

ZTE

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TECHNOLOGIES

VIP Voices

Telefonica:

Past, Present and Future

Telkomsel: Paling Indonesia

LTE Forum Special

Evolution from 4G to 5G

LTE Deployment Strategy
of China Mobile

LTE Implementation, Experience and
Plans at Hutchison Drei Austria

Special
Topic

UniCare

UniCare Helps Operators Deal with the New Normal and Create New Network Value

Enrique Blanco, Global CTO of Telefonica

ZTE



Telefonica: Past, Present and Future

Telefonica is a Spanish broadband and telecom provider with operations in Europe, Asia, North America and Latin America. Recently, *ZTE Technologies* interviewed Enrique Blanco, Global CTO of Telefonica. He shared with us Telefonica's experience in multinational operation, goal of transforming to a video company and strategic plan of building the best network. He also talked about his expectation for the whole industry and ZTE.



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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 Partners with South East Asia Telecom to Bring 4G LTE to Cambodia



18 June 2015, Shenzhen — ZTE announced a partnership with South East Asia Telecom (SEATEL) to build a national FDD-LTE network in Cambodia to deliver high-performance mobile broadband services to consumers and businesses across the country.

ZTE is the exclusive provider of end-to-end 4G solutions and products, including core network EPC, microwave, power, IPRAN, bearer and online charging system (OCS). ZTE will also provide its industry-leading network coordination products Cloud UniCore and Cloud Radio, helping SEATEL realize flexible networking, resources sharing, intelligent O&M to build a superior and cost-efficient 4G network. The national LTE network infrastructure in Cambodia is a key step for SEATEL's international expansion.

ZTE and OFS Claim 400G Ultra-Long-Haul Record

25 June 2015, Shenzhen — ZTE and OFS announced a record-setting 400G ultra-long-haul high-speed transmission result, successfully transmitting record 128.8-GBaud WDM QPSK signals over 10,130- and 6,078-kilometer terrestrial fiber links. These transmission results, once again, set a benchmark for the global optical networking industry and support the next-generation transport standard to cope with the exponential growth of IP traffic.

The successful test demonstrated the coherent transmission system with the highest electrical time division multiplexing (ETDM)-based symbol rate of 128.8-GBaud over record breaking distances, in which the single-carrier 515.2-Gb/s polarization division multiplexing

(PDM)-QPSK/9-QAM signals were transmitted over 10,130 km/6,078 km, respectively, over 100 km spans of OFS TeraWave™ optical fiber featuring optimized effective area and low loss. It was the highest ETDM-based symbol rate reported so far, and the longest WDM transmission distance of single-carrier 400G signals with terrestrial span lengths (100 km). For the first time, the 515.2-Gb/s single-carrier PDM-QPSK signals in 200-GHz-grid are successfully transmitted over distances over 10,000 km in a terrestrial transmission environment. Researchers have also demonstrated the transmission of single carrier 128.8-GBaud filtered QPSK signals in 100-GHz-grid over 6,078 km, which has the line SE of 5.152 b/s/Hz.

ZTE 5G Technology Clinches Top Global Award from Frost & Sullivan

23 June 2015, Shenzhen — ZTE is pleased to receive the “2015 Global Technology Innovation Award in 5G Networks” from leading market consultants Frost & Sullivan.

The award recognizes ZTE's global industry leadership in research on 5G, or 5G mobile networks, and superior technology innovations. ZTE was the first telecom solutions provider to develop pre5G solutions, which use 5G-ready technologies to provide commercial 4G LTE subscribers with 5G-like access experience. The

Technology Innovation of the Year Award is part of Frost & Sullivan's Best Practices Awards, rewarding companies for excellence in technology evolution within their industry sectors.

“ZTE demonstrated excellent technology capabilities in the field of 5G research,” said Neil Wang, Partner and Managing Director for China at Frost & Sullivan. “The award is in recognition of ZTE outstanding success in 5G innovations, industry leadership, and the enormous future growth potential of their technology.”



ZTE Positive on M-ICT Opportunities in France after Toulouse Summit

3 July 2015, Toulouse, France — ZTE anticipates increased opportunities for partnerships with companies in France in next-generation networks and ICT technology innovations, after CEO Shi Lirong’s participation as a panelist at this week’s China-France Business Summit in Toulouse.

At the “Digital Revolution and the Future of Industry” panel, Mr. Shi outlined opportunities for deeper collaboration in key technologies including 5G, the Internet of Things and new energy. The high-level China-France Business Summit was attended by top industry and government leaders, including Li Keqiang, Premier of the People’s Republic of China, and Manuel Valls, Prime Minister of France.

“ZTE values opportunities to work with our partners in France to accelerate the digitalization of industries and the development of smarter technologies and applications for consumers and businesses,” Mr. Shi said. “ZTE’s M-ICT strategy focuses on innovations in leading-edge networks and enterprise computing technologies to drive increased productivity and efficiencies for customers, making our company closely aligned with ongoing efforts in France to promote integration of ICT technologies with traditional industries.”

Other speakers on the panel included Luc Remont, President of Schneider Electric France, Li Huidi, Vice President of China Mobile, and Bernard Charles, CEO of Dassault System.

ZTE and MTN Launch M2M/IoT Platform

1 July 2015, Shenzhen — ZTE has jointly launched an Internet of Things (IoT) platform in Africa with leading ICT provider, MTN Group. The innovative platform adopts cutting-edge technologies suited to developing markets,

bringing flexible connectivity for devices in the region. ZTE and MTN have also launched a global machine to machine (M2M) SIM card, providing customers with a blanket rate for M2M activity across MTN’s African network.

ZTE Qcell Wins the Best Innovation in Heterogeneous Networks Award at the LTE World Summit 2015



25 June 2015, Shenzhen — ZTE has won the “Best Innovation in Heterogeneous Networks” award with its Qcell digital indoor coverage solution at the LTE World Summit 2015 in Amsterdam.

The Qcell digital indoor coverage solution has been commercially deployed and highly praised by Sichuan Telecom, Chongqing Unicom, as well as other customers. This award reaffirms the advantages and overall quality of the Qcell solution regarding in-depth coverage and deployment of 4G networks.

ZTE’s Qcell solution helps operators quickly build integrated multi-mode (2G/3G/4G) indoor coverage networks with high performance at a low cost. This solution is comprised of three parts: picoRRU, pBridge, and BBU. The picoRRU, currently the world’s smallest multi-frequency and multi-mode RRU, uses standard Ethernet cables for networking and power supply. The BBU and pBridge are connected through optic fibres to facilitate resource sharing between multiple cells. In addition, the Qcell solution shares a network management system with traditional macro base stations. This simplified network architecture not only lowers engineering complexity and deployment and maintenance costs, but also reduces 60% of the deployment time.

Telefonica:

Past, Present and Future

Reporters: Liu Yang and Zhang Ying



Enrique Blanco, Global CTO of Telefonica

Telefonica is a Spanish broadband and telecommunications provider with operations in Europe, Asia, North America and Latin America. It is one of the largest telecommunications companies in the world. Recently, *ZTE Technologies* interviewed Enrique Blanco, Global CTO of Telefonica. With over 30 years of experience at Telefonica, he shared with us Telefonica's experience in multinational operation. Facing the intense competition in the industry, he revealed Telefonica's goal of transforming to a video company and strategic plan of building the best network. He also talked about his expectation for the whole industry and ZTE.

Q: Telefonica has 90 years of history. What have been some of Telefonica's successes?

A: I was working in Telefonica when

the company got only its break in Spain. That was more than 30 years ago. I've had the privilege to go to different operations when Telefonica decided to start working in these operations. If you ask me about the successful experiences of Telefonica, it's about the commitment and, mainly, the passion for learning. When Telefonica is operating in a country, we are trying to understand clearly the necessities of customers in that country. We are trying to use all the capabilities and learn about the professionals that are working in the country. It's not the case that we arrive in a country and expect these guys to start doing everything we say. We try to understand and know the people, organizations, technicians, and the rest. In fact, we try to incorporate in our DNA what these people are doing and trying to improve in this country. Telefonica enhances what people are already doing in a country. We try to learn off all these countries, and we choose excellent people to work for us. You can see that our directors, CEO and CFO come from dozens of countries that we are operating in, including Argentina, Peru and Mexico. We try to increase not only revenue and customer base, but we also try to learn.

For me, the main success of Telefonica is our ability to learn country by country. When we do this, we identify growth possibilities. Sometimes it is very difficult to do it, but we are trying to move. We

are a multinational. The key for Telefonica is to incorporate into its DNA the knowledge and capabilities and we try to understand the specific customers' demands that we have in each country. For me, this is the main difference. The rest is just work, work, and work.

Q: What type of challenges do you face in your role? How do you tackle them?

A: Sometimes, when you are doing a lot of things, you forget what your challenges are. However, I try not to forget my responsibilities, which include helping country by country, our commercial teams to be competitive. We need to be sure that we can offer our customers all the services with good QoS. This implies timing the deployment well, choosing the right vendors, implementing the right processes throughout the deployment, and using the right maintenance and provisioning models.

We are a service company and a technology company. My responsibilities are to be sure that we offer the commercial teams in each country all the levels of technology they need. We are trying to be the best. This is the first point we try not to forget. The second point is we never ever take any decision that is not in the interest of our customers. If you don't forget these two main rules, you reduce the possibility of making a mistake.

Q: Where is Telefonica now in terms of 4G LTE?

A: Two and a half years ago, Telefonica made the decision to increase its capex, investment and capabilities. We are investing in 4G evolution, FTTH and ultra-broadband capabilities, including the backhaul for our base stations. We assume these challenges today. We can affirm that we are deploying LTE in all our operations with different rates. We are very close to 60% LTE coverage in Spain, 70% LTE coverage in the UK, and 50% LTE coverage in Germany. We are also deploying LTE in all countries in Latin America. We are even deploying LTE in countries where smartphone penetration is not so high. We can't forget that we still have customers on 3G because of the price of smartphones. Even in these cases, Telefonica is facing a very clear challenge, but we are betting on 4G LTE. So at the moment, we are rolling out 4G in all the countries where Telefonica is operating.

We are now ready. We are starting VoLTE in Germany. We will deploy it in Spain very soon. We are committed to deploying VoLTE in Latin American countries in 2015 and 2016. This is very important.

In terms of VoIP, all our customers that are working with FTTH in Spain are using VoIP. All the enterprise voice traffic that is going through our networks is using VoIP and IMS

platform. So we are fully committed and trying to deploy VoIP. All the networks and core is IP. We are still using voice-switching for voice 2G and 3G. VoLTE is what matters. But we are committed. We know that the future is data. In fact, voice is data.

