Overview

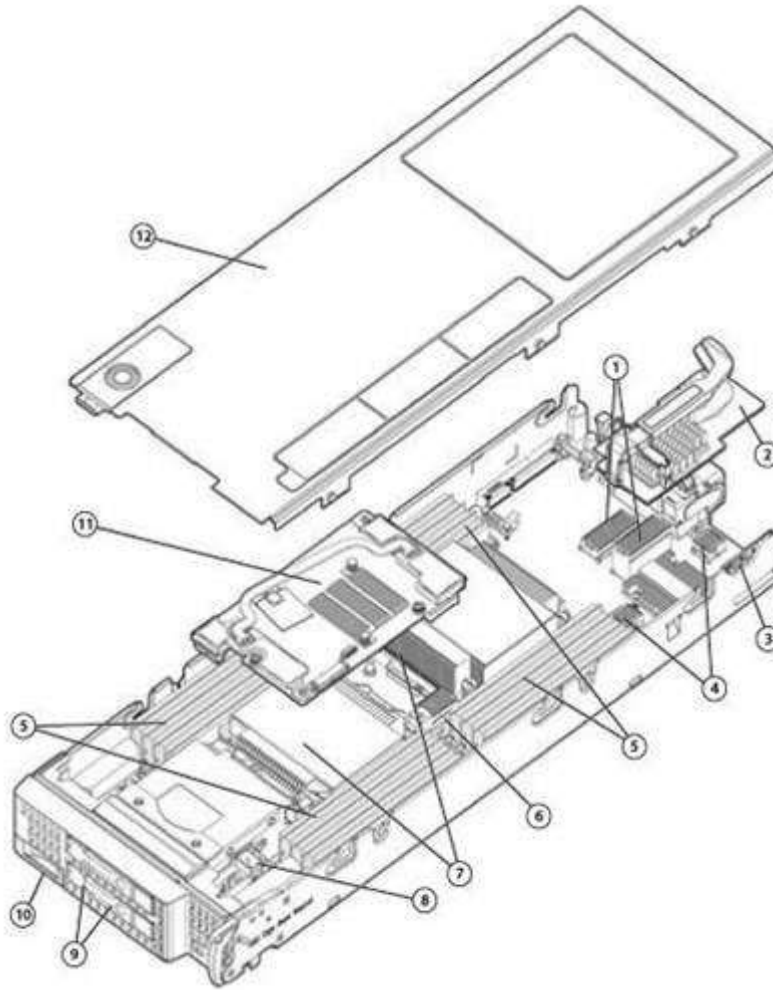## HP ProLiant WS460c Gen8 Workstation Blade

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/P230i Controller connector

7. Up to two (2) Intel® Xeon® E5-2600 family processors
8. Internal USB 2.0 and Trusted Platform Module (TPM) connectors
9. Two (2) small form factor (SFF) hot-plug drive bays
10. HP c-Class Blade SUV (Serial, USB, VGA) connector
11. HP Smart Array P220i/P230i Controller with 512MB FBWC
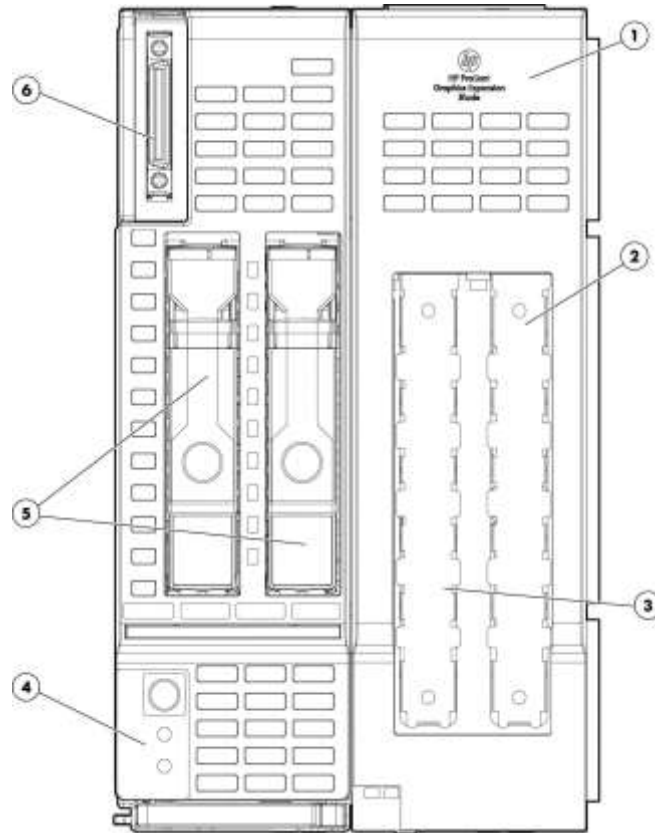12. Access panel

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

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_na/12790_na.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_na/12810_na.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.
NOTE: For optimal cooling and system performance the WS460c Gen8 requires the c7000 enclosure to be configured with 10 fans and the c3000 enclosure to be configured with 6 fans.
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® E5-2643 v2 (3.5GHz/6-core/25MB/8.0GT-s QPI/130W, DDR3-1866, HT, Turbo2-1/1/1/1/2/3)
	Intel® Xeon® E5-2650L v2 (1.7GHz/10-core/25MB/8.0GT-s QPI/70W, DDR3-1600, HT, Turbo2-2/2/2/2/2/2/2/2/3/4)
	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-

Standard Features

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, or the E5-2637 v2, or the E5-2667 v2 is used. In a 2 processor configuration, there are twelve (12) total available DIMM slots.
NOTE: For the maximum supported memory speeds for each processor listed above, please reference the 'Memory Speed by Processor Model' table in the Memory section of the QuickSpecs.
NOTE: HT indicates that the processor model supports Intel® Hyper-Threading Technology.
NOTE: Turbo indicates the maximum potential frequency increment when using Intel® Turbo Boost Technology, with 8, 7, 6, 5, 4, 3, 2 or 1 core(s) active.
NOTE: DDR3 speed is the maximum memory speed of the processor. Actual memory speed may depend on the quantity and type of DIMMs installed.
NOTE: Up to 2 processors supported. Mixing different processor models is not supported.
NOTE: For the Intel® C600 Chipset E5-2600 Series, the letter preceding the model number indicates the Product Line (E3, E5, E7); 2600x, 2 = number of CPUs in a Node, 6 is socket/segment designation, 00 = Processor SKU, and x = L for low power SKUs.
NOTE: The WS460c Gen8 supports one or two processors.

