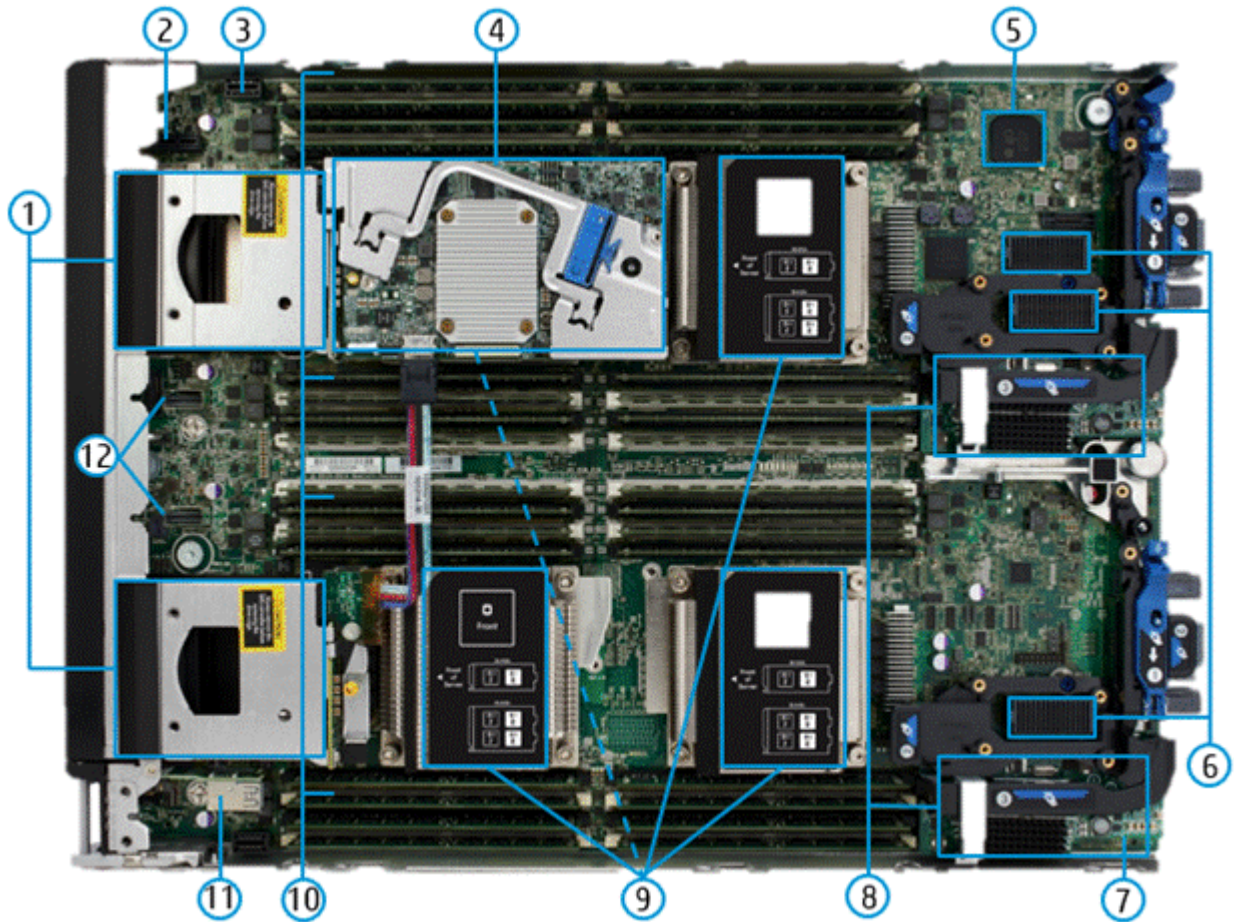


Overview



HP ProLiant BL660c Gen9 Server Blade – Internal View

- | | |
|---|--|
| 1. Four hot-plug drive bays | 7. Micro-SD slot |
| 2. M.2 Option Connector | 8. FlexibleLOM adapters |
| 3. HP BLc 12W Smart Storage Battery connector | 9. Two or Four Intel® Xeon® E5-4600 v3 family processors |
| 4. HP Smart Array P246br Controller with 1GB FBWC | 10. Thirty two DDR4 DIMM slots (8 per processor) |
| 5. iLO Management Engine | 11. USB 3.0 and TPM |
| 6. Mezzanine Slots (x16 PCI 3.0) | 12. Embedded SATA Connectors |

What's New

- Flexible Controller Options
- Support for 2133MHz DDR4 memory
- Support for 12Gb SAS internal hard drives and 12Gb SAS storage controller offerings
- 4 SFF drive bays
- Support for the Intel E5-4600 v3 Product Family

Standard Features

NOTE: This document covers the HP ProLiant BL660c Gen9 server blade only. For information on HP BladeSystem c-Class Enclosures and HP BladeSystem c-Class Interconnect and Mezzanine Components, please see the following: HP BladeSystem c-Class Enclosures QuickSpecs:

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

NOTE: For optimal cooling and system performance the BL660c Gen9 Server Blade requires the c7000 enclosure to be configured with 10 fans and the c3000 enclosure to be configured with 6 fans.

NOTE: For proper BladeSystem operation, the minimum required versions of HP Onboard Administrator and HP Virtual Connect are required and available via the HP Service Pack for ProLiant, please see <http://www.hp.com/go/spp/download>.

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

Processor

Two or four of the following depending on Model

E5-4600 v3 series Processors

HP BL660c Gen9 Intel® Xeon® E5-4610v3 (1.7GHz/10-core/25MB/105W)
HP BL660c Gen9 Intel® Xeon® E5-4620v3 (2.0GHz/10-core/25MB/105W)
HP BL660c Gen9 Intel® Xeon® E5-4640v3 (1.7GHz/12-core/30MB/105W)
HP BL660c Gen9 Intel® Xeon® E5-4650v3 (2.1GHz/12-core/30MB/105W)
HP BL660c Gen9 Intel® Xeon® E5-4660v3 (2.1Hz/14-core/35MB/120W)
HP BL660c Gen9 Intel® Xeon® E5-4669v3 (2.1GHz/18-core/45MB/135W)
HP BL660c Gen9 Intel® Xeon® E5-4667v3 (2.0GHz/16-core/40MB/135W)
HP BL660c Gen9 Intel® Xeon® E5-4627v3 (2.6GHz/10-core/45MB/135W)
HP BL660c Gen9 Intel® Xeon® E5-4655v3 (2.9GHz/6-core/30MB/135W)

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

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

NOTE: Supports 1 to 4 processors. Mixing different processor models is not supported.

NOTE: For the Intel® C610 Chipset E5-4600 v3 Series, the letter preceding the model number indicates the Product Line (E3, E5, E7); 4600x, 4 = number of CPUs in a Node, 6 is socket/segment designation, 00 = Processor SKU, and x = L for low power SKUs.

NOTE: All processors within the server must be identical.

NOTE: The processor model as well as the memory configuration determines the maximum speed memory can operate. Please see the "Memory" section later in this document.

Cache Memory

One of the following depending on Model

45MB (1x45MB) L3 cache

NOTE: E5-4627v3 and E5-2669v3 processors

40MB (1x40MB) L3 cache

NOTE: E5-4667v3 processor

35MB (1x35MB) L3 cache

NOTE: E5-4660v3 processor

30MB (1x30MB) L3 cache

NOTE: E5-4640v3, E5-4650v3, and E5-4655v3 processors

Standard Features

25MB (1x25MB) L3 cache
NOTE: E5-4610v3 and E5-4620v3 processors

Chipset

Intel® C610 Series Chipset
 Intel® E5-4600v3 Processor Family
NOTE: For more information regarding Intel chipsets, please see the following:
<http://www.intel.com/products/server/chipsets/>.

Upgradeability

Upgradeable to four (4) processors

On System Management Chipset

HP iLO (Firmware HP iLO4 2.0), 4GB NAND with 1GB USB user space configurable via UEFI and accessible via iLO. Read and learn more in the [iLO QuickSpecs](#).
NOTE: For more information, visit: <http://www.hp.com/go/ilo>

Memory Protection

Advanced ECC
 Memory Online Spare Mode (Rank Spare Mode)

Memory

One of the following depending on Model

Type	HP SmartMemory DDR4 Load Reduced (LRDIMM), or Registered (RDIMM)
Standard (Pre-configured Models)	128GB (4 x 32GB) DDR4 2133MHz RDIMMs at 1.2V 128GB (8 x 16GB) DDR4 2133MHz RDIMMs at 1.2V 64GB (4 x 16GB) DDR4 2133MHz RDIMMs at 1.2V
Maximum (LRDIMM)	2TB (32 x 64GB) up to 2133MHz at 1.2V
Maximum (RDIMM)	1TB (32 x 32GB) up to 2133MHz at 1.2V

NOTE: HP memory from previous generation servers (DDR3) is not compatible with this server. HP SmartMemory is required to realize the memory performance improvements and enhanced functionality listed in this document for Gen9. For additional information, please see the HP SmartMemory QuickSpecs at:

<http://www8.hp.com/h20195/v2/GetHTML.aspx?docname=c04111535>

NOTE: LRDIMM and RDIMM are distinct memory technologies and cannot be mixed within a server.
NOTE: Depending on the memory configuration and processor model, the memory speed may run at 2133MHz, 1866MHz, or 1600MHz. Please see Memory Population Table or the Online Memory Configuration Tool at: <http://h22195.www2.hp.com/MemoryTool/Home/Legal>

Network Controller

One of the following depending on Model

One (1) 20Gb 2-port FlexFabric FLB, 10Gb 2-port HP FlexFabric FLB, or 10Gb 2-port Ethernet FLB
NOTE: Supports FCoE, TCP/IP offload engine, hardware-based accelerated iSCSI, iSCSI boot, and autosensing 10Gb/1Gb Ethernet.

