SPECIAL TOPIC: BEARER NETWORKS

P11 Intelligent Next-Generation Bearer Networks Create New Value

P3 CVT: Making Communication Easier for You

An interview with Jim Gifford, chief operation officer of CVT
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Jim Gifford, chief operation officer of Copper Valley Telecom (CVT), has been in the telecommunications business since 1977, starting with a background in CATV then moving over traditional wireline telephone services. CVT, a small company, has provided opportunities to become experienced in not only day-to-day operations but also engineering of new services ranging from switching, new soft switching, IT, fiber backbone, fiber to the premise, backbone microwave networks, WiFi, AMPS and CDMA network, all in remote Alaska.

Now, Jim Gifford shares his insights into broadband network construction and differentiated competitiveness in the mobile broadband and smartphone era.

**Journalist:** Could you introduce your company, CVT (including CVW), and its business?

**Jim Gifford:** Copper Valley Telecom is a small rural telecommunications company providing wireline telephone and wireless services in South Central Alaska, covering a service area in excess of 9,600 square miles and a small population of 10,000. Copper Valley provides traditional wireline telephone, Internet and wireless CDMA EV-DO Rev. A services.

CVT is a member owned community based telecommunications cooperative, dedicated to providing the best value, state-of-the-art communication services to keep up with our customers’ needs.

Copper Valley Wireless (CVW) is the subsidiary company of CVT. CVW is mainly devoted to building wireless network and developing the wireless services.

**Journalist:** What are the objectives of CVT and CVW in 2011? What approaches will you take to achieve these objectives?
**Jim Gifford:** This year is shaping up to be another busy construction year for Copper Valley Telecom. As is the national trend, our objective is to bring broadband everywhere. CVT delivers broadband over fiber and copper cables, and wirelessly using both cellular 3G and Wi-Fi hot spots. Copper Valley’s focus during 2011 is to replace satellite fed connectivity with new terrestrial fiber and microwave networks to support broadband services. An initial deployment of fiber to the premise and VDSL service is underway as well.

Additional enhancements provide for redundancy and Internet connectivity upgrades. With the new transport facilities, new cell sites are being deployed along with capacity system upgrades. For example, we are also upgrading electronics in our central offices and electronics sites near subdivisions and homes to support faster and more reliable internet connections. CVT is also busy upgrading our Internet connections to the rest of the world to provide for e-commerce and over the top (OTT) services such as downloading of movie TV, gaming and entertainment.

In a word, you will see CVT employees and contractors busy working to bring broadband to more places where you work, live and play.

**Journalist:** Mobile internet, mobile broadband and smartphones are developing rapidly. CVT is a full-service operator. How does the company adjust its strategies to deal with development trends?

**Jim Gifford:** CVT will be the full service telecommunications provider of choice by offering cutting edge technology through innovative business approaches and competent, highly trained employees. With the rapid growth of wireless services, CVW has developed two cells on
wheels (COW’s), which are deployed to different venues, such as the Ski Season on Thompson Pass, the summer tourist season supporting remote lodges on the Denali Highway and fill in service to relieve service congestion as demand grows and changes. Additionally CVT is adding cell sites and transport capacity to support ever growing EV-DO usage. Our customers are hungry for bandwidth and until recently with CVT’s network expansion have been limited to satellite based services.

**Journalist:** How does your company have over these carriers?

**Jim Gifford:** CVT provides service in very remote low-density population areas, several of our service areas have no commercial electricity, limited or no road access, requiring travel by boat or air to reach the communities and cell sites. CVT maintains a number of standalone mountain top microwave/cell sites requiring helicopter only access, powered by solar, wind and cycled propane generators. We are a member owned local company, so our focus is serving our members and the remote areas they live, work and enjoy in the remote region of Alaska.

**Journalist:** In 2006, ZTE began cooperating with CVW on CDMA equipment. How do you evaluate ZTE’s products and services? What’s your expectation for future collaboration between CVT and ZTE?

**Jim Gifford:** In the remote areas and restricted access of our service area, mountain top cell sites, and extreme Alaska temperatures reaching -60 Fahrenheit during the winters, the ZTE CDMA network has exceeded our expectations on reliability and capacity power usage. The ZTE CDMA platform providing voice and EV-DO data to both mobile and fixed customers is an essential service business, residential and emergency communications. CVT anticipates continued growth with ZTE of the 3G network with continued build out of cell sites providing additional coverage and capacity.

**Journalist:** Could you tell us about CVW’s planned evolution from CDMA to LTE?

**Jim Gifford:** CVW is planning an initial LTE deployment starting in 2012 and expects to operate a dual CDMA and LTE network for several years as the LTE network is extended from the villages and towns out to the more rural and remote areas of our vast service areas.
Cloud computing is a strategic new industry and represents a new generation of technological revolution. In the foreseeable future, there will be bigger spurts of energy in the field of cloud computing. Cloud computing has also brought new opportunities to traditional IT equipment providers—who have been prompted to make significant changes to traditional IT products.

Cloud computing is a new commercial computing model in which computing tasks are distributed in a resource pool consisting of a large number of computers. A variety of applications can obtain the necessary computing power, storage space and software services as needed. The resource pool is a pool of infrastructure, and its openness directly influences the quality of other cloud-based services such as Platform as a Service (PaaS) and Software as a Service (SaaS).

Depending on service models, cloud computing is classified into Infrastructure as a Service (IaaS), PaaS and SaaS. Fundamentally, the provision of cloud computing power refers to application and service delivery from the IT infrastructure. Computational resources are provided on demand via a computer network, and these resources are easily extensible. To a user, resources in the cloud are infinitely extensible and available any time. Resources can be used and expanded whenever needed, and payment can be made according to the amount of resource used. Just like water and electricity are public utilities, cloud computing will become the IT infrastructure that provides continuous computational services to people everywhere. Gartner defines cloud computing as a style of computing where scalable and elastic IT capabilities are provided as a service to multiple customers using Internet technologies.

The essence of cloud computing is the aggregation of mass data and application resources. So there are very demanding requirements on performance, stability, and manageability of the background servers. Traditional low-end servers are not an ideal platform for cloud computing. Two points must be considered in relation to the web server farm pattern currently used by Google and Amazon. One is that Google and Amazon provide limited cloud computing application types,
ZTE Unveils Proprietary Cloud Computing Operating System

Future sales of ‘CoCloud’ OS & cloud computing solutions expected to account for 1/3 of total revenue

18 May 2011, Shenzhen — ZTE for the first time demonstrated its complete range of cloud computing solutions, including its proprietary ‘CoCloud’ operating system. The entire range was unveiled at the China Cloud Computing Conference in Beijing.

With CoCloud as the centerpiece, ZTE’s cloud solutions consist of platforms that are used to manage IT resources, virtual computing, cloud operating management, and cloud security. Together with a range of cloud applications, the solutions cover all industries—from traditional telecom markets to government and enterprise markets. ZTE also announced the establishment of its Global Cloud Computing Center in Nanjing.

In the 2010 annual report released on March 18, ZTE made its commitment to cloud computing and integrated circuits (IC) known. “It is our ambition that cloud computing account for a third of ZTE’s total revenue,” said Shi Lirong, president of ZTE. “Cloud computing has revolutionized resource provision methods and user application methods in most computing aspects. Under the new industrial framework, we expect to introduce radical changes in both IT and CT market and to open up new opportunities for industry players.” The establishment of ZTE’s Global Cloud Computing Center in Nanjing is a significant milestone for ZTE’s cloud computing strategy.
Although industry and governments have worked for more than a decade to transition into IPv6, this transition is still nowhere near complete. The long-predicted doomsday for IPv4 is quickly approaching. The Internet Assigned Numbers Authority (IANA) will run out of unallocated IP addresses in August 2011 and the Regional Internet Registries (RIR) will run out of unallocated IP addresses in May 2012. It is therefore imperative that IPv4 be transitioned to IPv6.