Standard Features

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: 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
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)	32GB (4 x 8GB) DDR3 1600MHz RDIMMs at 1.5V

Standard Features

One of the following
depending on Model

Maximum (LRDIMM)	512GB (16 x 32GB) up to 1333MHz at 1.35V
Maximum (RDIMM)	256GB (16 x 16GB) up to 1600MHz at 1.5V
	384GB (16 x 24GB) up to 1333MHz at 1.35V
Maximum (UDIMM)	128GB (16 x 8GB) up to 1600MHz at 1.5V

NOTE: 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_na/14225_na.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 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 FlexibleLOM from below.
One (1) HP Flex-10 10Gb 2-port 530 FlexLOM or
One (1) HP FlexFabric 10Gb 2-port 534FLB FlexibleLOM or HP FlexFabric 10Gb 2-port 554FLB FlexibleLOM, HP FlexFabric 20Gb 2-port 630FLB
NOTE: Windows 7, directly presiding on system (i.e. "OS on bare-metal"), is supported only with HP Flex-10 10Gb 2-port 530FLB. All other adapters supported with use on server OS or hypervisor environment only.
NOTE: FlexFabric supported only with server OS and/or in a virtualized environment using hypervisors.
NOTE: Supports FCoE, Flex-10, TCP/IP offload engine, hardware-based accelerated iSCSI, iSCSI boot, and autosensing 10Gb/1Gb Ethernet.
NOTE: Each port is autosensing 1Gb/10Gb, and can interoperate with 1Gb 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.

Standard Features

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

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

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/P230i 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/P230i supports two (2) small form factor (SFF) hot plug drive bays.
NOTE: The server supports up to a combined total of two (2) FBWC battery

Standard Features

<table>
<tr><td></td><td colspan="3">options.</td></tr>
<tr><td rowspan="4">Maximum Internal Storage
One of the following depending on Model</td><td>Hot Plug SFF SAS</td><td>2.4TB</td><td>2 x 1.2TB drives</td></tr>
<tr><td>Hot Plug SFF SATA</td><td>2.0TB</td><td>2 x 1.0TB drives</td></tr>
<tr><td>Hot Plug SFF SAS SSD</td><td>1.6TB</td><td>2 x 800GB drives</td></tr>
<tr><td>Hot Plug SFF SATA SSD</td><td>1.6TB</td><td>2x800GB drives</td></tr>
<tr><td></td><td colspan="3">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.</td></tr>
<tr><td rowspan="3">Interfaces</td><td>Micro SDHC Slot</td><td colspan="2">One (1) internal Micro Secure Digital High Capacity (Micro SDHC) card slot</td></tr>
<tr><td>USB 2.0 Port</td><td colspan="2">One (1) internal USB 2.0 connector for USB flash media drive keys</td></tr>
<tr><td colspan="3">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.</td></tr>
<tr><td>Industry Standard Compliance</td><td colspan="3">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</td></tr>
<tr><td>Operating Systems Support for HP ProLiant Workstations</td><td colspan="3">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</td></tr>
<tr><td>Enclosures</td><td colspan="3">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</td></tr>
</table>

Standard Features

(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

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.

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:

  o **HP iLO**: The HP iLO management processor is the core foundation for other capabilities within HP iLO Management Engine.
  o **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.
  o **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.
  o **HP Intelligent Provisioning**: Lets customers provision and

Standard Features

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.

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

Standard Features

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

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

Standard Features

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

Blade Enclosure Infrastructure

- Pooled power for true N+N power redundancy through up to six (6) hot-plug, high-efficiency, common slot enclosure-based power supplies (configuration dependent).
- Up to ten (10) redundant enclosure-based hot-plug 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

Optional Features

Graphics Adapter

- AMD FirePro S4000X graphics (Single or dual cards configuration capable)
    - For professional 2D & 3D graphics with hardware acceleration via graphics subsystem
    - 2GB (GDDR5) memory
    - Supports up to six displays
    - Mezzanine card can occupy either mezzanine slot 1 and/or 2
    - Windows 7 Pro (64-bit) OS directly presiding on system (i.e. "OS on bare-metal") support only
- NVIDIA Quadro K3100M graphics (Single card configuration only)
    - Workstation class performance for ultra high end professional 3D graphics
    - 4GB (GDDR5) memory
    - Supports up to two displays by default firmware. Up to four displays can be supported by using firmware edition 80.04.F1.00.01 and driver 331.82b or later.
    - Mezzanine card which occupies mezzanine slot 2
    - GPU Pass-through with
        - Citrix XenDesktop 5.6 FP1 Enterprise/Platinum, XenServer 6 Enterprise / Platinum edition
        - VMware Horizon View 5.2 and vSphere5.1

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

- NVIDIA GRID K1GPU adapter
    - For VDI acceleration delivering true PC graphics experience
    - Four entry class GPU
    - 4GB (DDR3) memory per GPU, total of 16GB
    - Supports shared graphics, pass-through and hardware GPU virtualization
    - PCIe Gen3, x16 double-width card (One per Graphics Expansion Blade)
    - Available only with Intel® Xeon® E5-2600 v2 series processor configuration
- NVIDIA GRID K2 GPU adapter
    - For VDI acceleration delivering true PC graphics experience
    - Two high-end GPU
    - 4GB (GDDR5) memory per GPU, total of 8GB
    - Supports shared graphics, pass-through and hardware GPU virtualization
    - o PCIe Gen3, x16 double-width card (One per Graphics Expansion Blade)
    - Available only with Intel® Xeon® E5-2600 v2 series processor configuration
- NVIDIA Quadro K4000 (Single-width PCIe x16 in graphics expansion blade)
    - For professional high end 3D graphics and VDI acceleration
    - 3GB (GDDR5) memory
    - Supports up to four displays per card
    - PCIe Gen2, x16 single-width card (Two per Graphics Expansion Blade can be supported.)
    - GPU Pass-through with
        - Citrix XenDesktop 5.6 Enterprise/Platinum, XenServer 6 Enterprise / Platinum editions
        - VMware View Horizon 5.2, vSphere 5.1
- NVIDIA Quadro K5000 (Double-width PCIe x16 in graphics expansion blade)
    - For professional ultra high-end 3D graphics and VDI acceleration
    - 4GB (GDDR5) memory
    - Supports up to four displays
    - PCIe Gen2, x16 double-width card (One per Graphics Expansion Blade)
    - GPU Pass-through with
        - Citrix XenDesktop 5.6 Enterprise/Platinum, XenServer 6 Enterprise / Platinum editions
        - VMware View Horizon 5.2, vSphere 5.1

