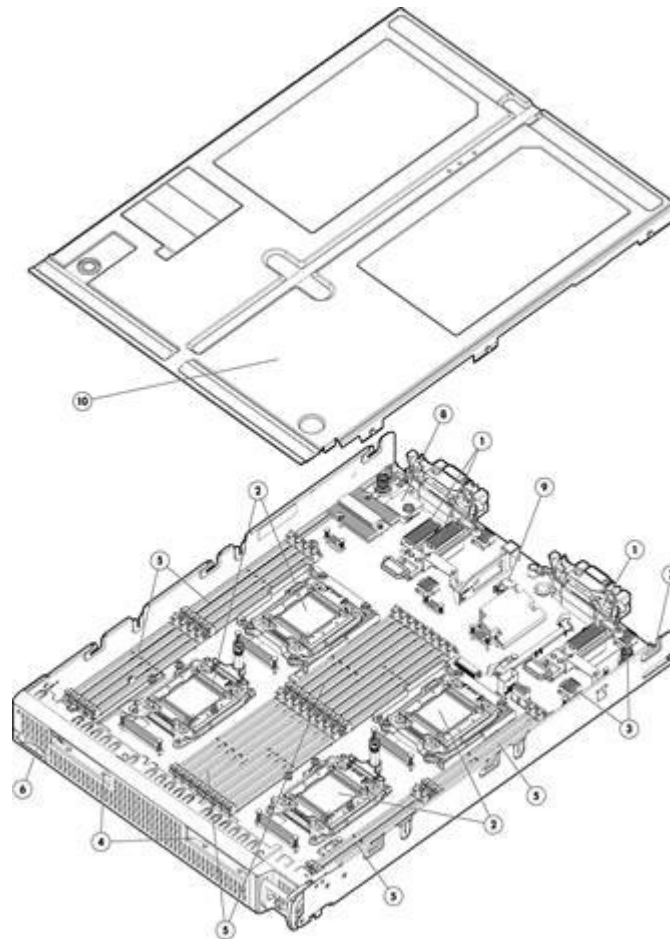


### Overview



#### HP ProLiant BL660c Generation 8 (Gen8) Server Blade

- |   |  |
|---|--|
| 1. Three (3) PCIe 3.0 mezzanine I/O expansion slots         | 6. HP c-Class Blade SUV (Serial, USB, VGA) connector |
| 2. Up to four (4) Intel® Xeon® E5-4600 family processors    | 7. MicroSDHC card connector                          |
| 3. Two FlexibleLOM connectors                               | 8. Trusted Platform Module (TPM) connector           |
| 4. Two (2) small form factor (SFF) hot-plug drive bays      | 9. Internal USB 2.0 connector                        |
| 5. Thirty-two (32) DDR3 DIMM memory slots (8 per processor) | 10. Access panel                                     |

### What's New

- Support for the HP Flex-10 10Gb 2-port 530FLB FlexibleLOM

### Standard Features

**NOTE:** This document covers the HP ProLiant BL660c Gen8 server blade only. For information on HP BladeSystem c-Class Enclosures and HP BladeSystem c-Class interconnect and mezzanine options, please see the following:

HP BladeSystem c-Class Enclosures QuickSpecs:

- HP BladeSystem c3000 Enclosure QuickSpecs at [http://h18000.www1.hp.com/products/quickspecs/12790\\_div/12790\\_div.html](http://h18000.www1.hp.com/products/quickspecs/12790_div/12790_div.html)  
**NOTE:** The ProLiant BL660c Gen8 requires the c3000 Enclosure to be configured with 6 fans.
- HP BladeSystem c7000 Enclosure QuickSpecs at [http://h18000.www1.hp.com/products/quickspecs/12810\\_div/12810\\_div.html](http://h18000.www1.hp.com/products/quickspecs/12810_div/12810_div.html)  
**NOTE:** The ProLiant BL660c Gen8 requires the c7000 Enclosure to be configured with 10 fans.
- HP BladeSystem c-Class interconnect and mezzanine options 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 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>.

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#### Processor

One of the following depending on Model

##### Eight-Core Processors

Intel® Xeon® E5-4650 (2.7GHz/8-core/20MB/130W) Processor  
Intel® Xeon® E5-4650L (2.6GHz/8-core/20MB/115W) Processor  
Intel® Xeon® E5-4640 (2.4GHz/8-core/20MB/95W) Processor  
Intel® Xeon® E5-4620 (2.2GHz/8-core/16MB/95W) Processor

##### Six-Core Processors

Intel® Xeon® E5-4617 (2.9GHz/6-core/15MB/130W) Processor  
Intel® Xeon® E5-4610 (2.4GHz/6-core/15MB/95W) Processor  
Intel® Xeon® E5-4607 (2.2GHz/6-core/12MB/95W) Processor

##### Four-Core Processors

Intel® Xeon® E5-4603 (2.0GHz/4-core/10MB/95W) Processor

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#### Cache Memory

One of the following depending on Model

16MB or 20MB L3 cache  
**NOTE:** For eight-core processors.  
12MB or 15MB L3 cache  
**NOTE:** For six-core processors.  
10MB L3 cache  
**NOTE:** For four-core processors.

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#### Chipset

Intel® C600 Series Chipset  
**NOTE:** For more information regarding Intel chipsets, please see the following:  
<http://www.intel.com/products/server/chipsets/>.

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#### Upgradeability

Upgradeable to four (4) processors

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### Standard Features

**On System Management Chipset** HP iLO (Firmware: HP iLO 4)  
**NOTE:** For more information, visit: <http://www.hp.com/go/ilo>

**Memory Protection**

- Data bus ECC protection
- Advanced ECC / SDDC
- Rank sparring (on line spare)
- Lockstep mode
- DIMM address/control bus parity protection
- Failed DIMM isolation
- Demand scrubbing
- Patrol scrubbing
- Memory thermal control

**Memory**  
One of the following  
depending on Model

Type	HP SmartMemory DDR3 Load Reduced (LRDIMM) and Registered (RDIMM)
Standard (Pre-configured Models)	128GB (8 x 16GB) DDR3 1600MHz RDIMMs at 1.5V 128GB (8 x 16GB) DDR3 1333MHz RDIMMs at 1.35V
Maximum (LRDIMM)	1.0TB (32 x 32GB) up to 1333MHz at 1.35V
Maximum (RDIMM)	512GB (32 x 16GB) up to 1600MHz at 1.5V 512GB (32 x 16GB) up to 1333MHz at 1.35V

**NOTE:** HP memory from previous generation servers are not qualified or warranted with this server. HP SmartMemory is required to realize the memory performance improvements and enhanced functionality listed in this document for Gen8. For additional information, please see the HP SmartMemory QuickSpecs at: [http://h18000.www1.hp.com/products/quickspecs/14225\\_na/14225\\_na.html](http://h18000.www1.hp.com/products/quickspecs/14225_na/14225_na.html)

**NOTE:** LRDIMMs and RDIMMs 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 1600MHz, 1333MHz, or 1066MHz. Please see Memory Population Table or the Online Memory Configuration Tool at: [www.hp.com/go/ddr3memory-configurator](http://www.hp.com/go/ddr3memory-configurator).

### Standard Features

#### Network Controller

Two (2) HP FlexibleLOM connectors for one or two dual-port FlexibleLOMs

**NOTE:** FlexibleLOM options include 10Gb FlexFabric, 10Gb Flex-10, and 10Gb Ethernet.

**NOTE:** FlexFabric capabilities require the use of an HP Virtual Connect FlexFabric module. Learn more at: <http://www.hp.com/go/bladeflexsystem/interconnects>

**NOTE:** The server supports one or two FlexibleLOMs, which must be identical.

**NOTE:** For Pre-configured Model configurations, two FlexibleLOMs are already included; no additional FlexibleLOMs are added.

**NOTE:** For a Factory Integrated Model configuration with one FlexibleLOM, it is added in the HP Networking section of "Step 2" in the Factory Integrated Models section.

**NOTE:** For a Factory Integrated Model configuration with two FlexibleLOMs, the second FlexibleLOM (although same technology) is a different part number. You must select the first FlexibleLOM in the "Step 2" HP Networking section and select the second FlexibleLOM in the "Step 4" HP Networking section.

**NOTE:** All FlexibleLOMs are dual port: one port is routed to interconnect module bay 1 and the other to bay 2.

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#### Expansion Slots

Three (3) I/O expansion mezzanine slots:

- x8 PCIe 3.0 Type A (supports Type A mezzanine cards) (expansion slot 1).
- x16 PCIe 3.0 Type B (supports Type A and Type B mezzanine cards) (expansion slot 2).
- x16 PCIe 3.0 Type B (supports Type A and Type B mezzanine cards) (expansion slot 3).

Mezzanine card options include:

- Dual-port to quad-port (depending on the model) 10Gb FlexFabric, 10Gb Flex-10, 10Gb Ethernet, and 1Gb Ethernet for additional Ethernet network ports.
- Dual-port 8Gb Fibre Channel HBAs for SAN connectivity.
- QDR and FDR InfiniBand for low latency and high bandwidth server interconnectivity.
- HP Smart Array P721m Controller for direct attached SAS Storage
- HP I/O Accelerator Options for higher I/O performance and low latency access to storage, with the reliability of solid state

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#### 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

### Standard Features

- 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 at [www.hp.com/support/rbsu](http://www.hp.com/support/rbsu).

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### Storage Controller

All Models

One (1) embedded HP Smart Array P220i Controller

**NOTE:** The HP Smart Array P220i supports RAID 0 and 1. It includes 512MB flash-backed write cache (FBWC) on pre-configured models and is optional on factory integrated models. The FBWC is not required for RAID capability. The purpose of the cache is it can increase hard drive write performance and provides data protection in case the server losses power.

