Family guide

Eight steps to building a BladeSystem

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HP BladeSystem overview

With an unprecedented set of smart innovations, HP BladeSystem—including the new HP ProLiant Gen8 server family—provides the foundation of a self-aware and intelligent converged infrastructure. We're talking about a cloud-ready infrastructure that can support all your applications on a single platform, with both ProLiant and Integrity server blades and a range of storage and networking options. Architected for any workload from client to cloud, its modular, future-proof design takes advantage of proven innovations like Virtual Connect, Intelligent Infrastructure, and Insight Management. And it can be quickly scaled, repurposed, and upgraded to fit your changing business needs.

The proof is in the numbers

HP BladeSystem is engineered to maximize every hour, watt, and dollar, saving up to 56% total cost of ownership[1] over traditional infrastructures. Because core infrastructure is shared, capital costs can be significantly lower. Blades share power, cooling, network, and storage infrastructure at the BladeSystem enclosure level. Since equipment is not needed for each server, there is a dramatic reduction in power distribution units, power cables, LAN and SAN switches, connectors, adapters, and cables. And you can bring in the newest generation technologies by simply changing the components that need to be changed.

Making routine infrastructure changes takes up to 90%[1] less time with the wire-once connectivity only available with HP Virtual Connect. Virtual Connect simplifies and converges your server edge connections, making server connections transparent to storage and networks. You can reduce server edge infrastructure like network interface cards, cables, and switches by up to 95%.[2]

HP BladeSystem Intelligent Infrastructure allows you to double the capacity of your data center without adding power infrastructure. You can reclaim trapped capacity by dynamically "capping" power to prevent over-provisioning. This alone reduces blades power and cooling infrastructure requirements by up to 50%[3], without impacting performance. You can see exactly how and where you are using your power at the data center level and focus scarce power resources on your most important business priorities.

HP Insight Control unlocks the potential of your HP BladeSystem, cutting management time in half.[4] With HP Insight Control, you can provision servers quickly, manage health proactively, control servers from anywhere, and manage power confidently. With over six million licenses shipped, Insight Control is the most broadly used systems management platform in the industry.

Learn how HP BladeSystem can help you drive business innovation by visiting **hp.com/go/bladesystem**.

Modular, future-proof design

HP's global community of business technology experts and partners are here to help you build a solution and support plan that is just right for your needs. And we do a lot of the hard work for you by integrating the infrastructure essentials inside the BladeSystem. It arrives at your door ready to deliver the best business results.

Building your ideal BladeSystem infrastructure solution begins with these eight simple steps:

- **Step 1**: Choose your operating environment
- **Step 2**: Choose your BladeSystem enclosure
- **Step 3**: Choose your interconnects
- **Step 4**: Choose your server blades
- **Step 5**: Choose your storage infrastructure
- **Step 6**: Choose your infrastructure management
- **Step 7**: Choose your power and cooling configurations
- **Step 8**: Choose your services

Step 1: Choose your operating environment

HP Integrity and HP ProLiant server blades run in almost the same operating environment as other HP servers, but with the advantages of a BladeSystem infrastructure. You can mix and match different Integrity and ProLiant server blades and run multiple operating environments in the same enclosure.

Supported operating systems (OS) and virtualization software

- Microsoft® Windows®: **hp.com/go/wincert**
- Red Hat Enterprise Linux (RHEL): **hp.com/go/rhelcert**
- SUSE Linux Enterprise Server (SLES): **hp.com/go/slescert**
- Oracle Linux Unbreakable Enterprise Kernel: **hp.com/go/oelcert**
- Oracle Solaris: **hp.com/go/solaris**
- VMware: **hp.com/go/vmware**

Integrity certification

- Microsoft Windows: **hp.com/go/integrity/windows**
- HP-UX 11i: **hp.com/go/integrity/hpux**
- HP Integrity NonStop: **hp.com/go/integrity/nonstop**
- HP Open VMS: **hp.com/go/integrity/openvms**

Purchase your entire operating environment from HP

HP resells and provides full-service and support for Microsoft Windows operating systems, Red Hat Linux subscriptions, SUSE Linux subscriptions, and VMware hypervisors. Learn more at **hp.com/go/ossupport**.

Step 2: Choose your BladeSystem enclosure

HP offers two versatile enclosures to match the unique needs of large or small IT environments. Both enclosures share the same server, storage, and networking components. Each one repackages the moving parts of your infrastructure—cables, power supplies and fans, networking, built-in management and more—to give you greater convenience. **Intelligent infrastructure** technology allows BladeSystem to pool and share power and cooling resources, while Insight Control efficiently delivers those resources based on required performance levels.

HP BladeSystem **Onboard Administrator** is the built-in enclosure management processor, subsystem, and firmware base used to support the HP BladeSystem c-Class enclosures and all the managed devices contained within them. Onboard Administrator provides a single point from which to perform management tasks on server blades or switches within the enclosure. Together with the enclosure's HP Insight Display, the Onboard Administrator has been designed for both local and remote administration of HP BladeSystem c-Class.

This module and its firmware provides:

- Wizards for simple, fast setup and configuration
- Highly available and secure local or remote access to the HP BladeSystem infrastructure
- Security roles for server, network, and storage administrators
- Automated power and cooling of the enclosure
- Agent-less device health and status
- Power and cooling information and control

Each enclosure is shipped with a first Onboard Administrator module/firmware. HP BladeSystem enclosures can be configured with redundant Onboard Administrator modules to provide uninterrupted manageability of the entire enclosure and blades. When two Onboard Administrator modules are present, they work in an active-standby mode, assuring full redundancy of the enclosure's integrated management.

	HP BladeSystem c3000 enclosure Smaller, versatile design ideal for offices or branch locations that only need up to eight server or storage components at a time. Uses a standard power outlet, doesn't require special air conditioning, and includes features designed to help small staffs be more productive with less effort.	**HP BladeSystem c7000 enclosure** Larger, modular block of infrastructure ideal for bigger data centers. Holds up to 16 types of server and storage blades and offers twice as many interconnect expansion slots to run nearly any application in a dynamic, high-performance IT environment.
Device bays	Up to 8 server and storage blades, mixed configurations supported	Up to 16 server and storage blades, mixed configurations supported
Interconnect bays	4	8 (up to 4 redundant I/O fabrics)
Power supplies	Up to (6) 1200W	Up to (6) 2400W
Fans	Up to 6 hot-plug Active Cool fans	Up to 10 hot-plug Active Cool fans
Onboard Administrator	Up to 2	Up to 2
Height	6U	10U
HP related offerings		
Support services[6]	See HP BladeSystem Services at http://www8.hp.com/us/en/business-services/it-services.html?compURI=1066793#tab=1.	
Options	Redundant Onboard Administrator, Insight Control Management software, 10000 G2 Series rack	

Find a complete list of supported options at **hp.com/go/BladeSystem**.

Step 3: Choose your interconnects

Virtual Connect is an essential building block for any virtualized or cloud-ready environment. This innovative wire-once HP connection management simplifies server connectivity, making it possible to add, move, and change servers in minutes versus hours or days. Virtual Connect is the simplest way to connect servers to any network and reduces network sprawl at the edge by up to 95%.[5]

Interconnects: Virtual Connect modules

	HP Virtual Connect FlexFabric 10Gb/24-port Module Premium module for converged Ethernet and Fibre Channel, or iSCI environments.	**HP Virtual Connect Flex-10 10Gb Ethernet Module** Innovative module that introduced Flex-10, provides optimal support for Ethernet or converged iSCSI connectivity.	**HP Virtual Connect Flex 10/10D Module** Innovative module that introduced Flex-10, provides optimal support for Ethernet or converged iSCSI connectivity.
Blade type	Single bay	Single bay	Single bay
Network connections	16x10 Gb downlinks; 2x10 Gb cross connects; 4x10 Gb external SR, LR fiber and copper uplinks SFP+ (Enet/FC); 4x10 Gb external SR, LRM, and LR fiber and copper uplinks SFP+ (Enet); 1 internal interface to c-Class Onboard Administrator Module	16x10 Gb downlinks midplane; 2x10 Gb cross connects; 1x10 Gb copper uplink CX-4 8x10 Gb SR, LR, or LRM fiber uplinks SFP+ 1 management USB port; 1 internal interface to c-Class Onboard Administrator Module	16 x 10 Gb downlinks midplane 4 x 10 Gb cross connect 10 x 10 Gb SR, LR, or LRM fiber uplinks SFP+ 1 internal interface to c-Class Onboard Administrator Module
Media types	Fibre Channel SFP/SFP+ 2/4/8 Gb short wave up to 500 m; 1/2/4 Gb long wave up to 10 km Ethernet SFP/SFP+ 10GbE SR, LR, and LRM; 10GbE copper direct attached cable; 1GbE SX; 1GbE 1000Base-T copper; HP 7m C-series Active Copper SFP+ Cable; HP 10m C-series Active Copper SFP+ Cable; HP X242 SFP+ 15M DAC Cable HP X242 SFP+ 7m DAC Cable	SFP+ SR, LR, LRM SFP SX, RJ-45 SFP + Copper Twinax CX-4 (IB4x) HP 7m C-series Active Copper SFP+ Cable HP 10m C-series Active Copper SFP+ Cable HP X242 SFP+ 15M DAC Cable HP X242 SFP+ 7m DAC Cable	SFP+ SR, LR, LRM SFP SX, RJ-45 SFP + Copper HP 7m C-series Active Copper SFP+ Cable HP 10m C-series Active Copper SFP+ Cable HP X242 SFP+ 15M DAC Cable HP X242 SFP+ 7m DAC Cable
Performance	Line rate, full-duplex; 480 Gb/s bridging fabric; 1.2 µs on Ethernet only ports; 1.7 µs Ethernet/FC ports; maximum Ethernet frame size 9216 (Jumbo Frame); maximum FC frame size 2148 bytes (2112 byte payload); buffer-to-buffer flow control management; packet prioritization	Line rate, full-duplex 480 Gb/s bridging fabric, less than 1.5 µsec latency	Line rate, full-duplex 600 Gb/s bridging fabric Less than 0.9 µs with Ethernet only ports Maximum Ethernet frame size 9216 (Jumbo Frame)
Protocol support	IEEE 802.1Qbb (preliminary), 802.1Qaz (preliminary), 802.1AB, 802.1D, 802.1Q, IEEE 802.2, 802.3ad; INCITS FC-BB-5 Rev 2.00 INCITS T11 N_Port ID Virtualization (NPIV)	802.1AB, 802.1D, 802.1Q, IEEE 802.2, 802.3ad	802.1AB, 802.1D, 802.1Q, IEEE 802.2, 802.3ad
Management	Simple and intuitive graphical user interface, and setup wizards; embedded SNMP v1, v2; SMI-S; port mirroring—any uplink port can be used as a dedicated mirrored port from the server port(s)	Simple and intuitive graphical user interface, and setup wizards; embedded SNMP v1, v2 port mirroring—any uplink port can be used as a dedicated mirrored port from the server port(s)	Simple GUI and setup wizards embedded SNMP v1, v2; SMI-S CLI port mirroring—any uplink port can be used as a dedicated mirrored port from the server port(s)
Extended management features	Virtual Connect Enterprise Manager (VCEM) support, supports PXE, WOL, port VLAN, VLAN Tagging, VLAN pass through, IGMP Snooping, NIC Teaming, Integrated with Onboard Administrator, HP Systems Insight Manager, HP Storage Essentials (FC Management MIB); Telnet, and SNMP, FC port-telemetry via GUI, Telemetry support for Port utilization including memory and CPU performance measurement.	VCEM support, supports PXE, WOL, port VLAN, VLAN Tagging, VLAN pass through, IGMP Snooping, NIC Teaming, Integrated with Onboard Administrator, HP Systems Insight Manager, Telnet, and SNMP. Telemetry support for Port utilization including memory and CPU performance measurement	Virtual Connect Manager supports PXE, WOL, port VLAN, VLAN Tagging, VLAN pass through, IGMP Snooping, NIC Teaming Integrated with Onboard Administrator, HP Systems Insight Manager Telnet, SNMP. Telemetry support for Port utilization including memory and CPU performance measurement
High-availability features	Link Aggregation Protocol; automatic loop protection; mirrored profile database; multi-path heartbeat between redundant modules	Link Aggregation Protocol; automatic loop avoidance; mirrored profile database; multi-path heartbeat between redundant modules	Link Aggregation Protocol automatic loop protection mirrored profile database multi-path heartbeat between redundant modules
Security	LDAP, SSL, TACACS+ and Radius Role-based management including support Network Access Group	LDAP, SSL, TACACS+ and Radius Role-based management including support Network Access Group	LDAP, SSL, TACACS+ and Radius Role-based management including support Network Access Group
Maximum per enclosure	8	8	8
Warranty in year(s)[9] (parts/labor/onsite)	1/1/1	1/1/1	1/1/1

