

Overview of the HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers

A technical white paper from HP



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Executive summary

The HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers utilize the exclusive HP Scalable Processor Chipset zx1, which integrates the next-generation PA-RISC microprocessor, the PA-8900 processor, providing high-bandwidth and low-latency connections to memory and I/O.

This white paper provides details about these new PA-8900-based HP 9000 servers, shows their features and benefits, discusses their electrical architecture, and provides a breakdown of their unique high-availability features.

Introducing the PA-8900 processor

The PA-8900 processor is a dual-core microprocessor chip that runs at the same speeds—800 MHz and 1 GHz—that are now offered in the HP 9000 rp3410-2, rp3440-4 and rp4440-8 Servers, but doubles the 32 MB cache of the PA-8800 microprocessor to 64 MB. Like the PA-8800, the PA-8900 microprocessor achieves a compelling, balanced increase in performance over the PA-8700+ and previous versions of the PA-RISC microprocessor in a broad range of commercial and technical computing applications. Key advances include greater compute density, a higher-bandwidth system bus, and a large second-level cache, translating into a significant performance boost. In addition to these performance increases, the PA-8900 processor provides significant advances in high availability and lower power requirements compared to previous generations of PA-RISC processors.

The PA-8900 processor is a true dual-core design. Each CPU core is essentially a PA-8800 processor with a fully enabled cache of 64 MB. The dual-core PA-8800 processor, and now the PA-8900, delivers more than twice the compute power of a PA-8700 processor without requiring additional “bus interface glue chips” to slow down system performance. Each CPU core has its own pair of L1 instruction and data caches. The cores share access to both a large second-level cache and the system bus interface. Access is designed to be “fair” so that each CPU core gets an equal share of the cache bandwidth. The increase in cache to 64 MB could mean as much as 10 to 16% performance improvement over the PA-8800 processor, with its 32 MB of cache. Exact performance will of course vary, depending on workload and whether the workload is more sensitive to increases in cache size versus clock frequency.

The PA-8900 processor has a large 0.75 MB single-cycle instruction and 0.75 MB data cache for each of the two CPU cores. The on-chip Level 1 caches are backed up with the shared 64 MB secondary cache. The Level 2 cache is implemented with four custom 72 Mb DRAM chips that are tightly coupled to the processor. The PA-8900 processor implements powerful error detection and correction systems. This means that, in the vast majority of cases, computation occurs without interruption—and in the extremely unlikely event of an uncorrectable error, the program will be halted without corruption of the data.

The PA-8900 processor uses the same system interface bus as the Intel® Itanium® 2 processor. This makes it possible to use the same chipsets in the HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers as in the HP Integrity rx1620, rx2620, and rx4640 Servers. The electrical design of the system bus allows up to four dual-core PA-8900 processors to be physically connected to a single bus. This makes it possible to implement very economical 1-CPU, 2-CPU, 4-CPU, and 8-CPU server configurations with the HP zx1 Chipset. The system bus can support data at rates up to 8 GB per second—excellent bandwidth that benefits computation-intensive technical applications. This is a factor-of-five bandwidth increase over the system bus on the PA-8700+ processor.

HP microprocessor designers re-engineered the on-chip cache units and the floating-point unit to eliminate unnecessary power consumption. They achieved this by adding logic that detects when a particular functional unit is idle and shuts down extraneous switching activity, such as clocks. Heavily loaded buses that were previously driven unconditionally are now only driven when they are

transmitting useful data. Thus, each PA-8900 core will deliver more performance than the PA-8700+ processor while consuming less power—about 35 watts per CPU core. This allows the HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers to reach higher levels of performance within the same thermal envelope. For customers, this means being able to double the number of processors in a system without expensive machine-room upgrades to power or cooling systems—or extra floor space.

Introducing the HP 9000 rp4410-4 Server

The HP 9000 rp4410-4 Server is a new PA-8900-based server in a 4U form factor. It is based on the same hardware as the HP 9000 rp4440-8 Server, the main difference being that the HP 9000 rp4410-4 Server has two of its four processor sockets disabled via firmware, limiting the box to a 4-way system. Yet like the HP 9000 rp4440-8 Server, the HP 9000 rp4410-4 Server has full access to all 16 or 32 memory slots (for a total of up to 128 GB of memory) and full access to all six PCI-X I/O slots. Because it has a maximum of four processors, the HP 9000 rp4410-4 Server qualifies for Oracle® Standard Edition licensing. The HP 9000 rp4410-4 Server is available in 1-, 2- and 4-way configurations and can be easily upgraded to an HP 9000 rp4440-8 Server via a firmware upgrade kit.

HP 9000 PA-8900–based servers

HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers are targeted at performance-hungry markets such as technical and scientific computing, Secure Sockets Layer (SSL) Web serving, application serving, and database applications. What's more, these systems are highly affordable, and they support the robust HP-UX 11i v1 and HP-UX 11i v2 for HP 9000 operating-system environment. The HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers offer the world's only in-box upgrade from an existing entry-class RISC server to an Itanium 2–based server.

HP 9000 rp3410-2 and 3440-4 Servers

HP 9000 rp3410-2 Server at a glance

The HP 9000 rp3410-2 Server, with its sleek 2U footprint, can be equipped with up to two 800 MHz PA-8900 processors loaded with 3 MB of on-chip L1 cache (1.5 MB per processor) and as much as 6 GB of RAM. This means that it has extraordinary compute density, with the ability to install up to 20 servers in a standard 2-meter rack.

The HP 9000 rp3410-2 Server can be installed in a rack or in a standalone, vertical tower configuration. And there's a full range of HP storage peripherals and I/O adapters to complete the package.

HP 9000 rp3410-2 Server details

HP 9000 rp3410-2 Server product specifications

- Central processor
 - 1 to 2 PA-8900 processors at 800 MHz
- Cache
 - 1.5 MB level 1 cache per CPU core
 - 64 MB level 2 cache per processor module (contains 2 PA-8900 processor cores)

- Main memory
 - 1 GB minimum to 6 GB maximum PC2100 parity-protected ECC chip spare DDR CL2 memory in 12 DIMM slots
 - 8.5 GB/s memory bandwidth
- Chipset
 - HP zx1 Chipset
 - 80-nanosecond memory latency
 - 6.4 GB/s system bus bandwidth
 - 3.0 GB/s aggregate I/O bandwidth
- Operating system support
 - HP-UX 11i v1 and HP-UX 11i v2 for HP 9000 (choice of Foundation, Enterprise, Mission-Critical, and Technical Computing operating environments)
- Expansion slots
 - 2 PCI-X; 1 slot 1 GB/s sustained, 64-bit 133 MHz and 1 slot 512 MB/s sustained
- Hot-plug disk drives (3 bays for 1-inch-high 3.5-inch disks)
 - 900 GB maximum internal storage
 - Integrated dual-channel Ultra160 SCSI controller
 - Disk sizes available: 36 GB 15,000 rpm, 73 GB 15,000 rpm, 146 GB 10,000 rpm, and 300 GB 10,000 rpm
- Removable media
 - One slimline media bay for optional IDE optical drives
 - Choice of DVD-ROM slimline drive or DVD+RW optical drive
- Core I/O interconnect ports
 - Gigabit-TX LAN with RJ-45 connector (10/100/1000BT auto-sensing)
 - Ultra160 SCSI
 - 4 USB Series A 2.0 (480 Mb/s) ports
 - HP Integrated Lights Out (iLO) Manageability Card:
 - 10/100BT management LAN with Web console access
 - RS-232 local console
 - RS-232 remote/modem console
 - RS-232 general purpose
- Advanced Remote Server Management (optional—max 1)
 - Integrated Lights Out (iLO) Advanced Pack activation key and license
- Power and cooling
 - One 650 W hot-swap power supply standard
 - Optional second 650 W hot-swap power supply for N+1 redundancy
 - 4 cooling fans with N+1 redundancy
- Power requirements
 - Input current: 7.2 A @ 100–230 V/3.2 A @ 200–240 V (auto-ranging)
 - Line frequency: 50 Hz to 60 Hz
 - Power consumption:
 - Per dual-core processor 130 W
 - Per SCSI hard disk: 23 W
 - Per PCI card: 10 to 25 W
 - Typical system: 600 W

Physical and environmental specifications

- Altitude
 - Operating: 10,000 ft. (3000 m) maximum
 - Storage: 15,000 ft. (4600 m) maximum
- Temperature
 - Operating: +41° to +95° F (+05° to +35° C)
 - Non-operating: -40° to +158° F (-40° to +70° C)
- Humidity
 - Operating: 15% to 80% (relative)
- Physical dimensions in rack orientation
 - Height: 3.4 in. (8.6 cm)
 - Width: 19 in. (48.3 cm)
 - Depth: 26.8 in. (68.0 cm)
- Physical dimensions in standalone, vertical orientation
 - Height: 19.5 in. (49.5 cm)
 - Width: 11.6 in. (29.5 cm)
 - Depth: 26.6 in. (67.5 cm)
- Net weight
 - Minimum standalone configuration: 49.4 lb. (22.4 kg)
 - Maximum standalone configuration: 56.3 lb. (25.5 kg)
 - Minimum rack configuration: 38.6 lb. (17.5 kg)
 - Maximum rack configuration: 49.0 lb. (22.2 kg)

HP 9000 rp3440-4 Server at a glance

The HP 9000 rp3440-4 Server, with its sleek 2U footprint, can be equipped with up to four 800 MHz or 1 GHz PA-8900 processors loaded with 3 MB of on-chip L1 cache (1.5 MB per processor) and as much as 32 GB of RAM. This means that it has extraordinary compute density, with the ability to install up to 20 servers in a standard 2-meter rack.

The HP 9000 rp3440-4 Server can be installed in a rack or in a standalone, vertical tower configuration. And there's a full range of HP storage peripherals and I/O adapters to complete the package.