Q: What preparations have you made for 5G?

A: We are very active in 5G. We are very active in the Next-Generation Mobile Alliance (NGMA). The standards have been defined. We closed the final requirements in the White Paper in November 2014 in Frankfurt with big operators and vendors, and we defined the main features of 5G. If you ask me when 5G would be available, all of us would say 2020, but we can't wait until 2020, especially the main features. Telefonica is defining the main features that will be standard in 5G and try to develop them for our customers. We are talking about Germany's evolution to 5G. We use carrier aggregation and try to offer our customers speeds at 150 Mbps. We work very hard to reduce the latency until just a few milliseconds. We even define the services for Internet of Things or industrial internet. We are trying to get these features with capabilities we have in 4G. So we are looking at 5G and defining clearly what will be improvements from the customer's point of view.

We recently are working in the launch of one initiative named 5TONIC what intended to become



An interview

an open research and innovation ecosystem in which industry and academia come together to boost technology and business innovative ventures in the area of 5G products and services. The spirit is to become a central hub for knowledge sharing and industry collaboration in the area of 5G technologies across Europe.

Q: What are some of your latest service and product launches? How can your services stay competitive in the market?

A: Good question. If you ask me

which are the more successful services that we are offering today, it is video. Telefonica decided that we are a video company. It is very important. Telefonica is the main provider of video in some countries we are operating. We are trying to be the first paid TV provider in Spain; we try to do it in Brazil; we are trying to do it in other operations. In fact, Telefonica has a dream—we are working very hard to be considered as a video company. This means that the video services are in our DNA. This is the main service we are delivering.

When we are including the IP



We don't want to be an OTT but we are trying to change radically the value chain. We are trying to offer new services—video is an excellent opportunity—but services such as VoLTE and Voice over Wi-Fi are to be services of Telefonica.

products in our networks, we open our networks to the OTT companies. When it comes to the main services that customers are using, to be honest, they are closer to the OTT than to the big operators. If you think the latest services you are using for messaging, maybe you will think WhatsApp. We need to solve this so we are working very hard and to offer and commercialize new services.

We don't want to be an OTT but we are trying to change radically the value chain. We are trying to offer new services—video is an excellent opportunity—but services such as

VoLTE and Voice over Wi-Fi are to be services of Telefonica. Cloud services are going to be used by our big customers with our unique platform. We are building all the pieces and trying to offer our customers some services that can't be replicated. We are working very hard, and we are fully convinced that we will achieve it. Any operator that doesn't get this final solution will have problems. I'm very confident that we will succeed because we are monetizing data, we are offering our customers new services (basically cloud, video and convergence), and we are even giving them the possibilities to bundle the fixed and wireless. These are something that we are doing; we are doing successfully. But we need to keep working 24 hours every day.

Q: How do you define the relationship between OTT and Telefonica?

A: We are part of the ecosystem. We need to work very closely, but the rules need to be the same for all of us.

Today, the rules are quite different. Let me give you an example. Do you remember the main services that one big operator offered to customers ten years ago? Messaging and voice. All these services have been revolutionized. All the demonstrations are looking at how you offering these kinds of services—there are regulatory issues that you need to solve and so on. If you see OTTs, they are today offering messaging and voice. They are not limited; they can do whatever. The point is that operators and OTTs are a part of the same ecosystem, so we need to cooperate; we need to understand each other and work closely together. It is clear that OTTs are helping us offer more and more services and increase our user base. But the long-term perspective needs to be the same for all of us. If this doesn't happen, it will affect telco investments. Transport requirements double every year but revenue is not growing as fast. OTTs are doing nothing in terms of investing in infrastructure. This

needs to be solved.

Q: What's your next five-year development plan? What's your focus now?

A: Our target for the next five years is to build the best network in all operations we are present. In Spain, we will maintain FTTH capabilities, we will cover with LTE and LTE-A, we will build all the capabilities in our backhaul, and we will evolve our cores.

Our plans now fully aligned. We are trying to build the best network country by country. This is what we have in our strategic and technological plan. We are doing this with huge efforts and efficiency. We are trying to change radically the architecture, using virtualization capabilities (NFV+SDN).

The final target is to build the best network because this is the only way to be competitive. If we build the best network, we will remain competitive. If we are competitive, we will increase our customer base and revenues. And then, we can re-invest to keep offering the best services. It's a virtuous circle and the reason why building the best network is our strategic plan.

Q: What do you think will be the new trends of global telecom industry?

A: We need to think it as an industry.

We need to grow capex and be efficient in opex, we need to get more and more base stations, need to be in more and more roofs, and we will also need additional antennas. This is going to happen in that way. What we need to do is trying to simplify the networks.

My point is the main trend at this moment is to be clever and make our infrastructure more simple and efficient. If we don't do it, we can't sustain operation. The main trend is how we can simplify our architecture, how we can simplify our processes, how we think that we need to grow and evolve our networks. Let me give you an example. Virtualization is the only way that we have to simplify our architecture. If we don't do it, we are losing levels to grow in a sustainable way. Virtualization is a necessity that we need to deploy because we need to solve it in a much simpler way how we are evolving, growing and optimizing our networks. These are the trends that we would like to follow and these are some topics that need to be covered.

Nobody can do this alone. This is going to happen if we think it as an industry and it is a clear message for the operators and vendors. We need to push. If we don't defend our position, all of us will lose. It is very important. If we don't think as an industry, we will go slowly and not be in the position we need to be in.

Q: What is your expectation for the development of the telecom industry?

A: Our customers ask us operators to increase the throughput every day. Five years ago 2 Mbps was the approach, today it is ridiculous. We need go through fixed access going up to 300 Mbps at least. The wireless access need to be increased to an average of up to 50 Mbps at least. We are in an industry where our customers are asking for more and more access capabilities. This is good. The point is that if our customers are asking for these, we need to build more different networks than we are building today.

The main message to the big operators is we need to work together. If we maintain our thinking that we can do it alone so that we can get advantage, we will lose the opportunity. Let me give you an example, in some countries where there are two or three big operators, we are leasing up to 40,000 base stations. In this scenario network sharing makes total sense. It is about working smarter as an industry and it will mean greater efficiency, fewer site builds, broader coverage and, crucially, lower investment in innovation.

Q: How do you comment on the cooperation between Telefonica and ZTE? And how do you think

it will evolve in the future?

A: ZTE is one of the largest players in the industry. Telefonica can't understand the changes and solve the challenges that we have without the help from companies like ZTE.

One of the key topics for us is to be sure that we are using the right vendor in each piece we are operating. We are working with ZTE in different technologies, so we are working in the transport layer, we are working in the big routers, we are evolving 100 Gbps to 400 Gbps, and we need to provide GPON capabilities. The service capability is key for us.

We need to explore the different capabilities with the radio and wireless approach, from TDD through FDD and through Wi-Fi.

If you ask me about the relationship between Telefonica and ZTE, it is that we have good momentum but also room for improvement. Nevertheless, we need to select when ZTE can help us improve. One of the very significant parts in innovation is in the hands of ZTE. For Telefonica, innovation includes many parts, such as services, GPONs, transport and devices in terms of differentiation.

To be honest, I can't understand how I myself can do my job if I don't work closely with ZTE as one of my main vendors. The point we need you to help us determine the right level



at which you can help us. Sometimes vendors are pushing and trying to be presented in all the fields, and sometimes this is not possible. I need your help but I need you focused when you really can help me. I'll tell you when you can help us. If we work closely and we understand when you can help us, we will be going faster. At this moment, my main concern is that we need to go faster and faster.

ZTE needs to help us do it. This is my main message. How can you help us go faster in the network evolution, in the virtualization and in the transport revolution, and how can we work together on our networks? We are trying to build the best network. For me, the relationship is in good momentum but has room for improvement. Let's improve. Let us do it together! [ZTE TECHNOLOGIES](#)

Telkomsel: Paling Indonesia

Reporter: Zhang Ying



*Bona Lambok Pandapotan Parapat,
EVP of Pamasuka Area of Telkomsel*

Telkomsel is the largest subsidiary of Telkom Group and a mobile phone network operator in Indonesia. Telkomsel currently has one of the widest networks in Indonesia, covering more than 97% of Indonesia. Telkomsel provides subscribers with prepaid and post-paid services as well as a variety of value-added services. Recently, *ZTE Technologies* interviewed Bona Lambok Pandapotan Parapat, EVP of Pamasuka Area of Telkomsel, and Ivan Cahya Permana, vice president of technology and systems at Telkomsel. They talked about Telkomsel's LTE

services, 5G plan, networking strategies, advantages and challenges in Indonesia. They also shared with us their visions for Telkomsel and expectations for the future cooperation between Telkomsel and ZTE.

Bona Lambok Pandapotan Parapat

Q: Could you talk about your role and responsibilities in Telkomsel?

A: I am the EVP of Pamasuka Area of Telkomsel, heading the regional office

covering Kalimantan, Sulawesi, Maluku and Papua operational area.

Q: What are the unique characteristics of Indonesian telecom market? What's the meaning of your slogan "Paling Indonesia"?

A: The Indonesian telecom market mostly comprises mobile services used by about 280 million subscribers. More than 95% of these subscribers are prepaid and around 50% are data users. Although traditional SMS has been overtaken by OTT applications, the volume of SMS is still quite high and contributes to around 30% of our revenue.

Paling Indonesia is a slogan used by Telkomsel which indicates that compared to other telco operators, we care the most to build Indonesia. It is also because the shareholders majority is still owned by Indonesians.

Q: What have been the key challenges in O&M?

A: The key challenges are still to

Through its commitment to be one of the respectable partners, ZTE has shown its quality in its deliverables to Telkomsel, and I do hope ZTE continues to show its top performance and grow its business together with us.

find more efficient solutions in transmission system and power supply to manage our operational cost to cover a vast area.

Q: Many operators are rushing towards LTE and seizing the opportunities for further growth. What is your plan for deploying LTE?

A: Telkomsel has already implemented LTE in five big cities in the first half of 2015, and we will continue to modernize our network so that it is LTE capable in all the big cities.

Q: Could you introduce to us some innovative services that Telkomsel delivered in Indonesia?

A: For legacy and data services we have introduced several attractive packages to our customers to cater to their needs, either individually or by Close User Group.

For digital services we have launched digital payment, digital advertising, on-line game, etc and even build a platform for local developers to build their own apps.

Q: What are your main goals in the next five years and how to achieve them?

A: Telkomsel as the largest subsidiary of Telkom Group would like to ensure that we will be the market leaders in digital services, both in terms of market share and revenue share.

Telkomsel will continue to improve its competence in creating attractive digital services and at the same time improve its network capability.

