The Four Principles for Building Future All-IP Mobile Network

A Successful Promotion of Balanced Development between Products and Markets

—Interview with Mr. Cui Yi, General Manager of the Asia-Pacific Region of ZTE Corporation
ZTE gives you a smooth migration to NGN.

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You get a scalable, high-capacity system, giving you an abundance of value-added services to offer your customers.
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ZTE is a leading global provider of telecommunications equipment and network solutions.
We deliver innovative, custom-made products and services to customers in more than 135 countries, helping them achieve continued revenue growth, while shaping the future of the world’s communications.
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Welcome!
A Successful Promotion of Balanced Development between Products and Markets

– Interview with Mr. Cui Yi, General Manager of the Asia-Pacific Region of ZTE Corporation

Focus on IP Networks

The Four Principles for Building Future All-IP Mobile Network

With the development of IP technologies, telecom networks gradually evolve into all-IP based networks which are interoperable and converged.

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ZTE Strongly Promotes Custom-made All-IP Multi-Service Bearer Solutions

By promoting custom-made all-IP multi-service bearer solutions on the emerging markets, ZTE has achieved landmark progress in the data field. In 2007, the annual overseas revenue from its data products exceeds the domestic revenue for the first time.

According to Naresh, a senior analyst with Gartner, the world-famous consulting firm in telecommunications, as the global IP network develops, there is a strong demand for transformation of IP network in emerging markets, and ZTE and other vendors have provided a series of solutions to meet this demand.

ZTE has rolled out custom-made all-IP multi-service bearer solutions for operators in emerging markets such as India, Vietnam, Russia, and Colombia. “Relying on strong R&D capability and customization advantages, we provide new business growth points for operators in emerging markets. Our data products achieved outstanding performance in 2007, with a growth rate of over 100% again. The annual overseas revenue exceeds the domestic revenue for the first time,” said Mr. Fan Xiaobing, General Manager of Bearer Network Product Line of ZTE.

ZTE has established close cooperation with VNPT, Viettel and other famous operators in Vietnam. Network transformation and strategic transformation based on an IP bearer platform are two clear development trends for telecom networks in the industry. ZTE’s backbone/metropolitan area network solutions provide superior all-IP multi-service bearer platform for the mainstream fixed network operators in Vietnam.

In the recent IP Network Seminar Vietnam 2008 held by ZTE, over 200 famous experts from operators such as VNPT and Viettel expressed their high recognition for the innovative solutions. VNPT experts from Vietnam said in their speech, “ZTE’s all-IP multi-service bearer solution is well tailored, boasting stable performance, reliable quality and high cost-effectiveness.”

(ZTE Corporation)

ZTE Wins National IPTV Project in Belarus

Deal another significant company milestone in penetrating Eastern Europe

ZTE successfully penetrates the Eastern European IPTV market by recently sealing an IPTV project contract with the Republican Unitary Telecommunication Enterprise (RUE) Beltelecom, a National Telecommunications Operator of the Republic of Belarus.

Since May 2006, Beltelecom has been initiating the national IPTV development and conducting IPTV trial tests with leading providers in the industry. ZTE beats other competitors in the contract bid with its network video technology, which has a solid network performance infrastructure design, and one of the most reliable and comprehensive end-to-end multimedia solutions in the industry that meets sophisticated needs of multimedia service providers.

(ZTE Corporation)
ZTE DSLAM Improves Operators’ Carbon Footprint and Slashes Power Costs

ZTE revealed that its award winning Broadband Universal Access System could help operators make a major impact on their carbon footprint as well as save millions of dollars a year in power costs. ZTE’s DSLAM ZXDSL FSAP 9806H overreaches the European code of conduct on energy consumption for broadband equipmentv from a power consumption point, offering a significant power consumption savings per port. “Operators are becoming increasingly aware of their responsibility towards the environment,” said Zhang Xinyu, director, global market, fixed network management team at ZTE. “ZTE’s DSLAM solution enables broadband providers to radically reduce their carbon footprint and has recently been recognized as the ‘Best Green Innovation’ at the Convergence World Awards,” he added.

ZTE’s 9806H is a network device offering up to 96 ADSL2+ lines or 64 VDSL2 lines in a 2U rack and is located near the customers’ location, so connecting multiple DSLs to a high-speed internet line using multiplexing techniques. This Broadband Universal Access System is perfectly suited for this fiber-to-the-x (FTTx) network architecture model and enables operators to build a next-generation broadband network while reusing existing copper cables. This helps preserve operators’ existing investments and maximize the revenues associated to new broadband services, including video-on-demand, IPTV, and Internet games.

(Oracle Corporation)

Oracle and ZTE Extend Alliance for Service Delivery Platform Blueprint Development

Oracle and ZTE announced that they have extended their alliance in connection with the marketing and development of service delivery platform (SDP) offerings in China and globally. Oracle is the global No. 1 communications software vendor and ZTE is a leading global provider of communications equipment and network solutions. Demonstrating its strong enabler capabilities, ZTE is already a supplier of unified software platform to application providers, offering a strong management portal to provide flexible and complete access to applications, as well as asset management functionalities. Oracle and ZTE will leverage their complementary strengths in communications and enterprise software to collaborate in the development of an SDP blueprint and proof-of-concept. Both parties will work with additional partners to enrich the total SDP solution.

(Oracle Corporation)
Asia-Pacific Dominates Mobile Growth
May 2, 2008

More than half of the world’s fastest emerging mobile markets are in the Asia-Pacific region, according to a new Light Reading report titled Top 10 Emerging Mobile Markets 2007. Of the 10 markets ranked by 2007 subscriber growth, six are from Asia/Pacific, including the top four countries—China, India, Indonesia, and Pakistan. Vietnam is ranked seventh, followed by Bangladesh in eighth place.

Not surprisingly, those six countries accounted for a vast majority of near 320 million new mobile customers added by the 2007 top 10 emerging mobile markets: Together they added 253.4 million new mobile accounts, or 79 percent of the total.

(www.unstrung.com)

Romanian CDMA Operator, Zapp Plans UMTS Rollout
May 6, 2008

During a press conference held last month, Chris Bataillard, CEO of Romania’s Zapp announced that their 2100 MHz network will be functional by June 30th, providing mobile high-speed data services based on ZTE’s UMTS/HSDPA solutions.

As per their license obligations, Zapp has to deploy a full 3G network by end of 2011, the first step of this process being due on June 30th, 2008 and refers to covering 19 major cities in Romania.

By the end of the first stage of the UMTS network build-up, over 5.5 million people will be within the range of Zapp’s UMTS signal. It means that the company will have fulfilled its license obligations to provide UMTS services to at least 26% of the Romanian population.

(www.cn-c114.net)

Qualcomm to Launch Smartphones
May 14, 2008

Mobile chipset maker company Qualcomm is in talks with vendors and Original Equipment Manufacturers (OEMs) to launch Smartphones in the country at a price tag of Rs 10,000 by next year.

“We are working with our OEMs to bring to market smartphones with full in-built HSDPA next year,” Qualcomm India and SAARC President Kanwalinder Singh said.

He said Qualcomm would work with OEM partners to make smartphones a mass-use product. Qualcomm has OEMs partners like ZTE, Huawei, LG, Samsung, HTC.

Smartphones are full-featured mobile phones with personal computer like functionality with camera and email capabilities with a complete personal organizer.

(www.cn-c114.net)

Global Wireless Chip Market Grew 7.6% Last Year-Report
May 20, 2008

Wireless chip growth outpaced the overall chip market in 2007, a study from technology researcher iSuppli said.

The study, quoted by a Reuters report, also said Qualcomm led with 24% chip revenue growth, helping it overtake Texas Instruments.

Wireless sales grew by 7.6 % to $29.5 billion in 2007 compared with a 3.3% growth rate for the overall chip market, the Reuters report further quoting iSuppli, said.

(www.telecomasia.net)
Before people are aware, the emerging markets in the Asia-Pacific region have become a cake being snatched by international operators and become strategic markets for global high-end operators. The Asia-Pacific region is one of the most important markets for ZTE, where ZTE has achieved eye-catching performance over recent years. Then, how is ZTE’s market development in the Asia-Pacific region? How do the products of ZTE change the local market pattern and adapt to the local community? With these questions in mind, we have an interview with Mr. Cui Yi, General Manager of the Asia-Pacific Region of ZTE Corporation.
**Balanced Development between Products and Markets**

At the beginning of 2005, ZTE established a regional platform in the Asia-Pacific region and started its all-around layout in terms of markets and products. This is an important milestone in the development of the Asia-Pacific market and from then on, its market operation in the Asia-Pacific region entered a fast lane. After several years of unremitting efforts, ZTE has achieved remarkable market performance.

