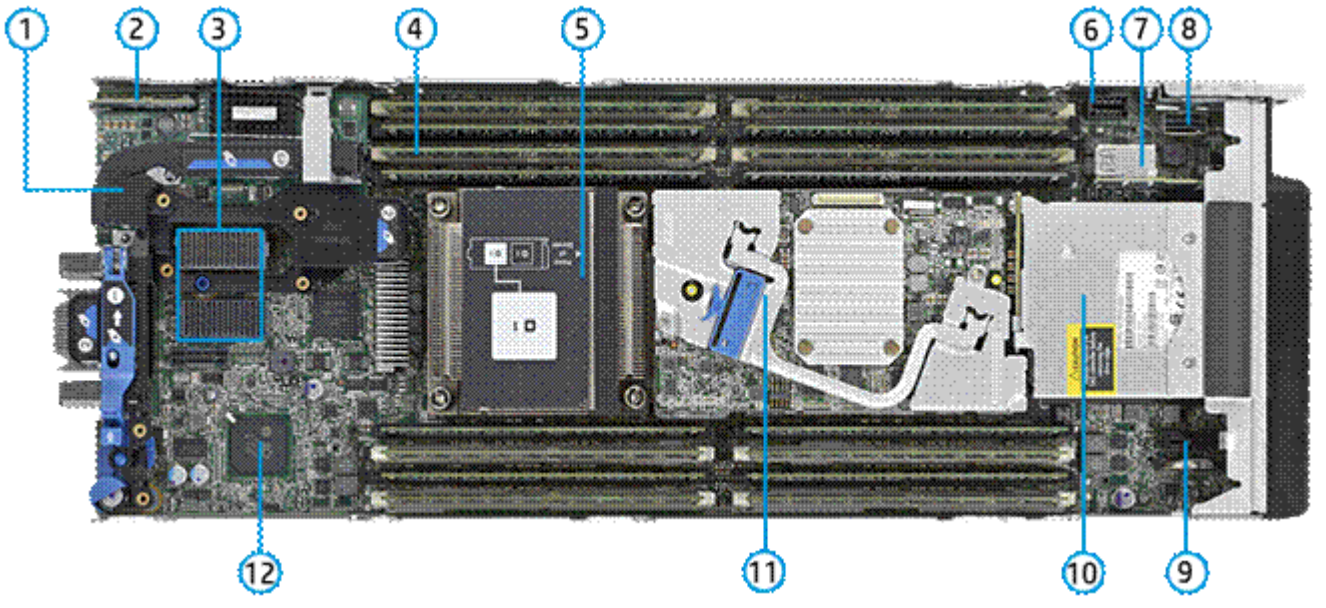
Overview

HP ProLiant WS460c Gen9 Graphics Server Blade – External View

1. Local I/O Connector (covered)
2. Small form factor (SFF) drive bays
3. HP ProLiant WS460c Gen9 Graphics Server Blade base system (single-width model)
4. PCIe Gen3 x16 slot 1
5. PCIe Gen3 x16 slot 2
6. HP ProLiant WS460c Graphics Server Blade with graphics expansion (double-width model)



HP ProLiant WS460c Gen9 Graphics Server Blade – Internal View

1. FlexibleLOM adapter
7. USB 3.0 and TPM

Overview

2. Nand Flash & Micro SD
3. Mezzanine Slots (x16 PCI 3.0)
4. Sixteen (16) DDR4 DIMM memory slots (8 per processor)
5. Up to two (2) Intel® Xeon® E5-2600 v3 family processors
6. HP BLc 12W Smart Storage Battery connector
8. Embedded SATA Connector
9. Solid State Device Connector
10. Two hot-plug drive bays
11. HP Smart Array P244br Controller with 1GB FBWC
12. iLO Management Engine

What's New

- NVIDIA Tesla M6 with GRID virtualization technology, Quadro M6000/M5000, and AMD FirePro S4000X
- Flexible Controller Options
- Support for 2133MHz DDR4 memory
- Support for 12Gb SAS internal hard drives and 12Gb SAS storage controller offerings
- Support for the Intel E5-2600 v3 Product Family

Standard Features

NOTE: This document covers the HP ProLiant WS460c Gen9 server blade only. For information on HP BladeSystems 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 at
  http://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c04123379
  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 at
  http://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c04229580
  NOTE: The c7000 HP c-Class enclosures have full backwards and forwards compatibility, existing server blades are supported in the new enclosures and any future server blades will be supported in the existing enclosures.
- HP BladeSystem c-Class Interconnect and Mezzanine Components at
  http://h18004.www1.hp.com/products/blades/components/c-class-interconnects.html
  http://h18004.www1.hp.com/products/blades/components/c-class-adapters.html

NOTE: For optimal cooling and system performance the WS460c Gen9 Server Blade requires the c7000 enclosure to be configured with 10 fans and the c3000 enclosure to be configured with 6 fans.
NOTE: For proper BladeSystem operation, the minimum required versions of HP Onboard Administrator and HP Virtual Connect are required and available via the HP Service Pack for ProLiant, please see http://www.hp.com/go/spp/download.

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

Processor One of the following depending on selection	**E5-2600 v3 series Processors** HP BL460c Gen9 Intel® Xeon® E5-2690v3 (2.6GHz/12-core/30MB/135W) HP BL460c Gen9 Intel® Xeon® E5-2680v3 (2.5GHz/12-core/30MB/120W) HP BL460c Gen9 Intel® Xeon® E5-2670v3 (2.3GHz/12-core/30MB/120W) HP BL460c Gen9 Intel® Xeon® E5-2660v3 (2.6GHz/10-core/25MB/105W) HP BL460c Gen9 Intel® Xeon® E5-2650v3 (2.3GHz/10-core/25MB/105W) HP BL460c Gen9 Intel® Xeon® E5-2640v3 (2.6GHz/8-core/20MB/90W) HP BL460c Gen9 Intel® Xeon® E5-2683v3 (2GHz/14-core/35MB/120W) HP BL460c Gen9 Intel® Xeon® E5-2630v3 (2.4GHz/8-core/20MB/85W) HP BL460c Gen9 Intel® Xeon® E5-2620v3 (2.4GHz/6-core/15MB/85W) HP BL460c Gen9 Intel® Xeon® E5-2623v3 (3GHz/4-core/10MB/105W) HP BL460c Gen9 Intel® Xeon® E5-2609v3 (1.9GHz/6-core/15MB/85W) HP BL460c Gen9 Intel® Xeon® E5-2603v3 (1.6GHz/6-core/15MB/85W) HP BL460c Gen9 Intel® Xeon® E5-2650Lv3 (1.8GHz/12-core/30MB/65W) HP BL460c Gen9 Intel® Xeon® E5-2698v3 (2.3GHz/16-core/40MB/135W) HP BL460c Gen9 Intel® Xeon® E5-2630Lv3 (1.8GHz/8-core/20MB/55W) HP BL460c Gen9 Intel® Xeon® E5-2695v3 (2.3GHz/14-core/35MB/120W) HP BL460c Gen9 Intel® Xeon® E5-2637v3 (3.5GHz/4-core/15MB/135W) HP BL460c Gen9 Intel® Xeon® E5-2697v3 (2.6GHz/14-core/35MB/145W) HP BL460c Gen9 Intel® Xeon® E5-2667v3 (3.2GHz/8-core/20MB/135W) HP BL460c Gen9 Intel® Xeon® E5-2643v3 (3.4GHz/6-core/20MB/135W) HP BL460c Gen9 Intel® Xeon® E5-2699v3 (2.3GHz/18-core/45MB/145W) **NOTE:** DIMM slots 4 and 5 are not accessible when either the E5-2699 v3, the E5-2697 v3, the E5-2643 v3, the E5-2637 v3, or the E5-2667 v3 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 when using Intel® Turbo Boost Technology. The frequency boost increment is dependent on the processor SKU and the number of active cores. In general, a higher boost increment is obtained when fewer cores are active.
NOTE: DDR4 speed is the maximum memory speed of the processor. Actual memory speed may depend on the quantity and type of DIMMs installed.
NOTE: Supports 1 or 2 processors. Mixing different processor models is not supported.
NOTE: For the Intel® C610 Chipset E5-2600 v3 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 Gen9 includes two I/O mezzanine expansion slots. A processor must be installe 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 v3 and E5-2609 v3.
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.

Cache Memory
One of the following depending on processor

45MB (1x45MB) L3 cache
NOTE: For Eighteen-core processors.

40MB (1x40MB) L3 cache
NOTE: For Sixteen-core processors.

35MB (1x35MB) L3 cache
NOTE: For Fourteen-core processors.

30MB (1x30MB) L3 cache
NOTE: For Twelve-core processors.

25MB (1x25MB) L3 cache
NOTE: For Ten-core processors.

20MB (1x20MB) L3 cache
NOTE: For Six or Eight-core processors.

15MB (1x15MB) L3 cache
NOTE: For Quad or Six-core processors.

10MB (1x10MB) L3 cache
NOTE: For Quad-core processors.

Chipset

Intel® C610 Series Chipset

Intel® E5-2600v3 Processor Family

NOTE: For more information regarding Intel chipsets, please see the following: http://www.intel.com/products/server/chipsets/.

Upgradeability

Upgradeable to two (2) processors

Standard Features

On System Management Chipset	HP iLO (Firmware HP iLO4 2.0), 4GB NAND with 1GB USB user space configurable via UEFI and accessible via iLO. Read and learn more in the iLO QuickSpecs. **NOTE:** For more information, visit: http://www.hp.com/go/ilo
Memory Protection	Advanced ECC Memory Online Spare Mode (Rank Spare Mode)
Memory One of the following depending on selection	Type: HP SmartMemory DDR4 Load Reduced (LRDIMM), or Registered (RDIMM) Standard (Pre-configured Models): 128GB (4 x 32GB) DDR4 2133MHz RDIMMs at 1.2V 64GB (4 x 16GB) DDR4 2133MHz RDIMMs at 1.2V 32GB (2 x 16GB) DDR4 2133MHz RDIMMs at 1.2V 32GB (2 x 16GB) DDR4 2133MHz RDIMMs at 1.2V 16GB (2 x 8GB) DDR4 2133MHz RDIMMs at 1.2V 16GB (2 x 8GB) DDR4 2133MHz RDIMMs at 1.2V Maximum (LRDIMM): 1TB (16 x 64GB) up to 2133MHz at 1.2V Maximum (RDIMM): 512GB (16 x 32GB) up to 2133MHz at 1.2V **NOTE:** Support for 64GB LRDIMM and 32GB RDIMM available later in 2015. **NOTE:** HP memory from previous generation servers (DDR3) is not compatible with this server. HP SmartMemory is required to realize the memory performance improvements and enhanced functionality listed in this document for Gen9. For additional information, please see the HP SmartMemory QuickSpecs at: http://www8.hp.com/h20195/v2/GetHTML.aspx?docname=c04111535 **NOTE:** LRDIMM and RDIMM are distinct memory technologies and cannot be mixed within a server. **NOTE:** Depending on the memory configuration and processor model, the memory speed may run at 2133MHz, 1866MHz, or 1600MHz. Please see Memory Population Table or the Online Memory Configuration Tool at: http://h22195.www2.hp.com/MemoryTool/Home/Legal
Network Controller One of the following depending on selection	One (1) 20Gb 2-port FlexFabric FLB, 10Gb 2-port HP FlexFabric FLB, or 10Gb 2-port Ethernet FLB **NOTE:** Windows 7, 8.1 directly presiding on system (i.e. "OS on bare-metal"), is supported only with HP Flex-10 10Gb 2-port 536FLB with basic network functions only. All other adapters supported with use on server OS or hypervisor environment only. **NOTE:** FlexFabric supported only with server OS and/or in a virtualized environment using hypervisors. **NOTE:** Supports FCoE, , TCP/IP offload engine, hardware-based accelerated iSCSI, iSCSI boot, and autosensing 10Gb/1Gb Ethernet. **NOTE:** Each port is autosensing the speed, 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 or Flex10/10D module. Fibre Channel over Ethernet (FCoE) is supported with HP interconnects. Learn more at: http://www.hp.com/go/bladesystem/interconnects One (1) HP FlexFabric 10Gb 2-port 536FLB FlexibleLOM One (1) HP FlexFabric 10Gb 2-port 560FLB FlexibleLOM One (1) HP FlexFabric 20Gb 2-port 630FLB FlexibleLOM One (1) HP FlexFabric 20Gb 2-port 650FLB FlexibleLOM **NOTE:** FlexibleLOMs are not compatible with prior generation c-Class server blades Standard iLO Network Controller: One (1) 10/100 Mbps port for the HP iLO 4 to Onboard Administrator link. The Onboard Administrator (with 10/100/1000 Mbps) to BladeSystem link is 1Gbps

Expansion Slots

Two (2) I/O expansion mezzanine slots: (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: Slot is occupied and not available with double-width model.
- 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
  NOTE: A second processor must be installed (in processor slot 2) to have access to the seconc expansion slot (expansion slot 2).
  NOTE: When NVIDIA Quadro K3100M card is installed in Mezz slot 2, no other card may be installed in Mezz slot 1.

