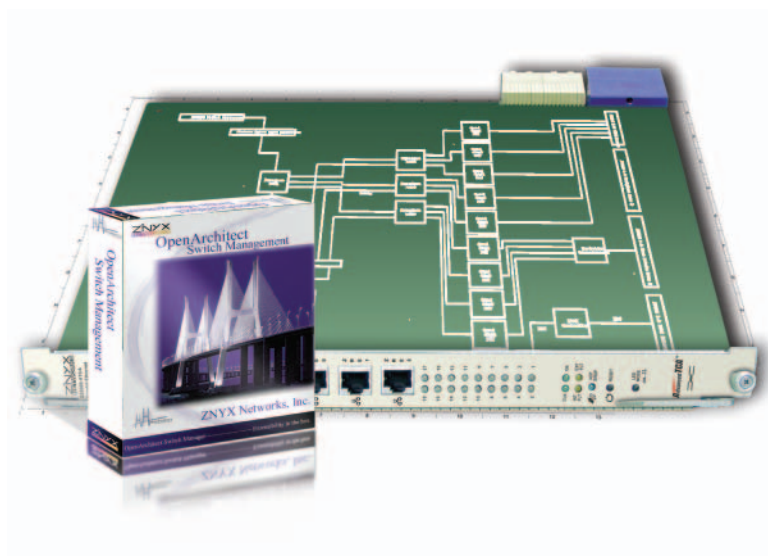


ZX5000 - Gigabit Ethernet Base Fabric Switch for AdvancedTCA™ *Product Specification*



ZX5000 Product Specification

AdvancedTCA™ Base Fabric Switch

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ZX5000 Product Specification

AdvancedTCA™ Base Fabric Switch

Product Overview

1.0 Overview

PICMG® 3.0 AdvancedTCA™ was developed to provide a standardized platform specifically optimized for carrier-grade applications, providing fault-tolerance and a standard fabric interface such as Ethernet.

AdvancedTCA™ defines an open architecture modular computing platform that can be quickly integrated to created highly scalable, high performance service solutions with components available from a wide range of commercial vendors.

The AdvancedTCA™ backplane provides a dual-dual star topology – parallel networks with redundancy – to provide separate communication paths for chassis management (Base Fabric) and data transport (Data Fabric) traffic.

The ZX5000 Base Fabric Switch communicates with other payload Boards in a Shelf (chassis) via point-to-point 10/100/1000 BASE-T Ethernet connections and provides the interface to the Dedicated Shelf

Management Controller (ShMC) that resides outside of the Ethernet backplane sub-system. The shelf manager provides essential system management features that include:

- "Managed Device" watchdog
- Hot-Swap handler
- Payload power budgeting
- Cooling operations

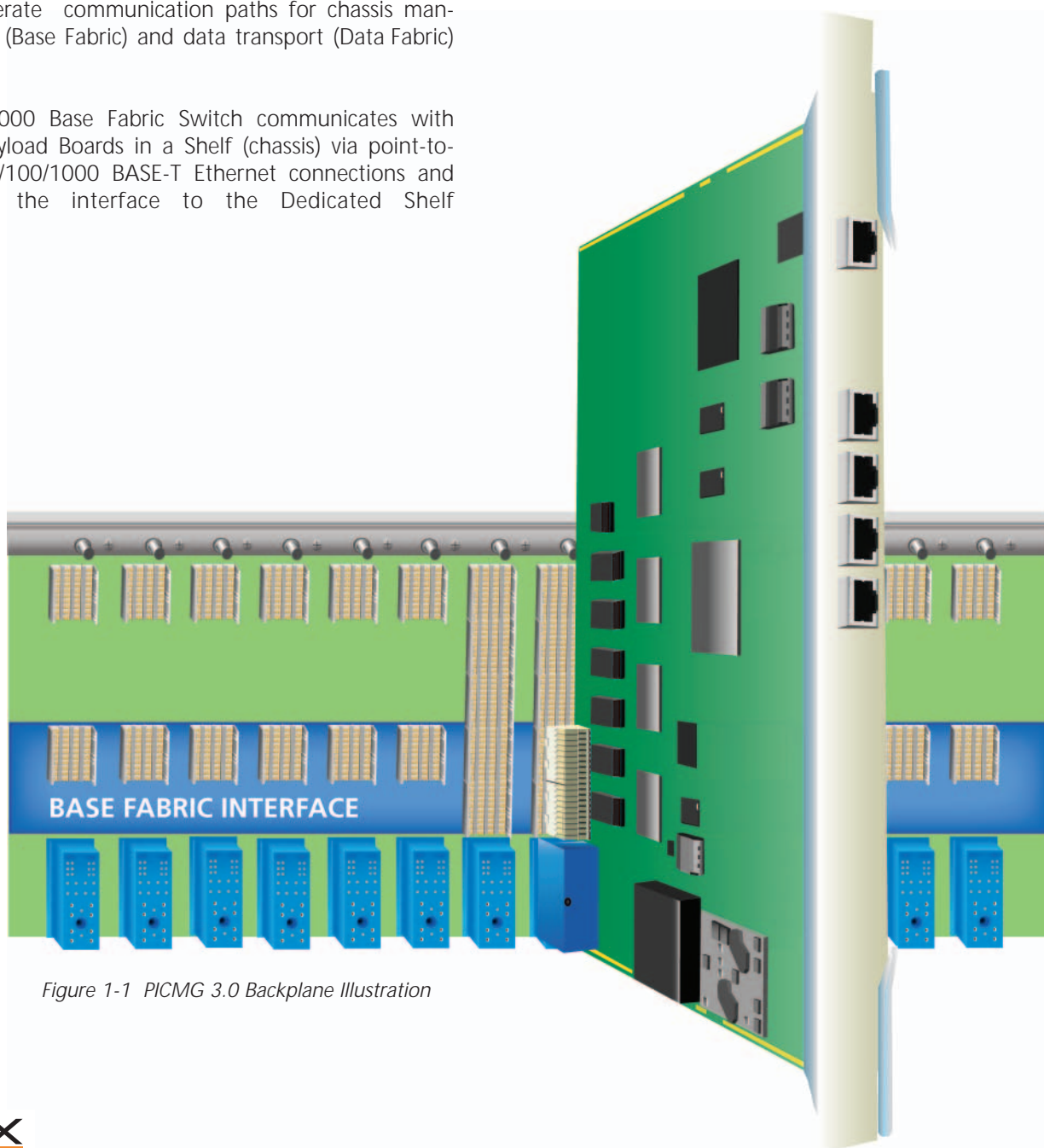


Figure 1-1 PICMG 3.0 Backplane Illustration

1.1 Product Description

The ZX5000 is a 16-port PICMG 3.0 compliant AdvancedTCA® Base Fabric switch based on the Intel IXE5416 switch silicon. Providing Gigabit Ethernet service for 12 payload slots, the ZX5000 uses the ZNYX Networks OpenArchitect 3/IXE Control Plane Engine running on its embedded MPC8255 to provide complete and flexible switch management. Three switch egress ports are provided, and one more port is dedicated to the switch-to-switch connection in redundant configurations. For additional management connections, one out-of-band 10/100 Ethernet management port and one RS-232 serial port are provided to the front panel. The ZX5000 provides full PICMG 3.0 compliant chassis management with its on-board IPMI controller.

1.2 Product Features (at-a-glance)

-OpenArchitect 3.0 / IXE provides a complete Layer 2/3 switch management platform, customized for embedded Ethernet networks such as AdvancedTCA™ chassis.

-16 Gbps non-blocking switch fabric supports full line-speed communications on all channels simultaneously

-Enhanced Protocol Stack provides OSPF, RIPv1/v2, IGMP, and more.

