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Tapping the Value of FTTH Users

ZTE TECHNOLOGIES

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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

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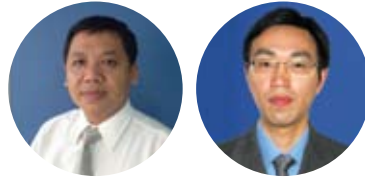
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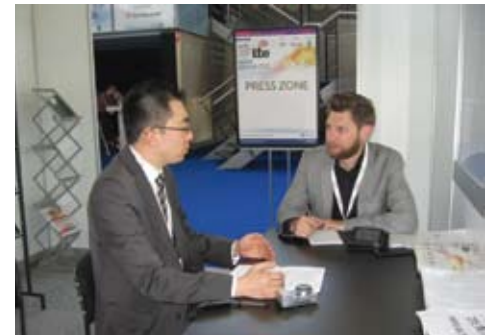
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ZTE to Sell ZTE Open Firefox OS Phone on eBay US and UK



12 August 2013, Shenzhen — ZTE announced that sales of the ZTE Open Firefox OS phone will start soon on the ZTE store on eBay US and UK. Recently launched with Telefónica in Spain, Venezuela and Colombia, the ZTE Open will now be available for the first time in Orange priced at \$79.99 (£59.99) and will be unlocked to allow use on all mobile networks.

The global availability of the ZTE Open through eBay means that more consumers worldwide are now able, for the first time, to buy an affordable smartphone based entirely on open web standards. The ZTE Open is powered by Firefox OS, which frees developers, operators and consumers from the constraints of existing closed ecosystems by using the Web as the platform for all functionality and applications.

ZTE Retains Leading Vendor Position in China Telecom **PON** Equipment Tenders

11 July 2013, Shenzhen — ZTE is pleased to be selected in all 13 of China Telecom's annual tenders for passive optical network (PON) equipment and broadband terminals for 2013, strengthening ZTE's position as a leading supplier to China Telecom in optical network products.

This year, ZTE won tenders for the strategically-important 10G-EPON products in 14 provinces, as the category was included in the China Telecom annual tenders for the first time. ZTE has long been a main supplier of FTTx products to China Telecom as part of the strategic

partnership between the two companies.

"ZTE is committed to supporting China Telecom's drive to build broadband networks," said Mr. Zhang Zhenhui, vice president at ZTE. "ZTE and China Telecom will work together to sustain the strong momentum in network construction and promote the healthy development of the industry supply chain. ZTE will offer comprehensive services to China Telecom to support the growth of next-generation PON technology and intelligent optical distribution network (ODN), helping China Telecom build superior network infrastructure."

ZTE MF253 LTE Wireless Router to Power Ubiquitous 4G Data Access



29 July 2013, Shenzhen — ZTE announced the launch of MF253, the company's new LTE wireless router that enables 4G mobile data access for homes, retail stores and offices.

With a sleek upright design, the MF253 supports data downlink speeds of 100 Mbps, and 50 Mbps for uplink, delivering high-speed mobile internet

access for up to 32 users simultaneously. With a streamlined white chassis and blue indicator lights, the MF253 is a stylish addition to all desks and settings.

Customized versions of MF253 for markets in the Americas, Europe and China ensure comprehensive support for a broad range of LTE spectrum used in different markets globally, meeting the needs of customers all over the world. Support for an external antenna will allow the MF253 to be deployed in areas of poor mobile signals. The MF253's MIMO wireless technology enables 300Mbps data transfers and supports as many as 32 simultaneous users.



ZTE Forecasts Profit in First Nine Months of 2013 in Earnings Rebound

21 August 2013, Shenzhen — ZTE forecasts the company will post net profit of between RMB 500 million and RMB 750 million in the first nine months of 2013, rebounding from a loss in the same period a year earlier.

The turnaround in ZTE's financial performance this year was achieved on the back of improved gross profit margins and stringent cost controls. In ZTE's first-half results announcement released today, the company reported net profit attributable to shareholders of the listed company of RMB 310 million, a year-on-year increase of 26.6%. Basic earnings per share amounted to RMB 0.09. Revenue decreased 11.9% to RMB 37.58 billion.

By focusing on profitability, ZTE's

gross profit margins improved in the first half. The company also benefited from greater cost efficiency, with a significant year-on-year drop in selling, administrative and research costs, in addition to the disposal gain from the sale of a subsidiary.

In the first half of 2013, telecom operators globally adopted greater prudence in their infrastructure investments. ZTE focused on developing its business in major markets and deepening partnerships with mainstream global carriers to ensure the company's products and services meet our customer needs. Revenue fell because of a drop in sales of GSM and UMTS products in China, and declining demand for 2G devices.

ZTE Grand Memo LTE Poised to be China's First 4G Handset After Permit Award

9 September 2013, Shenzhen — ZTE's Grand Memo LTE is poised to become the first 4G device available for sale in China, after it became the first to be awarded a TD-LTE handset permit by the Ministry of Industry and Information Technology.

The single-SIM, dual stand-by voice solution used by ZTE Grand Memo LTE, a quad-band device compatible with the TD-LTE/FDD/TDS/GSM bands, means it can support simultaneous high-speed data transmission and high-quality voice calls.



ZTE Activates Hong Kong's First 300 Mbps Capable 4G Network for CSL

10 September 2013, Shenzhen — ZTE helped CSL Limited complete a demonstration of Hong Kong's first 300 Mbps-ready 4G network, paving the way for wider-scale commercial deployment of next-generation mobile services to consumers and business customers.

ZTE's industry-leading carrier aggregation (CA) technology was deployed by CSL in the demonstration. ZTE's capabilities in CA and LTE-Advanced (LTE-A) solutions help CSL leverage its unrivalled radio spectrum assets to serve the needs of customers who demand the highest-performance mobile services.

As a key enabling technology in next-generation LTE-A networks, CA combines two or more carrier frequencies in the same or different bands into one channel, increasing peak transmission speeds. ZTE's CA solution helps unlock the potential of the spectrum assets of CSL, which is the only mobile operator in Hong Kong equipped with a pair of 20 MHz spectrum in the 1800 MHz and 2600 MHz frequency bands for 4G services.

"LTE-A is the next step in the evolution of 4G LTE network service for CSL and our customers, one that allows us to optimize our spectrum advantage. We're very happy to receive the support from ZTE in enabling us to demonstrate this latest technology first in the Hong Kong," noted Phil Mottram, CEO of CSL Limited.



Christian Daigneault, CTO of CSL

CSL: Communication for Everyone

Reporters: Zhao Rujing and Fang Li

Hong Kong enjoys top-tier fast speed mobile and fixed broadband in the world. CSL was Hong Kong's first mobile operator and is a subsidiary of Telstra Corporation Limited, Australia's leading telecommunications and information services company. In Hong Kong, CSL is the only mobile company to employ a distinctive market segmentation strategy. CSL provides customer-centered services through 1010, one2free, New World Mobility, and a number of other prepaid brands. ZTE interviewed Christian Daigneault, CTO of CSL. He talked about CSL's network transformation, customer experience, and challenges in monetizing LTE.

Q: You have worked for large operators in Europe, North America, Asia, Latin America, and Africa. What attracted you to CSL?

A: Hong Kong city itself was the big attraction for me. In many ways, Hong Kong is one of the most advanced markets in the world, especially for mobile broadband. Hong Kong has some of the most complex environment to run mobile networks and also has very demanding customers. Another aspect that attracted me was the support from CSL's parent company, Telstra, the major shareholder of CSL. CSL was in a good position to be the strongest operator in Hong Kong. Both Hong Kong and Greater China in general were very attractive to me, and the complexity of the task at hand was a great challenge.

Q: You successfully led CSL's network transformation. What was the key to success in this project?

A: We began our network transformation in 2007. We wanted to transform our basic voice network into a full IP network for broadband users and high-speed data, ready for future upgrade to LTE. One key factor to our successful transformation was our strong partnership with ZTE.

CSL and ZTE made a big bet on the new and yet unproven technology to lead the industry. In March 2009, we were one of the first operators to provide an all IP 21 Mbps HSPA+ ready for LTE. There were many technological challenges to overcome since what we were doing was not done before by anyone. Both ZTE and CSL took the challenge, smooth out the difficulties along the road, and achieved a very good result. We transformed our network to HSPA+ 21 Mbps in about one year, which is extremely fast considering that it was a full swap of the entire network, from core to RAN, also including the backhaul. Not to be forgotten, we had millions of live customers during this time, so this upgrade had to be done seamlessly without impacting customers.

Q: How is the LTE network performing and what still needs to be done to expand LTE coverage?

A: Our LTE network is performing very well now. The network covers more than 95% of the population of Hong Kong. Most of the network has been upgraded to LTE, which means that LTE users are currently served by the LTE network most of the time, except for voice calls where they need to fallback to 3G. The LTE rollout has greatly enhanced customer

■ VIP Voices

experience. Recently, we expanded our LTE spectrum to a full 20 MHz at 2600 MHz and a full 15 MHz spectrum at 1800 MHz. With these two frequency bands, we have probably one of the highest-capacity LTE networks among operators in the world. We are very fortunate to have a large spectrum, and we are leveraging this advantage to the maximum extent. With 20 MHz bandwidth, our network supports Cat4, i.e. 150 Mbps speeds, and has further enhanced the customer experience in Hong Kong.

Q: How did you improve customer experience after the LTE network has been rolled out?

A: The first step was to extend the LTE

rollout to all sites, which is almost completed. The second was to increase the LTE bandwidth by refarming more of our 2G spectrum at 1800 MHz to LTE. 1800 MHz provides better in-building penetration than 2600 MHz and provides more consistent coverage. Once you have deployed the full network and expanded the bandwidth, the third step has been network tuning. We had to improve handover between cell sites, and optimize load balancing between 1800 MHz LTE, 2600 MHz LTE, and 3G. We have to optimize our complex multilayer network so that we can leverage all these resources for maximum throughput and better customer experience.

Q: How will you migrate your 2G

or 3G subscribers to 4G LTE?

A: First of all, this migration is happening naturally because Hong Kongers are always attracted by the newest technologies. Customers are switching to new handsets and smartphones regularly. In our stores, we are now only selling 4G LTE capable devices. Customers are moving to 4G because LTE really benefits them and provides much better customer experience especially that the 3G network has reached its capacity limit in many areas like in Hong Kong MTR.

Q: How do you profit from LTE, and how have your customers responded to your LTE offerings?

A: We don't really differentiate 3G or 4G in terms of pricing plans or packages. If you buy a 4G device, you benefit from the 4G network. Monetizing LTE is really related to the uptake of smartphones. This is related to enhanced customer experience. More and more users are converting to smartphones, which brings us higher revenue than traditional feature phones. With LTE, users are also consuming more data and since most of our plans are volume-based. This also means more revenue.

Q: CSL has signed LTE roaming agreements with SK Telecom and Telstra. What are CSL's future plans for LTE roaming?

A: We have many operators in the pipeline doing testing at this point. LTE is still new and other operators are not



An interview

yet ready. We have a large number of 3G roaming partners with more than 500 agreements and we intend to continue to lead with LTE.

Q: What do you think about ZTE as a partner?

A: The partnership with ZTE has been very successful for CSL. We have partnered with ZTE since 2008 and since that time ZTE helped us lead with new technologies such as first to introduce HSPA+ at 21 Mbps, first to introduce LTE and later LTE CAT 4. We have been able to lead our market and been recognized by our customers as the best network in Hong Kong. This certainly contributed to CSL success. In the last 12 months, we have been ahead of other operators in Hong Kong in terms of revenue. Having the best network that offers superior experience is at the core of our strategy.

Q: How does ZTE compare with other vendors?

