Overview of the HP Integrity rx1620, rx2620, and rx4640 Servers

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Executive summary

This white paper provides details about the HP Integrity rx1620, rx2620, and rx4640 Servers, describes their features and benefits, discusses their electrical architectures, and provides a breakdown of their unique high-availability features.

Introduction

The line- of HP Integrity servers has been designed to meet present and future varying business needs and increasing technology requirements. From the largest server, the HP Integrity Superdome, to the new HP Integrity Blade servers, HP Integrity servers provide flexible capacity, secured availability, and simplified management. The entry level of the HP Integrity server line is anchored by the HP Integrity rx1620, rx2620, and rx4640 Servers.

Flexibility to meet changing business needs

The HP Integrity rx1620, rx2620, and rx4640 Servers have proven longevity and flexibility, providing maximum return on investment. The rx2620 and rx4640 Servers now support their third-generation Intel® Itanium® 2 processor, the Dual-Core Intel Itanium 2 processor. At the center of these two- and four-processor systems is the HP designed scalable processor chipset, zx1, which was designed to provide flexible capacity, secured availability, and simplified management. Flexible capacity is delivered through a balanced I/O, expandable memory, in-box upgrades, and up to three deployment environments; in industry-standard racks or as stand-alone systems, and with the rx2620, in the office environment where quiet, efficient, but powerful systems are needed. Further, the HP Integrity rx1620, rx2620, and rx4640 Servers support four operating environments:

- HP-UX
- Red Hat and SUSE Linux
- Microsoft® Windows® Enterprise Edition 2003
- OpenVMS

With thousands of applications supported on HP Integrity servers, including industry-leading applications, such as SAP, Peoplesoft, BEA, Oracle®, Microsoft SQL, and SAS, these servers can truly be deployed wherever they are needed. Secured availability is provided with features such as Dynamic Processor Resiliency (DPR), error checking and correction on the system frontside bus, double chip sparing, proactive hardware memory scrubbing, industry-standard high-availability features, and support for HP Serviceguard. In addition, Integrated Lights-Out (iLO v1) management integrates software and hardware management for remote server management.

Efficiency and power to deliver improved price:performance

The HP Integrity rx1620, rx2620, and rx4640 Servers also continue to deliver on price and performance. As the requirements increase for performance, power demands increase and power systems are taxed and electric bills become costly. HP is looking at this problem holistically and, as a result, has helped create several industry standards for power and cooling, like ASHARE TC 9.9, the Uptime Fault Tolerant Power Specification, and the Green Grid Alliance. In addition, HP was one of seven companies (Compaq and Digital Equipment Corporation, now merged into HP, were two of the remaining six) who worked with the U.S. Environmental Protection Agency (EPA) in June 1992 to develop the Energy Star® program.

With its commitment to efficiency, HP designed Integrity servers to be efficient, powerful servers. The rx2620 with the Dual-Core Intel Itanium 2 now provides double the floating point operations per second (FLOPS), 512 gigaflops, in a rack of 20 Servers in a lower power envelope that previously

delivered 256 gigaflops. The HP Integrity rx4640 Server now delivers 25% higher performance with four processor cores, compared to the current Itanium 2 processor, and gives the higher performance at 38% lower power usage—all this at industry-leading price:performance.

Introducing the Dual-Core Intel Itanium 2 processor

The new Dual-Core Intel Itanium 2 processor extends the roadmap for 64-bit computing and focuses on maintaining Intel's leadership position in performance with the implementation of several new features. Originally codeveloped by HP and Intel, the Intel Itanium 2 microarchitecture is a high-performance, parallel, 64-bit architecture that has the performance headroom to grow in the future and can be priced at a level that ensures its widespread adoption.

The Dual-Core Intel Itanium 2 processor places two separate logical processors, referred to as cores, on one physical chip, referred to as the processor, supplying significant performance gains. These processors are supported by more than two and a half times as much on-die cache as the current generation of Itanium 2 processors—up to 25.6 MB across three levels. The new Dual-Core processors also provide improvements in execution (more efficient speculation recovery), improved memory hierarchy (split L2 cache to dedicate a 1-MB L2 instruction per core), and up to 12 MB L3 cache per core. In addition, these processors use HyperThreading, which provides two threads per core, or four threads per processor. In an HP Integrity rx4640 Server, for example, that equates to up to 16 threads per system, over eight cores and four processors—four times the execution threads of the current Intel Itanium 2 processor. Combining all of these features into one Dual-Core processor provides vastly improved performance.

The Intel Itanium 2 Dual-Core processor and the zx1 chipset are the fundamental building blocks of the entry-class HP Integrity rx1620, rx2620, and rx4640 Servers.

Itanium 2–based HP Integrity rx1620, rx2620, and rx4640 Servers

Itanium 2-based servers from HP are targeted at performance-hungry markets such as technical and scientific computing, Secure Sockets Layer (SSL) web serving, application serving, database applications, and enterprise resource planning (ERP) software, just to name a few. Additionally, these systems are highly affordable, making them extremely attractive to software developers.

HP Integrity rx1620 Server

The HP Integrity rx1620 Server packages the Single-Core Intel Itanium 2 processors in a slim, 1U system package. It offers industry-leading FLOPS for compute-intensive workloads, at lower power levels, where space is at a premium. The HP Integrity rx1620 Server supports up to two Single-Core 1.6-GHz Intel Itanium 2 processors with 3.0 MB of on-chip L3 cache, a system bus speed of 533 MHz, and as much as 16 GB of RAM. These features provide extraordinary compute density. Fitting 40 Servers into an HP 10000 Series G2 rack delivers 512 gigaflops of computing power.

The HP Integrity rx1620 Server also leverages the same system management architecture, hardware, and software as the HP Integrity rx2620 and HP Integrity rx4640 Servers. It is ideal for compute-intensive server farms in the high-performance technical and scientific computing markets, and it is a perfect fit for the network edge, security, and software engineering fields. Features such as memory chip spare, an optional management processor, and high-availability clustering support make the HP Integrity rx1620 Server a leader among high-compute density servers.

The HP Integrity rx1620 Server also supports a full range of HP storage peripherals and I/O adapters to meet the requirements of the most demanding environments.

Figure 1. The HP Integrity rx1620 Server is a rackmount unit

Product specifications

- CPU
  - One or two low-voltage Single-Core Intel Itanium 2 processors at 1.3 GHz or 1.6 GHz
  - 400-MHz frontside system bus (1.3 GHz)
  - 533-MHz frontside system bus (1.6 GHz)
- Cache (all on-chip)
  - 32 KB L1 cache
  - 256 KB L2 cache
  - 3.0 MB L3 cache (1.3 GHz and 1.6 GHz)
- Main memory
  - 1 GB to 16 GB of PC2100 parity-protected error checking and correcting (ECC) chip spare DDR CL2 memory in eight DIMM slots (DIMMs must be installed in groups of two)
  - 8.5 GB/s memory bandwidth
- Chipset
  - HP zx1 chipset
  - 80-ns memory latency
  - 6.4 GB/s system bus bandwidth with 1.3-GHz/400-MHz frontside system bus
  - 8.5 GB/s system bus bandwidth with 1.6-GHz/533-MHz frontside system bus
  - 3.7 GB/s aggregate I/O bandwidth
- Expansion slots
  - One PCI-X, 1 GB/s sustained, 64-bit, 133-MHz, full-length
  - One PCI-X, 1 GB/s sustained, 64-bit, 133-MHz, accommodates cards up to 19.1 cm (7.5 inches) in length
- Hot-plug disk drives (two bays for 1-inch-high 3.5-inch disks)
  - 600 GB maximum internal storage
  - Integrated dual-channel Ultra320 SCSI controller
  - Disk sizes available: 36 GB, 15,000 rpm; 73 GB, 15,000 rpm; 146 GB, 15,000 rpm; and 300 GB, 15,000 rpm
- Removable media
  - One slimline media bay for optional IDE optical drives

  - Choice of DVD-ROM or DVD+RW drive
- Core I/O interconnect ports
  - Two 10/100/1000 BaseTX LAN (auto speed sensing, RJ-45 connector, Wake on LAN capability)
  - Dual-channel Ultra320 SCSI controller—Two internal disks on one channel; one channel for external disks only
  - One general-purpose RS-232 serial ports
  - VGA with optional management processor card
  - Two USB Series A 2.0 (480 Mb/s) ports
  - Management processor interconnect with optional management processor card:
    - 10/100 BaseT management LAN with web console access
    - RS-232 local console
    - RS-232 remote/modem console
    - RS-232 general purpose
- Power and cooling
  - One 460-W power supply, standard
  - Four cooling fans
- Power requirements
  - Input current: 100 to 127 V, approximately 5.5 A/200 to 240 V, approximately 2.8 A (auto-ranging)
  - Line frequency: 50 Hz to 60 Hz
  - Maximum power input: 585 W
  - Typical input power: 440 W

