RETIRED: Retired products sold prior to the November 1, 2015 separation of Hewlett-Packard Company into Hewlett Packard Enterprise Company and HP Inc. may have older product names and model numbers that differ from current models.

Overview

HPE ProLiant WS460c Gen8 Graphics Server Blade

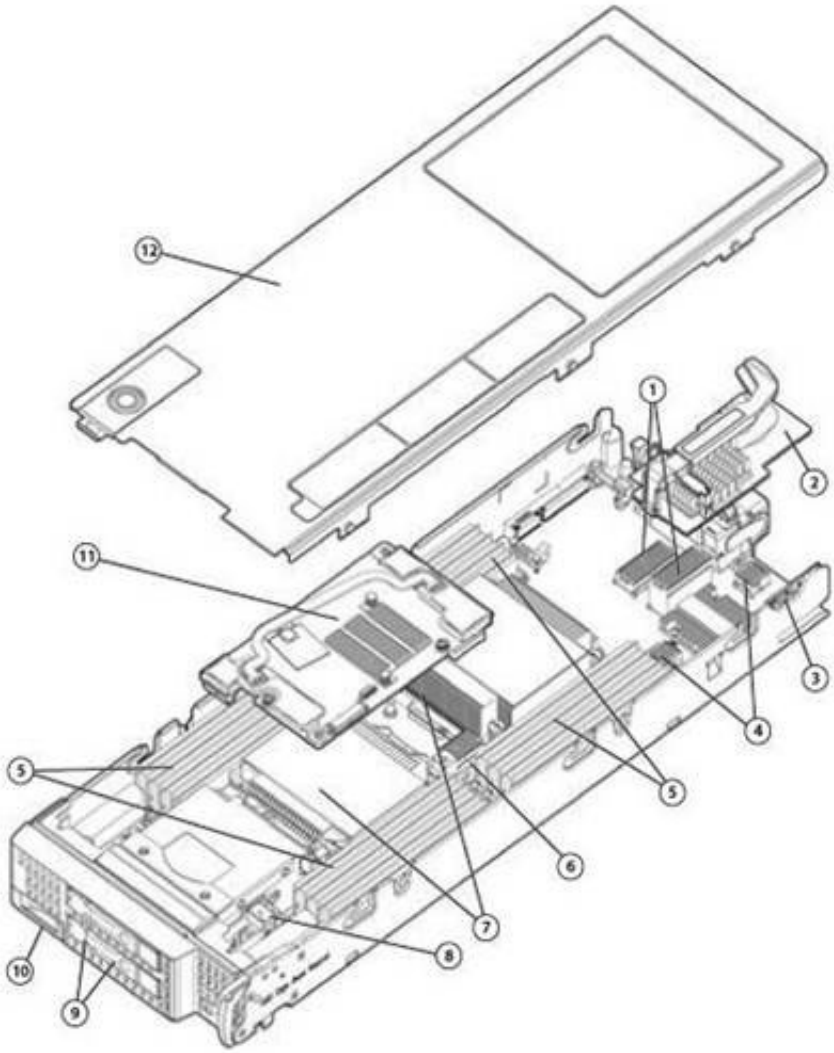

Figure 1 - HPE ProLiant WS460c Gen8 Graphics Server Blade (single-width type)

1. Two (2) PCIe 3.0 mezzanine I/O expansion slots
2. FlexibleLOM adapter
3. MicroSDHC card connector
4. FlexibleLOM connectors (supporting one (1) FlexibleLOM)
5. Sixteen (16) DDR3 DIMM memory slots (8 per processor)
6. HPE Smart Array P220i/P230i Controller connector
7. Up to two (2) Intel® Xeon® E5-2600 family processors
8. Internal USB 2.0 and Trusted Platform Module (TPM) connectors
9. Two (2) small form factor (SFF) hot-plug drive bays
10. HPE c-Class Blade SUV (Serial, USB, VGA) connector
11. HPE Smart Array P220i/P230i Controller with 512MB FBWC
12. Access panel

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Overview

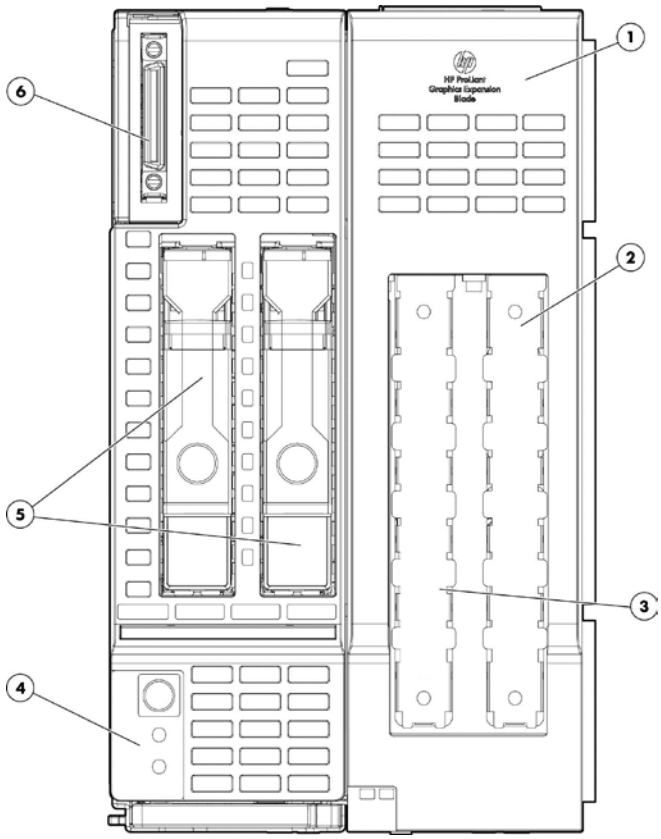

Figure 2 - HPE ProLiant WS460c Gen8 Graphics Server Blade with graphics expansion (double-width type)

1. HPE Graphics Expansion Blade
2. Standard full length PCI Express Generation 2 (x16) slot 2
3. Standard full length PCI Express Generation 2 (x16) slot 1
4. HPE ProLiant WS460c Gen8 Graphics Server Blade base system
5. Small form factor (SFF) drive bays
6. Local I/O Connector (shown with cover removed)

What's New

- Support for AMD FirePro S4000X MXM mezzanine graphics
- Support for HPE Fibre Channel HBA mezzanine cards
- Support for HPE FlexFabric 20Gb 2-port 630FLB adapter
- Support for HPE OneView Software License

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Standard Features

This document covers the HPE ProLiant WS460c Gen8 Graphics Server Blade and its specific options. For more information on HPE BladeSystem c-Class Enclosures and HPE BladeSystem c-Class Interconnect and Mezzanine Components, please see the following:

- HPE BladeSystem c-Class Enclosures QuickSpecs:
  - HPE BladeSystem c3000 Enclosure QuickSpecs:
    http://h18000.www1.hp.com/products/QuickSpecs/12790_div/12790_div.html
    NOTE: The c3000 HPE c-Class enclosures have full backwards and forwards compatibility, existing server blades are supported in the new enclosures and any future server blades will be supported in the existing enclosures.
  - HPE BladeSystem c7000 Enclosure QuickSpecs:
    http://h18000.www1.hp.com/products/QuickSpecs/12810_div/12810_div.html
    NOTE: The c7000 HPE c-Class enclosures have full backwards and forwards compatibility, existing server blades are supported in the new enclosures and any future server blades will be supported in the existing enclosures.
    NOTE: For optimal cooling and system performance the WS460c Gen8 requires the c7000 enclosure to be configured with 10 fans and the c3000 enclosure to be configured with 6 fans.
  - HPE BladeSystem c-Class Interconnect and Mezzanine Components:
    http://h18004.www1.hp.com/products/blades/components/c-class-interconnects.html
    http://h18004.www1.hp.com/products/blades/components/c-class-adapters.html

The HPE ProLiant WS460c Gen8 provides greater 2P x86 server blade density without compromise and maximum power-efficiency with flexibility and choice.
HPE ProLiant WS460c Gen8 Graphics Server Blade and optional HPE WS460c Gen8 graphics expansion blade includes:

NOTE: For the Standard Features shipped in the "Factory Integrated Models", please see the "Configuration Information - Factory Integrated Models" section.

HPE Processor	**E5-2600 v2 series Processors**
One of the following depending on Model	Intel® Xeon® E5-2697 v2 (2.7GHz/12-core/30MB/8.0GT-s QPI/130W, DDR3-1866, HT, Turbo2- 3/3/3/3/3/3/3/4/5/6/7/8)
	Intel® Xeon® E5-2695 v2 (2.4GHz/12-core/30MB/8.0GT-s QPI/115W, DDR3-1866, HT, Turbo2- 4/4/4/4/4/4/4/4/5/6/7/8)
	Intel® Xeon® E5-2690 v2 (3.0GHz/10-core/25MB/8.0GT-s QPI/130W, DDR3-1866, HT, Turbo2- 3/3/3/3/3/3/3/4/5/6)
	Intel® Xeon® E5-2680 v2 (2.8GHz/10-core/25MB/8.0GT-s QPI/115W, DDR3-1866, HT, Turbo2- 3/3/3/3/3/4/5/6/7/8)
	Intel® Xeon® E5-2670 v2 (2.5GHz/10-core/25MB/8.0GT-s QPI/115W, DDR3-1866, HT, Turbo2- 4/4/4/4/4/4/5/6/7/8)
	Intel® Xeon® E5-2660 v2 (2.2GHz/10-core/25MB/8.0GT-s QPI/95W, DDR3-1866, HT, Turbo2- 4/4/4/4/4/4/5/6/7/8)
	Intel® Xeon® E5-2643 v2 (3.5GHz/6-core/25MB/8.0GT-s QPI/130W, DDR3-1866, HT, Turbo2- 1/1/1/1/2/3)
	Intel® Xeon® E5-2650L v2 (1.7GHz/10-core/25MB/8.0GT-s QPI/70W, DDR3-1600, HT, Turbo2- 2/2/2/2/2/2/2/3/4)
	Intel® Xeon® E5-2667 v2 (3.3GHz/8-core/25MB/8.0GT-s QPI/130W, DDR3-1866, HT, Turbo2- 3/3/3/3/4/5/6/7)
	Intel® Xeon® E5-2643 v2 (3.5GHz/6-core/25MB/8.0GT-s QPI/130W, DDR3-1866, HT, Turbo2- 1/1/1/1/2/3)
	Intel® Xeon® E5-2637 v2 (3.5GHz/4-core/15MB/8.0GT-s QPI/130W, DDR3-1866, HT, Turbo2- 1/1/2/3)

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Standard Features

Intel® Xeon® E5-2640 v2 (2.0GHz/8-core/20MB/7.2GT-s QPI/95W, DDR3-1600, HT, Turbo2- 3/3/3/3/3/3/4/5)
Intel® Xeon® E5-2630 v2 (2.6GHz/6-core/15MB/7.2GT-s QPI/80W, DDR3-1600, HT, Turbo2- 3/3/3/3/4/5)
Intel® Xeon® E5-2630L v2 (2.4GHz/6-core/15MB/7.2GT-s QPI/60W, DDR3-1600, HT, Turbo2- 2/2/2/2/3/4)
Intel® Xeon® E5-2620 v2 (2.1GHz/6-core/15MB/7.2GT-s QPI/80W, DDR3-1600, HT, Turbo2- 3/3/3/3/4/5)
Intel® Xeon® E5-2609 v2 (2.5GHz/4-core/10MB/6.4GT-s QPI/80W)
Intel® Xeon® E5-2603 v2 (1.8GHz/4-core/10MB/6.4GT-s QPI/80W)

E5-2600 series Processors

Intel® Xeon® E5-2690 (2.9GHz/8-core/20MB/8.0GT-s QPI/135W, DDR3-1600, HT, Turbo2- 4/4/4/5/5/7/7/9)
Intel® Xeon® E5-2680 (2.7GHz/8-core/20MB/8.0GT-s QPI/130W, DDR3-1600, HT, Turbo2- 4/4/5/5/5/7/8/8)
Intel® Xeon® E5-2670 (2.6GHz/8-core/20MB/8.0GT-s QPI/115W, DDR3-1600, HT, Turbo2- 4/4/5/5/6/6/7/7
Intel® Xeon® E5-2667 (2.9GHz/6-core/15MB/8.0GT-s QPI/130W, DDR3-1600, HT, Turbo2- 3/3/3/4/5/6)
Intel® Xeon® E5-2665 (2.4GHz/8-core/20MB/8.0GT-s QPI/115W, DDR3-1600, HT, Turbo2- 4/4/5/5/6/6/7/7)
Intel® Xeon® E5-2660 (2.2GHz/8-core/20MB/8.0GT-s QPI/95W, DDR3-1600, HT, Turbo2- 5/5/6/6/7/7/8/8)
Intel® Xeon® E5-2650 (2.0GHz/8-core/20MB/8.0GT-s QPI/95W, DDR3-1600, HT, Turbo2- 4/4/5/5/5/7/8/8)
Intel® Xeon® E5-2650L (1.8GHz/8-core/20MB/8.0GT-s QPI/70W, DDR3-1600, HT, Turbo2- 2/2/3/3/4/4/5/5)
Intel® Xeon® E5-2643 (3.3GHz/4-core/10MB/130W) Processor Kit
Intel® Xeon® E5-2640 (2.5GHz/6-core/15MB/7.2GT-s QPI/95W, DDR3-1333, HT, Turbo2- 3/3/4/4/5/5)
Intel® Xeon® E5-2637 (3.0GHz/2-core/5MB/8.0GT-s QPI/80W, DDR3-1600, HT, Turbo2- 5/5)
Intel® Xeon® E5-2630 (2.3GHz/6-core/15MB/7.2GT-s QPI/95W, DDR3-1333, HT, Turbo2- 3/3/4/4/5/5)
Intel® Xeon® E5-2630L (2.0GHz/6-core/15MB/8.0GT-s QPI/60W, DDR3-1333, HT, Turbo2- 3/3/4/4/5/5)
Intel® Xeon® E5-2620 (2.0GHz/6-core/15MB/7.2GT-s QPI/95W, DDR3-1333, HT, Turbo2- 3/3/4/4/5/5)
Intel® Xeon® E5-2609 (2.4GHz/4-core/10MB/6.4GT-s QPI/80W)
Intel® Xeon® E5-2603 (1.8GHz/4-core/10MB/6.4GT-s QPI/80W)

NOTE: The Intel Xeon E5-2600 v2 Processor Family can only be configured with the new 1866MHz HPE Smart Memory or the new 1600MHz Low Voltage (1.35v) HPE Smart Memory. The previously shipping Intel Xeon E5-2600 Processor Family cannot be configured with the new 1866MHz HPE Smart Memory or the new 1600MHz Low Voltage (1.35v) HPE Smart Memory.
NOTE: DIMM slots 4 and 5 are not accessible when either the E5-2690, the E5-2643, the E5-2643 v2, or the E5-2637 v2, or the E5-2667 v2 is used. In a 2 processor configuration, there are twelve (12) total available DIMM slots.
NOTE: For the maximum supported memory speeds for each processor listed above, please reference the 'Memory Speed by Processor Model' table in the Memory section of the QuickSpecs.
NOTE: HT indicates that the processor model supports Intel® Hyper-Threading Technology.
NOTE: Turbo indicates the maximum potential frequency increment when using Intel® Turbo Boost Technology, with 8, 7, 6, 5, 4, 3, 2 or 1 core(s) active.
NOTE: DDR3 speed is the maximum memory speed of the processor. Actual memory speed may depend on the quantity and type of DIMMs installed.
NOTE: Up to 2 processors supported. Mixing different processor models is not supported.
NOTE: For the Intel® C600 Chipset E5-2600 Series, the letter preceding the model number indicates the Product Line (E3, E5, E7); 2600x, 2 = number of CPUs in a Node, 6 is socket/segment designation, 00 = Processor SKU, and x = L for low power SKUs.
NOTE: The WS460c Gen8 supports one or two processors.
NOTE: The WS460c Gen8 includes two I/O mezzanine expansion slots. A processor must be installed in processor slot 1 for access to the first mezzanine expansion slot (expansion slot 1). A processor must be installed in processor slot 2 for access to the second mezzanine expansion slot (expansion slot 2).
NOTE: All processors within the server must be identical.

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Standard Features

NOTE: All processors support Intel® Hyper-Threading and Intel® Turbo Boost Technologies except the E5-2603 and E5-2609.
NOTE: The letter "L" following the model number indicates denotes lower wattage.
NOTE: The processor model as well as the memory configuration determines the maximum speed memory can operate. Please see the see the "Memory" section later in this document.
NOTE: The Intel Xeon E5-2620 processor does not support DIMMs at 1.35V. Using the HPE RBSU, 1.35V DIMMs can be changed to operate at 1.5V.
NOTE: When HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits are used with any processors except the E5-2690, the E5-2643, the E5-2637 v2, the E5-2643 v2, or the E5-2667 v2 all 16 DIMM slots on the WS460c Gen8 must be fully populated with these 24GB DIMMs. When HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits are used with either the E5-2690, the E5-2643, the E5-2637 v2, the E5-2643 v2, or the E5-2667 v2, all 12 available DIMM slots on the WS460c Gen8 must be fully populated with these 24GB DIMMs.

Cache Memory One of the following depending on Model	30MB (1x30MB) L3 cache **NOTE: For Twelve-core processors.** 25MB (1x25MB) L3 cache **NOTE: For Six, Eight or Ten-core processors.** 20MB(1x20MB) shared L3 cache **NOTE: For Eight-core processors.** 15MB(1x15MB) shared L3 cache **NOTE: For Quad or Six-core processors.** 10MB(1x10MB) shared L3 cache **NOTE: For Quad-core processors.** 5MB (1x5MB) Level 3 cache **NOTE: For Dual-core processors.**
Chipset	Intel® C600 series Intel® E5-2600 and 2600v2 Processor Families **NOTE: For more information regarding Intel chipsets, see http://www.intel.com/products/server/chipsets/**
Upgradeability	Upgradeable to two (2) processors
On System Management Processor	HPE iLO (Firmware: HPE iLO 4) **NOTE: For more information, visit: http://www.hp.com/go/ilo**
Memory Protection	Advanced ECC mode Memory Online Spare Mode (Rank Spare Mode) Lockstep Mode
Memory	Type HPE SmartMemory

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Standard Features

	DDR3 Load Reduced (LRDIMM), Registered (RDIMM), or Unbuffered ECC (UDIMM)
DIMM Slots Available	Sixteen (16) DIMM slots
Standard (Pre-configured Models)	32GB (4 x 8GB) DDR3 1600MHz RDIMMs at 1.5V
One of the following depending on Model	
Maximum (LRDIMM)	512GB (16 x 32GB) up to 1333MHz at 1.35V
Maximum (RDIMM)	256GB (16 x 16GB) up to 1600MHz at 1.5V 384GB (16 x 24GB) up to 1333MHz at 1.35V
Maximum (UDIMM)	128GB (16 x 8GB) up to 1600MHz at 1.5V

NOTE: HPE memory from previous generation servers are not qualified or warranted with this server. HPE SmartMemory is required to realize the memory performance improvements and enhanced functionality listed in this document for Gen8. For additional information, please see the HPE SmartMemory QuickSpecs at:
http://h18000.www1.hp.com/products/QuickSpecs/14225_div/14225_div.html
NOTE: LRDIMM, RDIMM and UDIMMs are all distinct memory technologies and cannot be mixed within a server. The majority of ProLiant Gen8 servers support RDIMM, UDIMM and LRDIMM.
NOTE: The internal USB 2.0 Port is not available when the HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits (700404-B21) are used.
NOTE: When HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits are used with any processors except the E5-2690, the E5-2643, the E5-2637 v2, the E5-2643 v2, or the E5-2667 v2 all 16 DIMM slots on the WS460c Gen8 must be fully populated with these 24GB DIMMs. When HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits are used with either the E5-2690, the E5-2643, the E5-2637 v2, the E5-2643 v2, or the E5-2667 v2, all 12 available DIMM slots on the WS460c Gen8 must be fully populated with these 24GB DIMMs.
NOTE: The Intel Xeon E5-2600 Processor Family cannot be configured with the new 1866MHz HPE Smart Memory or the new 1600MHz Low Voltage (1.35v) HPE Smart Memory.
NOTE: Depending on the memory configuration and processor model, the memory speed may run at 1866MHz, 1600MHz, 1333MHz, or 1066MHz. Please see Memory Population Table or the Online Memory Configuration Tool at: http://www.hp.com/go/ddr3memory-configurator.