Why Slow Transition to IPv6?

IPv6 has many advantages over IPv4, including larger address space, better header format, plug and play, higher security, end-to-end QoS, and better IP mobility. Despite the limitations of IPv4 and the impending IPv4 address exhaustion, operators are still behind in their IPv6 migration plans.

The basic reason for slow deployment of IPv6 is unbalanced development of the industry chain. IPv6 migration involves network equipment, terminals, IT systems, service systems, and applications. Although IPv6 has grown into a mature technology that is commercially available on network equipment and IT systems, most terminals (excluding PCs), service systems and applications have not been made IPv6 ready. This is due to the “bucket effect” in the industry chain. Few service types are supported on IPv6 networks, and operators have adopted a wait-and-see attitude towards IPv6 migration because there is no obvious ROI. The unbalanced development of the industry chain hampers IPv6 deployment.

Another reason for the slow deployment of IPv6 is that there is no complete solution for evolving to IPv6. A solution for the backbone network is available and meets current service demands, but there is no solution for the MAN that is mature enough for large-scale commercial deployment. There are two IPv6 solutions for user access.

- **Native IPv6 access**: Subscribers obtain IPv6 configuration information from BNG and access an IPv6 network through PPPoEv6 or IPoEv6. Native IPv6 access solves the problem of IPv4 address depletion but does not allow for feature-rich services because most current applications do not run smoothly on an IPv6-only host. Therefore, native IPv6 cannot adapt to network features at the present stage but will be applied in the final stage of network evolution.

- **Dual-stack access**: Subscribers obtain IPv4/IPv6 configuration information and access dual-stack networks through a single PPP session for both IPv4 and IPv6 or IPoEv4/IPoEv6. The dual-stack access solution ensures feature-rich services but cannot be deployed on a large scale because it uses public IPv4 addresses.

**DS-Lite**

Because of application and terminal constraints, a large-scale upgrade to IPv6 cannot be completed within a short time. Most ICPs have no intention of deploying IPv6, and IPv4-IPv4 traffic will still be prevalent on...
the network in years to come. Dual Stack Lite (DS-Lite) has thus been put forward to drive IPv6 deployment and ensure IPv4 service continuity.

DS-Lite combines IPv4-in-IPv6 tunnels and IPv4 NAT. It is collaboratively implemented by the address family translation router (AFTR) and basic bridging broadband element (B4). The DS-Lite model is shown in Fig. 1.

B4 (or home gateway) enables the DHCPv4 server function to allocate private IPv4 addresses to internal terminals. If B4 is a terminal, it assigns a fixed private IPv4 address by itself. The operator network advertises AFTR address information (IPv6 addresses) through static configuration or DHCPv6. B4 initiates a request to create an IPv4-in-IPv6 tunnel (known as softwire) to AFTR and encapsulates or decapsulates outgoing IPv4 or incoming IPv6 traffic (the destination address is IPv6 address of B4 WAN interface).

AFTR creates an IPv4-in-IPv6 tunnel (softwire) to B4 and uses the NAT function to decapsulate/encapsulate outgoing IPv6 or incoming IPv4 traffic as well as IPv4-IPv4 NAT. Since IPv4 addresses are allocated by users on their own, different users may have the same IPv4 address. To avoid address conflict, NAT table entries maintained by AFTR are different from common IPv4 NAT table entries, and the IPv6 address of B4 WAN interface is added to differentiate users.

The DS-Lite model supports IPv6 deployment. AFTR and B4 perform native forwarding of IPv6 traffic.

**DS-Lite CGN Solution**

To push IPv6 deployment, DS-Lite carrier-grade NAT (DS-Lite CGN) is currently being researched in this industry. DS-Lite CGN falls into two types: standalone CGN and embedded CGN. Standalone CGN implements DS-Lite AFTR through hardware. Embedded CGN developed on the BNG (BRAS) platform has a dedicated card for DS-Lite and provides PPPoEv6/IPoEv6+DS-Lite for user access and DS-Lite AFTR. ZTE’s ZXR10 M6000 can be deployed as either a standalone CGN or an embedded CGN.

Standalone CGN can be centrally deployed or distributed. In centralized deployment (Fig. 2), subscribers obtain IPv6 configuration information from BNG over PPPoEv6/IPoEv6, and a softwire to CGN is created. CGNs dual-homed to MAN core routers provide DS-Lite AFTR for MAN subscribers. They are deployed in pairs to enable DS-Lite hot backup and load sharing. This improves network availability.

In distributed deployment (Fig. 3), CGNs connected to IPv6 BNG—the control device at the edge of MAN—provide DS-Lite AFTR for subscribers covered by IPv6 BNG.
As for the embedded CGN, BNGs provide IPv6 access and DS-Lite AFTR through PPPoE6/IPonE6+DS-Lite for subscribers covered by BNGs. Because some BNGs cannot be upgraded, the existing IPv4 BNG serves as LAC, and IPv6 BNG integrates the functions of LNS and CGN. An L2TP tunnel is set up between the IPv4 BNG (LAC) and IPv6 BNG (LNS), and a softwire is set up between the home gateway (B4) and IPv6 BNG. In this way, IPv6 access can be provided for subscribers.

Standalone CGN and embedded CGN have their own advantages and disadvantages, as listed in Table 1. Embedded CGN has not yet matured. It causes service interruption, it is not reliable, it has poor scalability and complicated O&M. However, standalone CGN is highly reliable, has good scalability, easy O&M, and is simple to upgrade with little impact on existing services. France Telecom has chosen to deploy standalone CGN for its initial network evolution.

Centralized deployment of standalone CGN is therefore considered the best choice for operators to evolve their networks to IPv6, and distributed deployment of standalone CGN can be adopted in large MAN scenarios as a supplement for wide area coverage. The DS-Lite CGN solution allows for smooth network evolution, protects operator profits, and promotes IPv6 deployment.

Table 1. Standalone CGN vs. embedded CGN.

<table>
<thead>
<tr>
<th>Solution Model</th>
<th>Smooth Transition</th>
<th>Reliability</th>
<th>Deployment Cost</th>
<th>Network Maintenance</th>
<th>Scalability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standalone CGN</td>
<td>Small change to BNG configuration; no impact on existing services</td>
<td>Simple functions; high reliability; easy to implement CGN hot backup</td>
<td>Low cost; occupies equipment room</td>
<td>Independent O&amp;M</td>
<td>CGN cards are added flexibly based on user base</td>
</tr>
<tr>
<td>Embedded CGN</td>
<td>Big change to BNG configuration (additional CGN card is needed); system failure risk that affects existing services</td>
<td>Complicated functions; low reliability; difficult to implement BNG+CGN hot backup</td>
<td>High cost</td>
<td>Complicated O&amp;M due to mixed BRAS and CGN interfaces</td>
<td>Poor scalability; occupies BNG slot</td>
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Figure 4. Deployment of embedded CGN.
Developments in telecommunication technology have changed people’s lives. The move from 2G to 3G/LTE has enabled people to see mobile communications rather than just hear them, and the move from broadcast television to interactive television has enabled people to use television rather than passively watch it. The advancement from fixed Internet access to mobile Internet has enabled people to share and access information flexibly anytime and anywhere. With the development of the Internet, Internet of Things and cloud computing, telecommunication technologies have permeated into fields as diverse as transportation, medical care, energy, homes, and agriculture.

In the area of rich services, the value of the whole industry chain is moving towards terminals and services. Bearer networks are becoming transparent, and operators are becoming mere pipe providers. OVUM predicts that the compound annual growth of mobile broadband subscribers from 2009 to 2015 will be 31%, whereas the compound annual growth of mobile broadband services will be just 22%. This means that the growth of subscribers is faster than the growth of business revenue. Market research conducted by Analysys Mason on the Norwegian mobile broadband market shows that traffic from data cards increased by 175% in 2009, whereas revenue increased by only 75% with a 48% decline in unit yield. The traffic from data cards is 10 times the Internet traffic from mobile phones, whereas the unit yield of the former is only one ninth that of the latter. This means higher CAPEX and lower unit yield. It means that operators are building communication pipes but are not benefiting from the growth in profit brought about by business development. They must provide high-bandwidth and high-quality bearer pipes that provide good service. But without a corresponding increase in profit, this can be costly.