**NOTE:** The HP Smart Array P220i supports upgradeable firmware with recovery ROM.

**NOTE:** The HP Smart Array P220i supports two (2) small form factor (SFF) hot plug drive bays.

Available Options: Smart Array Advanced Pack 2.0 Software for enhanced performance, reliability, availability, and security of system data

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### Maximum Internal Storage

Hot Plug SFF SAS	2.0TB	2 x 1.0TB
Hot Plug SFF SATA	2.0TB	2 x 1.0TB
Hot Plug SFF SAS SSD	1.6TB	2 x 800GB
Hot Plug SFF SATA SSD	800GB	2 x 400GB

**NOTE:** The ProLiant BL660c Gen8 server includes the new HP hot plug small form factor (SFF) SmartDrive carrier for enhanced management and reduced maintenance errors. HP drives from previous generation servers are not compatible with the ProLiant BL660c Gen8 drive bays.

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

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### Interfaces

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

**NOTE:** The above options are for integrated hypervisor virtualization environments needing a low cost boot solution with the highest performance and reliability.

### Standard Features

#### Industry Standard Compliance

ACPI 2.0  
Microsoft® Logo certifications  
USB 2.0 Support  
IMPI 2.0  
Secure Digital 2.0  
TMP 1.2 Support  
IEEE (specific IEEE standards 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

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#### Operating Systems and Virtualization Software Support for ProLiant Servers

[Microsoft Windows Server](#)  
[Red Hat Enterprise Linux \(RHEL\)](#)  
[SUSE Linux Enterprise Server \(SLES\)](#)  
[VMware](#)  
[Citrix XenServer](#)

**NOTE:** For more information on HP's Certified and Supported ProLiant Servers for OS and Virtualization Software and latest listing of software drivers available for your server, please visit our Support Matrix at: <http://www.hp.com/go/ossupport> and our driver download page <http://www.hp.com/support/BL660cGen8>.

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#### Enclosures

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 eight (8) ProLiant BL660c Gen8 servers plugged vertically.
- The HP BladeSystem c3000 rack enclosure is 6U high and holds up to four (4) HP ProLiant BL660c Gen8 servers plugged horizontally.
- Server blades, storage blades, interconnect modules, power supplies, fans, and redundant Onboard Administrator modules are all designed to fit into the c3000 and c7000 enclosures.

**NOTE:** For additional enclosure information, please see <http://h18004.www1.hp.com/products/blades/components/enclosures/c-class/index.html>.

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#### Graphics

Integrated Matrox G200 video standard

- 1280 x 1024 (32 bpp)
  - 1920 x 1200 (16 bpp)
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### Standard Features

**Form Factor**

HP ProLiant BL660c Gen8 is a single-wide, full-height server blade that plugs into the HP BladeSystem c3000 and c7000 enclosures.

**On System Management**

HP iLO Management Engine

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

- **HP iLO:** The HP iLO (Integrated Lights-Out) management processor is the core foundation for the HP iLO Management Engine
- **HP Agentless Management:** Provides built in server health monitoring and alerting capability without OS agents, that starts working the moment a power cord and an Ethernet cable are connected.
- **HP Active Health System:** Always on, continuous monitoring for increased stability and shorter downtimes; 100% configuration history; Health and service alerts and easy export and upload to Service and Support.
- **HP Intelligent Provisioning:** Lets customers provision and configure a single server without any separate media. No more SmartStart CDs or firmware DVDs are needed.
  - To start Intelligent Provisioning:
    - Press the F10 key during the ProLiant Gen8 server boot process (also known as power on self test or POST).
    - Please go to the Intelligent Provisioning website at [www.hp.com/go/intelligentprovisioning](http://www.hp.com/go/intelligentprovisioning) for additional information and to view usage videos.
    - Use the Service Pack for ProLiant (SPP) at [www.hp.com/go/spp](http://www.hp.com/go/spp) to get firmware and software updates.
  - **HP iLO Mobile App:** Enables the ability to access, deploy, and manage your server anytime from anywhere from select smartphones and mobile devices. For additional information please visit: [www.hp.com/go/ilo/mobileapp](http://www.hp.com/go/ilo/mobileapp)

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

### Standard Features

**HP Insight management software** HP Service Pack for ProLiant (SPP)

HP Service Pack for ProLiant (SPP) and HP Smart Update Manager (HP SUM) version 5 provide a new, comprehensive approach to firmware and system software maintenance. Together they provide better operating stability and ensure maximum uptime. The SPP will be updated at a predictable cadence, typically coinciding with new HP server hardware launches. By enabling all firmware to be updated online and integrating firmware and system software updates in one operation HP SUM and the SPP offer faster updates of individual servers and dramatically faster updates of entire BladeSystem enclosures. Further improving system uptime and stability is the fact that HP provides 12 months of support on each Service Pack for ProLiant.

The user experience around HP SUM and the SPP has been improved in several ways, starting with the web download. A single web page provides access to a single download containing both the latest version of HP SUM version 5 and the latest SPP. Optional smaller subsets with only specific types of servers or specific operating systems are offered to save on download time. The HP SUM application has been re-written to provide a more straightforward, intuitive user interface that guides the user through the steps of discovery, analyses and update, providing comprehensive information on available updates, criticality and interdependencies. This information is also available in reports. By providing the option of multiple local or shared repositories which can be easily updated from hp.com, HP SUM provides the tools to optimize stability and consistency throughout the company. While HP SUM and the SPP will recommend the combinations of firmware and system software that HP has found to be the best practice, the application gives customers the flexibility to set their own specific baseline.

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

The Service Pack for ProLiant (which includes HP SUM 5) can be downloaded from [www.hp.com/go/spp/download](http://www.hp.com/go/spp/download). More information can be found: [www.hp.com/go/spp](http://www.hp.com/go/spp) and <http://www.hp.com/go/hpsum>.

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### Standard Features

#### Security

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

#### Availability

#### Memory

- Data Bus ECC protection provides automatic correction from a single data bit error and detection of double data error bits. Often called single error correction/double error detection (SEC/DED).
- 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. HP offers the rank sparing rather than DIMM sparing as rank sparing uses less spare memory resulting in reduced overhead.
- Memory lockstep mode is used to correct a single x8 DRAM device failure on a DIMM. The DIMMs in each paired memory channel must have identical HP part numbers.
- Memory demand and patrol scrubbing 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.
- Memory thermal control is used to prevent DIMMs from overheating. Achieved by slowing down the memory access rate per the temperature monitored by DIMM sensor.

#### Mezzanine options and I/O

- One or two FlexibleLOM connectors each supporting two (i.e. redundant) Ethernet ports routed to redundant interconnect modules.
- 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) hot-plug SAS/SATA/SSD drive bays.
- Integrated HP Smart Array P220i Controller with 512MB FBWC capability, RAID 0 and 1, and upgradeable firmware with recovery ROM capability.  
NOTE: The 512MB flash-backed write cache (FBWC) is included on pre-configured models and is optional on factory integrated models. The FBWC is not required for RAID capability. The purpose of

### Standard Features

the cache is it can increase hard drive write performance and provides data protection in case the server losses power

- Optional HP D2200sb Storage Blade for direct attachment of up to 12 drives to an adjacent blade within the c-Class enclosure.
- 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) redundant enclosure-based hot-plug HP Active Cool fans that scale to meet future demands and optimize airflow, reduce power draw, and improve acoustic performance.
- Dual grid power providing redundant rack enclosure power feeds to the server blade enclosure.
- HP Dynamic Power Saver Mode the total enclosure power consumption is monitored in real time and automatically adjusted with changes in demand for improved efficiency and reliability.
- HP Dynamic Power Capping safely limits power usage without impacting performance by capping peak usage instead of average power usage, removes risk to electrical infrastructure with a fast-acting, hardware-based capping algorithm, and reclaims more power by dynamically controlling power limits based on workload demand.
- Up to eight interconnect modules per server blade enclosure providing four simultaneous redundant fabrics for FlexFabric, Virtual Connect Ethernet, Fibre Channel, InfiniBand, Pass Thru Ethernet, etc.
- Enclosure crosslinks between adjacent enclosures to provide interconnect module-to-module connections or as Virtual Connect module stacking links.
- Optional enclosure redundant Onboard Administrator system management module.

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

### Optional Features

<b>Fibre Channel Support</b>	Up to three (3) optional Fibre Channel mezzanine HBAs are supported on the HP ProLiant BL660c Gen8.	
<b>Compatible SAN</b>	HP ProLiant BL660c Gen8 server blades are optimized for HP MSA, EVA and XP.  HP ProLiant BL660c Gen8 server blades are compatible with select 3rd party SANs. Please see blade storage page for more details at <a href="http://h18004.www1.hp.com/products/blades/components/c-class-sans.html">http://h18004.www1.hp.com/products/blades/components/c-class-sans.html</a> .	
<b>HP Virtual Connect</b>	HP Virtual Connect is an interconnect option for BladeSystem c-Class that simplifies server connectivity to data and storage networks, and reduces costs. Unique HP Flex-10 technology makes maximum use of network bandwidths, provide dynamic tuning and enable extreme flexibility to meet individual server and infrastructure requirements by allocating up to 4 network connections per server port. Virtual Connect FlexFabric modules extend those capabilities to allocate one function per port to storage connections. HP Virtual Connect Enterprise Manager (VCEM) provides server management software with a central console to administer network connections and workloads for thousands of servers. For more information on Virtual Connect Enterprise Manager, see <a href="http://www.hp.com/go/vcem">http://www.hp.com/go/vcem</a> . For more information on Virtual Connect Ethernet, Fibre Channel, Converged Network and management options, see <a href="http://www.hp.com/go/virtualconnect">http://www.hp.com/go/virtualconnect</a> .	
<b>HP Insight management software</b>	<b>HP Insight Control</b>	HP Insight Control, a product option, delivers essential infrastructure management that can help save time and money by making it easy to deploy, migrate, monitor, remote control, and optimize your IT infrastructure through a single, simple management console.  Two versions of Insight Control are available, to serve environments requiring either a Linux-based or a Windows-based central management server: HP Insight Control for Linux, and HP Insight Control. For more information, see <a href="http://www.hp.com/go/insightcontrol">http://www.hp.com/go/insightcontrol</a> .  HP Insight Control includes one year of 24 x 7 HP Software Technical Support and Update Service ensuring rapid access to HP support staff and proactive delivery of software updates. For more information about this service, see <a href="http://www.hp.com/services/insight">http://www.hp.com/services/insight</a> .
	<b>HP Matrix Operating Environment</b>	The HP Matrix Operating Environment (Matrix OE) for ProLiant and Integrity servers is an integrated command center that helps you instantly adjust to dynamic business demands. This advanced infrastructure management software lets you reduce the cost of common data center tasks by up to 40 percent while keeping pace with your changing business.  The HP Matrix OE includes the automated provisioning, optimization, and recovery management capabilities for HP CloudSystem Matrix, the ideal platform for private cloud and Infrastructure as a Service (IaaS). For more information, see <a href="http://www.hp.com/go/matrixoe">http://www.hp.com/go/matrixoe</a> .
	<b>HP iLO Advanced License for ProLiant BladeSystem Servers</b>	HP iLO management processors for HP ProLiant Gen8 servers virtualizes system controls to help simplify server setup, engage health monitoring and power and thermal control, and promote remote administration. HP iLO functions out-of-the-box without additional software installation and

### Optional Features

functions regardless of the servers' state of operation. The HP iLO can be accessed from any location via a web browser and works hand-in-hand with HP Systems Insight Manager, Insight Control, and Matrix Operating Environment, helping customers unleash the value of the ProLiant platform and deliver the highest possible quality of IT service to the business.