-10/100/1000 Mbps Ethernet enables a <3uS latency for building mission-critical high-speed communications applications while maintaining backwards compatibility with legacy equipment.

Figure 1-2 : ZX5000 Photo



1.2.1 Layer 2 Features

-802.1p packet prioritization provides Quality of Service (QoS) queuing to reserve band-width for mission-critical data packets.

-Jumbo Frames Support enables packets up to 9K to be transmitted un-fragmented across the network for lower overhead and higher throughput

-802.3ad Link Aggregation allows multiple network links to be combined forming a single scalable data-pipe.

802.1D Spanning Tree Protocol (STP) finds the shortest path between two networks and eliminates loops from the topology.

Fast Forward Port alters the STP algorithm by bypassing the Listening and Learning states, transitioning directly to Forward, reducing recovery times.

802.1Q and port-based VLANs isolate traffic and enable communications to flow more efficiently within groups of mutual interests.

802.3x Flow Control implemented in hardware to eliminate Broadcast Storms.

IGMP (Internet Group Management Protocol) Snooping allows the ZX5000 to "listen in" on the IGMP communications between hosts and routers to automatically add port entries to the GDA list for that group.

GMRP (GARP Multicast Registration Protocol) determines which VLAN ports are listening to which multi-cast addresses to reduce unnecessary traffic through the switch.

GVRP (GARP VLAN Registration Protocol) provides a Layer 2 mechanism for dynamically managing port memberships.

Port Mirroring creates a copy of the packets from a single link or a set of links and sends the copies to a single "mirror_to" port.

1.2.2 Layer 3 Features

Wire Speed IP Forwarding (Routing) of Layer 3 packets for maximum throughput.

IGMPv2 (Available Q4 '03) is used by IP hosts to report their multicast group memberships to routers.

DVMRPv2 (Distance Vector Multicast Routing Protocol)

(Available Q4 '03) for routing multi-cast datagrams through an inter-network.

RIPv1/v2 (Routing Information Protocol) determines a route based on the smallest hop count between source and destination.

OSPFv2 (Open Shortest Path First) calculates a shortest-path tree and maintains a routing table to reduce the amount of hops it takes to get to the destination address, reducing latency.

1.2.3 High Availability Features

Power-On Diagnostics provide a Flash memory, DRAM, Switch silicon and LED tests to ensure correct operation.

Redundant Run-time OS images in Flash ensures that if the main image becomes corrupted, a backup copy resides locally on the switch.

Hot-Swap compliance allows the switch to be inserted or extracted during operation with no electrical side-effects.

IPMI integration with onboard sensors reports important switch health information to a Dedicated Shelf Management Controller (ShMC).

OpenArchitect/HA Suite™ (upgrade) provides software at each end of every embedded Ethernet link within the ATCA chassis. This complete solution, with total control of the sending and receiving Ethernet components allows the chassis to repond and automatically correct any single point-of-failure. During failover/failback, Continuous Service is guaranteed with no change in node IP or MAC address.

1.2.4 Network Service Features

FTP Server/Client allows the transfer of files to/from the switch using the File Transfer Protocol.

DHCP Server/Client/Relay enables the ZX5000 to assign or accept IP addresses using the Dynamic Host Configuration Protocol.

Network Time Protocol (NTP) can set the real-time clock on a system to synchronize the time across a network.

NFS Server/Client allows the ZX5000 to expand the size of Network applications, beyond the limitations of local file system storage.

Network Address Translation (NAT) allows a router to act as an agent between the Internet and a local network.

2.0 Hardware Overview

The ZX5000 is an 8U Base Fabric board designed for use in the fabric-interface of a AdvancedTCA™ system chassis compliant with the PCI Industrial Computer Manufacturers Group (PICMG) 3.0 standard. 12 Gigabit Ethernet ports, an interswitch link and a communications channel with the Dedicated Shelf Management Controller are routed to the fabric interface through the Zone 2 P23 and P24 ZD connectors. Redundant -48v VDC power, metallic test, ringing generator, Shelf Management system connections, and Hardware Addressing are routed to the P10 Zone 1 connector.

An RS-232 RJ-45 console port, 10/100 Ethernet out-of-band management port and 3 Gigabit Ethernet ports are routed to the front-panel bracket.

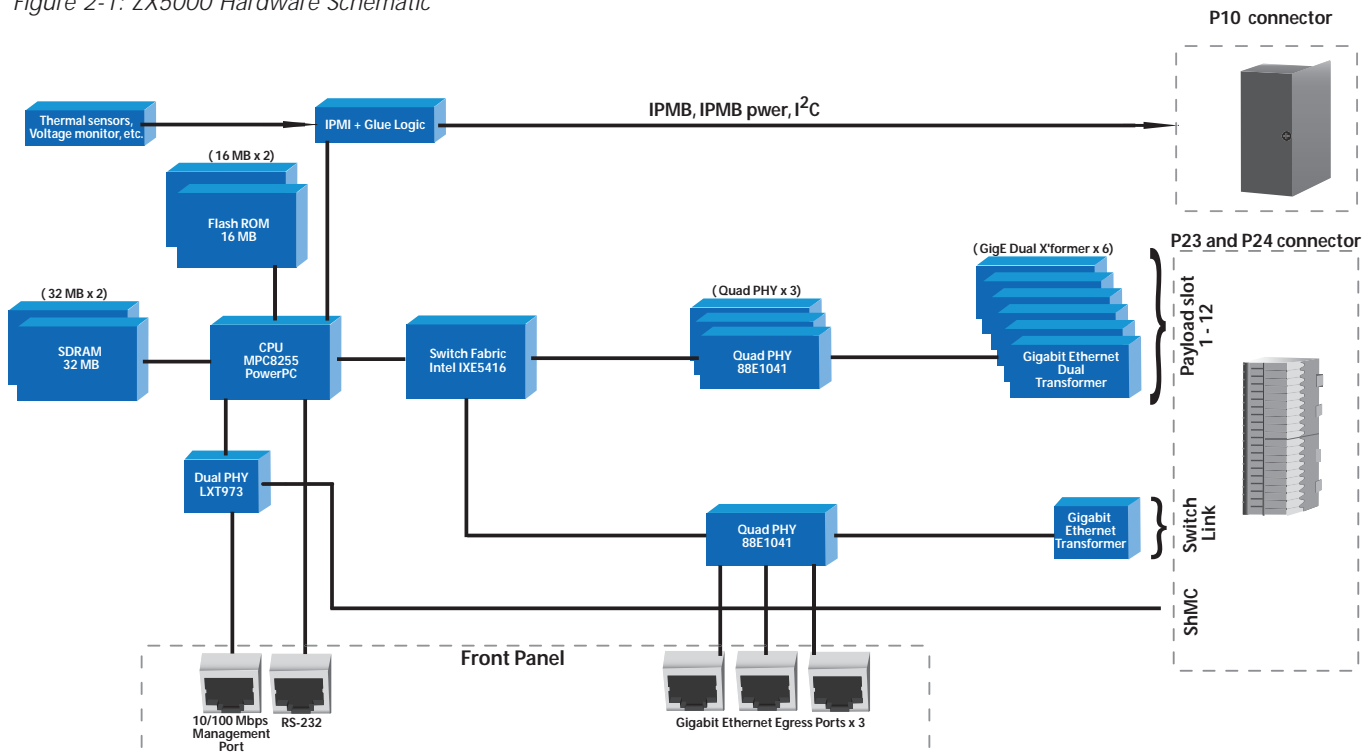
The single-board assembly includes the switch fabric, memory-subsystem, Ethernet PHY devices, RJ-45s, MPC8255 embedded processor with RAM and Flash ROM, DC-DC power supplies, HotSwap and IPMI circuitry. The bracket assembly provides visibility for all user-accessed LEDs, and provides required gasket seals for RFI emission/immunity requirements.

