A Milestone of GSM BTS

Stepping Forward to a World-Class Corporate University

An interview with Chen Jianzhou, Dean of ZTE University
January 18, 2010, Jakarta — ZTE today announced that it has successfully constructed and launched the world’s first commercial EV-DO Rev.B network in Bali, Indonesia, together with Smart Telecom, one of Indonesia’s CDMA telecommunication service providers, and Qualcomm, the leading developer and innovator of advanced wireless technologies and data solutions. In the first phase, 48 CDMA base stations have been upgraded to EV-DO Rev.B commercial systems to provide an average download speed of 8.6Mbps to a peak download speed of 9.3Mbps.

The commercial network will provide Smart Telecom customers with high-quality voice and mobile data services. Through its highly innovative solutions, ZTE has provided Smart Telecom a leading edge in the telecommunication industry in Indonesia, especially among the CDMA operators. ZTE has also this month launched its EV-DO Rev.B data card AC2790 in Indonesia market. ZTE will continue to support Smart Telecom with technology innovations as well as sustainable development to reduce network construction, operation and maintenance costs and to provide local users with the highest quality, high-speed communications services.


Smart Telecom, part of the Indonesia’s renowned consortium Sinar Mas, is one of the leading telecom operators in Indonesia market. Smart Telecom had previously utilized 3.1Mbps EV-DO Rev.A technology. The 9.3Mbps download rate of its new EV-DO Rev.B commercial network makes Smart Telecom the fastest 3G network in Indonesia.

“EV-DO Rev.B network is now commercially available, and only in the Bali Denpasar area,” said Mr. Sutikno Widjaja, President Director of Smart Telecom. “Within Q1 2010, all existing base stations in Bali will be upgraded to EV-DO Rev.B and by the end of 2010, Rev.B is expected to be available throughout all major cities in Indonesia. To date, Smart Telecom has 32 cities covered with its previous evolution, EV-DO Rev.A which provides the most reliable wireless broadband services at a download speed of up to 3.1Mbps.”

“It’s an honor for ZTE to cooperate with Smart Telecom to deploy the first EV-DO Rev.B technology in Indonesia,” said Mr. Cuiyi, President of ZTE Asia Pacific Region. “I would like to extend my warmest congratulations to Smart Telecom on becoming the world’s first operator providing commercial EV-DO Rev.B services to its customers. Largely attributable to Smart Telecom’s strong track record for technology development and deployment and its reputation for high levels of service, Indonesian people are now benefiting from experiencing the most advanced EV-DO data services in the world.”
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An interview with Chen Jianzhou, Dean of ZTE University

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News Brief

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

An interview with Chen Jianzhou, Dean of ZTE University

By Zhao Lili

ZTE University stands on the east coast of Shenzhen, a prosperous coastal city in southern China. It is a corporate university founded by leading telecommunication equipment and network solutions provider, ZTE Corporation. Relying on technical strength, advanced training facilities, standardized training management, and a team of excellent lecturers, the university has attracted learners from all over the world who are eager to learn telecommunications knowledge and advanced management ideas.

Recently, reporter Zhao Lili of ZTE TECHNOLOGIES interviewed Chen Jianzhou. Now, let’s dive into this corporate university on the beautiful seashore.

Clear Orientation Creates Better Value for Internal and External Customers

Drawing on many years of experience in the training industry, Chen Jianzhou explained three key elements necessary for building a corporate university. These elements include correct orientation, clear internal and external service-driven mechanisms, and continual building of core competency to improve services. So how does ZTE University make its orientation clear and improve its value?

Chen Jianzhou told us that the
Our university is committed to providing professional training, documentation, and consultancy services to ZTE and its cooperators, and to build strategic cooperative partnerships. Currently, the university operates three kinds of businesses: training, documentation, and hotel. The training business comprises ZTE staff training, and external customer training, both of which employ technical and/or management training according to specific needs.

The documentation business also consists of two parts: general user-orientated documentation and customized documentation. The former is delivered to customers in conjunction with ZTE products, while the latter focuses on specific projects, and is under full-process management.

The last business is our hotel business, which differs from an ordinary hotel business. It offers facilities such as classrooms, projectors, audio, and print materials, thereby satisfying specific training needs. ZTE University has been in existence for seven years, and its responsibilities have been continually expanded during this time. Apart from these three major businesses, ZTE University also assists ZTE in its effort towards globalization, which involves building up an English working environment, implementing English certification, and offering English training.

A major change for the university, occurring in 2009, was the introduction of market-oriented services. Market-oriented services are designed to enhance the company’s brand image and push forward its services marketing through value-added training and services contracts. “We have attracted income to ZTE after promoting service contracts in 2009. We have also made contributions towards furthering the company’s services marketing; in particular, our training courses on management and advanced techniques have strengthened our communication and exchanges with high-level customers. The management training we offered to high-level leaders of a telecom operator in China, for example, played an important role in its service transformation, helping them to strengthen business vitality and improve operational efficiency,” said Chen Jianzhou.

In addition to training, documentation also plays an important role in ZTE and partner organizations. Some high-end operators pay great attention to documentation detail and usually ask for customized documentation. For example, in a cooperative project with a Hong Kong mobile operator, the university successfully developed customized documentation for them through project operation management. The project itself was complicated for it involved 2G/3G network swapping and convergence, a feature which posed great difficulties to the process of document production. Therefore, the university promptly assigned documentation managers to the project site and set up a full-process documentation delivery team. Employing such joint efforts, the team was able to supply satisfactory documents to the operator.

In addition to its external customers, ZTE University is also responsible for training the company’s staff and management leaders. Training classes are arranged annually for management leaders at all levels, and have played a significant role in deepening their understanding and encouraging the implementation of company policies and strategies.
Learning-Oriented Hotels Open Up New Business Model Opportunities

The hotel industry occupies a central place in the working and daily lives of many people — especially business people. A person’s time can generally be spent at home, in the company, or on a journey. When on a journey, people usually require the services of a hotel, and commercial hotels are the most common type of hotels used for business and other purposes.

When asked to describe learning-oriented hotels, an idea put forward by ZTE University, Chen Jianzhou gave us a clear answer. He said that there could be many types of hotels with different market orientations, such as commercial hotels, convenience hotels, and learning-oriented hotels. ZTE’s learning-oriented hotels aim to create a truly people-oriented learning environment that can meet training needs. The concept of learning-oriented hotels put forward three years ago is different to that of commercial hotels.

Learning-oriented hotels are designed to create a convenient environment for learners. Signboards inside the hotels, for instance, are different to those in other hotels. The learning-oriented hotel in Dameisha, Shenzhen, has clear signboards that guide learners from lobby to classroom, dining room, and guest room, and provide specific information about classes, dining, and rest time. Each guest room is equipped with reference books for learning, and high-speed Internet access, which allows learners to browse the university website and communicate with one another. The hotel also has a book bar where learners can borrow or check out learning materials.

Consumption and entertainment facilities unrelated to learning, such as sauna and department stores, are not available in the hotel. Moreover, we are actively exploring new methods of classroom management, and new designs that will improve ease of use in lecture rooms, discussion rooms, and library. Overall, we focus on learning as a key concept when building and operating our learning-oriented hotels.

Strengthening the Construction of Overseas Training Centers

With the continuous expansion of ZTE’s business around the world, the globalization of training has also become a necessary task, and an important direction of development for ZTE University. It has been four years since ZTE University started to build overseas training centers in 2005. Overseas training centers not only facilitate learning for both local ZTE employees and overseas customers, but also contribute to the promotion of skills of the local population.

On this point, Chen Jianzhou provides valuable insight. First of all, the business of ZTE University serves the company’s strategy, so its domestic and overseas operations are in line with the company’s strategy. We will continue to develop overseas training centers based on the following needs:

First, overseas training centers are necessary to meet the training needs of overseas customers. In most cases, customers require the company to provide relevant technical training when signing contracts. It is often impractical for the customer to send all its employees to China for training; therefore, 80% of customers ask for local training delivery. This means that in the future, we will need more of our own facilities, and resources such as teachers, classrooms, organizers and accommodation. Customers from developing countries sometimes even ask us to assist them in establishing their own technical centers in a bid to strengthen the capability of their employees.