A: In my experience, I have been working with most vendors in different markets. What makes ZTE different is its flexibility in listening to the customer and to deliver to expectation. We have very specific requirements in Hong Kong due to the high complexity of the radio environment and other factors. Other vendors sometimes cannot customize for Hong Kong since they have to prioritize amongst all operators and then Hong Kong has little weight. ZTE can meet our specific requirements much better than other vendors.

Hong Kong is one of the most

advanced mobile markets in the world. What we do in Hong Kong can always be applied in other markets and this is one reason ZTE is motivated in leading in Hong Kong. We were the first to launch LTE in Asia. ZTE was able to adapt its schedule to debut LTE in Hong Kong first. For other vendors, Hong Kong was not necessarily their top priority. We were also able to launch HSPA+ earlier because of ZTE's flexibility. We have also gone through the tests of LTE Advance at 300 Mbps successfully with ZTE. We are planning the commercial introduction of LTE Advance at 300 Mbps, so we are continuing on this road to lead with LTE.

Q: ZTE has provided you with network optimization assistance recently. How would you qualify their performance?

A: The response from ZTE has been good. In late 2012, our network was benchmarked against the networks of other operators and was found to be second best which was totally unacceptable to us. We had ZTE's R&D engineers come to Hong Kong, and we worked out a six-month project to boost the network which was completed at the end of 2012. This was not only a traditional RF optimization project; it also involved fine-tuning the radio software to deal with the high level of interference in HK and extremely user density. ZTE has flexibility, skills, and expertise to tweak and enhance our network performance. Now, CSL is back to No.1 in terms of higher speeds in more locations, which means a consistently

more stable broadband connection.

Q: Are there any plans for future cooperation with ZTE?

A: We are working on expanding our network. Growth in Hong Kong is still strong, and traffic is almost doubling every 18 months. We need to continue to increase capacity and coverage. We are working very hard with ZTE to introduce new technology to enhance customer experience further, such as LTE Advanced at 300 Mbps using Carrier Aggregation, Cloud Radio and VoLTE, so that we can continue to lead in the Hong Kong market. We have a joint innovation agreement with ZTE that we are pushing very strongly because we believe it is good for both of us. CSL will benefit from offering the best experience to its customers, and ZTE benefits by gaining valuable experience. Hong Kong is a good testing ground for new technology.

Q: Do you have any advice for ZTE?

A: ZTE needs to remain ahead. Vendors are all under great pressure to innovate to meet their customer business requirements. I would like to see ZTE taking more leadership and provide new solutions to help us being successful. I'm really talking about innovation in terms of products, services and new business models. ZTE would do well to transition from being a good engineering and manufacturing vendor to being a full-service and solution provider. They need to really help operators be successful in intensely competitive markets. **ZTE TECHNOLOGIES**



Metro Atlanta Chamber: Making Atlanta Thrive

Reporters: Julie and Zhao Rujing



Larry Williams, vice president of Technology Industry Development at MAC

The Metro Atlanta Chamber exists for one reason: to help Atlanta thrive. The Chamber is at the core of Atlanta's economic development and is a unique forum for companies to make business contacts in Atlanta. Today, Metro Atlanta is home to 14 Fortune 500 companies. These companies have contributed to the growth of Atlanta and continue to thrive alongside other MAC members. ZTE is a member of the MAC, and we interviewed Larry Williams, vice

president of Technology Industry Development at MAC. He talked about Atlanta's key strengths in mobile technology, the recipe for Atlanta's unique success, and the future of the mobile industry.

Q: Why is Atlanta a global hub for mobility?

A: Atlanta is really at the center of the global convergence of all technology and almost all technology has to be delivered over a mobile platform. If you think about that convergence, Atlanta is a place where mobile content meets the



necessary distribution channels. You also have enablers, such as app developers, and you have some of the biggest names in online security here. Along with these parties, you also have some of the largest global brands, such as Coca-Cola, Delta Airlines, and Home Depot. These are the most forward-thinking brands in terms of using mobility to engage customers. There is no other place right now with this kind of mobile ecosystem that drives not only innovation and adoption but also revenue.

Q: What are Atlanta's key strengths in mobile technology?

A: We are at the epicenter, where mobile technology ecosystems come together. As we like to say, "Atlanta is where mobility meets the real world." When you think about what it takes to make mobile technology work—everything from infrastructure to hardware and development—Atlanta has a huge ecosystem. We have players such as The Weather Channel and Turner Broadcasting that deliver content. Then

we have companies such as AirWatch that are enablers of mobile technology, providing critical security needed for mobile transactions. Atlanta also has people that develop apps, and we have the world's largest brands, such as Coca-Cola, that drive business with mobility. We also have a population that is very receptive to mobile technology. There is widespread mobile usage here: People here really get mobility. That means we are able to roll out new technologies faster. Of course, we also have companies such as ZTE that are a gateway to the world of mobile technology. ZTE can help realize potential growth and development in an industry that Atlanta stands at the forefront of.

Q: What is the recipe for Atlanta's unique success in this growing field?

A: It is a combination of great research, great institutions, and an entrepreneurial culture. We have people who are able to figure out how mobile technology developments apply to consumers and businesses and who can turn these developments into marketable products.

We also have a culture of engagement, where companies large and small are willing to work together to build great ideas. Companies such as AT&T, Coca-Cola, Newell Rubbermaid, UPS, Turner Broadcasting, and McKesson are willing to sit around a table and pool their might to promote Atlanta's mobility industry and the betterment of the community. That's a great recipe for success.

Q: How have Atlanta's business leaders embraced the growth of Atlanta's mobile technology ecosystem?

A: AirWatch can build the world's largest and fastest-growing mobile device management company in Atlanta because, in large part, Atlanta has decades of experience in network and internet security. Atlanta has through-companies such as ISS (which became IBM Internet Security Systems) and Dell SecureWorks. We have a long history of innovation and know-how in this industry. Atlanta has always been at the center of telecommunications and mobile technology. There is a richness and depth in our expertise that has laid the foundation for us to be successful. Because of this foundation, it is easy

■ VIP Voices



for Atlanta to quickly embrace next-generation forms of technology, such as mobility, and be at the forefront of development and up-scaling. Our companies are leading the way in developing the apps and the latest ways to manage devices that are driving revenues, along with the market.

Q: What is the MAC Mobility Task Force and how has this group helped to push forward Atlanta's mobility strategy?

A: The Metro Atlanta Chamber Mobility Task Force is the 'who's who' of global mobility leaders representing companies like AT&T, Coca-Cola Co. and AirWatch. These high-level leaders in these global companies are lending their time, expertise, and muscles to propel forward this effort. Earlier this year, Airwatch made room on its stage at the Mobile World Congress

in Barcelona, Spain to announce our mobility initiative and leaders from Coca-Cola Co. and AT&T spoke about our task force efforts before a global audience. You have leaders like Chris Walters at The Weather Channel helping to lead our mobility industry growth efforts, along with entrepreneurs at one of our fastest-growing companies, Proximus Mobility. Now we have AT&T and Cisco partnering on a new Foundry innovation center near Georgia Tech. This kind of collaboration illustrates the key strengths of this powerful and ambitious taskforce.

Q: What have been some of Atlanta's biggest mobility industry success stories to date?

A: Our biggest success stories have come from our companies. Most recently, AT&T selected Atlanta as the site of its latest Foundry innovation

center, making our city one of only four in the world to have a prized innovation hub. Meanwhile, AirWatch announced one of the biggest investment rounds ever, raising a landmark \$200 million. This year, global payments company, Elavon, picked Atlanta as the location for its new technology development center. Panasonic Automotive Systems Company of America also chose to build a new research center at Georgia Tech in Atlanta.

Q: What does the future hold for the mobility industry and what is Atlanta's stake in this fast-growing sector?

A: We are at the center of an industry and ecosystem that is only going to grow and become more in demand globally. Our growth potential is remarkable. We have companies, organizations, and strategies that ensure we are not only the mobility hub of today but also at the forefront of this industry for years to come.

Q: What role does ZTE play as a member of MAC and what will be the future of cooperation between ZTE and MAC?

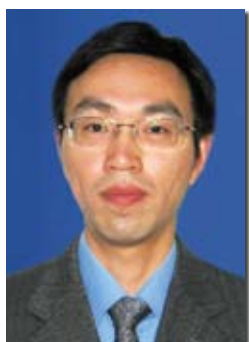
A: We value ZTE as a collaborative member of MAC. Having a company as visible and respected as ZTE is important to our overall efforts. Our success in helping to build a great technology ecosystem in metro Atlanta depends on visible, global, and important companies such as ZTE, AT&T, and Cisco. ZTE is an important player in our technology and mobility industries, and we look forward to continued engagement with the company. ZTE is a valuable contributor to our economy, and having companies like ZTE here makes Atlanta a better place. **ZTE TECHNOLOGIES**

Tapping the Value of FTTH Users

By Li Qing and Bao Jie



Li Qing, chief engineer of fixed network management and service planning, ZTE Corporation



Bao Jie, chief engineer of wireline service planning, ZTE Corporation

PON boosts user bandwidth, but how can operators benefit from this? In this article, we discuss the urgency of shifting the focus of network OAM from KPI management to QoE management. We outline a QoE management architecture and how it may be applied in FTTH networks. We also describe how to use ONU DPI to cheaply implement FTTH QoE management and how to tap the value of FTTH users.

FTTH QoE Management Helps Increase Broadband Revenue

Many recent PON rollouts have rapidly expanded the FTTH user base and also the basic capabilities of broadband access networks. This has created a promising future for high-bandwidth services.

Bits of data passing through a broadband pipe have different value. Data belongs to different ISPs and

different services, and the money paid by end users, ISPs, and other hidden stakeholders for this data can vary greatly. Value difference presents big opportunities. For example, a bit generated by browsing a webpage might have less value than a bit generated by playing a paid online game. Even the same bits generated from internet browsing may have different value according to the webpages viewed.

Telecom operators create the huge space within which data can realize its value. These operators urgently need to transform their business models and OAM mechanisms as opposed to merely increasing their operational income by increasing bit traffic. They must identify, manage, apply, and expand bit value.

Traditional OAM focuses on equipment, faults, and network. Maintenance is based on user complaint mechanisms, so faults cannot be proactively detected. This kind of

management involves equipment management, alarm management, and performance management.

Network OAM and management need to be redirected towards QoE so that each user and service experience can be clearly viewed (Fig. 1).

QoE management helps grow the number of front-end users and services, and also serves as a basic tool for operators to tap the value of different users, services, and ISPs. Operators can also implement forward or backward charging.

CEM and Applications

Customer experience management (CEM) is designed to measure and express the service experience of a specific user or group. CEM uses quantitative indexes to represent user service and network experience and to reflect the gap between what users expect and the actual quality of services and networks.

The customer experience management center (CEMC) uses active and passive probes deployed in the network to collect information about network and service operation. CEMC interacts with ACS, PON EMS, and traffic monitoring systems to obtain information about network and equipment operation, and it also interacts with OSS to acquire user SLA information (Fig. 2). By integrating and drilling down all this information in multiple dimensions, CEMC can analyze and manage FTTH users and services in real-time. Key aspects of CEM are

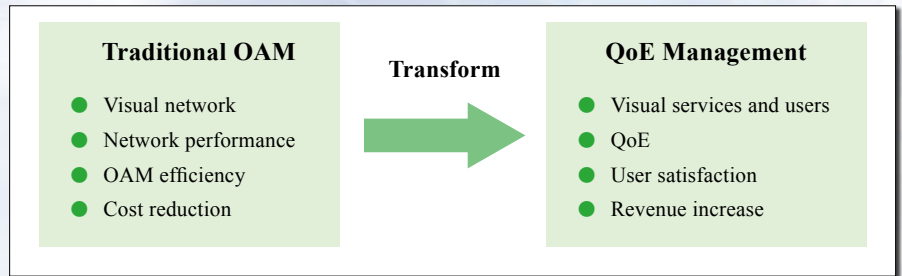


Figure 1. Transforming OAM.