Interconnects: Virtual Connect modules (continued)

	 **HP Virtual Connect 8Gb 20-Port Fibre Channel Module** Best cost per Fibre Channel port of Virtual Connect modules.	 **HP Virtual Connect 8Gb 24-Port Fibre Channel Module** Highest Fibre Channel port density of Virtual Connect modules.
Blade type	Single bay	Single bay
Network connections	16 internal 8Gb downlinks presented as F_Ports 4 external 8Gb uplinks presented as N_Ports	16 internal 8Gb downlinks presented as F_Ports 8 external 8Gb uplinks presented as N_Ports
Media types	8Gb Optical Short Wave Transceiver (SFP+) 4/8Gb Optical Short Wave Transceiver (SFP+)	4Gb Optical Short Wave Transceiver (SFP+) 4/8Gb Optical Long Wave Transceiver up to 10 km (SFP+)
Performance	Up to 1600 MB/s throughput per port; maximum frame size 2148 bytes (2112 byte payload); bandwidth of 852 MB at 8 Gb/s; full duplex aggregate bandwidth up to 17.04 GB; full duplex fabric latency < 0.1 µsec at 8 Gb/s	Up to 1600 MB/s throughput per port; maximum frame size 2148 bytes (2112 byte payload); bandwidth of 852 MB at 8 Gb/s full duplex
Protocol support	NCITS T11 N_Port ID Virtualization (NPIV)	NCITS T11 N_Port ID Virtualization (NPIV)
Management	Simple and intuitive graphical user interface and setup wizards accessible through VC Ethernet module; command line interface accessible through VC Ethernet module; embedded SNMP v1 and v2 SMI-S	Simple and intuitive graphical user interface and setup wizards accessible through VC Ethernet module; command line interface accessible through VC Ethernet module; embedded SNMP v1 and v2 SMI-S
Extended management features	VCEM support HP Storage Essentials (FC Management MIB)	VCEM support HP Storage Essentials (FC Management MIB)
High-availability features	All VC-FC modules provide the highest levels of availability and reliability. Modules detect uplink port connectivity loss and automatically move server connections to another available uplink port within the same module. HBAs are dynamically re-mapped without downtime to the SAN.	All VC-FC modules provide the highest levels of availability and reliability. Modules detect uplink port connectivity loss and automatically move server connections to another available uplink port within the same module. HBAs are dynamically re-mapped without downtime to the SAN.
Security	LDAP, SSL, role-based management	LDAP, SSL, role-based management
Maximum per enclosure	6	6
Warranty in year(s)[9] (parts/labor/onsite)	1/1/1	1/1/1
HP related offerings		
Support services[6]	Enhanced Network Installation and Startup service for HP BladeSystem interconnect switches and modules.	
Software	Virtual Connect Enterprise Manager centralizes connection management and workload mobility for thousands of servers.	
External storage	iSCSI with HP P4000 G2 SAN Solutions or P2000 G3, P6000 EVA, XP, P9500.	

Interconnects: Ethernet switches

						
	Cisco Catalyst Blade Switch 3020 Cisco Catalyst technology for HP BladeSystem c-Class enclosures.	**Cisco Catalyst Blade Switch 3120G/3120X** 1Gb and 1Gb/10Gb versions with stacking capabilities allow for ease of management.	**HP GbE2c Layer 2/3 Ethernet Blade Switch** Ideal for low-cost 1Gb aggregation.	**HP Networking 6120G/ XG Blade Switch** Ideal switch for mixed 1Gb/10Gb networks or data centers in transition	**HP Networking 6120XG Blade Switch** Most powerful 10Gb Ethernet switch for BladeSystem, also supports full FCoE capabilities	**Cisco Fabric Extender for HP (B22HP)** For use with Cisco Nexus 5000 series switches
Performance	48Gb switching fabric; 128Mb DDR SDRAM; 32Mb Flash memory	80Gb switching fabric; 256Mb SDRAM; 64Mb Flash memory	48Gb switching fabric; 128Mb SDRAM; 16Mb Flash memory	106Gb switching fabric; 512Mb SDRAM; 256Mb Flash memory	480 Gb switching fabric; 512 Mb SDRAM; 640Mb Flash memory; 16 internal 10Gb downlinks	106Gb switching fabric; 512Mb SDRAM; 256Mb Flash memory
Port configuration	16 internal 1Gb downlinks; 8 external 10/100/1000 SFP/ BASE-T uplinks; 2 configurable as cross-connects; 1 management console port	16 internal 1Gb downlinks; 4 external 10/100/1000/ BASE-T uplinks; 2 internal cross connects; 4 optional external 10/100/1000 SFP uplinks; 2 external 10Gb X2 uplinks (3120X only)	16 internal 1Gb downlinks; 5 external 10/100/1000 BASE-T uplinks; 2 internal cross-connects; 1 management console port	16 internal 1Gb downlinks; 4 external 10/100/1000BASE-T uplinks; 2 external SFP Uplinks; 2 external SFP uplinks; 1 external 10Gb CX4 uplink; 2 external 10Gb XFP ports; 1 internal 10 Gb cross-connect;1 management console port	16 internal 10Gb downlinks; 8 external 10Gb SFP+ (1Gb SFP) ports including one shared CX-4; Port-Supports SR/LR/LRM; Up to two internal 10Gb cross-connects; 1 management console port	16 internal 1Gb/10Gb downlinks; 8 external SFP+ uplinks
Management features	CiscoWorks, SNMP v1, v2, v3, Telnet, and CLI	CiscoWorks, SNMP v1, v2, v3, Telnet, and CLI	Dual-mode CLI—AOS and iSCLI, SNMP v1, v2, v3, HTTP, HTTPS, NTP server support, and RMON	PCM/PCM+, SNMP v1, v2, v3, HTTP, HTTPS, NTP server support, RMON, sFlow, SNTP auth	PCM/PCM+, SNMP v1, v2, v3, HTTP, HTTPS, NTP server support, RMON, sFlow, SNTP auth	Managed through Cisco Nexus 5000
High-availability features	Per VLAN Spanning Tree Plus; Uplink Fast; Port Fast; Bridge Protocol Data Unit	Per VLAN Spanning Tree Plus; Uplink Fast; Port Fast; Bridge Protocol Data Unit	Link Aggregation Protocol; Uplink failure detection; Spanning Tree; Virtual Router Redundancy Protocol (VRRP)	Link Aggregation Protocol; Uplink failure detection; Spanning Tree	Link Aggregation Protocol; Uplink failure detection; Spanning Tree	Feature attributes derived from parent Nexus switch
Protocols supported	SSH v2, 802.1s, 802.1w, 802.1x, 802.3ad, 802.3x, 802.1d, 802.1p, 802.1q, 802.3, 802.3u, 802.3ab, and 802.3z	SSH v2, 802.1s, 802.1w, 802.1x, 802.3ad, 802.3x, 802.1d, 802.1p, 802.1q, 802.3, 802.3u, 802.3ab, and 802.3z	SSH v2, TACACS, TACACS+, RADIUS, 802.3, 802.3u, 802.3ab, 802.1d, 802.1s, 802.1w, 802.1p, 802.3ac, and 802.1x	SSH v2, TACACS, TACACS+, RADIUS, 802.3, 802.3u, 802.3ab, 802.1ab, 802.1d, 802.1s, 802.1w, 802.1p, 802.1q, 802.3ac, and 802.1x	SSH v2, TACACS, TACACS+, RADIUS, 802.3, 802.3u, 802.3ab, 802.1ab, 802.1d, 802.1s, 802.1w, 802.1p, 892.1q, 802.3ac, and 802.1x, Converged Enhanced Ethernet (802.1Qaz - Data Center Bridging Capability Exchange Protocol (DCBX), 802.1Qbb—Priority-based Flow Control, 802.1Qaz - Enhanced Transmission Selection)	Protocol attributes derived from parent Nexus switch
Warranty in year(s)[9] (parts/ labor/onsite)	1/1/1 3-year software updates	1/1/1 3-year software updates	1/1/1	1/1/1; Lifetime replacement	1/1/1; Lifetime replacement	1/1/1
HP related offerings						
Support services[6]	HP BladeSystem Enclosure service					
Options	1000 Base SX Fiber SFP Module	IP Services Software upgrade license for Cisco 3120 Series, 1000 Base SX Fiber SFP Module, 10Gb CX4 X2 Module (3120X), 10Gb SR X2 Module (3120X), 10Gb LRM X2 Module (3120X), 0.5, 1.0, and 3.0 meter stacking cables	Fiber SFP module kit (maximum 2 per switch), Premium Software Subscription service	SFP+/XFP/SFP Modules, DAC Cables modules, CEE Upgrade License	SFP+/XFP/SFP Modules, DAC Cables modules, CEE Upgrade License	Cisco FET Transceivers
External storage	iSCSI with HP P4000 G2 SAN Solutions or P2000 G3					

