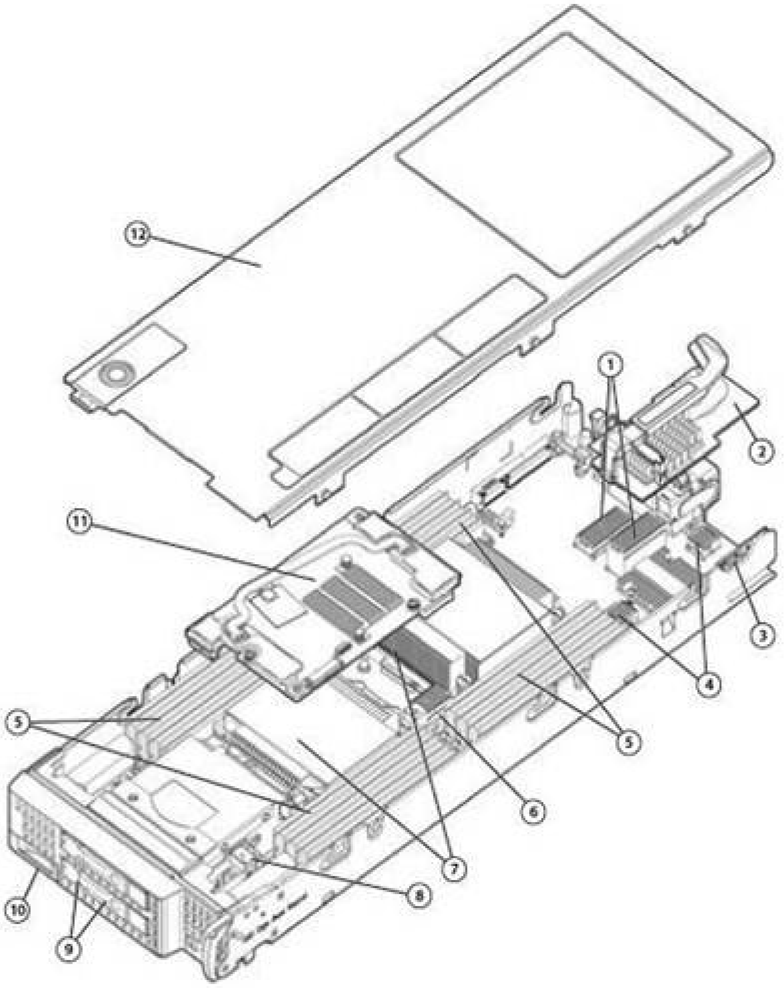

Figure 1 - HP ProLiant WS460c Gen8 Workstation Blade (single-width type)

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. HP Smart Array P220i 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. HP c-Class Blade SUV (Serial, USB, VGA) connector
11. HP Smart Array P220i Controller with 512MB FBWC
12. Access panel

Overview

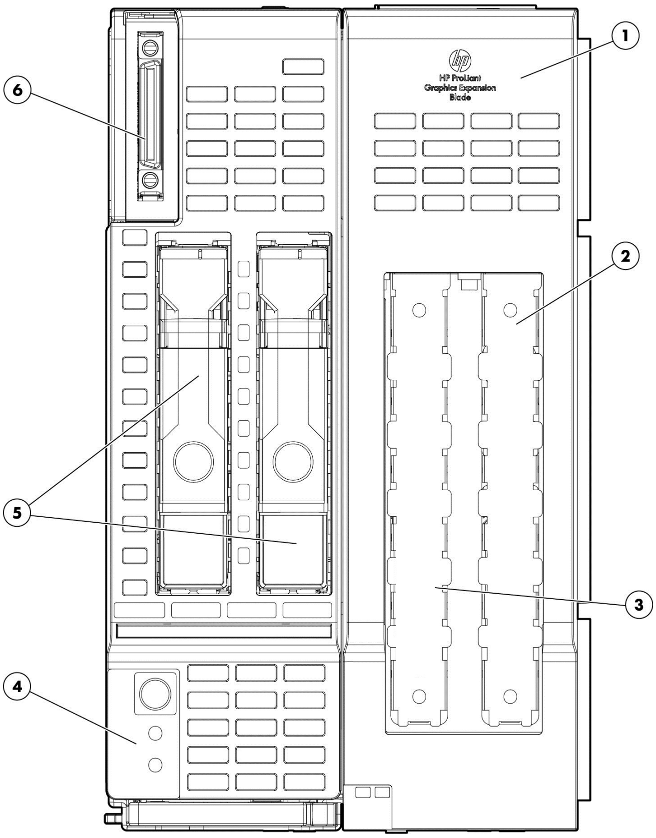

Figure 2 - HP ProLiant WS460c Gen8 Workstation Blade with graphics expansion (double-width type)

1. HP 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. HP ProLiant WS460c Gen8 Workstation Blade base system
5. Small form factor (SFF) drive bays
6. Local I/O Connector (shown with cover removed)

What's New

- Support for HP 32GB (1x32GB) Quad Rank x4 PC3-14900L (DDR3-1866) Load Reduced CAS-13 Memory Kit
- Support for600 GB and 300GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Hard Drives

Standard Features

This document covers the HP ProLiant WS460c Gen8 workstation blade and its specific options. For more information on HP BladeSystem c-Class Enclosures and HP BladeSystem c-Class Interconnect and Mezzanine Components, please see the following:
HP BladeSystem c-Class Enclosures QuickSpecs:
HP BladeSystem c3000 Enclosure QuickSpecs:
http://h18000.www1.hp.com/products/quickspecs/12790_div/12790_div.html
NOTE: The c3000 HP 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.
HP BladeSystem c7000 Enclosure QuickSpecs:
http://h18000.www1.hp.com/products/quickspecs/12810_div/12810_div.html
NOTE: The c7000 HP 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.
HP 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 HP ProLiant WS460c Gen8 provides greater 2P x86 server blade density without compromise and maximum power-efficiency with flexibility and choice.

HP ProLiant WS460c Gen8 workstation blade and optional HP 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.

HP 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® E5-2650 v2 (2.6GHz/8-core/20MB/8.0GT-s QPI/95W, DDR3-1866, HT, Turbo2- 4/4/4/4/5/6/7/8)
	Intel® Xeon® E5-2650L v2 (1.7GHz/10-core/25MB/8.0GT-s QPI/70W, DDR3-1600, HT, Turbo2- 2/2/2/2/2/2/2/2/3/4)
	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)
	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 HP Smart Memory or the new 1600MHz Low Voltage (1.35v) HP Smart Memory. The previously shipping Intel Xeon E5-2600 Processor Family cannot be configured with the new 1866MHz HP Smart Memory or the new 1600MHz Low Voltage (1.35v) HP Smart Memory.

NOTE: DIMM slots 4 and 5 are not accessible when either the E5-2690, the E5-2643, the E5-2643 v2, 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

Standard Features

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: 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 HP RBSU, 1.35V DIMMs can be changed to operate at 1.5V.
NOTE: When HP 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 HP 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	HP iLO (Firmware: HP iLO 4) **NOTE:** For more information, visit: http://www.hp.com/go/ilo

Standard Features

Memory Protection	Advanced ECC mode Memory Online Spare Mode (Rank Spare Mode) Lockstep Mode	
Memory	Type	HP SmartMemory DDR3 Load Reduced (LRDIMM), Registered (RDIMM), or Unbuffered ECC (UDIMM)
	DIMM Slots Available	Sixteen (16) DIMM slots
	Standard (Pre-configured Models) One of the following depending on Model	32GB (4 x 8GB) DDR3 1600MHz RDIMMs at 1.5V
	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: HP memory from previous generation servers are not qualified or warranted with this server. HP SmartMemory is required to realize the memory performance improvements and enhanced functionality listed in this document for Gen8. For additional information, please see the HP 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 HP 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits (700404-B21) are used.