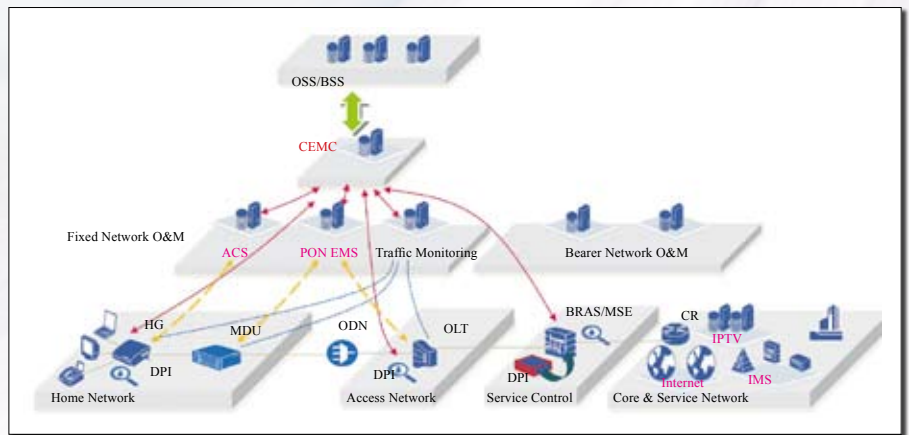


Figure 2. Typical framework for implementing CEM in an FTTH network.

- customer experience management, which involves QoE management for specific customers.
- SLA management, which involves QoS baseline management.
- QoS management, which allows for visual management of all services.
- service fault location, which involves automatic diagnosis and accumulating troubleshooting experience.
- user behavior analysis.

With these key functions, CEM provides service support for different operator departments.

CEM application for front-end marketing

- VIP user experience management. CEM evaluates VIP user experience, accesses user-related service or network indexes, and provides corresponding service assurance that involves monitoring, guaranteeing,

and caring for VIP user experience.

- user experience analysis. By analyzing user service experience, CEM provides reference data for operators to make management decisions and helps them attract and retain users.

CEM application for back-end OAM

- network OAM assurance. CEM monitors specific services in real time, and QoS can be automatically or manually evaluated. CEM details the causes of low-quality service, suggests improvements, and manages the SLA.
- end-to-end network quality evaluation. CEM performs a segment-by-segment analysis of key indexes, including DNS delay, packet loss ratio for an access link, HTTP first-byte delay, and DHCP access success rate. CEM also performs a statistical analysis of user distribution and failure type in each segment and displays analysis indexes in all related dimensions. In this way, CEM helps an operator determine network quality and user distribution.
- fault location. CEM obtains data from data sources and uses them in combination with an expert knowledge base to automatically locate service faults.

CEM application for front-end customer service

- retaining very angry persons (VAP). CEM analyzes user service data and

Table 1. Comparison of two DPI probe deployment modes.

	Centralized DPI	Distributed DPI
Description	Specialized DPI probes are deployed at the network side to identify and control packets	DPI probes are deployed at the user side to identify and control packets
Advantages	DPI probes are easy to install, configure, manage, and maintain. They are close to the core network and can collect data from a vast area.	Risk of DPI faults is low; DPI probes are flexible to operate and cost-effective. The probes are close to users and thus very accurate when collecting data.
Disadvantages	Single point fault risks, high cost.	Widespread deployment of DPI probes, inconvenient to deploy

sifts out VAPs. Then, it evaluates VAP user service experience and analyzes and solves problems to reduce complaints. The process involves VAP user identification, VAP user experience monitoring, and VAP user fault analysis.

Tapping the Value of FTTH Users: ONU DPI

CEM analyzes the statistics of a huge amount of network operation data. This data may be network management and traffic data, including data about resources, network and

traffic that reflects the status of a rugged communication pipe. The data may also be DPI data, including data about service interaction and service performance that indicates the status of a refined communication pipe.

DPI data is generally obtained by deploying DPI probes in the network. Probes are deployed at the network side (in a centralized way) or at the user side (in a distributed way).

These two methods of deployment have their own advantages and disadvantages (Table 1). The decision to deploy DPI probes at the network

*CEM uses **ONU DPI** to monitor network quality and can determine QoS at the user side. As operators quickly transform their businesses, CEM will be widely used as a basic management tool.*

or user side should be determined by actual needs.

At the user side, a DPI module can be integrated into a PON home gateway unit (HGU). This can circumvent the need to install a standalone DPI probe at the user side. This method of deployment has the following advantages:

- The DPI probe can accurately locate users, and analyze and control specific user services.
- The DPI probe is a service originator that provides QoS guarantee and filters abnormal traffic at the source.
- The DPI probe allows for fine-grained analysis and control of different user terminals within a home.
- The DPI probe perceives the status of user service as soon as possible and responds to faults in real time.
- DPI probes are deployed in a distributed way and are implemented by software. There is no need to

invest in hardware. Requirements can be fulfilled in stages, and short-term results can be obtained.

Differentiating to allow operators to charge specific ISP services

Operators can sign differentiated service agreements with ISPs to guarantee services and charge ISPs for them. FT recently signed a differentiated service charge agreement with Google. This is a good attempt at collaboration between upstream and downstream enterprises in the value chain and will improve user QoE and ISP QoS.

Guaranteeing QoS to develop self-run services

CEM provides QoS guarantee for self-run services. CEM analyzes the content of IP packets, identifies self-run services (by finding and matching keywords), designates key services, and provides a QoS guarantee. This helps establish high-quality self-run services.

Guiding marketing and boosting operating income

CEM uses traffic statistics to identify the distribution of high-value users. An operator can proactively target their marketing activities to people who use services heavily and need high bandwidth. They can also increase ARPU by quickly offering free trial high-speed services and then later signing a contract with the user.

Monitoring network quality at the user side to improve QoE

More and more value-added services are connected to the network through HGUs. CEM uses ONU DPI to monitor network quality and can determine QoS at the user side. This first-hand QoE data helps an operator optimize their network and improve user QoE.

Much work is being done on CEM for PON. As operators quickly transform their businesses, CEM will be widely used as a basic management tool. **ZTE TECHNOLOGIES**

eODN: The Road to Intelligence

By Zhang Weibin

Broadband network development opens a window for operators to gain ground on their competition. Fiber has its long reach and large capacity and thus will replace copper in future telecom networks. In recent years, many countries have chosen to build their national broadband networks with FTTH, and this has led to an explosion in fiber applications. However, an FTTH optical distribution network (ODN) is different from a traditional outside plant (OSP) network in terms of network planning, construction, and maintenance. FTTH ODNs demand careful management of a massive number of fibers.

Challenges in ODNs

Lack of a unified support platform

Currently, ODN market

analysis, planning and design, and construction and maintenance are compartmentalized. ODN network planning and design involves many software releases, and this leads to loss of key information during data transfer. The people constructing the network cannot promptly determine regional demands for bandwidth, so the network cannot be adequately constructed to meet real demand. Also, changes to the ODN cannot be sent to the GIS database. This means a large amount of data needs to be imported and exported in the background and must be manually recorded on site. This process is inefficient and open to error.

Lack of efficient mass-fiber management

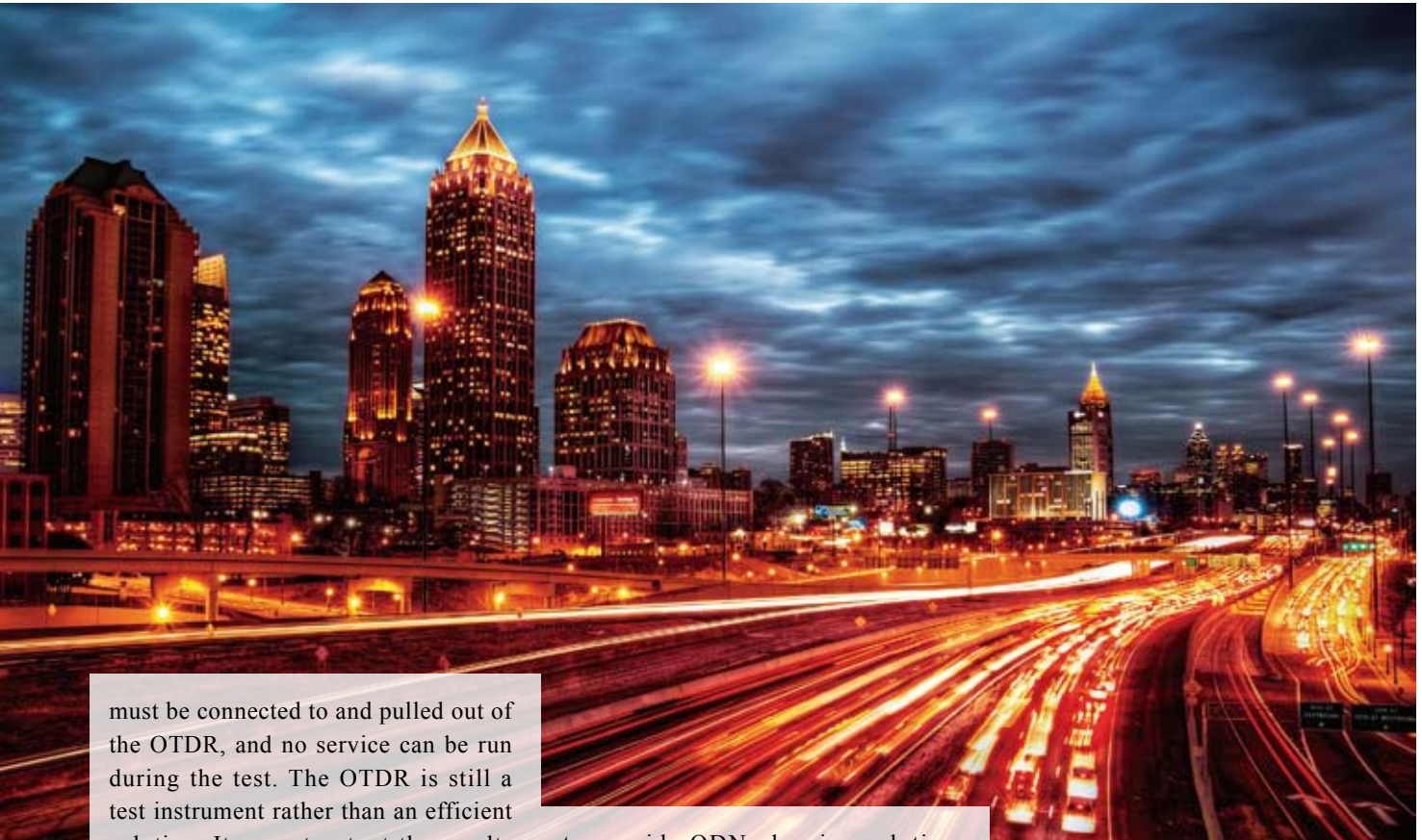
In ODNs, a paper label is affixed to each fiber to identify its port and

manage passive equipment. With a rapidly increasing number of fibers, it is difficult to locate a specific port or fiber route. Information about the ODN is manually recorded and modified. Statistically, failure to update a database in time reduces the accuracy of fiber resources in many places to below 70%. This greatly affects the availability of resource information. Managing passive ODN equipment with paper labels is unnecessarily difficult, and a more efficient approach is needed.

Lack of real-time network diagnosis

Optical performance testing is an important part of ODN installation and maintenance. An optical time-domain reflectometer (OTDR) is widely used in ODN testing. However, during testing, an optical connector

■ Special Topic: Intelligent ODN



must be connected to and pulled out of the OTDR, and no service can be run during the test. The OTDR is still a test instrument rather than an efficient solution. It cannot output the results of a test as a test report. Results must first be analyzed by trained and experienced personnel.

Requirements of Future ODN Construction

Operators seek to build a flexible, accurate, efficient fiber network. They strike a balance between using existing resources and creating new build-outs according to service demands and market forecasts. The full lifecycle concept can be introduced into different stages of ODN deployment.

