IPTN: IP Bearer Network Solution Oriented to 2G/3G Mobile Backhaul

ZTE中兴

Market Demand Analysis

As the competition in the global telecom market becomes increasingly fierce, the 2G and 3G bearer services coexist, the traffic bandwidth increases constantly and the interfaces tend to be IP-based, the bearer networks are required to provide powerful multi-service bearer capability, statistical multiplexing, differentiated QoS, carrier-class service guarantee, high-precision clock synchronization, and excellent network extensibility.

Multi-service bearer

The 3G BTS tends to provide FE interfaces, and the 2G BTS tends to be IP-based. This requires the bearer network to bear Ethernet, TDM and ATM services in a unified manner.

Statistical multiplexing and differentiated QoS

Generally, the bandwidth of a 2G BTS is 1 to 2× E1, which primarily carries traditional voice traffic. At the early stage of 3G, the bandwidth of a 3G BTS is about 10 to 20Mbps. When HSxPA services are deployed on a large scale, the bandwidth of the 3G BTS will increase to 40-50Mbps. The IP services including real-time and non-real-time services are in a large proportion, and their QoS requirements vary significantly. This requires the bearer network to provide efficient statistic multiplexing and differentiated QoS while offering larger bearer capacity.

Carrier-class OAM&P

No matter what technology is used to construct 2G/3G mobile backhaul networks, it is necessary to satisfy the carrier-class bearer requirements including carrier-class protection switching in less than 50ms, end-to-end service provisioning, and carrier-class OAM capability. When the operators having conventional MSTP-based bearer networks adopt the packet technology to construct their 2G/3G bearer networks, they need to leverage their mature experience in MSTP networks in terms of networking, management and fault diagnosis, so as to reduce the impact on network operation and maintenance.

High-precision clock synchronization

The TDD-based 3G mobile systems (such as CDMA2000, TD-SCDMA and WiMAX) require clock synchronization. The BTS clock synchronization can be implemented through the GPS technique, but it is difficult to install antennas and feeders and it is necessary to back up the ground clock synchronization. Therefore, most operators require the 3G bearer network to provide excellent clock synchronization that can enhance reliability of the GPS clock synchronization.

Excellent network extensibility

The fast, wide and deep coverage of 3G networks can greatly enhance the operators' competitive edge, so their bearer networks should be highly extensible to support fast network deployment and smooth evolution from 2G/3G to LTE.

Low TCO

Operators always expect a low TCO for their network construction. The IP bearer network solution oriented to 2G/3G mobile backhaul should reduce both the CAPEX and OPEX.

ZTE's IPTN Solution

ZTE has always been committed to the R&D of advanced bearer technologies and IP-based mobile backhaul applications. Based on the concepts of global leading operators on radio bearer network construction, ZTE has launched its IPTN, the IP bearer solution oriented to 2G/3G mobile backhaul.

ZTE's IPTN solution adopting the open and unified packet switching platform provides efficient bearer for delivery of 2G/3G packet services, TDM/ATM services as well as IP-based new services in the future. The TDM E1, IMA E1 and FE services sent from the BTS can be connected directly or through microwave and PON equipment to IPTN (see Figure 1).

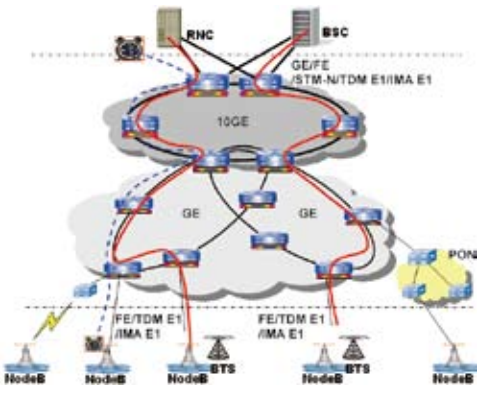

Figure 1 Networking of IPTN solution

ZTE's IPTN solution has the following features:

Open service platform

It adopts the Pseudo Wire Emulation Edge-to-Edge (PWE3) technology to transport various traffic over TDM, ATM, Ethernet and IP networks and support multiple service interfaces such as FE, GE, 10GE, STM-N (CH, POS, ATM), TDM E1 and IMA E1, fully meeting the bearer requirements of 2G/3G mobile backhaul services. For the TDM E1 and ATM IMA E1 services sent from the BTS, the IPTN core convergence equipment connects with the RNC/BSC via E1 or ch.STM; for the FE services sent from the BTS, the IPTN core convergence equipment connects with the RNC/BSC via GE, FE or 10GE.

Efficient statistical multiplexing and Diff-Serv based QoS

By using the unified packet core and integrating the protection and OAM features of traditional TDM transport equipment, it provides efficient bearer capability, including statistical multiplexing, structured TDM timeslot compression, and idle ATM cell drop. It supports Diff-Serv QoS model and provides differentiated service that meets the Service Level Agreement (SLA) requirements through service classification, traffic conditioning, traffic policing, queue scheduling, and traffic shaping.

Carrier-class service guarantee

It provides carrier-class protection mechanisms. At the equipment level, it provides 1+1 hot backup for key boards such as cross-connection board, clock board, main control board and power board, with a carrier-class reliability of 99.999%; at the network level, it provides end-to-end protection mechanism: Link Aggregation Group (LAG) protection and Inverse Multiplexing for ATM (IMA) protection at the User-Network Interface (UNI) side and 1+1/1:1 protection, SNC 1+1/1:1 protection and MPLS-TP ring network protection at the Network-to-Network Interface (NNI) side, thus ensuring a carrier-class protection switching in less than 50ms.

SDH-like OAM

It provides SDH-like OAM features. With the hardware-based OAM support, it implements carrier-class functions such as auto diagnosis of network faults, protection switching, performance monitoring, fault locating, etc. It complies with the ITU-T G.8114, Y.1731 and IEEE 802.3ah standards and provides end-to-end OAM on demand and management, thereby enhancing the carrier-class features of the packet network. Moreover, it uses ZTE's unified NetNumen platform to implement centralized management of all IPTN devices and conventional transport devices.

High-precision clock synchronization

ZTE is the first in the industry to adopt the IEEE 1588 Precision Time Protocol (PTP) for its clock synchronization solution based on the G.8261 standard for synchronous Ethernet. The solution greatly improves the precision of clock synchronization, and effectively reduces the packet sending frequency and the convergence duration, thereby meeting the frequency and clock synchronization requirements of BTSs in different modes.

Good network extensibility

It provides good network extensibility. At the early stage of 3G, the IPTN solution adopts the hierarchical networking that consists of the access layer and the convergence layer. The networking bandwidth of the access layer is GE and that of the convergence layer is 10GE. When the 3G becomes mature or evolves to LTE, the IPTN solution will evolve to the Mesh-based networking. During the evolution, the IPTN has good adaptability to the addition of network devices and upgrade of link and equipment capacity.

Conclusion

To cater to the operator's requirements on services, investment protection, network evolution, network reliability, and environmental protection, ZTE's IPTN solution is designed to support the constant bandwidth growth of mobile BTSs while reducing CAPEX and OPEX. It can bear IP services of mobile BTSs as well as the traditional services in an efficient, flexible and reliable manner, supporting smooth evolution to reduce the operator's risk of technology selection. The IPTN solution has been highly recognized by operators and has been commercially deployed in some areas. As more and more 3G networks are deployed and the 2G/3G BTSs are IP-based, the IPTN solution will be widely used in the IP bearer networks for 2G/3G mobile backhaul.

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