Optional Features

- NVIDIA Quadro K6000 (Double-width PCIe x16 in graphics expansion blade)
  - For ultra high-end 3D graphics requiring large-scale visualization and VDI acceleration
  - 12GB (GDDR5) memory
  - Supports up to four displays
  - PCIe Gen3, x16 double-width card (One per Graphics Expansion Blade)
  - GPU Pass-through with
    - Citrix XenDesktop 5.6 Enterprise/Platinum, XenServer 6 Enterprise / Platinum editions
    - VMware View Horizon 5.2, vSphere 5.1
- HP MultiGPU with six NVIDIA Quadro K3100M
  - Three NVIDIA Quadro K3100M per HP Multi GPU carrier adapter. Required to use in a set of two HP Multi GPU cards for total six NVIDIA Quadro K3100M GPUs
  - For VDI acceleration in pass-through mode with Citrix XenServer and VMware vSphere
  - PCIe-x16, Gen2
  - GPU Pass-through with
    - Citrix XenDesktop 5.6 Enterprise/Platinum, XenServer 6 Enterprise / Platinum editions
    - VMware View Horizon 5.2, vSphere 5.1
  - Available only with Intel® Xeon® E5-2600 v2 series processor configuration
- NVIDIA Tesla K20 5GB Computational Accelerator
  - For High Performance Computing (GPGPU acceleration)
  - 2496 CUDA cores
  - 1.17 Tflops of double-precision peak performance
  - 3.52 Tflops of single-precision peak performance
  - PCIe Gen2
- NVIDIA Tesla K20X 6GB Computational Accelerator (Qualified. Factory integration not available)
  - For High Performance Computing (GPGPU acceleration)
  - 2688 CUDA cores
  - PCIe Gen2
  - 1.32 Tflops of double-precision peak performance
    - 3.95 Tflops of single-precision peak performance
  - PCIe Gen2

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

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

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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

Optional Features

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.

HP OneView	The HP OneView architecture combines server, storage, and networking with control of datacenter environmentals into a single, integrated management platform. Architected to deliver lifecycle management for the complete Converged Infrastructure, it facilitates collaboration, removes friction, collapses cycle times, eliminates error-prone work, and accelerates time to value. HP OneView v1.1 combines management of servers and virtual connect with open integration to automate and customize existing tools and processes. With OneView, you'll work smarter-with greater visibility and control-and fully capitalize on the benefits of a Converged Infrastructure.
	For more information on HP OneView management, see: http://www.hp.com/go/oneview.

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.
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

QuickSpecs

Service and Support

Service and Support	**HP Technology Services for Industry Standard Servers**
	HP Technology Services delivers confidence, reduces risk and helps customers realize agility and stability. Connect to HP to help prevent problems and solve issues faster. Our support technology lets you to tap into the knowledge of millions of devices and thousands of experts to stay informed and in control, anywhere, any time.
	Protect your business beyond warranty with HP Care Pack Services HP Care Pack Services enable you to order the right service level, length of coverage and response time as you purchase your new server, giving you full entitlement for the term you select.

Recommended HP Care Pack Services for your HP product

Optimized Care	**HP Proactive Care Advanced** - 24x7 coverage, three year Care Pack Service Achieve a higher return on your product investment with the personal attention from a locally assigned Account Support Manager who delivers recommendations designed to improve availability and performance. Leverage your system's ability to connect to HP for automated problem detection and rapid critical event management to increase stability and reduce unplanned downtime. This recommendation provides 24x7 coverage with four-hour response for hardware and two-hour callback for supported software. Collaborative call management comes with Proactive Care Advanced or you may choose full support from HP where we own all cases through to resolution. HP is a leading provider of support services for most operating systems used on HP BladeSystem with long, successful partnerships with vendors such as Microsoft, Red Hat, VMware, SUSE and others. Purchasing software support from HP simplifies troubleshooting and shortens time to resolution with one call for hardware or software questions. http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=4AA5-3259ENW&cc=us&lc=en
Standard Care	**HP Proactive Care with 24x7 coverage, three year Care Pack Service** HP Proactive Care helps prevent problems and stabilize IT by utilizing secure, real-time, predictive analytics and proactive consultations when your products are connected to HP. This Care Pack Service combines three years' proactive reporting and advice with our 24x7 coverage and enhanced escalation management, four hour hardware response time and two hour call back for software questions on leading industry standard software running on your HP ProLiant server. http://h20195.www2.hp.com/v2/GetPDF.aspx/4AA3-8855ENW.pdf
Related Services	**HP ProLiant Server Hardware Installation** Provides for the basic hardware installation of HP branded servers, storage devices and networking options to assist you in bringing your new hardware into operation in a timely and professional manner. http://h20195.www2.hp.com/V2/GetPDF.aspx/5981-9356EN.pdf **Factory Express for Servers and storage** 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. For more information on Factory Express services for your specific server model please contact your sales representative or go to: http://www.hp.com/go/factory-express. **Data Privacy Services** Protect your data through better media management. HP Data privacy services help manage and protect sensitive data to reduce the risk of unauthorized access to private information and help meet

Service and Support

compliance requirements. Our retention services allow you to keep drives and other devices upon failure, our removal services provide convenient data sanitization and our recovery services allow you to safely retire IT assets and capture any remaining value from the hardware. www.hp.com/services/dataprivacy

Additional HP Care Pack services can be found at: http://www.hp.com/go/cpc

Get connected to HP to improve your support experience	Prevent problems with innovative, automated monitoring tools and proactive services. Combining Proactive Care Services with our remote support technology such as Insight Online provides you with expert advice and personalized, cloud-based automated IT support, helping to prevent unplanned down time and solve problems quickly. For more information, visit: www.hp.com/go/proactiveinsightexperience
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

Configuration Information - Factory Integrated Models

NOTE: This section lists some of the steps required to configure a Factory Integrated Model. To ensure only valid configurations are ordered, 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   739347-B21

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

Configurable Model ships with:

One (1) FlexibleLOM connector providing a choice for one (1) of the supported 10Gb or 20Gb FlexibleLOMs (see Step 2)
Two (2) 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)

HP ProLiant WS460c Gen8 Configure-to-order Workstation   678276-B21

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 Configure-to-order Blade Server (678276-B21).

