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ZTE Profile

ZTE is a leading global provider of telecommunications equipment and network solutions. It has the widest and most complete product range in the world—covering virtually every sector of the wireline, wireless, service and terminals markets. The company delivers innovative, custom-made products and services to over 500 operators in more than 140 countries, helping them achieve continued revenue growth and shape the future of the world's communications.

ZTE中兴 ZTE CORPORATION

KPN:

Facing up to the **Growing Challenges**

Reporters: Liu Yang and Zhao Rujing



Trik Hoving is chief officer for strategy, innovation and technology at KPN Group. In a recent interview, he talked about the challenges facing KPN in the highly competitive European market and discussed KPN's development strategies. With customer needs always at the front of his mind, he is meeting the challenges head on and is confident about his company's future prospects. Erik also shared his thoughts about ZTE, now KPN's strategic partner, and what Western and Asian telecommunications companies can learn from each other.

Journalist: Could you introduce KPN and its main business focus?

Erik Hoving: KPN is a North-West European operator with its heritage in the Netherlands. We are the incumbent operator and a full, integrated access player in the Netherlands. We provide fixed, mobile, and IT services, but in Germany and Belgium we are a mobileonly operator. In the Netherlands, we are a service provider, a communications provider to both consumers and businesses.

Journalist: What challenges do you face as a multinational operator?

Erik Hoving: There are many challenges we face at the moment in Europe.

There are a number of economic challenges that we have. In Europe, we



have economic challenges related to the economy and a potential economic recession. These kind of challenges are keeping us busy.

We are faced with a number of business challenges. As the incumbent operator in the Netherlands, we are faced with challenges from cable companies on television, broadband Internet, and telephony.

In the Netherlands, we are facing a challenging business market as competition is increasing.

In the mobile phone consumer area, especially in the Netherlands, we see that new players, who we call "over-the-top" players, enter our business. These are the likes of Google, Facebook, and WhatsApp. They gradually get their hands on our customers in a competitive manner, in the sense that people are using their telephone to connect to Facebook rather than connect with KPN. People are definitely connecting to Facebook. So increasingly in the marketplace, competitors are capturing the attention of our customers.

Then in technologies, we see a huge change in usage from voice to data. People in the past used our network primarily to make voice calls. That has massively changed now to usage of huge amounts of data. So they use the Internet to download information and stream video. This means, from a technological perspective, you have to completely rebuild the infrastructure within a couple of years to accommodate data.

Journalist: In face of these challenges, what is KPN's overall development strategy?

Erik Hoving: We have two very clear goals in our mind. First, we have to make

sure that we balance all the things we do for multiple stakeholders. We have our shareholders, employees and customers. But I would put it a little differently. Primarily, we have our customers. We have to make sure that we keep our customers close to us and ensure our customers keep very close to the way we operate, the way we do business. Ultimately, customers are the reason why we are in business. Second, we have to make sure that we our shareholders want to stay with us and see KPN as a trustworthy investment. And third, our strategy is based on making sure that we have a balanced view of our stakeholders.

If you want to see where we are going in the coming years, we actually have two parts to our strategy. One part is to bring the broadband world into the Netherlands. We have called this ambition "becoming the broadband port of Europe." We want to build the best quality broadband networks (access plane) in the Netherlands in terms of fiber, upgraded copper, and mobile access to consumers and businesses. The second thing is that we believe there is room for a mobile-only player. But then we have to become and remain the challenger. These are the two things we are striving towards.

Journalist: The amount of mobile data traffic is significantly increasing worldwide. What approaches has KPN taken to profit from mobile data growth?

Erik Hoving: I can say a simple thing—partly we are in the business that if people want it, we build it. We are building a network that people definitely want, and we profit and benefit from



the huge amount of data. What created the demand for data? It was basically iPhones and smartphones. It wasn't the operators who created the demand of data; it was the need for smartphones and tablets to be interfaced with computers that created the huge demand. We fulfill the needs by building data networks. We actually, at this moment are in the game of fulfilling the demands. That's why we benefit.

At the same time, it is also a problem because the demands for voice go down, and with it, our traditional voice and SMS revenue. People shift their behavior from voice and SMS to data. On one hand, there is growth in data, and on the other, there is a decline in voice and SMS. So this is the balance we have to strike.

But primarily our biggest thing is to introduce products and services that our customers in the future really want. They want HDTV and broadband Internet access in their homes, mobile broadband Internet access, and very good quality voice. We should be able to deliver to our customers without trouble—good quality products and good services.

Journalist: To facilitate mobile data growth, KPN and ZTE are now working on the expansion of HSPA+ networks in Germany and Belgium. Have you encountered any difficulties? How do you rate ZTE's project team and solutions such as SDR?

Erik Hoving: We built a partnership with ZTE, and we are learning a lot from each other. In any relationship there are always moments that you like each other and don't like each other. There are always things that go well and things that go wrong. I think that,

fundamentally, we built the relationship on trust. This means we do what we say we will do. I think that we have never missed any fundamental milestones, any fundamental achievements that we planned for. Actually for us, ZTE is very easy to work with. They are very customer friendly, very open to suggestions, and at the same time, extremely good at executing the plan we have agreed to. I think that from a relationship perspective, the relationship with ZTE in Germany and Belgium is very good. The ZTE team is extremely well organized and extremely close to customer. I am very positive about it.

We often say that the way we work with ZTE is changing our own organization. So I am very positive about that. I am also very positive about the kind of technology and products that ZTE has introduced. It is really the combination of people, products, and technology that is good for KPN.

Journalist: In what ways is ZTE changing your organization?

Erik Hoving: I think that on a very high level we European operators can learn a lot from Asian companies and the other way around.

I think that there are a couple of things that Asian, specifically Chinese, companies like ZTE do extremely well. You set a long-term goal and you work day by day to achieve the long-term goal. You always have in mind what you want to achieve in the long run. Day by day you take steps towards that longerterm objective. It's something that we have actually, somewhere lost, and by working with ZTE we are getting it back.

The second thing is ZTE works very practically. Sometimes we are making things so complicated, the processes, for instance. Through working with ZTE we have learnt to be very practical again.

At the same time, ZTE can learn a lot from working with E-Plus about how to organize going to the market and how to make money in a very difficult environment. The business environment in Germany is very mature in the way it has been operating. There is a mutual relationship for both parties at the moment.

Journalist: LTE is gaining momentum in Europe as operators such as T-Mobile and Vodafone introduce LTE networks. What is KPN's LTE deployment plan?

Erik Hoving: At the moment, we are conducting LTE trials with ZTE in Germany and Belgium. In Germany, we are trialing LTE 2600 MHz, 2100 MHz, and 1800 MHz. We are trying out LTE to see what LTE can bring us. We are also trialing LTE 2600 MHz in the Netherlands with a different supplier.

I think LTE is going to be the next cornerstone of the way we operate in the future. However, I think it is important to get the timing right. I agree with that everybody is investing in LTE networks. I think from a technology perspective I believe in LTE. The question is which LTE? I mean, neither customers nor the market necessarily demand LTE. The market demands profitable content, and customers ultimately don't care whether it is 3G or LTE—all they want is an iPhone that performs. So I understand if you are a technology company, you are busy with LTE. We are very busy with customers.

And you know, I think that we have a long way to go with HSPA+. Ultimately, I understand that LTE is much more efficient way of using spectrum. I don't think at this moment that customers care too much. What they actually want is to see their Facebook and to use their iPad. They don't care about LTE or HSPA+. This is really the technology part of our industry being very busy and doing something. Do I think we'll investigate it? Of course. We'll roll out. Basically, all our networks that are being built at this moment are LTE-capable. So if we want to shift to LTE, we can.

Journalist: KPN began cooperating with ZTE in 2005, and now ZTE is KPN's strategic partner. Why did you select ZTE as a strategic partner?

Erik Hoving: We selected ZTE for many reasons. KPN is the smallest of the bigger and the biggest of the smaller operators in Europe. We have a group of very big operators in Europe, including Vodafone, T-Mobile, Orange, and Telefonica. In this group, KPN is the smallest. We are significantly smaller than Orange, T-Mobile, and Telefonica. But we are much bigger than the small operators. If you look at the small operators in Europe, we are two to four times bigger. We also have two very distinct strategies: one for the Netherlands and one for outside the Netherlands.

In Europe, we are always looking for a differentiated value proposition. We are the challenger in the mobile arena, which means we have to make choices that are different than others because we want to serve different customers. We want to make money in Germany by giving mobile connectivity for 10 or 15 Euro a month. We cannot follow the traditional choices made by T-Mobile and Vodafone.



We always make different choices. When we selected ZTE in 2009, it became very clear that ZTE would be a crucial partner for our challenger strategy. They think with us, and they think the same way as us. They are willing to put their money where the mouth is. They develop things with us, they are very much involved with us, and they operate in Germany and Belgium—very close to us. These things are very different from the incumbent suppliers that we had before. So the relationship has changed from a supplier-operator relationship to a true partnership. ZTE was willing to do that at the same time that we need it. This is why we are very happy with ZTE.

Journalist: How do you think the partnership will evolve in the future?

Erik Hoving: I think partnerships always evolve over the time. We recently signed with ZTE to introduce ZTE to our fixed networks in the Netherlands. So ZTE is not only our international partner, they are also our partner in the Netherlands. I believe the partnership with ZTE will be strengthened in many places. We will investigate ideas further in the partnership, and we will work together on handsets. We introduced a private-branded handset in Germany in 2010, very successfully. I think there is going to be multiple projects we will do with ZTE.

It is very easy for KPN to develop projects and ideas with ZTE and to implement them. There's no time-tomarket for us when we do a project with ZTE. We come with ideas, we bounce them off each other, and then we execute them. So I believe that, especially in mobile in Germany and Belgium, there is going to be continuous deployment of ZTE networks and operations. There will be more relationships between KPN's German and Belgian operators and ZTE in the handset area. In the Netherlands, I think we will see ZTE as one of our primary partners to create our copper networks. There again, the differentiating thing about ZTE was their ability to bring vectoring and bonding technologies immediately to the market when we asked for it. We are going to introduce vectoring technology with ZTE in the Netherlands within a timeframe we didn't think was possible. With ZTE, the movement from idea to actual implementation is amazingly fast.

