ZXCTN 9000 Carrier-Class Multiservice Platform—Converge New Services and Network

Overview

The ZXCTN 9000 supports any-to-any Layer 2 and Layer 3 network and service interworking reliably and concurrently. It provides service providers a graceful migration path to a converged network based on MPLS/MPLS-TP.

The ZXCTN 9000 enables connection-oriented characteristics of the traditional transport network such as SDH-like OAM, perfect protection mechanisms and powerful management, while maintaining the superior statistical multiplexing and flexible deployment of pure IP networks.

ZXCTN 9000 mainly locates at aggregation/core layer. Facing the complicated and uncertain service network bearing demands, it integrates the advantages of packet and transmission technologies. Adopting the system architecture with packet switching as kernel, it integrates various IP/MPLS, MPLS-TP services and standardized interfaces including TDM/ATM/Ethernet/POS.

Figure 1. Design sketch of ZXCTN 9008/9004/9002

Disclaimer: Product appearance could be changed without announce.

Features

**Integrated multi-service bearing platform satisfies all-service development demands**

Based on full-packet architecture, ZXCTN 9000 adopts PWE3 emulation which is compatible with TDM and ATM. It supports highly efficient MPLS/MPLS-TP tunnel technologies and L2/L3 VPN, completely meets all-service development demands and reduces network TCO. ZXCTN 9000 also supports rich high-density interfaces including TDM/ATM/Ethernet/POS.

**Leading clock technology satisfies highly precise synchronization demand**

ZTE was the first vendor to propose the IEEE 1588v2+G.8261 synchronization solution which has been submitted by ITU-T. The solution takes the technical advantages of IEEE1588v2 and G.8261, and provides four features: high-precision synchronization, faster convergence, lower bandwidth requirement and service load independence. By replacing GPS, it saves on the cost of GPS construction and maintenance.

**Complete end-to-end QoS solution provides refined differentiated services**

ZXCTN 9000 provides end-to-end QoS management which can fully meet different requirements of different services on delay, jitter, and bandwidth. It supports Diff-Serv based QoS scheduling. It implements traffic classification and marking based on port, VLAN, 802.1p, DSCP/TOS, MAC, and IP address. It supports service traffic monitoring, queue scheduling, congestion control and traffic shaping. Implementing bandwidth control of user-level multi-service, it truly realizes service access SLA and provides guarantee for carriers’ refined operation.

**Powerful hierarchical OAM improves network availability**

ZXCTN 9000 completely supports MPLS OAM, MPLS-TP OAM, and Ethernet OAM. Based on hardware hierarchical monitoring, it implements fast fault detection and location, performance monitoring, and end-to-end service management. It supports...
continuous OAM and OAM-on-demand to guarantee carrier-class service quality of service in packet transmission network. Based on various granularities such as physical port, logic link, tunnel, and pseudo-wire, hierarchical OAM makes more transparent network operation & maintenance and easier operation management.

**Multiple reliability mechanisms guarantee network security**

ZXCTN 9000 supports multiple ways to provide linear protection, ring protection and VRRP, etc. It provides multiple choices for complicated all-service application scenarios to guarantee 50ms fast switching. Network edge-level protection supports multiple protections of LAG and IMA with the reliability of carrier-class 99.999%.

ZXCTN 9000 is equipped with rich security features and anti-attack features. It supports wire-speed forwarding, packet detection and traffic differentiation capacity with tens of thousands ACL configuration. It supports CPU protection and protocol packet rate limit, routing authentication, DDoS attack detection, and hierarchical network management to completely prevent risks of network attack.

**Open technical platform supports high-speed development of service network**

ZXCTN 9000 adopts open technical platform which is compatible with traditional transmission and data network to support smooth evolution solution of network. Inter-operation between it and traditional SDH/MSTP is supported. The software flexibly suits the development of multiple standards (IP/MPLS, MPLS-TP, and Ethernet ring) and reduces technology selection risks. With its hardware adopting advanced distributed and modular system architecture and design philosophy, it reserves enough expanded bandwidth thus provides long-term support for network evolvement.

