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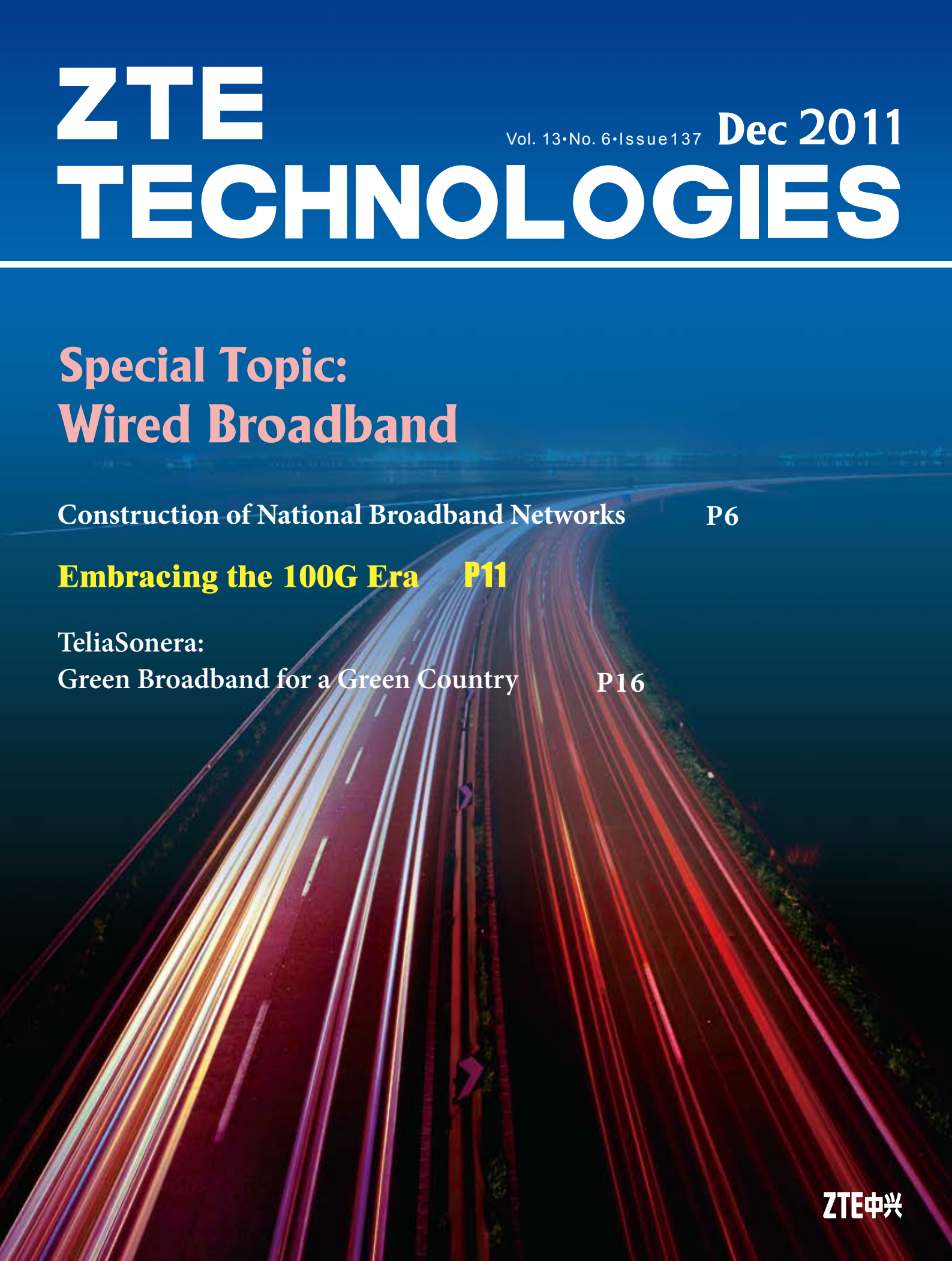
Special Topic: Wired Broadband



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ZTE Profile

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

ZTE中兴 ZTE CORPORATION

European Broadband Access Business Model

By Liu Feng

Competitive Pressure

As the EU further opens up fixed access infrastructure and formulates policies for future broadband coverage, many emerging telecom, cable, and mobile operators are entering the fixed broadband sector. Revenue from fixed voice is declining because of increased mobile usage, so fixed broadband—a major source of future revenue for traditional operators—will surely become more competitive. Operators are most concerned about offering higher bandwidth, better quality of service (QoS), and better quality of experience (QoE) at a lower price and in shorter time than their rivals. To rally against competition from emerging telecom and cable operators, traditional fixed operators have worked out broadband plans. BT has an NGA initiative and DT has also devised a GPON 2.0 plan.

Service-Driven Force

In recent years, over-the-top (OTT) services have developed rapidly and will eventually replace IPTV and digital TV as mainstream video services in the future. Informa forecasts that by 2015 OTT-centered video services will account for 50% of all Internet traffic, and point-to-point (P2P), storage, and Web browsing services will make up the other 50%. Since P2P and storage services are difficult to manage, operators focus their attention on OTT and IPTV. The most pressing issue is adjusting network architecture so that it offers custom-made OTT services with end-to-end QoS and QoE guarantee. In this way, OTT services are no longer transparent to their networks. To get a slice of the OTT pie, traditional operators have adjusted their network architectures. Telefonica has

deployed a unified content distribution network (CDN), TeliaSonera has built its own OTT platform, and DT has defined its MPLS deployment in its GPON 2.0 plan.

Faced with stiff competition and driven by emerging services, traditional fixed operators in Europe have chosen the following paths for network development:

Future-proofing

- building broadband access networks with super-high bandwidth to meet EU requirements for future broadband coverage and video bandwidth

Resilience and intelligence

- leveraging the advantages of network infrastructure to extend the network's value to cloud (service side) and terminals (home network side)
- offering differentiated service assurance to users, content providers, and service providers through an end-to-end intelligent network
- QoS-based charging as opposed to bandwidth-based charging.

Benefits to Operators

ZTE cooperates closely with European operators and understands broadband trends on the continent. ZTE has proposed a European fixed broadband business model based on terminal-pipe-cloud architecture. This business model brings European operators the following benefits:

Fast broadband connection to support video growth. Video has dominated multimedia services driven by the growth of HDTV and 3DTV. Operators in Europe have a clear objective of broadband development. The EU aims to have 100% broadband coverage by 2013 and to increase coverage bandwidth to 30Mbps for all Europeans by 2020. It also aims to have 50% of all European households subscribed to Internet connections above 100Mbps. To reach this goal, existing access networks need to be immediately reconstructed. Most operators in Europe are boosting bandwidth for future-proof access networks by shortening the length of last mile and adopting FTTH/GPON+NG PON or FTTC/VDSL2 technologies.

Simplified network to reduce OPEX. PON technologies are being introduced to simplify the existing network. Less central office sites and active optical nodes are used. Future-proof NGOSS architecture further streamlines the existing O&M process and cuts OPEX and labor costs. Mobile backhaul over PON enables fixed-mobile convergence in the last mile and helps operators increase network efficiency and reduce overall construction costs.

Intelligent network to generate new revenue streams. A unified CDN is built, and access network interfaces and APIs are open to ICPs and ISPs. A smart pipe is also set up to ensure differentiated end-to-end QoS and to allow operators, ICPs and ISPs to share the OTT value chain. An intelligent home network connects all home appliances and electronic devices through a service gateway and also serves as a media sharing center that allows streaming media to be shared by all digital devices. All these household electronic devices are controlled through a unified visual user interface. This improves user experience and stickiness.

Fast deployment to shorten time to market. Network construction solutions are tailored to market environments and network conditions. This ensures that operators get a head start in the broadband access market through fast network construction and service provision. In areas with a good copper network, existing copper resources can be used to quickly offer super-high bandwidth through VDSL2. In areas requiring new network construction, operators can deploy cutting-edge fiber technology to quickly deliver FTTH services and to grab a large share of the market.

Uni NGA

ZTE's Uni NGA is tailor-made for operators in Europe and meets network requirements of European fixed broadband business models. The solution is based on a terminal-pipe-cloud architecture and focuses on integration, openness, intelligence and low TCO. It also provides operators with end-to-end QoS and security guarantee.

- Integration: ZTE's future-proof unified broadband access platform enables full-service access and full-scenario coverage. The platform supports access to both existing services, such as ISDN, and future video-centered broadband services. It supports a diverse range of access media, including copper wires and fibers, and various application scenarios, such as FTTH, FTTB, FTTC and FTTN. In addition to fixed broadband services, it provides data traffic offload and mobile backhaul through WLAN.
- Openness: Uni NGA supports broadband access over copper and fiber and allows for smooth evolution to NG PON. This meets EU requirements for full and open competition. Operators can jointly build and operate an FTTx network, which reduces construction costs and risks and increases network efficiency.
- Intelligence: Uni NGA allows operators to transform from being an extensive dumb pipe to an optimized smart pipe. Dynamic service assurance provides better service awareness and adaptive QoS. Quality-based charging is implemented through enhanced service differentiation, accurate traffic detection, and on-demand service provision. An innovative business model with an end-to-end smart pipe at its core allows operators to benefit from both downstream users and upstream ISPs and ICPs.
- Low TCO: Working on the principle of "less consumption, lower cost and better life", ZTE helps operators build low-TCO networks with green technology and equipment. ZTE's custom-made, future-proof solution protects operator investments and reduces network construction costs. A green network with intelligent and unified O&M also reduces OPEX.

Speeding up broadband connection is a core goal for operators. ZTE's Uni NGA solution helps operators boost network performance with an integrated, intelligent, and low-TCO solution and generate new revenue streams with an innovative business model.

Success Cases

Many European operators are putting the broadband access business model into practice. After speeding up broadband connection, they have built intelligent networks to increase network value, reduce TCO, and create new revenue sources.

In Lithuania, ZTE customized an FTTH solution for TEO, a subsidiary of TeliaSonera. By offering speeds of up to 100Mbps, the solution pushed Lithuania into the top 3 countries in the world for average data speeds. TEO was also recognized by the Lithuanian government as the greenest enterprise because of its deployment of the green FTTH network.

In the UK, ZTE helped local operators, including IFNL, build FTTH networks using GPON. Supported by the EU's unified plan and policies of the UK, the FTTH networks provide broadband access in rural areas, promote competition in the local broadband access market, and boost local economies.

