Tech Company

Zen4 System Hardware Guide

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Chapter 1   Zen4 System and Hardware Overview

This chapter introduces the Tech Company Zen4 server and describes its relationship to advanced data center computing. It also gives an overview of important network concepts in the Zen4 system and provides a brief overview of the Zen4 hardware components.

System and Architectural Overview

The Tech Company Zen4 enterprise server combines partitionable symmetric multiprocessing (SMP) using 64-bit AMD Opteron® processors with multi-Gigabit Ethernet networking, Fibre Channel storage I/O, and offloaded application services. The network and storage I/O can be dynamically allocated across a built-in 80-Gbps switch fabric. Multiple Zen4 system chassis can be directly coupled and managed as a single pool of resources. The result is a mainframe-class architecture that offers high throughput and stability for enterprise applications.

The Zen4 system consists of a chassis with the following installed resources ():

- **Processor and Memory Modules (PMMs)** that support general-purpose computing requirements. Two types of PMMs are available: PMM-0410s and PMM-0200s.

  PMM-0410s provide processor sockets for up to four AMD Opteron 64-bit x86 CPUs with memory. The PMM-0410 also offers a total of 8 Gbps of storage I/O bandwidth using Fibre Channel interfaces.

  PMM-0200s provide CPU sockets for a maximum of two AMD Opteron 64-bit x86 CPUs with memory. Applications can be installed on a PMM-0200 to provide low-latency access by the PMM-0410. Such a configuration can improve performance for certain applications on the PMM-0410 that depend on other applications that can be accessed with low latency.

- **Z-Series System Modules (ZSMs)** that implement provisioning, system management, and fabric management capabilities.

- **Ethernet Network Modules (ENMs)**, each providing 10 Gbps of network I/O bandwidth, using either copper or fiber optic interfaces.

- **Fibre Channel Modules (FCMs)** that interface to storage arrays and storage devices, either directly or indirectly through storage area networks (SANs).

- **Application Service Modules (ASMs)** that provide acceleration facilities for specialized functions such as load balancing, SSL encryption, and XML processing. The initial ASM implementation is the ASM-0201, which hosts SSL acceleration and server load balancing (SLB) services either in standalone or "cluster" mode.

Major Zen4 components are designed for front-accessible servicing. Power modules are located on the back of the chassis (). Fan trays above and below the resource modules provide system cooling.

Figure 1-1. Zen4 Chassis—Front View

Figure 1-2. Zen4 Chassis—Rear View

Technical Overview

The Zen4 system is a collection of resources arranged around a coherent fabric and a network or I/O fabric. Three broad types of resources are attached to the fabrics and linked through an internal switch: processing and memory, I/O modules (Ethernet and Fibre Channel), and application off-load or acceleration services. The Z-Series System Module (ZSM) monitors and manages these resources. The processors and associated memory are organized as standard SMP servers, allowing flexible combining and partitioning to meet application needs. The Ethernet and Fibre Channel interfaces provide connections to the external network and to storage resources. The Zen4 system includes built-in Layer 2 network switching capabilities.

Within a Zen4 system are multiple operating environments, including user operating environments for customer application deployment and internal operating environments for the Zen4 software. The user operating system (for example, SUSE® Linux Enterprise Server 9 SP2) runs in a partition to create a server that runs user applications.

Reliability, availability, and serviceability (RAS) are three qualities that represent the collective quality-of-service attributes of network systems. The Zen4 system has a combination of features, hardware design, and software design that maximizes uptime and minimizes downtime. Hardware design features that contribute to high levels of RAS include front access to most components for servicing, redundant cooling and power systems, and redundancy of system control modules and network interfaces. A graphical user interface (GUI) and command line interface (CLI) are available for managing system resources; in addition, an SNMP agent allows the Zen4 chassis to be integrated into enterprise monitoring systems such as HP OpenView or IBM Tivoli® for diagnostics, monitoring, and troubleshooting. The partition boot architecture of the Zen4 system helps minimize downtime arising from disruptive operating system updates.

Server administration and network administration are combined in the Zen4 system; the flexible security model provided by the Zen4 platform allows these functions to be separated in settings where this is preferred. The Zen4 platform provides fine-grained security and role-based access control that defines specific access privileges for different user roles. In addition to the default user roles, you can also define other specific roles and access privileges. Within each user role, you can also specify query-only access and query-plus-set access for individual management and administration operations.

Figure 1-2 shows a block diagram of the Zen4 system.

Figure 1-1. Zen4 System Block Diagram

Processors, Memory, and Partitioning

Application processors are deployed on modules called Processor and Memory Modules (PMMs). PMMs support general-purpose computing requirements and are available in two types: PMM-04xx series and PMM-02xx series. Currently, the PPMM-0410 and PMM-0200 are supported.