Network Controller
One of the following depending on Model

Pre-configured Models
One (1) HPE Flex-10 10Gb 2-port 530 FlexLOM

Configurable Models
One FlexibleLOM from below.
One (1) HPE Flex-10 10Gb 2-port 530 FlexLOM or
One (1) HPE FlexFabric 10Gb 2-port 534FLB FlexibleLOM or HPE FlexFabric 10Gb 2-port 554FLB FlexibleLOM, HPE FlexFabric 20Gb 2-port 630FLB

NOTE: Windows 7, directly presiding on system (i.e. "OS on bare-metal"), is supported only with HPE Flex-10 10Gb 2-port 530FLB or HPE FlexFabric 10Gb 2-port 534FLB FlexibleLOM with basic network functions only. All other adapters supported with use on server OS or hypervisor environment only.
NOTE: FlexFabric supported only with server OS and/or in a virtualized environment using hypervisors.
NOTE: Supports FCoE, Flex-10, TCP/IP offload engine, hardware-based accelerated iSCSI, iSCSI boot, and autosensing 10Gb/1Gb Ethernet.
NOTE: Each port is autosensing 1Gb/10Gb, and can interoperate with 1Gb HPE BladeSystem c-Class

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Standard Features

interconnect components. Both ports will operate at the same speed.
NOTE: FlexFabric capabilities require the use of an HPE Virtual Connect FlexFabric module. Fibre Channel over Ethernet (FCoE) is supported with the HPE 10GbE Pass-Thru Module, HPE 6120XG Blade Switch with the CEE license installed, HPE Cisco B22HPE Fabric Extender and HPE Cisco B22HPE Fabric Extender with 16 FET for BladeSystem c-Class. Learn more at:
http://www.hp.com/go/bladesystem/interconnects
NOTE: FlexibleLOMs are not compatible with prior generation c-Class server blades

Standard iLO Network Controller:
One (1) 10/100 Mbps port for the HPE iLO 4 to Onboard Administrator link. The Onboard Administrator (with 10/100/1000 Mbps) to BladeSystem link is 1Gbps.

Expansion Slots

Two (2) I/O expansion mezzanine slots: (One occupied and second not available when "2nd slot enablement kit" is installed with expansion blade)

- x16 PCIe 3.0 Type A (supports Type A mezzanine cards) (expansion slot 1).
  NOTE: This expansion slot supports AMD FirePro S4000X.
- x16 PCIe 3.0 Type B (supports Type A and Type B mezzanine cards (expansion slot 2).
  NOTE: This expansion slot supports NVIDIA Quadro K3100M or AMD FirePro S4000X.
  NOTE: A second processor must be installed (in processor slot 2) to have access to the second expansion slot (expansion slot 2).
  NOTE: When NVIDIA Quadro K3100M card is ordered for Mezz slot 2, no other cards may be ordered for Mezz slot 1.
  NOTE: Supports both single and dual Mezz Graphics configuration with AMD FirePro S4000X mezzanine graphics.
- Two (2) Full-size PCIe expansion slots (available with expansion blade only).
  - x16 PCIe 2.0 full-size, full-length PCIe card expansion slot
    NOTE: Supported only with qualified select HPE PCIe cards listed in this document.
- Mezzanine card options include:
  - Dual-port 8Gb or 16Gb Fibre Channel HBA for SAN connectivity.
  - QDR and FDR InfiniBand for low latency and high bandwidth server interconnectivity.

HPE Server ROM

HPE ROM (read only memory) is now digitally signed using HPE's Corporate Signing Service. This signature is verified before the flash process starts, reducing accidental programming and preventing malicious efforts to corrupt system ROM.

HPE ROM provides for essential initialization and validation of hardware components before control is passed to the customer-installed operating system. The ROM also provides the capability of booting from various fixed media (HDD, CD-ROM) and removable media (USB), to continue operation to the operating system.

HPE ROM performs very early configuration of the video controller, to allow monitoring of initialization progress via an attached monitor. If configuration or hardware errors are discovered during this early phase of hardware initialization, suitable messages are now displayed on the connected monitor. Additionally, these configuration or hardware errors are logged to the Integrated Management Log (IML) to assist in diagnosis.

HPE's ProLiant ROM is used to configure the following:

- Processor and chipset status registers
- System memory, memory map, and memory initialization

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Standard Features

- System hardware configuration (integrated PCI devices and optional PCIe cards).
- Customer-specific BIOS configuration using the HPE ROM-Based Setup Utility (RBSU).

NOTE: For further information, please refer to HPE's RBSU (ROM based setup utility) user guide: http://www.hp.com/support/rbsu

Storage Controller	All Models	One (1) HPE Smart Array P220i/P230i Controller with 512MB of flash backed write cache (FBWC), RAID 0 and 1 support, and upgradeable firmware with recovery ROM **NOTE: The HPE Smart Array P220i/P230i supports two (2) small form factor (SFF) hot plug drive bays.** **NOTE: The server supports up to a combined total of two (2) FBWC battery options.**

Maximum Internal Storage One of the following depending on Model	Hot Plug SFF SAS	4.0TB	2 x 2.0TB drives
	Hot Plug SFF SATA	4.0TB	2 x 2.0TB drives
	Hot Plug SFF SAS SSD	3.2TB	2 x 1.6TB drives
	Hot Plug SFF SATA SSD	3.2TB	2x1.6TB drives

NOTE: The ProLiant WS460c Gen8 server includes the new HPE hot plug small form factor (SFF) SmartDrive carrier for enhanced management and reduced maintenance errors. HPE drives from previous generation servers are not compatible with the WS460c Gen8 drive bays.

Interfaces	Micro SDHC Slot	One (1) internal Micro Secure Digital High Capacity (Micro SDHC) card slot
	USB 2.0 Port	One (1) internal USB 2.0 connector for USB flash media drive keys

NOTE: The above options are for integrated hypervisor virtualization environments needing a low cost boot solution with the highest performance and reliability.
NOTE: The internal USB 2.0 Port is not available when the HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits (700404-B21) are used.

Industry Standard Compliance

ACPI 2.0
Microsoft® Logo certifications
USB 2.0 Support
IMPI 2.0
Secure Digital 2.0
TMP 1.2 Support
IEEE (specific IEEE standards dependant on Ethernet adapter card(s) installed)
Advanced Encryption Standard (AES)
Triple Data Encryption Standard (3DES)
SNMP
SSL 2.0
DMTF Systems Management Architecture for Server Hardware Command Line Protocol (SMASH CLP)
Active Directory v1.0
PCIe 3.0

Operating Systems Support for HPE ProLiant

Client Operating Systems:
Microsoft ® Windows 7® Professional (64-bit)
Server Operating Systems:

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Standard Features

Workstations

Red Hat Enterprise Linux (RHEL)
Citrix XenServer
VMware Horizon View 5.2, vSphere 5.1 or later
Microsoft Windows Server

NOTE: For more information on HPE's Certified and Supported ProLiant Servers for OS and Virtualization Software and latest listing of software drivers available for your server, please visit our Support Matrix at: www.hp.com/info/ossupport and our driver download page http://www.hp.com/support/WS460cGen8

Enclosures

Hewlett Packard Enterprise offers two different c-Class workstation blade enclosures to meet your individual needs:
The HPE BladeSystem c7000 rack enclosure is 10U high and holds up to sixteen (16) ProLiant WS460c Gen8 workstations plugged vertically or (8) HPE ProLiant WS460c Gen8 Workstation Blades paired with (8) HPE WS460c Gen8 Graphics Expansion Blades plugged vertically.

The HPE BladeSystem c3000 rack enclosure is 6U high and holds up to eight (8) HPE ProLiant WS460c Gen8 workstations plugged horizontally or (4) HPE ProLiant WS460c Gen8 Workstation Blades paired with (4) HPE WS460c Gen8 Graphics Expansion Blades plugged horizontally.

Workstation blades, server blades, storage blades, interconnect modules, power supplies, fans, and redundant Onboard Administrator modules are all designed to fit into the c3000 and c7000 enclosures.
For additional enclosure information, please see:

http://h18004.www1.hp.com/products/blades/components/enclosures/c-class/index.html

Mezzanine Support

- Two (2) I/O expansion or graphics adapter mezzanine slots
- Supports up to (2) mezzanine cards

Graphics

Integrated Matrox G200 video standard
- 1280 x 1024 (32 bpp)
- 1920 x 1200 (16 bpp)

HPE iLO 4 On System Management Memory
- 16 MB Flash
- 256 MB DDR 3 with ECC (112 MB after ECC and video)

Form factor

HPE ProLiant WS460c Gen8 and WS460c Gen8 Graphics Expansion Blade are both half-height server blades that plug into the HPE BladeSystem c3000 and c7000 enclosures. HPE WS460c Gen8 is a single-width blade while the Graphics Expansion Blade model is double-width.

On System Management

HPE iLO Management Engine

- HPE iLO Management Engine is a comprehensive set of embedded management features supporting the complete lifecycle of the server, from initial deployment, through ongoing management, to service alerting and remote support.
  HPE iLO Management Engine comes standard on all HPE ProLiant Gen8 servers.

  The HPE iLO Management Engine portfolio includes:
  - **HPE iLO**: The HPE iLO management processor is the core

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Standard Features

foundation for other capabilities within HPE iLO Management Engine.

- **HPE Agentless Management** Provides built in server health monitoring and alerting capability without OS agents, that starts working the moment a power cord and an Ethernet cable are connected.

- **HPE Active Health System**: Always on, continuous monitoring for increased stability and shorter downtimes; 100% configuration history; Health and service alerts and easy export and upload to Service and Support.

- **HPE Intelligent Provisioning**: Lets customers provision and configure a single server without any separate media. No more SmartStart CDs or Smart Update Firmware DVD are needed
  - To start Intelligent Provisioning:
    - Press the F10 key during the ProLiant Gen8 server boot process (also known as power on self test or POST).
    - Please go to the Intelligent Provisioning website at **http://www.hp.com/go/intelligentprovisioning** for additional information and to view usage videos.
    - Use the Service Pack for ProLiant (SPP) at **http://www.hp.com/go/spp** to get firmware and software updates.

- **HPE iLO Mobile App**: Enables the ability to access, deploy, and manage your server anytime from anywhere from select smartphones and mobile devices. For additional information please visit: **http://www.hp.com/go/ilo/mobileapp**

NOTE: For more information, visit: http://www.hp.com/go/ilo or HPE iLO Management Engine technologies whitepaper.

HPE Insight Management	HPE Service Pack for ProLiant (SPP)	HPE Service Pack for ProLiant (SPP) and HPE Smart Update Manager (HPE SUM) provide a comprehensive approach to firmware and system software maintenance. Together they provide better operating stability and ensure maximum uptime. The SPP will be updated at a predictable cadence, typically coinciding with new HPE server hardware launches. By enabling firmware to be updated online and integrating firmware and system software updates in one operation, HPE SUM and the SPP offer faster updates of individual servers and dramatically faster updates of entire BladeSystem enclosures. Further improving system uptime and stability is the fact that Hewlett Packard Enterprise provides 12 months of support for each Service Pack for ProLiant release. The user experience around HPE SUM and the SPP has been improved in several ways, starting with the web download. A single web page provides access to a single download containing both the latest version of HPE SUM and the latest SPP. Optional smaller subsets with only specific types of servers or specific operating systems are offered to save on download time. The HPE SUM application provides a straightforward, intuitive user interface that guides the user through the steps of

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Standard Features

discovery, analyses and update, providing comprehensive information on available updates, criticality and interdependencies. This information is also available in reports. By providing the option of multiple local or shared repositories which can be easily updated from hp.com, HPE SUM provides the tools to optimize stability and consistency throughout the company. While HPE SUM and the SPP recommend the combinations of firmware and system software that Hewlett Packard Enterprise has found to be the best practice, the application gives customers the flexibility to set their own specific baseline.

The Service Pack for ProLiant has been rigorously tested with specific attention for interaction between firmware, drivers and agents both within the server as well as in interaction with the BladeSystem enclosure components (Onboard Administrator and Virtual Connect). This testing ensures the highest quality as well as providing the input for HPE SUM to deploy updates taking into account all interdepencies, when determining the correct updates and order of update deployment.

NOTE: The Service Pack for ProLiant (which includes HPE SUM) can be downloaded from http://www.hp.com/go/spp/download. More information can be found: http://www.hp.com/go/SmartUpdate, http://www.hp.com/go/spp and http://www.hp.com/go/hpsum

Security

- Power-on password
- Administrator's password
- HPE iLO 4 On System Management Chipset with:
  - SSL encryption
  - Secure Shell version 2
  - Advanced Encryption Standard (AES) and Triple Data Encryption Standard (3DES) on browser, CLP and XML scripting interface
  - AES and RC4 encryption of video
- External USB port enable/disable
- Network server mode
- Serial interface control
- TPM (Trusted Platform Module) 1.2 option
- Advanced Encryption Standard (AES)
- Intel® Advanced Encryption Standard-New Instructions (AES-NI)

Availability

Memory

- Advanced ECC uses single device data correction (SDDC) to detect and correct single and all multi-bit error that occurs within a single DRAM chip. Both x4 and x8 SDDC are supported (x8 requires lockstep mode).
- Memory online spare mode (also known as rank spare mode) detects a rank that is degrading and switches operation to the spare rank.
- Memory Lockstep mode is used to correct a single x8 DRAM device failure on a DIMM. The DIMMs in each paired memory channel must have identical HPE part numbers.
- Memory demand and patrol scrubbing to prevent accumulation of correctable errors and reducing the likelihood of unplanned downtime.
- Failed DIMM isolation improves the service time thus improving the overall system availability.
- Address parity protection available on RDIMMs and LRDIMMs detects address bit errors to improve service time and overall system availability.

Storage

- Two (2) Small Form Factor hot-plug SAS/SATA/SSD drive bays.
- Integrated HPE Smart Array P220i Controller with 512MB FBWC, RAID 0 and 1 support, and

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Standard Features

upgradeable firmware with recovery ROM capability.
- Optional HPE D2200sb Storage Blade for direct attachment of up to 12 drives to an adjacent blade within the c-Class enclosure. (Available with single-width WS460c only)
- Optional dual-port Fibre Channel mezzanine card for redundant SAN connections. (With configurations where mezzanine slot is available)

Processor/Chipset
- Processor internal sensors & thermal control protection against over-temperature conditions.
- Cache parity/ECC protects cache data from accidental data corruption.
- Machine Check Architecture (MCA) detects and captures hardware errors such as system bus, memory ECC, parity, and cache, and improves service time.
- Intel® QPI Protocol Protection allows detection of data errors using a checksum of 8-bits.
- Core Disable for FRB (fault resilient boot) allows a system to power-on despite a failing core-pair. It uses BIST (built-in self test) results to detect a failure and disables the target core-pair upon subsequent boot.

Blade Enclosure Infrastructure
- Pooled power for true N+N power redundancy through up to six (6) hot-plug, high-efficiency, common slot enclosure-based power supplies (configuration dependent).
- Up to ten (10) redundant enclosure-based hot-plug HPE Active Cool fans that scale to meet future demands and optimize airflow, reduce power draw, and improve acoustic performance.
- Dual grid power providing redundant rack enclosure power feeds to the server blade enclosure.
- HPE Dynamic Power Saver Mode the total enclosure power consumption is monitored in real time and automatically adjusted with changes in demand for improved efficiency and reliability.
- HPE Dynamic Power Capping safely limits power usage without impacting performance by capping peak usage instead of average power usage, removes risk to electrical infrastructure with a fast-acting, hardware-based capping algorithm, and reclaims more power by dynamically controlling power limits based on workload demand.
- Up to eight interconnect modules per server blade enclosure providing four simultaneous redundant fabrics for FlexFabric, Virtual Connect Ethernet, Fibre Channel, InfiniBand, Pass Thru Ethernet, etc.
- Enclosure crosslinks between adjacent enclosures to provide interconnect module-to-module connections or as Virtual Connect module stacking links.
- Optional enclosure redundant Onboard Administrator system management module.

Warranty

- This product is covered by a global limited warranty and supported by HPE Services and a worldwide network of Hewlett Packard Enterprise Authorized Channel Partners. Hardware diagnostic support and repair is available for three years from date of purchase. Support for software and initial setup is available for 90 days from date of purchase. Enhancements to warranty services are available through HPE Pointnext operational services or customized service agreements. Certain restrictions and exclusions apply. Hard drives have either a one year or three year warranty; refer to the specific hard drive QuickSpecs for details.

NOTE: Server/Workstation warranty includes 3 year Parts, 3 year Labor, 3-year on-site support. Warranty repairs may be accomplished through the use of Customer Self Repair (CSR) parts. These parts fall into two categories: 1) Mandatory CSR parts are designed for easy replacement. A travel and labor charge will result when customers decline to replace a Mandatory CSR part; 2) Optional CSR parts are also designed for easy replacement but may involve added complexity. Customers may choose to have Hewlett Packard Enterprise replace Optional CSR parts at no charge. Additional information regarding worldwide limited warranty and technical support is available at:
http://h18004.www1.hp.com/products/servers/platforms/warranty/index.html

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Optional Features

Graphics Adapter

- AMD FirePro S4000X graphics (Single or dual cards configuration capable)
  - For professional 2D & 3D graphics with hardware acceleration via graphics subsystem
  - 2GB (GDDR5) memory
  - Supports up to six displays
  - Mezzanine card can occupy either mezzanine slot 1 and/or 2
  - Windows 7 Pro (64-bit) OS directly presiding on system (i.e. "OS on bare-metal") support only

- NVIDIA Quadro K3100M graphics (Single card configuration only)
  - Workstation class performance for ultra high end professional 3D graphics
  - 4GB (GDDR5) memory
  - Supports up to two displays by default firmware. Up to four displays can be supported by using firmware edition 80.04.F1.00.01 and driver 331.82b or later.
  - Mezzanine card which occupies mezzanine slot 2
  - GPU Pass-through with
    - Citrix XenDesktop 5.6 FP1 Enterprise/Platinum, XenServer 6 Enterprise / Platinum edition
    - VMware Horizon View 5.2 and vSphere5.1

Full-size PCI Express Adapters For WS460c Graphics Expansion Blade:

- NVIDIA GRID K1GPU adapter
  - For VDI acceleration delivering true PC graphics experience
  - Four entry class GPU
  - 4GB (DDR3) memory per GPU, total of 16GB
  - Supports shared graphics, pass-through and hardware GPU virtualization
  - PCIe Gen3, x16 double-width card (One per Graphics Expansion Blade)
  - Available only with Intel® Xeon® E5-2600 v2 series processor configuration

- NVIDIA GRID K2 GPU adapter
  - For VDI acceleration delivering true PC graphics experience
  - Two high-end GPU
  - 4GB (GDDR5) memory per GPU, total of 8GB
  - Supports shared graphics, pass-through and hardware GPU virtualization
  - o PCIe Gen3, x16 double-width card (One per Graphics Expansion Blade)
  - Available only with Intel® Xeon® E5-2600 v2 series processor configuration

- NVIDIA Quadro K4000 (Single-width PCIe x16 in graphics expansion blade)
  - For professional high end 3D graphics and VDI acceleration
  - 3GB (GDDR5) memory
  - Supports up to four displays per card
  - PCIe Gen2, x16 single-width card (Two per Graphics Expansion Blade can be supported.)
  - GPU Pass-through with
    - Citrix XenDesktop 5.6 Enterprise/Platinum, XenServer 6 Enterprise / Platinum editions
    - VMware View Horizon 5.2, vSphere 5.1

- NVIDIA Quadro K5000 (Double-width PCIe x16 in graphics expansion blade)
  - For professional ultra high-end 3D graphics and VDI acceleration
  - 4GB (GDDR5) memory
  - Supports up to four displays
  - PCIe Gen2, x16 double-width card (One per Graphics Expansion Blade)
  - GPU Pass-through with
    - Citrix XenDesktop 5.6 Enterprise/Platinum, XenServer 6 Enterprise / Platinum

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Optional Features

editions
- VMware View Horizon 5.2, vSphere 5.1

- NVIDIA Quadro K6000 (Double-width PCIe x16 in graphics expansion blade)
  - For ultra high-end 3D graphics requiring large-scale visualization and VDI acceleration
  - 12GB (GDDR5) memory
  - Supports up to four displays
  - PCIe Gen3, x16 double-width card (One per Graphics Expansion Blade)
  - GPU Pass-through with
    - Citrix XenDesktop 5.6 Enterprise/Platinum, XenServer 6 Enterprise / Platinum editions
    - VMware View Horizon 5.2, vSphere 5.1

- HPE MultiGPU with six NVIDIA Quadro K3100M
  - Three NVIDIA Quadro K3100M per HPE Multi GPU carrier adapter. Required to use in a set of two HPE Multi GPU cards for total six NVIDIA Quadro K3100M GPUs
  - For VDI acceleration in pass-through mode with Citrix XenServer and VMware vSphere
  - PCIe-x16, Gen2
  - GPU Pass-through with
    - Citrix XenDesktop 5.6 Enterprise/Platinum, XenServer 6 Enterprise / Platinum editions
    - VMware View Horizon 5.2, vSphere 5.1
  - Available only with Intel® Xeon® E5-2600 v2 series processor configuration

- NVIDIA Tesla K20 5GB Computational Accelerator
  - For High Performance Computing (GPGPU acceleration)
  - 2496 CUDA cores
  - 1.17 Tflops of double-precision peak performance
  - 3.52 Tflops of single-precision peak performance
  - PCIe Gen2

- NVIDIA Tesla K20X 6GB Computational Accelerator (Qualified. Factory integration not available)
  - For High Performance Computing (GPGPU acceleration)
  - 2688 CUDA cores
  - PCIe Gen2
  - 1.32 Tflops of double-precision peak performance
    - 3.95 Tflops of single-precision peak performance
  - PCIe Gen2

Fibre Channel Support

When vacant mezzanine slot is available on WS460c, one optional Fibre Channel mezzanine HBA is supported on the HPE ProLiant WS460c Gen8 with server OS or hypervisors. Windows client OS (Windows 7) not supported.