Q: Telkomsel and ZTE have worked together on both 2G and 3G projects in Indonesia. How do you rate the partnership between Telkomsel and ZTE? What are your expectations for ZTE in future?

A: It was not an easy journey for ZTE to take part in Telkomsel business at the beginning. But through its commitment to be one of the respectable partners, ZTE has shown its quality in its deliverables to Telkomsel, and I do hope ZTE continues to show its top performance and grow its

business together with us.

Q: What are your thoughts on the future trends in the global telecom market?

A: There will be heavy competition between OTT players and mobile operators. Both sides will drive the unlimited demand of bandwidth for which new solutions have to be in place. The solutions provide very high capacity in both radio network and transport systems. Much more advanced smartphones will connect mobile users using primarily digital services.

Ivan Cahya Permana

Q: Could you describe the Indonesian telecom market?

A: It is already saturated in term of individual subscribers. We're also facing huge challenges from OTT players, exponential traffic data growth, pricing competition and high customer expectations on service quality. There are more than ten operators competing in Indonesia, and this has led to an

unhealthy telecom industry. Thus, the government has streamlined the industry by promoting consolidation between operators.

Q: In a market as competitive as Indonesia, what are your advantages?

A: Our vast network is still our main advantage. Indonesia is the largest archipelago in the world, scattered over an area greater than China and second only to Russia. It takes a lot of effort to provide network coverage to all the parts of Indonesia. Many operators don't have

the capabilities to do that.

Q: NFV and SDN are big trends. How will NFV and SDN influence your networking strategy?

A: Telkomsel sees NFV and SDN as the new promising technologies because they increase TCO efficiency, make the network more flexible, and shorten time to market. However, there are several things that need to be considered: standardization, maturity of the technology, interoperability, and carrier-grade performance. When these aspects are further developed,

we believe NFV and SDN will enable an agile and sustainable networking strategy for Telkomsel.

Q: As everyone moves into LTE, how will Telkomsel position its LTE services? Will LTE be Telkomsel's key focus to promote future growth?

A: No doubt the future will be LTE, but our near future will still depend on 3G as the major growth engine. We predict by 2019 most of Telkomsel's subscriber base will still be using 3G, and the number of 4G subscribers will



be relatively small.

Q: 5G is expected to be available in 2020. Do you think Telkomsel will be ready for 5G at that time?

A: For sure, as a leading operator in the nation, Telkomsel will try its best to serve customers with the most up-to-date technology, including 5G. Technically speaking, we believe Telkomsel will not have any problems deploying 5G by 2020. However, all of the decisions will be driven by overall ecosystem readiness and business requirements.

Q: What is Telkomsel's marketing strategy to increase ARPU and the subscriber base?

A: Mobile data and a diverse portfolio of digital products and services will be our strategy for increasing ARPU. We're also counting on IoT to significantly increase our subscriber base.

Q: Many operators are transitioning from products to services. Have you taken any steps towards such transformation?

A: Digital company transformation will be our next corporate objective strategy. It will lay the foundation for our company on how we should provide a diverse portfolio of digital products and services, which need to be driven by consumer requirements and tailored to customer needs.

Q: How have ZTE's services and solutions brought value to Telkomsel?

A: ZTE's experienced teams have



Ivan Cahya Permana, vice president of technology and systems at Telkomsel

collaborated with Telkomsel. ZTE also provides innovative, customized solutions to comply with the requirement in Telkomsel network. In the future, we hope that Telkomsel and ZTE can improve the collaboration and partnership to achieve the mutual benefit.

Q: What is your vision for Telkomsel?

A: Our vision is to be a world-class,

trusted provider of mobile digital lifestyle services and solutions. We hope Telkomsel will be the epicenter of digital innovation and the accelerator for Indonesian's economic growth.

Q: What is your strategy or focus for the next three years?

A: We will be focusing our activities on network capacity expansion in 3G and 4G, additional spectrum acquisition, and digital company transformation. [ZTE TECHNOLOGIES](#)



ZTE and GSMA hosted a forum covering the theme "Expanding the LTE Boundaries" at MWC 2015. The forum was attended by more than 200 senior management representatives from well-known global telecom operators as well as representatives from the terminal chip and communications sectors. Attendees at the forum were encouraged to exchange ideas on the development trends of LTE networks and the latest service applications, and discussed a range of topics including the establishment of a new mobile internet of everything. At the forum Dr. Xiang Jiying, a chief scientist at ZTE discussed evolution from 4G to 5G. Other speakers at the forum included Dr. Liu Guangyi, a chief scientist of wireless technologies at China Mobile, and Dr. Mario Paier, head of network strategy and technology, Hutchison Drei Austria.



Evolution from 4G to 5G

By Xiang Jiying

On behalf of ZTE, I'd like to share the latest activity we have regarding 5G. We will focus more on the road from 4G to 5G. When 5G is mentioned, most of time, we think that it is something far away. But when we consider 5G as a group of technologies, we may find something different.

Pre5G

The first question is: Of all the 5G candidate technologies, is there anything that will be truly revolutionary? The answer is no. We know that some candidate technologies will be highly disruptive, but none will be truly revolutionary because all these technologies are still based on the frequency, time and space domains.

The second question is: Is there anything we can use from 4G?



Dr. Xiang Jiying, chief scientist, ZTE

Some 5G technologies can be evolved from 4G, and we can identify some of the 5G candidate technologies back in 4G. This has been our approach to pre5G.

Pre5G has four components. First, it uses 5G technology. Second, it uses 4G handsets. This is the most important thing. We don't have to modify 4G handsets. Third, we should provide a 5G-like experience. It is not 5G experience, but it is similar to 5G experience. Fourth, timing is important. 5G will be available much earlier than 2020. We know the target is 2020, but we can achieve pre5G this year.

Massive MIMO

The first technology we have identified for pre5G is massive MIMO. We know that this will probably be the most important technology, even for true 5G. According our preliminary simulations, massive MIMO can have four to six times the capacity of 4G. However, massive MIMO may need more than 100 antennas, which is 10 times more than 4G right now.

There are three main challenges that need to be overcome in massive MIMO.

Overhead

When there are 10 times more antennas, the overhead should be 10 times more. We know that for LTE, the overhead from RS is 4%, and for massive MIMO, it may be more than 18%. This is unacceptable. After innovating with TDD mode, we found that we don't need to depend on the feedback in TDD mode. This means we can achieve massive MIMO in 4G using TDD mode.

ZTE is evolving some 5G technologies from 4G. We call this pre5G.

Size

The second issue is size. Because we have 10 times more antennas, the concern is how big the antenna beam is. After analysis, we found that the target size for the massive MIMO system comprising 128 antennas may be similar to that of the current 8-antenna system, which China Mobile has commercially deployed.

Complexity

128 antennas may be 10 times or even 100 times more complex than 4G. To address this issue, we developed a baseband chipset for the processor. We use a vector processor, which is good for all kinds of 4G and advanced 5G technologies. With this chipset, we can support massive MIMO right now.

Massive MIMO 3D Coverage Field Trials

We found the massive MIMO is very good for tall building coverage, because the beam forming is three-dimensional, not two-dimensional. The most interesting thing is the boost in capacity. Our field tests showed that we can triple the capacity of 4G. At MWC, we demonstrated how we could even quadruple capacity.

MUSA

The second technology we identified for pre5G is multi-user shared access (MUSA). There are two big advantages of MUSA: 1) It overcomes the near-far effect, so we can better balance the central user and remote user; and 2) it is very good for massive connection. For 5G, massive connection is very important, and MUSA may be a key technology to address this.

Summary

There are many pathways from 4G to 5G. ZTE is evolving some 5G technologies from 4G. We call this pre5G. All of us are moving towards 5G, and we have confidence in our pathway because of the feedback from customers. 

LTE Deployment Strategy of China Mobile

By Liu Guangyi

Last year, China Mobile built the largest network in the world. We deployed 700,000 base stations, released more than 1000 TDD-LTE devices and have 100 million subscribers. Based on this, the average monthly data usage of our 4G subscribers has increased by 3.8 times. How do we do this? We have developed a comprehensive solution to provide indoor and outdoor coverage in shopping malls even on high-speed trains. And also terminal has matured rapidly.

Strategy for an Excellent Network

4G Network Strategy

We hope to continue to build our excellent network. We need to introduce advanced technologies such as carrier aggregation, higher-order MIMO and higher-order modulation, step by step to increase capacity. We will introduce VoLTE this year and improve the efficiency of our voice solutions. Then we can transfer our GSM network subscribers over to our 4G network. Then it enables us to quickly re-form our GSM network spectrum for the development of FDD LTE network. Then we have a converged LTE network. It can also make our network very simple, and we can only have one network. The optimization and maintenance will be very simple. We hope to make our network a smart pipe rather than a dumb pipe. We want to provide differentiated services to our subscribers and also optimize different services. Then we can offer the best user experience to our subscribers. For further evolution, we hope to introduce network function virtualization to our core networks and quickly introduce new features.

4G Device Strategy

We believe that devices are very important for the success of 4G. We hope to balance the development of different types of



Dr. Liu Guangyi, chief scientist of wireless technologies at China Mobile

terminals including high-end, medium and low-end. We also hope to reduce the cost of smart phones.

4G Service Strategy

We offer our subscribers converged communication services, which include new calls, new messages and new contacts. Currently, we are working with our partners to promote the development of native and APP modes to support our convergent communication.

Enablers for an Excellent Network

This year, our target is deployment of one million base stations in our network, 250 million subscribers, 100% roaming with LTE operators globally, and 200 million devices sales volume. To achieve this, there are many technologies that we will introduce into our network step by step. Now I would like to discuss some directions in the near future.

Carrier Aggregation

If you have carrier aggregation, you can use more spectrums to serve one user. Then you can greatly increase the user's data rate.

Small Cell

Small cell is a very flexible solution for us. At China Mobile, we have deployed a very large number of Wi-Fi APs. We can make full use of such Wi-Fi network infrastructure and deploy our small cells very quickly. We cooperate with our partners to define small-cell products, called "nanocell" products, which combine Wi-Fi APs with the small-cell base station. They share the same backhaul and power supply, so we can deploy very fast based on our Wi-Fi network. This year we will deploy 10,000 small cells. In near future, this number will be even larger.

3D MIMO

Since the standardization of TDD-LTE, MIMO has been a key technology for LTE. In China Mobile's network, we have introduced 1-layer beam forming, 2-layer beam forming, and even 8-layer beam forming. Recently, we also introduced coordinated multi-site beam forming, called CoMP.

Our next step is 3D MIMO, which is the same as massive MIMO mentioned by Dr. Xiang from ZTE at the beginning of the forum. We believe that 3D MIMO is a better

term for such technology because it can catch the feature of such a deployment.