  NOTE: This expansion slot supports dual-port and quad-port mezzanine cards. For dual-port cards, one port is routed to interconnect module bay 5 and the other to bay 6. For quad-port cards, one port is routed to interconnect module bay 5, one to bay 6, one to bay 7, and one to bay 8.
  NOTE: A second processor must be installed (in processor slot 2) to have access to the seconc expansion slot (expansion slot 2).
- Two (2) Full-size PCIe expansion slots (available with expansion blade only).
  - x16 PCIe 3.0 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 20Gb FlexFabric, Dual-port 10Gb FlexFabric, 10GbE options for additional network ports.
- Dual-port 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: http://www.hp.com/support/rbsu

HP Server UEFI /Legacy ROM

Unified Extensible Firmware Interface (UEFI) is an industry standard that provides better manageability and more secured configuration while interacting with your server at boot time. HP ProLiant Gen9 platform defaults to UEFI and can be factory or field configured for Legacy BIOS Boot Mode.

Standard Features

NOTE: Windows 7 on “bare-metal” supported with Legacy BIOS mode only.
NOTE: Citrix XenServer supported with Legacy BIOS mode only.
NOTE: The UEFI System Utilities function is analogous to the HP ROM-Based Setup Utility (RBSU) of legacy BIOS. For more information, please visit http://www.hp.com/go/proliantuefi/docs
UEFI enables numerous new capabilities specific to HP ProLiant servers such as:

- Secure Boot
- Operating system specific functionality
- Support for > 2.2 TB (using GPT) boot drives
- USB 3.0 Stack
- Embedded UEFI Shell
- Mass Configuration Deployment Tool using HP RESTful API
- PXE boot support for IPv6 networks
- Boot support for option cards that only support a UEFI option ROM

NOTE: For more information please visit http://www.hp.com/go/proliant/uefi
NOTE: For UEFI Boot Mode, boot environment and OS image installations should be configured properly to support UEFI.
NOTE: HP UEFI FIO Setting (758959-B22) can be selected to configure the system in Legacy mode ir the factory.

Maximum Internal Storage
One of the following depending on Model

Hot Plug SFF SAS	2.4TB	2 x 1.2TB
Hot Plug SFF SATA	2.0TB	2 x 1.0TB
Hot Plug SFF SAS SSD	3.2TB	2 x 1.6TB
Hot Plug SFF SATA SSD	1.6TB	2 x 800GB

NOTE: The ProLiant WS460c Gen9 server includes the HP hot plug small form factor (SFF) SmartDrive carrier for enhanced management and reduced maintenance errors. HP drives from previous generation servers (prior to Gen8) are not compatible with the ProLiant WS460c Gen9 drive bays.

Interfaces

Micro SDHC Slot	One (1) internal Micro Secure Digital High Capacity (Micro SDHC) card slot
USB 3.0 Port	One (1) internal USB 3.0 connector for USB flash media drive keys

NOTE: The above options are intended for integrated hypervisor virtualization environments.

Industry Standard Compliance

ACPI 2.0
Microsoft® Logo certifications
USB 3.0 Support
IPMI 2.0
Secure Digital 2.0
TPM 1.2 Support
IEEE (specific IEEE standards depending 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
ASHRAE A3
FIPS 140-2 Level-2 certification pending

Standard Features

Operating Systems and Virtualization Software Support for ProLiant Servers

Client Operating Systems:
Microsoft ® Windows 7® Professional (64-bit), Enterprise (64-bit)
NOTE: Windows 7 is supported only with Legacy BIOS mode
Microsoft ® Windows 8.1® Professional (64-bit), Enterprise (64-bit)
Red Hat Enterprise Linux (RHEL) Desktop 6.5 or later (64-bit only)
Server Operating Systems:
Microsoft Windows Server 2012 R2 (64-bit) Standard, Enterprise and DataCenter editions (Citrix XenApp)
Red Hat Enterprise Linux (RHEL) 6.5 or later (64-bit only)
VMware Horizon View 6 or later, vSphere 5.5 or later
Citrix XenDesktop 7 or later, XenServer 6.5 or later
NOTE: Citrix XenServer supported only with Legacy BIOS mode
NOTE: Citrix XenServer with HP MultiGPU graphics option support coming soon.
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/servers/WS460cGen9

Enclosures

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

- The HP BladeSystem c7000 rack enclosure is 10U high and holds up to sixteen (16) ProLiant WS460c Gen9 servers plugged vertically or (8) HP ProLiant WS460c Gen9 Blades paired with (8) HP WS460c Gen9 Graphics Expansion modules plugged vertically..
- The HP BladeSystem c3000 rack enclosure is 6U high and holds up to eight (8) HP ProLiant WS460c Gen9 servers plugged horizontally or (4) HP ProLiant WS460c Gen9 Blades paired with (4) HP WS460c Gen9 Graphics Expansion modules plugged horizontally..

Server blades, interconnect modules, power supplies, fans, and redundant Onboard Administrator modules are all designed to fit into the c3000 and c7000 enclosures.
NOTE: For additional enclosure information, please see:
http://h18004.www1.hp.com/products/blades/components/enclosures/c-class/index.html

Graphics

Integrated Matrox G200eh video controller

- 1600 x 1200 (32 bpp)
- 1920 x 1200 (16 bpp)

HP iLO Management On System Management Memory

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

Form Factor

HP ProLiant WS460c Gen9 and WS460c Gen9 Graphics Expansion Blade are both half-height server blade that plugs into the HP BladeSystem c3000 and c7000 enclosures.

Embedded Management

HP Integrated Lights Out
Monitor your servers for ongoing management, service alerting, reporting and remote management with iLO. Learn more at http://www.hp.com/go/ilo

UEFI
Configure and boot your servers securely with industry standard Unified Extensible Firmware Interface (UEFI). Learn more at http://www.hp.com/go/ProLiant/uefi.

Standard Features

	HP RESTful API	RESTful API is an application programming interface. RESTful Web Service API served by iLO's web server. http://www.hp.com/go/restfulapi .
	Intelligent Provisioning	Provision servers by discovering and deploying 1 to few servers with Intelligent Provisioning. Learn more at http://www.hp.com/go/intelligentprovisioning.
Server Utilities	**HP Smart Update**	Optimize firmware and driver updates with HP Smart Update solutions. Learn more at http://www.hp.com/go/smartupdate.
	HP Systems Insight Manager (HP SIM)	HP SIM allows you to monitor the health of your HP ProLiant Servers and HP Integrity Servers, and also provides you with basic support for non-HP servers. HP SIM also integrates with HP SUM to provide quick and seamless firmware updates. Learn more at http://www.hp.com/go/sim.
	Scripting Tool Kit and Windows PowerShell	Provision 1 to many servers using your own scripts to discover and deploy them with HP Scripting Tool Kit for Windows and Linux or HP Scripting Tools for Windows PowerShell. Learn more at http://www.hp.com/go/ProLiantSTK or http://www.hp.com/go/powershell.
	HP RESTful Interface Tool	HP RESTful API tool is a scripting tool to provision servers using RESTful API Interface to discover and deploy servers at scale. Learn more at http://www.hp.com/go/restfulapi.
	HP iLO Mobile Application	Enables the ability to access, deploy, and manage your server anytime from anywhere from select smartphones and mobile devices. For additional information please visit: http://www.hp.com/go/ilo/mobileapp.
	HP Insight Online	HP Insight Online, available at no additional cost as part of your HP warranty, Care Pack or contractual support agreement with HP, is a personalized dashboard for simplified tracking of IT operations and support information from anywhere, anytime. Learn more at http://www.hp.com/go/insightonline/info.

Security

- Power-on password
- Administrator's password
- Keyboard password (QuickLock)
- HP iLO Management 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)
- FIPS 140-2 Level-2 certification pending

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.

Standard Features

- 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.

Mezzanine options and I/O

- Support for one (1) FlexibleLOM, providing two (2) (i.e. redundant) Ethernet ports
- Multiple mezzanine I/O expansion slots that support a wide variety of mezzanine cards each supporting multiple data paths routed to redundant interconnect modules.
- Network Adapter Teaming (bonding) provides network fault tolerance, transmit load balancing, and switch-assisted load balancing.

Storage

- Two (2) Small Form Factor hot-plug SAS/SATA HDD or SSD drive bays.
- Choice of the HP Smart Array P244br Controller with 1GB FBWC/HP, Smart HBA H244br, or the HP B140i (chipset SATA). RAID 0 and 1 support for all three storage controller offerings.,
- Optional dual-port Fibre Channel mezzanine card(s) for redundant SAN connections.

Processor/Chipset

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

Server 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) enclosure-based hot-plug HP Active Cool fans that scale to meet future demands, 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 monitors the total enclosure power consumption in real time and automatically adjusts with change 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 specific hard drive QuickSpecs for details.

NOTE: Server 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

Standard Features

http://h18004.www1.hp.com/products/servers/platforms/warranty/index.html.

