, and other equipment and service indicators to customer experience, customer satisfaction, and other customer experience indicators. Their operational perspectives have also changing from network-centric operation to customer-centric operation. In this process, a major issue for operators is to build customer experience management (CEM) capabilities to effectively evaluate and enhance customer experience. ZTE has rolled out its MS2.0 solution to assist operators in establishing a service operations center (SOC), create CEM-centric core competitiveness, and drive operation transformation.

ZTE's MS2.0 solution focuses on complete customer experience management (Fig. 1).

- It builds a complete user-centric operation system and management view to ensure smooth front-to-back -end operations.
- It provides full-channel experience management for operators' front-end organizations including markets, channels, and customer centers.
- It provides full-service experience management for operators' three major businesses: wireless, broadband, and video.
- It implements full-lifecycle

Zhou Yong
Vice Director of Service Product Department, ZTE

Hu Bing
Service Solution Director, ZTE

experience management throughout the whole process of using operator services by customers.

Implementing End-to-End CEM

ZTE's MS2.0 is a customer experience management solution that listens to real end-user experience, delivers it to each customer operation center in a timely manner, and handles the poor customer experience issues in a closed loop through the end-to-end CEM procedure. In this way, user experience and loyalty can be effectively enhanced.

Customer Experience Evaluation

Customer experience is an important indicator to measure user loyalty. It is inseparable from corporate revenues and can effectively reflect a company's sustainable profitability. The creation of the customer experience theory has aroused widespread concern across all industries.

By building an operation model driven by customer experience, ZTE can help operators establish an interactive bridge between front-end and back-end departments to effectively improve customer experience and user retention rate and to ultimately increase their revenue.

Complete CEM Solution

ZTE's complete CEM solution has the following attractions:

- Listen to real customer experience to establish a complete CEM system. How to

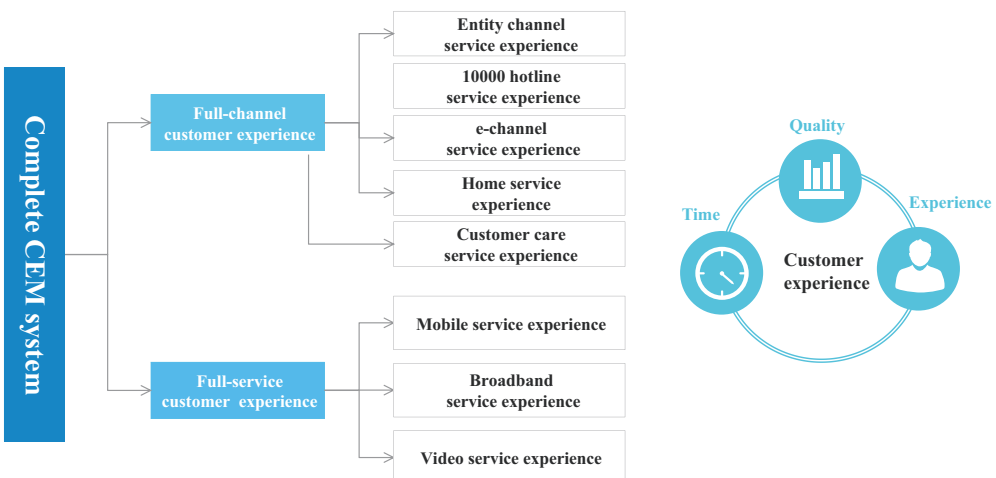


Figure 1. A complete CEM system.

experience by focusing on service quality. Some manufacturers add certain content about customer satisfaction, but there is still a lack of a full-service full-channel customer experience evaluation system. ZTE starts with users' telecom service usage and full-lifecycle touch points to evaluate customer experience throughout the full lifecycle covering customer learning, acquirement, usage, evaluation, and renewal of telecom services. Two dimensions are creatively introduced: telecom services and customer groups. ZTE has brought forth the magic cube concept of telecom customer experience evaluation and has established a three-dimensional (full-service, full-channel, full-lifecycle) customer experience evaluation system. The system segments experience data according to different customer groups and services throughout the whole lifecycle of using telecom services by customers. It defines and evaluates customer experience from different segments and dimensions. The complete CEM

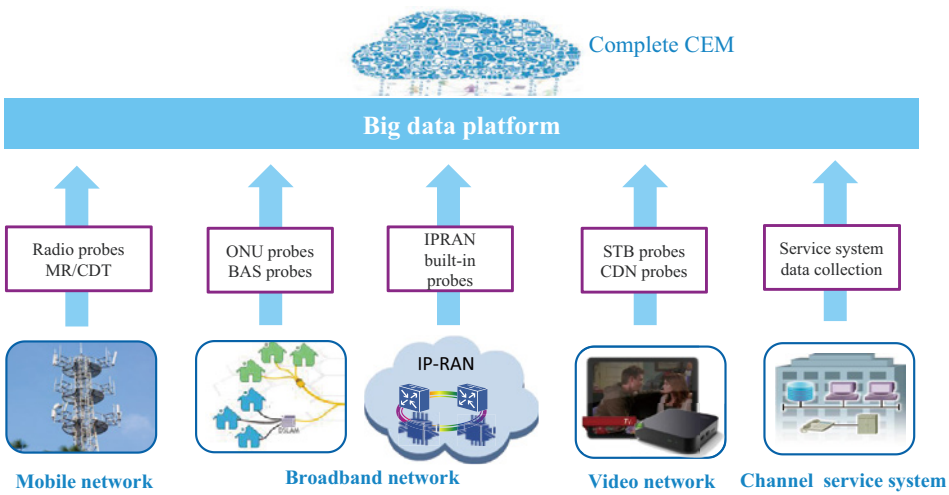


Figure 2. CEM big data platform.

evaluate and improve customer experience has been a challenge to telecom companies and also a major problem that has troubled business operation. Nowadays, there are many customer experience systems in the industry, and most of them evaluate customer

evaluation system enables full-service, full-channel customer experience management for telecom customers, maximally restoring real customer experience.

- Create a complete multivendor-supported CEM big data platform to enhance customer

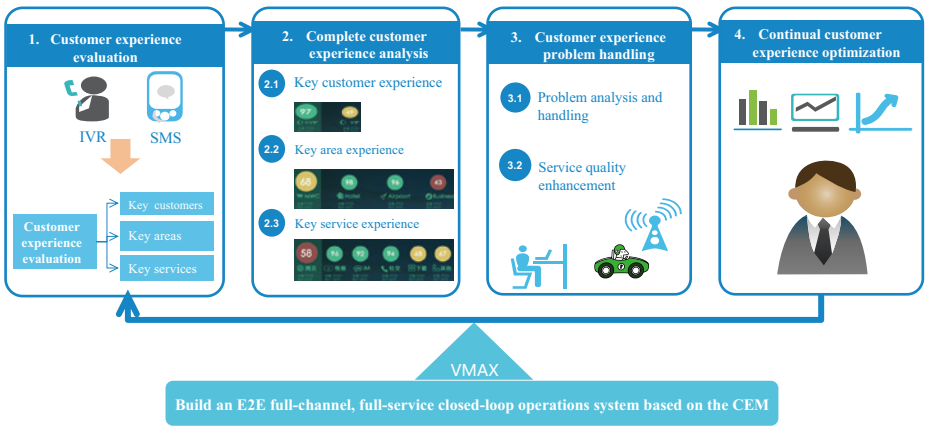


Figure 3. CEM centric closed-loop workflow.

experience. By solidifying the CEM evaluation system centered on customer experience cube, ZTE has developed a full-service, full-channel, and full-lifecycle customer CEM big data platform that can help operators implement real-time monitoring and automatic analysis of customer experience. The platform deploys data probes and develops data interfaces with multiple vendors to extract the data that affects customer experience from network and service systems supplied by multiple vendors (Fig. 2). It performs real-time monitoring and evaluation of customer experience from the aspects of full services and full channels throughout the whole telecom service lifecycle. Moreover, based on the evaluation indicator system established by ZTE, the platform can locate and handle the problems that affect customer experience so as to completely enhance CEM capabilities for operators.