NOTE: When HP 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 HP 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 v2 Processor Family can only be configured with the new 1866MHz HP Smart Memory or the new 1600MHz Low Voltage (1.35v) HP Smart Memory. The previously shipping Intel Xeon E5-2600 Processor Family cannot be configured with the new 1866MHz HP Smart Memory or the new 1600MHz Low Voltage (1.35v) HP 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: www.hp.com/go/ddr3memory-configurator.

Network Controller
One of the following depending on Model

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

Configurable Models
One (1) HP FlexFabric 10Gb 2-port 534FLB FlexibleLOM or HP FlexFabric 10Gb 2-port 554FLB FlexibleLOM
NOTE: 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 HP BladeSystem c-Class interconnect components. Both ports will operate at the same speed.
NOTE: FlexFabric capabilities require the use of an HP Virtual Connect FlexFabric module. Fibre Channel over Ethernet (FCoE) is supported with the HP 10GbE Pass-Thru Module, HP 6120XG Blade Switch with the CEE license installed, HP Cisco B22HP Fabric Extender and HP Cisco B22HP 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 HP 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: (occupied and not available with expansion blade)

- x16 PCIe 3.0 Type A (supports Type A mezzanine cards) (expansion slot 1).
  NOTE: This expansion slot supports NVIDIA Quadro 500M or 1000M.
- x16 PCIe 3.0 Type B (supports Type A and Type B mezzanine cards (expansion slot 2).
  NOTE: This expansion slot supports NVIDIA Quadro 500M or 1000M or 3000M.
  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 3000M 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. Graphics adapter mezzanine - NVIDIA Quadro 500M(single or dual), 1000M (single or dual), 3000M (single) (single).
- 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 HP PCIe cards listed in this document.

Standard Features

HP Server ROM

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

HP 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.

HP 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.

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

- Processor and chipset status registers
- System memory, memory map, and memory initialization
- System hardware configuration (integrated PCI devices and optional PCIe cards).
- Customer-specific BIOS configuration using the HP ROM-Based Setup Utility (RBSU).

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

Storage Controller

All Models

One (1) HP Smart Array P220i Controller with 512MB of flash backed write cache (FBWC), RAID 0 and 1 support, and upgradeable firmware with recovery ROM

NOTE: The HP Smart Array P220i 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	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

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

Standard Features

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 HP 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 HP ProLiant Workstations

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

Server Operating Systems:
Red Hat Enterprise Linux 5.8+ (64-bit only) ; HP Supported, partner certification pending
Red Hat Enterprise Linux 6.2+ (64-bit only) ; HP Supported, partner certification pending
Citrix XenDesktop 5.6fp1
Citrix XenServer 6+ Enterprise editions
VMware Horizon View 5.2, vSphere 5.1 or later
Microsoft Windows Server

NOTE: For more information on HP'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: http://www.hp.com/go/ossupport and our driver download page http://www.hp.com/support/WS460cGen8

Standard Features

Enclosures

HP offers two different c-Class workstation blade enclosures to meet your individual needs:

The HP BladeSystem c7000 rack enclosure is 10U high and holds up to sixteen (16) ProLiant WS460c Gen8 workstations plugged vertically or (8) HP ProLiant WS460c Gen8 Workstation Blades paired with (8) HP WS460c Gen8 Graphics Expansion Blades plugged vertically.

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

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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)

HP iLO 4 On System Management Memory

- 16 MB Flash
- 256 MB DDR 3 with ECC (112 MB after ECC and video)

Form factor

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

Standard Features

On System Management HP iLO Management Engine

- HP 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.
  HP iLO Management Engine comes standard on all HP ProLiant Gen8 servers.

  The HP iLO Management Engine portfolio includes:

  - **HP iLO**: The HP iLO management processor is the core foundation for other capabilities within HP iLO Management Engine.
  - **HP 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.
  - **HP 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.
  - **HP 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 www.hp.com/go/intelligentprovisioning for additional information and to view usage videos.
      - Use the Service Pack for ProLiant (SPP) at www.hp.com/go/spp to get firmware and software updates.
  - **HP 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: www.hp.com/go/ilo/mobileapp

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

Standard Features

HP Insight Management	HP Service Pack for ProLiant (SPP)	HP Service Pack for ProLiant (SPP) and HP Smart Update Manager (HP 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 HP server hardware launches. By enabling firmware to be updated online and integrating firmware and system software updates in one operation, HP 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 HP provides 12 months of support for each Service Pack for ProLiant release. The user experience around HP 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 HP 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 HP SUM application provides a straightforward, intuitive user interface that guides the user through the steps of 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, HP SUM provides the tools to optimize stability and consistency throughout the company. While HP SUM and the SPP recommend the combinations of firmware and system software that HP 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 HP 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 HP SUM) can be downloaded from www.hp.com/go/spp/download. More information can be found: http://www.hp.com/go/SmartUpdate, www.hp.com/go/spp and http://www.hp.com/go/hpsum

Standard Features

Security

- Power-on password
- Administrator's password
- HP 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 HP 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 HP Smart Array P220i Controller with 512MB FBWC, RAID 0 and 1 support, and upgradeable firmware with recovery ROM capability.
- Optional HP 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.

Standard Features

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 HP 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.
- HP 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.
- HP 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 HP Services and a worldwide network of HP 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 HP Care Pack 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 HP 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

Graphics Adapter

- NVIDIA Quadro Quadro 500 MXM graphics (Single or dual cards configuration capable
    - For professional 2D & 3D graphics with hardware acceleration via graphics subsytem
    - 1G (DDR3) memory
    - Supports up to two displays
    - Mezzanine card can occupy either mezzanine slot 1 or 2
- NVIDIA Quadro Quadro 1000 MXM graphics (Single or dual cards configuration capable)
    - For professional 2D & 3D graphics with hardware acceleration via graphics subsytem
    - 1G (DDR3) memory
    - Supports up to two displays
    - Mezzanine card can occupy either mezzanine slot 1 or 2
    - GPU Pass-through with
        - Citrix XenDesktop 5.6 FP1 Enterprise/Platinum, XenServer 6 Enterprise / Platinum editions
        - VMware Horizon View 5.2 and vSphere 5.1
- NVIDIA Quadro 3000M graphics (Single card configuration only)
    - Workstation class performance for ultra high end professional 3D graphics
    - 2G (GDDR5) memory
    - Supports up to two displays
    - 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 (GDDR5) 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
    - 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 two displays
    - PCIe Gen2, x16 single-width card (Two per Graphics Expansion Blade can be supported. Factory integration limited to single-card only)
    - 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)

Optional Features

    - For professional ultra high-end 3D graphics and VDI acceleration
    - 4GB (GDDR5) memory
    - Supports up to two 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 editions
        - VMware View Horizon 5.2, vSphere 5.1
- NVIDIA Quadro 6000 (Double Wide PCIe-x16 in graphics expansion blade)
    - For ultra high-end 3D graphics and VDI acceleration
    - 6GB (GDDR5) memory
    - Supports up to two displays
    - PCIe-x16 full height card (one per Graphics Expansion Blade)
    - GPU Pass-through with
        - NVIDIA driver 261.xx or greater
        - Citrix XenDesktop 5.5 Enterprise/Platinum, XenServer 6 Enterprise / Platinum editions
        - Shared GPU mode with Windows Server OS and VMware
- HP MultiGPU with eight NVIDIA Quadro 1000M
    - Four NVIDIA Quadro 1000M per HP MultiGPU carrier adapter in a set of two HP MultiGPU cards
    - 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
- HP MultiGPU with six NVIDIA Quadro 3000M
    - Six NVIDIA Quadro 3000M per HP MultiGPU carrier adapter in a set of two HP MultiGPU cards
    - 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

Fibre Channel Support

When vacant mezzanine slot is available on single-wide WS460c, one optional Fibre Channel mezzanine HBA is supported on the HP ProLiant WS460c Gen8 with server OS or hypervisors. Windows client OS not supported. Currently, double-wide WS460c cannot accommodate any optional mezzanine cards.