In Germany, ZTE and DT have worked closely to develop a custom-made GPON solution that further simplifies DT's network structure. MPLS was introduced to make the network more intelligent. The solution enabled DT to provide all SPs with end-to-end security and QoS guarantee. Through the enhanced user awareness and experience, DT has maintained its leading position in the German market.

Construction of National Broadband Networks

By Xie Jun

Trends

A national broadband network (NBN) is a country's telecommunication infrastructure and differs from a regular broadband network built by a telecom operator. The backbone of an NBN can be newly constructed or it can be based on the existing network of the country's leading telecom operator. Dedicated networks, such as an e-government network, enterprise network, education network, and military network, can be supplements.

With high-speed Internet access, there is an increasing demand for high-bandwidth HDTV and 3D-TV. This is driving the world's leading telecom operators to build networks with higher bandwidth. The digital economy will be an important part of the future global economic system as governments seek to develop new industries to stimulate consumption, narrow the digital divide, create employment, and push forward economic recovery. In recent years, there has been an upsurge in NBN construction around the world. Some countries have even published their national strategies for broadband development.

By the end of March 2011, 98 countries and regions had broadband strategies. The US, UK, and Australia have released their specific plans for broadband development that include goals, policies and specific measures. Governments are now playing an increasingly important role in broadband development.

Figure 1. National broadband plans for some countries.

Features

Despite differences in strategic goals, choice of technology, and construction models, NBNs in different countries have some common features.

- **High bandwidth.** A basic requirement of an NBN is to provide ultra-high bandwidth that can cater to the needs of high-bandwidth services into the future. Singapore's Intelligent Nation 2015 Plan (iN2015) will be put in place by 2012. It will be capable of delivering broadband speeds of up to 1Gbps and offer bandwidth-intensive applications such as video conferencing, video surveillance, streaming media, and HDTV.
- **Open architecture.** An NBN requires open network architecture rather than simple network scale-up. Open network architecture provides an open platform that encourages competition between small- and mid-sized ISPs and CSPs.
- **Convergence.** An NBN must allow for fixed-mobile convergence, interoperability between telecom and private networks, transition from narrowband to broadband networks, and unified scheduling of diverse services.
- **Environmental friendliness.** An NBN is part of a country's long term strategy and must be environmentally friendly.

Construction Model

An open access platform and wholesale business model are fundamental for building an NBN. These help create a fair competitive environment for operators and retail service providers (RSPs) and also offer more options to users.

Open access is a new network construction model. An open access network can be jointly built by network operators, equipment vendors, RSPs and stakeholders. RSPs purchase bandwidth from network operators and compete with each other on the same platform to provide competitive and attractive services for end users. The open access network comprises four layers:

- **Layer 1:** physical infrastructure (including communication pipes, poles and enclosures) that is typically managed by an infrastructure operator (I.O.)
- **Layer 2:** physical fibers that are built and operated by a network operator (N.O.)
- **Layer 3:** active infrastructure (including physical network equipment such as OLTs and ONTs) that is typically built and operated by a communications operator (C.O.)
- **Layer 4:** retail services (including voice, data and video services) that are provided by RSPs.

Open access is widely used for building NBNs. There are five open access models.

- **Model 1:** an operator's self-built infrastructure—the traditional network buildout model.
- **Model 2**: Portugal and France use this model. In Portugal, the telecommunications regulator, Anacom, makes the open access rules. Physical pipe resources in the network are open. Through competition, the physical infrastructure at layer 1 is leased to each RSP for construction and operation at layer 2, layer 3 and layer 4. In France, ARCEP is the telecommunications regulator. France Telecom builds physical infrastructure and leases it to each RSP for construction and operation at layer 2, layer 3, and layer 4.
- **Model 3:** The UK uses this model. The UK telecommunications regulator, Ofcom, makes detailed open access rules. British Telecom is C.O., N.O., and I.O. and opens the network to RSPs in a bitstream mode.

  The bitstream model significantly lowers the RSP qualifications and offers diverse and competitive service options to end users. This model has been adopted by Malaysia and Australia for their NBN projects.
- **Model 4:** Holland uses this model. Rigerfiber is the N.O. and I.O. and opens the network to other RSPs.
- **Model 5:** Singapore uses this model. Singapore's telecommunications

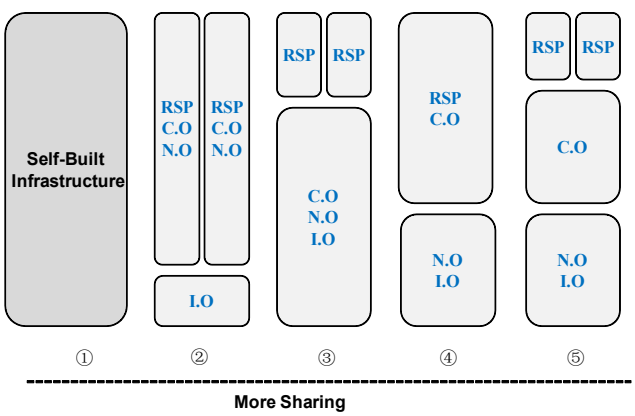


Figure 2. Open access model options.

regulator, IDA, makes detailed open access rules. OpenNet is N.O. and I.O., responsible for providing passive infrastructure. Nucleus Connect, a subsidiary of Starhub, provides equipment and is responsible for building active infrastructure and leasing it to RSPs in a bitstream mode.

In these five open access construction models, model 2 and model 4 have physical openness at layer 1 and layer 2. These models are not very different from a traditional model in terms of equipment. However, model 3 and model 5, where RSPs and C.O. are separated, have a brand-new wholesale bitstream mode. These models place higher requirements on network equipment.

Considerations

Government influence and policy support

Governments are playing an increasingly important role in constructing and operating NBNs. Countries that have done well in their NBN development have clear and consistent broadband policies. South Korea started its NBN initiative in the mid 1980s and worked out six broadband plans. They are the preliminary shape of the Korean broadband strategy. Japan also laid down its e-Japan strategy in 2001 and perfected it in subsequent years. Broadband policies and strategies for different countries are market regulation, market efficiency, and prevalence and equity of broadband access.

Fair and efficient market mechanism

Full competition is key to success in the broadband network market. Countries that have been successful in deploying NBNs all have complete policies and laws that encourage market competition. These include a free license management mechanism, convenient wireless resource acquisition, and permission to access mainstream operator networks. Although broadband development varies from country to country, equity of broadband access (to ensure all users in urban and under-developed areas have access to broadband) is a key issue that all governments have to consider.

Technical solution

Networks are evolving from low-rate narrowband to high-speed broadband. Narrowband voice networks prevail in most countries around the world, and existing infrastructure, including ODNs, local communications pipes and copper cables, need to be swapped or upgraded to meet the broadband needs. A feasible network swapover and upgrade solution that can be implemented phase by phase and that is suitable for different areas is a technical guarantee for NBN. Any technical solution must also be environmentally friendly.

A Discussion on OFDM-PON

By Zhang Peihua

Innovation in network technologies is driving the growth of IPTV, HDTV, 3DTV, mobile media, and streaming video. To meet the corresponding explosion in bandwidth demand, 40G and 100G optical systems have been commercially deployed at the backbone layer. 400G/1T systems are also being researched. The access layer must be capable of handling increased traffic and supporting many more services. Currently, access networks are passive optical networks (PONs) with a tree structure; in particular, TDM-PON has been widely applied. EPON and GPON are suitable for FTTx networks. The 10G xPON standard and industry chain have matured, and 10G xPON will become a mainstream technology for FTTx networks in the next five years.

NG-PON2, a long-term PON solution, is a hot topic being discussed by ITU-T and FSAN. Most operators expect NG-PON2 to provide higher bandwidth, higher split ratio, longer transmission distance, and greater access capacity while making full use of existing optical distribution networks. Technology options for NG-PON2 include WDM-PON, OFDM-PON, TWDM-PON, and high-speed TDMA-PON.

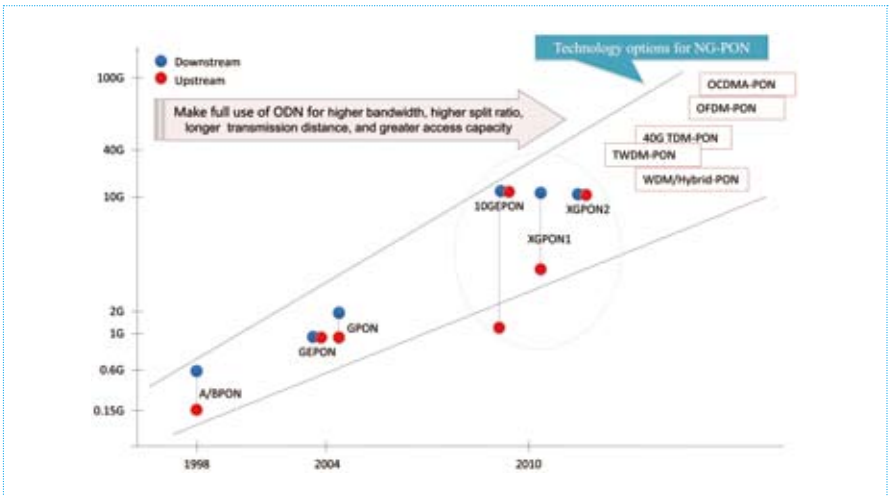


Figure 1. NG-PON2 roadmap.

Orthogonal frequency division multiplexing (OFDM) in optical communications is innovative. OFDM is a multicarrier transmission technique that dynamically allocates high-speed serial bit streams to subcarriers with overlapping spectra to improve spectral efficiency. High-order modulation schemes such as PSK and QAM are used for these subcarriers. This enhances system capacity. OFDM is effective in eliminating inter-symbol interference caused by multipath and chromatic dispersion in transmission links.It increases symbol length and uses cyclic prefixes. OFDM modulation incorporates software defined radio. DSP chips are programmed to implement DFT/IDFT as well as digital-to-analog or analog-to-digital conversion. Most system functions, excluding RF front-end and antenna, are software-implemented. The advantages of using software are flexibility, ease of use, accurate computing, reconfigurability, and efficient digital signal processing.