Second, overseas training centers are necessary to meet the needs of our company. ZTE now employs several thousand international staff in its overseas offices. They also need to expand their knowledge and develop relevant skills. However, most are located outside China, so the challenge for ZTE University is to meet their learning needs. Considering all the differences between countries and languages, how should we reasonably arrange training?

Third, there are needs centered on documentation. Standardized documents provided with each ZTE product line have become incapable of fully meeting the customization requirements of our clients. In particular, some high-end customers require documents to be exactly consistent with their on-site equipment. So some documents need to be developed locally. In addition, the company’s international employees also need access to documentation, even if they have already received relevant training, as the transmission of routine information relies mainly on documents.

Fourth, there exists the need to train overseas university students. Through training, ZTE pools local telecom talent and provides these students with job opportunities, which also helps expand
the company’s local brand and reputation.

Since 2006, we have established 10 overseas training centers in countries as diverse as Ethiopia, India, France, Brazil, Indonesia, Pakistan, Algeria, Egypt, Columbia and Mexico. The training centers in Ethiopia, India, France and Brazil have also been upgraded to overseas divisions. They are called overseas divisions because they not only provide standard training, but also manage document production and other responsibilities of the university.

With respect to training bases, besides the Dameisha training base in Shenzhen, we will establish new bases in Shanghai, Nanjing, Xi’an and Sanya, China, in 2010 to alleviate the mounting pressure on Shenzhen, and to offer greater convenience and more courses to learners. We also plan to establish overseas training bases for the first time in Ethiopia and France.

With the gradual development of overseas training centers, ZTE University has not only meeting the company’s internal and external learning and training needs, but is also contributing to the improvement of knowledge and employment among local people. The company’s leader once stated that the biggest social responsibilities of an enterprise are firstly to pay tax, secondly to reduce unemployment, and finally to contribute to the industry and field you are in. In the communications industry, for example, a business’s responsibility might be to construct high-quality communications networks worldwide. Apart from this, there also exist other types of social responsibilities, such as protecting the environment.

For ZTE University, a core social responsibility is to train learners and facilitate the transfer of knowledge. Knowledge is a kind of productive force. China advocates invigorating the country through science and education, the core of which is knowledge. The aim of education is to cultivate talents, and the core value of knowledge is reflected through people. This process is dynamic and so must be the dissemination of education and training. The dissemination of knowledge drives competition, and is a central tenet of social responsibility. Improving the capabilities an individual enhances the capability of a team as a whole, and the overall capability of society.

Take the training center in Bandung, Indonesia as an example. It has been a very successful endeavour. The center trains customers and ZTE staff, publicly recruits local learners, and trains local talents. It has received a positive response from the local society. A great number of university students and those seeking re-employment have all registered actively. As for those with outstanding academic performance, ZTE has chosen to directly hire them. In this way, ZTE is annually contributing to the development of a large number of talented individuals within the local Bandung area, while providing many job opportunities — which has positive flow-on effects for the wider society.

**Plans for the Future Based on the Vision**

Speaking on the vision and future plans of ZTE University, Chen Jianzhou was very pragmatic and clear-minded. “ZTE’s vision is to become a world-class enterprise in the telecom industry. As a corporate university within ZTE, it also aims to be a first-class corporate university within the industry. Driven by such an ambitious goal, we can plan our future in a scientific way. Our university will serve as an efficient and advanced knowledge-service platform that can directly contribute to the company’s business growth. This is our overall orientation,” said Chen Jianzhou. “On this platform, we will launch training, documentation, and learning related software development, as well as consultancy services and interactive businesses related to knowledge transfer. It is a challenge for us, because we not only need to keep abreast of the company’s internal and external environments, but also the most advanced knowledge, methods, and means within the telecommunications industry.”

Chen Jianzhou added that it is very important for the university to effectively integrate internal and external resources to push forward the goal together. For example, engaging professionals in developing or teaching training courses is an important consideration. Such professionals might not work in the university, but in another department of the company or even outside the company. Attracting individuals who are skilled in both theory and practice to ZTE University is a challenge.

Indeed, how to integrate all resources, correctly understand internal and external environments, and offer better service is a challenge for ZTE. Moving into the future, we intend to stick to our original development direction, that is, we will continue to actively expand our knowledge service systems and improve the capabilities of individuals, while pressing for the construction of training bases at home and abroad. We will set key projects according to the company’s strategy and provide high-quality training and documentation through our efficient operations to meet diverse training needs. Moreover, we will actively expand our development space, integrate our resources, and pay close attention to the training field, with the view of building ZTE University into a corporate university of global excellence.
A Milestone of
GSM BTS

Application of Multi-Carrier Technology in GSM

By Lv Qianhao

Evolution of Broadband GSM BTS

Global GSM subscriber base is expected to reach a record of 4.2 billion at the end of 2010. As the most important part in the mobile communications system, the GSM EDGE Radio Access Network (GERAN) is advancing with the evolution of standards and technologies. The growth history of GSM BTS is exactly an epitome of the development of wireless technologies. The current GSM BTS has gone through four stages as shown in Figure 1.
GSM is a narrowband digital communications system. Both the 1st and 2nd generation GSM BTS adopted the Single-density TRX Unit (STRU). With the miniaturization of RF components and the development of DSP technology, the Dual-density TRX Unit (DTRU) was widely used in the 3rd and 4th generation GSM BTS. The dual-density module encapsulates two single-density RF modules in one unit to double the capacity of BTS. However, STRU and DTRU are in nature narrowband carrier technology, in which each carrier corresponds to a separate RF channel.

As operators are increasingly focusing on lower TCO and smooth evolution, the key for them to survive the competition is to fast and cost-effectively deploy or expand their networks. This requirement gives rise to the 5th generation GSM BTS that supports 3GPP R7/R8 EDGE, and 3GPP R9 EDGE Enhancement and Evolved-EDGE. The 5th generation GSM BTS can provide data rates of up to 2–4Mbps at the air interface for GSM and support WCDMA, HSPA, or even LTE. It also supports MIMO and OFDM. The introduction of software radio combined with the wideband Multi-Carrier Power Amplifier (MCPA) technology and the reduction in cost help to make a truly Software Defined Radio (SDR) BTS.

**Introduction of MCPA into GSM**

The core of the 5th generation GSM BTS is open architecture based on the wideband multi-carrier technology, in which MCPA is introduced into the GSM RF module to substitute the traditional narrowband analog power amplifier and achieve broadband RF.

As shown in Figure 2, the core of MCPA is to first couple signals in the digital Intermediate Frequency (IF) part, and then output them through the broadband power amplifier, which means that a physical module can be software configured as required into many logical radio sub-carriers without the need of coupling. This would undoubtedly help to develop a low-TCO BTS featuring higher integration, larger capacity and lower power consumption. Moreover, the Digital Pre-Distortion (DPD) technology widely used in WCDMA MCPA can also be widely used in GSM BTS, which will further improve the service support capacity of GSM BTS and greatly extend the life cycle of GSM network.

The multi-carrier technology was commercialized in WCDMA base station as early as in 2002, and then extensively used in CDMA2000 and TD-SCDMA base stations. However, it was not until 2008 that ZTE took the lead to introduce it into the GSM field. The reasons lie in technology, cost and standard restraints. Firstly, WCDMA and CDMA2000 are wideband multi-carrier systems, while each carrier in GSM system has only a bandwidth of 200kHz. The narrower the bandwidth, the more difficult the design of IF and Digital-to-Analog Converter (DAC). Secondly, due to the higher initial cost, MCPA is not suitable for the widely-used GSM system. Thirdly, no GSM standards prior to 3GPP R8 cover the multi-carrier technology.