Graphics Adapter

Mezzanine Graphics Adapters for single-width model:

- NVIDIA Tesla M6 graphics
  - Workstation class performance for ultra high end professional 3D graphics, or VDI acceleration delivering true PC graphics experience.
  - 8GB (GDDR5) memory
  - Supports shared graphics, pass-through and hardware GPU virtualization
  - Supported Environments (Refer to “Technical Specification” section at end of document for full listing per graphics adapter)
    - Bare Metal Client Operating System – Non Virtualized
      - Not Supported
    - Server / Hypervisor
      - Citrix XenServer 6.5 or later
      - VMware vSphere5.5 or later
      - Microsoft® Windows Server 2012 R2 (64-bit)
- 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
  - Supported Environments (Refer to “Technical Specification” section at end of document for full listing per graphics adapter)
    - Bare Metal Client Operating System – Non Virtualized
      - Microsoft ® Windows 7® SP1, 8.1
      - Red Hat Enterprise Linux (RHEL) 6.5 or later (64-bit only)
    - Server / Hypervisor
      - Citrix XenServer 6.5 or later
      - VMware vSphere5.5 or later
    - Microsoft® Windows Server 2012 R2 (64-bit)
- 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
  - Supported Environments (Refer to “Technical Specification” section at end of document for full listing per graphics adapter)
    - Windows 7 Pro (64-bit) OS directly presiding on system (i.e. "OS on bare-metal") support only

Full-size PCI Express Graphics Adapters for double-width model (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)
  - Supported Environments (Refer to “Technical Specification” section at end of document for full listing per graphics adapter)
    - Bare Metal Client Operating System – Non Virtualized
      - Not Supported
    - Server / Hypervisor
      - Citrix XenServer 6.5 or later
      - VMware vSphere5.5 or later
      - Microsoft® Windows Server 2012 R2 (64-bit)
- 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)
-
- Supported Environments (Refer to “Technical Specification” section at end of document for full listing per graphics adapter)
  - Bare Metal Client Operating System – Non Virtualized
    - Not Supported
  - Server / Hypervisor
    - Citrix XenServer 6.5 or later
    - VMware vSphere5.5 or later
    - Microsoft® Windows Server 2012 R2 (64-bit)

- NVIDIA Quadro M5000 (double-width PCIe x16 in graphics expansion blade)
  - For professional ultra high-end 3D graphics and VDI acceleration
  - 8GB (GDDR5)
  - Supports up to four 4K displays
  - PCIe Gen3, x16 single-width card (One per Graphics expansion Blade can be supported)
  - Supported Environments (Refer to “Technical Specification” section at end of document for full listing per graphics adapter)
    - Bare Metal Client Operating System – Non Virtualized
      - Microsoft ® Windows 7® SP1, 8.1
      - Red Hat Enterprise Linux (RHEL) 6.5 or later (64-bit only)
    - Server / Hypervisor
      - Citrix XenServer 6.5 or later
      - VMware vSphere5.5 or later
      - Microsoft® Windows Server 2012 R2 (64-bit)
- NVIDIA Quadro M6000 (double-width PCIe x16 in graphics expansion blade)
  - For professional ultra high-end 3D graphics and VDI acceleration
  - 12GB (GDDR5)
  - Supports up to four 4K displays per card
  - PCIe Gen3, x16 double-width card (One per Graphics Expansion Blade)
  - Supported Environments (Refer to “Technical Specification” section at end of document for full listing per graphics adapter)
    - Bare Metal Client Operating System – Non Virtualized
      - Microsoft ® Windows 7® SP1, 8.1
      - Red Hat Enterprise Linux (RHEL) 6.5 or later (64-bit only)
    - Server / Hypervisor
      - Citrix XenServer 6.5 or later
      - VMware vSphere5.5 or later
      - Microsoft® Windows Server 2012 R2 (64-bit)
- 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.)
  - Supported Environments (Refer to “Technical Specification” section at end of document for full listing per graphics adapter)
    - Bare Metal Client Operating System – Non Virtualized
      - Microsoft ® Windows 7® SP1, 8.1
      - Red Hat Enterprise Linux (RHEL) 6.5 or later (64-bit only)
    - Server / Hypervisor
      - Citrix XenServer 6.5 or later
      - VMware vSphere5.5 or later
      - Microsoft® Windows Server 2012 R2 (64-bit)
- 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)
- Supported Environments (Refer to “Technical Specification” section at end of document for full listing per graphics adapter)
  - Bare Metal Client Operating System – Non Virtualized
    - Microsoft ® Windows 7® SP1, 8.1
    - Red Hat Enterprise Linux (RHEL) 6.5 or later (64-bit only)
  - Server / Hypervisor
    - Citrix XenServer 6.5 or later
    - VMware vSphere5.5 or later
    - Microsoft® Windows Server 2012 R2 (64-bit)

- 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 Gen2, x16 double-width card (One per Graphics Expansion Blade)
  - Supported Environments (Refer to “Technical Specification” section at end of document for full listing per graphics adapter)
    - Bare Metal Client Operating System – Non Virtualized
      - Microsoft ® Windows 7® SP1, 8.1
      - Red Hat Enterprise Linux (RHEL) 6.5 or later (64-bit only)
    - Server / Hypervisor
      - Citrix XenServer 6.5 or later
      - VMware vSphere5.5 or later
      - Microsoft® Windows Server 2012 R2 (64-bit)
- HP MultiGPU with two NVIDIA Tesla M6
  - Two NVIDIA Tesla M6 per HP Multi GPU carrier adapter. Can be configured with one or two sets of HP Multi GPU cards for total two or four NVIDIA Tesla M6 GPUs respectively
  - For VDI acceleration through shared graphics, pass-through, or hardware GPU virtualization with Citrix XenServer and VMware vSphere
  - PCIe-xx16, Gen3
  - Supported Environments (Refer to “Technical Specification” section at end of document for full listing per graphics adapter)
    - Bare Metal Client Operating System – Non Virtualized
      - Not Supported
    - Server / Hypervisor
      - Citrix XenServer 6.5 or later
        NOTE: Citrix XenServer with HP MultiGPU graphics option support coming soon.
      - VMware vSphere5.5 or later
      - Microsoft® Windows Server 2012 R2 (64-bit)
- HP MultiGPU with three NVIDIA Quadro K3100M
  - Three NVIDIA Quadro K3100M per HP Multi GPU carrier adapter. Can be configured with one or two sets of HP Multi GPU cards for total three or six NVIDIA Quadro K3100M GPUs respectively
  - For VDI acceleration in pass-through mode with Citrix XenServer and VMware vSphere
  - PCIe-x16, Gen3
  - Supported Environments (Refer to “Technical Specification” section at end of document for full listing per graphics adapter)
    - Bare Metal Client Operating System – Non Virtualized
      - Not Supported
    - Server / Hypervisor
      - Citrix XenServer 6.5 or later
        NOTE: Citrix XenServer with HP MultiGPU graphics option support coming soon.
      - VMware vSphere5.5 or later
      - Microsoft® Windows Server 2012 R2 (64-bit)

Fibre Channel Support		One optional Fibre Channel mezzanine HBA is supported on the HP ProLiant WS460c Gen9 where vacant mezzanine slot is available.
Compatible SAN		HP ProLiant BL460c/WS460c Gen9 server blades are optimized for HP MSA, EVA, 3PAR and XP. HP ProLiant BL460c/WS460c Gen9 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.
HP Virtual Connect		HP Virtual Connect is an interconnect option for c-Class BladeSystem 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 (FCoE). HP OneView's software-defined approach to infrastructure management enables central console to administer network connections and workloads for thousands of servers, see hp.com/go/oneview For more information on Virtual Connect Ethernet, Fibre Channel, Converged Network and management options, see http://www.hp.com/go/virtualconnect.
Embedded Management	**iLO Advanced for BladeSystem**	HP iLO Advanced for BladeSystem licenses offer smart remote functionality without compromise, for all HP ProLiant servers. The license includes the full integrated remote console, virtual keyboard, video, and mouse (KVM), multi-user collaboration, console record and replay, and GUI-based and scripted virtual media and virtual folders. You can also activate the enhanced security and power management functionality. Learn more about HP iLO Advanced at http://www.hp.com/go/iloadvanced
Server Management	**HP Insight Control**	HP Insight Control, lets you 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 OneView	Powerful converged management of servers, storage, and network for IT service automation and infrastructure simplicity, see http://www.hp.com/go/oneview .
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

Storage Software

Whether you need to solve a specific data protection, archiving, or storage command and control challenge, or deliver on strategic consolidation, compliance, or continuity initiatives, look no further than HP storage software. Our storage software helps you reduce costs, simplify storage infrastructure, protect vital assets and respond faster to business opportunities.

Storage software that gets the job done:

- **Data Protection and Recovery Software**
  Whether you're a large enterprise or a smaller business, HP data protection and recovery software will cost-effectively protect you against disaster and ensure business continuity.
- **Data Archive and Migration Software**
  HP's storage software enables you to comply with data retention and retrieval requirements, improve application performance, and reduce costs by efficiently migrating infrequently accessed or less valuable data to lower cost storage.
- **Storage Resource Management Software (SRM)**
  HP's storage resource management software reduces operational costs and provides the command and control foundation you need to efficiently manage and visualize your physical and virtual environments.
- **Data Replication Software**
  HP offers array-based and host-based replication software for use in disaster recovery, testing, application development and reporting.
- **Storage Device Management Software**
  Maximize your investment in HP storage and networking with software that enables hardware-specific configuration, performance tuning and connectivity management.
- **HP StoreVirtual VSA**
  HP StoreVirtual VSA allows you to create fully featured shared storage on a VMware vSphere or Microsoft Hyper-V virtualized server. This server model starting November 2013, includes a limited license for HP StoreVirtual VSA software with 1TB of capacity. To download the license key and StoreVirtual VSA software, visit: http://www.hp.com/go/unlockVSA.
  NOTE: You will need your server serial number in order to complete the registration form. Fully functional, capacity-based licenses are available in 4TB, 10T and 50TB sizes. For more information and access to the 60-day free trial, visit: http://www.hp.com/go/tryVSA

NOTE: For more information available Storage Software including QuickSpecs, please see: http://www.hp.com/go/storage/software.

HP Insight Online

HP Insight Online is part of 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 Remote Support tools. 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

Get connected to HP

To get the most from your investment in HP Servers, get connected to HP using our innovative remote support technology which provides system health monitoring, pre-failure alert notification and more. For details, visit http://www.hp.com/services/getconnected

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.html

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. https://h22174.www2.hp.com/SimplifiedConfig/Index

Recommended Support Services for WS460

Service and Support	**HP Technology Services for BladeSystem** 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 let 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.
Optimized Support recommendation	**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. http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=4AA5-3259ENW&cc=us&lc=en
Standard Support recommendation	**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	**Data Center Platform Consulting Services** Choose HP Technology Services Consulting to modernize and migrate your key systems. These services help fine tune your data center to improve security, management and efficiency across IT infrastructure, operations, and facilities and prepare you for the new style of IT. HP understands the needs of the data center of the future and will serve as your guide for the journey. http://www.hp.com/services/consulting **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 compliance requirements. Our retention services allow you to keep drives and other devices upon failure with Defective Media Retention and Comprehensive Defective Material Retention, our removal services provide convenient data sanitization and our recovery services allow you to safely retire IT assets and capture any remaining value from the hardware. http://www.hp.com/services/dataprivacy **Factory Express for Servers and storage** HP Factory Express offers configuration, customization, integration and deployment services for HP servers and storage products. Choose how your factory solutions are built, tested, integrated, shipped and deployed. http://www.hp.com/go/factory-express **Additional hardware Installation services for HP BladeSystem** In addition to hardware installation of your Blade server, HP offers installation and startup services for your BladeSystem and Network infrastructure. http://www.hp.com/services/bladesystemservices **HP Foundation Care** HP Foundation Care provides hardware and software support, enabling faster resolution of problems on HP and third party products**.** Standard service levels have been simplified, making it even easier for you to determine the right level of coverage for your SLA and budgetary requirements. http://www.hp.com/services/foundationcare
Get connected to HP to improve your support experience	Connecting products to HP will help prevent problems with 24x7monitoring, prefailure alerts, automatic call logging, and parts dispatch, plus current data will be available for the proactive reports that are part of Proactive Care Services. With Connected products, you can have a dashboard to manage your IT anywhere, anytime, from any device.

Recommended Support Services for WS460

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.