Compatible SAN

HPE ProLiant WS460c Gen8 graphics server blades are optimized for HPE MSA, EVA and XP.
HPE ProLiant WS460c Gen8 graphics server blades are compatible with select 3rd party SANs. Please see blade storage page for more details at:
http://h18004.www1.hp.com/products/blades/components/c-class-sans.html

HPE Virtual Connect

HPE Virtual Connect is an interconnect option for BladeSystem c-Class that simplifies server connectivity to data and storage networks, and reduces costs. Unique HPE Flex-10 technology makes maximum use of network bandwidths, provide dynamic tuning and enable extreme flexibility to meet individual server and infrastructure requirements by allocating up to 4 network connections per server port. Virtual Connect FlexFabric modules extend those capabilities to allocate one function per port to storage connections. HPE

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Optional Features

Virtual Connect Enterprise Manager (VCEM) provides server management software with a central console to administer network connections and workloads for thousands of servers. For more information on Virtual Connect Enterprise Manager, see **http://www.hp.com/go/vcem**. For more information on Virtual Connect Ethernet, Fibre Channel, Converged Network and management options, see **http://www.hp.com/go/virtualconnect**.

HPE Insight Management	HPE Insight Control	HPE Insight Control, a product option, delivers essential infrastructure management that can help save time and money by making it easy to deploy, migrate, monitor, remote control, and optimize your IT infrastructure through a single, simple management console. For more information, see **http://www.hp.com/go/insightcontrol**. HPE Insight Control includes one year of 24 x 7 HPE Software Technical Support and Update Service ensuring rapid access to Hewlett Packard Enterprise support staff and proactive delivery of software updates. For more information about this service, see **http://www.hp.com/services/insight**.
	HPE Matrix Operating Environment	The HPE Matrix Operating Environment (Matrix OE) for ProLiant and Integrity servers is an integrated command center that helps you instantly adjust to dynamic business demands. This advanced infrastructure management software lets you reduce the cost of common data center tasks by up to 40 percent while keeping pace with your changing business. The HPE Matrix OE includes the automated provisioning, optimization, and recovery management capabilities for HPE CloudSystem Matrix, the ideal platform for private cloud and Infrastructure as a Service (IaaS). For more information, see **http://www.hp.com/go/matrixoe**.
	HPE iLO Advanced License for ProLiant BladeSystem Servers	HPE iLO management processors for HPE ProLiant Gen8 servers helps simplify server setup, engage health monitoring and power and thermal control, and promote remote administration. HPE iLO functions out-of-the-box without additional software installation and functions regardless of the servers' state of operation. The HPE iLO can be accessed from any location via a web browser and works hand-in-hand with HPE Systems Insight Manager, Insight Control, and Matrix Operating Environment, helping customers unleash the value of the ProLiant platform and deliver the highest possible quality of IT service to the business. Advanced functionality, such as graphical remote console, multi-user collaboration, and video record/playback can be activated with the optional HPE iLO Advanced or HPE iLO Advanced for BladeSystem licenses. The Advanced licensed features offer sophisticated remote administration of servers in dynamic data center and remote locations and can help significantly reduce cost associated with IT-related travel and unplanned downtime. **NOTE: For more information, visit http://www.hp.com/go/ilo.**
HPE OneView	The HPE OneView architecture combines server, storage, and networking with control of datacenter environmentals into a single, integrated management platform. Architected to deliver lifecycle management for the complete Converged Infrastructure, it facilitates collaboration, removes friction, collapses cycle times, eliminates error-prone work, and accelerates time to value. HPE OneView v1.1 combines management of servers and virtual connect with open integration to automate and customize existing tools and processes. With OneView, you'll work smarter-with greater visibility and control-and fully capitalize on the benefits of a Converged Infrastructure.	

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Optional Features

For more information on HPE OneView management, see: **http://www.hp.com/go/oneview**.

High Performance Clusters	HPE Cluster Platforms	HPE Cluster Platforms are specifically engineered, factory-integrated large-scale ProLiant clusters optimized for High Performance Computing, with a choice of servers, networks and software. Operating system options include specially priced offerings for Red Hat Enterprise Linux and SUSE Linux Enterprise Server, as well as Microsoft Windows HPC Server. A Cluster Platform Configurator simplifies ordering. **http://www.hp.com/go/clusters**
	HPE HPC Interconnects	High Performance Computing (HPC) interconnect technologies are available for this server as part of the HPE Cluster Platform portfolio. These high-speed InfiniBand and Gigabit interconnects are fully supported by Hewlett Packard Enterprise when integrated within an HPE cluster. Flexible, validated solutions can be defined with the help of configuration tools. **http://www.hp.com/techservers/clusters/ucp/index.html**
	HPE Insight Cluster Management Utility	HPE Insight Cluster Management Utility (CMU) is an HPE-licensed and HPE-supported suite of tools that are used for lifecycle management of hyperscale clusters of Linux ProLiant systems. CMU includes software for the centralized provisioning, management and monitoring of nodes. CMU makes the administration of clusters user friendly, efficient, and effective. **http://www.hp.com/go/cmu**
HPE Insight Online		HPE Insight Online is a new addition to the HPE Support Center for one stop, secure access to product and HPE support information personalized to your IT environment. Insight Online can automatically display devices remotely monitored by HPE Insight Remote Support. With Insight Online's easy navigation you can efficiently track your IT support contracts and device status from anywhere and at anytime. **http://www.hp.com/go/insightonline**
Expansion Blade Support		Supports one (1) optional storage, tape, or PCI expansion blade.
Factory Express Portfolio for Servers and Storage		HPE Factory Express offers configuration, customization, integration and deployment services for Hewlett Packard Enterprise servers and storage products. Customers can choose how their factory solutions are built, tested, integrated, shipped and deployed. Factory Express offers service packages for simple configuration, racking, installation, complex configuration and design services as well as individual factory services, such as image loading, asset tagging, and custom packaging. Hewlett Packard Enterprise products supported through Factory Express include a wide array of servers and storage: HPE Integrity, HPE ProLiant, HPE ProLiant Server Blades, HPE BladeSystem, HPE 9000 servers as well as the MSAxxxx, VA7xxx, EVA, XP, rackable tape libraries and configurable network switches. For more information on Factory Express services on your specific server model please contact your sales representative or go to: **http://www.hp.com/go/factory-express**.
HPE Simple Configurator		SCE is a guided self service tool to help sales and non technical people provide customers with initial configurations in 3 to 5 minutes. You may then send the configuration on for configuration help, or use in your existing ordering processes. If you require "custom" rack configuration or configuration for products not available in SCE, please contact Hewlett Packard Enterprise's Customer Business Center or an Authorized Partner for assistance. **http://www.hp.com/products/configurator**

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Service and Support

Service and Support

HPE Technology Services for Industry Standard Servers

HPE Technology Services delivers confidence, reduces risk and helps customers realize agility and stability. Connect to Hewlett Packard Enterprise to help prevent problems and solve issues faster. Our support technology lets you to tap into the knowledge of millions of devices and thousands of experts to stay informed and in control, anywhere, any time.

Protect your business beyond warranty with HPE Pointnext operational services

HPE Pointnext operational services enable you to order the right service level, length of coverage and response time as you purchase your new server, giving you full entitlement for the term you select.

Recommended HPE Pointnext operational services for your HPE product

Optimized Care

HPE Proactive Care Advanced - 24x7 coverage, three year Care Pack Service

Achieve a higher return on your product investment with the personal attention from a locally assigned Account Support Manager who delivers recommendations designed to improve availability and performance. Leverage your system's ability to connect to Hewlett Packard Enterprise for automated problem detection and rapid critical event management to increase stability and reduce unplanned downtime. This recommendation provides 24x7 coverage with four-hour response for hardware and two-hour callback for supported software. Collaborative call management comes with Proactive Care Advanced or you may choose full support from Hewlett Packard Enterprise where we own all cases through to resolution. Hewlett Packard Enterprise is a leading provider of support services for most operating systems used on HPE BladeSystem with long, successful partnerships with vendors such as Microsoft, Red Hat, VMware, SUSE and others. Purchasing software support from Hewlett Packard Enterprise simplifies troubleshooting and shortens time to resolution with one call for hardware or software questions.

https://www.hpe.com/h20195/V2/GetDocument.aspx?docname=4AA5-3259ENW&cc=us&lc=en

Standard Care

HPE Proactive Care with 24x7 coverage, three year Care Pack Service

HPE Proactive Care helps prevent problems and stabilize IT by utilizing secure, real-time, predictive analytics and proactive consultations when your products are connected to Hewlett Packard Enterprise. This Care Pack Service combines three years' proactive reporting and advice with our 24x7 coverage and enhanced escalation management, four hour hardware response time and two hour call back for software questions on leading industry standard software running on your HPE ProLiant server.

https://www.hpe.com/h20195/v2/getpdf.aspx/4aa3-8855enw.pdf

Related Services

HPE ProLiant Server Hardware Installation

Provides for the basic hardware installation of Hewlett Packard Enterprise branded servers, storage devices and networking options to assist you in bringing your new hardware into operation in a timely and professional manner.

http://h20195.www2.hp.com/V2/GetPDF.aspx/5981-9356EN.pdf

Factory Express for Servers and storage

HPE Factory Express offers configuration, customization, integration and deployment services for Hewlett Packard Enterprise servers and storage products. Customers can choose how their factory solutions are built, tested, integrated, shipped and deployed. For more information on Factory Express services for your specific server model please contact your sales representative or go to: **http://www.hp.com/go/factory-express**.

Data Privacy Services

Protect your data through better media management. HPE Data privacy services help manage and protect

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Service and Support

sensitive data to reduce the risk of unauthorized access to private information and help meet compliance requirements. Our retention services allow you to keep drives and other devices upon failure, our removal services provide convenient data sanitization and our recovery services allow you to safely retire IT assets and capture any remaining value from the hardware. **http://www.hp.com/services/dataprivacy**

Additional HPE Pointnext operational services can be found at: **http://www.hp.com/go/cpc**.

Get connected to Hewlett Packard Enterprise to improve your support experience

Connecting products to Hewlett Packard Enterprise will help prevent problems with 24x7monitoring, prefailure alerts, automatic call logging, and parts dispatch, plus current data will be available for the proactive reports that are part of Proactive Care Services. With Connected products, you can have a dashboard to manage your IT anywhere, anytime, from any device.

HPE Support Center

Personalized online support portal with access to information, tools and experts to support Hewlett Packard Enterprise business products. Submit support cases online, chat with Hewlett Packard Enterprise experts, access support resources or collaborate with peers. Learn more **http://www.hp.com/go/hpsc**

HPE's Support Center Mobile App allows you to resolve issues yourself or quickly connect to an agent for live support. Now, you can get access to personalized IT support anywhere, anytime.

HPE Insight Remote Support and HPE Support Center are available at no additional cost with a Hewlett Packard Enterprise warranty, HPE Care Pack or Hewlett Packard Enterprise contractual support agreement.

NOTE: HPE Support Center Mobile App is subject to local availability.

Parts and Materials

Hewlett Packard Enterprise will provide HPE-supported replacement parts and materials necessary to maintain the covered hardware product in operating condition, including parts and materials for available and recommended engineering improvements.

Parts and components that have reached their maximum supported lifetime and/or the maximum usage limitations as set forth in the manufacturer's operating manual, product quick-specs, or the technical product data sheet will not be provided, repaired, or replaced as part of these services.

The defective media retention service feature option applies only to Disk or eligible SSD/Flash Drives replaced by Hewlett Packard Enterprise due to malfunction.

For more information

To learn more on HPE ProLiant servers and HPE BladeSystem servers, please contact your Hewlett Packard Enterprise sales representative or Hewlett Packard Enterprise Authorized Channel Partner. Or visit: **http://www.hp.com/services/bladesystem**

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Configuration Information - Factory Integrated Models

NOTE: This section lists some of the steps required to configure a Factory Integrated Model. To ensure only valid configurations are ordered, Hewlett Packard Enterprise recommends the use of an Hewlett Packard Enterprise approved configurator. Contact your local sales representative for information on CTO product offerings and requirements.
NOTE: Configure-to-order server blades must start with a CTO Blade Server.
NOTE: FIO indicates that this option is only available as a factory installable option.
NOTE: All Factory Integrated Models will be populated with sufficient hard drive blanks based on the number of initial hard drives ordered with the server.

Step 1: Base Server Blade Configuration (Select a configurable Blade)

HPE Models

HP ProLiant WS460c Gen8 E5-v2 Configure-to-order Workstation 739347-B21

NOTE: Single-width, half-height bade with two mezzanine card slots available.
NOTE: HPE Smart Array P220i Controller FIO Kit (690164-B21) or HPE Smart Array P230i Controller FIO Kit (735062-B21) must be added separately as part of the Server Blade Configuration Process. Choose one of the controllers in Step 3.

Configurable Model ships with:

One (1) FlexibleLOM connector providing a choice for one (1) of the supported 10Gb or 20Gb FlexibleLOMs (see Step 2)
Two (2) HPE small form factor hot-plug SAS/SATA/SSD hard drive bays
Two (2) x16 PCIe I/O expansion slots (one Type A, one Type A/B)
One (1) integrated USB connector and one (1) MicroSDHC connector
One (1) TPM connector
HPE iLO Management Engine (standard)

NOTE: Single-width, half-height bade with two mezzanine card slots available.
NOTE: The HPE Smart Array P220i Controller FIO Kit (690164-B21) comes included with the HPE ProLiant WS460c Gen8 Configure-to-order Blade Server (678276-B21).

Configurable Model ships with:

One (1) FlexibleLOM connector providing a choice for one (1) of the supported 10Gb or 20Gb FlexibleLOMs (see Step 2)
One (1) HPE Smart Array P220i Controller with 512MB FBWC and RAID 0 and 1 support
Two (2) HPE small form factor hot-plug SAS/SATA/SSD hard drive bays
Two (2) x16 PCIe I/O expansion slots (one Type A, one Type A/B)
One (1) integrated USB connector and one (1) MicroSDHC connector
One (1) TPM connector
HPE iLO Management Engine (standard)

HP WS460c Gen8 E5-v2 Graphics Expansion Configure-to-order Blade 739348-B21

NOTE: Double-width half-height blade with two, full-length, PCIe x16 slots. No mezzanine card slots on base blade are currently available.
NOTE: HPE Smart Array P220i Controller FIO Kit (690164-B21) or HPE Smart Array P230i Controller FIO Kit (735062-B21) must be added separately as part of the Server Blade Configuration Process. Choose one of the controllers in Step 3.
NOTE: Base unit comes only with Slot1 of the expansion blade enabled. To enable Slot2, optional Slot2 Enablement FIO Kit (PN 721120-B21) is required. This kit is available at time of initial purchase only.

Configurable Model ships with:

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Configuration Information - Factory Integrated Models

One (1) FlexibleLOM connector providing a choice for one (1) of the supported 10Gb or 20Gb FlexibleLOMs (see Step 2)
Two (2) HPE small form factor hot-plug SAS/SATA/SSD hard drive bays
Two (2) x16 PCIe I/O expansion slots (one Type A, one Type A/B)
One (1) integrated USB connector and one (1) MicroSDHC connector
One (1) TPM connector
HPE iLO Management Engine (standard)

NOTE: Double-width half-height blade with two, full-length, PCIe x16 slots. No mezzanine card slots on base blade are currently available.

NOTE: The HPE Smart Array P220i Controller FIO Kit (690164-B21) comes included with the HPE ProLiant WS460c Gen8 Graphics Expansion Configure-to-order Blade Server (684690-B21)

NOTE: Base unit comes only with Slot1 of the expansion blade enabled. To enable Slot2, optional Slot2 Enablement FIO Kit (PN 721120-B21) is required. This kit is available at time of initial purchase only.

Configurable Model ships with:

One (1) FlexibleLOM connector providing a choice for one (1) of the supported 10Gb or 20Gb FlexibleLOMs (see Step 2)
One (1) HPE Smart Array P220i Controller with 512MB FBWC and RAID 0 and 1 support
Two (2) HPE small form factor hot-plug SAS/SATA/SSD hard drive bays
Two (2) x16 PCIe I/O expansion slots (one Type A, one Type A/B)
Reserved for Expansion Blade mezzanine connectors and unavailable)
One (1) HPE Graphics Expansion Blade Slot1 enablement connector
One (1) integrated USB connector and one (1) MicroSDHC connector
One (1) TPM connector
HPE iLO Management Engine (standard)

Step 2: Choose Required Options (one of the following from each list unless otherwise noted)

HPE Processors

NOTE: All configure-to-order processor kits (i.e. xxxxxx-L21) contain one (1) processor.

NOTE: If two processors are desired, select one xxxxxx-L21 here in Step 2 and one xxxxxx-B21 in Step 3.