OFDM can be used as a modulation technique to increase spectral efficiency and channel capacity. It can also eliminate multipath and dispersion effects. Subcarriers can be used to enable OFDMA and to allow flexible bandwidth allocation for multiple subscribers and services. Different subcarriers can be

allocated to subscribers or services such as TDM, FTTH, FTTB, mobile station, WiMAX repeater, and WiFi hot spots. These features make OFDM applicable to access networks (Fig. 2).

OFDM has been successfully applied to ADSL, DVB-T, WLAN and WiMAX and is a core transmission technology for next generation wireless systems including 3GPP LTE. OFDM-PON dynamically allocates bandwidth and has superior transmission capability. Cheaper electronic devices are used instead of costly optical devices, and ASIC based DSP and AD/DA also reduce equipment costs. OFDM-PON can be combined with WDM and has therefore become a competitive technology for NG-PON2. Combining OFDM and PON has the following advantages:

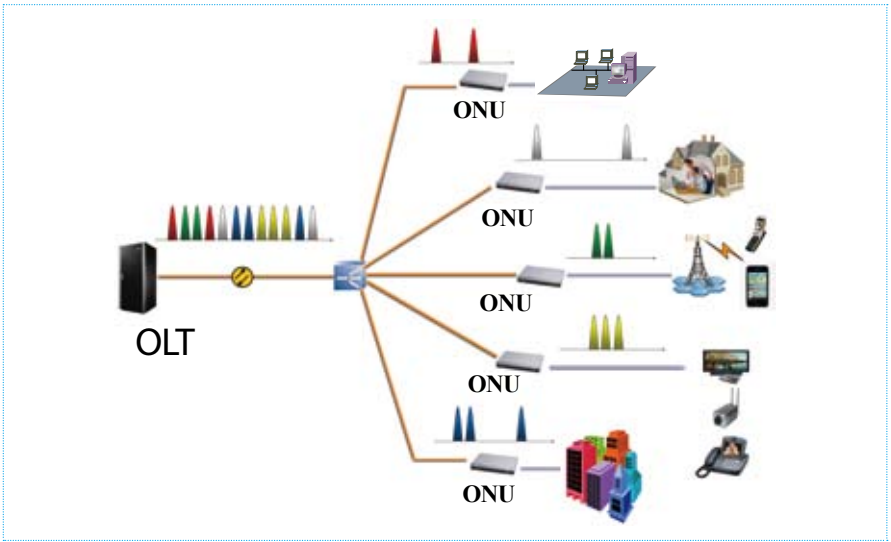


Figure 2. OFDM-based multiservice access.

- **Dynamic allocation of subcarriers.** Depending on channel environments and application scenarios, OFDM can dynamically allocate the number of bits carried by each subcarrier, the modulation scheme used by each subcarrier, and the transmitting power of each subcarrier. It does this by using a simple FFT algorithm. In OFDM-PON, allocation of each subcarrier occurs in real time according to access distance, subscriber type, and access service. Uncomplicated protocols help optimize the access network.
- **Converged wireline and wireless access.** An optical access network has enormous bandwidth potential and good QoS but lacks mobility and is unable to meet the diverse requirements of different terminals. A wireless access network is more flexible and mobile but has poor QoS. OFDM is a mature technology in wireless communications that has been applied to WiMAX, WiFi and UWB. By using OFDM to carry PON signals, wireline and wireless access can be converged. In other words, OFDM supports access to baseband OFDM, UWB (MB-OFDM), WiMAX or WiFi, and millimeter-wave OFDM signals. This significantly increases the universality of access networks.
- **Enhanced spectral efficiency.** Because of orthogonality between subcarriers, OFDM allows spectral overlap of individual subchannels. OFDM also uses a simple constellation mapping algorithm for high-order modulation schemes such as 16QAM and 8PSK. OFDM in PON makes effective use of spectral resources and improves spectral efficiency. This lays a solid foundation for WDM-PON to be upgraded to DWDM-PON and UDWDM-PON.
- **Smooth evolution to ultra-long-haul access network.** A simple network structure improves the performance of an access network and reduces costs. Converged MAN and PON access has become a hot topic in recent years, and ultra-longhaul access networks (longer than 80km) have been proposed. The primary issue for ultra-longhaul access is reducing the effect of fiber chromatic dispersion. Theoretically, OFDM signals are free from chromatic and polarization-mode dispersion in optical links. Therefore, OFDM-PON can be used to smoothly evolve optical access networks to ultra-longhaul access networks.
- **Avoiding costly optical devices and using cheaper electronic devices.** Integrated optical devices are very costly, and optical modules of 10G or higher can significantly drive up the cost of an access network. OFDM avoids costly optical devices and uses cheaper electronic devices. OFDM leverages the integration and low-cost advantages of high-speed digital signal processors and high-frequency microwave devices to develop access networks and make them more popular.

Work on NG-PON2 is progressing well in FSAN. An NG-PON2 white paper is expected to be released in early 2012. ZTE led research into key techniques for OFDM-PON in China's "863" program and "tri-network convergence" project. OFDM-PON prototype will be completed by the end of 2013. ZTE has been actively involved in standardization of NG-PON2.

Embracing the 100G Era

By Shi Sheping

According to data released by the OIF, the average annual traffic growth of network operators is much higher than their revenue growth. Operators have to reduce cost per unit of traffic to relieve revenue pressure. The most effective means of lowering TCO is to improve system transmission capacity. Through the joint efforts of the IEEE, ITU-T and OIF, 100G standards have been drafted. Vendors worldwide have released or will soon release their 100G products, and the 100G DWDM era is just around the corner.

Ready for 100G Commercialization

Mature 100G standards will pave the way for widespread 100G deployment. ZTE has rolled out an advanced 100G DWDM solution to meet the need for large-scale commercial 100G. ZTE's 100G DWDM system has the following features:

- The system uses PM-QPSK modulation, coherent demodulation, and equalization/compensation. An optical receiver can tolerate chromatic dispersion of up to 50,000ps/nm and polarization mode dispersion of over 90ns. This means that chromatic dispersion compensation modules (DCMs) for fiber links do not need to be used. The engineering and OAM are also simplified in 100G DWDM equipment.
- The system supports 80 channels in the C-band with the same 50GHz channel spacing used in 10G and 40G DWDM systems. Transmission capacity reaches up to 8Tb/s, ten times the capacity of a 10G DWDM system. This meets the increasing demand for data services and ensures longer equipment lifecycle.
- Core chips in the system are manufactured using a cutting-edge 40nm CMOS process. This process allows the system to be highly integrated, consume less power, and have better signal processing capability than the 65nm CMOS process. High integration enables advanced soft-decision forward error correction (SD-FEC), which allows for much higher error-correction performance than the commonly-used hard-decision FEC. In the system, OSNR tolerance is increased by about 2dB, and transmission capacity is increased by about 60%. The system can transmit over more than 1500km (20×22dB) without electronic regeneration. The transmission distance is close to that of a 10G DWDM system.

ZTE is now ready for 100G

commercialization. The company cooperated with operators in testing its 100G DWDM products, and good results were achieved. With the world's best high-performance 100G DWDM products, ZTE offers the most competitive 100G solution.

Leading the Industry with Beyond-100G

As well as developing 100G products, ZTE has also started researching beyond-100G optical transmission technology. Significant progress has been made in this research. In 2011, ZTE performed two verification tests on its industry-leading 100G DWDM system.

11.2 Tb/s single-channel transmission test

ZTE achieved a single-channel fiber-optic transmission rate of 11.2Tb/s in a first-time experiment at the Optical Fiber Communication Conference in March 2011.

Optical signals were successfully transmitted over a stretch of 640km standard single-mode fiber. ZTE's patented carrier generation technology generates 112 orthogonal subcarriers with 25GHz channel spacing and 22.4nm spectral width (Fig. 2 and Fig. 3). With each subcarrier bearing 100Gb/s optical signals, the experiment realized optical signals with a single-channel rate of 11.2Tb/s (10Tb/s net line rate plus overheads such as FEC).

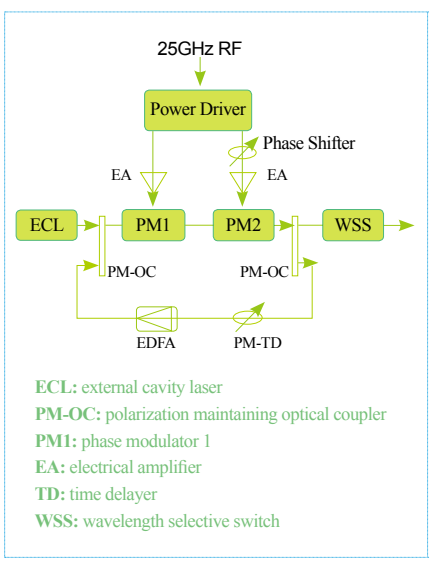


Figure 1. Orthogonal subcarrier generation.

24 Tb/s transmission test

ZTE announced the world's first 24Tb/s DWDM prototype at the Opto-Electronics and Communications Conference in July 2011.

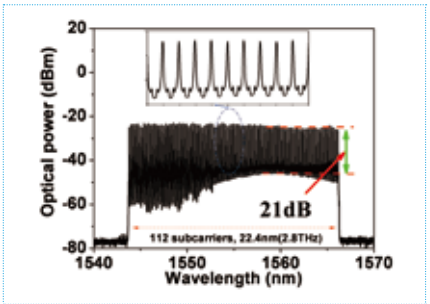


Figure 2. Optical spectrum of 112 subcarriers.

The transmission rate of 24Tb/s (24×1.3Tb/s) sets a new record in optical networking. The 24Tb/s DWDM system has 24 wavelength channels (12 C-band and 12 L-band) with 350GHz channel spacing (Fig. 3).

Based on optical OFDM technology, a laser source generates 13 orthogonal subcarriers for each channel, and each subcarrier bears 100Gb/s optical signals. The transmission per channel is 1.3Tb/s (1Tb/s net after eliminating FEC), and a 24-channel fiber provides a transmission rate of 24Tb/s. The transmission distance is 2400km standard single mode fiber only by using the standard erbium doped fiber amplifiers.

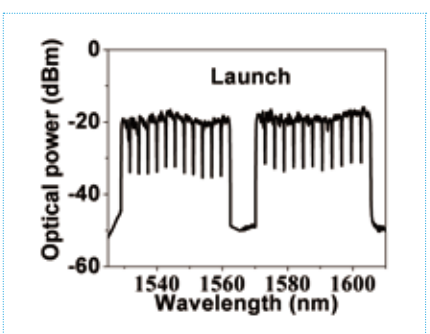


Figure 3. 24-channel wavelength spectrum.