- PMM-0410s provide CPU sockets for up to four AMD Opteron 64-bit x86 CPUs with memory. The PMM-0410 also offers a total of 8 Gbps of storage I/O bandwidth using Fibre Channel interfaces. The Zen4 chassis supports two installed PMM-0410s.

- PMM-0200s provide CPU sockets for a maximum of two AMD Opteron 64-bit x86 CPUs with memory. Applications can be installed on a PMM-0200 to provide low-latency access by the PMM-0410. Such a configuration can improve performance for certain applications on the PMM-0410 that depend on other applications that can be accessed with low latency.

The application processors and memory are the only resources that attach to the coherency fabric. The processors and memory on a PMM can be organized into standard SMP servers; in a chassis equipped with PMM-0410s, multiple PMMs can be linked through the coherency fabric (backplane) to create instances of SMP servers containing up to eight processor sockets. Smaller partitions of two or four processors can also be configured.

A chassis equipped with two PMM-0410s can support eight system processors (or 16 system processors with dual-core processing), 128 GB of system memory, 30 Gbps allocated between network traffic and storage traffic, and three Application Service Modules (ASMs).

The PMM-0410s and the coherency fabric support physical partitioning of the processors and memory. Because each partition is an independent server, multiple independent instances of operating systems can be hosted concurrently. Both types of partitions allow a partition to be created, initialized, started, stopped, reset, or destroyed without affecting the operation of other partitions. Each partition appears as a separate entity for system management.

Physical partitioning is implemented in the hardware and in system software. The hardware ensures that hardware and software faults in one hardware partition cannot propagate to another partition.

For more information about the PMMs, refer to the *Zen4 Hardware Guide* (P/N 502-0001-01).

System Management

System management is implemented through a combination of management software components and a distributed hardware management subsystem. Through the hardware management subsystem, system components communicate with the ZSM, which manages chassis resources. The hardware management subsystem also allows remote, "lights-out" operation of the Zen4 system. This management capability extends to a system in the standby power state, when it has limited operational capabilities as it waits for instructions. All system messages are directed to the ZSM console and system log (syslog) facility.

Access to the Zen4 system for management and software installation is through network or serial connections, eliminating the need for keyboard, video, and monitor connectors on the system itself. In addition, because all necessary software installation can be accomplished through a network connection, the Zen4 system is designed without a CD-ROM drive.

The Zen4 chassis has an LCD front panel display with associated selection buttons. Using the front panel display, you can view system status information and restart the chassis. The CLI, accessible through a direct console port connection or a network connection, provides complete management functions for the system. The Tech Company Z-Visor™ software provides the same management capabilities as the CLI, through a user-friendly graphical interface. Z-Visor also provides visual alarms and alerts.

The management network is backed up by an intra-chassis management bus based on RS-485 serial links.

System I/O Fabric

All system modules are tied together through an I/O fabric implemented as a 32 x 32 crossbar switch. The system has 11 network fabric ports, allocated as follows:

- Two 10-Gbps ports are assigned to each of two PMM-0410s (up to four ports total).

- One 10-Gbps port is assigned to each I/O module installed in slot 5, 6, or 7 of the Zen4 chassis (support for up to three ENMs or up to two FCMs, providing up to three or two ports total).

- One 2.5-Gbps port is assigned to each ASM or PMM-0200 installed in slots 8, 9, and 10 of the Zen4 chassis (up to three ports total).

- One 2.5-Gbps port is assigned to the ZSM.

The switch hardware is instantiated on the ZSM.

ENMs are available with fixed 1-Gbps copper Ethernet ports, 1-Gbps SFP Ethernet ports, or 10-Gbps optical Ethernet ports. The ENMs provide an interface between the external network and the internal I/O fabric. Up to three ENMs can be installed in the Zen4 chassis, for a total network bandwidth of 30 Gbps.

FCMs are available with eight 2-Gbps Fibre Channel interfaces. One FCM provides access to an aggregate of 16-Gbps Fibre Channel I/O bandwidth through 2-Gbps Fibre Channel interfaces. A system with two installed FCMs, therefore, provides a total of 32 Gbps of Fibre Channel I/O. In addition, each PMM-0410 has dedicated Fibre Channel ports that are associated only with the server partitions on that PMM.

The fabric supports four priorities for general traffic. The use of the priorities is determined by software through configuration of the hardware, with the exception that all I/O control protocol read response messages are fixed to use fabric priority 0.

Diskless Operation

The Zen4 system is designed to provide "diskless operation" and therefore does not include an internal hard drive for the User Operating System (UOS). The Zen4 provisioning facility allows users to create flexible server configurations that can be revised and reconfigured quickly based on a number of considerations. This flexibility is lost if the operating system resides on an internal hard drive.

Long-term storage for the management application is provided by an on-board flash disk and a 2.5-inch hard disk on the ZSM. The flash disk is used for Zen4 operating system boot, configuration data, and application software. The 2.5-inch hard disk is used for logging.