HP 9000 rp3440-4 Server details

HP 9000 rp3440-4 Server product specifications

- Central processor
 - 1, 2, or 4 PA-8900 processors at 800 MHz or 1 GHz
- Cache
 - 1.5 MB level 1 cache per CPU core
 - 64 MB level 2 cache per processor module (contains 2 PA-8900 processor cores)
- Main memory
 - 1 GB minimum to 32 GB maximum PC2100 parity-protected ECC chip spare DDR CL2 memory (Note: Maximum configuration of 32 GB memory is only supported with 4 GB DIMMs in 8 DIMM slots; the remaining 4 DIMM slots must be left unpopulated. Up to 24 GB memory is supported with 2 GB DIMMs filling all 12 DIMM slots.)

- 8.5 GB/s memory bandwidth
- Chipset
 - HP zx1 Chipset
 - 80-nanosecond memory latency
 - 6.4 GB/s system bus bandwidth
 - 4.0 GB/s aggregate I/O bandwidth
- Operating system support
 - HP-UX 11i v1 and HP-UX 11i v2 for HP 9000 (choice of Foundation, Enterprise, Mission-Critical, and Technical Computing operating environments)
- Expansion slots
 - 4 PCI-X; 1 slot, 1 GB/s sustained, 64-bit 133 MHz, 3 slots 512 MB/s sustained, 64-bit 133 MHz
- Hot-plug disk drives (3 bays for 1-inch-high 3.5-inch disks)
 - 900 GB maximum internal storage
 - Integrated dual-channel Ultra160 SCSI controller
 - Disk sizes available: 36 GB 15,000 rpm, 73 GB 15,000 rpm, 146 GB 10,000 rpm, and 300 GB 10,000 rpm
- Removable media
 - One slimline media bay for optional IDE optical drives
 - Choice of DVD-ROM slimline drive or DVD+RW optical drive
- Core I/O interconnect ports
 - Gigabit-TX LAN with RJ-45 connector (10/100/1000BT auto-sensing)
 - Ultra160 SCSI
 - 4 USB Series A 2.0 (480 Mb/s) ports
 - iLO Manageability Card:
 - 10/100BT management LAN with Web console access
 - RS-232 local console
 - RS-232 remote/modem console
 - RS-232 general purpose
- Advanced Remote Server Management (optional—max 1)
 - Integrated Lights Out (iLO) Advanced Pack activation key and license
- Power and cooling
 - One 650 W hot-swap power supply standard
 - Optional second 650 W hot-swap power supply for N+1 redundancy
 - 4 cooling fans with N+1 redundancy
- Power requirements
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 - Line frequency: 50 Hz to 60 Hz
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 - Per dual-core processor 130 W
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 - Per PCI card: 10 to 25 W
 - Typical system: 600 W

Physical and environmental specifications

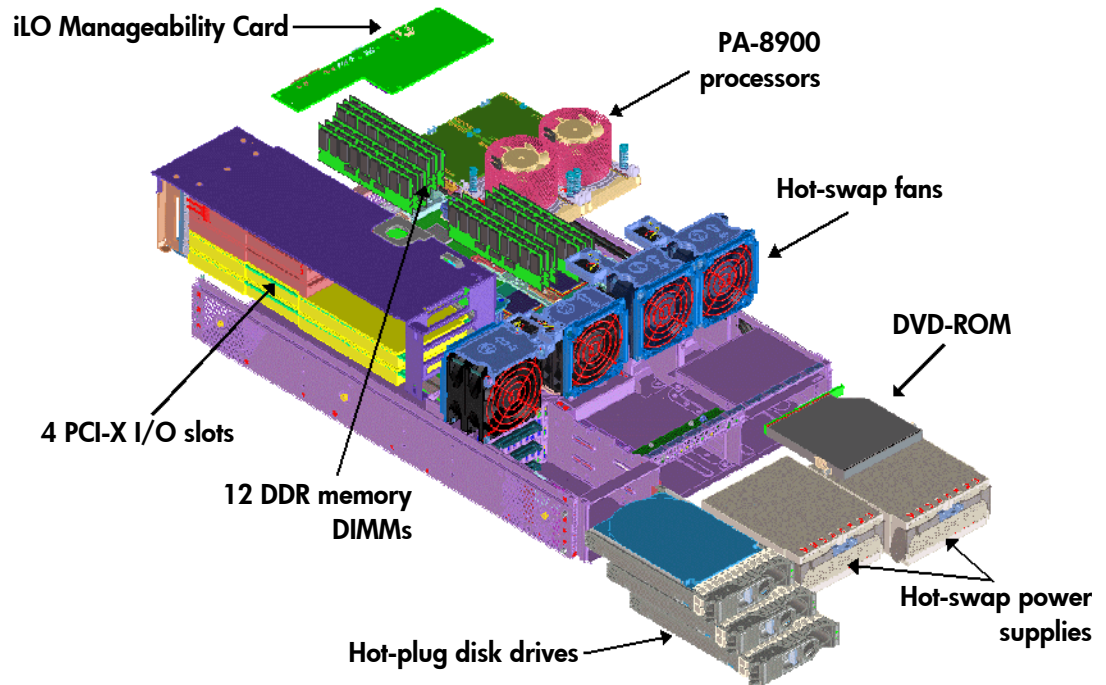
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 - Height: 19.5 in. (49.5 cm)
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 - Depth: 26.6 in. (67.5 cm)
- Net weight
 - Minimum standalone configuration: 49.4 lb. (22.4 kg)
 - Maximum standalone configuration: 56.3 lb. (25.5 kg)
 - Minimum rack configuration: 38.6 lb. (17.5 kg)
 - Maximum rack configuration: 49.0 lb. (22.2 kg)

Mechanical design and packaging of the HP 9000 rp3400 series servers

The exploded view reveals the location of major components as well as the mechanical and architectural features of the HP 9000 rp3400 series servers. The server is partitioned into three electrical partitions—the system board, including CPUs, memory, and core I/O; the I/O backplane, including four PCI-X I/O slots (2 slots in the HP 9000 rp3410-2 Server and 4 in the HP 9000 rp3440-4 Server); and the iLO Manageability Card.

Figure 1. Major components of the HP 9000 rp3400 series servers



Two hot-swap power supply bays are located in the lower right corner of the server (when viewed from the front). Just above the power supplies is a slimline optical media drive bay, supporting either a DVD-ROM slimline drive or a DVD+RW optical drive. To the left of the unit's front are three bays for hot-plug hard disk drives. Directly behind the power supplies and peripheral bays are four hot-swap cooling fans.

The left side of the system houses the I/O backplane and I/O card bay. There are four PCI-X slots in the I/O card bay.

The right rear of the server contains the main system board. The system board contains two processor sockets, 12 memory DIMM slots, and the core I/O controllers. The iLO Manageability Card sits on an independent circuit board that attaches to the rear of the main system board.

Racking density

The HP 9000 rp3400 series servers are designed to provide unprecedented performance density. At only two EIA units (one EIA unit = 1.75 inches) per server, up to 20 systems can be installed into a single 2-meter HP cabinet.

The HP 9000 rp3400 series servers are supported in HP Rack System/E and 10000 series racks. They are also supported in a variety of third-party, non-HP racks and cabinets.

Note: Dimensions for rack configuration are as follows:

H = 3.4 inches (8.6 cm), D = 26.8 inches (68.0 cm), W = 19 inches (48.3 cm).

Standalone pedestal configuration

When a cabinet is not desired, the HP 9000 rp3400 series servers are also available in a standalone configuration. The standalone system is ideal for an office environment, under a desk, or on a shelf. The standalone configuration uses a stylish tower mounting shell, with the system simply placed inside this shell.

Note: Dimensions for standalone/pedestal configuration:

H = 19.5 inches (49.5 cm), D = 26.6 inches (67.5 cm), W = 11.6 inches (29.5 cm).

HP 9000 rp4410-4 and 4440-8 Servers

Figure 2. Up to 10 rack-optimized HP 9000 rp4410-4 and 4440-8 Servers will fit into a 2-meter (40U) rack.



HP 9000 rp4410-4 Server at a glance

The HP 9000 rp4410-4 Server is a new PA-8900-based server in a 4U form factor. It is based on the same hardware as the HP 9000 rp4440-8 Server, the main difference being that the HP 9000 rp4410-4 Server has two of its four processor sockets disabled via firmware, limiting the box to a 4-way system. Yet like the HP 9000 rp4440-8 Server, the HP 9000 rp4410-4 Server has full access to all 16 or 32 memory slots (for a total of up to 128 GB of memory) and full access to all six PCI-X I/O slots. Because it has a maximum of four processors, the HP 9000 rp4410-4 Server qualifies for Oracle Standard Edition licensing. The HP 9000 rp4410-4 Server is available in 1-, 2-, and 4-way configurations and can be easily upgraded to an HP 9000 rp4440-8 Server via a firmware upgrade kit.

The HP 9000 rp4410-4 Server can be configured with 800 MHz or 1.0 GHz PA-8900 processors with 1.5 MB of on-chip L1 cache per processor and 64 MB of shared L2 cache per processor module. The rack-dense 4U form-factor allows up to 10 systems to be installed in a 2-meter rack.

Like the HP 9000 rp4440-8 Server, the HP 9000 rp4410-4 Server is designed to be easy to install, service, and maintain. It fits easily into HP 9000 server racks, Compaq ProLiant racks, and many third-party racks using side-mounted slides and a cable management arm that can be installed quickly without tools. The server's blue server identification LED can be activated locally or remotely for easy physical identification of problem hardware, and the quick-find LED panel speeds problem diagnosis by identifying defective or mismatched hardware components. And for reduced maintenance costs, the server is designed for easy repair, with field-replaceable and simple swap-out parts.