According to Mr. Cui Yi, General Manager of the Asia-Pacific region, ZTE has kept a stable momentum of development in the Asia-Pacific market these years, and has seized various opportunities in the market. Hence, ZTE follows the general trend of the Asia-Pacific market, and has a leaping growth every year. Two distinctive features can be summarized: On the one hand, ZTE’s market development in every country of the Asia-Pacific region is relatively balanced. For example, in Indonesia, Malaysia, Philippines, Singapore, and Australia, ZTE shows a good momentum of development in terms of its local market position, market share, brand recognition, and project growth. Among these countries, as Indonesia has a large population, ZTE has a large market share and high brand recognition in Indonesia. On the other hand, in terms of products, fixed network, mobile and value-added services as well as terminal products, they all keep a balanced development. Especially in the last two years, terminal products increase at a remarkable speed. In 2007, ZTE’s 3G mobile phones broke into the high-end market in Australia on a large scale, and CDMA mobile phones entered the Indonesian market, which make Indonesia and Australia two core markets of ZTE’s terminal products.

Thanks to the balanced and stable development of ZTE in the Asia-Pacific region in terms of both products and markets, a scientific prediction can thus be made on the future planning of labor and resources, which greatly reduces risks in various aspects. Meanwhile, the mutual cooperation of various products may provide a comprehensive solution for customers, helping ZTE achieve good brand recognition among its customers.

As for high-end international operators in the Asia-Pacific region, according to Mr. Cui Yi, ZTE’s products cover nearly all mainstream high-end operators and it is cooperating with the top operators in each country. In Australia, ZTE has established a partnership with Telstra, the largest operator in Australia and supplies it with WCDMA 3G terminals on a large scale. In addition, bearer network products, including Ethernet switch and DWDM transmission products are supplied to Amcom in Australia on a large scale. Amcom is an important operator in Western Australia and also the fastest growing broadband service provider in the country. In Singapore, ZTE’s value-added services cover all three operators, SingTel, StarHub and M1, and bring them remarkable revenues to these operators. SingTel is also the most influential multinational operator in the region, which has established operating organizations in 15 countries and regions across the world. ZTE has conducted all-around cooperation with SingTel Group in Indonesia, Philippines, Thailand and Singapore. In Malaysia, ZTE is an important supplier of Telekom Malaysia. The company started cooperation on broadband terminals, value-added services and other fields with Telekom Malaysia as early as in 2003. In 2006, it succeeded in its bidding for the 40% market share of an MSAN project. In 2007, it gained a 70% market share in the previous MSAN project and a 70% market share of a power project. In addition, Telekom Malaysia International (TMI) is a major international operator in Southeast Asia, boasting a large telecommunication investment in Asia-Pacific and Africa. ZTE has conducted cooperation with TMI in India, Cambodia, Bengal, Sri Lanka, etc. In Indonesia, ZTE has established a partnership with all mainstream operators, including Telkom, the largest fixed network operator in Indonesia, Telkomsel, the largest mobile operator, as well as Indosat, HCPT, SMART, M-8, etc. In Indonesia, ZTE’s CDMA system has a capacity of 15 million lines in total. Optical transmission, power, fixed network broadband access products and VAS products are traditional competitive products with stable large volume sales. From 2006, the sales of terminal products started to increase sharply, and now ZTE has become a mainstream supplier of CDMA terminals and 3G data terminals in Indonesia. This year, the sales volume of GSM products also began to increase stably, and the sales contract value has reached USD 200 million in total. In Philippines, ZTE’s CDMA products have always ranked the first in the market share. Besides, its fixed network products are well applied in Globe, Digitel and other operators. Generally speaking, ZTE supplies a variety of products in the Asia-Pacific region, but wireless products and terminal products have seen the most rapid development in recent years.

**Deep Analysis on Customer Demand to Seize Market Opportunities**

In its development over the last few years, ZTE has closely followed the development trend in the Asia-Pacific region, made a deep analysis on customer demand, seized market opportunities in a rapid manner, and thus established a good market pattern and built a solid foundation for its further
development in the future.

According to Mr. Cui Yi, there is an unbalanced development in the communication industry in some parts of the Asia-Pacific region and customers have different requirements for the communication services, but still, there are great market potentials. On the one hand, in areas such as Philippines and Indonesia, there is still huge space for development in the infrastructure construction, such as popularization of telephones, and network coverage. On the other hand, Singapore and Australia are developed countries with a high telephone penetration rate, but a lot of market opportunities can still be found if these markets are segmented.

There is a natural increase of demand for communications in each country, and the increase keeps pace with the economic development. This is more noticeable in developing countries. Since the financial crisis in 1997 and 1998, there has been a common down period of several years in the communication development in each country. But with the recovery of the economy in 2003 and 2004, the market has witnessed an obvious increase of demand for communications. Especially in Indonesia where there is a vigorous demand for infrastructure construction, ZTE has extensive cooperation with the mainstream operators in Indonesia in terms of both wired and wireless products. For example, in 2004, ZTE undertook the construction of the first DWDM national backbone transmission network in Java Indonesia. Ever since then, its transmission products have seen a steady growth among the mainstream operators in Indonesia. In 2004, after successfully establishing a partnership with Indosat, ZTE started cooperation with such operators as TELKOM and SMART on CDMA products, keeping a high market share. At present, ZTE also has good cooperation with Telkom, Telkomsel, Indosat, Mobile-8, SMART, STI and other operators in Indonesia on its terminal products.

In the high-end market in Asia-Pacific, the development of communications has not come to a stop. Mr. Cui Yi continued: In developed countries, there is already a very high penetration rate of telephones. For example, the penetration rate of mobile phones in Singapore and Australia has reached 100%. But does this mean that they have no further demand for communications? No. There are still a lot of communication constructions in these countries every year, which requires our constant exploration and development. For example, in Singapore, ZTE accurately grasps the customer demand and provides a Color Ring Back Tone (CRBT) platform and CRBT services for SingTel, the largest operator in Singapore by means of an innovative business model of “joint operation and maintenance and profit sharing”, increasing its CRBT penetration rate from the original 1.3% to 10% and bringing about considerable financial profits. Another example is: The operators have an urgent demand for reconstructing their intelligent networks to enhance the charging function and formulate highly attractive business packages, which brings us new market opportunities. In July 2007, ZTE signed a contract on an OCS project with StarHub, an operator in Singapore, to provide a complete mobile prepaid real-time online charging system and a customer handling platform. At present, ZTE has become a major service supplier in Singapore and one of the few vendors that can provide service products for three main operators in Singapore.
**Customization Capability to Break into the High-End Market**

In ZTE’s end-to-end solution, the supply of customized terminals is quite important. The fast customization of terminals to meet the requirements of operators is the competitive edge boasted by ZTE in its differentiated competition with other mobile phone vendors. Mr. Cui Yi described a success case in Australia.

He said, Australia is a high-end market, having high requirements on communication equipment and terminals, especially on customization. At the beginning of 2006, we learned that Telstra, an Australian telecommunication operator, needed a batch of highly customized 3G terminals with a very special frequency, that is, 850 MHz, and a strict delivery date. For a project with such high requirements, we actively communicated with the customer on the one hand, and coordinated the product line of the company and promoted R&D of the customer-made products on the other hand. From April 2006 when this project was initiated till October of the same year when the delivery started, until the end of 2006, we completed a delivery worth tens of millions of USD. In 2007, we continued with the momentum and finished a delivery worth hundreds of millions of USD, an increase of multiple times. Therefore, in addition to our sharp insight to seize market opportunities, the fast response capability of our R&D as well as customization capability is a key to the success of this project.

**Social Responsibility and Win-Win Development**

Enterprises are not only the operating entities in economic activities, but also play an important role in the society. At present, many multinational corporations take the social responsibility as a strategic target for their development in China and carry out a series of activities for public welfare, making their due contribution for the society while creating wealth. Then, while successfully practicing the “going abroad” strategy to achieve development and expansion in overseas regions, how does ZTE adapt to the local community and make harmonious development?