System Battery/System Time

Over time, batteries can leak and damage other system components. To increase system reliability, the ZSM uses a capacitor, rather than a battery, to maintain the system time when the chassis is not plugged into a power source. The system time can be maintained for approximately 48 hours while the chassis is unplugged.

Operation

This section outlines the operational features of the Zen4 system.

Hot-Plug and Controlled Hot Removal

All the modules used in the Zen4 system have circuitry to allow removal and insertion of a module without interrupting system power. This is accomplished by controlling the inrush current and power sequencing on the boards.

High Availability

The Zen4 system is designed with redundant subsystems to ensure high availability of resources. Four power modules that can be connected to two independent power feeds share the power load during normal operation. If one power feed fails, the remaining two power modules can provide sufficient power for the system. System operation requires at least two power modules. Two fan trays, each with six fans, provide cooling for the chassis. If one tray (or part of a tray) fails, the ZSM increases the speed of the remaining fans to maintain cooling until the faulty fan tray can be replaced. Multiple interfaces are available on the PMM-0410s and ENMs to provide redundancy for storage and network access.

Software Components

Software components of the Zen4 system include the system software image, user operating system (UOS), and management software that includes the command line interface (CLI) and the Z-Visor software graphical user interface (GUI). The system software image resides on the ZSM; it manages the chassis hardware resources, including the server partitions. User operating systems are associated with partitions and execute on the processors on the PMM. The CLI is accessible through a console connection or from a client workstation. Z-Visor software is accessed from a management workstation and manages the Zen4 sytem through an Ethernet connection to the ZSM.

Typical System Installation

Figure 1-3 shows a typical installation of the Zen4 system with four server partitions. Each partition has two Fibre Channel I/O connections to a storage area network (SAN) and two Ethernet connections to the external network. The ZSM has an Ethernet connection and a serial connection to a management network.

Figure 1-1. Logical View of Typical Installation

Appendix 1 Product Support

This appendix provides information about product warranties, customer service, returning components, and ordering replacement or spare components.

Note: For additional product support information that is not covered in this appendix, visit the Tech Company Customer Support web site or call one of the customer service phone numbers listed in .

Warranty

Zen4 systems are covered by a comprehensive warranty. For detailed information about the standard warranty, contact the Tech Company Sales or Customer Support Team.

Verifying Warranty Status

To verify warranty status, contact Tech Company Customer Support or your Tech Company account representative. You will need the chassis serial number from the label on the back of the Zen4 chassis.

Service Levels

The goal of the Tech Company Customer Support organization is to consistently deliver the quality of service you require in a mission-critical, data center environment. Tech Company is committed to providing around-the-clock customer service, either directly or through our service partners who have been factory-trained and certified by Tech Company Systems. You can log calls at any time by telephone or email, or through a web interface to our support system. All calls are actively managed to conclusion by a Tech Company Support Engineer. (A service partner may provide the on-site repair services.) Status tracking is available via the web interface to our support system.

Tech Company provides multiple scalable service levels to suit individual customer needs. Some of the service levels include access to an assigned Tech Company Customer Support account engineer. This engineer can help you with installation and upgrade planning and provide progress reviews. An assigned account engineer is the primary point of contact for handling service calls.

Customers with the appropriate service contract may designate one of the following priority levels for service calls:

- Priority 1, highest severity; work starts immediately to resolve the problem.
- Priority 2, medium severity; work starts within 1 hour to resolve the problem.
- Priority 3, lowest severity; work starts within 4 hours to resolve the problem.

Customer Support

For additional information about customer service, visit the Tech Company website at www.TechCompany.com/customersupport.

Table 1-1. Customer Support Contact Information

24-hour hotline (US)	(800) 968-6501
Email	support@TechCompany.com

Returning Products

Products returned to Tech Company must be pre-authorized by Tech Company with an RMA number marked on the outside of the package, and sent prepaid, insured, and packaged appropriately for safe shipment using the packaging that the replacement was sent in. Only packages with RMA numbers written on the outside of the shipping carton and/or the packing slips and shipping paperwork will be accepted by the Tech Company receiving department. All other packages will be rejected.

Title to any returned products or components will transfer to Tech Company upon receipt. Tech Company will be responsible for all freight charges for returned products or components as long as you use the carrier designated by Tech Company.

To return a component:

1. **Contact the Tech Company Customer Support Center Hotline to request a replacement component. Be prepared to provide the following information:**

   — Chassis serial number

   — Serial number of item to be returned

   — Model number of item to be returned

   — Description of problem

   — Return address and phone number

   Tech Company will issue an RMA number and ship a replacement component.

2. **After the replacement item has been unpacked and installed, use the same packaging materials to pack the defective item for return to Tech Company.**

3. **Make sure that the RMA number is clearly marked on the packaging exterior.**

4. **Ship the product back to Tech Company using the carrier designated by Tech Company.**

Replacement Parts

To order replacement parts or spares, visit the Tech Company Customer Support web site or contact your Tech Company account representative.