# Technologies in HP ProLiant Gen8 c-Class server blades

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Introduction

HP ProLiant Gen8 servers and the HP BladeSystem infrastructure incorporate wire-once, cloud-ready technologies that maximize every hour, watt and dollar. By abstracting the servers from their uplinks, HP liberates administrators from traditional infrastructure constraints and simplifies management between networks and servers. This allows the creation of pools of network, storage, and compute resources. With wire-once technology you can add, move, or change servers in minutes. As a BladeSystem solution, HP CloudSystem is at the core of our cloud-ready Converged Infrastructure which is part of the HP Converged Cloud architecture. HP CloudSystem offers a complete system to build and manage services across public, private, and hybrid clouds. HP CloudSystem provides a unified cloud-ready platform for enterprises and service providers.

HP BladeSystem provides an intelligent infrastructure, controlled by the Onboard Administrator which monitors health and allocates power and cooling resources dynamically to keep everything operating optimally and at maximum efficiency. Utilizing HP Thermal Logic technologies such as Active Cool fans and features such as Dynamic Power Capping, you’re assured of operations that can reduce energy consumption, reclaim capacity and extend the life of your data center. With the high capacity of the NonStop signaling midplane, you can meet the performance needs of your most demanding applications and their availability requirements as well. And because of the Systems Insight Display, administrators can perform many functions locally without having to run to remote console stations or tether to the enclosure just to examine a message or change a basic configuration.

HP hardware design and engineering give HP ProLiant Gen8 server blades industry-leading performance, power efficiency, and thermal control. Embedded management enhancements include Integrated Lifecycle Automation capabilities enabled by innovations such as Intelligent Provisioning for easy system set-up, Active Health for agentless hardware monitoring and alerting, and Smart Update for automated firmware and system software maintenance. ProLiant Gen8 server blades utilize HP Insight Management software to automate key management processes, including a system’s physical deployment, configuration, and problem management. ProLiant Gen8 server blades enable your organization to consolidate physical servers and components while still maintaining the same workload capacity and performance.

We’ve engineered the ProLiant Gen8 server blades with enhanced memory and storage capacities, the HP Integrated Lights-Out Management Engine, and cloud-enabled HP Insight Management. These existing and new features give Gen8 server blades more flexibility and simplified management:

- User-centric and intuitive design features help reduce common downtime issues
- Integrated Lifecycle Automation (an industry first) includes embedded HP Intelligent Provisioning, seamless monitoring abilities through the HP Active Health System, and system maintenance capabilities that are standard across all ProLiant servers, and are built using the HP iLO Management Engine
- Automated energy optimization enhances the server’s ability to analyze and respond to data generated by HP 3D Sea of Sensors within the server
- HP Virtual Connect reduces networking and hardware costs by enabling up to four FlexNICs per physical NIC port; and FlexFabric adapters converge network and storage traffic into a single consolidated stream up to the server/network edge

For complete specifications of each server blade, see the HP website: [www.hp.com/go/bladesystem](http://www.hp.com/go/bladesystem).

HP BladeSystem Infrastructure

HP ProLiant Gen8 server blades are an HP BladeSystem component. HP BladeSystem Infrastructure has become essential as businesses look for increasing levels of operational flexibility to meet changing needs and require an IT infrastructure that can embraces convergence. A converged infrastructure allows you to eliminate technology silos and pool resources as interoperable resources.

HP BladeSystem is a change ready converged infrastructure focused on simplicity, integration and automation. You can deploy HP BladeSystem Infrastructure today and scale it over time as you require. It’s a cloud-ready system architecture designed to easily deploy into traditional enterprise solutions, but you also can build on top of that initial deployment.
with applications and virtualization that move your infrastructure into a cloud-based environment. You can do all this with the HP BladeSystem infrastructure as the foundation.

We've engineered HP BladeSystem Infrastructure underlying technologies to help maximize every hour, watt, and dollar associated with your operation. This means that HP BladeSystem implementation is not a “rip and replace” proposition. Budget constraints and investment preservation are always a concern. HP BladeSystem allows you to deploy an infrastructure and upgrade it as your needs change. Once installed HP BladeSystem Infrastructure maximizes power and cooling efficiency with industry leading hardware and management technologies.

HP BladeSystem is the best infrastructure for virtualization and leads the industry in server virtualization. HP BladeSystem combines server, networking, storage, and management into one modular infrastructure. We've enhanced HP BladeSystem virtualization capabilities with ability to directly integrate with VMware vCenter and Microsoft System Center to better manage these virtualization environments. HP BladeSystem infrastructure efficiently connects to shared storage, and Virtual Connect FlexFabric allows you to use one set of wires for both storage and networking capability.

**HP ProLiant c-Class server blade architecture**

In addition to industry-leading performance and management, we've designed HP ProLiant Gen8 server blade architecture for easier management and serviceability. These architectural features begin with HP BladeSystem c-Class enclosures and include FlexibleLOM, improved mezzanine card access, HP SmartDrive carriers, and HP Smart Socket Guide.

**HP c-Class enclosures**

An HP ProLiant c-Class server blade is a complete server that slides into an HP BladeSystem c-Class enclosure. There are two different c-Class enclosures available to meet the needs of large or small IT environments:

- The HP BladeSystem c3000 rack enclosure is 6U high and holds up to 8 half-height and 4 full-height (mixed configuration supported) HP ProLiant c-Class server blades.
- The HP BladeSystem c7000 rack enclosure is 10U high and holds up to 16 half-height and 8 full-height (mixed configuration supported) HP ProLiant c-Class server blades.

The HP BladeSystem enclosures contain management, thermal, and power technologies that enhance the performance, efficiency, and reliability of c-Class server blades:

- Onboard Administrator module which provides a single point of control for intelligent management of the entire enclosure, with an optional redundant Onboard Administrator system management module.
- Insight Display powered by the Onboard Administrator provides local management through an LCD display conveniently sited on the front of the system
- Up to ten hot plug Active Cool fans in the c7000 enclosure and six in the c3000 enclosure.
- Up to six hot plug high efficiency power supplies per enclosure. A choice of AC single-phase intelligent and non-intelligent, AC three-phase, or 48V DC power.
- Dual Grid Power
- Redundant rack enclosure power feeds to the blade chassis.
- Up to four redundant I/O fabrics providing a wide selection of interconnects including Ethernet, Fibre Channel, InfiniBand, and SAS simultaneously.
The c-Class enclosure’s System Insight Display (Figure 1) makes administrators more efficient. It lets you to set up a bare-metal enclosure for access. The display also allows you to perform routine administration functions without a crash-cart of other equipment attached to the enclosure.

Figure 1.

You can find out more about HP c-Class enclosures at http://h18004.www1.hp.com/products/blades/components/enclosures/c-class/index.html

HP ProLiant Gen8 server blade hardware design

HP ProLiant Gen8 servers lead the industry in engineering excellence with industry standard designs. This section describes the major hardware design elements implemented in the ProLiant Gen8 server blade platforms:

- Sockets for up to four cost-effective Intel® Xeon® E5 processors, each with up to eight cores and 130 watts without system configuration restrictions
- Sockets for up to two AMD Opteron™ 6200 Series processors
- Up to 32 DDR3 DIMM sockets for up to 1.0 TB of HP SmartMemory and a maximum memory speed up to 1600 MHz. Up to three PCIe expansion slots (two x16) featuring the highest performing mezzanine option cards, now and in the future
- HP FlexibleLOM technology providing network adapter flexibility
- HP Smart Carriers for hot-plug disk drives
- HP Smart Socket Guide
**Half-height HP ProLiant Gen8 server blades**

Half-height ProLiant Gen8 server blades provide up to two processors, twelve to sixteen DIMM slots, up to two hot-plug drives, one FlexibleLOM slot, and up to two mezzanine slots. Optional mezzanine cards provide a wide variety of different I/O fabric connectivity to the interconnect bays. The FlexibleLOM features up to two 10 Gb FlexFabric ports (Figure 2).

*Figure 2.*

Improved access to mezzanine cards facilitates quicker removal and easy access to the FlexibleLOM adapter. To further improve serviceability, every ProLiant Gen8 server blade comes with a DIMM tool to make insertion and removal of individual DIMMs much easier.

We've designed the half-height ProLiant Gen8 servers for midmarket and enterprise IT environments. With an ideal balance of performance, scalability, and expandability, the new half-height ProLiant Gen8 server blades offer a simpler way to manage a data center. We've engineered this server blade platform with enhanced memory and storage capacities, the HP iLO Management Engine, and with HP Insight Remote Support (HP Insight Online) to give you cloud-based service and support.