Driven by factors like market potential, structure update, cost reduction, and standard evolution, major GSM equipment vendors begin to pay great attention to the development of GSM BTS. The
BTS products are evolving to have higher integration, smaller size, lower power consumption and wider application, and to support higher-speed data services and multi-network convergence. The R&D of RF module has attracted increasing attention in the industry, with the view to reducing cost and improving performance to adapt to the new technologies and standards. All this leads to the introduction of MCPA into GSM.

**Multi-Carrier GSM BTS — The Edge Tool to Cut TCO**

**Fast deployment, green coverage**

The typical capacity of a traditional GSM BTS is 12TRX. The largest dual-density BTS of the industry launched by ZTE in 2007 has a capacity of only 18TRX. After adopting the multi-carrier technology, one MCPA can support a capacity of six GSM carriers, three times larger than the traditional DTRU; and the BTS is smaller in size, which can support 36TRX in a single cabinet and 72TRX in a stacked cabinet. The adoption of the multi-carrier technology makes it unnecessary to use the hybrid combiner or double filter combiner, and helps to reduce equipment failure and insertion loss. Therefore, the multi-carrier GSM BTS has the advantage of strong coverage over the traditional one.

In addition, the MCPA module allows the sharing of power resource, or a power pool, helping to implement dynamic coverage-capacity swapping and improve the coverage area of the BTS.

With the help of technologies like DPD, the efficiency of MCPA has been further enhanced. Because MCPA has a unique carrier pool, its power resources can be allocated dynamically based on the traffic and the power needed. This improves the BTS resource utilization. Besides, since MCPA needs no combiner, its power consumption is greatly reduced. Therefore, the carrier power needed to cover the same area is greatly reduced. For example, the power consumption

> The BTS products are evolving to have higher integration, smaller size, lower power consumption and wider application, and to support higher-speed data services and multi-network convergence. “
of ZTE’s BS8800 SDR (multi-carrier GSM BTS) is only 70% of or even lower than that of the traditional GSM BTS, as shown in Figure 3.

Using the multi-carrier GSM BTS that features high integration, low power consumption, and high power output, the number of BTSs needed for network construction is significantly reduced. Hence, the goal of fast network deployment and green coverage can be achieved.

**Easy O&M, smooth expansion**

The MCPA module enables higher BTS integration and fewer BTSs used, which helps to reduce the O&M cost and difficulty, and achieve smooth capacity expansion.

For example, a GSM operator adopted the configuration of S222 at the initial stage of network construction, but later it needs to expand the configuration to S666 due to the growing subscriber base. If the operator uses the conventional dual-density carriers, it is necessary to add one cabinet and six DTRUs, which would be very expensive. However, using the MCPA technology, the operators only need to configure the software at the O&M center, without going to the BTS site to add hardware or modify connection. This would undoubtedly reduce the difficulty in capacity expansion and bring great savings in labor resource and hardware cost.

**Cost-effective evolution**

Both the variety of wireless standards and the growing complexity of network deployment have brought tremendous challenges to the long-term and sustainable development of operators. Traditional GSM BTS fails to achieve smooth expansion while multi-carrier GSM BTS can lay a solid foundation for SDR-based BTS. The RF Unit (RU) of SDR-base BTS is software reconfigurable and programmable, which helps to implement intelligent spectrum allocation and support multiple standards. The GSM BTS based on wideband multi-carrier technology can send and receive RF signals of many standards like GSM, WCDMA and LTE, through software configuration on the 20MHz continuous band. In practical networking, the RF module can be configured to support GSM/WCDMA dual modes, or WCDMA/LTE dual modes, or GSM/WCDMA/LTE multiple modes, thus realizing cost-effective system integration and evolution.

The new-generation SDR-based BTS solution using the wideband multi-carrier technology can not only meet the operators’ needs for building multi-standard, multi-band networks, but also help them effectively adjust their network development strategies to adapt to the market change and achieve sustained competitiveness and profitability.

**Looking into the Future**

The MCPA-based GSM BTS will evolve into a flat Intelligent, Information, and IP-based Base Station System (I3BSS), where the functions of BSC and CN will be integrated into a master BTS, and a slave BTS will be a low-cost, discrete access point. This kind of architecture will further reduce network complexity and construction cost to satisfy the need of a seamless converged high-speed data network in the future.

The introduction of advanced technologies like MCPA, all-IP architecture, high-speed DSP and CPRI into GSM makes a true 3G GSM that can boost profitability and lay a solid foundation for a seamless converged high-speed broadband network.
Today the world is facing all kinds of crises, such as the financial crisis, the environmental crisis, and the energy crisis. As all the crises deeply influence the telecom industry, no one can stand outside of them — Incumbent operators are worried about the continued decline in ARPU, higher OPEX and the risk to introduce new services; emerging operators do not have budget to deploy new networks, especially the RAN with huge CAPEX; governments and telecom regulators find it difficulty to issue new licenses to encourage competition; and consumers hope to access more value-added services at lower fees. All of us are not quite satisfied with the current telecom environment, but how could we do?

Deeper network sharing, especially the RAN sharing, gives us an opportunity to change the telecom industry into a deeper win-win model. Network sharing can have the following benefits:

- Save network OPEX and up to 40% of CAPEX on infrastructure equipment;
- Offer a new resource of revenue for incumbent operators;
- Remove market barriers for new operators;
- Shift the focus of competition from network deployment cost to service innovation;
- Accelerate network deployment, especially in rural areas;
- Help to build a green network and reduce negative environmental impact.

Although network sharing has many attractions, the challenges we have to face are:

- How to share network resources such as frequency spectrum, BTS, BSC, tower, and transmission facilities between operators;
- How to operate and maintain the shared network;
- How to independently deliver new services over the shared network;
- How to allow the access of pre-R6 UE to the shared network without message routing overload;
- How to achieve seamless mobile management;
- How to display the operator’s logo on pre-R6 UE.

As a leading global provider of telecom equipment, ZTE can offer flexible network sharing solutions to meet the various market and customer requirements. All solutions are compliant with the 3GPP specifications and used in open, multi-vendor environments. The innovative solutions ZTE has developed can better address the above challenges.

Generally, there are two main forms of RAN sharing: dedicated carrier RAN sharing (logic BSC/RNC) and shared carrier RAN sharing.

The dedicated carrier RAN sharing mode shown in Figure 1 allows physical sharing of RAN and a logical division of carriers. It is independent of terminals, which means that operators can have their own subscribers and brands, while subscribers do not know whether the network is shared or not. The operators can broadcast independent PLMN IDs on their own carriers, while the UEs only need to access CN of the home operator. As the shared BSC/RNC can be connected to other shared BSCs/RNCs or non-shared BSCs/RNCs, normal handover can be performed between BSCs/RNCs of the same operator to ensure
Focus

With abundant experience in terminal production, ZTE can provide solutions to the problems brought by pre-R6 UE which does not support the 3GPP network sharing protocol, and has developed an innovative solution to decreasing the message routing load.

Facing the deeper crisis in the telecom industry, operators worldwide start to make use of the huge potential and advantages of deeper RAN-sharing. Global tier-one operators such as Vodafone, Orange, T-Mobile and Optus have showed their great interest in the RAN-sharing solution. They are actively performing tests on RAN-sharing, or even require that RAN-sharing be a feature for network admission, especially in Europe.

As a world leader in mobile communications, ZTE can offer deeper RAN-sharing solutions that allow up to four operators to share the same RAN network simultaneously. The deeper RAN-sharing solution will lead the telecom industry towards a win-win model capable of satisfying the needs of equipment vendors, operators, subscribers, and even governments and telecom regulators.

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**RNC/BSC site level configuration including network hardware and transmission facilities;**

**RNC/BSC site level software upgrade and status query;**

**RNC/BSC site level FM and PM.**

The NetNumen™ M31 supports independent NMS interfaces that help operators manage their own networks.