Compatible SAN

HP ProLiant WS460c Gen8 graphics server blades are optimized for HP MSA, EVA and XP.

HP 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

Optional Features

HP Virtual Connect	HP Virtual Connect is an interconnect option for BladeSystem c-Class that simplifies server connectivity to data and storage networks, and reduces costs. Unique HP 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. HP 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.

HP Insight Management	HP Insight Control	HP 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. HP Insight Control includes one year of 24 x 7 HP Software Technical Support and Update Service ensuring rapid access to HP support staff and proactive delivery of software updates. For more information about this service, see http://www.hp.com/services/insight.
	HP Matrix Operating Environment	The HP 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 HP Matrix OE includes the automated provisioning, optimization, and recovery management capabilities for HP CloudSystem Matrix, the ideal platform for private cloud and Infrastructure as a Service (IaaS). For more information, see http://www.hp.com/go/matrixoe.
	HP iLO Advanced License for ProLiant BladeSystem Servers	HP iLO management processors for HP ProLiant Gen8 servers helps simplify server setup, engage health monitoring and power and thermal control, and promote remote administration. HP iLO functions out-of-the-box without additional software installation and functions regardless of the servers' state of operation. The HP iLO can be accessed from any location via a web browser and works hand-in-hand with HP 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 HP iLO Advanced or HP 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.

Optional Features

High Performance Clusters	HP Cluster Platforms	HP 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
	HP HPC Interconnects	High Performance Computing (HPC) interconnect technologies are available for this server as part of the HP Cluster Platform portfolio. These high-speed InfiniBand and Gigabit interconnects are fully supported by HP when integrated within an HP cluster. Flexible, validated solutions can be defined with the help of configuration tools. http://www.hp.com/techservers/clusters/ucp/index.html
	HP Insight Cluster Management Utility	HP Insight Cluster Management Utility (CMU) is an HP-licensed and HP-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

HP Insight Online

HP Insight Online is a new addition to the HP Support Center for one stop, secure access to product and HP support information personalized to your IT environment. Insight Online can automatically display devices remotely monitored by HP 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

HP Factory Express offers configuration, customization, integration and deployment services for HP 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. HP products supported through Factory Express include a wide array of servers and storage: HP Integrity, HP ProLiant, HP ProLiant Server Blades, HP BladeSystem, HP 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.

Optional Features

HP 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 HP's Customer Business Center or an Authorized Partner for assistance. http://www.hp.com/products/configurator

Service and Support

Service and Support

HP Technology Services for Industry Standard Servers and BladeSystem
Capitalizing on HP ProLiant server and HP BladeSystem capabilities requires a service partner who understands your increasingly complex business technology environment. That's why it makes sense to team up with the people who know HP infrastructure hardware and software best - the experienced professionals at HP Services.

Protect your business beyond warranty with HP Care Pack Services
HP Care Pack services offer complete care and support expertise with committed response choices designed to meet your IT and business needs.

HP Foundation Care services offer scalable reactive support-packages for HP industry-standard servers and software. You can choose the type and level of service that is most suitable for your IT and business needs. HP Proactive Care delivers high levels of system availability through proactive service management and advanced technical response.

Recommended HP Care Pack Services for your HP product

Optimized Care

3-Year HP 6 hour Call to Repair Response, Proactive Care
Combined reactive and proactive support for hardware and software helping optimize your systems and delivering high levels of availability through proactive service management and advanced technical response. Hardware problem resolution to return the hardware in operating condition within 6 hours of the initial service request. A Technical Account Manager, as your single point of contact, will own your call or issue end to end until resolved.
http://h20195.www2.hp.com/v2/GetPDF.aspx/4AA3-8855EEE.pdf

HP Install WS460c WS Blade Service
This easy-to-buy, easy-to-use HP Care Pack service helps ensure that your new HP hardware is installed smoothly, efficiently, and with minimal disruption of your IT and business operations.

Standard Care

3-Year HP 24x7 4 hour response, Proactive Care Service
This service gives you combined reactive and proactive support including rapid access to our Advanced Solution Center to manage and prevent problems and a Technical Support Specialist with a broad level of technical knowledge that will engage with additional technical expertise as needed from HP's vast global resources.
http://h20195.www2.hp.com/v2/GetPDF.aspx/4AA,3-8855EEE.pdf

HP Install WS460c WS Blade Service
This easy-to-buy, easy-to-use HP Care Pack service helps ensure that your new HP hardware is installed smoothly, efficiently, and with minimal disruption of your IT and business operations.

Service and Support

Related Services	**HP Proactive Care Personalized Support - Environmental Option** The Personalized Support option provides an assigned Account Support Manager who can bring best practices from across the industry plus extra technical skills to your IT team. This option is only available as an add-on to HP Proactive Care Support. **HP Proactive Select Service** Provides a flexible way to purchase HP best-in-class consultancy and technical services. You can buy Proactive Select Service Credits when you purchase your hardware and then use the credits over the next 12 months. http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA2-3842ENN.pdf **NOTE:** Additional HP Care Pack services can be found at: http://www.hp.com/go/cpc
Insight Online/Insight Remote Support	HP Insight Remote Support provides 24 X 7 remote monitoring, proactive notifications, and problem resolution. This comes at no additional cost with your HP solution. Learn more about Insight Remote Support http://www.hp.com/go/insightremotesupport and Insight Online http://www.hp.com/go/insightonline **NOTE:** Insight Remote Support is a prerequisite for Proactive Care. All blades within a single HP BladeSystem enclosure must be at the same service level.
HP Support Center	Personalized online support portal with access to information, tools and experts to support HP business products. Submit support cases online, chat with HP experts, access support resources or collaborate with peers. Learn more http://www.hp.com/go/hpsc HP'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. HP Insight Remote Support and HP Support Center are available at no additional cost with a HP warranty, HP Care Pack or HP contractual support agreement. **NOTE:** HP Support Center Mobile App is subject to local availability.
Parts and Materials	HP will provide HP-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 HP due to malfunction.
For more information	To learn more on HP ProLiant servers and HP BladeSystem servers, please contact your HP sales representative or HP Authorized Channel Partner. Or visit: www.hp.com/services/bladesystem

Pre-configured Models

NOTE: For the Standard Features shipped in the "Factory Integrated Models", please see the "Configuration Information - Factory Integrated Models" section.
NOTE: Pre-configured models ship with the configurations below. Options can be selected from the Core or Additional options section of this QuickSpecs.
NOTE: HP does not allow factory integration of options into pre-configured models. Any additional options purchased will be shipped separately.
NOTE: If you desire a custom configuration please see "Configuration Information - Factory Integrated Models" section of this QuickSpecs.
NOTE: All Pre-configured Models come populated with some hard drive blanks installed.
NOTE: Not all models are available in all regions. Check with your local country HP offices for availability.

