

# ZTE's ADSL System

*Lü Gang*

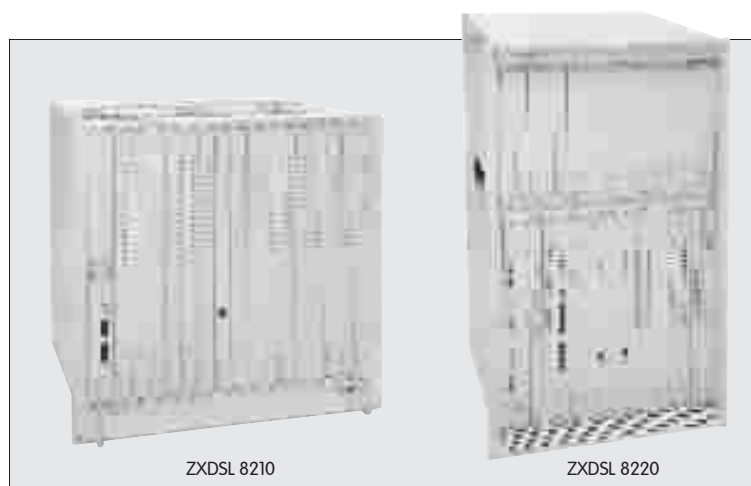
(Shanghai Institute, Network Division of ZTE Corporation, Shanghai 200231, China)

**Z**TE's ADSL system is based on the existing twisted-pair copper connection, and uses FDM and DMT technologies. It offers adequate bandwidth to support not only narrow band voice services but also broadband data services such as VOD, video-conferencing, web browse and electronic business, etc, which greatly improves the efficiency of traditional networks and brings operators considerable investment profits and solutions for a sustainable development strategy.

## 1 Technical Features of ZTE's ADSL System

ZTE's ADSL system is fully compatible with both G. DMT full-rate ADSL and G. lite lite-rate ADSL standards. It adopts ZTE's proprietary forward error correction technology, special algorithm for noise filtering and self-adapted power control technology. This greatly reduces crosstalk problems presented in multi-pair cables and can prevent disconnection under strong interference caused by telephone ringing, pickup and hangup actions. It possesses perfect line protection circuits, which ensures the system running stably and reliably. These technical features reassure operators in launching broadband data services over the 8 Mbit/s downstream link and 1 Mbit/s upstream link within a distance of 5 km.

Since the open feature was considered a lot at the initial design, ZTE's ADSL possesses excellent interoperability with other manufacturers' central offices and subscriber end equipment. Furthermore, it also possesses excellent interoperability with many other pop-



ular manufacturers' network equipment such as broadband access systems, ATM switches, Ethernet switches and routers, etc.

ZTE paid great attention to improving the reliability and quality of its ADSL equipment at the initial R&D stages, so the system passed the network access test by the Ministry of Information Industry in 2000, and ZTE became one of the first manufacturers to obtain the ADSL network access certificate. In January 2002, ZTE's ADSL system passed the strict European CE certification, which made ZTE the first DSL equipment manufacturer with CE certification in China and brought ZTE's ADSL products a great opportunity to enter the international markets.

## 2 Product Series

ZTE's ADSL office-end products include high/middle capacity equipment ZXDSL 8210, middle capacity equipment ZXDSL 8203, low capacity equipment ZXDSL 8426, super-high

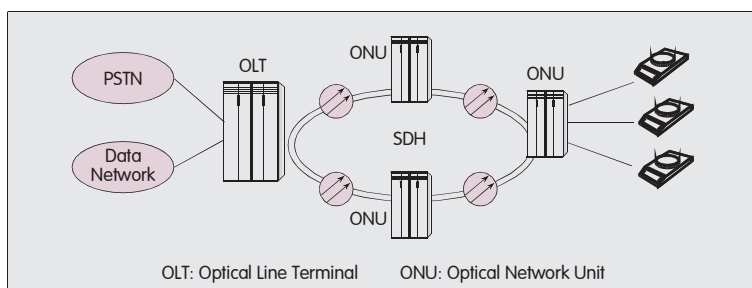


Figure 1. An integrated broadband and narrowband network.

capacity equipment ZXDSL 8220. All these systems support ADSL over ISDN, ADSL over POTS, SHDSL and VDSL services.

The backboard exchange capacity of ZXDSL 8210 can reach 3.5G. ZXDSL 8210 can support ATM 155 M Interface, ATM 34 M Interface, 100 M Ethernet Interface, GE IP Interface and E1/IMA Interface, and conveniently and flexibly realize networking based on IP, ATM or SDH. ZXDSL 8210 uses the built-in mode for the voice demultiplexer design, which improves the integration level of the system and brings much convenience for system maintenance. The system can provide 65 000 VC connections to adequately meet customer's needs. The system adopts a fully distributed architecture, and redundancy backup and filter protection methods for its power supply sub-system to ensure the reliability of power supply.

ZXDSL 8203 supports 64 users in one 4U shelf and it can be expanded to 256 users. ZXDSL 8203 supports the ATM 155 M, ATM 34 M and E1/IMA interfaces, and it enables networking on the bases of IP, ATM or SDH.

ZXDSL 8426 provides 24-line access to integrated equipment, and supports one IP interface or four E1 interfaces that fully complies with the G.703 standard. It can support maximum 4×E1 IMA bindings, which gives access to corresponding IMA E1 interfaces of upper level networks through SDH transmission. Over the existing SDH network, ZXDSL 8426 may greatly expand the coverage of ADSL.