Configurable Model ships with:

One (1) FlexibleLOM connector providing a choice for one (1) of the supported 10Gb or 20Gb FlexibleLOMs (see Step 2)
One (1) 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)

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

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

Configurable Model ships with:

One (1) FlexibleLOM connector providing a choice for one (1) of the supported 10Gb or 20Gb 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)

HP WS460c Gen8 Graphics Expansion Configure-to-order Blade   684690-B21

Configuration Information - Factory Integrated Models

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 Graphics Expansion Configure-to-order Blade Server (684690-B21)

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

Configurable Model ships with:

One (1) FlexibleLOM connector providing a choice for one (1) of the supported 10Gb or 20Gb FlexibleLOMs (see Step 2)
One (1) 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:** If two processors are desired, select one xxxxxx-L21 here in Step 2 and one xxxxxx-B21 in Step 4.

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

Configuration Information - Factory Integrated Models

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, or the E5-2637 v2, or the E5-2667 v2 is used. In a 2 processor configuration, there are twelve (12) total available DIMM slots.
NOTE: For the maximum supported memory speeds for each processor listed above, please reference the 'Memory Speed by Processor Model' table in the Memory section of the QuickSpecs.
NOTE: HT indicates that the processor model supports Intel® Hyper-Threading Technology.
NOTE: Turbo indicates the maximum potential frequency increment when using Intel® Turbo Boost Technology, with 8, 7, 6, 5, 4, 3, 2 or 1 core(s) active.
NOTE: DDR3 speed is the maximum memory speed of the processor. Actual memory speed may depend on the quantity and type of DIMMs installed.
NOTE: Up to 2 processors supported. Mixing different processor models is not supported.
NOTE: For the Intel® C600 Chipset E5-2600 Series, the letter preceding the model number indicates the Product Line (E3, E5, E7); 2600x, 2 = number of CPUs in a Node, 6 is socket/segment designation, 00 = Processor SKU, and x = L for low power SKUs.
NOTE: All processors within the server must be identical.
NOTE: All processors support Intel® Hyper-Threading and Intel® Turbo Boost Technologies except the E5-2603 and E5-2609.
NOTE: The letter "L" following the model number indicates denotes lower wattage.
NOTE: The processor model as well as the memory configuration determines the 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: 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

Configuration Information - Factory Integrated Models

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_na/14225_na.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.

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 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit	761501-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 Memory Kit	761501-B21

QuickSpecs

Configuration Information - Factory Integrated Models

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 or 20Gb FlexibleLOM Adapters

HP Flex-10 10Gb 2-port 530FLB FIO Adapter	684211-B21
HP FlexFabric 10Gb 2-port 554FLB FIO Adapter	684212-B21

Configuration Information - Factory Integrated Models

HP FlexFabric 10Gb 2-port 534FLB FIO Adapter	700742-B21
HP FlexFabric 20Gb 2-port 630FLB FIO Adapter	700066-B21

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

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

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

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 Insight Control including 1yr 24x7 Support ProLiant ML/DL/BL-bundle FIO Electronic License	C6N36ABE
Converged Infrastructure Management Software	HP OneView for Blade Server incl 3yr 24x7 Supp FIO Bundle Physical 1 Svr Lic	F6Q89A
	HP OneView for Blade Server incl 3yr 24x7 Supp FIO Bundle 1 Svr E-LTU	F6Q89AAE
HP Storage Controllers	HP Smart Array P220i Controller FIO Kit	690164-B21
	HP Smart Array P230i/512 6Gb FIO SAS Controller	735062-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) or HP Smart Array P230i Controller FIO Kit (735062-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 mode	
	NVIDIA Quadro K3100M Mezzanine FIO Graphics Kit	750969-B21
	AMD FirePro S4000X MXM Mezzanine FIO Graphics Kit	752424-B21

NOTE: Windows 7 OS support only

NVIDIA GRID K1 PCIe GPU FIO Adapter	730876-B21

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

HP MultiGPU Carrier with 3 NVIDIA K3100M FIO Graphics Kit	752423-B21

NOTE: This part number includes one HP MultiGPU Carrier Card with three Quadro K3100M graphics loaded. Required to use in two carrier cards configuration (Total of six Quadro K3100M).
NOTE: Requires Expansion Blade Slot2 Enablement FIO Kit (PN 721120-B21).
NOTE: Available only with Intel® Xeon® E5-2600 v2 series processor configuration

HP Gen8 Expansion Blade Slot 2 FIO Enablement Kit	721120-B21

NOTE: This optional kit is available at time of initial system purchase only. This kit is required when supporting two HP MultiGPU Carrier cards or two NVIDIA Quadro K4000 graphics.

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

Configuration Information - Factory Integrated Models

and Additional sections below; or the following:

HP BladeSystem c3000 Enclosure QuickSpecs:

http://h18000.www1.hp.com/products/quickspecs/12790_na/12790_na.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_na/12810_na.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.

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

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.

Core Options

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 or 20 Gigabit Ethernet FlexibleLOM

HP Flex-10 10Gb 2-port 530FLB Adapter	656590-B21

NOTE: Please see QuickSpecs for technical specifications and additional information at http://h18000.www1.hp.com/products/quickspecs/14216_na/14216_na.html.
NOTE: Client OS on bare metal is supported only with this BLOM.