E5-2600 series Processors

HP ProLiant WS460c Gen8 E5-2637 2P 32GB-R Workstation 678275-B21	**Processor(s)**	(2) Intel® Xeon® E5-2637 (3.0GHz/2-core/XMB//80W, DDR3-1066, HT, Turbo 1/1/2/2) Processor
	Cache Memory	5MB (1x5MB) Level 3 cache
	Memory	32GB (8x 4GB) PC3-12800R (DDR3-1600) Registered DIMMs at 1.5V) **NOTE:** Total of 16 DIMM slots.
	Graphics Adapter	(1) NVIDIA Quadro 3000M with 2GB memory
	Network Adapter	HP Flex-10 10Gb 2-port 530FLB FlexibleLOM
	Storage Controller	HP Smart Array P220i Controller with 512MB FBWC RAID 0,1
	Hard Drives	None ship standard Supports up to two (2) HP hot-plug SFF SAS/SATA/SDD drives **NOTE:** Client operating systems require local hard disk drives. Order desired capacity/performance drives separately.
	Internal Storage	SAS: 2.0TB; SATA: 2.0TB; SAS SSD: 2.4TB; SATA SSD:1.6TB
	Optical Drive Bay	None
	Expansion Slots	2 standard - Slot 1 supports Type A mezzanine Cards. Slot 2 supports Type A and Type B mezzanine cards
	Management	HP iLO Management Engine (standard) Optional: HP Insight Control
	Operating System	None **NOTE:** Client OS license and software not included.
	Form Factor	Up to eight (8) half-height blades supported in the HP BladeSystem c3000 Enclosure Up to sixteen (16) half-height blades supported in HP BladeSystem c7000 Enclosure
	Warranty	Server warranty includes 3-year Parts, 3-year Labor, 3-year on-site support

NOTE: This section lists some of the steps required to configure a Factory Integrated Model. To ensure only valid configurations are ordered, HP recommends the use of an HP 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)

HP Models	HP ProLiant WS460c Gen8 E5-v2 Configure-to-order Workstation **NOTE:** Single-width, half-height bade with two mezzanine card slots available. **NOTE:** HP Smart Array P220i Controller FIO Kit (690164-B21) must be added separately as part of the Server Blade Configuration Process. **Configurable Model ships with:** One (1) FlexibleLOM connector providing a choice for one (1) of the supported 10Gb FlexibleLOMs (see Step 2) Two (2) HP 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 HP iLO Management Engine (standard)	739347-B21
	HP ProLiant WS460c Gen8 Configure-to-order Workstation **NOTE:** Single-width, half-height bade with two mezzanine card slots available. **NOTE:** The HP Smart Array P220i Controller FIO Kit (690164-B21) comes included with the HP ProLiant WS460c Gen8 10Gb FlexibleLOM 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 FlexibleLOMs (see Step 2) One (1) HP Smart Array P220i Controller with 512MB FBWC and RAID 0 and 1 support Two (2) HP 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 HP iLO Management Engine (standard)	678276-B21
	HP WS460c Gen8 E5-v2 Graphics Expansion Configure-to-order Blade **NOTE:** Double-width half-height blade with two, full-length, PCIe x16 slots. No mezzanine card slots on base blade are currently available. **NOTE:** HP Smart Array P220i Controller FIO Kit (690164-B21) must be added separately as part of the Server Blade Configuration Process. **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 FlexibleLOMs (see Step 2) Two (2) HP small form factor hot-plug SAS/SATA/SSD hard drive bays	739348-B21

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
HP iLO Management Engine (standard)

HP WS460c Gen8 Graphics Expansion Configure-to-order Blade	684690-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: The HP Smart Array P220i Controller FIO Kit (690164-B21) comes included with the HP ProLiant WS460c Gen8 10Gb FlexibleLOM 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 FlexibleLOMs (see Step 2)
One (1) HP Smart Array P220i Controller with 512MB FBWC and RAID 0 and 1 support
Two (2) HP 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) HP Graphics Expansion Blade Slot1 enablement connector
One (1) integrated USB connector and one (1) MicroSDHC connector
One (1) TPM connector
HP iLO Management Engine (standard)

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

HP 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
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® E5-2690 (2.9GHz/8-core/20MB/135W) FIO Processor Kit	662076-L21
HP BL460c Gen8 Intel® Xeon® E5-2680 (2.7GHz/8-core/20MB/130W) FIO Processor Kit	662063-L21
HP BL460c Gen8 Intel® Xeon® E5-2670 (2.6GHz/8-core/20MB/115W) FIO Processor Kit	662064-L21
HP BL460c Gen8 Intel® Xeon® E5-2667 (2.9GHz/6-core/15MB/130W) FIO Processor Kit	667804-L21
HP BL460c Gen8 Intel® Xeon® E5-2665 (2.4GHz/8-core/20MB/115W) FIO Processor Kit	667803-L21
HP BL460c Gen8 Intel® Xeon® E5-2660 (2.2GHz/8-core/20MB/95W) FIO Processor Kit	662065-L21
HP BL460c Gen8 Intel® Xeon® E5-2650 (2.0GHz/8-core/20MB/95W) FIO Processor Kit	662066-L21
HP BL460c Gen8 Intel® Xeon® E5-2650L (1.8GHz/8-core/20MB/70W) FIO Processor Kit	662078-L21
HP BL460c Gen8 Intel® Xeon® E5-2643 (3.3GHz/4-core/10MB/130W) FIO Processor Kit	662072-L21
HP BL460c Gen8 Intel® Xeon® E5-2640 (2.5GHz/6-core/15MB/95W) FIO Processor Kit	662067-L21
HP BL460c Gen8 Intel® Xeon® E5-2637 (3.0GHz/2-core/5MB/80W) FIO Processor Kit	662077-L21
HP BL460c Gen8 Intel® Xeon® E5-2630 (2.3GHz/6-core/15MB/95W) FIO Processor Kit	662068-L21
HP BL460c Gen8 Intel® Xeon® E5-2630L (2.0GHz/6-core/15MB/60W) FIO Processor Kit	662079-L21
HP BL460c Gen8 Intel® Xeon® E5-2620 (2.0GHz/6-core/15MB/95W) FIO Processor Kit	662069-L21
HP BL460c Gen8 Intel® Xeon® E5-2609 (2.4GHz/4-core/10MB/80W) FIO Processor Kit	662070-L21
HP BL460c Gen8 Intel® Xeon® E5-2603 (1.8GHz/4-core/10MB/80W) FIO Processor Kit	667805-L21

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

NOTE: The Intel Xeon E5-2620 processor does not support DIMMs at 1.35V. Using the HP 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, 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.

Configuration Information - Factory Integrated Models

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 maximum speed memory can operate. Please see the see the "Memory" section later in this document.
NOTE: When HP 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 HP 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: HP 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).

HP Memory

NOTE: HP memory from previous generation servers are not qualified or warranted with this HP ProLiant WS460c Server. HP SmartMemory is required to realize the memory performance improvements and enhanced functionality listed in this document for Gen8. For additional information, please see the HP 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 HP 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered

Configuration Information - Factory Integrated Models

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 HP 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 HP 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits (700404-B21) are used.