I'd like to thank ZTE, Huawei and our other partners very much. We have finished trialing our pre-commercial 3D MIMO products in our networks and found that throughput tripled. It's very helpful in enlarging the capacity of network and also making full use of the spectrum.

TDD/FDD Convergent Network

We are working on TDD-FDD convergent networking. For China Mobile, we have both TDD spectrum and FDD spectrum. We hope in the future we can reform our FDD spectrum and build the FDD-TDD convergent network in China. We can just thank 3GPP for the standardization of convergence between TDD and FDD. You can have seamless handover between the TDD and FDD. You can also have load balance between the TDD and FDD carriers. Finally, you can have some joint operation between the TDD and FDD carriers. For example, you can support carrier aggregation between the TDD and FDD spectrum.

From an industry perspective, the network infrastructure and devices are ready for the Phase I and Phase II's convergent networking. Next, we need to do more work together with the whole industry, and try to make joint operation of TDD-FDD mature as early as possible. Also there are already 18 operators at GTI who have built the FDD-TDD convergent networks, which give us very good demonstration on the capability of TDD-FDD convergent network.

Mobile Edge Computing

Mobile edge computing incorporates storage and computing capability into the base station. Then on the base station, you can optimize the radio application for transmission over the air. You can also provide the location-based services based on big data analysis, especially user behavior.

SON

We also try to introduce more advanced SON features, which enable easy and low-cost network deployment and smart maintenance.

Currently, we have self-configuration, self-running, PCI self-optimization. And we also have ANR and MRO. Now we are working on MDT and eMDT, which will make our network optimization and trouble-shooting automatic.

Summary

China Mobile has deployed the largest 4G network in the world. Our target is to build an excellent 4G network that has wider and deeper coverage and that is faster and smarter. Our next step is to introduce more and more advanced technologies to enhance the capability of the whole network. [ZTE TECHNOLOGIES](#)

LTE Implementation, Experience and Plans at Hutchison Drei Austria

By Mario Paier

Hutchison Drei Austria (H3A) belongs to the Hutchison Whampoa Limited Group. The Group is Hong Kong based, and mainly owned by Sir Li Ka-shing. In the telecom part, there is the Three Group in Europe and additionally operations in Hong Kong, Macao, Indonesia, Vietnam and Sri Lanka. The Three Group in Europe consists of the operations in Sweden, Denmark, Ireland, Great Britain, Italia, and Austria. In Austria we launched 3G services in 2003. We didn't build up an own 2G network, but we used national roaming to complement our network. Beginning of 2013, we acquired Orange Austria. With the acquisition we now have more than 3.6 million customers.

Traffic Development

Last year, the traffic volume handled by our mobile network was about 10 million Gigabytes per month, meaning that on average each customer used some 3 GB per month. There are three mobile operators in Austria. In terms of subscribers, we are the smallest, but in terms of transmitted data volume, we have the biggest share. 62% of the overall data volume of all the Austria operators is carried by our network.

Frequency Assignment

Now we come to the network part, starting with the frequency assignment as the basis for our LTE deployment. We have frequency spectrum available in several bands. Our main focus concerning traffic volume and connected customers still is 3G. We operate 3G in the 2.1 GHz band (band 1). We have 2x25 MHz available in this band. But LTE is becoming more and more important. Our main deployment of LTE is in the 1800 MHz band (band 3). Currently we have 2x30 MHz available in this band. This band was formerly used for GSM only and we started to re-farm it to LTE last year.



Dr. Mario Paier, head of network strategy and technology, Hutchison Drei Austria

We cut down the GSM spectrum from 2x30 to 2x10 MHz, and we are currently implementing 2x20 MHz LTE in this band. Further in the 2.6 GHz band we have assigned 2x25 MHz FDD frequencies (band 7) and 25 MHz TDD spectrum (band 38). Beginning of next year we will additionally have available 2x5 MHz FDD spectrum in the 900 MHz band (band 8).

Network Consolidation and Modernization after Acquisition of Orange Austria

In 2013 we acquired Orange Austria.

The legacy Hutchison network consisted of 4000 sites. In the years 2009 and 2010 we swapped out our legacy vendor equipment and implemented ZTE equipment on all RAN sites and in the core network. We covered 94% of the population with 3G in the 2.1 GHz band. Each of the 4000 sites was equipped with 3G equipment and we also had started to implement LTE. By the end of 2013 we covered 28% of the population with the 2.6 GHz FDD network.

The legacy Orange network consisted of 4600 sites, covering a population of 98%. Almost each site had 1800 MHz 2G deployed. Orange covered a population of 73% with 3G. Beginning of 2014 we have started to merge the networks. We are building one network from the two networks and the target network will contain 6000 sites. We have an increase of the site number for both customer bases by almost 50%. The overall number of sites is reduced by 2600 sites which results in a significant opex saving. 98% of population will be covered after merging the two networks.

We are currently implementing 2G, 3G and 4G on each site of the network. We selected ZTE as vendor for all three RATs. 2G is implemented in the 1800 MHz band with 2x10 MHz. We are deploying 3G in the 2100 MHz and 4G in the 1800 MHz band. As mentioned before, our 2.6 GHz FDD network covers 28% of the population mainly in high traffic areas. We are continuing to roll out 2.6 GHz according to traffic demand if the capacity of the FDD 1800 MHz LTE is exhausted. Additionally next year, we will start to implement LTE in the 900 MHz band for coverage enhancement.

LTE Implementation

The 1800 MHz band is our main LTE band. We implement it on all sites of the network with MIMO 2x2. With this configuration and 2x20 MHz spectrum the peak data rate in the downlink is 150 Mbps. The uplink data rate is up to 50 Mbps. We deploy Uni-RAN equipment from ZTE and we use multi RAT radio units for LTE 1800 MHz and GSM 1800 MHz which simplifies the structure of the sites and saves costs. Further we use a one antenna per sector coping with 1800 MHz and 2100 MHz. Additionally, the 2.6 GHz band is focused on capacity. In this band, we also implement 2x20 MHz FDD with MIMO 2x2 and achieve the same peak data rates as in the 1800 MHz band. For voice service currently we use CSFB. The next step we will implement VoLTE.

LTE Performance


From the speed tests performed by customers with the OOKLA speed test application, we can see the median downlink throughput on our network is close to 50 Mbps, the median uplink is about 25 Mbps and the latency is 30 ms. Currently we have some 25% of the overall traffic on LTE, so still the major part is on 3G. We expect that by the end of this year, the traffic on LTE will overtake the 3G traffic.

LTE Potential

There are several options within the next years to improve LTE QoS and to enhance capacity to cope with the increased demand from customers. As first step we may implement carrier aggregation of the bands 1800 MHz and 2600 MHz. This would increase the peak data rates up to 300 Mbps in the downlink and will improve efficiency.

Another possibility to enhance capacity is to roll out the 25 MHz of the 2600 MHz TDD band. According to the experience of other operators it is necessary to install separated antennas for FDD and TDD 2600 MHz. Potentially in downlink only usage of TDD is an option to use one antenna for both 2600 MHz bands.

A further option to increase capacity is the implementation of MIMO 4x4. Additional antennas and additional radio equipment would have to be installed. Up to 600 Mbps in downlink could be reached with carrier aggregation in combination with MIMO 4x4.

And finally we could re-farm part of our spectrum of the 2100 MHz band, which is currently used for 3G, towards LTE. Due to the higher efficiency of LTE this is also a possibility for additional capacity. . 



UniCare

Helps Operators Deal with the New Normal and Create New Network Value

By Wu Jiangtao

The global telecom market has entered a stage of slow growth. With the popularity of intelligent terminals and impact of OTTs, traditional voice and SM services are shrinking and mobile data services are developing rapidly. The revenue structure of telecom industry will continue to be optimized.

According to data released by the Ministry of Industry and Information Technology of China, in 2014, non-voice service revenues accounted for 58.2% of the total revenue but the annual revenue growth rate fell to 3.6%, which indicates slow development of the telecom industry. The rapid growth of data traffic has brought in no extra revenue and compounding this problem is the fact

that traffic charges have been decreasing.

Facing the new normal state, telecom operators put effort into exploring a transformation road. On the one hand, operators want to enhance data services by deploying LTE networks. On the other hand, they participate in internet services by means of self-operation, cooperation, and acquisition. When operators implement transformation strategies, the following three major issues arise:

- how to use LTE networks to provide differentiated services.



experience and lays the foundation for LTE networks to provide differentiated services. In addition, UniCare realizes network traffic and data values insight and exploration, effectively helping operators improve investment efficiency and open the possibility for new service forms.

LTE Service Quality E2E Optimization to Provide Differentiated Services

With the mobile internet becoming increasingly closer to people’s lives, operators must quickly locate and solve service problems, or even predict problems to eliminate hidden problems and attract more users. Differentiated user-based services require visual and controllable networks. ZTE’s UniCare solution provides operators with optimization schemes of LTE service quality E2E optimization, helping them achieve the following goals:

- traffic visualization: display and monitor the distribution of network traffic in

terms of network types, NEs, areas, and sites. With UniCare, operators can dispatch and allocate network bandwidth to solve traffic congestion and improve network quality.

- service quality visualization: support quality assessment and monitor mainstream mobile internet services, such as web browsing, online video, instant messaging, social platform and app store, in real time.
- automatic delimitation of service quality problems: support E2E fast and automatic delimitation of service quality problems (involving mobile internet, CSFB, and VoLTE services). Orders can then be automatically dispatched to related maintenance departments of terminals, wireless devices, core network devices, and services.
- E2E network optimization: by associating wireless CDT/MR data, it can accurately locate service quality problems and facilitate

- how to enhance ROI of LTE networks.
- how to explore traffic and data values and find new service forms.