- Assist operators in building a SOC-centric CEM closed-loop workflow to drive operation transformation. With the complete customer experience evaluation system and multivendor-supported CEM big data platform, operators establish a dedicated SOC so that they can develop core capabilities for customer experience evaluation, analysis, and enhancement. They can also adjust their organizational structure and workflows to set up a CEM-centric closed-loop workflow for customer experience evaluation and enhancement (Fig. 3). The closed-loop workflow helps operators fulfill continuous customer experience optimization. Based on customer experience, operators can drive the transformation from network and service centric operations to customer experience centric operations. Through the optimized operations, telecom companies can significantly increase their operating profits.

Conclusion

ZTE's MS2.0 managed service solution contains a customer experience evaluation system, a customer experience analysis big data platform, and a service operations center. A CEM centric closed-loop workflow can be established for customer experience evaluation, analysis, and enhancement. All this helps operators fulfill the goal of operation transformation. ZTE will continue to work with operators worldwide in strategic cooperation and joint innovation to build a valued operations system that will help them achieve optimized operations.

Automatic Fault Demarcation and Localization

Based on Customer Experience

By Xu Baode, Wu Jiangtao

With the development of data services and the evolution of network structures, the traditional network fault analysis can't adapt to the current rapid changing network environment; therefore, reform is the general trend.

To date, big data has enabled operators to handle mass data rapidly through a distributed parallel big-data processing mechanism, which lays a technological foundation for operators to analyze, demarcate and locate faults based on customer experience rather than network.

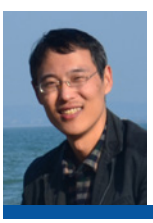
Basic Idea of Fault Demarcation and Localization

Customers are generating various service data from time to time. When a service fails, it is necessary to find out the causes. In the traditional pyramid (top-down) analysis, we first get the proportion of index error from upper layers to lower layers of the network. Generally, the analysis is in the following sequence: the entire network → network elements (NEs) of the core network → the indexes of the radio cells interacting with the NEs of the core network.

After the trouble spots with bad indexes are determined, we then obtain the original call detail records (CDRs) and original signaling to analyze and determine the fault causes.

The traditional pyramid analysis has the following disadvantages:

- It is started from the upper layer index, which is a comprehensive calculation result of a large number of samples. Thus, the index is not sensitive to a few errors.
- It heavily depends on isolated points. Thus, it is inefficient when the differences among indexes are not so obvious.
- The 4G network is flat, the core network devices are organized in a pool, and the hierarchical relationship among network devices has become more complex. Therefore, it is difficult to locate faults level by level.
- It is not intuitive enough to present



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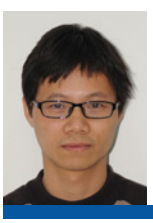

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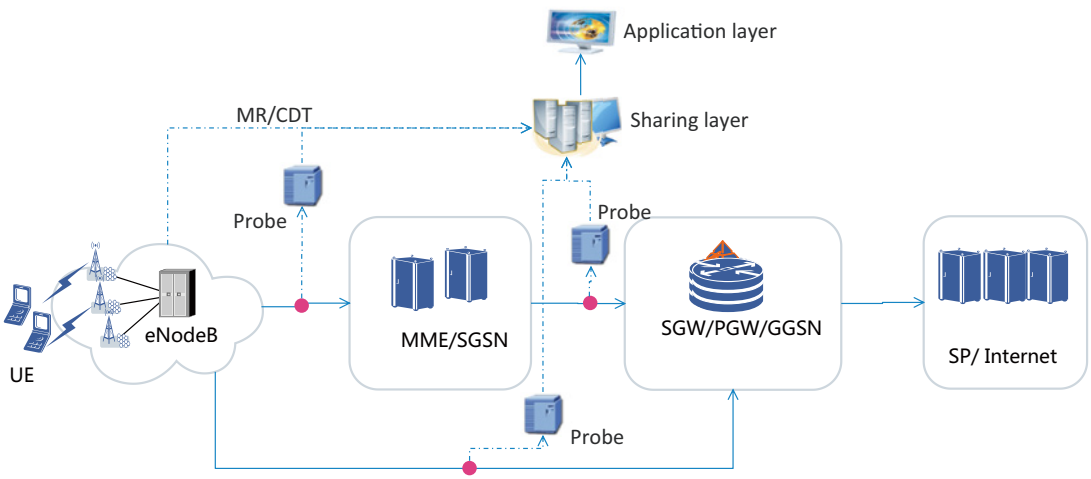


Figure 1. Big data sources.

abnormal indexes, and much manpower is required to demarcate and locate the faults.

Therefore, the pyramid analysis can't meet the requirements of network evolution. Operators need a new fault demarcation and localization technology, which is customer experience-oriented and based on big data analysis. Compared with the traditional pyramid analysis, the new one is called reversed-pyramid (bottom-up) analysis.

With the reversed-pyramid analysis, the trouble spots with bad indexes can be directly demarcated and located in accordance with abnormal CDRs, and then the fault causes can be determined. In other words, the NEs to be optimized can be deduced from root causes.

The reversed-pyramid analysis is started from the original CDRs. Each CDR is checked to see whether it is normal. If not, the following questions need to be answered: what are the errors? which KPIs and services are affected? what are the causes of the errors? After analysis, all abnormal CDRs and error causes can be determined.

Data Collection and Processing

As the data at the radio side is eNodeB interconnection data, probes are not required in data collection and processing, and the eNodeBs of different vendors can be interconnected through public or private interfaces. The control-plane and user-plane data at the core network side is collected through probes, not restricted by equipment types or vendors. The collected data is output to the big data platform, on which data association, cleansing, and statistics are implemented (Fig. 1).

After data is collected to the big data platform, the CDRs of the core network are associated with the radio side, and end-to-end CDRs are generated and saved. Then, data is analyzed by the reversed-pyramid method. Because a fault may occur at different stages of a service, each stage needs to be checked.

- Determine whether the radio indexes are normal. If not, the number of fault causes at the radio side is incremented by one.

- Determine whether the internet DNS/SP node is faulty at the internet side. The interaction and changes (in busy hours and idle hours) of DNS, TCP and GET needs to be analyzed. If there is any error, the number of fault causes at the internet side is incremented by one.
- Check the indexes of NEs at the core network side, including SGW and MME, throughout the day and their changes in busy and idle hours. If there is any error, the number of fault causes at the core network side is incremented by one.
- Periodically maintain and update the information of a faulty UE at the UE side. (Note: A UE is faulty if it has had bad indexes within a certain period continuously.) If the UE fault can be found in the faulty UE information table, the number of fault causes at the UE side is incremented by one.

If no faulty node is found in the above process, it is concluded that the fault is due to other causes.

After the above analysis, statistics on the abnormal CDRs is collected to produce useful data, including the proportion of problems at different stages, the proportion of causes at different stages, numbers of users and CDRs affected by each faulty NE and area. In other words, the severity of problems is quantified to provide reference to determining whether an area is faulty.

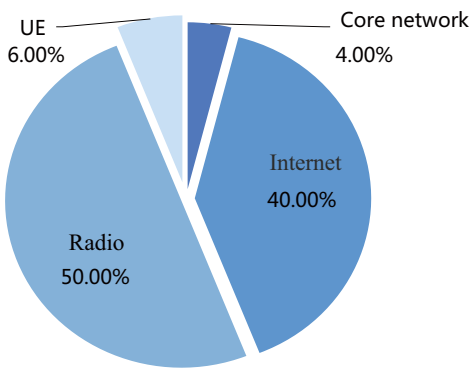


Figure 2. The proportion of causes for abnormal CDRs.