HP 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
HP 8GB (1x8GB) Dual Rank x4 PC3L-12800R (DDR3-1600) Registered CAS-11 Low Voltage Memory Kit	713983-B21
HP 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
HP 8GB (1x8GB) Single Rank x4 PC3-14900R (DDR3-1866) Registered CAS-13 Memory Kit	731761-B21
HP 16GB (1x16GB) Dual Rank x4 PC3L-12800R (DDR3-1600) Registered CAS-11 Low Voltage Memory Kit	713985-B21
HP 16GB (1x16GB) Dual Rank x4 PC3-14900R (DDR3-1866) Registered CAS-13 Memory Kit	708641-B21
HP 24 GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kit	716324-B21

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

HP 4GB (1x4GB) Single Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit	647893-B21
HP 4GB (1x4GB) Single Rank x4 PC3-12800R (DDR3-1600) Registered CAS-11 Memory Kit	647895-B21
HP 8GB (1x8GB) Dual Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit	647897-B21
HP 8GB (1x8GB) Single Rank x4 PC3-12800R (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
HP 16GB (1x16GB) Dual Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit	647901-B21
HP 16GB (1x16GB) Dual Rank x4 PC3-12800R (DDR3-1600) Registered CAS-11 Memory Kit	672631-B21
HP 24 GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kit	716324-B21

HP 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kit	700404-B21

NOTE: This is a Factory Installed Option (FIO) only.

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

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

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

HP 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-10600L (DDR3-1333) Load Reduced CAS-9 Low Voltage Memory Kit	647903-B21

NOTE: The HP 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.

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: www.hp.com/go/ddr3memory-configurator.

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

NOTE: PC3L is a low voltage memory.

HP Networking

FlexibleLOM Adapters

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

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

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

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Step 3: Choose Additional Factory Integration Options

HP Insight Software	HP Insight Control including 1yr 24x7 Support ProLiant ML/DL/BL-bundle Single Server FIO License	C6N36A

HP Storage Controllers	HP Smart Array P220i Controller FIO Kit	690164-B21

NOTE: The HP Smart Array P220i Controller FIO Kit (690164-B21) comes included with the HP ProLiant WS460c Gen8 10Gb FlexibleLOM Configure-to-order Blade Server (678276-B21 and 684690-B21). However when choosing the HP ProLiant WS460c Gen8 E5-v2 10Gb FlexibleLOM Configure-to-order Blade Server (739347-B21 or 739348-B21), the HP Smart Array P220i Controller FIO Kit (690164-B21) must be added separately as part of the Server Blade Configuration Process.

HP Graphics Options

NOTE: Choose from following graphics mezzanine cards for use with the single-width HP ProLiant WS460c Gen8 model (P/N 739347-B21 or 678276-B21).

HP Q3000 Gen8 Mezzanine FIO Graphics Kit	679855-B21
HP Q1000 Gen8 Mezzanine FIO Graphics Kit	679858-B21
HP Q500 Gen8 Mezzanine FIO Graphics Kit	679860-B21

NOTE: When NVIDIA Quadro 3000M 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 HP ProLiant WS460c Gen8 (P/N 739348-B21 or 684690-B21).

NVIDIA GRID K1 PCIe GPU FIO Adapter	730876-B21

NOTE: Available only with Intel® Xeon® E5-2600 v2 series processor configuration

NVIDIA GRID K2 GPU PCIe Graphics Accelerator **NOTE:** GRID K2 requires GPU Enablement Kit (PN 734206-B21). **NOTE:** Available only with Intel® Xeon® E5-2600 v2 series processor configuration	729851-B21
NVIDIA Quadro K4000 PCI-E Graphics Adapter	730870-B21
NVIDIA Quadro K5000 PCI-E Graphics Adapter	730872-B21
HP Quadro 3000 MXM PCI-E Graphics Option Kit **NOTE:** This kit includes two sets of HP Multi-GPU Carrier Card each with three Quadro 3000M graphics loaded. (Total of six Quadro 3000M). **NOTE:** Requires Expansion Blade Slot2 Enablement FIO Kit (PN 721120-B21). **NOTE:** Available only with Intel® Xeon® E5-2600 v2 series processor configuration	667762-B21
HP Quadro 1000 MXM PCI-E Graphics Option Kit **NOTE:** This kit includes two sets of HP Multi-GPU Carrier Card each with four Quadro 1000M graphics loaded. (Total of eight Quadro 1000M). **NOTE:** Requires Expansion Blade Slot2 Enablement FIO Kit (PN 721120-B21). **NOTE:** Available only with Intel® Xeon® E5-2600 v2 series processor configuration	667761-B21
HP Gen8 Expansion Blade Slot 2 FIO Enablement Kit **NOTE:** This optional kit is available at time of initial system purchase only. This option can be chosen regardless of graphics selection.	721120-B21
HP WS460c Gen8 GPU Enablement Kit **NOTE:** Required when selecting NVIDIA GRID K2 for factory integration. Contains 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:
HP BladeSystem c3000 Enclosure QuickSpecs:
http://h18000.www1.hp.com/products/quickspecs/12790_div/12790_div.html
NOTE: The c3000 HP 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.
HP BladeSystem c7000 Enclosure QuickSpecs:
http://h18000.www1.hp.com/products/quickspecs/12810_div/12810_div.html
NOTE: The c7000 HP 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.
HP 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.

NOTE: Some options may not be integrated at the factory. To ensure only valid configurations are ordered, HP recommends the use of an HP 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.

HP 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 (HP BladeSystem c7000 Enclosure) or bays 2-4 (HP 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 Gigabit Ethernet FlexibleLOM	
	HP Flex-10 10Gb 2-port 530FLB Adapter **NOTE:** Please see QuickSpecs for technical specifications and additional information at http://h18000.www1.hp.com/products/quickspecs/14216_div/14216_div.html. **NOTE:** Client OS on bare metal is supported only with this BLOM.	656590-B21
	HP FlexFabric 10Gb 2-port 534FLB Adapter **NOTE:** Please see QuickSpecs for technical specifications and additional information at: http://h18000.www1.hp.com/products/quickspecs/14617_div/14617_div.html	700741-B21
	HP FlexFabric 10Gb 2-port 554FLB Adapter	647586-B21
HP Fibre Channel	HP LPe1205A 8Gb Fibre Channel Host Bus Adapter for BladeSystem c-Class **NOTE:** Please see QuickSpecs for technical specifications and additional information at http://h18000.www1.hp.com/products/quickspecs/14338_div/14338_div.html	659818-B21
	HP QMH2672 16Gb Fibre Channel Host Bus Adapter **NOTE:** Please see QuickSpecs for technical specifications and additional information at http://h18000.www1.hp.com/products/quickspecs/14622_div/14622_div.html	710608-B21
HP 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

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

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

NOTE: DIMM slots 4 and 5 are not accessible when either the E5-2690, the E5-2643, the E5-2643 v2, 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 HP 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 HP 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.

HP Memory

NOTE: HP memory from previous generation servers are not qualified or warranted with this HP ProLiant WS460c Server. HP SmartMemory is required to realize the memory performance improvements and enhanced functionality listed in this document for Gen8. For additional information, please see the HP 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 HP 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 HP 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 HP 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits (700404-B21) are used.