Obviously, Mr. Cui Yi has given a deep consideration to this issue. He said, when seeking overseas development, we shall not just do business and make money, but also take the initiative to shoulder the local social responsibilities. We shall build a good social atmosphere and highlight our sense of social responsibility through many means. For example, we have built a training center in Bandung, Indonesia, which proves to be very successful. In our opening ceremony that year, we invited leaders from the government departments and telecommunication operators in Indonesia, receiving a favorable response from the society. In this training center, we not only deliver trainings to our customers and employees, but also recruit local trainees in Indonesia and train talents, which gains an active response from the society. Many undergraduates and people requiring re-employment trainings are enrolled. Our training center boasts the most complete training and testing facilities in the local community, allowing trainees to conduct on-site operations, thus creating a very good result. At present, our training enjoys a very high reputation in Bandung, recruiting trainees every semester, and attracting active enrollment without a large-scale publicity. If we recruit 100 trainees, there are usually 500 to 600 people coming for the enrollment. We directly recruit those with an excellent examination record as permanent employees of ZTE. In this way, we cultivate a large number of talents for the local community every year and provide a lot of job opportunities for the same time, showing a very good social effect in the local community. Therefore, we shall not only provide good products and communication networks at overseas regions, but also take the initiative to take social responsibility. Only in this way can we adapt to the local community and achieve greater development.
All IP and convergence have become an inevitable trend in the evolution of mobile networks. In the future, both the services and the bearer modes of voice, packet data and multimedia will be all IP-based.

With the development of IP technologies, telecom networks gradually evolve into all-IP based networks which are interoperable and converged. This will not only help the operators to upgrade their networks gracefully and deploy them efficiently, but also effectively reduce capital expenditures (CAPEX) and operating expenses (OPEX) of the operators, thus protecting their investments and allowing them to gain investment returns quickly. Most important of all, this will make different networks and their services accessible.

However, we must be aware of the fact that the global telecom revenues mainly come from the traditional voice services, particularly in emerging markets where the operators’ revenues from voice services account for more than 80% of their total revenues. Therefore, no matter how the network evolves, the voice service users and the revenues thereof will be the primary factor the operators take into account in their network evolution. Currently, the Quality of Service (QoS) cannot be guaranteed in the IP Multimedia...
Subsystem (IMS)-based voice services, and it is still a question whether QoS can be guaranteed in other IMS-based real-time services. As a result, even with radio access network (RAN) and core network (CN) becoming all-IP based, the voice services-oriented 3G circuit-switched (CS) domain and the multimedia services-oriented IMS will co-exist in future networks for quite a long time.

In addition, the operators are challenged with other network-related problems, including capability, reliability, operating cost and QoS.

**Carrier-Class All-IP Platform to Establish a Solid Network Foundation**

The development of all-IP networks, especially the interoperation of IP-based services in various networks, has laid a solid foundation for network integration. In the next generation networks, bearer and control will be separated. This idea resembles the evolution path of Softswitch-based IMS mobile networks.

Being a leader and an active advocate of all-IP architecture, ZTE first launched a carrier-class all-IP platform in 2004. This platform adopts a system architecture that separates the media plane from the control plane, which not only accords with the development trend of all-IP systems, but also ensures the system reliability. In the system, two Ethernet networks are designed: one for interconnection of media streams and the other for interconnection of inner control streams. This creative design ensures the system reliability because with the media plane being physically separated from the control plane, the impact of burst media traffic on the control plane is avoided.

The reliability of ZTE all-IP platform has been proved. In the peak hours of the New Year’s Day of 2008, ZTE all-IP BSCs at Hyderabad, India survived huge traffic. At two of these BSCs, the voice traffics in the peak hours were 8.8 and 6.8 times, respectively, of the traffics in normal hours. At that time, the networks of other operators in the same area, i.e. Hyderabad, were all paralyzed, but ZTE’s equipment worked well.

With its leadership in CDMA2000 all-IP being further consolidated, ZTE has already become one of the global CDMA equipment leaders. One 2008 Yankee Group report shows that ZTE ranks top 2 in the years 2007-2009 in terms of competitiveness of its CDMA equipment (see Figure 1).

**Complete Disaster Tolerance Solution to Protect the Network**

As the capacity of a single system is quite large, the all-IP equipment requires high stability and high reliability. As a result, it is necessary to make all-round backup at each layer.

To protect the network to the utmost extent and ensure it to run reliably, ZTE CDMA2000 all-IP solutions consider seriously the system redundancy backup mechanism in its design, and adopt the following backup modes: 1+1, N+1 or N+M for core parts or equipment, and 1+1 (active/standby) for core databases. Moreover, the network architecture is dual-network and dual-plane, thus eliminating any single point of failure in the network.

With respect to disaster tolerance of network elements, ZTE CDMA2000 all-IP solutions support several backup modes: Ap-Flex, Media Gateway (MGW) load sharing, Mobile Switching Center emulation (MSCe) backup and Home Location Register emulation (HLRe) backup. These all-IP based disaster tolerance solutions take advantage of the flatness characteristic of IP networks and avoid transmission resource waste, like the case in the Time Division Multiplexing (TDM)-based solutions.

**Most Efficient Transmission Scheme to Save TCO**

An all-IP system can effectively improve transmission efficiency, save the network construction and renting expenses, as well as reduce the Total Cost of Ownership (TCO). Compared with TDM-based schemes, the IP over E1 scheme can incredibly improve the E1 transmission efficiency by 10 times, and the IP over FE/GE scheme can save the voice transmission bandwidth by as much as 80%.

![Figure 1 - Global CDMA equipment vendors' competitiveness score and ranking (Yankee Group, 2008)](image-url)
For the operator who has only traditional TDM bearer network, ZTE provides the IP over E1 scheme to take full use of the current transmission resources.

For the operator who has IP backbone bearer network, ZTE suggests the IP over FE/GE scheme to get the network flatter and improve the scalability and flexibility of the network.

For the operator who has remote areas and islands to be covered but lacks transmission resources, ZTE offers the satellite link solution and the microwave networking scheme to construct a large local network. In this way, the operator can have a bigger capacity with its limited resources, and enhance the profitability of the network.

**Optimal QoS Mechanism to Ensure Good Network Performance**

Real-time services, such as voice services, are the main challenge the all-IP mobile network has to face. Among current CDMA2000 all-IP networks, two of them support Voice over IP (VoIP) services: CDMA2000 Multimedia Domain (MMD) (IMS) and CDMA2000 Legacy MS Domain (LMSD).

CDMA2000 MMD network, adopting end-to-end all-IP architecture, provides end-to-end VoIP services to replace the traditional mobile telephone services; while CDMA2000 LMSD network, where traditional mobile terminals are still used, applies IP technologies in its access network and CS core network but keeps the air interfaces unchanged. To distinguish the two kinds of VoIP services provided in CDMA2000 MMD and LMSD networks, the VoIP services provided in LMSD network are often called “mobile IP Phone”.

The biggest problem in the development of VoIP services is an optimal QoS mechanism, which ensures that the voice quality will not be poorer than that in traditional mobile phone calls.

Figure 2 illustrates the difference of end-to-end QoS mechanism in CDMA2000 MMD and CDMA2000 LMSD networks.

As shown in Figure 2, in the QoS mechanism of CDMA2000 MMD network, the QoS strategy and services are implemented by terminals, access networks and core networks together; while LMSD network, where traditional mobile terminals are still used, guarantees its end-to-end QoS with access networks and core networks.

Besides, to reduce the impact of network jitter, frame loss and packet disorder, the system is also required to perform the QoS functions at the application layer: adaptive dynamic buffer, packet reordering, missing frame compensation, etc. These functions are performed by intelligent terminals in CDMA2000 MMD system, but by access and/or core networks in CDMA2000 LMSD system.

To reduce impact of frame loss on voice quality further, ZTE has developed a patent technology, called SuperVT. This technology can effectively reduce the impact of packet loss on voice quality. With this technology, LMSD system can greatly lower the indexes of the bearer network while the conversation quality can be satisfied: maximum one-way delay is less than 200ms, jitter less than 80ms and packet loss ratio less than 5%.