NOTE: Each port is autosensing the speed, and can interoperate with 1Gb HP BladeSystem c-Class interconnect components. Both ports will operate at the same speed.

NOTE: FlexFabric capabilities require the use of an HP Virtual Connect FlexFabric or Flex10/10D module module.

Fibre Channel over Ethernet (FCoE) is supported with HP interconnects. Learn more at:
<http://www.hp.com/go/ bladesystem/interconnects>

One (1) HP FlexFabric 10Gb 2-port 536FLB FlexibleLOM
 One (1) HP FlexFabric 20Gb 2-port 650FLB FlexibleLOM

NOTE: FlexibleLOMs are not compatible with prior generation c-Class server blades

Standard iLO Network Controller:

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

Expansion Slots

Three (3) I/O expansion mezzanine slots:

- x16 PCIe 3.0 Type A (supports Type A mezzanine cards) (expansion slot 1).

Standard Features

NOTE: This expansion slot supports dual-port mezzanine cards: one port is routed to interconnect module bay 3 and the other to bay 4.

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

NOTE: This expansion slot supports dual-port and quad-port mezzanine cards. For dual-port cards, one port is routed to interconnect module bay 5 and the other to bay 6 (or interconnect module bays 5 and 6 for mezz slot 3). For quad-port cards, one port is routed to interconnect module bay 5, one to bay 6, one to bay 7, and one to bay 8.

NOTE: Four processors must be installed to have access to the second expansion slot (expansion slot 2).

Mezzanine card options include:

- Dual-port 20Gb FlexFabric, Dual-port 10Gb FlexFabric, 10GbE options, and quad-port 1Gb Ethernet server adapter mezzanine options for additional network ports.
- Dual-port 16Gb Fibre Channel HBA for SAN connectivity.
- QDR and FDR InfiniBand for low latency and high bandwidth server interconnectivity.
- I/O accelerator mezzanine options for high transaction rate local storage

HP Server ROM

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

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

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

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

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

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

HP Server UEFI /Legacy ROM

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

NOTE: The UEFI System Utilities function is analogous to the HP ROM-Based Setup Utility (RBSU) of legacy BIOS. For more information, please visit <http://www.hp.com/go/proliantuefi/docs>

UEFI enables numerous new capabilities specific to HP ProLiant servers such as:

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

NOTE: For more information please visit <http://www.hp.com/go/proliant/uefi>

NOTE: For UEFI Boot Mode, boot environment and OS image installations should be configured properly to support UEFI.

Standard Features

NOTE: HP UEFI FIO Setting (758959-B22) can be selected to configure the system in Legacy mode in the factory.

Storage Controller	All BTO Models	One (1) HP Smart Array P246br Controller with 1GB Flash-Backed Write Cache (FBWC) supporting RAID 0, 1, and 5.
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NOTE: The HP Smart Array P246br and the HP B140i (chipset SATA). Support four (4) small form factor (SFF) hot plug drive bays.

Maximum Internal Storage One of the following depending on Model	Hot Plug SFF SAS	4.8TB	4 x 1.2TB
	Hot Plug SFF SATA	8.0TB	4 x 2.0TB
	Hot Plug SFF SAS SSD	6.4TB	4 x 1.6TB
	Hot Plug SFF SATA SSD	7.68TB	4 x 1.92TB

NOTE: The ProLiant BL660c Gen9 server includes the HP hot plug small form factor (SFF) SmartDrive carrier for enhanced management and reduced maintenance errors. HP drives from previous generation servers (prior to Gen8) are not compatible with the ProLiant BL660c Gen9 drive bays.

Interfaces	Micro SDHC Slot	One (1) internal Micro Secure Digital High Capacity (Micro SDHC) card slot
	USB 3.0 Port	Two (2) internal USB 3.0 connectors for USB flash media drive keys

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

Industry Standard Compliance	<p>ACPI 2.0</p> <p>Microsoft® Logo certifications</p> <p>USB 3.0 Support</p> <p>IPMI 2.0</p> <p>Secure Digital 2.0</p> <p>TPM 1.2 Support</p> <p>IEEE (specific IEEE standards depending on Ethernet adapter card(s) installed)</p> <p>Advanced Encryption Standard (AES)</p> <p>Triple Data Encryption Standard (3DES)</p> <p>SNMP</p> <p>SSL 2.0</p> <p>DMTF Systems Management Architecture for Server Hardware Command Line Protocol (SMASH CLP)</p> <p>Active Directory v1.0</p> <p>PCIe 3.0</p> <p>ASHRAE A3</p> <p>FIPS 140-2 Level-2 certification pending</p>
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Operating Systems and Virtualization Software Support for ProLiant Servers	<p>Microsoft Windows Server</p> <p>Red Hat Enterprise Linux (RHEL)</p> <p>SUSE Linux Enterprise Server (SLES)</p> <p>VMware</p>
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NOTE: For more information on HP's Certified and Supported ProLiant Servers for OS and Virtualization Software and latest listing of software drivers available for your server, please visit our Support Matrix at: <http://www.hp.com/go/ossupport> and our driver download page: <http://www.hp.com/servers/BL660cGen9>

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

- The HP BladeSystem c7000 rack enclosure is 10U high and holds up to eight (8) ProLiant BL660c Gen9 servers plugged vertically.
- The HP BladeSystem c3000 rack enclosure is 6U high and holds up to eight (4) HP ProLiant BL660c Gen9 servers plugged horizontally.

Server blades, interconnect modules, power supplies, fans, and redundant Onboard Administrator modules are all designed to fit into the c3000 and c7000 enclosures.

NOTE: For additional enclosure information, please see:

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

Graphics

Integrated Matrox G200eh video controller

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

HP iLO Management On System Management Memory

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

Form Factor

HP ProLiant BL660c Gen9 is a full-height server blade that plugs into the HP BladeSystem c3000 and c7000 enclosures.

Embedded Management

HP Integrated Lights Out

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

UEFI

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

HP RESTful API

RESTful API is an application programming interface. RESTful Web Service API served by iLO's web server. <http://www.hp.com/go/restfulapi> .

Intelligent Provisioning

Provision servers by discovering and deploying 1 to few servers with Intelligent Provisioning. Learn more at <http://www.hp.com/go/intelligentprovisioning>.

Server Utilities

HP Smart Update

Optimize firmware and driver updates with HP Smart Update solutions. Learn more at <http://www.hp.com/go/smartupdate>.

HP OneView Standard

HP OneView Standard can inventory, monitor, alert, and report on your G6 thru Gen9 servers, with use of the REST API and HP OneView user interface. Annual support is optionally available. Learn more at <http://www.hp.com/go/oneview>.

HP Systems Insight Manager (HP SIM)

HP SIM allows you to monitor the health of your HP ProLiant Servers and HP Integrity Servers, and also provides you with basic support for non-HP servers. HP SIM also integrates with HP SUM to provide quick and seamless firmware updates. Learn more at <http://www.hp.com/go/sim>.

Scripting Tool Kit and Windows PowerShell

Provision 1 to many servers using your own scripts to discover and deploy them with HP Scripting Tool Kit for Windows and Linux or HP Scripting Tools for Windows PowerShell. Learn more at http://www.hp.com/go/ProLiantSTK_or <http://www.hp.com/go/powershell>.

HP RESTful Interface Tool

HP RESTful API tool is a scripting tool to provision servers using RESTful API Interface to discover and deploy servers at scale. Learn more at <http://www.hp.com/go/restfulapi>.

Standard Features

- HP iLO Mobile Application** Enables the ability to access, deploy, and manage your server anytime from anywhere from select smartphones and mobile devices. For additional information please visit: <http://www.hp.com/go/ilo/mobileapp>.
- HP Insight Online** HP Insight Online, available at no additional cost as part of your HP warranty, Care Pack or contractual support agreement with HP, is a personalized dashboard for simplified tracking of IT operations and support information from anywhere, anytime. Learn more at <http://www.hp.com/go/insightonline/info>.