NOTE: This section lists some of the steps required to configure a Factory Integrated Model (configure-to-order or CTO server). 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)

Models	HP ProLiant WS460c Gen9 Configure-to-order Graphics Server Blade	752426-B21
	Configurable Models ship with:	
	One (1) FlexibleLOM connector providing a choice for one (1) of the supported 10Gb/20Gb FlexibleLOMs (see Step 2) Two (2) HP small form factor hot-plug SAS/SATA/ HDD or 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 (standard)	
	HP ProLiant WS460c Gen9 Graphics Expansion Configure-to-order Blade **NOTE:** Base unit comes only with Slot1 of the expansion blade enabled. To enable Slot2, optional Slot2 Enablement FIO Kit (PN 775168-B21) is required. This kit is available at time of initial purchase only.	752427-B21
	Configurable Models ship with:	
	One (1) FlexibleLOM connector providing a choice for one (1) of the supported 10Gb/20Gb FlexibleLOMs (see Step 2) Two (2) HP small form factor hot-plug SAS/SATA/ HDD or 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 (standard)	

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

HP Processors	**NOTE:** All configure-to-order processor kits (i.e. xxxxxx-L21) contain one (1) processor. **NOTE:** If two processors are desired, select one xxxxxx-L21 here in Step 2 and one xxxxxx-B21 in Step 4.	
	E5-2600 v3 series Processors	
	HP BL460c Gen9 Intel® Xeon® E5-2690v3 (2.6GHz/12-core/30MB/135W) FIO Processor Kit	726987-L21
	HP BL460c Gen9 Intel® Xeon® E5-2680v3 (2.5GHz/12-core/30MB/120W) FIO Processor Kit	726988-L21
	HP BL460c Gen9 Intel® Xeon® E5-2670v3 (2.3GHz/12-core/30MB/120W) FIO Processor Kit	726989-L21
	HP BL460c Gen9 Intel® Xeon® E5-2660v3 (2.6GHz/10-core/25MB/105W) FIO Processor Kit	726990-L21
	HP BL460c Gen9 Intel® Xeon® E5-2650v3 (2.3GHz/10-core/25MB/105W) FIO Processor Kit	726991-L21
	HP BL460c Gen9 Intel® Xeon® E5-2640v3 (2.6GHz/8-core/20MB/90W) FIO Processor Kit	726992-L21

HP BL460c Gen9 Intel® Xeon® E5-2683v3 (2GHz/14-core/35MB/120W) FIO Processor Kit	726993-L21
HP BL460c Gen9 Intel® Xeon® E5-2630v3 (2.4GHz/8-core/20MB/85W) FIO Processor Kit	726994-L21
HP BL460c Gen9 Intel® Xeon® E5-2620v3 (2.4GHz/6-core/15MB/85W) FIO Processor Kit	726995-L21
HP BL460c Gen9 Intel® Xeon® E5-2623v3 (3GHz/4-core/10MB/105W) FIO Processor Kit	726996-L21
HP BL460c Gen9 Intel® Xeon® E5-2609v3 (1.9GHz/6-core/15MB/85W) FIO Processor Kit	726997-L21
HP BL460c Gen9 Intel® Xeon® E5-2603v3 (1.6GHz/6-core/15MB/85W) FIO Processor Kit	726999-L21
HP BL460c Gen9 Intel® Xeon® E5-2650Lv3 (1.8GHz/12-core/30MB/65W) FIO Processor Kit	727000-L21
HP BL460c Gen9 Intel® Xeon® E5-2698v3 (2.3GHz/16-core/40MB/135W) FIO Processor Kit	727001-L21
HP BL460c Gen9 Intel® Xeon® E5-2630Lv3 (1.8GHz/8-core/20MB/55W) FIO Processor Kit	727002-L21
HP BL460c Gen9 Intel® Xeon® E5-2695v3 (2.3GHz/14-core/35MB/120W) FIO Processor Kit	727003-L21
HP BL460c Gen9 Intel® Xeon® E5-2637v3 (3.5GHz/4-core/15MB/135W) FIO Processor Kit	765268-L21
HP BL460c Gen9 Intel® Xeon® E5-2697v3 (2.6GHz/14-core/35MB/145W) FIO Processor Kit	767049-L21
HP BL460c Gen9 Intel® Xeon® E5-2667v3 (3.2GHz/8-core/20MB/135W) FIO Processor Kit	773123-L21
HP BL460c Gen9 Intel® Xeon® E5-2643v3 (3.4GHz/6-core/20MB/135W) FIO Processor Kit	773124-L21
HP BL460c Gen9 Intel® Xeon® E5-2699v3 (2.3GHz/18-core/45MB/145W) FIO Processor Kit	779795-L21

NOTE: DIMM slots 4 and 5 are not accessible when either the E5-2699 v3, the E5-2697 v3, the E5-2643 v3, the E5-2637 v3, or the E5-2667 v3 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 when using Intel® Turbo Boost Technology. The frequency boost increment is dependent on the processor SKU and the number of active cores. In general, a higher boost increment is obtained when fewer cores are active.

NOTE: DDR4 speed is the maximum memory speed of the processor. Actual memory speed may depend on the quantity and type of DIMMs installed.

NOTE: Supports 1 or 2 processors. Mixing different processor models is not supported.

NOTE: For the Intel® C610 Chipset E5-2600 v3 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 Gen9 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 v3 and E5-2609 v3.
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.

HP Memory

NOTE: HP memory from previous generation servers (DDR3) is not compatible with this server. HP SmartMemory is required to realize the memory performance improvements and enhanced functionality listed in this document for Gen9. For additional information, please see the HP SmartMemory QuickSpecs at: http://www8.hp.com/h20195/v2/GetHTML.aspx?docname=c04111535
NOTE: LRDIMM and RDIMM are distinct memory technologies and cannot be mixed within a server.
NOTE: Depending on the memory configuration and processor model, the memory speed may run at 2133MHz, 1866MHz, or 1600MHz. Please see Memory Population Table or the Online Memory Configuration Tool at: http://h22195.www2.hp.com/MemoryTool/Home/Legal

HP SmartMemory

Registered DIMMs (RDIMMs) - E5-2600 v3 series Processors

HP 8GB (1x8GB) Dual Rank x8 DDR4-2133 CAS-15-15-15 Registered Memory Kit	759934-B21
HP 8GB (1x8GB) Single Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit	726718-B21
HP 16GB (1x16GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit	726719-B21
HP 32GB (1x32GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit	728629-B21

Load Reduced DIMMs (LRDIMMs) - E5-2600 v3 series Processors

HP 32GB (1x32GB) Quad Rank x4 DDR4-2133 CAS-15-15-15 Load Reduced Memory Kit	726722-B21
HP 16GB (1x16GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Load Reduced Memory Kit	726720-B21
HP 48GB (1x16GB +1x32GB) DDR4-2133 CAS-15-15-15 Load Reduced Memory FIO Kit	792278-B21
HP 64GB (1x64GB) Quad Rank x4 DDR4-2133 CAS-15-15-15 Load Reduced Memory Kit	726724-B21

NOTE: All DDR4 memory option kits consist of one DIMM per kit. For detailed memory configuration rules and guidelines, please use the Online DDR4 Memory Configuration Tool.
NOTE: Depending on the memory configuration and processor model, 2133MHz memory may operate at a lower speed. Please see the see the "Memory" section later in this document for details.
NOTE: For additional memory rules and guidelines, see the "Memory" section later in this document.
NOTE: For more information on ProLiant Energy Efficient Features, see: http://www.hp.com/go/proliant-energy-efficient

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.

20Gb FlexibleLOM Adapters

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

HP FlexFabric 20Gb 2-port 650FLB FIO Adapter	700764-B21

10Gb FlexibleLOM Adapters

HP FlexFabric 10Gb 2-port 536FLB FIO Adapter	766491-B21
HP Ethernet 10Gb 2-port 560FLB FIO Adapter	684214-B21

NOTE: Windows 7, 8.1 directly presiding on system (i.e. "OS on bare-metal"), is supported only with HP Flex-10 10Gb 2-port 536FLB with basic network functions only. All other adapters supported with use on server OS or hypervisor environment only.
NOTE: FlexFabric supported only with server OS and/or in a virtualized environment using hypervisors.
NOTE: Please see the QuickSpecs for Technical Specifications and additional information: http://www.hp.com/go/ProLiantNICs

Step 3: Choose Additional Factory Integration Options

HP Graphics Adapters

NOTE: Choose from following graphics mezzanine cards for use with the single-width HP ProLiant WS460c Gen9 model

NVIDIA Quadro K3100M PCIe3 Mezzanine Graphics FIO Kit	786051-B21
HP NVIDIA Tesla M6 Mezzanine Graphics FIO Adaptor	805132-B21

NOTE: When NVIDIA Quadro K3100M or Tesla M6 card is installed in Mezz slot 2, no other card may be installed in Mezz slot 1.

AMD FirePro S4000X PCIe3 Mezzanine Graphics FIO Kit	785918-B21

NOTE: Choose one of the following standard PCIe graphics card for use with the double-width HP ProLiant WS460c Gen9 (P/N 752427-B21).

NVIDIA GRID K1 PCIe GPU FIO Adapter	730876-B21
NVIDIA GRID K2 Dual GPU PCIe Graphics Accelerator **NOTE:** GRID K2 requires GPU Enablement Kit (PN 734206-B21)	729851-B21
HP NVIDIA Quadro M5000 Graphics Accelerator	M9R60A
HP NVIDIA Quadro M6000 Graphics Accelerator	J0G92A
NVIDIA Quadro K4000 PCI-E Graphics Adapter **NOTE:** Up to two K4000 cards may be installed in expansion blade. Slot 2 Enablement FIO Kit (PN 775168-B21) required for two cards configuration	730870-B21
NVIDIA Quadro K5000 PCI-E Graphics Adapter	730872-B21
NVIDIA Quadro K6000 PCI-E Graphics Adapter	730874-B21
HP Gen9 MultiGPU Carrier with 3 NVIDIA K3100M FIO Graphics Kit **NOTE:** This part number includes one HP MultiGPU Carrier Card with three Quadro K3100M graphics loaded. May be configured with single or dual carriers. **NOTE:** Requires Expansion Blade Gen9 Slot2 Enablement FIO Kit (PN 775168-B21).	810907-B21
HP MultiGPU Carrier with 2 NVIDIA Tesla M6 GPU FIO Adapter	805133-B21

NOTE: This part number includes one HP MultiGPU Carrier Card with two Tesla M6 graphics loaded. May be configured with single or dual carriers.
NOTE: Requires Expansion Blade Gen9 Slot2 Enablement FIO Kit (PN 775168-B21)

HP WS460c Gen9 Expansion Blade Slot2 Enablement FIO Kit **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.	775168-B21
HP WS460c Gen8 GPU Enablement Kit **NOTE:** Required when selecting NVIDIA GRID K2 for factory integration. Contains bulkhead I/O plate.	734206-B21

HP Insight Software	HP Insight Control including 1yr 24x7 Support ProLiant ML/DL/BL-bundle Single Server FIO License	C6N36A
Converged Infrastructure Management Software	**HP OneView with iLO Advanced - Server hardware required on same purchase order**	
	HP OneView incl 3yr 24x7 Supp Flex Qty E-LTU	E5Y35AAE
	HP OneView for Blade Server incl 3yr 24x7 Supp FIO Bundle Physical 1 Svr Lic	F6Q89A
HP Storage Controllers	HP Smart Array P244br/1GB FBWC 12Gb 2-ports Int FIO SAS Controller	761871-B21
	HP H244br 12Gb 2-ports Int FIO Smart Host Bus Adapter	761878-B21
	HP FIO Enable Smart Array B140i Setting	784308-B21
	NOTE: The HP Smart Array B140i Controller (chipset SATA) comes standard with the HP WS460c Gen9 10Gb/20Gb FLB CTO Blade (727021-B21). If neither the HP Smart Array P244br nor the HP H244br controllers are chosen, a SATA cable will be provided to support SATA devices for the two internal drives. If RAID is required when using the B140i, please choose 'HP FIO B140i RAID Enable Kit - BIOS Setting' (784308-B21).	