**Conclusion**

It has become an inevitable trend to converge IP-based telecom networks. The IP technologies were originally designed for transmitting Internet services with “Best Effort”, so it is not an easy thing to construct a carrier-class all-IP network with good performance, high reliability and optimal QoS. In constructing the future all-IP mobile networks, four principles should be followed: First, the system architecture should separate the media plane from the control plane; second, the system should have a complete disaster tolerance backup solution; third, different interfaces should be available to allow flexible networking in diversified transmission conditions, thus improving the transmission efficiency and reducing the TCO of the operator; fourth, an optimal QoS mechanism should be worked out.

With four years’ experience in all-IP commercialization and continuous innovation, ZTE has developed its CDMA2000 all-IP networks, providing the telecom operators with complete, one-stop solutions. Moreover, it is committed to long-term quality services, and truly helps the operators construct reliable networks and make profits on a long-term basis.
Due to its widespread applications in global telecom networks, Ethernet technology has been considered the most potential trend in data communications. All Ethernet-based technologies are evolving at fast pace. The transformation from traditional Ethernet to Carrier-class Ethernet (CE) has become one of the hottest topics in the industry.

At present, carrier-class Ethernet technologies have basically solved the problems concerning switching protection time, QoS, network management, full-service bearer, and clock and time synchronization. Leveraging the expandable, high-bandwidth and low-cost advantages of traditional Ethernet technologies, the carrier-class Ethernet network can provide all functions and performances required by telecom networks, and it becomes a best choice for future all-IP network and an optimal solution for fixed-mobile convergence (FMC).

Tendency Towards All-IP Mobile Network

Today global mobile network operators are all facing the problem of transformation. Leading mobile operators such as British Telecom (BT), France Telecom (FT) and China Mobile are being actively involved in developing IP-based mobile bearer networks. There are several reasons for the operators to restructure their networks.

Rapid development of mobile broadband services

The market demand and technology advancement drive the growth of mobile broadband services. The existing networks can hardly meet the broadband requirement of mobile users. The users’ demand for Internet and video services impels the mobile network to evolve from a single voice and text network to a broadband mobile network. In addition, the mobile 3G and 4G technologies make a basis for the broadband services development.

Demand for diversified mobile services

The declining ARPU from traditional voice services forces mobile operators to speed up their network transformation, and to seek new service opportunities for maximum profit. The current hottest topic in the industry is all-IP mobile network. The convergence of mobile communications and Internet
technologies can bring more attractive services to mobile networks and increase the operators’ ARPU.

**Pressure of network investment costs**

The construction of bearer network accounts for a large part of the mobile operator’s total investment costs. Currently, the costs for leased cables and construction of SDH and MSTP networks are still quite high. With the increasing demand for bearer networks in future network development, the cost-effective Ethernet network will find more appeal with mobile operators.

To cope with the pressures from the services, convergence, technology advancement and costs, the tendency toward all-IP mobile networks is unavoidable. Carrier-class Ethernet is a new technology best fit in with the challenges, which can help mobile operators solve various problems in the access layer of mobile network.

**Key Technologies for All-IP Radio Access Network**

Different from traditional Ethernet, carrier-class Ethernet has been significantly enhanced in technology and performance to meet all kinds of challenges in mobile network transformation.

**Clock and time synchronization**

Basicall all mobile base stations require synchronization. Traditional TDM transmission networks can recover the synchronization clock via the E1/T1 link. In carrier-class Ethernet networks, two synchronization techniques are introduced to meet the synchronization requirements: one is Ethernet synchronization technology based on the ITU-T G.8261, which is a network-based clock synchronization technology independent of network load, latency and jitter; the other is packet synchronization technology based on the IEEE 1588v2, which makes use of packets to achieve synchronization, provides highest accuracy for point-to-point links, and implements frequency, phase and time synchronization.

**Rich interfaces**

The traditional Ethernet technology mainly provides Ethernet interfaces, while Radio Access Network (RAN) has various TDM and ATM interfaces. One of the most important enhancements in the carrier-class Ethernet switch is the provision of TDM and ATM interfaces. This is a necessary process for IP transformation of radio base stations. The carrier-class Ethernet technology is a solution for smooth transition to future Ethernet interfaces (3G and 4G) from traditional radio interfaces (2G).

**QoS guarantee**

The introduction of varieties of new services, especially the high-bandwidth data services in radio networks, has great impact on traditional voice and other real-time services. The “Best Effort” IP network can hardly guarantee the QoS for key services. Therefore, future radio networks must be manageable, with guaranteed QoS. The carrier-class Ethernet technologies adopt powerful hardware-based QoS mechanism and OAM functions. Through the enhanced Ethernet service classification, bandwidth restriction and flexible scheduling, the carrier-class Ethernet network can implement hierarchical QoS based on services, users and applications. Meanwhile, various Ethernet-based OAM standards can also provide better QoS guarantee.

**Tunnel technology**

Tunnel technology is an important demand of future radio networks. It is the core of bearer network technologies, and also a hot technology of carrier-class Ethernet. Presently, there are multiple tunnel technologies available in the market that develop and compete with one another.
**PBT**

Based on the MAC in MAC encapsulation, Provider Backbone Transport (PBT) provides enhanced carrier-class OAM and protection functions. It uses the existing Ethernet hardware to offer a new forwarding mode, transforming the traditionally connectionless Ethernet into a connection-oriented tunnel technology. With the reliability and manageable capability similar to SDH technology, PBT provides private Ethernet lines with hard QoS and carrier-class performance. It has good expandability, disabling Ethernet MAC address learning and broadcasting functions. It uses the VID and MAC address as the global unique address and the destination-based address in its forwarding decision, removing the restriction for service expandability. It provides bandwidth reservation and effective carrier-class protection switching capability. By using the tunnel technology, PBT allows interoperability with services based on MPLS and L2 VPN, offering a cost-effective and reliable bearer solution for Ethernet networks.

**VPLS**

Based on MPLS, Virtual Private LAN Service (VPLS) is a L2 VPN technology that can extend WAN MPLS to Ethernet access. Using the L2 MPLS label encapsulation, VPLS is independent of physical topology and capable of supporting any logical topology architecture. With flexible networking capability, it is applicable for point-to-point and point-to-multipoint service applications. With the hierarchical mechanism, it provides enhanced scalability and support large-capacity application scenarios. Moreover, it uses the MPLS Traffic Engineering (TE) to achieve resource optimization, and the Fast Re-Route (FRR) to implement carrier-class protection switching. VPLS is by far the most mature technology for carrier-class Ethernet, but it is expensive in terms of networking costs and is complex to configure and manage.

**TMPLS**

Defined by the ITU-T SG15, Transport MPLS (TMPLS) is a connection-oriented packet transport MPLS-based technology. As an MPLS subset, TMPLS abandons the control protocol stack that IETF defines for MPLS, simplifies MPLS data plane, removes unnecessary IP-based connectionless forwarding processes, and adds ITU-T transport style protection switching and OAM functions. Backed up by a series of ITU standards, TMPLS can meet the requirements of carrier-class reliability and manageability. Although relatively mature in terms of technology, TMPLS needs to be further improved in practical carrier-class Ethernet applications.

**ZTE’s All-IP Radio Access Network Solution**

As a leading global provider of telecommunications equipment and network solutions, ZTE actively cooperates with operators, equipment manufacturers, and standard organizations in carrier-class Ethernet technologies, aiming to provide complete solutions for RAN and future FMC. Its carrier-class Ethernet RAN solution is shown in Figure 1. ZTE’s carrier-class Ethernet product family based on the traditional Ethernet technologies provide an additional synchronization mechanism to implement Ethernet and IEEE 1588v2-based synchronization. Its switches support various TDM interfaces, satisfying the current access requirements at the radio sites; its access devices support Ethernet solutions, making preparation for future IP access; and its hardware-based hierarchical QoS mechanism provides powerful services, users and applications-based QoS control, meeting different service level agreement (SLA) requirements of telecom network. Furthermore, ZTE’s carrier-class Ethernet solutions can be implemented over PBT, VPLS, and TMPLS technologies. Through years of active participation in tracking the development and evolution of the three technologies, the company is able to select the best suitable technology according to the actual network conditions, offering a complete carrier-class Ethernet RAN solution.
Quality IP Networks Enabling India’s National Broadband Policy

Li Le  Wang Chuanqi

On January 23, 2007, the President of India, APJ Abdul Kalam, proclaimed in his speech to the Congress that 2007 would be a year of Broadband in India. In response to the call for broadband, Indian Government launches a national broadband policy and major players in the market are looking forward to being at the forefront of the broadband spread.