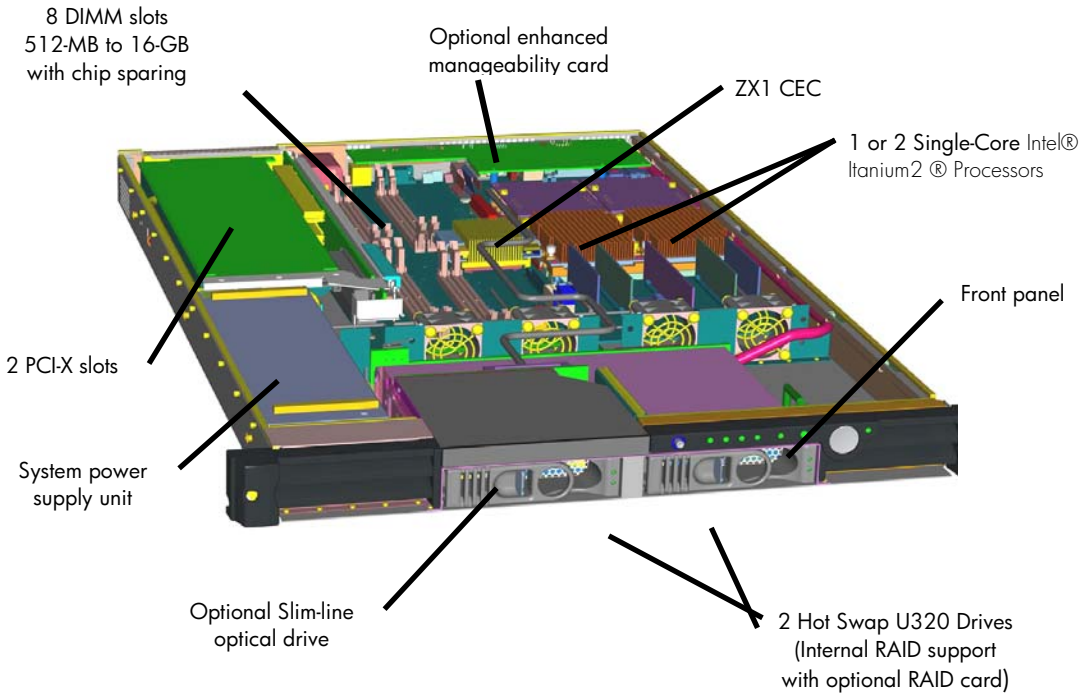
Physical and environmental specifications

- Environmental specifications
  - Altitude
    - Operating: 3,048 m (10,000 ft.) maximum
    - Storage: 4,572 m (15,000 ft.) maximum
  - Temperature
    - Operating: +41° F to +95° F (+05° C to +35° C)
    - Non-operating: –40° F to +158° F (–40° C to +70° C)
  - Humidity
    - Operating: 15% to 80% (relative)
- Physical dimensions in rack orientation
  - Height: 44 mm (1.75 inches)
  - Width: 482 mm (19 inches)
  - Depth: 680 mm (26.8 inches)
- Net weight
  - Maximum stand-alone configuration: 15 kg (31 lb)

Mechanical design and packaging

The exploded view reveals the location of major components and the mechanical and architectural features of the HP Integrity rx1620 Server. It is partitioned into three electrical partitions — the system board, including processors, memory, and core I/O; the I/O backplane, including two PCI-X I/O slots; and the optional management processor board.

Figure 2. Major components of the HP Integrity rx1620 Server



Two hot-swap disk drive 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 a DVD or a DVD+RW combo drive. Directly behind the power supplies and peripheral bays are four cooling fans.

The left side of the system houses the I/O backplane and I/O card bay. There are two PCI-X slots in the I/O card bay: one full-length slot and one half-length slot (191 mm (7.5 inches)).

The right rear of the server contains the main system board. The system board contains two Intel Itanium 2 processor sockets, eight memory DIMM slots, and the core I/O controllers. The optional management processor sits on an independent circuit board that attaches to the rear of the main system board.

Racking density

The HP Integrity rx1620 Server is designed to provide unprecedented performance density. At only one EIA unit (EIA unit = 1.75 inches (44 mm)) per server, up to 40 systems can be installed into a single 42U HP 10000 Series G2 Rack.

The HP Integrity rx1620 Server is supported in HP 10000 Series G2 Racks. The server is also supported in a variety of third-party racks and cabinets.

Note: Dimensions for rack configuration are as follows: height = 44 mm (1.75 inches), depth = 680 mm (26.8 inches), width = 482 mm (19 inches).

HP Integrity rx2620 Server

The HP Integrity rx2620 Server is the industry's highest performing one to two Dual-Core Itanium 2-based server. It has a sleek 2U footprint and can be equipped with up to two Dual-Core 1.6-GHz Intel Itanium 2 processors loaded with 18 MB of on-chip L3 cache and as much as 32 GB of RAM, which provides extraordinary compute density and expandability. Fitting 20 Servers into a 42U rack delivers an astounding 512 gigaflops of potential power. The HP Integrity rx2620 Server is also available in a stand-alone version and new office environment version, which delivers lower acoustics that meet deskside or workspace requirements.

The HP Integrity rx2620 Server also has extensive availability and management features, which make it ideal for deployments in mission-critical data centers or compute-intensive server farms. Features, such as hot-swap redundant components, memory chip spare, an optional management processor, and high-availability clustering support, make the Integrity rx2620 Server the clear leader among four-core Itanium 2-based servers.

The HP Integrity rx2620 Server offers incredible investment protection. If you have an HP Integrity rx2620 Server with Single-Core Intel Itanium 2 processors installed, you can upgrade to Dual-Core Intel Itanium 2 processors simply by installing a Dual-Core processor kit and new firmware. In addition, the HP Integrity rx2620 Server supports a full range of HP storage peripherals and I/O adapters to meet the requirements of the most demanding applications.

Figure 3. The HP Integrity rx2620 Server can be installed in a rack or as a stand-alone unit

Product specifications

- CPU
  - One or two Dual-Core Intel Itanium 2 processors at 1.4 GHz or 1.6 GHz
  - 400-MHz frontside system bus
- Cache (all on-chip)
  - 32 KB L1 cache
  - 1 MB instruction and 256 KB data L2 cache per core
  - 12 MB L3 cache (1.4 GHz) (6 MB per core)
  - 18 MB L3 cache (1.6 GHz) (9 MB per core)
- CPU
  - One or two Single-Core Intel Itanium 2 processors at 1.6 GHz
  - 400-MHz frontside system bus
- Cache (all on-chip)

  - 32 KB L1 cache
  - 256 KB L2 cache
  - 3 MB L3 cache
- Main memory
  - 1 GB to 32 GB[1] PC2100 parity-protected ECC chip spare DDR CL2 memory in 12 DIMM slots (DIMMs must be installed in groups of four)
  - 8.5 GB/s memory bandwidth
- Chipset
  - HP zx1 chipset
  - 80-ns memory latency
  - 6.4 GB/s system bus bandwidth
  - 4.3 GB/s aggregate I/O bandwidth
- Choice of form factors
  - Rackmount
  - Stand-alone (vertical mount)
  - Office environment (vertical mount, lower acoustics)
- Expansion slots
  - One PCI-X, 1 GB/s sustained, 64-bit, 133-MHz
  - Three PCI-X, 0.5 GB/s sustained, 64-bit, 133-MHz
  - Full-length, with an independent bus for each
- Hot-plug disk drives (three bays for 1-inch-high 3.5-inch disks)
  - 900 GB maximum internal storage
  - Integrated dual-channel Ultra320 SCSI controller
  - Disk sizes available: 36 GB, 15,000 rpm; 73 GB, 15,000 rpm; 146 GB, 15,000 rpm; and 300 GB, 15,000 rpm
- Removable media
  - One slimline media bay for optional IDE optical drives
  - Choice of DVD-ROM or DVD+RW drive
- Core I/O interconnect ports
  - Two 10/100/1000 BaseTX LAN (auto speed sensing, RJ-45 connector, Wake on LAN capability)
  - Dual-channel Ultra320 SCSI controller—Two internal disks on one channel; one channel for external disks only
  - Two general-purpose RS-232 serial ports
  - VGA with optional processor management card
  - Four USB Series A 2.0 (480 Mb/s) ports
  - Management processor interconnect with optional processor management card
    - 10/100 Base-TX management LAN with web console access
    - RS-232 local console
    - RS-232 remote/modem console
    - RS-232 general purpose

[1] A maximum of 32 GB of main memory is achieved and supported by purchasing two 16 GB options. The 16 GB memory option contains four 4-GB DIMMs. Therefore, the maximum memory is reached with eight 4-GB DIMMs (twelve 4-GB DIMMs is not supported).