HP FlexFabric 10Gb 2-port 534FLB Adapter	700741-B21

NOTE: Please see QuickSpecs for technical specifications and additional information at: http://h18000.www1.hp.com/products/quickspecs/14617_na/14617_na.html

HP FlexFabric 10Gb 2-port 554FLB Adapter	647586-B21

NOTE: Please see QuickSpecs for technical specifications and additional information at: http://h18000.www1.hp.com/products/quickspecs/14219_na/14219_na.html

HP FlexFabric 20Gb 2-port 630FLB Adapter	700065-B21

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

HP Infiniband QDR/Ethernet 10Gb 2-port 544M Adapter	644160-B21

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

HP Infiniband FDR/Ethernet 10Gb/40Gb 2-port 544M Adapter	644161-B22

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

HP InfiniBand FDR 2-port 545M Adapter	702213-B21

NOTE: InfiniBand QDR and FDR speeds are only supported on the HP BladeSystem c7000 Enclosure. For additional information, please see the HP BladeSystem c7000 Enclosure and InfiniBand QuickSpecs at:
http://h18004.www1.hp.com/products/quickspecs/12586_na/12586_na.html
http://h18000.www1.hp.com/products/quickspecs/13078_na/13078_na.html

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

HP LPe1605 16Gb Fibre Channel HBA for BladeSystem c-Class	718203-B21

NOTE: Please see QuickSpecs for technical specifications and additional information at

Core Options

http://h18000.www1.hp.com/products/quickspecs/14742_na/14742_na.html

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

NOTE: Please see QuickSpecs for technical specifications and additional information at
http://h18000.www1.hp.com/products/quickspecs/14338_na/14338_na.html

HP QMH2672 16Gb Fibre Channel Host Bus Adapter 710608-B21

NOTE: Please see QuickSpecs for technical specifications and additional information at
http://h18000.www1.hp.com/products/quickspecs/14622_div/14622_div.html

HP QMH2572 8Gb Fibre Channel Host Bus Adapter for BladeSystem c-Class 651281-B21

NOTE: Please see QuickSpecs for technical specifications and additional information at
http://h18000.www1.hp.com/products/quickspecs/14622_na/14622_na.html

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
	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

Core Options

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, or the E5-2637 v2, or the E5-2667 v2 is used. In a 2 processor configuration, there are twelve (12) total available DIMM slots.

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

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

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

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

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

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

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

NOTE: When 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_na/14225_na.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-

Core Options

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 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit	761501-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 Memory Kit	761501-B21

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

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

Core Options

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_na/13021_na.html

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

Core Options

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
HP 1.2TB 6G SAS 10K rpm SFF (2.5-inch) SC Dual Port Enterprise 3yr Warranty Hard Drive	718162-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_na/12244_na.html	
12G SAS Hot Plug VE SFF (2.5-inch) SC EV SSD	
HP 1.6TB 12G SAS Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	762263-B21
HP 800GB 12G SAS Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	762261-B21
12G SAS Hot Plug SFF (2.5-inch) SC ENT SSD	
HP 600GB 12G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	759212-B21
HP 450GB 12G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	759210-B21
HP 300GB 12G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	759208-B21
12G SAS ME Hot Plug SFF (2.5-inch) SC EM SSD	
HP 800GB 12G SAS Mainstream Endurance SFF 2.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive	741146-B21
HP 400GB 12G SAS Mainstream Endurance SFF 2.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive	741142-B21
HP 200GB 12G SAS Mainstream Endurance SFF 2.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive	741138-B21
12G SAS ME Hot Plug SFF (2.5-inch) SC EM SSD	
HP 800GB 12G SAS Mainstream Endurance SFF 2.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive	741159-B21
HP 400GB 12G SAS Mainstream Endurance SFF 2.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive	741155-B21
HP 200GB 12G SAS Mainstream Endurance SFF 2.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive	741151-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) SC EV G1 Solid State Drives	
HP 480GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty G1 Solid State Drive	756657-B21
HP 240GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty G1 Solid State Drive	756636-B21
HP 120GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty G1 Solid State Drive	756621-B21

Core Options

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

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

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

HP 800GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	717973-B21
HP 800GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty M1 Solid State Drive	764929-B21
HP 600GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	739898-B21
HP 480GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	717971-B21
HP 480GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty M1 Solid State Drive	764927-B21
HP 300GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	739888-B21
HP 240GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	717969-B21
HP 240GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty M1 Solid State Drive	764925-B21
HP 120GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Boot 3yr Wty Solid State Drive	717965-B21
HP 120GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty M1 Solid State Drive	764923-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 K1 PCIe GPU FIO Adapter	730876-B21
	NOTE: Available only with Intel® Xeon® E5-2600 v2 series processor configuration	
	NVIDIA GRID K2 Dual GPU PCIe Graphics Accelerator	729851-B21
	NOTE: GRID K2 requires GPU Enablement Kit (PN 734206-B21).	
	NOTE: Available only with Intel® Xeon® E5-2600 v2 series processor configuration	
	NVIDIA Tesla K20 5 GB Computational Accelerator	C7S14A
	NOTE: Requires GPU Enablement Kit (PN 734206-B21)	
	NVIDIA Tesla K20X 6 GB Computational Accelerator	C7S15A
	NOTE: Requires GPU Enablement Kit (PN 734206-B21)	
	NVIDIA Quadro K4000 PCI-E Graphics Adapter	730870-B21
	NVIDIA Quadro K5000 PCI-E Graphics Adapter	730872-B21
	NVIDIA Quadro K6000 PCI-E Graphics Adapter	730874-B21
	HP WS460c Gen8 GPU Enablement Kit	734206-B21
	NOTE: Required when using NVIDIA GRID K2 GPU (PN 729851-B21) or Tesla K20 or K20X.	

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 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_na/12631_na.html

HP iLO Advanced Licenses	HP iLO Advanced Blade 1 Server License with 3yr 24x7 Tech Support and Updates	BD502A
	HP iLO Advanced for BladeSystem including 3yr 24x7 Technical Support and Updates E-LTU	E6U63ABE
	HP iLO Advanced for BladeSystem including 1yr 24x7 Technical Support and Updates E-LTU	E6U60ABE
	HP iLO Advanced for BladeSystem including 1yr 24x7 Support Single Server License	512488-B21

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_na/14276_na.html

Converged Infrastructure Management Software	**HP OneView**	
	HP OneView with iLO Advanced	
	HP OneView incl 3yr 24x7 Supp Phys 1 Svr Lic	E5Y34A
	HP OneView incl 3yr 24x7 Supp Flex Qty E-LTU	E5Y35AAE
	HP OneView Media Kit Phys No Lic	E5Y37A
	HP OneView without iLO Advanced	
	HP OneView w/o iLO Adv incl 3yr 24x7 Supp Phys 1 Svr Lic	E5Y38A
	HP OneView w/o iLO Adv inc 3yr 24x7 Supp Flex Qty E-LTU	E5Y39AAE

NOTE: For additional license kits please see the QuickSpecs at http://h18004.www1.hp.com/products/quickspecs/14621_na/14621_na.html

High Performance	HP Insight Cluster Management Utility 1yr 24x7 Flexible License	QL803B