To deal with challenges encountered in bearer networks, ZTE proposes an intelligent next-generation bearer network with intelligent bearers, converged bearers, broadband bearers, high-reliability bearers and IPv6 evolution. This helps operators build high-bandwidth, low-cost, visible, controllable, manageable and evolvable bearer networks in order to create added value.

**Intelligent Bearer**

An intelligent bearer network provides differentiated services and open platforms. It guarantees high-value services and restricts low-value services. It also opens network resources to partners so that operators have a sound secondary operation environment to increase their value and create win-win situations with partners. The intelligent bearer network proposed by ZTE includes:

- an intelligent optical network. Automatic creation of optical paths, quick deployment of end-to-end services, and automatic topology discovery simplifies network OAM. Various protection and recovery modes are adopted to improve network security and differentiated
service capabilities. New services are provided quickly in optical transport networks, dynamic circuit requirements of IP networks can be met, and the structure of the transport network can be optimized and evolved.

- Optimized OAM. Data are collected through deep packet inspection and traffic probing at the front end and are analyzed by the traffic and behavior analysis system at the back end. Inspecting services, defining user behaviors, and automatically discovering user behaviors are necessary in building an intelligent multidimensional communication pipe that can control services. Statistics on user status, online user type, user distribution, and network resource allocation make networks visible. Differentiated services, access, and charging modes make users manageable. Visible, controllable, and optimized management of bearer networks can be realized. Network resource allocation can also be optimized and the value per bit maximized in bearer networks.

Converged Bearer

Convergence is the core of intelligent full-service bearing networks. A converged bearer not only reduces network construction costs but also allows for network expansion and evolution. The key to a converged bearer network is equipment convergence. This unifies multiservice bearing, adapts to development trends of telecom technologies, and protects operator investments. The converged bearer network proposed by ZTE covers converged access and converged IP and optical network.

In mobile backhaul, IP/MPLS and MPLS-TP are gradually being converged. IP/MPLS enhances OAM and network protection, and MPLS-TP enhances L3 VPN. Based on a unified software and hardware platform, ZTE’s converged transport network equipment, ZXCTN, enables both IP/MPLS and MPLS-TP, protects network investments, and supports smooth evolution.

In the backbone network, IP networks are heavily burdened. Expanding traditional IP networks greatly increases costs and cannot solve the problem of traffic congestion. How to use relatively low-cost optical networks has become the focus of operators. The appropriate solution is to fully converge the service planes, control planes, and management planes of IP and optical networks. This is an important development trend of bearer networks. ZTE proposes a converged IP and optical network. By using PCE and network planning tools at the optical and IP layers, the two layers can share network resources, plan collaboratively, optimize traffic paths, improve backbone network resource use, and improve transport efficiency. The problem of risk sharing can also be solved to improve backbone network stability. For fast service deployment and quick fault locating, unified end-to-end network management is performed for the IP and optical layers. This improves operating efficiency and reduces TCO.

Broadband Bearer

High bandwidth is the basis of an intelligent bearer network and is important for improving user experience. Developing high-bandwidth bearer networks has become a main concern of operators. Cluster systems and 100G are hot technologies that have attracted much attention in the industry. ZTE has participated in drafting IEEE 100GE, ITU-T 100G ODU4 and 100G WDM standards. ZTE’s data and optical network products all support 100G platforms. The ZXR10 T8000 100G cluster router has the largest capacity in the industry. By using an innovative virtual cluster control technique, a
IPv6 Evolution

Because the IANA IPv4 address pool was exhausted in February 2011, and the addresses of the Asia Pacific Network Information Center (APNIC), which allocates addresses in Asia Pacific, will soon be exhausted, operators in Asia Pacific will be unable to obtain IPv4 addresses for business development. IPv6 has therefore been introduced to solve this problem. With the advantages of mass address space, end-to-end QoS, mobile IP address, network security, and plug and play, IPv6 meets the requirements for service development and has become the core of next-generation Internet.

ZTE has been involved in developing IPv6. It has worked closely with France Telecom, China Telecom, and China Mobile to develop quality products and solutions for smooth evolution to IPv6. ZTE’s end-to-end 100G bearer network solution provides ultra-high speed across the network—from convergence layer to backbone layer and from transport layer to IP layer. The solution greatly increases network capacity, enriches operator services, optimizes network architecture, and enhances an operator’s competitive edge.

High-Reliability Bearer

High reliability is the key to the stable running of bearer networks. ZTE proposes a plane-independent network architecture for service bearing. The public service plane carries high-speed Internet access and dedicated Internet access services, and the telecom service plane bears differentiated services such as mobile service, government and enterprise VPN, and self-operated service. Plane-independent protection technologies are also deployed to ensure reliable service bearing. On the public service plane, ZTE’s ethernet smart ring, ethernet smart switch (ZESR/ZESS), and link aggregation group (LAG) are deployed to protect networks at the convergence layer. Virtual router redundancy protocol (VRRP) is deployed to protect gateways, dual-node cluster hot backup is deployed to protect the service control layer, and IP fast re-route (IP FRR) is deployed to protect routes at the IP layer. On the telecom service plane, 1+1/1:1 path protection, ring protection, traffic engineering (TE) protection and LAG are deployed to protect backhaul services. VRRP, dual-node cluster hot backup, TE FRR/VPN and FRR/IP FRR are deployed to protect the MAN service control layer and backbone layer. At the transmission layer, optical path shared protection, optical multiplex section shared protection, 1+1 optical path protection, 1+1 optical multiplex section protection, and 1:N optical path protection are deployed for high network reliability.

cloud computing-based control plane, and high-performance 100G chips, the cluster router can support at most a 16+64 multichassis system and 200Tbps switching. This provides high-speed bearer channels for intelligent bearer networks. ZTE’s end-to-end 100G bearer network solution provides ultra-high speed across the network—from convergence layer to backbone layer and from transport layer to IP layer. The solution greatly increases network capacity, enriches operator services, optimizes network architecture, and enhances an operator’s competitive edge.

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The global information explosion, high-definition videos, and cloud computing have brought about a dramatic increase in network traffic. Smoothly expanding and upgrading bearer networks has become the key to fast broadband connection. In 2010, ZTE launched the industry’s most complete 100G end-to-end (E2E) bearer network solution that converges 100G transmission, 100G routing, and 100G switching. This solution now paves the way for the development of broadband networks.

The 100G E2E bearer network solution provides ultra-high speed across the network—from convergence layer to backbone layer and from transport layer to IP layer. All three of ZTE’s high-end products for bearer network—the ZXR10 T8000100G cluster router, ZXONE 8000 large-capacity cross-connecting equipment, and the ZXR10 8900E core switch—support the 100G interfacing board. The 100G network formed by these three high-end devices and the unified network management plane significantly increase network capacity, enrich operator services, optimize network architecture, and enhance competitiveness.

By deploying ZXWM M920 and ZXONE 8000 as part of an ultra wideband 100G bearer network solution, operators can eliminate traffic bottlenecks in the core networks and meet the demand of growing data business. ZTE’s self-developed multiplexing QPSK modulation supports ultra long distance transmission of over 1000km without the need for power relays. ZTE’s proprietary core switch chip has large-capacity OTN cross-connecting based on ODU2/ODU3/ODU4 granules. This provides flexible traffic scheduling for core nodes. The 100G E2E bearer network supports, at most, a ten-dimensional ROADM system. It uses the WASON intelligent control plane to greatly shorten the time for service deployment and provides multiple recovery paths for key services. It also supports hybrid transmission of 40G/100G. Operators can simply upgrade the circuit-side single board of their existing platform to support 100G. This reduces networking costs and protects network investment.