E5-2600 v2 series Processors

HP BL460c Gen8 Intel Xeon E5-2697v2 (2.7GHz/12-core/30MB/130W) FIO Processor Kit	718045-L21
HP BL460c Gen8 Intel Xeon E5-2695v2 (2.4GHz/12-core/30MB/115W) FIO Processor Kit	718054-L21
HP BL460c Gen8 Intel® Xeon® E5-2690v2 (3.0GHz/10-core/25MB/130W) FIO Processor Kit	718055-L21
HP BL460c Gen8 Intel Xeon E5-2680v2 (2.8GHz/10-core/25MB/115W) FIO Processor Kit	718056-L21
HP BL460c Gen8 Intel Xeon E5-2670v2 (2.5GHz/10-core/25MB/115W) FIO Processor Kit	718057-L21
HP BL460c Gen8 Intel Xeon E5-2667v2 (3.3GHz/8-core/25MB/130W) FIO Processor Kit	718366-L21
HP BL460c Gen8 Intel Xeon E5-2660v2 (2.2GHz/10-core/25MB/95W) FIO Processor Kit	718058-L21
HP BL460c Gen8 Intel® Xeon® E5-2650v2 (2.6GHz/8-core/20MB/95W) FIO Processor Kit	718358-L21
HP BL460c Gen8 Intel Xeon E5-2650Lv2 (1.7GHz/10-core/25MB/70W) FIO Processor Kit	718364-L21

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Configuration Information - Factory Integrated Models

HP BL460c Gen8 Intel Xeon E5-2643v2 (3.5GHz/6-core/25MB/130W) FIO Processor Kit	718367-L21
HP BL460c Gen8 Intel Xeon E5-2640v2 (2.0GHz/8-core/20MB/95W) FIO Processor Kit	718359-L21
HP BL460c Gen8 Intel Xeon E5-2637v2 (3.5GHz/4-core/15MB/130W) FIO Processor Kit	718368-L21
HP BL460c Gen8 Intel Xeon E5-2630v2 (2.6GHz/6-core/15MB/80W) FIO Processor Kit	718360-L21
HP BL460c Gen8 Intel Xeon E5-2630Lv2 (2.4GHz/6-core/15MB/60W) FIO Processor Kit	718365-L21
HP BL460c Gen8 Intel Xeon E5-2620v2 (2.1GHz/6-core/15MB/80W) FIO Processor Kit	718361-L21
HP BL460c Gen8 Intel® Xeon® E5-2609v2 (2.5GHz/4-core/10MB/80W) FIO Processor Kit	718362-L21
HP BL460c Gen8 Intel Xeon E5-2603v2 (1.8GHz/4-core/10MB/80W) FIO Processor Kit	718363-L21

E5-2600 series Processors

HP BL460c Gen8 Intel Xeon E5-2620 (2.0GHz/6-core/15MB/95W) FIO Processor Kit	662069-L21

NOTE: The Intel Xeon E5-2600 v2 Processor Family can only be configured with the new 1866MHz HPE Smart Memory or the new 1600MHz Low Voltage (1.35v) HPE Smart Memory. The previously shipping Intel Xeon E5-2600 Processor Family cannot be configured with the new 1866MHz HPE Smart Memory or the new 1600MHz Low Voltage (1.35v) HPE Smart Memory.

NOTE: The Intel Xeon E5-2620 processor does not support DIMMs at 1.35V. Using the HPE RBSU, 1.35V DIMMs can be changed to operate at 1.5V.

NOTE: DIMM slots 4 and 5 are not accessible when either the E5-2690, the E5-2643, the E5-2643 v2, or the E5-2637 v2, or the E5-2667 v2 is used. In a 2 processor configuration, there are twelve (12) total available DIMM slots.

NOTE: For the maximum supported memory speeds for each processor listed above, please reference the 'Memory Speed by Processor Model' table in the Memory section of the QuickSpecs.

NOTE: HT indicates that the processor model supports Intel® Hyper-Threading Technology.

NOTE: Turbo indicates the maximum potential frequency increment when using Intel® Turbo Boost Technology, with 8, 7, 6, 5, 4, 3, 2 or 1 core(s) active.

NOTE: DDR3 speed is the maximum memory speed of the processor. Actual memory speed may depend on the quantity and type of DIMMs installed.

NOTE: Up to 2 processors supported. Mixing different processor models is not supported.

NOTE: For the Intel® C600 Chipset E5-2600 Series, the letter preceding the model number indicates the Product Line (E3, E5, E7); 2600x, 2 = number of CPUs in a Node, 6 is socket/segment designation, 00 = Processor SKU, and x = L for low power SKUs.

NOTE: All processors within the server must be identical.

NOTE: All processors support Intel® Hyper-Threading and Intel® Turbo Boost Technologies except the E5-2603 and E5-2609.

NOTE: The letter "L" following the model number indicates denotes lower wattage.

NOTE: The processor model as well as the memory configuration determines the

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Configuration Information - Factory Integrated Models

maximum speed memory can operate. Please see the see the "Memory" section later in this document.
NOTE: When HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits are used with any processors except the E5-2690, the E5-2643, the E5-2637 v2, the E5-2643 v2, or the E5-2667 v2 all 16 DIMM slots on the WS460c Gen8 must be fully populated with these 24GB DIMMs. When HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits are used with either the E5-2690, the E5-2643, the E5-2637 v2, the E5-2643 v2, or the E5-2667 v2, all 12 available DIMM slots on the WS460c Gen8 must be fully populated with these 24GB DIMMs.
NOTE: HPE ProLiant WS460c Gen8 shares same processor modules with BL460c Gen8 server. If two processors are desired, select one xxxxxx-L21 and one xxxxxx-B21.
NOTE: The WS460c Gen8 supports one or two processors.
NOTE: All configure-to-order processor kits (i.e. xxxxxx-L21) contain one (1) processor.
NOTE: If two processors are desired, select one xxxxxx-L21 here in Step 2 and one xxxxxx-B21 in Step 3.
NOTE: The WS460c Gen8 includes two I/O mezzanine expansion slots. A processor must be installed in processor slot 1 for access to the first mezzanine expansion slot (expansion slot 1). A processor must be installed in processor slot 2 for access to the second mezzanine expansion slot (expansion slot 2).

HPE Memory

NOTE: HPE memory from previous generation servers are not qualified or warranted with this HPE ProLiant WS460c Server. HPE SmartMemory is required to realize the memory performance improvements and enhanced functionality listed in this document for Gen8. For additional information, please see the HPE SmartMemory QuickSpecs at:
http://h18000.www1.hp.com/products/QuickSpecs/14225_div/14225_div.html
NOTE: LRDIMM, RDIMM and UDIMMs are all distinct memory technologies and cannot be mixed within a server. The majority of ProLiant Gen8 servers support RDIMM, UDIMM and LRDIMM.
NOTE: A minimum of one DIMM is required per server.
NOTE: For additional memory rules and guidelines, see the "Memory" section later in this document.
NOTE: When HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits are used with any processors except the E5-2690, the E5-2643, the E5-2637 v2, the E5-2643 v2, or the E5-2667 v2 all 16 DIMM slots on the WS460c Gen8 must be fully populated with these 24GB DIMMs. When HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits are used with either the E5-2690, the E5-2643, the E5-2637 v2, the E5-2643 v2, or the E5-2667 v2, all 12 available DIMM slots on the WS460c Gen8 must be fully populated with these 24GB DIMMs.
NOTE: The internal USB 2.0 Port is not available when the HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits (700404-B21) are used.

HPE SmartMemory

Registered DIMMs (RDIMMs) - E5-2xxx v2 series Processors

HP 4GB (1x4GB) Single Rank x4 PC3L-12800R (DDR3-1600) Registered CAS-11 Low	713981-B21

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Configuration Information - Factory Integrated Models

Voltage Memory Kit	
HP 4GB (1x4GB) Single Rank x4 PC3-14900R (DDR3-1866) Registered CAS-13 Memory Kit	708637-B21
HPE 8GB (1x8GB) Dual Rank x4 PC3L-12800R (DDR3-1600) Registered CAS-11 Low Voltage Memory Kit	713983-B21
HPE 8GB (1x8GB) Single Rank x4 PC3L-12800R (DDR3-1600) Registered CAS-11 Low Voltage Memory Kit	731765-B21
HP 8GB (1x8GB) Dual Rank x4 PC3-14900R (DDR3-1866) Registered CAS-13 Memory Kit	708639-B21
HPE 8GB (1x8GB) Single Rank x4 PC3-14900R (DDR3-1866) Registered CAS-13 Memory Kit	731761-B21
HPE 16GB (1x16GB) Dual Rank x4 PC3L-12800R (DDR3-1600) Registered CAS-11 Low Voltage Memory Kit	713985-B21
HPE 16GB (1x16GB) Dual Rank x4 PC3-14900R (DDR3-1866) Registered CAS-13 Memory Kit	708641-B21

Registered DIMMs (RDIMMs) - E5-2xxx series Processors

HP 4GB (1x4GB) Single Rank x4 PC3L-10600 (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit	647893-B21
HPE 4GB (1x4GB) Single Rank x4 PC3-12800 (DDR3-1600) Registered CAS-11 Memory Kit	647895-B21
HP 8GB (1x8GB) Dual Rank x4 PC3L-10600 (DDR3-1333) Registered CAS-9 LP Memory Kit	647897-B21
HPE 8GB (1x8GB) Single Rank x4 PC3-12800 (DDR3-1600) Registered CAS-11 Memory Kit	647899-B21
HP 8GB (1x8GB) Dual Rank x4 PC3-12800R (DDR3-1600) Registered CAS-11 Memory Kit	690802-B21
HPE 16GB (1x16GB) Dual Rank x4 PC3L-10600 (DDR3-1333) Registered CAS-9 LP Memory Kit	647901-B21
HPE 16GB (1x16GB) Dual Rank x4 PC3-12800R (DDR3-1600) Registered CAS-11 Memory Kit	672631-B21
HP 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 LV Memory Kit	761501-B21

Unbuffered with ECC DIMMs (UDIMMs) - E5-2xxx v2 series Processors

HP 2GB (1x2GB) Single Rank x8 PC3L-12800E (DDR3-1600) Unbuffered CAS-11 Low Voltage Memory Kit	713975-B21
HP 2GB (1x2GB) Single Rank x8 PC3-14900E (DDR3-1866) Unbuffered CAS-13 Memory Kit	708631-B21
HP 4GB (1x4GB) Dual Rank x8 PC3L-12800E (DDR3-1600) Unbuffered CAS-11 Low Voltage Memory Kit	713977-B21
HP 4GB (1x4GB) Dual Rank x8 PC3-14900E (DDR3-1866) Unbuffered CAS-13 Memory Kit	708633-B21
HP 8GB (1x8GB) Dual Rank x8 PC3L-12800E (DDR3-1600) Unbuffered CAS-11 Low Voltage Memory Kit	713979-B21

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Configuration Information - Factory Integrated Models

	HP 8GB (1x8GB) Dual Rank x8 PC3-14900E (DDR3-1866) Unbuffered CAS-13 Memory Kit	708635-B21
	Unbuffered with ECC DIMMs (UDIMMs) - E5-2xxx series Processors	
	HPE 2GB(1x2GB) Single Rank x8 PC3-12800E (DDR3-1600) Unbuffered CAS-11 Memory Kit	669320-B21
	HP 2GB (1x2GB) Single Rank x8 PC3L-10600(DDR3-1333) Unbuffered CAS-9 LP Memory	647905-B21
	HPE 4GB (1x4GB) Dual Rank x8 PC3-12800E (DDR3-1600) Unbuffered CAS-11 Memory Kit	669322-B21
	HP 4GB (1x4GB) Dual Rank x8 PC3L-10600(DDR3-1333) Unbuffered CAS-9 LP Memory Kit	647907-B21
	HPE 8GB (1x8GB) Dual Rank x8 PC3- 12800E (DDR3-1600) Unbuffered CAS-11 Memory Kit	669324-B21
	HP 8GB (1x8GB) Dual Rank x8 PC3L-10600(DDR3-1333) Unbuffered CAS-9 LP Memory Kit	647909-B21
	Load Reduced DIMMs (LRDIMMs) - E5-2600 v2 series Processors	
	HPE 32GB (1x32GB) Quad Rank x4 PC3-14900L (DDR3-1866) Load Reduced CAS-13 Memory Kit	708643-B21
	Load Reduced DIMMs (LRDIMMs) - E5-2600 series Processors	
	HP 32GB (1x32GB) Quad Rank x4 PC3L-10600 (DDR3-1333) LRDIMM CAS-9 LP Memory Kit NOTE:NOTE: The HPE Q3000 Gen8 Mezz Graphics Kit (679855-B21) is installed in Mezz slot 2 and hence requires a two processor configuration which will provide a processor installed in the second CPU socket.	647903-B21

NOTE: All DDR3 memory option kits consist of one DIMM per kit. For detailed memory configuration rules and guidelines, please use the Online DDR3 Memory Configuration Tool: http://www.hp.com/go/ddr3memory-configurator.

NOTE: Kits described as LP include Low Power DIMMs. For more information on ProLiant Energy Efficient Features, see Error! Hyperlink reference not valid..

NOTE: Depending on the memory configuration and processor model the memory speed may run at 1333MHz, 1066MHz or 800MHz. Please see the Online Memory Configuration Tool for details: http://www.hp.com/go/ddr3memory-configurator

NOTE: For additional memory rules and guidelines, see the "Memory" section later in this document.

NOTE: For more information on ProLiant Energy Efficient Features, see: http://www.hp.com/go/proliant-energy-efficient

NOTE: PC3L is a low voltage memory.

HPE Networking

FlexibleLOM Adapters

NOTE: The server requires one (1) FlexibleLOM that is installed in the

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Configuration Information - Factory Integrated Models

FlexibleLOM connectors. All FlexibleLOMs are dual port: One port is routed to interconnect module bay 1 and the other to bay 2 of the enclosure.

10Gb or 20Gb FlexibleLOM Adapters

HP Flex-10 10Gb 2-port 530FLB FIO Adapter	684211-B21
HP FlexFabric 10Gb 2-port 554FLB FIO Adapter	684212-B21
HP FlexFabric 10Gb 2-port 534FLB FIO Adapter	700742-B21
HPE FlexFabric 20Gb 2-port 630FLB FIO Adapter	700066-B21

NOTE: For use with Client OS such as Windows 7, directly presiding on system (i.e. "OS on bare-metal"), is supported only with the HPE Flex-10 10Gb 2-port 530FLB or HPE FlexFabric 10Gb 2-port 534FLB FlexibleLOM with basic network functions only. All other adapters are supported with use on supported server OS environment.

NOTE: FlexFabric supported only with server OS and/or in a virtualized environment using hypervisors.

NOTE: Please see the QuickSpecs for Technical Specifications and additional information: http://www.hp.com/go/ProLiantNICs

Step 3: Choose Additional Factory Integration Options

HPE Insight Software	HPE Insight Control including 1yr 24x7 Support ProLiant ML/DL/BL-bundle Single Server FIO LTU	C6N36A
Converged Infrastructure Management Software	**HPE OneView with iLO Advanced - Server hardware required on same purchase order**	
	HPE OneView for Blade Server including 3yr 24x7 Support FIO Bundle Physical 1-server LTU	F6Q89A
HP HPE Storage Controllers	HPE Special Request/Equipment Logistic Service	690164-B21
	NOTE: The HPE Smart Array P220i Controller FIO Kit (690164-B21) comes included with the HPE ProLiant WS460c Gen8 10Gb FlexibleLOM Configure-to-order Blade Server (678276-B21 and 684690-B21). However when choosing the HPE ProLiant WS460c Gen8 E5-v2 10Gb FlexibleLOM Configure-to-order Blade Server (739347-B21 or 739348-B21), the HPE Smart Array P220i Controller FIO Kit (690164-B21) or HPE Smart Array P230i Controller FIO Kit (735062-B21) must be added separately as part of the Server Blade Configuration Process.	
HPE Secure Encryption	HP Secure Encryption per Svr Entitlement	C9A82AAE
	NOTE: HPE Secure Encryption is supported on the HPE Smart Array P230i as an option. HPE Secure Encryption licensing is based on the number of physical drives requiring encryption.	
	NOTE: For more information about HPE Secure Encryption, go to http://www.hp.com/go/hpsecureencryption.	

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Configuration Information - Factory Integrated Models

HPE Graphics Options	**NOTE: Choose from following graphics mezzanine cards for use with the single-width HPE ProLiant WS460c Gen8 mode**	
	NVIDIA Quadro K3100M Mezzanine FIO Graphics Kit	750969-B21
	AMD FirePro S4000X MXM Mezzanine FIO Graphics Kit	752424-B21
	NOTE: Windows 7 OS support only	
	NOTE: When NVIDIA Quadro K3100M card is ordered for Mezz slot 2, no other cards may be ordered for Mezz slot 1.	
	NOTE: Choose one of the following standard PCIe graphics card for use with the double-width HPE ProLiant WS460c Gen8 (P/N 739348-B21 or 684690-B21).	
	HPE BL e-Class Special Enclosure NOTE:NOTE: Available only with Intel® Xeon® E5-2600 v2 series processor configuration	730876-B21
	NVIDIA GRID K2 Dual GPU PCIe Graphics Accelerator	729851-B21
	NOTE: GRID K2 requires GPU Enablement Kit (PN 734206-B21)	
	NOTE: Available only with Intel® Xeon® E5-2600 v2 series processor configuration	
	NVIDIA Quadro K4000 PCI-E Graphics Adapter	730870-B21
	NOTE: Up to two cards may be installed in expansion blade. Slot 2 Enablement FIO Kit (PN 721120-B21) required for two cards configuration	
	NVIDIA Quadro K5000 PCI-E Graphics Adapter	730872-B21
	NVIDIA Quadro K6000 PCI-E Graphics Adapter	730874-B21
	HP MultiGPU Carrier with 3 NVIDIA K3100M FIO Graphics Kit	752423-B21
	NOTE: This part number includes one HPE MultiGPU Carrier Card with three Quadro K3100M graphics loaded. Required to use in two carrier cards configuration (Total of six Quadro K3100M).	
	NOTE: Requires Expansion Blade Slot2 Enablement FIO Kit (PN 721120-B21).	
	NOTE: Available only with Intel® Xeon® E5-2600 v2 series processor configuration	
	NVIDIA Tesla K20X 6GB Computational Accelerator NOTE:NOTE: Tesla K20X requires GPU Enablement Kit (PN 734206-B21).	C7S15A
	HP Gen8 Expansion Blade Slot 2 FIO Enablement Kit	721120-B21
	NOTE: This optional kit is available at time of initial system purchase only. This kit is required when supporting two HPE MultiGPU Carrier cards or two NVIDIA Quadro K4000 graphics.	
	HPE WS460c Gen8 GPU Enablement Kit NOTE:NOTE: Required when selecting NVIDIA GRID K2 or Tesla K20/K20X for factory integration. Contains bulkhead I/O plate.	734206-B21

Step 4: Choose Additional Options for Factory Integration

NOTE: For additional options, please refer to the "Core Options" and "Additional Options" section below. For additional options, including server blade enclosures interconnect and mezzanine options and power subsystem options; please see the Core Options and Additional sections below; or the following:

HPE BladeSystem c3000 Enclosure QuickSpecs:

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Configuration Information - Factory Integrated Models

http://h18000.www1.hp.com/products/QuickSpecs/12790_div/12790_div.html

NOTE: The c3000 HPE c-Class enclosures have full backwards and forwards compatibility, existing server blades are supported in the new enclosures and any future server blades will be supported in the existing enclosures.

HPE BladeSystem c7000 Enclosure QuickSpecs:

http://h18000.www1.hp.com/products/QuickSpecs/12810_div/12810_div.html

NOTE: The c7000 HPE c-Class enclosures have full backwards and forwards compatibility, existing server blades are supported in the new enclosures and any future server blades will be supported in the existing enclosures.

NOTE: For optimal cooling and system performance the WS460c Gen8 requires the c7000 enclosure to be configured with 10 fans and the c3000 enclosure to be configured with 6 fans.

HPE BladeSystem c-Class Interconnect and Mezzanine Components:

http://h18004.www1.hp.com/products/blades/components/c-class-interconnects.html

http://h18004.www1.hp.com/products/blades/components/c-class-adapters.html.

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Core Options

NOTE: Some options may not be integrated at the factory. To ensure only valid configurations are ordered, Hewlett Packard Enterprise recommends the use of an Hewlett Packard Enterprise approved configurator. Contact your local sales representative for additional information.
NOTE: For additional options, please refer to the "Core Options" and "Additional Options" sections below.

HPE Networking

NOTE: Each 10 Gigabit Ethernet adapter requires a minimum of 2GB of server memory.
NOTE: A 10 Gigabit Ethernet adapter supports linking at 1Gbps or 10Gbps when connected to an interconnect module with 10Gb Ethernet downlinks.
NOTE: A 10 Gigabit Ethernet adapter supports linking at only 1Gbps when connected to an interconnect module with 1Gb Ethernet downlinks.
NOTE: The 10 Gigabit Ethernet adapters on each server blade connect to a 10Gb interconnect in bays 3-6 (HPE BladeSystem c7000 Enclosure) or bays 2-4 (HPE BladeSystem c3000 Enclosure).