ZTE’s BSC/RNC can provide access control, call control and load balance control based on the operators’ QoS level.

The system resource can be distributed to the operator of higher priority;

The service priority can be defined separately for each operator. Therefore, operators can negotiate to set different priorities in launching different services or the same service with different performance.

In addition, the solution supports Shared Network Area (SNA). CN can send the SNA and LA mapping table to RNC. After the UE attachment procedure, the mapping between SNA and Temporary Mobile Subscriber Identifier (TMSI) is sent to and stored in RNC. In this way, seamless mobility management can be achieved in the handover and location update process.

Due to its simplicity in operation, the dedicated carrier RAN sharing mode has prevailed in recent years. In contrast, the shared carrier RAN sharing mode, a deeper sharing mode that can provide high spectrum efficiency is more complicated and not selected by many operators and vendors.

The shared carrier RAN sharing mode is shown in Figure 2. In ZTE’s solution, a shared NetNumen™ M31 (EMS) provides all O&M functions:

**Figure 1. Dedicated carrier RAN sharing.**

**Figure 2. Shared carrier RAN sharing.**
In the latest epic disaster film, 2012, the world starts to fall apart with volcanic eruptions, typhoons, seismic catastrophes and melting glaciers. Notably, it is not aliens or a killer virus that threaten the human race in 2012, but a heating up of Earth’s core leading to a shifting of its crust, in other words, climate change. In fact, the issue of rising sea levels caused by global warming has been threatening the human race today. Scientists have warned that if carbon emissions are not effectively curtailed, the earth would get warmer and warmer, and some coastal areas would be flooded by the end of the century.

In addition to the climate issue, the human race is also plagued by energy crisis. Scientists predict that the oil on the earth will be used up in 50 years, and coal in 100 years at most. Energy shortage has become one of the world’s largest problems.

According to Gartner, the IT industry’s contribution to the greenhouse effect is up to 2% now. With the growing number of base stations and servers in use, the telecom industry emits more greenhouse gas while consuming more energy. At the 2009 Mobile Asia Congress, the GSM Association (GSMA) announced the launch of Mobile’s Green Manifesto, which has been developed in collaboration with The Climate Group. The Green Manifesto shows that the mobile industry plans on reducing the global greenhouse gas emissions per connection by 40% by 2020 compared to 2009. As the number of mobile connections is set to rise by 70% to 8 billion by 2010, the mobile industry could enable greenhouse gas emission reductions of 1,150 Mt CO2e in 2020, which is the equivalent of taking one in every three cars off the road.

Energy saving and greenhouse gas emission reduction are important factors that most operators consider in purchasing mobile base stations. As the life cycle of a telecom standard becomes shorter and shorter, how to protect the operators’ investments, how to fast construct a cost-effective communication network in underdeveloped regions, and how to ensure the bandwidth for deploying broadband data services in the future are the problems equipment vendors have to consider.

In 2008, ZTE took the lead to launch its SDR series base stations that adopt innovative distributed structure, unified MicroTCA platform, and multi-carrier technologies to significantly boost system integration and efficiency, as well as network convergence and evolution capabilities. ZXSDR series base stations support multi-mode, multi-band wireless operation through software configuration. This not only simplifies network structure, but also allows powerful evolution to LTE, thus greatly reducing the costs in equipment investment and network evolution. ZTE’s SDR series base stations have found successful applications with mainstream operators including CSL in Hong Kong, TATA in India and Best in Belaru. The launch of SDR series base stations makes it easier for GSM operators to build cutting-edge networks with smooth evolution to LTE.

ZTE’s SDR series base stations have the following advantages:

- Unified SDR hardware platform for smooth evolution to UMTS/LTE: As the SDR base station platform supports various wireless standards such as GSM, UMTS and LTE, GSM operators can...
have the flexibility to choose desired technology for their network evolution. For example, they can evolve GSM to UMTS/ LTE or directly to LTE, without any equipment swapping, which maximally protects their investments.

- Energy saving and environment friendliness: The SDR series base stations feature high integration, small footprint, large capacity, and high resource utilization. They use the advanced technologies like intelligent TRX shutdown, intelligent RRU shutdown, PA voltage adjustment, and TCH migration to BCCH TRX, to greatly reduce power consumption.
- Supporting IP networking and mobile broadband evolution: The SDR series base stations support IP backhaul and the base station controllers support IP packet switching. They are used to deliver all-IP networking solutions that allow mobile and broadband evolution.
- A full range of SDR base stations applicable to various scenarios: The SDR series base stations are complete in variety, capable of providing optimum solutions for various application scenarios.

ZTE’s SDR base station family includes indoor macro base station (ZXSDR BS8800), outdoor macro base station (ZXSDR BS8900), distributed base station (ZXSDR BS8700), integrated outdoor micro base station (ZXSDR BS8906), and compact micro base station (ZXSDR BS8908). Each type of base station is composed of the baseband unit, the RF unit and the cabinet, supporting full-band GSM single-mode and full-band GSM/ UMTS dual-mode.

ZXSDR BS8800

It is large in capacity and small in size. It can be used indoors. If using the latest RSU82 RF module launched by ZTE, it provides a capacity of up to 48TRX in a single cabinet. If added the side cabinet, it supports up to 12 RSU modules.

ZXSDR BS8900

It has a capacity as large as that of ZXSDR BS8800, and provides IP55 protection for outdoor use. Its cabinet contains five small shelves that can be flexibly configured for different application scenarios. For different site conditions, it can be used to offer integrated base station, distributed base station or BBU+RRU solutions as required.

ZXSDR BS8700

It consists of two parts: BBU and RRU, which can be used either indoors or outdoors. Such distributed base station architecture allows flexible site selection, zero footprint, extended coverage, and baseband pool in high-traffic scenarios.

ZXSDR BS8906

It can be pole or wall mounted. If using the latest RSU82 module, it provides the configuration of S44 in a single cabinet.

ZXSDR BS8908

It is a compact base station with low power consumption, supporting indoor, outdoor and pole-mounted installations. It is less than 14L in size and less than 15Kg in weight, and consumes less than 200W of power.

Relying on large-scale commercialization of its SDR products, ZTE acquired 20.8% market share of the world GSM wireless mobile equipment in 2009. Its SDR base stations have recorded a total volume shipment of over 200,000 units as of October 2009. It took ZTE almost one year to achieve the first 100,000 SDR units shipped by April 2009, and only six months to ship the second 100,000. The fast growth showcases global operators’ recognition and favor of ZTE as a leading provider of SDR base stations, helping them meet the rapid market needs.
Since firstly appeared in the 1990s, GSM has been growing for 20 years. As it is becoming more and more mature and robust, its network optimization methods keep evolving from drive test data analysis to signaling trace analysis, counter-based performance data analysis, and to handset-based Measurement Report (MR) data analysis. The optimization methods tend to be more intelligent, diversified and more concerned about user speech perception. In particular, the appearance of MR data optimization has greatly changed the traditional way of network optimization, for it can optimize network performance for each user by acquiring and analyzing key MR data in the call. With a complete analysis from the macro analysis at the network level to the micro analysis at the user level, the MR data optimization is adopted to decode the private “call password” of each user, making it possible to offer user-oriented optimization and enhance user speech perception.

**Innovative Data Acquisition**

As we all know, under the GSM mode, the mobile phone makes a measurement report every 480ms on the uplink and downlink level/quality/ Time Advance (TA), power, and neighboring cell level during the call, which accurately describes the user’s wireless signal environment. However, because of the huge number of users, the daily call measurement reports contain massive data. To acquire and analyze the massive MR data, a higher requirement has been raised on system architecture and the way of data acquisition.