- Power and cooling
  - One 650-W hot-swap power supply, standard
  - Optional second 650-W hot-swap power supply for N+1 redundancy
  - Four cooling fans configured in two redundant pairs
- Power requirements
  - Input current: 100 to 120 V, 7.2 A/200 to 240 V, 3.2 A (auto-ranging)
  - Line frequency: 50 Hz to 60 Hz
  - Maximum power input: 714 W

Physical and environmental specifications

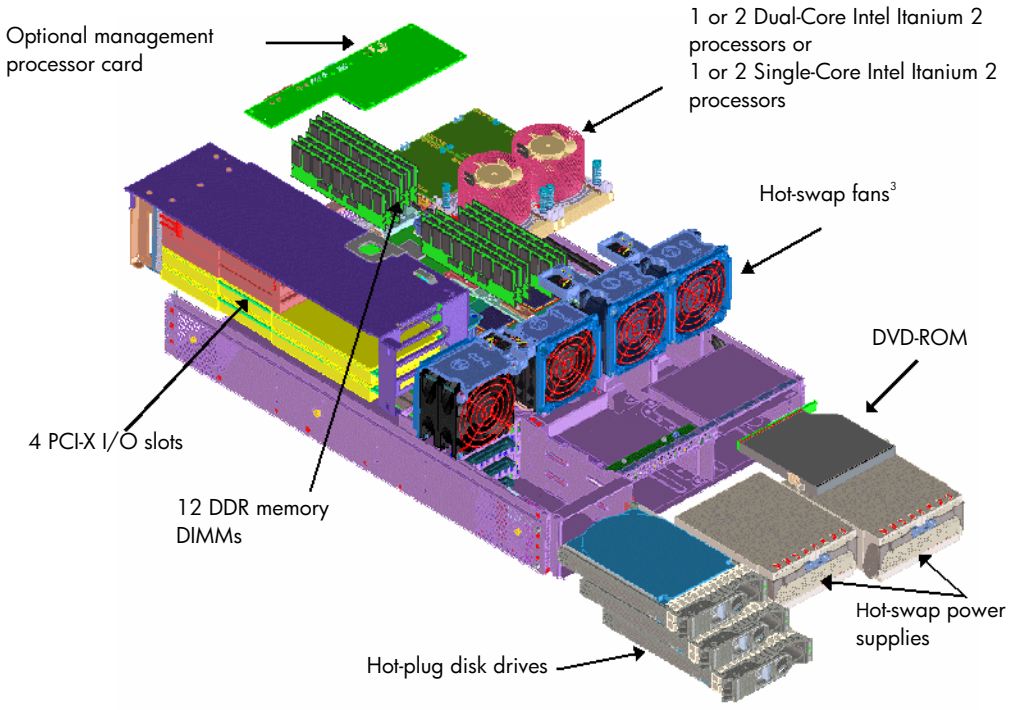
- Environmental specifications
  - Altitude:
    - Operating: 3,048 m (10,000 ft) maximum
    - Storage: 4,572 m (15,000 ft) maximum
  - Temperature:
    - Operating: +41° F to +95° F (+05° C to +35° C)
    - Non-operating: –40° F to +158° F (–40° C to +70° C)
  - Humidity:
    - Operating: 15% to 80% (relative)
- Acoustics (operator/bystander) at 25° C
  - Rackmount and stand-alone: Less than 6.8 Bels LwA
  - Office environment: Less than 5.5 Bels LwA[2]
- Physical dimensions in rackmount orientation
  - Height: 86 mm (3.4 inches), 2U EIA
  - Width: 482 mm (19 inches)
  - Depth: 680 mm (26.8 inches)
- Physical dimensions in stand-alone and office environment server, vertical orientation
  - Height: 494 mm (19.5 inches)
  - Width: 297 mm (11.7 inches)
  - Depth: 672 mm (26.5 inches)
- Net weight
  - Minimum stand-alone and office server configuration: 23 kg (49.4 lb)
  - Maximum stand-alone and office server configuration: 26 kg (56.2 lb)
  - Minimum rackmount configuration: 176 kg (38.6 lb)
  - Maximum rackmount configuration: 23 kg (49.0 lb)

[2] This configuration does not support N+1 power or fans.

Mechanical design and packaging

The exploded view reveals the location of major components and the mechanical and architectural features of the HP Integrity rx2620 Server. It is partitioned into three electrical partitions—the system board, including processors, memory, and core I/O; the I/O backplane, including four PCI-X I/O slots; and the management processor board.

Figure 4. Major components of the HP Integrity rx2620 Server



Two hot-swap power supply bays (not supported with the office environment server option) 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 drive or a DVD+RW 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 Intel Itanium 2 processor sockets, 12 memory DIMM slots, and the core I/O controllers. The management processor sits on an independent circuit board that attaches to the rear of the main system board.

Racking density

The HP Integrity rx2620 Server is designed to provide unprecedented performance density. At only two EIA units (one EIA unit = 1.75 inches (44 cm)) per server, up to 20 systems can be installed into a single 42U HP cabinet.

The HP Integrity rx2620 Server is supported in HP 10000 G2 Series Racks. The server is also supported in a variety of third-party racks and cabinets.

Note: Dimensions for rack configuration are as follows: height = 86 mm (3.4 inches), depth = 680 mm (26.8 inches), width = 482 mm (19 inches).

Stand-alone pedestal configuration

The HP Integrity rx2620 Server is also available in a stand-alone or office environment configuration. Both of these configurations use a stylish tower mounting shell, with the system simply placed inside this shell. The office environment kit includes quieter fans and does not support N+1 power or fans.

Note: Dimensions for stand-alone configuration are as follows: height = 495 mm (19.5 inches), depth = 673 mm (26.5 inches), width = 297 mm (11.7 inches).

HP Integrity rx4640 Server

The HP Integrity rx4640 Server supports both the Single-Core and Dual-Core Intel Intanium 2 processor. An HP Integrity rx4640 Server can be equipped with up to four Single-Core Intel Itanium 2 processors or up to four Dual-Core Intel Itanium 2 processors (Single-Core and Dual-Core processors cannot be mixed in the same system) and as much as 128 GB of RAM. The HP Integrity rx4640 Server also supports six available PCI-X I/O expansion slots.

The HP Integrity rx4640 Server also has extensive availability and management features, which make it ideal for deployment in mission-critical data centers or compute-intensive server farms. Features such as hot-swap redundant components, memory chip spare, an integrated management processor, and high-availability clustering support make the HP Integrity rx4640 Server ideal for nearly any computing environment.

Furthermore, the HP Integrity rx4640 Server was designed for investment protection. The Itanium 2-based server can be "built" by a board-swap, in-chassis upgrade from an existing RISC server. If you have an HP Integrity rx4640 Server with Single-Core Intel Itanium 2 processors installed, you can upgrade to Dual-Core Intel Itanium 2 processors simply by swapping processors and installing new firmware.

The HP Integrity rx4640 Server can be installed in a rack or in a stand-alone, pedestal configuration along with a host of choices from the full range of HP storage peripherals and I/O adapters.