Interconnects: Fibre Channel switches

	 **Brocade 8Gb SAN Switch** Next generation, high performance embedded Fibre Channel switch option for medium and enterprise-class customers.	 **Cisco MDS 8Gb Fabric Switch** High performance Fibre Channel storage connectivity to HP BladeSystem c-Class in an embedded form factor.
Performance	8 Gb/s, non-blocking and auto-sensing 2/4/8 Gb	8 Gb/s, non-blocking and auto-sensing 2/4/8 Gb
Port configuration	384 Gb/s (end-to-end)	384 Gb/s (end-to-end)
Management features	Web Tools; Advanced zoning; Power Pack+ (bundled or optional): Adaptive Networking, Server Application Optimization, ISL Trunking, Advanced Performance Monitoring, Fabric Watch, Extended Fabrics; SAN Network Advisor (optional)	Cisco MDS 9000 Family Command Line Interface (CLI), Cisco Fabric Manager, Cisco Fabric Manager Server for HP BladeSystem c-Class (optional), Cisco Enterprise Package for HP BladeSystem c-Class (optional), Cisco Fabric Manager Server Enterprise Package Bundle for HP BladeSystem c-Class (optional)
High-availability features	Redundant switches; hot pluggable; non-disruptive software upgrades	Redundant switches; hot pluggable; non-disruptive software upgrades
Protocols supported	Fibre Channel	Fibre Channel
Warranty in year(s)[9] (parts/labor/onsite)	1/1/1	1/1/1
HP related offerings		
Support services[6]	3-year, 24x7 hardware support service	3-year, 24x7 hardware support service
Options	SFP+ (short wave) SFPs (short wave, long wave)	SFP+ (short range, long range) SFPs (short range, long range)
External storage	HP P2000 G3 FC/MSA2000 G2, P6000/EVA, and P9500/XP disk arrays	HP P2000 G3 FC/MSA2000 G2, EVA, P9500/XP disk arrays

Interconnects: Fibre Channel HBA mezzanine cards

	 **HP BLc Emulex LPe1205-HP 8Gb FC HBA[7]**	 **HP LPe1205A 8Gb FC HBA**	 **QLogic QMH2562 8Gb FC HBA 15[8]**	 **Emulex LPe1105-HP 4Gb FC HBA**	 **HP QLogic QMH2462 4Gb FC HBA**	 **Brocade 804 8Gb FC HBA**	 **HP QMH2572 8GB FC HBA[8]**
Performance	Up to 200,000 I/Os per second per channel	Up to 200,000 I/Os per second per channel	Up to 200,000 I/Os per second per channel	115,000 IOPS per port	150,000 IOPS per port	Up to 500,000 IOPS per port	Up to 200,000 I/Os per second per channel
Port configuration	Dual 8Gb Fibre Channel ports	Dual 8Gb Fibre Channel ports	Dual 8Gb Fibre Channel ports	Dual 4Gb Fibre Channel ports	Dual 4Gb Fibre Channel ports	Dual 8Gb Fibre Channel ports	Dual 8Gb Fibre Channel ports
Management features	Emulex installation and management tools automate installation and provide local and remote HBA configuration and management	Emulex installation and management tools automate installation providing local and remote HBA configuration and management	QLogic SANsurfer FC HBA Manager for centralized management and remote control of distributed HBAs	Emulex installation and management tools automate installation and provide local and remote HBA configuration and management	QLogic SANsurfer FC HBA Manager for centralized management and remote control of distributed HBAs	Integrates into HP Data Center Fabric Manager	QLogic SANsurfer FC HBA Manager for centralized management and remote control of distributed HBAs
High-availability features	Multi-path support for redundant HBAs and paths	Multi-path support for redundant HBAs and paths	Multi-path support for redundant HBAs and paths	Multi-path support for redundant HBAs and paths	Multi-path support for redundant HBAs and paths	Multi-path support for redundant HBAs and paths	Multi-path support for redundant HBAs and paths
Protocols supported	Full support for both FC service class 2 and 3	Full support for both FC service class 2 and 3	Fibre Channel	Full support for both FC service class 2 and 3	Full support for both FC service class 2 and 3	Full support for both FC service class 2 and 3	Fibre Channel
Warranty in year(s)[9] (parts/labor/onsite)	1/1/1	1/1/1	1/1/1	1/1/1	1/1/1	1/1/1	1/1/1

Interconnects: Ethernet network adapter mezzanines

				
	HP NC325m PCI Express Quad Port Gigabit Server Adapter	**NC360m Quad-Port 1GbE Adapter**	**NC364m Quad-Port 1GbE Adapter**	**HP NC382m PCI Express Dual Port Multifunction Gigabit server adapter**
Hardware features				
IEEE compliance	802.1p, 802.1Q, 802.3, 802.3ad and 802.3x	802.1p, 802.1Q, 802.3, 802.3ad and 802.3x	802.1p, 802.1Q, 802.3, 802.3ad and 802.3x	802.1p, 802.1Q, 802.3, 802.3ad and 802.3x
Ports and transfer rate	(4) 2,000 Mbps	(2) 2,000 Mbps	(4) 2,000 Mbps	(2) 2,000 Mbps
Form factor	x4 PCIe, type I card	x4 PCIe, type I card	x4 PCIe, type I card	x4 PCIe, type I card
Network controller	Dual Broadcom 5715S	Intel® 82571EB	Dual Intel 82571EB	Broadcom 5709S
Software features				
PXE	Yes	PXE boot with VC modules only	PXE boot with VC modules only	Yes
TOE, accelerated iSCSI, and iSCSI boot	N/A	TOE (Windows)	TOE (Windows)	TOE (Windows), Accelerated iSCSI and iSCSI boot (Windows and Linux)
Adapter teaming	Yes	N/A	N/A	Yes
Warranty in year(s)[9] (parts/labor/onsite)	1/0/0[11]	1/0/0[11]	1/0/0[11]	1/0/0[11]

Interconnects: Ethernet network adapter mezzanines

	 **NC542m Dual-Port Flex-10 10GbE Multifunction BLc Adapter**	 **NC532m Dual-Port Flex-10 10GbE Multifunction BLc Adapter**	 **HP NC550m 10Gb 2-port PCIe x8 Flex-10 Ethernet Adapter**	 **NC551m Dual-Port FlexFabric 10Gb Converged Network Adapter**	 **HP NC552m 10Gb 2-port Flex-10 Ethernet Adapter**	 **HP NC553m 10Gb 2-port FlexFabric Adapter**
Hardware features						
IEEE compliance	802.1p, 802.1q, 802.3u, 802.3ad, 802.3ae, 802.3x, 802.3z, and 802.3ap (10GBase-KX4)	802.3u, 802.3x, 802.3ad, 802.1p, 802.1q, 802.3z, 802.3ae, and 802.3ap (10GBase-KX4)	802.3ae, 802.3ap (10GBase-KX4), 802.1q, 802.1qau, 802.3x, 802.1p, 802.3ad, 802.3u and 802.3z	802.1p, 802.3ad, 802.3x, 802.1q, 802.1qau, 802.3u, 802.3ae, 802.3ap 0GBase-KX4), and 802.3z	802.3ae, 802.3ap (10GBase-KX4), 802.1q, 802.1qau, 802.3x, 802.1p, 802.3ad, 802.3u and 802.3z	802.1p, 802.1q, 802.1qau, 802.3u, 802.3ad, 802.3ae, 802.3ap (10GBase-KX4), 802.3x and 802.3z
Ports and transfer rate	(2) 20,000 Mbps	(2) 20,000 Mbps	(2) 20,000 Mbps	(2) 20,000 Mbps	(2) 20,000 Mbps	(2) 20,000 Mbps
Form factor	x8 PCIe 2.0 type 1 card	x8 PCIe 2.0 type 1 card	x8 PCIe 2.0 type 1 card	x8 PCIe 2.0 type 1 card	x8 PCIe 2.0 type 1 card	x8 PCIe 2.0 type 1 card
Network controller	Mellanox ConnectX-2EN	Broadcom 57711	Emulex BE2	Emulex BE2	Emulex BE3	Emulex BE3
Software features						
PXE	N/A	Yes	Yes	Yes	N/A	N/A
TOE, accelerated iSCSI, and iSCSI boot	N/A	TOE (Windows), Accelerated iSCSI (Windows and Linux)	TOE (Windows)	TOE (Windows), Accelerated iSCSI (Windows and Linux)	TOE (Windows)	TOE, Accelerated iSCSI and iSCSI boot
Adapter teaming	N/A	Yes	N/A	N/A	N/A	N/A
Warranty in year(s)[9] (parts/labor/onsite)	1/0/0[11]	1/0/0[11]	1/0/0[11]	1/0/0[11]	1/0/0[11]	1/0/0[11]