HP 9000 rp4410-4 Server details

HP 9000 rp4410-4 Server product specifications

- Central processor
 - 1, 2, or 4 processors at 800 MHz or 1.0 GHz
- Cache
 - 1.5 MB level 1 cache per CPU core
 - 64 MB level 2 unified cache per processor module (contains 2 PA-8900 CPU cores)
- Main memory
 - 1 GB minimum to 128 GB maximum PC2100 parity-protected ECC chip spare DDR CL2 memory
 - Choice of either 16-DIMM or 32-DIMM memory carrier board
 - 12.8 GB/s memory bandwidth
- Chipset
 - HP zx1 Chipset
 - 105-nanosecond memory latency
 - 6.4 GB/s system bus bandwidth
 - 4.0 GB/s aggregate I/O bandwidth
- Operating-system support
 - HP-UX 11i v1 and HP-UX 11i v2 for HP 9000 (choice of Foundation, Enterprise, Mission-Critical, and Technical Computing operating environments)
- Expansion slots
 - 2 hot-plug PCI-X on independent buses, 64-bit 133 MHz
 - 4 hot-plug PCI-X on 2 shared buses, 64-bit 66 MHz
- Hot-plug disk drives (2 bays)
 - 600 GB maximum internal storage
 - Integrated dual-channel Ultra320 SCSI controllers
 - Optional high-availability (duplex) configuration for internal disk drives
 - Disk sizes available: 36 GB 15,000 rpm, 73 GB 15,000 rpm, 146 GB 10,000 rpm, and 300 GB 10,000 rpm
- Removable media
 - Optional slimline DVD-ROM drive
 - DVD+RW drive (with CD-write capability)
- Core I/O interconnect ports
 - Dual-port Gigabit-TX LAN with RJ-45 connectors (10/100/1000Base-T auto-sensing)
 - Dual Ultra320 SCSI port for external peripherals
 - Optional dual-channel Ultra320 SCSI RAID controller
 - The iLO Manageability Card:
 - 10/100BT management LAN with Web console access

- RS-232 local console
- RS-232 remote/modem console
- RS-232 general purpose
- 2 USB Series A 2.0 (480 Mb/s) ports
- Advanced Remote Server Management (optional—max 1)
 - Integrated Lights Out (iLO) Advanced Pack activation key and license
- Power and cooling
 - One 1200 W hot-swap power supply standard
 - Optional second 1200 W hot-swap power supply for N+1 redundancy
 - 6 cooling fans with N+1 redundancy
- Power requirements
 - Input current: 8 A at 200–240 V
 - Line frequency: 50 Hz to 60 Hz
 - Maximum power consumption: 836 W (conservative), 609 W (typical)

Physical and environmental specifications

- Altitude
 - Operating: 10,000 ft. (3000 m) maximum
 - Storage: 15,000 ft. (4600 m) maximum
- Temperature
 - Operating: +41° to +95° F (+05° to +35° C)
 - Non-operating: –40° to +158° F (–40° to +70° C)
- Humidity
 - Operating: 15% to 80% (relative, non-condensing)
- Physical dimensions in rack orientation
 - Height: 6.87 in. (17.46 cm), 4U EIA
 - Width: 17.32 in. (44.00 cm)
 - Depth: 27.2 in. (69.0 cm), including 1.1 in. (2.9 cm) front bezel
- Physical dimensions in a standalone configuration
 - Height: 20.90 in. (53.00 cm)
 - Width: 10.27 in. (26.08 cm)
 - Depth: 27.36 in. (69.5 cm)
- Net weight
 - Maximum system configuration: 111 lb. (50.35 kg)

HP 9000 rp4440-8 Server at a glance

This competitively priced server delivers exceptional price/performance, reliability, and availability in a compact, rack-dense design to meet the most demanding enterprise-level computing requirements. The HP 9000 rp4440-8 Server can be equipped with up to eight 800 MHz or 1.0 GHz PA-8900 processors with 1.5 MB of on-chip L1 cache per processor and 64 MB of shared L2 cache per processor module, as much as 128 GB of RAM, and six PCI-X I/O expansion slots. With a rack-dense 4U form-factor, the HP 9000 rp4440-8 Server maximizes the number of servers per rack, up to 10 per 2-meter rack, for a better return on IT.

The HP 9000 rp4440-8 Server was designed to be easy to install, service, and maintain. It fits easily into HP 9000 server racks, Compaq ProLiant racks, and many third-party racks using side-mounted slides and a cable management arm that can be installed quickly without tools. The server's blue server identification LED can be activated locally or remotely for easy physical identification of problem hardware, and the quick-find LED panel speeds problem diagnosis by identifying defective or mismatched hardware components. And for reduced maintenance costs, the server is designed for easy repair, with field-replaceable and simple swap-out parts.

HP 9000 rp4440-8 Server details

HP 9000 rp4440-8 Server product specifications

- Central processor
 - 2, 4, 6, or 8 processors at 800 MHz or 1.0 GHz
- Cache
 - 1.5 MB level 1 cache per CPU core
 - 64 MB level 2 unified cache per processor module (contains 2 PA-8900 CPU cores)
- Main memory
 - 1 GB minimum to 128 GB maximum PC2100 parity-protected ECC chip spare DDR CL2 memory
 - Choice of either 16-DIMM or 32-DIMM memory carrier board
 - 12.8 GB/s memory bandwidth
- Chipset
 - HP zx1 Chipset
 - 105-nanosecond memory latency
 - 6.4 GB/s system bus bandwidth
 - 4.0 GB/s aggregate I/O bandwidth
- Operating-system support
 - HP-UX 11i v1 and HP-UX 11i v2 for HP 9000 (choice of Foundation, Enterprise, Mission-Critical, and Technical Computing operating environments)
- Expansion slots
 - 2 hot-plug PCI-X on independent buses, 64-bit 133 MHz
 - 4 hot-plug PCI-X on 2 shared buses, 64-bit 66 MHz
- Hot-plug disk drives (2 bays)
 - 600 GB maximum internal storage
 - Integrated dual-channel Ultra160 SCSI controllers
 - Optional high-availability (duplex) configuration for internal disk drives
 - Disk sizes available: 36 GB 15,000 rpm, 73 GB 15,000 rpm, 146 GB 10,000 rpm, and 300 GB 10,000 rpm
- Removable media
 - Optional slimline DVD-ROM drive
 - DVD+RW drive (with CD-write capacity)
- Core I/O interconnect ports
 - 2 Gigabit-TX LAN with RJ-45 connectors (10/100/1000Base-T auto-sensing)
 - Dual Ultra320 SCSI port for external peripherals
 - Optional dual-channel Ultra320 SCSI RAID controller
 - iLO Manageability Card:
 - 10/100BT management LAN with Web console access

- RS-232 local console
- RS-232 remote/modem console
- RS-232 general purpose
- 2 USB Series A 2.0 (480 Mb/s) ports
- Advanced Remote Server Management (optional—max 1)
 - Integrated Lights Out (iLO) Advanced Pack activation key and license
- Power and cooling
 - One 1200 W hot-swap power supply standard
 - Optional second 1200 W hot-swap power supply for N+1 redundancy
 - 6 cooling fans with N+1 redundancy
- Power requirements
 - Input current: 8 A at 200–240 V
 - Line frequency: 50 Hz to 60 Hz
 - Maximum power consumption: 1186 W (conservative), 889 W (typical)

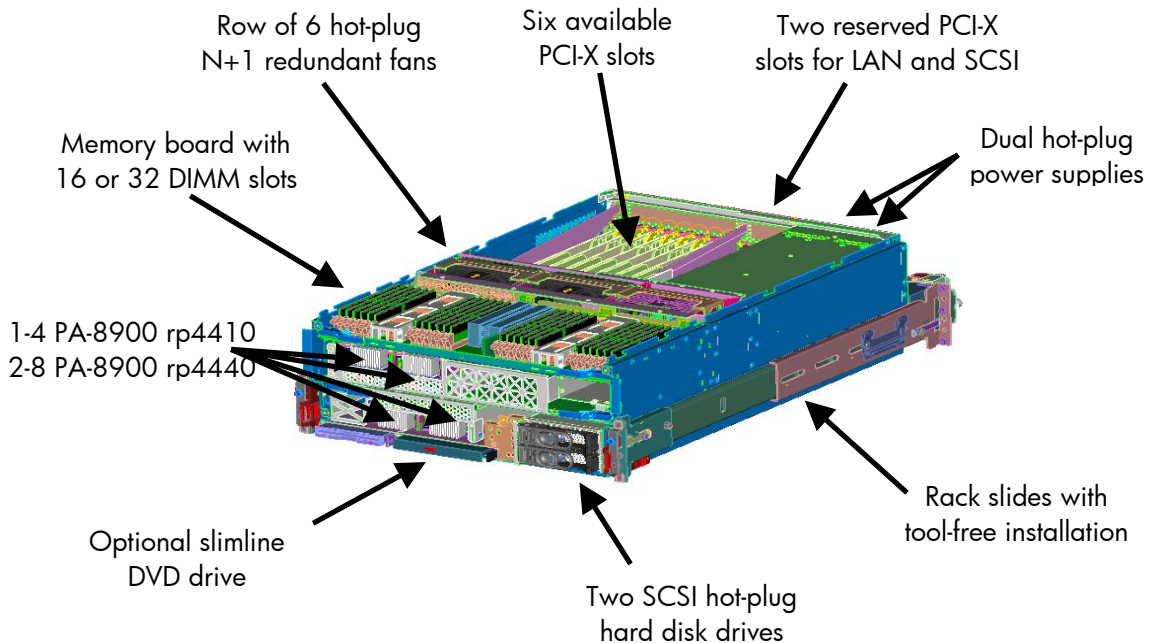
Physical and environmental specifications

- Altitude
 - Operating: 10,000 ft. (3000 m) maximum
 - Storage: 15,000 ft. (4600 m) maximum
- Temperature
 - Operating: +41° to +95° F (+05° to +35° C)
 - Non-operating: –40° to +158° F (–40° to +70° C)
- Humidity
 - Operating: 15% to 80% (relative, non-condensing)
- Physical dimensions in rack orientation
 - Height: 6.87 in. (17.46 cm), 4U EIA
 - Width: 17.32 in. (44.00 cm)
 - Depth: 27.2 in. (69.0 cm), including 1.1 in. (2.9 cm) front bezel
- Physical dimensions in a standalone configuration
 - Height: 20.90 in. (53.00 cm)
 - Width: 10.27 in. (26.08 cm)
 - Depth: 27.36 in. (69.5 cm)
- Net weight
 - Maximum system configuration: 115 lb. (52.16 kg)

Mechanical design and packaging of the HP 9000 rp4410-4 and rp4440-8 Servers

The interior view illustrates the location of major components as well as the mechanical and architectural features of the HP 9000 rp4410-4 and rp4440-8 Servers. Both servers are partitioned into two main electrical partitions—the system partition, including baseboard, CPU board, and memory carrier board; and the I/O partition, consisting of PCI-X I/O slots, core I/O, and the iLO Manageability Card.