**Workstation blades**

If you need to you to centralize your organization’s workstations in the data center rather than placing standalone units at the user’s desk, the HP ProLiant WS460c Gen8 Workstation series will allow you to do that. Locating this half-height workstation in the data center lets you more easily, securely, and economically manage computing resources.

The HP ProLiant WS460c Gen8 Workstation series (with an optional expansion blade) provides hardware accelerated graphics in a dedicated remote desktop environment. HP Remote Graphics Software helps deliver a client operating system on the WS460c Gen8 made available to a single remote access client. HP Session Allocation Manager manages and seamlessly maps end-users to available resource pool.
**Full-height ProLiant Gen8 server blades**

Full-height ProLiant Gen8 server blades (Figure 3) provide up to 4 processors, and provide twice as much I/O bandwidth to the interconnect modules as the half-height server blades.

*Figure 3.*

The full-height ProLiant Gen8 server blade platform, represented by the ProLiant BL660c, is a new density-optimized offering with 4P performance and features in a single-wide, full-height form factor. Built on the Gen8 features of the ProActive Insight Architecture, this server blade platform doubles the computing density compared to the previous 4P server blade without compromising on performance, scalability, and expandability. In addition, the ProLiant BL660c Gen8 server blade gives customers the ability to consolidate servers and repurpose valuable enclosure space, further reducing data center server sprawl. This server blade platform includes:

- Two 2.5” hot plug bays; 2.0TB SAS, 2.0TB SATA, 1.6TB SSD
- Enhanced PCIe 3.0 Smart Array P220i controller with optional 512MB FBWC
- New ProLiant Gen8 Smart Drive carrier
- 32 DDR3, LRDIMM/RDIMM/LVDIMM sockets to 1600 MHz, 1.0TB maximum
- HP SmartMemory, Advanced ECC, Lock-Step, Online Spare
- One or two dual-port FlexibleLOMs: 10Gb FlexFabric, 10Gb Flex-10, and 10Gb Ethernet
- Three mezzanine slot options for 1Gb Ethernet, 10Gb Ethernet, 10Gb Flex-10, 10Gb FlexFabric, 8Gb Fibre Channel, I/O accelerators, external storage controllers, and QDR and FDR InfiniBand

The ProLiant BL660c Gen8 server blade is ideal for virtualization, database, business processing, decision support, HPC, and general 4P data-intensive applications where fine-tuning of data center space and price versus performance are important.
**HP Smart Socket Guide**

The HP Smart Socket Guide (Figure 4) provides ease and simplicity of processor installation or upgrade. You get quick, precise processor installation and lower risk of downtime due to improper installation or replacement. Other non-HP systems use only a clamping mechanism prone to socket damage due to mishandling or poor processor placement. The HP Smart Socket Guide is a precision guidance mechanism that ensures the processor is correctly keyed and placed within the socket.

**Figure 4.**
**HP Smart Drive hot-plug drive carrier**

The ProLiant Gen8 Smart Drive hot-plug drive carrier (Figure 5) includes several improvements that are consistent throughout the c-Class server blade family.

**Figure 5.**

- Improved drive status indication
- Intuitive icon based display
- Minimized data loss and improved serviceability
- **Do not remove** LED to minimize human error (helps prevent data loss due to wrong drive removal)

The Smart Drive Carrier now includes a **Do Not Remove** icon to help you “choose wisely” and never remove the wrong drive. The light automatically illuminates to indicate drives that are not operating in a redundant condition, which could cause a fault condition if removed. The smaller size of the carrier is designed to improve airflow for system cooling and, in some cases, allows additional drive bays to be incorporated into the system. The carrier has many other capabilities including verification that the drive is genuine HP equipment. This ensures that our customers have the comfort of knowing that HP is protecting them. In addition, the new Smart Carrier data collection is tied closely to Active Health to help you rapidly identify issues when they occur.

**NOTE:** Hot-plug drives for ProLiant G7 and previous servers are not compatible with Gen8 servers

**FlexibleLOM**

Servers with network adapter ports embedded on the system board are referred to as using LAN-on-motherboard (LOM) architecture. LOM architecture results in an efficient system design that does not require an add-on option for network functionality. Servers with LOM architectures offer optimum cost-to-performance solutions, if the network adapter ports embedded on the server’s system board meets your specific network requirements.

However, the “one size fits all” LOM strategy can create issues. For instance, if the LOM on your server does not match your network infrastructure exactly, you will either have to settle for something less than you wanted, purchase add-in cards to meet your needs, or not use all the features that you purchased. Even if the LOM meets current needs, your
network requirements could change in the future, forcing you to abandon system board components (that will continue to draw power) and add a card.

FlexibleLOM technology for HP ProLiant Gen8 server blades provide customers with network adapter flexibility including choice of technology, speed, and number of ports (model dependent). The ProLiant Gen8 FlexibleLOMs install as a daughter card on the server blade board similar to a mezzanine card (Figure 6).

**Figure 6.**

The following FlexibleLOM adapters are available for HP ProLiant Gen8 server blades:

- **HP Ethernet 1 Gb 2-Port 361FLB adapter** provides entry-level Ethernet connectivity with easy transition to 10 Gb Ethernet at later time.
- **HP Flex-10 10 Gb 2-Port 530FLB adapter** provides Ethernet connectivity compatible with Virtual Connect Flex-10 interconnect technology.
- **HP Flex-10 10 Gb 2-Port 554FLB Adapter** provides Ethernet and/or FCoE, or Ethernet and iSCSI connectivity with Virtual Connect Flex-10 compatibility as an interconnect.
- **HP Ethernet 10 Gb 2-Port 560FLB Adapter** provides Ethernet, Ethernet and iSCSI connectivity.
**Mezzanine expansion slots**

ProLiant Gen8 server blades feature two or three PCIe 3.0 mezzanine expansion slots up to x16 bandwidth (PCIe 2.0 in the ProLiant BL465c server blade). These expansion slots provide the highest performing I/O cards now and into the future (Figure 7).

**Figure 7:**

![Image of mezzanine expansion slots]

**HP Power Regulator for ProLiant**

HP Power Regulator for ProLiant is a hardware feature that enables ProLiant servers to dynamically control performance states (p-states) of the system processors. Insight Control Power Management monitors and uses HP Power Regulator technology. p-states are affected by processor frequency and voltage:

- **Processor frequency** - A lower p-state causes the processor to operate at a lower frequency. For example, a 3.773 GHz processor might operate at 3.0 GHz in a lower p-state.
- **Processor voltage** - A lower p-state causes the processor to operate at a lower level of voltage. For example, a processor operating at 1.4 V at maximum p-state might operate at 1.2 V in the minimum p-state.

Processor technologies

HP ProLiant Gen8 c-Class server blades use multi-core technologies from Intel and AMD (shown in Table 1). A multi-core processor has two or more separate execution cores on one or more physical dies so that it can perform more work within a given clock cycle. To take advantage of multi-core processing, software must be multi-threaded to distribute the work across multiple execution cores.

Table 1:

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<th>ProLiant Gen8 server blade</th>
<th>Processor family</th>
<th>Number of processors</th>
<th>Number of cores</th>
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<td>HP ProLiant BL420c</td>
<td>Intel Xeon processor E5-2400 family</td>
<td>1 or 2</td>
<td>4 or 6 or 8</td>
</tr>
<tr>
<td>HP ProLiant BL460c</td>
<td>Intel Xeon processor E5-2600 family</td>
<td>1 or 2</td>
<td>2 or 4 or 6 or 8</td>
</tr>
<tr>
<td>HP ProLiant BL465c</td>
<td>AMD Opteron 6200 Series</td>
<td>1 or 2</td>
<td>4 or 8 or 12 or 16</td>
</tr>
<tr>
<td>HP ProLiant BL660c</td>
<td>Intel Xeon processor E5-4600 family</td>
<td>2 or 4</td>
<td>4 or 6 or 8</td>
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Intel Xeon processors

We use Intel Xeon E5-2400, E5-2600, and E5-4600 series processors in the newly introduced 2 and 4-socket ProLiant Gen8 c-Class server blades. These processors use hafnium-based, 32 nm Hi-k metal gate silicon technology. Xeon E5-2600 series processors in the HP ProLiant Gen8 server blades have two, four, six, or eight cores and operate from 60 W (lower power) to 135 W (high performance). These processors feature an integrated northbridge and memory controller. The processors work with registered DIMMs (RDIMMs), unbuffered DIMMs (UDIMMs), low-voltage RDIMMs (LV RDIMMs), and load-reduced DIMMs (LR-DIMMs). HP ProLiant Gen8 server blades based on Intel E5 processors use the Intel C600 Series Chipset with one of these E5 processors:

- The ProLiant Gen8 BL420c provides up to two Intel Xeon E5-2400 processors, and delivers up to 1600 MHz speeds with 12 DIMMs enabling up to 384 GB of HP SmartMemory
- The ProLiant Gen8 BL460c provides up to two Intel Xeon E5-2600 processors with 2-, 4-, 6-, and 8-cores. The E5-2600 handles 16 threads, delivering up to 33 percent higher performance1, with capabilities for up to 130 W processors without system configuration restrictions
- The ProLiant Gen8 BL660c provides up to four density-optimized Intel Xeon E5-4600 processors, each with up to eight cores and 130 watts without system configuration restrictions

The ProLiant Gen8 server blades feature these Intel Xeon processor capabilities:

- Processor Internal Sensors and Thermal Control - Protection against over-temperature conditions.
- Cache parity/ECC - Protects cache data from accidental data corruption due to particle hits, etc.
- Legacy Error Mode - Corrupt data is contained before it is processed.
- QPI Protocol Protection via Cycle Redundancy Check (CRC) - Automatically detects data errors using a checksum of either 8 bits or 16 bits.
- QPI Link Level Retry - Retransmits when a transient error is detected on the QPI link.
- PCIe Advanced Error Reporting - Enhanced PCIe reporting features such as finer granularity in defining the error type, ability to specify the severity of each uncorrectable error, error logging, ability to identify the source of an error, and more.
- Direct Media Interface link (DMI) - A x4 bi-directional chip-to-chip interconnect between the processor and chipset. The DMI link provides 2.0 GB/s of bandwidth in each direction (Upstream and Downstream).
- Processor internal sensors and thermal control - Protection against over-temperature conditions.

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1 Compared to the Intel Xeon 5600 processor family
AMD Opteron processors

HP ProLiant Gen8 server blades based on AMD processors use up to two Multi-Core AMD Opteron 6200 Series processors with 4, 8, 12, or 16 cores per processor with PCIe 2.0 using the AMD SR5690 and SP5100 chipsets.

The building block of 8-core Opteron 6200 series processors is the Bulldozer module. The Bulldozer module executes two parallel threads using two 128-bit integer cores. Each core has four pipelines and a dedicated integer, but share the fetch/decode stage and the L2 cache. The flexible floating point unit can be dedicated or shared between the two cores per cycle.

The AMD Opteron 6200 series processor has 8 Bulldozer modules, runs from 1.6 GHz up to 2.6 GHz, and operates from 85 W up to 140 W. The processors fit into the 1944-pin G34 socket and use the AMD SR5690/SP5100 chipset.

The AMD Opteron 6200 series processor consists of two 8-core dies with four Hyper Transport 3.0 links that operate up to 6.4 GT/s. It has two integrated memory controllers, each with two DDR3 memory channels that operate up to 1866 GT/s. The memory controllers are compatible with LR DIMMs, RDIMMs, UDIMMs, and low-voltage DIMMs.

The AMD Opteron 6200 series processors incorporate the following technologies:

- HT Assist AMD Smart Fetch Technology
- AMD-P suite of power-management features
- AMD-V™ with Rapid Virtualization Indexing

For complete listings of all processor models and specifications, see the HP ProLiant Gen8 server blade QuickSpecs: http://www.hp.com/go/blades

Thermal technologies

We make it possible for you to manage ProLiant Gen8 server blade component and ambient temperatures through innovative component engineering, efficient server blade design, and HP Thermal Logic technologies.

Thermal engineering

For ProLiant c-Class server blades, we’ve designed smaller heat sinks than rack-mount servers use. The server blade heat sinks have vapor chamber bases, thinner fins, and tighter fin pitch than previous designs to achieve the largest possible heat transfer surface in the smallest possible package (Figure 8). The smaller heat sink allows more space on the server blades for DIMM slots and hard drives.

Figure 8:
Precise ducting on ProLiant c-Class server blades manages airflow and temperature based on the unique thermal requirements of all the critical components. The airflow is tightly ducted to ensure that no air bypasses the server blade and to obtain the most thermal work from the least amount of air moved. Ducting reduces the amount of required airflow, which in turn reduces the power draw of fans. The lower airflow requirement has the added benefit of optimizing the available data center cooling capacity.

**HP 3D Sea of Sensors**

Introduced with ProLiant G6 servers, HP Sea of Sensors provides the data to precisely control the fans and directly cool specific components, while not overcooling other components. This can reduce fan power consumption up to dozens of watts per server. HP 3D Sea of Sensors in ProLiant Gen8 server blades extends the use of sensors, adding additional thermal sensors on HP-branded PCI cards (networking and storage), backplanes, and mezzanine cards. This gives you a three dimensional view of system cooling, automatically tracking thermal activity across the server. 3D Sea of Sensors is part of the Thermal Logic portfolio of features designed for thermal and power management. Read more about these technologies in the “Power monitoring and management” section later in this paper.

**Memory technologies**

ProLiant Gen8 servers feature HP SmartMemory and enhanced memory protection with HP Advanced Memory Error Detection Technology.

**HP SmartMemory**

IT trends such as server virtualization, cloud computing, and high-performance computing require a significant increase in the average server memory capacity. As a result, DRAM manufacturers are increasing chip component densities to achieve higher memory capacities. The combination of higher memory demand, component complexity, and availability requirements has increased the importance of system memory. These increasing memory requirements define the system’s reliability, performance, and overall server power consumption to a much greater extent than before. Therefore, choosing the right memory is the key to ensure high reliability and performance, and to deliver a faster return on your IT investment.

HP SmartMemory is a unique technology introduced for HP ProLiant Gen8 servers, and unlike other third-party memory, HP SmartMemory authenticates whether memory has passed HP’s rigorous qualification and testing to ensure that customers are getting the highest quality, genuine HP Qualified Server Memory. HP SmartMemory unlocks certain performance and high efficiency features optimized for HP ProLiant Gen8 Servers:

- **HP SmartMemory** uses up to 20% less power than third-party memory while achieving the same performance. At low voltage (1.35 V), HP SmartMemory operates at DDR3-1333 MHz with one and two DIMMs per channel and at DDR3-1066 MHz at three DIMMs per channel. In comparison, third-party memory may require 1.5 V to achieve the same performance.
- **HP SmartMemory** performance is 25% higher with unbuffered ECC (UDIMM) memory and capable of 1333 MT/s up to 2 DIMMs per channel at 1.35V. Third-party memory provides only 1066 MT/s bandwidth, and often at higher operating voltage (1.5V).
- **New DDR3-1600 RDIMM capabilities for maximum bandwidth**
- **24GB RDIMM** – We developed the only 24GB three rank DIMM. By adding another rank, we give Gen8 server blades (initially the Gen8 BL460c) a similar cost/capacity point as servers with two sockets per channel.
- **New 32GB LRDIMM** - Load reduced DIMMs (LRDIMM) increase capacity by 33% enabling HP ProLiant Gen8 Intel 2-socket server blades to provide up to 512 GB and 4-socket servers to 1.0TB

HP SmartMemory features enhanced reporting through the HP Active Health System and HP iLO (see the “HP iLO Management Engine” section later in this document). Because of some ProLiant Gen8 SmartMemory features, ProLiant G7 server DDR3 memory is not interchangeable. One example is the SmartMemory 32GB quad rank DIMM that appears to the processor as a dual rank type allowing is to use all the lanes. HP SmartMemory is ideal for HP ProLiant Gen8 customers who are looking to extract all the memory performance, dependability, and power savings that ProLiant Gen8 servers are designed to deliver.
HP Advanced Memory Error Detection technology

Uncorrectable memory errors can cause applications and operating systems to crash, so they are costly in terms of downtime and repairs. The best way to prevent unnecessary DIMM replacements is to filter out superfluous errors and identify critical errors that can lead to a shutdown. You can no longer rely on simple error event counts on systems containing up to 14 trillion memory transistors. With HP Advanced Memory Error Detection Technology, we re-invented a precision system that pinpoints errors that cause downtime.

HP Advanced Memory Error Detection Technology seeks out specific defects that either cause performance degradation or significantly increase the probability of an uncorrectable (non-recoverable) memory condition. By improving the prediction of non-recoverable memory events, this technology prevents unnecessary DIMM replacements and increases server uptime.