ZXDSL 8416 provides 16-line access to integrated equipment, and supports upstream interfaces. Its relatively compact design lowers the system demands for space and power supply conditions, so it is suitable to be used in offices and small residential areas.

ZXDSL 8220 is a type of central-office end

equipment with a capacity of 992 lines of ADSL access, which is designed to meet the rapidly growing broadband services in big cities. The equipment can also provide various interfaces such as ATM, IP and E1 interfaces, and can be deployed on different networks such as IP or ATM networks.

ZTE's ADSL user-end products include the ZXDSL 831, which has an external Ethernet interface, and ZXDSL 852, which provides an external USB interface, and the plug-in PCI card model of ZXDSL 823. All of them meet different demands of end users. Especially, ZXDSL 831 can offer such functions as built-in dial-up and routing, which makes the system convenient and reliable to use and easy to maintain.

By providing many kinds of network management modes such as CLI, TELNET, and SNMP, the system can perform not only low cost local management, but also centralized network management with the in-band and out-band combined mode. The system can be networked independently, or under a centralized access network management. Some network processing modules such as the broadband access server, Ethernet exchange, etc. can also be added to support unified all-network data equipment management.

### 3 Operator-Oriented Networking

ZTE considers network efficiency and operator's profits as well as customers' needs for network access. Combined with ZXE10 UAS broadband access server, ZTE's ADSL system provides flexible access for ADSL users with strict accounting, authorization and authentication services. It can perform perfect flow control for ADSL users and help operators to develop "Prioritized Services", which ensures effective and diverse network services.

At the early stage after the launch of broadband services, the number of users is usually limited and users are also quite distributed. Therefore, at this stage, ZTE's ADSL may be deployed in the integrated broadband and narrowband mode for the access of distributed broadband users. The network topology is shown in Figure 1.

The remote optical network unit (ONU) of ZXA10 access network provides integrated ac-

cess for a small number of ADSL users and narrow band POTS, ISDN, and DDN users. The broadband data from ONU is transmitted to OLT side through the 2 Mbit/s channel of SDH and each ONU provides several E1 interfaces for broadband data transmission, while other data such as POTS, ISDN and DDN are transmitted through the remaining E1 interfaces. ZX10 provides an E1 multiplexing unit on the OLT side to perform ADSL broadband data aggregation and convergence, and give access to upper level data networks through 100 Mbit/s interfaces.

The integrated broadband and narrowband solution does not require extra investment for the construction of large capacity digital subscriber line access multiplexer (DSLAM), and avoids building a large-scale broadband MAN in one step. The advantage is its rapid implementation of high-speed ADSL and Ethernet access without any change of the existing network equipment. This not only saves invest-

ment cost efficiently and makes network expansion and upgrade easy, but also provides a solution for the balance of network construction, data service development and user scale, so as to take the operation of the whole telecommunication industry closer to the market and bring a higher investment benefit rate with the lowest risk for network construction.

In areas rich in ATM resources, ZXDSL 8210 can be deployed on cascade networks with star, chain, or tree topologies. But in areas rich in IP resources, it can not only be cascade-connected with themselves with star topology in IP mode, but also be cascade-connected with ZXDSL 8416 and ZXDSL 8426 and get access to upper level networks. In areas with spare SDH resources and a small number of access users, the E1 networking mode can be adopted. ZXDSL 8210 and ZXDSL 8426 support IMA E1 interface, and can use the G.703 E1 interface to be cascade-connected over SDH.

ZTE

## Continued from Page 34

the timeslot is still kept on the E&M multiplexer. Due to its low cost, this service is widely used in the departments of large enterprises scattered at different locations.

(5) 64 kbit/s data service is required to provide a G.703 interface.

The GR introduced in 1997 primarily raises requirements on narrowband circuit services. The ever-evolving services industry forces TEC to update the GR regularly. The newly issued GR has added several requirements to cater for broadband data services and the adoption of 2.5 Gbit/s SDH transmission systems as the transmission backbone of OFAN is under consideration to satisfy the ever-growing demand for bandwidth.

The updating includes:

(1) Demand for  $N \times 64$  kbit/s services ( $1 < N < 32$ ) predominantly to satisfy the need of big enterprises for high capacity and a reliable data transmission service.

(2) Add options of ATM. The transmission and access modes are recommended for use in the new GR.

(3) Add requirements for XDSL access technology, which refers primarily to asymmetrical digital subscriber line (ADSL) and

high-bit-rate digital subscriber line (HDSL). It requires the future access network system to provide DMT-or-G.lite-based ADSL. HDSL is primarily employed for copper wires to transmit 2 Mbit/s signals.

(4) Add requirements on Ethernet interfaces. Both COT and AT can provide Ethernet interface of 10/100/1 000 Mbit/s.

Although the latest GR to be released has added a great number of requirements for broadband access, there are still a number of unresolved problems. For example, no solution has been raised on how to transmit broadband services between AT and COT, which will lead to issues for the consistency and interconnectivity of future access network equipment. Moreover, the new GR specifies the access network with a Z interface as one of the main equipment types rather than takes it as optional item or simply washes it out; this will impose a negative impact on the construction of a high level OFAN.

ZTE

Manuscript received: 2002-12-16

## Biography

Le Zhifeng graduated from Southeast University and gained a bachelor's degree. Currently he works with the International System Department of Network Division of ZTE Corporation. He is a senior system engineer, mainly working on Access Network and DSL/BAS technologies.

37

Jun. 2003 No.1  
ZTE Telecommunications