Planning

Resource usage, subscriber distribution, and market competition should be closely monitored to determine where investments should be made. Powerful, specialized network planning software is needed

to provide ODN planning solutions for different scenarios.

Design

Operators deploy the network and configure equipment, according to planning data. Intelligent design tools greatly increase work efficiency and make the network design more consistent.

Construction

The design results can be exported to a unified platform that allows construction information to be queried, uploaded, and electronically accessed using a handheld terminal. Paperless operation is convenient and environmentally friendly.

Maintenance

Operators seek to electronically manage their ODN in order to visually locate equipment and

ports. A real-time optical link test system that promptly locates and diagnoses faults is needed to fulfill service level agreements. During installation, engineers need to know equipment distribution and detailed geographic information.

Network upgrade and expansion

Operators need to know detailed information about the operational status of their equipment and the usage of network resources. Such information can help them optimize network design and increase return on investment.

eODN: The Road to Intelligence

ZTE has created a full lifecycle eODN solution that addresses problems in ODNs and helps with the evolution to a fiber network. An intelligent electronic identification

and real-time monitoring solution, based on geographic information system (GIS), can help an operator rapidly and efficiently plan, construct, and maintain an FTTx network. Such a solution covers every stage of ODN construction and provides smart end-to-end ODN operation and maintenance. The solution involves three main modules: eDesign, eManager and eMonitor (Fig. 1).

eDesign is the network planning and design module based on GIS. This module creates an ODN deployment proposal that adheres to city planning regulations. Based on geographical grids, eDesign correlates user demands and required resources within a region so that services can be accurately matched with resources. This is important for broadband planning and deployment, resource allocation, and business development. In the planning and design stage, eDesign provides automatic drawing, modularized product configuration, and effective statistics. Many networks can be created in a short time.

eManager is the module for managing and maintaining a massive number of optical fibers. Each fiber core is considered a nerve of an ODN, and expert knowledge about the operational status of each nerve is necessary. ZTE has introduced smart electronic labels (e-Tags) to replace paper labels on optical fibers. eODN uses e-Tags to store important routing, occupancy,

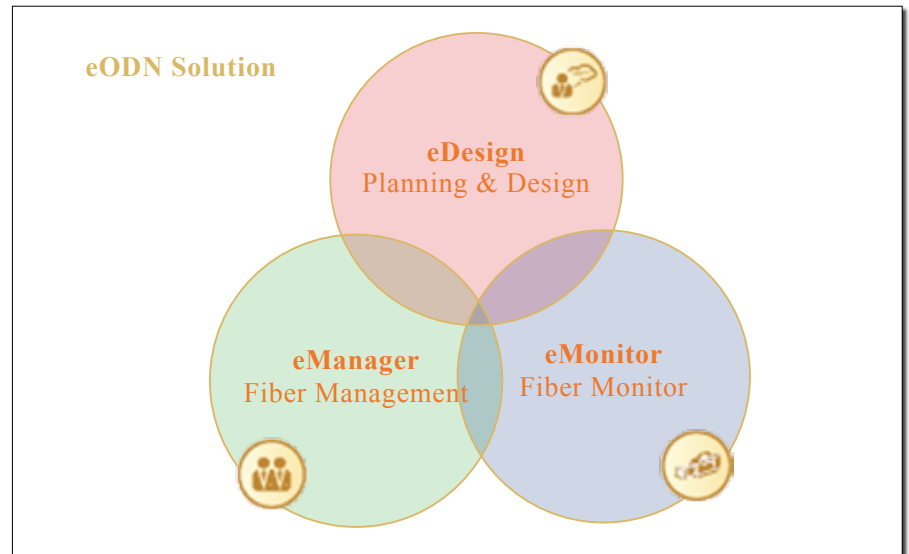


Figure 1. ZTE's full lifecycle eODN solution.

and maintenance history about a connection on an ODN node. e-Tags can be embedded in an ODF, OCC or ODB. Information from all fibers and ports can be acquired and sent to a data server. The smart electronic labels are like a chip planted in each fiber. They make equipment more intelligent and the fiber network more perceptible and accurate.

eMonitor is the real-time performance monitoring module for an FTTx network. Good maintenance helps extend network life. eMonitor uses integrated OTDR and OSW hardware as well as a special platform to analyze performance and locate faults. eMonitor can diagnose problems in fiber networks without interrupting services. This allows operators to monitor

network performance at any time without having to notify customers. eMonitor also has an analysis platform that stores the results of network health tests in a library. Network performance is automatically monitored, and an alarm is sounded when there is an abnormality. When a fault is located, eMonitor displays the result on a GIS map and triggers a fault-handling mechanism. ODN construction is the most costly and time-consuming part of constructing an FTTH network. It is very difficult to expand or upgrade an ODN once it has been deployed. Therefore, it is important to build a stable, flexible, long-term fiber network from the outset. ZTE has the industry expertise and innovative know-how to support operators in ODN deployment. **ZTE TECHNOLOGIES**



eODN *for Intelligent* *Modernization of Optical Networks*

By Wang Yadong and Zhang Weibin

Intelligent ODN greatly improves resource management and OAM efficiency in passive optical networks. It makes optical equipment intelligent by synchronizing resource information and automating service flow. Great strides are being made in the standardization of intelligent ODN, and big operators are currently piloting the technology. Large-scale deployment of intelligent ODN is just around the corner.

As research on intelligent ODN progresses, industry has shifted its focus to modernizing existing optical networks. A huge number of fiber

resources have been deployed in the early stages of optical network construction. Statistics from the British research firm CRU show that two billion kilometers of optical fiber has been installed since the 1990s. This is enough to circle the earth 50,000 times. In traditional fiber resource management, information about resources is usually statically stored in a resource management system. Inefficient data verification and management causes many fibers to be rendered useless in construction. Roughly 30% of fiber is wasted. The flow-on effect of fiber wastage is increased pipe costs, labor costs, and leasing costs (incurred by the space taken up by useless fiber).

Optical fiber is a kind of precious resource that needs to be in service for at least 20 years. Intelligent fiber modernization is a way of revitalizing existing fiber resources to maximize their usage.

Several issues need to be addressed when modernizing an optical network. First, active services must not be affected. This is mandatory for network modernization. Unplugging an active service or re-splicing the ports of an active service for purpose of intelligent upgrade is unacceptable to both operators and subscribers. In this case, the benefits brought about by modernization may not actually offset the negative impact of a severe network interruption. Second, the changes made during modernization can be minimized

by reusing existing cabinets, trays, and ports. The cost of replacing all trays and cabinets may approach the cost of rebuilding the network from scratch. Third, modernization must significantly improve fiber resource management. Industry has proposed a solution whereby a 2D code label is attached to each port, and a mobile phone is used to photograph the ports one by one. This only simplifies the reading process, but ports are still not efficiently recorded or managed. Fourth, the focus of fiber resource modernization should be process optimization. Upgrading hardware without optimizing the software processes will not result in more accurate fiber management.

Addressing all these issues at the same time is not easy and requires the help of a vendor that has comprehensive technical capabilities. After a long period of developing technology and tracking customer requirements, ZTE has introduced eODN, an intelligent modernization solution. eODN is designed to optimize the management processes for an optical network. Traditional optical node equipment can be upgraded without interrupting active services. eODN does not require any changes to cabinets, trays, or optical connectors. Instead, a jacket with an electronic label is added to the connector port, and an interactive circuit is added to the cover plate of the tray. The jacket and cover plate interact through a gold finger or through an RFID to automatically collect port information

and visualize construction. eODN also analyzes field resource information, schedules optical routes, and displays topology. With these functions, eODN strengthens traditional resource

management systems, which only store static data. After software and hardware have been optimized, network can perform as well as a newly built intelligent ODN. **ZTE TECHNOLOGIES**

▶▶ *News Link*

ZTE Ranked No. 1 in World PON Market by Ovum

20 March 2013, Shenzhen — ZTE has achieved the global No. 1 ranking for shipments of passive optical networking (PON) products according to industry consulting firm Ovum. ZTE was the world's leading vendor with 42 percent market share globally in shipments of PON optical line terminals (OLTs) in 2012, after the company shipped 1.72 million lines. Based on Ovum's data, ZTE also ranked first globally in shipments of optical network terminals (ONTs) and optical network units (ONUs) with 32 percent market share, after the company achieved shipments of more than 13 million lines. Ovum's data also showed that ZTE attained this market leadership even though the total number of OLT ports shipped declined between 2011 and 2012.

ZTE's leading position in the PON market is built on the company's commitment to technology research and innovation. In 2012, ZTE announced the

industry's first prototype TWDM-PON compliant with the latest standards during the Broadband World Forum, and demonstrated the coexistence and evolution of multiple access technologies including NG-PON2, XG-PON1, GPON, and WDM-PtP on the same platform and ODN. ZTE was also the first in the world to announce a commercial system-class solution using vectoring technology, and set up the first commercial laboratory for XG-PON1. ZTE introduced the industry's first compact OLT product, and enriched and improved the forms and networking abilities of PON OLT products. ZTE announced eODN, the industry's first end-to-end full-life-cycle optical operation and maintenance solution, which includes the rack-mounted eMonitor optical path monitoring system. eODN dramatically increases the efficiency of network planning, design, deployment, operation and maintenance, and has already been widely deployed.

eDesign

for a Brand-New Network Planning Experience

By Luan Tian

Optics is the driving force behind broadband development. More than 110 countries have revealed or are formulating their national broadband strategies. Bandwidth-hungry services and mature technologies are also bolstering the development of optical networks. FTTx deployment is creating new challenges for operators in that they must plan for large-scale rollout of fiber and ODN equipment.

Planning access for 10,000 users typically involves designing more than 1000 kilometers of optical routes, selecting locations for more than 15,000 ODN devices, and planning more than 6000 connection points. A city may have more than one million users, which significantly increases the planning workload.

Currently, there is no unified platform or specialized tools for planning optical networks. Instead, planners have to use different software. The lack of a unified platform means that data cannot be effectively transferred between different planning software. Data can be easily lost; it is difficult to share; and it cannot be easily visualized. In addition, the available software is not specifically designed for optical network planning. To address these issues, ZTE has developed eDesign, an intelligent tool for optical network planning. eDesign is dedicated to optical networks and includes functions such as information collection, resource analysis, network planning, and equipment configuration.

30% of time was spent on planning, 70% on drawing



Past

70% of time is spent on planning, 30% on drawing



Now

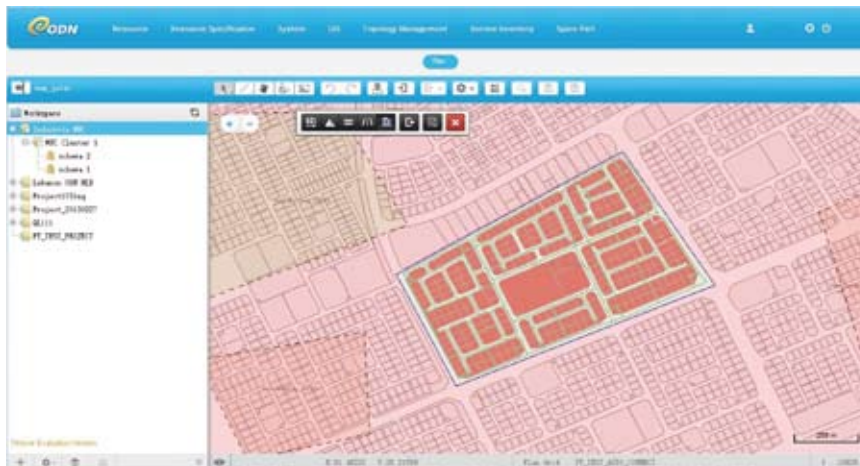


Figure 1. Main interface of eDesign.