ProLiant Gen8 server blades include these advanced memory protection features:

- Advanced ECC / SDDC - Continued memory operation in the event of a single memory device failure. Allows removal of a single DRAM from the memory map if it exhibits a failure and recovers its data into a new device. Support for both x4 and x8 SDDC.
- Rank Sparring (OnLine Spare) - Dynamic fail-over to a spare DIMM rank or spare rank pair behind the same memory controller. No OS involvement. You cannot enable this feature concurrently with memory mirroring. HP offers the rank sparing rather than DIMM sparing as rank sparing uses less spare memory resulting in less overhead.
- Demand Scrubbing - Writes corrected data back to the memory once a correctable error is detected on a read transaction.
- Patrol Scrubbing - Proactively searches the system memory repairing correctable errors. Patrol and Demand scrubbing work together to prevent accumulation of correctable errors and reducing the likelihood of unplanned downtime.
- Failed DIMM Isolation - Identifies a specific failing DIMM lockstep pair thereby enabling the user to replace only the failed DIMM pair. Identifies a single DIMM for correctable errors and DIMM pair for uncorrectable errors.
- Memory Thermal Control - Used to prevent DIMMs from overheating. Achieved by slowing down the memory access rate. The temperature is monitored by a DIMM sensor.
- DIMM Address/Control Bus Parity Protection - Methods to detect and protect command and address errors.
- Lockstep Memory Mode - Corrects a single x8 DRAM device failure on a DIMM. The DIMMs in each paired memory channel must have identical HP part numbers.


I/O Interconnect and convergence technologies

HP ProLiant Gen8 server blades support PCI Express (PCIe), serial attached SCSI (SAS), serial ATA (SATA) I/O technologies, 1 Gb and 10 Gb Ethernet, 10 Gb FlexFabric, 10 Gb Flex-10, 8 Gb Fibre Channel, and 4X DDR (20 Gb) InfiniBand. Beyond the I/O technology and performance characteristics described in this section, I/O convergence is an increasingly important factor in current and future data center infrastructure. HP Converged Infrastructure and Virtual Connect technology address the need for a common, virtualized network fabric. HP ProLiant Gen8 server blades also support I/O convergence with HP optional mezzanine cards, and FlexibleLOMs.

PCI Express technology

The PCI Express (PCIe) serial interface provides point-to-point connections between the chipset I/O controller hub and I/O devices. Each PCIe serial link consists of one or more dual-simplex lanes. Each lane contains a send pair and a receive
pair to transmit data at the signaling rate in both directions simultaneously. ProLiant Gen8 server blades support PCIe 3.0 slots (PCIe 2.0 in the BL465c), which have a signaling rate of 2.5 Gb/s per direction per lane. After accounting for 20 percent serializing/deserializing encoding overhead, the resulting effective maximum bandwidth is 2 Gb/s (250 MB/s) per direction per lane. Therefore, a x4 link with 4 send and receive pairs has an effective bandwidth of 2 GB/s. A x8 link has an effective bandwidth of 4 GB/s. This flexibility allows slower devices to transmit on a single lane with a relatively small number of pins while faster devices can transmit on more lanes as required. The PCIe 3.0 technology on the ProLiant BL420c, BL460c, and BL660c Gen8 server blades offer improved latency and up to 400 percent bandwidth per I/O expansion slot.2

Serial Attached SCSI technology

SAS is a serial communication protocol for direct-attached storage devices such as SAS and SATA Small Form Factor (SFF) and Large Form Factor (LFF) disk drives. It is a point-to-point architecture in which each device connects directly to a SAS port rather than sharing a common bus, as parallel SCSI devices do. Point-to-point links increase data throughput and improve the ability to locate and fix disk failures. More importantly, SAS architecture solves the parallel SCSI problems of clock skew and signal degradation at high signaling rates.

Optional mezzanine cards

HP offers a variety of optional mezzanine cards to connect to outside networks and storage. HP ProLiant c-Class server blades support up to two mezzanine cards (half height servers) and three mezzanine cards (full height servers) that connect to the various interconnect fabrics such as Fibre Channel, Ethernet, serial-attached SCSI, and InfiniBand. Type A and Type B mezzanine cards differ only in the amount of power allocated to them by the server and in the physical space they occupy on the server blade. Type A mezzanine cards have slightly less power available to them and are slightly smaller. Type A mezzanine cards are compatible with all mezzanine connectors in ProLiant Gen8 c-Class server blades. Type B mezzanine cards are compatible with Mezzanine 2 or 3 connectors in full-height ProLiant Gen8 c-Class server blades. Type B mezzanine cards are also compatible with Mezzanine 2 connectors in half-height ProLiant Gen8 c-Class server blades.

Both types of mezzanine cards use a 270-pin connector, enabling up to eight lanes of differential transmit and receive signals. Because the connections between the device bays and the interconnect bays are hard-wired through the signal midplane, the mezzanine cards must be matched to the appropriate type of interconnect module. For example, a Fibre Channel mezzanine card must be placed in the mezzanine connector that connects to an interconnect bay holding a Fibre Channel switch. For the most up-to-date information about the c-Class mezzanine card options, go to the HP website: http://h18004.www1.hp.com/products/blades/components/c-class-interconnects.html.

Network and virtualization technologies

Multifunction 1 Gb or 10 Gb Ethernet FlexibleLOM adapters on all c-Class server blades provide several advantages.

**TCP/IP Offload Engine (TOE)** - The increased bandwidth of Gigabit Ethernet networks increases demand for CPU cycles to manage the network protocol stack. This means that performance of even a fast CPU will degrade while simultaneously processing application instructions and transferring data to or from the network. Computers most susceptible to this problem are application servers, web servers, and file servers that have many of concurrent connections.

The ProLiant TCP/IP Offload Engine for Windows speeds up network-intensive applications by offloading TCP/IP-related tasks from the processors onto the network adapter. TOE network adapters have on-board logic to process common and repetitive tasks of TCP/IP network traffic. This effectively eliminates the need for the CPU to segment and reassemble network data packets. Eliminating this work significantly increases the application performance of servers attached to gigabit Ethernet networks.

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2 Per HP internal testing, compared to a ProLiant BL460c G7 x8 PCI Gen 2 expansion slot. Actual results will depend on application, system configuration and tuning.
TOE is included on integrated Multifunction Gigabit Ethernet adapters and optional multifunction mezzanine cards. It is supported on Microsoft® Windows® Server 2003 when the Scalable Networking Pack is installed. With the delivery of Windows Server 2008, the TCP/IP Offload Chimney that shipped in the Scalable Networking Pack is included as part of the latest Windows operating system.

**Receive-side Scaling (RSS)** - RSS balances incoming short-lived traffic across multiple processors while preserving ordered packet delivery. Additionally, RSS dynamically adjusts incoming traffic as the system load varies. As a result, any application with heavy network traffic running on a multi-processor server will benefit. RSS is independent of the number of connections, so it scales well. This makes RSS particularly valuable to web servers and file servers handling heavy loads of short-lived traffic.

Windows Server 2008 supports RSS as part of the operating system.

**iSCSI Acceleration** - Accelerated iSCSI offloads the iSCSI function to the NIC rather than taxing the server CPU. Accelerated iSCSI is enabled by the HP ProLiant Essentials Accelerated iSCSI Pack that is used with certain embedded Multifunction NICs in Windows and Linux® environments.

**iSCSI boot for Linux** - iSCSI boot for Linux is available on ProLiant Gen8 BladeSystem 554M and 554FLB10 Gb adapters. iSCSI boot allows the host server to boot from a remote OS image located on a SAN within a Red Hat or SUSE Linux environment. The host server uses an iSCSI firmware image (iSCSI boot option ROM), making the remote disk drive appear to be a local, bootable “C” drive. Administrators can configure the server to connect to and boot from the iSCSI target disk on the network. It then downloads the OS image from the iSCSI target disk. The HP iSCSI boot solution also includes scripts to significantly simplify the installation process. Adding an iSCSI HBA card is not required.

For complete specifications about HP network adapter products, go to [www.hp.com/go/ProLiantNICs](http://www.hp.com/go/ProLiantNICs).

**Virtual Connect and Virtual Connect Manager**

HP Virtual Connect is hardware abstraction technology that lets you configure and connect physical and virtual servers. Through its ability to virtualize BladeSystem server connections to external networks, HP Virtual Connect lets you add, move, and change servers inside BladeSystem domains without affecting access to LAN and SAN within the domain. HP Virtual Connect and converged networking are key components of HP Converged Infrastructure. Convergence of networking and storage data traffic over HP FlexFabric converged network adapters and interconnect modules are supported in all ProLiant server blades.

We initially converged networks using Virtual Connect Flex-10 technology to replace multiple lower bandwidth physical NIC ports, and now we’re using Virtual Connect FlexFabric to implement LAN/SAN convergence technology. HP Virtual Connect FlexFabric broadens Flex-10 technology to provide solutions for converging these different network protocols.