Application

Figure 2 shows the proportion of causes for abnormal CDRs obtained from the big data platform of a province of China. Most faults are occurred at the radio side and internet side.

- At the radio side, automatic fault demarcation and localization indicates that most faults are due to weak coverage.
- At the internet side, automatic fault demarcation and localization indicates that most faults are due to the remote distance of some foreign SPs, and packet loss and heavy load of some domestic SPs during network transmission.
- At the UE side, it is found that most errors occur on MI handsets. An investigation on consumer groups shows that most of MI handset users are youths. According to a data service statistics on MI handsets, about 55% are instant communication and webpage services, about 10% are large-traffic services such as video and download services, and about 35% are other services.

As the traffic of instant communication and webpage services is relatively small, the measured rate indexes are not high. Though the core network has a stable performance, it sometimes may have load problems in busy hours. Therefore, the results of fault demarcation and localization provide evidence for operators to dispatch lists and solve problems.

Conclusion

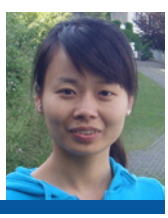
The automatic fault demarcation and localization is one of the core technologies of automated network fault analysis, automated network optimization, and unmanned network optimization.

With more than 30 years of experience in terms of network optimization and delivery, ZTE boasts an advanced problem-analysis-experience knowledgebase with mass data and analysis logic. As the big data and artificial intelligence developed, ZTE will surely help operators improve user experience in the future.

ZTE's SOC Improves Operator Revenues

By Chen Shenglan, Yu Chunchun

Chen Shenglan
Service Solution Manager, ZTE



Yu Chunchun
Service Product Manager, ZTE

With the development of mobile internet, OTTs are grabbing a bigger slice of the telecom market. It has become one of the most important challenges for operators to take effective marketing initiatives to attract new users and increase service usage.

ZTE has proposed the customer experience-centric O&M concept and developed service operations center (SOC). ZTE's SOC includes service indicator system, SOC platform, SLA system and architecture change system.

Relying on its big data analysis capabilities, in accordance with business needs of operators, ZTE taps the value of massive telecom data, and provides accurate marketing recommendations for operators to improve operating revenues.

This article describes three dimensions of how ZTE's SOC help operators improve operating revenues: channel distribution guide, package marketing, and terminal marketing. Channel distribution guide provides data for operators based on user resident area identification and traffic distribution, so that operators can achieve the highest return on investment (ROI). Package marketing and terminal marketing reduce potential marketing user groups through user attributes and behavior analysis, and then operators can carry out precision marketing with limited resources.

Focusing on User Distribution for Channel Distribution Guidance

Currently, the ideal channel distribution principles involve overall layout, user orientation, supply-and-demand matching, reasonable input and output, and key areas priority. How to implement these principles is the key for operators to select channel distribution programs.

Generally, operators select outlets based on regional pedestrian flow and the commercial nature of stores. The areas with large stream of people and stores with relevance to the telecom industry are usually selected for channel distribution. However, from the viewpoint of the operational effectiveness, the operating conditions of some channel outlets are not ideal .

In this case, ZTE's SOC provides accurate recommendations for operator channel distribution through user resident area identification, which identifies user resident areas by analyzing user frequent resident cells, the most commonly-used services, and usage periods.

The user resident area distribution and high-traffic base stations distribution enable operators

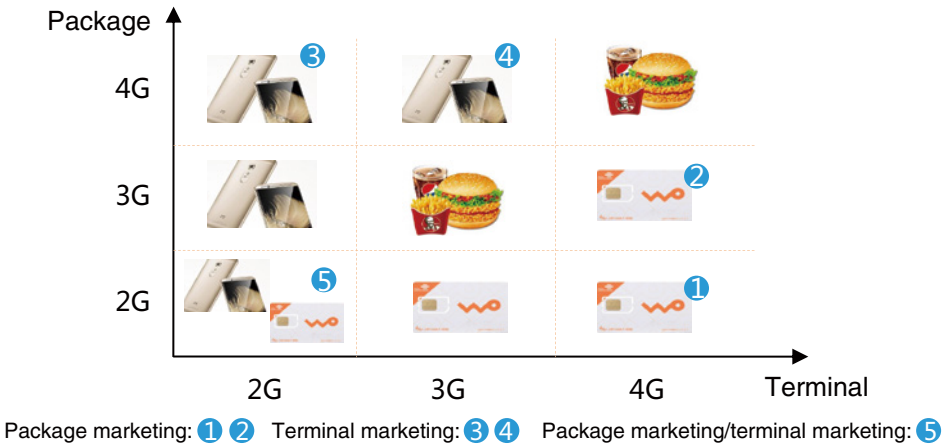


Figure 1. Package and terminal marketing strategies.

to verify the rationality of existing channel outlets, and indicate new channel outlets. Some operators established new channel outlets based on ZTE's recommendations, and the success rate of user service subscription has been improved significantly.

Multi-Dimensional Analysis for Precision Marketing

In terms of marketing support, ZTE's SOC taps new value growth points from the existing users, analyzes their attributes, voice calls, internet use behavior, service preferences and terminal information according to network side data and user side data, and explores potential user groups to put forward marketing recommendations for operators.

The multi-dimensional analysis is implemented by the following steps:

Segment Users

According to service packages and terminal types, users are divided into nine groups, including 2G-package 2G-terminal users and 2G-package 3G-terminal users. Different marketing strategies are made for different user groups (Fig. 1).

Set Feature Vectors and Standard Values

- Traffic usage: Through comparison, the users whose average monthly traffic is much higher than their package traffic are identified as the objects of upgrade. In addition, 2G/3G terminal users with high-traffic can be set as the objects of terminal marketing.
- User age distribution: Considering consumption capacity and difficulty of guiding users in different ages, users are divided into three groups: the young, middle-aged, and elderly. The marketing is conducted in accordance with user priority.
- ARPU distribution: Through comparison, the users whose ARPU is much higher than their package fees are identified as the objects of upgrade. ARPU also indicates user consumption capacity, and serves as reference for terminal upgrade.

Operators can customize feature vectors and standard values according to different user groups, and finally select the potential objects of package upgrade and terminal marketing in multiple dimensions (Fig. 2).

Package Marketing

Package marketing targets three user groups:

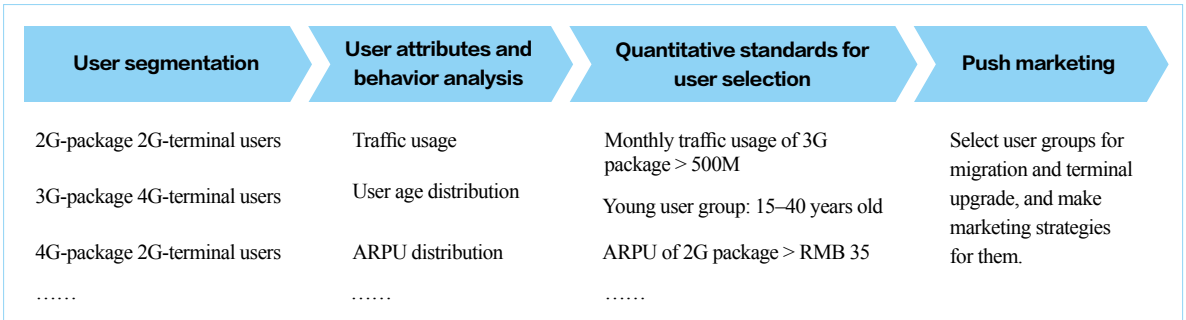


Figure 2. Potential marketing objects selection.