**Unified network management system simplifies operation and maintenance**

ZXCTN 9000 adopts ZTE unified network management platform NetNumen, together with SDH/MSTP, ASON, WDM, OTN, Switch and Router to implement integrated management. It supports static and dynamic configuration of service connection to implement end-to-end path creation and management. It provides powerful QoS, OAM management, real-time alarm and performance monitoring. Being easy to operate and maintain, its network element management and friendly interface conforms to the requirement of traditional transmission network, making the packet network the manageable and easy to maintain.

**Green product, green operation and maintenance**

ZXCTN 9000 adopts APC (Automatic Power consumption Control), CAN bus for global intelligent monitoring and intelligent system for dynamic power consumption adjustment. It also supports fans with infinitely variable speed, port-based automatic power consumption adjustment, and realizes minimum energy consumption of each port. Together with its other advantages such as small size, light weight, and large capacity, ZXCTN 9000 can efficiently help carriers to save energy and allow simpler deployment environment.

**Customer Benefits**

**Enhanced Service Level Agreements (SLA)**

The ZXCTN 9000 opens up new revenue streams by offering meaningful SLAs. These SLAs extend QoS contracts previously available only for ATM circuits to new and advanced broadband data services such as Ethernet and IP. Mission-critical services can now exist on technologies previously limited to traditional best-effort performance.

**Superior Traffic Management**

The ZXCTN 9000 ensures that policies defining SLAs for each service contract are honored. The state-of-the-art QoS processing technology provides deterministic and granular per-flow and per-service SLA bandwidth management. Service-aware queuing techniques and traffic shaping help ensure predictability through varying levels of network utilization.

**Evolutionary Migration of Legacy Networks**

The ZXCTN 9000 supports open, standards-based software and hardware to interface with legacy equipment and protocols. Deployed legacy multiservice networks can be integrated with the ZXCTN 9000-based network as part of a nondisruptive migration.

**Enabling New Revenue Streams**
With the enhanced SLA and superior MPLS traffic engineering, the ZXCTN 9000 enables service providers to offer high-growth IP services using MPLS L2 VPN or L3 BGP/MPLS VPN, while supporting legacy SDH/PDH and ATM services from the same platform.

**Guaranteed Service Availability**

The perfect reliability mechanisms and redundant hardware assures no single point of failure, non-service affecting product upgrades, Layer 2 and Layer 3 protocol GR, in-service network expansion and carrier-class protection and switching to maximize fault tolerance and performance. Carrier-class design provides full redundancy in common equipment and software resiliency features enable maximum service and network uptime.

**Investment Protection**

While increasing the breadth of the service portfolio, the ZXCTN 9000 extends service providers’ investment in legacy network equipment by scaling its capacity as customer demands grow, without forklift upgrades. With significant high-density and high-speed capabilities, the ZXCTN 9000 accommodates growth in both end-user traffic and services. The switch fabric is highly scalable, providing up to 1.6Tbps of nonblocking performance in a single chassis.

**Capex Reduction**

Service providers frequently maintain multiple core service networks based on the individual end-customer services being offered. The ZXCTN 9000 provides a consolidated network infrastructure, collapsing multiple overlay networks to reduce the total number of network elements. Capital expenditures are further reduced with industry-leading technology, density and performance improvement.

**Opex Reduction**

The ZXCTN 9000 reduces truck rolls, lowers spares inventory and minimizes operational costs for service providers.

In addition, the Graphic network management and E2E service configuration further reduces operational complexity of managing multiple networks or network layers in the service provider network. Reduced operations costs are facilitated to bring greater profits and revenues.

**Applications and Services**

The ZXCTN 9000 enables service providers to offer the following services on converged network architecture, benefiting from new revenue opportunities while maintaining their legacy investments:

- **Layer 1/Layer 2 Legacy Services**
  - Private line service via TDM circuit emulation
  - ATM service (Layer 2 VPN)
  - Ethernet service defined in MEF, including E-LINE, E-LAN and E-TREE

- **MPLS Layer 2 VPNs**
  - VPWS for point-to-point TDM, ATM, and Ethernet/VLAN (Layer 2 VPN)
  - VPLS and H-VPLS for large-scale multipoint-to-multipoint connectivity

- **MPLS/BGP Layer 3 VPNs**
  - High-performance Layer 3 VPNs

- **Wireless Transport**
  - 3G migration
  - Wireless backhaul
  - RAN aggregation
  - Wireless core
  - TDM circuit emulation for 2G transport
  - FMC