Bharat Sanchar Nigam Limited (BSNL), the biggest state-owned telecom operator in India, holds the license to operate telecom services across the country except Delhi and Mumbai. The existing broadband network of BSNL covers only part of areas in large cities such as Gurgaon, Chennai, Bangalore, Jaipur and Kolkata, and has extremely low coverage in rural areas and small and middle-sized cities. Driven by the increasing demands for broadband services, BSNL has enlarged its investment in the fixed-line broadband project since 2006.

BSNL’s broadband project is a nationwide IP MAN construction project aiming to improve rural network coverage, increase efficiency of government office automation, and speed up national broadband construction. After completion, it will allow broadband users in 800 cities and suburbs of the country to enjoy the high-speed ADSL2+ and VDSL broadband services.

With the global trend toward
IP telecom service, IP technologies featuring good openness and extensibility have been widely applied around the world. The triple play of voice, data and video becomes an inevitable trend. A comment titled “Power to people!” in the March 2008 issue of VOICE & DATA, a famous communications magazine serving India, stated: “Internet and communication technologies have brought about unprecedented changes in the way people communicate and conduct businesses, and broadband is the key contributor toward this change”. It is widely believed that societies that adopt, adapt, and absorb the benefits of broadband enabled information and communication technologies (ICT) services and applications quickly and deeply, will achieve enormous benefits in terms of productivity, innovation, growth, and quality of life. Therefore, the broadband project of BSNL is of great significance in giving Indian people unimaginable power to access, organize, and transform information and in boosting economic development of the country.

ZTE was selected by BSNL to construct the broadband project due to its proven expertise in broadband network construction. It set up a professional team devoted to the early project preparation, bidding procedures, technical presentation and clarification, engineering survey and implementation, etc. After half a year’s hard work, ZTE has built an advanced broadband network for BSNL. So far, the network has been put into smooth operation, delivering services to more than 2 million broadband users in India.

ZXR10 T64G (see Figure 1), a high-end switching router supplied by ZTE, adopts the crossbar hardware architecture capable of providing large-capacity L2/L3/L4 wire-speed and high-bandwidth non-blocking forwarding capabilities. Its hardware-based QoS can guarantee deployment of varieties of value-added services. In compliance with the global Metro Ethernet Forum (MEF) standard, ZXR10 T64G offers carrier-class reliability. Additionally, its VLAN and QinQ features provide broadband users with high QoS guarantee for both user and service isolation, thus offering different QoS for different services and allowing users to have quality service experience. Due to its outstanding performance-cost ratio, the ZXR10 T64G high-end switching router stood out among other products supplied by multiple vendors all over the world in the BSNL broadband project, and received high praise from the Bid Evaluation Group. Finally ZTE was awarded the contract to supply 2200 ZXR10 T64G routers that cover 800 large, middle and small-sized cities such as Bhopal, Gwalior, Panjim, Ludhiana, Chandigarh and Indore, and also cover vast rural areas.

After the initial project was completed, BSNL put the network into commercial use. As the network allows BSNL to deliver low-cost and high-speed broadband access services to the users, the number of broadband users grows at an explosive pace, greatly enhancing profitability of India’s broadband network market. With continual service development, ZTE, as a cooperative partner of BSNL, is ready to satisfy the customer’s requirements, managing to extend broadband coverage to more cities. In the capacity expansion project, the ZXR10 T64G high-end switching routers are being deployed in most cities of 23 states of India including Punjab, Karnataka, UP–East and Andhra Pradesh, and also in the biggest suburb broadband network. Accordingly, ZTE has become the top vendor of LAN SWITCH in the BSNL broadband network project.

About the Metro Ethernet Forum

The Metro Ethernet Forum (MEF) is a global industry alliance comprising of more than 120 organizations including telecommunications service providers, cable operators, MSOs, network equipment, test vendors, labs and software manufacturers, semiconductors vendors and testing organizations. The MEF’s mission is to accelerate the worldwide adoption of Carrier-class Ethernet networks and services. The MEF develops Carrier Ethernet technical specifications and implementation agreements to promote interoperability and deployment of Carrier Ethernet worldwide.
Carrier-Class Metro Ethernet Network Becomes a Global Trend

The carrier-class Ethernet technology has been widely applied in Europe and the U.S., and is being increasingly recognized around the world. Many global top-tier telecom operators have successfully deployed carrier-class metro Ethernet networks. According to Heavy Reading, a leading telecom market research firm, the carrier-class metro Ethernet technology will become an inevitable global trend. Currently operators in each country are accelerating their deployment of carrier-class metro Ethernet services to meet new challenges brought by continuous subscriber growth. To develop a carrier-class Ethernet network has become a key task for the operators. Additionally, the Metro Ethernet Forum (MEF) certification can help service providers offer carrier-class Ethernet services conforming to the related specifications.

About PCCW

PCCW is a major telecom operator in Hong Kong and a leading information & communications company in Asia. The company is dedicated to development of innovative telecom technologies and services, especially the new-generation fixed-line and mobile telephone service, broadband information technology, radio communication, customer communication center service, and broadband TV service delivered through the broadband TV network. Its business covers 14 countries across the world, providing the industry with cutting-edge technologies and high-quality network communication services. PCCW helps customers expand their services to the Asian market and then to the global market.

As a MEF member, PCCW has won the prestigious Annual Excellent Asia-Pacific Service Provider Award from MEF. With the development of IPTV, NGN and 3G services, PCCW needs to establish an integrated network platform. IP is the core and basis of the integrated solution that can achieve unified bearing of multiple services.

From the market perspective, enterprise users are PCCW’s target customers. As the enterprise users are shifting their requirements from the original simple broadband connectivity to the personalized services tailored to specific applications, it is necessary for the network to support complex L2 and L3 functions. Operation in a single service mode would fail to retain customers or grow revenue. The key enabler for integrated broadband access service required by enterprise VPN, virtual private line, virtual LAN, and high-speed Internet is carrier-class metro Ethernet service, because all carrier-class metro Ethernet networks set the same requirements for TCO savings, QoS guarantee, reliability and scalability.

Highlights of ZTE’s Carrier-Class Metro Ethernet Network Solution

ZTE has technical advantages in the deployment of carrier-class metro Ethernet network. Its data products consist of the ZXR10 G-series and ZXR10 8900-series switches used at the core and convergence layers of the metro Ethernet network, the ZXR10 5900-series and 5200-series Gigabit Ethernet switches used at the convergence layer, and the ZXR10 2900-series switches used at the access layer.

PCCW selects ZTE’s field-proven 10-Gigabit Ethernet Smart Ring (ZESR) solution in deploying its carrier-class metro Ethernet network. It adopts the ZXR10 G-series high-end routing switches featuring modular and distributed architecture and the ZTE’s patented ZESR technology that needs less than 50ms switching time in case of link failure and can provide ideal end-to-end QoS for varieties of services by using traffic classification and queuing technologies. The ZXR10 G-series core switches fully support multicast, VPN and network security technologies, allowing operators to use the same bearer network to carry IPTV, VoIP, broadband and enterprise...
private network services. ZTE’s data products can perfectly support not only the earliest QinQ, ZESR and VLAN translation features, but also the latest 802.1ag, 802.3ah, and IEEE 1588v2 functions.

**End-to-end QoS guarantee**

ZTE’s data products feature non-blocking wire-speed forwarding, DiffServ/ToS and IEEE 802.1p/q functions. They can provide end-to-end QoS guarantee for data, voice, video, and broadband VPN services and satisfy the IPTV service requirements for bandwidth, delay and jitter.

**Complete redundancy protection mechanism**

ZTE’s patented ZESR technology is able to implement fast convergence and provide less than 50ms protection switching time for key services in case of link failure, thus guaranteeing stable service delivery and carrier-class reliability of the network.

**Effective bearing of voice and video services**

The ZXR10 G-series, 5200-series and 5900-series switches can all support multicast communication. They have the controllable multicast capabilities such as multicast management, multicast security control and static multicast configuration, allow separation of unicast and multicast communication and support fast switchover of channels.

**Efficient management and maintenance mechanism**

It is necessary to enhance service management capability based on the traditional network management. Services are identified at the edge layer so that classification, scheduling and shaping of the flows can be done to effectively control point-to-point (P2P) traffic.

**User and network security guarantee**

ZTE’s series of switches can distinguish users, implement secure separation and fully support network security technologies, enabling operators to carry multiple services with one bearer network.