Step 4: Choose Additional Options for Factory Integration

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

- HP BladeSystem c3000 Enclosure QuickSpecs:
  http://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c04123379
  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://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c04229580
  NOTE: The c7000 HP c-Class enclosures have full backwards and forwards compatibility, existing server blades are supported in the new enclosures and any future server blades will be supported in the existing enclosures.
- HP BladeSystem c-Class Interconnect and Mezzanine Components:
  http://h18004.www1.hp.com/products/blades/components/c-class-interconnects.html and
  http://h18004.www1.hp.com/products/blades/components/c-class-adapters.html

NOTE: For optimal cooling and system performance the WS460c Gen9 Server Blade requires the c7000 enclosure to be configured with 10 fans and the c3000 enclosure to be configured with 6 fans.

HP Networking

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).

20 Gigabit Ethernet Mezzanine Cards

HP FlexFabric 20Gb 2-port 630M Adapter 700076-B21
NOTE: Please see QuickSpecs for technical specifications and additional information at http://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c04312720

HP FlexFabric 20Gb 2-port 650M Adapter 700767-B21
NOTE: Please see QuickSpecs for technical specifications and additional information at http://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c04347342

10 Gigabit Ethernet Mezzanine Cards

HP FlexFabric 10Gb 2-port 534M Adapter 700748-B21
NOTE: Please see QuickSpecs for technical specifications and additional information at: http://h18000.www1.hp.com/products/quickspecs/14619_div/14619_div.html

HP Ethernet 10Gb 2-port 560M Adapter 665246-B21
NOTE: Please see QuickSpecs for technical specifications and additional information at: http://h18000.www1.hp.com/products/quickspecs/14478_div/14478_div.html.

1 Gigabit Ethernet Mezzanine Cards

HP Ethernet 1Gb 4-port 366M Adapter 615729-B21
NOTE: Please see QuickSpecs for technical specifications and additional information at: http://h18000.www1.hp.com/products/quickspecs/14335_div/14335_div.html

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.

20Gb FlexibleLOM Adapters

HP FlexFabric 20Gb 2-port 630FLB Adapter 700065-B21
NOTE: Please see QuickSpecs for technical specifications and additional information at http://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c04312719

HP FlexFabric 20Gb 2-port 650FLB Adapter 700763-B21
NOTE: Please see QuickSpecs for technical specifications and additional information at http://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c04347341

10Gb FlexibleLOM Adapters

HP FlexFabric 10Gb 2-port 536FLB Adapter 766490-B21
NOTE: Windows 7, 8.1 directly presiding on system (i.e. "OS on bare-metal"), is supported only with HP Flex-10 10Gb 2-port 536FLB with basic network funtions only. All other adapters supported with use on server OS or hypervisor environment only.
NOTE: FlexFabric supported only with server OS and/or in a virtualized environment using hypervisors.
NOTE: Please see QuickSpecs for technical specifications and additional information at http://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c04347246

	HP Ethernet 10Gb 2-port 560FLB Adapter **NOTE:** Please see QuickSpecs for technical specifications and additional information at http://h18000.www1.hp.com/products/quickspecs/14331_div/14331_div.html	655639-B21
	HP Infiniband Mezzanine Adapters **NOTE:** When an InfiniBand adapter is installed in mezzanine slot 1, only one port is active (regardless of operating mode). When installed in mezzanine slot 2, 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_div/12586_div.html http://h18000.www1.hp.com/products/quickspecs/13078_div/13078_div.html	
	HP InfiniBand QDR/Ethernet 10Gb 2-port 544+M Adapter **NOTE:** The QDR InfiniBand adapter may be installed in either mezzanine slot of the server.	764282-B21
	HP InfiniBand FDR/Ethernet 10Gb/40Gb 2-port 544+M Adapter **NOTE:** The FDR InfiniBand adapter must be installed in mezzanine slot 1 for FDR mode and may be installed in either mezzanine slot if operated in any other mode.	764283-B21
	HP InfiniBand FDR 2-port 545M Adapter	702213-B21
HP Fibre Channel	HP LPe1605 16Gb Fibre Channel HBA for BladeSystem c-Class **NOTE:** Please see QuickSpecs for technical specifications and additional information at http://h18000.www1.hp.com/products/quickspecs/ 14742_div/ 14742_div.html	718203-B21
	HP QMH2672 16Gb Fibre Channel Host Bus Adapter **NOTE:** Please see QuickSpecs for technical specifications and additional information at http://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c04126962	710608-B21
HP Processors	**E5-2600 v3 series Processors**	
	HP BL460c Gen9 Intel® Xeon® E5-2690v3 (2.6GHz/12-core/30MB/135W) Processor Kit	726987-B21
	HP BL460c Gen9 Intel® Xeon® E5-2680v3 (2.5GHz/12-core/30MB/120W) Processor Kit	726988-B21
	HP BL460c Gen9 Intel® Xeon® E5-2670v3 (2.3GHz/12-core/30MB/120W) Processor Kit	726989-B21
	HP BL460c Gen9 Intel® Xeon® E5-2660v3 (2.6GHz/10-core/25MB/105W) Processor Kit	726990-B21
	HP BL460c Gen9 Intel® Xeon® E5-2650v3 (2.3GHz/10-core/25MB/105W) Processor Kit	726991-B21
	HP BL460c Gen9 Intel® Xeon® E5-2640v3 (2.6GHz/8-core/20MB/90W) Processor Kit	726992-B21
	HP BL460c Gen9 Intel® Xeon® E5-2683v3 (2GHz/14-core/35MB/120W) Processor Kit	726993-B21
	HP BL460c Gen9 Intel® Xeon® E5-2630v3 (2.4GHz/8-core/20MB/85W) Processor Kit	726994-B21
	HP BL460c Gen9 Intel® Xeon® E5-2620v3 (2.4GHz/6-core/15MB/85W) Processor Kit	726995-B21
	HP BL460c Gen9 Intel® Xeon® E5-2623v3 (3GHz/4-core/10MB/105W) Processor Kit	726996-B21
	HP BL460c Gen9 Intel® Xeon® E5-2609v3 (1.9GHz/6-core/15MB/85W) Processor Kit	726997-B21
	HP BL460c Gen9 Intel® Xeon® E5-2603v3 (1.6GHz/6-core/15MB/85W) Processor Kit	726999-B21
	HP BL460c Gen9 Intel® Xeon® E5-2650Lv3 (1.8GHz/12-core/30MB/65W) Processor Kit	727000-B21

Core Options

HP BL460c Gen9 Intel® Xeon® E5-2698v3 (2.3GHz/16-core/40MB/135W) Processor Kit	727001-B21
HP BL460c Gen9 Intel® Xeon® E5-2630Lv3 (1.8GHz/8-core/20MB/55W) Processor Kit	727002-B21
HP BL460c Gen9 Intel® Xeon® E5-2695v3 (2.3GHz/14-core/35MB/120W) Processor Kit	727003-B21
HP BL460c Gen9 Intel® Xeon® E5-2637v3 (3.5GHz/4-core/15MB/135W) Processor Kit	765268-B21
HP BL460c Gen9 Intel® Xeon® E5-2697v3 (2.6GHz/14-core/35MB/145W) Processor Kit	767049-B21
HP BL460c Gen9 Intel® Xeon® E5-2667v3 (3.2GHz/8-core/20MB/135W) Processor Kit	773123-B21
HP BL460c Gen9 Intel® Xeon® E5-2643v3 (3.4GHz/6-core/20MB/135W) Processor Kit	773124-B21
HP BL460c Gen9 Intel® Xeon® E5-2699v3 (2.3GHz/18-core/45MB/145W) Processor Kit	779795-B21

NOTE: DIMM slots 4 and 5 are not accessible when either the E5-2699 v3, the E5-2697 v3, the E5-2643 v3, the E5-2637 v3, or the E5-2667 v3 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 when using Intel® Turbo Boost Technology. The frequency boost increment is dependent on the processor SKU and the number of active cores. In general, a higher boost increment is obtained when fewer cores are active.
NOTE: DDR4 speed is the maximum memory speed of the processor. Actual memory speed may depend on the quantity and type of DIMMs installed.
NOTE: Supports 1 or 2 processors. Mixing different processor models is not supported.
NOTE: For the Intel® C610 Chipset E5-2600 v3 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 Gen9 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 v3 and E5-2609 v3.
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.

HP Memory

NOTE: HP memory from previous generation servers (DDR3) is not compatible with this server. HP SmartMemory is required to realize the memory performance improvements and enhanced functionality listed in this document for Gen9. For additional information, please see the HP SmartMemory QuickSpecs at:
http://www8.hp.com/h20195/v2/GetHTML.aspx?docname=c04111535
NOTE: LRDIMM and RDIMM are distinct memory technologies and cannot be mixed

within a server.
NOTE: Depending on the memory configuration and processor model, the memory speed may run at 2133MHz, 1866MHz, or 1600MHz. Please see Memory Population Table or the Online Memory Configuration Tool at: http://h22195.www2.hp.com/MemoryTool/Home/Legal

HP SmartMemory

Registered DIMMs (RDIMMs) - E5-2600 v3 series Processors

HP 8GB (1x8GB) Dual Rank x8 DDR4-2133 CAS-15-15-15 Registered Memory Kit	759934-B21
HP 8GB (1x8GB) Single Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit	726718-B21
HP 16GB (1x16GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit	726719-B21
HP 32GB (1x32GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit	728629-B21

Load Reduced DIMMs (LRDIMMs) - E5-2600 v3 series Processors

HP 32GB (1x32GB) Quad Rank x4 DDR4-2133 CAS-15-15-15 Load Reduced Memory Kit	726722-B21
HP 16GB (1x16GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Load Reduced Memory Kit	726720-B21
HP 48GB (1x16GB +1x32GB) DDR4-2133 CAS-15-15-15 Load Reduced Memory FIO Kit	792278-B21
HP 64GB (1x64GB) Quad Rank x4 DDR4-2133 CAS-15-15-15 Load Reduced Memory Kit	726724-B21

NOTE: Depending on the memory configuration and processor model, 2133MHz memory may operate at a lower speed. Please see the see the "Memory" section later in this document and the Online Memory Configuration Tool for details at http://h22195.www2.hp.com/MemoryTool/Home/Legal .

HP Hard Drives

NOTE: The ProLiant WS460c Gen9 server includes the HP hot-plug small form factor (SFF) SmartDrive carrier for enhanced management and reduced maintenance errors. HP drives from generation G7 servers and before are not compatible with the WS460c Gen9 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.

Solid State M.2 SATA Drives

HP Dual 64GB Value Endurance Solid State M.2 Enablement Kit for ProLiant Blades	775588-B21
HP 64GB Value Endurance Solid State M.2 Enablement Kit for ProLiant Blades	785233-B21

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 Hot Plug with SmartDrive 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 the QuickSpecs for technical specifications and additional information at http://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c04111725.