Conclusion

Operators worldwide have already started planning to commercialize 100G transmission. ZTE can provide the most competitive 100G solutions. ZTE is continually refining its 100G products and creates value for operators. As 100G products become more commercialized, the focus of current research will turn towards beyond-100G. ZTE has developed beyond-100G technology that is at world-class standard, and has established beyond-100G research programs with numerous operators to jointly lead the beyond-100G trend.

C-RAN Bearer Network Solution

By Wang Huitao and Zhao Yong

C-RAN is a centralized, cooperative, clean and cloud computing architecture in radio access networks. Baseband units (BBUs) in C-RAN are centrally deployed, which allows for baseband sharing, saves equipment room, and considerably reduces energy consumption and TCO. Cooperative radio also significantly improves network performance.

In a traditional mobile access network, the access network layer transmits signals at the A/Iub interfaces. Signals are transmitted at a typical bandwidth of tens of megabits per second using MSTP/PTN. In C-RAN mode, BBUs are centralized, and the access network layer also needs to transmit signals at an Ir interface (that complies with the CPRI standard). Signals are transmitted at a typical bandwidth of several gigabits per second using fiber. C-RAN is applied in areas where there is abundant fiber. China Mobile's branch in Zhuhai has adopted C-RAN, and Korea Telecom has also adopted it in its CCC network. In fiber-scarce regions, ZTE has developed an array of solutions, including enhanced fiber connection, colored fiber connection, and OTN bearer. All these solutions use a very few fibers to meet C-RAN bearer requirements in different scenarios.

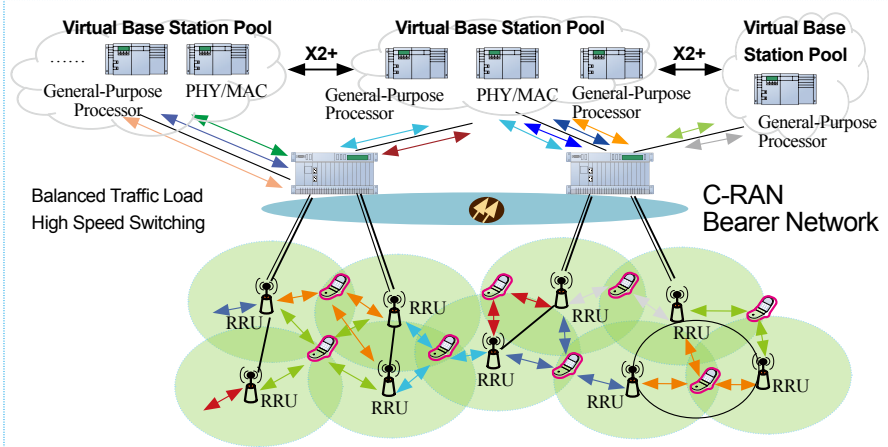


Figure 1. C-RAN architecture.

Transmission Requirements for CPRI

In a RAN, different wireless systems need different bandwidths. Table 1 lists CPRI bandwidth requirements for site types of three typical wireless systems.

As well as specifying the bandwidth requirement, the CPRI standard also specifies that

- the transmission distance should be not less than 10km. (ZTE's BBU can

Table 1. CPRI bandwidth requirements for different wireless systems.

Wireless System	Site Type	Cascading	Bandwidth for Each Carrier	Bandwidth for a Single Site with Three Sectors
GSM	S666	Support	50Mbps	6Gbps
TD-SCDMA	S444	Support	400Mbps	6Gbps
TD-LTE	S111	Not Support	9.8Gbps	3×10Gbps
Note: The actual bandwidth of each GSM site is 1.25Gdps. When 18 RRUs are cascaded, bandwidth can reach up to 6Gbps.				

compensate a transmission length of 40km)

- jitter introduced into each RRU should be less than ±0.002ppm
- time synchronization for TD-SCDMA and TD-LTE base stations should be precise to ±1.5us. When the 1588 protocol is used in C-RAN for time synchronization, the recommended precision for transmission between BBU and RRU is ±100ns.

In a solution that does not use a transmission device, BBU-RRU can use CPRI overhead to perform basic OAM. In current network planning, C-RAN is used in the access network layer. The BBU pool is located at the border of the convergence layer and access layer, and 4 to 6 sites are connected to each ring.

C-RAN Bearer Network Solution

The core function of C-RAN is to transmit data at the Ir interface. Since IQ data at the Ir interface have large bandwidth and high jitter requirement and cannot be multiplexed or converged, it is impossible for traditional SDH/MSTP/PTN/PON/Switch bearer equipment to carry the IQ data. WDM is therefore used to solve the transmission issue in C-RAN.

Fiber connection is directly used for fast C-RAN deployment in areas with abundant fibers resources. There are two schemes available for areas where fiber is scarce. One is to use a few fibers to build an independent C-RAN by means of enhanced fiber connection or colored fiber connection. The other is to use outdoor OTNs as bearers.

Enhanced fiber connection

Because bandwidth for the CPRI link is small in a GSM network, a large number of RRUs can be cascaded to save fibers. Enhanced fiber connection allows for cascading of up to 18 RRUs through the CPRI interface (Fig. 2). A mature 6G optical module can be used for each RRU. Equipment at the radio side provides protection and OAM for enhanced fiber connection using CPRI signals.

With enhanced fiber connection, six GSM sites can be networked with only one pair of fibers. This is an optimal transmission scheme for GSM C-RAN.

Colored fiber connection

In colored fiber connection, WDM is used to configure optical multiplexers/demultiplexers (OMDs) in the BBU pool and optical add/drop (OAD) devices on the RRU nodes. Fig. 3 shows a configuration of four RRU nodes, each with an OAD1. Optimal modules on the BBUs and RRUs are colored (WDM) modules with certain wavelengths. CWDM is used to support a maximum of 18 wavelengths, and DWDM is used to support a maximum of 80 wavelengths.

Each wavelength connection between BBU and RRU is a physical point-to-point connection, so power budget is a key issue.

Power budget calculation is OAD

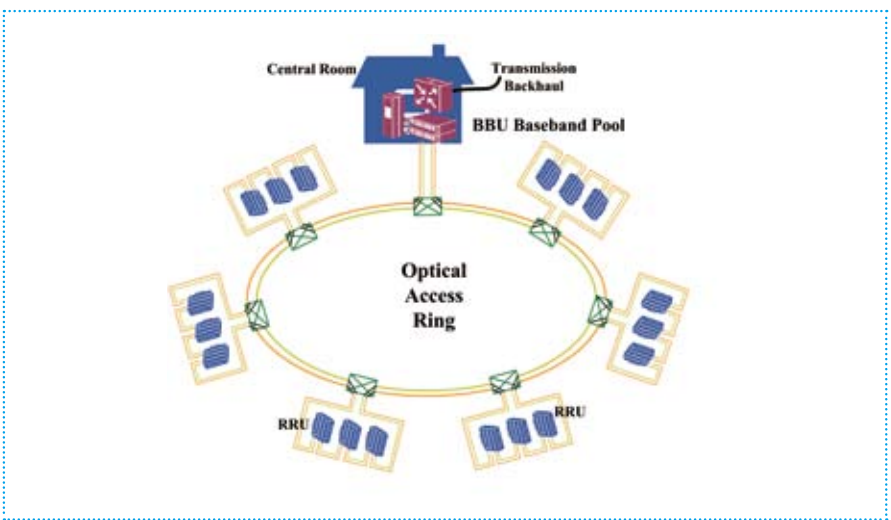


Figure 2. Enhanced fiber connection with 18 cascaded RRUs.

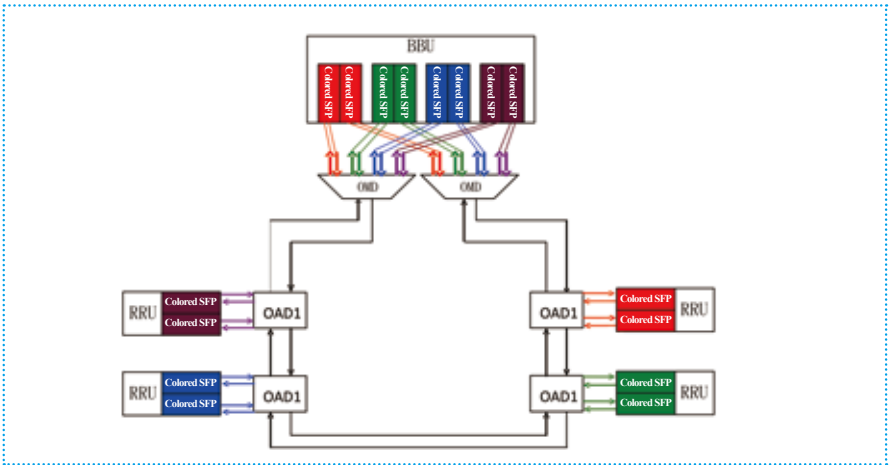


Figure 3. Schematic diagram of colored fiber connection.

insertion loss on a local add/drop path + OAD insertion loss on other nodes + OMD insertion loss + adapter loss + optical fiber loss + engineering margin < optical module power budget. For example, the power budget for a colored 8-wavelength CWDM fiber connection of six TD-SCDMA sites with a loop length of 20km is $1 + 5 \times 1+2.5 + (8 + 5 \times 2) \times 0.5 + 0.25 \times 20 + 3 = 25.5$dB. At present, the power budget for a 6G colored optical module is 25dB, which meets the basic requirement for colored fiber connection in TD-SCDMA C-RAN. By increasing the power budget of colored optical modules, six TD-SCDMA sites with loop length of 40km can be color-fiber connected.

For future LTE, each site will need three 10G wavelengths, and colored CWDM fiber connection will still support four sites with a loop length of 20km. When DWDM and OA are used, six sites with a loop length of 40km are supported. For densely-deployed LTE sites where few changes have been made to the optical network topology, an OAD will be shared by more LTE sites. 24 LTE sites can be networked on a ring with a pair of fibers, and these sites will have a loop length of 40km.

