Technical white paper

HP ProLiant DL580 Gen8 Server technology

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Introduction

The HP ProLiant DL580 Gen8 Server is a four-socket (4S) scale-up platform designed for performance, efficiency, and reliability. The server architecture and key technologies make the DL580 Gen8 server an excellent choice for enterprise customers seeking enhanced performance and investment protection. To meet the requirements for demanding and data-intensive workloads, the architecture includes key advancements in processor performance, memory capacity, I/O bandwidth, and storage performance.

Figure 1. The HP ProLiant DL580 Gen8 Server.

The DL580 Gen8 server accommodates up to four Intel® Xeon® E7 4800/8800 v2 processors, as much as 3 TB[1] memory capacity (with 32-GB DIMMs), and large I/O scalability with nine PCIe Gen3 slots. This expansive ability makes the DL580 Gen8 server well-suited for the following environments:

- **Large Enterprise Database**—The server's high (60) processor core capability provides up to 30x faster database processing (over previous generation systems) for handling large online transaction processing (OLTP) and decision support data bases.
- **Server Consolidation and Virtualization**—Within a virtual environment, the DL580 Gen8 server's high-bandwidth and large memory capacity provide a 2x increase (over previous generation systems) in execution speed of multiple applications.
- **High Performance Numeric Computing**— The DL580 Gen8 server easily handles the high I/O bandwidth requirements of these applications through its capability of up to three double-wide x16 General-Purpose Computing on Graphics Processing Units (GPGPUs). The GPGPUs offload repetitive floating-point applications (numeric computing intensive, high precision arithmetic). GPGPUs have a 10x floating point advantage over processors.

Of course, the expansiveness of the DL580 Gen8 server doesn't mean that you have to start with a fully loaded system—it's also about headroom for future scale-up. The DL580 Gen8 server allows you to scale both the processor and memory subsystems significantly, as your business demands grow to avoid additional server acquisitions and keeps your total cost of ownership (TCO) down.

The DL580 Gen8 server meets the resiliency and robustness requirements for critical environments. We have developed a number of technologies for the DL580 Gen8 server —memory protection schemes, RAID functions, wellness features, data-at-rest encryption, and power and cooling redundancy—that address your data availability, protection, and integrity concerns.

The DL580 Gen8 server offers comprehensive management capabilities. A combination of hardware and software features allows your IT personnel to provision, monitor, and maintain the server locally or remotely. The robust architecture and easy manageability of the ProLiant DL580 Server translates to less attention required of your IT personnel. Nevertheless, the mechanical design of the DL580 Gen8 server allows quick access to virtually all major components to facilitate servicing that requires minimum or even no downtime.

The following sections describe he technical details of the DL580 Gen8 server.

[1] 6-TB capacity with 64-GB DIMMs, when available.

Key features

Key features of the DL580 Gen8 server include:

- Four sockets for Intel E7 4800/8800 v2 series processors (up to 15 cores per processor, 60 cores total)
- 96 DIMM sockets for a maximum memory capacity of 3 TB with 32 GB DIMMs (6 TB with 64 GB DIMMs[2])
- 10 Small Form Factor (SFF) drive bays (12 Gbps SAS interface)
- HP Smart Array P830i Controller with 2G FBWC or optional 4G FBWC
- Flexible LAN-on-Motherboard, user selectable NIC:
  - Four 1 GbE ports
  - Two 10 GbE ports
- Front panel accessibility to key components including:
  - Hard drives
  - USB and video ports
- Four hot-pluggable Common Slot power supplies (maximum)
- Nine PCIe Gen3 I/O slots:
  - Four x8 slots
  - Five x16 slots
- Unified Extensive Firmware Interface (UEFI) mode and Legacy mode
- Physical security: security bezel with key
- Data security:
  - UEFI Secure Boot
  - Intel Secure Key
  - Intel OS Guard
  - TPM (optional)

The modular architecture of the DL580 Gen8 server eases serviceability in an enterprise environment. These features include:

- A front-serviceable component drawer for the processor, memory, and fans
- A System Insight Display panel (Figure 2) that indicates the system layout and provides the status of key components and functions
- DIMMs mounted in easily-removable cartridges
- Common Slot hot-plug power supplies for quick replacement
- All internal SFF drive bays accessible from the front panel
- "3D Sea of Sensors" technology to track and manage the temperature and health of the individual subsystems and the field-replaceable units (FRUs)

Figure 2. System Insight Display
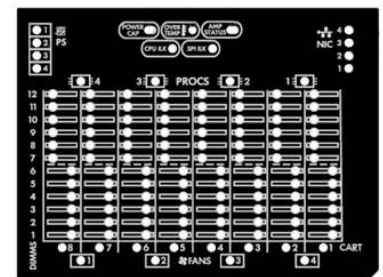
Operating systems and virtualization software

The DL580 Gen8 server can run the following operating systems and virtualization software:

- Microsoft® Windows® 2008 Server with Service Pack 2 (SP2) (Standard, Datacenter, Enterprise, Web, and Embedded Editions)
- Microsoft Windows 2008 Server R2 with Service Pack 1 (SP1) (Standard, Datacenter, Enterprise, Web, and Embedded Editions)
- Microsoft Windows 2012 Server (Standard and Datacenter Editions, and Hyper-V)
- Microsoft Windows 2012 Server R2 (Standard and Datacenter Editions, and Hyper-V)
- Microsoft Windows Hyper-V, R2 with SP1
- Red Hat® Enterprise Linux (RHEL) 6.4 (includes XEN and KVM)
- SUSE Linux Enterprise Server (SLES) 11 SP3 (includes XEN and KVM)
- VMware vSphere 5.5

[2] When available.