With strong R&D capabilities and deep market insights, ZTE develops its UniCare—a technical service solution that is designed to help operators meet new challenges and transform their operation. UniCare deconstructs customer experience and service quality from three layers—network, service, and customer—and focuses on end-to-end (E2E) network optimization, which achieves visualization and manageability of mobile data service

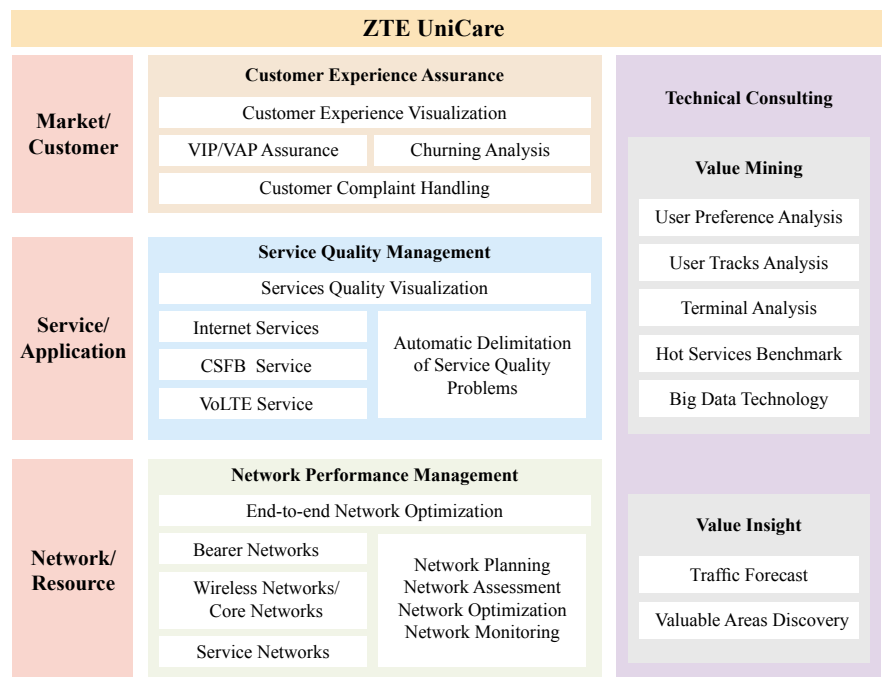


Figure 1. ZTE’s UniCare solution architecture.

ZTE's UniCare solution has made a great leap on automatic delimitation in terms of service quality and customer experience.

problem handling. By combining with the experience database and professional optimization methods, it can implement E2E optimization of the bearer, wireless, core, and service networks.

Insight into Valuable Areas to Enhance Investment Efficiency

With the boom in mobile internet applications, the Pareto principle and tidal effect play an increasingly important role in mobile networks. The traffic in hotspots accounts for a large portion of the total traffic volume. Operators are focusing on how to assess network value of a different area from the perspective of service quality and user experience to make the most efficient investment. By introducing UniCare, ZTE helps telecom operators improve investment efficiency from the following aspects:

- traffic prediction: according to the existing network traffic, UniCare

can predict future traffic growth and provide a reliable basis for network expansion to avoid blind investment.

- valuable areas discovery: UniCare assesses the maturity and benefits of networks in a different area. Network maturity mainly includes network coverage, load, speed, and other indicators. Network benefits involve traffic, service composition, and user composition (such as VIP user ratio). With a comprehensive assessment, valuable areas with high benefit ratio can be discovered. ZTE can, in line with network maturity and benefits, give advice on areas of development and investments to increase ROI.

Data Value Mining to Achieve Win-Win Cooperation

Breakthroughs must be made in the simple traffic selling model of network pipelines. The breakthrough point lies in exploring data values of network pipelines.

With data, operators can implement precise marketing strategies. Moreover, by knowing service development trends from traffic data, operators can cooperate with relevant OTT service providers or carry out self-operated services to create new service forms. It has been proven that third-party applications introduced to data-based open platform are more likely to stimulate data usage and generate new service directions. ZTE's UniCare solution innovates network data values from the following aspects:

- supports big data technology and achieves aggregation, storage, and analysis of massive data.
- forms customer portraits from terminal selections, service preferences, and position tracks, so as to implement precision marketing strategies.
- provides service quality benchmarks and references for self-operated services as well as OTT cooperation.
- supports open data interfaces and helps operators build an open telecom data ecosystem.

ZTE's UniCare solution has made a great leap on automatic delimitation in terms of service quality and customer experience. It helps operators establish competitive advantages in the mobile internet wave. ZTE has already cooperated with China Mobile, China Unicom, China Telecom, MTN and Telenor, helping them win initiatives during transformation. [ZTE TECHNOLOGIES](#)

UniCare CEA: Creating Superb User Experience

By Yang Yi

LTE networks have advanced faster than expected in terms of handling mobile internet. The share of revenue from mobile data and internet increased from 17% in 2013 to 23.5% in 2014. Of all mobile users, 45.3% are broadband users, which is 12.6% more than in 2013.

According to the above statistics, the number of data users is exploding, and data services are rapidly replacing

traditional voice services as major sources of revenue for operators. To respond to challenges created by data services, an increasing number of operators have shifted the focus of their O&M from network performance to user experience.

Key Phases of O&M Transformation

ZTE's UniCare customer experience assurance (UniCare CEA) is a high-end

service that guarantees rapid improvement of user experience when operators transform their O&M model. This service has two phases: establishing a user experience evaluation system and improving end to end user experience.

Phase 1: Establishing a User Experience Evaluation System

The method commonly used for building a user experience evaluation

system is to install probes and analysis tools on network interfaces to collect raw data, inspect the service and extract a key QoS field through deep packet inspection (DPI), and work out single-user, single-service QoS indicators based on the service and field.

The results of network trials conducted by operators show that user experience evaluation is not accurate enough because of

- poor network coverage. Users would consider the network to be poor if their mobile terminals do not display full signal bars. This kind of experience is not included in the current evaluation system.
- inadequate service access. The current user experience evaluation system does not indicate whether access to a RAN, CN or service is successful or not, nor does it indicate how long it takes to gain access.
- insufficient service usage. Problems occur during service usage, for example, websites cannot be opened, it takes a long time to open a web page or download a file, and video streams cannot be played smoothly. Currently, most services cannot be inspected. More than 10% of total traffic is uninspected, which means that service experience of some users is not evaluated. Non-subdivision of already inspected web browsing services like Netease newsreader app and Ifeng news app, or even non-subdivision of inspected sub-websites like headline news and sports news, would lead to

an inaccurately evaluated user experience. The extraction and algorithms of indicators for some core services and applications is not accurate. This would also affect user experience evaluation.

Phase 2: Improving End to End User Experience

Once a mature user experience evaluation system has been built, operators can use the indicators provided by the system to verify user experience by VVIP, VIP, VAP, and roaming users or by regions. If user experience is poor or deteriorates, user experience needs to be analyzed and improved from end to end. Three steps are involved:

- delimit problems. Clarify the NEs and corresponding departments that are responsible for degradation of user experience. The Terminal Department should take charge of terminal problems, and the Network Optimization Department or Wireless Maintenance Department should be in charge of radio problems.
- locate problems. Relevant departments analyze problems and determine the causes.
- solve problems. Work out ways to solve the problems. For example, optimize or expand the network to address coverage, capacity, and interference problems; troubleshoot problems, or provide differentiated services like PCC to improve user experience. However, an end-to-end user

experience analysis and improvement mechanism has not yet been fully developed. There are many reasons for this, but the primary reason is lack of experience and mature skills, which leads to a waste of human resources and inaccurate delimitation and location of problems.

UniCare CEA: More Accurate and Efficient

Drawing on 30 years of experience in telecom equipment R&D, O&M and network optimization, ZTE has rolled out its UniCare CEA solution that can help operators transform O&M more stably and rapidly. UniCare CEA has the following distinct features.

More Accurate User Experience Evaluation System

A network cannot receive service requests from a UE because of poor reverse coverage. The app probes installed on mobile terminals can collect terminal signaling and behaviors and use them to supplement relevant user experience data that cannot be obtained on the network side. The accuracy of a user experience evaluation system can be increased by 1–3%.

The MR/CDT data on the radio side can be used to supplement relevant user experience data in network coverage, RRC setup, and RAB establishment. System accuracy can be increased by 2–3%.

The DPI function can inspect more than 95% of traffic and sub-divide it into specific apps or trails that a user follows. For example, each time a

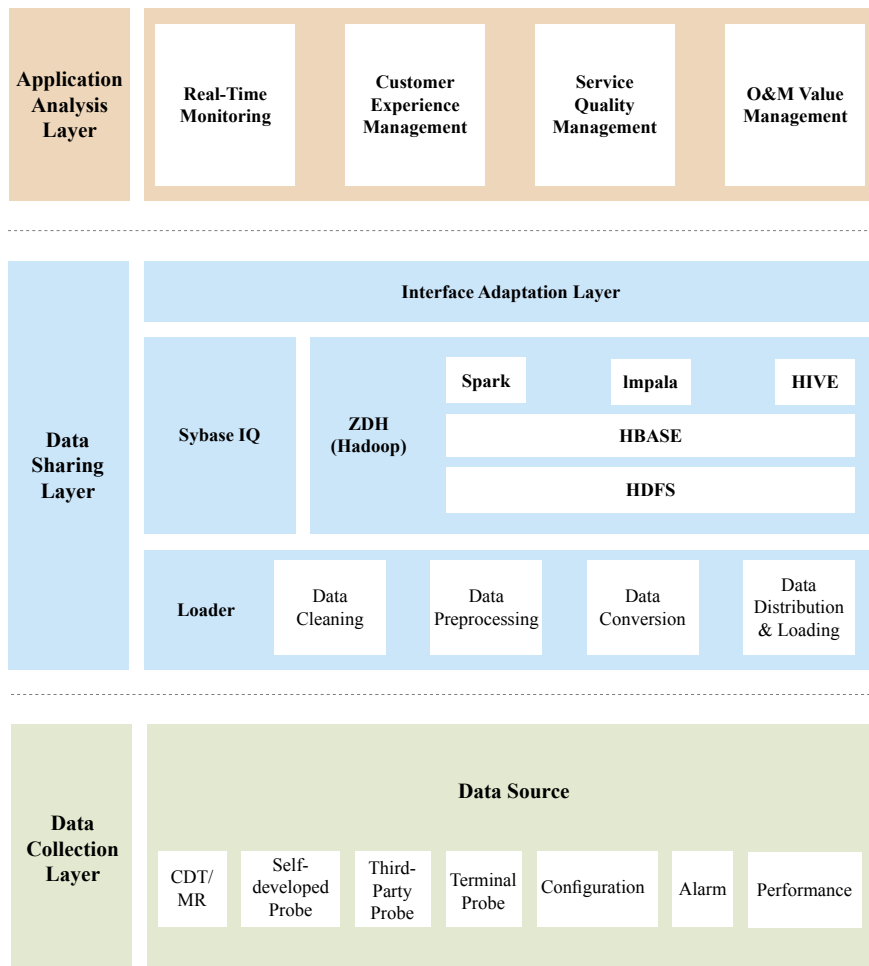


Figure 1. ZXVMAX architecture.

user opens a website on the Netease newsreader app can be inspected.

Deep user experience indicators such as page display success rate/delay, and the number of video interruptions as well as shallow user experience indicators such as DNS

success rate/delay, TCP handshake success rate/delay, website response success rate/delay, and download rate can also increase system accuracy.