Interconnects: Ethernet network adapter mezzanines and FlexibleLOM

	 **HP Flex-10 10Gb 2-port 530FLB Adapter**	 **HP Flex-10 10Gb 2-port 530M Adapter**	 **HP Flex-10 10Gb 2-port 552M Adapter**	 **HP FlexFabric 10Gb 2-port 554FLB Adapter**	 **HP FlexFabric 10Gb 2-port 554M Adapter**
Hardware features					
IEEE compliance	802.3, 802.1ab, 802.3x,802.3ad, 802.3p,802.1q, 802.3ae, 802.1au, 802.3ap	802.3, 802.3ab, 802.3u, 802.3x, 802.3ad, 802.3p, 802.1q, 802.3ae,802.3ap	802.1p, 802.1q, 802.1qau, 802.3ad, 802.3ae, 802.3ap (10GBase-KX4), and, 802.3x	802.1p, 802.1q, 802.1qau, 802.3ad, 802.3ae, 802.3ap (10GBase-KX4), and 802.3x	802.1p, 802.1q, 802.1qau, 802.3ad, 802.3ae, 802.3ap (10GBase-KX4) and 802.3x
Ports and transfer rate	2 x 20,000 Mbps	2 x 20,000 Mbps	2 x20,000 Mbps	2 x 20,000 Mbps	2 x 20,000 Mbps
Form factor	x8 PCIe 2.0 FlexibleLOM	x8 PCIe 2.0 type A card	x8 PCIe 2.0 type A card	x8 PCIe 2.FlexibleLOM	x8 PCIe 2.0 type A card
Network controller	Broadcom 57810S	Broadcom 57810S	Emulex BE3	Emulex BE3	Emulex BE3
Software features					
PXE	Yes	Yes	Yes	Yes	Yes
TOE, accelerated iSCSI, and iSCSI boot	TOE (Windows)	TOE (Windows)	TOE (Windows)	TOE, Accelerated iSCSI, and iSCSI boot	TOE, Accelerated iSCSI, and iSCSI boot
Adapter teaming	Yes	Yes	N/A	N/A	N/A
Warranty in year(s)[9] (parts/labor/onsite)	1/0/0[11]	1/0/0[11]	1/0/0[11]	1/0/0[11]	1/0/0[11]

InfiniBand Switch Module

	HP BLc 4X QDR IB Switch	HP BLc 4X DDR IB G2 Switch
Performance	40 Gb/s (QDR) per port, 2.5 TBps switching capacity	20 Gb/s (DDR) per port, 1.28 TBps switching capacity
Port configuration	16 4X QDR QSFP uplink ports	16 4X DDR QSFP uplink ports
Management features	Externally managed	Externally managed
Support notes	Require subnet manager on the fabric. Supported only on new RoSH 6 of 6 compliant c7000 enclosure	Require subnet manager on the fabric
Protocols supported	IBTA	IBTA
Warranty in year(s)[9] (parts/labor/onsite)	1-year part exchange	1-year part exchange

Interconnects: InfiniBand Mezzanine HCA

	HP 4X QDR IB Dual-Port Mezzanine HCA	HP IB 4X DDR Dual-Port Mezzanine HCA
Performance	4x quad data rate (40 Gb/s)	4x double data rate (20 Gb/s)
Port configuration	Dual-port	Dual-port
Management features	OFED driver stack	OFED driver stack
Supported ProLiant BL	BL280c G6, BL460c G6, and BL490c G6	BL260c G5, BL280c G6, BL2x220c G5, BL460c, BL460c G5, BL460c G6, BL465c G5, BL480c, BL490c G6, BL495c G5, BL680c G5, BL685c, BL685c G5, and BL685c G6
Supported Integrity BL	N/A	BL860c
Warranty in year(s)[9] (parts/labor/onsite)	1-year part exchange	1-year part exchange

Direct Connect SAS Controller and Switch

	 HP 4X QDR IB Dual-Port Mezzanine HCA	 HP IB 4X DDR Dual-Port Mezzanine HCA	 HP 3Gb SAS Switch for HP BladeSystem c-Class[10]	 HP 6Gb SAS Switch for HP BladeSystem c-Class[10]	 HP 6Gb SAS Switch for HP BladeSystem c-Class[10]
Performance	3 Gb/s SAS	6 Gb/s SAS	3 Gb/s SAS available 512 MB BBWC	6 Gb/s SAS includes 1 GB FBWC	6 Gb/s SAS available 256 MB Cache
Port configuration	Eight 3 Gb/s SAS ports	Eight 6 Gb/s SAS ports	4 external 2x SAS connections through the blade mezzanine connector	4 external 2x SAS connections through the blade mezzanine connector	2 internal 1x SAS connections 2 external 2x SAS connections through the blade mezzanine connector (external only enabled with cache)
Management features	Virtual SAS Manager	Virtual SAS Manager	Smart Array management with online array expansion, RAID migration, and online spares	Smart Array management with online array expansion, RAID migration, and online spares (with BBWC upgrade)	Smart Array management with online array expansion, RAID migration, and online spares (with BBWC upgrade)
Availability features	Redundant switches for high availability and path failover	Redundant switches for high availability and path failover	Battery backed write cache, RAID (including RAID 6 with ADG, RAID migration Recovery ROM)	Flash backed write cache, RAID (including RAID 6 with ADG, RAID migration Recovery ROM)	RAID 0/1
Protocols supported	3 Gb/s SAS/1.5 Gb/s SATA	6 Gb/s SAS/3 Gb/s SATA	3 Gb/s SAS/1.5 Gb/s SATA	6 Gb/s SAS/3 Gb/s SATA	6 Gb/s SAS/3 Gb/s SATA
Warranty in year(s)[9] (parts/labor/onsite)	1/1/1	1/1/1	3/0/0	3/0/0	3/0/0
HP related offerings					
Capacity for server blades	Shared SAS storage: Each BladeSystem enclosure supports up to four P2000 G3 storage arrays.				
Data protection	HP 1/8 G2 Autoloader and MSL Tape Libraries with SAS tape drives connect to the direct connect SAS switch to protect data on your server blades.				

Note: With a SAS Mezzanine card and the new 3Gb SAS BL switch, you can connect external disk and tape solutions with a simple cable connection.

Step 4: Choose your server blades

Build and configure each server blade with the right features to fit your needs, without compromise.

HP ProLiant BL2x220c G7
Enhanced performance and efficiency for high performance computing with 20X better bandwidth with integrated InfiniBand.

HP ProLiant BL420c Gen8
Redefines the term "entry-level" in the blade market with breakthrough server blade economics for essential enterprise workloads.

HP ProLiant BL460c Gen8
The world's most popular server blade delivers the ideal balance of performance, scalability, and expandability, making it the standard for dense data center computing.

HP ProLiant BL465c Gen8
Unprecedented performance, enhanced flexibility, and simplified management. Ideal for virtual workloads, flexible enough for any application.

Number of processors	2 per node	1 or 2	1 or 2	1 or 2
Maximum number of cores	12 per node	16	16	32
Processor family	Intel® Xeon® 5600 series	Intel® Xeon® E5-2400	Intel® Xeon® E5-2600	AMD Opteron™ 6200 Series
Maximum processor frequency	3.20 GHz	2.4 GHz	3.0 GHz	3.3 GHz
Memory Slots	6 per node	12	16	16
Maximum memory per server	96 GB per node	384 GB	512 GB	512 GB
Networking ports (embedded)	(2) 1GbE per node (1) 4X QDR InfiniBand/10Gb Flex-10 per node	None	None	None
Maximum FlexibleLOM ports	None	2	2	2
Maximum drive bays[11]	1 SFF NHP SATA/SSD per node	2 SFF SATA/SAS/SSD	2 SFF SATA/SAS/SSD	2 SFF SATA/SAS/SSD
Maximum internal storage	500 GB	2.0 TB	2.0 TB	2.0 TB
I/O expansion slots	None	2 PCIe 3.0 mezzanine	2 PCIe 3.0 mezzanine	2 PCIe 2.0 mezzanine
Form factor	Half-height, double-dense server blade 32 nodes per 10U enclosure	Half-height server blade 16 per 10U enclosure 8 per 6U enclosure	Half-height server blade 16 per 10U enclosure 8 per 6U enclosure	Half-height server blade 16 per 10U enclosure 8 per 6U enclosure
Management	HP iLO 3 HP Systems Insight Manager Optional: HP Insight Control	HP iLO Management Engine HP Systems Insight Manager Optional: HP Insight Control	HP iLO Management Engine HP Systems Insight Manager Optional: HP Insight Control	HP iLO Management Engine HP Systems Insight Manager Optional: HP Insight Control
Warranty in year(s)[9] **(parts/labor/onsite)**	3/0/0	3/3/3	3/3/3	3/3/3

Server blade options, including memory DIMMs and hard drives are available on select models. For more information, visit **hp.com/go/proliantoptions** or **hp.com/go/integrityblades**.

Applications and virtual machines

The number of applications, virtual machines, and users supported by your solution will determine the number of server blades needed. Together with our channel partners, we can help you choose the right number of blades with our solution-sizing tools and expertise.

In addition, ActiveAnswers is an online resource with a variety of solutions to help you make the right choice. Learn more about ActiveAnswers or find simple solution help at **hp.com/go/activeanswers**.