Figure 3. Major components of the HP 9000 rp4410-4 and rp4440-8 Servers



Removing the front bezel and a sheet-metal section that covers the top one-third and front of the server provides access to the memory and processor boards. Memory can be easily added to the server (when powered off) without removing the memory carrier. Depending on the choice of memory carriers, up to 16 or 32 dual in-line memory modules (DIMMs) can be loaded into the server. Both the memory carrier and processor boards can be easily removed without tools by unlatching and sliding them forward.

A media bay located at the lower front of the server accepts an optional, slimline DVD drive. Located to the right of the media bay are the power switch and LED indicators for system status. A pair of hot-plug, low profile disk drives is located in the lower right front corner of the server.

Three pairs of redundant, hot-swap fans span the width of the server behind the processor board, memory board, and other assemblies located in the front half of the server.

Behind the bank of fans are two hot-swap power-supply bays at the right rear of the server. Each power supply has a pull-through fan where air exits at the rear. To the left of the power supplies and behind the bank of fans are eight PCI-X slots. Factory-installed SCSI controller and Ethernet LAN cards occupy two of these slots. The remaining six PCI-X slots have hot-plug capability and can be loaded with I/O cards selected by the end user.

Racking density

The HP 9000 rp4410-4 and rp4440-8 Servers offer unparalleled performance density. At four EIA units per server, up to ten servers can be installed into a single 2-meter rack cabinet.

The HP 9000 rp4410-4 and rp4440-8 Servers are supported in HP Rack System/E, 10000 series, 9000 series, and 7000 series rack cabinets. Refer to the *HP Server Configuration Guide* for the latest list of qualified third-party racks.

Note: Dimensions for rack configuration: H = 6.87 inches (17.46 cm), D = 27.2 inches (69.0 cm), W = 17.32 inches (44.00 cm).

High-availability slider rails

The HP 9000 rp4410-4 and rp4440-8 Servers come standard with a pair of side-mounted high-availability (HA) slider rails, which use no additional vertical space and can be installed without tools. With the HA slider rails, the unit can be completely serviced without removing it from the rack, thus allowing side-by-side racks of systems to be completely supported without sacrificing floor space for side access to the system.

Cabinet spacing requirements

The HP 9000 rp4410-4 and rp4440-8 Servers require a minimum of 24 inches (61 cm) of free space in both the front and rear of the cabinet for proper ventilation. During product installation and servicing, a total of 30 inches (76 cm) of free space is needed at the front of the cabinet.

Standalone (rackless) configuration

When a cabinet is not desired, the HP 9000 rp4410-4 and rp4440-8 Servers are also available in standalone (rackless) configurations. The standalone system is ideal for a back room or on a shelf; however, the standalone server should not be placed in an office environment due to acoustic and RFI characteristics. The standalone configuration utilizes the same internal chassis and front plastic bezel as the racked version. A tubular steel frame attaches to the sides and wraps around the bottom of the server. Either server can be positioned either upright or on its side when the tubular frame is attached. The frame also makes it easy for two people to pick up and move the server. Up to three HP 9000 rp4410-4 or rp4440-8 Servers can be stacked in a horizontal position, as in a rack, with plastic brackets that snap onto the steel tubes.

Note: Dimensions for standalone configuration: H = 20.90 inches (53.00 cm), D = 27.36 inches (69.5 cm), W = 10.27 inches (26.08 cm).

HP 9000 rp3410-2, rp3440-4, 4410-4, and rp4440-8 Server architecture

This section discusses the electrical architecture of the HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers. Topics covered include the HP zx1 Chipset, block diagrams, and I/O layout.

Overview of the HP Scalable Processor Chipset zx1

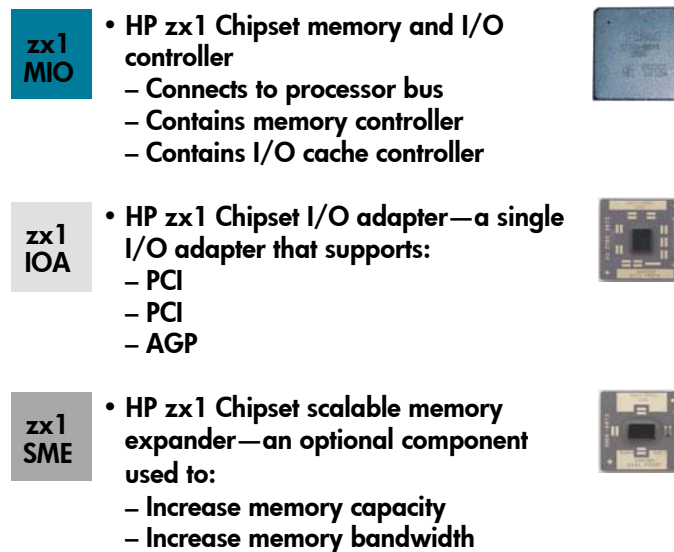
HP develops chipsets to meet the needs of enterprise and technical customers. In a world where every company has access to the same 64-bit processors, HP's strength is to develop and tune systems to deliver the kind of performance and reliability that IT, engineering, and research professionals demand.

The HP zx1 Chipset is the central building block of the HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers. Invented entirely by HP, the HP zx1 Chipset is a modular three-chip solution designed for cost-effective, high-bandwidth, low-latency 1- to 8-way symmetric multiprocessing (SMP) servers.

The HP zx1 Chipset consists of three modular components:

- **The HP zx1 Chipset memory and I/O controller** connects to the processor bus and contains dual memory controllers and the I/O cache controller. It interfaces to the processor bus and provides a low-latency connection to DDR memory, either directly or through HP zx1 Chipset scalable memory expanders. The controller can connect up to 12 HP zx1 Chipset memory expanders for quadruple the base memory capacity. It can also connect up to eight HP zx1 Chipset I/O adapters, capable of sustaining 4.0 GB/s of I/O bandwidth.
- **The HP zx1 Chipset I/O adapter chip** is a scalable solution designed to support PCI-X, PCI, and AGP bus architectures. It provides a scalable I/O implementation for a wide variety of systems. The HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers do not deploy AGP graphics bus technology.
- **The HP zx1 Chipset scalable memory expander** is an optional component used to increase memory capacity and increase memory bandwidth. Acting as a memory hub, it decreases the number of signal loads on the memory bus, thereby allowing the system to increase its memory transfer rate. Memory expanders are not used in the HP 9000 rp3410-2 and rp3440-4 Servers. The HP 9000 rp4410-4 and rp4440-8 Servers, however, deploy 6 memory expanders, resulting in large memory capacity (up to 128 GB over 32 DIMM slots) and bandwidth (12.8 GB/s).

Figure 4. The HP zx1 Chipset consists of three components



The HP zx1 Chipset was designed with several goals in mind:

- **Provide the best performance**—for demanding applications that don't fit within the processor cache, the memory system design is the key to performance. The HP zx1 Chipset's memory bandwidth has been enhanced with dual memory controllers to provide from 8.5 to 12.6 GB/s of memory bandwidth with 80 to 105 nanoseconds of open page latency.
- **Provide the right functionality**—including both memory capability and PCI-X support.
 - These servers provide enough memory capacity—6 GB for the HP 9000 rp3410-2 Server, 32 GB for the HP 9000 rp3440-4 Server, and 128 GB for the HP 9000 rp4410-4 and rp4440-8 Servers—for the most demanding tasks.
 - The HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers support 133 MHz PCI-X buses capable of handling the latest generation of high-speed I/O adapters.
- **Enable a family of systems via a modular, multi-chip design**—Designers can choose the chipset components they need and select the number of these components to meet system cost and design requirements. For example, the more expandable HP 9000 rp4410-4 and rp4440-8 Servers deploy HP zx1 Chipset scalable memory expanders for greater memory capacity. The HP 9000 rp3410-2 and rp3440-4 Servers, on the other hand, do not deploy HP zx1 Chipset scalable memory expanders, resulting in lower system costs.