Figure 5. The HP Integrity rx4640 Server is suitable for rackmount or stand-alone duty

Product specifications

- Central processor
  - Up to four Dual-Core Intel Itanium 2 processors at 1.6 GHz/24 MB L3 cache or 1.6 GHz/18 MB L3 cache
- Cache: Intel Itanium 2 single processor (all on-chip)
  - 32 KB L1 cache
  - 1 MB instruction and 256 data L2 cache per core
  - 18MB or 24 MB L3 cache (9 MB and 12 MB per core)
- Central processor
  - Up to four Single-Core Intel Itanium 2 processors at 1.5 GHz or 1.6 GHz
- Cache: Intel Itanium 2 single processor (all on-chip)
  - 32 KB L1 cache
  - 256 KB level 2 cache
  - 4 MB level 3 cache (1.5 GHz)
  - 6 MB level 3 cache (1.6 GHz)
  - 9 MB level 3 cache (1.6 GHz)
- 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-ns memory latency
  - 6.4 GB/s system bus bandwidth
  - 4.3 GB/s aggregate I/O bandwidth
- Expansion slots
  - Two PCI-X on independent buses, 64-bit, 133-MHz
  - Four PCI-X on two shared buses, 64-bit, 66-MHz
- Hot-plug disk drives (two 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, 15,000 rpm; and 300 GB, 15,000 rpm
- Removable media
  - Optional slimline DVD-ROM drive or DVD+RW drive
- Core I/O interconnect ports
  - Two-port Gigabit-TX LAN with RJ-45 connector (10/100/1000BaseT auto-sensing)
  - Two-channel Ultra320 SCSI adapter
  - Management processor interconnect:
    - 10/100BaseT management LAN with Web console access
    - RS-232 local console
    - RS-232 remote/modem console
    - RS-232 general purpose

  - Two USB Series A 2.0 (480 Mb/s) ports (optional)
  - VGA
- Power and cooling
  - One 1,200-W hot-swap power supply standard
  - Optional second 1,200-W hot-swap power supply for N+1 redundancy
  - Six cooling fans configured in three redundant pairs
- Power requirements
  - Input current: 8 A at 200 to 240 V
  - Line frequency: 50 Hz to 60 Hz
  - Maximum power input: 1,368 W

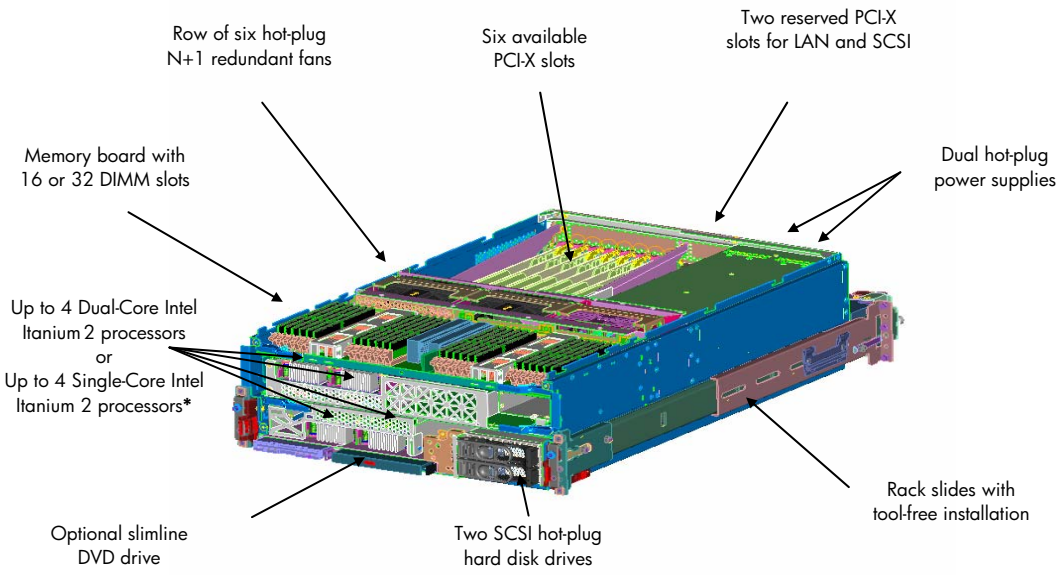
Physical and environmental specifications

- Environmental specifications
  - Altitude:
    - Operating: 3,048 m (10,000 ft) maximum
    - Non-operating: 4,572 m (15,000 ft) maximum
  - Temperature:
    - Operating: +41° F to +95° F (+05° C to +35° C)
    - Non-operating: –40° F to +158° F (–40° C to +70° C)
  - Humidity:
    - Operating: 15% to 80% (relative, non-condensing)
- Physical dimensions in rackmount orientation
  - Height: 173 mm (6.8 inches), 4U EIA
  - Width: 482 mm (19 inches)
  - Depth: 6.0 mm (27.2 inches), including a 29 mm (1.1-inches) front bezel
- Physical dimensions in stand-alone configuration
  - Height: 261 mm (10.3 inches)
  - Width: 532 mm (21.0 inches)
  - Depth: 695 mm (27.4 inches)
- Net weight
  - Maximum configuration: 46 kg (100 lb)

Mechanical design and packaging

The exploded view illustrates the location of major components and the mechanical and architectural features of the HP Integrity rx4640 Server. The server is partitioned into two main electrical partitions—the system partition, including baseboard, CPU board, and memory carrier boards, and the I/O partition, consisting of PCI-X I/O slots, core I/O, and the management processor.

Figure 6. Major components of the HP Integrity rx4640 Server



* Note: Dual-Core Intel Itanium 2 processors and Single-Core Intel Itanium 2 processors cannot be mixed in the same system.

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 your choice of memory carriers, 16 or 32 DIMMs can be loaded into the server. Both the memory carrier and processor boards can be easily removed without tools by unlatching them 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 Integrity rx4640 Server offers unparalleled performance density. At four EIA units per server, up to 10 Servers can be installed into a single 42U cabinet.

The HP Integrity rx4640 Server is supported in HP 10000 G2 Series Racks. The server is also supported in a variety of third-party racks and cabinets. See the *HP Server Configuration Guide* for the latest list of qualified third-party racks.

Note: Dimensions for rack configuration are as follows: height = 173 mm (6.8 inches), depth = 690 mm (27.2 inches), width = 482 mm (19 inches).

High-availability slider rails

The HP Integrity rx4640 Server comes 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 enabling 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 Integrity rx4640 Server requires a minimum of 610 mm (24 inches) of free space in both the front and rear of the cabinet for proper ventilation. During product installation and servicing, a total of 760 mm (30 inches) of free space is needed at the front of the cabinet.

Stand-alone (rackless) configuration

When a cabinet is not needed, the HP Integrity rx4640 Server is also available in a stand-alone (rackless) configuration. The stand-alone system is ideal for a back room or on a shelf; however, the stand-alone server should not be placed in an office environment because of acoustic and radio frequency interference (RFI) characteristics. The stand-alone 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. The HP Integrity rx4640 Server can be positioned on its bottom or side when the tubular frame is attached. The frame also makes it easy for two people to lift and move the server. Up to three HP Integrity rx4640 Servers can be stacked in a horizontal position, as in a rack, with plastic brackets that snap onto the steel tubes.

Note: Dimensions for stand-alone configuration are as follows: height = 261 mm (10.3 inches), depth = 695 mm (27.4 inches), width = 532 mm (21 inches).

Single- and Dual-Core Itanium 2-based HP Integrity servers

This section discusses the electrical architecture of the HP Integrity rx1620, rx2620, and rx4640 Servers. Topics covered include the HP zx1 chipset, block diagrams, and I/O layout.

Overview of the HP scalable processor chipset zx1

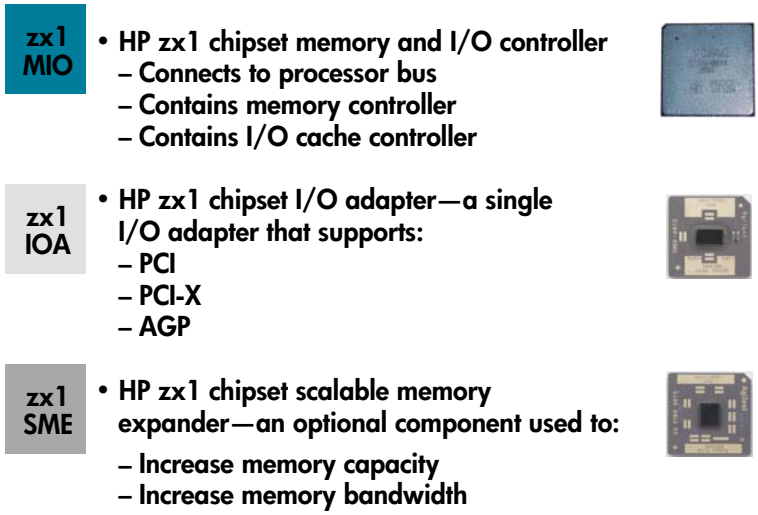
HP develops chipsets to meet the needs of enterprise and technical customers. In a world where every company has access to the same 64-bit processors, the strength of HP is developing and tuning systems to deliver the kind of performance and reliability that IT, engineering, and research professionals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

The HP zx1 chipset is the central building block of the HP Integrity rx1620, rx2620, and rx4640 Servers. The HP zx1 chipset is a modular, three-chip solution designed for cost-effective, high-bandwidth, low-latency, up to eight-core symmetric multiprocessing (SMP) servers and workstations. Invented entirely by HP, the HP zx1 chipset is an exclusive value-add in the standards-based world of Itanium 2-based platform computing.