You can use Virtual Connect Manager (VCM) to change, move, or redeploy any server within a single Virtual Connect domain. VCM is embedded firmware on the Virtual Connect Ethernet Module and the FlexFabric Module. VCEM extends the Virtual Connect architecture to large multi-domain environments. You can use VCEM to change, move, or redeploy any server within the VC domains that VCEM controls. VCEM is a plug-in for HP Systems Insight Manager (HP SIM) and benefits from the rich feature set offered by HP SIM. These features include centralized authentication, enclosure discovery, and security. Again, VCEM is supported in all ProLiant server blades, Virtual Connect Flex-10 adapters, FlexFabric adapters, and interconnects.


**HP Virtual Connect Flex-10/10D modules and adapters**

The introduction of HP Virtual Connect Flex-10/10D modules and adapters enhances the ability for Virtual Connect to converge networks and reduce I/O sprawl at the server edge. The Flex-10/10D module contains 30 ports with a total effective full-duplex bandwidth of 600 Gb. It has 10 dedicated SFP+ uplinks, which can be either 1/10GbE, and has 4x 10GbE inter-stacking links (ISL). The effective increase in uplink bandwidth is 67% when compared to Virtual Connect Flex-10 and doubles the number of stacking links. The Virtual Connect Flex-10/10D converges traffic onto a single fabric
with iSCSI and LAN. It provides Virtual Connect wire-once connection management that streamlines processes, allowing you to implement server changes in a matter of minutes.

**Virtual Connect direct-attach Fibre Channel Using HP Flat SAN technology**

Fibre Channel is the storage fabric of choice for most enterprise IT infrastructures. Until now, Fibre Channel required an intermediate SAN fabric to create your storage solution. However, this fabric can be expensive, and can result in increased complexity and IT infrastructure costs.

We have improved efficiency of server and storage connectivity with HP Virtual Connect direct-attach Fibre Channel for 3PAR StoreServ Solutions with Flat SAN technology. You can now connect HP 3PAR StoreServ systems directly to the HP Virtual Connect FlexFabric Modules (Figure 9). That eliminates the need for an intermediate SAN switch complex, multi-tier SANs, and excess networking equipment. This innovative solution requires no SAN fabric licenses. In an existing fabric-attach environment, you can use the 3PAR StoreServ Solutions with Flat SAN technology to direct-attach and fabric-attach storage simultaneously.

![Figure 9](image)


**HP ProLiant Smart Storage**

Over the last several years, the bandwidth and throughput of the memory and processor subsystems has grown exponentially with advent of additional processor cores, higher bandwidth, more DIMMs, and other advances. And while storage performance has grown steadily, it has not kept pace with other system advances. One such example of this performance gap is in the area of database applications. In order to achieve industry leading benchmark numbers, HP matches a number of hard drives to balance the load of ever-increasing processor and memory speeds. In the year 2000, we used 180 spindles. In 2009 we used over 1,000 spindles. Now, industry demands go well past 2,000 spindles on traditional hard drives.

For HP ProLiant Gen8 servers, we’ve addressed the storage performance gap with solid state drives (SSD) and SSD-optimized Smart Array controllers. Compared to a 1,000-spindle hard drive solution, we’ve been able to achieve maximum performance with less than 100 SSDs. A key to achieving this performance was to remove controller bottlenecks associated with improved SSD performance. We’ve removed those performance bottlenecks in Smart Array controllers for ProLiant Gen8 servers. Compared to previous generation controllers, the new Smart Array controller delivers more than four times the I/O rate for read operations and more than six times the IOP rate for database
workloads. The Gen8 Smart Array controller with SSDs is 60 times faster than the previous generation controller with traditional hard drives. When you combine Gen8 Smart Array controller and SSD performance with PCIe 2.0 support, bandwidth increases more than 85%.

ProLiant Gen8 servers use HP Smart Array P-Series Controllers. The servers also accommodate HP I/O accelerators, which reduce write latencies and increase the overall load capability of each server. HP I/O accelerators can drive down costs in HPC environments.

For more information about ProLiant Smart Storage technology, read the technology brief “Selecting storage controllers: technology considerations.” Find it at www.hp.com/servers/technology.

HP Smart Array controllers and storage technologies

We embed HP Smart Array P-Series Controllers on the system board or offer them as daughter cards on ProLiant Gen8 server blades. The controllers utilize the PCI Express 3.0 host interface and the 6 Gb/s SAS or 6 Gb/s SATA storage interfaces. Technology enhancements for the P-Series controllers include increased performance and Smart Array Advanced Pack (SAAP) 2.0 features. P-Series controllers also allow up to 200 drives, Active Health Logging, and Predictive Spare Activation. These controllers use an embedded RAID-on-Chip (ROC).

Smart Array P-Series controllers work with the following tools:

- Active Health Logging
- Array Configuration Utility (ACU)
- ACU-CLI (command line interface)
- SNMP agents
- Web-Based Enterprise Management (WBEM) providers

Flash-backed write cache standard on most controllers

As cache memory speeds get faster and cache sizes get larger, battery technology has been pushed to the limit by ever-increasing energy demands for primary power loss data protection. With ProLiant Gen8, we are completing the transition to the flash-backed cache (FBWC) for all Gen8 Smart Array products. This enables HP to provide faster and larger caches. This industry-leading technology also eliminates the issues associated with battery maintenance and disposal.

FBWC is now standard on most Smart Array Controllers. FBWC uses a large capacitor and flash memory instead of battery power to hold write cache data. FBWC provides lifetime data retention should the power go out. When the server is powered back on, FBWC writes the data to the drive. Depending on the controller model, FBWC is available in 512 MB, 1 GB, or 2 GB modules.

HP I/O Accelerators

HP I/O Accelerators are available for ProLiant DL and BL servers. For ProLiant Gen8 servers, we moved to 25nm NAND technology that will improve performance. We provide HP I/O accelerators for situations when you have specific applications that require them.

Predictive Spare Activation technology

Predictive Spare Activation technology protects data by rebuilding an identified problem drive to a spare drive before it is needed. This eliminates a period of exposure during the drive rebuild when an additional drive could fail. HP drives can report a predictive failure before an actual drive failure occurs. Predictive Spare Activation automatically copies the data from a predictive failure drive to a global spare drive. The copy operation reduces the time before the spare drive becomes active. After the copy completes, the predictive failure drive is marked as a drive failure. You can then remove it from the RAID set for servicing.

Advanced Data Mirroring

A new feature of the Smart Array Advanced Pack 2.0 is Advanced Data Mirroring (ADM). ADM uses additional drives for redundancy, but data are actively read from and written to the drives. ADM allows triple mirroring of RAID 1 and 1+0
configurations, which provides the highest level of fault tolerance offered by Smart Array. ADM is over 1000 times more reliable than two-drive mirroring. ADM generates three copies of the data protecting you from two drive failures, and you continue to get good performance.

**HP SmartCache**

HP SmartCache utilizes SSDs for caching to accelerate workload performance. The solution uses HP Smart Analytics technology to intelligently assign frequently accessed “hot data” to high-performance SSD drives. By providing workload-aware intelligence to optimize system operations, this smart caching capability helps clients achieve higher performance for transactional workloads. HP SmartCache performance outcomes are application dependent.

**Dynamic Workload Acceleration**

To optimize solid state media performance and eliminate controller bottlenecks, ProLiant Gen8 servers include an embedded next-generation Smart Array controller optimized for SSDs with six times the performance of previous-generation controllers. Recently, this technology helped HP ProLiant achieve the TPC-C 10 benchmark in the industry. To drive further gains in application performance, we’ve doubled the cache capacity in our next generation servers for faster writes and reads of data. Compared to the previous generation with traditional disk drives, ProLiant Gen8 delivers over 200,000 IOPS per server with intelligent solid state storage technology.

**Drive technology**

With the new ProLiant Gen8 servers, we focused on the need to meet and exceed the industry’s growing requirement for storage. Many of the ProLiant Gen8 platforms now have very flexible storage configurations to scale to various capacity points.

Dealing with that storage density can be even more important. The new Smart Array for Gen8 has incorporated new resiliency features to focus on density including:

- RAID advanced data mirroring (ADM) for three-drive mirroring
- Predictive Rebuild to eliminate fault tolerant downtime exposure windows
- Rapid parity initialization to deploy new RAID volumes up to 95% faster than the previous generation

**HP SmartDrive**

For our ProLiant Gen8 servers, we designed the HP SmartDrive for improved drive density, and drive status indication has transitioned from LED-based in the previous generation to a more intuitive icon-based carrier. The compact drive carrier design enables a 50% increase in spindle count (per server).

The drive’s front bezel includes a blue backlight for locating a specific SmartDrive selected from within the storage software. An icon-based display reports the drive’s status. A “do-not-remove” LED helps prevent a drive failure whenever anyone tries to remove the wrong drive. Other serviceability improvements include authentication, failure logging, and integration with the HP Active Health System.