Different from the hard data acquisition mode commonly adopted by equipment manufacturers like Ericsson, Nokia Siemens Networks, and Nortel Networks, where MR data are acquired by hanging a meter on the Digital Distribution Frame (DDF) that connects BSC and BTS, ZTE adopts its innovative soft data acquisition mode (see Figure 1), in which MR data are acquired directly from BSC and used for the dedicated server. The direct MR data acquisition from BSC allows simple networking and

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**Figure 1. ZTE’s innovative soft MR data acquisition.**
easy deployment, making it possible to acquire MR data from multiple equipment rooms and adjust the home location of BTS without any effect on MR data acquisition. As a result, the efficiency and stability of data acquisition has been greatly improved.

**Integrated Basic Data**

Acquiring all users’ measurement reports cannot fully satisfy the need of network optimization analysis. We are more concerned about in which call events the users make their measurement reports, namely, about the wireless signal environment during the key call events, such as mobile phone access, assignment, handover, and disconnection. As these data are not carried in the measurement reports, they must be provided with the help of BSC. Through the integrated data analysis, an in-depth analysis of each user’s CDR, and the simulation of each user’s wireless environment during the call, we can get the most accurate first-hand information for network optimization and adjustment.

To make basic data as informative as possible, ZTE’s BSC system provides key information about connection point and time for key call events during each user’s call, and gives a detailed explanation for event failure or abnormal connection release. Moreover, the analysis software can simulate the location where the call is made through a special location algorithm to recover to some extent the whole call process. As a result, all users in the network can provide their “drive test reports” 24 hours every day. The perfect integration of the data from BSC and the MR data from the mobile phone provides a basis for analyzing user call behavior and simulating user speech perception, thus making network optimization more accurate and efficient.

**Efficient Network Analysis**

ZTE developed its NETMAX, a professional network optimization tool that helps to make all kinds of efficient network analysis.

It can acquire relational data of all cells and their related cells through the automatic full-band BCCH allocation scheduling and use them as the basic data to implement network-wide frequency optimization and neighboring cell optimization. All this helps to reduce interference, lower call-drop rate, improve wireless access rate and handoff success rate, and finally achieve the whole network optimization.

It can acquire MR data of the whole network, and provide uplink and downlink coverage statistics, quality statistics, interference statistics, and traffic distribution statistics. With the fine granularity for statistics that covers the carriers of each Network Element (NE), it can accurately tell apart over-coverage, weak coverage, and interfered cells and areas, providing a basis for adjustment of antenna feeder and frequency band.

It can make relational quality/level/TA analysis (see Figure 2) on the basis of the massive statistical data to find the hidden failure and the cells or carriers. Moreover, through the user access failure or assignment failure, it can find the fault connection boards without dial testing, thus enabling quick and efficient trouble shooting.

It can make a statistical analysis of the terminal capability for all users to find the terminal models that have common problems, and thus implement a real end-to-end network optimization.

It can analyze user call behavior (such as frequency offset and handoff), simulate user call behavior, optimize wireless parameters of a single cell, and adjust the Location Area Code (LAC) to provide professional and customized network optimization service.

ZTE focuses on decoding and analyzing the private “call password” of each user with its special MR optimization tool, with the view of offering more considerate and professional network optimization service to operators and best service experience to each subscriber.
Conditions Before the Introduction of SDPs in China

In China, there are three major telecom players: China Telecom, China Unicom and China Mobile. China Telecom has around 350 million fixed line network users. In July 2008, China Telecom acquired the CDMA network of China Unicom supporting around 30 million CDMA users. As a result, China Telecom’s existing service network structure is quite complex (see Figure 1).

The service network is made up of separate “silos” and it is very difficult for China Telecom to achieve its strategic transformation from a conventional telecom provider to a comprehensive information service provider. The existing network architecture cannot meet the requirements of end customers, SPs, CPs and of the operator itself. For example:

- Customers need a greater choice of services and of access methods (i.e. one point of access for all network services). They want more converged services, plus fraud and privacy protection from SPs that abuse the system.

Figure 1. China Telecom’s service network architecture (pre-SDP deployment).
CPs and SPs also suffer from the existing network platform because they require more open network access. They also need lower barriers-of-entry for new audio/data/multimedia and convergent services so they can be introduced more quickly and easily.

China Telecom wants unified management of customer information and service data. It aims to develop a general service platform that can avoid duplicate network construction, that can expand network support for more services, and one that strengthens the supervision of CPs and SPs.

China Unicom has dealt with a similar situation. Before China Unicom launched its Service Delivery Platform (SDP), it had over ten different service management systems (see Figure 2). This complexity made the provisioning and maintenance of value-added services difficult and costly. There was also a lack of information sharing and a much slower product development cycle because of its convoluted network topology.

**SDP Platform Deployments in China**

In order to solve the above problems, and to handle serious competitive threats, telecom operators in China began introducing SDPs starting in 2006.

Equipment vendors, such as Alcatel, ZTE, Huawei, and Ericsson, were active participants since early 2004 in creating SDP specifications and in conducting field trial tests for China Telecom. After four rounds of integration and acceptance testing, domestic vendors produced better results than their international peers. ZTE gained the largest market share, followed by Huawei. After a year of network construction, China Telecom completed SDP deployments in all provinces at the end of 2008.

China Telecom introduced an SDP platform into its network by adding an Integrated Service Access Gateway (ISAG) and an Integrated Service Management Platform (ISMP). This new network had a horizontal architecture (see Figure 3). It successfully lowered market and technical entry barriers for CPs and SPs by establishing a fast, easy, flexible and dynamic service development environment, featuring Session Initiation Protocol (SIP) and Application Programming Interface (API) support, similar to Parlay X.

In the case of China Unicom, Ericsson, ZTE and Huawei played leading roles in setting SDP specifications, in field trials and in platform construction for Value-added Authorization Centers (VACs) and WAP portals. ZTE has clearly demonstrated strong innovation in WAP portals. For example, it can provide a flexible and customizable architecture that caters to the individual

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**Figure 2. China Unicom’s service network architecture (pre-SDP deployment).**

**Figure 3. China Telecom's service network architecture (post-SDP deployment).**
requirements of end users. It is therefore no surprise that it won the largest share of WAP portal contracts from China Unicom. Although Ericsson entered the SDP market early, technical support delays and a lack of service maintenance have caused its market share at China Unicom to decline.

**SDP Project Implementations in China**

SDP project implementations in China are quite different from other markets because of the country’s large population, short project timelines, and due to the vast scale and complexity of its national network infrastructure. A strong project team with good technical support and experience in meeting objectives quickly is in high demand at the operator level. Domestic vendors, like ZTE and Huawei, have significant advantages. They routinely offer strong and experienced SDP project teams with highly-responsive support from their R&D centers in China. It is clear that they are applying lessons learned from previous implementation projects and that they are capable of finding solutions to problems quickly. For example, in March 2008, China Telecom requested a nationwide system upgrade in about two weeks. Due to a limited maintenance window and a lack of unified testing and validation, it needed equipment vendors to complete all R&D requirements and system upgrades. Domestic vendors have clearly excelled at finishing network upgrades on schedule.

**SDP Market Share in China**

In China, operators generally tend to build SDP systems using a double-layered architecture. In each province they usually build a single SDP platform that is interconnected nationally. At China Telecom, each province has deployed a UAG and UMP that is linked with a national UAG and UMP counterpart. At China Unicom, each province has built a VAC.

Figure 5 indicates the market share of Ericsson, ZTE and Huawei in China’s SDP market. ZTE currently has 42% market share, followed by Huawei.

*Figure 4. China Unicom’s service network architecture (post-SDP deployment).*

*Figure 5. China SDP vendor market share.*
SDP Development Trends in China

After the deployment of SDP platforms in China, network architectures have shifted from traditional vertical designs to horizontal architectures. This is allowing new services to be quickly and easily deployed within the network. It also means that operators can be more bold and decisive in introducing new service deployments based on SDP platforms:

- **Enhanced service development tools:** These can address the requirements of developer at multiple levels while shortening the time to market.
- **More convergent services:** With the trend towards convergence among Information and Communications Technologies (ICT) being accelerated by SDPs, value-added services are expected to emerge that will create significant new revenue sources for operators and their partners.
- **More content-based services:** In the 3G era, users want more information and entertainment choices, so “content is king”. Being able to rapidly launch new content with a flexible pricing system will be crucial.
- **Social networking/community based services:** These personalized content-based services can be better supported using a SDP environment.