QuickSpecs

Additional Options

Clusters	**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_na/12612_na.html	
	HP Insight Cluster Management Utility 3yr 24x7 Flexible License	BD476A
	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.	
	HP Insight Cluster Management Utility Media	BD477A
	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_na/12612_na.html	
HP Security	HP Trusted Platform Module Option	488069-B21
	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.	
HP Secure Encryption	HP Secure Encryption No Media E-LTU per Drive	D8S85AAE
	HP Secure Encryption No Media Flexible License per Drive	D8S84A
	NOTE: HP Secure Encryption is supported on the HP Smart Array P731m and the P230i as an option. HP Secure Encryption licensing is based on the number of physical drives requiring encryption. **NOTE:** For more information about HP Secure Encryption, go to http://www.hp.com/go/hpsecureencryption.	
HP Fibre Channel Mezzanines **HP Fibre Channel Mezzanines**	**NOTE:** All Fibre Channel mezzanine HBAs are supported on the HP ProLiant WS460c Gen8 with server OS or hypervisors only. Windows client OS (Windows 7) on bare-metal not supported.	
	HP LPe1605 16Gb Fibre Channel HBA for BladeSystem c-Class	718203-B21
	NOTE: Please see QuickSpecs for technical specifications and additional information at http://h18000.www1.hp.com/products/quickspecs/14742_na/14742_na.html	
	HP LPe1205A 8Gb Fibre Channel Host Bus Adapter for BladeSystem c-Class	659818-B21
	NOTE: Please see QuickSpecs for technical specifications and additional information at	

Additional Options

http://h18000.www1.hp.com/products/quickspecs/14338_na/14338_na.html	
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_na/14622_na.html	710608-B21
HP QMH2572 8Gb Fibre Channel Host Bus Adapter for BladeSystem c-Class **NOTE:** For the above Fibre Channel Host Bus Adapter, please see the QuickSpecs for technical specifications and additional information at: http://h18000.www1.hp.com/products/quickspecs/14230_na/14230_na.html	651281-B21

HP InfiniBand Mezzanines	**NOTE:** InfiniBand mezzanine HCAs are supported on the HP ProLiant WS460c Gen8 with server OS or hypervisors. Windows client OS (Windows 7) not supported. **NOTE:** When an InfiniBand adapter is installed in mezzanine slot 1, only one port is active (regardless of operating mode). When installed in any other mezzanine slot, both ports are active. **NOTE:** InfiniBand QDR and FDR speeds are only supported on the HP BladeSystem c7000 Enclosure. For additional information, please see the HP BladeSystem c7000 Enclosure and InfiniBand QuickSpecs at: http://h18004.www1.hp.com/products/quickspecs/12586_na/12586_na.html http://h18000.www1.hp.com/products/quickspecs/13078_na/13078_na.html	
	HP Infiniband QDR/Ethernet 10Gb 2-port 544M Adapter **NOTE:** The QDR InfiniBand adapter may be installed in any vacant mezzanine slot of the server.	644160-B21
	HP Infiniband FDR/Ethernet 10Gb/40Gb 2-port 544M Adapter **NOTE:** The FDR InfiniBand adapter must be installed in mezzanine slot 1 for FDR mode and may be installed in any mezzanine slot if operated in any other mode.	644161-B22
	HP InfiniBand FDR 2-port 545M Adapter	702213-B21

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. **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_na/12729_na.html	BS580B

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_na/12753_na.html	448018-B21

HP Flash Media Kits for USB Drives	**HP Flash Media Kits for USB Drives**	
	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	608447-B21

Additional Options

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.

HP Enterprise Mainstream Flash Media Kits for Memory Cards

HP 8GB USB Enterprise Mainstream Flash Media Drive Key Kit	737953-B21
HP 8GB microSD Enterprise Mainstream Flash Media Kit	726116-B21
HP 32GB microSD Enterprise Mainstream Flash Media Kit	700139-B21

NOTE: Please see the QuickSpecs for Technical Specifications and additional information:
http://h18000.www1.hp.com/products/quickspecs/13971_na/13971_na.html

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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_na/14225_na.html.
- For memory population rules and additional memory guidelines, please see the WS460c Gen8 user guide at:
  http://www.hp.com/support.

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

WS460c Gen8 Supported Memory Bandwidth																
DIMM Type	Registered DIMMS (RDIMMs)															Load Reduced (LRDIMMs)
DIMM Rank	Single Rank (1R)							Dual Rank (2R)								Three Rank (3R)	Quad Rank (4R)
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																
16 slot servers	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16

Memory

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 1066MHz.
NOTE: Maximum memory speed is a function of the processor QPI bus speed; see the table below "Memory Speed by Processor Model".
NOTE: When 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.

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

Memory

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
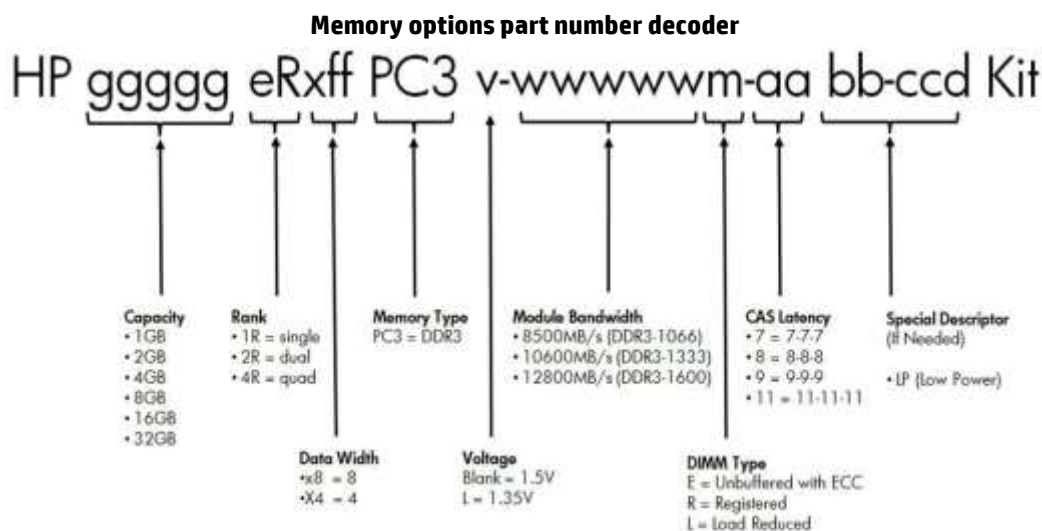
Following are memory options available from HP:

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_na/14225_na.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.