**SAS and SATA Small Form Factor hard drives**

The SAS architecture enables system designs that deploy high-performance SAS and high-capacity SATA\(^3\) SFF and LFF drives. This capability provides a broad range of storage solutions that give IT managers the flexibility to choose storage devices based on reliability, performance, and cost.

SFF drives provide higher performance than large form factor drives. The smaller SFF platters reduce seek times because the heads have a shorter distance to travel. RAID performance improves by increasing the numbers of spindles.

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\(^3\) For more information about these features, refer to the technology brief “Serial ATA technology”:

Solid state drives

HP server solid state drives (SSD) were introduced in late 2008 for use in specific HP BladeSystem environments. SSDs connect to the host system using the same protocols as disk drives, but they store and retrieve file data in flash memory arrays rather than on spinning media. SSDs have much lower latencies than traditional hard drives. They also power up quickly. They also achieve high random-read performance. HP SSDs provide a level of reliability equivalent to or slightly greater than current HP Midline disk drives for servers.

Solid state memory (NAND) provides higher capacity, reliability, and performance for local, low-power boot drives than USB keys provide. HP server SSD interfaces are compatible with traditional disk drives connected to a SATA (or SAS) controller. This allows benchmarking and direct comparison of their external performance with that of disk drives to determine their suitability in various application environments.4

The HP Smart SSD Wear Gauge is a unique HP technology monitoring the lifespan of solid state drives. SSDs have a limited write cycle lifetime and the HP Wea r Gauge technology calculates how much life remains on your SSDs so you can plan for their replacement ahead of time.

Management technologies

HP ProLiant Gen8 servers are built for the new infrastructure requirements driving today’s data centers. With a wide range of embedded automation and intelligent management features, these are the world’s most self-sufficient servers. Powered by the HP ProActive Insight Architecture, ProLiant Gen8 servers continuously analyze thousands of system parameters to optimize application performance and proactively improve uptime.

The HP ProActive Insight architecture with Integrated Lifecycle Automation incorporates three major innovations to simplify common tasks and keep systems running at peak performance:

- **HP Intelligent Provisioning** - A single tool for all ProLiant Gen8 server configuration tasks. We’ve embedded all the firmware, drivers, and tools that you need to quickly get your systems online. This means no CDs or DVDs needed. Simply press F10 to get started.

- **Active Health System** - Provides continuous health monitoring and 100 percent configuration change logging. This unified diagnostic tool quickly assists in problem analysis with secure data transfer to the HP support team.

- **Smart Update** – A system maintenance tool with simplicity that systematically updates servers and blade infrastructures at the scale of the data center. HP offers Smart Update which includes HP Smart Update Manager (HP SUM) and HP Service Pack for ProLiant (SPP). These HP tools allow you to systematically update servers and blade infrastructures within an hour. HP SUM and HP SPP support many previous-generation servers allowing you to rapidly update mixed enclosures of old and newer servers at one time.

In every HP ProLiant Gen8 server, we integrate management and support software technologies into a seamless experience across the server lifecycle:

- **Server monitoring and management** – HP BladeSystem Onboard Administrator and HP iLO Management Engine
- **Power monitoring and management** – HP Thermal Logic and HP Insight Control power management software
- **Unified infrastructure management** - HP Systems Insight Manager and HP Insight Control
- **Firmware and system software management** - Service Pack for ProLiant and HP Smart Update Manager 5.0

Server monitoring and management

We enhanced our server monitoring and management capabilities in ProLiant Gen8 server blades with new technologies like HP Agentless Management, HP Active Health, and improved embedded HP Remote Support.

4 For more information about Solid state drive technology, refer to the HP technology brief titled “Solid state drive technology for ProLiant servers” http://h20000.www2.hp.com/bc/docs/support/SupportManual/c01580706/c01580706.pdf
**HP BladeSystem Onboard Administrator**

The brain of the BladeSystem c-Class enclosure is the Onboard Administrator (OA) module located in the enclosure. It performs four management functions for the enclosure:

- Detecting component insertion and removal
- Identifying components and required connectivity
- Managing power and cooling
- Monitors health of the enclosure power supplies and fans
- Provides management Ethernet connectivity to the OA, server blade iLO, and interconnects
- Provides multi-user, role-based access for enclosure, server, and interconnect management.

An optional second OA in the BladeSystem c7000 enclosure provides redundancy for these functions.

IT administrators can access the OA in three different ways:

- Through the web browser graphical user interface (GUI)
- Through the scriptable command line interface (CLI)
- Through the built-in Insight Display diagnostic LCD panel on the front of the c-Class enclosure.

The OA with KVM module adds the ability to connect the BladeSystem c7000 enclosure directly to a keyboard, mouse, monitor, or KVM switch through USB/VGA ports. It provides approximately a 1.7x performance boost over the basic OA module and contains a PowerPC 440EPx 400 MHz processor, 1 Gb Ethernet support, and 512 MB DDR2 memory.

For the Onboard Administrator and OA with KVM to be interoperable, upgrade the firmware on both OAs to version 2.41 or later. For detailed information about c-Class enclosure capabilities, refer to “Technologies in the HP BladeSystem c7000 Enclosure”: [http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00816246/c00816246.pdf](http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00816246/c00816246.pdf).

**HP iLO Management Engine**

HP iLO Management Engine is a set of embedded management technologies that comes standard on all ProLiant Gen8 servers. These technologies support the core lifecycle management of the server, including initial deployment, service alerting, and remote support.

The iLO Management Engine subsystem is a standard component of all HP ProLiant Gen8 servers that simplifies initial server blade setup, server health monitoring, power and thermal optimization, and remote server administration. The iLO subsystem includes an intelligent microprocessor, secure memory, and a dedicated network interface. This design makes iLO independent of the host server and its operating system.

iLO Management Engine enables and manages the Active Health System and also features Agentless Management. All key internal subsystems are monitored by iLO. SNMP alerts are sent directly by iLO regardless of the host operating system or even if no host operating system is installed. Using iLO, you can do the following:

- Access a high-performance and secure Remote Console to the server from anywhere in the world.
- Use the shared iLO Remote Console to collaborate with up to six server administrators.
- Remotely mount high-performance Virtual Media devices to the server blade.
- Securely and remotely control the power state of the managed server blade.
- Have true Agentless Management with SNMP alerts from iLO regardless of the state of the host server blade.
- Access Active Health System troubleshooting features through the iLO interface.

For more information about iLO features (which may require an iLO Advanced or iLO Advanced for BladeSystem license), see the iLO documentation on the Documentation CD or on the HP website ([http://www.hp.com/go/ilo/docs](http://www.hp.com/go/ilo/docs)).
**HP Agentless Management**

HP Agentless Management is base hardware monitoring and alerting capability without the complexity of OS-based agents. And it’s available the moment you connect a power cord and Ethernet cable to the server. HP Agentless Management Service is an optional add-on utility that provides OS configuration data and additional subsystem coverage. iLO Management Engine and Agentless Management are components of the HP ProActive Insight architecture and integrated lifecycle automation built into HP ProLiant Gen8 servers. Agentless Management, allows you to monitor core hardware and related alerts without installation of agents or providers on the host OS. On ProLiant Gen8 servers, HP SIM discovers the iLO Management Engine and its host server without software agents. You do not need to install Insight Management agents or WBEM providers. The iLO Management Engine will detect core error conditions within the server and report those error conditions as SNMP alerts to HP SIM or other management consoles. The iLO Management Engine detects and reports error conditions for the following components:

- Embedded Smart Array controllers
- CPU
- Memory
- Power supplies
- Fans
- Thermal sensors

To manage a ProLiant Gen8 server using Agentless Management, your management server must use HP SIM 7.0 or later.

**HP Active Health System**

The HP Active Health System is a diagnostic tool that continuously monitors and records every change in server hardware and system configuration. The Active Health System assists in diagnosing problems and rapidly resolving system failures.

Until now, a system issue without an obvious root cause required using multiple diagnostics tools to investigate the cause. These diagnostic tools may provide the necessary information, but you can only run them after an issue has developed. Another concern is that the tools often analyze subsystems individually instead of collectively. HP Active Health System removes these limitations.

HP Active Health System runs on iLO, so there is no impact on server performance. Active Health System logs every change in hardware and system configuration, variations in temperature and voltage, and every alert. HP support engineers can use this log to solve even the most elusive, intermittent issues in a lot less time. More important, you will spend less time resolving issues.