FlexibleLOM Adapters
NOTE: The server supports one (1) FlexibleLOM that is installed in the FlexibleLOM connectors and is already included in the pre-configured models. However, it must be added in Step 2 for Configure-to-Order Models. The FlexibleLOM options below are used to change these original FlexibleLOMs.

10 or 20 Gigabit Ethernet FlexibleLOM

HPE Flex-10 10Gb 2-port 530FLB Adapter — 656590-B21
NOTE:NOTE: Please see QuickSpecs for technical specifications and additional information at https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04111539.
NOTE:NOTE: Client OS on bare metal is supported only with this BLOM.

HP FlexFabric 10Gb 2-port 534FLB Adapter — 700741-B21
NOTE: Please see QuickSpecs for technical specifications and additional information at: https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04111370

HPE FlexFabric 10Gb 2-port 554FLB Adapter — 647586-B21
NOTE:NOTE: Please see QuickSpecs for technical specifications and additional information at: https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04111537

HPE FlexFabric 20Gb 2-port 630FLB Adapter — 700065-B21

HPE Infiniband Mezzanine Adapters
NOTE: InfiniBand mezzanine HCAs are supported on the HPE ProLiant WS460c Gen8 with server OS or hypervisors. Windows client OS (Windows 7) not supported.
NOTE: When an InfiniBand adapter is installed in mezzanine slot 1, only one port is active (regardless of operating mode). When installed in any other mezzanine slot, both ports are active.

HP InfiniBand QDR/EN 10Gb Dual Port 544M Adapter — 644160-B21
NOTE:NOTE: The QDR InfiniBand adapter may be installed in upper mezzanine slot of the WS460c when vacant

HP InfiniBand FDR/EN 10/40Gb Dual Port 544M Adapter — 644161-B22

RETIRED: Retired products sold prior to the November 1, 2015 separation of Hewlett-Packard Company into Hewlett Packard Enterprise Company and HP Inc. may have older product names and model numbers that differ from current models.

Core Options

NOTE:NOTE: The FDR InfiniBand adapter may be installed in upper mezzanine slot of the WS460c when vacant

HP InfiniBand FDR 2-port 545M Adapter

NOTE: InfiniBand QDR and FDR speeds are only supported on the HPE BladeSystem c7000 Enclosure. For additional information, please see the HPE BladeSystem c7000 Enclosure and InfiniBand QuickSpecs at:
https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04126044
https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04154440

HPE Fibre Channel

NOTE: All Fibre Channel mezzanine HBAs are supported on the HPE ProLiant WS460c Gen8 with server OS or hypervisors only. Windows client OS (Windows 7) on bare-metal not supported.

HPE LPe1605 16Gb Fibre Channel Host Bus Adapter for BladeSystem c-Class 718203-B21

NOTE: Please see QuickSpecs for technical specifications and additional information at: https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04315132

HPE LPe1205A 8Gb Fibre Channel Host Bus Adapter for BladeSystem c-Class 659818-B21

NOTE: Please see QuickSpecs for technical specifications and additional information at: https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04163733

HP QMH2672 16Gb Fibre Channel Host Bus Adapter

NOTE: Please see QuickSpecs for technical specifications and additional information at: https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04126962

HPE QMH2572 8Gb Fibre Channel Host Bus Adapter 651281-B21

NOTE: Please see QuickSpecs for technical specifications and additional information at: https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04126962

HPE Processors

E5-2600 v2 series Processors

HP BL460c Gen8 Intel Xeon E5-2697v2 (2.7GHz/12-core/30MB/130W) Processor Kit 718045-B21

HP BL460c Gen8 Intel Xeon E5-2695v2 (2.4GHz/12-core/30MB/115W) Processor Kit 718054-B21

HP BL460c Gen8 Intel Xeon E5-2690v2 (3.0GHz/10-core/25MB/130W) Processor Kit 718055-B21

HP BL460c Gen8 Intel Xeon E5-2680v2 (2.8GHz/10-core/25MB/115W) Processor Kit 718056-B21

HP BL460c Gen8 Intel Xeon E5-2670v2 (2.5GHz/10-core/25MB/115W) Processor Kit 718057-B21

HP BL460c Gen8 Intel Xeon E5-2667v2 (3.3GHz/8-core/25MB/130W) Processor Kit 718366-B21

HP BL460c Gen8 Intel Xeon E5-2660v2 (2.2GHz/10-core/25MB/95W) Processor Kit 718058-B21

HP BL460c Gen8 Intel Xeon E5-2650v2 (2.6GHz/8-core/20MB/95W) Processor Kit 718358-B21

HP BL460c Gen8 Intel Xeon E5-2650Lv2 (1.7GHz/10-core/25MB/70W) Processor Kit 718364-B21

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Core Options

HP BL460c Gen8 Intel Xeon E5-2643v2 (3.5GHz/6-core/25MB/130W) Processor Kit	718367-B21
HP BL460c Gen8 Intel Xeon E5-2640v2 (2.0GHz/8-core/20MB/95W) Processor Kit	718359-B21
HP BL460c Gen8 Intel Xeon E5-2637v2 (3.5GHz/4-core/15MB/130W) Processor Kit	718368-B21
HP BL460c Gen8 Intel Xeon E5-2630v2 (2.6GHz/6-core/15MB/80W) Processor Kit	718360-B21
HP BL460c Gen8 Intel Xeon E5-2630Lv2 (2.4GHz/6-core/15MB/60W) Processor Kit	718365-B21
HP BL460c Gen8 Intel Xeon E5-2620v2 (2.1GHz/6-core/15MB/80W) Processor Kit	718361-B21
HP BL460c Gen8 Intel Xeon E5-2609v2 (2.5GHz/4-core/10MB/80W) Processor Kit	718362-B21
HP BL460c Gen8 Intel Xeon E5-2603v2 (1.8GHz/4-core/10MB/80W) Processor Kit	718363-B21

E5-2600 series Processors

HP BL460c Gen8 Intel Xeon E5-2690 (2.9GHz/8-core/20MB/135W) Processor Kit	662076-B21
HP BL460c Gen8 Intel Xeon E5-2680 (2.7GHz/8-core/20MB/130W) Processor Kit	662063-B21
HP BL460c Gen8 Intel Xeon E5-2670 (2.6GHz/8-core/20MB/115W) Processor Kit	662064-B21
HP BL460c Gen8 Intel Xeon E5-2667 (2.9GHz/6-core/15MB/130W) Processor Kit	667804-B21
HP BL460c Gen8 Intel Xeon E5-2665 (2.4GHz/8-core/20MB/115W) Processor Kit	667803-B21
HP BL460c Gen8 Intel Xeon E5-2660 (2.2GHz/8-core/20MB/95W) Processor Kit	662065-B21
HP BL460c Gen8 Intel Xeon E5-2650 (2.0GHz/8-core/20MB/95W) Processor Kit	662066-B21
HP BL460c Gen8 Intel Xeon E5-2650L (1.8GHz/8-core/20MB/70W) Processor Kit	662078-B21
HP BL460c Gen8 Intel Xeon E5-2643 (3.3GHz/4-core/10MB/130W) Processor Kit	662072-B21
HP BL460c Gen8 Intel Xeon E5-2640 (2.5GHz/6-core/15MB/95W) Processor Kit	662067-B21
HP BL460c Gen8 Intel Xeon E5-2637 (3.0GHz/2-core/5MB/80W) Processor Kit	662077-B21
HP BL460c Gen8 Intel Xeon E5-2630 (2.3GHz/6-core/15MB/95W) Processor Kit	662068-B21
HP BL460c Gen8 Intel Xeon E5-2630L (2.0GHz/6-core/15MB/60W) Processor Kit	662079-B21
HP BL460c Gen8 Intel Xeon E5-2620 (2.0GHz/6-core/15MB/95W) Processor Kit	662069-B21
HP BL460c Gen8 Intel Xeon E5-2609 (2.4GHz/4-core/10MB/80W) Processor Kit	662070-B21
HP BL460c Gen8 Intel Xeon E5-2603 (1.8GHz/4-core/10MB/80W) Processor Kit	667805-B21

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Core Options

NOTE: The WS460c Gen8 supports one or two processors.
NOTE: The WS460c Gen8 includes two I/O mezzanine expansion slots. A processor must be installed in processor slot 1 for access to the first mezzanine expansion slot (expansion slot 1). A processor must be installed in processor slot 2 for access to the second mezzanine expansion slot (expansion slot 2).
NOTE: All processors within the server must be identical.
NOTE: The letter "L" preceding the model number indicates denotes lower wattage.
NOTE: The processor model as well as the memory configuration determines the maximum speed memory can operate. Please see the see the "Memory" section later in this document
NOTE: The Intel Xeon E5-2620 processor does not support DIMMs at 1.35V. Using the HPE RBSU, 1.35V DIMMs can be changed to operate at 1.5V.
NOTE: The Intel Xeon E5-2600 v2 Processor Family can only be configured with the new 1866MHz HPE Smart Memory or the new 1600MHz Low Voltage (1.35v) HPE Smart Memory. The previously shipping Intel Xeon E5-2600 Processor Family cannot be configured with the new 1866MHz HPE Smart Memory or the new 1600MHz Low Voltage (1.35v) HPE Smart Memory.
NOTE: DIMM slots 4 and 5 are not accessible when either the E5-2690, the E5-2643, the E5-2643 v2, or the E5-2637 v2, or the E5-2667 v2 is used. In a 2 processor configuration, there are twelve (12) total available DIMM slots.
NOTE: For the maximum supported memory speeds for each processor listed above, please reference the 'Memory Speed by Processor Model' table in the Memory section of the QuickSpecs.
NOTE: HT indicates that the processor model supports Intel® Hyper-Threading Technology.
NOTE: Turbo indicates the maximum potential frequency increment when using Intel® Turbo Boost Technology, with 8, 7, 6, 5, 4, 3, 2 or 1 core(s) active.
NOTE: DDR3 speed is the maximum memory speed of the processor. Actual memory speed may depend on the quantity and type of DIMMs installed.
NOTE: Up to 2 processors supported. Mixing different processor models is not supported.
NOTE: For the Intel® C600 Chipset E5-2600 Series, the letter preceding the model number indicates the Product Line (E3, E5, E7); 2600x, 2 = number of CPUs in a Node, 6 is socket/segment designation, 00 = Processor SKU, and x = L for low power SKUs.
NOTE: All processors support Intel® Hyper-Threading and Intel® Turbo Boost Technologies except the E5-2603 and E5-2609.
NOTE: When HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits are used with any processors except the E5-2690, the E5-2643, the E5-2637 v2, the E5-2643 v2, or the E5-2667 v2 all 16 DIMM slots on the WS460c Gen8 must be fully populated with these 24GB DIMMs. When HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits are used with either the E5-2690, the E5-2643, the E5-2637 v2, the E5-2643 v2, or the E5-2667 v2, all 12 available DIMM slots on the WS460c Gen8 must be fully populated with these 24GB DIMMs.

HPE Memory

NOTE: HPE memory from previous generation servers are not qualified or warranted with this HPE ProLiant WS460c Server. HPE SmartMemory is required to realize the

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Core Options

memory performance improvements and enhanced functionality listed in this document for Gen8. For additional information, please see the HPE SmartMemory QuickSpecs at:
http://h18000.www1.hp.com/products/QuickSpecs/14225_div/14225_div.html
NOTE: LRDIMM, RDIMM and UDIMMs are all distinct memory technologies and cannot be mixed within a server. The majority of ProLiant Gen8 servers support RDIMM, UDIMM and LRDIMM.
NOTE: A minimum of one DIMM is required per server.
NOTE: For additional memory rules and guidelines, see the "Memory" section later in this document.
NOTE: When HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits are used with any processors except the E5-2690, the E5-2643, the E5-2637 v2, the E5-2643 v2, or the E5-2667 v2 all 16 DIMM slots on the WS460c Gen8 must be fully populated with these 24GB DIMMs. When HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits are used with either the E5-2690, the E5-2643, the E5-2637 v2, the E5-2643 v2, or the E5-2667 v2, all 12 available DIMM slots on the WS460c Gen8 must be fully populated with these 24GB DIMMs.
NOTE: The internal USB 2.0 Port is not available when the HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits (700404-B21) are used.

HPE SmartMemory

Registered DIMMs (RDIMMs) - E5-2xxx v2 series Processors

HP 4GB (1x4GB) Single Rank x4 PC3L-12800R (DDR3-1600) Registered CAS-11 Low Voltage Memory Kit	713981-B21
HP 4GB (1x4GB) Single Rank x4 PC3-14900R (DDR3-1866) Registered CAS-13 Memory Kit	708637-B21
HPE 8GB (1x8GB) Dual Rank x4 PC3L-12800R (DDR3-1600) Registered CAS-11 Low Voltage Memory Kit	713983-B21
HPE 8GB (1x8GB) Single Rank x4 PC3L-12800R (DDR3-1600) Registered CAS-11 Low Voltage Memory Kit	731765-B21
HP 8GB (1x8GB) Dual Rank x4 PC3-14900R (DDR3-1866) Registered CAS-13 Memory Kit	708639-B21
HPE 8GB (1x8GB) Single Rank x4 PC3-14900R (DDR3-1866) Registered CAS-13 Memory Kit	731761-B21
HPE 16GB (1x16GB) Dual Rank x4 PC3L-12800R (DDR3-1600) Registered CAS-11 Low Voltage Memory Kit	713985-B21
HPE 16GB (1x16GB) Dual Rank x4 PC3-14900R (DDR3-1866) Registered CAS-13 Memory Kit	708641-B21

Registered DIMMs (RDIMMs) - E5-2xxx series Processors

HP 4GB (1x4GB) Single Rank x4 PC3L-10600 (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit	647893-B21
HPE 4GB (1x4GB) Single Rank x4 PC3-12800 (DDR3-1600) Registered CAS-11 Memory Kit	647895-B21

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Core Options

HP 8GB (1x8GB) Dual Rank x4 PC3L-10600 (DDR3-1333) Registered CAS-9 LP Memory Kit	647897-B21
HPE 8GB (1x8GB) Single Rank x4 PC3-12800 (DDR3-1600) Registered CAS-11 Memory Kit	647899-B21
HP 8GB (1x8GB) Dual Rank x4 PC3-12800R (DDR3-1600) Registered CAS-11 Memory Kit	690802-B21
HPE 16GB (1x16GB) Dual Rank x4 PC3L-10600 (DDR3-1333) Registered CAS-9 LP Memory Kit	647901-B21
HPE 16GB (1x16GB) Dual Rank x4 PC3-12800R (DDR3-1600) Registered CAS-11 Memory Kit	672631-B21
HP 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 LV Memory Kit	761501-B21

Unbuffered with ECC DIMMs (UDIMMs) - E5-2xxx v2 series Processors

HP 2GB (1x2GB) Single Rank x8 PC3L-12800E (DDR3-1600) Unbuffered CAS-11 Low Voltage Memory Kit	713975-B21
HP 2GB (1x2GB) Single Rank x8 PC3-14900E (DDR3-1866) Unbuffered CAS-13 Memory Kit	708631-B21
HP 4GB (1x4GB) Dual Rank x8 PC3L-12800E (DDR3-1600) Unbuffered CAS-11 Low Voltage Memory Kit	713977-B21
HP 4GB (1x4GB) Dual Rank x8 PC3-14900E (DDR3-1866) Unbuffered CAS-13 Memory Kit	708633-B21
HP 8GB (1x8GB) Dual Rank x8 PC3L-12800E (DDR3-1600) Unbuffered CAS-11 Low Voltage Memory Kit	713979-B21
HP 8GB (1x8GB) Dual Rank x8 PC3-14900E (DDR3-1866) Unbuffered CAS-13 Memory Kit	708635-B21

Unbuffered with ECC DIMMs (UDIMMs) - E5-2xxx series Processors

HPE 2GB(1x2GB) Single Rank x8 PC3-12800E (DDR3-1600) Unbuffered CAS-11 Memory Kit	669320-B21
HP 2GB (1x2GB) Single Rank x8 PC3L-10600(DDR3-1333) Unbuffered CAS-9 LP Memory	647905-B21
HPE 4GB (1x4GB) Dual Rank x8 PC3-12800E (DDR3-1600) Unbuffered CAS-11 Memory Kit	669322-B21
HP 4GB (1x4GB) Dual Rank x8 PC3L-10600(DDR3-1333) Unbuffered CAS-9 LP Memory Kit	647907-B21
HPE 8GB (1x8GB) Dual Rank x8 PC3- 12800E (DDR3-1600) Unbuffered CAS-11 Memory Kit	669324-B21
HP 8GB (1x8GB) Dual Rank x8 PC3L-10600(DDR3-1333) Unbuffered CAS-9 LP Memory Kit	647909-B21

Load Reduced DIMMs (LRDIMMs) - E5-2600 v2 series Processors

HPE 32GB (1x32GB) Quad Rank x4 PC3-14900L (DDR3-1866) Load Reduced CAS-13 Memory Kit	708643-B21

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Core Options

Load Reduced DIMMs (LRDIMMs) - E5-2600 series Processors

HP 32GB (1x32GB) Quad Rank x4 PC3L-10600 (DDR3-1333) LRDIMM CAS-9 LP Memory Kit NOTE:NOTE: The HPE Q3000 Gen8 Mezz Graphics Kit (679855-B21) is installed in Mezz slot 2 and hence requires a two processor configuration which will provide a processor installed in the second CPU socket.	647903-B21

NOTE: All DDR3 memory option kits consist of one DIMM per kit. For detailed memory configuration rules and guidelines, please use the Online DDR3 Memory Configuration Tool: http://www.hp.com/go/ddr3memory-configurator.

NOTE: Kits described as LP include Low Power DIMMs. For more information on ProLiant Energy Efficient Features, see: http://www.hp.com/go/proliant-energy-efficient.

NOTE: Depending on the memory configuration and processor model the memory speed may run at 1333MHz, 1066MHz or 800MHz. Please see the Online Memory Configuration Tool for details: www.hp.com/go/ddr3memory-configurator

NOTE: For additional memory rules and guidelines, see the "Memory" section later in this document.

NOTE: For more information on ProLiant Energy Efficient Features, see: http://www.hp.com/go/proliant-energy-efficient

NOTE: PC3L is a low voltage memory.

HPE Hard Drives

NOTE: The ProLiant WS460c Gen8 server includes the new HPE hot-plug small form factor (SFF) SmartDrive carrier for enhanced management and reduced maintenance errors. HPE drives from previous generation servers are not compatible with the WS460c Gen8 drive bays.

NOTE: The mixing of standard SAS drives with SAS SSD is supported within the server, but limits the RAID configuration to two separate RAID 0 volumes. Mixing of other drives types is not supported.

NOTE: HPE hard drives have either a one year or three year warranty; refer to the specific hard drive QuickSpecs for details.

NOTE: The hard drive options are not required when configuring a drive-less model.