2G-package 2G-terminal users, 2G-package 4G-terminal users, and 3G-package 4G-terminal users.

- First, by analyzing users' ARPU, in accordance with users' package fees, the user groups whose average monthly consumption is much higher than their package fees are identified.
- Second, according to users' traffic usage and voice service habits, the packages with a higher matching degree are selected, and accurate recommendations are made for potential users.
- Finally, the marketing is conducted based on user priority, which is determined by user age.

For instance, to develop the internet surfing habits of 2G-package 4G-terminal users, the users (from 15 to 55 years old) whose monthly traffic usage is more than 100 MB and monthly ARPU is more than RMB 50 are selected as marketing targets, and the marketing is conducted according to user priority: level 1: 25–35 years old; level 2: 15–25 and 35–45 years old; and level 3: 45–55 years old.

This strategy has been adopted by operators, and some of the 2G-package users have been upgraded. Compared with random call inquiry without data analysis, the marketing success rate of operators has been greatly improved.

Terminal Marketing

Terminal marketing can bring high returns for operators. It enables operators to reduce costs through centralized procurement and expand user base with high terminal subsidies. In addition, terminal marketing of the existing users optimizes the terminal structure, thereby enhancing the penetration of high-end terminals.

ZTE's SOC explores potential users for terminal upgrade by analyzing terminal types and user traffic. Considering the terminal costs and subsidies, as well as package fees and user age, ZTE's SOC identifies the marketing objects, optimizes the marketing process, and develops users' internet use habits through terminal upgrade, thereby improving customer experience and user loyalty.

For instance, to improve the customer experience of 4G-package 2G-terminal users, the users (from 20 to 45 years old) whose monthly traffic usage is more than 100 MB and monthly ARPU is more than RMB 75 are selected as marketing targets, and the marketing is conducted based on user priority: level 1: 25–40 years old; level 2: 40–45 years old; and level 3: 20–25 years old.

In some regions, 2G-terminal users with low package fees take a relatively high proportion. By analyzing data and terminal subsidy policies, ZTE's SOC enables operators to identify the user groups for terminal upgrade and implement precision marketing with limited resources, so as to increase the success rate of marketing.

Summary

In the mobile internet era, data is the most valuable resource. Operators boast massive network and user data, which will become the trump card to create more value. ZTE is willing to help operators explore data value and improve operating revenues.

Virtual DT:

An Innovation in Drive Test for Cost-Efficiency

By Yao Xiaobing, Li Jingtao

With the rapid development of telecom businesses, it is more difficult and expensive to optimize networks in a traditional way due to the expanding network size, increasing types of services, and a growing number of users. There is a pressing need for a revolutionary solution to network optimization. ZTE has launched its virtual drive test (DT) solution that fundamentally transforms traditional network optimization by building high-quality networks cost efficiently.

Traditional Network Optimization

Drive test is indispensable in network optimization. In a traditional drive test, professional testers drive along target routes and collect network coverage data through continuous and field tests with special instruments. The traditional drive test is inefficient and accounts for about 45% of the total cost for the network optimization project. Moreover, the test has specific requirements on test instruments and testing skills, and also the collected data has a certain limitation.

Innovative Virtual DT

ZTE's innovative virtual DT technology changes fundamentally the way of drive test and brings considerable benefits to operators in terms of cost and efficiency. Based on real user data, virtual DT obtains and analyzes massive wireless network MR data with latitude and longitude information, associates them with call detail trace (CDT), fits them to defined routes, and produces through the GIS presentation the same effects as a traditional DT does. Virtual DT provides wireless network coverage analysis solution without the need of actual drive test. The solution covers wider areas and is more close to real conditions of end users.

Virtual DT is implemented in the following steps:

- Define routes: Based on the imported maps and historical DT data, virtual DT divides complex urban roads into grids and defines them.
- Extract data: Virtual DT selects and filters the data with AGPS information from massive MR data continuously

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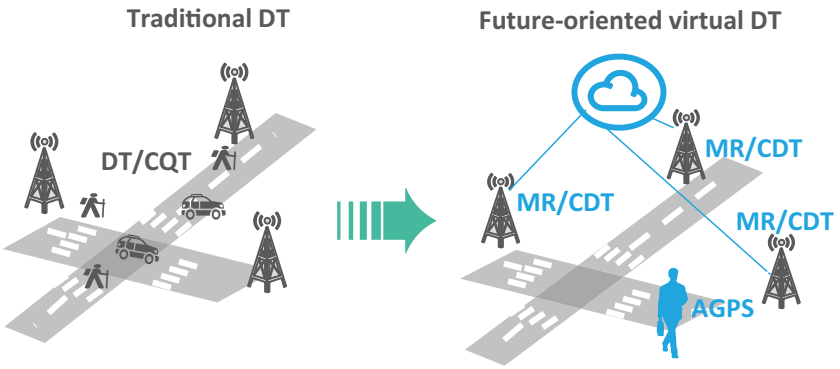

Figure 1. Innovative, convenient, and economical VDT methodology.

reported by mobile phones of people on the roads or in running vehicles, associates them with CDT, and matches them to the road grids. Because of the high precision of AGPS data, the AGPS-based user location can really reflect quality of the current network.

- Present the result: Based on the coverage shown on the GIS map, abnormal events, and other related information, virtual DT puts the filtered data into statistical analysis and accurately evaluates network performance.

ZTE's virtual DT technology allows any person and terminal to be a data source for virtual drive test. This greatly minimizes DT's dependence on testers and instruments, enhances cost competitiveness, and really makes possible drive test anytime and anywhere.

Difference between Virtual DT and Traditional DT

Virtual DT is a leading innovative wireless coverage analysis solution aimed at helping operators improve their network O&M efficiency. The solution can partly replace traditional DT. ZTE's VDT focuses on wireless coverage analysis and RF optimization. The differences between virtual DT and traditional

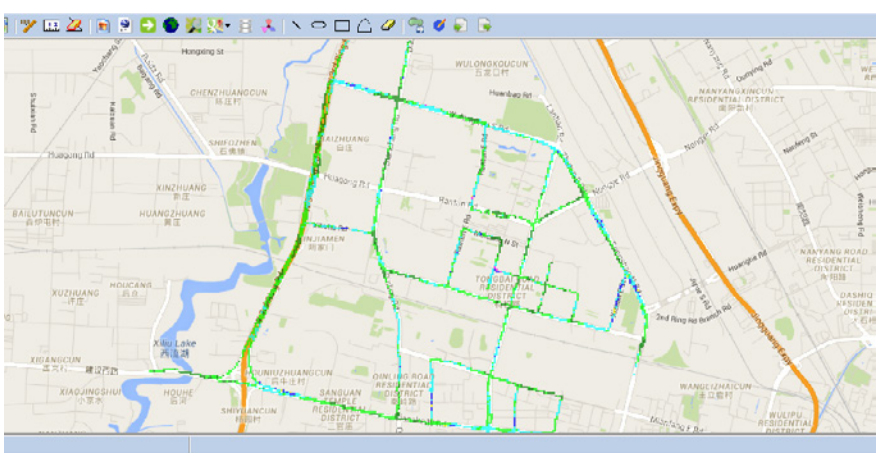

Figure 2. A GIS view of coverage provided by virtual DT.

Table 1. The difference between virtual DT and traditional DT.

	Virtual DT	Traditional DT
Tools	Wireless network optimization platform	DT software, analysis software
Data source	Massive MR data with latitude and longitude information	Data reported by individual test terminals
Analysis areas	Outdoor scenarios	Roads accessible by vehicles
Function items	Coverage analysis (including uplink measurement information)	Coverage analysis (without uplink measurement information), event analysis, throughput analysis
Other resources	None	Testers, test tools, vehicles

DT are shown in Table 1.