OAM for colored CWDM fiber connection is similar to that for fiber connection. Wireless equipment provides protection and OAM through CPRI signals. OAD is a passive optical device that can be placed in an outdoor power cabinet or in an optical cross-connecting box. OMD and OA can be installed in the equipment room where a BBU pool is located. Through colored fiber connection, both TD-SCDMA and TD-LTE C-RAN bearer schemes can be implemented with only one pair of fibers.

OTN bearer

OTN is a WDM-based integrated bearer device. In the C-RAN bearer network solution, CPRI can be a service type carried by OTN. Various mapping schemes for CPRI over OTN have been defined in the ITU-T G.709 standard. The stringent requirements on CPRI jitter and delay can be fully met by using a proper network design.

As well as C-RAN, OTN also supports SDH, MSTP, PTN, PON and Ethernet transmission. Because OTN is introduced into the transmission layer, it provides perfect protection, OAM, and fault diagnosis and can support ring, tree (UniPON), and mesh topologies.

Traditionally, an OTN is used in a backbone transmission network, and the cost is high. When OTN is widely used as a C-RAN bearer, its functions can be implemented with an ASIC. This significantly cuts equipment cost. Moreover, no equipment room is needed for C-RAN application. Where a compact OTN is mounted on a corridor wall or on an outdoor pole, small industrial components reduce temperature and allow for better temperature control.

When OTNs are used in an access network, multiservice bearer requirements can be met by building new OTN transmission networks and expanding existing ones.

Conclusion

The primary issue in a C-RAN bearer network is the cost of fiber in large-scale deployments. For GSM C-RAN, ZTE provides an enhanced fiber connection solution that uses 18 cascaded RRUs to greatly save fiber resources. This solution has been commercialized. For TD-SCDMA C-RAN, ZTE provides a colored CWDM fiber connection solution that supports six networked sites (18 cascaded RRUs) with only one pair of fibers. Field tests for this solution are currently being carried out. The solution adopts mature DWDM, OA and FEC technologies that can be used to fully meet bearer needs of future LTE.

Enhanced fiber connection and colored fiber connection have advantages over traditional fiber connection. Both are low-cost C-RAN bearer network solutions that save fiber resources, protect the network, and perform OAM. With enhanced fiber connection and colored fiber connection, widespread C-RAN deployment is feasible. Moreover, outdoor OTNs can be used in access networks as bearers for multivendor integrated services including C-RAN, broadband access and VIP dedicated lines.

TeliaSonera
Green Broadband for a Green Country

By Chen Zongcong

In recent years, Northern Europe has been at the cutting edge of information and communications technology and has led the world in broadband construction. Lithuania has a population of only 3.5 million and a broadband subscriber base of 600,000. Broadband penetration in Lithuania is among the highest in the world. TEO is the largest telephony and broadband Internet provider in Lithuania. The company is 68% owned by TeliaSonera, a leading provider of telecommunication services in Nordic and Baltic countries.

The Green Broadband Plan

TEO began offering integrated telecom, IT and TV services in 1992 and has always been concerned about environmental issues. In 2009, TEO was recognized as the greenest enterprise by the Lithuanian government, and now TEO aims to build a low-TCO, green broadband access network.

To offer better services, TEO has recently devised a new-generation network plan. FTTH broadband access is a key part of the plan that will deliver speeds of up to 1Gbps to users. Users will be able to enjoy voice, data and IPTV.

TEO previously used DSL and AON in its broadband network. DSL was deployed at the early stage, and AON has been widely used in recent years. Choosing an appropriate broadband technology for future network construction is a major concern for TEO. GPON has been highly recognized by operators worldwide for its high bandwidth, low power consumption, small carbon footprint, and flexibility in the use of optical fibers and equipment.

As part of the task of building a national information system, TEO plans to build a highly-efficient optical network that has 200Mbps bandwidth and can be upgraded to 1Gbps in the future. High bandwidth and multiservice bearing are TEO's basic requirements for its future broadband network. TEO also aims to build an end-to-end eco-friendly network that consumes less power, emits less carbon dioxide, cuts down CAPEX and OPEX, and minimizes noise from equipment. A GPON-based, low-TCO,

green FTTH solution is preferred by TEO.

On the Way to Green Broadband

TEO initiated a GPON FTTH project in 2009, and 11 equipment vendors were invited to bid for the project. ZTE provided an end-to-end GPON solution that could fully meet TEO's requirements. Its green broadband concept is in line with TEO's corporate culture. After many rounds of selection and testing, TEO finally chose ZTE as its partner to develop one of the world's fastest, greenest networks.

Fastest

Using ZTE's GPON solution, TEO rolled out the fastest broadband network in the world, delivering speeds of up to 200Mbps to customers. The GPON solution allows for smooth evolution, which ensures higher bandwidth access of 1Gbps in the future.

Greenest

ZTE's green innovations significantly reduce power consumption. They satisfy TEO's need for green broadband in five aspects:

- innovative ASIC and PCB components, highly integrated cards, and smart fan speed control to reduce power consumption
- lead-free design and no use of harmless materials
- smooth evolution to 10G EPON, 10G GPON, and WDM PON to prolong the lifecycle of equipment
- small footprint to save space and energy
- end-to-end OAM solution involving zero touch, automatic line and equipment diagnosis, and remote diagnosis and management to effectively cut labor costs.

TEO building


Artur Zajankovskij (L), sales manager of ZTE CIS office and Edvardas Linkevicius (R), general manager of TEO network development department receive the GTB innovation award

The Promising Green Broadband

On June 8, 2011, TEO and ZTE won Global Telecom Business magazine's Innovation Award for Fixed Network Infrastructure Innovation. The award recognizes the fastest, greenest GPON network, and was given for the network jointly deployed in Lithuania.

"We are honored to accept this award for providing an environmentally friendly telecom platform. With ZTE's technology, TEO will benefit from over 37 percent TCO savings in the first four years, increased bandwidth and QoS levels, and high energy efficiency. Our GPON platform is helping TEO reduce its TCO and manage a more efficient network," said Li Guotao, general manager of ZTE's Baltic Office.

According to data released by the NetIndex, Lithuania ranks 2nd globally for both upstream and downstream data speeds. Lithuania deploys fiber-optic Internet technologies at the fastest rate in Europe. At the end of 2010, 200Mbps fiber-optic Internet access was used by approximately 23 percent of Lithuanian residents. TEO successfully upgraded the GPON network in June 2011, and its customers now enjoy speeds of up to 300Mbps. With the help of ZTE, TEO is well on its way to green broadband. TEO will embrace a more promising future for FTTH networks.

Beltelecom: Creating a National Broadband Strategy in Belarus

By Zhang Lei

The Largest Fixed-line Operator in Belarus

Beltelecom is the largest state-owned communications enterprise in Belarus and has a monopoly on fixed-line and data transmission services throughout the country.

As well as being the number one fixed-line operator and leading ISP in Belarus (through its subsidiary, Belpak), Beltelecom also has a stake in the top three mobile operators in the country.

Beltelecom has built extensive communications networks across Belarus, and its backbone fiber-optic lines have egresses to neighboring countries. Beltelecom provides international toll, terrestrial network, TV, and broadcast services. It operates a satellite ground station known as the "information port" through an international satellite channel.

Beltelecom owns public data transmission networks and Internet resources that provide almost all ways of accessing international digital information. Mobile operators in Belarus can connect international space stations to offer international roaming. Beltelecom is the main international pipe supplier in Belarus and plays a crucial role in its Internet service market.

National IPTV Strategy

Traditional DSL access has not been sufficient to meet the ever-increasing bandwidth demand in Belarus, and Beltelecom has been developing Belarus's national IPTV strategy. In 2010, Beltelecom initiated a national broadband network (NBN) that will meet user requirements long into the future.

Beltelecom chose to use GPON to meet its increased bandwidth needs, and FTTH was chosen as the construction mode. With a fast, integrated FTTH network, Beltelecom can provide their customers with quality services.

The advanced FTTH solution has significant advantages, and the scale of the investment will be large. Major concerns for Beltelecom are how to protect its investment, reduce energy consumption, cut OPEX, and boost profitability.

Building a Future-Proof FTTH Network

In September 2010, Beltelecom and ZTE began discussions on selecting an appropriate FTTH construction mode. After rounds of technical evaluations and comparing business models, Beltelecom and ZTE determined that a GPON-based FTTH solution was the best fit.

Future-proof optical access construction mode

An array of ONTs, including F601, F820, F620 and F660 will be used to satisfy high bandwidth requirements of different applications. The GPON-based NBN will provide a variety of quality services, including high-speed Internet, IPTV, and

dedicated lines. In addition, it will meet the ever-increasing service and bandwidth requirements of users well into the future.

Smooth evolution to NG-PON

Existing GPON is inevitably incapable of handling growing broadband requirements. How can this pressing issue be addressed? The ONT uplink module has to be pluggable so that Beltelecom can upgrade the existing GPON to NG-PON simply by replacing the uplink module. This upgrade will deliver higher bandwidth, better QoS, and more networking options and will protect Beltelecom's initial investments.

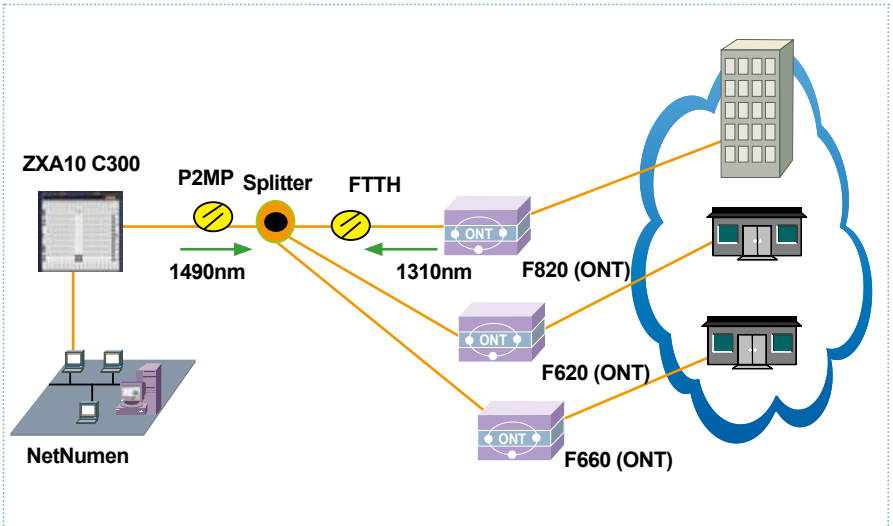


Figure 1. FTTH solution with diverse ONTs.