Core Options

SAS Hot Plug with SmartDrive SFF (2.5-inch) Enterprise Drives

HP 1.2TB 6G SAS 10K rpm SFF (2.5-inch) SC Dual Port Enterprise 3yr Warranty Hard Drive	718162-B21
HP 900GB 6G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652589-B21
HP 600GB 6G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652583-B21
HP 450GB 6G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652572-B21
HP 300GB 6G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652564-B21
HP 300GB 6G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652611-B21
HP 146GB 6G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652605-B21

SAS Hot Plug SmartDrive 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 at http://h18000.www1.hp.com/products/quickspecs/12244_div/12244_div.html.

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

HP 1.8TB 12G SAS 10K rpm SFF (2.5-inch) SC Enterprise 512e 3yr Warranty Hard Drive	791034-B21
HP 1.2TB 12G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	781518-B21
HP 900GB 12G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	785069-B21
HP 600GB 12G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	781516-B21
HP 300GB 12G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	785067-B21

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

HP 1.92TB 12G SAS Read Intensive SFF 2.5-in SC 3yr Wty Solid State Drive	802891-B21
HP 800GB 12G SAS Write Intensive SFF 2.5-in SC 3yr Wty Solid State Drive	802586-B21
HP 400GB 12G SAS Write Intensive SFF 2.5-in SC 3yr Wty Solid State Drive	802582-B21
HP 200GB 12G SAS Write Intensive SFF 2.5-in SC 3yr Wty Solid State Drive	802578-B21

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

HP 2TB 12G SAS 7.2K rpm SFF (2.5-inch) SC 512e 1yr Warranty Hard Drive	765466-B21
HP 1TB 12G SAS 7.2K rpm SFF (2.5-inch) SC 512e 1yr Warranty Hard Drive	765464-B21

6G SATA Hot Plug SFF (2.5-inch) SC HDD

HP 2TB 6G SATA 7.2K rpm SFF (2.5-inch) SC 512e 1yr Warranty Hard Drive	765455-B21
HP 1TB 6G SATA 7.2K rpm SFF (2.5-inch) SC 512e 1yr Warranty Hard Drive	765453-B21

6G SATA Hot Plug SFF (2.5-inch) SC SSD

HP 960GB 6G SATA Read Intensive SFF 2.5-in SC 3yr Wty Solid State Drive	789155-B21
HP 480GB 6G SATA Read Intensive SFF 2.5-in SC 3yr Wty Solid State Drive	789145-B21
HP 240GB 6G SATA Read Intensive SFF 2.5-in SC 3yr Wty Solid State Drive	789135-B21

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

HP 120GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Boot 3yr Wty Solid State Drive	717965-B21
HP 80GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Boot 3yr Wty Solid State Drive	734360-B21

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

HP 1.6TB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	757339-B21
HP 800GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	717973-B21
HP 600GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	739898-B21
HP 480GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	717971-B21
HP 300GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	739888-B21
HP 240GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	717969-B21
6G SATA Value Endurance SFF (2.5-inch) SC Enterprise Value M1 Solid State Drives	
HP 120GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty M1 Solid State Drive	764923-B21
HP 240GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty M1 Solid State Drive	764925-B21
HP 480GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty M1 Solid State Drive	764927-B21
HP 800GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty M1 Solid State Drive	764929-B21
6G SATA ME Hot Plug SFF (2.5-inch) Enterprise Mainstream 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 SAS VE (2.5-inch) SC EV 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
12G SAS ME SFF (2.5-inch) SC Enterprise Mainstream H2 Solid State Drives	
HP 1.6TB 12G SAS Mainstream Endurance SFF 2.5-in ENT Mainstream SC 3yr Wty H2 Solid State Drive	779176-B21
HP 200GB 12G SAS Mainstream Endurance SFF 2.5-in ENT Mainstream SC 3yr Wty H2 Solid State Drive	779164-B21
HP 400GB 12G SAS Mainstream Endurance SFF 2.5-in ENT Mainstream SC 3yr Wty H2 Solid State Drive	779168-B21
HP 800GB 12G SAS Mainstream Endurance SFF 2.5-in ENT Mainstream SC 3yr Wty H2 Solid State Drive	779172-B21
12G SAS VE SFF (2.5-inch) SC EV Solid State Drives	

Core Options

	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 (2.5-inch) 512e SC HDD	
	HP 600GB 12G SAS 15K rpm SFF (2.5-inch) SC 512e Enterprise 3yr Warranty Hard Drive	748387-B21
	HP 1.8TB 12G SAS 10K rpm SFF (2.5-inch) SC Enterprise 512e 3yr Warranty Hard Drive	791034-B21
	SAS Hot Plug with SmartDrive SFF (2.5-inch) Enterprise Drives	
	HP 300GB 12G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	759208-B21
	HP 450GB 12G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	759210-B21
	HP 600GB 12G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	759212-B21
	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: Please see the QuickSpecs for technical specifications and information at http://h18000.www1.hp.com/products/quickspecs/14038_div/14038_div.html.	

HP Graphic Options	NVIDIA GRID K1 PCIe GPU FIO Adapter	730876-B21
	NVIDIA GRID K2 Dual GPU PCIe Graphics Accelerator **NOTE:** GRID K2 requires GPU Enablement Kit (PN 734206-B21).	729851-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 NVIDIA Quadro M5000 Graphics Accelerator	M9R60A
	HP NVIDIA Quadro M6000 Graphics Accelerator	J0G92A
	HP WS460c Gen8 GPU Enablement Kit **NOTE:** Required when using NVIDIA GRID K2 GPU (PN 729851-B21)	734206-B21

Additional Options

HP Insight software	**HP Insight Control**	
	HP Insight Control including 1yr 24x7 Technical Support and Updates Single Server License	C6N27A
	HP Insight Control including 1yr 24x7 Technical Support and Updates Electronic License	C6N28ABE
	HP Insight Control including 1yr 24x7 Support ProLiant ML/DL/BL-bundle FIO Electronic License	C6N36ABE
	HP Insight Control Server Provisioning Media Kit	BD883A
	HP Insight Management Media Kit	C6N31A
	NOTE: HP Insight Management Media Kit contains DVDs without licenses. Contains HP Systems Insight Manager, HP Insight Control, HP Matrix Operating Environment, and Virtual Connect Enterprise Manager software. Uses an integrated installer to perform quick and accurate software installation and updates.	
	NOTE: Electronic and Flexible-Quantity licenses can be used to purchase multiple licenses with a single activation key.	
	NOTE: Customer will receive a license entitlement certificate, which must be redeemed online or via fax in order to obtain the license activation key(s). Includes one year of 24 x 7 HP Software Technical Support Service.	
	NOTE: Licenses ship without media. The HP Insight Management Media Kit can be ordered separately, or can be downloaded at http://www.hp.com/go/insightupdates	
	NOTE: For additional license kits, please see the QuickSpecs at: http://www8.hp.com/h20195/v2/GetHTML.aspx?docname=c04123391	
HP iLO Advanced License	**HP Integrated Lights-Out (iLO) Advanced for ProLiant BladeSystem Remote Management**	
	HP iLO Advanced for BladeSystem including 3yr 24x7 Technical Support and Updates E-LTU	E6U63ABE
	HP iLO Advanced Blade 1 Server License with 3yr 24x7 Tech Support and Updates	BD502A
	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: 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 or three years of 24 x 7 HP Software Technical Support Service. **NOTE:** For additional license kits, including electronic delivery options, please see the iLO QuickSpecs at http://www.hp.com/go/iLO	
	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 or three year of 24 x 7 HP Software Technical Support Service. **NOTE:** For additional license kits, please see the QuickSpecs at: http://h18004.www1.hp.com/products/quickspecs/14276_div/14276_div.html	
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

Additional Options

	HP OneView w/o iLO including 3yr 24x7 Support 1 Server LTU	P8B24A
	HP OneView w/o iLO including 3yr 24x7 Support Flex Quantity E-LTU	P8B26AAE
	HP OneView w/o iLO including 3yr 24x7 Support FIO 1 Server LTU	P8B31A
	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_div/14621_div.html.	
High Performance Clusters	**HP Cluster Management Utility**	
	HP Insight Cluster Management Utility 1yr 24x7 Flexible License	QL803B
	HP Insight Cluster Management Utility 3yr 24x7 Flexible License **NOTE:** These part numbers can be used to purchase one certificate for multiple licenses and support with a single activation key. Each license is for one node (server). Customer will receive a printed end user license agreement and license entitlement certificate via physical shipment. The license entitlement certificate must be redeemed online in order to obtain a license key. Customer also will receive a support agreement.	BD476A
	HP Insight Cluster Management Utility Media **NOTE:** For additional license kits please see the QuickSpecs at http://h18004.www1.hp.com/products/quickspecs/12612_div/12612_div.html.	BD477A
HP Security	HP Trusted Platform Module Option **NOTE:** The TPM (Trusted Platform Module) is a microcontroller chip that can securely store artifacts used to authenticate the server platform. These artifacts can include passwords, certificates and encryption keys. Windows® BitLocker™ Drive Encryption (BitLocker) is a data protection feature available in Windows Server® 2008 R2. 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 R2 has not been tampered with while the system was offline. **NOTE:** For more information about TPM, including a white paper, go to http://www8.hp.com/h20195/v2/GetDocument.aspx?docname=4AA5-4782ENW. **NOTE:** ProLiant OS pre-installed units will come with the partition required for TPM deployment. **NOTE:** The TPM key is unique to every TPM deployed server and must be retained. Misplacing or losing the key could result in data loss.	488069-B21
HP Storage Controllers	HP Smart Array P244br/1GB FBWC 12Gb 2-ports Int SAS Controller	749680-B21
	HP H244br 12Gb 2-ports Int Smart Host Bus Adapter	726809-B21
HP Secure Encryption	HP Secure Encryption No Media E-LTU per Drive	D8S85AAE
	HP Secure Encryption No Media Flexible License per Drive **NOTE:** HP Secure Encryption is supported on the HP Smart Array P244br and H244br (running in RAID mode) 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.	D8S84A

HP InfiniBand Mezzanine Adapters

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_div/12586_div.html
http://h18000.www1.hp.com/products/quickspecs/13078_div/13078_div.html

HP InfiniBand QDR/Ethernet 10Gb 2-port 544+M Adapter	764282-B21

NOTE: The QDR InfiniBand adapter may be installed in any mezzanine slot of the server.

HP InfiniBand FDR/Ethernet 10Gb/40Gb 2-port 544+M Adapter	764283-B21

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.

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

HP Flash Media Kits for USB Drives

HP Flash Media Kits for USB Drives

HP Enterprise Mainstream Flash Media Kits for Memory Cards

HP Dual 8GB microSD Enterprise Midline USB Kit	741279-B21
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_div/13971_div.html

HP Care Pack Services

Proactive Care Services

HP 3 year 24x7 WS460c Gen9 Proactive Care Service	U8BF0E
HP 3 year 24x7 with Defective Media Retention WS460c Gen9 Proactive Care Service	U8BF1E
HP 3 year 24x7 WS460c Gen9 Proactive Care Advanced Service	U8BF3E
HP 3 year 24x7 with Defective Media Retention WS460c Gen9 Proactive Care Advanced Service	U8BF4E
HP 3 year 24x7 BL4xxc Gen9 Proactive Care Service	U7BN8E
HP 3 year 24x7 with Defective Media Retention BL4xxc Gen9 Proactive Care Service	U7BN9E
HP 3 year 24x7 BL4xxc Gen9 Proactive Care Advanced Service	U7BT6E
HP 3 year 24x7 with Defective Media Retention BL4xxc Gen9 Proactive Care Advanced Service	U7CF8E

Installation Services

HP Install c-Class Server Blade Service	UE493E
HP Installation WS460c Workstation Blade Service	UR362E

NOTE: 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 DDR4 Memory Configuration Tool: http://h22195.www2.hp.com/MemoryTool/Home/Legal

Memory Subsystem Architecture

Each Intel® Xeon® E5-2600 v3 family or Intel® Xeon® E5-2600 v3 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 64GB capacity DIMMs are supported for 1TB of memory (16 DIMM slots x 64GB per DIMM).