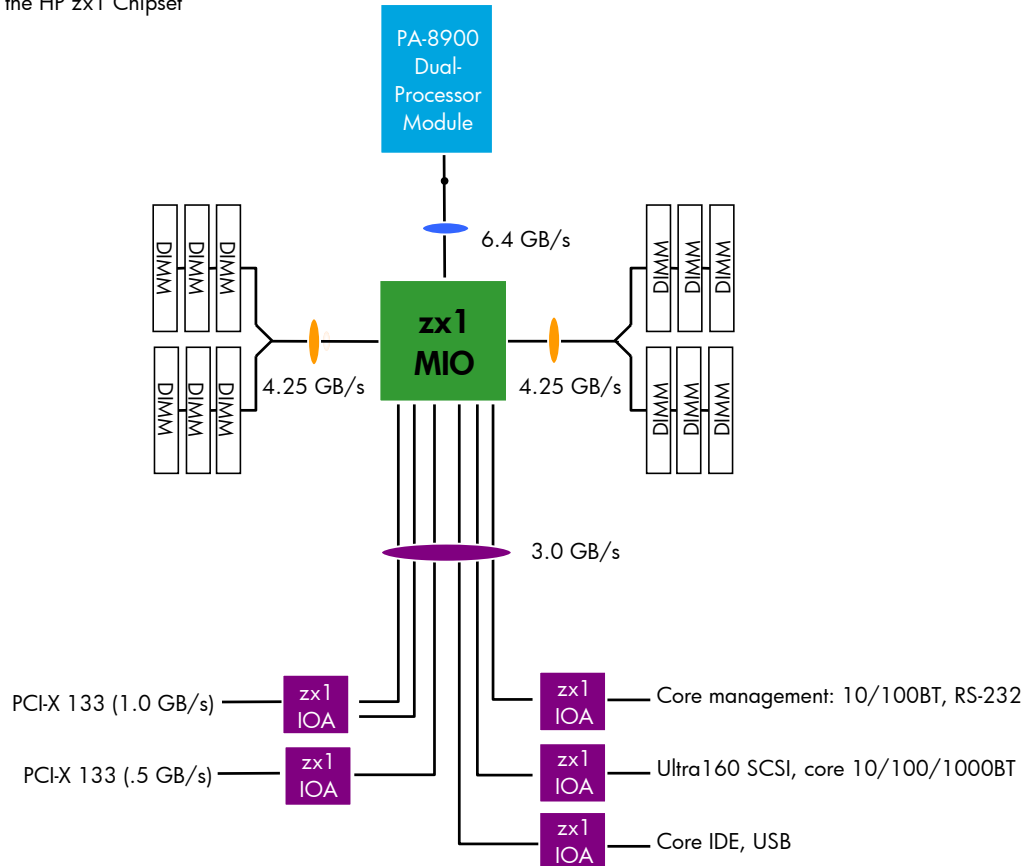
Features and benefits of the HP zx1 Chipset

Feature	User benefit
High memory bandwidth, low memory latency	Top application performance, faster time to solution
High memory capacity	Improved performance for large models/databases
133 MHz PCI-X	Highest-performance I/O adapters
Modularity	Family of PA-RISC and Itanium-processor-based servers and workstations, each tailored for the right level of cost and scalability

Architectural overview of the HP 9000 rp3410-2 Server

The HP 9000 rp3410-2 Server supports either one or two PA-8900 processors (up to one PA-8900 Dual-Processor Module) linked to the HP zx1 Chipset memory and I/O controller through a 200 MHz, double-pumped, 128-bit front-side system bus. Total bandwidth on the system bus is 6.4 GB/s.

Figure 5. The HP 9000 rp3410-2 Server architecture features one PA-8900 Dual-Processor Module (one or two CPU cores) and the HP zx1 Chipset



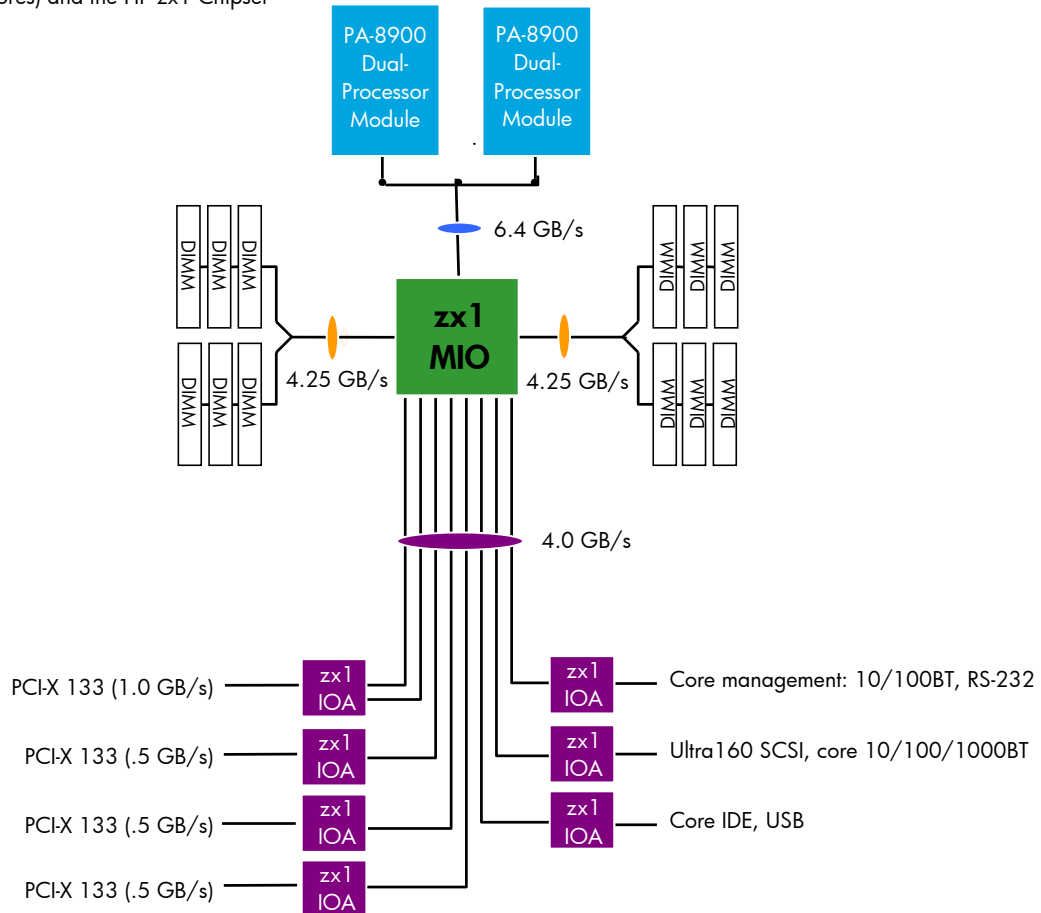
Memory DIMMs are attached directly to two 266 MHz, 4.25 GB/s memory buses. Combined memory bandwidth across both buses is 8.5 GB/s. Each bus links up to six double-data-rate (DDR) sync DRAM memory DIMMs. Total system memory capacity is 6 GB.

The I/O architecture consists of six 0.5 GB/s channels allocated among five HP zx1 Chipset I/O adapters. Each of these five adapters provides a PCI-X or PCI bus to the available I/O slots and core I/O devices. The first two channels connect to a 133 MHz PCI-X I/O slot, providing 1 GB/s of sustained throughput. Another channel connects to a 133 MHz PCI-X I/O slot, providing 512 MB/s of sustained throughput. The remaining three I/O channels link to three PCI buses, which in turn link to the core LAN, SCSI, IDE, and USB interfaces, and to the iLO Manageability Card.

Architectural overview of the HP 9000 rp3440-4 Server

The HP 9000 rp3440-4 Server supports either one, two, or four PA-8900 processors (one or two PA-8900 Dual-Processor Modules) linked to the HP zx1 Chipset memory and I/O controller through a 200 MHz, double-pumped, 128-bit front-side system bus. Total bandwidth on the system bus is 6.4 GB/s.

Figure 6. The HP 9000 rp3440-4 Server architecture features up to two PA-8900 Dual-Processor Modules (up to four CPU cores) and the HP zx1 Chipset



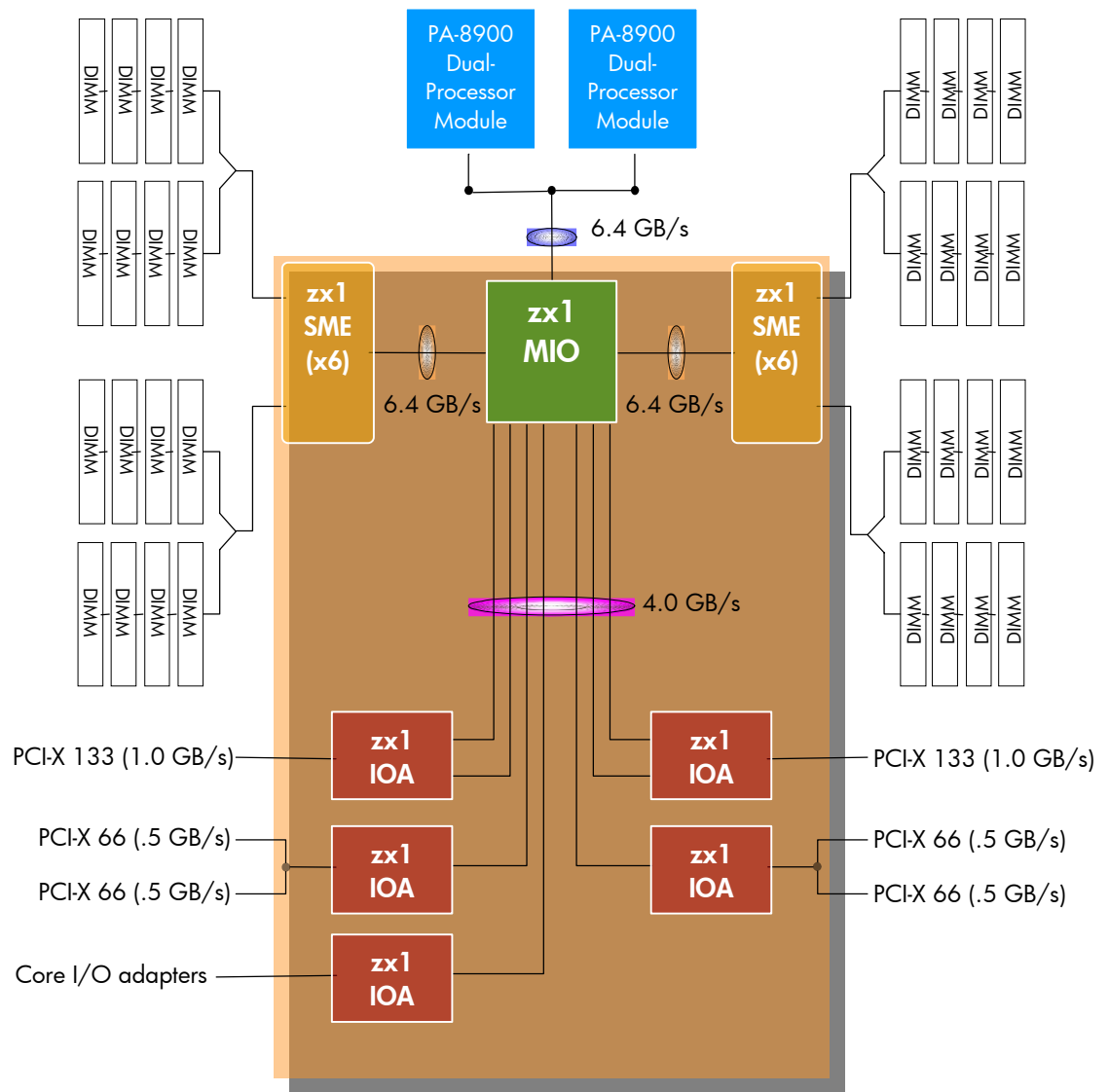
Memory DIMMs are attached directly to two 266 MHz, 4.25 GB/s memory buses. Combined memory bandwidth across both buses is 8.5 GB/s. Each bus links up to six double-data-rate (DDR) sync DRAM memory DIMMs. Total system memory capacity is 32 GB.