Security

- Power-on password
- Administrator's password
- Keyboard password (QuickLock)
- HP iLO Management On System Management Chipset with:
 - SSL encryption
 - Secure Shell version 2
 - Advanced Encryption Standard (AES) and Triple Data Encryption Standard (3DES) on browser, CLP and XML scripting interface
 - AES and RC4 encryption of video
- External USB port enable/disable
- Network server mode
- Serial interface control
- TPM (Trusted Platform Module) 1.2 option
- Advanced Encryption Standard (AES)
- Intel® Advanced Encryption Standard-New Instructions (AES-NI)
- FIPS 140-2 Level-2 certification pending

Availability

Memory

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

Mezzanine options and I/O

- Support for one (2) FlexibleLOMs, providing four (4) (i.e. redundant) Ethernet ports
- Multiple mezzanine I/O expansion slots that support a wide variety of mezzanine cards each supporting multiple data paths routed to redundant interconnect modules.
- Network Adapter Teaming (bonding) provides network fault tolerance, transmit load balancing, and switch-assisted load balancing.

Storage

- Four (4) Small Form Factor hot-plug SAS/SATA HDD or SSD drive bays.
- Choice of the HP Smart Array P246br Controller with 1GB FBWC/HP or the HP B140i (chipset SATA). RAID 0 and 1 support for both storage controller offerings.,
- Optional dual-port Fibre Channel mezzanine card(s) for redundant SAN connections.

Processor/Chipset

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

Standard Features

upon subsequent boot.

Server Blade Enclosure Infrastructure

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

Warranty

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

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

Optional Features

Fibre Channel Support

Up to three (3) optional Fibre Channel mezzanine HBAs are supported on the HP ProLiant BL660c Gen9.

Compatible SAN

HP ProLiant BL660c Gen9 server blades are optimized for HP MSA, EVA, 3PAR and XP. HP ProLiant BL660c Gen9 server blades are compatible with select 3rd party SANs. Please see blade storage page for more details at <http://h18004.www1.hp.com/products/blades/components/c-class-sans.html>.

HP Virtual Connect

HP Virtual Connect is an interconnect option for **c-Class BladeSystem** that simplifies server connectivity to data and storage networks, and reduces costs. Unique HP Flex-10 technology makes maximum use of network bandwidths, provide dynamic tuning and enable extreme flexibility to meet individual server and infrastructure requirements by allocating up to 4 network connections per server port. Virtual Connect FlexFabric modules extend those capabilities to allocate one function per port to storage connections (FCoE).
HP OneView's software-defined approach to infrastructure management enables central console to administer network connections and workloads for thousands of servers, see hp.com/go/oneview
For more information on Virtual Connect Ethernet, Fibre Channel, Converged Network and management options, see <http://www.hp.com/go/virtualconnect>.

Embedded Management**iLO Advanced for BladeSystem**

HP iLO Advanced for BladeSystem licenses offer smart remote functionality without compromise, for all HP ProLiant servers. The license includes the full integrated remote console, virtual keyboard, video, and mouse (KVM), multi-user collaboration, console record and replay, and GUI-based and scripted virtual media and virtual folders. You can also activate the enhanced security and power management functionality. Learn more about HP iLO Advanced at <http://www.hp.com/go/iloadvanced>

Server Management **HP Insight Control**

HP Insight Control, lets you deploy, migrate, monitor, remote control, and optimize your IT infrastructure through a single, simple management console. For more information, see <http://www.hp.com/go/insightcontrol>.

HP OneView Advanced

HP OneView Advanced is converged management that reduces infrastructure complexity with automation simplicity. This modern architecture accelerates your IT operations across servers, storage, and network resources using software-defined approaches and automation. Learn more at <http://www.hp.com/go/oneview>.

HP Matrix Operating Environment

The HP Matrix Operating Environment (Matrix OE) for ProLiant and Integrity servers is an integrated command center that helps you instantly adjust to dynamic business demands. This advanced infrastructure management software lets you reduce the cost of common data center tasks by up to 40 percent while keeping pace with your changing business. The HP Matrix OE includes the automated provisioning, optimization, and recovery management capabilities for HP CloudSystem Matrix, the ideal platform for private cloud and Infrastructure as a Service (IaaS).

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

HP Insight Cluster Management Utility (CMU)

HP Insight Cluster Management Utility is a Hyperscale management framework that includes software for the centralized provisioning, management and monitoring of nodes and infrastructure. Learn more at <http://www.hp.com/go/cmu>.

Optional Features

High Performance Clusters

HP Cluster Platforms

HP Cluster Platforms are specifically engineered, factory-integrated large-scale ProLiant clusters optimized for High Performance Computing, with a choice of servers, networks and software. Operating system options include specially priced offerings for Red Hat Enterprise Linux and SUSE Linux Enterprise Server, as well as Microsoft Windows HPC Server. A Cluster Platform Configurator simplifies ordering. <http://www.hp.com/go/clusters>

HP HPC Interconnects

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

Storage Software

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

Storage software that gets the job done:

- **Data Protection and Recovery Software**

Whether you're a large enterprise or a smaller business, HP data protection and recovery software will cost-effectively protect you against disaster and ensure business continuity.

- **Data Archive and Migration Software**

HP's storage software enables you to comply with data retention and retrieval requirements, improve application performance, and reduce costs by efficiently migrating infrequently accessed or less valuable data to lower cost storage.

- **Storage Resource Management Software (SRM)**

HP's storage resource management software reduces operational costs and provides the command and control foundation you need to efficiently manage and visualize your physical and virtual environments.

- **Data Replication Software**

HP offers array-based and host-based replication software for use in disaster recovery, testing, application development and reporting.

- **Storage Device Management Software**

Maximize your investment in HP storage and networking with software that enables hardware-specific configuration, performance tuning and connectivity management.

- **HP StoreVirtual VSA**

HP StoreVirtual VSA allows you to create fully featured shared storage on a VMware vSphere or Microsoft Hyper-V virtualized server. This server model starting November 2013, includes a limited license for HP StoreVirtual VSA software with 1TB of capacity. To download the license key and StoreVirtual VSA software, visit: <http://www.hp.com/go/unlockVSA>.

NOTE: You will need your server serial number in order to complete the registration form. Fully functional, capacity-based licenses are available in 4TB, 10T and 50TB sizes. For more information and access to the 60-day free trial, visit: <http://www.hp.com/go/tryVSA>

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

Expansion Blade Support

Supports one (1) optional D2220sb storage or PCI expansion blade

NOTE: Expansion blade support requires the use of either the HP Dynamic Smart Array B140i or the HP Smart Array P246br controller.

NOTE: Expansion blade support requires server firmware versions from SPP 2015.04 or later

Optional Features

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

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

Factory Express Portfolio for Servers and Storage HP Factory Express offers configuration, customization, integration and deployment services for HP servers and storage products. Customers can choose how their factory solutions are built, tested, integrated, shipped and deployed. Factory Express offers service packages for simple configuration, racking, installation, complex configuration and design services as well as individual factory services, such as image loading, asset tagging, and custom packaging. HP products supported through Factory Express include a wide array of servers and storage: HP Integrity, HP ProLiant, HP ProLiant Server Blades, HP BladeSystem, HP 9000 servers as well as the MSAxxxx, VA7xxx, EVA, XP, rackable tape libraries and configurable network switches. For more information on Factory Express services on your specific server model please contact your sales representative or go to: <http://www.hp.com/go/factory-express.html>

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

Configuration Information - Factory Integrated Models

Service and Support

HP Technology Services for BladeSystem

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

Protect your business beyond warranty with HP Care Pack Services

HP Care Pack Services enable you to order the right service level, length of coverage and response time as you purchase your new server, giving you full entitlement for the term you select.

Optimized Support recommendation

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

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

<http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=4AA5-3259ENW&cc=us&lc=en>

Standard Support recommendation

HP Proactive Care - 24x7 coverage, three year Care Pack Service

This service helps prevent problems and stabilize IT by utilizing secure, real-time, predictive analytics and proactive consultations when your products are connected to HP. It combines three years' proactive reporting and advice with 24x7 four hour response coverage and enhanced escalation management. It also includes collaborative call management with two hour call back on software questions to reduce troubleshooting on hardware and industry leading software.

<http://h20195.www2.hp.com/v2/GetPDF.aspx/4AA3-8855ENW.pdf>

Related Services

Data Center Platform Consulting Services

Choose HP Technology Services Consulting to modernize and migrate your key systems. These services help fine tune your data center to improve security, management and efficiency across IT infrastructure, operations, and facilities and prepare you for the new style of IT. HP understands the needs of the data center of the future and will serve as your guide for the journey.

<http://www.hp.com/services/consulting>

Data Privacy Services

Protect your data through better media management. HP Data privacy services help manage and protect sensitive data to reduce the risk of unauthorized access to private information and help meet compliance requirements. Our retention services allow you to keep drives and other devices upon failure with Defective Media Retention and Comprehensive Defective Material Retention, our removal services provide convenient data sanitization and our recovery services allow you to safely retire IT assets and capture any remaining value from the hardware.

<http://www.hp.com/services/dataprivacy>

Factory Express for Servers and storage

HP Factory Express offers configuration, customization, integration and deployment services for HP servers and storage products. Choose how your factory solutions are built, tested, integrated, shipped and deployed.