The E2E 100G bearer network uses ZXR10 T8000 in the backbone IP layer, which creates a super node and allows for smooth evolution from 10G to 100G. The telecom-class 100G routing cluster system, ZXR10 T8000, has the largest capacity in the industry. By using the virtual cluster control technique, a cloud computing-based control plane, and high-performance chips, ZXR10 T8000 can support a maximum of a 16+64 multi-chassis system and 200T switching. The highly-integrated 40G/100G chipsets with low power consumption provide end-to-end high-speed bearer channels that reduce transmission cost per bit. ZXR10 T8000 operates on ZXROS—ZTE’s self-developed operating system. ZXROS has a modular, process-oriented, micro-kernel software platform that implements hot patching, non-stop routing, online component upgrading, and online cluster upgrading through dynamic process loading. These O&M tasks are completed without affecting
user service experience.

In the convergence access layer, the solution uses a ZXR10 8900E core switch that has the first 100G port in the industry. The new-generation ultra wideband core switch is based on ZTE’s multidimension secure switching architecture and a fully distributed OS platform. It provides ultra high-speed 40G and 100G Ethernet interfaces as well as a 480GB single board that is currently the highest in the industry. ZXR10 8900E supports a full range of customized solutions, including complete Ethernet, MPLS, multicast services, and advanced MAN bearer platform. It supports IEEE 1588v2 and synchronous Ethernet (for future convergence of bearers), advanced deep packet inspection and security control, and multidimensional core convergence platform. It also supports virtualization, FCoE and virtual cluster switching so that a future cloud-based bearer platform can be built.

In the network management layer, ZTE’s NetNumen U31 unified network management system is used for centralized management, fast end-to-end scheduling, and comprehensive monitoring of services offered. With efficient and stable advanced system architecture, the modular structure of components is easy to expand and maintain. NetNumen U31 also provides a complete security solution to ensure system security and reliability.

ZTE has been promoting the development and commercialization of 100G standards in the industry. They have been heavily involved in drafting proposals for IEEE 100GE, ITU-T 100G ODU4, and OIF 100G WDM. ZTE has mastered core technologies such as large-capacity photoelectric switching, 100G message processing, 100G MAC, 100G OTN packaging, and 100G wavelength-division multiplexing. They have good strategic partnerships within industry circles.

ZTE’s routers, switches, IPTN, and OTN/WDM products fully support a 100GE interface. ZTE’s long-distance transmission equipment supports a 100G line interface and large-capacity electric cross-connecting. While implementing high-performance 100G, ZTE strives for functional completeness, user friendliness, and low-power consumption. Cost-efficient bearer network solutions allow operators to smoothly upgrade their networks and use one-stop 100G services.

The 100G industrial chain is being developed and has not yet matured. 100G and 40G are technologies of the same period. The technical complexity of 40G is a little less than that of 100G, and the port density of 40G can be 2-3 times higher than in 100G equipment. A mature 40G industry will be established soon to meet pressing application needs in the market. 40G is a practical transition technology that will coexist with 100G in the long term. The 100G WDM industry is being gradually improved. Because of different bandwidth requirements and development strategies between operators, different economic development between countries and regions, and different network levels, 40G and 100G will coexist in the long term. In general, 100G will gradually dominate in the trunk and 40G will be used more in MAN areas.

In 2011, the 100G market is expected to remain in the testing and trial stage, on the verge of large-scale application. ZTE will participate with key operators to test and trial 100G WDM and 100G routing and will continue to improve their product features and solutions. This will lay a good foundation for marketing the products for later large-scale application.

Another requirement for developing 100G technology is enhancing the port density of 40G and 10G. Good solutions can be provided only by combining the two. In 2011, ZTE will launch more products with high-density 10G and high-density 40G to enhance its competitiveness in the 10G/40G era. These products will also allow ZTE to smoothly transition into the 100G application environment.

Figure 1. ZTE’s 100G E2E bearer network solution.
With the constant expansion of mobile networks and continuous technological upgrades, mobile network technology has developed from the AMPS system—put into use in 1983—through AMPS/TACS, GSM/CDMA and UMTS/TD-SCDMA/CDMA2000, into LTE. The speed of wireless communication has soared from 2bps in the Marconi era to 1Gbps. Even if a Marconi telegraph was used to transfer data unceasingly from 1896 to the present, the amount of information transferred to date would be far less than what an LTE user can access in a single minute.

With the evolution and dense deployment of networks, there are more and more optimization parameters and wireless environment evaluation indexes. Network complexity is also growing exponentially. The coexistence of network systems further increases this complexity.

With a variety of 2G, 3G and LTE networks in use, resource allocation and scheduling scenarios are like a dispatcher at a transportation center who needs to organize and coordinate a variety of transport modes from ox carts to jets to provide continuous transport for many customers. This requires the dispatcher to master the characteristics of each mode. In highly complex networks, manual network configuration used in the 2G/3G era as well as traditional O&M and optimization based on drive tests have gradually been overloaded. Automatic network configuration is now a trend in the post-3G era.

**The Introduction of SON**

In 2007, 3GPP started to research use cases and standards proposals in RAN3 and RAN5 to introduce self-organizing networks (SON) into LTE networks. In its R8 and R9 versions, 3GPP has completed all the definitions and specifications of various scenarios, including automatic discovery of adjacent cells and automatic physical cell identity (PCI) allocation. Scenarios and technology programs for optimizing mobile robustness, coverage, capacity, and random access channel will be discussed in the specifications of the follow-up R9 and R10 versions. Mobile load balancing and minimum drive test and energy savings will also be discussed. Currently, the basic technical direction is to implement network self-organizing, self-optimizing and self-
healing by enhancing measurement capacity of terminals and strengthening exchange of configuration and load information between base stations.

ZTE has deployed SON functions such as automatic discovery of adjacent cells in its LTE products. In-depth research has been done on network stability, improved user perception and system cost and energy savings, and much technology has been accumulated. This helps to develop a more cost-efficient, reliable and intelligent network solution.

ZTE’s Uni-RAN solution, based on the unified SDR hardware and software platform, fully supports self-detection, self-discovery, self-configuration, self-linking, self-update and self-testing in base stations—from system power-up to service provisioning. This full-function support avoids complex on-site configuration required in traditional base station commissioning and greatly reduces human error.

A key feature of SON technology is that base stations can automatically make decisions, change cell topology and wireless configuration, and perform handover by collecting user measurement reports and exchanging information with adjacent cells. However, a network with these features only has the basic characteristics of a self-organizing system. There are no external commands (such as human interference), and new structures such as cell range, adjacent cell topology, and user distribution are formed through mutual coordination. In the case of large-scale nodes, the convergence speed of a self-organizing system depends on the algorithm, interaction period, and effect manifestation period. If the algorithms are not designed properly, the system may exist in a long-term shock or chaotic state. Algorithms for automatically discovering adjacent cells, optimizing mobile robustness, balancing mobile load can cause chain reactions. ZTE has performed full system simulations and has carefully designed algorithms and delay indicators that make the system responds quickly to disturbances and optimally balance signaling load and function coordination within the convergence time. These algorithms and indicators also support stable and continuous network improvement.

When designing and implementing SON functions, ZTE understands that operators need to continue to provide services using their existing networks and that data configuration and optimization needs to happen as quickly as possible during LTE deployment. With SON functions deployed by ZTE, the relevant 2G/3G adjacent cell parameters in the LTE base stations can be quickly configured. The newly deployed LTE network can also complete data configuration for existing 2G/3G networks in the shortest time and initiate the appropriate interoperability functions.

Measurement done by enhanced user terminals in current SON technology increases overall measuring and signaling traffic as well as terminal power consumption to a certain extent. This reduces system capacity. But if the measurement operation is performed too frequently, user experience is affected (e.g. terminal battery life is shortened). Using a unique CDT/MR data acquisition and analysis tool called NetMax, ZTE incorporates a proprietary SON minimum-user terminal selection function. This reduces the user terminal measurement and signaling interaction to a minimum so that users do not feel the impact of these features.