	 **HP ProLiant BL620c G7** Provides an ideal combination of extensive scalability and performance allowing you to do more with a two-processor server than ever before.	 **HP ProLiant BL660c Gen8** The ideal 4-socket dense form factor without compromising on performance, scalability, and expandability.	 **HP ProLiant BL680c G7** The world's first ultra-terabyte memory 4S blade provides maximum performance and unparalleled expansion.	 **HP ProLiant BL685c G7** Cost-effective, dense, four-socket computing for virtualization and compute-intensive applications.
Number of processors	1 or 2	2 or 4	2, 3, or 4	2 or 4
Maximum number of cores	20	32	40	64
Processor family	Intel® Xeon® E7-2800	Intel® Xeon® E5-4600	Intel® Xeon® E7-4800	AMD Opteron™ 6100 Series AMD Opteron™ 6200 Series
Maximum processor frequency	2.4 GHz	2.9 GHz	2.4 GHz	3.3 GHz
Memory Slots	32	32	64	32
Maximum memory per server	1.0 TB	1.0 TB	2.0 TB	1.0 TB
Networking ports (embedded)	(4) 10GbE FlexFabric	None	(6) 10GbE FlexFabric	(4) 10GbE FlexFabric
Maximum FlexibleLOM ports	None	4	None	None
Maximum drive bays[11]	2 SFF SATA/SAS/SSD	2 SFF SATA/SAS/SSD	4 SFF SATA/SAS/SSD	2 SFF SATA/SAS/SSD
Maximum internal storage	2.0 TB	2.0 TB	4.0 TB	2.0 TB
I/O expansion slots	3 PCIe 2.0 mezzanine	3 PCIe 3.0 mezzanine	7 PCIe 2.0 mezzanine	3 PCIe 2.0 mezzanine
Form factor	Full-height server blade 8 per 10U enclosure 4 per 6U enclosure	Full-height server blade 8 per 10U enclosure 4 per 6U enclosure	Full-height, double-wide server blade 4 per 10U enclosure 2 per 6U enclosure	Full-height server blade 8 per 10U enclosure 4 per 6U enclosure
Management	HP iLO 3 HP Systems Insight Manager Optional: HP Insight Control	HP iLO Management Engine HP Systems Insight Manager Optional: HP Insight Control	HP iLO 3 HP Systems Insight Manager Optional: HP Insight Control	HP iLO 3 HP Systems Insight Manager Optional: HP Insight Control
Warranty in year(s)[9] **(parts/labor/onsite)**	3/3/3	3/3/3	3/3/3	3/3/3
HP related offerings				
Support services[6]	Installation and Startup for HP BladeSystem Infrastructure plus 3–5 year HP Support Plus 24 Care Pack.			
Storage	Choose from a full portfolio of internal and external storage.			
Infrastructure management	HP Insight Control for essential infrastructure management across ProLiant Blades. Matrix Operating Environment for advanced infrastructure management across ProLiant blades. Refer to the product documentation for the latest product support.			

Server blade options, including memory DIMMs and hard drives are available on select models. For more information, visit **hp.com/go/proliantoptions** or **hp.com/go/integrityblades**.

Step 5: Choose your storage infrastructure

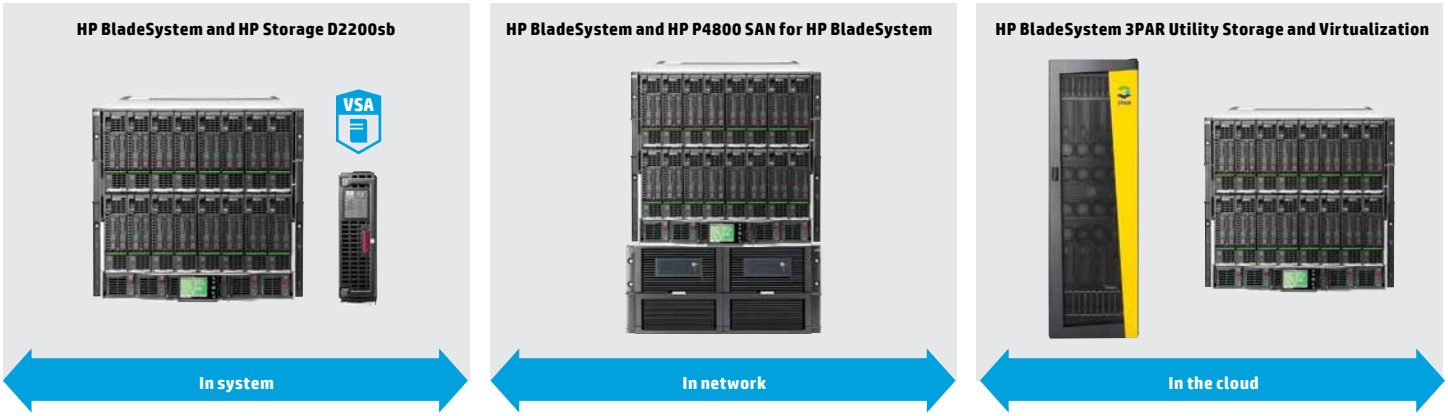
Connect to external HP SAN, NAS, and backup solutions or put storage solutions inside the same BladeSystem enclosure, side by side with your server blades, to quickly add storage expansion and data protection—without adding a single cable.

HP BladeSystem data protection options

HP ProLiant Server and HP BladeSystem technology are foundational elements of the HP Converged Storage architecture. The Converged Storage portfolio, including HP 3PAR, LeftHand, StoreOnce, and IBRIX storage systems, eliminates the boundaries between storage and the rest of IT. Built on modular, industry-standard hardware, scale-out federated software, and integrated management, HP Converged Storage delivers the simplicity, efficiency, and agility that you need to support virtualization, the cloud, and today's proliferation of data.

HP BladeSystem is one of the most affordable ways to connect servers to your Fibre Channel-based SAN. The BladeSystem architecture reduces cables and transceivers and can help you save up to 64%[12] compared to traditional rackmount environments. For more information on SAN options from HP, visit **hp.com/go/storage**.

Figure 1: Scalable storage solutions for HP BladeSystem



HP BladeSystem Storage options (internal)

	 **HP D2200sb Storage Blade** Delivers direct attached storage for the adjacent server blade, and shared iSCSI storage with HP P4000 Virtual SAN Appliance.	 **HP X1800sb G2 Network Storage Blade** Combine the X1800sb with D200sb storage blade to enable file serving and iSCSI shared storage inside the BladeSystem enclosure.	 **HP X3800sb G2 Network Storage Gateway** Flexible SAN gateway built for HP BladeSystem, consolidates file-serving access onto FC, SAS, or iSCSI storage	 **HP Tape Blades** Provides direct attach data protection for the adjacent server and network backup protection for all data residing within the enclosure.
Interconnect	Direct attach over PCIe. (iSCSI SAN storage when configured with HP P4000 VSA on adjacent server blade)	SAN connect: iSCSI, FC, and SAS	SAN connect: iSCSI, FC, and SAS	Up to 6 GB/sec SAS
Drives supported	Up to 12 SFF SAS, SATA, SAS/SATA SSD drives	Two local 146 GB SFF SAS drives are pre-installed with Microsoft Windows Storage Server 2008 R2, Standard x64 Edition	Two local 146 GB SFF SAS drives are pre-installed with Microsoft Windows Storage Server 2008 R2, Enterprise x64 Edition	LTO-5 Ultrium (read and write) LTO-4
Maximum capacity	Up to 10.8 TB raw SAS Up to 12 TB raw SATA	Combine with the HP D2200sb storage blade for shared storage inside the enclosure or use as a gateway to unlimited external storage	Gateway to unlimited external storage	1.6 TB to 3 TB (2:1 compression)
Form factor	Half-height storage blade	Half-height storage blade	Half-height server blade	Half-height storage blade
RAID levels supported	RAID 0, 1+0, 5, and 6	OS drives configured with RAID 1	OS drives configured with RAID 1	N/A
Warranty in year(s)[9] (parts/labor/onsite)	3-year parts exchange	Hardware—3 Software—1	Hardware—3 Software—1	3-year, next-day, parts exchange
HP related offerings				
Support services[6]	Installation and Startup for HP BladeSystem Infrastructure and 3-year, 24x7 hardware support	3-year, Support Plus 24 and Enhanced 3-year, Proactive 24 service	3-year, Support Plus 24 and Enhanced 3-year, Proactive 24 service	3-year, 24x7 hardware support

HP BladeSystem Storage options (internal)

	 **HP IO Accelerator for HP BladeSystem c-Class** Ideal for organizations faced with increasing demands for better application performance from their technology infrastructure.
Capacity (Native)	320 GB MLC, 640 GB MLC
Servers supported	BL280c G6, BL460c, BL460c G6, BL460c G7, BL490c G6, BL490c G7, BL465c G6, BL465c G7, BL480c, BL495c G6, BL680c G6, BL685c G5, BL685c G6, BL620c G7, and BL680c G7
Maximum IOPS	145,000 IOPS (with the 640 GB card)
Supported operating systems	RHEL 4, 5, 6 (64-bit support only); SLES 10 (64-bit support only), Windows Server x86-64 2003, 2008 (64-bit support only). VMware ESX 4.0 update 1, VMware ESX 4.1 (64-bit support only), SLES 11
Warranty in year(s)[9] (parts/labor/onsite)	3/0/0

HP BladeSystem Storage options (external)

For more information on SAN options from HP, visit **hp.com/go/storage**.