The wireless network optimization platform is more stable than DT software and analysis software. Virtual DT uses more abundant data sources covering a wider range of network issues, and its areas for analysis are wider than those of traditional DT. Virtual DT supports key indicators analysis. It can be completed without additional labor or vehicle costs.

Table 2. Statistical analysis of efficiency and cost of virtual and traditional DT in the project.

	Drive tests (month)	Manpower (person–month)	Cost (yuan/month)
Traditional DT	8 tests/cluster	3	66000
Virtual DT	4 tests/cluster	1.5	33000
Efficiency increase/ cost saving	50%	50%	–33000

Application Case

The LTE network O&M optimization project of an operator has 3051 eNodeBs in total (669 of them in the core areas). Because of the growing number of users and the increasingly active online users, coverage has gradually become one of the main bottlenecks that affect network quality. To operate and maintain the network efficiently, the operator introduced ZTE's revolution of network performance management (RoNPM) service that could analyze and optimize network coverage for three months in the core areas using the virtual DT technology.

A total of 48 areas with coverage problems were found during the three months of coverage analysis and optimization. 33 areas with the coverage problems were under RF optimized adjustment, and 15 new sites were suggested to be built. With the introduction of ZTE's virtual DT solution, the operator reduced the number of monthly average drive tests to four tests/cluster from the previous eight tests/cluster. This greatly reduces DT costs as shown in Table 2. ZTE's virtue DT technology allows operators to significantly improve their network quality and double their DT efficiency while reducing costs by 50%.

M-ICT 2.0: VOICE for a Digital Future

By Wang Xiang

The ICT industry develops dramatically. Anything that can be connected in the world will be made digital and interconnected to support future digital economy. The coming digital era will be defined by ubiquitous intelligence across all aspects of our lives. The most prominent trends will be big data and artificial intelligence (AI), and underpinning all the changes is the increasingly pervasive range of cloud computing platforms and services.

The emergence of the sharing economy and massive use of peer-to-peer networks have shown the way forward for businesses of all sizes. In response to this rapidly changing and dynamic landscape, ZTE has put forward its M-ICT 2.0 strategy that can help businesses seize opportunities in the new digital era.

Insights and Strategy

ZTE has insights into five key trends that will influence and determine future industrial development. These trends are virtuality, openness, intelligence, cloudification and the internet of everything, encapsulated in the acronym VOICE. They will drive innovative collaboration and concurrent advances across various fields (Fig. 1).

ZTE believes that digital transformation will reach a critical stage of development within the next five years, with VOICE being the core foundation. Core elements such as manpower, material, process and data will be more connected within and between corporations; collaboration and interactions will be more efficient; and open collaboration and sharing will propel a major shift in business models.

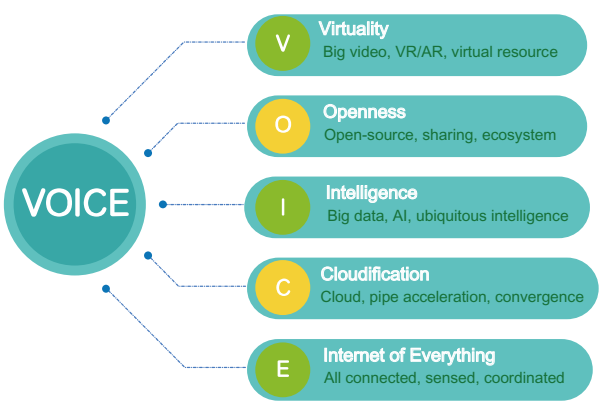

Figure 1. Definition of VOICE.

In terms of user experience, the internet of everything enables information transfer and sharing through connected individuals, making it easier for people to perceive and act in the physical world. This flow of information helps create a virtual world with greater freedom of expression that pushes the experience to new heights.

With a combination of virtuality and reality, people can use virtual technology to reinforce their cognition and transformation of the physical world. Living in an increasingly complicated world mixed with virtuality and reality, people also need a simpler and easier way to manage their lives. Thus, greater intelligence stands out as an essential element in this digital future.

The concept of "all things digital" generates big data and builds environments for machine learning, while the internet of everything provides objects for artificial intelligence. The idea of "everything is connected, perceived and intelligent" helps people significantly increase productivity as well as quality of life.

The next five years will be critical

ZTE has insights into five key trends encapsulated in the acronym VOICE: virtuality, openness, intelligence, cloudification and the internet of everything, which will influence and determine future industrial development.

—**Wang Xiang,** Director of Strategy Planning Department, ZTE Corporation

in the ongoing global economic transformation towards an open, sharing, and digital economy. The VOICE concept will have a far-reaching impact on businesses and propel them into a new user-centric, technology-based, and business model-driven digital paradigm (Fig. 2). The internet of everything, intelligence, and virtuality represent requirements; cloudification provides technical support, and openness means new business models. All of them work together to result in the reconfiguration of R&D models, industry supply chains, and the overall value network.

ZTE will focus on the five trends of VOICE in the coming five years to develop its products and services. This will require extensive collaboration with users, partners and industries to achieve sustainable ICT development.

Virtuality

Virtuality means integration of physical and virtual worlds to enhance user experience through big video, VR and AR. Traditional customer requirements are oriented to functions and performance. Today customers pay more attention to optimal experience. Experience can be improved in two aspects: optimizing user experience (from abstract text, vivid picture to big video with 8K super HD resolutions) and improving interactive experience (from keys, touch screens to voice, gesture, and VR/AR interaction). Big video plus VR/AR applications will enhance the virtual world and create a more vivid experience. Big video has been widely applied in many industries, and VR/AR is expected to become the next-generation computing platform.

ZTE determines to grasp these emerging opportunities. For big video, ZTE will focus on the network and service platform, extend video conferencing applications, increase the use of multimedia chips and penetrate into the high-value video ecosystem. ZTE will also enhance VR/AR technology foundations through terminal and cloud integration, channel optimization, and more targeted industry focus.

Openness

Openness refers to the transition from traditional competition-based business model to close collaboration on an open basis. Business models are critical in innovation, and their innovation drives enterprise growth. Therefore, business models must be considered in the top-level design of the enterprise development strategy.

ZTE considers that openness is the core philosophy in business model innovation in this digital era. Openness involves development in open source, ecosystems, and the sharing economy. It will bring about a reconfiguration in R&D models, industry supply chains, and the value network.

ZTE determines to adopt three-reconfiguration strategy for business model innovation in three major fields: open sources, ecosystems, and sharing economy. ZTE will focus on open source communities in the operator, chip, and ICT infrastructure domains, and develop ecosystems in terminal, smart city and IoT fields. Regarding to the sharing economy, ZTE will pay attention to transformation opportunities, enable the transformation, and run it if necessary.

Intelligence

Intelligence will be ubiquitous and interactive in the future society. Artificial intelligence will be upgraded rapidly and will even surpass the intelligence of human beings. ZTE divides intelligence development into four levels: basic intelligence, computing intelligence, perception intelligence, and cognitive intelligence. Basic intelligence is initiated by sensors appearing everywhere and supporting smart hardware. Computing intelligence supports data mining where data is processed and analyzed to build the basics of the digital economy—big data apps. Perception intelligence means to enhance human auditory and visual sensation. Cognitive intelligence is to drive self-learning and conscious decision-making.

ZTE has adopted relative policies to grasp the opportunities of intellectualization:

- Use various perception technologies, especially machine vision and natural language processing, to offer integrated solutions.
- Focus on chips, OS, and modules related to intelligence processing to enable smart hardware and terminals.
- Focus on big data platforms and cloud infrastructure for exploring key industrial operations and the value of big data.
- Accumulate operational capabilities for the cognitive platform.