NOTE: 64GB DIMM support available in earl 2015.

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.
- LRDIMM and RDIMMs are all distinct memory technologies and cannot be mixed within a server. The majority of ProLiant Gen9 servers support RDIMM and LRDIMM.
- 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 Gen9 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://www8.hp.com/h20195/v2/GetHTML.aspx?docname=c04111535
- For memory population rules and additional memory guidelines, please see the WS460c Gen9 user guide at http://www.hp.com/support.

Supported Memory Bandwidth on Intel® Xeon® E5-2600 v3 series Processors

DIMM Rank	Register DIMM (RDIMM)			Load Reduced (LRDIMM)	
	Single Rank (1R)	Dual Rank (2R)		Dual Rank (2R)	Quad Rank (4R)
DIMM Capacity	8GB	16GB	8GB	16GB	32GB
Voltage	Std Voltage 1.2V	Std Voltage 1.2V	Std Voltage 1.2V	Std Voltage 1.2V	Std Voltage 1.2V
SLOTS THAT CAN BE POPULATED					
12 slot servers	12	12	12	12	12
16 slot servers	16	16	16	16	16
MAXIMUM CAPACITY (GB)*					
12 slot servers	96	192	96	192	384
16 slot servers	128	256	128	256	512
POPULATED DIMM SPEED (MT/s)					
1 DIMM Per Channel	2133	2133	2133	2133	2133
2 DIMM Per Channel	2133	2133	2133	2133	2133

*Maximum Capacity will vary based on individual serve platform qualification schedule

Memory

Memory Speed by E5-2600 v3 Series Processor Model

Processor Models	Supported Memory Speeds
E5-2690 v3, E5-2695 v3, E5-2697 v3, E5-2698 v3, E5-2699 v3, E5-2687W v3, E5-2683 v3, E5-2680 v3, E5-2670 v3, E5-2667 v3 , E5-2660 v3, E5-2650 v3, E5-2650L, E5-2643 v3, E5-2637 v3	2133MHz
E5-2640 v3, E5-2630 v3, E5-2630L v3, E5-2623 v3, E5-2620 v3	1866MHz
E5-2609 v3, E5-2603 v3	1600MHz

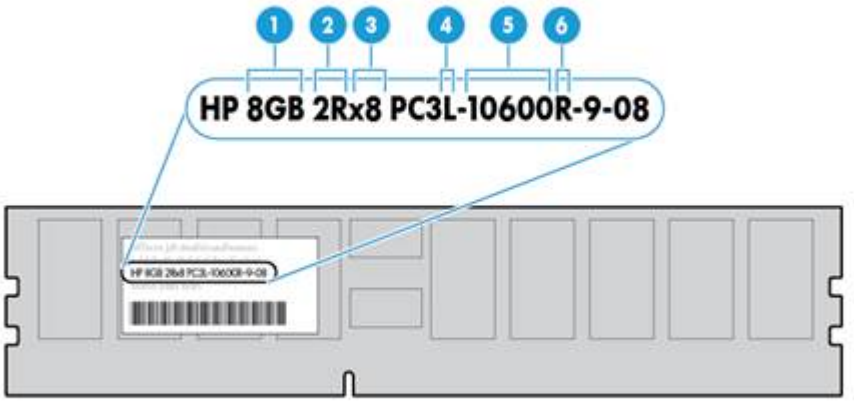
Standard and Maximum Memory Capacity (Pre-configured Models) for E5-2600 v3 Series

Pre-Configured Models	Standard Memory	Maximum Memory Plus Optional Memory	Standard Memory Replaced with Optional Memory
Intel Xeon E5-2670 v3	128GB (4x 32GB)	896GB (4x 32GB + 12x 64GB)	1TB (16x 64GB)
Intel Xeon E5-2660 v3	64GB (4x 16GB)	256GB (4x 16GB + 12x 16GB)	1TB (16x 64GB)
Intel Xeon E5-2650 v3, E5-2640 v3	32GB (2x 16GB)	256GB (2x 16GB + 14x 16GB)	1TB (16x 64GB)
Intel Xeon E5-2620 v3, E5-2609 v3	16GB (2x 8GB)	240GB (2x 8GB + 14x 16GB)	1TB (16x 64GB)

NOTE: Support for 64GB LRDIMMs and 32GB RDIMMs to be available by early 2015.
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



Item	Description	Definition
1	Capacity	8 GByte 16 GByte 32 GByte
2	Rank	1R = Single-rank 2R = Dual-rank 4R = Quad-rank

Memory

3	Data width	x4 = 4-bit x8 = 8-bit
4	Memory generation	DDR4
5	Max. Memory speed	2133MT/s
6	CasLatency	P = 15
6	DIMM type	R = RDIMM (registered) L = LRDIMM (load reduced)

Following are memory options available from HP:

HP Memory

NOTE: HP memory from previous generation servers (DDR3) is not compatible with this server. HP SmartMemory is required to realize the memory performance improvements and enhanced functionality listed in this document for Gen9. For additional information, please see the HP SmartMemory QuickSpecs at: http://www8.hp.com/h20195/v2/GetHTML.aspx?docname=c04111535

NOTE: LRDIMM and RDIMM are distinct memory technologies and cannot be mixed within a server.

NOTE: Depending on the memory configuration and processor model, the memory speed may run at 2133MHz, 1866MHz, or 1600MHz.

HP SmartMemory

Registered DIMMs (RDIMMs)

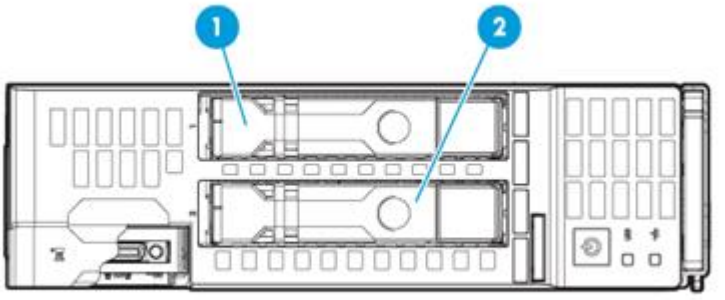
Registered DIMMs (RDIMMs) - E5-2600 v3 series Processors

HP 8GB (1x8GB) Dual Rank x8 DDR4-2133 CAS-15-15-15 Registered Memory Kit	759934-B21
HP 8GB (1x8GB) Single Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit	726718-B21
HP 16GB (1x16GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit	726719-B21
HP 32GB (1x32GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit	728629-B21

Load Reduced DIMMs (LRDIMMs) - E5-2600 v3 series Processors

HP 48GB (1x16GB +1x32GB) DDR4-2133 CAS-15-15-15 Load Reduced Memory FIO Kit	792278-B21
HP 32GB (1x32GB) Quad Rank x4 DDR4-2133 CAS-15-15-15 Load Reduced Memory Kit	726722-B21
HP 16GB (1x16GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Load Reduced Memory Kit	726720-B21
HP 64GB (1x64GB) Quad Rank x4 DDR4-2133 CAS-15-15-15 Load Reduced Memory Kit	726724-B21

NOTE: Depending on the memory configuration and processor model, 2133MHz memory may operate at a lower speed. Please see the see the "Memory" section later in this document.



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

System Unit	**Dimensions** (H x W x D) (with bezel)	Single-width model: 7.11 x 2.18 x 20.37 in (18.07 x 5.54 x 51.76 cm) Double-width model: 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 at http://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c04123379 • HP BladeSystem c7000 Enclosure QuickSpecs at http://www8.hp.com/h20195/v2/GetHTML.aspx?docname=c04229580 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/hppoweradvisor. **NOTE:** For optimal cooling and system performance the WS460c Gen9 Graphics Server Blade requires the c7000 enclosure to be configured with 10 fans and the c3000 enclosure to be configured with 6 fans.	
	System Inlet Temperature (Single-width model)	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 1,000 ft) above sea level to a maximum of 3,050 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).
	System Inlet Temperature (Double-width model)	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 1,000 ft) above sea level to a maximum of 3,050 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).
	Extended Ambient Operating Support	For Approved hardware configurations, the supported system inlet range is extended to be: 5° to 10°C (41° to 50°F) and 35° to 40°C (95° to 104°F) at sea level with an altitude derating of 1.0°C per every 175 m (1.8°F per every 574 ft) above 900 m (2953 ft) to a maximum of 3050 m (10,000 ft) **NOTE:** Qualifications for extended ambient configurations are detailed at: https://www.hp.com/servers/ASHRAE	
	Relative Humidity (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	Operating	3,050 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 (1,500 ft/min).
		Non-operating	9,144 m (30,000 ft). Maximum allowable altitude change rate is 457 m/min (1,500 ft/min).
	Acoustic Noise	For acoustic noise specifications, please see the HP BladeSystem c-Class Enclosures QuickSpecs located at: HP BladeSystem c3000 Enclosure QuickSpecs: http://h18000.www1.hp.com/products/quickspecs/12790_div/12790_div.html HP BladeSystem c7000 Enclosure QuickSpecs: http://h18000.www1.hp.com/products/quickspecs/12810_div/12810_div.html	

HP Smart Array P244br Controller	**Disk Drive Interface**	12Gb/s SAS (Serial Attached SCSI) 6Gb/s SATA (Serial ATA)
	Server Interface	x8 5G PCIe 3.0 provides 8GB/s maximum bandwidth
	Cache Memory	1GB flash backed write cache (FBWC) cache standard
	Logical Drives Supported	64 (with included 1GB cache)
	Host Memory Addressing	64-bit, supporting servers memory space greater than 4GB
	RAID Support	RAID 1 (mirroring), RAID 0 (striping), RAID 10
	Other	Upgradeable firmware with recovery ROM Online drive flash (with SAS drives)

HP Smart HBA H244br Controller	**Disk Drive Interface**	12Gb/s SAS (Serial Attached SCSI) 6Gb/s SATA (Serial ATA)

	Server Interface	x8 5G PCIe 3.0 provides 8GB/s maximum bandwidth
	Cache Memory	None
	Logical Drives Supported	64
	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 Dynamic Smart Array B140i Controller	**Disk Drive Interface**	6Gb/s SATA (Serial ATA)
	Server Interface	Embedded x4 PCIe 2.0
	SAS Connectors	2 internal SATA ports
	Cache Memory	None
	SAS Speed	6Gb/s SATA links
	Logical Drives Supported	Up to 10 logical volumes (2 physical drives)
	Host Memory Addressing	64-bit, supporting greater than 4GB server memory space
	Hot Plug Support	Yes
	RAID Support	RAID 1 (Mirroring) RAID 0 (Striping)
	Other	Upgradeable firmware with recovery ROM
HP FlexFabric 10Gb 2-port 536FLB FlexibleLOM	**Type**	Integrated dual-port KR 10Gb FlexibleLOM with FlexFabric (Flex-10, FCoE, hardware-based iSCSI, iSCSI boot, TCP/IP offload engine, and autosensing 1Gb/10Gb Ethernet capability)
	Network Processor	QLogic 57840S with integrated MAC/PHY
	Data Transfer Method	x8 PCI Express 3.0
	Network Transfer Rate	Two ports, each at 20Gbps full duplex; 40Gbps aggregate full duplex theoretical bandwidth **NOTE:** Each port is autosensing 1Gb/10Gb, and can interoperate with 1Gb or 10Gb HP BladeSystem c-Class interconnect components. Both ports will operate at the same speed. **NOTE:** Each port on the 554FLB adapter transmits from the server at 20Gbps (theoretical) full duplex.
	IEEE Compliance	802.1p, 802.1q, 802.1qau, 802.3ad, 802.3ae, 802.3ap (10GBase-KX4) and 802.3x
	Standard Features	Full hardware offload of iSCSI and FCoE storage protocol processing for highest performance converged Ethernet data and storage networks. Dual-port 10GbE Flex-10 FlexibleLOM network adapter that provides the flexibility to choose the type of LOM to meet growing infrastructure needs Industry-leading throughput and latency performance. Supports HP's Flex-10 blade interconnect technology. User configurable bandwidth settings when combined with the 10Gb Flex-10 Virtual Connect module. From 100Mb/s to10Gb/s on up to four "Physical Function" NICs per port, in increments of 100Mb/s for NIC. The combined bandwidth of NICs cannot exceed port bandwidth i.e. 10 Gb.