### China SDP Platforms — Vendor Comparison

Ericsson, Alcatel-Lucent, ZTE, Nokia Siemens Networks (NSN) and Huawei are the main SDP vendors in China. Although they all provide SDP solutions, they each offer different implementations.

iSuppli has recently completed a detailed investigation of SDP platforms available in China (see Table 1). Here is the general evaluation criteria applied to all SDP vendors:

- **Openness assessment:** Openness is the most important feature. SDPs are ranked based on how easily applications can be deployed. Open interfaces for applications should include SMS, Multimedia Messaging Services (MMS), location-based services, WAP, push-to-talk, voice, as well as interface modes for applications similar to Parlay X, web services etc.
- **Network compatibility:** Compatibility is an evaluation of how easily SDPs interconnect and work with other networks, including GSM, CDMA, 3G, NGN and IMS-based networks.
- **Availability of Service Creation Environments (SCEs):** The development environment is based on service creation and service testing tools. SCEs should meet the diverse requirements of developers and help to reduce overall time-to-market.
- **Manageability:** SDPs provide unified management for value-added services. Management capabilities should include product/service/price packages, subscribers, CPs, SPs, provisioning, Service Level Agreements (SLAs) and terminal management.
- **Price flexibility:** Does the SDP support variable pricing methods, such as by time, traffic and usage? Moreover, to help operators meet competitive requirements, there should be support for multiple kinds of discounts by usage, subscriber type, special times of day etc.

**Integration and deployment experience** should include:

- The capacity to integrate other systems: For example, integrated Billing and Order Support Systems (BOSS), plus SMS and MMS support centers
- A track record of successful commercial partnerships: This helps to reduce the risk for operators when they first develop and deploy a new service.
- **Broad project management experience:** This promotes effective and long-term cooperation between SDP vendors and operators.
- **Cost savings:** To what degree operators can achieve lower operational expenditures (OPEX) and capital expenditures (CAPEX) in post-SDP implementation.

### Table 1. China SDP rankings by component

<table>
<thead>
<tr>
<th>ITEM/Score</th>
<th>Ericsson</th>
<th>ZTE</th>
<th>Huawei</th>
<th>Alcatel-Lucent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Openness</td>
<td>7</td>
<td>8</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Network Compatibility</td>
<td>7</td>
<td>9</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Availability of SCE</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Manageability</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Charging Flexibility</td>
<td>7</td>
<td>8</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Integration and Deployment Experience</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Degree of Lower OPEX</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td>5</td>
</tr>
</tbody>
</table>
Today, environmental friendliness, energy conservation, and consumption reduction have become a global consensus. The best way for a telecom operator to reduce its OPEX is to build a green network, which is also the major trend of future telecom networks. A green network helps to cut tariff rates, reduce environmental pollution, and thereby benefit subscribers. With the development of energy conservation technologies, the telecom industry is stepping into a green era.

**Core Concept of IPTN**

With the deployment of 3G networks and implementation of full-service operation strategy, the IP-based telecom services place higher requirements on the bandwidth, scheduling, flexibility, cost, and quality of bearer networks. In response to the IP-based tendency, ZTE has launched its new-generation IP-based Packet Transport Network (IPTN) solution (see Figure 1) that uses the open and unified packet switching platform to carry multiple services, and integrates the synchronization clock, carrier-class OAM, and protection functions. It is an end-to-end bearer network solution covering the access and convergence layers and completely catering to the full-service scenario needs of Mobile Backhaul and FMC.

The IPTN solution fully considers the operators’ needs for building green bearer networks. It can provide low CAPEX and OPEX while meeting the increasing
bandwidth needs. Its green concepts are characterized by:

- **Energy saving and environmental friendliness:** It uses smaller-footprint IPTN products that consume fewer resources and emit less harmful gas, effectively reducing OPEX.
- **Efficient OAM:** It adopts carrier-class OAM technologies and an intelligent network management platform to offer refinement management and easy operation and maintenance, which can improve maintenance efficiency and lower OPEX.
- **Network security:** It supports multiple network protection mechanisms and provides high-accuracy time synchronization capability, satisfying the need for a substitute for GPS while completely improving network security and lowering CAPEX and OPEX.
- **Evolution with investment protection:** It supports integrated TDM/ATM/Ethernet/IP bearer mode to protect existing network investment; adopts a scalable technical platform that can satisfy the needs for smooth standard and service evolution while lowering CAPEX.

**Optimized Design for Energy Saving and Environmental Friendliness**

The initial design of ZTE’s IPTN products is carried out for energy saving and emission reduction, aiming to minimize their pollution to the environment.

The IPTN product adopts ZTE’s self-developed lower-consumption chip that supports the dormant/standby mode. It uses the Automatic Power Control (APC) technology and supports variable-speed fan control. In addition, it provides intelligent and dynamic adjustment of power consumption that can reduce useless power consumption in the equipment. In the verification test for China Mobile’s IP-based MAN transport networks conducted in 2009, the power consumption of ZTE’s IPTN products was simply one-third of the average power consumption of their kind in the industry.

Due to the compact design, the IPTN product is small in size and low in power consumption, bringing about effective space and power savings. ZXCTN 6100 is the most compact packet transport network platform that is commercially used at the access layer. It is only 1U in height, and thus adapts to the base station access environment flexibly.

The IPTN product fully complies with various international standards on environmental protection. Its hardware platform is packed by leadless and degradable materials, complying with the RoHS requirements and Management Regulations on Pollution Control of Electronic Information Products. In addition, ZTE implements the green certification for suppliers, and has signed a letter of commitment to environmental friendliness with them.

**SDH-like OAM**

ZTE’s IPTN products can save time and reduce difficulty in OAM. They inherit the OAM features of SDH, such as hardware-based hierarchical OAM, complete performance and alarm detection on pseudo wire, tunnel and section layers, fast location of the faults of different levels, carrier-class end-to-end management and cascaded monitoring, and high network availability.

Furthermore, they use the unified intelligent network management platform (NetNumen T3) that can implement centralized management of SDH/MSTP, ASON, WDM, and OTN, and provide NE management and user-friendly interfaces for easy end-to-end service configuration and management.

**Guarantee for Network Security**

ZTE’s IPTN products have multiple protection solutions, achieving the carrier-class reliability of 99.999%. The redundancy backup is provided for key components at the equipment layer; the Link Aggregation (LAG) and IMA protection functions are provided at the client side; multiple protection modes

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Figure 1. ZTE’s IPTN solution

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are supported at the network layer. In addition to Label Switched Path (LSP) protection and Sub-Network Connection Protection (SNCP), ZTE’s IPTN products are the first of their kind to implement the connection-oriented T-MPLS ring network protection (see Figure 2). With its protection switching time less than 50ms, the T-MPLS ring network protection is reliable and similar to SDH Multiplex Section Protection (MSP) that can avoid LSP protection congestion caused by fiber interruption. This kind of ring network protection has the advantages of simply configuration and high efficiency, which are prominent especially when there are a huge number of LSPs. Its OAM is based on section detection that can save more resources than that of tunnel protection.

ZTE’s IPTN products provide industry-leading time synchronization capability. Most vendors in the industry adopt only the IEEE 1588v2 for time synchronization. By leveraging the advantages of various packet synchronization technologies, ZTE took the lead to propose its unique Ethernet time synchronization solution, that is, to implement the IEEE 1588v2 time synchronization based on the synchronous Ethernet and accurately insert or pick up the timestamp through hardware so as to effectively reduce the 1588v2 packet sending frequency and speed up the convergence. The solution has advantages of high accuracy, high compensation, and high reliability. Using the SSM or BMC protocols, it can implement automatic protection switching of the time links to guarantee reliable transfer of time signals and satisfy the need for a substitute for GPS.