The I/O architecture consists of eight 0.5 GB/s channels allocated among seven HP zx1 Chipset I/O adapters. Each of these seven adapters provides a PCI-X or PCI bus to the available I/O slots and core I/O devices. The first two channels connect to a single 133 MHz PCI-X I/O slot, providing 1 GB/s of sustained throughput. This slot is ideal for high-bandwidth I/O adapters such as high-performance clustering interconnects. The next three I/O channels link to three independent 133 MHz PCI-X I/O slots, each with 0.5 GB/s of sustained throughput. The remaining three I/O channels link to three PCI buses, which in turn link to the core LAN, SCSI, IDE, and USB interfaces, and to the iLO Manageability Card.

Architectural overview of the HP 9000 rp4410-4 Server

The HP 9000 rp4410-4 Server supports one, two, or four PA-8900 processors (up to two PA-8900 Dual-Processor Modules) linked to the HP zx1 Chipset memory and I/O controller through a 200 MHz, double-pumped, 128-bit system bus. Total bandwidth on the system bus is 6.4 GB/s.

Figure 7. The HP 9000 rp4410-4 Server supports up to two PA-8900 Dual-Processor Modules (up to 4 CPU cores) linked to the HP zx1 Chipset



The HP zx1 Chipset memory controller links to two independent 200 MHz, 6.4 GB/s memory buses. Each bus connects to three HP zx1 Chipset scalable memory expanders, which in turn allocate bandwidth to the double data rate (DDR) sync DRAM memory DIMMs. Total DIMM capacity is either 16 or 32 units on a single memory carrier board.

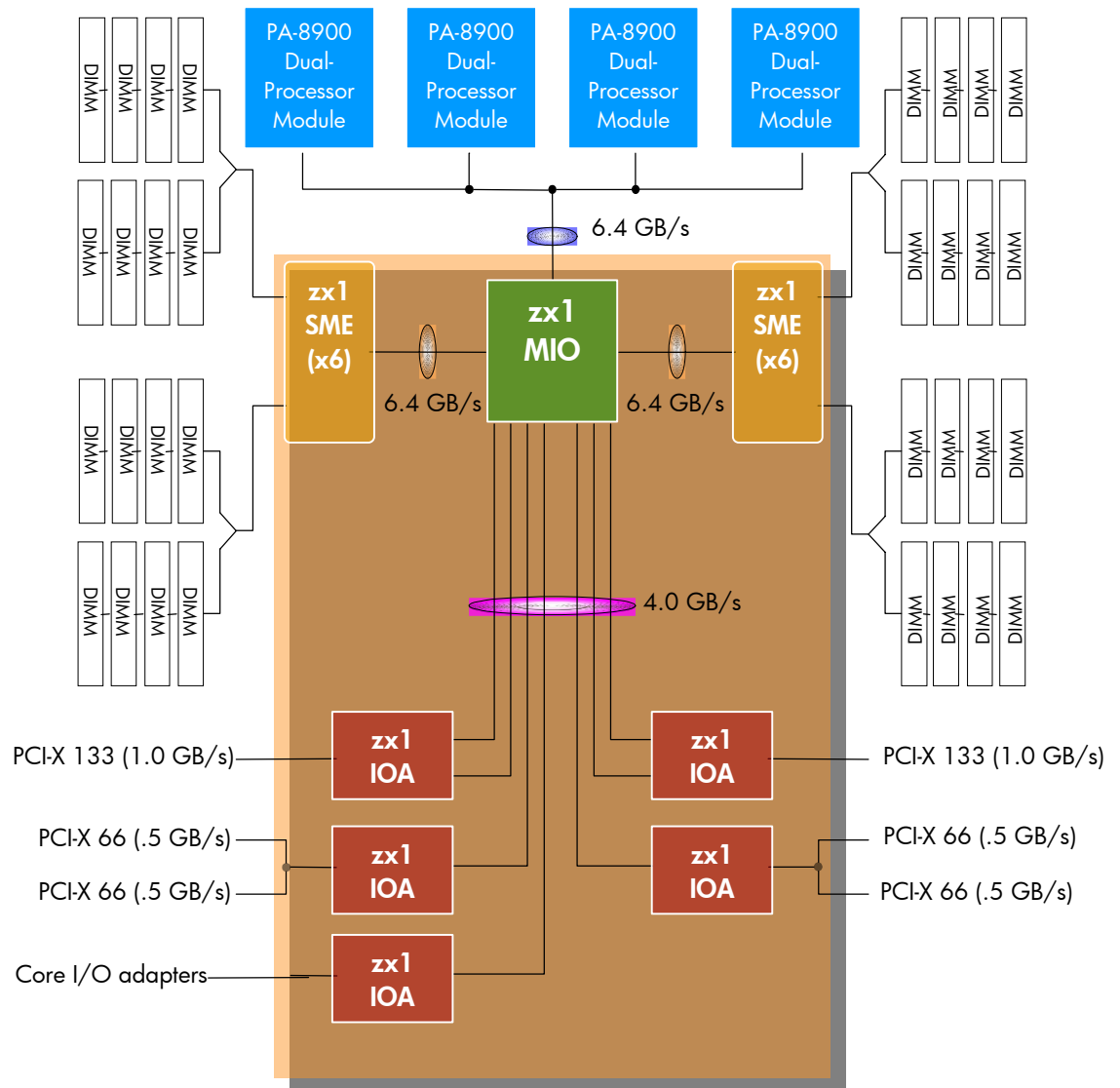
The I/O architecture consists of eight 0.5 GB/s channels allocated among six HP zx1 Chipset I/O adapters. Each of these six adapters provides a PCI-X or PCI bus to the available I/O slots and core I/O devices. The first two I/O channels connect to an independent 133 MHz PCI-X I/O slot with 1.0 GB/s of sustained throughput. The next two I/O channels connect to an identical 133 MHz PCI-X slot. Two more I/O channels connect to a pair of HP zx1 I/O Chipset adapters, each of which in turn connects to a pair of 66 MHz PCI-X I/O slots. Each slot-pair shares 0.5 GB/s of bandwidth.

The final two I/O channels connect to the core I/O. One channel provides 0.5 GB/s of bandwidth to the core dual-port 10/100/1000BT LAN as well as to the dual-channel Ultra320 SCSI controller. The other channel provides 0.5 GB/s of bandwidth to the core management LAN, RS-232 serial ports, and USB ports.

Architectural overview of the HP 9000 rp4440-8 Server

The HP 9000 rp4440-8 Server supports two or eight PA-8900 processors (up to four PA-8900 Dual-Processor Modules) linked to the HP zx1 Chipset memory and I/O controller through a 200 MHz, double-pumped, 128-bit system bus. Total bandwidth on the system bus is 6.4 GB/s.

Figure 7. The HP 9000 rp4440-8 Server supports up to four PA-8900 Dual-Processor Modules (up to 8 CPU cores) linked to the HP zx1 Chipset



The HP zx1 Chipset memory controller links to two independent 200 MHz, 6.4 GB/s memory buses. Each bus connects to three HP zx1 Chipset scalable memory expanders, which in turn allocate bandwidth to the double data rate (DDR) sync DRAM memory DIMMs. Total DIMM capacity is either 16 or 32 units on a single memory carrier board.

The I/O architecture consists of eight 0.5 GB/s channels allocated among six HP zx1 Chipset I/O adapters. Each of these six adapters provides a PCI-X or PCI bus to the available I/O slots and core I/O devices. The first two I/O channels connect to an independent 133 MHz PCI-X I/O slot with 1.0 GB/s of sustained throughput. The next two I/O channels connect to an identical 133 MHz PCI-X slot. Two more I/O channels connect to a pair of HP zx1 I/O Chipset adapters, each of which in turn connects to a pair of 66 MHz PCI-X I/O slots. Each slot-pair shares 0.5 GB/s of bandwidth.