	HP P4800 G2 SAN Solutions for BladeSystem Highly available storage converged with BladeSystem for virtual server environments.	**HP X9000 Network Storage Systems** Simple, efficient and adaptable scale-out NAS solution provides capacity and scalability.	**HP P2000 G3 Modular Smart Arrays** Storage consolidation for small to mid-sized companies and remote locations.	**HP P4000 G2 LeftHand SAN Solutions** Highly available storage for virtual server environments.
Interconnect	(2) 10 Gb Flex-10 ports with each P4000sb blade	Ethernet 1 Gb, 10 Gb, InfiniBand. Supports CIFS, NFS, IBRIX, HTTP/S, FTP/S, NDMP, and WebDAV protocols	P2000 G3—8 Gb Fibre Channel, 6 Gb SAS, 1GbE and 10GbE iSCSI	(2) 1 Gb iSCSI ports with each P4000 SAN node; optional field upgrade to 10GbE
Drives supported	Up to 1120 LFF SAS drives	24 to 656 drives depending on the model;1 TB 6 G 7.2 k LFF dual-port MDL SAS; 2 TB 6 G 7.2 k LFF dual-port MDL SAS; 600 GB 6 G 15 k LFF dual-port ENT SAS depending on the model	LFF: SAS, MDL SAS, SATA SFF: SAS, MDL SAS, SATA	Up to 384 LFF SAS, MDL SAS or 128 SSD drives depending on model
Maximum capacity	2240 TB depending on model. Capacity, performance, and redundancy increase as additional nodes are added to the P4800 SAN	Up to 192 TB for the X9320 (2 TB MDL-SAS drives); up to 1.3 PB for the X9720 (2 TB MDL-SAS); up to 16 PB in the single namespace	57.6 TB with LFF SAS drives; 288 TB with LFF SAS MDL drives; 192 TB with LFF SATA MDL drives; 134 TB with SFF SAS drives; 149 TB with SFF SAS MDL drives; 74 TB with SFF SATA MDL drives	768 TB depending on model. Capacity, performance, and redundancy increase as additional nodes are added to the P4000 SAN
RAID levels supported	RAID 10, 5, and 6. Network RAID eliminates any single point of failure in the SAN	RAID 5 or 6 depending on the model	RAID 0, 1, 3, 5, 6, 10, and 50	RAID 10, 5, and 6. Network RAID eliminates any single point of failure in the SAN
Warranty in year(s)[9] (parts/labor/onsite)	3/3/3	3/3/3 1-year software	3/3/3	3/3/3
HP related offerings				
Support services[6]	Installation and Startup service, and 3-year Support Plus 24 service	Installation and Startup service, and 3-year Support Plus 24 service. Required: Installation and startup service	HP P2000 G3 Family Disk Array service, Installation and Startup service, and 3-year Support Plus 24 service	Installation and Startup service, and 3-year Support Plus 24 service

HP BladeSystem Storage options (external)

	 **HP P6000 EVA** Helps reduce storage management burden for demanding application environments.	 **HP P9500/XP Disk Arrays** Storage for mission-critical applications that cannot afford downtime.	 **HP 600 Modular Disk System** High-density, cost-effective storage for BladeSystem.
Interconnect	8 Gb/s Fibre Channel, 1 Gb/s iSCSI, 10 Gb/s iSCSI and FCoE	8 Gb/s Fibre Channel, 10 Gb/s FCoE4 Gb/s FICON	Direct connect SAS1[10]
Drives supported	Up to 450 SFF or 240 LFF SAS or midline SAS drives	SFF SAS HDDs and SSDs, up to 2048 SFF SAS drives	Up to 70 LFF SAS or SATA drives
Maximum capacity	Up to 480 TB	Up to 2 PB	Up to 1260 TB supported in a single BladeSystem Enclosure
RAID levels supported	VRAID 0, VRAID 1, VRAID 0+1, VRAID 5, VRAID 0+5, VRAID 6, and Cross VRAID Snaps	RAID 1, RAID 5, and RAID 6	RAID functionality provided by P700m Smart Array controller installed in each server
Warranty in year(s)[9] (parts/labor/onsite)	3/3/3	3 year, 24x7, 4-hour response for hardware	3-year, next-day, parts exchange
HP related offerings			
Support services[6]	Installation and Startup service, and 3-year Support Plus 24 service Installation and Startup included with P6300 EVA	Required: Installation and Startup service. Recommended: 3-year Critical service	Installation and Startup service, and 3-year Support Plus 24 service

	 **HP Virtual Library Systems** Data deduplication Fibre Channel appliance with multi-node support for cost-effective backup of data centers and remote offices.	 **HP StoreOnce Backup Systems[11]** Disk-based data protection with data deduplication and low-bandwidth replication.	 **HP Tape Automation** Tape autoloaders for efficient, unattended, cost-effective backups.	 **HP Data Protector Software** HP Backup and Recovery software for complete protection across the entire enterprise infrastructure.
Interconnect	4x4 Gb Fibre Channel, depending on model	10 GbE x 16 ports; 1 GbE x 16 ports; 8 Gb Fibre Channel x 16 ports; iSCSI on lower-end models	4x4 Gb Fibre Channel, 2x8 Gb; Fibre Channel, 6 Gb SAS	
Capacity	Scalable up to 640 TB usable capacity, 768 TB raw	Scalable up to 768 TB (raw) or 512 TB (usable)	Up to 3 TB per drive, up to 6 drives per autoloader; up to 12 TB usable capacity, 18 TB raw	
Transfer rate	Up to 17.2 TB/hr	Up to 24 TB/hr	Up to 3 TB/hr	
Format	N/A	N/A	N/A	
Media compatibility/ RAID levels supported	Hardware RAID 6	Hardware RAID 5 or RAID 6	LTO-5; LTO-4; LTO-3	
Form factor	Rack-based external data protection	Rack-based. 1U, 2U, 4U, and 42U depending on model	Rack-based external data protection	
Warranty in year(s)[9] (parts/labor/onsite)	1/1/1, next day response with 9x5 phone support	1/1/1, next day response with 9x5 phone support	1/1/1, next day response with 9x5 phone support	
HP related offerings				
Support services[6]	3-year, 24x7 software / hardware support	3-year, 24x7 hardware support depending on model	3-year, 24x7 hardware support	HP Support 9x5, HP Software Support 24x7

Step 6: Choose your infrastructure management

HP Insight Management is a complete suite of ProLiant Server lifecycle management capabilities that can flexibly operate from embedded on-system utilities, or your preferred CMS, and now even from the cloud. Managing ProLiant Servers with Insight Management results in increased efficiency and precise control of your server infrastructure resources. With a rich set of capabilities that are easy to access and simple to use it covers critical areas such as server deployment and configuration, health and alerting, energy, power and remote management, and warranty and contract information access via a cloud-based portal. The core components that make up Insight Management are HP iLO Management Engine, HP Insight Control, and HP Insight Online. With Insight Management's proactive management and built-in automation, ProLiant Servers are so intelligent they practically manage themselves.

HP iLO Management Engine is a complete set of embedded management features supporting the complete lifecycle of the server, from initial deployment through ongoing management to service alerting and support. By delivering comprehensive embedded management that covers every step of the server lifecycle for every server in their environment, HP helps customers speed time to deployment, maximize server and application availability through proactive notification, and dramatically accelerate time to resolution when issues do arise.

HP Insight Control is essential server management that enables you to fully utilize the management capability built into your HP ProLiant Servers. Insight Control delivers powerful capabilities that allow you to proactively monitor ProLiant Server health and performance (both physical and virtual), deploy ProLiant Servers quickly, reduce energy costs, and control ProLiant Servers from anywhere. Additionally, HP Insight Control extends the ProLiant server management experience to customers who have standardized on HP Performance Suite, Microsoft® System Center, and VMware vCenter Server.

HP Insight Online provides one stop, secure access to the information you need to monitor the devices in your IT environment, along with standard warranty and contract services, from anywhere, anytime. Through the HP Support Center portal, Insight Online can automatically display devices remotely monitored by HP Insight Remote Support software and lets you easily track service events and support cases, view device configurations, and proactively monitor your HP contracts and warranties as well as HP Proactive service credit balances.

Insight Management has a rich set of capabilities that are easy to access and simple to use and cover all aspects of the server lifecycle, resulting in increased efficiency and precise control of your ProLiant Servers. Please see the below table outlining the differences between these rich capabilities.

Insight Management capabilities

	HP iLO Advanced	HP Insight Control-Linux	HP Insight Control[12]	HP Insight Online[13]
Service and Support Events				●†
Channel Partner Access				●†
Contracts and Warranty Management			●†	●
VMware vCenter Server Integration			●	
Microsoft System Center Integration			●	
Server Migration			●	
Health and Alerting		●	●	●†
Server Deployment		●	●	
Virtual Machine Management		●	●	
Advanced Power Management		●	●	
Performance Management		●	●	
Console Record, Replay, Collaboration	●	●	●	
Virtual Media, Folders, Keyboard, Video and Mouse	●	●	●	
Alerting, Syslog, Power Management	●	●	●	
HP iLO Management Engine[14]	●	●	●	

To see how other customers have benefited by implementing HP Insight Software, read the IDC white paper at **hp.com/go/insightroi**.

For more details on software for HP ProLiant and HP Integrity, visit the following sites.

HP Insight Management: **hp.com/go/insight**
HP Insight Control: **hp.com/go/insightcontrol**
HP Insight Control for Linux: **hp.com/go/insightcontrolforlinux**
HP Insight Online: **hp.com/go/insightonline/info**
HP Insight Control Services: **hp.com/services/InsightControl**

Step 7: Choose your power and cooling configurations

If you can't measure the power you use, you can't control it. But with HP Thermal Logic you can do both. HP Intelligent Infrastructure technology combines energy-efficient design with accurate measurement and control—all without sacrificing performance. This means you can double the capacity of HP server blades in the data center with a combination of Dynamic Power Capping delivered through HP Insight Control. The combination of Intelligent Infrastructure with Insight Control software allows you to manage all of your HP servers and storage environments from a single console—so that you can easily do more with fewer resources. Save power every second with power configurations and redundancy levels to suit your needs.

HP has created the HP Power Advisor utility to provide more accurate and meaningful estimates of power needs for HP ProLiant server blades. It can even show you how Intelligent Infrastructure can help you save money by enhancing power and cooling. Learn more or download the HP Power Advisor at **hp.com/go/hppoweradvisor**.