Efficiency

eDesign incorporates the principle and procedure of FTTx network planning. The user is prompted through the planning and design of an ODN, and this ensures the integrity of the planning process and allows new planners to familiarize themselves with the process in a short amount of time. eDesign supports auto-absorption technology. A pipe or optical cable can be dragged over the target road, reducing workload and improving precision. Equipment requirements can be automatically calculated according to the design

results. This allows the planner to select equipment and configuration models that best match the design. The workload can be cut in half. eDesign also provides databases of ready-made models of buildings, equipment, and optical cables. Planners can adjust these models and policies as needed.

Ease of Use

eDesign supports collaborative work and integrates information silos. This allows for efficient collection of information and improved planning efficiency. The planning principle is grid-based. Different planning

layers are displayed independently and can be viewed as needed. Plans can be exported in different file formats according to the customer's requirements.

Accuracy

eDesign is based on the Geographic Information System. Information about geography and equipment can be visually displayed on a map, and data can be analyzed holistically. Planners do not need to read bare data and text reports, and this facilitates better decision-making. In the initial stage of planning, eDesign allows planners to create multiple preliminary plans, compare these plans from several dimensions, and display these plans as graphs and tables. The most cost-effective plan can then be chosen and fleshed out. eDesign uses plane and entity as units to quickly and automatically measure a selected area. This eliminated human error.

eDesign helps planners build a simulated optical network in keeping with their original ideas. The post-construction scenario is clearly, fully displayed so that construction personnel can understand the whole network before they even start work. **ZTE TECHNOLOGIES**

eManager

for Unprecedented Management Experience

By Liang Weihong

In this information era, broadband construction is gaining fervor. In China, the broadband rollout is in full swing, and a “Broadband China” strategy has been formulated by the national government. Tri-network integration is making it increasingly urgent for operators to provide all services. 3G and 4G network deployment and the emergence of new applications—such as smart transportation, smart grid and wireless city—have spurred the development of optical networks. But there are some serious problems with optical networks.

Operators have been plagued by high installation costs brought about by inaccurate resource data, including data on ports and connections. Troubleshooting has also been problematic because existing fault-management systems are not suitable for optical networks, and faults have to be manually located.

Many factors contribute to

inaccurate resource data. Resource data may not have been properly obtained, or mistakes may have been made in the manual entering of data during construction or routine maintenance. In the field, information may be written on paper labels or tagged to network equipment, which makes it more difficult to modify data. Different companies or departments may maintain the same network but save different copies of data, leading to inaccuracies or even conflicting data. Without a good troubleshooting system, the speed at which a fault is located is largely determined by how familiar the maintenance engineer is with the network. The engineer has to memorize the whole network map but cannot share it with others. This leads to inefficient troubleshooting.

OAM difficulties incur high opex in optical networks. In light of the continuous growth of optical networks, this trend cannot be quickly reversed. Existing data inaccuracies give rise to



flow-on inaccuracies that exacerbate network problems. As problems worsen, data in the resource system become more inaccurate and unreliable. Resources may become unusable because they become difficult to test, and network resources are wasted. The effect of this is increased capex.

To address management problems

that occur at every stage of the ODN lifecycle, a full-lifecycle optical network management solution is needed. ZTE's eODN system covers all process across the entire optical network. Since it was released in 2011, eODN has attracted widespread industry attention and has been fully verified. eODN gives operators a slew

of features for intelligent, efficient, flexible, pain-free optical network management. As part of eODN, eManager elevates ODN management to a new level.

Operational Convenience

eManager has a function that guides a field engineer to perform patch cord operations. eManager turns on a LED that indicates the port to be connected. This limits the possibility of manual errors. After the port has been connected, eManager performs an on-site check and gives prompts so that a second field visit is not needed. All ports are also displayed in a list for ease of searching.

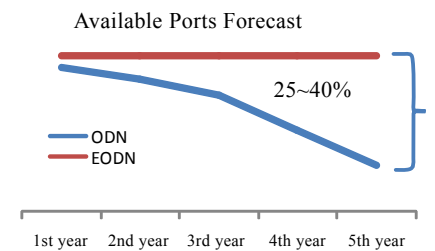
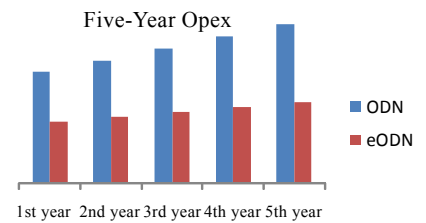
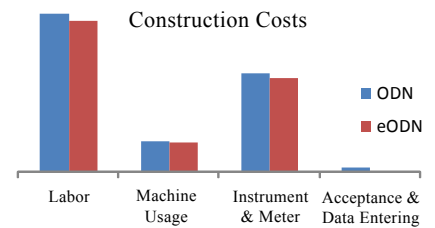
Simplified Workflow

Entering data is usually burdensome for construction and maintenance personnel. Manually entering huge amounts of resource data is inefficient and results in errors being made. Errors are difficult to discover and may provide an inaccurate picture of actual network conditions after the network has been built. eManager allows one-key data entry. With only a couple of clicks, a vast amount of data can be saved in the resource system. Needless to say, the data-entry workload is drastically reduced in the later stage of construction and during routine maintenance.

eManager effectively manages every stage of the ODN lifecycle. OAM efficiency is improved, and management costs are cut almost in half. This system results in clear, accurate data on network resources and prevents resources being wasted. With its inherent advantages,

eManager gives operators an improved OAM experience.

Lower Costs



Compared with traditional ODN, eODN reduces construction costs by 5.4% and opex by about 48.8% over five years. Research shows that with traditional ODN, resources are deposited 3 to 10 percent per year and 25 to 40 percent or higher in five years. By contrast, an eODN can maintain resource volume and prevent resource waste. With eODN, network TCO is 16-24% lower than that of a traditional ODN over five years. **ZTE TECHNOLOGIES**

eMonitor for More Reliable, Efficient Network Monitoring

By Gao Bin

Optical networks are becoming increasingly complex and difficult to maintain. It is therefore necessary to find a way to effectively manage physical network resources, ensure the normal running of optical networks, and promptly detect network faults and risks. A fast fault-handling mechanism makes optical network maintenance easier. Operators want a fault-handling system that ensures the optical network is run efficiently, securely and stably and that reduces fiber maintenance costs.

ZTE's intelligent optical monitoring system, eMonitor, is designed to monitor the performance of all optical networks, including access, mobile backhaul, metropolitan area network, and backbone. eMonitor mainly comprises the eMonitor software platform and the easy optical monitor unit (eOMU)

hardware platform, which is used for optical fiber monitoring and surveying (Fig. 1). eMonitor connects to the OSS through a northbound interface to seamlessly connect the whole system and workflow.

● Centralized optical fiber monitoring system

eMonitor allows for centralized fiber monitoring. Each fiber-monitoring system can monitor a large number of fiber resources and a wide variety of fiber resources. Monitoring equipment can also be shared to reduce capex.

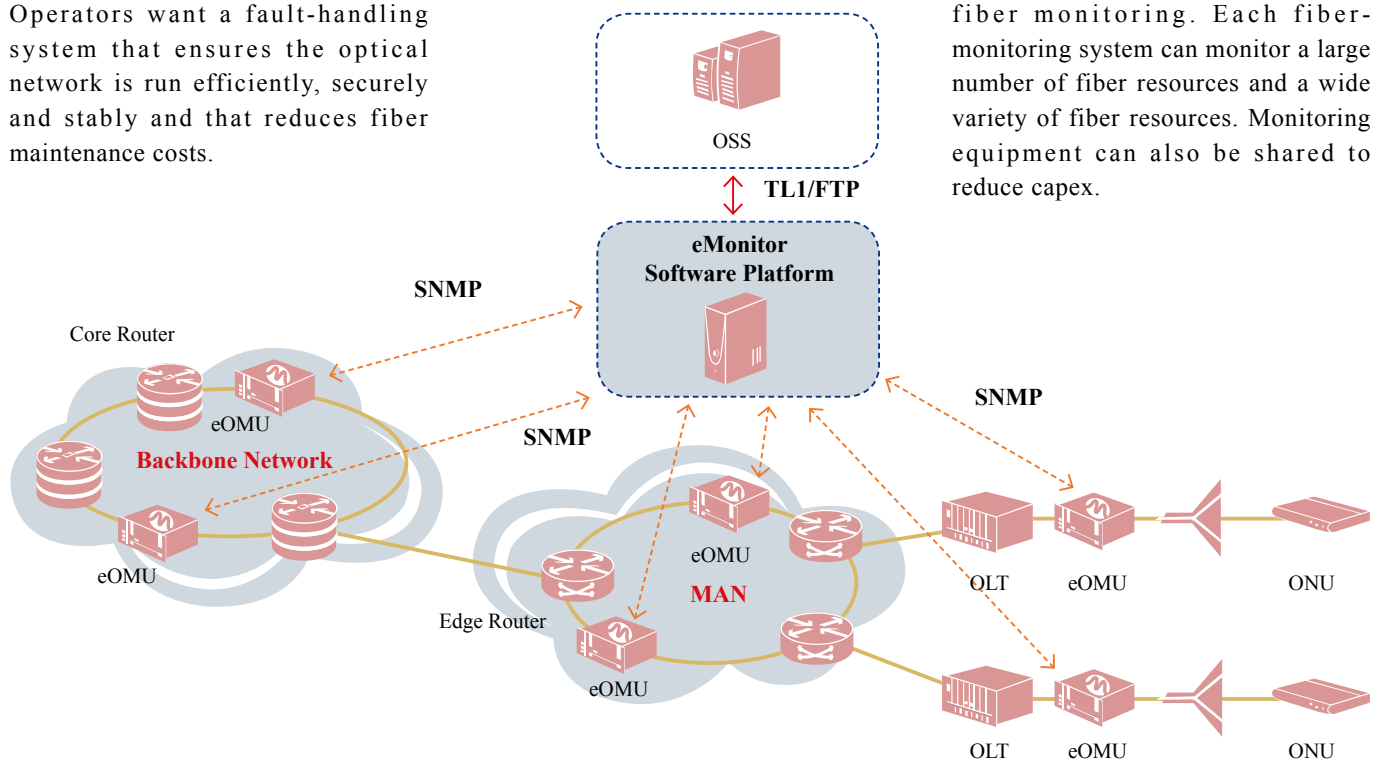


Figure 1. eMonitor platform.

● **Fast, accurate fault detection and location**

eMonitor is an intelligent fiber-monitoring tool that rapidly detects and locates faults such as breakpoints and attenuation.

● **Diverse detection modes**

For different scenarios, eMonitor has multiple detection modes based on combinations of pulse width, dynamic range, resolution, and time.

● **Real-time and online fault monitoring**

eMonitor supports periodic and real-time fault monitoring using a polling mechanism. When the system detects a fault, it sends a fault alarm in real time. Monitoring occurs online and does not affect services. This allows operators to promptly understand and respond to faults.

● **Intelligent optical fiber event identification**

eMonitor uses a powerful algorithm to accurately and intelligently identify fiber events. The algorithm uses data from the fiber health library to diagnose fiber events.

● **Visualized fault location**

Faults detected by eMonitor can be displayed in real time on a GIS map. Visualized fault detection allows operators to quickly find where a fault is.

Table 1. Categories of faults monitored by eMonitor.

Monitored Location	Category of Fault	Effect
Backbone fiber	Fiber breakage	Reflection
	Connector damage	Reflection
	Macrobend	Attenuation
	Fiber angulation	Attenuation
	Pollution or water seepage into connector	Connector box or splicing-point attenuation
	Fiber ageing	Attenuation
Optical splitter	Optical splitter attenuation	Attenuation
Branch fiber	Fiber breakage	Reflection (FBG*/reflector)
	Connector damage	Reflection (FBG/reflector)
	Minor bending or compression of fiber. Polluting or dampening of distribution box/connector	Attenuation. Monitoring capability is related to both split ratio and attenuation range.