More Intelligent Problem Delimitation and Location

UniCare CEA provides automatic end-to-end problem delimitation. Its core tool ZXVMAX can apply big data-based machine learning technologies to the telecom field and use the clustering algorithm to accurately and automatically delimit user experience problems such as investment processing and service quality problems. These problems can be delimited to a cell, MME, XGW, SP, or mobile terminal.

UniCare CEA can be used to automatically locate RAN problems. Problems on the RAN side associated with poor/overshoot coverage, capacity, parameter configuration, and network fault can be automatically located by correlating MR/CDT data, network configurations, and parameter configurations and using the automatic matching algorithm in the rule base.

Stronger Data Processing

ZXVMAX has been developed on ZTE’s enhanced big data platform. It consists of Hadoop, Impala, Spark and other core components (Fig. 1). ZXVMAX provides correlation analysis of huge data through clustered data storage and computing, and can greatly improve data analysis and query efficiency.

ZTE’s UniCare CEA is backed by an experienced solution team, a senior service delivery team, and the industry-leading intelligent analysis tool ZXVMAX, which can help operators rapidly and precisely evaluate and improve user experience. [ZTE TECHNOLOGIES](#)

Information Security Services:

Cornerstone of Network Operation in the M-ICT Era

By Wang Haiying

As cloud computing, Internet of Things (IoT), mobile internet, and other new technologies are developing, information society is moving towards “mobile internet of everything.” Information technologies have changed and are profoundly changing the world we live in. In this context, high attention is paid to security and privacy, especially information and network security.

In the M-ICT era, communications networks are developing into IP-based ones, which accelerates the convergence of IT and CT networks and makes them more transparent but also more vulnerable to external viruses and hacks. The emerging mobile office and BYOD services have raised new security requirements. Virtualization, cloud computing, and data centers have also created new challenges to the communications networks. All these require higher-security products, and information security services are becoming increasingly important as well.

A study by the Internet Data Center (IDC) shows that the Chinese security service market is expected to reach RMB 6.5 billion by 2017, with a CAGR of 15.1%. According to Gartner, the global security service market will reach

US\$78.9 billion by 2017, with a CAGR of 12.07%. This market is growing stably.

As a global leading provider of integrated end-to-end communication solutions, ZTE boasts long-standing experience in all fields of the communications industry and is committed to providing operators, governments, and companies with a suite of end-to-end information security services for the information age.

ZTE’s information security services cover the entire lifecycle of an information system and include security consulting, security testing and evaluation, security integration, O&M security, special security, and security knowledge.

O&M Security Services

ZTE provides O&M security services for operators and government and enterprise customers to maintain and manage software and hardware of their information and network systems in real time. These services are developed on the overall customer information security framework and security policies and integrate cutting-edge technologies, professional service tools, experienced O&M security teams, and mature service management systems. They guarantee the security of physical communication networks, system platforms, data, and applications, and provide customers with O&M security services including security monitoring, security check and

reinforcement, emergency response, and security audit.

Security Integration Services

Based on advanced security concepts and a sophisticated security system, ZTE tailors network equipment and information system integration services for customers. ZTE helps with security system planning, security solution design and implementation, and engineering security management for a complete and efficient information security system.

Special Security Services

With years of study and experience in cloud computing, big data, virtualization, and other state-of-the-art technologies, ZTE offers special security services to ensure the security and reliability of a customer’s core data, Web applications,





Security Consulting Services

ZTE's security consulting services are designed to analyze existing security policies and standards of the target network system, and clarify the role and importance of these policies and standards in the construction of IT security infrastructure. They fully evaluate risks and security abilities of customer systems and provide complete requirement analysis, function analysis, framework design, deployment and implementation of preliminary solutions for the construction of security infrastructure. This enables a customer to know how far their current system security is from their goals, helps customers design and build security systems that meet compliance requirements, and provides measures to reduce security risks and improve security management.

The M-ICT era has changed the way we obtain, store, transmit, and process information. The complexity of network architectures, explosive growth of users, and dramatic expansion of data make it more difficult to secure information. With its great technical reserves, professional security teams, and extensive practice experience in the communications industry, ZTE provides end-to-end security services from information system planning and design to system implementation and O&M at physical, network, system, and upper application levels, covering the wireless network, core network, and services that include both legacy services and cloud computing, big data, and IoT services. ZTE's information security services help customers streamline their security from both service and technical perspectives, guarantee the security of customer data, and contribute to the construction and operation of information systems in the M-ICT era. [ZTE TECHNOLOGIES](#)

clouds, virtualization applications, data centers, and mobile terminals.

Security Test and Evaluation Services

As well as legacy risk evaluation, ZTE's security test and evaluation services also focus on different types of customer systems at different stages of the network lifecycle and provide security test services targeted to Web application systems and wireless networks to help discover potential

security problems before systems are put into operation. These services analyze service flows to locate service risks and provide security measures and suggestions for improvement to help customers control risks in their information systems.

Security Knowledge Services

ZTE provides security knowledge services customized to different levels of customer needs. Technology and management training courses are offered so that customers can acquire a full range of security knowledge and skills from general security awareness, to specific attack and defense operations, to senior information security management.

SQM: A New O&M Experience for PTN

By Bao Jie

Packet transport network (PTN) is an important bearer solution for metropolitan area networks. PTN provides 2G/3G backhaul, WLAN hotspot access, and dedicated line access for VIP group users. The fast-growing demand for 4G LTE has meant that more PTNs have to be constructed.

The need to uniformly carry all types of integrated services, especially LTE services, has increased O&M requirements of PTNs. The biggest challenges for PTN O&M are ensuring efficient service deployment, quality service transport, and rapid fault location.

Challenges of PTN O&M

When PTN is used to carry LTE and dedicated VIP group users, higher service bandwidth and network performance are required. Delimiting responsibilities and locating and diagnosing faults can also be more difficult. The challenges related to PTN O&M—which includes O&M during network deployment, routine O&M, and fault maintenance—are ever greater.

An LTE network requires high-performance transmission between eNBs

and a core network and between eNBs themselves. LTE eNB deployment and site adjustment involves establishing and scheduling many PTN-based backhaul channels, and it is difficult to accurately determine whether the newly deployed channels meet the bearer requirements of LTE eNBs.

During routine maintenance, operators often find that they receive user complaints even though the network KPIs indicate that the network is running well. This means that traditional KPIs obtained from the network management system do not truly reflect the actual network QoS and do not prevent service experience declining when network performance declines.

Traditional O&M is divided into several maintenance domains according to a specific private network, so it is often insufficient for handling complaints about 3G, LTE, and dedicated line services in a timely manner. Faulty nodes are difficult to locate quickly, and faulty private networks cannot be accurately delimited. This results in a long fault handling process that affects customer satisfaction.

SQM Solution

To cope with the challenges of PTN O&M, ZTE has joined

operators in researching key O&M requirements and has developed a service quality management (SQM) system. The SQM system is centered on network and service performance management to authenticate and control QoS, and also quantify, compare, and test QoS indicators.

The SQM system deployed in the PTN can analyze network and service performance and optimize the O&M procedure. It has the following features:

- A distributed performance measurement system that primarily uses active performance measurement but also passive performance measurement can accurately measure PTN and service performance.
- The embedded RFC2544, Y.1564, Y.1731, and TWAMP testing functions supports origination, transparent transmission, and reflection of measurement flow, fully covering end-to-end measurement of L2 link performance and L3 service performance in the PTN.
- The SQM system supports end-to-end performance testing on any service link and link-by-link performance testing on specified links in the PTN in order to meet the need for long-term QoS monitoring of important links and the need for rapid fault location.

- The SQM system measures online service quality on a real-time basis and provides visual quality management based on typical PTN service granules, including presentation, alarms, analysis, and reports in order to meet the need for controllable service quality.

SQM Applications

LTE network construction and guaranteeing service for group users are an operator's top priorities in PTN O&M. Higher requirements for QoS include rapid service channel commissioning, guaranteed 24-hour high-quality channel performance, efficient troubleshooting, and periodic QoS report. SQM is a good solution for these important aspects of O&M. It also provides visual, personalized applications for maintenance personnel, network monitoring personnel, and O&M management personnel involved in the O&M flow.

Performance Assessment on Newly Commissioned Service Channels

For newly commissioned LTE backhaul channels or dedicated lines for VIP group users, the SQM solution has built-in RFC2544 or Y.1564 testing functions. This means that channel performance can be tested and the quality of L2 or L3 channels can be determined in order to meet service deployment requirements and ensure successful service provision.

ZTE's SQM solution for PTN helps an operator construct converged, efficient, reliable full-service bearer architecture.

Real-Time Monitoring of the Performance of Online Services

For online Ethernet services, the SQM solution monitors channel performance in real time through the embedded Y.1731/TWAMP test. Service performance is shown visually so that the status of services inside the bearer channels is clear and alarms can be raised immediately if channel performance deteriorates.

Rapid Fault Location

For complaints about wireless and dedicated-line service faults, the SQM solution provides active fault measurement and location oriented to service applications. Through link-by-link measurement and quality analysis of service paths in the PTN, faulty nodes are rapidly and exactly located and failure worksheets are efficiently implemented.

SLA Service Management

For service guarantee of hotspot eNBs and important dedicated lines, the SQM solution provides 24/7

uninterruptible performance monitoring and makes a statistical analysis on key indicators based on the SLA. The solution also outputs SLA reports to improve customer service satisfaction.

With the growth of full-service operation, operators are enhancing their operation support capabilities. SQM is crucial in a competitive era. SQM is strategically important. Operators can adopt SQM step-by-step in private networks according to their own network resources, business development, and organization structure, and finally implement SQM throughout the network.

ZTE's SQM solution for PTN helps an operator construct converged, efficient, reliable full-service bearer architecture. The solution also increases an operator's ability to carry integrated services and guarantee end-to-end bearer channels. It introduces an end-to-end service quality management system that meets the requirement for intelligent and intensive O&M and creates a transition to user experience and service quality-centered O&M. **ZTE TECHNOLOGIES**

ZTE'S CEA SERVICE

HELPS GUANGZHOU MOBILE ENHANCE SERVICE QUALITY

By Li Jingtao and Bi Shu

With the evolution of mobile broadband technologies, boom in internet services, and boom in intelligent terminals, Chinese operators are facing fierce competition to expand their mobile broadband user base.

Providing customers with differentiated, personalized, high-quality mobile internet services gives operators a core advantage. It is also a major way to increase revenue and user loyalty. Therefore, Guangzhou Mobile introduced ZTE's customer experience assurance (CEA) services to evaluate service performance, troubleshoot potential problems, and develop optimization solutions. This helps Guangzhou Mobile improve service quality according to customer experience.