Journalist: Could you tell us what are KPN's goals in the next three years?

Erik Hoving: We have a couple of them. We want to be the number one integrated access player in the Netherlands. What it boils down is this: we want to be the number one in the consumer residential market; we want to be the best mobile consumer player in the Netherlands; and we want to remain the number one player in the business market in the Netherlands.

Moreover, on the international side, we want to continue to expand as the mobile challenger in Germany. We want to gain market share in Germany and in Belgium, and we will look for other opportunities that we can exploit as the mobile challenger. ZTE TECHNOLOGIES

Opportunities and Challenges in the Big Data Era

Reporter: Yue Lihua

n the coming years, 4G will be the catalyst for explosive growth in data Ltraffic, and operators worldwide are gearing up for this eventuality. How will 4G coexist with their legacy 2G and 3G networks? Why does LTE need small cells and SON? With these questions in mind, reporter Yue Lihua interviewed William Ho, vice president of the consumer group at Current Analysis. William Ho was attending the ZTE Global Analyst Conference held in Shenzhen.

YLH: Even though many 3G services are just up and running, LTE is already being deployed around the world. What is the driving force behind this? In your opinion, what is the proposition of LTE?

WH: I think the proposition to all consumers is faster data services. As we move from a voice-centric world to a data-centric world, there is much greater demand for data, speed, and access to information. The proposition is also a



William Ho, vice president of the consumer group at Current Analysis

consistently good experience. Relative to 3G, LTE/4G allows operators to provide better use of limited spectrum and more efficient data.

YLH: In the big-data era, how will 2G, 3G and 4G (LTE) networks coexist?

WH: I think, for the most part, 4G networks are going to overlay existing 2G and 3G networks in established markets. The challenge is to move the subscriber base to the more LTE technology with fallback operation on older 2G/3G networks. However, in the future, operators will "refarm" their spectrum. That is taking existing spectrum operating with older 2G or 3G technology and replacing it with newer technology, like LTE. It is less expensive to deliver a data byte using LTE than 3G and 2G.

YLH: Will 4G networks completely replace 3G networks? When do you think LTE networks will be available worldwide?

WH: It really depends on the operator. If they have significant CAPEX already invested in 3G infrastructure, as is the case for many operators in the U.S., then it will take longer for 4G networks to become prominent. 4G is just starting to be deployed, and you always need a fallback. If you are in a market that doesn't have 4G, then you compete on 3G. So it really depends on how aggressive an operator is in deploying 4G, and that have to invest in their networks and spectrum availability. It's like renovating your house bit by bit. You may not have prioritize according to funds, goals and you are then forced to meet this need or

YLH: As LTE and HSPA+ networks are more widely deployed, lowerpower small cells are becoming popular. What's your opinion on the business model of small cells?

WH: Small cells allow an operator to reuse spectrum to deliver service in a targeted area. In a macro view, small cells are about coverage and capacity. As people are more data dependent, there is an expectation that a data network is going to be available. It's necessary for operators in a highly competitive environment to deliver the user experience that subscribers expect.

is a function of how much money they the funds to do it all at once, so you necessity. There is another side, which is operational efficiency for delivering data. If subscribers are demanding more data, lose them to competition; it becomes a fight to provide a fast network to retain and attract new customers. This is another factor that drives aggressive deployment.



For example, if you go to the mall and you want to look something up but can't because of poor coverage or poor data speeds, you may become unsatisfied and view your operator unfavorably. Low capacity might mean you are in one part of the city and have really fast speed, but then you go to the mall, and it's really slow. That is another factor that influences customer satisfaction or dissatisfaction. When it comes time to renew your contract, you may not renew it simply because of that poor experience. In the operator community, the churn rate is a key performance indicator. Therefore, it is in the operator's interest to have good coverage and capacity.

YLH: Chinese operators have started large-scale Wi-Fi deployment. Some say Wi-Fi is the real big deal. What do you think about the importance of Wi-Fi?

WH: Wi-Fi is an important way of offloading data without acquiring additional spectrum. You have small cells that can offload data in a small area, but at the same time, you still have capacity issues because spectrum is finite. So operating Wi-Fi in unlicensed spectrum is another tool that operators can use to meet customer data demand. In some cases, Wi-Fi access points may be integrated into small cells that complements or supplements an operator's data capability.





YLH: Self organizing network (SON) is a concept for automating network operations and management. Why does LTE need SON? What are the benefits of SON in LTE?

WH: Conceptually SON allows an operator to automatically optimize their existing and newer LTE networks. With LTE and small cell technology enabling higher data traffic, operating and managing the network will become more complicated. SON allows for newer base stations to get online with minimal configuration and optimizes these stations' operational characteristics to best meet the needs of the overall network. For example, instead of sending a technician out to adjust cellsites' antenna directions and increasing power levels, SON allows for these tasks to be done automatically and quickly. All this means SON potential is an operational efficiency gain for the operator.

YLH: What are the opportunities to promote the development of TD-LTE and FDD-LTE?

WH: The largest driver for TD-LTE

success will be China Mobile, and in the FDD-LTE world, in my opinion, Verizon Wireless has shown that it is global catalyst. While there were other operators, such as MetroPCS, who launched LTE before Verizon in the U.S, it takes a largescale operator with hefty resources and an aggressive plan to accelerate LTE takeup. It's the same with China Mobile; there are opportunities because it's sufficiently large enough to accelerate the TD-LTE ecosystem, and as a result global operators, particularly in Europe, Japan and the U.S. can benefit.

YLH: Finally, can you predict the trends in the wireless sector?

WH: From the consumption standpoint, operators are trying to move people from regular voice phones to smartphones. As people adopt smartphones and get attached to data, there will be no stepping back to regular voice phones. The consumption profile is such that voice calls have diminished relative to previous years, and data consumption is much higher with convenient habits such as social networking, surfing the Internet, consuming streaming video and audio. Multiply this worldwide and that adds up to a lot of bandwidth consumption. More vendors therefore have the opportunity to provide effective solutions for operators to meet the customer demand. It's tough because there are over-the-top (OTT) players, like Tencent QQ (messaging) and video content players such as YouTube and Youku, who provide free services and generate data consumption. As customers increase their use of these OTT services, it becomes difficult for operators to monetize their own alternative services. In essence, the OTT player's brand will supersede the operator's brand for that particular service. This is a problem for operators because operators are struggling for ways to increase the average revenue per user (ARPU). The environment today is such that operators are spending a great deal of capital to boost infrastructure to deal with demand created by third-party services. This trend is continuing and operators are looking for solutions. **ZTE** TECHNOLOGIES



Jörgen Askeroth, chief technology officer at Hi3G Access

No Second Place:

The Choice of 3 Scandinavia

Source: Global Telecom Business (March/April 2012)

örgen Askeroth, chief technology officer at Hi3G Access, explains how the Scandinavian operator has soft-launched the first TDD/FDD dualmode LTE network.

Hi3G Access was founded in 2001. The company is based in Stockholm, and operates in Sweden and Denmark under the brand 3 Scandinavia. A joint venture between Hutchison Whampoa and Investor AB, Hi3G Access holds the 3G licenses for 3 Scandinavia, which provides 3G mobile voice and mobile broadband.

The company is recognized for its high-speed network and is wellpositioned in a market that is growing strongly because of fixed-to-mobile migration in voice and broadband.

With 1.15 million subscribers in Sweden, Hi3G Access has around 10% market share and is the fourth largest operator in the country. Hi3G runs

its own UMTS 3G home network in Stockholm, Goteborg and Malmo. It also shares the 3G Infrastructure and Service AB (3GIS) network, a joint venture between 3 Scandinavia and Telenor Sweden that covers the 70 percent of Sweden's population outside the three main cities.

In December 2011, Hi3G soft launched in Sweden the world's first TDD/FDD dual-mode LTE network. Jörgen Askeroth took up the position of chief technology officer at Hi3G in October 2001.

Journalist: 3 Sweden recently soft launched the world's first LTE FDD/ TDD dual-mode network. Please introduce your company and network?

JA: 3 is one of the leading operators in Sweden, and we have had the best mobile network for five consecutive



We choose 2×10 MHz FDD, which we are using for a large coverage footprint in the future.

Spectrum is key for us, and it indirectly determines what technology is

For us, LTE is the natural choice;

actually, it is the only option. We have a global perspective; we are following the trends, and moving with the market. 2.6 GHz TD-LTE was a natural choice for us. It provides the most cost-efficient use of spectrum and the best performance.

After an extensive procurement process, we selected ZTE as our vendor. We had very high requirements on the availability of technology and support after the roll-out, and ZTE meets our requirements.

Together with ZTE, we have been rolling out the LTE network in Sweden for the past year. We soft launched the service on December 15, 2011. Another important reason we launched in December was, of course, the availability of devices. We received the first device from ZTE in November, so it was quite natural to commence the soft launch in December.

Journalist: 3 Sweden is a very important international operator and has gained worldwide attention of late. What are 3 Sweden's operational highlights? What has 3 Sweden achieved in bringing all these services to your subscribers?

JA: I think all markets are competitive, particularly the mobile data markets. Whatever you do, you need to be the best. You really have to focus on what you are doing.

Our goal is to be the best and never settle for second place. From the day our company was established we have been very innovative, and this has brought us great success.

Jörgen Askeroth: Our goal is to be the best and never settle for second place. It is essential that we have TDD spectrum for our growth and performance.

Journalist: TD-LTE has become a hot topic. Why has 3 Sweden chosen TD-LTE? What is the meaning of this choice to the industry?

JA: We chose TD-LTE as our main spectrum resource, and because we have 50 MHz available, we have two carriers that we can combine for high capacity and performance.

But we also have LTE FDD because we believe that not all devices will support TDD in the future.

We have to support all devices, and also from a capacity standpoint, we had to roll out an LTE TDD/FDD dual-mode network.