Advanced functionality, such as graphical remote console, multi-user collaboration, and video record/playback can be activated with the optional HP iLO Advanced or HP iLO Advanced for BladeSystem licenses. The Advanced licensed features offer sophisticated remote administration of servers in dynamic data center and remote locations and can help significantly reduce cost associated with IT-related travel and unplanned downtime.

**NOTE:** For more information, visit <http://www.hp.com/go/ilo>.

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#### 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

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

##### HP Insight Cluster Management Utility

HP Insight Cluster Management Utility (CMU) is an HP-licensed and HP-supported suite of tools that are used for lifecycle management of hyperscale clusters of Linux ProLiant systems. CMU includes software for the centralized provisioning, management and monitoring of nodes. CMU makes the administration of clusters user friendly, efficient, and effective. <http://www.hp.com/go/cmu>

##### HP HPC Linux Value Pack

HP HPC Linux Value Pack is an HP-licensed and HP-supported option to HP Insight CMU, for the development and deployment of applications on HPC Cluster Platforms. Value Pack includes the Platform LSF workload scheduler and Platform Application Center, as well as the HP-MPI parallelization library. <http://h20311.www2.hp.com/hpc/us/en/linux-value-pack.html>

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#### HP Insight Online

HP Insight Online is a new addition to the HP Support Center for one stop, secure access to product and HP support information personalized to your IT environment. Insight Online can automatically display devices remotely monitored by HP Insight Remote Support. With Insight Online's easy navigation you can efficiently track your IT support contracts and device status from anywhere and at anytime. <http://www.hp.com/go/insightonline>

### Optional Features

**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>

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**HP Simple Configurator** SCE is a guided self service tool to help sales and non technical people provide customers with initial configurations in 3 to 5 minutes. You may then send the configuration on for configuration help, or use in your existing ordering processes. If you require "custom" rack configuration or configuration for products not available in SCE, please contact HP's Customer Business Center or an Authorized Partner for assistance. <http://www.hp.com/products/configurator>

### Service and Support

#### Service and Support

##### **HP Technology Services for Industry Standard Servers and BladeSystem**

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

##### **What HP ProLiant and BladeSystem Services can do for you**

HP ProLiant and BladeSystem Services can help you design, deploy, test, integrate, support, and manage IT and infrastructure solutions. This way, HP proposes services solutions that include more than just uplift of base warranty. Foundation Care services portfolio consists of scalable, reactive support services for HP industry-standard servers and software. New to this portfolio is HP Collaborative Support. If you are running business critical environments, HP offers Proactive Care. These services help deliver high levels of application availability through proactive service management and advanced technical response

You can get the support you need by choosing from one of a number of service packaged solutions we have designed to address wider set of customer support needs.

HP Technology Services meets business challenges with services offered in three support recommendations - **Optimized Care, Standard Care, and Basic Care** - available for each product group. Such support solutions enable customers to optimize technology operations, minimize risk, and drive better business outcomes with easy-to-buy, easy-to-use scalable support recommendations for servers, storage, networking and software.

All three service recommendations include support services from the broader portfolio of Foundation Care and Proactive Care services.

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#### **Optimized Care : Supports maintaining servers at optimum performance availability**

##### **Optimized Care**

##### **HP Installation and Startup Service for HP BladeSystem c-Class Infrastructure for c3000/c7000 enclosure**

Provides for the installation and startup of a BladeSystem c3000 Infrastructure in a single blade enclosure including hardware and software, including deployment of OS, HP SIM, RDP, RDP, PMP and VPM  
<http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA0-5964ENW.pdf>

##### **HP Installation and Startup Service for HP BladeSystem c-Class Enhanced Network**

P Provides for the configuration and testing of BladeSystem Ethernet interconnect switches to facilitate proper implementation of network protocols and access to advanced features  
<http://h20195.www2.hp.com/V2/GetPDF.aspx/4aa0-5969ENW.pdf>

##### **3-Year HP 24x7 4 hour Response, Proactive Care for c3000/c7000 enclosure + 3-Year HP 24x7 4 hour Response, Proactive Care for Blade server**

Helps optimize your systems and delivers high levels of application availability through proactive service management and advanced technical response. A skilled Technical Manager will own your query or issue end to end until resolved, delivering a single point of contact for you

**Additional Services** : Factory Express, Education Services, Proactive Select - 30 Credits .

### Service and Support

#### Standard Care : Support Recommendation that maintains high level of server availability

##### Standard Care

##### **HP Installation and Startup Service for HP BladeSystem c-Class Infrastructure for c3000/c7000 enclosure**

Provides for the installation and startup of a BladeSystem c3000 Infrastructure in a single blade enclosure including hardware and software, including deployment of OS, HP SIM, RDP, PMP and HP Installation and Startup Service for HP BladeSystem c-Class Infrastructure for c3000/c7000 enclosure

Provides for the installation and startup of a BladeSystem c3000 Infrastructure in a single blade enclosure including hardware and software, including deployment of OS, HP SIM, RDP, PMP and VPM.

<http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA0-5964ENW.pdf>

##### **HP Installation and Startup Service for HP BladeSystem c-Class Enhanced Network**

P Provides for the configuration and testing of BladeSystem Ethernet interconnect switches to facilitate proper implementation of network protocols and access to advanced features

<http://h20195.www2.hp.com/V2/GetPDF.aspx/4aa0-5969ENW.pdf>

##### **3-Year, HP 24x7 4 hour Response, Collaborative Support for c3000/c7000 enclosure + 3-Year, HP 24x7 4 hour Response, Collaborative Support for Blade server**

Offers customers a single point of contact for server problem diagnosis, remote and on site hardware problem resolution, basic software problem diagnosis, fault isolation, and resolution if available to HP plus call logging with the customer's ISV if needed. <http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA3-8232ENW.pdf>

**Additional Services:** Software support service with 24X7 availability with a 2 hour response, Training courses on Microsoft, Linux (Red Hat and SUSE), VMware, and HP Insight Software, 10 Proactive Select Credits, Factory Express

<http://www8.hp.com/us/en/business-services/it-services.html?compURI=1078865>

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#### Basic Care : delivers minimum recommended support service level

##### Basic Care

##### **HP Installation and Startup Service for HP BladeSystem c-Class Infrastructure for c3000/c7000 enclosure**

Provides for the installation and startup of a BladeSystem c3000 Infrastructure in a single blade enclosure including hardware and software, including deployment of OS, HP SIM, RDP, PMP and VPM.

<http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA0-5964ENW.pdf>

##### **HP Installation and Startup Service for HP BladeSystem c-Class Enhanced Network**

P Provides for the configuration and testing of BladeSystem Ethernet interconnect switches to facilitate proper implementation of network protocols and access to advanced features

<http://h20195.www2.hp.com/V2/GetPDF.aspx/4aa0-5969ENW.pdf>

##### **3-Year, HP 24x7 4 hour Response, Hardware Support Onsite Service for c3000/c7000 enclosure + 3-Year, HP 24x7 4 hour Response, Hardware Support Onsite Service for Blade server**

Provides you with rapid remote support and if required an HP authorized representative who will arrive on site any time and day of the year to begin hardware maintenance service within 4 hours of the service request being logged

<http://h20195.www2.hp.com/V2/GetPDF.aspx/5982-6547EEE.pdf>

##### **3-Year , HP 24x7 Software Support for Insight Control**

Provides 3-year software support service that delivers comprehensive software services, including access to HP technical resources and software updates <http://h20195.www2.hp.com/V2/GetPDF.aspx/5981->

### Service and Support

[6645EEE.pdf](#)

**Additional Services** - Factory Express, Education Services, Proactive Select - 10 Credits.

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**Insight Remote Support** Provides 24 X 7 remote monitoring, proactive notifications, and problem resolution. Learn more <http://www.hp.com/go/insightremotesupport>

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

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

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

\*HP' Support Center Mobile App is subject to local availability

**HP Support Center** For ProLiant servers and storage systems, the services cover HP-branded hardware options qualified for the server, purchased at the same time or afterward, internal to the enclosure, as well as external monitors up to 22" and tower UPS products; these items will be covered at the same service level and for the same coverage period as the server unless the maximum supported lifetime and/or the maximum usage limitation has been exceeded. Coverage of the UPS battery is not included; standard warranty terms and conditions apply.

The defective media retention service feature option applies only to Disk or eligible SSD/Flash Drives replaced by HP due to malfunction. It does not apply to any exchange of Disk or SSD/Flash Drives that have not failed. SSD/Flash Drives that are specified by HP as consumable parts and/or that have exceeded maximum supported lifetime and/or the maximum usage limit as set forth in the manufacturer's operating manual or the technical data sheet are not eligible for the defective media retention service feature option.

**For more information** To learn more on HP ProLiant servers and HP BladeSystem servers, please contact your HP sales representative or HP Authorized Channel Partner. Or visit: [www.hp.com/services/bladesystem](http://www.hp.com/services/bladesystem)



### Pre-configured Models

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

**NOTE:** Pre-configured models ship with the configurations below. Options can be selected from the Core or Additional options section of this QuickSpecs.