**Resource savings**

ZTE’s G-series core routing switches provide powerful service support capabilities as well as abundant and extensible interface types to satisfy PCCW’s needs for rapid capacity expansion. Moreover, they are fully compatible with the operator’s incumbent network and can support smooth upgrade by software, thus helping the operator save lots of equipment costs. During the network upgrade and evolution, they can also save fiber, interfaces and other network resources.

**Summary**

A standards-based network must have the features of scalability, QoS guarantee, reliability and carrier-class management. Guided by this idea, PCCW joins hands with ZTE to construct a robust broadband access network. The network serves as a multi-play platform capable of carrying IPTV, NGN, 3G and metro Ethernet services, and provides PCCW’s enterprise users with high bandwidth, high QoS, and highly-reliable 10 GE service access.
ZTE Builds an Advanced Gigabit Metro Ethernet Network in Australia

Yu Liting

On March 14, 2008, Australian telecom carrier Amcom Telecommunications won the 17th Western Australian Information Technology and Telecommunications Awards (WAITTA) for its DWDM and Gigabit Ethernet Network. This award-winning network adopts ZTE’s integrated Metro Ethernet network solutions.

Amcom, a major Western Australian-based telecom operator, has been devoted to delivering telephony, fibre, DSL broadband and Internet services to consumers and business customers since it was founded in 1988. Today, the company has become the fastest-growing broadband service provider in Australia.

Due to the increasing growth of subscribers and insufficiency of network capacity, small-capacity switches and broadband remote access servers (BRAS) are encountering bottlenecks. Broadband services are restricted to Internet access and enterprise dedicated line transmission, so it is difficult to deploy new value-added services. Facing fierce market competition, Amcom realizes that it is an urgent task to restructure the exiting metro network into a new one capable of delivering integrated services. In addition to expanding its IP core network, Amcom needs to consider enhancing the bandwidth access capability of devices at the convergence layer to deploy more value-added services. Amcom started the metro Ethernet network project in 2006, aiming to build a high-quality multi-service bearer platform to transfer voice, data and video services in Western Australia and provide end-users with VoIP, broadband access, and IPTV services.

After careful sifting through networking solutions proposed by global leading equipment vendors and strict tests conducted for the equipments they supplied, Amcom finally selected ZTE to build its new metro Ethernet network in December 2006.

Amcom adopts ZTE’s field-proven 10-Gigabit Ethernet Smart Ring (ZESR) solution, where ZXR10 G-series high-end routing switches used. With modular and distributed architecture, ZXR10 G-series core switches not only provide stable and large-capacity wire-speed switching, but also make use of ZTE’s patented ZESR technology that needs less than 50ms switching time in case of link failure and can provide ideal end-to-end QoS for varieties of services by using traffic classification and queuing technologies. In addition, ZXR10 G-series core switches can fully support multicast, VPN and network security technologies, enabling Amcom to carry IPTV, VoIP and broadband services via the same bearer network.

To solve the network bottleneck problem, Amcom deploys ZTE’s 10G MPLS routing switches (ZXR10 T64G) and ZXR10 3906 switches in six major cities across the country, offering superior large-capacity data switching and access capabilities. To deliver multiple services such as voice, data, video and other broadband value-added services, Amcom puts strict requirements on network latency, jitter and packet loss rate. It adopts ZTE’s non-blocking routing, IP DiffServ, ToS and IEEE 802.1p/q technologies to provide reliable end-to-end QoS guarantee.

After the Gigabit Metro Ethernet network was built and put into service, Amcom has seen an unprecedented growth in broadband users. All data and transmission products supplied by ZTE are running smoothly over the network, helping Amcom achieve expected profits and win widespread recognition from the industry and end-users.
CDMA, as one of the mainstream cellular technologies, has been tremendously successful in the past 10 years. The North America and advanced Asia (including Japan and South Korea) markets have been driving the growth of CDMA, particularly CDMA2000 1x EV-DO. Traditional CDMA equipment manufacturers, namely Alcatel-Lucent, Nortel and Motorola, have been dominant in those markets. As North American and advanced Asian markets mature with a mobile penetration rate more than 80%, emerging markets such as China, India, other emerging Asia-Pacific countries, Africa and Eastern Europe will drive the growth of CDMA during the next 5 years. More than 70% of the new CDMA subscriber base will come from the China and India markets.

ZTE has performed extremely well in the CDMA markets. Not only has ZTE sold more than 20 million CDMA handsets globally, it has also won more than 70 CDMA infrastructure expansion and new contracts in 2007, which placed it first in contract wins in 2007. ZTE has shipped more than 68,000 sets of base stations since it entered the CDMA markets. ZTE’s global installed subscriber lines have more than tripled from 30 million lines in 2005 to 110 million lines by the end of 2007. With the “swap out” agreement with Ericsson and China Unicom in December 2007, ZTE is now the dominant CDMA equipment vendor in China, with more than 34% market share, followed by Motorola with 21% and Alcatel-Lucent with 20%. ZTE also holds a commanding position in the Indian CDMA markets, to which ZTE has shipped more than 20,000 sets of base stations and 10 million CDMA handsets.

In this Yankee Group Report, we evaluate major CDMA equipment vendors’ competitiveness using seven key factors, which are price, technology, existing installed base, integration capability, product portfolio, government support and company culture. We also divide CDMA markets into North America, Advanced Asia-Pacific, China, India, emerging Asia-Pacific, Africa, Latin America and Eastern Europe. We then weight competitiveness scores based
on the subscriber ratio (ratio=regional sub number/global sub number). As shown in Figure 1, Alcatel-Lucent is ranked number one, and will maintain its leadership position until 2009. ZTE is ranked number two from 2007 to 2009–the gap between Alcatel-Lucent and ZTE is closing every year. Nortel and Huawei are ranked third and fourth, respectively, in 2007 and 2008 with very small margin. ZTE’s increasing competitiveness is credited to its large installed base in China, India and emerging Asia-Pacific, as well as its long-term commitment and investment in CDMA technology.

**CDMA Market Overview**

The number of global CDMA mobile subscribers will grow from 381 million in 2007 to 435 million in 2011, with the penetration rate reaching close to 40%. 57% of the CDMA subscriber base is in North America (United States and Canada) and advanced Asia-Pacific (South Korea and Japan). The mobile market in both North America and advanced Asia-Pacific is saturating because of high mobile penetration rate. In the past 10 years, North America and advanced Asia-Pacific have driven the growth of the CDMA market but as the market matures, the growth of the CDMA market will come from the emerging markets. Particularly, China and India will be the main driving force of CDMA during the next 5 years.

China will drive growth with the issuance of the 3G license and the telecom market reorganization. India will drive growth with Reliance, the second largest operator in India, adding a significant number of subscribers in addition to further expansion of wireless local loop (WLL) for Reliance, BSNL and Tata Telecom. Both cellular CDMA and WLL CDMA will grow in India because Reliance is committed to the long-term development of CDMA. Furthermore, WLL is also set to develop quickly in India given the need for cost-effective ways of extending telecom infrastructure in the vast rural areas of India. In mature markets like North America and the advanced Asia-Pacific regions (South Korea and Japan), system upgrade to CDMA2000 1x EV-DO Rev. A and beyond is the main market opportunity.

**CDMA Vendor Competitiveness Analysis**

The CDMA supplier landscape has changed significantly in the past few years. Emerging vendors ZTE and Huawei have been very active in emerging markets such as China, India, Africa and Asia-Pacific. Most of the traditional suppliers, namely Alcatel-Lucent, Ericsson, Motorola, Nortel and Samsung, have decided to cut back their R&D spending on the CDMA product portfolio. Ericsson’s exit from China Unicom is a good example. In this section, we use seven key factors to analyze CDMA vendors’ competitiveness.

- **Seven factors that reflect vendors’ competitiveness**

Yankee Group uses seven factors to analyze a CDMA equipment manufacturer’s competitiveness. Our analysis is based on each vendor’s past performance and regional market growth potential. We apply the same seven factors in different regional markets, which include North America, advanced Asia-Pacific, China, India, emerging Asia-Pacific, Africa, Latin America and Eastern Europe. We rated each vendor on a scale of 1 to 5, where 5 indicates “best.”