Journalist: What benefits does 3 Sweden expect to gain by introducing TD-LTE? Can you foresee a trend?

JA: The benefits are very, very clear. The

data growth we have experienced over the last five years has meant we need TDD spectrum to accommodate this growth and provide performance. It is a natural choice for us to go for TD-LTE. We also believe that TDD will be very important on the global market because

> other operators are so interested in the technology. This is also a very important consideration.

> Journalist: What were some of the challenges encountered in rolling out the FDD/TDD network?

> **JA:** Building a combined TDD/ FDD network is a challenge because of the complexity. We now have all modes of base stations. We have 3G LTE FDD. and LTE TDD base stations.

This is a challenge in terms of site acquisition and radio. We have had to use the same antennas on some sites

But I think it is a must for us to have a combination of LTE TDD and FDD because of the availability of devices. We have to support all devices.

Journalist: Sweden has the most advanced mobile networks in the world. What is 3 Sweden's strategy to enhance its position in the future?

JA: 3 Sweden believes that technology is second and customer experience is first. This means that customers do not care about what technology is used.

We have to offer the best service, the best performance; that is our focus. The shortage of spectrum for 3G means it is natural to go to LTE, which offers more spectrum and higher performance. ZTE TECHNOLOGIES



Bill Huang, general manager of the China Mobile Research Institute

Building the Right Mobile Broadband Infrastructure for the **Cloud Age**

By Bill Huang

The growth of mobile broadband is putting pressure on network capacity and profitability. Operators are seeking the best way to move forward, and smart pipe is one of these ways. ZTE convened a forum on smart pipes on February 29, the third day of MWC 2012. Bill Huang, general manager of the China Mobile Research Institute, gave a speech. He talked about what it takes to build an infrastructure that caters to the growth of mobile broadband.

It is my honor and pleasure to be here for the third time. I'd like to take this opportunity to congratulate ZTE for your success in the business and your contribution to promoting and developing TD-LTE.

I want to use the word "cloud age" in this speech because I truly believe the emergence of cloud computing is a unique opportunity for the IT industry to take the application platform away from the desktop PC and put it into portable mobile devices. This could be a true revolution not only for mobile communications but also for information technology in general.

There is one point I want to make: With the explosive growth of mobile broadband, it is very important for operators to recognize that new business will be centered on providing bandwidth. In many emerging economies, the lack of well-built 3G infrastructure and more expensive smartphones means bandwidth revenue is still reasonably small. If you look at vendors like Softbank, Hutchison, and NTT Docomo, the bulk of their revenue comes from data traffic. It's very important, therefore, to transform our businesses and put value

on traffic. Traffic is no longer going to be a supplementary service; it's going to be our new business. When telephones are provided free of charge, this will be our source of income.

Another point I would make is this: If you look at some of the simple numbers China Mobile has collected from its network, there is a dramatic increase in data traffic. Data traffic easily doubles every year. It's not hard to imagine that it will increase a thousand times in ten years. If we increase the traffic a thousand times, can we increase the ARPU a thousand times? The answer is obviously no. Can we increase the ARPU ten times? Perhaps no. Can we triple ARPU? Maybe. So the pressure for us to find ways of building the right infrastructure to support this business model is unprecedented.

LTE is emerging as the main 4G technology. Specifically, I want to talk about TD-LTE. Throughout the world, TDD spectrums are the only spectrums that are still abundant, and the cost of these spectrums is considerably lower than FDD spectrums. The unique advantage of having asymmetric downlink and uplink makes TDD more economical; you get more bandwidth out of the same spectrum. China Mobile is currently deploying TDD on a very large scale. The entire TD-LTE ecosystem has already been built up and is running. Converged TDD-LTE and FDD-LTE is going to be the most ubiquitous RF standard in history. At the global TD-LTE initiative (GTI) conference, held two days ago, our CEO predicted that China Mobile is going to deploy 20,000 base stations by the end of 2012 and 200,000 base stations globally by 2014. That is a fundamental shift towards LTE.

For our bandwidth business, we can't ignore cost. Nor can we ignore ubiquity of terminals. Wi-Fi or WLAN is now emerging as an essential tool for mobile operators. We have already included WLAN as part of our mobile networks for China Mobile, not only as a supplementary thing. If you look at the numbers, we have already deployed close to 1.6 million access points. In three years, six million APs will be deployed. Where will we deploy these APs? We will place them in hot zones or hotspots where people are most likely to use mobile broadband in stationary conditions. We will eventually place them in residential areas, schools, and enterprises. The natural evolution of this is international roaming, international tariffs, and international authentication for WLAN. WLAN worldwide roaming is a big issue. People don't know how to select the right Wi-Fi points, and payment is also complicated.

What would be the backbone for this new network? We hope to achieve 10 Mbps for personal users, 100 Mbps for family users, and 1000 Mbps for enterprises. To accomplish this, we must quickly migrate SDH-based transport networks to packet-based transport networks. We call this SDH-PTN migration. The new hierarchy becomes 1G-10G-100G. 40G is being used right now, but we have seen the economies of the target countries for 100G strengthening, and it is becoming more feasible to push 100G into commercialization. At first, 100G may be more expensive to deploy than 40G, but as 100G becomes more popular, it becomes





more economical because fiber is saved.

What is the true goal of building smart pipes? Building the smart pipes means creating the mechanism to extract value from bandwidth businesses. The dumbest pipe is the Internet, where all applications have equal priorities. P2P movie download is the same as Skype, and this doesn't make sense. If we follow this business model, we will go out of business. The appetite for bandwidth is insatiable; if we double our international gateway from 100 Gbps to 200 Gbps, P2P software, which is constantly testing bandwidth availability, will very quickly discover this, and your pipe will soon be full. Without the proper smart pipe technology for policy awareness, traffic shaping, caching, and streaming, the network will always be congested.

Network congestion is inherent in the current design of the Internet. It is very important to the future of the IP network and Internet that we use policy management to create SLAs. We potentially need to apply policy control based on SLA in smart pipes. Today it is missing. We have to understand in the mobile broadband age that alwaysonline is increasingly important, but it is an increasing headache for mobile network design.

Signaling has been and continues to be an uncharged overhead when users access the network. If signaling dominates network traffic, the user will only be able to transmit one byte. Think about the nightmare this will cause. You build the network and create the signaling so you can charge people to transmit at 1 Mbps,

but instead, people can only send one byte and you use maybe 100 bytes or 1000 bytes to help that one byte. That's why the network is going crazy. This is a very important issue to be resolved. Increasingly, operators are building always-online facilities, that is, building software and API to enable applications so that their heartbeat becomes organized and not random.

New technology is also creating problems for our network construction. One very important new technology I want to talk about is cloud-based radio access network (C-RAN). In C-RAN, baseband processing is centralized. The radio and antennas, through which we transmit digitized signals over fiber, are distributed. This is a big issue because the speed of the backhaul is so high that most people are using naked fiber. Can we do this on a large scale? The answer is no. I don't know how we can solve this problem, but we need to work on it. If cloud RAN is to be successful, we need to solve the backhaul for cloud RAN signals. The challenge is there. There are potentially many different ways to solve this problem. You can compress the radio signal so that you have less bandwidth, or you can make cheaper optics. In any case, this is the future if we want to save 15% CAPEX and 18% OPEX. To achieve this, we have to do something.

I think the future is bright for the mobile industry. It is not only bright but burning. We have to be ready for that high growth. Now we want to increase usage, but we want to increase revenue at the same time. I hope we can work together with operators, developers, and vendors. We are focusing our energy on solving these problems and creating better business models. **ZTE TECHNOLOGIES**



QoE Management:

Telecom Services and the Transition to an Experience Economy

By He Hongwei and Du Xianjun

The move from service economy to experience economy is a trend evidenced by Apple's "customer experience first" philosophy. As operators speed up deployment of 3G and 4G networks and reduce data tariffs, customers are experiencing higher mobile Internet speeds and are trying out new services and applications. They are increasingly turning towards interactive services and applications and are highly aware of service experience. Telecom services have entered a post-3G/4G era called the experience economy. As operators migrate towards full service operation, market competition is becoming fiercer. Operators who build quality networks, meet user needs, and offer more innovative services will survive the competition. Quality of experience (QoE) is therefore key to successful telecom services. Surviving and being profitable means managing QoE, attracting and retaining customers, improving user satisfaction and expanding the subscriber base. The challenge operators face today is how to monitor and improve QoS in real time and offer custom-made differentiated services. Customer experience management (CEM) is essential.

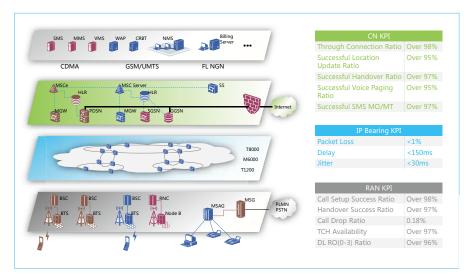


Figure 1. KPIs for dedicated networks.

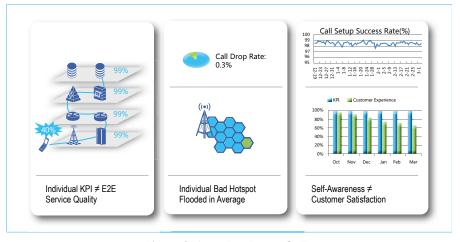


Figure 2. Actual end-user QoE.



Table 1. The difference between customer oriented and traditional network oriented OAM.

	Network Oriented OAM	Customer Oriented OAM	
Orientation	Equipment or network oriented	End-to-end service or customer oriented	
Focus	Network performance and fault	QoE	
Assessment	KPI dominated	CEI—>KQI—>KPI	
Analysis	Bottom-up approach	Top-down approach	

however, call quality is still low. It may be that calls are dropping in an abnormal cell. Customers in this cell may be experiencing very bad service, but this low-quality cell is covered by other cells with high KPIs (Fig. 2). Therefore, network KPIs do not necessarily reflect end-to-end QoS and should not be the sole basis for enhancing QoS.