**Embedded HP Remote Support**

Beginning with HP Insight Remote Support v7.0.5, we’ve enabled HP iLO to access HP Insight Remote Support software in every ProLiant Gen8 server. HP Insight Remote Support Software delivers secure 24/7 support for HP servers and storage. We can remotely monitor your systems for hardware failures using secure technology that’s been proven at thousands of companies around the world. In many cases, our proactive monitoring and alerting can help you avoid problems before they occur. Insight Remote Support can start working for you after a few keystrokes on a single activation screen. For more information, go to [http://h18004.www1.hp.com/products/servers/management/insight-remote-support/next-gen/index.html](http://h18004.www1.hp.com/products/servers/management/insight-remote-support/next-gen/index.html).

**HP Intelligent Provisioning**

HP Intelligent Provisioning provides out-of-the-box, single-server deployment and configuration. Intelligent Provisioning replaces SmartStart and provides an improved user interface and all of the specific tools, drivers, and agents that you need to setup, deploy and maintain your specific ProLiant Gen8 server. Then we enclosed them in an intuitive user interface and embedded them in a NAND flash chip on the motherboard. With Intelligent Provisioning, there is no media. Just press F10 to get started.

This makes deploying ProLiant Gen8 servers up to three times faster than deploying previous-generation servers. If some time passes before you deploy a ProLiant Gen8 server, you can use the built-in update capabilities to access HP.com or your local repository, and download the latest updates.
For specific OS support, see the HP Intelligent Provisioning Release Notes. For more information on Intelligent Provisioning software, see the HP website (www.hp.com/go/intelligentprovisioning).

Power monitoring and management

We enhanced our monitoring and management tools for ProLiant Gen8 servers. These tools include Thermal Logic, HP Systems Insight Manager 7.0 and HP Insight Control Power Management software.

HP Thermal Logic technologies

HP Thermal Logic is our portfolio of technologies embedded throughout ProLiant servers. Thermal Logic reduces energy consumption, reclaims capacity and extends the life of your data center. Thermal Logic innovations include:

- 3D Sea of Sensors – More component and ambient sensors adjust fan speeds and power only the slots in use.
- Power Management Tools – Insight Control management software delivers deep insight, precise control, and ongoing optimization to unlock the potential of your infrastructure Energy Star Qualified Servers – HP has partnered with Energy Star® to offer the most energy efficient servers in the market.

HP 3D Sea of Sensors

3D Sea of Sensors data enables more precise and efficient cooling of ProLiant Gen8 servers. The data is included in the always-on diagnostic information of the HP Active Health System.

HP 3D Sea of Sensors technologies enable the Automated Energy Optimization capabilities in the ProLiant Gen8 server family. With embedded intelligence across three dimensions providing a sense of location, along with more power utilization and thermal demand data, you gain a unique level of visibility and control over the energy efficiency of your data center.

To find out more about Automated Energy Optimization, download this brochure http://h20195.www2.hp.com/v2/GetPDF.aspx/4AA3-9650ENW.pdf

Power provisioning tools

These tools help administrators maximize data center power usage by fitting more IT equipment in the available power and cooling capacity.

- **HP Dynamic Power Capping** – Dynamic Power Capping uses sophisticated monitoring and control circuitry to prevent server power from exceeding a preset level. Because Dynamic Power Capping is hardware-based, it can quickly control sudden surges in power consumption by servers and prevent tripping even the fastest circuit breakers used in HP Power Distribution Units (PDUs). You can set a power cap for an individual server from the iLO user interface. For groups of servers, you can set the power caps from the power management module within HP Insight Control.

- **HP Enclosure Dynamic Power Capping** – We designed Enclosure Dynamic Power Capping technology specifically for BladeSystem enclosures. It lets you set a power cap for an HP BladeSystem Enclosure by using Insight Control (version 2.0 or later) or Onboard Administrator (firmware version 2.30 or later). The Onboard Administrator monitors and maintains the power cap for the entire enclosure by adjusting cap levels on individual server blades. As one server blade becomes busy and another becomes idle, the Onboard Administrator adjusts the individual caps to give each server blade the power it needs while maintaining the total enclosure power draw below the cap.

- **HP Power Advisor utility** – The HP Power Advisor 3.0 utility helps you calculate the expected power use of ProLiant and Integrity servers to determine power distribution, power redundancy, and battery backup requirements. It lets you calculate the power requirements for a single server, a rack of servers, or multiple racks of servers. These calculations are based on data collected through extensive testing of various HP ProLiant and Integrity server configurations, running a particular synthetic workload. You can adjust the calculations to determine server power requirements at different server utilization levels that more closely match your expected workload. Read the "HP Power Advisor utility" technology brief at http://h20000.www2.hp.com/bc/docs/support/SupportManual/c01861599/c01861599.pdf. HP Power Advisor 3.0 and higher include support for ProLiant Gen8 servers.

You can find more information about HP Thermal Logic technologies on the HP website: [www.hp.com/go/thermallogic](http://www.hp.com/go/thermallogic).

**Power Management Tools**

We enhanced Insight Control Power Management software for ProLiant Gen8 server blades.

- We added the Intelligent Power Discovery solution to BladeSystem enclosures attached to HP Intelligent PDUs. Insight Control power management will now automatically discover the power connections for the enclosures. For BladeSystem enclosures, you will no longer have to manually create and edit the rack in HP SIM and Insight Control.

- We upgraded Insight Control Power Management to help you identify unused or under-utilized servers that waste data center resources. Insight Control power management will generate a report summarizing system power consumption by CPU utilization and the age of the system. This enhanced report will aid in planning the retirement or repurposing of under-utilized servers.

- We let you import physical and power topology configuration updates into Insight Control power management from other data center infrastructure management (DCIM) tools, such as HP Asset Center. Before, you could import only initial configurations.

- HP Power Regulator – Insight Control Power Management uses HP Power Regulator technology to control system processor performance states (p-states).

- HP Power meter – An integrated power meter in HP ProLiant c-Class server blades provides analysis of actual server power use. The BladeSystem Onboard Administrator can access the power meter through the external power management software such as HP Insight Power Manager (IPM). IPM also consolidates power data for multiple servers to a central location. IT departments can use this information to charge business units or third parties for the actual energy costs associated with workload processing. The HP BladeSystem Onboard Administrator provides instant and time-averaged views of the power consumption of individual servers or of all servers within a BladeSystem c-Class enclosure.


**HP Insight Management**

HP Systems Insight Manager and HP Insight Control are part of HP Insight Management. These management capabilities enhance your ability to troubleshoot complex problems that span server and storage infrastructure with a single source for server and storage asset information. You get a comprehensive selection of Insight Management products for extended management of HP ProLiant platforms.

**HP Systems Insight Manager for server-storage management**

HP Systems Insight Manager (HP SIM) 7 is the foundation for the HP Insight server-storage management strategy. HP SIM is a hardware-level management product that supports multiple operating systems on HP ProLiant. HP Integrity and HP 9000 servers, HP MSA, EVA, XP storage arrays, and third-party storage arrays. Through a single management view of Microsoft Windows, HP-UX 11i v1, HP-UX 11i v2, HP-UX 11i v3, and Red Hat, and SUSE Linux, HP SIM provides the basic management features of system discovery and identification, single-event view, inventory data collection, and reporting. The core HP SIM software uses Web Based Enterprise Management (WBEM) to deliver the essential capabilities required to manage all HP server platforms.

- HP SIM provides hardware-level management for HP ProLiant servers, HP Integrity servers, HP BladeSystem; HP MSA, HP EVA, and HP XP storage arrays; and HP Networking A-series devices

- HP SIM includes device discovery, identification, and asset management. All asset information is stored in a database for systematic inventory management

- You can generate various reports based on formats using the latest industry standards
• Integrated with HP Insight Remote Support, HP SIM also provides contracts and warranty management, and automates remote support.

• For previous-generation servers, the Version Control Agent (VCA) was responsible for determining whether the server is out of date with its assigned baseline. A baseline is a set of software and firmware that has been tested to work together on a particular server. That required a VCA on every server. On ProLiant Gen8 servers running HP SIM 7.0, users can assign the software and firmware versions that should be installed. The software column of the SIM system list indicates the status of the ProLiant server compared to the assigned baseline.

For ProLiant Gen8 server blades, HP SIM will discover the iLO Management Engine and its host server without software agents. You do not need to install Insight Management agents or WBEM providers. The iLO Management Engine will detect core error conditions within the server and report those error conditions as SNMP alerts to HP SIM or other management consoles.

**HP Insight Control for systems management**

HP Insight Control and Matrix Operating Environment build on and complement the HP SIM capabilities with deployment, migration, power and performance management, and remote monitoring and control. You also get integrated support for virtualization, infrastructure provisioning and optimization, and continuity of services protection. Plug-in applications are available for workload management, capacity management, and virtual machine (VM) management.