Low OPEX

In FTTH, a large number of ONTs are deployed in user homes, and all user-side devices are passive. This greatly reduces OPEX. Terminals are managed by TR069 in a unified manner. This helps create a true plug-and-play environment and significantly reduces OPEX.

The innovative, energy-saving design of ZTE's OLT reduces power consumption of each PON port by 42% so that power consumption conforms to the EU standard and the required power supply is significantly reduced. Statistics show that a broadband access network using this technology saves 50% on system-side power consumption per day. This greatly reduces Beltelecom's electricity costs.

Reduced power supply requirements in the FTTH network, allow for faster network construction and rollout and quicker profit.

The large number of outdoor cabinets in a traditional network gives rise to a variety of issues, including radiation, heat dissipation, and noise. FTTH changes the way a network is operated and greatly reduces the OPEX on maintaining outdoor equipment.

ZTE's innovative cabinet designs allow Beltelecom to offer users diverse broadband services and boosts Beltelecom's image as responsible corporate citizen that fulfils its environmental obligations.

Consolidating Market Leadership Through FTTH

After cooperating with ZTE on GPON and NG-PON for a long time, Beltelecom proposed the FTTH construction mode for the first time and conducted evaluation and testing. It calculated the TCO for different construction models. Beltelecom and ZTE jointly introduced a new configuration management model for GPON technology. The FTTH deployment will have a bandwidth capacity of more than 100Mbps and will establish Beltelecom as the leader in the Belarusian broadband market. Beltelecom strives to offer high-quality telecommunication services to its customers.

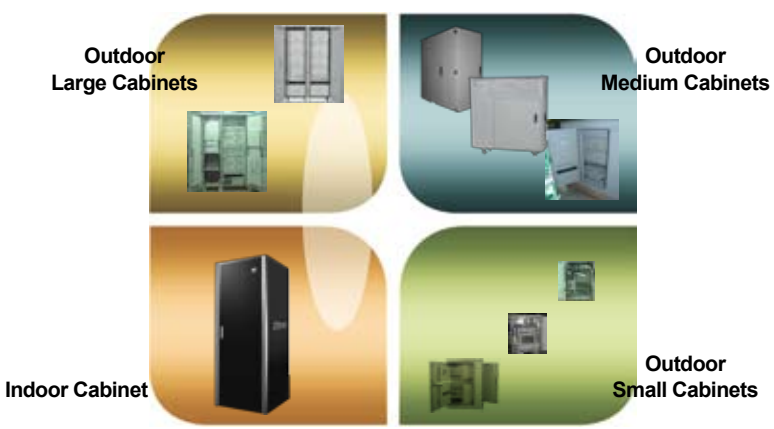


Figure 2. Diverse outdoor and indoor cabinet solutions.

Telkom Kenya Makes Changes with Orange

By Feng Wanli, Hu Xin and Qiu Jiayuan

Kenya is the financial, communication, and transportation hub of Eastern and Central Africa. Its GDP growth was 5% in 2010, and this is expected to rise to 5.7% in 2011. Kenya's area is 580,000km^2, and its population is nearly 39 million.

Telkom Kenya, operating under the Orange brand, is the only integrated telecommunications solutions provider in Kenya. It offers mobile telephony services (using the GSM and CDMA platforms), fixed line services, and broadband Internet.

At the end of 2010, Kenya had 24.969 million mobile subscribers and mobile phone penetration of 63.2%. The market was split between Safaricom (17.451 million subscribers), Airtel (3.792 million subscribers), Orange Teklom (2.134 million subscribers), and EssarTelecom (1.592 million subscribers). Safaricom competed neck-and-neck with Airtel for many years until the duopoly was ended by Essar Telecom and Telkom in 2007. Along with the split-up of the market, average voice tariffs across the industry have plummeted by more than 80% since Airtel entered and began slashing its tariffs in 2010.

Rapid Development

In 2007, Telekom Kenya-the government-owned fixed-line operator-was granted a mobile license by the Communications Commission of Kenya (CCK) to provide and operate mobile cellular services.

In March 2007, the Kenyan government announced a plan to privatize Telkom Kenya to make the operator more efficient and profitable. In November 2007, France Telecom bought a 51% stake in Telkom Kenya for USD 390 million.

Telkom Kenya launched CDMA2000 1X EV-DO service in July 2007, and at the end of 2007, the service had 200,000 subscribers. In September 2008, Telkom Kenya launched GSM services under the Orange brand, attracting 30,000 subscribers in the first month. In November 2010, CCK announced that Orange Telkom Kenya had been granted a 3G license. In March 2011, Orange Telkom Kenya awarded a HSPA+ 3G network rollout contract to ZTE.

In September 2011, Orange Telkom Kenya announced the launch of its 21Mbps HSPA+ network at a press event held in Nairobi. The new network was officially launched by the president of Kenya, H.E.Mwai Kibaki, at an event attended by key corporate and government officials.

Mickael Ghossein, CEO of Orange Telkom Kenya, said they intended to use the new network to make their company the undisputed market leader in mobile internet services. Orange Telekom will offer the most versatile and robust network to enhance customer

> “ZTE products and technologies are on the same level as those of European vendors. After running into some difficulties at the beginning, the project got on the right track. The rollout has run according to plan so far, and we are very happy with its status.”
>
> —Alain Bridard , CTO of Orange Telkom Kenya

Kenya’s president H.E.Mwai Kibaki at the launch ceremony

experience. “The mobile phone has evolved from being a tool for basic voice and text communication to being a tool of convenience,” said Ghossein.

RAN Renewal Project

The RAN renewal project will see 682 Ericsson and ALU 2G sites replaced with ZTE SDRs. 820 new sites will be built over three years.

“To help Orange Telkom Kenya satisfy the demand for reliable mobile application services, we provided them with world-class technologies and effective solutions with the lowest TCO in the industry,” said Xu Chengrong, CEO of ZTE Kenya.

ZTE used advanced dual PA for the swap-over and new site deployment. The dual PA technology allows for smooth evolution to HSPA+ and LTE without any changes to hardware.

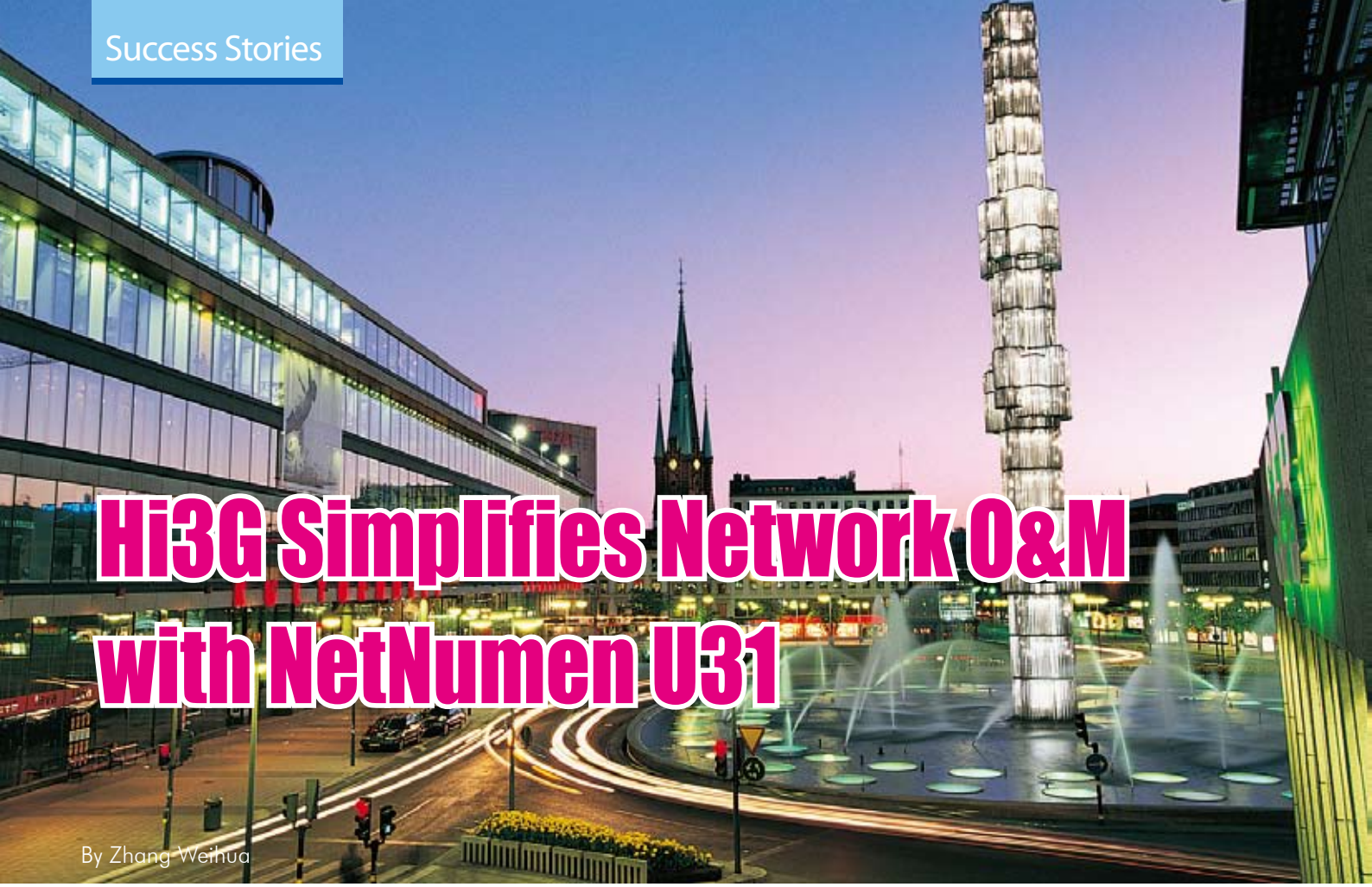
Full use was also made of CAF/ feeder resources to reduce equipment costs. MW cabinets were customized for outdoor sites, end-to-end mobile backhaul was integrated, and hotspot coverage was implemented.

Objective

Orange Telkom Kenya’s objective is to be the market leader in mobile Internet. The 3G network rollout will help Telkom Kenya double its number of subscribers by the end of 2011 and secure number two position in the Kenyan mobile market by 2015.