2.1 Intelligent Platform Management Interface

All AdvancedTCA™ systems support an intelligent hardware management system, based on the Intelligent Peripheral Management Interface Specification. The hardware management system provides the ability to manage the power, cooling, and interconnect needs of intelligent devices, to monitor events, and to log events to a central repository.

The management controller communicates with the Shelf Manager over dual Intelligent Platform Management Buses (IPMB). If an IPMB fault or management controller failure occurs, a bus isolation device should be switched to isolate the backplane/system IPMB bus from the SBC board. If possible, the IPM device should activate the redundant IPMB to re-establish system management communication and report the fault.

Figure 2-1: ZX5000 Hardware Schematic



2.2 Hardware Components

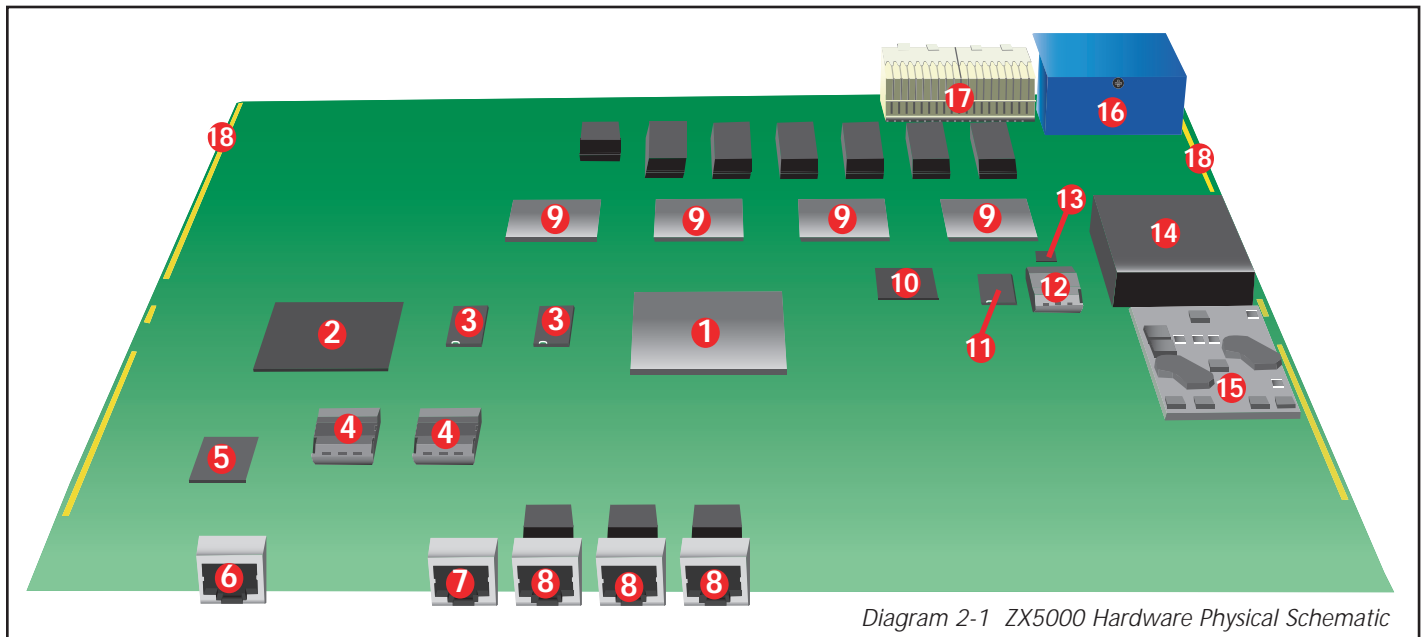


Diagram 2-1 ZX5000 Hardware Physical Schematic

- 1 Switch – Intel IXE5416 Media Switch**
The Intel® Media Switch IXE5416 16-Port fabric is a single-chip Gigabit Ethernet switching that uses a shared-memory architecture to achieve gigabit wire speed switching on all ports.

The IXE5416 supports VLANs, link aggregation, traffic prioritization and wire-speed packet filtering based on layer 2 and layer 3/4 information.
- 2 Embedded Controller – Motorola MPC8255 PowerPC®**
THE MPC8255 is an Embedded 32-bit RISC communications processor (CP) with a dual-issue integer core and Floating-Point Unit (FPU), providing flexible support for communications protocols.
- 3 Application Memory SDRAM**
On boot, the ZX5000 loads the OpenArchitect Control Plane Engine from the FlashROMs into the 64MB of SDRAM.
- 4 FlashROM (2x)**
16 MB Flash ROMs store the boot image, run-time image and configuration settings. (32 MB Total)
- 5 LXT973 Dual 10/100 PHY**
PHY for out-of-band Ethernet Management and communication with the Dedicated Shelf Management Controller (ShMC)
- 6 Out-of-band Management Port**
10/100 Mbps Ethernet RJ-45 console port for switch management
- 7 Console Management Port**
RS232 RJ-45 console port for switch management.
- 8 Front Panel Ethernet Port (3x)**
10/100/1000 Mbps RJ-45 ports capable of creating multiple uplinks to aggregate bandwidth.
- 9 10/100/1000 Quad PHY (4x)**
Fully IEEE802.3 compatible quad PHY with support for auto-negotiation, auto polarity correction, and auto-MDI/MDI-X to reduce cabling error.
- 10 Dual IPMB Controller**
Intelligent hardware management system for communicating power, cooling, and device health information to the Shelf Management Controller (ShMC).
- 11 IPMB SRAM Memory**
The IPMB controller software is loaded into a 256K Static RAM module during boot.
- 12 IPMB Flash Memory**
Contains the IPMB controller software required during boot.
- 13 Sensor**
Thermal sensor and voltage monitor report health information to the Shelf Management Controller (ShMC).
- 14 Power Filter Module**
Reduces the conducted-common mode and differential-mode noise on input or output lines of high-frequency switching power supplies.
- 15 DC/DC Converter**
48v in / 12v out isolated DC/DC converter with thermal shutdown protection.
- 16 P10 Backplane Connector**
Carries the signals for -48VDC power, metallic test, ringing generator, Shelf management systems and hardware addressing.
- 17 P23 and P24**
ZD Connectors that carry Base Fabric signalling for up to 16 payload cards
- 18 ESD Segments**
Provides contact between the chassis and ZX5000, providing an discharge path to the shelf ground

3.0 Software Overview

The OpenArchitect management software components, consisting of the Linux kernel, IP protocol stack, control applications and the OA Engine, run on the embedded microprocessor. OpenArchitect provides extensive routing policies (RIP, OSPF, BGP, etc.), link management protocols such as Spanning Tree, traffic management protocols (VLAN, QoS, etc.) and high availability functionality (VRRP, fast fail-over, etc.). OpenArchitect enables rapid porting of other UNIX/Linux-based protocols that conform to industry standard RFCs. It also enables the development of application-specific routing programs.

(See chapter 13 for information about ZNYX add-on software and third-party solutions.)

3.1 Linux

OpenArchitect is based on a standard Linux 2.4.2 kernel compiled for the architecture (PPC, MIPS, etc.) on which the system is to be run. Linux provides a stable and open software runtime environment that supports both open-source and proprietary code, including process and task scheduling, UNIX-like file system, dynamically loaded device driver environment, and shared object libraries.