<http://www.hp.com/go/factory-express>

HP ProLiant Blade Server Hardware Installation

This easy-to-buy, easy-to-use HP Care Pack service helps ensure your new HP BladeSystem hardware is installed smoothly, efficiently and with minimal disruption to your IT and business operations.

<http://www.hp.com/services/bladessystemservices>

Configuration Information - Factory Integrated Models

Additional hardware Installation services for HP BladeSystem

In addition to hardware installation of your Blade server, HP offers installation and startup services for your BladeSystem and Network infrastructure.

<http://www.hp.com/services/bladessystemservices>

Connect your devices to HP

Unlock all of the benefits of your technology investment by connecting your products to HP. Achieve up to 77% reduction in down time, near 100% diagnostic accuracy and a single consolidated view of your environment. By connecting, you will receive 24x7 monitoring, pre-failure alerts, automatic call logging, and automatic parts dispatch. HP Proactive Care Service and HP Datacenter Care Service customers will also benefit from proactive activities to help prevent issues and increase optimization. All of these benefits are already available to you with your server storage and networking products, securely connected to HP support.

Parts and Materials

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

Parts and components that have reached their maximum supported lifetime and/or the maximum usage limitations as set forth in the manufacturer's operating manual, product quick-specs, or the technical product data sheet will not be provided, repaired, or replaced as part of these services. The defective media retention service feature option applies only to Disk or eligible SSD/Flash Drives replaced by HP due to malfunction.

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

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

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

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

NOTE: All Pre-configured Models come populated with some hard drive blanks installed.

NOTE: Not all models are available in all regions. Check with your local country HP offices for availability.

E5-4600 v3 series Processors

HP ProLiant BL660c Gen9 E5-4650v3 Processor(s)

128GB-R 4P Server Blade 728349-B21 Cache Memory Memory

(4) Intel® Xeon® E5-4650 v3 (2.1GHz/12-core/30MB/9.6GT-s QPI/105W, DDR4-2133, HT, Turbo)

30MB (1x30MB) Level 3 cache
128GB (4x 32GB) PC4-2133P-R (DDR4-2133) Load Reduced DIMMS at 1.2V)

NOTE: Total of 32 DIMM slots.

Network Controller
Storage Controller

(2) HP FlexFabric 20Gb 2-port 630FLB FlexibleLOM
HP Smart Array P246br Controller with 1GB FBWC RAID 0,1,5

Hard Drive

None ship standard
Supports up to four (4) HP hot-plug SFF SAS/SATA/SDD drives

Internal Storage

SAS: 8TB; SATA: 8TB; SAS SSD: 7.68TB; SATA SSD: 6.4TB

Optical Drive Bay
Expansion Slots

None
3 standard - Slot 1 supports Type A mezzanine Cards. Slots 2 and 3 support Type A and Type B mezzanine cards.

Management

HP iLO Management (standard)
Optional: HP OneView or HP Insight Control

Form Factor

Up to four (4) full-height blades supported in the HP BladeSystem c3000 Enclosure
Up to eight (8) full-height blades supported in HP BladeSystem c7000 Enclosure

Configuration Information - Factory Integrated Models

	Warranty	Server warranty includes 3-year Parts, 3-year Labor, 3-year on-site support.
HP ProLiant BL660c Gen9 E5-4620v3 128GB-R 4P Server Blade 728350-B21	Processor(s)	(4) Intel® Xeon® E5-4620 v3 (2.0GHz/10-core/25MB/8.0GT-s QPI/105W, DDR4-1866, HT, Turbo)
	Cache Memory	25MB (1x25MB) Level 3 cache
	Memory	128GB (8x 16GB) PC4-2133P-R (DDR4-2133) Registered DIMMS at 1.2V NOTE: Total of 32 DIMM slots.
	Network Controller	(2) HP FlexFabric 10Gb 2-port 536FLB FlexibleLOM
	Storage Controller	HP Smart Array P246br Controller with 1GB FBWC RAID 0,1,5
	Hard Drive	None ship standard Supports up to four (4) HP hot-plug SFF SAS/SATA/SDD drives
	Internal Storage	SAS: 8TB; SATA: 8TB; SAS SSD: 7.68TB; SATA SSD: 6.4TB
	Optical Drive Bay	None
	Expansion Slots	3 standard - Slot 1 supports Type A mezzanine Cards. Slots 2 and 3 support Type A and Type B mezzanine cards.
	Management	HP iLO Management (standard) Optional: HP OneView or HP Insight Control
Form Factor	Up to four (4) full-height blades supported in the HP BladeSystem c3000 Enclosure Up to eight (8) full-height blades supported in HP BladeSystem c7000 Enclosure	
	Warranty	Server warranty includes 3-year Parts, 3-year Labor, 3-year on-site support.
HP ProLiant BL660c Gen9 E5-4610v3 64GB-R 2P Server Blade 728351-B21	Processor(s)	(2) Intel® Xeon® E5-4610 v3 (1.7GHz/10-core/25MB/6.4GT-s QPI/105W, DDR4-1600, HT, Turbo)
	Cache Memory	25MB (1x25MB) Level 3 cache
	Memory	64GB (4x 16GB) PC4-2133P-R (DDR4-2133 Registered DIMMs at 1.2V) NOTE: Total of 32 DIMM slots.
	Network Controller	(2) HP FlexFabric 10Gb 2-port 536FLB FlexibleLOM
	Storage Controller	HP Smart ArrayP246br Controller with 1GB FBWC RAID 0,1,5
	Hard Drive	None ship standard Supports up to four (4) HP hot-plug SFF SAS/SATA/SDD drives
	Internal Storage	SAS: 8TB; SATA: 8TB; SAS SSD: 7.68TB; SATA SSD: 6.4TB
	Optical Drive Bay	None
	Expansion Slots	3 standard - Slot 1 supports Type A mezzanine Cards. Slots 2 and 3 support Type A and Type B mezzanine cards.
	Management	HP iLO Management (standard) Optional: HP OneView or HP Insight Control
Form Factor	Up to four (4) full-height blades supported in the HP BladeSystem c3000 Enclosure Up to eight (8) full-height blades supported in HP BladeSystem c7000 Enclosure	
	Warranty	Server warranty includes 3-year Parts, 3-year Labor, 3-year on-site support.

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

Configuration Information - Factory Integrated Models

server). To ensure only valid configurations are ordered, HP recommends the use of an HP approved configurator. Contact your local sales representative for information on CTO product offerings and requirements.

NOTE: Configure-to-order server blades must start with a CTO Server Blade.

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

NOTE: All Factory Integrated Models will be populated with sufficient hard drive blanks based on the number of initial hard drives ordered with the server.

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

Models	HP ProLiant BL660c Gen9 10/20GB FlexibleLOM Configure-to-Order Server	728352-B21
	Configurable Models ship with:	
	Two (2) FlexibleLOM connectors providing a choice for one or two of the supported 10Gb/20Gb FlexibleLOMs (see Step 2)	
	Four (4) HP small form factor hot-plug SAS/SATA/ HDD or SSD hard drive bays	
	Three (3) x16 PCIe I/O expansion slots (one Type A, two Type A/B)	
	Two (2) integrated USB connector and one (1) MicroSDHC connector	
	One (1) TPM connector	
	HP iLO Management (standard)	

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

HP Processors	<p>NOTE: All configure-to-order processor kits (i.e. xxxxxx-L21) contain two (2) processors.</p> <p>NOTE: If four processors are desired, select one xxxxxx-L21 here in Step 2 and one xxxxxx-B21 in Step 4.</p> <p>NOTE: The BL660c Gen9 supports two or four processors; one and three processor configurations are not supported.</p> <p>E5-4600 v3 series Processors</p> <p>HP BL660c Gen9 Intel® Xeon® E5-4610v3 (1.7GHz/10-core/25MB/105W) FIO 2-processor Kit</p> <p>HP BL660c Gen9 Intel® Xeon® E5-4620v3 (2.0GHz/10-core/25MB/105W) FIO 2-processor Kit</p> <p>HP BL660c Gen9 Intel® Xeon® E5-4640v3 (1.9GHz/12-core/30MB/105W) FIO 2-processor Kit</p> <p>HP BL660c Gen9 Intel® Xeon® E5-4650v3 (2.1GHz/12-core/30MB/105W) FIO 2-processor Kit</p> <p>HP BL660c Gen9 Intel® Xeon® E5-4660v3 (2.1GHz/14-core/35MB/120W) FIO 2-processor Kit</p> <p>HP BL660c Gen9 Intel® Xeon® E5-4669v3 (2.1GHz/18-core/45MB/135W) FIO 2-processor Kit</p> <p>HP BL660c Gen9 Intel® Xeon® E5-4667v3 (2.0GHz/16-core/40MB/135W) FIO 2-processor Kit</p> <p>HP BL660c Gen9 Intel® Xeon® E5-4627v3 (2.6GHz/10-core/45MB/135W) FIO 2-processor Kit</p> <p>HP BL660c Gen9 Intel® Xeon® E5-4655v3 (2.9GHz/6-core/30MB/135W) FIO 2-processor Kit</p> <p>NOTE: For the maximum supported memory speeds for each processor listed above, please reference the 'Memory Speed by Processor Model' table in the Memory section of the QuickSpecs.</p> <p>NOTE: Supports 2 or 4 processors. Mixing different processor models is not supported.</p> <p>NOTE: For the Intel® C610 Chipset E5-6600 v3 Series, the letter preceding the model number indicates the Product Line (E3, E5, E7); 4600x, 4 = number of CPUs in a Node, 6 is socket/segment designation, 00 = Processor SKU, and x = L for low power SKUs.</p> <p>NOTE: All processors within the server must be identical.</p>	<p>728378-L21</p> <p>728376-L21</p> <p>728374-L21</p> <p>728372-L21</p> <p>728370-L21</p> <p>728380-L21</p> <p>728382-L21</p> <p>728384-L21</p> <p>792028-L21</p>
HP Memory	<p>NOTE: HP memory from previous generation servers (DDR3) is not compatible with this server. HP SmartMemory is required to realize the memory performance improvements and enhanced functionality listed in this document for Gen9. For additional information, please see the HP SmartMemory QuickSpecs at:</p>	