The new network has enhanced the competitiveness of Telekom Kenya and has generated a new revenue stream for the company. “This network is the platform with which we will provide fast and reliable Internet speeds of up to 21Mbps. Our high-definition voice and other features are designed to meet the dynamic needs of our customers now and into the future”, said Orange Telkom Kenya chairman Eddy Njoroge.

The 3G network puts Telkom Kenya on par with some of the best operators in the world. Orange Telkom Kenya is becoming more effective, more productive and more customer-oriented.



Hi3G Simplifies Network O&M with NetNumen U31

By Zhang Weihua

Sweden has one of the most developed telecom markets in the EU and is home to the world's first commercial LTE networks. Hi3G Sweden AB, an operator in Northern Europe, is seeking to strengthen its competitive edge and maintain the rapid growth of its subscriber base. At the beginning of 2011, Hi3G built the world's first FDD/TDD LTE network that offers customers diverse services and smooth data experience.

Hi3G Sweden AB is now looking for ways to cut down the high additional costs of managing UMTS, LTE FDD, and LTE TDD equipment. There are costs involved in server configuration, O&M labor, complicated IT network planning, capacity expansion, and network interoperability.

To address the future trend of network convergence and cut down CAPEX and OPEX, Hi3G adopted ZTE's efficient NetNumen U31 for unified network management.

NetNumen U31 has the following advantages:

- **unified platform to simplify software and hardware configuration and lower O&M cost**

NetNumen U31 is built on a unified element management platform (UEP) that makes full use of system resources. To

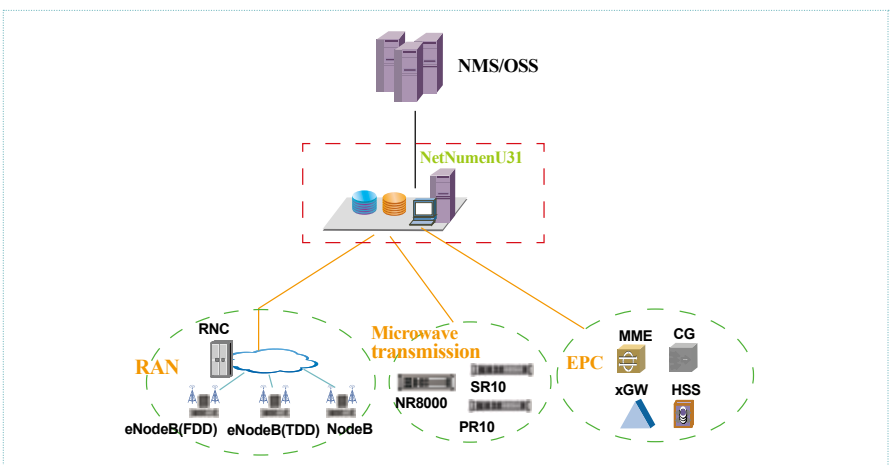


Figure 1. NetNumen U31 solution.

manage tens of thousands of UMTS, LTE FDD, and LTE TDD cells, Hi3G chose to deploy only one set of NetNumen U31 software and hardware rather than dozens of servers. Few O&M nodes are used, and flat network architecture is supported. This saves equipment room and power consumption, simplifies network planning, and lowers the cost of regular network checks.

- **distributed deployment to leverage old devices and protect operator investment**

Rapid subscriber growth drives the need for network expansion. When the performance threshold of network O&M is exceeded, NetNumen U31 uses distributed architecture to extend its management capability. Distributed deployment means that good use is made of old devices and operator investment is protected.

- **security and reliability to ensure smooth operation**

Network security plays an important role in network O&M. As well as integrating traditional security management functions, NetNumen U31 also provides Hi3G with total security solutions ranging from OS to database applications. These security solutions protect Hi3G from security threats. All access and operation logs are kept in the system and are automatically uploaded to a third-party audit server for further checking.

- **standard northbound interfaces to lower interoperability cost**

Interoperability is also an important issue that should be considered when constructing an operator OSS. Diverse, non-standard, unstable interfaces lead to time-consuming preparation, heavy workload, and frequent changes for network interoperability. ZTE took the lead by standardizing northbound interfaces. Standard SNMP, CORBA, and DB interfaces are provided to suit any wireless network. ZTE has also collaborated with mainstream NMS/BOSS vendors such as IBM, HP, and Aircom, to build OSS interoperability testing labs. This significantly reduces workload, time, and costs for network interoperation and allows operators to deliver services in the shortest time.

- **industry-leading plug-in design to support unified management of microwave and wireless equipment**

Microwave has been widely accepted as the transmission solution for wireless networks because of its low cost, fast deployment, and flexible networking. Managing microwave and wireless equipment in a unified and centralized manner is a challenge for operators. NetNumen U31 adopts industry-leading plug-in design that allows for unified management of microwave and wireless equipment, end-to-end monitoring, fast fault location and QoS guarantee.

- **integrated value-added tools to simplify fault location and network optimization**

Traditional drive test and signaling tools are time-consuming, labor-intensive and expensive to use. Northern European operators are seeking new tools to replace them. NetNumen U31 uses call trace system (CTS) and measurement report (MR) as a cost-effective replacement for these tools. CTS has cross-domain signaling trace and signal flow diagram so that operators can rapidly figure out the location of a faulty signaling node. MR collects a great deal of measurement report data from all cells in the network. By analyzing them through a post-analysis

system, operators can find problems with signal coverage, frequency allocation, and adjacent cell interference. MR also automatically converts suggestions for network adjustment into scripts that can be executed by NetNumen U31. This helps optimize network performance.

Hi3G Sweden AB has put into service NetNumen U31—the world's first unified network management system that can manage UMTS, LTE FDD, and LTE TDD networks simultaneously. NetNumen U31 will be able to manage microwave networks by the end of 2011. Through innovation and collaboration, ZTE will continue to help Hi3G Sweden AB make its network O&M simple and efficient.

ZTE: Banking on the TD-LTE Market

June 30, 2011
Source: tele.net.in

Growth in mobile data traffic has created a new and significant revenue stream for telecom operators across the world. Statistics show that the data revenue of Verizon, AT&T, T-Mobile, Vodafone and other mainstream operators has increased by an average of 30 percent over the past year. Attention is, therefore, being given to data and broadband services, and this has created a huge opportunity for telecom vendors.

Chinese telecom equipment manufacturer, ZTE Corporation, is one such player that has benefited from the surge in demand for high-speed networks. Where players like NSN, Alcatel-Lucent and Motorola are running at losses, the Shenzhen-based vendor has been steadily rising up the ladder, reporting increased margins quarter on quarter. According to a report by research firm Ovum, ZTE clocked up year-on-year revenue growth of 40 percent in the quarter ended December 2010. Over the same period, Juniper's revenue grew 26 percent, Alcatel-Lucent's 13 percent, Ericsson's 11 percent, and NSN's 0.5 percent.

Despite its late entry into the Indian telecom market, ZTE has taken rapid strides. After establishing fully fledged operations in the country in 2003, ZTE has come a long way to notch up revenues of $1 billion in 2009-10 from its Indian operations. Revenues from its Indian operations increased by 30 percent in 2010-11.

In fact, India is the second largest market for ZTE after China and accounts for about 10 percent of the company's revenues.

Growth in India

Part of 2009 and the first half of 2010 was a slow growth period for ZTE in the Indian market. This was largely due to network security concerns raised by the Indian government against Chinese vendors.

Citing national security reasons, the Department of Telecommunications required all operators to obtain a security clearance before importing equipment, especially from China. As a result, no telecom equipment orders were placed during this period.

However, in the second half of 2010, the government issued guidelines allowing telecom operators to import equipment from foreign vendors if

certain security criteria were met.

With this issue almost settled, ZTE has been aggressively trying to reverse the negative growth trend. It has obtained several orders from telecom operators that are rolling out 3G and broadband wireless access (BWA) networks.

Bharat Sanchar Nigam Limited (BSNL) was the first operator to award a contract to ZTE after the seven-month-long blanket ban on all imports of Chinese telecom equipment. The Rs 3 billion contract requires ZTE to supply WiMAX equipment to BSNL's designated franchisees. BSNL has signed up with Teracom, Take Solutions, Adishwar India, and Ampoules to launch WiMAX-based broadband services.

ZTE has subsequently won large orders from Aircel, Sistema Shyam TeleServices Limited (SSTL), and Reliance Communications (RCOM).

Meanwhile, with the Indian government firm on providing a fillip to domestic manufacturing, ZTE has been exploring the possibility of setting up its own manufacturing unit in India. This makes good business sense considering that, as part of the National Telecom Policy, 2011, the government is likely to introduce measures to encourage local manufacturing and make it mandatory for India's mobile operators to source a certain percentage of their network infrastructure from local manufacturing plants.

ZTE India, which currently imports equipment and handsets from China, has a small facility at Manesar, but this unit focuses on repairs and maintenance that support its existing Indian operator customers rather than on manufacturing.

Having a local manufacturing presence will be critical for ZTE to make its mark in India's emerging BWA market.

The Chinese company is hoping to do better in the TD-LTE market than it did in India's initial 3G infrastructure market, where it was awarded just nine (of a total of 68) deals during 2010.

In fact, ZTE has already conducted TD-LTE trials for Bharti Airtel and Reliance Industries Limited (RIL), and is set to conduct trials for the other key players that are focusing on LTE in India. "We are also in talks with the major players for commercial deployment of the TD-LTE networks and will soon launch the entire range of

TD-LTE offerings including equipment, dongles, and smartphones in the Indian market," said Isaac Liang, international market director of TDD products, ZTE.

Global Operations

Besides its home market of China, ZTE's key focus includes Europe, Asia-Pacific, and North America. "The Middle East and Africa are also emerging as key growth centres of telecommunications," said Ranjan Sharma, director of wireless, ZTE India.

ZTE's revenue from its international operations grew 27.45 percent to about 38.1 billion yuan in 2010, which accounted for 54.2 percent of its total operating revenue for the year.

In 2010, for the first time in the company's history, the largest portion of its overseas revenue came from the US and European markets. ZTE's year-on-year growth in the two markets was 50 percent, which is 21 percent of its total operating revenue.

The company's sales revenue in the US touched $300 million in 2010, tripling the total in 2009. Sales in the US are expected to reach $600 million in 2011 and $1 billion in 2012.