Core Options

HP 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
HP 8GB (1x8GB) Dual Rank x4 PC3L-12800R (DDR3-1600) Registered CAS-11 Low Voltage Memory Kit	713983-B21
HP 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
HP 8GB (1x8GB) Single Rank x4 PC3-14900R (DDR3-1866) Registered CAS-13 Memory Kit	731761-B21
HP 16GB (1x16GB) Dual Rank x4 PC3L-12800R (DDR3-1600) Registered CAS-11 Low Voltage Memory Kit	713985-B21
HP 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-10600R (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit	647893-B21
HP 4GB (1x4GB) Single Rank x4 PC3-12800R (DDR3-1600) Registered CAS-11 Memory Kit	647895-B21
HP 8GB (1x8GB) Dual Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit	647897-B21
HP 8GB (1x8GB) Single Rank x4 PC3-12800R (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
HP 16GB (1x16GB) Dual Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit	647901-B21
HP 16GB (1x16GB) Dual Rank x4 PC3-12800R (DDR3-1600) Registered CAS-11 Memory Kit	672631-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	
HP 2GB (1x2GB) Single Rank x8 PC3-12800E (DDR3-1600) Unbuffered CAS-11 Memory Kit	669320-B21
HP 2GB (1x2GB) Single Rank x8 PC3L-10600E (DDR3-1333) Unbuffered CAS-9 Low Voltage Memory Kit	647905-B21
HP 4GB (1x4GB) Dual Rank x8 PC3-12800E (DDR3-1600) Unbuffered CAS-11 Memory Kit	669322-B21
HP 4GB (1x4GB) Dual Rank x8 PC3L-10600E (DDR3-1333) Unbuffered CAS-9 Low Voltage Memory Kit	647907-B21
HP 8GB (1x8GB) Dual Rank x8 PC3-12800E (DDR3-1600) Unbuffered CAS-11 Memory Kit	669324-B21
HP 8GB (1x8GB) Dual Rank x8 PC3L-10600E (DDR3-1333) Unbuffered CAS-9 Low Voltage Memory Kit	647909-B21
Load Reduced DIMMs (LRDIMMs) - E5-2600 v2 series Processors	
HP 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-10600L (DDR3-1333) Load Reduced CAS-9 Low Voltage Memory Kit	647903-B21

NOTE: The HP 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.

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: www.hp.com/go/ddr3memory-configurator.

NOTE: Kits described as LP include Low Power DIMMs. For more information on ProLiant Energy Efficient Features, see: 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: www.hp.com/go/proliant-energy-efficient
NOTE: PC3L is a low voltage memory.

HP Hard Drives

NOTE: The ProLiant WS460c Gen8 server includes the new HP hot-plug small form factor (SFF) SmartDrive carrier for enhanced management and reduced maintenance errors. HP 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: HP 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

HP 1TB 6G SATA 7.2K rpm SFF (2.5-inch) SC Midline 1yr Warranty Hard Drive	655710-B21
HP 500GB 6G SATA 7.2K rpm SFF (2.5-inch) SC Midline 1yr Warranty Hard Drive	655708-B21

NOTE: Please see QuickSpecs for Technical Specifications and additional information: http://h18000.www1.hp.com/products/quickspecs/13021_div/13021_div.html (Worldwide)

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
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

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

HP 1TB 6G SAS 7.2K rpm SFF (2.5-inch) SC Midline 1yr Warranty Hard Drive	652749-B21
HP 500GB 6G SAS 7.2K rpm SFF (2.5-inch) SC Midline 1yr Warranty Hard Drive	652745-B21

NOTE: Please see QuickSpecs for Technical Specifications and additional information: http://h18000.www1.hp.com/products/quickspecs/12244_div/12244_div.html (Worldwide)

6G SAS MLC Hot Plug SFF (2.5-inch) Enterprise Mainstream Solid State Drives

HP 800GB 6G SAS Mainstream Endurance SFF 2.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive	690829-B21
HP 400GB 6G SAS Mainstream Endurance SFF 2.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive	690827-B21
HP 200GB 6G SAS Mainstream Endurance SFF 2.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive	690825-B21

6G SAS SLC Hot Plug SFF (2.5-inch) Enterprise Performance Solid State Drives

HP 1.2TB 6G SAS 10K rpm SFF (2.5-inch) SC Dual Port Enterprise 3yr Warranty Hard Drive	718162-B21
HP 1.2TB 6G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	697574-B21
HP 400GB 6G SAS SLC SFF (2.5-inch) SC Enterprise Performance 3yr Warranty Solid State Drive	653082-B21
HP 200GB 6G SAS SLC SFF (2.5-inch) SC Enterprise Performance 3yr Warranty Solid State Drive	653078-B21

6G SATA MLC 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 VE Hot Plug SFF(2.5-inch Enterprise Solid State Drives

Core Options

	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 Boot 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 Boot 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: http://h18000.www1.hp.com/products/quickspecs/14038_div/14038_div.html (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.	
HP Graphic Options	NVIDIA GRID K2 Dual GPU PCIe Graphics Accelerator **NOTE:** GRID K2 requires GPU Enablement Kit (PN 734206-B21). **NOTE:** Available only with Intel® Xeon® E5-2600 v2 series processor configuration	729851-B21
	NVIDIA Quadro K4000 PCI-E Graphics Adapter	730870-B21
	NVIDIA Quadro K5000 PCI-E Graphics Adapter	730872-B21
	HP WS460c Gen8 GPU Enablement Kit **NOTE:** Required when using NVIDIA GRID K2 GPU (PN 729851-B21).	734206-B21

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, HP recommends the use of an HP approved configurator. Contact your local sales representative for additional information.

HP Insight software	**HP Insight Control**	
	HP Insight Control including 1yr 24x7 Technical Support and Updates Single Server License	C6N27A
	HP Insight Control including 1yr 24x7 Technical Support and Updates Electronic License	C6N28ABE
	HP Insight Control including 1yr 24x7 Support ProLiant ML/DL/BL-bundle FIO Electronic License	C6N36ABE
	HP Insight Control Server Provisioning Media Kit	BD883A
	HP Insight Management Media Kit	C6N31A
	NOTE: HP Insight Management Media Kit contains DVDs without licenses. Contains HP Systems Insight Manager, HP Insight Control, HP 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 HP Software Technical Support Service.	
	NOTE: Licenses ship without media. The HP 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: http://h18004.www1.hp.com/products/quickspecs/12631_div/12631_div.html	
	HP Insight Control Server Deployment	
	HP Insight Control Server Deployment including 1yr 24x7 Support Electronic License	T9082AAE
	HP Insight Control Server Deployment including 1yr 24x7 Support Single Server License	452151-B21
	NOTE: Licenses ship without media. The HP Insight Management Media Kit can be ordered separately, or can be downloaded at http://www.hp.com/go/insightupdates.	
	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 HP Software Technical Support Service.	
	NOTE: For additional license kits, please see the QuickSpecs at: http://h18004.www1.hp.com/products/quickspecs/12631_div/12631_div.html	

Additional Options

HP iLO Advanced Licenses	HP iLO Advanced Blade 1 Server License with 3yr 24x7 Tech Support and Updates	BD502A
	HP iLO Advanced Blade including 3yr 24x7 Tech Support and Updates Electronic License	E6U63ABE
	HP iLO Advanced for BladeSystem including 1yr 24x7 Tech Support and Updates Electronic License	E6U60ABE
	HP iLO Advanced for BladeSystem including 1yr 24x7 Support Single Server License **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. **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 HP Software Technical Support Service. **NOTE:** For additional license kits, please see the QuickSpecs at: http://h18004.www1.hp.com/products/quickspecs/14276_div/14276_div.html	512488-B21
High Performance Clusters	HP Insight Cluster Management Utility 1yr 24x7 Flexible License **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:** For additional license kits please see the QuickSpecs at: http://h18004.www1.hp.com/products/quickspecs/12612_div/12612_div.html (Worldwide)	QL803B
	HP Insight Cluster Management Utility 3yr 24x7 Flexible License **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
	HP Insight Cluster Management Utility Media **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:** For additional license kits please see the QuickSpecs at: http://h18004.www1.hp.com/products/quickspecs/12612_div/12612_div.html (Worldwide)	BD477A