Configuration Information - Factory Integrated Models

<http://www8.hp.com/h20195/v2/GetHTML.aspx?docname=c04111535>

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

NOTE: Depending on the memory configuration and processor model, the memory speed may run at 2133MHz, 1866MHz, or 1600MHz. Please see Memory Population Table or the Online Memory Configuration Tool at:

<http://h22195.www2.hp.com/MemoryTool/Home/Legal>

HP SmartMemory

Registered DIMMs (RDIMMs) - E5-4600 v3 series Processors

HP 8GB (1x8GB) Dual Rank x8 DDR4-2133 CAS-15-15-15 Registered Memory Kit 759934-B21

HP 8GB (1x8GB) Single Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit 726718-B21

HP 16GB (1x16GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit 726719-B21

HP 32GB (1x32GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit 728629-B21

Load Reduced DIMMs (LRDIMMs) - E5-4600 v3 series Processors

HP 32GB (1x32GB) Quad Rank x4 DDR4-2133 CAS-15-15-15 Load Reduced Memory Kit 726722-B21

HP 16GB (1x16GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Load Reduced Memory Kit 726720-B21

HP 48GB (1x16GB +1x32GB) DDR4-2133 CAS-15-15-15 Load Reduced Memory FIO Kit 792278-B21

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

NOTE: For more information on ProLiant Energy Efficient Features, see:

<http://www.hp.com/go/proliant-energy-efficient>

HP Networking

FlexibleLOM Adapters

NOTE: The server requires one (1) FlexibleLOM that is installed in the FlexibleLOM connectors. All FlexibleLOMs are dual port: One port is routed to interconnect module bay 1 and the other to bay 2.

20Gb FlexibleLOM Adapters

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

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

10Gb FlexibleLOM Adapters

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

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

Step 3: Choose Additional Factory Integration Options

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

HP OneView Software **HP OneView Advanced with HP iLO Advanced & with rights-to-use HP Insight for Converged Mgmt Control**

(Server hardware required on the same purchase order)

HP OneView for Blade Server incl 3yr 24x7 Supp FIO Bundle Physical 1 Svr Lic F6Q89A

HP Storage Controllers HP Smart Array P246br/1GB FBWC 12Gb 4-ports Int FIO SAS Controller 749975-B21

HP FIO Enable Smart Array B140i Setting 784308-B21

NOTE: The HP Smart Array B140i Controller (chipset SATA) comes standard with the HP BL660c Gen9 10Gb/20Gb FLB CTO Blade. If the HP Smart Array P246br controller is not chosen, SATA cables will be provided to support SATA devices for the four internal drives. If RAID is required when using the B140i, please choose 'HP FIO B140i RAID Enable Kit - BIOS Setting' (784308-B21).

Step 4: Choose Additional Options for Factory Integration

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

Configuration Information - Factory Integrated Models

Core Options and Additional sections below; or the following:

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

NOTE: For optimal cooling and system performance the BL660c Gen9 Server Blade requires the c7000 enclosure to be configured with 10 fans and the c3000 enclosure to be configured with 6 fans.

Core Options

HP Networking

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

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

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

20 Gigabit Ethernet Mezzanine Cards

HP FlexFabric 20Gb 2-port 630M Adapter

700076-B21

NOTE: Please see QuickSpecs for technical specifications and additional information at <http://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c04312720>

HP FlexFabric 20Gb 2-port 650M Adapter

700767-B21

NOTE: Please see QuickSpecs for technical specifications and additional information at <http://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c04347342>

10 Gigabit Ethernet Mezzanine Cards

HP FlexFabric 10Gb 2-port 534M Adapter

700748-B21

NOTE: Please see QuickSpecs for technical specifications and additional information at: http://h18000.www1.hp.com/products/quickspecs/14619_div/14619_div.html

1 Gigabit Ethernet Mezzanine Cards

HP Ethernet 1Gb 4-port 366M Adapter

615729-B21

NOTE: Please see QuickSpecs for technical specifications and additional information at: http://h18000.www1.hp.com/products/quickspecs/14335_div/14335_div.html

FlexibleLOM Adapters

NOTE: The server supports a maximum of two FlexibleLOMs that are installed in the FlexibleLOM connectors.

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 is a different part number. When two FlexibleLOMs are needed you must

select the first FlexibleLOM in the "Step 2" HP Networking section and the second FlexibleLOM from here in "Step 4" HP Networking section.

20Gb FlexibleLOM Adapters

HP FlexFabric 20Gb 2-port 630FLB Adapter

700065-B21

NOTE: Please see QuickSpecs for technical specifications and additional information at <http://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c04312719>

HP FlexFabric 20Gb 2-port 650FLB Adapter

700763-B21

NOTE: Please see QuickSpecs for technical specifications and additional information at <http://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c04347341>

10Gb FlexibleLOM Adapters

HP FlexFabric 10Gb 2-port 536FLB Adapter

766490-B21

NOTE: Please see QuickSpecs for technical specifications and additional information at <http://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c04347246>

HP Infiniband Mezzanine Adapters

NOTE: When an InfiniBand adapter is installed in mezzanine slot 1, only one port is active (regardless of operating mode). When installed in mezzanine slot 2, both ports are active.

Core Options

NOTE: InfiniBand QDR and FDR speeds are only supported on the HP BladeSystem c7000 Enclosure. For additional information, please see the HP BladeSystem c7000 Enclosure and InfiniBand QuickSpecs at:

http://h18004.www1.hp.com/products/quickspecs/12586_div/12586_div.html

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

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

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

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

NOTE: The FDR InfiniBand adapter must be installed in mezzanine slot 1 for FDR mode and may be installed in either mezzanine slot if operated in any other mode.

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

HP Fibre Channel	HP LPe1605 16Gb Fibre Channel HBA for BladeSystem c-Class 718203-B21
	NOTE: Please see QuickSpecs for technical specifications and additional information at http://h18000.www1.hp.com/products/quickspecs/14742_div/14742_div.html
	HP QMH2672 16Gb Fibre Channel Host Bus Adapter 710608-B21
	NOTE: Please see QuickSpecs for technical specifications and additional information at http://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c04126962
	HP LPe1205A 8Gb Fibre Channel Host Bus Adapter 659818-B21
	HP QMH2572 8Gb Fibre Channel Host Bus Adapter 651281-B21

HP Processors

E5-4600 v3 series Processors

NOTE: All configure-to-order processor kits (i.e. xxxxxx-L21) contain two (2) processors.

NOTE: If four processors are desired, select one xxxxxx-L21 here in Step 2 and one xxxxxx-B21 in Step 4.

NOTE: The BL660c Gen9 supports two or four processors; one and three processor configurations are not supported.

HP BL660c Gen9 Intel® Xeon® E5-4610v3 (1.7GHz/10-core/25MB/105W) FIO 2-processor Kit 728378-L21

HP BL660c Gen9 Intel® Xeon® E5-4620v3 (2.0GHz/10-core/25MB/105W) FIO 2-processor Kit 728376-L21

HP BL660c Gen9 Intel® Xeon® E5-4640v3 (1.9GHz/12-core/30MB/105W) FIO 2-processor Kit 728374-L21

HP BL660c Gen9 Intel® Xeon® E5-4650v3 (2.1GHz/12-core/30MB/105W) FIO 2-processor Kit 728372-L21

HP BL660c Gen9 Intel® Xeon® E5-4660v3 (2.1GHz/14-core/35MB/120W) FIO 2-processor Kit 728370-L21

HP BL660c Gen9 Intel® Xeon® E5-4669v3 (2.1GHz/18-core/45MB/135W) FIO 2-processor Kit 728380-L21

HP BL660c Gen9 Intel® Xeon® E5-4667v3 (2.0GHz/16-core/40MB/135W) FIO 2-processor Kit 728382-L21

HP BL660c Gen9 Intel® Xeon® E5-4627v3 (2.6GHz/10-core/45MB/135W) FIO 2-processor Kit 728384-L21

HP BL660c Gen9 Intel® Xeon® E5-4655v3 (2.9GHz/6-core/30MB/135W) FIO 2-processor Kit 792028-L21

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

NOTE: Supports 2 or 4 processors. Mixing different processor models is not supported.