OpenArchitect uses the familiar “Bourne Again” (bash) shell. OpenArchitect makes complex configuration and management easy with the use of scripting and daemons. All the familiar Unix tools and commands can be used to create quick, easy, and reliable scripts.

3.2 Software Interfaces

As an alternative or supplement to the bash shell command-line-interface, ZNYX will offer an “IOS-like” shell that uses a syntax and structure familiar to many network architects. This software package may be added to OpenArchitect 3.3 distributions or later, and provides the ability to configure and display status of all switch parameters.

OpenArchitect can also be managed through a web browser, java client, telnet session, or Command Line Interface.

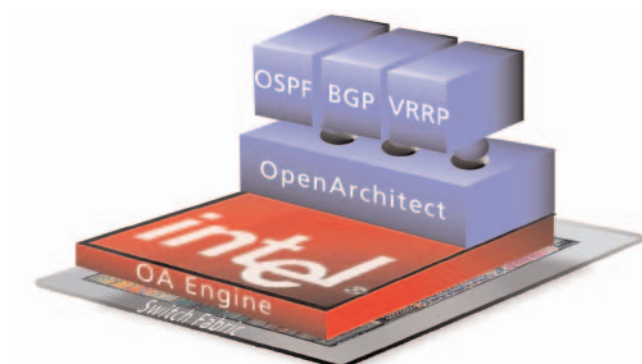


Diagram 3-1 The OpenArchitect environment is modular, allowing components to be customized for application-specific projects.

3.3 IP Protocol Stacks

A major advantage of using OpenArchitect is the multiple vendors for linux applications and protocol stacks. There are several commercially available packages that will run unmodified within the OpenArchitect environment.

3.4 OA Engine

The OA Engine is the bridge between the software environment and high performance switch fabric. The engine transparently moves routing policies established by software to the switch fabric's forwarding table. This bridge enables line-rate packet switching to be executed on a silicon switch fabric chip, yet managed by open-source routing.

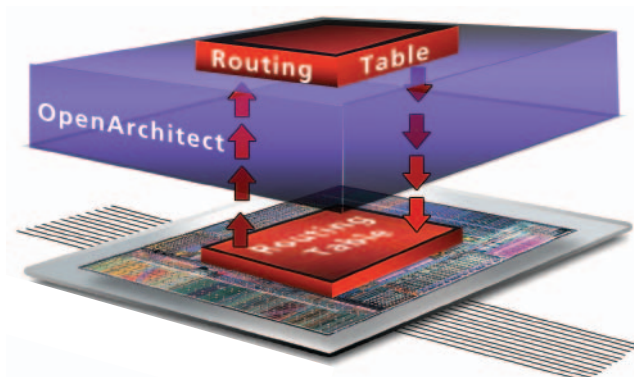


Diagram 3-2 Routing Table changes made in the OpenArchitect environment are mirrored to the switch Fabric routing table for line-rate packet processing

3.5 OpenArchitect/Linux

The following sections list utilities, protocols, MIBs, Daemons, and scripts that are in the standard OpenArchitect/Linux Distribution.

3.5.1 OpenArchitect Linux z-Daemons

These software components are daemons that are provided as part of the OpenArchitect product and are fully authored by ZNYX Networks.

z-Daemon	Description
zgvrpd	GARP VLAN Registration Protocol (GVRP). Available Q4 '03
zfilterd	Operates L2-L7 filtering rules. Available Q4 '03
zgmrpd	GARP Multicast Registration Protocol (GMRP). Available Q4 '03
zl2d	Operates Layer 2 protocols.
zl3d	Operates Layer 3 protocols.
zqosd	Controls Quality-of-Service operations. Available Q4 '03
zsnoopd	Supports IGMP snooping, loading the forwarding silicon's L2 Multicast tables. Available Q4 '03

3.5.2 OpenArchitect Linux z-Utilities and Scripts

These programs are command-line or script-based programs that are typically invoked by the command line shell, and are provided as part of the OpenArchitect product, fully authored by ZNYX Networks.

Item	Description
brctl	Bridge and Spanning Tree protocol administration.
zal	Utility to print out switch table (name subject to change)
zbootcfg	Modifies boot-time parameters.
zconfig	Primary OpenArchitect™ switch configuration utility.
zcos	Class-of-Service queue control. Available Q4 '03
zflash	Utility that writes data to Flash ROM.
zlc	Link and LED status control.
zmirror	Controls link mirroring. Available Q4 '03
zmnt	Reads Flash ROM to RAM disk.
zrc	Packet rate control utility. Available Q4 '03
zreg	General-purpose utility to read-and-write registers of the switch hardware.
zstats	Displays switch status.
zsync	Saves change-images to Flash Rom.
zvlan	Displays VLAN information.

3.5.3 OpenArchitect Linux Standard Daemons

These programs are generally parts of standard Linux distributions and are provided in OpenArchitect without modification.

Item	Description
dhcpd	DHCP server.
ftpd	FTP daemon to transfer files in and out.
gated	L3 protocol suite. Support for RIP versions 1 and 2, OSPF v 2, EGP version 2, BGP versions 2 through 3, ICMP. Gated version is 4.0.8.
in.telnetd	TELNET server.
inetd	General port listening daemon.
mROUTED	DVMRP v2 & IGMP v2 support
ntpd	Network Time Protocol server.
ROUTED	L3 protocol suite.
Rpc.lockd	NFS Support.
Rpc.mountd	NFS Support.
Rpc.nfsd	NFS Support.
Rpc.statd	NFS Support.
snmpd	SNMP Version 1, 2, and 3 support with the new MIBs
syslogd	Support for event logs both local and remote.
telnetd	TELNET daemon to enable in-band connections to getty/shell.
tftpd	TFTP server.
thttpd	HTTP server daemon
(CGI scripts)	Scripts and programs that can be used with the HTTP server to build a browser interface to OpenArchitect. Release date is to be determined.

3.5.4 OpenArchitect Linux Standard Utilities & Scripts

These programs and scripts are generally found in standard Linux distributions and are included in OpenArchitect without modification.

Item	Description	
Arp	List and change Address Resolution Protocol (ARP) table.	
Awk	Script programming language.	
Bash	Version 2.04. User shell.	
busybox	BusyBox Version 0.47 combines tiny versions of many common UNIX utilities into a single small executable. See ftp://oss.lineo.com/busybox/BusyBox.html	
dhclient	Automatically configure ports using DHCP protocol.	
dhcrelay	DHCP Relay.	
Diff	Compute differences in files.	
exportfs	Make volumes available under NFS.	
Free	List memory resources.	
ftp	Access FTP sites.	
hexdump	Examine binary files.	
Hostname	Display or set name assigned to host.	
Ifconfig	Configure network interfaces.	
Init	root task.	
Insmod	Install kernel modules.	
ip	Alternate utility to ifconfig.	
iptables	Linux firewall configuration utility. (Requires zfilterd)	Available Q4 '03
ksyms	List kernel symbols.	
lsmod	List modules.	
netstat	Network Status.	
nfsstat	Print status of NFS.	
nice	Set process priority.	
nohup	Background pipe tool.	
ntptime	Get date from NTP server.	
ping	Test network utility.	
portmap	NFS Support Utility.	
ps	View process status.	
rarp	Examine RARP table.	
rmmod	Remove kernel modules.	
route	Manage route table.	
snmpget	Get SNMP object.	
snmphtml	Utility that polls MIB objects from an HTML template.	
snmpset	Set SNMP object.	
snmpwalk	Walk SNMP sub-tree.	
strace	Traces system calls.	
sum	Calculate checksum.	
Tar	Archive utility.	
Tc	Traffic control utility.	
Tcpdump	Snoop Network Traffic.	
telnet	Access remote system via TELNET protocol.	
Tftp	Access TFTP server.	
Tinylogin	TinyLogin Version 0.78 contains login and user administration tools. See http://tinylogin.lineo.com/TinyLogin.html	
Top	View process status	
Ttcp	UDP/TCP traffic generation tool.	
Vi	Visual Editor.	
Vmstat	View virtual memory status.	