For more information on the latest compatible OSs, virtualization software, and software drivers available for your server, see our Support Matrix at hp.com/go/ossupport.

Comparison of the HP ProLiant DL580 Gen8 Server to the HP ProLiant DL580 G7 Server

When compared to ProLiant G7 Servers, the DL580 Gen8 server can bring the latest advancements and benefits to your environment, including:

- **Processors**—With the latest Intel® Xeon® Processor E7 4800/8800 v2 series, the DL580 Gen8 server allows up to 60 cores for better performance of multithreaded applications and more resources for virtual machines.
- **Memory**—With 96 DIMM sockets and 32GB DDR3 DIMMs, the DL580 Gen8 server is capable of a 3 TB[3] memory footprint... a 50% increase.
- **Storage Controller**—An integrated Smart Array P830i storage controller comes standard with Flash-Backed Write Cache (FBWC) and provides up to 12 Gbps SAS throughput for an almost 2x performance improvement.
- **Network Controller**—A FlexibleLAN-On-Motherboard (FlexibleLOM) design allows you to configure the system with a NIC solution best suited to your network infrastructure— without requiring the use of an I/O slot.
- **UEFI compliant**—As a successor to legacy BIOS, UEFI offers significant advantages in system manageability, pre-boot security, and storage capability.

Table 1 presents a comparison of the DL580 Gen8 server to the previous ProLiant DL580 G7 Server.

Table 1. Comparison of DL580 Gen8 server and DL580 G7 server

Component	ProLiant DL580 Gen8 Server	ProLiant DL580 G7 Server
Chipset	Intel C602J Chip set with three QPI links per processor at 8.0GT/s per link	Intel 7500 Chip set with four QPI links per processor at 6.4GT/s per link
Processors	Intel Xeon processor E7 4800/8800 v2 series; up to 15 cores per CPU for a maximum of 60 cores per server. Smart Socket Guide processor mount simplifies processor upgrades	Intel Xeon processor E7 series; up to 10 cores per CPU for a maximum of 40 cores per server
Memory	96 DDR3 sockets, up to 1600 MT/s, 3-TB[4] maximum capacity	64 DDR3 sockets, up to 1066MT/s, 2-TB maximum capacity
Storage Controller	HP Smart Array P830i 12 Gbps SAS controller	HP Smart Array P410i 6 Gbps SAS controller
Internal drives	10 SFF SAS/SATA/SSD	8 SFF SAS/SATA/SSD
Network Controller	FlexibleLOM configure-to-order (CTO) choice of: Quad 1 GbE NIC Dual 10 GbE NIC	Embedded NIC: Standard: NC375i Quad Port GbE Multifunction NIC; Optional: Dual Port 10 GB E upgrade
Expansion Slots	9 PCIe Gen3 I/O slots: Four x8 slots Five x16 slots	Up to 11 FL/FH I/O slots Base: 2 PCI-E 2.0 x16, 3 PCI-E 2.0 x8 Optional mezzanines: Option 1: 2 PCIe 2.0 x16, 4 PCIe 2.0 x8 Option 2: 1 PCIe 2.0 x16, 2 PCIe 2.0 x8, 1 PCIe 2.0 x4, 2 PCI-X
USB Ports	Front: 2, Rear: 4, Internal: 2	Front: 2, Rear: 2, Internal: 1
System ROM	UEFI ROM with option for UEFI mode or Legacy mode	Legacy BIOS only
Redundancy	Fan: Hot-Plug, N+1 redundant fans Power: Up to four (N+N) 1500W 94% efficient, common slot; optional	Fan: Hot-Plug, N+1 redundant fans Power: Up to four N+N) 1200W 94% efficient, common slot; optional

[3]3-TB capacity with 32-GB DIMMs. 6-TB capacity possible when 64-GB DIMMs are available.
[4] 6-TB capacity with 64-GB DIMMs when available.

**Table 1.** Comparison of DL580 Gen8 server and DL580 G7 server   (continued)

Component	ProLiant DL580 Gen8 Server	ProLiant DL580 G7 Server
Management	Integrated Lights-Out 4 (iLO 4), Insight Control, System Insight Display, Intelligent Provisioning, active Health System, Embedded Remote capability, Agentless Management	Integrated Lights-Out 3 (iLO 3), Insight Control, System Insight Display

HP ProLiant DL580 Gen8 Server architectural overview

The DL580 Gen8 server is a powerful, 4U enterprise server incorporating technologies that extends the capabilities of industry standard x86 computing. This high-performance server can run both 32-bit and 64-bit applications simultaneously. The ability to accommodate four processors running up to 60 cores with access to 3 TB[5] of memory yields a dramatic increase in performance over previous generation systems.

Figure 3 shows the architecture of the DL580 Gen8 server.