SATA Hot Plug SFF (2.5-inch) Midline (MDL) Drives

HPE 1TB SATA 6G Midline 7.2K SFF (2.5in) SC 1yr Wty Digitally Signed Firmware HDD	655710-B21
HPE 500GB 6G SATA 7.2K rpm SFF (2.5-inch) SC Midline 1yr Warranty Hard Drive NOTE:NOTE: Please see QuickSpecs for Technical Specifications and additional information: https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04111725(Worldwide)	655708-B21

6G SAS Hot Plug with Smart Drive SFF (2.5-inch) Enterprise Drives

HP 900GB 6G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652589-B21
HP 600GB 6G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652583-B21
HP 450GB 6G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652572-B21

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Core Options

HP 300GB 6G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652564-B21
HP 300GB 6G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652611-B21
HP 146GB 6G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652605-B21
HP 1.2TB 6G SAS 10K rpm SFF (2.5-inch) SC Dual Port Enterprise 3yr Warranty Hard Drive	718162-B21

6G SAS Hot Plug Smart Drive SFF (2.5-inch) Midline Drives

HPE 1TB 6G SAS 7.2K rpm SFF (2.5-inch) SC Midline 1yr Warranty Hard Drive	652749-B21
HPE 500GB 6G SAS 7.2K rpm SFF (2.5-inch) SC Midline 1yr Warranty Hard Drive NOTE:NOTE: Please see QuickSpecs for Technical Specifications and additional information: https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04111744 (Worldwide)	652745-B21

12G SAS (2.5-inch) 512e SC HDD

HPE 600GB SAS 12G Enterprise 15K SFF (2.5in) SC 3yr Wty 512e HDD	748387-B21
HPE 1TB SAS 12G Midline 7.2K SFF (2.5in) SC 1yr Wty 512e Digitally Signed Firmware HDD	765464-B21
HPE 1TB SAS 12G Midline 7.2K SFF (2.5in) SC 1yr Wty Digitally Signed Firmware HDD	832514-B21
HPE 1.8TB SAS 12G Enterprise 10K SFF (2.5in) SC 3yr Wty 512e HDD	791034-B21
HPE 2TB SAS 12G Midline 7.2K SFF (2.5in) SC 1yr Wty 512e HDD	765466-B21

12G SAS SFF (2.5in) RI-3 SC SSD

HPE 3.84TB SAS 12G Read Intensive SFF (2.5in) SC 3yr Wty SSD	816576-B21
HPE 1.92TB SAS 12G Read Intensive SFF (2.5in) SC 3yr Wty SSD	816572-B21
HPE 960GB SAS 12G Read Intensive SFF (2.5in) SC 3yr Wty SSD	816568-B21
HPE 480GB SAS 12G Read Intensive SFF (2.5in) SC 3yr Wty SSD	816562-B21

12G SAS SFF (2.5in) MU-3 SC SSD

HPE 3.2TB SAS 12G Mixed Use SFF (2.5in) SC 3yr Wty SSD	822567-B21
HPE 1.6TB SAS 12G Mixed Use SFF (2.5in) SC 3yr Wty SSD	822563-B21
HPE 800GB SAS 12G Mixed Use SFF (2.5in) SC 3yr Wty SSD	822559-B21
HPE 400GB SAS 12G Mixed Use SFF (2.5in) SC 3yr Wty SSD	822555-B21

6G SATA 2.5in SFF RI-3 SC SSD

HPE 3.84TB SATA 6G Read Intensive SFF (2.5in) SC 3yr Wty SSD	816929-B21

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Core Options

HPE 1.92TB SATA 6G Read Intensive SFF (2.5in) SC 3yr Wty SSD	816919-B21
HPE 960GB SATA 6G Read Intensive SFF (2.5in) SC 3yr Wty SSD	816909-B21
HPE 480GB SATA 6G Read Intensive SFF (2.5in) SC 3yr Wty SSD	816899-B21
HPE 240GB SATA 6G Read Intensive SFF (2.5in) SC 3yr Wty SSD	816889-B21
HPE 120GB SATA 6G Read Intensive SFF (2.5in) SC 3yr Wty SSD	816879-B21

6G SATA 2.5in SFF MU-3 SC SSD

HPE 1.92TB SATA 6G Mixed Use SFF (2.5in) SC 3yr Wty SSD	817011-B21
HPE 960GB SATA 6G Mixed Use SFF (2.5in) SC 3yr Wty SSD	816995-B21
HPE 480GB SATA 6G Mixed Use SFF (2.5in) SC 3yr Wty SSD	816985-B21
HPE 240GB SATA 6G Mixed Use SFF (2.5in) SC 3yr Wty SSD	816975-B21
HPE 120GB SATA 6G Mixed Use SFF (2.5in) SC 3yr Wty SSD	816965-B21

6G SATA (2.5-inch) 512e SC HDD

HPE 1TB SATA 6G Midline 7.2K SFF (2.5in) SC 1yr Wty 512e Digitally Signed Firmware HDD	765453-B21
HPE 2TB SATA 6G Midline 7.2K SFF (2.5in) SC 1yr Wty 512e Digitally Signed Firmware HDD	765455-B21

6G SATA 2.5in WI-PLP SC SSD

HPE 1.2TB SATA 6G Write Intensive SFF (2.5in) SC 3yr Wty SSD	804677-B21
HPE 800GB SATA 6G Write Intensive SFF (2.5in) SC 3yr Wty SSD	804671-B21
HPE 400GB SATA 6G Write Intensive SFF (2.5in) SC 3yr Wty SSD	804665-B21
HPE 200GB SATA 6G Write Intensive SFF (2.5in) SC 3yr Wty SSD	804639-B21

6G SATA 2.5in MU-PLP SC SSD

HPE 1.6TB SATA 6G Mixed Use SFF (2.5in) SC 3yr Wty SSD	804631-B21
HPE 800GB SATA 6G Mixed Use SFF (2.5in) SC 3yr Wty SSD	804625-B21
HPE 480GB SATA 6G Mixed Use SFF (2.5in) SC 3yr Wty SSD	832414-B21
HPE 200GB SATA 6G Mixed Use SFF (2.5in) SC 3yr Wty SSD	804613-B21

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Core Options

6G SATA 2.5in RI-PLP SC SSD

HPE 1.6TB SATA 6G Read Intensive SFF (2.5in) SC 3yr Wty SSD	804605-B21
HPE 800GB SATA 6G Read Intensive SFF (2.5in) SC 3yr Wty SSD	804599-B21
HPE 480GB SATA 6G Read Intensive SFF (2.5in) SC 3yr Wty SSD	804593-B21
HPE 240GB SATA 6G Read Intensive SFF (2.5in) SC 3yr Wty SSD	804587-B21
HPE 120GB SATA 6G Read Intensive SFF (2.5in) SC 3yr Wty SSD	804581-B21
HPE 80GB SATA 6G Read Intensive SFF (2.5in) SC 3yr Wty SSD	804575-B21

6G SATA Read Intensive (2.5-inch) SC G2 Solid State Drive

HP 480GB 6G SATA Read Intensive SFF 2.5-in SC 3yr Wty Solid State Drive	789145-B21

12G SAS Hot Plug SFF (2.5-inch) SC ENT HDD

HPE 1.2TB SAS 12G Enterprise 10K SFF (2.5in) SC 3yr Wty HDD	781518-B21
HPE 900GB SAS 12G Enterprise 10K SFF (2.5in) SC 3yr Wty HDD	785069-B21
HPE 600GB SAS 12G Enterprise 10K SFF (2.5in) SC 3yr Wty HDD	781516-B21
HPE 300GB SAS 12G Enterprise 10K SFF (2.5in) SC 3yr Wty HDD	785067-B21

12G SAS Hot Plug Value Endurance SFF (2.5-inch) SC Enterprise Value SSD

HP 1.6TB 12G SAS Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	762263-B21
HPE 800GB SAS 12G Read Intensive SFF (2.5in) SC 3yr Wty SSD	762261-B21

12G SAS Hot Plug SFF (2.5-inch) SC Enterprise SSD

HPE 600GB SAS 12G Enterprise 15K SFF (2.5in) SC 3yr Wty HDD	759212-B21
HPE 450GB SAS 12G Enterprise 15K SFF (2.5in) SC 3yr Wty HDD	759210-B21
HPE 300GB SAS 12G Enterprise 15K SFF (2.5in) SC 3yr Wty HDD	759208-B21

12G SAS Mainstream Enterprise Hot Plug SFF (2.5-inch) SC Enterprise Mainstream H2 Solid State Drives

HPE 200GB SAS 12G Write Intensive SFF (2.5in) SC 3yr Wty SSD	779164-B21
HPE 400GB SAS 12G Write Intensive SFF (2.5in) SC 3yr Wty SSD	779168-B21
HPE 800GB SAS 12G Write Intensive SFF (2.5in) SC 3yr Wty SSD	779172-B21

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Core Options

HPE 1.6TB SAS 12G Write Intensive SFF (2.5in) SC 3yr Wty SSD	779176-B21

12G SAS Write Intensive SFF (2.5-inch) SC 3yr Wty H2 Solid State Drive

HPE 200GB SAS 12G Write Intensive SFF (2.5in) SC 3yr Wty SSD	802578-B21
HPE 400GB SAS 12G Write Intensive SFF (2.5in) SC 3yr Wty SSD	802582-B21
HPE 800GB SAS 12G Write Intensive SFF (2.5in) SC 3yr Wty SSD	802586-B21
HPE 1.92TB SAS 12G Read Intensive SFF (2.5in) SC 3yr Wty SSD	802891-B21

6G SATA Mainstram Hot Plug SFF (2.5-inch) Enterprise Performance Solid State Drives

HP 800GB 6G SATA Mainstream Endurance SFF 2.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive	691868-B21
HP 400GB 6G SATA Mainstream Endurance SFF 2.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive	691866-B21
HP 200GB 6G SATA Mainstream Endurance SFF 2.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive	691864-B21
HP 100GB 6G SATA Mainstream Endurance SFF 2.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive	691862-B21

6G SATA Value Endurance Hot Plug SFF(2.5-inch) SC Enterprise Value M1 Solid State Drives

HPE 120GB SATA 6G Read Intensive SFF (2.5in) SC 3yr Wty SSD	764923-B21
HPE 240GB SATA 6G Read Intensive SFF (2.5in) SC 3yr Wty SSD	764925-B21
HPE 480GB SATA 6G Read Intensive SFF (2.5in) SC 3yr Wty SSD	764927-B21
HPE 800GB SATA 6G Read Intensive SFF (2.5in) SC 3yr Wty SSD	764929-B21

6G SATA Value Endurance Hot Plug SFF(2.5-inch) SC Enterprise Value G1 Solid State Drives

HP 480GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty G1 Solid State Drive	756657-B21
HP 240GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty G1 Solid State Drive	756636-B21
HP 120GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty G1 Solid State Drive	756621-B21

6G SATA Light Enterprise Hot Plug SFF(2.5-inch) SC Enterprise Light G1 Solid State Drives

HP 960GB 6G SATA Light Endurance SFF 2.5-in SC Enterprise Light 3yr Wty G1 Solid State Drive	756601-B21

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Core Options

	6G SATA Value Endurance Hot Plug SFF(2.5-inch) Enterprise Value Solid State Drives	
	HP 1.6TB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	757339-B21
	HP 800GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	717973-B21
	HP 600GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	739898-B21
	HP 480GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	717971-B21
	HP 300GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	739888-B21
	HP 240GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	717969-B21
	HP 120GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Boot 3yr Wty Solid State Drive	717965-B21
	HP 80GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Boot 3yr Wty Solid State Drive	734360-B21
	NOTE: Please see the QuickSpecs for Technical Specifications and additional information: https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04154378 (Worldwide)	
	NOTE: Hard drives have either a one year or three year warranty; refer to the specific hard drive QuickSpecs for details.	
	NOTE: The hard drive options are not required when configuring a Drive-less Model.	
HPE Graphic Options	HPE BL e-Class Special Enclosure	730876-B21
	NOTE: Available only with Intel® Xeon® E5-2600 v2 series processor configuration	
	NVIDIA GRID K2 Dual GPU PCIe Graphics Accelerator	729851-B21
	NOTE: GRID K2 requires GPU Enablement Kit (PN 734206-B21).	
	NOTE: Available only with Intel® Xeon® E5-2600 v2 series processor configuration	
	NVIDIA Tesla K20X 6GB Computational Accelerator NOTE:NOTE: Requires GPU Enablement Kit (PN 734206-B21)	C7S15A
	NVIDIA Quadro K4000 PCI-E Graphics Adapter	730870-B21
	NVIDIA Quadro K5000 PCI-E Graphics Adapter	730872-B21
	NVIDIA Quadro K6000 PCI-E Graphics Adapter	730874-B21
	HPE WS460c Gen8 GPU Enablement Kit NOTE:NOTE: Required when using NVIDIA GRID K2 GPU (PN 729851-B21) or Tesla K20 or K20X.	734206-B21

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Additional Options

NOTE: For additional options, please refer to the "Core Options" and "Additional Options" sections below.
NOTE: Some options may not be integrated at the factory. To ensure only valid configurations are ordered, Hewlett Packard Enterprise recommends the use of an Hewlett Packard Enterprise approved configurator. Contact your local sales representative for additional information.

HPE Insight software	**HPE Insight Control**	
	HPE Insight Control including 1yr 24x7 Technical Support and Updates 1-server LTU	C6N27A
	HPE Insight Control including 1yr 24x7 TSU E-LTU	C6N28ABE
	HPE Insight Control including 1yr 24x7 Support ProLiant ML/DL/BL-bundle FIO E-LTU	C6N36ABE
	HP Insight Control Server Provisioning Media Kit	BD883A
	HPE Insight Management Media Kit	C6N31A

NOTE: HPE Insight Management Media Kit contains DVDs without licenses. Contains HPE Systems Insight Manager, HPE Insight Control, HPE Matrix Operating Environment, and Virtual Connect Enterprise Manager software. Uses an integrated installer to perform quick and accurate software installation and updates.

NOTE: Electronic and Flexible-Quantity licenses can be used to purchase multiple licenses with a single activation key.

NOTE: Customer will receive a license entitlement certificate, which must be redeemed online or via fax in order to obtain the license activation key(s). Includes one year of 24 x 7 HPE Software Technical Support Service.

NOTE: Licenses ship without media. The HPE Insight Management Media Kit can be ordered separately, or can be downloaded at http://www.hp.com/go/insightupdates.

NOTE: For additional license kits, please see the QuickSpecs at: https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04123391

HPE iLO Advanced Licenses	HPE iLO Advanced for BladeSystem including 3yr 24x7 Tech Support and Updates 1-server LTU	BD502A
	HPE iLO Advanced for BladeSystem including 3yr 24x7 Technical Support and Updates E-LTU	E6U63ABE
	HPE iLO Advanced for BladeSystem including 1yr 24x7 Technical Support and Updates E-LTU	E6U60ABE
	HPE iLO Advanced for BladeSystem including 1yr 24x7 Support 1-server LTU NOTE:NOTE: Electronic licenses can be used to purchase multiple licenses with a single activation key, and is available in all countries except China and Japan. Customers in China and Japan should order the physical equivalent.	512488-B21

NOTE: Customer will receive a license entitlement certificate, which must be redeemed online or via fax in order to obtain the license activation key(s). Includes one year of 24 x 7 HPE Software Technical Support Service.

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Additional Options

NOTE: For additional license kits, please see the QuickSpecs at:
https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04154343

Converged Infrastructure Management Software	**HPE OneView**	
	HPE OneView with iLO Advanced	
	HPE OneView including 3yr 24x7 Support Physical 1-server LTU	E5Y34A
	HPE OneView including 3yr 24x7 Support Flexible Quantity E-LTU	E5Y35AAE
	HPE OneView Physical Media Kit LTU	E5Y37A
	HPE OneView w/o iLO including 3yr 24x7 Support 1-server LTU	P8B24A
	HPE OneView w/o iLO including 3yr 24x7 Support Flexible Quantity E-LTU	P8B26AAE
	HPE OneView w/o iLO including 3yr 24x7 Support 1-server FIO LTU	P8B31A
	NOTE: For additional license kits please see the QuickSpecs at: https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04111367.	
High Performance Clusters	HPE Insight Cluster Management Utility 1yr 24x7 Flexible LTU NOTE:NOTE: This part number can be used to purchase one certificate for multiple licenses with a single activation key. Each license is for one node (server). Customer will receive a printed end user license agreement and license entitlement certificate via physical shipment. The license entitlement certificate must be redeemed online in order to obtain a license key. NOTE:NOTE: For additional license kits please see the QuickSpecs at: https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04111735 (Worldwide)	QL803B
	HPE Insight Cluster Management Utility 3yr 24x7 Flexible LTU NOTE:NOTE: These part numbers can be used to purchase one certificate for multiple licenses and support with a single activation key. Each license is for one node (server). Customer will receive a printed end user license agreement and license entitlement certificate via physical shipment. The license entitlement certificate must be redeemed online in order to obtain a license key. Customer also will receive a support agreement.	BD476A
	HPE Insight Cluster Management Utility Media NOTE:NOTE: Order a minimum of one license per cluster to purchase media including software and documentation, which will be delivered to the customer, and also licenses CMU management. No license key is delivered or required. NOTE:NOTE: For additional license kits please see the QuickSpecs at: https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04111735 (Worldwide)	BD477A
HPE Security	HPE Trusted Platform Module Option	488069-B21
	NOTE: The TPM (Trusted Platform Module) is a microcontroller chip that can securely	

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Additional Options

store artifacts used to authenticate the server platform. These artifacts can include passwords, certificates and encryption keys. Windows® BitLocker™ Drive Encryption (BitLocker) is a data protection feature available in Windows Server® 2008. BitLocker leverages the enhanced security capabilities of a Trusted Platform Module (TPM) version 1.2. The TPM works with BitLocker to help protect user data and to ensure that a server running Windows Server 2008 has not been tampered with while the system was offline.
NOTE: For more information about TPM, including a white paper, go to http://www.hp.com/go/TPM.
NOTE: ProLiant OS pre-installed units will come with the partition required for TPM deployment.
NOTE: The TPM key is unique to every TPM deployed server and must be retained. Misplacing or losing the key could result in data loss.

HPE Fibre Channel Mezzanines

NOTE: All Fibre Channel mezzanine HBAs are supported on the HPE ProLiant WS460c Gen8 with server OS or hypervisors only. Windows client OS (Windows 7) on bare-metal not supported.

HPE LPe1605 16Gb Fibre Channel Host Bus Adapter for BladeSystem c-Class NOTE:NOTE: Please see QuickSpecs for technical specifications and additional information at: https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04315132	718203-B21
HPE LPe1205A 8Gb Fibre Channel Host Bus Adapter for BladeSystem c-Class NOTE:NOTE: Please see QuickSpecs for technical specifications and additional information at: https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04163733	659818-B21
HPE QMH2672 16Gb Fibre Channel Host Bus Adapter NOTE:NOTE: Please see QuickSpecs for technical specifications and additional information at: https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04126962	710608-B21
HPE QMH2572 8Gb Fibre Channel Host Bus Adapter NOTE:NOTE: For the above Fibre Channel Host Bus Adapter, please see the QuickSpecs for technical specifications and additional information at: https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04126040	651281-B21

HPE InfiniBand Mezzanines

NOTE: InfiniBand mezzanine HCAs are supported on the HPE ProLiant WS460c Gen8 with server OS or hypervisors. Windows client OS (Windows 7) not supported.
NOTE: When an InfiniBand adapter is installed in mezzanine slot 1, only one port is active (regardless of operating mode). When installed in any other mezzanine slot, both ports are active.
NOTE: InfiniBand QDR and FDR speeds are only supported on the HPE BladeSystem c7000 Enclosure. For additional information, please see the HPE BladeSystem c7000 Enclosure and InfiniBand QuickSpecs at:
https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04126044
https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04154440

HP InfiniBand QDR/EN 10Gb Dual Port 544M Adapter NOTE:NOTE: The QDR InfiniBand adapter may be installed in any vacant mezzanine slot	644160-B21

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Additional Options

	of the server.	
	HP InfiniBand FDR/EN 10/40Gb Dual Port 544M Adapter NOTE:NOTE: The FDR InfiniBand adapter must be installed in mezzanine slot 1 for FDR mode and may be installed in any mezzanine slot if operated in any other mode.	644161-B22
	HP InfiniBand FDR 2-port 545M Adapter	702213-B21
HPE Ultrium Tape Blades	HP StoreEver LTO-5 Ultrium SB3000c Tape Blade **NOTE: LTO-5 Ultrium tape technology.** **NOTE: For the above Ultrium tape drives, please see the QuickSpecs for technical specifications and additional information at: https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04154444**	BS580B
HPE Expansion Blade	HPE BLc PCI Expansion Blade NOTE:NOTE: Ships with one pre-installed PCI-X connect board. Also includes one PCIe connect board which requires installation. NOTE:NOTE: This Expansion Blade does not support any PCIe graphics adapters. For such use, HPE WS460c Gen8 Graphics Expansion (PN 684690-B21) must be used. NOTE:NOTE: Please see the QuickSpecs for Technical Specifications and additional information: https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04123380 (Worldwide)	448018-B21
HPE Flash Media Kits for USB Drives	**HPE Enterprise Mainstream Flash Media Kits for Memory Cards** HPE 8GB USB Enterprise Mainstream Flash Media Drive Key Kit	737953-B21
	HPE 8GB microSD Enterprise Mainstream Flash Media Kit	726116-B21
	HPE 32GB microSD Mainstream Flash Media Kit NOTE:NOTE: Please see the QuickSpecs for Technical Specifications and additional information: https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04123175	700139-B21
HPE Pointnext operational services	**NOTE: The HPE Care Pack service part numbers below for ProLiant BL c-Class workstation blades, cover the workstation blade and all Hewlett Packard Enterprise branded hardware options qualified for the workstation, purchased at the same time or afterwards, internal to the workstation with the exception of options requiring separate coverage as defined in the applicable HPE services data sheet.**	
	Proactive Care Services	
	HPE 3 year Proactive Care 24x7 with DMR ProLiant WS460c Service	U3C21E
	HPE 3 year Proactive Care 24x7 ProLiant WS460c Service	U3C18E
	HPE 3 year Proactive Care Call to Repair ProLiant WS460c Service	U3C24E
	HPE 3 year Proactive Care Call to Repair 24x7 with DMR ProLiant WS460c Service	U3C27E

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Additional Options

Installation Services

HPE Installation Non Standard Hours WS460c Workstation Blade Service	UR363E
HPE Installation WS460c Workstation Blade Service	UR362E

Additional HPE Pointnext operational services can be found at:
http://www.hp.com/go/cpc

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Memory

For detailed memory configuration rules and guidelines, please use the Online DDR3 Memory Configuration Tool:
http://www.hp.com/go/ddr3memory-configurator

Memory Subsystem Architecture
Each Intel® Xeon® E5-2600 family processor socket contains four memory channels that support two DIMMs each for a total of eight (8) DIMM per installed processor or a grand total of sixteen (16) DIMMs for the server. Up to 32GB capacity DIMMs are supported for 512GB of memory (16 DIMM slots x 32GB per DIMM).