**NOTE:** HP does not allow factory integration of options into pre-configured models. Any additional options purchased will be shipped separately.

**NOTE:** If you desire a custom configuration please see "Configuration Information - Factory Integrated Models" section of this QuickSpecs.

**NOTE:** Not all Pre-configured Models are available in all regions. Check with your local country HP offices for availability.

### Performance Models

<b>HP ProLiant BL660c Gen8 E5-4650 2.7GHz 8-core 4P 128GB-R Server</b> 679114-B21	<b>Processor(s)</b>	Four (4) Intel® Xeon® E5-4650 (2.7GHz/8-core/20MB/130W)
	<b>Cache Memory</b>	20MB Level 3 cache
	<b>Memory</b>	128GB (16x 8GB) PC3-12800R (DDR3-1600) Registered DIMMs at 1.5V <b>NOTE:</b> Total of 32 DIMM slots.
	<b>Network Controller</b>	Two (2) HP FlexFabric 10Gb 2-port 554FLB FlexibleLOMs
	<b>Storage Controller</b>	HP Smart Array P220i Controller with 512MB FBWC and RAID 0, 1
	<b>Hard Drive</b>	None ship standard; includes 2 SFF hard drive blanks Supports up to two (2) HP hot-plug SFF SAS/SATA/SDD drives
	<b>Internal Storage</b>	SAS: 2.0TB; SATA: 2.0TB; SAS SSD: 1.6TB; SATA SSD: 800GB
	<b>Optical Drive Bay</b>	None
	<b>Expansion Slots</b>	3 standard - Slot 1 supports Type A mezzanine Cards. Slots 2 and 3 support Type A and Type B mezzanine cards.
	<b>Management</b>	HP iLO Management Engine (standard) Optional: HP Insight Control
	<b>Form Factor</b>	Up to four (4) full-height server blades supported in the HP BladeSystem c3000 Enclosure Up to eight (8) full-height server blades supported in HP BladeSystem c7000 Enclosure
	<b>Warranty</b>	Server warranty includes 3 year parts, 3 year labor, 3-year on-site support.

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<b>HP ProLiant BL660c Gen8 E5-4620 2.2GHz 8-core 4P 128GB-R Server</b> 679115-B21	<b>Processor(s)</b>	Four (4) Intel® Xeon® E5-4620 (2.2GHz/8-core/16MB/95W)
	<b>Cache Memory</b>	16MB Level 3 cache
	<b>Memory</b>	128GB (16x 8GB) PC3L-10600R (DDR3-1333) Registered DIMMs at 1.35V <b>NOTE:</b> Total of 32 DIMM slots.
	<b>Network Controller</b>	Two (2) HP FlexFabric 10Gb 2-port 554FLB FlexibleLOMs
	<b>Storage Controller</b>	HP Smart Array P220i Controller with 512MB FBWC and RAID 0, 1
	<b>Hard Drive</b>	None ship standard; includes 2 SFF hard drive blanks Supports up to two (2) HP hot-plug SFF SAS/SATA/SDD drives
	<b>Internal Storage</b>	SAS: 2.0TB; SATA: 2.0TB; SAS SSD: 1.6TB; SATA SSD: 800GB
	<b>Optical Drive Bay</b>	None
	<b>Expansion Slots</b>	3 standard - Slot 1 supports Type A mezzanine Cards. Slots 2 and 3 support Type A and Type B mezzanine cards.

### Pre-configured Models

<b>Management</b>	HP iLO Management Engine (standard) Optional: HP Insight Control
<b>Form Factor</b>	Up to four (4) full-height server blades supported in the HP BladeSystem c3000 Enclosure Up to eight (8) full-height server blades supported in HP BladeSystem c7000 Enclosure
<b>Warranty</b>	Server warranty includes 3 year parts, 3 year labor, 3-year on-site support.

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<b>HP ProLiant BL660c Gen8 E5-4617 2.9GHz 6-core 4P 128GB-R Server 679116-B21</b>	<b>Processor(s)</b>	Four (4) Intel® Xeon® E5-4617 (2.9GHz/6-core/15MB/130W)
	<b>Cache Memory</b>	15MB Level 3 cache
	<b>Memory</b>	128GB (16x 8GB) PC3-12800R (DDR3-1600) Registered DIMMs at 1.5V <b>NOTE: Total of 32 DIMM slots.</b>
	<b>Network Controller</b>	Two (2) HP FlexFabric 10Gb 2-port 554FLB FlexibleLOMs
	<b>Storage Controller</b>	HP Smart Array P220i Controller with 512MB FBWC and RAID 0, 1
	<b>Hard Drive</b>	None ship standard; includes 2 SFF hard drive blanks Supports up to two (2) HP hot-plug SFF SAS/SATA/SDD drives
	<b>Internal Storage</b>	SAS: 2.0TB; SATA: 2.0TB; SAS SSD: 1.6TB; SATA SSD: 800GB
	<b>Optical Drive Bay</b>	None
	<b>Expansion Slots</b>	3 standard - Slot 1 supports Type A mezzanine Cards. Slots 2 and 3 support Type A and Type B mezzanine cards.
	<b>Management</b>	HP iLO Management Engine (standard) Optional: HP Insight Control
	<b>Form Factor</b>	Up to four (4) full-height server blades supported in the HP BladeSystem c3000 Enclosure Up to eight (8) full-height server blades supported in HP BladeSystem c7000 Enclosure
	<b>Warranty</b>	Server warranty includes 3 year parts, 3 year labor, 3-year on-site support.

### Configuration Information - Factory Integrated Models

**NOTE:** This section lists some of the steps required to configure a Factory Integrated Model or configure-to-order (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:** Factory Integrated Models must start with a CTO Server.

**NOTE:** FIO indicates that this option is only available as a factory installable option.

**NOTE:** All CTO (Configure to Order) systems 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)

<b>Models</b>	HP ProLiant BL660c Gen8 10Gb FlexibleLOM Configure-to-order Blade Server	679118-B21
	<b>Each configurable model ships with:</b>	
	Two (2) FlexibleLOM connectors providing a choice of supported FlexibleLOMs (see Step 2)	
	One (1) embedded HP Smart Array P220i Controller with RAID 0, 1	
	Optional HP Smart Array P220i Controller 512MB FBWC (listed in step 4)	
	Two (2) HP small form factor hot-plug SAS/SATA/SSD hard drive bays	
	Three (3) PCIe Gen 3.0 I/O expansion slots (one x8 Type A, two x16 Type B)	
	One (1) integrated USB connector and one (1) MicroSDHC connector	
	One (1) TPM connector	
	HP iLO Management Engine (standard)	

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

<b>HP Processors</b>	<p><b>NOTE:</b> The BL660c Gen8 supports two or four processors; one and three processor configurations are not supported.</p> <p><b>NOTE:</b> All processor kits contain two (2) processors.</p> <p><b>NOTE:</b> If four processors are desired, select one 2P xxxxxx-L21 processor kit here in Step 2 and one xxxxxx-B21 2P processor kit in Step 3.</p> <p><b>NOTE:</b> All processors within the server must be identical.</p> <p><b>NOTE:</b> 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.</p>	
	<b>Eight-Core Processors</b>	
	HP BL660c Gen8 Intel® Xeon® E5-4650 (2.7GHz/8-core/20MB/130W) FIO 2-processor Kit	679098-L21
	HP BL660c Gen8 Intel® Xeon® E5-4650L (2.6GHz/8-core/20MB/115W) FIO 2-processor Kit	679110-L21
	HP BL660c Gen8 Intel® Xeon® E5-4640 (2.4GHz/8-core/20MB/95W) FIO 2-processor Kit	679100-L21
	HP BL660c Gen8 Intel® Xeon® E5-4620 (2.2GHz/8-core/16MB/95W) FIO 2-processor Kit	679102-L21
	<b>Six-Core Processors</b>	
	HP BL660c Gen8 Intel® Xeon® E5-4617 (2.9GHz/6-core/15MB/130W) FIO 2-processor Kit	679112-L21
	HP BL660c Gen8 Intel® Xeon® E5-4610 (2.4GHz/6-core/15MB/95W) FIO 2-processor Kit	679104-L21
	HP BL660c Gen8 Intel® Xeon® E5-4607 (2.2GHz/6-core/12MB/95W) FIO 2-processor Kit	679106-L21

### Configuration Information - Factory Integrated Models

#### Four-Core Processors

HP BL660c Gen8 Intel® Xeon® E5-4603 (2.0GHz/4-core/10MB/95W) FIO 2-processor Kit 679108-L21

#### HP Memory

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

[http://h18000.www1.hp.com/products/quickspecs/14225\\_na/14225\\_na.html](http://h18000.www1.hp.com/products/quickspecs/14225_na/14225_na.html)

**NOTE:** LRDIMMs and RDIMMs are all distinct memory technologies and cannot be mixed within a server.

**NOTE:** A minimum of one DIMM is required per processor.

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

#### HP SmartMemory

##### Load Reduced DIMMs (LRDIMMs)

HP 32GB (1x32GB) Quad Rank x4 PC3L-10600L (DDR3-1333) Load Reduced CAS-9 Low Voltage Memory Kit 647903-B21

##### Registered DIMMs (RDIMMs)

HP 16GB (1x16GB) Dual Rank x4 PC3-12800R (DDR3-1600) Registered CAS-11 Memory Kit 672631-B21

HP 8GB (1x8GB) Dual Rank x4 PC3-12800R (DDR3-1600) Registered CAS-11 Memory Kit 690802-B21

HP 8GB (1x8GB) Single Rank x4 PC3-12800R (DDR3-1600) Registered CAS-11 Memory Kit 647899-B21

HP 4GB (1x4GB) Single Rank x4 PC3-12800R (DDR3-1600) Registered CAS-11 Memory Kit 647895-B21

HP 16GB (1x16GB) Dual Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit 647901-B21

HP 8GB (1x8GB) Dual Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit 647897-B21

HP 4GB (1x4GB) Single Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit 647893-B21

**NOTE:** Depending on the memory configuration and processor model, 1600MHz and 1333MHz memory may operate at a lower speed. Please see the "Memory" section later in this document and the Online Memory Configuration Tool for details at [www.hp.com/go/ddr3memory-configurator](http://www.hp.com/go/ddr3memory-configurator).