Figure 3. HP ProLiant DL580 Gen8 Server architecture.
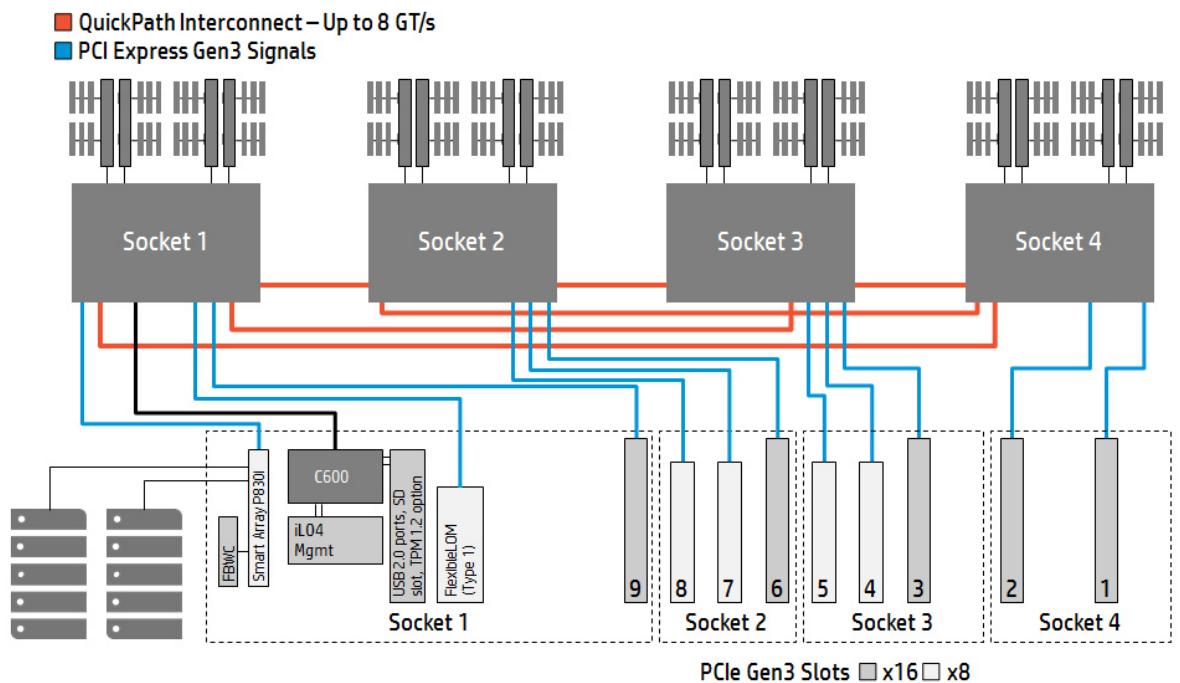
Processors

The DL580 Gen8 server accommodates up to four Intel Xeon E7 4800/8800 v2 series processors. With up to 15 cores per processor, a 60-core server running 120 logical processors with hyper-threading enabled is possible. The four-socket architecture uses three 8.0 GT/s Quick-Path Interconnect® links to each processor. The Intel Xeon E7 4800/8800 v2 series processors add new memory capabilities as well as reliability, availability, and serviceability (RAS) enhancements over earlier generation processors.

Intel Xeon E7 4800/8800 v2 series processor advantages include:

- Up to 15 cores per processor
- Up to 30 threads per processor with Intel Hyper-Threading Technology

[5]With 32-GB DIMMs. 6 TB capacity possible with 64-GB DIMMs when available.

- QuickPath architecture with three 8.0 GT/s links
- Up to 37.5 MB of shared cache per processor
- Integrated memory controllers with up to 24 DIMMS per processor
- Intel scalable memory buffer (SMB) and scalable memory interconnects (SMI)
- Up to 8.0 GT/s memory bandwidth with 1600 MHz DIMMs

The DL580 Gen8 server also takes advantage of Intel Xeon E7 4800/8800 v2 series processor's advanced RAS capabilities for the following functions:

- HP Advanced Error Recovery and HP Memory Quarantine/HP Advanced Error Containment
- HP Advanced Fault Resiliency for:
  - DDDC (memory)
  - SDDC (memory)
  - Online Sparing (memory)
  - Interconnects and clocks
  - Fans
  - Power Supplies
- HP Advanced Event Detection and Reporting for:
  - Active Health System
  - Address/Control parity
  - Patrol and Demand Scrub
  - Integrated Management Logs
  - OS level logging and crash dumps
  - HP Qualified Options
  - HP Smart Memory

Table 2 lists the processor options available for the DL580 Gen8 server.