Memory Population Rules and Guidelines:

- A minimum of one DIMM is required per processor.
- Install DIMMs only if the corresponding processor is installed.
- If only one processor is installed in a two processor system, only half of the DIMM slots are available.
- DIMM sizes can be mixed in channel. To maximize performance, it is recommended to balance the total memory capacity between all installed processors and to load the channels similarly whenever possible.
- RDIMMs operating at either 1.35V or 1.5V may be mixed in any order, but the system will power them at the higher voltage.
- LRDIMM, RDIMM and UDIMMs are all distinct memory technologies and cannot be mixed within a server. The majority of ProLiant Gen8 servers support RDIMM, UDIMM and LRDIMM.
- The Intel Xeon E5-2620 processor does not support DIMMs at 1.35V.
- DIMMs of different speeds may be mixed in any order; the server will select a common optimal speed.
- The maximum memory speed is a function of the memory type, memory configuration, and processor model.
- The maximum memory capacity is a function of the memory type and number of installed processors.
- HPE memory from previous generation servers is not compatible with the WS460c Gen8 Server Blade.
- To realize the performance memory capabilities listed in this document, HPE SmartMemory is required. For additional information, please see the HPE SmartMemory QuickSpecs at: **http://h18000.www1.hp.com/products/QuickSpecs/14225_div/14225_div.html**.
- For memory population rules and additional memory guidelines, please see the WS460c Gen8 user guide at **http://www.hp.com/support**.

NOTE: Memory configurations listed do not apply to "Factory Integrated Models".

WS460c Gen8 Supported Memory Bandwidth																			
DIMM Type	Registered DIMMS (RDIMMs)																	Load Reduced (LRDIMMs)	
DIMM Rank	Single Rank (1R)							Dual Rank (2R)								Three Rank (3R)	Quad Rank (4R)	Quad Rank (4R)	
DIMM Capacity	4GB	4GB	4GB	4GB	8GB	8GB	8GB	8GB	8GB	8GB	8GB	16GB	16GB	16GB	16GB	24GB	32GB	32GB	
DIMM Native Speed (MHz)	1333	1600	1600	1866	1600	1600	1866	1333	1600	1600	1866	1333	1600	1600	1866	1333	1333	1866	
Voltage*	LV	Std	LV	Std	Std	LV	Std	LV	Std	LV	Std	LV	Std	LV	Std	LV	LV	Std	
*LV= low voltage at 1.35V; Std = standard voltage at 1.5V.																			
SLOTS THAT CAN BE POPULATED																			
16 slot servers	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	
MAXIMUM CAPACITY (GB)																			

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Memory

Capacity	64	64	64	64	128	128	128	128	128	128	128	256	256	256	256	384	512	512
POPULATED DIMM SPEED (MHz)																		
1 DIMM Per Channel	1333	1600	1600	1866	1600	1600	1866	1333	1600	1600	1866	1333	1600	1600	1866	n/a	1333**	1866
2 DIMM Per Channel (2DPC)	1333	1600	1600	1866	1600	1600	1866	1333	1600	1600	1866	1333	1600	1600	1866	1333	1333**	1866

*** Maximum capacity will vary based on individual server platform qualification schedule**
**** LRDIMM enables 3 DIMMs per channel. HPE SmartMemory will support up to 3DPC@DDR3-1066 at 1.35V. Third party memory may only support 3DPC @DDR3-1066 at 1.5V.**

WS460c Gen8 Supported Memory Bandwidth										
DIMM Type	Unbuffered with ECC DIMMs (UDIMMs)									
DIMM Rank	Single Rank (1R)		Dual Rank (2R)							
DIMM Capacity	2GB	2GB	4GB	4GB	4GB	4GB	8GB	8GB	8GB	8GB
DIMM Native Speed (MHz)	1333	1600	1333	1600	1600	1866	1600	1333	1600	1866
Voltage*	LV	Std	LV	Std	LV	Std	Std	LV	LV	Std
SLOTS THAT CAN BE POPULATED										
16 slot servers	16	16	16	16	16	16	16	16	16	16
MAXIMUM CAPACITY (GB)										
Capacity	32	32	64	64	64	64	128	128	128	128
POPULATED DIMM SPEED (MHz)										
1 DIMM Per Channel	1333	1600	1333	1600	1600	1866	1600	1333	1600	1866
2 DIMM Per Channel (2DPC)	1333***	1600	1333***	1600	1600	1866	1600	1333***	1600	1866

***** Using HPE SmartMemory, UDIMMs at 2DPC are supported up to 1333MHz. Third party UDIMMs at 2DPC may only support up to 1066MHz.**
NOTE: Maximum memory speed is a function of the processor QPI bus speed; see the table below "Memory Speed by Processor Model".
NOTE: When HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits are used with any processors except the E5-2690, the E5-2643, the E5-2637 v2, the E5-2643 v2, or the E5-2667 v2 all 16 DIMM slots on the WS460c Gen8 must be fully populated with these 24GB DIMMs. When HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits are used with either the E5-2690, the E5-2643, the E5-2637 v2, the E5-2643 v2, or the E5-2667 v2, all 12 available DIMM slots on the WS460c Gen8 must be fully populated with these 24GB DIMMs.
NOTE: The internal USB 2.0 Port is not available when the HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits (700404-B21) are used.

Memory Speed by Processor Model

Processor Model	**Supported Memory Speeds**
E5-2680, E5-2670, E5-2667, E5-2665, E5-2660, E5-2650, E5-2650L, E5-2637	1600/1333/1066MHz

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Memory

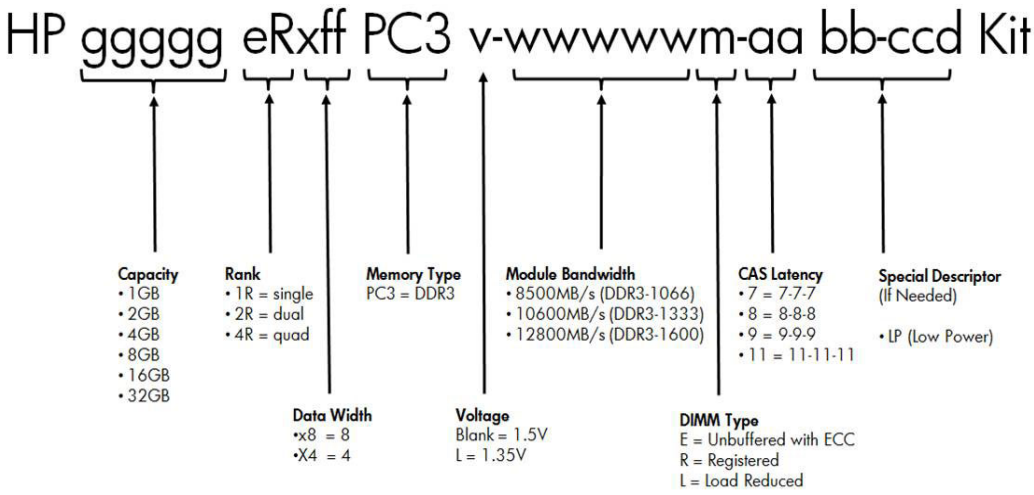
E5-2640, E5-2630, E5-2630L, E5-2620	1333/1066MHz
E5-2609, E5-2603	1066MHz

Standard and Maximum Memory Capacity (Pre-configured Models)			
Pre Configured Models	**Standard Memory**	**Maximum Memory Plus Optional Memory**	**Standard Memory Replaced with Optional Memory**
Intel Xeon E5-2637	32GB (8x 4GB)	160GB (8x 4GB + 8x 16GB)	512GB (16x 32GB)

NOTE: Capacity references are rounded to the common gigabyte (GB) values.

- 2GB = 2,048MB
- 4GB = 4,096MB
- 8GB = 8,192MB
- 16GB = 16,384MB
- 32GB = 32,768MB

Memory options part number decoder



Following are memory options available from HP:

HPE Memory

NOTE: HPE memory from previous generation servers are not qualified or warranted with this HPE ProLiant WS460c Server. HPE SmartMemory is required to realize the memory performance improvements and enhanced functionality listed in this document for Gen8. For additional information, please see the HPE SmartMemory QuickSpecs at:
http://h18000.www1.hp.com/products/QuickSpecs/14225_div/14225_div.html

NOTE: LRDIMM, RDIMM and UDIMMs are all distinct memory technologies and cannot be mixed within a server. The majority of ProLiant Gen8 servers support RDIMM, UDIMM and LRDIMM.

NOTE: A minimum of one DIMM is required per server.

NOTE: For additional memory rules and guidelines, see the "Memory" section later in this document.

NOTE: When HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits are used with any processors except the E5-2690, the E5-2643, the E5-2637 v2, the E5-2643 v2, or the E5-2667 v2 all 16

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Memory

DIMM slots on the WS460c Gen8 must be fully populated with these 24GB DIMMs. When HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits are used with either the E5-2690, the E5-2643, the E5-2637 v2, the E5-2643 v2, or the E5-2667 v2, all 12 available DIMM slots on the WS460c Gen8 must be fully populated with these 24GB DIMMs.

NOTE: The internal USB 2.0 Port is not available when the HPE 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits (700404-B21) are used.

HPE SmartMemory

Registered DIMMs (RDIMMs) - E5-2xxx v2 series Processors

HP 4GB (1x4GB) Single Rank x4 PC3L-12800R (DDR3-1600) Registered CAS-11 Low Voltage Memory Kit	713981-B21
HP 4GB (1x4GB) Single Rank x4 PC3-14900R (DDR3-1866) Registered CAS-13 Memory Kit	708637-B21
HPE 8GB (1x8GB) Dual Rank x4 PC3L-12800R (DDR3-1600) Registered CAS-11 Low Voltage Memory Kit	713983-B21
HPE 8GB (1x8GB) Single Rank x4 PC3L-12800R (DDR3-1600) Registered CAS-11 Low Voltage Memory Kit	731765-B21
HP 8GB (1x8GB) Dual Rank x4 PC3-14900R (DDR3-1866) Registered CAS-13 Memory Kit	708639-B21
HPE 8GB (1x8GB) Single Rank x4 PC3-14900R (DDR3-1866) Registered CAS-13 Memory Kit	731761-B21
HPE 16GB (1x16GB) Dual Rank x4 PC3L-12800R (DDR3-1600) Registered CAS-11 Low Voltage Memory Kit	713985-B21
HPE 16GB (1x16GB) Dual Rank x4 PC3-14900R (DDR3-1866) Registered CAS-13 Memory Kit	708641-B21

Registered DIMMs (RDIMMs) - E5-2xxx series Processors

HP 4GB (1x4GB) Single Rank x4 PC3L-10600 (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit	647893-B21
HPE 4GB (1x4GB) Single Rank x4 PC3-12800 (DDR3-1600) Registered CAS-11 Memory Kit	647895-B21
HP 8GB (1x8GB) Dual Rank x4 PC3L-10600 (DDR3-1333) Registered CAS-9 LP Memory Kit	647897-B21
HPE 8GB (1x8GB) Single Rank x4 PC3-12800 (DDR3-1600) Registered CAS-11 Memory Kit	647899-B21
HP 8GB (1x8GB) Dual Rank x4 PC3-12800R (DDR3-1600) Registered CAS-11 Memory Kit	690802-B21
HPE 16GB (1x16GB) Dual Rank x4 PC3L-10600 (DDR3-1333) Registered CAS-9 LP Memory Kit	647901-B21
HPE 16GB (1x16GB) Dual Rank x4 PC3-12800R (DDR3-1600) Registered CAS-11 Memory Kit	672631-B21
HP 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 LV	761501-B21

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Memory

Memory Kit

Unbuffered with ECC DIMMs (UDIMMs) - E5-2xxx v2 series Processors

HP 2GB (1x2GB) Single Rank x8 PC3L-12800E (DDR3-1600) Unbuffered CAS-11 Low Voltage Memory Kit	713975-B21
HP 2GB (1x2GB) Single Rank x8 PC3-14900E (DDR3-1866) Unbuffered CAS-13 Memory Kit	708631-B21
HP 4GB (1x4GB) Dual Rank x8 PC3L-12800E (DDR3-1600) Unbuffered CAS-11 Low Voltage Memory Kit	713977-B21
HP 4GB (1x4GB) Dual Rank x8 PC3-14900E (DDR3-1866) Unbuffered CAS-13 Memory Kit	708633-B21
HP 8GB (1x8GB) Dual Rank x8 PC3L-12800E (DDR3-1600) Unbuffered CAS-11 Low Voltage Memory Kit	713979-B21
HP 8GB (1x8GB) Dual Rank x8 PC3-14900E (DDR3-1866) Unbuffered CAS-13 Memory Kit	708635-B21

Unbuffered with ECC DIMMs (UDIMMs) - E5-2xxx series Processors

HPE 2GB(1x2GB) Single Rank x8 PC3-12800E (DDR3-1600) Unbuffered CAS-11 Memory Kit	669320-B21
HP 2GB (1x2GB) Single Rank x8 PC3L-10600(DDR3-1333) Unbuffered CAS-9 LP Memory	647905-B21
HPE 4GB (1x4GB) Dual Rank x8 PC3-12800E (DDR3-1600) Unbuffered CAS-11 Memory Kit	669322-B21
HP 4GB (1x4GB) Dual Rank x8 PC3L-10600(DDR3-1333) Unbuffered CAS-9 LP Memory Kit	647907-B21
HPE 8GB (1x8GB) Dual Rank x8 PC3- 12800E (DDR3-1600) Unbuffered CAS-11 Memory Kit	669324-B21
HP 8GB (1x8GB) Dual Rank x8 PC3L-10600(DDR3-1333) Unbuffered CAS-9 LP Memory Kit	647909-B21

Load Reduced DIMMs (LRDIMMs) - E5-2600 v2 series Processors

HPE 32GB (1x32GB) Quad Rank x4 PC3-14900L (DDR3-1866) Load Reduced CAS-13 Memory Kit	708643-B21

Load Reduced DIMMs (LRDIMMs) - E5-2600 series Processors

HP 32GB (1x32GB) Quad Rank x4 PC3L-10600 (DDR3-1333) LRDIMM CAS-9 LP Memory Kit	647903-B21

NOTE: All DDR3 memory option kits consist of one DIMM per kit. For detailed memory configuration rules and guidelines, please use the Online DDR3 Memory Configuration Tool: http://www.hp.com/go/ddr3memory-configurator.

NOTE: Kits described as LP include Low Power DIMMs. For more information on ProLiant Energy Efficient Features, see: http://www.hp.com/go/proliant-energy-efficient.

NOTE: Depending on the memory configuration and processor model the memory

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Memory

speed may run at 1333MHz, 1066MHz or 800MHz. Please see the Online Memory Configuration Tool for details: **http://www.hp.com/go/ddr3memory-configurator**

NOTE: For additional memory rules and guidelines, see the "Memory" section later in this document.

NOTE: For more information on ProLiant Energy Efficient Features, see: **http://www.hp.com/go/proliant-energy-efficient**

NOTE: PC3L is a low voltage memory.

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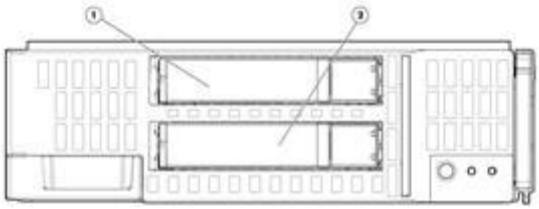
Storage



1-2 2 x SFF hot-plug SAS, SATA, SAS SDD, and SATA SSD hard drives

Maximum Internal Storage Capacity

Hot Plug SFF SAS	2.4TB	2 x 1.2TB drives
Hot Plug SFF SATA	2.0TB	2 x 1.0TB drives
Hot Plug SFF SAS SSD	1.6TB	2 x 800GB drives
Hot Plug SFF SATA SSD	1.6TB	2x800GB drives

Additional Third Party Option

Teradici PCoIP® Hardware Accelerator

Teradici PCoIP® Hardware Accelerator (APEX 2800) for HPE ProLiant Gen 8 Server Blades

NOTE: This is a third party product marketed, sold and supported by the solution's vendor. For more information, check vendor's website at: http://www.teradici.com/hardware-accelerator

NOTE: This solution must be purchased separately and is available from solution vendor's authorized resellers. Hewlett Packard Enterprise does not resell or factory integrate the solution

NOTE: This solution is supported by the vendor on servers:

- **HPE ProLiant BL460c Gen8 Server Blade**
- **HPE ProLiant WS460c Gen8 Graphics Expansion Blade**

NOTE: Teradici, PCoIP and PC-over-IP are trademarks of Teradici Corporation and may be registered in the United States and/or other countries.