#### HP Networking

#### FlexibleLOM Adapters

**NOTE:** The ProLiant BL660c Gen8 supports one or two FlexibleLOMs, which must be identical.

**NOTE:** For a single FlexibleLOM Factory Integrated Model configuration, select the option here in the "Step 2" HP Networking section.

**NOTE:** For a two FlexibleLOM Factory Integrated Model configuration, the second FlexibleLOM (although same technology) is a different part number. When two FlexibleLOMs are needed you must select the first FlexibleLOM here in the "Step 2" HP Networking section and the second FlexibleLOM from "Step 4" HP Networking section.

**NOTE:** All FlexibleLOMs are dual port: one port is routed to interconnect module bay 1 and the other to bay 2.

#### 10GbE Ethernet FlexibleLOMs

### Configuration Information - Factory Integrated Models

HP Flex-10 10Gb 2-port 530FLB FIO Adapter	684211-B21
HP FlexFabric 10Gb 2-port 554FLB FIO Adapter	684212-B21
HP Ethernet 10Gb 2-port 560FLB FIO Adapter	684214-B21

#### HP Storage Controllers

#### Optional Upgrades

HP 512MB FBWC for BL660c FIO kit	694033-B21
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**NOTE:** Please see the Smart Array Advanced Pack 2.0 QuickSpecs for Technical Specifications and additional information at [http://h18000.www1.hp.com/products/quickspecs/13200\\_na/13200\\_na.html](http://h18000.www1.hp.com/products/quickspecs/13200_na/13200_na.html). (Smart Array Advanced Pack)

### Step 3: Choose Additional Factory Integration Options

<b>HP Insight Software</b>	HP Insight Control including 1yr 24x7 Support ProLiant ML/DL/BL-bundle Single Server FIO License	582765-B21
	HP Insight Control for Linux including 1yr 24x7 Support ML/DL Bundle 1 Server FIO License	TC203A

### Step 4: Choose Additional Options for Factory Integration

**NOTE:** 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://h18000.www1.hp.com/products/quickspecs/12790\\_div/12790\\_div.html](http://h18000.www1.hp.com/products/quickspecs/12790_div/12790_div.html)  
**NOTE:** The ProLiant BL660c Gen8 requires the c3000 Enclosure to be configured with 6 fans.
- HP BladeSystem c7000 Enclosure QuickSpecs:  
[http://h18000.www1.hp.com/products/quickspecs/12810\\_div/12810\\_div.html](http://h18000.www1.hp.com/products/quickspecs/12810_div/12810_div.html)  
**NOTE:** The ProLiant BL660c Gen8 requires the c7000 Enclosure to be configured with 10 fans.
- 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>

### Core Options

#### HP Networking

##### 10Gb Ethernet Mezzanines

**NOTE:** All 10Gb Ethernet adapters are Type A mezzanine cards that can be installed in any of the BL660c Gen8 mezzanine slots.

**NOTE:** Each 10 Gigabit Ethernet adapter requires a minimum of 2GB of server memory.

**NOTE:** A 10 Gigabit Ethernet adapter supports linking at 1Gbps or 10Gbps when connected to an interconnect module with 10Gb Ethernet downlinks.

**NOTE:** A 10 Gigabit Ethernet adapter supports linking at only 1Gbps when connected to an interconnect module with 1Gb Ethernet downlinks.

**NOTE:** The 10 Gigabit Ethernet adapters on each server blade connect to a 10Gb interconnect in bays 3-6 (HP BladeSystem c7000 Enclosure) or bays 2-4 (HP BladeSystem c3000 Enclosure).

HP FlexFabric 10Gb 2-port 554M Adapter

647590-B21

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

[http://h18000.www1.hp.com/products/quickspecs/14221\\_na/14221\\_na.html](http://h18000.www1.hp.com/products/quickspecs/14221_na/14221_na.html).

HP Flex-10 10Gb 2-port 552M Adapter

674764-B21

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

[http://h18000.www1.hp.com/products/quickspecs/14218\\_na/14218\\_na.html](http://h18000.www1.hp.com/products/quickspecs/14218_na/14218_na.html).

##### 1Gb Ethernet Mezzanines

**NOTE:** All 1Gb Ethernet adapters are Type A mezzanine cards that can be installed in any of the BL660c Gen8 mezzanine slots.

HP Ethernet 1Gb 4-port 366M Adapter

615729-B21

##### 10Gb Ethernet FlexibleLOM Adapters

**NOTE:** The server supports one or two FlexibleLOMs, which must be identical.

**NOTE:** For Pre-configured Model configurations, two FlexibleLOMs are already included; no additional FlexibleLOMs are added.

**NOTE:** For a Factory Integrated Model configuration with one FlexibleLOM, it is added in the HP Networking section of "Step 2" in the Factory Integrated Models section earlier in this document; it is not added here.

**NOTE:** For a Factory Integrated Model configuration with two FlexibleLOMs, the second FlexibleLOM (although same technology) is a different part number. You must select the first FlexibleLOM earlier in this document in the "Step 2" HP Networking section and select the second FlexibleLOM here in the "Step 4" HP Networking section.

**NOTE:** The FlexibleLOMs here can also be used change the FlexibleLOM(s) that original came with the server.

**NOTE:** All FlexibleLOMs are dual port: one port is routed to interconnect module bay 1 and the other to bay 2.

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

656590-B21

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

[http://h18000.www1.hp.com/products/quickspecs/14216\\_na/14216\\_na.html](http://h18000.www1.hp.com/products/quickspecs/14216_na/14216_na.html).

HP FlexFabric 10Gb 2-port 554FLB Adapter

647586-B21

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

[http://h18000.www1.hp.com/products/quickspecs/14219\\_na/14219\\_na.html](http://h18000.www1.hp.com/products/quickspecs/14219_na/14219_na.html).

HP Ethernet 10Gb 2-port 560FLB Adapter

655639-B21

### Core Options

**NOTE:** Please see QuickSpecs for technical specifications and additional information at: [http://h18000.www1.hp.com/products/quickspecs/14331\\_na/14331\\_na.html](http://h18000.www1.hp.com/products/quickspecs/14331_na/14331_na.html).

#### 1Gb Ethernet FlexibleLOM Adapters

**NOTE:** The server supports one or two FlexibleLOMs. Two are already included in the Pre-configured Models and the first one is added per Step 2 for Factory Integrated Models. The 1GbE FlexibleLOM option below is used to change the original 10Gb FlexibleLOM(s) that originally came with the server.

**NOTE:** For a two FlexibleLOM configuration, the two FlexibleLOMs must be identical.

HP Ethernet 1Gb 2-port 361FLB Adapter 652500-B21

**NOTE:** Please see QuickSpecs for technical specifications and additional information at: [http://h18000.www1.hp.com/products/quickspecs/14333\\_na/14333\\_na.html](http://h18000.www1.hp.com/products/quickspecs/14333_na/14333_na.html)

### HP Fibre Channel

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

**NOTE:** This is a Type A mezzanine card that can be installed in any of the BL660c Gen8 mezzanine slots.

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

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

**NOTE:** This is a Type A mezzanine card that can be installed in any of the BL660c Gen8 mezzanine slots.

**NOTE:** Please see QuickSpecs for technical specifications and additional information at [http://h18000.www1.hp.com/products/quickspecs/14230\\_na/14230\\_na.html](http://h18000.www1.hp.com/products/quickspecs/14230_na/14230_na.html)

### HP Processors

**NOTE:** The BL660c Gen8 supports two or four processors; one and three processor configurations are not supported.

**NOTE:** All processor kits contain two (2) processors.

**NOTE:** All processors within the server must be identical.

**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.

#### Eight-Core Processors

HP BL660c Gen8 Intel® Xeon® E5-4650 (2.7GHz/8-core/20MB/130W) 2-processor Kit 679098-B21

HP BL660c Gen8 Intel® Xeon® E5-4650L (2.6GHz/8-core/20MB/115W) 2-processor Kit 679110-B21

HP BL660c Gen8 Intel® Xeon® E5-4640 (2.4GHz/8-core/20MB/95W) 2-processor Kit 679100-B21

HP BL660c Gen8 Intel® Xeon® E5-4620 (2.2GHz/8-core/16MB/95W) 2-processor Kit 679102-B21

#### Six-Core Processors

HP BL660c Gen8 Intel® Xeon® E5-4617 (2.9GHz/6-core/15MB/130W) 2-processor Kit 679112-B21

HP BL660c Gen8 Intel® Xeon® E5-4610 (2.4GHz/6-core/15MB/95W) 2-processor Kit 679104-B21

HP BL660c Gen8 Intel® Xeon® E5-4607 (2.2GHz/6-core/12MB/95W) 2-processor Kit 679106-B21

#### Four-Core Processors

HP BL660c Gen8 Intel® Xeon® E5-4603 (2.0GHz/4-core/10MB/95W) 2-processor Kit 679108-B21

### Core Options

#### HP Memory

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

[http://h18000.www1.hp.com/products/quickspecs/14225\\_div/14225\\_div.html](http://h18000.www1.hp.com/products/quickspecs/14225_div/14225_div.html)

**NOTE:** LRDIMMs and RDIMMs are all distinct memory technologies and cannot be mixed within a server.

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

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

#### HP SmartMemory

##### Load Reduced DIMMs (LRDIMMs)

HP 32GB (1x32GB) Quad Rank x4 PC3L-10600L (DDR3-1333) Load Reduced CAS-9 Low Voltage Memory Kit 647903-B21

##### Registered DIMMs (RDIMMs)

HP 16GB (1x16GB) Dual Rank x4 PC3-12800R (DDR3-1600) Registered CAS-11 Memory Kit 672631-B21

HP 8GB (1x8GB) Dual Rank x4 PC3-12800R (DDR3-1600) Registered CAS-11 Memory Kit 690802-B21

HP 8GB (1x8GB) Single Rank x4 PC3-12800R (DDR3-1600) Registered CAS-11 Memory Kit 647899-B21

HP 4GB (1x4GB) Single Rank x4 PC3-12800R (DDR3-1600) Registered CAS-11 Memory Kit 647895-B21

HP 16GB (1x16GB) Dual Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit 647901-B21

HP 8GB (1x8GB) Dual Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit 647897-B21

HP 4GB (1x4GB) Single Rank x4 PC3L-10600R (DDR3-1333) Registered CAS-9 Low Voltage Memory Kit 647893-B21

#### HP Hard Drives

**NOTE:** The ProLiant BL660c Gen8 server includes the new HP hot-plug small form factor (SFF) SmartDrive carrier for enhanced management and reduced maintenance errors. HP drives from previous generation servers are not compatible with the BL660c Gen8 drive bays.