3.5.5 OpenArchitect Protocols

OpenArchitect 3 is a control-plane technology for managing Ethernet switches with a unique "open architecture" that makes it easy to implement and use a large library of protocol and management software. Instead of the "classical control-plane" approach, where all such software must be ported to a specific environment, OpenArchitect can use nearly any software that can be installed and run on an open-source Linux system. The result is that OpenArchitect has more up-to-date support than any competitor.

Standard	Description	
Routing & Control		
768	UDP	2018 TCP Selective Acknowledgement Options
791	IP	2131 DHCP
792	ICMP	2132 DHCP Options and BOOTP Vendor Extensions
793	TCP	2236 IGMPv2
826	ARP	2328 OSPFv2
894	IpoE	2338 VRRP
903	RARP	2362 PIM-SM
904	EGPv2	2370 The OSPF Opaque LSA Option
919	IP Broadcast Datagrams	2453 RIPv2
922	IP Broadcast Datagrams with Subnets	2460 IPv6
950	Internet Standard Subnetting Procedure	2461 Neighbor Discovery for Ipv6
951	BOOTP	2462 Ipv6 stateless address auto-configuration
1027	Proxy ARP	2463 ICMPv6
1042	Transmission of IP datagrams of 802 networks	2464 Ipv6 over Ethernet
1058	RIPv1	2516 PPPoE
1112	Host Extensions for IP Multicast	2715 Multicast Interoperability
1122	Host Requirements – Communications	3022 NAT
1123	Host Requirements - Applications	
1155	SMIv1	Quality of Service
1191	Path MTU Discovery	896 Congestion control in IP/TCP internetworks
1256	ICMP Router Discovery Messages	2474 Definition of the DS field in Ipv4 and Ipv6 headers
1267	BGPv3	2475 An architecture for diffserv
1323	TCP Extensions for High Performance	2597 Assured Forwarding PHB
1332	PPP Internet Protocol Control Protocol (IPCP)	3084 COPS-PR
1333	PPP Link Quality Monitoring	3159 Structure of Policy Provisioning Information (SPPI)
1334	PPP Authentication Protocols	3246 Expedited Forwarding PHB
1403	OSPF-BGP Interaction	3260 New Terminology and Clarifications for DiffServ
1519	CIDR (Classless Inter-domain Routing)	3317 Diffserv QOS PIB
1533	DHCP Options and BOOTP Vendor Extensions	3318 Framework PIB
1542	BOOTP Clarification	3410 Per Hop Behavior Identification Codes
1548	Point to Point Protocol (PPP)	
1549	PPP in HDLC Framing	
1587	OSPF NSSA	
1661	Point to Point Protocol (PPP) (obsoletes 1548)	
1662	PPP in HDLC Framing (obsoletes 1549)	
1700	Assigned Numbers	
1702	Generic Routing Encapsulation over Ipv4 Networks	
1765	OSPF Database Overflow	
1771	BGPv4	
1812	Requirements for Ipv4 Routers	
1853	IP-IP Tunneling	
1981	Path MTU Discovery for IPv6	

3.5.5 OpenArchitect Protocols (continued)

Standard	Description
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Security

2401	Security Architecture for the Internet Protocol
2402	IP Authentication Header
2403	The use of HMAC-MD5-96 within ESP and AH
2404	The use of HMAC-SHA-1-96 within ESP and AH
2405	The ESP DES-CBC Cipher Algorithm with Explicit IV
2406	IP Encapsulating Security Payload (ESP)
2407	The Internet IP Security Domain of Interpretation for ISAKMP
2408	Internet Security Association and Key Management Protocol (ISAKMP)
2409	The Internet Key Exchange
2865	RADIUS
2866	RADIUS Accounting
2867	RADIUS Accounting Modifications for Tunnel Protocol Support
2868	RADIUS Attributes for Tunnel Protocol Support
2869	RADIUS Extensions
2882	Extended RADIUS Practices
3162	RADIUS and IPv6

Miscellaneous

821	SMTP
959	FTP
1057	RPC
1094	NFS
1305	NTP
1350	TFTP
1813	NFSv3
1866	HTML/2.0 (obsoleted by 2854)
1867	HTML/2.0 Forms with File Upload Extensions
1945	HTTP/1.0 Protocol
1951	DEFLATE Compressed Data Format Specification v1.3
1952	GZIP file format specification v4.3
2068	HTTP/1.1 Protocol
2069	An Extension to HTTP: Digest Access Authentication (obsoleted by 2617)
2617	HTTP Authentication: Basic and Digest Authentication (obsoletes 2069)
960	SCTP
3309	SCTP Checksum Change

IETF Draft compliance

Draft-ietf-magma-snoop-05.txt
Draft-ietf-pim-v2-dm-03 – (PIM-DM)
Draft-ietf-secsh-transport-15.txt (SSH Transport Layer Protocol)
Draft-ietf-secsh-userauth-16.txt (SSH Authentication Protocol)
Draft-ietf-secsh-connect-16.txt (SSH Connection Protocol)
Draft-ietf-secsh-architecture-13.txt (SSH Protocol Architecture)
Draft-ietf-secsh-filexfer-04.txt (SSH File Transfer Protocol)
Draft-ietf-secsh-publickeyfile-03.txt (SSH Public Key Format)
Draft-ietf-secsh-agent-01.txt (Secure Shell Authentication Agent Protocol)
Draft-ietf-idmr-dvmrp-v3-10.txt (DVMRP)

3.5.6 OpenArchitect MIBs

OpenArchitect includes extensive MIB (Management Information Base) support as documented by each of the RFCs listed.

MIB	Description
RFC 1157	SNMP v1/3
RFC 1213	Management Information Base for Network Management of TCP/IP-based internets: MIB-II
RFC 1215	A Convention for Defining Traps for use with the SNMP
RFC 1493	Definitions of Managed Objects for Bridges Available Q4 '03
RFC 1657	Definitions of Managed Objects for the Border Gateway Protocol (Version 4)
RFC 1724	RIP Version 2 MIB Extension
RFC 1850	OSPF Version 2 Management Information Base Available Q4 '03 – no support for sets
RFC 2011	SNMPv2 MIB for IP using SMIv2 Available Q4 '03
RFC 2012	SNMPv2 MIB for TCP using SMIv2 Available Q4 '03
RFC 2013	SNMPv2 MIB for UDP using SMIv2 Available Q4 '03
RFC 2021	RMON version 2 Available Q4 '03
RFC 2096	IP Forwarding Table MIB.
RFC 2571	SNMP Management Frameworks Available Q4 '03
RFC 2572	Message Processing and Dispatching for SNMP Available Q4 '03
RFC 2573	SNMP Applications Available Q4 '03
RFC 2574	USM for SNMPv3 Available Q4 '03
RFC 2575	VACM for SNMP Available Q4 '03
RFC 2576	Coexistence of SNMP v1, v2 and v3
RFC 2579	Textual Conversions for SMIv2.
RFC 2665	Ethernet-like Interface Types MIB. Available Q4 '03
RFC 2674	Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering and Virtual LAN Extensions Available Q4 '03
RFC 2787	Virtual Router Redundancy Protocol (VRRP) MIB.
RFC 2819	RMON MIB. Available Q4 '03
RFC 2863	The Interfaces Group MIB Available Q4 '03
RFC 2932	IPv4 Multicast Routing MIB Available Q4 '03
RFC 2742	Extensible SNMP Agents MIB Available Q4 '03
RFC 2932	IPv4 Multicast Routing MIB Available Q4 '03
RFC 3165	Delegation of Management Scripts MIB Available Q4 '03
UCDSNMP	Enterprise MIB UCD-SNMP MIB for Linux host management and monitoring

ZX5000 Product Specification

AdvancedTCA™ Base Fabric Switch

Electrical

4.0 Model Numbers (SKUs)

Customers may order the ZX5000 with OpenArchitect with the following SKU:

Table 5-1 : Typical Power Consumption for the ZX5000

SKU	Description
ZX5000	AdvancedTCA Base Fabric Switch with OpenArchitect

5.0 Electrical

5.1 Power Source

PICMG 3.0 systems are capable of dissipating as much power as 200W per single-slot. Dual, redundant -48VDC filtered power feeds are provided to each slot from the chassis powerplant (Referred to as Feed A and Feed B). The ZX5000 was designed to provide board level fusing by interrupting the flow of DC power in the event of an over-current situation.