The transition from network-centered to customer-centered OAM

With customer-centered OAM,

measures to quickly repair faults and

greater importance is attached to customer QoE. All OAM resources are centered on improving customer experience. QoE management is gradually being considered the core of network OAM. Good network OAM has traditionally meant smooth network operation; now it is being thought of in terms of good customer experience. The core value of network OAM is in real-time monitoring of QoE, evaluating operator QoS, and taking

QoE for Specific Service CEI Accessibility Retainability Integrity Delay KQI KPI3 KPI n Access Network NE Management Core Network NE Management CPU Load > CPU Load KPI of NE Congestion Rate Congestion Rate

Figure 3. End-to-end QoE assessment system.

recover services

Customer experience management (CEM) is customer- and service-oriented network OAM. Service experience management is differentiated according to different customers and services and is an effective tool for operators to optimize their network operation.

End-to-End CEMC

ZTE has launched an end-to-end customer experience management center (CEMC) that helps operators bridge the gaps between networks, services, and customers. Network OAM is optimized by monitoring and managing QoE and QoS.

CEMC comprises service quality management (SQM) and CEM. SQM belongs to QoS management and is used to manage quality of service and provides quality indices that can be used to monitor the end-to-end quality of different services. CEM belongs to QoE management and is used to measure QoE from the customer's perspective. By analyzing customer concerns, a QoE index system can be established that is as close as possible to the customer's actual experience. CEM is used to manage customer QoE.

End-to-end OoE assessment

After many years of research on QoE, ZTE has proposed an end-to-end QoE assessment system that consists of indices for customer, service, and network (Fig. 3). These are used to measure and assess customer OoE.

The top layer is customer experience indicator (CEI). This provides an objective measurement of customer experience. The CEI is used to describe customer service experience.

The second layer is key quality indicator (KQI). This indicates the performance of products and services. The KQI can be calculated using different KPIs. It is subdivided into product KOI and service KOI.

The third layer is network-based KPI. This represents a certain part of end-toend service data. The KPI is important for assessing network OAM. It is also the data basis for the CEI and KQI. KPIs are based on alarm, performance, and network configuration data; analysis data from active/passive probing and packet capturing, and billing data.

Complete OAM functions

Network OAM involves discovering, locating, and solving problems. These three aspects are closely interconnected to form a complete network OAM system (Fig. 4).

 Discovering problems involves finding an appropriate "thermometer" to determine the real-time customer

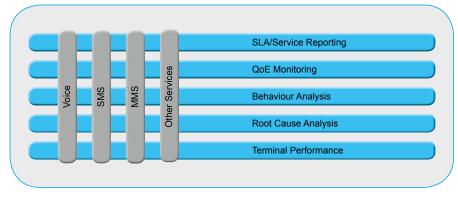


Figure 5. Combined architecture of functional platform and service support package.

QoE.

- Locating problems means identifying possible cause of problems when abnormalities are detected.
- Solving problems means remedying the symptoms.

CEMC provides complete OAM functions that help operators improve QoE, establish customer care mechanisms, provide a guaranteed service level agreement (SLA), and attract high-value enterprise customers.

Scalable deployment architecture

CEMC has a combined functional platform and service support package. The horizontal blue modules in Fig. 5 represent the functional platform, and the vertical yellow modules represent the service support package. The combined architecture has good scalability that manages QoE in accordance with operators' current service management focus and future service development needs

Telecom services are moving into the era of experience economy. This requires network OAM to be customer centered. With ZTE's endto-end CEMC solution, front-end sales and customer service sectors can interact effectively with back-end network planning and optimization, OAM, and information support sectors. The solution makes QoE visible, controllable, and traceable and helps operators compete in the experience economy era. ZTE TECHNOLOGIES

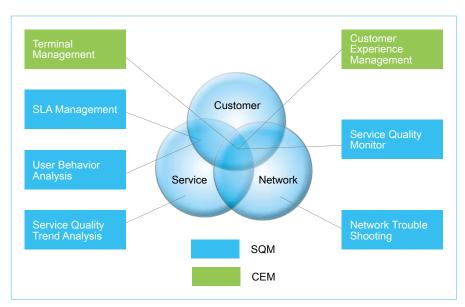


Figure 4. Core functions of CEMC.



th the development of mobile networks, customer needs and behaviors have changed. Mobile communications means so much more than simple voice communication; there is now mobile Internet with web surfing, video phone, streaming media, and microblogging. Traditional KPIs are no longer adequate for measuring the quality of mobile services. The objective of network optimization has gradually shifted from enhancing network performance to improving quality of experience (QoE). Therefore, assessing and optimizing QoE is the trend for optimizing future mobile networks.

QoE is the quality of network and services that a customer actually experiences. It encompasses the technical performance of the network as well as customer behavior features, service provider brand image, service quality, and prices.

In the case of coexisting 2G and 3G standards, network assessment and optimization are often independent, making it impossible to accurately

assess customer experience. Therefore, it is vital to develop a comprehensive and scientific means of assessing and optimizing QoE.

Assessing QoE in a Multinetwork Environment

In a mobile network, where multiple networks coexist, most users of dual-mode terminals experience trouble with multinetwork convergence. They do not know how to operate between networks nor do they care about what standard the network uses. Their only concern is whether the network signal is strong enough and whether they can access network quickly.

After years of in-depth research into QoE, ZTE has worked out an innovative system for measuring and assessing customer QoE in a multinetwork environment (Fig. 1).

The QoE assessment system is a mapping system comprising KPI, KQI, sub-QoE, and QoE layers. It supports data from multistandard networks and combines multiple networks on the KQI layer.

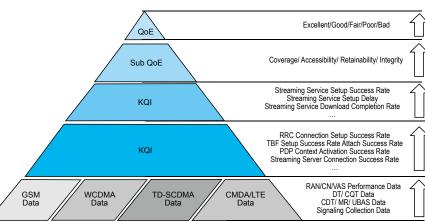


Figure 1. QoE assessment system in a multinetwork environment.

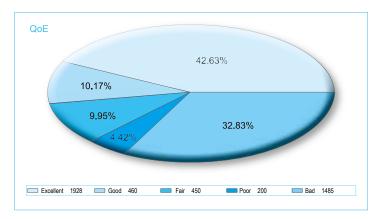


Figure 2. NetMAX QoE assessment.

Assessing QoE with NetMAX

ZTE's NetMAX solution is designed to assess the QoE of a radio access network (RAN). The solution is low cost but cannot distinguish specific packetswitched services. It is mainly used in small and medium-sized networks and is currently being implemented by China Mobile in Hunan. The solution has the following functions:

- overall QoE assessment. Customer QoE can be rated excellent, good, fair, poor, or bad (Fig. 2). Detailed statistics can be shown for each customer's KQI and sub-QoE and for overall network QoE. Optimization staff can determine each customer's QoE and optimize the network with poor QoE.
- QoE correlation analysis. If a customer has poor QoE, optimization staff can use correlation analysis to view a customer's QoE in each cell. They can quickly locate the cell where the customer has poor QoE and determine the causes, which may be poor coverage, poor accessibility, call drop, or poor call quality.
- KQI trend analysis. It may be necessary to analyze the point at which customer KQI begins to drop.

By analyzing KQI trends, optimization staff can clearly see the changes in customer KQI over time and optimize the network using a definite target. After optimizing the network, they can determine whether customer QoE is improved by observing the changes in customer KOI.

CEMC End-to-End QoE Assessment

ZTE's customer experience management center (CEMC) is a QoE assessment platform for multistandard networks and multiple data sources. It provides end-to-end monitoring for RAN, CN and VAS. It is mainly used in large-scale carrier networks.

CEMC uses self-adaptive linearweighted fitting algorithm to minimize the mean-square error between the QoE model and customer questionnaires. The CEMC system is highly automatic:

- It can be used in independent 2G and 3G networks as well as hybrid 2G/3G networks. In the future, CEMC QoE assessment will also be used for CDMA. LTE and other network standards.
- Performance, signaling, MR/CDT, and UBAS data can be imported.
- It supports voice, VP, SMS,

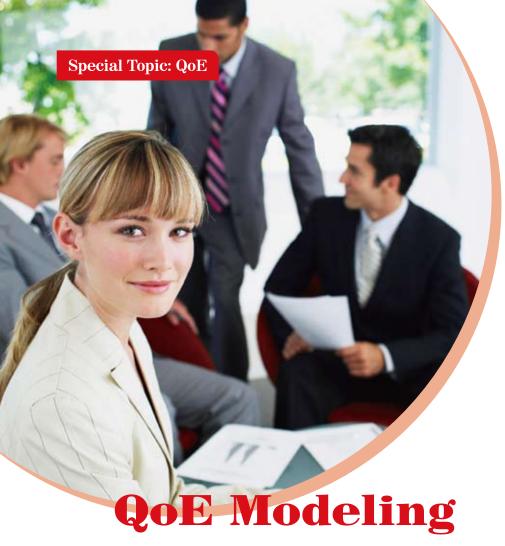
HTTP, WAP, FTP, streaming and MMS. It also supports customized services.

• It assesses customer QoE using the four-layer QoE/Sub, QoE/KQI/KPI mapping system. Through innovative computer fitting of customer questionnaires, a mathematical QoE model closest to actual customer experience can be obtained.

CEMC can be used to assess QoE from a whole-network level down to a region, cell, or customer level. In some carrier networks, it can also provide

- real-time QoE monitoring for the whole network. This allows optimization staff to easily obtain the real-time QoE assessments in order to promptly identify where QoE is deteriorating.
- QoE assessment for VIP customers. CEMC can define VIP customers, assess and monitor their QoE in realtime, perform end-to-end assessment of eight basic services, and display the results in graphs.
- real-time alarm. When QoE is deteriorating, alarms are sent via email or SMS to optimization staff so that they can check and optimize the network in real-time.