**Future SON: End-to-End Optimization**

ZTE is a leading supplier of LTE equipment and a primary contributor to LTE standardization. ZTE is committed to promoting standard LTE technologies, including SON. In future SON technology, self-organization and self-optimization will be expanded from the current wireless network to the entire end-to-end network. Network coverage optimization will be expanded to end-to-end service-awareness optimization and service-based coverage optimization and adjustment. ZTE will continue to drive the growth of LTE standards and technologies and provide operators with mature end-to-end equipment and solutions. ZTE will continue to help operators deploy LTE services faster and more effectively and create new business opportunities.
By Lu Kexing

Indonesia has more than 17,000 islands, making it the largest archipelago in the world. With around 240 million people, it is also the fourth most populated country. Indonesia’s economy has grown quickly in recent years, driven by market demand and supported by state policies. Its telecommunications industry has become more dynamic and has entered a stage of rapid growth.

PT. Telkom is the largest fixed-line operator and the leading international gateway operator in Indonesia. It boasts abundant communications infrastructure and holds a majority stake in Indonesia’s largest mobile operator, Telkomsel.

Because of the rapid development of Indonesia’s telecommunications industry and the increasing demand for communications services, the capacity of Telkom’s transport networks has become a bottleneck in service development. Indonesia’s unique geographical location also poses some problems for Telkom’s existing network protection solution. ZTE has developed a perfect solution for Telkom based on their existing network and has helped Telkom build a cutting-edge backbone transport network. This provides strong foundation for Telkom’s rapid business growth.

Securing a Dominating Position

Indonesia’s population and telecommunications infrastructure are distributed unevenly. The island of Java is only 10% of Indonesia’s territory but owns 70% of the total exchange capacity in the country. Java is strategically important to all operators in Indonesia.

Telkom planned to build its Java backbone transport network in 2004. The network would carry backbone services for all major cities in Java. Because of Java’s vital strategic position, Telkom put high requirements on network stability and reliability.

After a long and careful selection process, Telkom chose ZTE as their exclusive supplier of the Java backbone transport network. Ultra-long-haul dense wavelength division multiplexing (DWDM) and next generation synchronous digital hierarchy (NG-SDH) equipment was chosen, and since it was put into operation in 2005, the network has been stable and highly reliable. ZTE and the backbone network have been highly praised by Telkom. Telkom now earns millions of dollars every year by leasing transmission bandwidth to operators without backbone transmission facilities. Telkom’s Java backbone transport network has become the core telecom network in Indonesia. This cements Telkom’s dominating position in Indonesia’s telecom industry.

Seeking Optimal Solutions for Expanding Capacity

With the rapid development of Indonesia’s telecom industry, Telkom has encountered new challenges:
An upsurge in voice and data traffic and growing demand for new services mean there is an urgent need for Telkom to expand network capacity and simplify network hierarchy.

Indonesia has a lot of volcanic and earthquake activity. Many fiber breaks are caused by natural disasters and present new challenges to MSP protection at the SDH layer.

Because different types of old and new optical cables are used, cable aging and replacement places high requirements on management of optical power and dispersion. To address these problems, ZTE has proposed a unique solution for transforming dual-ring networks into three-ring and five-ring networks. Double insurance is provided for optical cables by integrating service protection functions of SDH and DWDM. An IP over WDM solution is adopted to carry fast-growing IP traffic over existing DWDM. These solutions meet all of Telkom’s requirements, helping Telkom successfully expand network capacity while greatly reducing investment.

Implementing Seamless In-Service Swapping

Telkom’s Java backbone transport network carries over 5,000 2M TDM services and a large number of POS services. In the capacity expansion project, many optical sections and nodes must be reconstructed or swapped. The project is so complicated that any service interruption caused by a small mistake will have serious consequences.

For in-service network reconstruction, ZTE leveraged the excellent protection capability of its transmission equipment and developed a highly reliable project implementation solution. The solution allows for multinode section-by-section reconstruction, whole service migration, offline circuit configuration, and fast system restoration. ZTE succeeded in upgrading and reconstructing the whole backbone network without adversely affecting network services.

Telkom also used ZTE’s automatic power optimization (APO) system to expand capacity. The system can automatically detect attenuation variation of optical cables, adjust system optical power in real time, and keep system power in an optimal state. Manual adjustment and optimization are not required for aging and attenuated optical cables. This reduces maintenance work and improves network performance. Telkom’s requirements for optimization and management of the WDM system have been well satisfied, and its network TCO has been reduced. The excellent performance of ZTE’s DWDM equipment and ZTE’s reliable project implementation mean Telkom’s Java backbone transport network has been smoothly upgraded to a 40G network and seamless in-service swapping has been implemented.

Telkom has cooperated with ZTE on many projects, including two expansions and reconstructions of its Java backbone transport network, construction of a MAN in Sumatra, construction of a backbone transport network in Bali, and construction of an inter-island WDM submarine cable network. Telkom has expanded its network coverage, and its leading position in Indonesia’s telecom market has been strengthened. From Q1 2009 to Q1 2010, Telkom increased its fixed broadband user base by 79% and mobile broadband user base by 607%.
Background
Telecom Malaysia (TM) is the largest telecommunication company in Malaysia. It has a monopoly on fixed-line networks and has a considerable share of the mobile market after acquiring Celcom and merging with its mobile operations arm, TMTouch. TM has 4.5 million narrowband subscribers and 1.6 million broadband subscribers.

With the rapid growth of the Internet and IP services, low-tariff VoIP is threatening traditional TDM-based telephony. Mobility and diverse services in 2G and 3G mobile networks is also a big challenge to traditional fixed-line services. Increasing demand for high-speed broadband in recent years has meant that TM has gradually been losing subscribers and not attracting new subscribers. Fixed-line revenue is declining. Faced with this competitive pressure, TM has come to realize that it must transform into a full-service operator.

TM has sought to build a quality and low-cost network that offers excellent service. A new-generation Metro-Ethernet network with open architecture and full-service bearer capability is their preferred choice. TM chose ZTE as its strategic cooperative partner because ZTE has a deep understanding of IP networks, quality products, and optimal solutions.

MSAN: The Door to Broadband Convergence
TM initiated a broadband/narrowband multiservice integrated access platform in 2005. ZTE tailored a 250,000-line multiservice access network (MSAN) solution for TM, which paved the way for TM to build a converged broadband network.

The MSAN solution has non-standard interfaces for connecting with traditional switches and supports the development of high-bandwidth broadband services. An embedded MSAN integrated access platform allows for integrated scheduling and reliable transmission of narrowband voice and data services as well as broadband services. Additional transmission equipment does not need to be configured. Network topologies such as star, ring, or tree are formed as required. This helps TM rapidly
deploy an access network. Through the integrated access platform, TM can smoothly deploy MSAN in NGN or even IMS. This meets the requirements for smooth network evolution and protects existing investments.

The MSAN solution also provides a unified network management platform for efficient management of all network elements. The unified access and management platform reduces operating costs.

**Unified Full-Service Bearer Platform**

Driven by the rapid development of broadband services and the evolution of wireless services, TM is acutely aware that a unified bearer platform supporting full-service operation is the basis of its business growth. In 2008, after its MSAN had been in operation for three years, TM proposed building a unified full-service bearer platform. TM needed a high-speed, low-cost and easily maintainable all-IP network that allowed for multiservice bearing and multiservice access. The network had to allow access to existing services and emerging services. To prepare for the evolution to LTE, the network also had to support 2G/3G/LTE RAN hybrid bearer services.