Cloudification

Cloud computing has pushed the development of IT applications of various industries in terms of technical architecture and business model. The traditional IT application architecture is shifting to cloud architecture. The business model for enterprise IT systems will gradually change from self-build and self-maintenance to public cloud and hybrid cloud service. Cloud computing not only changes enterprise IT architecture and business models but also drives telecom networks to evolve towards software-defined, flexible, and open architecture.

ZTE has summed up its cloudification strategy in four aspects: terminal and pipe acceleration, IT upgrade, platform cloudification, and operation extension.

- Terminal and pipe acceleration: Terminal acceleration means to focus on ZTE's two main terminal series. AXON and Blade to carry out value innovation, while pipe acceleration means to maintain network upgrade according to Moore's law and evolve telecom networks to ElasticNet architecture (Fig. 3). ZTE has capitalized on SDN/NFV opportunities to deliver cloud products and solutions, including multi-level distributed cloud deployment, network slicing on-demand, and shortcut functions designed for new application scenarios. ZTE has also enabled function componentization and decoupling to the maximum extent and strict isolation of the control plane from the user plane or the

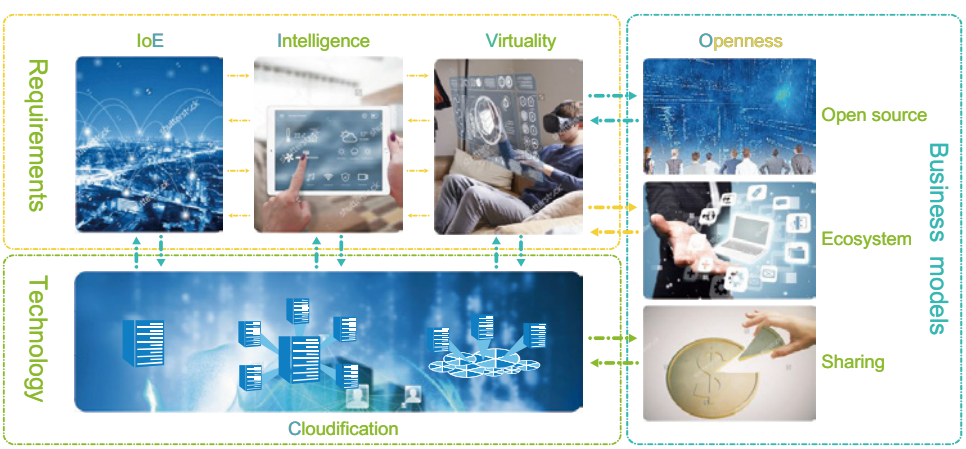

Figure 2. Future VOICE-based business paradigm.

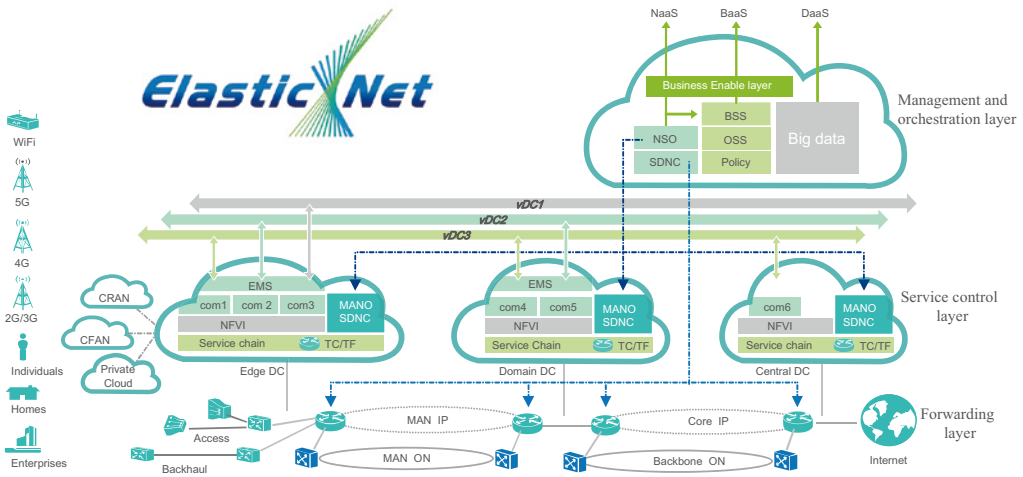

Figure 3. ElasticNet architecture evolution.

forwarding plane.

- IT upgrade: ZTE is committed to providing advanced IT infrastructure based on cloud architecture. ZTE will grasp every technology innovation opportunity, use open source to cross technical barriers, and improve its competitiveness in products and solutions.
- Platform cloudification: ZTE focuses on developing PaaS capabilities and products. In traditional operator markets, ZTE will enhance the PaaS policy to help operators transform to digital service operation. The PaaS impact will extend from internal to external, i.e., from inner cloud-based applications to external smart city and other key industrial applications.
- Operation extension: ZTE will develop the enterprise cloud services market based on smart city applications, and exploit vertical cloud applications in finance and manufacturing.

Internet of Everything

All things in the world can be digitalized and interconnected. It is estimated that 50 billion devices will be connected to the Internet by 2020. Although IoT applications are booming, the application fragmentation problem needs to be solved through greater industry collaboration and cloud computing. The IoT industry supply chain is more complex, and IoT business model needs to be innovated for further IoT service deployment and industry ecosystem development.

ZTE has extended connections and terminals, developed the platform, and focused on key industry applications. The strategy is summarized as “two platforms, three horizontal aggregations, and four vertical fields”. The two platforms are ecosystem platform and capital platform. The three horizontal aggregations refer to terminals, networks, and IoT PaaS. The four vertical fields contain smart home, industrial internet, internet of vehicles, and smart city.

Embracing and Sharing the Win-Win Future

Looking ahead to 2020, we can see that the future is to be built on an open and sharing digital economy, where all things are interconnected, there will be ubiquitous intelligence and virtual reality, and services will be all cloud-based. Tomorrow never waits. The VOICE concept will bring about tremendous business opportunities. It will help redefine future business paradigms. The internet of everything, intelligence, virtuality, and cloudification will interact with each other to drive unprecedented innovations in the ICT industry. Openness and the sharing economy will help reconstruct R&D models, industry chains, and value networks. ZTE will combine them to multiply the transformation effect and bring about qualitative and quantitative changes. ZTE TECHNOLOGIES

Transformation from NOC to SOC

By David Zhiwei Qin

NOC to SOC transformation is an innovative approach enabling the operational organization to monitor end-to-end services and take timely remedy actions based on service impact and customer experience.

—**David Zhiwei Qin,** Director of Service Business, ZTE Corporation

The massive use of mobile broadband services and associated applications has changed the way we work and live. The services used by customers today have gone beyond the legacy telecom domain. This creates blind spots in managing services end to end at the customer care and network operations center (NOC). Network operators are also facing revenue erosion from the competition of OTT. This further creates pressure on operators to differentiate themselves from their rivals by boosting customer experience on services and minimize operational costs. The way to address these challenges is to establish a service operations center (SOC) and transform from network-centric operations to service and customer centric operations. This article describes ZTE's vision, best practices and solutions in supporting NOC to SOC transformation.

Customer Journey, Touch Point and Lifetime Value Maximization

To address customer experience management (CEM), the first step is to understand touch points along the customer journey. A typical customer journey includes five stages: initial brand awareness, evaluation of the service offered, joining the network, use and care. If a consumer has a poor experience during any of these touch points, the customer may churn from the operator. By analyzing micro segmented customer groups and understanding customer behaviors at various touch points, we are able to capture and prioritize opportunities which please the customer. We can also understand negative customer experiences which need timely remedy action and proactive care.

The customer journey sets the framework for ZTE to work with the operator in identifying drivers for improving customer experience and implementing CEM use cases for customer retention, lifetime value maximization as well as advocacy of new products for boosting ARPU.