Drawing on years of experience in network optimization, ZTE has developed a QoE assessment system for a multinetwork environment. The NetMAX solution is designed to assess and optimize QoE in small and mediumsized networks. It is also low cost. The CEMC end-to-end OoE assessment solution is used in large-scale carrier networks. ZTE is dedicated to providing innovative technologies that make QoE measurable and assessable and improve customer experience. **ZTE TECHNOLOGIES**



By Zhang Hui

A Hot Topic

uality of experience (QoE) is not a new concept. Every effort an operator or supplier makes in their business has the goal of improving customer satisfaction and QoE. Why, then, is QoE still an issue in network management? Why has it not been adequately addressed?

QoE is gaining attention for two reasons: IP transformation and pipeline telecom operators. In the TDM age, bandwidth was occupied exclusively, voice and SMS were controlled by operators, and quality of service (QoS) could be monitored by signaling at the control plane. Everything was controlled by operators. IP-based multiuser multiplexing and best-effort service has greatly reduced network costs for operators but has also created unstable QoS. Voice and video in the future will most likely be accessed through the browser, so traditional operators will become mere pipe providers. China Mobile's self-operated services account for only five percent of its data traffic.

Servers and terminal applications for Internet services are not controlled by operators; however, operators are eager to know what services are running through their pipes and how QoS is implemented. Usually, customers lodge complaints to the operator hotline rather than to an Internet company such as Taobao or Sina.

An easy and accurate way of assessing QoE has not yet been found. Standards organizations and operators are conducting research into QoE issues and standards and have published research findings.

What is QoE Modeling?

The TeleManagement Forum (TMF) shows the relationship between QoE, QoS, key quality indicator (KQI), and key performance indicator (KPI) (Fig. 1). QoE can be affected by technical or nontechnical factors. QoS is represented by KQI and is what end-users experience directly. KPI represents the performance of sources (network equipment) and is invisible to users.

Customers experience services, so QoS best reflects QoE. Different services have different standards of measurement. The

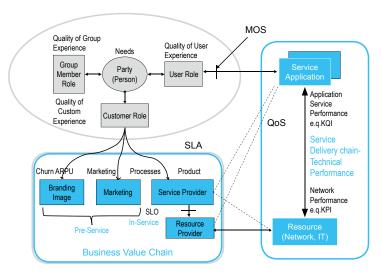


Figure 1. End-to-end QoE model.

TMF has defined KQIs for VoIP and IPTV. KQIs for IPTV include voice quality, image quality, synchronization of voice and image, delay, and response speed. Each KQI is affected by different network nodes.

The European Telecommunication Standards Institute (ETSI) has also introduced standards for different services. ETSI TS 102 250 series defines QoS and trigger points for FTP, mobile broadcast, ping, POC, streaming, telephony, video telephony, HTTP, email, SMS, and MMS. A successful HTTP session begins with the first SYN command and ends with receiving of the last data packet with content. However, trigger points for the quality of voice and video streaming are yet to be defined.

The ETSI has also divided QoS into layers (Fig. 2). QoS includes network availability and accessibility, which are independent of services, service accessibility, integrity, and retainability. QoS also includes parameters for different services. Service access can be subdivided into three stages: network access, IP service access, and Internet access. Different stages have a different impact on QoS.

To determine the QoE, it is necessary to obtain QoS statistics. There are many Internet applications and thousands of Internet protocols that are constantly changing. It is very expensive to exploit and manage every transaction on the network, and an early description of QoS in ITU-T Recommendation G.1010 was very general.

ITU-T Recommendation G.1010 defined three key factors that affect QoE: delay, delay variation, and information loss (including packet loss and information loss caused by codec).

Table 1. Model for user-centric QoS categories.

Error Tolerant	Conversation Voice and Video	Voice/Video Message	Streaming Audio and Video	Fax
Error Intolerant	Command/control (e.g. Telnet, Interactive Games)	Transaction (e.g. E-commerce. WWW Browsing/ Email Access)	Messaging Downloads (e.g. FTP, Still Image)	Background (e.g. Usenet)
	Interactive (Delay<<1s)	Responsive (Delay~2s)	Timely (Delay~10s)	Non-Critical (Delay>>10s)

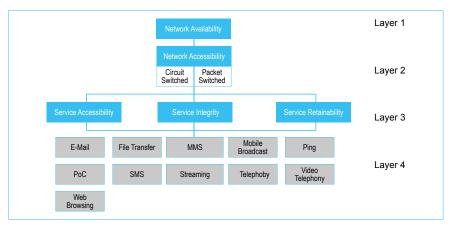


Figure 2. QoS aspects and the corresponding QoS parameters.

Table 1 shows the tolerance of typical services to delay and information loss. QoS for each type of service can be given according to delay, delay variation, and information loss.

To measure QoE, some equipment vendors and standards organizations map KPIs of the network and services to KQIs and then map KQIs to QoE. Because there are many KPIs and KQIs, the mapping relationship is a data matrix with parameters that can be determined by intelligent computer fitting of data from customer questionnaires.

How is QoE Modeling Applied?

Monitoring QoE is complicated. To give an objective QoE assessment and locate elements within the network or terminals that affect QoE, threedimensional monitoring needs to be done.

ZTE provides service monitoring solutions for equipment at each layer of the network. With these solutions, operators can collect and analyze user traffic while monitoring KPIs for both equipment and services.

ZTE's customer experience management center (CEMC) is an endto-end service-monitoring and QoE assessment system. CEMC provides abundant interfaces that collect NE data from terminals, RAN, bearer, core network, and services. Data collection is based on different levels of granularity: NE-level, user-level, and service-level. CEMC also has abundant adaptive interfaces that are capable of collecting data of a third-party vendor and in various formats. CEMC assesses end-toend network accessibility, availability of bearer pipes, and key QoS indices using deep packet inspection. It monitors QoE at user or NE granularity, allowing a balance between investment into network operation and data accuracy. TE TECHNOLOGIES



SmartFren:

Excellent OAM with ZSmart SQM

By Yin Qiang

martFren Telecom was formed in 2010 by the merger of Smart Telecom and Mobile-8. The company has a nationwide CDMA network and seven million users in Indonesia. ZTE is Smartfren's exclusive CDMA equipment supplier, and has provided Smartfren with an entire BSS/ OSS system, including billing system, CRM system and OSS.

In 2005, SmartFren Telecom started developing an OSS system that includes resource management and integrated network management systems. They

have also realized electronic OAM. As Smartfren expanded, especially after the merger with Mobile-8, they encountered some challenges in enhancing network operation and improving customer service quality. Smartfren lacked an effective way to

- improve customer service and settle customer complaints efficiently. Customers were not being satisfied.
- monitor and evaluate service quality
- monitor real-time product, and SLA service quality
- analyze service quality in terms of

customers, products, and networks.

SmartFren decided to establish a service quality management (SQM) system. In the OSS phase III project, an SQM system was designed to enhance network and service quality, improve customer satisfaction, and foster brand loyalty. By providing service monitoring and quality alarms, the SQM system helps SmartFren provide the best customer service. SQM system can

- define KQI and monitor end-toend quality across the whole service chain, from content and network providers to end users
- establish a system model (customers—services—network indexes) that includes network performance index, service conditions, efficient service delivery, efficient problem-solving, effective customer support, and quantifiable service quality index
- highlight services that affect customer satisfaction
- specify reasonable service-level objectives to meet customer

expectations and help customers realize the complexity of problems.

After analyzing SmartFren's need in depth, ZTE designed a customized solution called ZSmart SQM. The solution provides quantified data that reflects how a user experiences services and networks, and it facilitates service improvement.

ZSmart SQM comprises SQM and customer experience management (CEM) (Fig. 1). SQM is part of QoS management and is used for end-to-end monitoring of service quality. It forms models for different service-quality indexes. CEM is part of OoE management and is used to evaluate customer experience. It analyzes a customer's attention to services and weighs KQIs to create a QoE index system that truly reflects customer experience.

ZSmart SQM adheres to TM Forum standards, including GB917 and GB923. It meets SmartFren's OAM demands and supports future services. It can

• provide a key quality index system (KPIs, KQIs and QoE) as a reference

- for monitoring customer service quality and satisfying the SLA
- give real-time alarm in case of service degradation and violation of servicelevel objectives. This helps Smartfren detect service problems and improve customer satisfaction.
- monitor network operation and service response efficiency to help Smartfren better manage its networks and services
- support new and existing servicemonitoring tools, and this helps facilitate new service development.

For the advantages of ZSmart SQM to come into full play, adequate data sources and high data quality are necessary. ZSmart SQM incorporates information extracted from all of Smartfren's OSS resources, which include their integrated network management system, resource management system, service management system, and customer management system. With its customer—service—network model and key quality index system, ZSmart SQM allows operators clearly understand the quality of their service, from OAM to network services, from pre-sales to aftersales services. In this way, Smartfren can discover areas for improvement and give customers the best possible service.

ZSmart SQM has been partly implemented. It is helping SmartFren monitor service quality and conditions of local and nationwide networks. With ZSmart SOM, SmartFren can detect areas and equipment with service quality degradation and eliminate problems while saving manpower. ZSmart SQM analyzes network conditions and suggests optimization and planning. It also monitors KQI of service conditions and suggests improvements to service quality that ultimately improve customer satisfaction. ZTE TECHNOLOGIES

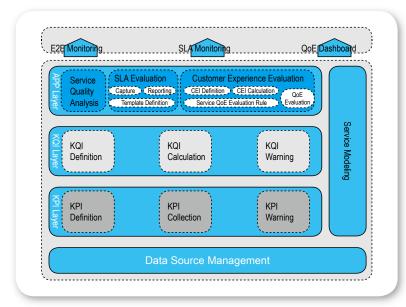


Figure 1. Structure of ZSmart SQM.

AIS Keeps Ahead in Thailand with 3G Network

By Mei Ya

dvanced Information Services (AIS) is the standard-bearer of mobile communications in Thailand. The company recently selected ZTE's core network platform to provide customized services and better UE. This will strengthen the competitiveness of AIS on the 3G network.