NOTE: For the Intel® C610 Chipset E5-6600 v3 Series, the letter preceding the

Core Options

model number indicates the Product Line (E3, E5, E7); 4600x, 4 = number of CPUs in a Node, 6 is socket/segment designation, 00 = Processor SKU, and x = L for low power SKUs.

NOTE: All processors within the server must be identical.

HP Memory

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

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

NOTE: Depending on the memory configuration and processor model, the memory speed may run at 2133MHz, 1866MHz, or 1600MHz. Please see Memory Population Table or the Online Memory Configuration Tool at:

<http://h22195.www2.hp.com/MemoryTool/Home/Legal>

HP SmartMemory

Registered DIMMs (RDIMMs) - E5-4600 v3 series Processors

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

Load Reduced DIMMs (LRDIMMs) - E5-4600 v3 series Processors

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

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

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

HP Hard Drives

NOTE: The ProLiant BL660c Gen9 server includes the HP hot-plug small form factor (SFF) SmartDrive carrier for enhanced management and reduced maintenance errors. HP drives from generation G7 servers and before are not compatible with the BL660c Gen9 drive bays.

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

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

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

Solid State M.2 SATA Drives

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

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

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

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

HP 2TB 6G SATA 7.2K rpm SFF (2.5-inch) SC 512e 1yr Warranty Hard Drive	765455-B21
HP 1TB 6G SATA 7.2K rpm SFF (2.5-inch) SC 512e 1yr Warranty Hard Drive	765453-B21
HP 1TB 6G SATA 7.2K rpm SFF (2.5-inch) SC Midline 1yr Warranty Hard Drive	655710-B21
HP 500GB 6G SATA 7.2K rpm SFF (2.5-inch) SC Midline 1yr Warranty Hard Drive	655708-B21

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

<http://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c04111725>.

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

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

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

HP 2TB 12G SAS 7.2K rpm SFF (2.5-inch) SC 512e 1yr Warranty Hard Drive	765466-B21
HP 1TB 12G SAS 7.2K rpm SFF (2.5-inch) SC 512e 1yr Warranty Hard Drive	765464-B21
HP 1TB 6G SAS 7.2K rpm SFF (2.5-inch) SC Midline 1yr Warranty Hard Drive	652749-B21
HP 500GB 6G SAS 7.2K rpm SFF (2.5-inch) SC Midline 1yr Warranty Hard Drive	652745-B21

NOTE: Please see QuickSpecs for technical specifications and additional information at http://h18000.www1.hp.com/products/quickspecs/12244_div/12244_div.html.

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

HP 1.6TB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive	757339-B21
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6G SATA Value Endurance SFF (2.5-inch) SC Enterprise Value M1 Solid State Drives

HP 120GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty M1 Solid State Drive	764923-B21
HP 240GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty M1 Solid State Drive	764925-B21
HP 480GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty M1 Solid State Drive	764927-B21
HP 800GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty M1 Solid State Drive	764929-B21

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

HP 200GB 12G SAS Mainstream Endurance SFF 2.5-in ENT Mainstream SC 3yr Wty H2 Solid State Drive	779164-B21
HP 400GB 12G SAS Mainstream Endurance SFF 2.5-in ENT Mainstream SC 3yr Wty H2 Solid State Drive	779168-B21
HP 800GB 12G SAS Mainstream Endurance SFF 2.5-in ENT Mainstream SC 3yr Wty H2 Solid State Drive	779172-B21

Core Options

HP 1.6TB 12G SAS Mainstream Endurance SFF 2.5-in ENT Mainstream SC 3yr Wty H2 Solid State Drive 779176-B21

12G SAS VE SFF (2.5-inch) SC EV Solid State Drives

HP 1.6TB 12G SAS Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive 762263-B21

HP 800GB 12G SAS Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive 762261-B21

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

HP 300GB 12G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive 759208-B21

HP 450GB 12G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive 759210-B21

HP 600GB 12G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive 759212-B21

NOTE: Please see the [QuickSpecs](http://h18000.www1.hp.com/products/quickspecs/14038_div/14038_div.html) for technical specifications and information at http://h18000.www1.hp.com/products/quickspecs/14038_div/14038_div.html.

Additional Options

HP Insight software HP Insight Control

HP Insight Control including 1yr 24x7 Technical Support and Updates Single Server License C6N27A

HP Insight Control including 1yr 24x7 Technical Support and Updates Electronic License C6N28ABE

HP Insight Control including 1yr 24x7 Support ProLiant ML/DL/BL-bundle FIO Electronic License C6N36ABE

HP Insight Control Server Provisioning Media Kit BD883A

HP Insight Management Media Kit C6N31A

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

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

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

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

NOTE: For additional license kits, please see the QuickSpecs at: <http://www8.hp.com/h20195/v2/GetHTML.aspx?docname=c04123391>

HP iLO Advanced License

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

HP iLO Advanced for BladeSystem including 3yr 24x7 Technical Support and Updates E-LTU E6U63ABE

HP iLO Advanced Blade 1 Server License with 3yr 24x7 Tech Support and Updates BD502A

HP iLO Advanced for BladeSystem including 1yr 24x7 Technical Support and Updates E-LTU E6U60ABE

HP iLO Advanced for BladeSystem including 1yr 24x7 Support Single Server License 512488-B21

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

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

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

NOTE: For additional license kits, please see the QuickSpecs at: http://h18004.www1.hp.com/products/quickspecs/14276_div/14276_div.html

HP OneView Software for Converged Mgmt

HP OneView Advanced (with HP iLO Advanced and with rights-to-use HP Insight Control)

HP OneView incl 3yr 24x7 Supp Phys 1 Svr Lic E5Y34A

HP OneView incl 3yr 24x7 Supp Flex Qty E-LTU E5Y35AAE

HP OneView Media Kit Phys No Lic E5Y37A

NOTE: Full licenses of HP OneView Advanced also provide the right-to-use HP Insight Control without additional charge.

Additional Options

NOTE: Server provisioning (via 'HP Insight Control server provisioning') is licensed as part of HP OneView Advanced and provides multi-server OS and driver provisioning. Media kit #BD883A can be ordered for a physical copy of this software (USB flash drive).

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

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

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

High Performance Clusters	HP Cluster Management Utility	
	HP Insight Cluster Management Utility 1yr 24x7 Flexible License	QL803B
	HP Insight Cluster Management Utility 3yr 24x7 Flexible License	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 .	
HP I/O Accelerator Options	HP 1.2TB Read Intensive Mezzanine PCIe Workload Accelerator for BladeSystem c-Class	794603-B21
	HP 1.6TB Read Intensive Mezzanine PCIe Workload Accelerator for BladeSystem c-Class	794605-B21
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 R2. BitLocker leverages the enhanced security capabilities of a Trusted Platform Module (TPM) version 1.2. The TPM works with BitLocker to help protect user data and to ensure that a server running Windows Server 2008 R2 has not been tampered with while the system was offline.	
	NOTE: For more information about TPM, including a white paper, go to http://www.hp.com/go/TPM .	
	NOTE: ProLiant OS pre-installed units will come with the partition required for TPM deployment.	
	NOTE: The TPM key is unique to every TPM deployed server and must be retained. Misplacing or losing the key could result in data loss.	
HP Storage Controllers	HP Smart Array P246br/1GB FBWC 12Gb 4-ports Int FIO SAS Controller	749975-B21
HP Secure Encryption	HP Secure Encryption No Media E-LTU per Drive	D8S85AAE
	HP Secure Encryption No Media Flexible License per Drive	D8S84A

Additional Options

NOTE: HP Secure Encryption is supported on the HP Smart Array P246br as an option. HP Secure Encryption licensing is based on the number of physical drives requiring encryption.

NOTE: For more information about HP Secure Encryption, go to <http://www.hp.com/go/hpsecureencryption>.

HP InfiniBand

Mezzanine Adapters

NOTE: When an InfiniBand adapter is installed in mezzanine slot 1, only one port is active (regardless of operating mode). When installed in any other mezzanine slot, both ports are active.

NOTE: InfiniBand QDR and FDR speeds are only supported on the HP BladeSystem c7000 Enclosure. For additional information, please see the HP BladeSystem c7000 Enclosure and InfiniBand QuickSpecs at:

http://h18004.www1.hp.com/products/quickspecs/12586_div/12586_div.html

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

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

764282-B21

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

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

764283-B21

NOTE: The FDR InfiniBand adapter must be installed in mezzanine slot 1 for FDR mode and may be installed in any mezzanine slot if operated in any other mode.