Table 2. Processor options for the DL580 Gen8 server

Category	Model	Number of cores	Frequency	Average CPU Power (ACP)	Cache size
Lower core, higher frequency	E7-8893v2 E7-8891v2	6 10	3.4 GHz 3.2 GHz	155 W 155 W	37.5 MB 37.5 MB
Advanced	E7-4890v2 E7-4880v2 E7-4870v2 E7-4860v2	15 15 15 12	2.8 GHz 2.5 GHz 2.3 GHz 2.6 GHz	155 W 130 W 130 W 130 W	37.5 MB 37.5 MB 30 MB 30 MB
Standard	E7-4850v2 E7-4830v2 E7-4820v2	12 10 8	2.3 GHz 2.2 GHz 2.0 GHz	105 W 105 W 105 W	24 MB 20 MB 16 MB
Basic	E7-4809v2	6	1.9 GHz	105 W	12 MB
High performance, low power	E7-8880v2	15	2.2 GHz	105 W	37.5 MB
High Performance Computing (HPC) optimized	E7-8857v2	12	3.0 GHz	130 W	30 MB

The DL580 Gen8 server features the HP Smart Socket Guide. This new design allows the installation and upgrade of processors to be a quick and precise routine that lowers the risk of improper installation, thereby reducing the chance of downtime.

Memory

The DL580 Gen8 server can be loaded with up to 96 DDR3 RDIMMs for a maximum footprint of 3 TB (with 32 GB DIMMs) and up to 6 TB of memory with future 64 GB DIMMs. The DL580 Gen8 server accommodates 4, 8, 16, and 32GB DDR3-1866/1600 RDIMM or Load Reduced DIMMs (LRDIMMs) that load into easily removable memory cartridges. Each processor contains two memory controllers, and each controller includes four channels. Each channel includes up to three DIMMs, for a total of 24 DIMMs per processor. The DIMMs are arranged 12 to a cartridge, two cartridges per processor, for a total of eight cartridges.

Each memory controller has two Scalable Memory Interface Gen2 (SMI) links operating in lockstep. Each SMI link connects to a scalable memory buffer (SMB). The SMB allows the scaling of memory up to 24 DIMMs per processor.

Achieving optimum memory performance

The DL580 Gen8 server includes 96 DIMMs slots across four multi-core processors. While there are multiple DIMM population configurations that may provide a desired memory size, you can only achieve optimal performance when populating DIMMs that can take advantage of the Intel Xeon Processor E7 v2 series architecture.

For optimum performance, we recommend the following practices (listed in order of significance for memory performance):

- Use both memory controllers inside the processor and populate two memory cartridges for each installed processor.
- Populate each DDR3 channel in each memory cartridge. To achieve this, the minimum DIMM count per cartridge is four DIMMs installed in DIMM locations A, B, C, and D.
- Dual- and quad-rank DIMMs provide the greatest capacity with the existing memory technology.

Note
The DL580 Gen8 server accepts LRDIMMs. LRDIMMs are labeled as quad-rank DIMMs. There are four ranks of DRAM on the DIMM, but the LRDIMM buffer creates an abstraction that allows the DIMM to appear as a logical dual-rank DIMM to the system. This is called Rank-Multiplication. The LRDIMM buffer also isolates the electrical loading of the DRAM from the system to allow for faster operation. These two changes allow the system to accommodate up to three LRDIMMs per memory channel, providing for up to 50% greater memory capacity and higher memory operating speed compared to quad-rank RDIMMs.

The DDR3 memory speed is a function of the Intel QuickPath Interconnect (QPI) bus speed determined by the processor. The DL580 Gen8 server runs all DIMMs at the highest possible speed that the processor and the installed memory are both capable. For example, processors with a QPI speed of 8.0 GT/s run memory at 1600 MT/s; processors with a QPI of 6.4 GT/s run memory at 1066 MT/s, processors with a QPI speed of 5.6 GT/s run memory at 978 MT/s, and processors with a QPI speed of 4.8 GT/s run memory at 800 MT/s. Memory speed is also effected by DIMM loading.

Table 3 shows the suggested DIMM loading for obtaining maximum throughput (MT/s) in performance mode.

Table 3. DIMM loading for performance mode

DIMM type	DIMM rank	Voltage	Maximum transfer rate (MT/s)		
			1 DIMM per channel	2 DIMMs per channel	3 DIMMs per channel
RDIMM	Single rank (4 GB)	LV	1333	1066	1066 (1.5V)*
	Single rank (4 GB)	STD	1333	1333	1066
	Single rank (8 GB)	LV	1333	1066	1066 (1.5V)*
	Single rank (8 GB)	STD	1333	1333	1066
	Dual-rank (16 GB)	LV	1333	1066	1066 (1.5V)*
	Dual-rank (16 GB)	STD	1333	1333	1066
LRDIMM	Quad-rank (32 GB)	STD	1333	1333	1333

* Using LV DIMMs in a 3 DIMMs per channel configuration causes the system to default to standard (STD) voltage.

Table 4 shows the suggested DIMM loading for obtaining maximum throughput (MT/s) in lockstep mode.

Table 4. DIMM loading for lockstep mode

			Maximum transfer rate (MT/s)		
DIMM type	DIMM rank	Voltage	1 DIMM per channel	2 DIMMs per channel	3 DIMMs per channel
RDIMM	Single rank (4 GB)	LV	1333	1066	1066 (1.5V)*
	Single rank (4 GB)	STD	1333	1333	1066
	Single rank (8 GB)	LV	1333	1066	1066 (1.5V)*
	Single rank (8 GB)	STD	1333	1333	1066
	Dual-rank (16 GB)	LV	1333	1066	1066 (1.5V)*
	Dual-rank (16 GB)	STD	1333	1333	1066
LRDIMM	Quad-rank (32 GB)	STD	1600	1600	1333

* Using LV DIMMs in a 3 DIMMs per channel configuration causes the system to default to standard (STD) voltage.