The final two I/O channels connect to the core I/O. One channel provides 0.5 GB/s of bandwidth to the core dual-port 10/100/1000BT LAN as well as to the dual-channel Ultra320 SCSI controller. The other channel provides 0.5 GB/s of bandwidth to the core management LAN, RS-232 serial ports, and USB ports.

Baseboard management controller

The baseboard management controller provides ease of system management. The baseboard management controller supports the industry-standard Intelligent Platform Management Interface (IPMI) specification. This specification describes the management features that have been built into the system, including diagnostics, configuration management, hardware management, and troubleshooting. The baseboard management controller interacts with the iLO Manageability Card to provide the highest level of system manageability and high-availability monitoring.

The baseboard management controller provides the following:

- 40 MHz ARM7TDMI RISC core, 1 MB flash ROM, 512 KB battery-backed RAM
- Power and reset management
- System “health” management: fans, power supplies, temperatures, voltages
- Event logging/reporting: system event log, forward progress log, diagnostic LEDs on status panel
- Device inventory
- Hardware and data protection: automatic clean OS shutdown on critical events, secure storage of system configuration parameters, protection of system flash ROM
- Link to dedicated out-of-band iLO Manageability Card via IPMB: enables remote management through the MP LAN or MP serial ports
- Compliance with Intelligent Platform Management Interface (IPMI) 1.0

HP iLO Manageability Card

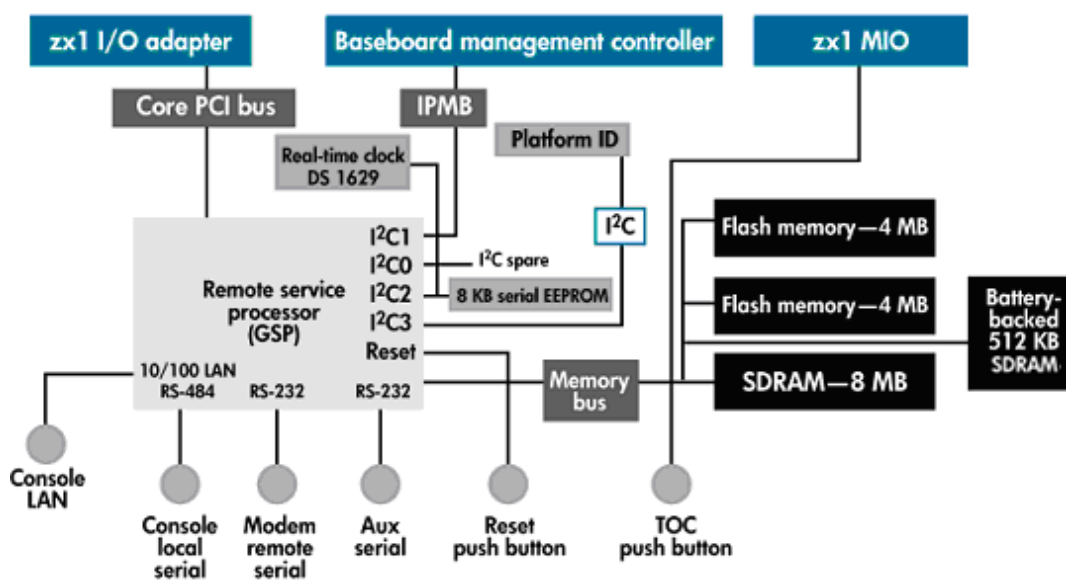
The iLO Manageability Card is included as a standard part of the HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers. This processor provides a remote interface into the baseboard management controller to manage system resources, diagnose the health of the system, and facilitate system repair. Administrators can interact with the iLO Manageability Card on a dedicated, out-of-band (that is, independent of the main system data paths) communication link that can be accessed via RS-232 serial ports or a 10/100BT management LAN.

The iLO Manageability Card minimizes or eliminates the need for the system administrator to be physically at the system to perform tasks such as diagnostics, system management, or even hard resets. The iLO Manageability Card has its own battery backup, so it can be accessed even in the unlikely event that the main system power is out and the operating system has stopped functioning.

Here are some of the features enabled by the iLO Manageability Card:

- System management over the Internet or intranet (Web console)
- System console redirection
- Console mirroring
- System configuration for automatic restart
- Viewing history log of system events
- Viewing history log of console activity
- Setting MP inactivity timeout thresholds
- Remote system control
- Remote power cycle (except for MP housekeeping power)
- Viewing system status
- Event notification to system console, e-mail, pager, and/or HP Response Centers; e-mail and pager notification work in conjunction with HP's Event Monitoring System (EMS)
- Automatic hardware protection of critical environmental problems
- Access to management interface and consoles on WAN failure (modem required)
- Automatic system restart
- Forward progress indicator (via a virtual front panel)
- Out-of-band manageability and system firmware update
- Configuration of manageability and console security
- Secure Sockets Layer (SSL) encryption on Web console access

Figure 8. High-level depiction of the HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers' iLO Manageability Card architecture



Built for high availability

The HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers have been designed to be an integral part of a mission-critical environment. They deliver from 99.95% to close to 99.999% availability, depending on the specific solution configuration, running both HP-UX 11i v1 and HP-UX 11i v2 for HP 9000. Delivering these levels of uptime requires a strong base of single-system high availability (SSHA) in the hardware. The HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers have redundancy and resiliency built in from the ground up, starting with the chassis infrastructure and continuing through the I/O and the memory and processor subsystems.

The servers' strong SSHA is further bolstered by HP's fault event monitoring service (EMS). And for the maximum possible uptime, an HP 9000 rp3410-2, rp3440-4, rp4410-4, or rp4440-8 Server can be configured as an integral part of a high-availability cluster using clustering software such as HP Serviceguard.

High-availability chassis infrastructure (power and cooling)

Fans in the HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers provide excellent cooling. They pull cool air from the front of the unit, flow the air back over internal system components, and then discharge the now-heated air out the back of the server. All the fans in the HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers are easily accessible and provide N+1 redundancy.

These servers have high-availability power supplies, too. The HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers' power subsystems provide high availability with N+1 redundant power options. They each come standard with a single hot-swap power supply; an optional second supply gives these servers 1+1 redundancy of power supplies. To further enhance availability, each power supply has its own dedicated power feed or line cord. Cords can be plugged into separate power grids for the maximum level of power protection.

Hot-plug disk drives

The HP 9000 rp4410-4 and rp4440-8 Servers support up to two SCSI disks, and the HP 9000 rp3410-2 and rp3440-4 Servers support up to three. All disks are accessible from the front of the system and can be removed (or hot-plugged) while the server continues to run.

A dual-channel SCSI controller manages the pair of disks in the HP 9000 rp4410-4 and rp4440-8 Servers. The disks can be configured either both on a single SCSI channel or one disk on each of the two channels, with disk mirroring for added availability. When only one SCSI channel is used for the disks, the second can be connected to an external device such as a tape drive.

A single dual-channel SCSI controller manages the three disks in the HP 9000 rp3410-2 and rp3440-4 Servers. One channel links to two internal disks; the second channel is connected to the third internal disk. This allows disk mirroring across separate SCSI channels, further enhancing availability.

An optional dual-channel Ultra320 SCSI RAID controller provides RAID1 support to the internal drives of the HP 9000 rp3440-4, rp4410-4, and rp4440-8 Servers.

Multiple I/O channels

The multiple HP zx1 Chipset I/O channels in the HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers provide failover, load balancing, and failure isolation. In these servers, failures on one channel do not disrupt activities on other channels. Furthermore, all three servers deploy fully independent PCI-X buses to isolate traffic on I/O adapters. If a problem occurs on one adapter, it will not interfere with traffic on another bus.

ECC and chip spare memory

The memory systems for the HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers utilize error-correcting code to correct single-bit errors as well as HP's chip spare technology to protect against multi-bit errors.

Chip spare enables an entire SDRAM chip on a DIMM to be bypassed in the event that a multi-bit error is detected on that SDRAM. In order to use the chip spare functionality, identical-sized DIMMs must be loaded in quads. Different DIMM sizes are supported, as long as they are in separate quads. For example, a quad of 512 MB DIMMs can be loaded along with a second quad of 1 GB DIMMs, and chip spare will be enabled on all the DIMMs.

Because of the chip spare feature, the HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers are completely resilient to all SDRAM failures, regardless of the number of bits involved in the fault condition. This virtually eliminates memory failures as a source of system errors.

Some other vendors deal with multi-bit SDRAM failures by accepting the fact that they will occur. That is, they use a scheme that supports only failure detection, not failure correction. HP believes that this is unacceptable and a dangerous choice for servers in business-critical environments. In fact, server systems that employ failure detection but not correction are at high risk to fail due to memory problems.

CPU error correction and dynamic processor resiliency

In the HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers, L1 and L2 caches both have full single-bit error checking and correcting as well as double-bit error detection. Additionally, all the instruction and data paths also have single-bit error-checking and -correcting capabilities. What's more, the system processor bus has parity detection, and the data path is covered by error correction.

The HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers employ dynamic processor resiliency (DPR), too. With DPR, any CPU generating correctable cache errors at a rate deemed unacceptable is de-allocated from use by the system. This feature helps protect against a CPU degrading to the point where it may cause system crashes.

DPR works like this: When excessive errors are reported against a CPU, the CPU is deactivated (that is, the operating system will not schedule any new processes on it). The system firmware remembers the CPU's serial number and the time when this action was taken. From then on, at each poll interval the system monitor checks (by comparing the serial numbers) to see if the CPU has been replaced or not. If the processor has been replaced, its history is reset.

If the system is rebooted before the offending CPU has been replaced, the monitor generates a warning message and immediately de-allocates the CPU.