Additional Options

HP Security	HP Trusted Platform Module Option **NOTE:** The TPM (Trusted Platform Module) is a microcontroller chip that can securely 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.	488069-B21
HP Fibre Channel Mezzanine Options	HP QMH2572 8Gb Fibre Channel Host Bus Adapter for BladeSystem c-Class **NOTE:** For the above Ultrium tape drives, please see the QuickSpecs for technical specifications and additional information at: http://h18000.www1.hp.com/products/quickspecs/14230_div/14230_div.html	651281-B21
HP Ultrium Tape Blades	HP StoreEver LTO-4 Ultrium SB1760c Tape Blade **NOTE:** LTO-4 Ultrium tape technology.	AQ697B
	HP StoreEver LTO-5 Ultrium SB3000c Tape Blade **NOTE:** LTO-5 Ultrium tape technology.	BS580B
	NOTE: For the above Ultrium tape drives, please see the QuickSpecs for technical specifications and additional information at: http://h18000.www1.hp.com/products/quickspecs/12729_div/12729_div.html	
HP Storage Blades	HP D2200sb PCIe Storage Blade **NOTE:** Please see the QuickSpecs for technical specifications and additional information at http://h18006.www1.hp.com/storage/bladesystem/index.html.	AP880A
HP Expansion Blade	HP BLc PCI Expansion Blade **NOTE:** Ships with one pre-installed PCI-X connect board. Also includes one PCIe connect board which requires installation. **NOTE:** This Expansion Blade does not support any PCIe graphics adapters. For such use, HP WS460c Gen8 Graphics Expansion (PN 684690-B21) must be used. **NOTE:** Please see the QuickSpecs for Technical Specifications and additional information: http://h18000.www1.hp.com/products/quickspecs/12753_div/12753_div.html (Worldwide)	448018-B21

Additional Options

HP USB and SD Options	HP 2GB USB Flash Media Drive Key Kit **NOTE:** HP qualified blank USB key for use with HP ProLiant servers that support the VMware virtualization environment. HP recommends this industry standard USB flash device for use with VMware ESXi. USB device must be installed in the internal slot of the ProLiant server for use with VMware ESXi. Refer to HP VMware Getting Started Guide for installation instructions.	608447-B21
	HP 32GB microSD Enterprise Mainstream Flash Media Kit **NOTE:** The USB flash media and Secure Digital cards are for integrated hypervisor virtualization environments needing a low cost boot solution with the highest performance and reliability. Learn more at http://h18004.www1.hp.com/products/servers/options/flash_drives.html	700139-B21
HP Care Pack Services	**NOTE:** The HP Care Pack service part numbers below for ProLiant BL c-Class workstation blades, cover the workstation blade and all HP 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 HP services data sheet.	
	Proactive Care Services	
	HP 3 year 4 hour 24x7 with Defective Media Retention ProLiant WS460c Proactive Care Service	U3C21E
	HP 3 year 4 hour 24x7 ProLiant WS460c Proactive Care Service	U3C18E
	HP 3 year 6 hour Call To Repair 24x7 ProLiant WS460c Proactive Care Service	U3C24E
	HP 3 year 6hr Call To Repair 24x7 with Defective Media Retention ProLiant WS460c Proactive Care SVC	U3C27E
	HP Proactive Care Personalized Support (Environmental Option)	
	HP 3 year ISS ProactiveCare Personalized Support	U6W98E
	Installation Services	
	HP Installation Non Standard Hours WS460c Workstation Blade Service	UR363E
	HP Installation WS460c Workstation Blade Service	UR362E
	Additional HP Care Pack services can be found at: http://www.hp.com/go/cpc	

Memory

For detailed memory configuration rules and guidelines, please use the Online DDR3 Memory Configuration Tool:
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.
- HP memory from previous generation servers is not compatible with the WS460c Gen8 Server Blade.
- To realize the performance memory capabilities listed in this document, HP SmartMemory is required. For additional information, please see the HP 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 Reduce (LRDIMM
DIMM Rank	Single Rank (1R)							Dual Rank (2R)								Three Rank (3R)	Quad Rank (4R)
DIMM Capacity	4GB	4GB	4GB	4GB	8GB	8GB	8GB	8GB	8GB	8GB	8GB	16GB	16GB	16GB	16GB	24GB	32GB
DIMM Native Speed (MHz)	1333	1600	1600	1866	1600	1600	1866	1333	1600	1600	1866	1333	1600	1600	1866	1333	1333
Voltage*	LV	Std	LV	Std	Std	LV	Std	LV	Std	LV	Std	LV	Std	LV	Std	LV	LV
*LV= low voltage at 1.35V; Std = standard voltage at 1.5V.																	
SLOTS THAT CAN BE POPULATED																	

Memory

16 slot servers	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
MAXIMUM CAPACITY (GB)																	
Capacity	64	64	64	64	128	128	128	128	128	128	128	256	256	256	256	384	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**
2 DIMM Per Channel (2DPC)	1333	1600	1600	1866	1600	1600	1866	1333	1600	1600	1866	1333	1600	1600	1866	1333	1333**

* Maximum capacity will vary based on individual server platform qualification schedule

** LRDIMM enables 3 DIMMs per channel. HP 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 HP SmartMemory, UDIMMs at 2DPC are supported up to 1333MHz. Third party UDIMMs at 2DPC may only support up to 1066MH

NOTE: Maximum memory speed is a function of the processor QPI bus speed; see the table below "Memory Speed by Processor Model".

NOTE: When HP 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, or the E5-2643 v2, the E5-2667 v2 all 16 DIMM slots on the WS460c Gen8 must be fully populated with these 24GB DIMMs. When HP 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, or 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 HP 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits (700404-B21) are used.

Memory

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

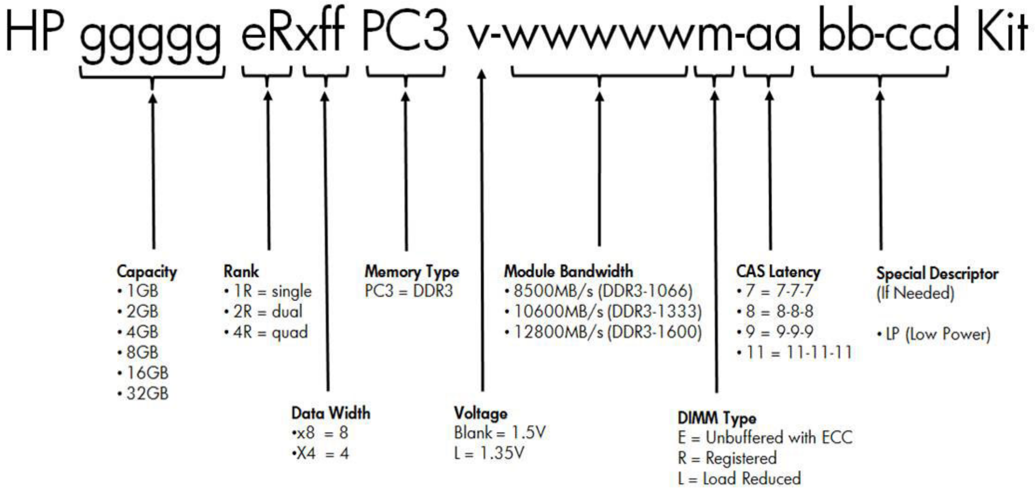
Standard and Maximum Memory Capacity (Pre-configured Models)

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:

HP Memory

NOTE: HP memory from previous generation servers are not qualified or warranted with this HP ProLiant WS460c Server. HP SmartMemory is required to realize the memory performance improvements and enhanced functionality listed in this document for Gen8. For additional information, please see the HP 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.