Memory RAS

To enhance availability, the server provides the following Advanced Memory Protection (AMP) modes:

- HP Advanced Error Recovery
- HP Memory Quarantine
- Advanced ECC
- Double device data correction (DDDC)—provides the capability to withstand failures in two x4 DRAM devices. DDDC can fix both single-and double-DRAM device memory errors.
- Online spare memory—rank sparing
- Mirrored Memory provides optimum protection against failed DIMMs. If one DIMM in a processor's memory cartridge experiences an uncorrectable error, the DIMM in the processor's mirrored cartridge can provide the correct data.

HP Memory Quarantine
As reliable as memory has become, there is still the risk of memory errors… especially with memory footprints in the terabytes. HP memory quarantine works with the MCA Recovery function of the processor that detects unrecoverable memory errors. When such an error is detected (which could otherwise result in a system halt or shutdown), HP Memory Quarantine tags the memory location as no longer usable and sends the address to the OS or hypervisor. The OS or hypervisor can then block out access to the bad location and continue to use the good memory around it.

Advanced ECC memory
Advanced ECC memory is the default memory mode for the DL580 Gen8 server. Advanced ECC memory can correct single-bit memory errors and multi-bit memory errors on a single x8 or two adjacent x4 DRAM devices. The DL580 Gen8 server provides notification when correctable errors exceed a predefined threshold. When Advanced ECC detects uncorrectable errors, the server notifies the user and shuts down the operating system. Advanced ECC is available for up to 3 terabytes of memory.

Double device data correction
The DL580 Gen8 server offers double device data correction (DDDC) with the Intel Xeon Processor E7 series. DDDC produces significantly less system downtime over SDDC. It can tolerate soft and hard errors encountered in up to two x4 DRAM devices within any DIMM pair. Tolerating memory faults greatly extends system up-time.

Using two DIMMs in a pair group, 16 check bits are available to the error correcting algorithm to protect 128 data bits (16 bytes) of data. By reserving one x4 DRAM device in each rank as a spare, the DDDC algorithm assures data availability after hard failures occur within any two x4 DRAM devices.

The DDDC algorithm protects against double-device failure of x4 DIMMs. DDDC is disabled if the memory configuration includes a mix of x4 and x8 DIMMs. This scenario will engage Single Device Data Correction (SDDC). Note that enabling Memory Mirroring will disable DDDC. In DDDC mode, DL580 Gen8 server provides the full memory bandwidth and capacity that is available in the system. There is no capacity or bandwidth overhead associated with enabling DDDC.

Online spare memory—rank-sparing

Online spare memory, or rank-sparing, protects against persistent DRAM failure. Online spare memory monitors DIMMs for excessively frequent correctable errors. It copies the content of an unhealthy rank to an available spare rank in advance of multi-bit or persistent single-bit failures. Rank-sparing is more efficient than DIMM-sparing because only a portion of a DIMM is set aside for memory protection.

When the system enables online sparing, the first ranked DIMM pair of 1A/8A are set aside as the sparing ranks, reducing available memory. If a DIMM rank on either of the SMI buses exceeds its correctable ECC threshold, the contents of the failing DIMM ranks go to the spare DIMM ranks. Once the copy is complete, all memory accesses to the previous failing DIMM ranks go to the spare DIMM ranks.

During normal operation, there is no performance penalty for rank-sparing. Upon detection of a frequent error, the performance impact occurs only during the time it takes to copy the data from the failing rank to the spare rank.

Online spare memory gives additional protection against degrading DIMMs. For example, rank sparing allows the allocation of a rank in a DIMM as the online spare memory for a collection of two DIMMs. If one of the non-spare DIMMs exceeds a threshold for correctable memory errors, the server automatically copies the contents of the degraded memory to the online spare rank. Then the server deactivates the failing memory rank, and automatically switches over to the online spare rank. This reduces the likelihood of uncorrectable memory errors, which could result in server downtime. Online spare memory protection is available independently of the operating system.

Mirrored memory

Mirrored memory, (available in the future), protects against failed DIMMs for up to 1 TB of active memory and 1 TB of mirrored memory using 32-GB DIMMs. Within each processor, mirroring occurs on the memory controller level. Note that each memory controller provides two scalable memory interconnect (SMI) links. When two memory controllers mirror each other, DIMM pairs associated with each memory controller maintain a copy of all memory contents. Memory writes go to DIMM pairs of both memory controllers. Memory reads come from only one set of DIMM pairs of the two memory controllers, unless an uncorrectable error occurs. If a memory read on one DIMM pair returns incorrect data due to an uncorrectable memory error, the system automatically retrieves the correct data from the mirrored DIMM pair. Systems do not lose mirroring protection because of transient and soft uncorrectable errors and maintain mirroring protection unless memory in both DIMM pairs fail.

I/O expansion

The DL580 Gen8 server provides nine I/O full length, full height PCIe 3.0 (Gen3) expansion slots. PCIe 3.0 is an expansion bus technology that arises from earlier PCI and PCIe technologies. A PCIe interface includes one or more lanes, as determined by the PCIe slot. Multiple-lane connections specified as x8 for an 8-lane link, and x16 for a 16-lane link.