HP InfiniBand FDR 2-port 545M Adapter

702213-B21

HP Flash Media Kits for USB Drives

HP Enterprise Mainstream Flash Media Kits for Memory Cards

HP 8GB USB Enterprise Mainstream Flash Media Drive Key Kit

737953-B21

HP 8GB microSD Enterprise Mainstream Flash Media Kit

726116-B21

HP 32GB microSD Enterprise Mainstream Flash Media Kit

700139-B21

HP Dual 8GB microSD Enterprise Midline USB Kit

741279-B21

NOTE: Please see the QuickSpecs for Technical Specifications and additional information:

http://h18000.www1.hp.com/products/quickspecs/13971_div/13971_div.html

HP Care Pack Services

Proactive Care Services

HP 3 year 24x7 BL4xxc Gen9 Proactive Care Service

U7BN8E

HP 3 year 24x7 with Defective Media Retention BL4xxc Gen9 Proactive Care Service

U7BN9E

HP 3 year 24x7 BL4xxc Gen9 Proactive Care Advanced Service

U7BT6E

HP 3 year 24x7 with Defective Media Retention BL4xxc Gen9 Proactive Care Advanced Service

U7CF8E

HP 3 year 24x7 BL660c Gen9 Proactive Care Service

U8LQ2E

HP 3 year 24x7 with Defective Media Retention BL660c Gen9 Proactive Care Service

U8LQ3E

HP 3 year 24x7 BL660c Gen9 Proactive Care Advanced Service

U8LQ5E

HP 3 year 24x7 with Defective Media Retention BL660c Gen9 Proactive Care Advanced Service

U8LQ6E

Installation Services

HP Install c-Class Server Blade Service

UE493E

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

Memory

For detailed memory configuration rules and guidelines, please use the Online DDR4 Memory Configuration Tool: <http://h22195.www2.hp.com/MemoryTool/Home/Legal>

Memory Subsystem Architecture

Each Intel® Xeon® E5-4600 v3 family or Intel® Xeon® E5-4600 v3 family processor socket contains four memory channels that support two DIMMs each for a total of eight (8) DIMM per installed processor or a grand total of thirty two DIMMs for the server. Up to 64GB capacity DIMMs are supported for 2TB of memory (32 DIMM slots x 64GB per DIMM).

Memory Population Rules and Guidelines:

- A minimum of one DIMM is required per processor.
- Install DIMMs only if the corresponding processor is installed.
- If only two processors are installed in a four processor system, only half of the DIMM slots are available.
- DIMM sizes can be mixed in channel. To maximize performance, it is recommended to balance the total memory capacity between all installed processors and to load the channels similarly whenever possible.
- LRDIMM and RDIMMs are all distinct memory technologies and cannot be mixed within a server. The majority of ProLiant Gen9 servers support RDIMM and LRDIMM.
- DIMMs of different speeds may be mixed in any order; the server will select a common optimal speed.
- The maximum memory speed is a function of the memory type, memory configuration, and processor model.
- The maximum memory capacity is a function of the memory type and number of installed processors.
- HP memory from previous generation servers is not compatible with the BL660c Gen9 Server Blade.
- To realize the performance memory capabilities listed in this document, HP SmartMemory is required. For additional information, please see the HP SmartMemory QuickSpecs at: <http://www8.hp.com/h20195/v2/GetHTML.aspx?docname=c04111535>
- For memory population rules and additional memory guidelines, please see the BL660c Gen9 user guide at <http://www.hp.com/support>.

Supported Memory Bandwidth on Intel® Xeon® E5-4600 v3 series Processors

DIMM Rank	Register DIMM (RDIMM)			Load Reduced (LRDIMM)		
	Single Rank (1R)	Dual Rank (2R)		Dual Rank (2R)	Quad Rank (4R)	
DIMM Capacity	8GB	16GB	8GB	16GB	32GB	64GB
Voltage	Std Voltage 1.2V	Std Voltage 1.2V	Std Voltage 1.2V	Std Voltage 1.2V	Std Voltage 1.2V	Std Voltage 1.2V
SLOTS THAT CAN BE POPULATED						
16 slot servers	16	16	16	16	16	16
32 slot servers	32	32	32	32	32	32
MAXIMUM CAPACITY (GB)*						
16 slot servers	128	256	128	256	512	1024
32 slot servers	256	512	256	512	1024	2048
POPULATED DIMM SPEED (MT/s)						
1 DIMM Per Channel	2133	2133	2133	2133	2133	2133
2 DIMM Per Channel	2133	2133	2133	2133	2133	2133

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

Memory

Memory Speed by E5-4600 v3 Series Processor Model

Processor Models	Supported Memory Speeds
E5-4627 v3, E5-4655 v3, E5-4650 v3, E5-4660 v3, E5-4667 v3, E5-4669 v3	2133MHz
E5-4620 v3, E5-4640 v3	1866MHz
E5-4610 v3	1600MHz

Standard and Maximum Memory Capacity (Pre-configured Models) for E5-4600 v3 Series

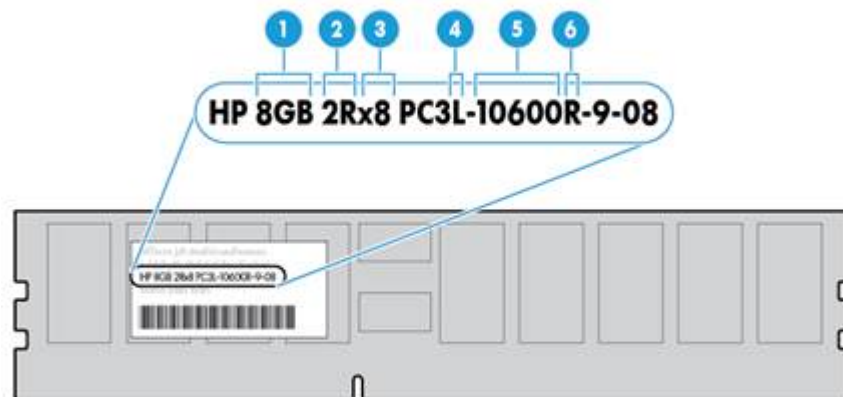
Pre Configured Models	Standard Memory	Maximum Memory Plus Optional Memory	Standard Memory Replaced with Optional Memory
Intel Xeon E5-4650 v3	128GB (4x 32GB)	1TB (4x 32GB + 12x 64GB)	1TB (16x 64GB)
Intel Xeon E5-2660 v3	64GB (4x 16GB)	256GB (4x 16GB + 12x 16GB)	1TB (16x 64GB)
Intel Xeon E5-2650 v3, E5-2640 v3	32GB (2x 16GB)	256GB (2x 16GB + 14x 16GB)	1TB (16x 64GB)
Intel Xeon E5-2620 v3, E5-2609 v3	16GB (2x 8GB)	240GB (2x 8GB + 14x 16GB)	1TB (16x 64GB)

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

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

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

Memory options part number decoder



Item	Description	Definition
1	Capacity	8 GByte 16 GByte 32 GByte
2	Rank	1R = Single-rank 2R = Dual-rank 4R = Quad-rank
3	Data width	x4 = 4-bit x8 = 8-bit
4	Memory generation	DDR4

Memory

Item	Description	Definition
5	Max. Memory speed	2133MT/s
6	CasLatency	P = 15
6	DIMM type	R = RDIMM (registered) L = LRDIMM (load reduced)

Following are memory options available from HP:

HP Memory

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

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

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

HP SmartMemory

Registered DIMMs (RDIMMs)

Registered DIMMs (RDIMMs) - E5-4600 v3 series Processors

HP 8GB (1x8GB) Dual Rank x8 DDR4-2133 CAS-15-15-15 Registered Memory Kit 759934-B21

HP 8GB (1x8GB) Single Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit 726718-B21

HP 16GB (1x16GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit 726719-B21

HP 32GB (1x32GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit 728629-B21

Load Reduced DIMMs (LRDIMMs) - E5-4600 v3 series Processors

HP 48GB (1x16GB +1x32GB) DDR4-2133 CAS-15-15-15 Load Reduced Memory FIO Kit 792278-B21

HP 32GB (1x32GB) Quad Rank x4 DDR4-2133 CAS-15-15-15 Load Reduced Memory Kit 726722-B21

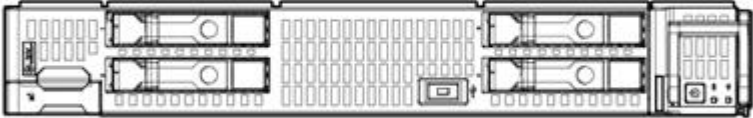
HP 16GB (1x16GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Load Reduced Memory Kit 726720-B21