Guangzhou Mobile is located in a front-line city for reforms and opening up in China and has always been encouraged to adopt new technologies. Guangzhou Mobile selects RNC10 that is in a major coverage area and with large service traffic as a pilot site, for

which ZTE provides CEA services.

In order to improve service quality, user experience, and customer satisfaction, ZTE customized a series of service solutions for Guangzhou Mobile. These solutions include TCP connection performance analysis and HTTP service performance analysis to analyze the quality of current mainstream services.

TCP Connection Performance Analysis to Enhance User Perception of Access

The analysis shows that the TCP connection success rate of Guangzhou Mobile was as low as about 70% and seriously affected service access performance (Fig. 1). Generally, the normal value is 92–93%, so the success

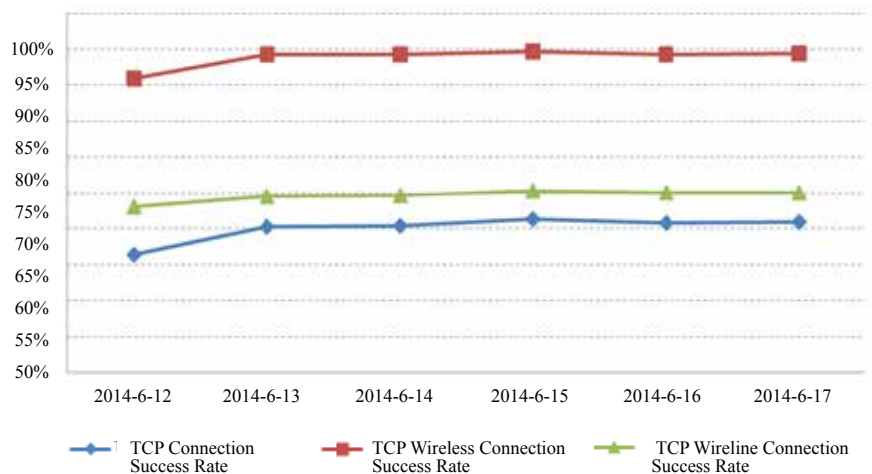


Figure 1. TCP connection success rate trend.

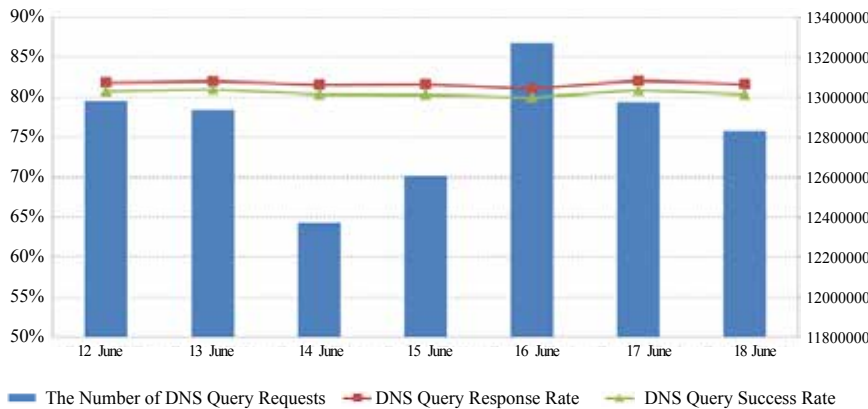


Figure 2. DNS query success rate trend.

rate of Guangzhou Mobile had to be increased by about 23%. This issue involves the coverage or interference on the wireless side.

The delay for TCP connection is 540 ms, and it is even longer on the wireless side. Therefore, the delay needed to be shortened on the upstream, wireless sides, and in TOP cells.

In traditional network management systems, TCP connection KPIs are poor, and we cannot tell whether the problem lies with wired part or wireless part. To address this issue, CEA is introduced to break down the overall connection process, find the root causes, and solve problems rapidly.

HTTP Service Performance Analysis to Enhance User Perception of Integrity

After analyzing HTTP services thoroughly, we discovered that the success rate of DNS query was relative low, and the GET response delay

was fairly long (Fig. 2). After further investigation, we found that DNS query failed due to defaulting or invalid users. The GET response delay depends mainly on the CMWAP channel. However, the GET response delay of CMWAP channel is six times greater than that of the CMNET channel. Therefore, the performance of CMWAP channel needed to be further improved.

The DNS query success rate is only a representation. Based on the industry-leading clustering algorithms, the CEA service pinpoints problems by analyzing the related network elements of a faulty network element and then solves the faulty APN efficiently. By doing this, the CEA service increases the overall success rate of DNS query and guarantees network quality.

Web Browsing Service Performance Analysis to Enhance User Perception of Usage

After analyzing the download rate of web browsing services, we discovered that approximately two-thirds of users had good perception, about one-third of users had fair or poor perception, and 16% of users had very poor perception.

Results of download rate analysis showed that perception of the download rate in 30% of the cells was fair and that in 1.7% of the cells was poor. For the cells with fair or poor user perception, which are possibly caused by large number of users, high load, or limited coverage, the download rate needs to be increased through expansion or coverage optimization.

Service usage patterns cannot be obtained by conventional means. Thanks to its accurate business models and in-depth understanding of network problems, ZTE's CEA service not only makes user behavior visible but also defines root causes rapidly, troubleshoots potential network problems, and makes suggestions for corrective measures.

Through cooperation between Guangzhou Mobile and ZTE, by focusing on user experience and service quality, the CEA service conducted a comprehensive bottom-up examination of networks and pinpointed some potential problems that were affecting service quality and user experience. These problems could not be detected by conventional means. CEA is a much more efficient way of solving problems. With special CEA optimization, user perception of the web browsing service increased from fair (3.23 points) to good (4.8 points). It guarantees the quality service of Guangzhou Mobile. [ZTE TECHNOLOGIES](#)



CHINA MOBILE: OPTIMIZING LTE NETWORKS

By Li Junhao

With the explosion of mobile communication, networks now need to handle a lot more data. This has been the impetus for large-scale LTE deployment. In 2014, China Mobile deployed its LTE networks widely.

After the first phase deployment of LTE networks, China Mobile put them into commercial use. However, many problems arose due to a discrepancy between the plans and actual construction. These problems were low performance, inadequate network coverage, complaints about voice

services, and a huge impact on network security and performance caused by major events.

As a major equipment supplier of China Mobile's LTE networks, ZTE leveraged its experience in product development and delivery and addressed these problems. ZTE delivered a complete LTE network optimization service, helping China Mobile survive the fierce competition in the market.

Rapid Network Performance Improvement

After deploying large-scale LTE

networks, China Mobile encountered problems with engineering quality and network planning that meant network performance was not up to expectations. Therefore, rapidly improving network quality became the primary task for China Mobile.

ZTE helped China Mobile quickly improve network performance by handling network alarms, verifying planning information, adjusting antennas and feeders, and checking configuration parameters. All this laid a good foundation for China Mobile to commercialize its LTE networks.

The Xuzhou branch of Jiangsu Mobile (Xuzhou Mobile) deployed the initial phase-I LTE network in early 2014. However, they were not satisfied with the network performance. In seven of ten areas, the download speed did not meet the requirements, nor did the average SINR in eight areas meet the requirements. Overall, only 20% of requirements were met. To address this issue, a ZTE team optimized the network over the course of a month. This helped Xuzhou Mobile increase the average downlink throughput of its LTE network to 37.35 Mbps and increase the average SINR to 14.86 dB. The network O&M also significantly improved, reaching an advanced level in China.

Building Advanced LTE Networks

By cooperating with ZTE to build advanced LTE networks in key cities, China Mobile has gained experience in network O&M and has promoted it across the country to rapidly improve network performance.

In Dali, Yunnan province, China Mobile and ZTE have established a joint network optimization war room. After three months of network optimization, Dali Mobile has increased its LTE network coverage rate from 96.22% to 97.31%, its average SINR value from 13.21 dB to 15.12 dB, and its average download speed from 26.32 Mbps to 38.11 Mbps. Network performance and user experience have been greatly enhanced.



The opening ceremony of advanced LTE network jointly built by Dali Mobile and ZTE

Increasing LTE Coverage

As LTE networks use high-band spectrum that has a relatively poor penetration, they are inadequate for extending coverage in many scenarios. This greatly affects user experience and the reputation of the LTE network. The basis for good LTE network experience and user satisfaction is to provide users with access to LTE networks anytime and anywhere. Therefore, increasing coverage is the focus of LTE network optimization.

ZTE's LTE network planning and optimization solution can leverage its small cells, integrated microcells, and small antennas to address coverage issues in typical residential areas and CBD. For instance, Beijing Financial St. is a typical CBD area spanning 1.846 km². Existing macrocells in Beijing

Financial St. could not meet coverage requirements; therefore, ZTE made a plan for integrated microcells. After these were deployed, the ratio of signal strength with RSRP greater than -101 dBm increased from 79.32% to 97.16%, and the ratio with SINR greater than -3 dB remained unchanged at about 96.71%. In this way, network coverage was significantly increased.

Optimizing Interference to Improve Network Quality

Network interference severely affects network performance and user experience. ZTE's LTE interference optimization involves optimizing regional centralized interference, single-cell interference, D-band interference, and F-band interference.

After LTE interference optimization,

Beijing Mobile has decreased the number of cells with F-band interference to 139, a decline of 29.08%. The total number of cells experiencing interference has decreased by 42.59% to 213.

During the interference optimization, ZTE has also found that external interference with the network can be caused by illegal use of cordless phones. To solve this problem, ZTE has developed an anti-interference algorithm that mitigates the effect of such interference on the network.

Optimizing CSFB to Make Smooth Voice

China Mobile has not yet deployed VoLTE on LTE networks, so it enables voice service by falling back to a GSM network through CSFB. CSFB may result in high delay and low call success rate because it involves multiple network elements, several scenarios, and complex processes. To address these issues, ZTE's CSFB solution has been designed for whole-process signaling analysis and special optimization of wireless network coverage, neighbor cell configuration, and boundary frequency points. The optimization also involves configuring key parameters for the access side, paging, and interoperability. All this improves CSFB performance.