*FBG = Fiber Bragg Grating

eMonitor uses optical signals of a specific wavelength to monitor fiber performance. Some of the categories of fault monitored by eMonitor are listed in Table 1.

In the eMonitor system, the eOMU

hardware platform for monitoring and surveying fiber has slightly more functions than a conventional OTDR. In the future, eOMU will be expanded into a full-service platform that can monitor all parameters that relate to fiber capability. **ZTE TECHNOLOGIES**

Leading 4G in Hong Kong: CSL's Successful Implementation of EPC Technology

By Pan Zhenchun

CSL is the leading mobile operator in Hong Kong and offers advanced technology, innovative services, and superior customer experience. In November 2010, CSL launched the world's first commercial dual-band 4G LTE/DC-HSPA+ mobile broadband network. Since then, CSL has continued to push ahead with international LTE roaming, IPv6 deployment, MME pooling, and IMS-based high-definition voice over LTE (VoLTE). This has greatly enhanced customer experience and driven the development of EPC technology.

Fully Converged Network, Low-Cost Operation

In 2008, CSL analyzed its network in depth and decided to fully converge the architecture by introducing a unified, large-capacity platform. ZTE's

uMAC (SGSN/MME), xGW (GGSN/SAE-GW), and USPP (HLR/EIR/HSS) products were used to converge CSL's three separate TDM core networks into an end-to-end, all-IP network that could support GSM, UMTS and LTE. The network reconstruction reduced network maintenance overhead and allowed for smoother network upgrades. It also directly reduced network opex.

Continuous Innovation: Leading in VoLTE

With the upsurge in LTE deployment worldwide, profiting from LTE networks has become important. VoLTE is considered one of key services that can demonstrate the value of LTE. VoLTE is a general term for LTE-based voice and video, and it represents the evolution of traditional circuit-switched services. Telecom vendors are fiercely competing over VoLTE.

At Mobile Asia Congress 2010 in Hong Kong, CSL and ZTE jointly demonstrated VoLTE using an LTE

mobile phone with IMS soft terminal. In 2011, CSL again worked with ZTE to launch a commercial VoLTE solution based on circuit-switched fallback. With this solution, voice calls fall back to the 3G circuit-switched domain for processing, and the LTE network is only used for data services. At the beginning of 2013, ZTE used IMS technology to make a high-definition VoLTE call with enhanced single radio voice call continuity. ZTE also used IMS so that the CSL's LTE network was interoperable with its existing 3G high-definition terminals.

International Roaming between HK and Korea

People from Hong Kong and South Korea frequently interact with each another. According to statistics, in 2011, more than 1 million Koreans visited Hong Kong each month, and 30,000 Hong Kong residents visited South Korea each month.

In June 2012, CSL and SK Telecom rolled out the world's first international LTE roaming service. This service allows people from Hong Kong and South Korea to seamlessly use LTE





EPC network, and to guarantee network security. The MME pool provides NE redundancy so that if a single point failure occurs, services are not affected. The MME pool has abundant SAE-GW selection policies based on network topology and priority level to balance traffic load. The MME pool can also significantly reduce signaling load generated by inter-MME updating and handover. This improves user experience when a terminal is moving.

Smart Pipes for Optimized Operation

CSL has taken into account the complex service environment in Hong Kong as well as various customization demands and has introduced ZTE's optimized operation and management solution, ZOOMs, into its EPC network.

A flexible policy and charge control solution, combined with deep packet inspection function, helps CSL inspect hundreds of different service protocols in its network. With dynamic and static policy configuration as well as a release function, CSL can provide differentiated charging and QoS for different services and users.

Conclusion

CSL has built a fully converged EPC network with cutting-edge VoLTE, international LTE roaming, IPv6, MME pool, and ZOOMs to win over Hong Kong's mobile market. CSL has also established a model for LTE/EPC network design, construction, and operation in the mobile internet age. **ZTE TECHNOLOGIES**

without constraint. Because IPv4 is still widely used, IPv4 and IPv6 networks will coexist for a long time to come. For this reason, ZTE uses IPv4/IPv6 dual stack in EPC elements so that IPv4 and IPv6 addresses can be allocated to users when they access the EPC network. In this way, people can access internet via IPv4 or IPv6 addresses. Terminals that support only IPv6 can access IPv4 resources through a 6in4 or 6to4 tunnel.

MME Pooling for a Highly Reliable Network

Separate control and bearer plane is characteristic of an EPC network architecture. The mobility management entity (MME) is the control plane element in an EPC network and is the brain of the network. MME controls user access, authentication, and mobility. An increased number of LTE customers and the rapid development of mobile internet services have greatly challenged the signaling processing capability of MME. A soaring signaling load may even cause network failure. For example, a 4G network of one big operator in North America failed and caused interruptions that seriously affected smartphones and wireless hot spots across the country.

CSL has adopted ZTE's MME pool to cater for the rapid increase in LTE customers, to build a highly reliable

networks in both countries without any difference in user experience. ZTE made all CSL EPC elements interoperable with SK Telecom network and terminals and designed related roaming architecture. This demonstrated ZTE's leadership in EPC network design as well as ZTE's ability to supply open, mature EPC interfaces.

IPv6 Expanding User Development Space

In the age of mobile broadband, more and more people have a permanent connection. Feature-rich mobile applications require a user to have at least one IP address. However, a lack of IPv4 addresses has restricted the expansion of LTE services and customer bases.

To tackle this problem, CSL has worked with ZTE to introduce IPv6 into CSL's EPC network. 128-bit IPv6 has almost infinite address space, so services and customer bases can grow

H3G Austria:

A Mobile Broadband Waltz

By Li Na

The Most Energetic Mobile Market in Europe

Austria is at the heart of Europe and is at the leading edge of European mobile communication. Its mobile market is highly developed and very competitive. By Q1 2012, SIM card penetration in Austria was 156% and growing.

Vigorous Newcomer; Ambitious Blueprint

Hutchison 3G (H3G) is one of the most important transnational operators and is a leader in wireless technology. In 2000, H3G received its 3G license and positioned itself as the most innovative mobile network operator in Austria. H3G has a strong focus on the Austrian market and continues to introduce new technologies and services there. In 2003, H3G Austria launched its 3G network and became the first operator in Austria to provide a pure 3G network.

When H3G entered Austria, the mobile voice market was saturated, and H3G Austria had to focus on mobile data. H3G Austria is ambitious to build the best mobile data network in Austria and provide users with affordable, high-quality 3G services.

For this reason, H3G Austria developed an ambitious goal: to achieve the lowest cost per megabyte in the market and to provide 94% network coverage with HSPA+. H3G Austria also aimed to reach a download rate up to 42 Mbps in September 2011 and cover high-traffic areas with LTE up to 100 Mbps in 2012.

The Magic of Mobile Broadband

H3G Austria's existing network came under tremendous pressure. Weak, restricted data service and limited ability to evolve the network hampered H3G

Austria's development.

The company had to find a way to significantly improve network performance and smoothly evolve to HSPA+ and LTE. Eventually, H3G decided to swap out the whole network and build an evolvable and profitable mobile broadband network. After an exhaustive evaluation of vendors, H3G chose ZTE to help upgrade its network.

ZTE helped H3G Austria modernize its wireless access network, core network, and bearer network. A six-year OAM service contract with ZTE guarantees that the network will perform stably.

Customized, Cost-Effective Wireless Solution

ZTE provided comprehensive Uni-RAN and Uni-Core solutions to H3G Austria.



ZTE's SDR-based Uni-RAN solution, with unified hardware platform, supports multimode, multiband converged networking. It provides 21.6 Mbps HSPA+ and 43.2 Mbps DC-HSPA+ and can even be upgraded to LTE via software. The solution has allowed H3G Austria to build a high-performance mobile broadband network in a very short time. The same BBUs in the SDR base stations can be shared during LTE deployment. To upgrade to LTE, an LTE processing card need to be added into the SDR BBU, which supports 12 LTE cells in 20 MHz bandwidth and 3600 RRC connected users per site. Investment in hardware, equipment rooms, and other facilities is substantially reduced.

With extensive interworking and swap over experience, ZTE deployed its Uni-Core CS core network and swapped

over the legacy circuit-switch network that had been installed by other vendors. ZTE provided many customized features so that H3G Austria can quickly deploy new services. In addition, ZTE's CS core network supports future-proof evolution to IMS, so the network investment can be preserved.

ZTE's Uni-Core solution provides service awareness and policy control to H3G's packet network. This allows H3G to control different services and users. The network architecture is also simplified for better network management and smooth evolution. It has high bandwidth to meet the need of an ever-growing number of subscribers. The network is also very reliable so that it is protected against single point failures and unpredicted disasters. The new packet core has massive capacity to carry H3G Austria's aggressively growing throughput. Network quality and user experience have been greatly improved.

● **Effective and reliable OAM**

ZTE's professional OAM solution ensures smooth migration from legacy network to ZTE-powered 3G and 4G. ZTE replaced a large number of H3G's third-party base stations and reused existing power supplies, towers, air conditioners, shelters, relay nodes, and microwave equipment.

After ZTE swapped over the network

and assumed OAM responsibilities, monthly fulfillment of the SLA has been above 99%. After one year of professional OAM by ZTE, network KPIs and customer satisfaction have both improved. The network now delivers a variety of feature-rich services to subscribers across Austria.

● **Fast deployment and delivery**

H3G Austria planned to swap 4000 sites and 3200 microwave hops by the end of 2011. ZTE helped H3G Austria cope with challenges during the network update, and ZTE's strong customized capability and implementation capability showed nothing is impossible.

The first challenge was reusing the cabinets because their heat dissipation qualities were not adequate for the new base stations. ZTE thoroughly surveyed the sites and proposed three solutions. Reusing legacy feeders and TMAs was a much tougher task. ZTE and H3G Austria classified and statistically recorded more than 10,000 TMAs and corresponding feeder connectors in the existing network. TMAs were reused across the whole network, and network KPIs were guaranteed.

Because cabinets, feeders, and TMAs were reused, labor costs were saved and implementation time was greatly shortened. By September 2011, ZTE had swapped over all 4000 sites and

■ Success Stories

“Based on the excellent contribution of ZTE project members and their management, we are fully convinced to make this project a great success and to help us improve our network quality on a constant basis.” – Matthias Baldermann, CTO of H3G Austria

3200 microwave hops. The project was finalized three months ahead of schedule.

At the end of 2011, H3G Austria launched the LTE network in the 2600 MHz band. H3G's commercial LTE network has been deployed for hotspots and urban areas. The maximum downlink throughput is 100 Mbps. Currently, the LTE network comprises 200 sites and shares hardware facilities with the UMTS network. The number of LTE sites will be increased on a monthly basis.

Symphony of Success: The Best Network in Austria

Fast deployment gave H3G Austria more opportunities.

In June 2011, H3G Austria and ZTE held a joint press conference in Vienna to talk about the network update. They gave a live demo of DC-HSPA+ to show that H3G's download speed was the highest in Austria.

In September 2011, the network had been completely updated and throughput had been increased tenfold. H3G Austria

could now transport as much data as the other two Austrian operators combined.

In December 2011, *CONNECT* magazine reported on the network tests carried out in Germany, Austria and Switzerland. The report stated that H3G Austria had the best-performing network in Germany, Austria and Switzerland. A score of 476 was the highest ever given by *CONNECT*. Just one year before, H3G Austria had scored poorly in the *CONNECT* test.



Figure 1. Challenging environment for deployment.



Figure 2. Mr. Jan Trionow, CEO of H3G Austria, presenting the news of “H3G ranked No.1 with the highest score '476' ever awarded by *CONNECT*” in 2011.