Each PCIe 3.0 lane consists of four wires for a differential pair of transmit-and-receive signals. PCIe 3.0 increases the serial transfer rate to 8 GT/s (over the PCIe 2.0 rate of 5 GT/s) and upgrades the encoding to 128b/130b (over the 8b/10b encoding of PCIe 2.0). Each PCIe 3.0 lane has a bandwidth of 985 MB/s per lane, effectively doubling the 512 MB/s throughput of PCIe 2.0. The end ports of the PCIe links automatically negotiate the highest bit rate and the highest number of lanes of which the slot and the add-in card are both capable.

The DL580 Gen8 server allows concurrent operation of all nine slots offering a substantial aggregate bandwidth. The server can accommodate dual-slot, high-powered PCIe add-in cards, and provides six auxiliary power connectors. With unencumbered bandwidth to the host memory, 225W and 300W add-in boards may perform high-performance computations demanded by vector processors and IO accelerators.

Table 5 lists the key parameters of the PCIe slots.

Table 5. HP ProLiant DL580 Gen8 Server PCIe Gen3 expansion slot parameters

Slot	Lane width	Connector width	Slot size	Processor link
9	x16	x16	FH, FL, dual-width	CPU 1
8	x8	x16	FH, FL, single-width	CPU 2
7	x8	x16	FH, FL, single-width	CPU 2
6	x16	x16	FH, FL, dual-width	CPU 2
5	x8	x16	FH, FL, single-width	CPU 3
4	x8	x16	FH, FL, single-width	CPU 3
3	x16	x16	FH, FL, dual-width	CPU 3
2	x16	x16	FH, FL, dual-width	CPU 4
1	x16	x16	FH, FL, dual-width	CPU 4

Notes:
- Availability of PCIe slots is dependent on processors installed.
- All slots are PCIe Gen3 and can accommodate full-height (FH), full-length (FL) expansion cards.
- The system can accommodate five 225-watt or four 300-watt expansion boards.

Storage

The DL580 Gen8 server provides ten internal small form factor (SFF) storage device bays (five upper, five lower) to accommodate solid-state (SSD) or hard disk (HDD) drives. Control for the ten drives can be through the embedded Smart Array Controller, or split between the embedded Smart Array Controller (for the lower five drives) and an additional optional Smart Array Controller PCIe card (for the upper five drives).

HP SFF HDD 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. HP SFF SSDs are now available in two versions: 12-Gb SAS enterprise performance drives and 12-Gb SAS enterprise mainstream drives. The two versions allow you to choose the performance and endurance best suited to your application.

The DL580 Gen8 server uses the latest version of our HP SmartDrive hot-plug carriers and an embedded Smart Array P830i/2G Controller, discussed in the following sections.

HP SmartDrive

The DL580 Gen8 server uses re-designed HP SmartDrive hot-plug carriers. HP SmartDrive carriers feature an enhanced display that makes servicing drives quicker and with significantly less chance of mistakes that can cause downtime and data loss. The enhanced display includes the following indicators:

- Drive activity spinner
- Do Not Remove indicator
- Drive status indicator
- Smart carrier authentication
- Drive error log NVRAM

Each drive carrier also features an authentication mechanism for ensuring that the drive is a trusted HP Qualified Option that is fully tested and optimized for the HP system.

Embedded HP Smart Array P830i/2G Controller

The DL580 Gen8 server features a Smart Array P830i/2G Controller embedded on the System Peripheral Interface (SPI) board. This controller includes a 12-Gbps Serial Attached SCSI (SAS) interface for up to a 2x performance increase over previous controllers when used with the latest 12-Gbps SAS storage devices.

Multiple technologies are included in the Smart Array P830i/2G (optional 4G) Controller to help you manage and protect your data faster and more confidently:

- **Drive Parameter Tracking:** monitors drive operational parameters, predicting failure and notifying the administrator.
- **Dynamic Sector Repairing:** continually performs background surface scans on the disk drives during inactive periods and automatically remaps bad sectors, ensuring data integrity.
- **RAID 6 with Advanced Data Guarding (ADG):** allocates two sets of parity data across drives and allows simultaneous write operations. This level of fault tolerance can withstand two simultaneous drive failures without downtime or data loss.
- **RAID 60 and RAID 5 (Distributed Data Guarding):** allocates one set of parity data across drives and allows simultaneous write operations. This level of fault tolerance can withstand a single drive failure without downtime or data loss.
- **RAID 5+0:** a RAID 0 array striped across elements. It combines the straight block-level striping of RAID 0 with the distributed parity of RAID 5.
- **RAID 1, 1+0 (Drive Mirroring):** allocates half of the drive array to data and the other half to mirrored data, providing two copies of every file. It is a high-performance RAID.
- **RAID 1 Advanced Data Mirroring (ADM) and RAID 10 ADM:** 1000x safer for data protection then a 2- drive mirroring or 3-drive RAID 5. New smart algorithms for 95% faster RAID setup-reduces initialization time from weeks to hours for large arrays
- **Smart Array Cache Tracking:** monitors integrity of controller cache, allowing pre-failure preventative maintenance.
- **Recovery ROM:** protects from firmware image corruption by storing a redundant copy of the image. If the active image becomes corrupt, the controller will use the redundant image and continue operating.
- **DRAM ECC:** detects and corrects data bit errors.
- **Flash-Backed Write Cache (FBWC):** memory module with capacitor-pack backup power. In the event of a controller or server failure, you can remove the FBWC module from the SPI board and place it in another system. The cached data will move to the disk drives
- **On-Line spares:** minimize downtime, reconstruct data, and facilitate a quick recovery from drive failure. You can install up to two spare drives before a drive failure. If a failure occurs, the recovery begins automatically with an On-Line Spare and data reconstructs.
- **HP Secure Encryption:** helps customers deal with data privacy challenges by encrypting the data through the use of data encryption keys via an easy-to-use deployment methodology. HP Secure Encryption encrypts the data on both the attached storage device *and* cache memory of the controller (i.e., data-at-rest encryption). All SDD and HDD devices in the Smart Drive portfolio for HP ProLiant Gen8 Server are applicable.