ZTE supplied TM with a complete carrier-class IPTN Ethernet solution. This adopts well-defined MAN architecture consisting of MAN convergence layer and MAN access layer. At the MAN access layer, single ring, multi-ring, and star networking modes can be deployed according to topology requirements. The MAN access layer also adopts carrier-class Ethernet ring protection switching (ESRP). ZTE’s innovative multiservice bearer platform is used at the MAN convergence layer—which has modular design and multicast replication. Carrier-class IPTN Ethernet is designed for a high-performance and reliable network. This lays a solid foundation for TM to implement full-service operation.

**Customized Auxiliary Facilities**

Malaysia has a tropical climate. The temperature is over 30˚C throughout the year, and the rainy season can last as long as eight months. In these weather conditions, telecom cabinets need to be waterproof, windproof and not easily corroded. They also need to be well cooled. ZTE’s cabinets are thoughtfully designed and equipped with heat exchangers to ensure equipment operates normally. The cabinets protect against mould, moisture, salt fog, corrosive industrial gases, and solar radiation. They are suitable for hot and humid climates as well as more severe environments.

Reliable power supply is the basis for stable network operation. ZTE developed custom-made power products for TM. The wiring for power supply was modified to reduce the carbon footprint of equipment and to make equipment easy to maintain. For core equipment, backup power supply was provided to improve system reliability. The lightning protection system was optimized to protect against severe local thunderstorms. Remote IP-based intelligent network and battery management were also implemented.

ZTE’s tailor-made cabinets and power supply products are designed for the special weather conditions in Malaysia. They performed excellently during five months of strict testing by TM.

**Continuous Profit Growth**

The transition to full-service operation enables TM to grow against the backdrop of the global financial crisis. TM continued to maintain its leadership position in the broadband segment in Malaysia with 1.68 million customers at the end of 2010, up 17.4%.

Through five years of close cooperation in the MSAN project, TM considered ZTE one of its most important partners. ZTE’s quick response, on-time logistics and delivery, fast network construction, and superior after-sales service are highly recognized by TM.

In September 2008, TM took on a bigger role in broadband development when it signed a private public partnership with the government to launch a premier High Speed Broadband (HSBB) service in Malaysia. At the end of 2010, ZTE—TM’s strategic cooperative partner—won more than 50 percent share of the HSBB MSAN and Metro-E project.
Brazil is the largest economy and has the second largest mobile phone subscriber base in Latin America. Previously owned by Portugal Telecom (PT) and Telefonica, Vivo is the largest mobile operator in Brazil. It has more than 60 million subscribers and about 30% market share in Brazil.

With the rapid development of 3G services, Vivo has to pay increasingly large leasing fees for bearer networks, and their O&M costs are increasing every year. Faced with this rising cost pressure, Vivo has determined to build a nationwide bearer network. The network will bear existing 2G/3G services and will support smooth upgrade to LTE with a low TCO.

Vivo’s original mobile bearer network was based on TDM microwave, SDH MUX and leased lines. This led to high OPEX. To gain a competitive advantage and move with the development trend of all IP, Vivo needs to construct a cost-efficient bearer network that can rapidly deliver new services, improve user experience, cut down CAPEX and OPEX, and ensure long-term network evolution. Strict requirements are therefore put on multiservice bearing capability, interoperability, reliability, optimized operation, and energy conservation in PTN equipment. After many field tests, Vivo chose ZTE as its major PTN equipment supplier.

ZTE’s full range of PTN products satisfy Vivo’s requirements for layered network construction. The small, highly-integrated ZXCTN 6000 series is used for the network access and aggregation layers. It employs full-packet, centralized switching and modular structure and allows for integrated access to TDM/ATM/ETH/IP services. The ZXCTN 9000 series based on advanced distributed modular architecture is used for the network core and aggregation layers. It supports a large-capacity switching matrix.

With automatic power control, smart fan speed control, and intelligent power consumption, the PTN products are also eco friendly. Their integrated, small-sized design cuts down equipment maintenance costs.

Vivo conducted strict three-phase tests for PTN products that ran for more than a month. ZTE outperformed all competitors in the tests. Vivo was satisfied with ZTE for its outstanding product performance, cost-effective solution and efficient teamwork.

“We worked well with ZTE throughout the project and are quite impressed with their technical expertise and quality products. Both parties will have happy long-term cooperation,” said Javier Rodriguez, CTO of Vivo.
ZTE ZXR10 T8000 Cluster Router

March 2011, selected from market research firm Current Analysis

Current Perspective

ZTE’s ZXR10 T8000 multichassis core router is competitive in the IP core router market because it addresses the capacity and scale requirements of the next wave of IP core (bearer) networks. ZTE launched its new T8000 at P&T/Wireless & Networks Comm China 2009 and since then has announced deployments for China Telecom, China Mobile and China Unicom as well as Smart Telecom, Atheeb, ECT, and VNPT. The T8000 is based on the vendor’s in-house-designed networking silicon, which allows service providers to build very large router configurations that can collapse multiple network layers. As service providers look to scale their networks, cluster-router architecture has become one of many tools that can be used to scale capacity and port density and simplify network topology.

The T8000 router is based on ZTE’s ZXRIC silicon chipset, which delivers up to 3.84Tbps switching capacity per chassis and supports 40 GigE interfaces. The three-chipset includes a scalable forwarding engine (ZXRIC PFE) that supports 40G (100G future) wire-speed forwarding, a support chip (ZXRIC SF600 and SA) that supports switching access to a three-stage 600Gbps switch fabric, and a multipolicy traffic management chip (ZXRIC TME) that provides fine-grained control over network traffic with five levels of QoS. T8000’s massive capacity comes from its ability to cluster multiple chassis into a single logical router. Interconnecting multiple racks allows for linear equipment capacity extension. The system currently supports multiple clustering methods, for example, 1+4 mode and 2+8 mode. Ultimately, the ZXR10 T8000 will support a 16+64 mode configuration, capable of delivering up to 200Tbps of switching capability and has up to 2048 40G interfaces or 1024 100G interfaces. Switch fabric options such as 1+1, 2+1 and 3+1 are available to meet specific resiliency requirements. The T8000 is also designed to comply with emerging national and international initiatives in green telecom. To reduce overall power consumption, it uses an intelligent and dynamic power management scheme for power supplies, line cards, and other system components.

ZTE entered the IP super core router market somewhat later than its competitors but has gained significant traction with major service providers. The launch of T8000 has been well received, especially by ZTE’s service provider customers China Unicom and ETC, and enables ZTE to compete better with vendors such as Cisco and Juniper. They have all announced and been delivering multichassis solutions for some time.

Buying/Selecting Criteria

- Manageability

  T8000 and other ZTE service provider routers are managed through the Netnumen U31 management system, which
handles the needs of the element, network and service layers. The system can manage multiple network layers, namely, the access layer, bearer layer, control layer and application layer. This means the solution can be deployed in different O&M scenarios. Netnumen provides full FCAPS functionality.

The Netnumen U31 service management function includes a TE manager, QoS manager, multicast manager, and VPN manager. The service management functions help simplify service delivery by coordinating data forwarding resources, handling faults, and providing a visual perspective of QoS.

Netnumen U31 has the ability to operate, maintain, and manage multiple NEs in a centralized way. It supports different types of OS and DB and includes topology management to provide a functional diagram of the whole network, including all nodes and links. It also provides fault analysis—such as alarm delay, alarm count, alarm restraint, alarm merger—and provides privileged access control and log records.

External interfaces include northbound interfaces such as TL1, Syslog, CORBA, SNMP, XML and MML. Southbound interfaces include SNMP (V1, V2C, V3)—standards used in various products and private MIB—TELNET, MMI, and TR069.

Performance and Architecture

- **T8000** currently provides 3.84Tbps full duplex switching capacity per chassis/rack, giving it strong performance metrics on a chassis and rack basis. After the ZXRIC 100G chipset is released, the switching capacity per rack will double to 7.68Tbps. The system’s 36-RU chassis footprint permits only one chassis per rack. Its current packet-forwarding performance is 1600 million packets per second for the 40G system.