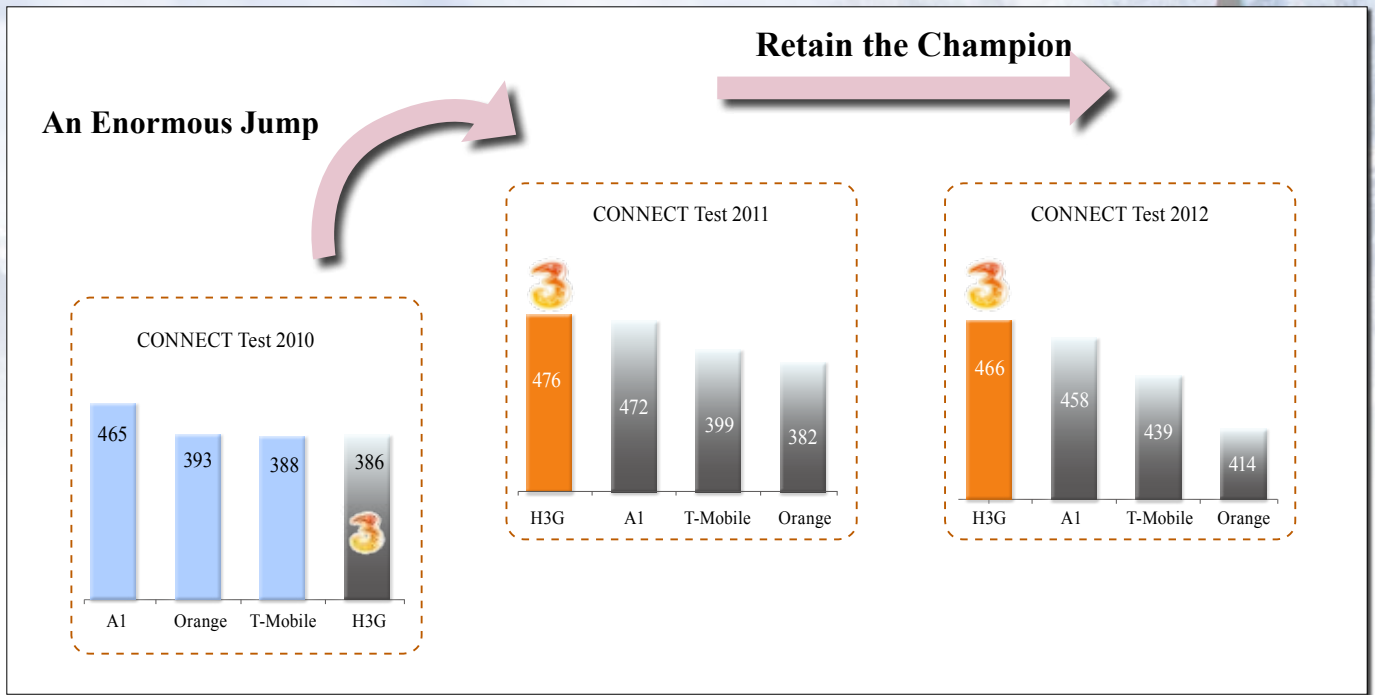


Figure 3. H3G Austria’s amazing performance during the latest three years in CONNECT test.

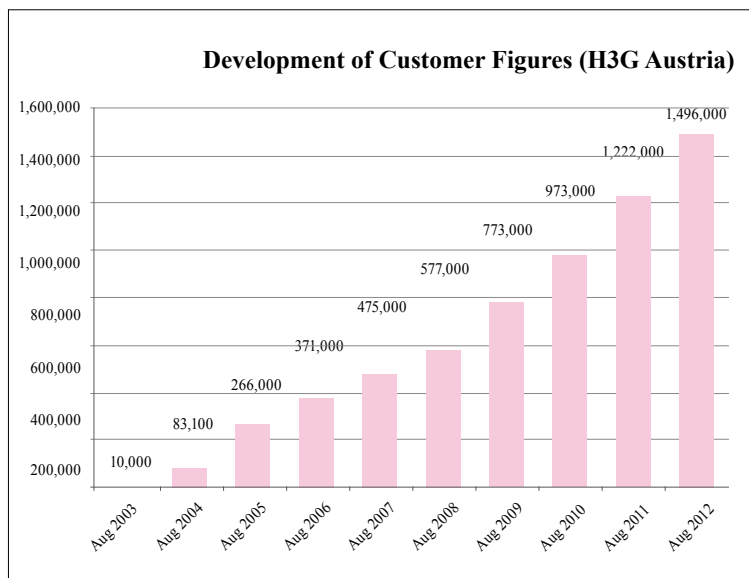


Figure 4. Continuous growth of subscribers with H3G Austria’s new network.

In October 2012, H3G Austria again came out on top in the CONNECT network test. The subscriber base grew rapidly in 2012, and the uplink and downlink data volume doubled within a year. H3G Austria’s network continued to perform perfectly and won the test. This again proved that H3G has the best network in Austria.

In July 2012, network traffic reached 3 PB per month.

Now, H3G subscribers are enjoying high-speed mobile broadband and multimedia services with the best network in Austria. **ZTE TECHNOLOGIES**

Delivering on the Promises of 4G LTE

By James Middleton

July 11, 2013
Source: Telecoms.com

With commercial LTE deployments well underway around the world, many network operators are finding themselves running three generations of technology at the same time. Not only is this situation resulting in many operational headaches due to the management of separate 2G, 3G and 4G LTE networks but also because the traffic running across those networks is becoming increasingly unbalanced.

Telecoms.com recently spoke to Mr. Lei Xue, director of Europe CTO Group at ZTE, to get his thoughts on how operators can tackle these scenarios while making best use of their existing network assets.

At the recent LTE World Summit in Amsterdam, network engineers of

the world were discussing technical implementations of LTE technology and its impact on existing and legacy network installations. At the event ZTE raised an interesting point, claiming that inter cell interference in commercial deployments is much higher than first thought and proposed solutions built into the LTE specification might not be sufficient remedy.

“In a current network you have 2G, 3G and LTE and the common situation is that network traffic is unbalanced. This is the first challenge to solve,” says Lei. “3G networks are already congested and 4G networks will probably be congested by 2017, so we find that radio performance is quite limited, especially due to interference. Moreover we find that standards do not



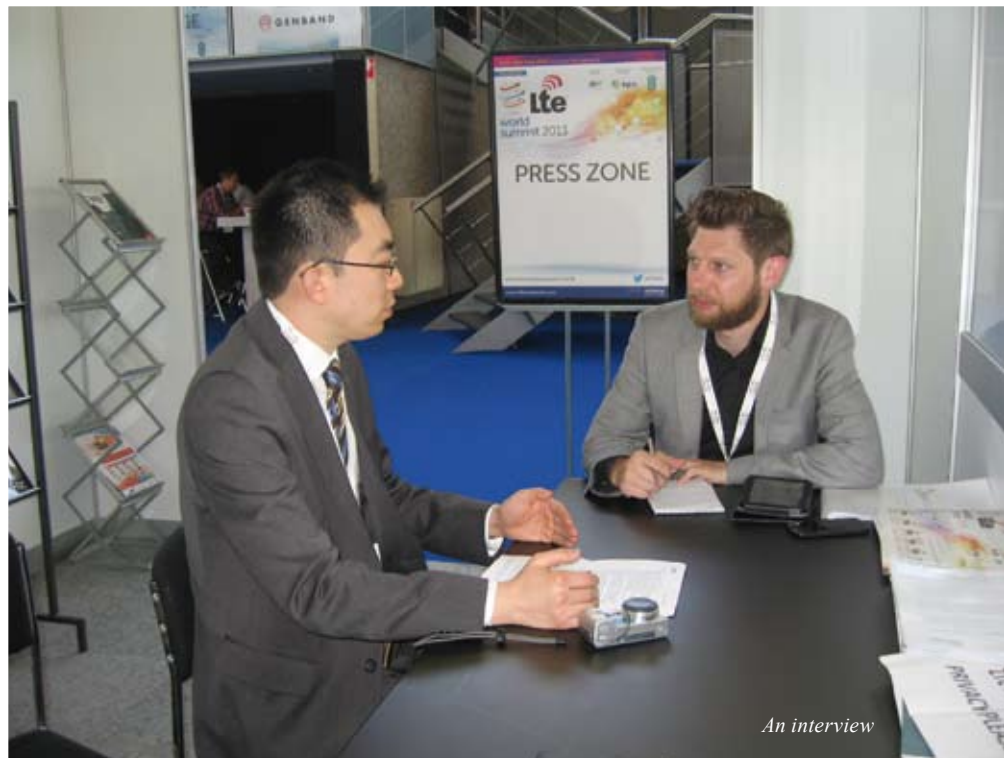
Lei Xue, director of Europe CTO Group at ZTE

allow for a lot of things LTE promised it could do.”

It’s well known that engineers talk about LTE downlink speed of 150 Mbps in the lab but in the field with interference considerations, operators will more likely experience a downlink of 30 Mbps. The problem is that is not what LTE promised. Then you have impacts on user experience, which is often quite different at the cell edge where you might have very low signal to noise ratio due to heavy interference, compared to the cell centre.

The obvious solution to dealing with these issues is for an operator to sink more investment into backhaul and fibre resources and to rely on solutions such as coordinated multipoint transmission/reception (CoMP) built into the LTE standard. Yet Lei raises the point that with the discovery that interference on those networks is actually much higher than was first thought, the big question now is whether operators can rely on techniques like CoMP to solve the problem. Rather, he says that ZTE set about designing cloud radio to tackle these particular challenges.

But the issue identified by ZTE is that the CoMP specification relies on significant backhaul assets being in place and those assets are seldom available in real world environments. The specification for CoMP relies largely on fibre backhaul being available



An interview

but cloud radio means operators can use existing backhaul solutions such as IP-RAN, Microwave and PTN etc.

Cloud radio helps operators make the most of huge investments they have made in fibre and legacy backhaul and means they don’t have to worry about investing a huge amount more. Based on software defined radio it uses existing backhaul assets to assist in interference control and because it is a software upgrade, the vendor can keep innovating and customers can benefit from fresh updates.

The ‘cloud’ element is a reference to the solution’s elasticity—the ability to deploy innovative technology such as ‘super cell’ dynamically and give

improved user experience at the cell edge. Essentially, helping operators deliver on the promises of 4G LTE.

In the cloud radio solution, the cloud scheduling part has very low bandwidth requirement, so it can be deployed with any IP backhaul. While cloud coordination need some additional transmission bandwidth (from several Mbps to hundreds of Mbps) to exchange the coordinative data among multiple cells/sites, that means the suitable transmission conditions for cloud coordination could be IP-RAN, Microwave, PTN etc. But that’s still much lower than the bandwidth requirement of a standard CoMP solution.

■ Press Clipping

► Tips

Cloud Radio: In an LTE network, base stations are deployed more densely than in 2G and 3G networks. Considering Shannon's Theory, the capacity of a single link has approximated its theoretical limit. To improve performance, operators need to improve system capacity by using a heterogeneous network (HetNet) topology. To relieve the strain on radio spectrum, intra-frequency networking has been introduced into LTE, but this increases interference between cells. Interference can greatly reduce performance at the cell edge and affect resource utilisation and cell-edge user experience. Cloud radio is a set of network optimisation techniques that eliminate inter-cell interference in time, space, and frequency.