In April 2008, ZTE became the sole vendor to start cooperation with China Mobile on the PTN-based GPS substitution, and worked out the Technical Specifications for PTN-based Time Synchronization and Research Report on the Feasibility of GPS Substitution in TD-SCDMA System. In August 2008 in Shenzhen, China, ZTE completed interconnection with the TD-SCDMA base station and the stress test for PTN-based time synchronization for a total of 35 nodes. The test results turned out to be successful, fully conforming to the requirement of TD synchronization. In China Mobile’s TD-SCDMA network trials in Shenzhen and Nanjing in 2009, ZTE adopted its IPTN solution to transfer time synchronization signals instead of GPS clock signals of the base station. The test results were highly accepted by China Mobile, lying a solid foundation for future large scale commercial use.

**Multi-Service Bearer Platform for Investment Protection and Smooth Evolution**

ZTE’s IPTN products provide abundant interfaces including FE, GE, 10GE, STM-N (CH, POS, and ATM), TDM E1, and IMA E1, and adopt the PWE3 technology to support integrated TDM/ATM/Ethernet/IP bearer mode, completely satisfying the needs of various service networks while keeping compatible with existing non-IP base stations to reduce CAPEX.

The IPTN products use a scalable technology platform that can support smooth evolvement of MPLS-TP standards through software upgrade. Its hardware follows the modular design concept; its core nodes enable high bandwidth reservation; and its ports can be smoothly upgraded to 40G/100G, thereby catering to the needs of bandwidth expansion and smooth network evolution.

**Conclusion**

ZTE has always adhered to the concept of environmental protection, and put it into practice. Its IPTN products can help operators build their advanced green bearer networks from the aspects of energy conservation, environmental friendliness, OAM efficiency, network security, and investment protection. ZTE is working closely with its partners worldwide to embrace the green era of the telecom industry.
The increasing complexity of telecom networks has imposed the requirements for more flexible network Operation & Maintenance (O&M). Telecom operators are seeking to handover their private networks to equipment suppliers for maintenance so that they can focus on providing more valuable services to subscribers to maximize the expected profits in the era of competition, which gives rise to the concept of managed services. To provide reliable and persistent managed services, the equipment suppliers should be clear about the challenges for network O&M, as shown in Figure 1.

Conventionally, various Element Management Systems (EMSs) are installed to manage and maintain their proprietary technology networks. As a result, these proprietary EMSs have the following obvious drawbacks such as lack of interoperability between EMSs, proprietary GUI style, inconsistency in management data, difficulties in report creations, lack of uniform maintenance flow, and lack of uniform asset management tool. The purpose of managed services is to reduce cost and improve QoS. As the traditional way of distributed network O&M fails to meet the target, the managed services supplier must move from distributed O&M to centralized O&M.

ZTE has rolled out its NetNumen™ Unified Network Management System (UNMS) that features centralized supervision, centralized maintenance and centralized management. The NetNumen™ UNMS has a use case in ZTE’s National Network Operations Centre (NNOC) in India and it is now providing top-quality managed services in combination with the Electronic Operation and Maintenance System (EOMS) for Indian telecom operators.

Benefits for Managed Services

The NetNumen™ UNMS has the following benefits for telecom managed services:

Centralized O&M

The NetNumen™ UNMS can implement centralized management of multiple EMSs, allowing operators to get the unified statistics about operation condition of the entire network. By analyzing the relationship among EMSs, it correlates alarms from multiple EMSs.

Figure 1. Challenges for network O&M.
so that the maintenance personnel can quickly locate and troubleshoot a root failure. Additionally, the EMSs utilize integrated network information resources and operate in coordination with one another to avoid blindness and improve O&M efficiency.

**Dynamic integration with EOMS**

The NetNumen™ UNMS generates a work order for critical alarms and associates it automatically to the trouble ticket system, and then the work order is issued and processed. In this way, the self-organized EOMS is established. The fixation of alarm processing flows in the EOMS accelerates the speed of fault handling, improves efficiency of O&M personnel, and facilitates overall management of service quality as well.

**Integration with asset management system**

In combination with the Asset Management System (AMS), the NetNumen™ UNMS provides centralized management of network assets. Knowing information about the network assets at any moment, operators can have appropriate spare parts configured and improve the asset utilization.

**Favorable expandability**

The NetNumen™ UNMS incorporates favorable extensibility that allows ZTE’s NNOC to bring in networks of many telecom operators under its control and provide managed services for them by raising further system integration and manpower utilization.

**Application for ZTE’s NNOC in India**

More and more operators are putting the definite requirements to equipment suppliers for providing a centralized network management system to reduce their network management overhead. Therefore, ZTE’s consideration to develop a unified management system occupies this capability to transform the operators’ requirement in an implementation form. The NetNumen™ UNMS has got a great popularity in many managed services projects.

Because of its large land area and widely dispersed population centers, India has a big telecommunication network. Many Indian operators have a strong requirement for managing and maintaining their entire networks at a single place in a centralized manner. For this reason, ZTE has constructed its managed services center in India (NNOC) that can provide a unified management platform for operators.

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**Figure 2. Architecture of ZTE’s NNOC in India.**
in India with the aim of reducing their total cost of operations and reducing their maintenance costs by eliminating unwanted operations. Figure 2 shows the architecture of ZTE’s NNOC in India.

ZTE’s NetNumen™ UNMS is used to implement centralized fault management and centralized performance management. The blue “A” in Figure 2 indicates an access adapter, through which the NetNumen™ UNMS gets alarm and performance data from its subordinate EMSs. Based on the data from each EMS, the NetNumen™ UNMS provides each operator with a complete alarm and performance analysis on its various private networks. The distributed heterogeneous network management finally becomes homogenous management.

The NetNumen™ UNMS submits the processed alarm data to the EOMS through the gateway. The trouble ticket subsystem of the EOMS then coordinates with all the relevant departments for electronic failure handling. Thus the failure handling is controlled in a closed-loop fashion.

The AMS is a data center containing all static network resources and other inventory resource information. Through the specific interface, external systems get their needed data conveniently. This centralized management of network resources helps to increase utilization of network resources.

The UNMS, EOMS and AMS all have their own report management modules that can provide each operator with a complete alarm and performance management report, work order handling report, and asset usage report of its various private networks. The maintenance staff can have a full knowledge about the operation condition of all private networks and report to the operators about their own network O&M and Service Level Agreement (SLA) satisfaction.

The NetNumen™ UNMS for ZTE’s NNOC in India implements centralized management of many private networks from different operators. Network failures can be located quickly and precisely through correlation analysis; the maintenance staff only need to check the operator interface on the UNMS; EMSs can be left unattended and maintained in an automatic fashion without the operator involvement. Therefore, the valuable expert resources can be shared and the cost of manpower can be cut greatly.

Conclusion

In order to fulfill the operators’ growing demands for centralized network management, ZTE has launched its NetNumen™ UNMS solution that can help them raise network O&M efficiency, lower the OPEX, reduce customer complaints and effectively improve their quality of services. With good extensibility, adaptation to the network development, and guarantee for sustainable operations support, the NetNumen™ UNMS has enhanced ZTE’s capability to deliver better managed services to operators worldwide.

ZTE Establishes Its First Managed Service Centre in India

September 24, 2009, Source: Voice&Data

ZTE announced that they have established their first Managed Service Centre in India. The Managed Service Centre—a National Network Operations Centre (NNOC) is ZTE's largest outside China and will primarily be used for offering managed services to Indian telecom operators. Established at an initial investment of USD 4 million, the NNOC will serve to showcase ZTE’s superior engineering capabilities to telecom operators in India and is in line with the company’s strategy for achieving leadership in the Indian telecom market.