Thailand has a population of 66 million and is a popular tourist destination in Southeast Asia. After the financial crisis, Thailand's communications industry is now developing rapidly and the country's economy is growing. In Thailand, both stateowned and private enterprises offer fixed-line communications, mobile Internet, and broadband. Mobile subscriber penetration in Thailand is 140%.

AIS is a subsidiary of SingTel and has 30 million mobile subscribers. This number is increasing at a rate of 7% per annum. AIS has greater than 50% market share in Thailand and offers prepaid and postpaid MMS, SMS, GPRS and EDGE services.

New Technology for New Challenges

To take the lead in the communications market, many operators in Thailand have been developing their 3G networks. AIS is the bellwether in Thailand's mobile industry and has made a 3G development plan in line with its own advantages. AIS's 3G network has more than 10 million users; however, current devices are satisfying the needs of an ever-increasing number of users. AIS has been searching for a more advanced network platform to improve its operation mode and reduce cost.

After a thorough investigative process, AIS selected ZTE as its long-term partner, and ZTE's core network platform will now be used to improve AIS's network capacity and performance. The platform is small, cheap to maintain, and consumes less power, and these benefits allow AIS to invest more into network operation. The direct-tunnel and IP interfaces (e.g. Iu over IP) of ZTE core network platform optimizes network architecture, reduces the number of transmitting nodes, and

facilitates data transmission. These benefit the future development of API's 3G network.

Customized Services Based on 3G Network

Because of fierce market competition, operators in Thailand are making every effort to draw in more customers with iPhone, Blackberry, and Android smartphones. They are rebuilding their networks and offering better data services. AIS is aware of the rapid development of data services and is consolidating its leading position in the market by offering a variety of customized services and improving its OAM capabilities. AIS's existing network lacks customized services and cannot respond quickly to customer needs. So ZTE has stepped in to help AIS customize its services.

ZTE has provided AIS with a customized function called APN modification. WAP parameters can be set automatically according to subscriber IMSI segment and subscription information and data services can be used freely.

3G services require high bandwidth, and there is increasing demand for

broadband service. ZTE has also provided AIS with a QoS improvement and modification function. QoS can be modified according to user information, which allows for better UE.

Considering some old GGSNs need upgrading or swapping during OCS deployment, which increases OAM costs and difficulties, AIS customizes SGSN to choose GGSN flexibly to solve this problem. For pre-paid subscribers, SGSN automatically selects GGSN supporting OCS and selects other GGSNs for postpaid subscribers.

The flexible, customized functions provided by ZTE improve UE and enhance network competitiveness. They also provide AIS with facilities for network maintenance.

AIS launched new PS products in June, 2010. These products underwent strict testing and were found to perform stably in commercial applications. The customized functions enable AIS to attract more users and keep ahead in the Thai market. From the end of 2009 to the end of 2010, AIS increased its user base by more than 7%, and its income from data services keeps growing. This lays a solid foundation for AIS to face new challenges in the mobile broadband market. ZIE TECHNOLOGIES



There has been a large increase in video advertising off the TV screen, and revenue from such advertising is increasing every year. Soaring television advertising fees and exponential growth in the number of television channels means that advertisers have to spend more to reach a wider audience. Many advertisers have therefore invested in outdoor video

advertising.

with iVAd

By Chen Hua and Wu Zhenyu

Media and advertising companies are developing video terminals to expand their advertising coverage. Interactive video terminals have been launched one after another, and this opens good opportunities for operators to develop outdoor video advertising. ZTE has developed an interactive video advertising system called iVAd. The system uses cutting-edge Internet techniques to tackle tough OAM issues in traditional electronic screens used for advertising. iVAd manages video advertising screens in different areas in a centralized way.

iVAd is based on ZTE's IPTV platform, which supports large-scale



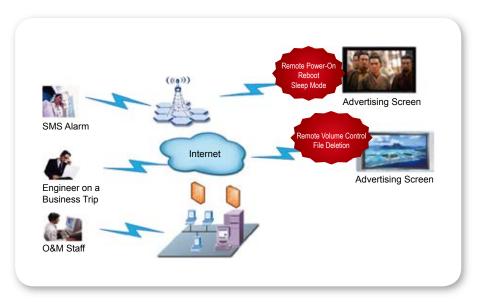


Figure 1. iVAd schematic.

IPTV and guarantees carrier-class QoS. Using IP streaming media technology, iVAd releases interactive advertisements via the IP network in a timely and accurate way. It uses digital multimedia technology to release picture, text, message, and video advertisements.

The iVAd architecture consists of management and capability platforms. The management platform manages IPTV and electronic advertising services, and the capability platform is used for STB access, service presentation and control, content delivery, streaming service, and downloading. A load can be shared across many nodes, each of which supports 2500 concurrent users and can be smoothly expanded to support hundreds of thousands of concurrent users.

iVAd has IPTV technology for building geographically distributed content-delivery networks (CDN) that support multiuser concurrent access and smooth capacity expansion. All key devices are capable of load sharing and are highly reliable. iVAd is also an open system that allows access to STBs from

different suppliers.

iVAd uses browser/server architecture. The iVAd system can be maintained via a web browser, and terminals can be remotely monitored and maintained anywhere and at any time. Remote maintenance involves powering on/off, rebooting, sleep mode, controlling volume, deleting files, and upgrading software. A synchronization mechanism is used between the OAM server and processor. The synchronization is configured and modified without restarting the service processor.

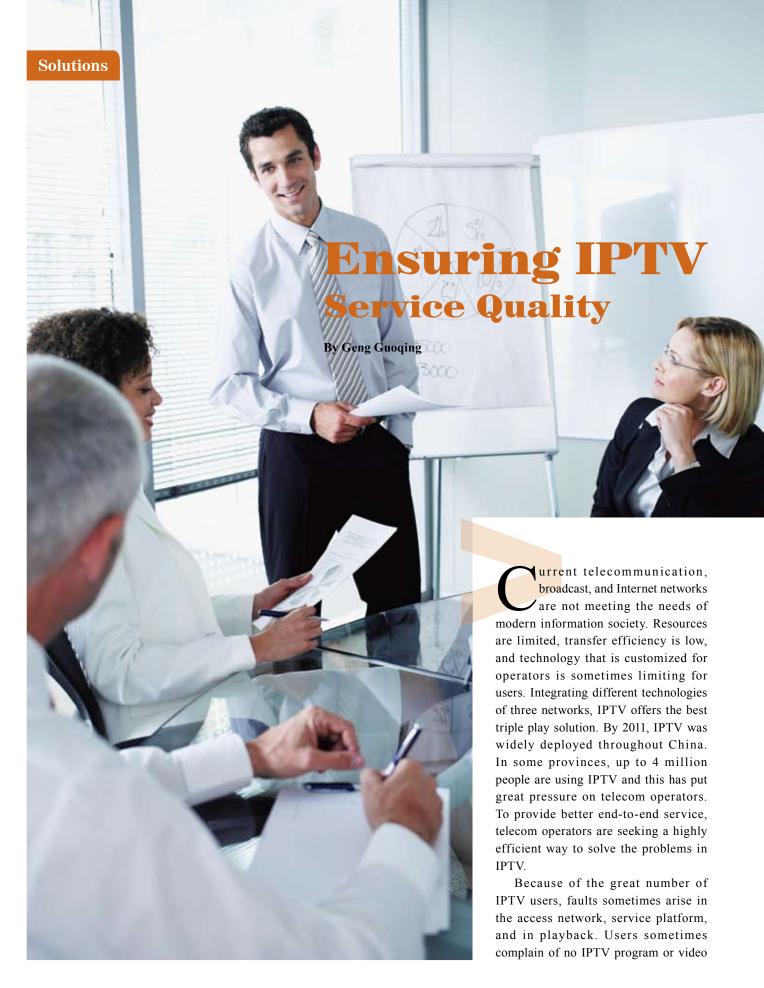
iVAd supports terminals with different-sized screens. The terminals support portrait and landscape displays and may be installed on a wall, pole, or on the floor. Touchscreen terminals allow users to interact directly with devices. iVAd also provides advertising templates and sites for videos, pictures, and texts as required by advertisers. Through remote web access, advertisers can monitor and manage the content, time, and frequency of an advertisement in real-time.

ZTE's iVAd provides

video training services such as regular

- enterprise training or corporate culture promotion
- video advertising in densely populated areas such as airports, railway stations, corridors, business halls, and CBDs
- emergency announcements for severe weather, earthquake, hazardous materials, fire alarm, and tsunamis
- fire prevention announcements in corridors of residential areas
- information query services in residential areas
- wireless city services related to tourism, utility fees, weather forecasts, online booking, and government affairs.

iVAd provides an independent virtual business environment. With a new iVAd platform, operators can widely deploy iVAd terminals in key areas. The prospect of reaching a large audience appeals to advertisers and brings in considerable profit. iVAd provides operators and enterprise users with a superior platform for video advertising and user management and helps them create blueocean opportunities. ZTE TECHNOLOGIES



lag. Such problems happen in the home, and it is difficult to precisely locate and test for faults. Resolving lag in a program involves different departments performing manual operations and analyzing data. Maintenance personnel may even need to come into user's home for troubleshooting. Therefore, IPTV service quality management is very important.

IPTV Service Quality Mode and Management Solution

At present, no international organization has clearly defined standards for IPTV service quality. The ITU is working on IPTV GSI to promote global standardization of IPTV. IPTV GSI uses the QoE definition given in ITU-T P.10/G.100. QoE consists of subjective quality evaluation and objective quality evaluation. In the former, video quality is evaluated through visual systems and subjective feeling; in the later, objective indicators and testing tools are used for evaluation.

Operators are increasingly concerned with defining and quantifying IPTV service quality and creating an IPTV service quality index that can be referred to for network OAM. A quality evaluation mode based on the technology link in IPTV is needed.

Mean opinion score can be used to evaluate video quality according to user experience. It has a five-point scale: 5 is excellent, 4 is good, 3 is fair, 2 is poor, and 1 is unsatisfactory.