The ZX5000 also performs the necessary emissions filtering functions as required in the PICMG 3.0 specification to meet the appropriate agency conducted and radiated emissions requirements.

5.2 Fusing and Fault Protection

In addition to Shelf level Fusing and Fault protection provided by the ATCA platform, the ZX5000 features components that are intended to interrupt DC power in the event of an over-current situation.

The following circuits are protected by an inline fuse:

Table 5-2 : Circuits protected by an inline fuse

Circuit	Fuse	Location
-48v DC Return A / B	125v / 10A	F1,F2
-48v DC Feed A / B	125v / 7A	F3,F4
enable signal feed A / B	125v / 1A	F5,F6

5.3 Power Requirements

The ZX5000 accepts either monolithic load wiring (one set of power inputs for the Shelf) or distributed load wiring (multiple sets of inputs, each providing power to a subset of Shelf Slots).

Table 5-3 : Typical Power Consumption for the ZX5000

Condition	Current	Typical Power Consumption
Board in Reset	336mA	16.1W
Board in Idle	416mA	20.0W
Full Switching	900mA	43.2W

(ATCA platforms have a power allotment of up to 200W per single-slot board):

5.4 Board Power Sequencing

Power sequencing is provided by pins of different length in the power connector (P10) and the subrack.

The Power-Up sequence is as follows:

During board insertion, ESD segment #1 and the guiderail make the first electrical contact between the chassis and ZX5000, providing a discharge path to the shelf ground. The second ESD segment then discharges the logic ground.

The first pins to mate in the power connector are the EARLY_A and EARLY_B pins which allows for the pre-charge of the power converter input capacitors. The last pins to engage in the power sequence are the ENABLE pins _A and _B.

Boards in a subrack only have a 10 w total power source until they have negotiated power-up rights with the Shelf Manager.

5.5 Port Connections

The OpenArchitect software uses the designator 'zre' to identify physical ports on the ZX5000 (virtual ports such as VLANs use the 'zhp' designator). The port assignment is listed below:

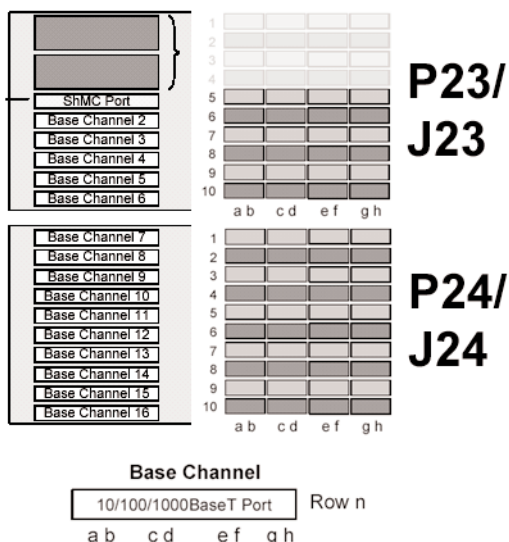
Table 5-4 : ZX5000 Port Connections

Port Assignment	Location	Connection
zre0	Front-Panel	Egress (RJ-45)
zre1	Front-Panel	Egress (RJ-45)
zre2	Front-Panel	Egress (RJ-45)
zre3	Backplane	Slot 3
zre4	Backplane	Slot 4
zre5	Backplane	Slot 5
zre6	Backplane	Slot 6
zre7	Backplane	Slot 7
zre8	Backplane	Slot 8
zre9	Backplane	Slot 9
zre10	Backplane	Slot 10
zre11	Backplane	Slot 11
zre12	Backplane	Slot 12
zre13	Backplane	Slot 13
zre14	Backplane	Slot 14
zre15	Backplane	Inter-Switch Link (ISL)
eth0	Front-Panel	RJ-45 Management port
eth1	Backplane	ShMC

5.6 Base Fabric Connector Pin-out

The ZX5000 connection to the Base Fabric backplane conforms to the PICMG 3.0 Base Fabric Interface standards, providing a single connection to each payload slot (star topology), or redundant connections when two ZX5000s are used (dual star). The pinouts for P23 / P24 are as follows:

Table 5-5 : Base Fabric Connection



6.0 Mechanical

The ZX5000 meets the requirements stated in the PICMG 3.0 AdvancedTCA specification for base fabric operation as well as the PICMG 2.1 Hot Swap specification.

6.1 Form Factor

The ZX5000 is a standard 8U height, 30.48 mm wide and approximately 280 mm deep PICMG 3.0 compliant board.

6.2 AdvancedTCA Connectors

The ZX5000 mates to the ATCA backplane through Zone 1 (P10) and Zone 2 (P23,P24) connectors.

The P10 Zone 1 connector serves as a dedicated power interface between the ZX5000 and backplane. The P10 connector provides blind-mating for safer insertion/extraction and meets all the requirements of the AdvancedTCA™ Zone 1 Connector requirements.

The P23/P24 connector is a high-speed differential 2mm Hard Metric ZD connector with prealignment and polarization built into the mating interface. Meets all Telcordia requirements.

6.3 Front Panel

The front panel of the ZX5000 meets all requirements established in the PICMG 3.0 specification including alignment and safety ground pins, captive retention screws, general status LED's, EMC gaskets, insertion/extraction handles and a 1.0 mm metal thickness to maintain a uniform look and feel with other manufacturers.

For front-panel features, refer to section 12.0 ZX5000 Front Panel Features on Page 17)

6.4 Console Port

There are multiple ways that you can interface with the switch software. There are two out-of-band ports mounted on the front panel of the ZX5000, a 10/100 Ethernet RJ-45 port and an RS-232 RJ-45 console port. An RJ45-to-serial cable adapter is supplied by ZNYX Networks to interface the ZX5000 with another device running any industry standard telnet application.

7.0 Switched Ethernet Ports

The ZX5000 provides 12 10/100/1000Mbps switched Ethernet channels to the ATCA backplane. The switch's meshed fabric of Media Access Controllers (MACs) support 1000Mbps at full duplex, line-rate operation. Each MAC conforms to the IEEE 802.3 (CSMA/CD) MAC interface. The ZX5000 adheres to the IEEE 802.3x flow control specification.

The ZX5000 sustains full line-rate Layer 2 switching and Layer 3 IP routing. Maximum switching capacity is 24 million packets-per-second .

The ZX5000 switch silicon also supports Layers 4-7 filtering. The OpenArchitect environment implements custom applications in those layers.