- **Triple Play Services**
  - IP telephony
  - IPTV
  - Broadcast TV
  - VoIP
  - Ethernet service defined in MEF, including E-LINE, E-LAN and E-TREE

**Product Architecture**
MSC
MSC is composed of control and management unit, switching fabric unit, clock unit and environment monitoring unit, taking charge of the management of system clock source, control plane, system maintenance plane, and environment monitoring plane. The ZXCTN 9000 provides 1+1 hot-standby redundancy for the MSC units to ensure non-interruption of the services in case the main MSC unit fails.

SC
Switching card takes charge of the fast switching of the service data in the whole system. Adopting high-performance and non-blocking switching fabric architecture, and integrated with innovative bandwidth expansion solution, it can implement multicast channel management, intelligent monitoring and global queue management.

The switch fabric has the following switching and fault tolerant features:

- Fully non-blocking switching architecture
- Highly efficient and deterministic performance
- Carrier-class routing/switching around internal failures
- Scalable single-stage, low-latency design to achieve up to 1.6Tbps in an 20U-high single chassis

### Technical Specification

<table>
<thead>
<tr>
<th>Technical Specification</th>
<th>ZXCTN 9008</th>
<th>ZXCTN 9004</th>
<th>ZXCTN 9002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size (H×W×D)</td>
<td>888.2x482.6x560(mm)</td>
<td>399.3x482.6x571(mm)</td>
<td>177x482.6x560(mm)</td>
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<tr>
<td>Weight</td>
<td>&lt;100kg</td>
<td>&lt;45kg</td>
<td>&lt;25kg</td>
</tr>
<tr>
<td>Number of slots</td>
<td>12</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Number of service slots</td>
<td>8</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Switching capacity</td>
<td>4.8Tbps</td>
<td>2.4Tbps</td>
<td>2.4Tbps</td>
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</table>

L1/L2 Feature

- ATM and IMA
- Ethernet/VLAN, link aggregation, E-line and E-LAN, VPLS, H-VPLS, Q-in-Q, STP, RSTP, MSTP
- EoS
- TDM: SAToP, CESoPSN
- HDLC
- ML-PPP
- Pseudo-wires based on Martini Draft for ATM, Ethernet/VLAN, PPP, HDLC and TDM traffic encapsulation

L3 Feature

- Routing: BGP4, IS-IS, OSPF
- Advanced Routing features: BGP extension for MPLS and BGP graceful restart
- IS-IS: Graceful Restart, Jumbo Frames, Domain-wide Prefix Distribution, Mesh Groups, IGP Shortcuts
- OSPF: Stateful Redundancy, NSSA, IGP Shortcuts, Multiple Instances, graceful restart
- MPLS: LDP, RSVP-TE
- Advanced MPLS Features: MPLS traffic engineering, RSVP-TE, IS-IS-TE, OSPF-TE, Constraint-based Shortest Path First (CSPF)
- RSVP-TE: Stateful redundancy, fast reroute (FRR) with sub 50ms failover, backup LSPs
- LDP: Graceful restart, fault tolerant, LDP over RSVP tunnels
- IP VPN: RFC2547bis/4364 MP-BGP, OSPF multi-instance, overlapping VPNs, Full mesh and hub/spoke VPN topologies
- Policies: Access lists, prefix lists, route maps, AS-path lists, extended community lists
- DHCP relay

Traffic Management
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<tr>
<td>• MPLS traffic engineering using OSPF-TE, ISIS-TE, RSVP-TE, LDP over RSVP tunnel</td>
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<tr>
<td>• CSPF routing</td>
<td></td>
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<tr>
<td>• E-LSP (EXP inferred)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>• CAC at LSP level</td>
<td></td>
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<tr>
<td>• Weighted Fair Queuing (WFQ)</td>
<td></td>
<td></td>
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<tr>
<td>• Policing at the ingress (Dual leaking bucket algorithm with 3 color marking + explicit drop)</td>
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<tr>
<td>• Shaping at the egress</td>
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<tr>
<td>• Weighted Random Early Detection (WRED) and/or Tail Drop (TD)</td>
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<tr>
<td>• Hierarchical queueing</td>
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<tr>
<td>• SLAs are applied (both policing and shaping) on Per-Flow Queues</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>• Multi-class pseudo-wires</td>
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<tr>
<td>• Weighted QoS</td>
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**Carrier Class Resiliency**