Service quality management can be used to measure IPTV service

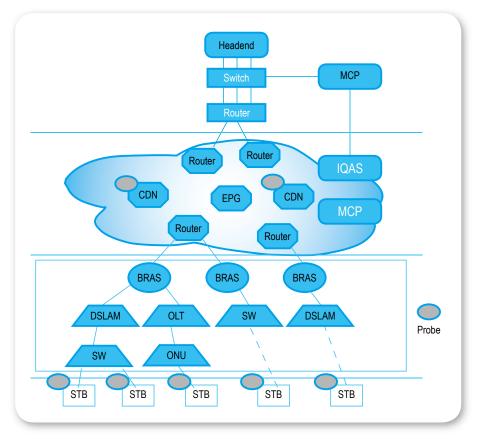


Figure 1. IQAS Network.

quality and help operators locate problems. SQM comprises three main methods:

- Monitoring point probe: Monitoring point probes are installed at both terminals of an IPTV system to continuously test and monitor target links. QoS and QoE faults can be efficiently located and accurate data about the faults can be obtained. However, this is costly, and there is heavy workload involved in deployment and maintenance. There are also blind spots.
- Terminal probe and data deduction: Probes are installed at the terminal to periodically collect network and
- video data from the STB as well as service quality data from users and network segments. Then the system analyzes the data according to topology data of the access network. When service appears to be abnormal, the system deduces where the fault is occurring according to topology data. This is relatively simple and less costly, but faults cannot be found at the headend, internal and output of the IPTV service platform.
- Tools: Tools can be used to locate problems in IPTV system links, but these are only auxiliary. Whole faults still need to be located by technicians themselves.

IQAS Ensures IPTV Service Quality

Knowing the defects of these solutions and software tools, ZTE has created an IPTV QoS Assurance System (IQAS). IQAS combines the advantages of three main solutions in order to monitor service quality and locate faults in headend, IPTV service system, network, and user end. The solution is built on the existing IPTV system, and this reduces deployment workload and MAO costs to the greatest possible extent.

IQAS monitors QoS data at the headend, service platform and user end by deploying probes. It deduces network faults using an expert database and logical calculation. It also analyzes user signaling faults using protocol tracking function and locates faults using software tools.

QoS monitoring and fault location in the head-end system and IPTV service platform

IQAS monitors the quality of headend video steam and network QoS through monitoring points in the headend multicast channel. Multicast channel stream monitoring points, which are required by the IPTV system and node side, can detect media being exported from the IPTV platform and can obtain the relevant network performance index. All probes at the monitoring points can be applied to platforms and terminal equipment of various manufacturers. This helps OAM technicians find content or platform faults as they occur, and this prevents UE from being negatively affected and reduces user complaints.

Monitoring and locating network service quality faults

IQAS has an expert system and reasoning function that is connected to



the synchronous network topological data of an operator's IT system. It combines an advanced knowledge base and reasoning machine. In the case of abnormal service, the system can promptly locate and monitor network faults. The knowledge base and reasoning function is continually upgraded so that faults are located with high precision. These functions avoid the need to deploy large numbers of probes in the access network and bearer network. They reduce cost and maintenance difficulty and eliminate dead zones that exist in the monitoring point probe function.

User-end QoS monitoring and fault locating

IQAS has monitoring points embedded in user terminals. These points record playback history and original service quality data. If the access is abnormal, for example, the wrong service account is accessed, or QoS is abnormal, for example, media loss rate exceeds the threshold value, IQAS automatically sends an alarm. For VIP users, IQAS has 24/7 QoS data collection so that the requirements of the SLA are met.

Signal tracing

IQAS collects signals through a standard interface in the IPTV service system and can trace the signals of specified users in the IPTV network. Signaling messages help OAM technicians analyze the service workflow of STB (that is, booting, authentication, subscription and VOD/TVOD/TSTV).

IQAS also has excellent STB management function. IQAS includes the asynchronous communication server function found in terminal management, and STBs and home gateway equipment can be remotely managed according to the TR-069 protocol. The terminal management function meets the management standards and expansion demands of China Telecom and China Unicom. Any STB that supports the TR-069 standard and relevant operator standards can be remotely managed.

IQAS also provides STB playback testing tools that can be used for remote control, testing STB, and monitoring EPG pages, channels and VOD programs. IQAS provides tools for capturing live channel or VOD specified by the media sever. These tools can be used to analyze program code and corresponding network quality. IQAS has STB protocol-analysis tools that can be used to obtain detailed protocol interactive LOG. This helps OAM technicians deal with service problems. With IQAS expert tools, technicians can solve all service quality faults efficiently.

IPTV operation, maintenance, and fault location are headaches for telecom operators. ZTE IQAS greatly enhances the ability of operators to offer IPTV service support. The system has already been adopted by commercial IPTV networks in America, Vietnam, Singapore, Russia, Indonesia, and China. ZTE TECHNOLOGIES



harti Airtel, a leading global telecom services provider with operations in 20 countries across Asia and Africa, on Tuesday launched India's first 4G service in Kolkata.

Bharti Airtel has selected ZTE Corporation to plan, design, supply and deploy its 4G network in Kolkata, which will allow its subscribers to experience high-speed wireless Internet access.

Airtel has launched the service on a state-of-the-art network based on TD-LTE, making India one of the first countries in the world to commercially deploy this cutting-edge technology. With this launch, India joins the most advanced telecom markets in the world and marks the beginning of a new chapter in the country's telecom success story.

Airtel's 4G (TD-LTE) network was launched by Kapil Sibal, minister of Communications and Information Technology. The launch will trigger a new phase of accelerated equitable and inclusive economic growth through proliferation of broadband services as envisioned by the government in the draft National Telecom Policy.

Commenting on the launch, Sunil Bharti Mittal, chairman and managing director, Bharti Airtel said, "Today's launch is a major milestone for India and Airtel. Over the past 15 years Airtel has been at the forefront of India's telecom revolution and has set the technology trends in India by aligning with the global standards. We are delighted to now provide leadership in setting the technology standard for 4G services in India by introducing the cutting edge TD-LTE. We are confident that others will follow in this direction and participate in our pioneering effort of making TD-LTE the defacto 4G standard in India."

"High speed wireless broadband has the potential to transform India, provide a robust platform for building the country's digital economy and truly empower people. With one of the largest pools of young population in the world, India will see massive growth in consumption of data and content over mobile devices and proliferation of mobile commerce. I look

forward to Airtel playing a pivotal role in shaping this exciting future for India." Mittal added.

Airtel 4G, besides offering rich content, will allow superfast access to high definition video streaming, multiple chatting, instant uploading of photos and much more. It will also help in bridging the digital divide and add to economic growth in rural areas by enhancing the reach of e-governance, e-health and e-education services.

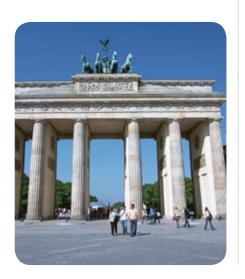
In 2010, Airtel had successfully bid for BWA license spectrum in Kolkata, Karnataka, Punjab and Maharashtra (excluding Mumbai) circles. It is currently working towards rolling out state-of-the-art networks in circles other than Kolkata.

Bharti Airtel is one of the founding members of the Global TD-LTE Initiative (GTI) which was launched at the Mobile World Congress 2011. Other key founding members of this global initiative include China Mobile and Softbank Mobile. TECHNOLOGIES

ZTE GSM-R **Products Achieve EIRENE Certificate** from TUV Rheinland

26 April 2012, Shenzhen — ZTE has announced that its generation SDR-based GSM-R products have passed European Integrated Railway Radio Enhanced Network (EIRENE) certification and achieved the certificate from TÜV Rheinland, which is a global leader in independent inspection and certification service. The achievement not only indicates the maturity, stability and reliability of ZTE GSM-R products but also showcases that ZTE's GSM-R products are suitable for the European global railway communication market.

ZTE's GSM-R system (GSM for Railways) is a comprehensive digital mobile communication system specially designed for railway communication. It provides location and feature-based addressing on the basis of advanced speech call items regulated in GSM Phase 2+ such as group calls, broadcast calls, multiple priorities and forced disconnection, effectively satisfying railway requirements including highspeed railways.



ZTE Demonstrates Telemedicine Video Conferencing Capabilities at ATA 2012



April 30, 2012, Shenzhen — ZTE demonstrated "open, intelligent and humanized" telemedicine and telehealth video conferencing capabilities at American Telemedicine Association (ATA) held April 29-May 1, 2012 in San Jose, California. The solutions will provide flexibility and scalability to health professionals and improve medical service quality and accessibility for healthcare consumers.

ZTE showcased a multi-scenario simulation experience of remote diagnosis. The demonstration of leading-edge telecommunications solutions and their applications for medicine is aligned with the company's dedication to "bringing you closer," which in part demonstrates the possibilities for connectedness between healthcare providers and patients.

ZTE Power Enters the Telenor Short List

3 May 2012, Shenzhen — ZTE has signed a global frame agreement with Telenor to supply ZTE power systems for the operator's base stations. According to the agreement, ZTE will have the opportunity to provide nine Telenor business units (including Norway, Sweden, Denmark, Hungary, Montenegro, Malaysia, Thailand, Pakistan and Bangladesh) with DC power systems (rectifiers) through to the end of 2013.

ZTE Gains World-Leading Market Share in Optical Network in 2011

Company achieves top growth rate for second straight year

27 April 2012, Shenzhen — ZTE announced its market share in the global optical network grew by 5 per cent in 2011, the most of any company worldwide.

According to a March 2011 report published by the research firm Ovum, ZTE gained the most market share of any company in the world for the second straight year in the global optical network market, with a 1.8 share points increase compared to 2010. In the same two-year period, the company moved from world No. 5 to world No. 2 ranking in the global optical network market, with annual revenues now surpassing \$1.7 billion.