- **Factor 1: Price**

CDMA equipment pricing is very sensitive in emerging markets, but less sensitive in mature markets such as North America and advanced Asia-Pacific. In our analysis, we have scored almost the same for all vendors in North America and advanced Asia-Pacific. Both Huawei and ZTE have been given the highest score in this category in emerging markets.

- **Factor 2: Technology**

We not only evaluate the technology competitiveness based on the current CDMA technology maturity, but also the company’s commitment to the CDMA market and its continued investment in the CDMA-related R&D. We gave high scores to Alcatel-Lucent, Huawei and ZTE in this category.

- **Factor 3: Existing installed base**

Existing installed base is very important for CDMA equipment vendors’ market positioning. We gave Alcatel-Lucent and Nortel very high scores in North America and advanced Asia-Pacific because of their dominant market position in those markets. We also gave Alcatel-Lucent, ZTE and Motorola very high scores in China. Huawei scored high in emerging Asia-Pacific and Latin America.

- **Factor 4: Integration capability**

Their integration capability is also a key factor for CDMA equipment vendors to win business. We not only consider the vendor’s experience and track record in the area, but also analyze how the vendor develops its professional services business strategy. In this category, traditional vendors such as Alcatel-Lucent, Nortel and Motorola have clear advantages over emerging vendors such as ZTE and Huawei.

- **Factor 5: Product portfolio**

Product portfolio includes a radio access network (RAN), core network and terminals. Huawei and ZTE have a clear advantage in this category. Alcatel-Lucent and Nortel scored low because they lack terminal products.

- **Factor 6: Government support**

In this study, we use this factor to assess a government’s impact on a local telecom market. In mature markets,
we gave Alcatel-Lucent, Motorola and Nortel relatively high scores. For China, India and other emerging markets, we have given Huawei and ZTE relatively high scores. A government’s impact is more significant in emerging markets than mature markets.

Factor 7: Company culture

Company culture reflects the vendor’s relationship with carriers, employee turnover and localization. Alcatel-Lucent, Nortel and Motorola scored high in North America and advanced Asia-Pacific. Huawei and ZTE scored very low in North America, but relatively high in China and India.

Vendor competitiveness analysis

Using the seven factors, we scored major CDMA equipment vendors’ competitiveness by major markets. As shown in Figure 2, Alcatel-Lucent and Nortel are the most competitive vendors in North America and advanced Asia-Pacific, followed by Motorola. ZTE is the most competitive vendor in China, India, emerging Asia-Pacific, Africa and Eastern Europe.

Market Opportunity for CDMA Vendors CDMA2000 EV-DO Rev. A and Beyond

Alcatel-Lucent has captured most of the CDMA2000 1x EV-DO Rev A network upgrade business so far through network upgrade deals with Verizon Wireless and Sprint Nextel. Most recently, Alcatel-Lucent also won the first commercial deployment of CDMA2000 1x EV-DO Rev A network in Macau for China Unicom. The CDMA2000 network upgrade opportunity is clearly in CDMA2000 1x EV-DO Rev A. Only a company with strong CDMA2000 1x EV-DO Rev A solutions will have a chance to continue competing in the CDMA markets.

Noticeably, according to CDG, ZTE has won more than 10 contracts in deploying commercial CDMA2000 1x EV-DO Rev A networks, including one with AirCell in the US market. Recently, top CDMA operator Verizon Wireless announced that it will adopt LTE as its 4G evolution strategy. This has opened new opportunity for companies such as Alcatel-Lucent and ZTE, both have been developing LTE products for CDMA2000 1x EV-DO Rev A. Verizon’s move will likely create challenges for its traditional infrastructure vendor Nortel and Motorola; both have been cutting back their R&D investments on CDMA products. The lack of R&D capability in developing LTE for CDMA2000 will eventually prompt Nortel and Motorola to work with either ZTE or Huawei in this area.

We believe CDMA migration path faces great uncertainty beyond EV-DO Rev A. The US wireless market has been the home of CDMA. With Verizon and Sprint Nextel picking LTE and mobile WiMAX as their 4G evolution path, respectively, it is almost certain that CDMA’s life will not go beyond EV-DO Rev A. CDMA’s 4G migration path using LTE or mobile WiMAX will create new opportunities for Alcatel-Lucent, ZTE and Huawei. Alcatel-Lucent and ZTE, with their large existing installed base, have the best chance to win CDMA’s 4G evolution business.
Easyservice Reducing OPEX of Broadband Services

Wang Fengyan
According to the PointTopic statistics, by the end of Q3 2007 there were 328.8 million broadband subscribers worldwide and in the next few years the broadband subscriber base will maintain a very high annual growth rate. The broadband services have generated significant revenue to operators. Especially, the revenue from broadband value-added services continues to grow at faster pace. Broadband services are becoming a main revenue resource for fixed-line operators and will play an important role in their business operation.

Broadband services not only bring about considerable revenue but also present a big challenge to operators. The capital expenditure (CAPEX) and operating expenditure (OPEX) are the two dominant cost factors that operators need to consider during the whole life cycle of the services. Compared with CAPEX, the OPEX issue is more important because it is basically a long-term expenditure that covers very broad aspects. Many high-end operators pay more attention to the OPEX factor of broadband service solutions, and are trying to find out an effective mode to cut it down. The OPEX issue has become an important and urgent task for operators’ business operation.

The OPEX of broadband services mainly involves three parts: management cost, maintenance cost and marketing cost. The management cost is based on the new technology management, new equipment management and the associated human resource management. For the introduction of a new technology, it might take a long time and cost a huge amount of money for operators to understand and master the technology. For the new equipment, operators shall lay down some related management procedures and regulations and establish a new management team as required, which also needs a certain number of investment portfolios. Generally, the new technology management and new equipment management are both related to the increase of human resource cost, thus resulting in the increase of OPEX. The maintenance cost includes the maintenance tools fee, onsite maintenance fee, customer service center operation cost and relevant traffic fee. Currently the most popular broadband access is the Digital Subscriber Line (xDSL), and the Passive Optical Network (PON) technology will be widely applied in the coming years. According to the statistics, about 65% of all broadband application failures occur at the broadband home user side, 25% of the failures occur at the copper or fiber access side, and only 10% of the failures are found on the broadband access and upper-level systems. The statistical figure clearly shows most of the maintenance cost is caused by the failures at the users’ home side, which leads to the increase of OPEX. Therefore, it is very important for operators to reduce the related onsite maintenance cost. The marketing cost is another factor contributing to high OPEX. To attract more users, operators need to launch more aggressive marketing campaigns such as new service and product announcements, advertisements and telephone call promotion.

An effective way to cut down OPEX is to build a new business operation mode, i.e., service-oriented and point-to-point service operation. Under this mode, the network operation features three major transformations: from access-oriented to service-oriented, from equipment-centered to customer-centered, and from manpower-concentrated to knowledge-based. With the three transformations, the service operation is greatly enhanced. Firstly, a knowledge-based system is...
set up to help operators understand and master new technologies. Secondly, an operator-to-user channel is created not only to help users handle exceptions and faults but also to help operators launch and promote new services. Thirdly, the broadband services operation procedure is established to help operators optimize service management.

Considering all these factors, ZTE has developed and launched its Easyservice (ZXESS), a new broadband services supporting system to help broadband service operators reduce their OPEX. Easyservice is a service-oriented and expert knowledge-based service supporting system that consists of a series of software function modules at both the office side and the broadband user side. The software modules at the office side are normally deployed in the operator network side and the ones at the broadband user side are deployed in the user home. Through the cooperation of these two parts, the Easyservice system forms a unified end-to-end broadband service supporting solution, enabling operators to expand their service operation scope from the telecom network equipment to the home users.

As shown in Figure 1, the software at the office side contains five functional modules: EasyCSM, EasyOptical, EasyMaintenance, EasyGateway and EasyMarketing. EasyCSM located in the customer service center is responsible for fault complaint handling. The position operators working in the customer service center can use EasyCSM to handle fault complaints and remove the faults, especially home network related faults. Through the import of diagnostic codes and expert knowledge base and with the assistance of EasyAssistant at the user side, EasyCSM can help operators dramatically reduce onsite maintenance and thus lower broadband complaints. EasyOptical is the PON-oriented maintenance procedure management software responsible for PON fault diagnosis, maintenance procedure management and PON access capability optimization. Adopting the service application-oriented failure diagnosis technology, EasyOptical can help operators optimize the management procedure, shorten failure diagnosis time, and improve PON maintenance efficiency. EasyMaintenance is the DSL-oriented maintenance procedure management software that fulfils similar functions like EasyOptical over the DSL network. EasyGateway is the customer premises equipment (CPE) remote management software based on the TR-069 protocol. It acts as an Auto Configuration Server (ACS) and implements remote management of home network terminals including remote terminal version management, software upgrade and fault diagnosis, thereby reducing onsite operation and maintenance and improving service efficiency. EasyMarketing is the value-added service supporting software responsible for broadband services promotion management. It is specially designed to help operators change their business marketing mode, drive the penetration of broadband services, and boost marketing efficiency.