Securing Network Operations to Safeguard Major Events

At concerts, sporting events, large exhibitions, and festivals, a heavy concentration of users often leads to a surge in voice and data traffic. This significantly affects the network and

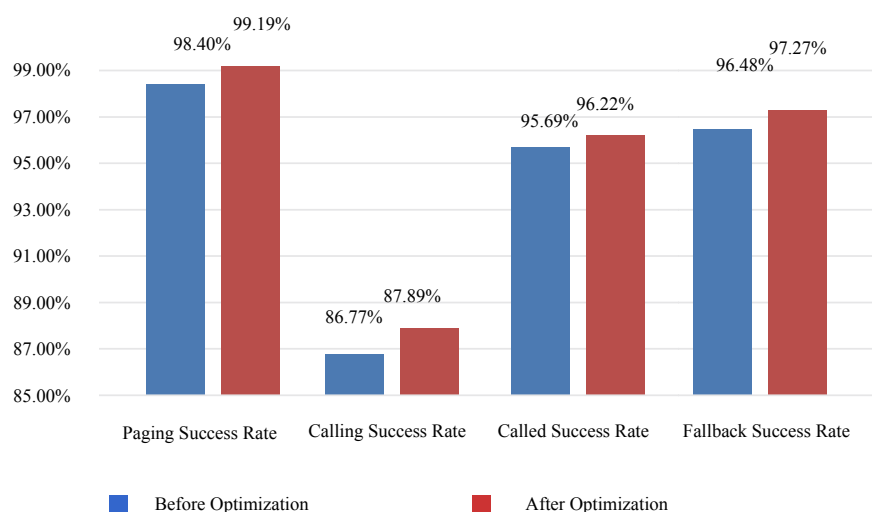


Figure 1. Zhejiang Mobile's CSFB performance before and after optimization.

greatly diminishes user experience. ZTE has developed a special solution to ensure network performance for major events. The solution involves adding temporary sites, adjusting network coverage, and configuring network parameters. In 2014, China Mobile worked with ZTE to safeguard major events such as Dalian International Beer Festival, Zhuhai Air Show, Internet Conference, and APEC Conference.

At the Dalian International Beer Festival, China Mobile and ZTE established a joint team for guaranteeing network security. The LTE network in Dalian withstood the challenges of a large volume of traffic during the festival. On the opening day, the

network withstood its maximum of 800 users. The indicators on the NMS showed that the RRC setup success rate of the sites around the Xinghai Square exceeded 99.8%, the cell radio connection rate exceeded 99.7%, the intra-system handover success rate exceeded 99.5%, and the paging congestion rate was 0. These good results were recognized by China Mobile. The network optimization service starts with basic optimization and makes an in-depth analysis of extended coverage, interference, CSFB, and major events to help China Mobile completely improve its LTE network performance and user experience. [ZTE TECHNOLOGIES](#)

Cloud UniCore:

Innovative Virtualized Core Network Solution

By Pan Zhenchun

In the mobile internet era, operators are facing serious challenges from OTTs. ZTE has proposed an M-ICT strategy that is user-centric and future-oriented. The strategy involves in-depth integration of IT, CT, and internet and assists operators to transform their services. Key components of the M-ICT strategy are network function virtualization (NFV) and software-defined network (SDN), both of which have become the focus of industry. With the introduction of NFV, operators are most concerned about:

- reducing network capex and opex and improving resource utilization while optimizing network performance
- ensuring IT technology in the virtualized network has carrier-class reliability
- ensuring rapid, convenient NE deployment, fault locating, and routine O&M in layers provided by multiple vendors

To address the above issues, ZTE proposes a cost-effective, easy-to-manage carrier-class Cloud UniCore virtualized core network solution. This solution involves all NEs in the 2G and 3G core networks and the EPC, IMS, or UDC.

High Price-Performance Ratio iSDN Gateway: Creating Highly Efficient User-Plane Channels

With x86 servers, pure NFV gateways have strong computational capability and can process data on the control plane. However, compared with dedicated data forwarding devices, they are inferior in forwarding data over the media plane. Gateways such as SGWs and PGWs are the key in the 4G core network, and data forwarding performance is crucial. ZTE proposes the iSDN architecture to achieve an SDN-based gateway. This architecture

separates complicated data processing from basic data processing in the media plane, and 80% of user data is forwarded at a wire speed through a high-speed switch. For the remaining data that requires complicated processing, service chain technology is used to schedule and process resources as needed. This not only improves the media-plane performance but also reduces device overhead. In addition, forwarding nodes are distributed by iSDN gateways. The control plane of the gateway selects the optimal forwarding node and path for user traffic according to user locations, service flow characteristics, and user properties (Fig. 1).

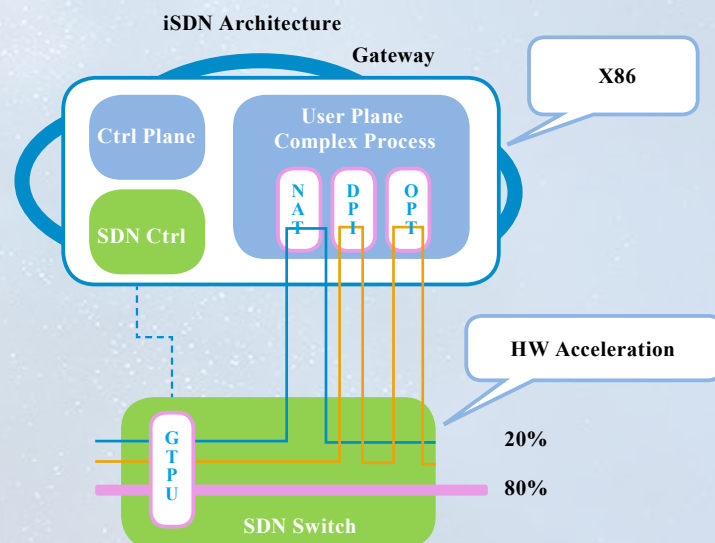


Figure 1. iSDN gateway architecture.

Integrated vCN: Simplified Network with High Integration

At present, the common virtualized core network solution still remains in the network element virtualization (NEV) stage. However, ZTE's integrated vCN solution can freely combine the functional components of various NEs in the core network. This solution can be applied to different scenarios and motivate the network evolution. Through the internal exchange between components and common modules combination, the virtual machine (VM) resource consumption, processing delay, and interworking difficulty between NEs can be reduced. Moreover, the high degree of integration in the integrated vCN solution makes it quicker and more convenient to deploy small networks.

Carrier-Class Reliability

Multi-Layer Reliability Guarantee: Second-Level Fault Recovery

The hypervisor layer is added to the virtualized network. The reliability of a single VM is lower than that of traditional telecom devices, and simple virtualized solutions cannot meet the carrier-class reliability requirements. Therefore, ZTE takes the following measures to improve the reliability of virtualized networks to 99.9999%.

- Multi-level dispersion and redundancy: POOL geographic redundancy and 1+1 or N+K backup of software and hardware

components.

- Multi-level monitoring and fault self-healing: in-band and out-band monitoring of software and hardware and VMs; insulate and restore faulty resources. By doing so, the system can be rapidly recovered and the service capability can be ensured.
- Service continuity guarantee: through hot patching, ISSU, VM hot migration, and synchronization, service continuity is guaranteed during the period of fault, O&M, and scaling process.

Intelligent Overload Control to Resist against Network Storm Attacks

A virtualized network combines overload control and scalability to admit new traffic by increasing resources, greatly enhancing the anti-load shocking capability of the network.

- Load closed-loop monitoring: monitors the CPU load, bandwidth usage, and session number in real time, and adaptively controls the load.
- A combination of load control and scalability: when the system load does not exceed the license limit, increase processing resources rapidly to admit new traffic. Furthermore, the control plane and media plane can be independently stretched to adapt to different overload scenarios.
- Overload control: when the system load reaches the license limit, if an overload event occurs, overload

control is initiated to suppress the ratio of new transactions. Meanwhile, overload information can be sent to adjacent NEs to ensure that services can still be effectively processed.

Ease of Maintenance

Big-Data Closed-Loop Troubleshooting Solutions

The NFVO, VNFM, VIM, and virtualized layer are newly added to a virtualized network, so the complicated structure makes it more difficult to locate faults. ZTE's big-data closed-loop troubleshooting solutions locate faults rapidly and accurately, and the fault locating period is shortened from 4 hours to 15 minutes.

- Accurate: monitoring hardware, software, and the virtualization of these from a multi-level perspective, and thus data can be collected on fault spots and faulty processes across the whole system. This makes data more complete and enables alarms to be more accurately located and analyzed.
- Intelligent: according to system alarms, by docking ZTE's VMAX system for big data analysis of network information and user behavior, alarms are automatically associated, root alarms are traced, and solution policies are matched to trigger related operations and reduce manual intervention, so as to handle alarms efficiently.
- Closed loop: system resources

are monitored, analyzed, policy-controlled, and re-monitored to keep the whole network stable and healthy.

Unified and Centralized O&M

After virtualization is introduced, software and hardware are layered by different vendors, and this increases O&M complexity. To solve this problem, ZTE introduced unified, centralized O&M to simplify virtualized network O&M. It achieves easy NFV O&M from deployment to optimization.

- Centralized monitoring and layered management: system resources are centrally monitored. An orchestrator provides the global resource management view to monitor the configuration, alarms, and performance of physical and virtual resources. The OSS/BSS/EMS monitors resources at service layers of NEs. An independent maintenance interface is provided at each layer to meet operators' layered management requirements.
- Providing centralized maintenance tool and one-key management for network services: the deployment, capacity expansion, and service orchestration of virtualized network can be completed through one-key operation in the interface. It simplifies O&M in a virtualized system in the core network and shortens the system's commissioning and capacity expansion period.



In October 2014, ZTE exclusively won the bid for China Mobile's RCS convergence communications project, the largest platform and application project in the history of China Mobile. China Mobile's active subscribers reached 16 million. This project shouldered the heavy responsibility of transforming China Mobile's next-generation convergence communications strategy. It commercially deployed the virtualized IMS devices and RCS service platform for the first time, and it will become the world's largest NFV commercial office and IMS-based RCS commercial network.

Recently, China Unicom and ZTE jointly carried out the "VoLTE Service based on vEPC and vIMS Architecture"

NFV proof of concept (PoC) project. ZTE provided the vEPC and vIMS, and assessed VoLTE service quality and user experience in virtualized network based on PoC project framework development of ETSI NFV industry standards group. Nowadays, ZTE is cooperating with multiple global tier-one operators to carry out NFV-based PoC tests and has documented many achievements with positive responses. This reveals the outstanding performance and success of ZTE's virtualization solutions. [ZTE TECHNOLOGIES](#)

A blurred photograph of a modern office interior. The scene shows a large, open-plan space with a high ceiling, recessed lighting, and a grid of ceiling panels. In the foreground, there is a large, dark-colored sofa or lounge area. The background features a long wall with large windows, through which some greenery is visible. The overall atmosphere is bright and professional, though the image is intentionally out of focus to emphasize the text.

ZTE

Tomorrow never waits