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 with the Intel Itanium 2 processor bus and provides a low-latency connection to DDR memory, either directly or through zx1 chipset scalable memory expanders. The controller can connect up to 12 zx1 chipset memory expanders for quadruple the base memory capacity. It can also connect up to eight zx1 chipset I/O adapters, capable of sustaining 4.3 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 Accelerated Graphics Port (AGP) bus architectures. It provides a scalable I/O implementation for a wide variety of systems. The HP Integrity rx1620, rx2620, and rx4640 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 memory bandwidth. Acting as a memory hub, it decreases the number of signal loads on the memory bus, thereby enabling the system to increase its memory transfer rate. Memory expanders are not used in the HP Integrity rx1620 or rx2620 Servers. The HP Integrity rx4640 Server, however, deploys six memory expanders, resulting in large memory capacity (up to 128 GB over 32 DIMM slots) and bandwidth (12.8 GB/s).

Figure 7. The three components of the HP zx1 chipset



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

- **Provide excellent performance**—For demanding applications that do not fit within the processor cache, the memory system design is the key to performance. The HP zx1 chipset memory bandwidth has been enhanced with dual memory controllers to provide from 8.5 to 12.8 GB/s of memory bandwidth with 80 to 105 ns of open page latency.
- **Provide the right functionality**—Use systems that include both memory capability and PCI-X support.
  - At 16 GB, 32 GB, and 128 GB, respectively, the HP Integrity rx1620, rx2620, and rx4640 Servers provide enough memory capacity for the most demanding tasks.
  - The HP Integrity rx1620, rx2620, and rx4640 Servers support 133-MHz PCI-X buses capable of handling the latest generation of high-speed I/O adapters.
- **Enable a family of systems through a modular, multichip 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 Integrity rx4640 Server deploys HP zx1 chipset scalable memory expanders for greater memory capacity. The HP Integrity rx1620 and rx2620 Servers, however, do not deploy zx1 chipset scalable memory expanders, resulting in lower system costs.

The HP zx1 chipset is ideal for use with the Intel Itanium 2 processor because it complements the processor's price:performance advantages. Moreover, the new zx1 chipset leverages the HP co-developer knowledge of the processor itself. Indeed, the HP zx1 chipset was the turn-on vehicle for the Intel Itanium 2 processor in February 2001. At that time, Itanium 2-based systems with the HP zx1 chipset were already running HP-UX 11i v2, Linux, and Microsoft Windows.

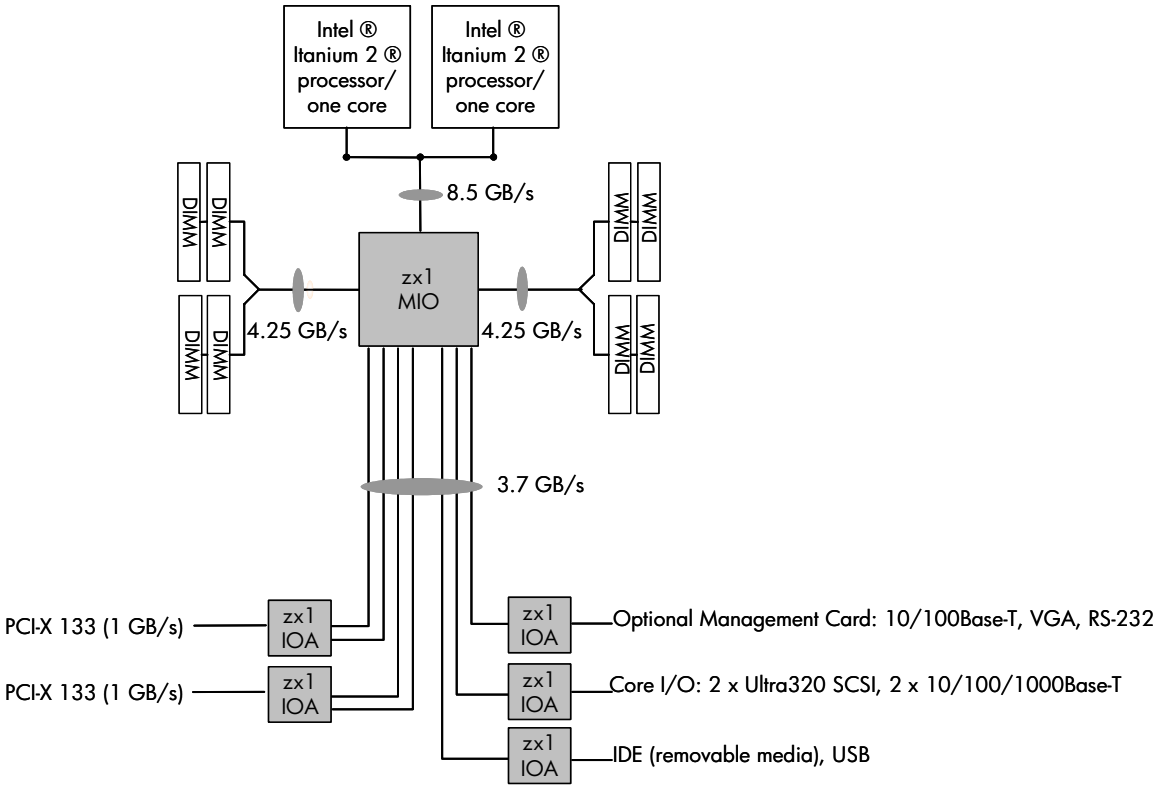
Table 2. Features and benefits of the HP zx1 chipset

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

Architectural overview of the HP Integrity rx1620 Server

The HP Integrity rx1620 Server supports one or two Single-Core Intel Itanium 2 processors linked to the HP zx1 chipset memory and I/O controller through a 267-MHz, double-pumped 128-bit frontside system bus (with 1.6 GHz/3 MB processor). Total bandwidth on the system bus is 8.5 GB/s.

Figure 8. The HP Integrity rx1620 Server architecture features Intel Itanium 2 processors and the HP zx1 chipset



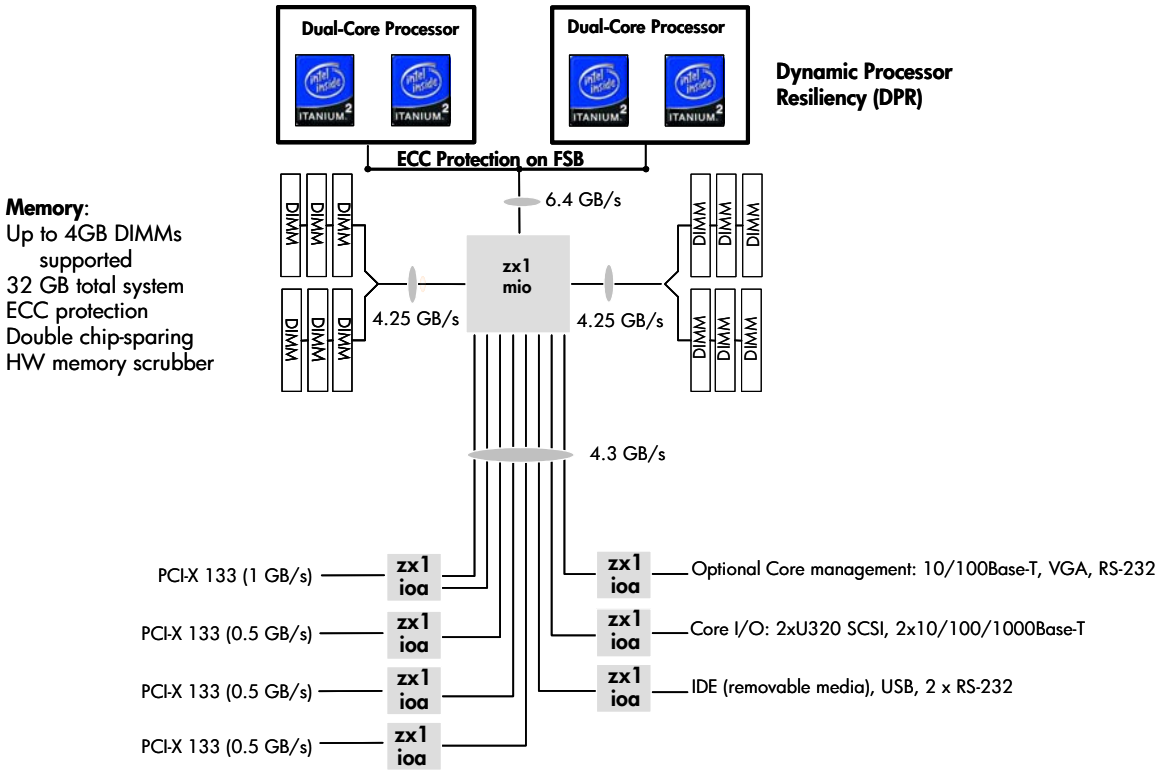
Memory DIMMs are attached directly to two 266-MHz, 4.25-GB/s memory buses. Combined memory bandwidth across both buses is 8.5 GB/s. Each bus links to six double data rate (DDR) DRAM memory DIMMs. Total system memory capacity is 16 GB, through twelve 8-GB DIMMs.