ZTE is best known for its wide portfolio of carrier equipment, ranging from optical transport to network infrastructure equipment, and is looking to become a household name with a growing portfolio of smartphones and tablets in the global telecom market.

ZTE won its initial market share in the telecom equipment market by adopting a low price point strategy and is now looking to do the same in the device and terminal space as well.

"ZTE is sticking to the lower end of the market to avoid competition from device makers such as HTC and Apple, which are targeting the higher end. If they try to compete up the value chain, they will be forced to raise prices and abandon their primary advantage," says an industry analyst.

The company aims to increase its contribution of terminals, including tablets, smartphones and personal computers, to half of its total revenue in three years time. In 2010, equipment sales accounted for more than 60 percent of its total revenue, but these sales are expected to slow down. The revenue generated by mobile devices made up 25 percent of ZTE's total revenue in 2010, and the company plans to increase this to 30 percent in 2011.

ZTE plans to sell 120 million mobile phones and media tablets worldwide this year, up from 90 million in 2010. Among the 120 million devices, 10 percent will be smartphones compared to last year's 3.33 percent.

ZTE also ventured into the cloud computing business in 2010 and is expecting over $2 billion in revenue in 2011 from enterprise cloud computing products. Its cloud computing portfolio includes data communications products, enterprise networks, servers and storage products for government networks.

All in all, while ZTE has made significant headway in the Indian and global markets, it is now important to sustain the growth momentum. The company's ability to maintain growth will go a long way towards determining whether it has a strong presence in the telecom equipment sector over the next five years.

ZTE TECHNOLOGIES

Frost & Sullivan Recognizes ZTE as 2011 LTE Vendor of the Year

Ye Lihe (L), senior director of ZTE wireless products receives the award from Aroop Zutshi (R), Frost & Sullivan CEO

10 November 2011, Shenzhen — ZTE announced it has been named LTE Vendor of the Year 2011 by leading consulting firm Frost & Sullivan.

Frost & Sullivan's LTE Vendor of the Year is awarded to companies that have achieved excellence in LTE in a given year. ZTE won on the strength of its growing number of contract wins and patent applications. The company's industry leading system equipment has entered high-end markets such as Europe, Japan and the United States, making the company one of the world's most competitive LTE solution providers.

ZTE Becomes Global Leader in CDMA Base Station Market with 33% Share

3 November 2011, Shenzhen — ZTE announced it has become the global leader in the CDMA base station market, with a 32.6 percent share in first half 2011.

According to a recent IDC analytical report on the global CDMA market, ZTE has increased its shipments of CDMA base stations steadily in recent years. At the end of Q2 2011, the company's shipment of base stations exceeded 320 thousand units, pushing it to the top spot in the global CDMA base station market.

ZTE and Vodacom DRC Introduce Commercial iVAS in Congo

Increases SMSC capacity tenfold

9 November 2011, Shenzhen — ZTE announced it partnered with Vodacom DRC to implement an integrated value-added platform solution (iVAS) in Kinshasa, Democratic Republic of Congo.

iVAS provides SMS, and USSD services are on track to be launched before the end of 2012. iVAS has improved the Congo's short message service center (SMSC) capacity tenfold, relieving congestion and significantly improving service to approximately 5 million mobile users. The first phase of the project was completed in less than 90 days and included SMSC integration.

Vodacom is a pan-African mobile telecommunications company that operates in the Democratic Republic of Congo as Vodacom DRC. It also operates in Lesotho, Mozambique, South Africa, and Tanzania. British mobile operator, Vodafone, owns a 65 percent stake in Vodacom.

ZTE 21Mbps Mobile Hotspot MF60 Sales Exceed One Million

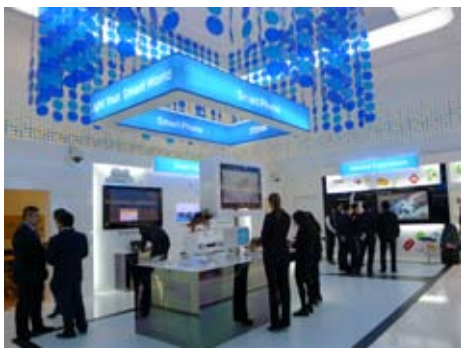
ZTE Mobile Hotspots are proving extremely popular since their launch April 2011

1 November 2011, Shenzhen — ZTE has now sold more than one million unique Wi-Fi (uFi) MF60 Mobile Hotspots since they were launched in April 2011 in Australia, U.S., and Europe. High-speed internet connection, coupled with favorable data plans offered by T-mobile U.S., Australia's Telstra, and Switzerland's Swisscom, has made the device a top seller in international markets.

The MF60 provides 21Mbps high-speed internet connection and supports up to ten Wi-Fi devices simultaneously. With a simple, sleek design, OLED display, Wi-Fi protected setup (WPS) one-key encryption, and Web UI operation, the unit provides users with rapid access to a mobile internet terminal. Customers can have an efficient and seamless mobile business and entertainment experience.

ZTE Debuts World's First Cloud-Based U-Safety Government Security Solution

Technology unveiled at ITU Telecom World in Geneva



24 October 2011, Shenzhen — ZTE unveiled the world's first cloud-based U-Safety government security solution.U-Safety is designed for secure digital government applications, and it was unveiled at ITU Telecom World in Geneva, Switzerland.

The core system is a combination of ZTE's Coalition Emergency Response System (CERS) and Global open Trunking architecture (GoTa).

ZTE's U-Safety solutions provide end-to-end security services for governments, including trunking calls, video monitoring, video conferencing, and other integrated services. The solutions also deliver high-speed data transmission, positioning, command and control, emergency response and intelligent data analysis. They are designed to help governments prevent and promptly respond to disasters and emergencies.

ZTE Participates in First-Ever MSF VoLTE Interoperability Test

Supplies end-to-end system and terminals used for VoLTE IMS calls

25 October 2011, Shenzhen — ZTE announced it participated in the first-ever voice over LTE (VoLTE) interoperability test. The event was hosted by the MultiService Forum (MSF) and backed by GSMA and was held at the Vodafone Test and Innovation Centre in Düsseldorf, Germany.

The test was designed to validate key network interfaces to ensure multivendor deployment strategies for LTE/EPC/IMS technologies, including GSMA's technical recommendations for IMS-based VoLTE. Test scenarios included VoLTE basic interoperability, global roaming, and interconnection (as specified by the GSMA).

ZTE provided end-to-end system and terminals for the test, including IMS Core (P/I/S-CSCF), eNodeB, MME, S-GW, P-GW, PCRF, HSS, DRA, IMS MMTel AS, IMS soft client and LTE UEs. ZTE supplied comprehensive network solutions for VoLTE IMS calls.

ZTE Wins Next-Generation Mobile Network Deal with Japan's WCP

The TD-LTE project reinforces ZTE's leadership in TDD

10 October 2011, Shenzhen — ZTE and Wireless City Planning (WCP) announced they have entered into a strategic partnership to use AXGP—a technology similar to TD-LTE—to build a next-generation mobile network in Japan. WCP is SoftBank's group company, one of the major mobile operators in Japan.

ZTE was chosen by WCP as its primary strategic partner for AXGP. Once complete, the network will reach 99% of Japan's ordinance-designated city population.

The two companies will also explore the possibility of creating a joint lab to develop emerging technologies and drive the development of next generation technologies, including AXGP. They will also extend the global reach of AXGP.

With its SDR platform, ZTE provides stronger baseband processing compared to other equipment providers. This allows the company to provide exclusive joint-cell processing technology and interference-eliminating technology.

ZTE Nine-Month Operating Revenue Rises 26.5% to RMB58.29 Billion

Terminal sales revenue increases 53%

27 October 2011, Shenzhen — ZTE announced that its operating revenue rose to RMB58.29 billion for the nine months ended September 30, 2011. This represents an increase of 26.5% year-on-year.

Net profit attributable to parent company shareholders for the same period was RMB1.07 billion, a year-on-year decline of 21.5%. The decrease is mainly attributable to increased expenses. Basic earnings per share for the period were RMB0.31.

Revenue from terminal sales increased 53.4% year-on-year, driven mainly by growth in sales of 3G and CDMA terminals, GSM handsets, and data cards. Revenue from telecommunications software systems, services, and other products grew year-on-year by 28% as a result of increased fixed terminal and service sales. ZTE also reported year-on-year growth of 15% in carrier network revenue. This is attributed to increased sales of ZTE's wireline products, optical communications systems, domestic sales of GSM/UMTS equipment, and international sales of CDMA equipment.

In the first three quarters of 2011, ZTE continued to strengthen its position as industry leader in the TD-LTE sector. This is evident in the company's initiatives in high-end markets, including new partnerships with Hutchison Sweden, Softbank Japan, and operators in India and Saudi Arabia. ZTE has also further developed its partnerships with France Telecom and MTN Group in the GSM/UMTS field.

ZTE secured a record-high market share of 12.5% in PTN, maintaining its position as the global leader in optical product manufacturing.

ZTE also obtained a 16.3% share of the high-end data product market among China's telecommunications operators, moving it into the No. 3 spot domestically. This is attributed to an increase in sales of the company's high-end data products, such as the M6000/T8000.

Cricket U.S. Introduces ZTE Memo

20 October 2011, San Diego — ZTE and Cricket Communications, a leading provider of innovative, value-driven wireless services and a wholly-owned subsidiary of Leap Wireless International, announced the availability of ZTE Memo.

ZTE Memo is a 3G bar-style phone that has full web browsing capabilities and a QWERTY keyboard. Memo's feature phone functions promote multitasking and deliver reliable mobile communications for personal or business use. A built-in 2 megapixel camera/camcorder and an MP3 player provide users with essential multimedia. Dedicated keys provide instant access to the phone's messaging and calendar tools for easier access to these common applications. ZTE Memo also has a number of Cricket services, including Cricket Navigator (a location solution) and the customizable MyHomeScreen, which allows users to personalize their interface and enhance their overall mobile experience.

ZTE Memo

Building value together

New solutions and opportunities are results of teamwork and commitment.
Our customers know, since we have collaborated with them to create win-win solutions since our foundation in 1985.
Today, ZTE is a global leader in telecom solutions, and now we want to service you.
Visit **www.zte.com.cn** to find out more and to contact us for new opportunities.

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