**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.

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

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

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

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

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

HP 300GB 6G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive 652564-B21

HP 300GB 6G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive 652611-B21



### Core Options

HP 146GB 6G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652605-B21
<b>SAS Hot Plug SmartDrive SFF (2.5-inch) Midline Drives</b>	
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
<b>NOTE:</b> Please see QuickSpecs for technical specifications and additional information at <a href="http://h18000.www1.hp.com/products/quickspecs/12244_na/12244_na.html">http://h18000.www1.hp.com/products/quickspecs/12244_na/12244_na.html</a> .	
<b>6G SATA Hot Plug with SmartDrive SFF (2.5-inch) Midline (MDL) Drives</b>	
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
<b>NOTE:</b> Please see the QuickSpecs for technical specifications and additional information at <a href="http://h18000.www1.hp.com/products/quickspecs/13021_na/13021_na.html">http://h18000.www1.hp.com/products/quickspecs/13021_na/13021_na.html</a> .	
<b>3G SATA MLC Hot Plug SFF (2.5-inch) Enterprise Mainstream Solid State Drives</b>	
HP 400GB 3G SATA MLC SFF (2.5-inch) SC Enterprise Mainstream 3yr Warranty Solid State Drive	653120-B21
HP 200GB 3G SATA MLC SFF (2.5-inch) SC Enterprise Mainstream 3yr Warranty Solid State Drive	653118-B21
HP 100GB 3G SATA MLC SFF (2.5-inch) SC Enterprise Mainstream 3yr Warranty Solid State Drive	653112-B21
<b>6G SAS MLC Hot Plug SFF (2.5-inch) Enterprise Mainstream Solid State Drives</b>	
HP 800GB 6G SAS MLC SFF (2.5-inch) SC Enterprise Mainstream 3yr Warranty Solid State Drive	653109-B21
HP 400GB 6G SAS MLC SFF (2.5-inch) SC Enterprise Mainstream 3yr Warranty Solid State Drive	653105-B21
HP 200GB 6G SAS MLC SFF (2.5-inch) SC Enterprise Mainstream 3yr Warranty Solid State Drive	658478-B21
<b>6G SAS SLC Hot Plug SFF (2.5-inch) Enterprise Performance Solid State Drives</b>	
HP 400GB 6G SAS SLC SFF (2.5-inch) SC Enterprise Performance 3yr Warranty Solid State Drive	653082-B21
HP 200GB 6G SAS SLC SFF (2.5-inch) SC Enterprise Performance 3yr Warranty Solid State Drive	653078-B21
<b>NOTE:</b> Please see the QuickSpecs for technical specifications and information at <a href="http://h18000.www1.hp.com/products/quickspecs/14038_na/14038_na.html">http://h18000.www1.hp.com/products/quickspecs/14038_na/14038_na.html</a> .	

### Additional Options

#### HP Insight Software

#### HP Insight Control

HP Insight Control including 1yr 24x7 Technical Support and Updates Electronic License T9074BAE

HP Insight Control including 1yr 24x7 Support ProLiant ML/DL/BL-bundle Electronic License TC278AAE

HP Insight Control including 1yr 24x7 Technical Support and Updates Single Server License 452148-B22

HP Insight Management Media Kit 436222-B21

**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:** Electronic software is available in all countries except China and Japan. Customers in China and Japan should order the physical equivalent.

**NOTE:** Customer will receive a license entitlement certificate. The license entitlement certificate 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 and Update 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 options please see the Insight Control QuickSpecs at: [http://h18000.www1.hp.com/products/quickspecs/12631\\_na/12631\\_na.html](http://h18000.www1.hp.com/products/quickspecs/12631_na/12631_na.html)

#### HP Insight Control for Linux

HP Insight Control for Linux w/1yr 24x7 Supp ML/DL/SL Bundle Electronic 1 Svr LTU TC203AAE

HP Insight Control for Linux including 1yr 24x7 Support Electronic License TC213AAE

**NOTE:** This part number can be purchased as a single license or as multiple licenses with a single activation key. Customer will receive a license entitlement certificate via e-mail. The license entitlement certificate 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 and Update Service.

**NOTE:** Electronic LTUs are only available through limited points of sales; if not available, order a printed license entitlement certificate instead.

HP Insight Control for Linux including 1yr 24x7 Support Single Server License TC209A

HP Insight Control for Linux Media Kit TC208A

**NOTE:** This optional Media pack DVD contains the ISO image for HP Insight Control for Linux, HP Systems Insight Manager, HP Insight Control power management, HP Insight Control virtual machine management, and an integrated installer. Servers must be acquired separately.

**NOTE:** This Media pack is optional because the latest ISO image and latest updates may be downloaded at no cost from <http://www.hp.com/go/ic-linux> (click on the Download button).

**NOTE:** Licenses ship without media. The Media Kit for Insight Control for Linux can be ordered separately, or can be downloaded at <http://www.hp.com/go/ic-linux> (click on Download button).

**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

### Additional Options

x 7 HP Software Technical Support Service.

**NOTE:** For additional license kits, please see the QuickSpecs at

[http://h18000.www1.hp.com/products/quickspecs/13019\\_na/13019\\_na.html](http://h18000.www1.hp.com/products/quickspecs/13019_na/13019_na.html)

#### HP Insight Control server deployment

HP Insight Control Server Deployment including 1yr 24x7 Support Electronic License

T9082AAE

HP Insight Control Server Deployment including 1yr 24x7 Support Single Server License

452151-B21

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

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

**NOTE:** For additional license kits please see the Insight Control QuickSpecs at

[http://h18004.www1.hp.com/products/quickspecs/12631\\_na/12631\\_na.html](http://h18004.www1.hp.com/products/quickspecs/12631_na/12631_na.html).

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#### HP iLO Advanced License HP Integrated Lights-Out (iLO) Advanced for ProLiant BladeSystem Remote Management

HP iLO Advanced Blade Electronic License with 3yr 24x7 Tech Support and Updates

BD503AAE

HP iLO Advanced Blade 1 Server License with 3yr 24x7 Tech Support and Updates

BD502A

HP iLO Advanced for BladeSystem including 1yr 24x7 Support Electronic License

TA851AAE

HP iLO Advanced for BladeSystem including 1yr 24x7 Support Single Server License

512488-B21

**NOTE:** Licenses ship without media. The Media Kit for Insight Control for Linux can be ordered separately, or can be downloaded at <http://www.hp.com/go/insightupdates>.

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

**NOTE:** For additional license kits, including electronic delivery options, please see the iLO QuickSpecs at <http://www.hp.com/go/iLO>

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#### 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

BD476A

**NOTE:** These part numbers can be used to purchase one certificate for multiple licenses and support with a single activation key. Each license is for one node (server). Customer will receive a printed end user license agreement and license entitlement certificate via physical shipment. The license entitlement certificate must be redeemed online in order to obtain a license key. Customer also will receive a support agreement.

HP Insight Cluster Management Utility Media

BD477A

**NOTE:** For additional license kits please see the QuickSpecs at

[http://h18004.www1.hp.com/products/quickspecs/12612\\_div/12612\\_div.html](http://h18004.www1.hp.com/products/quickspecs/12612_div/12612_div.html).

##### HP HPC Linux Value Pack

HP High Performance Computing Linux Value Pack 1 Processor Flexible License

TC293B

**NOTE:** This part number can be used to purchase one certificate for multiple licenses with a single activation key. Each license is for one socket (a.k.a. processor). 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

### Additional Options

to obtain a license key.

**NOTE:** For additional license kits please see the QuickSpecs at [http://h18004.www1.hp.com/products/quickspecs/13485\\_div/13485\\_div.html](http://h18004.www1.hp.com/products/quickspecs/13485_div/13485_div.html).

HP High Performance Computing Linux Value Pack Media Kit

TC294A

**NOTE:** This part number can be used to purchase media including software and documentation, which will be delivered to the customer.

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### HP I/O Accelerator Options

**NOTE:** The HP I/O Accelerator Options are Type B mezzanine cards that can be installed in BL660c Gen8 mezzanine slots 2 and 3.

HP 1.2TB Multi Level Cell IO Accelerator for BladeSystem c-Class

QK763A

HP 785GB Multi Level Cell IO Accelerator for BladeSystem c-Class

QK762A

HP 365GB Multi Level Cell IO Accelerator for BladeSystem c-Class

QK761A

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### HP Security

HP Trusted Platform Module Option

488069-B21

**NOTE:** The TPM (Trusted Platform Module) is a microcontroller chip that can securely store artifacts used to authenticate the server platform. These artifacts can include passwords, certificates and encryption keys. Windows® BitLocker™ Drive Encryption (BitLocker) is a data protection feature available in Windows Server® 2008. BitLocker leverages the enhanced security capabilities of a Trusted Platform Module (TPM) version 1.2. The TPM works with BitLocker to help protect user data and to ensure that a server running Windows Server 2008 has not been tampered with while the system was offline.

**NOTE:** For more information about TPM, including a white paper, go to <http://www.hp.com/go/TPM>.

**NOTE:** ProLiant OS pre-installed units will come with the partition required for TPM deployment.

**NOTE:** The TPM key is unique to every TPM deployed server and must be retained. Misplacing or losing the key could result in data loss.

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### HP Storage Controller

#### HP Smart Array P721m Controller

**NOTE:** The HP Smart Array P721m Controller is a Type B mezzanine card that can be installed in BL660c Gen8 mezzanine slots 2 and 3.