The I/O architecture consists of seven 0.5-GB/s channels allocated among five 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 four channels connect to two 133-MHz PCI-X I/O slots, providing 1 GB/s of sustained throughput per slot. These slots are ideal for high-bandwidth I/O adapters such as high-performance clustering interconnect. 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 management processor.

Architectural overview of the HP Integrity rx2620 Server

The HP Integrity rx2620 Server supports one or two single- or Dual-Core Intel Itanium 2 processors linked to the HP zx1 chipset memory and I/O controller through a 200-MHz, double-pumped 128-bit frontside system bus. Total bandwidth on the system bus is 6.4 GB/s.

Figure 9. The HP Integrity rx2620 Server architecture features Intel Itanium 2 processors and the HP zx1 chipset



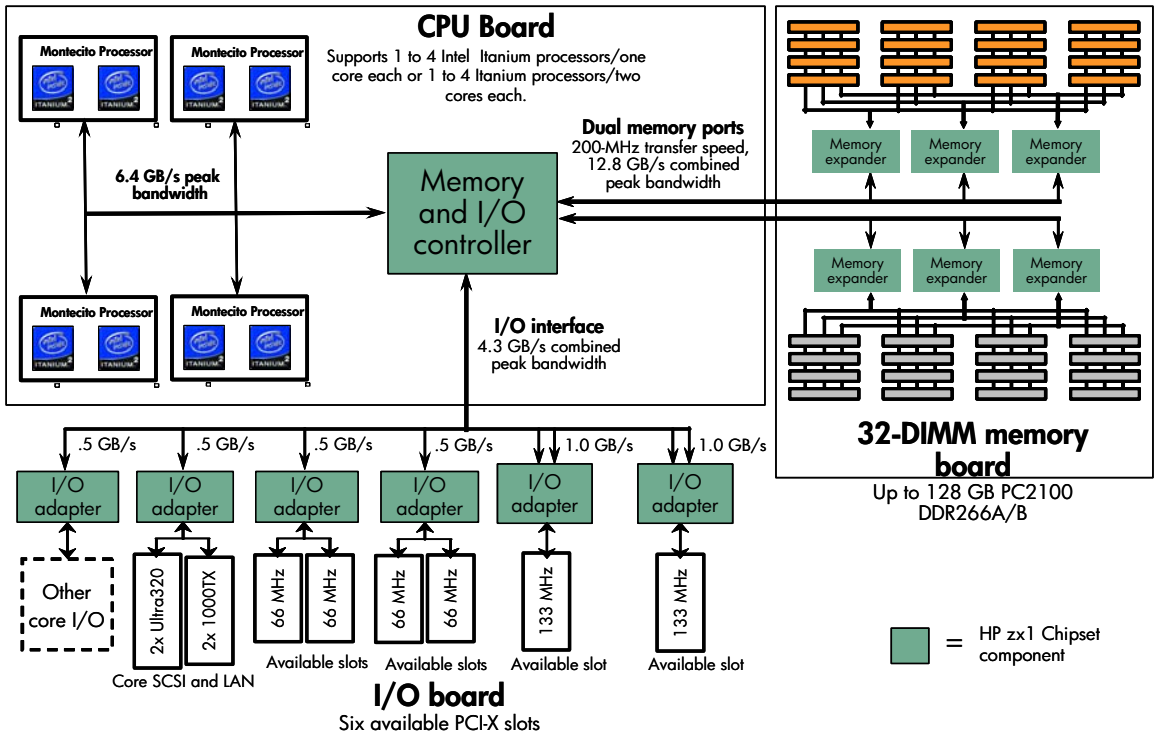
Memory DIMMs are attached directly to two 266-MHz, 4.25-GB/s memory buses. Combined memory bandwidth across both buses is 8.5 GB/s. Each bus links to six DDR DRAM memory DIMMs. Total system memory capacity is 32 GB, through eight 4-GB DIMMs.

The I/O architecture consists of eight 0.5 GB/s channels allocated among seven 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 interconnect. 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 management processor.

Architectural overview of the HP Integrity rx4640 Server

The HP Integrity rx4640 Server supports up to four single- or Dual-Core Intel Itanium 2 processors linked to the 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 10. The HP Integrity rx4640 Server supports up to four Single-Core or Dual-Core Intel Itanium 2 processors or four mx2 dual-processor modules linked to the HP zx1 chipset.



The zx1 chipset memory controller links to two independent 200-MHz, 6.4-GB/s memory buses, for a total memory bandwidth of 12.8-MB/s. Each bus connects to three zx1 chipset scalable memory expanders, which in turn allocate bandwidth to the DDR DRAM memory DIMMs. Total DIMM capacity is 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 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 zx1 chipset I/O 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 two-port core 10/100/1000BaseT LAN and 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, USB ports, and VGA.

Extensible Firmware Interface

The Extensible Firmware Interface (EFI) is an interface between the HP-UX 11i v2 and v3, Linux, and Windows operating systems and the Itanium 2-based platform firmware. The file system supported by the extensible firmware interface is based on the file allocation table (FAT) file system. EFI enables the use of FAT32 for the system partition. (The system partition is required on a bootable disk for the Itanium 2-based platform.)

For a hard disk, the system partition is a contiguous grouping of sectors on the disk. The starting sector and size are defined by the EFI partition table, which resides on the second logical block of the hard disk, or by the master boot record (MBR), which resides on the first sector of the hard disk. The system partition can contain directories, data files, and EFI images. The EFI system firmware can search the \EFI directory of the EFI system partition, EFI volume, to find possible EFI images that can be loaded. (The HP-UX 11i v2 and v3 boot loader is one example of an EFI image.)

Baseboard management controller

The baseboard management controller provides ease of system management. It 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 management processor 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 and reporting: System event log, forward progress log, and diagnostic LEDs on status panel
- Device inventory
- Hardware and data protection: Automatic clean operating system shutdown on critical events, secure storage of system configuration parameters, and protection of system flash ROM
- Link to dedicated out-of-band management processor through intelligent platform management bus (IPMB)
- Remote management through the MP LAN or MP serial ports
- Compliance with IPMI 1.0

HP management processor

The management processor (MP) is included as a standard part of the HP Integrity rx4640 Server and is an optional feature of the HP Integrity rx2620 and HP Integrity rx1620 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 management processor on a dedicated, out-of-band (independent of the main system data paths) communication link that can be accessed through RS-232 serial ports or a 10/100BaseT management LAN.

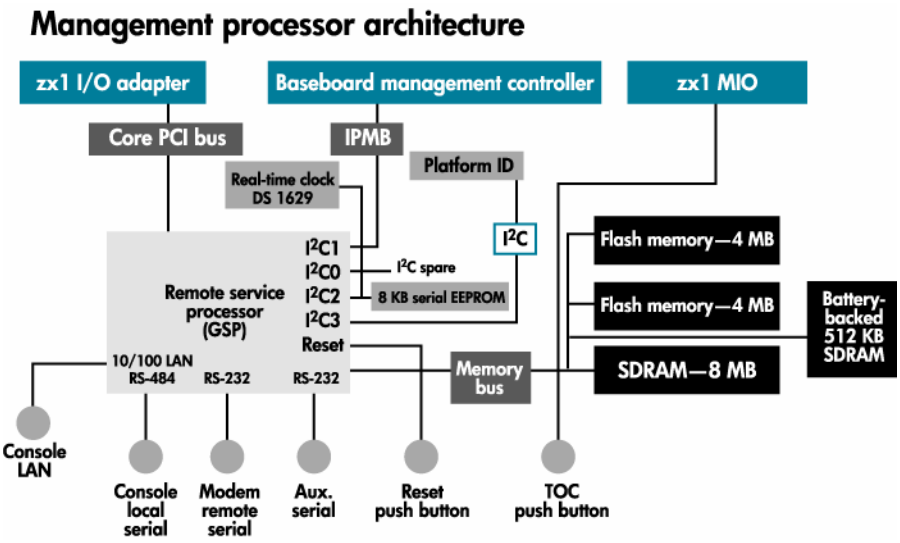
The management processor reduces the need for the system administrator to be physically at the system to perform tasks such as diagnostics, system management, or even hard resets. The

management processor 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.