Dealing with Challenges for NOC to SOC Transformation

Vision Alignment and Strategic Sponsorship from CXO

For transforming to customer-

focused operations, SOC is a key enabler of this CEM journey providing the most important operational capabilities. However there are practical challenges for such a transformation. One of the challenges is that the benefits for NOC to SOC transformation are hard to quantify. In practice, implementing NOC to SOC transformation always starts with future vision alignment with CXOs so as to gain executive sponsorship from the operator. Quite often, we start with proof of concept with demonstrated achievements before fully rolling out such a transformation.

CEM Maturity Assessment

Another challenge is that there is no industry standard to follow. To address this issue, ZTE has designed a CEM transformation blueprint which can be referenced at the design stage. To have a clear view from the current mood of operation (CMO) to future mood of operation (FMO), ZTE uses the TM Forum's CEM maturity framework for baselining the AS-IS state and defines the FMO in line with an operator's budget and priority. The CEM maturity framework consists of six dimensions in strategy, organization, people, process, metrics and tools as well as five levels of maturities. This maturity model provides a common platform to work with operators in prioritizing a phased approach for such a transformation.

Partnership for Transformation

NOC to SOC transformation is an innovative approach enabling the operational organization to monitor end-to-end services and take timely remedy actions based on service impact and customer experience. ZTE promotes a partnership model to work with operators in identifying and prioritizing CEM drives and use cases, and designing architecture changes in terms of future organization and process, which is in line with ZTE's blue print and big data VMAX solution. ZTE also emphasizes on joint governance to manage the change, which is critical to ensure the success and acceptance of transformation results.

ZTE's Blueprint and Solutions for NOC to SOC Transformation

ZTE has developed a SOC platform based on the big data solution that leverages its strength in network optimization, big data analytics and subscriber segmentation in QoE management. The following software packages are examples of ZTE's big data solution for CEM and SQM of MBB services.

Network Quality Assurance and Network Optimization Automation

Statistics indicate that most customer dissatisfaction in the MBB era is routed to network quality issues that are linked to network optimization. With ZTE's CEM solution, a significant number of optimization parameters can be automated in a visualized format in color code for its level of degradation on the GIS map through daily system calculation. The same are displayed in tabular format with direct results of root cause analysis along with expert suggestions. This significantly reduces the efforts and time in identifying optimization issues. With slicing and filtering functions of the raster map for network coverage, network quality can be easily monitored for designated areas such as motorway and central business districts (CBDs). By analyzing MR/CDT data, the system can discover network coverage holes and high-traffic areas in near real time. It can also precisely locate coverage problems in supporting the

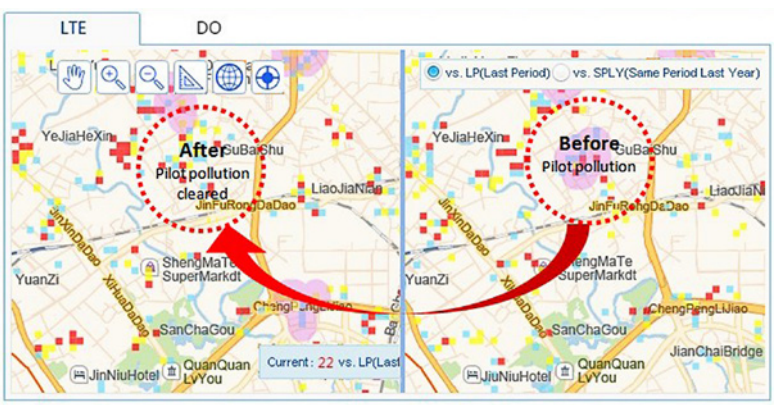

Figure 1. Network quality improvement on the GIS map.

decision-making process for adding additional RAN sites while taking into account the business impact and return for investment. Moreover, after new RAN sites are built, the improvement can be compared with a historical view on the GIS map (Fig. 1).

Call Center Automation for Voice and MBB Services

The call center automation solution supports a call center agent to initiate a query on service quality degradation over the past 30 days for a specific customer in terms of voice and data services. It also provides intelligent fault demarcation and localization. With this solution in place, the customer contact center can enhance the first call resolution rate for MBB services and assure customer satisfaction by timely initiating remedy action and proactive care.

QoE Monitoring and Customer Lifetime Value Maximization

The QoE monitoring provides the possibility to monitor and evaluate service quality degradation over the past 30 days for a configurable customer group in designated geographical areas. The QoE solution can be integrated with customer complaint management solutions from CRM tools used by a customer contact center so that a complete view of subscriber experience is correlated to true network problems measured by the QoE monitoring system (Fig. 2).

In order to maximize customer lifetime value, there is a need to maximize the lifetime value of existing customers and enhance their loyalty. The churn prevention solution and micro segmentation of targeted subscriber groups can predict the churner with its root causes. The solution is also built with a retention model that provides the best time with predefined initiatives to retain customers in the network.

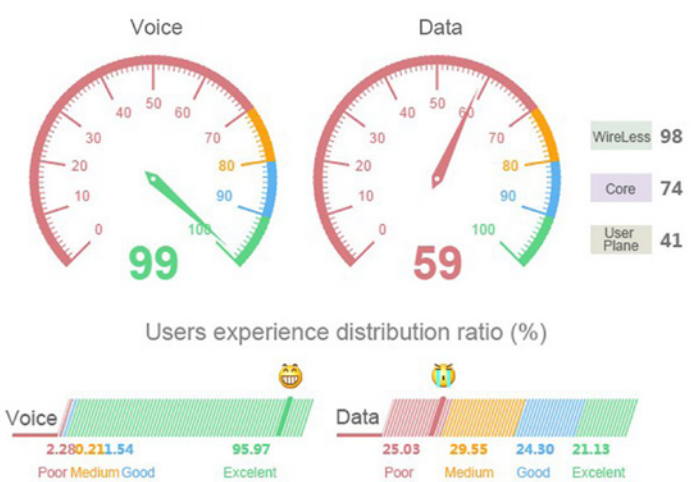

Figure 2. QoE monitoring.

Service Quality Monitoring

The near real-time service quality monitoring solution provides a GIS-based view of respective and combined voice and data service quality monitoring, and also a mechanism to monitor service degradation for targeted services and GIS areas (Fig.3). The solution analyzes problem demarcation and root causes in terms of service accessibility, retainability and integrity. The root causes are directly analyzed and summarized for corrective actions. The SQM is correlated with NOC umbrella systems with extended visibility and manageability that is not available from the end-to-end MBB service perspective in NOC today.

Insight Reporting

The knowledge of most popular services and applications enables network operators to know better customer consumption habits and service preferences. Therefore, operators can further tap into customer potentials for consumption.