HP Insight Control suite provides essential management for enterprise data centers that rely on centralized management of HP ProLiant servers. HP Insight Control, based on HP SIM, provides a unified, secure and extensible platform to centrally manage servers, storage, and other infrastructure devices across heterogeneous operating system environments. For example, HP Insight Control can manage server nodes running both Windows and Linux operating systems. HP Insight Control lowers the operating cost of your HP ProLiant servers with server management that unlocks the potential of ProLiant servers. Increase server deployment speed, reduce unplanned downtime, optimize data center capacity, and reduce system admin expenses and travel costs with complete remote control.

With Insight Control you can expect to realize the following management benefits:

• Deploy and migrate ProLiant servers quickly and consistently

• Manage ProLiant server health and performance proactively

• Control your ProLiant servers from anywhere (iLO Advanced included)

• Optimize power

• Integrate and extend your HP Software, Microsoft System Center®, and VMware vCenter™ Server environment

HP Insight Control delivers complete lifecycle management for HP ProLiant and BladeSystem infrastructure. Delivered on DVD media, Insight Control software uses an integrated installer to deploy and configure HP SIM and essential infrastructure management software rapidly and consistently, reducing manual installation procedures and speeding time-to-production. HP Insight Control provides a single, consistent management environment for rapid deployment of the operating system and hardware configuration. HP Insight Control also allows you to migrate physical and virtual servers to new servers without regard to whether the new servers are virtual or physical. You can also convert between virtualization platforms from various vendors. In addition, Insight Control provides proactive health and performance monitoring, power management, performance analysis, Lights-Out remote management, and virtual machine management for HP ProLiant servers and HP BladeSystem infrastructure. Insight Control also provides seamless single-console integration with Microsoft System Center® and VMware vCenter Server™ for users who have standardized on those management consoles.

HP Insight Control uses HP SIM as the primary management console and includes an iLO Advanced license. HP Insight Control runs on a Windows-based central management server (CMS) and can manage server nodes running both Windows and Linux operating systems.

We offer HP Insight Control for Microsoft System Center for customers that have chosen Microsoft System Center as their primary console. Based on HP Insight Control, it adds several extensions to make the ProLiant management information available through the System Center consoles, and also adds monitoring, alerting, proactive virtual machine management, and ProLiant OS deployment and update capabilities to the System Center consoles.

We offer HP Insight Control for VMware vCenter Server for customers that have chosen VMware vCenter Server as their primary console. Based on HP Insight Control, it adds several extensions to make the ProLiant management information available through the System Center consoles, and also adds monitoring, alerting, proactive virtual machine management, and ProLiant OS deployment and update capabilities to the System Center consoles.
available through the VMware vCenter Server console, enabling comprehensive monitoring, remote control, and power optimization directly from the vCenter console.

HP Insight Control includes one year of 24 x 7 HP Software Technical Support and Update Service ensuring rapid access to HP support staff and proactive delivery of software updates. For more information about this service, please visit: www.hp.com/go/insight.

**HP Insight Online**

The HP Insight Online, the industry’s first cloud-based management and support portal, gives you anywhere, anytime, any device support as well as user-friendly access to track server health and events and rapidly resolve issues. HP Insight Online is a new addition to HP Support Center for one stop, secure and personalized access to product and HP support information specific to your IT environment with standard HP warranty, CarePack or contract services. It’s designed for your IT staff who deploy, manage and support systems, as well as HP Authorized Partners who support your IT infrastructure. Through the HP Support Center, you have the option to automatically display devices remotely monitored by HP. It provides the ability to easily track service events and support cases, view device configurations and proactively monitor HP contracts and warranties. This allows your staff or HP Authorized Services Partner to be more efficient in supporting and servicing your IT environment. What’s more, they have the ability to do all this from anywhere and at any time. For more information on HP Insight Online http://h18004.www1.hp.com/products/quickspecs/14255_div/14255_div.html

**HP Smart Update system software management**

In complex data centers, as well as environments with only a few servers, updates to deploy new features, products, and bug fixes can be disruptive. We addressed this industry-wide need to reduce update complexity and frequency with the release of HP Smart Update consisting of HP Service Pack for ProLiant (HP SPP) and HP Smart Update Manager (HP SUM). Together, these management tools give you more flexibility, less downtime, and better overall operating stability. In addition, we provide 12 months of technical support for each HP SPP.

**HP Service Pack for ProLiant**

HP SPP is a comprehensive package of systems software (drivers, agents, utilities) and firmware for HP ProLiant SL, ML, and DL 300, 500, 700, and 900 Series servers. HP SPP supports ProLiant BL Series servers starting with G5 servers (includes HP ProLiant 100 series), two ProLiant 100 series G7 servers, and HP ProLiant Gen8 servers. Each HP SPP contains firmware and software components (drivers, agents, tools) that have undergone interdependency testing to ensure operational reliability. Each SPP supports update deployment of servers running Microsoft Windows, Linux, and VMware operating systems.

We typically release SPPs to coincide with major HP ProLiant server releases. Occasionally, we will need to release firmware, software components, or both with critical fixes outside an SPP release. These are known as Hot Fixes. You do not have to update your servers with a Hot Fix unless it affects your environment.

Firmware, software, and Hot Fixes with associated Customer Advisories for HP ProLiant servers and HP BladeSystem enclosure components will be available from the consolidated SPP download page below.

For a complete list of supported servers, review the HP Service Pack for ProLiant Server Support Guide for each SPP release. For a list of the contents of the SPP, see the HP Service Pack for ProLiant Release Notes or the contents report. All of these are available at www.hp.com/go/spp, and then click the link for SPP documentation.

**HP Smart Update Manager**

HP SUM is the HP deployment utility for firmware, drivers, agents and other tools. HP SUM has a simple, intuitive user interface that guides you through repository definition, device discovery, analysis, and updates. It provides comprehensive information on available updates, criticality, and interdependencies. It simplifies the firmware and software update process. It lets you schedule online updates, and improves reliability of the deployment and installation process. It is also scriptable through its command line interface and input file functionalities.

HP SUM does not permanently install agents or deployment software on the target servers. It uses Simple Object Access Protocol (SOAP) to push the update utilities from the HP SUM instance to the target server to execute the discovery,
inventory, and scheduling of the correct components to be downloaded. After the update, HP SUM removes all software used during the update and creates a log of everything that occurred.

HP SUM offers several advantages:

- It improves the efficiency of ProLiant servers and HP BladeSystem enclosure updates by preloading only what is needed and enabling online update components.
- It lets you schedule updates and reboots to occur at convenient times and gives you the option to maintain multiple repositories to apply updates consistently.
- It provides faster online updates for enclosures through improvements in Onboard Administrator and Virtual Connect update times.
- It supports HP CloudSystem Matrix.

**Data security technology with the Trusted Platform Module**

The Trusted Platform Module (TPM) is a hardware-based system security feature that can securely store information such as passwords and encryption keys to authenticate the platform. Administrators can also use TPM to store platform measurements that help ensure that the platform remains trustworthy. Select ProLiant Gen8 server blades support an optional TPM v1.2. A rivet supplied with the optional TPM v1.2 module attaches and secures the module to the system board. To prevent possible damage to the TPM module or to the system board, the TPM cannot be removed from the board once it has been installed.

For additional information about the TPM, see the HP technology brief titled “Data security in HP ProLiant servers using the Trusted Platform Module and Microsoft Windows BitLocker™ Drive Encryption”: http://h20000.www2.hp.com/bc/docs/support/SupportManual/c01681891/c01681891.pdf

**Conclusion**

HP ProLiant Gen8 server blades use a balanced architecture in a highly dense form factor and incorporate the latest Intel Xeon and AMD Opteron multi-core processors, high-performance HP SmartMemory, and Smart Storage options. HP design and engineering continue to provide user-centric features such as Smart Drive Carriers and FlexibleLOMs that make hardware configuration simpler and serviceability easier. We provide superior thermal and power/performance control with 3D Sea of Sensors and Dynamic Power Capping technologies. HP iLO Management Engine with Active Health technology raises the quality and detail of server core reporting to new levels. We continue to lead the industry trends to network convergence and virtualization with HP Virtual Connect FlexFabric adapters and interconnects.

Even world-class technology can’t do the job unless you can make it work in complex IT environments. HP lets you deploy, configure, monitor, and manage one or many Gen8 servers through HP Converged Infrastructure and Integrated Lifecycle Automation. These powerful management strategies and software suites give you the ability to monitor and manage entire IT ecosystems.
For more information

Visit the URLs listed below if you need additional information.

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<td>HP BladeSystem</td>
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<td>HP Smart Update (HP Service Pack for ProLiant and HP Smart Update Manager 5)</td>
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