The management processor enables the following features:

- 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 the HP Event Monitoring Service (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 (through 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 11. High-level depiction of the HP Integrity rx1620, rx2620, and rx4640 Server management processor architecture



Built for high availability

The HP Integrity rx4640 and rx2620 Servers have been designed to be an integral part of a mission-critical environment, delivering from 99.95% up to 99.999% availability, depending on the specific solution configuration. Delivering these levels of uptime requires a strong base of single-system high availability (SSHA) in the hardware. The HP Integrity rx4640 and rx2620 Servers have redundancy and resiliency built throughout, starting with the chassis infrastructure, through the I/O, and continuing through the memory and processor subsystems.

The servers' strong SSHA is further bolstered by the HP EMS. For the highest uptime, any of the three servers can be configured to be 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 Integrity rx4640, rx2620, and rx1620 Servers provide excellent cooling, pulling cool air from the front of the unit, flowing the air back over internal system components, and then discharging heated air out the back of the server. All the fans in the HP Integrity rx4640 and rx2620 Servers are easily accessible and provide N+1 redundancy (except in the rx2620 office environment option).

These servers also have high-availability power supplies. The HP Integrity rx4640 and rx2620 Server power subsystems provide high availability with N+1 redundant power options (except in the rx2620 office environment option). The HP Integrity rx4640 and rx2620 Servers each come standard with a single hot-swap power supply; an optional second power 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 Integrity rx4640 Server supports up to two SCSI disk drives, the HP Integrity rx2620 Server supports up to three, and the HP Integrity rx1620 Server supports up to two. 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 Integrity rx4640 Server. The disks can be configured on a single SCSI channel or with 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 Integrity rx2620 Server. One channel links to two internal disks; the second channel is connected to the third internal disk. This configuration enables disk mirroring across separate SCSI channels, further enhancing availability.

A single dual-channel SCSI controller manages the two disks in the HP Integrity rx1620 Server. One channel links to two internal disks, and another channel links to an external connector.

Multiple I/O channels

The multiple zx1 chipset I/O channels in the HP Integrity rx4640, rx2620, and rx1620 Servers provide failover, load balancing, and failure isolation. In these servers, failures on one channel do not disrupt activities on other channels. Furthermore, the servers deploy fully independent PCI-X buses to isolate traffic on I/O adapters. If a problem occurs on one adapter, it does not interfere with traffic on another bus.

ECC and chip spare memory

The memory systems for the HP Integrity rx4640, rx2620, and rx1620 Servers utilize error-correcting code to correct single-bit errors, and they use the HP chip spare technology to protect against multibit errors.

Chip spare enables an entire SDRAM chip on a DIMM to be bypassed in the event that a multibit error is detected on that SDRAM. 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 different quads. For example, a quad of 512 MB DIMMs can be loaded along with a second quad of 1 GB DIMMs, and chip spare is enabled on all the DIMMs.

Because of the chip spare feature, the HP Integrity rx4640, rx2620, and rx1620 Servers are completely resilient to all SDRAM failures, regardless of the number of bits involved in the fault condition. This characteristic greatly reduces memory failures as a source of system errors.

Some other vendors address a client's multibit SDRAM failures by expecting the failures to occur. Those vendors use a scheme that supports only failure detection and not failure correction This method is unacceptable to HP and a poor choice for servers in business-critical environments. Server systems that employ only failure detection are at a higher risk of failure resulting from memory problems.

Processor error correction and dynamic processor resiliency

In the HP Integrity rx1620, rx2620, and rx4640 Servers, the L1 and L2 cache both have full single-bit ECC, as well as double-bit error detection. Additionally, all the instruction and data paths also have single-bit ECC capabilities. The system processor bus also has parity detection, and the data path is covered by error correction.

The HP Integrity rx1620, rx2620, and rx4640 Servers employ Dynamic Processor Resiliency (DPR). With DPR, any processor generating correctable cache errors at a rate deemed unacceptable is deallocated from use by the system. This feature helps protect against a processor degrading to the point at which it can cause system crashes.

DPR works when excessive errors are reported against a processor. The processor is deactivated (the operating system does not schedule any new processes on it). The system firmware remembers the processor serial number and the time when this action was taken. From then, at each poll interval, the system monitor determines whether the processor has been replaced by comparing the serial numbers. If the processor has been replaced (requiring system shutdown), its history is reset.

If the system is rebooted before the offending processor has been replaced, the monitor generates a warning message and immediately deallocates the processor. (Such processor deallocation is only supported in the HP-UX 11i v2 and v3 operating systems. It is not supported in Windows or Linux.)

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 (more than 95% of cases) the information in SEL and FPL is sufficient to diagnose system failures to a single replaceable part. The SEL and FPL are available to the management processor (and therefore are available remotely) and to system-level tools, leading to quick and accurate diagnosis.

Fault management throughout the lifecycle

Fault management is the overall HP 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 operating system 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, enabling preservation of information for analysis or trending. Faults that generate errors and warnings are automatically logged to syslog, while 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 that you 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 and the monitoring capabilities monitor the health of system components and generate close to real-time events when problems develop. These events can trigger corrective action to enable the system to continue functioning, or they can trigger alerts to system administration 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
- Deallocate failing memory before it fails (dynamic memory resiliency)
- Deallocate failing processors before they fail (DPR)
- Deconfigure failed processors from the working set before the next reboot
- Shut down the system when power failure causes a switch to an uninterruptible power supply (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 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 HP OpenView Operations Center (OPC) messaging. Fault management events can be viewed directly on the server or through HP Systems Insight Manager, which can aggregate information from multiple systems in the data center.

You can also integrate fault management events with enterprise management software from HP (OpenView) or BMC, Tivoli, Computer Associates, or MicroMuse.

Added options with HP support

When you 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.

At the premium end of HP support offerings, you can also sign up to receive services from HP Instant Support Enterprise Edition (ISEE), which is an HP single, common remote support solution across multivendor environments. ISEE provides features to manage diverse environments, spanning from simple to complex, including mission-critical IT data centers. ISEE uses nearly continuous

hardware event monitoring and automated notification to identify and prevent potential critical problems. Through ISEE remote diagnostic scripts and vital information collected about the status and configuration of your environment, ISEE enables fast restoration of supported systems, storage, and network devices.

For mission-critical support customers, ISEE provides proactive capabilities to assess and help optimize your environment:

- Benchmarking and trending analysis of the availability of your HP-UX systems
- Fast recognition of unreachable systems to enable support processes to be quickly activated to determine the cause of outage
- ISEE activity summary of incidents, remote access sessions, and unreachable device notification incidents
- Systematically analyzing your HP-UX configurations for software patch irregularities (missing patches, superseded patches, and so on), providing a consolidated view of the patch status in your environment and simplifying patch maintenance activities to save you time

ISEE helps to minimize the risk of unplanned system downtime and impact to business productivity with nearly continuous remote monitoring and fault detection.

Proactive, not reactive

Fault management uses the philosophy of proactive (as opposed to reactive) management of problems and provides highly accurate fault diagnosis the first time, even as the problem occurs, initiating or fast corrective action. This functionality results in a substantial decrease in unplanned downtime.

An easy transition for RISC and IA-32 users

A major feature of the Intel Itanium 2 processor and the new HP servers is backward compatibility of the Intel Itanium 2 processor with IA-32 and PA-RISC processors. Backward compatibility is particularly useful for applications that are not performance-intensive or for system utilities and development tools that aid in porting and migration. Although most existing IA-32 and PA-RISC binaries are compatible, optimal performance can only be achieved once an application is compiled specifically for the Intel Itanium 2 processor.

Running 32-bit Microsoft Windows applications

Thirty-two-bit Microsoft Windows binaries can run on the 64-bit Windows operating system using the Intel Value Engine (IVE) hardware and Windows on Windows 64 (WOW64) software emulation, which is already part of 64-bit Microsoft Windows. The operating system automatically detects whether the application is 32-bit or 64-bit and handles it accordingly.