Memory

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

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

Storage



Technical Specifications

System Unit	Dimensions (H x W x D) (with bezel)	366.27mm (14.42") x 56.54mm (2.23") x 516.67mm (20.34")
	Weight (approximate)	<p>Maximum: 4 processors, 2 FlexibleLOMs, 32 DIMMs, 4 hard drives, 3 mezzanine cards, and 1 flash cache batteries installed 14.00 lb (6.33 kg)</p> <p>Minimum: 2 processors, 1 FlexibleLOM, and 2 DIMMs installed 10.50 lb (4.75 kg)</p>
	Power Specifications	<p>For power specifications including input requirements, BTU rating, and power supply output, please see the:</p> <ul style="list-style-type: none"> HP BladeSystem c3000 Enclosure QuickSpecs at http://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c04123379 HP BladeSystem c7000 Enclosure QuickSpecs at http://www8.hp.com/h20195/v2/GetHTML.aspx?docname=c04229580 <p>To review typical system power ratings use the HP Power Advisor which is available via the online tool located at http://www.hp.com/go/hppoweradvisor.</p> <p>NOTE: For optimal cooling and system performance the BL660c Gen9 Server Blade requires the c7000 enclosure to be configured with 10 fans and the c3000 enclosure to be configured with 6 fans.</p>
	System Inlet Temperature	<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> <p>System performance may be reduced if operating with a fan fault or above 30°C (86°F).</p> <p>Non-operating -30° to 60°C (-22° to 140°F). Maximum rate of change is 20°C/hr (36°F/hr).</p>
	Extended Ambient Operating Support	<p>For Approved hardware configurations, the supported system inlet range is extended to be: 5° to 10°C (41° to 50°F) and 35° to 40°C (95° to 104°F) at sea level with an altitude derating of 1.0°C per every 175 m (1.8°F per every 574 ft) above 900 m (2953 ft) to a maximum of 3050 m (10,000 ft)</p> <p>NOTE: Qualifications for extended ambient configurations are detailed at: https://www.hp.com/servers/ASHRAE</p>
	Relative Humidity (non-condensing)	<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>
	Altitude	<p>Operating 3,050 m (10,000 ft). This value may be limited by the type and number of options installed. Maximum allowable altitude change rate is 457</p>

Technical Specifications

		m/min (1,500 ft/min).
	Non-operating	9,144 m (30,000 ft). Maximum allowable altitude change rate is 457 m/min (1,500 ft/min).
Acoustic Noise	<p>For acoustic noise specifications, please see the HP BladeSystem c-Class Enclosures QuickSpecs located at:</p> <p>HP BladeSystem c3000 Enclosure QuickSpecs: http://h18000.www1.hp.com/products/quickspecs/12790_div/12790_div.html</p> <p>HP BladeSystem c7000 Enclosure QuickSpecs: http://h18000.www1.hp.com/products/quickspecs/12810_div/12810_div.html</p>	
HP Smart Array P246br Controller	Disk Drive Interface	12Gb/s SAS (Serial Attached SCSI) 6Gb/s SATA (Serial ATA)
	Server Interface	x8 5G PCIe 3.0 provides 8GB/s maximum bandwidth
	Cache Memory	1GB flash backed write cache (FBWC) cache standard
	Logical Drives Supported	64 (with included 1GB cache)
	Host Memory Addressing	64-bit, supporting servers memory space greater than 4GB
	RAID Support	RAID 1 (mirroring), RAID 0 (striping), RAID 5, RAID 10
	Other	Upgradeable firmware with recovery ROM Online drive flash (with SAS drives)
HP Dynamic Smart Array B140i Controller	Disk Drive Interface	6Gb/s SATA (Serial ATA)
	Server Interface	Embedded x4 PCIe 2.0
	SAS Connectors	4 internal SATA ports
	Cache Memory	None
	SAS Speed	6Gb/s SATA links
	Logical Drives Supported	Up to 10 logical volumes (4 physical drives)
	Host Memory Addressing	64-bit, supporting greater than 4GB server memory space
	Hot Plug Support	Yes
	RAID Support	RAID 1 (Mirroring) RAID 0 (Striping) RAID 5
	Other	Upgradeable firmware with recovery ROM
HP FlexFabric 10Gb 2-port 536FLB FlexibleLOM	Type	Integrated dual-port KR 10Gb FlexibleLOM with FlexFabric (Flex-10, FCoE, hardware-based iSCSI, iSCSI boot, TCP/IP offload engine, and autosensing 1Gb/10Gb Ethernet capability)
	Network Processor	QLogic 57840S with integrated MAC/PHY
	Data Transfer Method	x8 PCI Express 3.0
	Network Transfer Rate	Two ports, each at 20Gbps full duplex; 40Gbps aggregate full duplex theoretical bandwidth NOTE: Each port is autosensing 1Gb/10Gb, and can interoperate with 1Gb or 10Gb HP BladeSystem c-Class interconnect components. Both ports will operate at the same speed. NOTE: Each port on the 554FLB adapter transmits from the server at 20Gbps (theoretical) full duplex.

Technical Specifications

IEEE Compliance	802.1p, 802.1q, 802.1qau, 802.3ad, 802.3ae, 802.3ap (10GBase-KX4) and 802.3x
Standard Features	<p>Full hardware offload of iSCSI and FCoE storage protocol processing for highest performance converged Ethernet data and storage networks.</p> <p>Dual-port 10GbE Flex-10 FlexibleLOM network adapter that provides the flexibility to choose the type of LOM to meet growing infrastructure needs</p> <p>Industry-leading throughput and latency performance</p> <p>Supports HP's Flex-10 blade interconnect technology</p> <p>User configurable bandwidth settings when combined with the 10Gb Flex-10 Virtual Connect module. From 100Mb/s to 10Gb/s on up to four "Physical Function" NICs per port, in increments of 100Mb/s for NIC. The combined bandwidth of NICs cannot exceed port bandwidth i.e. 10 Gb.</p> <p>Up to 40Gb/s bi-directional near line rate throughput</p> <p>Hardware acceleration and offloads for stateless TCP/IP, TCP Offload Engine (TOE)</p> <p>Improved small packet performance</p> <p>Support for Preboot eXecution Environment (PXE)</p> <p>Integrated PHY and MAC</p> <p>Supports for SR-IOV</p> <p>Support for Network Partitioning (NPAR)</p>
HP FlexFabric 20Gb Type 2-port 650FLB FlexibleLOM	Integrated dual-port KR2 20Gb FlexibleLOM with FlexFabric (Flex-20, FCoE, RoCE, Tunnel Offload with VXLAN/NVGRE, hardware-based iSCSI, iSCSI boot, TCP/IP offload engine, and autosensing Ethernet speed capability)
Network Processor	Emulex XE-104
Data Transfer Method	x8 PCI Express 3.0
Network Transfer Rate	Two ports, each at 40 Gbps bi-directional; 80 Gbps aggregate bi-directional theoretical bandwidth
IEEE Compliance	802.3ae, 802.1Q, 802.3x, 802.1p, 802.3ad/LACP, 802.1AB(LLDP), 802.1Qbg, 802.1Qbb, 802.1Qaz, 802.3ap
Standard Features	<p>Dual 20Gb ports provide up to 80Gb bi-directional per adapter</p> <p>Multi-speed adapter operates at either 20GbE or 10GbE</p> <p>Converges FCoE or RoCE with LAN traffic on a single Ethernet wire</p> <p>Tunnel Offload support for VXLAN and NVGRE</p> <p>RDMA over Converged Ethernet (RoCE) for greater server efficiency and lower latency (6125XLG only)</p> <p>Advanced storage offload processing freeing up valuable CPU cycles</p> <p>Supports UEFI and legacy boot options</p> <p>Mixed Storage – supports NIC + FCoE on one port, and NIC + iSCSI on the other</p> <p>Concurrent Storage – concurrently supports NIC, FCoE, and iSCSI storage functions on the same port (NIC + FCoE + iSCSI)</p> <p>Industry-leading throughput and latency performance</p> <p>Supports HP's Flex-20 blade interconnect technology</p> <p>Over eight million small packets/s, ideal for web/mobile applications, mobile messaging, and social media</p> <p>User configurable bandwidth settings when combined with the 20Gb Flex-20 Virtual Connect module. From 100Mb/s to 10Gb/s on up to four "Physical Function" NICs per port, in increments of 100Mb/s for NIC. The combined</p>

Technical Specifications

bandwidth of NICs cannot exceed port bandwidth i.e. 20 Gb/s.
Greater bandwidth with PCIe 3.0
Jumbo Frames support
Supports Wake On LAN (WOL)
Support for Preboot eXecution Environment (PXE)
Support for Microsoft Windows SMB Direct
Optimized host virtualization density with SR-IOV support

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

Summary of Changes

Date	Version History	Action	Description of Change:
10-Jul-2015	From Version 2 to 3	Changed	Standard Features and Optional Features sections were updated.
		Removed	Skus removed from Core Options section: 741155-B21 741151-B21 741146-B21 717965-B21 734360-B21 717973-B21 739898-B21 717971-B21 739888-B21 717969-B21 691868-B21 691868-B21 691866-B21 691862-B21 756636-B21 756621-B21 748387-B21 791034-B21 781518-B21 785069-B21 781516-B21 785067-B21 684214-B21 665246-B21 665639-B21 684214-B21
		Added	Sku added in Core Options Section. 779176-B21
19-Jun-2015	From Version 1 to 2	Changed	Information in Additional Options and Configuration information - Factory Integrated Models section were updated.
		Removed	Obsolete Sku removed: 741146-B21
		Added	Skus were added in Additional Options Section: U8LQ2E U8LQ3E U8LQ5E U8LQ6E 659818-B21 651281-B21

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



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