• ZXCTN 9000 upgrade without affecting services and minimal customer traffic loss
• Fully redundant platforms to provide carrier-class reliability
• Hot-swappable switch fabric and line cards
• 1+1 hot-standby redundancy for MSCs both on data plane and control plane
• 1+1 hot-standby redundancy for power units (DC)
• 2+1 hot-standby redundancy for power units (AC)
• Nonstop forwarding for all traffic during control plane switchover
• Routing resiliency: OSPF and RSVP-TE stateful redundancy, OSPF, ISIS, BGP and LDP graceful restart
• Database redundancy: RIB and FIB routing and forwarding table, OSPF-TE and ISIS-TE traffic engineering database, CAC, VPLS MAC address
• Data path protection: Supports redundant LSPs and LSP fast reroute in sub-50 ms, link aggregation and SDH LMSP protection, ATM IMA, MLPPP, VRRP, STP, RSTP, MSTP, H-VPLS, backup pseudo-wires and VRRP, loop detection blocking
• Pseudo-wire redundancy: dual-homing
• TMPLS/MPLS-TP protection: LSP 1+1/1:1, Wrapping protection, SD protection
• Dual Node Interconnection protection
• BFD support for OSPF, IS-IS, BGP, LDP and RSVP LSP

**OAM**

Extensive network diagnostics capabilities are implemented to detect and diagnose abnormalities in the network. The feature set includes, but not limited to:

• GACH+ITU-T Y.1731 MPLS-TP OAM
• IEEE 802.3ah Ethernet in the First Mile (EFM) physical layer, OAM, including link events and remote loopback
• ITU-T Y.1731 Ethernet OAM
• Ethernet services disruption detection and diagnostics: port mirroring, continuity check (includes VPLS) link trace and loopback, as per IEEE 802.1ag (Draft) service OAM
• MPLS services disruption detection and diagnostics: LSP ping and trace, pseudo-wire Virtual Circuit Connectivity Verification (VCCV) and Bidirectional Forwarding Detection (BFD)

**Security**

Well-defined secure network element access, extensive monitoring and disaster recovery methods based on layered, reliable and scalable security architecture:

• Operating system security using protected memory and modular processes
• Management plane security using multi-level security matrix for secure EMS/NMS access, SNMPv3 security support, SFTP RADIUS, TACACS+, forensics capability for security audit or threat diagnostics, network database backup for disaster recovery
• Control plane security against DDoS and TCP SYN attacks and MD5 authentication
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<td></td>
<td>for IP, ATM and MPLS</td>
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<tr>
<td></td>
<td>• Data plane security for flexible class based traffic protection, E911 regulation for public safety, flexible access control list, lawful interception, resource protection, spoofing</td>
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<tr>
<td>Power supply (DC/AC)</td>
<td>DC: -48V/-60V+-10%</td>
<td></td>
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<tr>
<td></td>
<td>AC: 110V/220V+-10%, 50~60Hz</td>
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<tr>
<td>Power rating of power supply module</td>
<td>Total power consumption &lt;2500W, power supply module 2+1 redundancy</td>
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<tr>
<td>MTBF/MTTR</td>
<td>&gt;400000h/&lt;0.5h</td>
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<tr>
<td>Noise</td>
<td>&lt;70dB</td>
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<tr>
<td>Operating Environment Requirement</td>
<td>-5℃~+50℃, 10%~90%, Non-condensing</td>
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</tr>
<tr>
<td>Altitude</td>
<td>&lt;5,000m</td>
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<tr>
<td>Astigmatic Degree</td>
<td>9 level</td>
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<tr>
<td>Certificates</td>
<td>NEBS Level3, UL 60950-1; EN60950-1:2001; FCC Part 15 Class A; ETSI EN300 386 V1.3.1 (2001-09); EMC/Immunity; EN60825-1:1994, A11, A2; AS/NZS 60950.1:2003; CSA C22.2 No. 60950-1; CE; RoHS</td>
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