Comprehensive error logs

All system events are stored in the system event log (SEL) in nonvolatile memory. In addition, system firmware creates activity and forward progress logs (FPLs) in nonvolatile memory. In all but the most extreme situations—that is, in more than 95 percent of cases—this information will be sufficient to diagnose system failures to a single replaceable part. The SEL and FPL are available both to the iLO Manageability Card (which means they are available remotely) and to system-level tools, leading to quick and accurate diagnosis.

Fault management throughout the lifecycle

Fault management is HP's overall strategy and program to provide a complete value chain for detection, notification, and repair of system problems. Fault management starts during the design phase, when hardware and OS designers include capabilities and instrumentation points that provide the ability to detect and isolate system anomalies. Monitors are created to poll for system health information or to asynchronously respond to instrumentation points that have been designed into the system to report problems or faults.

Fault management also involves implementing several methods for maintaining historical event information, allowing preservation of information for analysis or trending. Faults that generate errors and warnings are automatically logged to syslog; notes and audit information are copied to an event log. Other options are available for preserving historical information as well.

Fault management provides immediate alerts of problems—and even potential problems—as soon as they are detected, so customers can take corrective action. In some cases fault monitors are actually smart enough to repair faults or prevent them from occurring.

Capabilities of fault monitors

Fault management, coupled with the monitoring capabilities, keeps tabs on the health of system components (such as monitoring voltage) and generates close-to-real-time errors and warnings on events (such as fan failure and temperature warnings) when problems develop. These events can trigger corrective action to enable the system to continue functioning, or they can trigger alerts to systems personnel to appropriately handle the situation before it becomes more severe.

Fault monitors are able to:

- Poll the system for health information
- Handle asynchronous events that have been designed into the hardware or software
- Perform corrective action when possible
- De-allocate failing memory before it fails (Dynamic Memory Resiliency)
- De-allocate failing processors before they fail (Dynamic Processor Resiliency)
- De-configure failed processors from the working set before the next reboot
- Shut down the system when power failure causes a switch to UPS
- Manage events so that system performance is not hindered in the face of errors
- Provide information on problem causes and what actions to take

Notification and integrated enterprise management

Fault management currently uses the HP EMS (Event Monitoring Service) infrastructure for its notification methodology. EMS enables a wide variety of notification methods, including pager, e-mail, SNMP traps, system console, system log, text log file TCP/UDP, and OpenView Operations Center (OPC) messaging. Fault management events can be viewed directly on the server, or through HP Insight Manager, which can aggregate information from multiple systems in the data center.

Customers also have the option to integrate fault management events with enterprise management software from HP (OpenView) or from BMC, Tivoli, Computer Associates, or MicroMuse.

Added options with HP support

For customers who purchase HP support, fault management events can be forwarded to the HP Support Organization. In this case, HP can take responsibility for monitoring, filtering, and trending the events and taking action on items that need attention.

Instant Support Enterprise Edition (ISEE)

HP Instant Support Enterprise Edition (ISEE), a support solution designed to keep mission-critical environments up and running, is available for the HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers. ISEE empowers the HP Mission Critical Support Center (MCSC) to provide remote support services that can significantly reduce the number, duration, and impact of outages on covered systems.

ISEE is a leading-edge remote support solution that combines processes and assistance from HP support personnel to provide powerful support capabilities for systems covered by mission-critical HP support contracts. It improves the availability of the HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers by providing:

- Frequent, automated data collection of the customer's mission-critical environment
- A secure, high-bandwidth link that furnishes HP support personnel with remote access to the customer environment for the purpose of conducting diagnostic tests and, potentially, solving reported problems
- Both reactive and proactive support for HP mission-critical customers

Mission Critical Support Center

Located within HP, the MCSC acts as the primary support center for collecting and tracking customer information and performing proactive problem analysis. It also provides a control point in the ISEE remote support architecture. To maintain the security of the customer environment, the MCSC allows only authorized high-availability (HA) Support Engineers to access the isolated LAN.

ISEE collects configuration data from the customer's mission-critical environment weekly to facilitate both reactive and proactive support. HP qualified support engineers interpret this data to expedite problem resolution. The HP account support team will also analyze the data as part of providing the following proactive services:

- HP-UX patch analysis—a detailed review of the current patch level of the customer's systems, with recommendations on patch installations, updates, and removals in order to align the server environment with the customer's pre-selected patch management strategy
- HP-UX operating system, hardware, and firmware analysis
- Detailed assessment of the HP-UX environment (or HP Serviceguard cluster), identifying opportunities to boost availability through planned configuration change management

Certain HP network support customers who are entitled to ISEE Advanced Configuration will also receive the benefits of HP Network Support Tools (NST). These tools provide HP's network support engineers with powerful diagnostics and mapping capabilities for network discovery, configuration collection, and troubleshooting for fast resolution of network problems. NST takes advantage of the ISEE platform and features, as well as its single remote access point. HP performs remote support functions only with customer authorization.

An easy transition to the Intel Itanium architecture

A major feature of HP's new servers is their upgradability not only from one PA-RISC processor to another, but also from a PA-RISC processor to the Intel Itanium 2 processor.

Running RISC applications

HP-UX 11i v1 and HP-UX 11i v2 for HP 9000 offer proven, secure upgrades to the latest versions of the OS. HP-UX 11i v2 for HP Integrity servers offers binary, source, and data compatibility, along with tools to provide a smooth path from HP 9000 to HP Integrity servers. For investment protection, HP-UX 11i v2 for HP Integrity servers allows users to run their PA-RISC binaries unchanged and completely transparently, thanks to the HP Aries dynamic code translator built into HP-UX 11i v2. This translator allows both 32-bit and 64-bit PA-RISC applications to run on the Intel Itanium 2 microarchitecture without the need to recompile. A straightforward recompile of 32-bit and 64-bit PA-RISC applications yields native Intel Itanium 2 processor binaries.

HP Services

Evolve your infrastructure confidently with a partner that stands accountable

When you're ready to take advantage of the enhanced performance provided by HP 9000 servers, HP has a full range of services to help make the transition as seamless and painless as possible. We'll help you quickly and confidently introduce your new HP 9000 systems into your existing IT environment and help maximize their potential for your business. We offer assessment services to precisely define porting requirements and chart a course to deployment, implementation services to install and configure equipment rapidly, and education services to provide your staff with the expertise required to help achieve optimal system performance. Throughout the evolution process, HP accepts full accountability for delivering on the service commitments that we and our partners have made—and our commitment to your satisfaction doesn't stop with the transition process itself.

Our support offerings—from simple reactive to comprehensive mission critical—reduce the risks of unscheduled downtime once your HP 9000 systems are installed. HP Services will utilize its wide range of offerings and its experienced services personnel to help your company fully exploit the robust architecture capabilities of the HP 9000 system, while protecting the existing infrastructure.

Full lifecycle services

HP Services offers a portfolio of services across your IT lifecycle that meets your business requirements.

- Evaluation and planning
- Porting and migration
- IT consolidation
- Deployment
- Ongoing support, including hardware and software support, proactive support, and mission-critical support
- Education
- Technical services
- Business continuity services
- Managed services

Proven experience and expertise

With our world-class methodologies, proven processes, IT expertise, advanced support technologies, and partnerships with industry leaders, HP Services can help customers gain the full benefits from this technology—improved resource utilization, reduced costs, and a better return on IT investment.

HP provides consistent delivery of its services via a global network of operations, education, and competency centers. HP Services employs more than 65,000 skilled and experienced professionals working in more than 160 countries, including 18,000 experts in UNIX®, 28,000 in Microsoft®, and 3,000 in Linux®. Through this expertise, companies are assured of end-to-end solutions that offer consistent quality, availability, and cost across multiple platforms and operating systems.

Our global network of services personnel have unmatched experience and expertise deploying go-to-market solutions using best-in-class processes across the lifecycle. And no matter what services our customers choose—from assessment or porting and migration, to complete deployment and education offerings, to ongoing support or full outsourcing solutions—HP will help them take advantage of their new architectures quickly and cost-effectively.

Conclusion

In its HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers, HP offers a line-up of powerful servers based on the new PA-8900 processor and featuring the new HP zx1 Chipset. The HP 9000 rp3410-2 Server utilizes one or two PA-8900 processors and up to 6 gigabytes of memory; the HP 9000 rp3440-4 Server utilizes one, two, or four PA-8900 processors and up to 32 gigabytes of memory; the HP 9000 rp4410-4 Server utilizes one, two, or four PA-8900 processors and up to 128 gigabytes of memory; and the HP 9000 rp4440-8 Server can be equipped with as many as 8 processors and as much as 128 GB of memory. These servers offer cutting-edge, 64-bit power along with excellent price/performance ratios.

The new servers are designed for superior performance with complex, floating-point-intensive computations, providing faster time to solution for demanding applications. They are ideal for running SAP, Siebel, PeopleSoft, and SAS business application suites.

The Intel Itanium 2 processor's ability to run both IA-32 and RISC binaries without modification helps protect previous software investments, and HP's porting services can effect a complete transition that takes full advantage of the Intel Itanium architecture.

Whether for technical computing or commercial IT, the HP 9000 rp3410-2, rp3440-4, rp4410-4, and rp4440-8 Servers offer superior power, scalability, and efficiency—with lower costs.

For more information

Looking for more information about the Intel Itanium Processor Family? Find out more about the architecture and how HP can help you make your transition by visiting:

www.hp.com/go/itanium

Or visit our Itanium-based servers and workstations site at:

www.hp.com/products1/itanium/servers_workstations/index.html

Or contact any of our worldwide sales offices or HP Channel Partners (in the U.S., call 1-800-637-7740).

HP product information and technical documentation is available online at:

www.hp.com/go/rp3410

www.hp.com/go/rp3440

www.hp.com/go/rp4410

www.hp.com/go/rp4440

To learn more about HP Services, visit:

www.hp.com/hps

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