Intelligent Infrastructure capabilities

Active Cool fans	Both high airflow and high pressure are delivered in a small size that can scale to meet future cooling needs. This technology provides the ability to optimize airflow, reduce power draw, and improve acoustic performance for any server blade configuration.
Parallel redundant scalable enclosure cooling (PARSEC) design	A hybrid model for cooling combines the best of local and centralized cooling in a single system to offer more effective airflow and cooling for all servers. Server blades get more cooling airflow where it is needed most and use less power than traditional rack servers.
Instant thermal monitoring	A real-time view of heat, power, and cooling data is provided. If the enclosure's thermal load increases, the Onboard Administrator's Thermal Logic feature instructs the fan controllers to increase fan speeds to accommodate the additional demand. Even better, it works in reverse, using all the features of Thermal Logic to keep fan and system power at the lowest level possible. Onboard Administrator monitors the thermal conditions on the hardware in real time, without a delay for a polling cycle.
Power pooled for true N+N power redundancy	All the power in the enclosure is provided as a single pool that any blade can access, providing increased flexibility when configuring the power in the system so that customers can choose what level of redundancy with which to operate. Because this power design has no zones, it facilitates both N+N and N+1 power modes, which future-proofs the enclosure for higher power requirements, if needed.
High-efficiency power supplies	High-efficiency power supplies can help you conserve power throughout your data center. These high-efficiency power supplies come standard with each BladeSystem enclosure. The c3000 power supplies are up to 90% efficient and the c7000 power supplies are up to 94% efficient. As a leader in energy efficiency, HP is the first in the market to offer Platinum level, 94% efficient power supplies for Blade Enclosures.
Dynamic power saver mode	Power load shifting improves power supply efficiency to provide real power and money savings. When enabled through Onboard Administrator, the total enclosure power consumption is monitored in real time and automatically adjusted with changes in demand.
Power Regulator	HP Power Regulator provides Integrated Lights-Out-controlled speed stepping for Intel x86, AMD x86, and Itanium® 9100 series processors. This feature improves server energy efficiency by giving CPUs full power for applications when they need it and reducing power when they do not.
Power workload balancing	Power workload balancing improves performance per watt and uses the HP Power Regulator technology to manage power at the enclosure level so that power usage stays within defined power caps. Using power caps, system administrators can constrain the most BTUs per enclosure and rack to enable the enclosure to fit in an existing rack power envelope. A simple power cap allows devices to power on until power usage reaches the specified power cap and then prevents any more devices from powering on. Power workload balancing is available now for ProLiant blades and will be available in the future for Integrity blades.
Enclosure Dynamic Power Capping	Safely limit power usage without impacting performance by capping peak instead of average power usage. Remove risk to the electrical infrastructure with a fast-acting, hardware-based capping algorithm. Reclaim more power with blades by dynamically controlling power limits based on workload demand.
HP Intelligent Power Distribution Unit (iPDU)	Brings state of the art management and control to rack mounted power distribution units (PDU) to prevent over provisioning of power from restricting growth in your data center. Using the core and stick architecture of HP Modular PDU line, the HP Intelligent PDU provides monitoring of power consumption at the core, load segment, stick, and outlet level with unmatched precision and accuracy. Remote management is built in and even provides power cycle ability of individual outlets on the Intelligent Extension Bars.

Step 8: Choose your services

With technology evolving at a rapid pace, it is increasingly important for companies to be able to rely on IT support services that are constantly adapting to address the complexities of today's evolved IT environment. Technology Support Services from HP for ProLiant Servers and BladeSystem redefines support, factoring in the breakthrough capabilities of HP ProLiant Servers and BladeSystem. HP offers a comprehensive set of services to manage and optimize every aspect of the server environment. Our end-to-end lifecycle services include working with your IT team to design your environment from scratch or integrate new technology into your existing infrastructure. Our services help customers quickly get systems up and running, and provide ongoing reactive and proactive support.

HP Foundation Care: Customers receive cost-effective reactive services, with separate or integrated hardware and software support options. This support includes HP Collaborative Support, with Independent Software Vendor (ISV) software problem resolution and enhanced call management.

HP Proactive Care: This advanced support is integrated with both reactive and proactive support. It offers a single point of contact for remote and onsite hardware support delivered by HP technology experts to help customers proactively address potential issues and minimize downtime.

HP Data Center Care: This service supports the customer's entire data center environment and is developed for environments that have HP as well as multivendor equipment. It is customized for the customer's specific needs and SLAs.

HP Lifecycle Event Services: These services give customers comprehensive end-to-end services —covering strategy, planning, deployment, technical, and education services, which can be used at any stage of the solution lifecycle.

We offer easy-to-use, cost effective support packages at various levels to meet your specific business needs. In addition, automated 24/7 support with HP Insight Software solutions that are at no additional cost that are tailored to meet your needs to proactively monitor, rapidly identify and resolve issues. And HP Education Services help address the challenge of managing costs and resources while keeping up with the latest technology.

For more information, visit **hp.com/services/bladesystem**
Or
Contact your local HP Sales representative or Authorized HP ServiceOne Partner.

To stay relevant, your employees need to quickly assimilate new IT skills. We offer a variety of HP training services, including instructor led courses, customized onsite training and innovative remotely assisted courses. For more information, visit **hp.com/learn**.

HP BladeSystem services

HP BladeSystem services include consulting, implementation, and support services for HP BladeSystems. As an important component of a total BladeSystem solution, these services put our experts to work helping your customers reach the business goals that led you to choose blade technology in the first place—more computing capacity in less space, using less power, and with simpler cabling.

Installation and Startup for HP BladeSystem c-Class Infrastructure	Provides for the installation of an HP BladeSystem c-Class enclosure, ProLiant and Integrity c-Class server blades, storage blades, SAN switch blades, Virtual Connect modules (Ethernet and Fibre Channel), Ethernet network interconnects, and InfiniBand, as well as deployment and basic configuration of HP Insight Control environment for HP BladeSystem software.
HP Installation and Startup Service for HP Insight Control	Provides for the deployment and basic configuration of HP Insight control on HP ProLiant ML and DL series servers or HP BladeSystem servers.
Enhanced Network Installation and Startup Service for HP BladeSystem	Provides advanced network software configuration, including configuration of HP Virtual Connect options.
HP MSA Family Disk Array Installation and Startup Service	Includes service planning, service deployment, installation verification tests, and customer-oriented sessions.
Proactive Care	Combines reactive reactive and proactive hardware and software support with access to local experts at the Advanced Solution Center when customers call HP, giving them fast answers, problem prevention, and global expertise locally.
HP Proactive 24 and Critical Service	Coverage options are available for HP BladeSystem enclosures, HP ProLiant and Integrity server blades, HP BladeSystem SAN switches, and HP Ultrium tape blades.
HP Support Plus 24	Provides integrated 24x7 4-hour response hardware support with 2-hour response software technical support and software update service.
Proactive Select	Flexible credit-based offering that enables you to purchase consultancy support to help optimize the performance of your blades environment. Consultancy options include IT Service Management, Security, Capacity Planning, System Health Checks, optimization of storage, server, and network performance optimization, and more.
Services for NonStop BladeSystem	**HP Service Solutions for NonStop BladeSystem** Three pre-defined service levels provide quick installation, customized configuration, rapid start-up, and 24x7 support: • Critical Service Solution • Proactive Service Solution • Foundation Service Solution **HP Evolution Services for NonStop BladeSystem** Mission-critical support addresses the diverse factors that impact system performance and availability. This encompasses not just hardware and system software, but also IT management processes, applications and databases, networks, environmental factors, and more. Learn how HP can help enhance uptime, performance, operations, and security across your NonStop system environment at **hp.com/products1/evolution/9000**. **Education services for NonStop BladeSystem** HP NonStop Technology Education is your source for training on HP Integrity NonStop servers and software. Choose from a broad range of courses, locations, and training media to make sure your HP NonStop system education is perfectly tailored to your requirements, operations, and security. Learn more at **hp.com/education/sections/nonstop.html**.

Related offerings

HP Integrity NonStop BladeSystem servers

Today's complex architectures often force you to choose between availability and scalability—and you're still left with a complex, expensive-to-manage infrastructure. The HP Integrity NonStop BladeSystem platform delivers out-of-the-box capabilities, significantly simplifying the infrastructure and reducing costs.

HP Integrity NonStop BladeSystem NB50000c and NB54000c are designed to deliver the industry's highest application service levels at the best return on investment and total cost of ownership in its class—based on standards such as the Intel Itanium processor, SQL, Web services, J2EE software architecture, and more.

Learn more about the advantages of HP Integrity NonStop BladeSystem servers at **hp.com/go/integrity**.

High-performance compute (HPC) clusters

Scale out your HPC infrastructure with the fastest blade systems available, featuring more processors, greater energy efficiency, and increased cooling capabilities. HP BladeSystem-based clusters are fully integrated, tested, and ready for the most demanding workloads.

Learn more about HP High-performance compute clusters at **hp.com/go/hpc**.

HP Client Virtualization Solutions

HP Client Virtualization offers an alternative desktop solution that increases security, decreases cost, and delivers higher availability for the desktop while continuing to provide end users with the full functionality of a standalone desktop.

Built on the foundation of the HP Converged Infrastructure—including the best-managed, virtualization-ready HP servers, storage, and client devices, combined with HP services and partner software—this comprehensive desktop replacement solution delivers a complete desktop experience as an on-demand service to any user, anywhere. Whether users are basic-task workers or on-the-go mobile workers, desktops and applications are made available quickly and easily with unified management of both physical and virtual infrastructures from the same centralized console.

HP can help you effectively implement Client Virtualization through two types of solutions designed to suit your business needs: HP VirtualSystem for Client Virtualization (with View or Xen Desktop) or a range of reference architectures.

HP VirtualSystem requires 50% less time to implement.[15] Plus, it eliminates the need to research compute, storage, and networking components, purchase and test different configurations, and order, purchase, assemble, and optimize different vendor component products. The reference architectures establish a starting point to reduce the implementation time and risks that often plague IT administrators. Both types of solutions are the result of testing in real work environments with real business applications.

Learn more about HP Client Virtualization Solutions at **hp.com/go/clientvirtualization**.

HP Workstation Blade Solution

As the demand for high-performance graphics applications grows, computing costs take an ever-larger bite out of the IT budget. HP helps IT bite back with an infrastructure solution that offers all of the benefits of data-center workstation computing without sacrificing performance. The HP ProLiant WS460c Server Blade provides centralized, mission-critical control from the security of the data center without sacrificing demanding visual performance.