Networking interface

The DL580 Gen8 server uses FlexibleLOM technology, which puts the network interface controller (NIC) on a daughter card. This design offers the close-coupled performance of an embedded controller while allowing you to select the network interface best suited to your environment—without sacrificing an expansion slot.

Three NIC options are available through the configure-to-order (CTO) or build-to-order (BTO) process:

- 4-port 1 GbE331 FLR Ethernet Adapter
- 2-port 10 GbE 534 FLR-SFP+ FlexFabric Adapter
- 2-port InfiniBand adapter[6]

ProLiant Network Adapter Teaming provides fault tolerance and load balancing across a team of two or more network adapters. The team of adapters works as a single virtual adapter. Several different types of teaming are available. Teaming options offers an easy, efficient, and cost-effective way to provide network fault tolerance and increased network bandwidth.

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[6]When available.

Server management technologies

Extensive server management is possible with the DL580 Gen8 server. Integrated Lights Out generation 4 (iLO 4) is included with the DL580 Gen8 server and, with the optional HP Insight Control utility, offer comprehensive and efficient hardware and software management needed for enterprise environments. Server management technologies offered by the DL580 Gen8 server include the following:

- iLO 4 management interface
- HP Insight Controller 7.2

HP iLO 4 management interface

The DL580 Gen8 server includes Integrated Lights Out 4 (iLO 4), the latest generation of our management interface. The iLO 4 hardware and firmware provide remote server management capabilities over the Ethernet. The iLO 4 management processor remains available whenever power is applied to the server chassis, even if the system is in shutdown.

iLO 4 uses a dedicated Ethernet port. The port can connect to a highly secured, dedicated management network that is out of the server's data path. Alternately, iLO 4 provides a Shared Network Port (SNP) that allows network access to both iLO and the host server using a single network port. SNP allows routing of iLO network traffic through a sideband connection on one of the server NIC interfaces. Although the iLO traffic shares a port with the server OS traffic, both the iLO processor and the server NIC have their own Media Access Control (MAC) address, which gives iLO and the server separate Internet Protocol (IP) addresses. The SNP simplifies hardware installation and reduces hardware costs because corporate and iLO network traffic comes through the system NIC.

With iLO 4 you can:

- Reduce expense and travel costs by accessing the embedded, secure Remote Console to the server from anywhere.
- Perform Intelligent Provisioning with 45% fewer startup steps for 3x faster deployment.
- Remotely mount high-performance Virtual Media devices to the server from anywhere on the network.
- Monitor the system using agentless management for increased security and stability.
- Send alerts regardless of the state of the host server.
- Perform Active Health diagnostics 5x faster without affecting server performance.
- Launch URL or scriptable Virtual Media from Remote Console.
- Experience a streamlined user interface using Web 2.0 technologies.
- Experience AES (in addition to RC4) encryption in the hardware for improved performance.

HP Insight Control

HP Insight Control is an optional management utility that gives you more control over your ProLiant servers. Installed as a virtual machine appliance, Insight Control 7.2 represents the next generation of multi-server OS and firmware provisioning.

Replacing the Symantec-based Rapid Deployment Pack (RDP) uses previously, Insight Control 7.2 offers the following key benefits:

- Rapid server provisioning from hours and days to minutes
- Fast and easy setup—installs as a virtual machine appliance in about an hour
- Easy to migrate from RDP with additional RDP Migration Service if needed
- Simple to operate leveraging HP Intelligent Provisioning for PXE-free deployments
- OS provisioning for the latest Windows, Red Hat, ESXi, and SUSE versions, as well as server firmware.
- Applicable to ProLiant G7 and G6 servers as well as optimized for ProLiant Gen8 / PXE-free intelligent provisioning
- Simple migration path from RDP to Insight Control server provisioning

Power management technologies

The DL580 Gen8 server includes the following power manager functions:

- HP Power Regulator
- HP Dynamic Power Capping

HP Power Regulator

The DL580 Gen8 server includes HP Power Regulator, an innovative OS-independent power management tool. HP Power Regulator is a ROM-based utility used to set the server to power modes:

- **Static high power**—Server runs continuously in the highest performance state
- **Static low power**—Server runs continuously in the lowest power state
- **Dynamic power savings**—Server processor-power adjusts according to application activity

HP Power Regulator improves the energy efficiency of the DL580 Gen8 server. Intel processors run at full power when they need to, but with reduced application activity, they run in a power savings mode without performance degradation. HP Power Regulator modes are set through RBSU during POST or the iLO 4 remote management console.