**NOTE:** The BL660 has three installation locations for the "capacitor pack" that comes with the FBWC on Smart Array controllers. The first install location is for the embedded Smart Array P220i Controller. The second install location is for an optional Smart Array controller Type A or B mezzanine card with FBWC installed in mezzanine slot 3. The third install location is for an optional Smart Array controller mezzanine card with FBWC installed in either mezzanine slot 1 (Type A only) or slot 2 (Type A or B).

HP Smart Array P721m/2G FBWC 4-ports Ext Mezzanine SAS Controller

650072-B21

HP Smart Array P721m/512 4-ports Ext Mezzanine SAS Controller

655636-B21

#### HP P220i Smart Array Controller Optional Upgrades

HP Smart Array Advanced Pack 2.0 No Media 1 Server 1yr 24x7 Support Software

BC377A

HP Smart Array Advanced Pack 2.0 No Media Electronic Lic 1yr 24x7 Support Software

BC390AAE

**NOTE:** Please see the Smart Array Advanced Pack QuickSpecs for Technical Specifications and additional information at

### Additional Options

[http://h18000.www1.hp.com/products/quickspecs/14404\\_na/14404\\_na.html](http://h18000.www1.hp.com/products/quickspecs/14404_na/14404_na.html)  
(Smart Array P721M Controller)  
[http://h18000.www1.hp.com/products/quickspecs/13200\\_na/13200\\_na.html](http://h18000.www1.hp.com/products/quickspecs/13200_na/13200_na.html)  
(Smart Array Advanced Pack)

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<b>HP InfiniBand Mezzanines</b>	<p><b>NOTE:</b> 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.</p> <p><b>NOTE:</b> 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: <a href="http://h18004.www1.hp.com/products/quickspecs/12586_na/12586_na.html">http://h18004.www1.hp.com/products/quickspecs/12586_na/12586_na.html</a> <a href="http://h18000.www1.hp.com/products/quickspecs/13078_na/13078_na.html">http://h18000.www1.hp.com/products/quickspecs/13078_na/13078_na.html</a></p>	
	HP QDR/EN InfiniBand 10Gb Dual Port 544M Adapter	644160-B21
	<b>NOTE:</b> The QDR InfiniBand adapter may be installed in any mezzanine slot of the server.	
	HP FDR/EN InfiniBand 10/40Gb Dual Port 544M Adapter	644161-B21
	<b>NOT:</b> 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.	

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<b>HP Ultrium Tape Blades</b>	HP LTO-4 SB1760c Tape Blade	AQ697B
	<b>NOTE:</b> LTO-4 Ultrium tape technology.	
	HP LTO-5 SB3000c Tape Blade	BS580B
	<b>NOTE:</b> LTO-5 Ultrium tape technology.	
	<b>NOTE:</b> The ProLiant BL660c Gen8 supports up to two expansion blades (Ultrium Tape Blade(s), HP D2200sb Storage Blade(s), and/or PCI Expansion Blade(s) ) that directly connect to the server via the enclosure midplane.	
	<b>NOTE:</b> For the above Ultrium tape drives, please see the QuickSpecs for technical specifications and additional information at: <a href="http://h18000.www1.hp.com/products/quickspecs/12729_na/12729_na.html">http://h18000.www1.hp.com/products/quickspecs/12729_na/12729_na.html</a>	

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<b>HP Storage Blades</b>	HP D2200sb Storage Blade	AP880A
	<b>NOTE:</b> The ProLiant BL660c Gen8 supports up to two expansion blades (Ultrium Tape Blade(s), HP D2200sb Storage Blade(s), and/or PCI Expansion Blade(s) that directly connect to the server via the enclosure midplane	
	<b>NOTE:</b> Please see the QuickSpecs for technical specifications and additional information at <a href="http://h18006.www1.hp.com/storage/bladessystem/index.html">http://h18006.www1.hp.com/storage/bladessystem/index.html</a>	

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### Additional Options

<b>HP Expansion Blade</b>	<p>HP Expansion Blade HP BLc PCI Expansion Blade</p> <p><b>NOTE:</b> The PCI Expansion Blade provides PCI card slots for an adjacent c-Class Server Blade.</p> <p><b>NOTE:</b> The ProLiant BL660c Gen8 supports up to two expansion blades (Ultrium Tape Blade(s), HP D2200sb Storage Blade(s), and/or PCI Expansion Blade(s) that directly connect to the server via the enclosure midplane.</p> <p><b>NOTE:</b> The PCI Expansion Blade ships with one pre-installed PCI-X connect board. Also includes one PCIe connect board which requires installation.</p> <p><b>NOTE:</b> Please see the QuickSpecs for technical specifications and additional information at <a href="http://h18000.www1.hp.com/products/quickspecs/12753_div/12753_div.html">http://h18000.www1.hp.com/products/quickspecs/12753_div/12753_div.html</a></p>	448018-B21
<b>HP USB and SD Options</b>	<p>HP 2GB USB Flash Media Drive Key Kit</p> <p><b>NOTE:</b> HP qualified blank USB key for use with HP ProLiant servers that support the VMware virtualization environment. HP value-add software like SmartStart. HP recommends this industry standard USB flash device for use with VMware ESXi. USB device must be installed in the internal slot of the ProLiant server for use with VMware ESXi. Refer to HP VMware Getting Started Guide for installation instructions.</p> <p>HP 4GB MicroSDHC Flash Media Kit</p> <p><b>NOTE:</b> The USB flash media and Secure Digital cards are for integrated hypervisor virtualization environments needing a low cost boot solution with the highest performance and reliability. Learn more at <a href="http://h18004.www1.hp.com/products/servers/options/flash_drives.html">http://h18004.www1.hp.com/products/servers/options/flash_drives.html</a>.</p>	608447-B21 647444-B21
<b>HP Care Pack Services</b>	<p><b>NOTE:</b> The HP Care Pack service part numbers below for ProLiant BL c-Class server blades, cover the server blade and all HP branded hardware options qualified for the server, purchased at the same time or afterwards, internal to the server.</p> <p>HP 3 year 6 hour Call To Repair 24x7 ProLiant BL6xxc Proactive Care Service</p> <p>HP 3 year 4 hour 24x7 ProLiant BL6xxc Proactive Care Service</p> <p>HP 3 year 4 hour 24x7 ProLiant BL6xxc Collaborative Support</p>	U3B38E U3B32E U1L12E

### Memory

For detailed memory configuration rules and guidelines, please use the Online DDR3 Memory Configuration Tool:

[www.hp.com/go/ddr3memory-configurator](http://www.hp.com/go/ddr3memory-configurator)

#### Memory Subsystem Architecture

Each Intel® Xeon® E5-4600 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 thirty-two (32) DIMMs for the server. Up to 32GB capacity DIMMs are supported for 1.0TB of memory (32 DIMM slots x 32GB per DIMM).

#### Memory Population Rules and Guidelines:

- A minimum of one DIMM is required per processor.
- Install DIMMs only if the corresponding processor is installed.
- DIMM slots attached to each processor socket are only available if a processor is installed in that socket.
- DIMM sizes can be mixed in channel. To maximize performance, it is recommended to balance the total memory capacity between all installed processors and to load the channels similarly whenever possible.
- RDIMMs operating at either 1.35V or 1.5V may be mixed in any order, but the system will power them at the higher voltage.
- LRDIMMs and RDIMMs are distinct memory technologies and cannot be mixed within a server.
- 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 BL660c Gen8 Server Blade.
- To realize the performance memory capabilities listed in this document, HP SmartMemory is required. For additional information, please see the HP SmartMemory QuickSpecs at: [http://h18000.www1.hp.com/products/quickspecs/14225\\_div/14225\\_div.html](http://h18000.www1.hp.com/products/quickspecs/14225_div/14225_div.html).
- For memory population rules and additional memory guidelines, please see the BL660c Gen8 user guide at <http://www.hp.com/support>.

BL660c Gen8 Supported Memory Bandwidth								
DIMM Type	Registered DIMMS (RDIMMs)							Load Reduced (LRDIMMs)
DIMM Rank	Single Rank (1R)			Dual Rank (2R)				Quad Rank (4R)
DIMM Capacity	4GB	4GB	8GB	8GB	8GB	16GB	16GB	32GB
DIMM Native Speed (MHz)	1333	1600	1600	1333	1600	1333	1600	1333
Voltage*	LV	Std	Std	LV	Std	LV	Std	LV
* LV= low voltage at 1.35V; Std = standard voltage at 1.5V.								
Slots That Can Be Populated	32	32	32	32	32	32	32	32
Maximum Capacity (GB)	128	128	256	256	256	512	512	1024
Populated DIMM Speed (MHz)								
1 DIMM Per Channel	1333	1600	1600	1333	1600	1333	1600	1333
2 DIMM Per Channel	1333**	1600	1600	1333**	1600	1333**	1600	1333**

### Memory

\*\* Using HP SmartMemory, 1333MHz RDIMM operate at 1.35V for 2 DIMMs per channel (2DPC). Third party 1333MHz RDIMM memory may only support 1.5V at 2DPC.