Located in Gurgaon, the NNOC employs over 200 people, 80% of whom are local employees from India. The Gurgaon NNOC is integrated with the ZTE Global Customer Support Center (GCSC) in China and the India Local Customer Support Center (LCSC) in Bangalore, in order to support collaboration and provide back up to each other. Equipped with the latest equipments and technology from ZTE, the NNOC will provide a unified management platform that will help in lowering the Total Cost of Ownership (TCO) for Indian telecom operators. While Tata Teleservices will be the first operator to utilize the services of the NNOC, ZTE will eventually connect all its customers in India to the centre.
Brazil's largest mobile operator, Vivo, offers ZTE 3G modem card equipped with Siano Mobile TV receiver to provide first mass-market mobile TV experience in South America

25 January 2010, Brazil — ZTE announced that together with Vivo, Brazil’s largest mobile operator, and Siano Mobile Silicon it has introduced the first 3G modem to provide mass-market mobile TV in Brazil. The device enables viewing up to 13 DTV channels comprised of sports, news and entertainment. The announcement is well timed to provide football fans with plenty of platform options to enjoy World Cup matches, including notebooks and netbooks.

The new data card was designed by ZTE based on Siano’s high performance SMS1130 multi-standard receiver chip, which supports the Brazilian Integrated Services Digital Broadcasting – Terrestrial (ISDB-T) DTV format. It provides unparalleled performance with record-breaking sensitivity levels that enable near-perfect mobile TV picture quality. The card is compatible with all standard notebooks, netbooks, and desktop PCs.

ZTE Joins World’s Top Three GSM Vendors

Company’s GSM product shipment over 750,000 carrier frequencies in 2009

10 February 2010, Shenzhen, China — ZTE announced that its global GSM sales continued to grow fast in 2009, with a shipment of over 750,000 carrier frequencies in the past year. As its share in the global newly added market rose to almost 20%, ZTE is now one of the top 3 equipment vendors in the industry. In 2009, ZTE successfully sold its GSM products to world-class multinational operators such as Telenor, TeliaSonera and Cell C, making large-scale advancements in European and emerging markets.

Recently a research conducted by Frost & Sullivan shows that GSM continues to drive mobile subscriptions’ growth in major markets. Global GSM accounts for 83.5% of global mobile subscribers and this preponderant proportion has retained for a long time. Up to 2009, there were over 3.93 billion GSM, WCDMA-HSPA subscribers worldwide.

From 2004 to 2009, ZTE’s GSM product sales already maintained a growth of over 100% each year, obtaining the fastest growth in the industry. ZTE’s GSM markets are mainly distributed in over 70 countries and regions including mainland China, Hong Kong of China, South Africa, Russia, India, Indonesia and Algeria.

ZTE Wins Telecom Asia’s 2009 “IPTV Supplier Award”

20 January 2010, Shenzhen, China — ZTE announced it has won Telecom Asia’s 2009 IPTV Supplier Award, a telecom industry award honoring the leading equipment supplier of IPTV solutions. This follows ZTE’s other recent and significant IPTV industry recognition as the recipient of the “Best IPTV Equipment Award” from Frost & Sullivan.

Sponsored by authoritative industry media outlet Telecom Asia, the IPTV Supplier Award recipient is selected by over 56 industry analysts, consultants and senior industry executives worldwide. ZTE attributes its win to its advanced IPTV technology and global market leadership. To date, ZTE has won 23 commercial IPTV contracts worldwide accounting for 2.6 million IPTV subscribers.

ZTE to Power Mass-Market Mobile TV in Brazil in Time for “Futebol” Fans to Enjoy 2010 World Cup

Brazil’s largest mobile operator, Vivo, offers ZTE 3G modem card equipped with Siano Mobile TV receiver to provide first mass-market mobile TV experience in South America
**ZTE Supports Aid Efforts into Haiti**

Company dispatches communications equipment to help on the ground community support

15 January 2010, Shenzhen, China — ZTE announced that it has delivered solar-powered handsets and its GoTa trunking system to the Haiti government to provide much needed communication equipment for aid efforts for the victims of the earthquake that hit Haiti on January 14. The Company has confirmed that its 11 employees stationed in Haiti are safe and in a healthy condition. ZTE has contacted the employees’ families to keep them informed of the current situation.

Immediately after the disaster, ZTE established a disaster response team to work with its Haiti office to develop and provide a relief program for Haiti’s earthquake victims. The team is focused on providing expert communication infrastructure advice and is composed of ZTE’s executive vice presidents and technical experts.

With the local electricity and power infrastructure destroyed by the earthquake, priority was given to provide solar-powered handsets that could be effectively used by relief agencies on the ground. The first batch of 1500 ZTE’s GSM solar mobile phones were dispatched to Haiti from Jamaica in the morning of January 15, 2010.

**ZTE Clinches USD378 Million GSM/UMTS Contract in South Africa’s Cell C**

26 January 2010, Shenzhen, China — ZTE announced that the Company, together with its subsidiary ZTE Corporation South Africa (PTY) Limited have entered into the Network Supply Agreement and the Managed Services Agreement (the “Agreements”) with Cell C (PTY) LTD., the mobile telecom operator in South Africa, and its controlling shareholder, OGER TELECOM (SOUTH AFRICA) (PTY) Limited.

Following the Agreements, the Company will supply GSM/UMTS network turn-key solutions and operations services to Cell C (PTY) LTD. at an aggregate sum of USD378 million. The Agreements specify product sales and engineering services in relation to the daily operations. Prior to today’s announcement, the Agreements have already begun to be executed by authorized representatives from both parties.

**ZTE Breaks Ground on Xi’an R&D Base**

18 January 2010, Xi’an, China — ZTE began construction on its research, development and manufacturing base in Xi’an, Shaanxi province. ZTE currently has 5,000 research and development employees in Xi’an, and it expects to record sales of more than RMB 1 billion in 2009.

ZTE signed an agreement with the Xi’an Development Zone Management Committee in September 2008 to invest more than RMB 6 billion in the Xi’an base.

**ZTE Unveils Android Plans**

14 January 2010, Shenzhen, China — ZTE announced its joining of the Open Handset Alliance, a partnership of more than 60 global mobile industry leaders and expects to launch smartphones based on the Android platform in the first quarter of this year.

As a member of the Open Handset Alliance, ZTE will work with its members to contribute to the development of the Android platform and bring to consumers a superior user experience than much of what is available on today’s mobile platforms. By joining the Open Handset Alliance, ZTE demonstrates its support for Android as an open mobile platform and its commitment to Android’s commercial success.

Android is a complete, open mobile phone software stack. It includes everything a manufacturer or operator needs to build a mobile phone. Android is available as open source via the Apache v2 license, and it is designed from the ground up to enable the best user experience possible on a mobile phone.
How to evolve to a converged NG-GSM/UMTS/LTE network without any extra hardware?

Easy—you start with the right base station. For example, the all-new ZTE Multi-Carrier base station based on mature SDR platform that uses configurable software rather than separate hardware modules to support GSM and UMTS simultaneously and achieve smooth evolution to LTE with quick technology integration and commercial application.

Currently, approximately 80 operators in about 60 countries use ZTE GSM/UMTS equipment with improved efficiency, lower costs, more services and wider range of standards compliances.

ZTE is a leading global provider of telecommunications equipment and network solutions, delivering innovative, custom-made products and services to customers in more than 140 countries and regions, helping its customers achieve continued revenue growth as well as shaping the future of the world’s communications industry.

Need to implement world-class design and quality standards for subscribers who will accept nothing less?

When the world’s biggest telecommunications operators need to bring tomorrow’s connections to today’s markets, they call us. We promise. We work tirelessly to meet their unique needs. We deliver the goods and build solid relationships with superb after-sales service. It’s what you’d expect from a company whose innovative, fully customizable mobile and broadband solutions have allowed it to partner some of the top global players in telecommunications, such as Vodafone.

So if you need telecoms solutions completely built around your needs as an operator, call us.

We’ll be there with you.

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