Memory

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 HP 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, or the E5-2643 v2, the E5-2667 v2 all 16 DIMM slots on the WS460c Gen8 must be fully populated with these 24GB DIMMs. When HP 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, or 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 HP 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage FIO Memory Kits (700404-B21) are used.

HP 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
HP 8GB (1x8GB) Dual Rank x4 PC3L-12800R (DDR3-1600) Registered CAS-11 Low Voltage Memory Kit	713983-B21
HP 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
HP 8GB (1x8GB) Single Rank x4 PC3-14900R (DDR3-1866) Registered CAS-13 Memory Kit	731761-B21
HP 16GB (1x16GB) Dual Rank x4 PC3L-12800R (DDR3-1600) Registered CAS-11 Low Voltage Memory Kit	713985-B21
HP 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-10600R (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit	647893-B21
HP 4GB (1x4GB) Single Rank x4 PC3-12800R (DDR3-1600) Registered CAS-11 Memory Kit	647895-B21
HP 8GB (1x8GB) Dual Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit	647897-B21
HP 8GB (1x8GB) Single Rank x4 PC3-12800R (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
HP 16GB (1x16GB) Dual Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit	647901-B21
HP 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 Low Voltage FIO Memory Kit **NOTE:** This is a Factory Installed Option (FIO) only.	700404-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	
HP 2GB (1x2GB) Single Rank x8 PC3-12800E (DDR3-1600) Unbuffered CAS-11 Memory Kit	669320-B21
HP 2GB (1x2GB) Single Rank x8 PC3L-10600E (DDR3-1333) Unbuffered CAS-9 Low Voltage Memory Kit	647905-B21
HP 4GB (1x4GB) Dual Rank x8 PC3-12800E (DDR3-1600) Unbuffered CAS-11 Memory Kit	669322-B21
HP 4GB (1x4GB) Dual Rank x8 PC3L-10600E (DDR3-1333) Unbuffered CAS-9 Low Voltage Memory Kit	647907-B21
HP 8GB (1x8GB) Dual Rank x8 PC3-12800E (DDR3-1600) Unbuffered CAS-11 Memory Kit	669324-B21
HP 8GB (1x8GB) Dual Rank x8 PC3L-10600E (DDR3-1333) Unbuffered CAS-9 Low Voltage Memory Kit	647909-B21
Load Reduced DIMMs (LRDIMMs) - E5-2600 v2 series Processors	
HP 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-10600L (DDR3-1333) Load Reduced CAS-9 Low Voltage Memory Kit	647903-B21

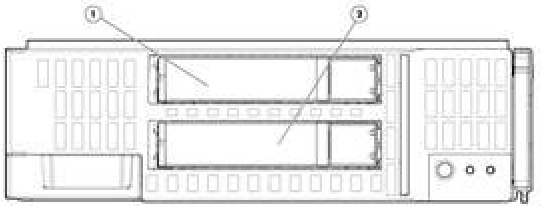
NOTE: The HP Q3000 Gen8 Mezz Graphics Kit (679855-B21) is installed in Mezz slot 2 and hence requires a two processor configuration which will provide a processor installed in the second CPU socket.

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: www.hp.com/go/ddr3memory-configurator.

NOTE: Kits described as LP include Low Power DIMMs. For more information on ProLiant Energy Efficient Features, see: 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: www.hp.com/go/proliant-energy-efficient
NOTE: PC3L is a low voltage memory.



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

Teradici PCoIP® Hardware Accelerator

Teradici PCoIP® Hardware Accelerator (APEX 2800) for HP 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: www.teradici.com/hardware-accelerator
NOTE: This solution must be purchased separately and is available from solution vendor's authorized resellers. HP does not resell or factory integrate the solution
NOTE: This solution is supported by the vendor on servers:

- HP ProLiant BL460c Gen8 Server Blade
- HP 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.

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: ● HP BladeSystem c3000 Enclosure QuickSpecs: http://h18000.www1.hp.com/products/quickspecs/12790_div/12790_div.html ● HP BladeSystem c7000 Enclosure QuickSpecs: http://h18000.www1.hp.com/products/quickspecs/12810_div/12810_div.html To review typical system power ratings use the HP 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 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).

Technical Specifications

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 HP BladeSystem c-Class Enclosures QuickSpecs located at URL: HP BladeSystem c3000 Enclosure QuickSpecs: http://h18000.www1.hp.com/products/quickspecs/12790_div/12790_div.html HP BladeSystem c7000 Enclosure QuickSpecs:	

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

HP Smart Array P220i 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)

HP 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 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

NVIDIA Quadro 500M graphics adapter	**Memory size**	1 GB
	Memory type	DDR-3
	Memory interface	128-bit
	Card type	MXM-v.3.0
	I/O interface	PCIe (x16) Gen2; **NOTE:** HP WS460c Gen8 I/O slot is PCIe GEN 3x16.
	Max power consumption	35W
	API	DirectX 10.1, Shader Model 4.0; OpenGL3.2
	Upgradeable Firmware	Upgradeable Firmware
	Operating Systems	Microsoft ® Windows 7® Professional (64-bit) Red Hat Enterprise Linux (RHEL) 5.8 and 6.2 (64-bit only)

Technical Specifications

NVIDIA Quadro 1000M graphics adapter	**Memory size**	2 GB
	Memory type	DDR-3
	Memory interface	128-bit
	Card type	MXM-v.3.0
	I/O interface	PCIe (x16) Gen2; **NOTE:** HP WS460c Gen8 I/O slot is PCIe GEN 3x16.
	Max power consumption	45W
	API	DirectX 10.1, Shader Model 4.0; OpenGL3.2
	Upgradeable Firmware	Upgradeable Firmware
	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 3000M graphics adapter	**Memory size**	2GB
	Memory type	GDDR-5
	Memory interface	256-bit
	Card type	MXM-v.3.0
	I/O interface	PCIe (x16) Gen2; **NOTE:** HP WS460c Gen8 mezzanine I/O slot is PCIe GEN 3x16.
	Max power consumption	75W
	API	DirectX 10.1, Shader Model 4.0; OpenGL3.2
	Upgradeable Firmware	Upgradeable Firmware
	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

Technical Specifications

NVIDIA Quadro 6000 graphics adapter	**Memory size**	6.0 GB
	Memory type	GDDR-5
	Memory interface	384-bit
	I/O interface	PCIe (x16) Gen 2
	Max power consumption	225W
	API	DirectX 11, Shader Model 5.0; OpenGL4.1
	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

Technical Specifications

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
Environment-friendly Products and Approach	**End-of-life Management and Recycling**	Hewlett-Packard offers end-of-life HP product return, trade-in, and recycling programs in many geographic areas. For trade-in information, please go to: http://www.hp.com/go/green. To recycle your product, please go to: http://www.hp.com/go/green or contact your nearest HP sales office. Products returned to HP 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 web site at: http://www.hp.com/go/green. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.

Technical Specifications

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