Additionally, Microsoft and Intel have now made available the IA-32 Execution Layer (IA-32 EL) software. The IA-32 EL is a software binary that is available for download from Microsoft; it will be integrated into Microsoft Windows Server 2003 Service Pack 1. Whenever a 32-bit application is launched, the operating system will call the IA-32 EL to translate the 32-bit application into a native Itanium 2–based application. 32-bit EL will continue to provide compatibility and will deliver further performance improvements on faster Intel Itanium processors released in the future.

Running 32-bit Linux applications

Thirty-two-bit Linux binaries can be run on Itanium 2-based systems using the processor's built-in hardware translation feature. The IVE hardware is part of the Intel Itanium 2 processor, and it gives a basic IA-32 functionality. If an application is performance-critical, recompiling the application enables it to take advantage of the strengths of the Intel Itanium 2 microarchitecture.

Running RISC applications

Users can run their PA-RISC binaries unchanged and completely transparently, thanks to the HP Aries dynamic code translator that is part of HP-UX 11i v2 and v3. This translator facilitates running 32-bit and 64-bit PA-RISC applications on the Intel Itanium 2 microarchitecture without the need to recompile, which can prolong the longevity of legacy applications from HP 9000 Servers to HP Integrity servers. A straightforward recompile of 32-bit and 64-bit PA-RISC applications yields native Intel Itanium 2 processor binaries. In addition, the HP-UX 11i v2 and v3 operating system has built-in source and data compatibilities. HP-UX 11i Linux binary and source compatibility enables the running of Linux applications. Finally, the HP transition assistance program provides peace of mind in upgrading to industry-leading technology.

Porting and migration services: Transition help from HP

Thousands of programs run quite well in Intel Itanium processor compatibility mode with few changes. However, porting these applications to the Intel Itanium 2 processor enables them to run even better because they can then take full advantage of the new processor's distinctive capabilities.

To help you make the transition to the Intel Itanium processor family and get the most from this exciting new technology, HP offers a flexible set of services. You can select from the following:

- Porting and Migration Workshop
- Porting and Migration Guidance
- Porting and Migration Detailed Assessment
- Porting and Migration Solution Delivery
- Online Services

HP services for the HP Integrity servers

Evolve your infrastructure confidently with a partner that stands accountable

When you are ready to take advantage of the performance improvements Itanium-based solutions offer, HP has a full range of multi-OS services to help make the transition as seamless and painless as possible. HP will help you quickly and confidently introduce HP Integrity servers into your existing IT environment and maximize their potential for your business. HP offers 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 achieve optimal system performance. Throughout the evolution process, HP accepts full accountability for delivering on the service commitments that HP and its partners have made. In addition, the HP commitment to your satisfaction does not stop with the transition process itself. The HP multi-OS support offerings—from simple reactive to comprehensive mission-critical—reduce the risks associated with downtime once your HP Integrity servers are installed. HP is looking forward to help with your long-term success by working with leading independent software vendors (ISVs) in both the technical and commercial markets to tailor their applications to the Intel Itanium 2 microarchitecture, and thereby using the full potential of your HP Integrity servers.

HP Services delivers end-to-end solutions that offer consistent quality and service levels across multiple platforms such as UNIX, Windows, and Linux, as well as systems from other well-known vendors. With the introduction of the Itanium 2-based midrange servers, HP is the only vendor that offers the services to support the implementation of multiple operating systems (UNIX, Windows, and Linux) on a single Itanium-based server. HP Services utilizes its wide range of offerings and its experienced services personnel to help companies fully exploit the Intel Itanium architecture's capabilities while protecting their existing infrastructures.

HP StorageWorks and HP servers

The cornerstone of an Adaptive Enterprise

At the heart of an Adaptive Enterprise—in which business and IT are synchronized to capitalize on change—is application processing and information storage. HP delivers storage and server portfolios that can accommodate the needs of any IT infrastructure through adaptive infrastructure solution offerings—from the most price-sensitive small or medium-sized business to the largest corporate enterprise.

Without question, HP has one of the broadest portfolios in the industry. As the worldwide leader in UNIX, Microsoft Windows, and Linux servers, the HP server portfolio encompasses ProLiant, Integrity, 9000 series, Alpha, and NonStop servers. As the worldwide leader in storage, the HP StorageWorks portfolio includes disk arrays, integrated management software, tape and optical devices, network attached storage (NAS), and storage area network (SAN) infrastructures. HP also consistently demonstrates the caliber of its HP StorageWorks and HP server lines—these products continually receive numerous best-in-class industry and customer awards.

Delivering more together

HP delivers best-in-class products that are open for connectivity to any heterogeneous environment consisting of multivendor servers, operating systems, storage, applications, and other components. "Open" has always been the foundation of the HP strategy for doing business. Yet using HP StorageWorks solutions and HP servers together in the same environment can yield additional advantages for the Adaptive Enterprise. By deploying HP storage and HP servers along with HP services, you gain more for your IT environment and overall business—more stability, efficiency, adaptability, and, ultimately, more return on IT investment.

More return on IT investment

HP delivers one of the broadest total product portfolios in the industry. HP StorageWorks and server product lines are second to none at providing best-in-class stand-alone functionality in any operating environment. HP StorageWorks hardware and software, HP servers, and HP Services together provide a more synergistic and powerful solution that enables an Adaptive Enterprise. You gain more control of your data center and overall business with more stability, efficiency, and adaptability, which all lead to increased return on IT investment.

Combined deployments can reduce you operating costs with better price:performance, investment protection, virtualization, unified management capabilities, and total IT consolidation, providing a better return on investment (ROI) and total cost of ownership (TCO).

IT availability is crucial in today's business environment. If an infrastructure is slow or down, revenue will go to the competition. HP storage and servers together deliver maximum uptime with complete, seamless, and **total** integration. With HP solutions and services, you can count on HP as a trusted partner with a single point of accountability. The result is faster time to problem resolution and overall increased IT availability.

HP is well suited to drive business adaptability. With solutions and technology from HP, you can change and adapt quickly to market needs. HP servers and storage can be delivered on-site in complete integrated turnkey solutions that are ready to deploy. In addition, virtualization removes traditional boundaries, and HP UDC delivers "wire once" capability for the entire data center. The full portfolio of HP services and managed solutions enables you to build and manage an Adaptive Enterprise. These solutions are all possible with HP.

Conclusion

On the road to becoming pervasive, the Dual-Core Intel Itanium 2 processor is faster and more capable than its predecessor. Now, with the HP Integrity rx1620, rx2620, and rx4640 Servers, HP offers powerful servers based on the Dual-Core Intel Itanium 2 processor and featuring the new HP zx1 chipset. The HP Integrity rx1620 Server utilizes one or two Dual-Core Intel Itanium 2 processors and up to 16 GB of memory, the HP Integrity rx2620 Server utilizes one or two Dual-Core Intel Itanium 2 processors and up to 32 GB of memory, and the HP Integrity rx4640 Server utilizes as many as four Dual-Core Intel Itanium 2 processors and 128 GB of memory. These servers offer cutting-edge, 64-bit power, along with excellent price:performance.

The new servers are tailored for complex, floating-point-intensive computations, providing faster time to solution for demanding applications. They are especially suited to SSL web serving, and they offer significant performance advantages over both IA-32- and RISC-based systems for Windows and database applications. They are also suited for running SAP, Siebel, PeopleSoft, and SAS business application suites.

The ability of the Intel Itanium 2 processor to run IA-32 and RISC binaries without modification helps provide protection for previous software investments, and HP porting services can affect a complete transition that takes full advantage of the Intel Itanium architecture. With these servers, you can run any of four industry-leading operating systems—HP-UX 11i v2 and v3, Linux, Windows, or OpenVMS 8.3. This multi-OS capability overcomes the complexities and challenges associated with deploying and maintaining a heterogeneous operating environment.

Whether for technical computing or commercial IT, the HP Integrity rx1620, rx2620, and rx4640 Servers offer superior power, scalability, and efficiency—with lower costs.

For more information

For more information about Intel Itanium processors, their architecture, and how HP can help you make your transition:

- See the following websites:
  - http://www.hp.com/go/itanium
  - The HP Itanium-based servers and workstations site at http://www.hp.com/products1/itanium/servers_workstations/index.html
- Contact any of our worldwide sales offices or HP channel partners (in the U.S., call toll-free 1-800-637-7740).

HP product information and technical documentation is available online at:

- http://www.hp.com/go/rx1620
- http://www.hp.com/go/rx2620
- http://www.hp.com/go/rx4640

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