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Technical Specifications

System Unit	**Dimensions** (H x W x D) (with bezel)	Single-width: 7.11 x 2.18 x 20.37 in (18.07 x 5.54 x 51.76 cm) Double-width: 7.11 x 4.46 x 20.37 in (18.07 x 11.08 x 51.76 cm)
	Weight (approximate)	**(Single-width type)**
		Maximum: all processors, 16 DIMMs, hard drives, mezzanine cards, and two flash cache batteries installed) — 14.00 lb (6.33 kg)
		Minimum: one processor and 2 DIMMs installed — 10.50 lb (4.75 kg)
		(Double-width type)
		Maximum: all processors, 16 DIMMs, hard drives, mezzanine cards, and two flash cache batteries installed), dual MultiGPU Carrier with eight Q1000M — 22.25 lb (10.09 kg)
		Minimum: one processor and 2 DIMMs installed, expansion blade slot 1,2 enabled, both slots vacant — 15.69 lb (7.12 kg)
	Power Specifications	For power specifications including input requirements, BTU rating, and power supply output, please see the: • HPE BladeSystem c3000 Enclosure QuickSpecs: **http://h18000.www1.hp.com/products/QuickSpecs/12790_div/12790_div.html** • HPE BladeSystem c7000 Enclosure QuickSpecs: **http://h18000.www1.hp.com/products/QuickSpecs/12810_div/12810_div.html** **NOTE: For optimal cooling and system performance the WS460c Gen8 requires the c7000 enclosure to be configured with 10 fans and the c3000 enclosure to be configured with 6 fans.** To review typical system power ratings use the HPE Power Advisor which is available via the online tool located at: **http://www.hp.com/go/bladesystem/powercalculator**
	System Inlet Temperature (Single-width type)	Operating — 10° to 35°C (50° to 95°F) at sea level with an altitude derating of 1.0°C per every 305 m (1.8°F per every 1000 ft) above sea level to a maximum of 3050 m (10,000 ft), no direct sustained sunlight. Maximum rate of change is 10°C/hr (18°F/hr). The upper limit may be limited by the type and number of options installed. System performance may be reduced if operating with a

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Technical Specifications

		fan fault or above 30°C (86°F).
	Non-operating	-30° to 60°C (-22° to 140°F). Maximum rate of change is 20°C/hr (36°F/hr).
System Inlet Temperature (Double-width type)	Operating	10° to 35°C (50° to 95°F) at sea level with an altitude derating of 1.0°C per every 305 m (1.8°F per every 1000 ft) above sea level to a maximum of 3050 m (10,000 ft), no direct sustained sunlight. Maximum rate of change is 10°C/hr (18°F/hr). The upper limit may be limited by the type and number of options installed. System performance may be reduced if operating with a fan fault or above 30°C (86°F). If ambient temperature over 30°C (86°F), and GPU power load is consistently and significantly high, GPU frequency will throttle down, and in extreme cases, system may initiate a protection shutdown sequence.
	Non-operating	-30° to 60°C (-22° to 140°F). Maximum rate of change is 20°C/hr (36°F/hr).
Relative Humidity (Single-width type) (non-condensing)	Operating	10 to 90% relative humidity (Rh), 28°C (82.4°F) maximum wet bulb temperature, non-condensing.
	Non-operating	5 to 95% relative humidity (Rh), 38.7°C (101.7°F) maximum wet bulb temperature, non-condensing.
Relative Humidity (Double-width type) (non-condensing)	Operating	10 to 90% relative humidity (Rh), 28°C (82.4°F) maximum wet bulb temperature, non-condensing.
	Non-operating	5 to 95% relative humidity (Rh), 38.7°C (101.7°F) maximum wet bulb temperature, non-condensing.
Altitude (Single-width type)	Operating	3050 m (10,000 ft). This value may be limited by the type and number of options installed. Maximum allowable altitude change rate is 457 m/min (1500 ft/min).
	Non-operating	9144 m (30,000 ft). Maximum allowable altitude change rate is 457 m/min (1500 ft/min).
Altitude (Double-width type)	Operating	3050 m (10,000 ft). This value may be limited by the type and number of options installed. Maximum allowable altitude change rate is 457 m/min (1500 ft/min).
	Non-operating	9144 m (30,000 ft). Maximum allowable altitude change rate is 457 m/min (1500 ft/min).
Acoustic Noise	For acoustic noise specifications, please see the HPE BladeSystem c-Class Enclosures QuickSpecs located at URL: HPE BladeSystem c3000 Enclosure QuickSpecs: **http://h18000.www1.hp.com/products/QuickSpecs/12790_div/12790_div.html** HPE BladeSystem c7000 Enclosure QuickSpecs: **http://h18000.www1.hp.com/products/QuickSpecs/12810_div/12810_div.html**	

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Technical Specifications

HPE Smart Array P220i / P230i Controller	**Disk Drive Interface**	6Gb/s SAS (Serial Attached SCSI)
	Server Interface	x4 PCI Express host interface
	Cache Memory	512MB flash backed write cache (FBWC) cache standard
	Logical Drive Capacity	64 (with included 512MB cache)
	Host Memory Addressing	64-bit, supporting servers memory space greater than 4GB
	RAID Support	RAID 1 (mirroring) and RAID 0 (striping)
	Other	Upgradeable firmware with recovery ROM Online drive flash (with SAS drives) HPE Secure Encryption is supported on P230i as an option
HPE MultiGPU Carrier card (single, carrier only)	**I/O Interface**	PCIe Gen3 x16
	Size	Full-size, full-length PCIe card
	MXM Connector	Four MXM v.3.0 connectors (follows MXM specifications) • Accepts three (3) MXM-B or four (4) MXM-A cards
	MXM Interface	PCIe Gen3 x8
	Supported MXM adapters	NVIDIA Quadro K3100M/3000M (three per carrier card) or NVIDIA Quadro 1000M (four per carrier card)
	Weight	1.60 lb (0.724 kg) - Single, vacant with no MXM graphics
AMD FirePro S4000X server module	**Memory size**	2GB
	Memory type	GDDR-5
	Memory interface	128-bit
	Card type	MXM-v.3.0, Type-A
	I/O interface	PCIe (x16) Gen3
	Max power consumption	45W
	API	DirectX 11, Shader Model 5.0; OpenGL4.3; OpenCL 1.2, AMD Mantle
	Upgradeable Firmware	Upgradeable Firmware. Up to six displays can be supported by single card.
	Operating Systems	Microsoft ® Windows 7® Professional (64-bit)
NVIDIA Quadro K3100M graphics adapter	**Memory size**	4GB
	Memory type	GDDR-5
	Memory interface	256-bit
	Card type	MXM-v.3.0
	I/O interface	PCIe (x16) Gen3;
	Max power consumption	75W
	API	DirectX 11, Shader Model 5.0; OpenGL4.3
	Upgradeable Firmware	Upgradeable Firmware. Up to four displays can be supported by using firmware

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Technical Specifications

		edition 80.04.F1.00.01 and driver 331.82b or later. Prior edition firmware supports up to two displays.
	Operating Systems	Microsoft ® Windows 7® Professional (64-bit) Microsoft® Windows Server 2008 R2 SP1 (64-bit) Standard, Enterprise and DataCenter editions Red Hat Enterprise Linux (RHEL) 5.8 and 6.2 (64-bit only) Citrix XenServer 6 Enterprise and Platinum Edition VMware vSphere5.1 or later
NVIDIA Quadro K4000 graphics adapter	**Memory size**	3.0 GB
	Memory type	GDDR-5
	Memory interface	192-bit
	I/O interface	PCIe (x16) Gen 2
	Max power consumption	80W
	API	DirectX 11, Shader Model 5.0; OpenGL4.3
	Operating Systems	Microsoft ® Windows 7® Professional (64-bit) Microsoft® Windows Server 2008 R2 SP1 (64-bit) Standard, Enterprise and DataCenter editions, Windows Server 2012 Red Hat Enterprise Linux (RHEL) 5.8 and 6.2 (64-bit only) Citrix XenServer 6 Enterprise and Platinum Edition VMware vSphere5.1 or later
NVIDIA Quadro K5000 graphics adapter	**Memory size**	4.0 GB
	Memory type	GDDR-5
	Memory interface	256-bit
	I/O interface	PCIe (x16) Gen 2
	Max power consumption	122W
	API	DirectX 11, Shader Model 5.0; OpenGL4.3
	Operating Systems	Microsoft ® Windows 7® Professional (64-bit) Microsoft® Windows Server 2008 R2 SP1 (64-bit) Standard, Enterprise and DataCenter editions, Windows Server 2012 Red Hat Enterprise Linux (RHEL) 5.8 and 6.2 (64-bit only) Citrix XenServer 6 Enterprise and Platinum Edition VMware vSphere5.1 or later
NVIDIA Quadro K6000 graphics adapter	**Memory size**	12.0 GB
	Memory type	GDDR-5
	Memory interface	384-bit
	I/O interface	PCIe (x16) Gen 3
	Max power consumption	225W
	API	DirectX 11, Shader Model 5.0; OpenGL4.3
	Operating Systems	Microsoft ® Windows 7® Professional (64-bit)

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Technical Specifications

		Microsoft® Windows Server 2008 R2 SP1 (64-bit) Standard, Enterprise and DataCenter editions, Windows Server 2012 Red Hat Enterprise Linux (RHEL) 5.8 and 6.2 (64-bit only) Citrix XenServer 6 Enterprise and Platinum Edition VMware vSphere5.1 or later
NVIDIA GRID K1 GPU adapter	**Number of GPU**	4 entry Kepler GPUs
	Memory size	4.0 GB per GPU (16GB total)
	Memory type	DDR-3
	I/O interface	PCIe (x16) Gen 3 (Gen 2 compatible)
	Max power consumption	130W
	API	DirectX 11, Shader Model 5.0; OpenGL4.3 (Varies by virtualization mode) GRID virtual GPU support (XenServer only)
	Operating Systems	Microsoft ® Windows Server 2012 Citrix XenServer 6 Enterprise and Platinum Edition VMware vSphere5.1 or later
NVIDIA GRID K2 GPU adapter	**Number of GPU**	2 High-end Kepler GPUs
	Memory size	4.0 GB per GPU (8GB total)
	Memory type	GDDR-5
	I/O interface	PCIe (x16) Gen 3 (Gen 2 compatible)
	Max power consumption	225W
	API	DirectX 11, Shader Model 5.0; OpenGL4.3 (Varies by virtualization mode) GRID virtual GPU support (XenServer only)
	Operating Systems	Microsoft® Windows Server 2012 Citrix XenServer 6 Enterprise and Platinum Edition VMware vSphere5.1 or later
NVIDIA Tesla K20 GPU Computational Accelerator	**GPU**	1 Kepler GK110
	CUDA cores	2496
	Memory size	5.0 GB
	Memory type	GDDR-5
	Memory bandwidth	208 GB/sec
	I/O interface	PCIe (x16) Gen 2
	Max power consumption	225W
	NOTE: For additional information please see QuickSpecs at: **https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04154396**	
NVIDIA Tesla K20X GPU	**GPU**	1 Kepler GK110
	CUDA cores	2688

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Technical Specifications

Computational Accelerator	**Memory size**	6.0 GB
	Memory type	GDDR-5
	Memory bandwidth	250 GB/sec
	I/O interface	PCIe (x16) Gen 2
	Max power consumption	235W

NOTE: For additional information please see QuickSpecs at:
https://www.hpe.com/h20195/v2/GetHTML.aspx?docname=c04154396

Environment-friendly Products and Approach	**End-of-life Management and Recycling**	Hewlett Packard Enterprise offers end-of-life Hewlett Packard Enterprise product return, trade-in, and recycling programs in many geographic areas. For trade-in information, please go to: **https://promotions.ext.hpe.com/WMCF.Web/us/en/page/GlobalLandingPage/** . To recycle your product, please go to: **https://promotions.ext.hpe.com/WMCF.Web/us/en/page/GlobalLandingPage/** or contact your nearest Hewlett Packard Enterprise sales office. Products returned to Hewlett Packard Enterprise will be recycled, recovered or disposed of in a responsible manner. The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard Enterprise web site at: **https://promotions.ext.hpe.com/WMCF.Web/us/en/page/GlobalLandingPage/**. These instructions may be used by recyclers and other WEEE treatment facilities as well as Hewlett Packard Enterprise OEM customers who integrate and re-sell Hewlett Packard Enterprise equipment.

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Summary of Changes

Date	Version History	Action	Description of Change
23-Oct-2017	From Version 31 to 32	Changed	Care Pack naming and Service and Support- Parts and Materials updated.
16-Feb-2016	From Version 30 to 31	Changed	Information updated in different sections.
		Added	SKU added in Core Options section: 832514-B21
		Removed	Obsolete SKU deleted in CoreOptions section: 789135-B21
11-Dec-2015	Fro Version 29 to 30	Changed	Configuration Information - Factory Integrated Models, Core Options, Additional Options, and Memory sections were updated.
		Added:	SKUs added in Core Options section: 816576-B21, 816572-B21, 816568-B21, 816562-B21, 822567-B21, 822563-B21, 822559-B21, 822555-B21, 816929-B21, 816919-B21, 816909-B21, 816899-B21, 816889-B21, 816879-B21, 817011-B21, 816995-B21, 816985-B21, 816975-B21, 816965-B21.
		Removed	Obsolete SKUs were deleted: 662064-L21, 662065-L21, 735062-B21, 735062-B21, 789155-B21, C7S14A, E5Y38A, E5Y39AAE, D8S85AAE, D8S84A, AP880A.
28-Sep-2015	From Version 28 to 29	Changed	Additional Options and Core Options sections were updated.
		Added	SKUs added: P8B24A. P8B26AAE. P8B31A
		Removed	Obsolete skus were deleted: E5Y43AAE, F6Q89AAE. 741155-B21, 678276-B21, 684690-B21, D8S85AAE, D8S84A, C7S14A, E5Y38A, E5Y39AAE, AP880A
17-Aug-2015	From Version 27 to 28	Added	SKUs added in Additional Options and Core Options sections: C9A82AAE, 804677-B21, 804671-B21, 804665-B21, 804639-B21, 804631-B21, 804625-B21, 832414-B21, 804613-B21, 804605-B21, 804599-B21, 804593-B21, 804587-B21, 804581-B21, 804575-B21
		Removed	Obsolete SKUs deleted: AQ697B, U6W98E
01-Jun-2015	From Version 26 to 27	Changed	Information updated in Additional options section.
		Added	SKUs were added in Core Options section: 748387-B21, 791034-B21
		Removed	Obsolete SKUs were removed in Core Options section: 662076-L21, 662063-L21, 667804-L21, 667803-L21, 662066-L21, 662078-L21, 662072-L21, 662067-L21, 662077-L21, 662068-L21, 662079-L21, 662070-L21, 667805-L21, 741151-B21, 741159-B21
30-Mar-2015	From Version 25 to 26	Changed	Standard Features, Configuration Information-Factory Integrated Models and Models sections were updated
		Added	SKUs Added: 765464-B21, 765466-B21, 765453-B21, 765455-B21, 789135-B21, 789145-B21, 789155-B21, 781518-B21, 785069-B21, 781516-B21, 785067-B21, 802578-B21, 802582-B21, 802586-B21, 802891-B21
		Removed	Obsolete SKUs Removed: 741146-B21, 741138-B21, 741142-B21
09-Feb-2015	From Version 24 to 25	Changed	Optional Features, Service and Support and Core Options sections were updated.
		Added	SKUs Added on HPE Hard Drives: 779164-B21, 779168-B21, 779172-B21, 779176-B21, 764923-B21, 764925-B21, 764927-B21, 764929-B21
01-Dec-2014	From Version 23 to 24	Changed	Core Options and Additional Options sections were updated. Name changed from HPE ProLiant WS460c Gen8 Workstation Blade to HPE ProLiant WS460c Gen8 Graphics Server Blade

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Summary of Changes

		Added	SKU Added on Hard Drives: 757339-B21
		Removed	Obsolete skus deleted: 764929-B21, 764927-B21, 764925-B21, 764923-B21
01-Nov-2014	From Version 22 to 23	Changed	Service and Support section was updated
29-Sep-2014	From Version 21 to 22	Added	SKUs added on Core Options: 764923-B21, 764925-B21, 764927-B21, 764929-B21, 756657-B21, 756636-B21, 756621-B21
		Removed	Obsolete sku removed: 608447-B21
09-Sep-2014	From Version 20 to 21	Changed	Standard Features sections was updated
		Added	SKUs added to Core Options section: 762263-B21, 762261-B21, 759212-B21, 759210-B21, 759208-B21, 741146-B21, 741142-B21, 741138-B21, 741159-B21, 741155-B21, 741151-B21
		Removed	Pre-Configured Models section was deleted SKUs Removed: 679858-B21, 679860-B21, 667761-B21
10-Jun-2014	From Version 18 to 20	Changed	Memory, Graphics Options, Hard Drives, Mezzanine Options, and Security were revised.
31-Mar-2014	From Version 17 to 18	Changed	Changes made throughout
18-Feb-2014	From Version 16 to 17	Changed	Changes made throughout the QuickSpecs. The What's New section was updated to the following: Support for NVIDIA Quadro K3100M mezzanine graphics Support for HPE MultiGPU Carrier with six NVIDIA Quadro K3100M graphics Support for NVIDIA Quadro K6000 PCIe graphics Support for NVIDIA K20X/K20 GPU accelerator Support for HPE Smart Array P230i controller as optional selection Support for HPE InfiniBand mezzanine HCA adapters
13-Dec-2013	From Version 15 to 16	Changed	HPE 24GB Three Rank x4 PC3L-10600R Registered CAS-9 Low Voltage FIO Memory Kit and Load Reduced DIMMs (LRDIMMS) E5-2600 v2 Series Processors were added to Memory HPE 1.2TB 6G SAS 10k rpm SFF SC Dual Port Enterprise 3yr Warranty Hard Drive, HPE 300GB and 600GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Boot 3yr Wty Solid State Drives were added to Hard Drives Teradici PCoIP Hardware Accelerator was added to Storage NVIDIA Quadro 6000 6GB PCI-E Adapter was removed from Graphics Options HPE 4GB microSD Enterprise Performance Flash Media Kit was removed from HPE USB and SD Options
01-Nov-2013	From Version 14 to 15	Changed	Revisions made to Notes in the processor and memory sections.
08-Oct-2013	From Version 13 to 14	Changed	Revisions made to processor and memory descriptions.
30-Sep-2013	From Version 12 to 13	Changed	Processors, Memory, Graphics Adapter, Fibre Channel Support, Networking, Storage Controllers, HPE Insight Software, and HPE iLO Advanced Licenses were revised.
10-Sep-2013	From Version 11 to 12	Changed	HPE Insight Management, Memory, Graphics Adapters, HPE iLO Advanced Features, and HPE Fibre Channel Mezzanine Options were revised.
20-Aug-2013	From Version 10 to 11	Changed	Correction made to version information.
19-Aug-2013	From Version 9 to 10	Changed	Graphics Adapter was moved from Standard Features and Optional Features HPE Insight Manager, Security, and Availability were revised in Standard Features Steps 2 and 3 were revised in Configuration Information - Factory

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Summary of Changes

			Integrated Models HPE 80GB 6G SATA Value Endurance SFF Solid State Drive was added and 3G SATA MLC Hot Plug SFF Mainstream Solid State Drives were removed from Hard Drives in Core Options Intel Xeon E5-2690 and Intel Xeon E5-2643 Processor Kits were added to Processors Citrix XenDesktop 5.6fp1 and VMware Horizon View 5.2 vSphere 5.1 or later were added to Operating Systems Support for HPE ProLiant Workstations Fibre Channel Support and Compatible SAN were added to Optional Features HPE FlexFabric 10Gb 2-port 553FLB Adapter was removed from HPE Networking in Core Options
10-Jun-2013	From Version 8 to 9	Changed	Changes were made to the following sections: What's New was changed to: Support for HPE 120GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Boot Solid State Drive Support for HPE 800GB, 480GB and 240GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value Solid State Drives Standard Features: HPE Processor, Cache Memory Configuration Information: Step 2, 3 Core Options: HPE Processors, HPE Hard Drives Additional Options: HPE Insight software, HPE Storage Blades, HPE USB and SD Options Memory
26-Apr-2013	From Version 7 to 8	Changed	Changes were made to the following sections: Callout # 4 of the 1st image. What's New Standard Features - Network Controller, Maximum Internal Storage, Operating Systems Support for HPE ProLiant Workstations, Mezzanine Support, Form factor Configuration Information Core Options - HPE Networking Additional Options - HPE Expansion Blade Memory Storage
25-Mar-2013	From Version 6 to 7	Changed	Changes were made to remove references to Platinum in the Standard Features, Configuration Information and Technical Specifications sections.
15-Mar-2013	From Version 5 to 6	Removed	Changes were made to remove part numbers 582765-B21, T9074BAE, 452148-B22, TC2748AAE, and 436222-B21.
05-Dec-2012	From Version 4 to 5	Changed	Changes were made to add the 2nd Overview image.
04-Dec-2012	From Version 3 to 4	Changed	Changes were made throughout the QuickSpecs.
24-Sep-2012	From Version 2 to 3	Changed	Changes made in Optional Features section.
17-Aug-2012	From Version 1 to 2	Changed	Changes made throughout the QuickSpecs.

RETIRED: Retired products sold prior to the November 1, 2015 separation of Hewlett-Packard Company into Hewlett Packard Enterprise Company and HP Inc. may have older product names and model numbers that differ from current models.

Summary of Changes

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For hard drives, 1GB = 1 billion bytes. Actual formatted capacity is less.

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