Memory

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 24GB (1x24GB) Three Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit	761501-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 Memory Kit	761501-B21

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

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

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

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

Memory

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.

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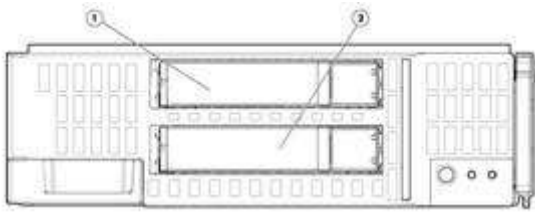
1-2   2 x SFF hot-plug SAS, SATA, SAS SDD, and SATA SSD hard drives

Maximum Internal Storage Capacity

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

Additional Third Party Option

Teradici PCoIP® Hardware Accelerator
Teradici PCoIP® Hardware Accelerator (APEX 2800) for 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.

Technical Specifications

System Unit	Dimensions (H x W x D) (with bezel)	Single-width: 7.11 x 2.18 x 20.37 in (18.07 x 5.54 x 51.76 cm)
		Double-width: 7.11 x 4.46 x 20.37 in (18.07 x 11.08 x 51.76 cm)
	Weight (approximate)	**(Single-width type)**
	Maximum: all processors, 16 DIMMs, hard drives, mezzanine cards, and two flash cache batteries installed)	14.00 lb (6.33 kg)
	Minimum: one processor and 2 DIMMs installed	10.50 lb (4.75 kg)
	(Double-width type)	
	Maximum: all processors, 16 DIMMs, hard drives, mezzanine cards, and two flash cache batteries installed), dual MultiGPU Carrier with eight Q1000M	22.25 lb (10.09 kg)
	Minimum: one processor and 2 DIMMs installed, expansion blade slot 1,2 enabled, both slots vacant	15.69 lb (7.12 kg)

Power Specifications

For power specifications including input requirements, BTU rating, and power supply output, please see the:

- HP BladeSystem c3000 Enclosure QuickSpecs: http://h18000.www1.hp.com/products/quickspecs/12790_na/12790_na.html
- HP BladeSystem c7000 Enclosure QuickSpecs: http://h18000.www1.hp.com/products/quickspecs/12810_na/12810_na.html

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

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

Technical Specifications

HP Smart Array P220i / P230i Controller	**Disk Drive Interface**	6Gb/s SAS (Serial Attached SCSI)
	Server Interface	x4 PCI Express host interface
	Cache Memory	512MB flash backed write cache (FBWC) cache standard
	Logical Drive Capacity	64 (with included 512MB cache)
	Host Memory Addressing	64-bit, supporting servers memory space greater than 4GB
	RAID Support	RAID 1 (mirroring) and RAID 0 (striping)
	Other	Upgradeable firmware with recovery ROM Online drive flash (with SAS drives) HP Secure Encryption is supported on P230i as an option
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 K3100M/3000M (three per carrier card) or NVIDIA Quadro 1000M (four per carrier card)
	Weight	1.60 lb (0.724 kg) - Single, vacant with no MXM graphics
AMD FirePro S4000X server module	**Memory size**	2GB
	Memory type	GDDR-5
	Memory interface	128-bit
	Card type	MXM-v.3.0, Type-A
	I/O interface	PCIe (x16) Gen3;
	Max power consumption	45W
	API	DirectX 11, Shader Model 5.0; OpenGL4.3; OpenCL 1.2, AMD Mantle
	Upgradeable Firmware	Upgradeable Firmware. Up to six displays can be supported by single card.
	Operating Systems	Microsoft ® Windows 7® Professional (64-bit)
NVIDIA Quadro K3100M graphics adapter	**Memory size**	4GB
	Memory type	GDDR-5
	Memory interface	256-bit
	Card type	MXM-v.3.0
	I/O interface	PCIe (x16) Gen3;
	Max power consumption	75W
	API	DirectX 11, Shader Model 5.0; OpenGL4.3
	Upgradeable Firmware	Upgradeable Firmware. Up to four displays can be supported by using firmware edition 80.04.F1.00.01 and driver 331.82b or later. Prior edition firmware supports up to two displays.
	Operating Systems	Microsoft ® Windows 7® Professional (64-bit) Microsoft® Windows Server 2008 R2 SP1 (64-bit) Standard, Enterprise and DataCenter editions Red Hat Enterprise Linux (RHEL) 5.8 and 6.2 (64-bit only) Citrix XenServer 6 Enterprise and Platinum Edition VMware vSphere5.1 or later
NVIDIA Quadro	**Memory size**	6.0 GB

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6000 graphics adapter	**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
NVIDIA Quadro K6000 graphics adapter	**Memory size**	12.0 GB
	Memory type	GDDR-5
	Memory interface	384-bit
	I/O interface	PCIe (x16) Gen 3
	Max power consumption	225W
	API	DirectX 11, Shader Model 5.0; OpenGL4.3
	Operating Systems	Microsoft ® Windows 7® Professional (64-bit) 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

Technical Specifications

		VMware vSphere5.1 or later
NVIDIA GRID K1 GPU adapter	**Number of GPU**	4 entry Kepler GPUs
	Memory size	4.0 GB per GPU (16GB total)
	Memory type	DDR-3
	I/O interface	PCIe (x16) Gen 3 (Gen 2 compatible)
	Max power consumption	130W
	API	DirectX 11, Shader Model 5.0; OpenGL4.3 (Varies by virtualization mode) GRID virtual GPU support (XenServer only)
	Operating Systems	Microsoft ® Windows Server 2012 Citrix XenServer 6 Enterprise and Platinum Edition VMware vSphere5.1 or later
NVIDIA GRID K2 GPU adapter	**Number of GPU**	2 High-end Kepler GPUs
	Memory size	4.0 GB per GPU (8GB total)
	Memory type	GDDR-5
	I/O interface	PCIe (x16) Gen 3 (Gen 2 compatible)
	Max power consumption	225W
	API	DirectX 11, Shader Model 5.0; OpenGL4.3 (Varies by virtualization mode) GRID virtual GPU support (XenServer only)
	Operating Systems	Microsoft® Windows Server 2012 Citrix XenServer 6 Enterprise and Platinum Edition VMware vSphere5.1 or later
NVIDIA Tesla K20 GPU Computational Accelerator	**GPU**	1 Kepler GK110
	CUDA cores	2496
	Memory size	5.0 GB
	Memory type	GDDR-5
	Memory bandwidth	208 GB/sec
	I/O interface	PCIe (x16) Gen 2
	Max power consumption	225W
	NOTE: For additional information please see QuickSpecs at: http://h18004.www1.hp.com/products/quickspecs/13743_na/13743_na.html	
NVIDIA Tesla K20X GPU Computational Accelerator	**GPU**	1 Kepler GK110
	CUDA cores	2688
	Memory size	6.0 GB
	Memory type	GDDR-5
	Memory bandwidth	250 GB/sec
	I/O interface	PCIe (x16) Gen 2
	Max power consumption	235W
	NOTE: For additional information please see QuickSpecs at: http://h18004.www1.hp.com/products/quickspecs/13743_na/13743_na.html	
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

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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.