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

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### Memory

#### Memory Speed by Processor Model

##### Processor Models

E5-4650, E5-4650L, E5-4640, E5-4617

E5-4620, E5-4617, E5-4610, E5-4607

E5-4603, E5-4607

##### Supported Memory Speeds

1600/1333/1066MHz

1333/1066MHz

1066MHz

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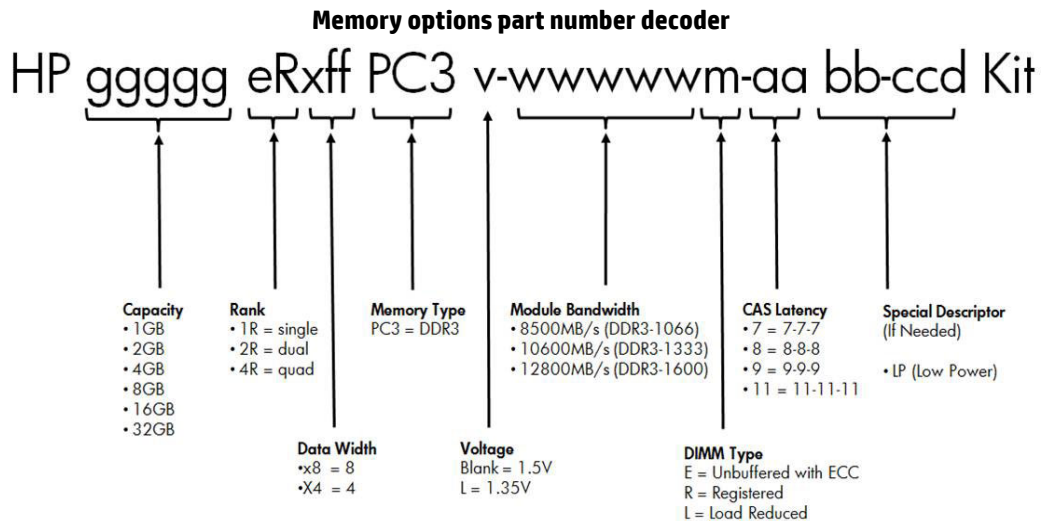
### Memory

#### Standard and Maximum Memory Capacity (Pre-configured Models)

Pre Configured Models	Standard Memory	Maximum Memory Plus Optional Memory	Standard Memory Replaced with Optional Memory
Intel Xeon E5-4650, E5-4620, and E5-4617	128GB (16x 8GB)	384GB (16x 8GB + 16x 16GB)	1024GB (32x 32GB)

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

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



Following are memory options available from HP:

#### HP Memory

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

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

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

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

#### HP SmartMemory

##### Load Reduced DIMMs (LRDIMMs)

HP 32GB (1x32GB) Quad Rank x4 PC3L-10600L (DDR3-1333) Load Reduced CAS-9 Low Voltage Memory Kit

647903-B21

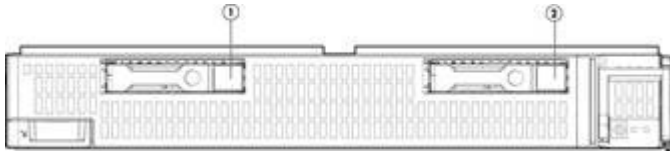
##### Registered DIMMs (RDIMMs)

### Memory

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

**NOTE:** Depending on the memory configuration and processor model, 1600MHz and 1333MHz memory may operate at a lower speed. Please see the "Memory" section later in this document and the Online Memory Configuration Tool for details at [www.hp.com/go/ddr3memory-configurator](http://www.hp.com/go/ddr3memory-configurator).

### Storage



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

#### Hard Drives

**NOTE:** The ProLiant BL660c Gen8 server includes the new HP hot-plug small form factor (SFF) SmartDrive carrier for enhanced management and reduced maintenance errors. HP drives from previous generation servers are not compatible with the BL660c Gen8 drive bays.

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

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

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

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

	Quantity Supported	Position Supported	Controller
900GB 6G SAS 10K	2	1-2	HP Smart Array P220i Controller
600GB 6G SAS 10K			
450GB 6G SAS 10K			
300GB 6G SAS 10K			
300GB 6G SAS 15K			
146GB 6G SAS 15K			

#### SAS Hot Plug SmartDrive SFF (2.5-inch) Midline Drives

	Quantity Supported	Position Supported	Controller
1TB 6G SAS 7.2K	2	1-2	HP Smart Array P220i Controller
500GB 6G SAS 7.2K			

#### 6G SATA Hot Plug with SmartDrive SFF (2.5-inch) Midline Drives

	Quantity Supported	Position Supported	Controller
1TB 6G SAS 7.2K	2	1-2	HP Smart Array P220i Controller
500GB 6G SAS 7.2K			

#### 3G SATA MLC Hot Plug SFF (2.5-inch) Enterprise Mainstream Solid State Drives

	Quantity Supported	Position Supported	Controller
400GB 3G SATA MLC	2	1-2	HP Smart Array P220i Controller
200GB 3G SATA MLC			
100GB 3G SATA MLC			

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

	Quantity Supported	Position Supported	Controller

### Storage

400GB 6G SAS SLC 200GB 6G SAS SLC	2	1-2	HP Smart Array P220i Controller
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#### **6G SAS MLC Hot Plug SFF (2.5-inch) Enterprise Mainstream Solid State Drives**

	<b>Quantity Supported</b>	<b>Position Supported</b>	<b>Controller</b>
800GB 6G SAS MLC 400GB 6G SAS MLC 200GB 6G SAS MLC	2	1-2	HP Smart Array P220i Controller

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### Technical Specifications

<b>System Unit</b>	<b>Dimensions</b> (H x W x D) (with bezel)	366.27mm (14.42") x 56.54mm (2.23") x 516.67mm (20.34")
	<b>Weight</b> (approximate)	<p>Maximum: 4 processors, 2 FlexibleLOMs, 32 DIMMs, 2 hard drives, 3 mezzanine cards, and 2 flash cache batteries installed 27.1 lb (12.3 kg)</p> <p>Minimum: 2 processors, 1 FlexibleLOM, and 2 DIMMs installed 20.2 lb (9.2 kg)</p>
	<b>Power Specifications</b>	<p>For power specifications including input requirements, BTU rating, and power supply output, please see the:</p> <ul style="list-style-type: none"> <li>● HP BladeSystem c3000 Enclosure QuickSpecs at <a href="http://h18000.www1.hp.com/products/quickspecs/12790_na/12790_na.html">http://h18000.www1.hp.com/products/quickspecs/12790_na/12790_na.html</a> <b>NOTE:</b> The ProLiant BL660c Gen8 requires the c3000 Enclosure to be configured with 6 fans.</li> <li>● HP BladeSystem c7000 Enclosure QuickSpecs at <a href="http://h18000.www1.hp.com/products/quickspecs/12810_na/12810_na.html">http://h18000.www1.hp.com/products/quickspecs/12810_na/12810_na.html</a> <b>NOTE:</b> The ProLiant BL660c Gen8 requires the c7000 Enclosure to be configured with 10 fans.</li> </ul> <p>To review typical system power ratings use the HP Power Advisor which is available via the online tool located at <a href="http://www.hp.com/go/hppoweradvisor">www.hp.com/go/hppoweradvisor</a>.</p>
	<b>System Inlet Temperature</b>	<p>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.</p> <p>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.</p>
	<b>Relative Humidity</b> (non-condensing)	<p>Non-operating -30° to 60°C (-22° to 140°F). Maximum rate of change is 20°C/hr (36°F/hr).</p> <p>Operating 10 to 90% relative humidity (Rh), 28°C (82.4°F) maximum wet bulb temperature, non-condensing.</p> <p>Non-operating 5 to 95% relative humidity (Rh), 38.7°C (101.7°F) maximum wet bulb temperature, non-condensing.</p>
	<b>Altitude</b>	<p>Operating 3,050 m (10,000 ft). This value may be limited by the type and number of options installed.</p>

### Technical Specifications

		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).
<b>Acoustic Noise</b>	For acoustic noise specifications, please see the HP BladeSystem c-Class Enclosures QuickSpecs located at: HP BladeSystem c3000 Enclosure QuickSpecs: <a href="http://h18000.www1.hp.com/products/quickspecs/12790_na/12790_na.html">http://h18000.www1.hp.com/products/quickspecs/12790_na/12790_na.html</a> HP BladeSystem c7000 Enclosure QuickSpecs: <a href="http://h18000.www1.hp.com/products/quickspecs/12810_na/12810_na.html">http://h18000.www1.hp.com/products/quickspecs/12810_na/12810_na.html</a>	
<b>HP Smart Array P220i Controller</b>	<b>Disk Drive Interface</b>	6G SAS (Serial Attached SCSI)
	<b>Server Interface</b>	x4 PCI Express host interface
	<b>Cache Memory Speed</b>	512MB flash backed write cache (FBWC) cache standard with Pre-configured Models and optional on Factory Integrated Models
	<b>Logical Drives Supported</b>	64 (with included 512MB cache)
	<b>Host Memory Addressing</b>	64-bit, supporting servers memory space greater than 4GB
	<b>RAID Support</b>	RAID 1 (mirroring) and RAID 0 (striping) <b>NOTE:</b> The FBWC is not required for RAID capability. The purpose of the cache is it can increase hard drive write performance and provides data protection in case the server losses power.
	<b>Other</b>	Upgradeable firmware with recovery ROM Online drive flash (with SAS drives)
<b>HP FlexFabric 10Gb 2-port 554FLB FlexibleLOM (Included with Pre-configured Models)</b>	<b>Type</b>	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)
	<b>Network Processor</b>	Emulex BE3
	<b>Data Transfer Method</b>	x8 PCI Express 2.0
	<b>Network Transfer Rate</b>	Two ports, each at 20Gbps full duplex; 40Gbps aggregate full duplex theoretical bandwidth <b>NOTE:</b> 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. <b>NOTE:</b> Each port on the 554FLB adapter transmits from the server at 20Gbps (theoretical) full duplex.
	<b>IEEE Compliance</b>	802.1p, 802.1q, 802.1qau, 802.3ad, 802.3ae, 802.3ap (10GBase-KX4) and 802.3x
	<b>Standard Features</b>	ProLiant Teaming including Network Fault Tolerance, Transmit Load Balancing, and Switch-Assisted Load Balancing 9K Jumbo frames (4K Jumbo frames when in FCoE mode) Microsoft Windows Receive Side Scaling (RSS) Hardware-based accelerated iSCSI iSCSI boot

### Technical Specifications

Flex-10 capability  
Fibre Channel over Ethernet (FCoE)  
TCP/IP offload engine (stateless TCP/IP)  
Autosensing 1Gb/10Gb Ethernet

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**Environment-friendly  
Products and Approach****End-of-life Management  
and Recycling**

Hewlett-Packard offers end-of-life HP product return, trade-in, and recycling programs in many geographic areas. For trade-in information, please go to: <http://www.hp.com/go/green>. To recycle your product, please go to: <http://www.hp.com/go/green> or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner.

The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard web site at: <http://www.hp.com/go/green>. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.

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