- **T8000** uses a distributed forwarding and a non-blocking cross bar switching fabric with three-plane separation (forwarding, control, and management) architecture. Separation of the forwarding plane from the management and control planes is a key architectural attribute necessary for next-generation service delivery.

- **T8000** supports between 4 and 10 million IP routes (RIB) based on configuration. These levels are more than adequate for projected Internet growth in the foreseeable future. Scalability for all routers in this class ranges from 1 to 6 million routes.

- **T8000** supports multichassis configurations in order to achieve massive scale, and multiple combinations of central fabric chassis (CFC) and line card chassis (LCC) can be configured. For example, a back to back mode is offered, 1+2, 1+4, 2+2, 2+4, 2+8, 4+16 and 16+64 mode. In terms of the existing design, the T8000 supports at most a 16+64 mode cluster configuration with a total switching capacity of 200Tbps.

Physical Specifications and Certifications

- **T8000** is rack-mountable, using standard 19-inch telco cabinets. Operators can deploy a single chassis version by using the LCC, which includes a main processing unit, switch fabric unit, packet forwarding and physical interface units. Service providers can deploy one 36-RU LCC per cabinet.

- **T8000** can be expanded to include multiple chassis for greater scale. Cluster configurations consist of a CFC and multiple LCCs, and this provides a maximum capacity of 200Tbps. Cluster mode configurations include non-redundant CFC configurations (1+2, 1+4) and redundant CFC configurations (2+2, 2+4, 2+8, 4+16, 16+64) of CFC and LCC respectively.

- **T8000** employs an intelligent power supply management system that automatically controls and optimizes power consumption of each module according to traffic conditions. The fan speed is variable, and the fan system intelligently initiates the line card and goes into hibernation to further reduce power consumption.
The T8000 draws approximately 5100 watts of power and weighs 210kg when fully configured. Its power consumption is one of the lowest in this product class. System power can be provided by DC or AC power modules, rated at 8000W and 2000W respectively for either chassis type (LCC, CFC). The -48V DC supplies are configured in 1+1 redundancy mode, and the 220V AC is configured in 4+4 redundancy mode.

T8000 is designed to comply with key safety and environmental standards such as CE, FCC, UL, RoHS and Anti-9 magnitude earthquake. The system has not been NEBS certified, which is critical for deployment in facilities of most North American service providers.

Port Density and Scalability
- T8000 supports up to 768 GigE ports per chassis. GigE ports are standard for such platforms, and ZTE’s current GigE port densities range from ten to 48 ports per physical interface module. This supports combinations of 10/100/1000Mbps.
- T8000 currently supports up to 64 10 GigE ports per chassis using the 40G packet forwarding unit (PFU). Up to 128 10 GigE ports will be supported with the future PFU-100. The system currently supports multiple versions of the physical interface comprising a one, two or four-port 10GigE WAN Ethernet optical; a one, two or four-port 10GigE LAN Ethernet optical; and a one or two-port 10GigE LAN/WAN interface.
- T8000 currently supports up to 16 40 GigE ports via a single port line card using the PFU-40 packet forwarding unit. Up to 32 40 GigE ports will be supported with the future PFU-100.
- T8000 will support up to 16 100 GigE ports via a single port line card using the future PFU-100 packet forwarding unit. The 100G ZXRIC chipset needed for the PFU-100 is expected to be generally available in 2012 following trial production in 2011.
- T8000 supports POS interfaces so that carriers can deploy up to 16 OC-768c/STM-256 or 64 OC-192c/STM-64 ports per chassis. POS support has also includes OC-48c/STM-16, OC-12/STM-4 and OC-3/STM-1. SONET interface requirements are still strong in the IP core and will be for the next two to three years as ethernet interfaces continue to gain dominance in the market.
- Unlike the Juniper T-series and Cisco XR12000 series routers, T8000 does not support ATM interfaces. ATM support is diminishing as a requirement in next-generation networks.
Routing and Service Features

- **T8000** provides Layer 2 support such as MAC address management, VLAN, Q-in-Q, Super VLAN, Smartgroup and interface binding. Effective Layer 2 services enable the service provider to transport non-routed traffic through the core network in a cost-effective way.

- **T8000** provides Layer 3 support including IPv4 unicast, IPv4 multicast, IPv6 unicast, IPv6 multicast, MPLS and TE. It also supports MPLS L2/L3 VPN, 6vPE, MPLS-TE, MPLS static tunnel, GRE, IPSec, and DS-TE. Layer 3 service support enables the service provider to support routed traffic, such as video, which requires multicast/unicast and caching for quality of experience and transport efficiency.

- **T8000** supports a full range of IPv4 and IPv6 services, including interworking. As the industry transitions from IPv4 because of the shortage of new addresses, IP core routers will need to provide effective migration support for both forms of IP traffic.

- **T8000** provides a full complement of quality of service (QoS) functions, such as classification, label, traffic policing, congestion control, queue scheduling, shaping, QPPB and H-QoS.

- **T8000** supports ongoing O&M functions such as CLI, GUI (Netnumen U31), MPLS VPN NM, QoS NM and TE NM, Ethernet OAM, MPLS OAM and an SLA tool.

Service Assurance

- **T8000** has separate data, control/management, and monitoring planes. The data plane supports wire-speed packet processing and non-blocking forwarding. The control and management planes, which can be redundantly configured, manage system configuration and processes for protocol and signaling. They also generate and maintain routing tables and facilitate information interaction between all components. A separate monitoring plane detects abnormalities with the power, fan and temperature and raises alarms.

- **T8000** uses a distributed and modular operating system, ZXROS that separates software processes so that interactions that could negatively impact the normal running of the system are avoided. The **T8000** software consists of multiple logical units, such as MPLS, where each logical unit is supported by 1+1 backup and can be run on different MPUs. The distributed protocol implementation framework enables the system to be scaled up to massive capacity while retaining resiliency and redundancy and maximizing available system resources.

- **T8000** uses a system controller (SC) to manage and control the system and provide multichassis resiliency. The SC is a logical component that can run on any main processing unit (MPU) of cluster system to achieve 1+1 redundancy between different chassis.

- **T8000** supports in-service component upgrades (ISCU), which enables online upgrades without affecting service delivery. Each component has a backup process that can be upgraded independent of the other. The system also supports a hot patch process to immediately solve problems as they occur.

- Resilience features include non-stop routing (NSR), non-stop forwarding (NSF), traffic engineered fast reroute (TE-FRR) and label distribution path FRR (LDP-FRR). The system also supports graceful restart (GR) and pseudowire redundancy. Given the requirements for “always on” services, system resiliency is a key attribute of any core router.

- **T8000** also provides clock synchronization services in order to support jitter and delay-sensitive traffic that transits through the IP core network. The system supports IEEE 1588 with synchronous ethernet interfaces, out-of-band 1PPS+TOD interface (where 1588v2 is not required), in-band ethernet interfaces (where service and time information are transmitted via one interface), and adaptive SSM or BMC protocols (to realize automatic protection switching of time link to guarantee reliable transmission).
**ZTE Awarded Optical Vendor of the Year and IPTV Vendor of the Year by Frost & Sullivan**

15 June 2011, Shenzhen — ZTE announced that it has been awarded “IPTV Vendor of the Year” for the third consecutive year by leading global research firm Frost & Sullivan. The award was presented at the 2011 ITC Awards. ZTE was also named “Optical Vendor of the Year” in recognition of the company’s significant contribution to the field of optical transmission. ZTE has a significant influence in the optical transmission and IPTV markets of Asia, South America and the Middle East.

Jayesh Easwaramon, vice president of ICT practice at Frost & Sullivan Asia Pacific commented that ZTE was the only vendor in the optical network market to grow its revenue in APAC. Despite stiff competition, ZTE added significant wins in tier 1 operators and also diversified its business outside China. Its product enhancements for PTN and OTN, including self-cooling and additional capacity, have improved operational efficiency and ZTE’s value proposition to operators.