Summary of Changes

Date	Version History	Action	Description of Change:
01-Nov-2014	From Version 22 to 23	Changed	Service and Support section was updated
29-Sep-2014	From Version 21 to 22	Added	Skus added on Core Options: • 764923-B21 • 764925-B21 • 764927-B21 • 764929-B21
		Removed	Obsolete sku removed: • 608447-B21
09-Sep-2014	From Version 20 to 21	Changed	Standard Features sections was updated
		Added	Skus added to Core Options section: • 762263-B21 • 741142-B21 • 762261-B21 • 741138-B21 • 759212-B21 • 741159-B21 • 759210-B21 • 741155-B21 • 759208-B21 • 741151-B21 • 741146-B21
		Removed	-Pre-Configured Models section was deleted -Skus Removed: • 679858-B21 • 679860-B21 • 667761-B21
10-Jun-2014	From Version 18 to 20	Changed	Memory, Graphics Options, Hard Drives, Mezzanine Options, and Security were revised.
31-Mar-2014	From Version 17 to 18	Changed	Changes made throughout
18-Feb-2014	From Version 16 to 17	Changed	Changes made throughout the QuickSpec. The What's New section was updated to the following: Support for NVIDIA Quadro K3100M mezzanine graphics Support for HP MultiGPU Carrier with six NVIDIA Quadro K3100M graphics Support for NVIDIA Quadro K6000 PCIe graphics Support for NVIDIA K20X/K20 GPU accelerator Support for HP Smart Array P230i controller as optional selection Support for HP InfiniBand mezzanine HCA adapters
13-Dec-2013	From Version 15 to 16	Changed	HP 24GB Three Rank x4 PC3L-10600R Registered CAS-9 Low Voltage FIO Memory Kit and Load Reduced DIMMs (LRDIMMS) E5-2600 v2 Series Processors were added to Memory HP 1.2TB 6G SAS 10k rpm SFF SC Dual Port Enterprise 3yr Warranty Hard Drive, HP 300GB and 600GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Boot 3yr Wty Solid State Drives were added to Hard Drives Teradici PCoIP Hardware Accelerator was added to Storage NVIDIA Quadro 6000 6GB PCI-E Adapter was removed from

Summary of Changes

			Graphics Options HP 4GB microSD Enterprise Performance Flash Media Kit was removed from HP USB and SD Options
01-Nov-2013	From Version 14 to 15	Changed	Revisions made to Notes in the processor and memory sections.
08-Oct-2013	From Version 13 to 14	Changed	Revisions made to processor and memory descriptions.
30-Sep-2013	From Version 12 to 13	Changed	Processors, Memory, Graphics Adapter, Fibre Channel Support, Networking, Storage Controllers, HP Insight Software, and HP iLO Advanced Licenses were revised.
10-Sep-2013	From Version 11 to 12	Changed	HP Insight Management, Memory, Graphics Adapters, HP iLO Advanced Features, and HP Fibre Channel Mezzanine Options were revised.
20-Aug-2013	From Version 10 to 11	Changed	Correction made to version information.
19-Aug-2013	From Version 9 to 10	Changed	Graphics Adapter was moved from Standard Features and Optional Features HP Insight Manager, Security, and Availability were revised in Standard Features Steps 2 and 3 were revised in Configuration Information - Factory Integrated Models HP 80GB 6G SATA Value Endurance SFF Solid State Drive was added and 3G SATA MLC Hot Plug SFF Mainstream Solid State Drives were removed from Hard Drives in Core Options Intel Xeon E5-2690 and Intel Xeon E5-2643 Processor Kits were added to Processors Citrix XenDesktop 5.6fp1 and VMware Horizon View 5.2 vSphere 5.1 or later were added to Operating Systems Support for HP ProLiant Workstations Fibre Channel Support and Compatible SAN were added to Optional Features HP FlexFabric 10Gb 2-port 553FLB Adapter was removed from HP Networking in Core Options
10-Jun-2013	From Version 8 to 9	Changed	Changes were made to the following sections: What's New was changed to: Support for HP 120GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Boot Solid State Drive Support for HP 800GB, 480GB and 240GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value Solid State Drives Standard Features: HP Processor, Cache Memory Configuration Information: Step 2, 3 Core Options: HP Processors, HP Hard Drives Additional Options: HP Insight software, HP Storage Blades, HP USB and SD Options Memory
26-Apr-2013	From Version 7 to 8	Changed	Changes were made to the following sections: Callout # 4 of the 1st image. What's New Standard Features - Network Controller, Maximum Internal Storage, Operating Systems Support for HP ProLiant Workstations, Mezzanine Support, Form factor Configuration Information Core Options - HP Networking Additional Options - HP Expansion Blade Memory Storage

Summary of Changes

25-Mar-2013	From Version 6 to 7	Changed	Changes were made to remove references to Platinum in the Standard Features, Configuration Information and Technical Specifications sections.
15-Mar-2013	From Version 5 to 6	Removed	Changes were made to remove part numbers 582765-B21, T9074BAE, 452148-B22, TC2748AAE, and 436222-B21.
05-Dec-2012	From Version 4 to 5	Changed	Changes were made to add the 2nd Overview image.
04-Dec-2012	From Version 3 to 4	Changed	Changes were made throughout the QuickSpec.
24-Sep-2012	From Version 2 to 3	Changed	Changes made in Optional Features section.
17-Aug-2012	From Version 1 to 2	Changed	Changes made throughout the QuickSpec.