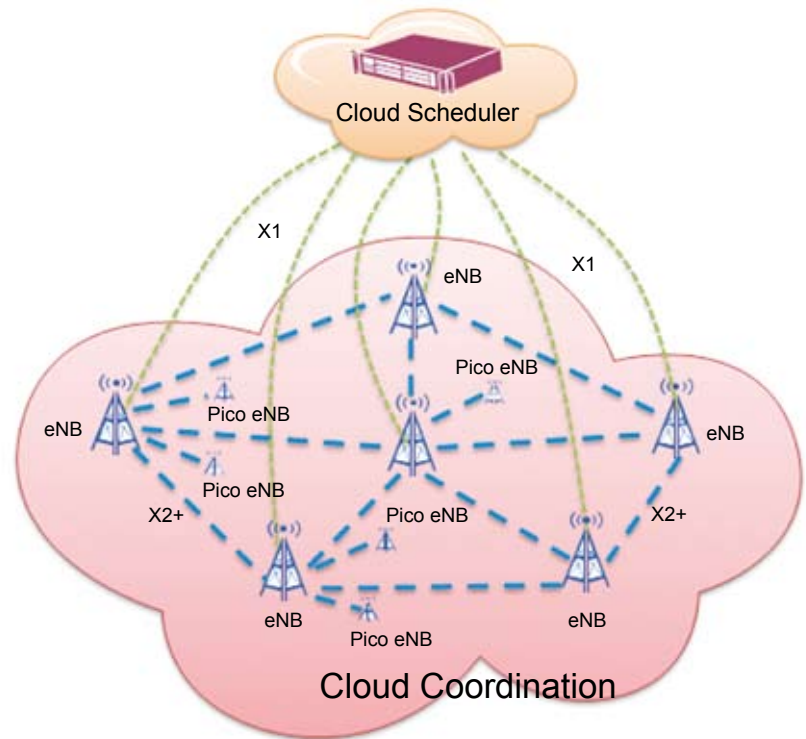


Figure 1. Cloud radio architecture.

“CoMP required originally that operators had fibre installed,” says Lei, “but cloud radio means they can make use of existing backhaul resources. If you have an IP-RAN/Microwave/PTN backhaul then that’s good and you don’t need to upgrade. So cloud radio helps you improve your cell performance and the imbalance between technologies. With insufficient inter-site coordination set out in live LTE environments, there is a risk of poor quality user experience.”

So the implementation of a cloud scheduler as part of the cloud radio proposal helps cells coordinate with each other in order to provide better performance. An enhanced cell cluster (super cell) would actually follow the user as they move around the network,

replacing the static clusters which often suffer with degradation of experience at the cell edge where there is most interference, or as the user is handing over to a new cell cluster.

One of the many innovative features in cloud radio is super cell, which delivers a very smooth experience and reduces handover. When a user hands-over normally, the network has to allocate resources to fulfil the request, which can be severely affected by signal strength, so the network can end up dedicating more resource to the user. A super cell aggregates several cells into one reducing handover and creates a dedicated radio resource for a user but minimises the impact of that resource.

Not only does ZTE claim the system

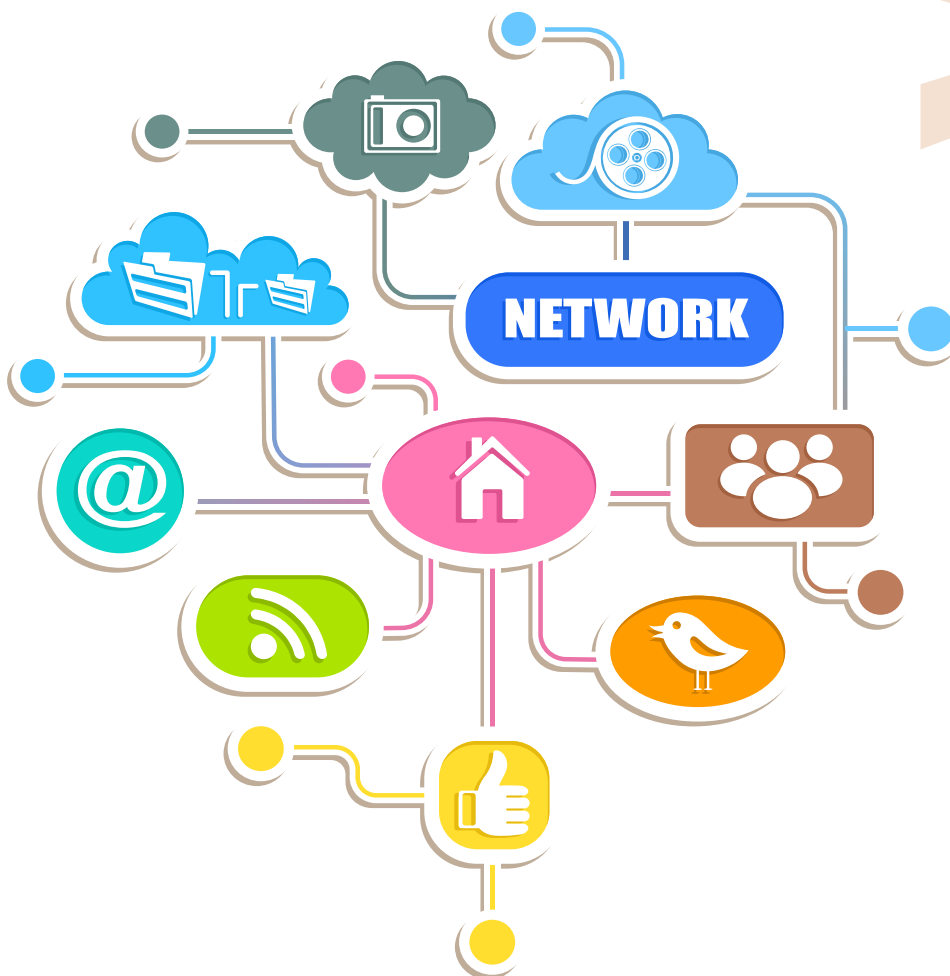
can provide a better experience on the cell edge, but it can also double cell edge capacity and reduce handover frequency by 50 percent. In fact, Lei claims that with fibre in place, cloud radio can deliver a 380 percent improvement at the cell edge and without fibre this drops to a still impressive 280 percent improvement.

The technology is an extension of ZTE’s previously introduced cloud RAN solution which enabled one BBU to support 1,000 cells while cloud radio allows operators to pool backhaul resource on demand. The whole focus is about getting more out of what operators already have available without further significant investment, so the carriers can focus on delivering to end users what 4G has promised. **ZTE TECHNOLOGIES**

New Value in Customer Experience:

ZTE's Integrated Service Solution for Wireless Networks

By Zeng Zhi



Telecom operators are changing the way they think about OAM, moving towards centralization and focusing more on the customer and market. ZTE provides operators with new integrated wireless service solutions and technical support to help operators meet the challenges of transitioning to integrated service provision. ZTE helps operators improve their overall customer service and OAM efficiency, optimize resources, and reduce OAM costs.

Telecom operators face unprecedented challenges with mobile internet.

● Revenue decline

Mobile phones have been steadily become more popular in China. By October 2013, mobile penetration across China will have reached 80% (100% in some cities). The potential to attract new customers has diminished, and revenue can no longer be solely derived by increasing the customer base. Rigorous competition between operators has also lowered tariffs and ARPU, and growth in traditional services, such as voice and SMS, is weak. In addition, a rapid

■ Solution



increase in traffic has not resulted in adequate revenue growth. The ICT industry has been converging, which means that core services traditionally provided by an operator are now being provided by external parties, and value has been transferred. The core of the industrial value chain is being fragmented so that terminal vendors and internet companies are acquiring a larger share. As the market diversifies, competition is becoming more complex and is seriously threatening operator profits.

- **Urgent need to increase OAM efficiency**

The development cycle for new technologies is gradually shortening, and 2G, 3G and LTE wireless technologies will continue to coexist for a long time. Consequently, network structures are

more complicated than ever, a lot of manpower and resources need to be invested into network maintenance. This is the reason for high opex. With massive network elements and complex services, end-to-end network problems can only be addressed by skilled OAM personnel. The overall service quality of a network can sometimes be compromised when the importance of network technical indexes is overemphasized. Currently, a lot of effort and investment is put into optimizing network KPIs. However, it is somewhat misguided to assume that better KPIs translate into fewer customer complaints.

- **Greater expectations for better experience**

Mobile users in the 3G era have growing demands in terms of higher data limits and better QoS. They are

also more likely than before to make service-related complaints. Operators in China are increasingly aware of customer experience and are working out indicators that accurately reflect customer satisfaction. Three types of customers needs to be given top priority: VIP customers with high ARPU, silent VAP customers, and VAP customers with a complaint. Operators always need to monitor QoS for high-ARPU customers and promptly find and solve problems. Silent VAP customers may have bad service experience and are on the verge of changing to another operator. It is therefore necessary to identify these customers and address their grievances in order to prevent churn. Operators also need to develop a fast closed-loop response mechanism to respond to complaints of VAP customers. As well as optimal service experience, customers also need feature-rich value-added mobile services. Operators therefore need to constantly adjust their marketing mode and target segment and turn from extensive management to optimized management. Operators also need to offer appropriate service guarantees, and network OAM needs to be ahead of or close to the market. Innovative products should be released quickly so that an end-to-end, closed-loop process is developed.

ZTE's integrated service solutions cover the whole lifecycle of wireless networks. The modular solutions provide operators with customized services to meet their specific demands at different stages of network development.

This process covers service research, design, development, testing, network construction, commercial launch, and market feedback.

ZTE has developed an integrated service solution for wireless networks. This solution helps operators follow the trend of transforming their OAM model. With flexible, customized service solutions, ZTE can meet the actual needs of operators and provide technical support for end-to-end, closed-loop OAM.

ZTE's integrated service solution comprises operational consulting, customer experience management, QoS management, and network performance management. The operational consulting service includes marketing optimization, new service development, and network development and construction. The QoS management and network performance management service guarantees customer experience. It improves network OAM according to market needs.

The operational consulting service includes customer behavior research and forecasting, business trend analysis and competitive benchmarking, marketing strategy proposals, service product development and planning, and network resource development proposals. This service is designed to improve responsiveness so that an operator can

promptly meet the diverse needs of the mobile market.

With customer experience management, customer experience can be quantified and visually evaluated, and the root problems that affect customer experience can be solved. Operators can then guarantee and improve customer experience in more focused way. Troubleshooting is streamlined so that customer complaints are resolved faster. As a result, customers will be more satisfied, high-ARPU customers will be retained, and revenue will increase.

With QoS management, network elements associated with specific services are analyzed. The network is comprehensively analyzed to improve end-to-end QoS and to drive business growth.

With network performance management, sophisticated technical solutions are provided for different network scenarios. These solutions include network security assessment, frequency re-planning, capacity optimization and forecasting, optimization of multiaccess network collaboration, and expansion of network coverage. ZTE's network performance management solution strikes the right balance between customer experience, service quality, and network performance and ensures that the ultimate objective of improving network

performance is to improve customer experience and gain a competitive edge.

Network performance, QoS, customer experience, and market development strategies have to be closely coordinated in order to drive steady growth. ZTE's integrated service solutions for wireless networks guarantee optimized network resources and performance, QoS, and customer experience.

ZTE's integrated service solutions cover the whole lifecycle of wireless networks. The modular solutions provide operators with customized services to meet their specific demands at different stages of network development. Initially, an operator places more importance on stable equipment, good preliminary planning (to reduce capex), and quickly improving network performance. When the network is on track, an operator begins to focus on improving end-to-end service, centralizing OAM to reduce costs, and improving customer experience. After this, an operator focuses on customer management, expanding business, and reading market. They also seek to free themselves from heavy OAM work and look for opportunities to open up value-added space in the market. ZTE helps free up operators from technical burdens so that they can focus on maximizing profit. **ZTE TECHNOLOGIES**

Bringing you Closer

CLOUD RADIO

Deliver 4G Promise

Commitment,
as steadfast as mountains.



Cloud Radio™ enables optimal radio performance adaptive to a variety of network availability. Through a series of key technologies breakthrough, Cloud Radio™ realizes sophisticated radio coordination empowering higher network performance for operators and better QOE for users. Operators win with Cloud Radio™ two core values: diversity and boundlessness. Cloud Radio™, delivers 4G promise and helps you to excel in 4G era.

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