In the IPTV market, ZTE ranks first in Asia in terms of the number of IPTV users, with a market share of 11%, and third in the global IPTV middleware market.

**ZTE Partners with Nucleus Connect to Build BSS/OSS System for Singapore’s Next Generation Nationwide Broadband Network**

22 June 2011, Shenzhen — ZTE today announced that Nucleus Connect, the operating company of Singapore’s next generation nationwide broadband network, has partnered with ZTE to build the BSS/OSS platforms that will allow Nucleus Connect to support end-to-end services such as business operations, billing, fault management, network management, and maintenance.

ZTE’s highly flexible BSS/OSS solution allows customized configurations that work well in an open access environment. ZTE’s BSS/OSS will provide Nucleus Connect with fast and reliable service provision, multimode billing, and effective network operation. It also performs maintenance through flexible process management, overlapped resource modeling, powerful SOA structure, and easy-to-scale interfacing models. ZTE’s system will support new services under the company’s wholesale bandwidth business and help Nucleus Connect run its business operations efficiently.

**Axiata and ZTE Sign a Five-Year Strategic Global Framework Agreement at CommunicAsia**

23 June 2011, Singapore — ZTE today announced at CommunicAsia 2011 that it has signed a five-year strategic global framework agreement with Axiata Group Berhad, one of Asia’s largest telecommunications companies. The signing strengthens the partnership between the two companies.

The global framework agreement will be a platform for the purchase of telecom and other products as well as the provision of services by ZTE to Axiata and its group of companies. This strategic effort will be mutually beneficial for both parties in realizing business efficiencies and competitive advantages through cash flow improvement and timely purchasing.
**ZTE Releases a Future-proof Optical Transport Network Device for Metro Edge Layer**

ZXMP M721 enables end-to-end optical metro transport network

27 June 2011, Shenzhen — ZTE today announced that it has released a compact OTN metro edge layer device, ZXMP M721, which further improves ZTE’s ability to deliver future-proof end-to-end metro transport networks.

Only 1U or 2U high, ZXMP M721 is a compact and intelligent OTN device that supports DC and AC power supply. It includes a range of new technologies to meet the changing requirements of metro edge layer networking. Its powerful and flexible network technologies include fast E2E service provision, service dispatching, OAM, and 1588 V2 time synchronization. These help ZTE achieve one of the telecom industry’s major goals—unified, future-proof E2E OTN metro transport networks.

**ZTE India Successfully Deploys a New VAS Platform for Vodafone Essar**

To offer anytime, anywhere news update service to Vodafone customers

28 June 2011, Shenzhen — ZTE today announced that it has successfully built and deployed an advanced VAS platform for Vodafone Essar in India. With the completion of the platform, Vodafone customers can now access Vodafone Newswrap—a mobile newspaper service. The introduction of Newswrap will play a key role in enhancing VAS revenue for Vodafone Essar in today’s highly competitive market.

As part of the project, ZTE India has created MNS and MMSC platforms using a revenue-sharing model for the first time. This adds a new dimension to ZTE’s business in India as it expands its focus from being an equipment provider to providing end-to-end VAS solutions.

**ZTE Ranked First in PTN Market Revenue Share in 1Q11 by Dell’Oro Group**

30 June 2011, Shenzhen — ZTE today announced that it has the highest revenue share in the PTN market for 1Q11.

According to a recent optical transport report published by Dell’Oro Group, ZTE has total market revenue of 43.9%, making it first among all global PTN companies. This also represents a massive growth in revenue, up 150% compared with 1Q10.

ZTE’s revenue increase can be largely attributed to sales in Asia-Pacific, EMEA, and Latin America. Its PTN products have been put into large-scale commercial use by the three operators in China and many tier one telecom operators in Europe and Latin America.

**ZTE AC30 Mobile Hotspot Launches with Alltel Wireless**

30 June 2011, Richardson TX — ZTE today announced the launch of Alltel AC30 Mobile Hotspot for Alltel Wireless. The device enables mobile customers to access the Internet via a secure 3G network connection.

The Alltel AC30 by ZTE is an ideal solution for customers who work remotely or use their mobiles for pleasure as the portable plug-and-play device easily connects to Alltel’s network. Users looking to increase productivity or provide Internet access to others will benefit from the hotspot’s ability to simultaneously connect up to five Wi-Fi enabled devices, including tablets, netbooks and gaming devices.
ZTE Unveils World’s First Commercial LTE Micro Base Station

ZTE’s new LTE BS8920 micro base station is a technological revolution in hotspot coverage and product footprint.

4 July 2011, Shenzhen — ZTE has launched ZXSDR BS8920, the world’s smallest commercially available LTE base station. At 150Mbps, BS8920 also has the largest capacity of any LTE micro base station. It has 2 ×10W transmit power and 2T4R modulation for a large footprint and offers significantly lower TCO because of its reduced hardware, reduced power consumption and lower deployment costs.

ZXSDR BS8920 is targeted at the rapidly growing market for urban and indoor hotspot coverage and costs up to 50% less than a distributed base station. The BS8920 has key features that reduce power consumption to as low as 100W on average. It also has up to 30 percent lower deployment costs compared with other distributed base stations.

BS8920 is less than half the size and weight of a standard RRU and meets the industry requirements for an Omni sector eNodeB product. It also supports all-standard LTE frequency band spectrums and AC/DC power supply.

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ZTE Sets World Record with First WDM Tbit ULH Transmission in Beyond-100G Field

13 July 2011, Shenzhen — ZTE announced that it achieved a signal transmission rate of 24Tb/s (24×1.3Tb/s) using its WDM technology. This transmission rate sets a new world record in optical networking, and the results were written up and presented as a post deadline paper at the Opto-Electronics and Communications Conference (OECC) 2011 in Kaohsiung, Taiwan.

The result comes on the back of an earlier world record set by ZTE where single-channel 10Tb/s optical OFDM signals were transmitted at the Optical Fiber Communication Conference (OFC) in March 2011. This makes ZTE the leader in both the 100G and beyond-100G optical networks.

1Tb/s transmission bit rate per channel is likely to become the industry standard after 100Gb/s. It has 10 times more capacity in terms of signal bandwidth. Previously, 1Tb/s single-channel transmission rate had only been talked about in theory. ZTE has also accomplished 24Tb/s WDM signal transmission, which is the first time in the industry WDM technology has achieved a terabit per second rate.

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ZTE Secures a $900 Million Syndicated Loan, Supporting Strategic Expansion in Overseas Markets

8 July 2011, Shenzhen — ZTE today announced it has entered into an agreement for a $900 million three to five year syndicated-term loan with 10 leading international banks through its wholly owned subsidiary ZTE (H.K.) LTD.

The loan will be guaranteed by ZTE and will be used for the general working capital requirements of ZTE (H.K.) LTD. Raising the debt in US dollars is an effective way for ZTE to hedge against the appreciation of the RMB. ZTE’s financing offer has significant support from 10 international banks and is more than two times over-subscribed from the initial target. This level of support clearly demonstrates ZTE’s strength and good prospects.

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Mr. Wei Zaisheng (L), executive vice president of ZTE and Mr. Lin Guangming (R), general manager of Bank of China (H.K.) LTD at the signing ceremony.
We’ve packed the power of ten routers into one.

In this 3G-4G era, operators face a deluge of users who all demand high speed access. How many? Try 160 million, all at once, just as world’s highest-switching-capacity router has to handle.

At ZTE, we’ve gone one better. We’ve developed a cluster core router—the ZXR10 T8000—that can handle and instantly re-assign capacity up to 200Tbps, with no data loss, in a single unit.

With advanced high-speed core routing forwarding up to 100G, high-capacity packet switching, and flawless traffic management that uses 5-level QoS mechanisms, it’s the industry’s most versatile bandwidth switcher. Oh, and it saves energy too.

www.zte.com.cn