8.0 IPMB

Figure 8-1 is a diagram of the IPMI circuit on the ZX5000. The principal management-oriented link within a Shelf is a two-way redundant implementation of the Intelligent Platform Management Bus (IPMB), which is based on the inter-integrated circuit (I²C) bus and is part of the IPMI architecture.

8.1 Shelf Management Architecture

The Shelf Manager is the highest-level management entity within the ATCA chassis. It is responsible for managing payload boards shelves.

ZX5000 Product Specification

AdvancedTCA™ Base Fabric Switch

Management

In AdvancedTCA™ Shelves, the main IPMB is designated as IPMB-0 and is implemented on either a bussed or radial basis. Each entity attached to IPMB-0 does so via an IPM controller, the distributed management controller of the IPMI architecture. Shelf Managers attach to IPMB-0 via a variant IPM Controller called the Shelf

Management Controller (ShMC).

The Shelf Manager communicates across the IPM Bus to individual IPM Controllers on each payload board. The Shelf Manager does the following:

- Watches over managed devices, reporting anomalous conditions to the System Manager and taking corrective actions to protect against system failure.
- Handles hot-swap events from removable devices, indicating their entry and removal
- Negotiates power budgeting with payload boards
- Controls the speed of the system fans to regulate temperature.
- Ensures that installed payload boards have compatible interfaces to the backplane before activating (electronic keying)

Figure 8-1 : ZX5000 IPMI Circuit

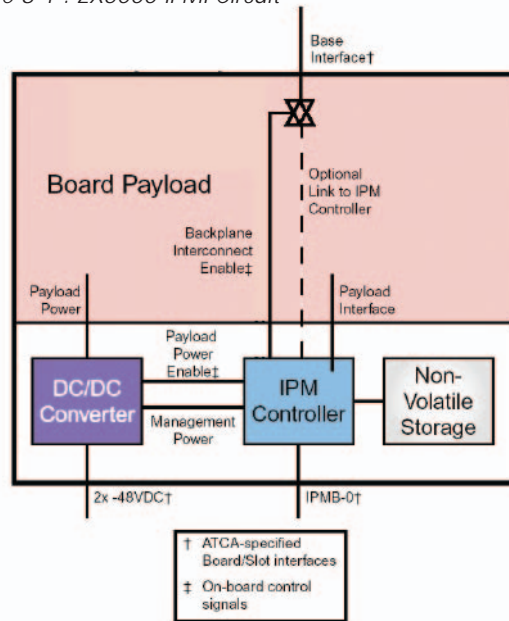
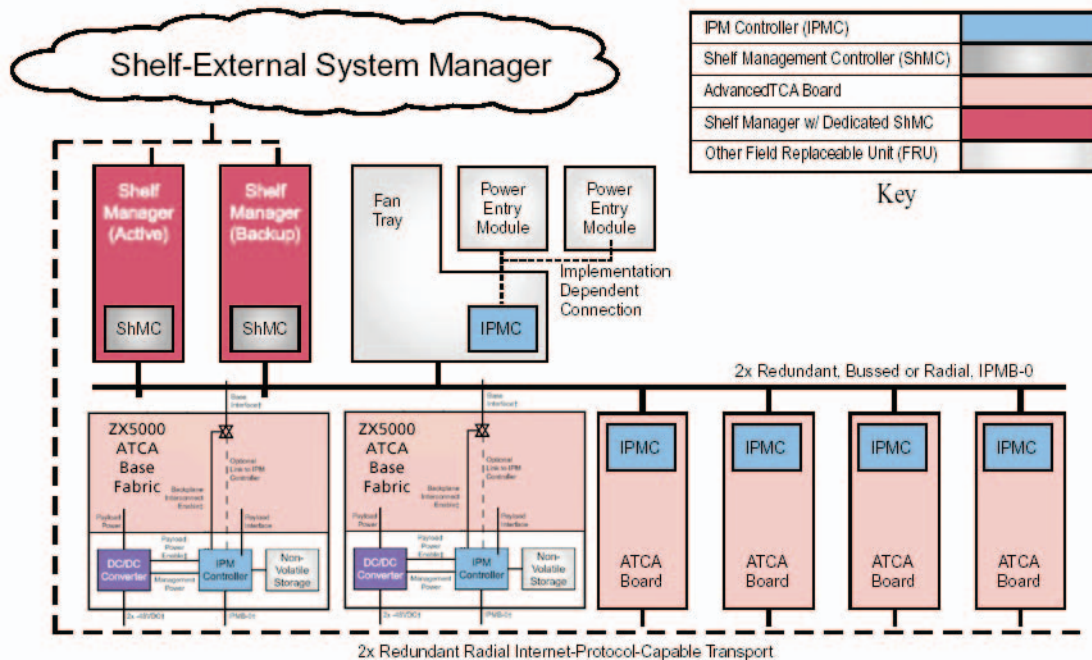


Figure 8-2 : ATCA Shelf Manager Overview



9.0 MPC8255 PowerPC Processor

The ZX5000 uses an embedded Motorola MPC8255 PowerPC Processor. The MPC8255 provides high performance (380 MIPS@200Mhz) with low power consumption (1.9W = typical power dissipation).

Multiple networking applications within the OpenArchitect environment run on the MPC8255. Other Linux applications also may run on the MPC8255; all receive direct access to the switch fabric and memory banks. The MPC8255 uses Motorola's 60x core architecture, which is standard across Motorola's PowerPC line. This feature eases porting Linux applications written for other PowerPC microprocessors.

10.0 Internal Memory

The ZX5000 locally stores switch configurations, applications and scripts within different memory technologies. The ZX5000 may optionally store, retrieve and replicate files from a remote server.

10.1 Flash Storage

A proactive memory architecture in the ZX5000 provides fault-free operation with no file corruption. The architecture includes two 16MB Application Flash ROMs. Flash1 serves as the primary working image. Flash2 stores a replica of Flash1, which provides an alternate boot mechanism if Flash1 is corrupted, or to restore the ZX5000 to its factory-shipped configuration.

Each 16MB ROM contains the OpenArchitect operating system and previously loaded Linux applications, stored in a compress format. You may flash-upgrade the ROM in three ways:

- In-band over any Ethernet port (the preferred method)
- Out-of-band via console connection
- Out-of-band via a serial connection

10.2 Application (Host) SDRAM

Compressed images on Flash1 and Flash2 load into the 64MB of application SDRAM after decompression.

11.0 High Availability Features

The AdvancedTCA platform provides technical means for High Availability. The ZX5000 was designed to take advantage of these features and provide an unparalleled

level of Service Continuity when combined with OpenArchitect/HA Suite.

Several White Papers related to High Availability and OpenArchitect/HA Suite are available for download from the ZNYX Networks website at www.znyx.com

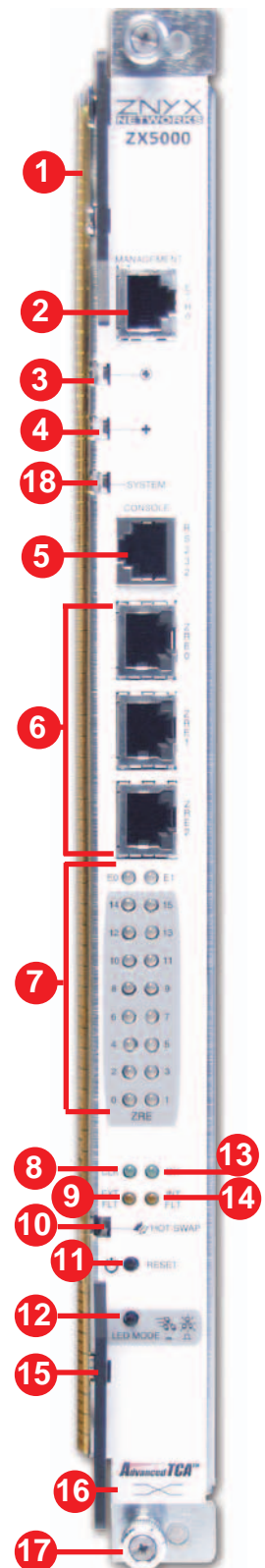
11.1 Hot Swap Circuitry

The ZX5000 provides a fully-compliant PICMG 2.1 HotSwap circuit. This ensures no electrical operation side effects when inserting or extracting the ZX5000 into/from a PICMG 3.0-compliant system. The system includes electrostatic discharge equalization strips, and early power-ups coupled to pre-charge all signal pins on insertion.