HP Dynamic Power Capping

Server performance per watt continues to increase steadily. However, the number of watts per server also continues to climb. These increases, combined with the growing number of servers and density in modern data centers, make planning and managing facility power and cooling resources critically important. HP Dynamic Power Capping is a ProLiant power management tool unique to HP and assists the data center administrator with managing these critical tasks.

Dynamic Power Capping is hardware based, and therefore can control server power consumption quickly. Dynamic Power Capping ensures sudden surges in server power demand do not allow the HP Power Distribution Unit circuit breakers to trip. Administrators can use power consumption information gathered with Insight Control power management software to set appropriate power caps to individual servers. Setting power caps to the peak observed power consumption makes it possible to free up additional power. Power is then available for additional servers.

UEFI mode

UEFI is a firmware interface with the same basic purpose of legacy BIOS, but uses a different firmware stack. UEFI employs a modular structure (Figure 4) of drivers and files grouped into services that adapts well to complex and varied architectures. UEFI's framework of coding is designed to scale with server architectural trends, including new processors.

Figure 4. UEFI elements
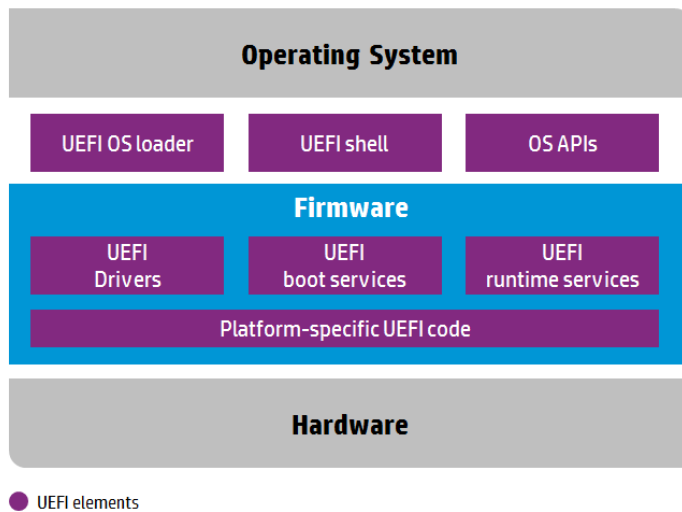
The DL580 Gen8 server includes HP-enhanced UEFI, a superset of the standard UEFI specifications that offers an advanced feature set. Our enhanced UEFI offers robust functionality including:

• Configuring system devices and installed options.

• Secure Boot that allows the system firmware, option card firmware, operating systems, and software collaborate to enhance platform security.

• Enabling and disabling system features.

• PXE boot support for IPv6 networks.

• PXE Multicast Boot allowing for faster PXE deployments for large numbers of servers.

• Enhanced UEFI Shell that provides a pre-boot environment for running scripts and tools.

• Access to the iLO 4 management engine.

• Operating system specific functionality, such as Microsoft Windows 2012, which supports several features only when installed in UEFI mode.

• ProLiant user interface that is intuitive and informative.

The UEFI pre-boot networking capabilities facilitate the DL580 Gen8 server's ability for Intelligent Provisioning. Intelligent Provisioning replaces the process of using CDs/DVDs for loading or updating firmware and software let you connect directly to hp.com to download drivers and firmware, perform updates, and install the operating system in the same step. Re-imaging a system's drive remotely from a backup server is also possible.

The DL580 Gen8 server's UEFI firmware includes a Compatibility Support Module (CSM) allowing the system to boot into Legacy mode or UEFI mode. The DL580 Gen8 server can be configured as a legacy BIOS-based platform (default) or a UEFI-based platform. This flexibility allows the system to be used in existing infrastructures that are legacy BIOS-based but might transition to UEFI in the future.

Conclusion

The outstanding four-socket scalability for the Intel Xeon E7 4800/8800 v2 processor, massive memory capacity, and PCIe expansion ability of the DL580 Gen8 server give it class-leading resiliency against application growth. This results in lower acquisition cost (both in hardware and licensing), reducing your total cost of ownership (TCO)… as much as 41 percent over previous generations.

Resources, contacts, or additional links

HP ProLiant DL580 Gen8 Server
hp.com/servers/dl580-gen8

UEFI: Successor to Legacy BIOS technical white paper
hp.com/V2/GetDocument.aspx?docname=4AA5-1111ENW&cc=us&lc=en

Best Practices for Deploying Linux on HP ProLiant DL580 Gen8 technical white paper
hp.com/V2/GetDocument.aspx?docname=4AA5-1115ENW&cc=us&lc=en

Best practices for configuring Microsoft Windows Server with the HP ProLiant DL580 Gen8 Server
hp.com/V2/GetDocument.aspx?docname=4AA5-1110ENW&cc=us&lc=en

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