The software at the broadband user side consists of two functional modules: EasyGuider and EasyAssistant. EasyGuider is the terminal installation navigation software that helps operators address the service access issue at the user side, lowering service fulfillment costs and improving the efficiency. EasyAssistant is the home network service terminal software that can resolve failures related to broadband access, including the failures occurring in both the PC and CPE. Through the self-diagnosis function of EasyAssistant, users can detect and remove most of the failures themselves, thus greatly lowering the operator’s O&M investment and enhancing broadband service quality. Moreover, EasyAssistant builds a broadband service supporting channel between broadband users and operators, so that operators can easily push new services and advertisements to broadband users the first time and meet their specific needs for customization.

As the broadband technology and services are developing day by day, the service supporting technology also has to be developed accordingly. Easyservice, as a future-oriented broadband service supporting system, is now following the latest trends in broadband, supporting not only fixed-line broadband services but also mobile broadband services based on the WiMAX or 3G in the near future. With the abundant experience in the broadband field, ZTE’s Easyservice will bring more convenience and cost savings to service operators.
ETC's Mobile Millennium Project

Wu Xingyu, Qi Dianning

Ethiopian Telecommunications Corporation (ETC) is one of the earliest state-owned companies in Ethiopia that holds the country’s telecom monopoly. ETC has deployed a 900M/1800M GSM network with a capacity of 800,000 lines in Addis Ababa, the capital city. The GSM system in 1800M frequency band was constructed by Nokia, and has a capacity of 450,000 lines; the GSM system in 900M frequency band was installed by Ericsson, and has a capacity of 350,000 lines. The actual users had reached 750,000, reaching saturation levels. The network is severely congested that ETC stopped selling SIM cards at the beginning of 2007, and a SIM card became hardly available. Such a network cannot accommodate the growing traffic volumes and the need to upgrade the current network became increasingly urgent with the advent of Ethiopian millennium.

Striking the Deal

According to the Ethiopian calendar, September 11, 2007 is the start of the 2000th year. To ensure that all millennium activities were carried out smoothly, the Ethiopian government required ETC to guarantee a smooth and trouble-free mobile communication during the millennium celebration period. ETC, accordingly, put forward the “millennium project”. In late 2006, ETC signed a three-year framework agreement with ZTE as the sole supplier for its expansion projects worth US$1.5 billion. In April 2007, ETC signed a formal contract with ZTE. Under the contract, ZTE will upgrade ETC’s network for the upcoming Ethiopian millennium celebration.

This is the first substantial contract since the framework agreement was signed between ZTE and ETC. Its success would have a far-reaching
impact on ZTE’s development in the Ethiopian market. ZTE paid much attention to this project, and made a series of plans while developing a schedule of the milestones of the project.

A Key Path
The core network construction time is long, and the debugging of other equipment could not be completed without the cooperation of the core network. Therefore, the project team decided to devote strong forces to building the core network in advance. In the process, several team members spent multiple sleepless nights in the operator’s equipment room while the backbone experts stayed in the equipment room of Nanjing R&D Center to provide remote online support.

A Race Against Time
Ethiopia’s rainy season starts from mid-to-late June, which presents an unfavorable condition for the construction of base station sites, especially the iron tower groundwork. To ensure project progress, the project team decided to complete the site civil engineering as much as possible before the rainy season.

The project team concentrated their efforts on the iron tower groundwork as soon as the materials arrived. After one month’s hard work, ZTE had finished the civil engineering of most sites by the end of June 2007, building a solid foundation for the commissioning of new sites.

Elaborate Organization
Massive base station and power supply modules arrived in mid-July 2007, and ZTE had to complete equipment installation before August 15th, 2007. Because of time pressure and heavy workload, the frontline leaders urgently transferred an engineering team of hundreds of workers from China to the project site.

There existed many coordination difficulties in commissioning the base stations in the capital city, but under the elaborate organization of the team leaders, all base stations in the capital city were unexpectedly installed on time.

Removing Problems to Improve Performance
September 1st to 6th 2007 was the period to improve an overall network performance before number allocation. Cross talk effects occurred in a large area on September 1st; facilitated by the project team, ETC engineers located the problem at a BSC of the N company after one day’s dial test, and coordinated with the N company which then quickly solved it. On the night of September 7th, it became impossible to call from a number segment; dialing a regular number would initiate the prepaid service process; with the help of the project team, the problem was located at an intelligent network of the H company through dial test and signal tracing, and was soon settled. For some particular areas that experienced severe congestion problems, the project team balanced the network traffic and improved the network performance by adjusting cell reselection parameter, handover parameter and antenna feeder, as well as providing Half Rate (HR) support.

Millennium Eve
ZTE and ETC jointly formed a millennium network safety assurance team to guarantee the stable network operation during the festival.

On September 16th, 2007, a good news was sent from Ethiopia: “Ethiopian network got through millennium’s peak traffic in a stable manner”. Since September 10th, 2007, the new network traffic had reached record heights and surged from 9,000 Erl per hour to the highest peak 14,000 Erl per hour on the night of September 12th, 2007, and the whole network operated stably throughout. The whole network traffic in the capital city had decreased to a normal level by 6:00 in the evening of September 13, indicating the network had gotten through the peak traffic during the millennium celebration. Currently, all network performance indices were superior to the indices before the cutover. The GSM network added nearly 90,000 subscribers in just four days, and the Ethiopians, for the first time, enjoyed GSM short message service at New Year’s Eve.

Good Project Leads to New Contract
This project lasted for less than 5 months, starting from April 25th until September 11th, 2007, Ethiopia’s new millennium. The team members have overcome many difficulties: short period, rainy season, and high technical risk involved in relocation and cutover. And they finally completed the project on schedule, with the required quality, giving a millennium gift to Ethiopians. The Ethiopian Premier Meles Zenawi highly praised the project, “This is unprecedented in the Ethiopian telecommunications history”.

The successful implementation of the millennium project also resulted from ETC’s effective coordination and support. After the millennium celebration, another piece of good news came: “ZTE received a phase two contract valued at US$500 million from ETC”.

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ZTE USA, Inc., a subsidiary of ZTE Corporation, announced at CTIA Wireless 2008 the availability of two new handsets for the U.S. market, the ZTE C78 and the ZTE C79 music phone. The handsets are among the first in the U.S. market to operate on the AWS frequency bands, in addition to the PCS and Cellular bands. Carriers who operate on these frequencies can now provide subscribers access to current and next generation voice, data and multimedia applications with ZTE’s high quality and affordable multimedia handsets. The C78 and C79 will join the recently announced C88 in ZTE’s portfolio of handsets for the U.S. market.

“With the recent availability of the new AWS spectrum, carriers now have the potential to provide expanded wireless services to U.S. customers. Selecting the right device is a key to bringing the benefits of the new spectrum to life for end-users,” said Dr. George Sun, CEO of ZTE USA. “Our new handsets allow U.S. carriers, both large and small, to leverage the AWS spectrum and fully profit from their investments in the spectrum.”

The C79 is a full-featured and easy-to-use flip phone which includes an MP3 music player, 1.3 megapixel camera, stereo Bluetooth, a 2 inch high resolution screen and support for MicroSD removable memory cards.

The C78 handset is an affordable “candy bar”-shaped phone equipped with a VGA camera and capabilities for multimedia messaging and Internet browsing. It also enables hands-free conversation through wireless headsets supporting Bluetooth.

As with all its products, ZTE both designs and manufactures its handsets in-house. This end-to-end approach enables ZTE to offer feature-rich, high quality phones at an attractive price point.

ZTE offers a full portfolio of end-to-end wireless handset and networking solutions in the U.S. that are designed to offer quality and technology innovation at affordable prices. The company’s handsets have won numerous international design awards.
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