ZTE IMS to Update Telefónica Group in Perú Fixed Network

Modernization project to lay foundation for unified core network

23 April 2012, Shenzhen — ZTE announced it will assist Telefónica Group in Perú to modernize its fixed network.

According to the agreement, ZTE will assist Telefónica Group in Perú with the deployment of an IMS core network based on an enhanced telecommunications computing architecture (ETCA) platform and replace aging switches on the network. The ZTE IMS solution supports most of existing PSTN/ISDN services and multiple legacy interfaces, such as BRI, PRI, POTS and NCS. This support will simplify operations and maintenance and lower operating expenses.

The ZTE IMS solution supports narrow band access and supports broadband access technologies including LTE and xPON. It provides a rich set of converged voice services in combination with services already provided by the existing network. These capabilities allow Telefónica Group in Perú to use a unified core network and quickly deliver legacy, new and future services.



ZTE Wins China Telecom IMS Network Construction Contract

Completed project will be largest network of its kind in the world

5 April 2012, Shenzhen — ZTE announced that it has won a contract with China Telecom to build an IMS phase II network in China.

When the project is complete, the IMS network will be the world's largest.

The ZTE-China Telecom contract includes construction of an IMS phase II

network covering 12 Chinese provinces, including: Anhui, Chongqing, Guangxi, Guizhou, Henan, Hubei, Jilin, Liaoning, and Ningxia, Shanxi, Tianjing and Yunnan. When the project is complete, ZTE will have acquired more than 60 per cent market share of China Telecom's IMS networks.



ZTE Launches IMS-based Multinetwork Voice Solution

24 April 2012, Shenzhen - ZTE has announced its IMS-based 4-net convergence voice solution at the IMS World Forum in Madrid. The solution supports one number service (voice/ SMS) and seamless voice switchover in GSM, WCDMA, LTE or WiFi networks. Subscribers can use a single number to answer a call or receive an SMS in various radio access network scenarios greatly improving the LTE experience.

ZTE Debuts IMS Application to Smartphone Users in Europe and America

25 April 2012, Shenzhen — ZTE announced its latest IMS application for smartphone users in Europe and America at the IMS World Forum 2012 held in Madrid. The application enables quick and efficient access to mobile VoIP.

Based on ZTE's successful IMS deployments in Europe with a dramatic increase of 100,000 new users per month on average, ZTE developed this innovative IMS application. It allows operators to offer a converged service combining Internet applications and traditional telecom services, enabling them to expand their subscriber scale and increase revenues.

ZTE Ships World's Best 1.8 Million PON OLT Shipments in 2011

17 April 2012, Shenzhen - ZTE announced it shipped 1.8 million passive optical network optical line terminals (PON OLTs) globally in 2011, ranking No. 1 worldwide.

According to a March 2012 report published by the research firm Ovum, ZTE became the world's leading PON

OLT supplier in terms of both annual shipments and market share of PON OLTs with 40.9 per cent share of the global market. The report, entitled Market Share Alert: 4Q11 and 2011 FTTx, DSL, and CMTS also stated that ZTE's market share increase from the previous year was 14.6 percent.

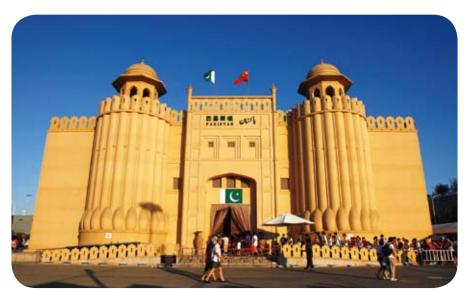
ZTE Wins Telenor Pakistan Infrastructure Upgrade Project

27 March 2012, Shenzhen — ZTE announced it has been selected by Telenor Pakistan (TP) to provide an array of equipment to assist in the construction of Pakistan's 'Turnkey' 2/3/4/G national network upgrade and extension project.

As part of the project, ZTE will provide 18,000 network stations and corresponding CNs, VAS, bearer network, green power and supporting facilities. In addition to swapping the existing 7,500 GSM stations, it also will construct 1,500 GSM new base stations, 7,000 HSPA base stations and

2.000 LTE base stations. Construction will take place between 2012 and 2017. In 2012, ZTE will begin expanding and enhancing TP's wireless network with the goal of achieving GSM, UMTS and LTE network upgrades and integration within 5 years.

ZTE also will provide full network operation management and end-to-end service network optimization services for TP. This will help the operator achieve significant improvements to network quality, allowing it to focus on its market operation services and enhancing its market share.





ZTE Revenue Grows 29% YOY to US\$2.9 Billion in Q1 2012

Net profits up 23% YOY during period

25 April 2012, Shenzhen - ZTE announced its results for the quarter ended March 31, 2012.

ZTE reported operating revenue of US\$2.96 billion in Q1 2012, an increase of 29.46% over the same period last year. Net profit attributable to shareholders was US\$22.99 million, an increase of 23.85% over the same period last year. Basic earnings per share were US\$0.00635.

ZTE's revenue generated by carrier networks rose by 13.65% compared to the same period the previous year, a reflection of an increase in revenue generated from sales of optical and data communications products. Terminal product revenues were up 27.33% compared to the same period last year, driven primarily by sales of 3G handsets. The company saw a large increase in sales of services and fixed terminals during the quarter.

During the reporting period, investments made by mobile carriers primarily focused on construction and optimization of mobile broadband and wireline broadband networks. This was a result of more in-depth 3G network deployments and the commercial deployments of 4G.

ZTE Revenue Grows 29% to USD 13.7 Billion

Company sees 30% increase in revenue in overseas market

28 March 2012. Shenzhen — ZTE announced its annual results for the year ended December 31, 2011.

Based on HKFRS and PRC ASBEs, ZTE recorded revenue of USD 13.69 billion in 2011, an increase of 28.6% compared to 2010. Net profit was USD 0.33 billion, down 33.4% from 2010's result. Basic earnings per share were USD 0.097.

The Group's domestic and overseas operating revenue grew 29% and 30% year-on-year respectively. In 2011, ZTE's terminal products sales continued to grow, with operating revenue of USD 4.27 billion, up 60.4% from the previous year.

During the reporting period, ZTE reported operating revenue of USD 6.27 billion from the domestic market, accounting for 45.8% of overall operating revenue and representing a year-on-year growth of 28.9%. The 12th Chinese National Five-Year Plan was also a driver of the company's development. ZTE assisted with the development of large 3G developments in China and construction of the country's national broadband network in 2011. The company's domestic operating revenue grew in the domestic market through its support of 3G carriers. It also deployed broadband access networks and ancillary transmission networks.

From the overseas market, ZTE reported operating revenue of USD 7.42 billion during the period, accounting for 54.2% of overall operating revenue and representing year-on-year growth of 30.3%. The company endeavored



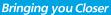
to enhance its market position by taking advantage of changes in the competitive landscape and developing its position in the international market. In 2011, the company reinforced its position in emerging markets and continued to achieve and cooperate with mainstream global carriers. As a result, ZTE sustained relatively fast year-on-year revenue growth from its international business.

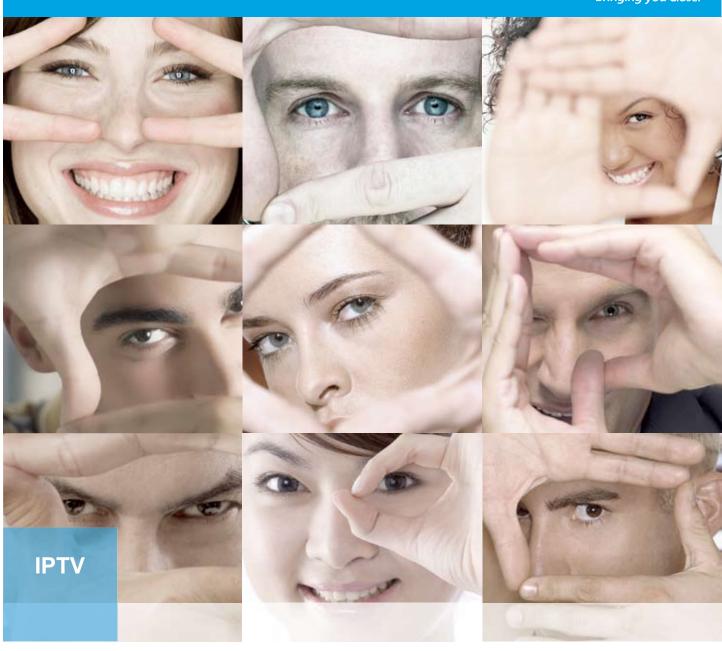
In emerging markets, ZTE has completed market deployments following agreements with mainstream operators such as MTN and América Móvil. It also strengthened cooperation with multinational operators such as Telefonica and France Telecom. In Europe, the company's system equipment has been implemented by nine of Europe's top 10 operators. In Japan, ZTE was selected by Softbank for TD-LTE projects.

According to a 2011 report by

research firm Gartner, ZTE became the second-fastest growing smartphone company in the world during the year. ZTE also was the fourth-largest mobile manufacturer in the world in terms of shipments during the year.

In addition to the company's growth in global market shares, ZTE sustained its strength in patent applications. Based on an announcement by the World Intellectual Property Organization (WIPO), ZTE filed for the most PCT patents of any company worldwide in 2011 with 2,826 filings. Of these, more than 60% were related to smart terminals and new technologies such as LTE/3G, cloud computing and The Internet of Things. The company's 4G/LTE patent applications accounted for 7% of patents applied for by global telecom vendors. Its smartphone-related patents applications were the fourth-largest globally and No. 1 nationally.





Picture your ideal IPTV solution.
Then come and talk to us.

At ZTE, we've already seen phenomenal success in IPTV with solutions that have propelled us to number 1 in Asia. Now we're ready to bring IPTV everywhere.

Our unique triple-screen topology platform - covering TV, PC and mobile and based on mature designs - allows for lightning fast, highly customized multimedia delivery, enabling operators to link hundreds of channels and services to a single system.

Of course, we also let you customize everything down to the minutest detail, so you can be sure of receiving a solution that's a perfect fit for your market.

All across the world, we're ready. So if you're looking to give your subscribers the entertainment that'll set you apart, give ZTE a call.

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