ZTE's insight reporting solution provides unified reporting with an aligned view between the customer-oriented organization and network-oriented organization. The data is gathered from not only the OSS domain but sometime even the BSS domain. Various insights can be generated in supporting agile service design, customer lifetime value maximization and network quality enhancement. The system can be integrated to the campaign management engine for launching and monitoring the effectiveness of service campaigns. Insights reports such as user behavior insight, terminal performance usage, traffic insights and value grid insights

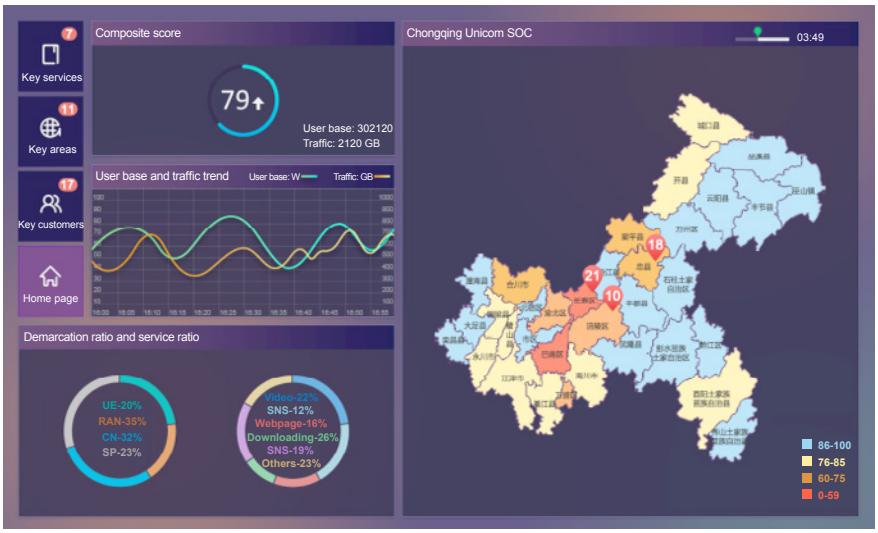

Figure 3. Service quality monitoring.

are within ZTE's CEM solution library. More reports can be generated upon the joint identification at the CEM realization phase.

Professional Services Assisting Operator's Transformation

NOC to SOC transformation can be a challenge task. ZTE provides consulting services to operators at the initial design stage. Through the transformation from NOC to SOC, cluster and value based network operations can be implemented. SOC is measured against the key business objectives (KBI) and key quality indexes (KQI) while NOC is measured against key performance indicators (KPI). By leveraging KBI and KQI library from ZTE, operators can benefit the learning from ZTE for its own customization. And meanwhile, ZTE has readymade functional organization blueprint in assisting operators to design their target SOC organizations. ZTE also has a set of process blueprints that can be used for customization. ZTE big data team can design and implement the solution based on the functional requirements defined at the consulting stage. Finally ZTE service team can run and operate the overall solution before fully transferring to operators through enabling programs.

Outlook of NOC to SOC Transformation

Mobile operators are further diversifying and transforming into digital communication service providers. This strategic shift is supported by latest SDN, NFV, and 5G wireless technologies. This is a disruptive technology evolution from the perspective of network architecture and OSS/BSS. However, having the capability to maintain customer-oriented services, measuring SLA for targeted network slices and providing user experience on demand are still essential in offering services in the era of digital economy.

Due to the complexity of services modeling for technology prior to 4G, SOC is a complementary function to NOC. With the advent of SDN and NFV, future networks will be managed by real time inventory, orchestrated fulfillmen and assurance. Our vision is that NOC and SOC will be converged into one unified MICT operation centre of the future namely OpCF. Today, ZTE's big data solution has laid down a solid foundation for such a migration. It will be an integral part of the future real-time orchestrated service and QoE assurance solutions.

Conclusion

With the advent of MBB services, there is an imminent need for operators to transform from network centric to service and user centric network operations. The introduction of SQM/CEM techniques managed via a SOC is essential for such a transformation. ZTE is the partner of choice in supporting such a transformation with its professional services and future proof VMAX big data solutions. ZTE TECHNOLOGIES

TELENOR PAKISTAN: TRANSFORMING OPERATIONS WITH ZTE MS2.0

By Du Huajun

Du Huajun
Service Solution Director,
ZTE Corporation

Telenor Group, one of the leading global operators, is seeking to transform from traditional operations to next-generation operations. Cooperating with its major vendors, Telenor Group has launched some operation transformation trials in its East Asia-Pacific Branch and Bangladesh Branch. Telenor Group also hopes to run a more comprehensive trial in Telenor Pakistan (TP), the biggest overseas branch of Telenor Group, to demonstrate and perfect its operation transformation methodology, and finally to meet the increasing demands for network quality, user experience, operating expenditure management, and marketing.

After careful consideration, Telenor Group selected ZTE as its major network equipment provider to help TP transform its operation mode. ZTE customized its MS2.0 solution to overcome operation challenges faced by TP. The transformation trial was proved to boost TP's market competitiveness in Lahore.

The traditional services take KPI as the major delivery indicator, while ZTE MS2.0 takes net promoter score (NPS) and customer complaint as delivery indicators. With ZTE MS2.0, network quality and user experience can be improved through end-to-end network assessment and optimization, end-to-end network feature application, value grid assessment, and KQI assessment and optimization of service quality. Witnessing the remarkable change and improvement in the old operation

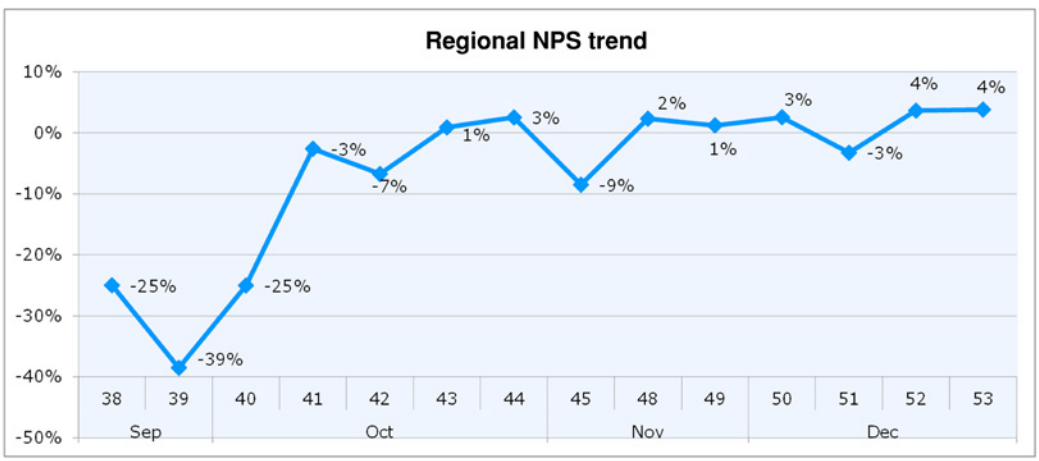

Figure 1. Significant increase of user experience NPS in Lahore, Pakistan.

mode, the top management of TP and customers were impressed by ZTE MS2.0. The striking annual appraisal indicators for improving NPS and data throughout popped up everywhere in TP's offices, and TP has high expectations for ZTE MS2.0.

By introducing the concept of value grid, TP can find the real value areas in the network, and then make development strategies for different regions. In the grid areas with sufficient capacity and idle traffic, the priority should be to explore new users. In the overloaded grid areas with insufficient capacity or deteriorated indicators, the priority should be to build new sites or optimize the related indicators. Value grid evaluation enables TP to put limited budget into the most valuable grid areas, so as to maximize the return of investment (ROI). After four months of optimization effort in the service deployment areas, the ratio of TP's value grid areas has increased by 12.7%.

TP attached great importance to its operation transformation project. Therefore, ZTE was staffed with delivery experts and equipped with VMAX, an industry-leading user experience management and analysis system based on big data. Through the close cooperation with ZTE, TP saw a remarkable improvement in key indicators in the service deployment areas: MPD (the call drop rate indicator for 3G networks) down by 30%, voice traffic up by 52%, and data traffic up by 49%. The success rate of operations performance was also increased accordingly: web page browsing up by 8.6%, Facebook message sending and receiving up by 12.8% and 19.7% respectively, and file sending and receiving up by 10.6% and 31.8% respectively.

From September to December 2015, in addition to substantial improvement in basic network indicators and steady increase of CS and PS traffic in the areas where MS2.0 was implemented, the NPS about which TP was most concerned jumped to +4% at the end of December 2015 from –39% in September 2015 (Fig. 1), which was a great achievement compared with other non-MS2.0 areas.

The top management of TP and CTO of Telenor Group were quite satisfied with the improvement in the network performance indicators and user experience.


ZTE
Tomorrow never waits