All required signals, such as ENUM# and BDSELECT# are supported for software control. This includes the Blue HotSwap LED required by the specification.

12.0 ZX5000 Front Panel Features

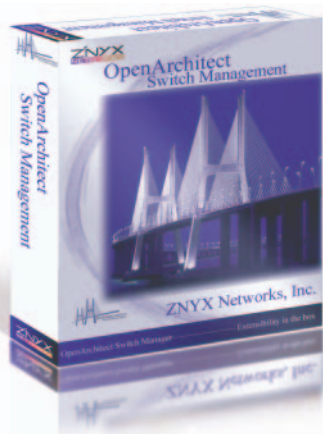
#	Description
1	Emission Gasket A requirement for PICMG 3.0 compliant boards, the emission gasket reduces the EMC emitted from the ATCA chassis.
2	Out of Band Management Port (eth0) 10/100 RJ-45 port for out-of-band management allows the switch to be administered through a telnet session.
3	Out of Service LED Color: Red Power-Up Display: Blinks 10 times Function: Off during normal operation, the Out-of-Service LED provides visual notification of a switch failure.
4	Healthy LED Color: Green Power-Up Display: Blinks 10 times Function: On during normal operation, the Healthy LED provides visual notification of normal switch operation.
5	Console Management Port A RS-232 port for out-of-band management allows the switch to be administered through a hyper terminal session.
6	10/100/1000 Ethernet Ports (zre0,zre1,zre2) Gigabit Ethernet ports for either uplinking into a network backbone, or to create a high-speed interconnect between multiple chassis.
7	Link/Activity LED Bank (zre0-zre15, eth0, eth1) Color: Green Power-Up Display: ON during power up Function: This LED displays the link speed (lit= active) or Link Activity (blinking=activity) depending on the mode selected by the LED Mode Button..
8	Clock LED Color: Green Power-Up Display: ON during power up Function: Blinking after power up. This LED reports that the health software diagnostics
9	External Fault LED Color: Orange Power-Up Display: ON during power up Function: ON indicates a failure external to the switch. (e.g., inability to establish a link on a configured port or another connectivity problem.
10	Hot Swap LED Color: Blue Power-Up Display: OFF during power up Function: After the extraction levers are released (pulled apart), ON indicates the ZX5000 is ready to be removed
11	Reset Button Pressing RESET runs a lamp test to ensure all switch LEDs are operating and restarts the ZX5000
12	LED Mode Button When the button is depressed, the Link/Activity Bank will display the Link Speed of the port. When the button is in the out position, the Link/Activity Bank will display the Activity of the port.
13	OK LED Color: Green Power-Up Display: OFF during power up ON after power up. Function: ON indicates the initialization has completed successfully
14	Internal Fault LED Color: Orange Power-Up Display: ON during power up Function: OFF after power up. ON indicates a failure of the internal tests
15	Ejector Handle Aids in inserting, securing and removing the board from the ATCA chassis.
16	Base Fabric Switch for ATCA logo ATCA and Base Fabric Switch logo for easy identification in the field
17	Captive Retention Screw Secures ATCA board into a standard ATCA slot.
18	System LED Color: Green Power-Up Display: blinks 10 times Function: Not Defined. Software controlled LED.



13.0 Software Compatibility

OpenArchitecture branded switches feature the ability to run Linux networking applications on top of the switch Operating System. OpenArchitecture is a ready-to-develop software environment for rapid porting of other UNIX/Linux-based protocols, including open source RFCs. It also enables the development of application-specific protocol configuration scripts. This extensibility and access to the open source networking software provides integrators with a low-cost, rapid development environment for creating new value-added services. Additional add-on software packages from ZNYX Networks are available to extend the value of the OpenArchitecture switch line.

13.1 ZNYX Networks Software



OpenArchitecture Switch Management

Overview

OpenArchitecture is an extensible open software platform for the routing, control and management of embedded Ethernet switches. The platform includes the Linux operating system, IP protocol stack, control applications and the OA Engine. OpenArchitecture powers IP packet transport in embedded switches such as line-rate CompactPCI Packet Switching Backplane blades from ZNYX Networks, or in proprietary form factors.

Routing IP for a New Breed of Embedded Applications

By using OpenArchitecture, systems manufacturers, component suppliers and application integrators can quickly and economically build powerful, high-value telecommunications solutions based on the Internet Protocol – including high availability systems. Examples include airborne Internet services, application servers, call server platforms, central office switching components, firewalls, terabit routers, voice-media gateways, voice-over-IP gateways, and wireless base stations.



OpenArchitecture HA Suite

Software Platform Adds High Availability And 100% Service Continuity to Embedded Ethernet Solutions

ZNYX Networks is now shipping the first embedded Ethernet software platform that provides five nines High Availability and the more demanding Service Continuity functionality for today's and tomorrow's next generation networks. OpenArchitecture/HA Suite delivers Service Continuity by creating a virtual interface for each redundant (primary and backup) Ethernet service. Each interface has a single virtual IP address that is persistent across any failover. This "IP Transparent failover" creates an environment where Ethernet hardware problems are invisible. Uninterrupted, applications continue to talk to clients using the same virtual IP address before and after a failure.

OpenArchitecture/HA Suite in an Embedded Environment

OpenArchitecture/HA Suite also is the only product to provide software at each end of every embedded Ethernet link – each switch-to-node link and the switch-to-switch link – within the chassis. This complete solution, with total control of the sending and receiving Ethernet components, delivers unparalleled HA and Service Continuity functionality:



OpenArchitecture VSLB

Virtual Server Load Balancing

OpenArchitecture Virtual Server Load Balancing is an OA software application that uses the advanced capabilities of the OpenArchitecture series of switches to perform load balancing for any array of servers. All servers may be accessed from the Internet via one virtual IP address, with traffic load distributed to the servers using one of several available algorithms. Data traffic is handled via switch silicon, so system throughput is limited only by the media speed.

13.2 Third Party Software

Protocol Stack Vendors

GateD™ Routing Software -



NextHop develops and markets network routing software solutions, partnering with customers and the industry to empower innovation in networking.

NextHop GateD™ carrier-class software suite has the most complete set of routing protocols in the industry...including OSPF, IS-IS, BGP, Multicast and IPv6. The GateD code base is more reliable, more tested, more widely used, and more scalable than any other vendor-neutral solution.

www.nexthoptechnologies.com

ZebOS™ Advanced Routing Suite



The ZebOS™ Advanced Routing Suite delivers scalable, modular, high-performance routing software that supports IPv4 and IPv6 versions of OSPF, BGP, and RIP routing protocols and MPLS, BGP-VPN, RSVP-TE, and CR-LDP switching and signaling protocols.

IP Infusion's portable source code enables equipment manufacturers to easily integrate routing and switching capabilities into their wireless and wireline platforms and to support a broad range of applications, including: mobile, storage area networking, bandwidth & traffic mgmt, provider edge, VPN, VoIP, and security solutions.

www.ipinfusion.com