		Up to 40Gb/s bi-directional near line rate throughput Hardware acceleration and offloads for stateless TCP/IP, TCP Offload Engine (TOE) Improved small packet performance Support for Preboot eXecution Environment (PXE) Integrated PHY and MAC Supports for SR-IOV Support for Network Partitioning (NPAR)
HP FlexFabric 20Gb 2-port 650FLB FlexibleLOM	**Type**	Integrated dual-port KR2 20Gb FlexibleLOM with FlexFabric (Flex-20, FCoE, RoCE, Tunnel Offload with VXLAN/NVGRE, hardware-based iSCSI, iSCSI boot, TCP/IP offload engine, and autosensing Ethernet speed capability)
	Network Processor	Emulex XE-104
	Data Transfer Method	x8 PCI Express 3.0
	Network Transfer Rate	Two ports, each at 40 Gbps bi-directional; 80 Gbps aggregate bi-directional theoretical bandwidth
	IEEE Compliance	802.3ae, 802.1Q, 802.3x, 802.1p, 802.3ad/LACP, 802.1AB(LLDP), 802.1Qbg, 802.1Qbb, 802.1Qaz, 802.3ap
	Standard Features	Dual 20Gb ports provide up to 80Gb bi-directional per adapter Multi-speed adapter operates at either 20GbE or 10GbE Converges FCoE or RoCE with LAN traffic on a single Ethernet wire Tunnel Offload support for VXLAN and NVGRE RDMA over Converged Ethernet (RoCE) for greater server efficiency and lower latency (6125XLG only) Advanced storage offload processing freeing up valuable CPU cycles Supports UEFI and legacy boot options Mixed Storage – supports NIC + FCoE on one port, and NIC + iSCSI on the other Concurrent Storage – concurrently supports NIC, FCoE, and iSCSI storage functions on the same port (NIC + FCoE + iSCSI) Industry-leading throughput and latency performance Supports HP's Flex-20 blade interconnect technology Over eight million small packets/s, ideal for web/mobile applications, mobile messaging, and social media User configurable bandwidth settings when combined with the 20Gb Flex-20 Virtual Connect module. From 100Mb/s to10Gb/s on up to four "Physical Function" NICs per port, in increments of 100Mb/s for NIC. The combined bandwidth of NICs cannot exceed port bandwidth i.e. 20 Gb/s. Greater bandwidth with PCIe 3.0 Jumbo Frames support Supports Wake On LAN (WOL) Support for Preboot eXecution Environment (PXE) Support for Microsoft Windows SMB Direct Optimized host virtualization density with SR-IOV support

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 (three per carrier card) **NOTE:** Citrix XenServer with HP MultiGPU graphics option support coming soon.
	Weight	1.60 lb (0.724 kg) - Single, vacant with no MXM graphics

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® SP1 Pro (64-bit), Enterprise (64-bit) Microsoft ® Windows 8.1® Pro (64-bit), Enterprise (64-bit) Microsoft® Windows Server 2012 R2 (64-bit) Standard, Enterprise and DataCenter editions (Citrix XenApp) Citrix XenServer 6.5 or later (Pass-Through GPU) VMware vSphere5.5 or later (vDGA) Red Hat Enterprise Linux (RHEL) 6.5 or later (64-bit only)
NVIDIA Tesla M6 graphics adapter	**Memory size**	8GB
	Memory type	GDDR-5
	Memory interface	256-bit
	Card type	MXM-v.3.0
	I/O interface	PCIe (x16) Gen3
	Max power consumption	100W
	API	DirectX 12, Shader Model 5.0; OpenGL4.5, CUDA, DirectCompute, OpenCL
	Operating Systems	Microsoft® Windows Server 2012 R2 (64-bit) Standard, Enterprise and DataCenter editions (Citrix XenApp) Citrix XenServer 6.5 or later (Pass-Through GPU) VMware vSphere5.5 or later (vDGA)
AMD FirePro S4000X graphics adapter	**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
	Operating Systems	Microsoft ® Windows 7® Professional (64-bit)
NVIDIA Quadro	**Memory size**	8GB

Technical Specifications

M5000 graphics adapter	**Memory type**	GDDR-5
	Memory interface	256-bit
	I/O interface	PCIe (x16) Gen3
	Max power consumption	165W
	API	DirectX 12, Shader Model 5.0; OpenGL4.5, CUDA, DirectCompute, OpenCL
	Operating Systems	Microsoft ® Windows 7® SP1 Pro (64-bit), Enterprise (64-bit) Microsoft ® Windows 8.1® Pro (64-bit), Enterprise (64-bit) Microsoft® Windows Server 2012 R2 (64-bit) Standard, Enterprise and DataCenter editions (Citrix XenApp) Citrix XenServer 6.5 or later (Pass-Through GPU) VMware vSphere5.5 or later (vDGA) Red Hat Enterprise Linux (RHEL) 6.5 or later (64-bit only)
NVIDIA Quadro M6000 graphics adapter	**Memory size**	12GB
	Memory type	GDDR-5
	Memory interface	384-bit
	I/O interface	PCIe (x16) Gen3
	Max power consumption	250W
	API	DirectX 12, Shader Model 5.0; OpenGL4.5, CUDA, DirectCompute, OpenCL
	Operating Systems	Microsoft ® Windows 7® SP1 Pro (64-bit), Enterprise (64-bit) Microsoft ® Windows 8.1® Pro (64-bit), Enterprise (64-bit) Microsoft® Windows Server 2012 R2 (64-bit) Standard, Enterprise and DataCenter editions (Citrix XenApp) Citrix XenServer 6.5 or later (Pass-Through GPU) VMware vSphere5.5 or later (vDGA) Red Hat Enterprise Linux (RHEL) 6.5 or later (64-bit only)
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® SP1 Pro (64-bit), Enterprise (64-bit) Microsoft ® Windows 8.1® Pro (64-bit), Enterprise (64-bit) Microsoft® Windows Server 2012 R2 (64-bit) Standard, Enterprise and DataCenter editions (Citrix XenApp) Citrix XenServer 6.5 or later (Pass-Through GPU) VMware vSphere5.5 or later (vDGA) Red Hat Enterprise Linux (RHEL) 6.5 or later (64-bit only)
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® SP1 Pro (64-bit), Enterprise (64-bit) Microsoft ® Windows 8.1® Pro (64-bit), Enterprise (64-bit) Microsoft® Windows Server 2012 R2 (64-bit) Standard, Enterprise and DataCenter editions (Citrix XenApp) Citrix XenServer 6.5 or later (Pass-Through GPU) VMware vSphere5.5 or later (vDGA) Red Hat Enterprise Linux (RHEL) 6.5 or later (64-bit only)
NVIDIA Quadro K6000 graphics adapter	**Memory size**	12.0 GB
	Memory type	GDDR-5
	Memory interface	384-bit
	I/O interface	PCIe (x16) Gen 2
	Max power consumption	225W
	API	DirectX 11, Shader Model 5.0; OpenGL4.3
	Operating Systems	Microsoft ® Windows 7® SP1 Pro (64-bit), Enterprise (64-bit) Microsoft ® Windows 8.1® Pro (64-bit), Enterprise (64-bit) Microsoft® Windows Server 2012 R2 (64-bit) Standard, Enterprise and DataCenter editions (Citrix XenApp) Citrix XenServer 6.5 or later (Pass-Through GPU) VMware vSphere5.5 or later (vDGA) Red Hat Enterprise Linux (RHEL) 6.5 or later (64-bit only)
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 7® SP1 Pro (64-bit), Enterprise (64-bit) Microsoft ® Windows 8.1® Pro (64-bit), Enterprise (64-bit) Microsoft® Windows Server 2012 R2 (64-bit) Standard, Enterprise and DataCenter editions (Hyper-V RemoteFX, XenApp) Citrix XenServer 6.5 or later (Pass-Through GPU, vGPU) VMware vSphere5.5 or later (vDGA, vSGA,vGPU)
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)

Technical Specifications

	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 7® SP1 Pro (64-bit), Enterprise (64-bit) Microsoft ® Windows 8.1® Pro (64-bit), Enterprise (64-bit) Microsoft® Windows Server 2012 R2 (64-bit) Standard, Enterprise and DataCenter editions (Hyper-V RemoteFX, XenApp) Citrix XenServer 6.5 or later (Pass-Through GPU, vGPU) VMware vSphere5.5 or later (vDGA, vSGA, vGPU)
Environment-friendly Products and Approach	**End-of-life Management and Recycling**	Hewlett-Packard offers end-of-life HP product return, trade-in, and recycling programs in many geographic areas. For trade-in information, please go to: http://www.hp.com/go/green. To recycle your product, please go to: http://www.hp.com/go/green or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner. The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard web site at: http://www.hp.com/go/green. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers wh integrate and re-sell HP equipment.

Summary of Changes

Date	Version History	Action	Description of Change:
28-Sep-2015	From Version 4 to 5	Changed	Overview, Optional Features, Core Options, Configuration Information, and Technical Specifications sections were updated.
		Added	Skus added: • 805132-B21 • 785918-B21 • M9R60A • J0G92A • P8B24A • P8B26AAE • P8B31A
		Removed	Obsolete skus were deleted: • F6Q89AAE • 741155-B21
01-Jun-2015	From Version 3 to 4	Changed	Information in Configuration Information- Factory Integrated models sections was updated.
		Added	Skus added to Hard Drives: • 748387-B21 • 728629-B21 • 726724-B21 • 791034-B21 • 781518-B21 • 785069-B21 • 781516-B21 • 785067-B21 • 802891-B21 • 802586-B21 • 802582-B21 • 802578-B21 • 765466-B21 • 765464-B21 • 765455-B21 • 765453-B21 • 789155-B21 • 789145-B21 • 789135-B21
		Removed	Obsolete Skus removed: • 741142-B21 • 741138-B21
06-Apr-2015	From Version 2 to 3	Changed	Standard Features section was updated
		Removed	Sku deleted: 718935-B21
03-Apr-2015	From Version 1 to 2	Added	Skus added on carepack section: • U8BF0E • U8BF1E • U8BF3E • U8BF4E • UR362E

Summary of Changes

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