HP ProLiant WS460c Workstation Blade

	HP ProLiant WS460c Workstation Blade The newest generation of uncompromised workstation-class compute power with data center class security, high density, and scalability.	**HP WS460c G6 Graphics Expansion Blade** Uncompromised workstation-class graphics performance.
Number of processors per node	1–2	
Maximum number of cores per node	12	
Processors supported	Dual-core, quad-core, and hex-core Intel Xeon processors: up to 3.06 GHz	
Cache	Up to 24 MB L3 (2x12 MB)	
Maximum memory per node	192 GB	
Network ports per node	2	
Drives supported per node	Up to 2	
Maximum internal storage per node	1.2 TB	
I/O expansion	2 PCIe mezzanine expansion slots (may be occupied by graphics)	
Graphics	NVIDIA Quadro FX 880M/FX 2800M	2 PCIe graphics expansion slots to host NVIDIA Quadro 6000 (6.0 GB) for ultra high-end 3D apps, NVIDIA Quadro 5000 (2.5 GB) for high-end 3D apps, or NVIDIA Quadro 4000 (2.0 GB) for mid-range to high-end 2D/3D apps; NVIDIA Tesla M2070Q (6.0 GB) and AMD Firestream FS9350 (2.0 GB) for high performance computing apps
Form factor	6U or 10U enclosure	6U or 10U enclosure
Warranty in year(s)[9] (parts/labor/onsite)	3/3/3	3/3/3
HP related offerings		
Support services[6]	3-year, 24x7 hardware support	

HP BladeSystem Telecom Solutions

HP BladeSystem carrier-grade platform meets telecom-specific needs for a rugged platform, while at the same time providing an adaptable infrastructure for evolving requirements. HP BladeSystem provides technology building blocks which reduce the time and expense of building tomorrow's network data center.

Current HP BladeSystem architectures are renowned for being cost-savvy, change-ready, energy-thrifty, and time-smart. With the HP BladeSystem c7000 carrier grade enclosure, HP ProLiant BL460c G6, and the HP Integrity BL860c carrier grade servers, the same benefits are now available for network equipment providers (NEPs) and communications service providers.

Designed for the specific requirements of the telecommunications industry, HP BladeSystem offers 48 VDC power, European Telecommunications Standards Institute (ETSI) and the Network Equipment Building Systems (NEBS) compliance, high reliability, enhanced support for OpenHPI, OpenSAF, and carrier grade Linux—all at a fraction of the cost of traditional telecom infrastructure systems.

All HP BladeSystem carrier-grade components have been tested to the NEBS Level 3 criteria (GR-63-CORE and GR-1089-CORE), and ETSI certified to EN 300 019, EN 300 386, and EN 300 754.

HP carrier-grade solutions include a 36Ux1 meter deep, fully hardened HP Seismic Rack cabinet system designed to withstand the rigors of telecom environmental and seismic events. The cabinet can support payloads up to 1200 pounds, and can house the full line of carrier-grade products, including the HP BladeSystem c7000, HP ProLiant DL380, and HP P2000 G3 storage array. The cabinet can support two 48 VDC breaker systems, rated at 240 amps each.

HP BladeSystem c7000 carrier-grade enclosure

HP BladeSystem c7000—NEBS Level 3 tested components

Server blades	HP ProLiant BL460c Gen8, two Intel Xeon processor E5-2600 series, up to 256 GB memory HP ProLiant BL620c G7, two Intel Xeon processor E7-2800 series, up to 256 GB memory HP Integrity BL860c i2, two Intel Itanium processors 9300 series, up to 192 GB memory	
Mezzanine options	HP NC325m Quad-port 1GbE Adapter HP NC360m Dual-port 1GbE Adapter HP NC382m Dual-port 1GbE Multifunction Adapter QLogic QMH2562 8 Gb FC HBA HP BLc Emulex LPe 1205-HP 8 Gb FC HBA NC542m Dual-port Flex-10 Mezzanine NC532m Dual Port Flex-10 adapter NC551m Dual Port FlexFabric adapter	NC552m 10Gb 2-port Flex10 NC553m 10Gb 2-port FlexFabric HP FlexFabric 10Gb 2-port 554FLB Adapter HP Flex-10 10Gb 2-port 530FLB Adapter HP Ethernet 10Gb 2P 560FLB adapter HP FlexFabric 10Gb 2-port 554M Adapter HP Flex-10 10Gb 2-port 552M Adapter HP PCI Expansion Blade, for use with BL460c
Interconnect modules	HP Virtual Connect Flex-10 10Gb Ethernet Module HP Virtual Connect FlexFabric 10Gb/24-Port Module HP Virtual Connect 8Gb 24-Port Fibre Channel Module HP Networking 6120XG HP Networking 6120G/XG HP GbE2c Layer 2/3 Ethernet Blade Switch Cisco Catalyst Blade Switch 3020 for HP BladeSystem c-Class Cisco Catalyst Blade Switch 3120 for HP BladeSystem c-Class HP 10 Gb Ethernet BLc Switch HP BLc 1 Gb Ethernet pass Thru-Module Brocade BLc 8 Gb SAN Switch	

HP Carrier-grade Server Blades

	HP ProLiant BL460c G6 (NEBS certified)	HP ProLiant BL620 G7 (NEBS certified)	HP Integrity BL860 i2 (NEBS certified)
Number of processors	1 or 2	1 or 2	1 or 2
Maximum number of cores	6	8	4
Processor family	Intel Xeon E5-2600 series	Intel Xeon E7-2800 Series, 8867L	Intel Itanium 9300 series
Maximum memory (per server)	256 GB	256 GB	192 GB
Network ports	2	4	4
Internal storage	2 hot plug SAS/SSD	2 hot plug SAS/SSD	2 hot plug SAS/SSD
I/O expansion	2 PCIe Mezzanine	3 PCIe Mezzanine	3 PCIe Mezzanine
Warranty in year(s) (parts/labor/onsite)	3/3/3	3/3/3	3/3/3

Interconnects (NEBS tested)	
HP Virtual Connect Flex-10 10Gb Ethernet Module for the BladeSystem c-Class	**Cisco Catalyst Blade Switch 3020 for HP BladeSystem c-Class**
HP Virtual Connect FlexFabric 10Gb/24-Port Module	**Cisco Catalyst Blade Switch 3120 for HP BladeSystem c-Class**
HP Virtual Connect 8Gb 24-Port Fibre Channel Module	**HP 10Gb Ethernet BLc Switch**
HP Networking 6120XG	**HP BLc 1Gb Ethernet pass Thru-Module**
HP Networking 6120G/XG	**Brocade BLc 8Gb SAN Switch**
HP GbE2c Layer 2/3 Ethernet Blade Switch	

HP Converged Systems

With a choice of different solutions from NonStop computing to virtual desktops, HP now brings the advantages of blades to a broad range of applications and environments. HP VirtualSystem and HP CloudSystem are available fully customized and delivered to you built according to your unique specifications.

HP VirtualSystem

- Best-in-class
  - Virtualization partners
  - HP Converged Infrastructure
  - Consulting and deployment services
- Open standards
  - Seamless integration with existing environments
  - Modular for easy scaling
  - Easily extensible to cloud
- Maximum performance
  - Purpose built and optimized
  - Deep integration with virtualization software platforms
  - Converged storage architected for virtualized environments

HP VirtualSystem provides you with the fastest time to value for virtualization. It can save you months of integration work by selecting and integrating best-of-breed HP Converged Infrastructure and leading virtualization software in one solution delivered by HP. The solutions are designed to help maximize performance, uptime, and scalability of virtualized workloads for small, medium, and large organizations.

Proven and optimized—HP VirtualSystem is part of the HP Converged Systems portfolio and is built on products and technologies proven to be optimized for virtualization to help you maximize performance, uptime, and scalability. We've combined leading virtualization software with HP Flex Fabric, HP Converged Storage, and HP servers. Integrated HP management software gives you better control over VM and infrastructure tasks.

Integrated services to align virtualization to business goals—HP VirtualSystem includes installation and implementation services to get your new system up and running quickly and properly and optional implementation services for the best possible experience.

VM storage with a scale-out approach—Greater unpredictability in the data center has resulted in the need for more simple, agile, and efficient storage for virtualization and ITaaS. HP Converged Storage (HP LeftHand and HP 3PAR) is built from the ground up for the needs of virtualization, cloud, and massive scaling.

Unified virtual and physical security and management—HP Insight Control enables holistic management of virtual and physical resources, with an integrated view from VM to the core of the network. It offers you deep insight across the complete network topology, as well as simplified troubleshooting and tuning.

Faster VM performance and density—The industry's leading HP ProLiant rack and blade servers deliver 27x more performance per watt and 20:1 consolidation rates over previous generations, and up to 3x better VM server density than competing solutions.[16] HP Converged Storage employs clustering and wide striping with deep virtualization platform integration, leading to higher performance and doubling VM density.

Learn more at **hp.com/go/virtualsystem**

HP CloudSystem

HP CloudSystem is the most complete, integrated, open platform that enables enterprises and service providers to build and manage services across private, public, and hybrid cloud environments.

Based on proven, market-leading HP Converged Infrastructure and Cloud Service Automation, HP CloudSystem integrates servers, storage, networking, security, and management to automate the infrastructure-to-application lifecycle for hybrid service delivery management. The result is a complete cloud solution that lets enterprises gain agility and speed, and allows service providers to drive top-line growth.

As a part of the HP Converged Cloud architecture, clients have a simplified, integrated platform that is easier to manage and provides flexibility and portability between private, public, and managed clouds.

Key benefits include:

- Single services view across hybrid cloud
- Multi-hypervisor, multi-OS, heterogeneous infrastructure
- Intelligent automation and orchestration
- Rapid application and infrastructure deployment

Learn more at **hp.com/go/cloudsystem**.

Figure 2: HP CloudSystem

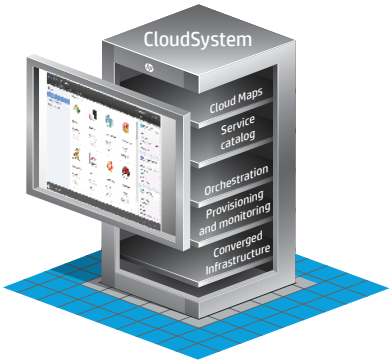
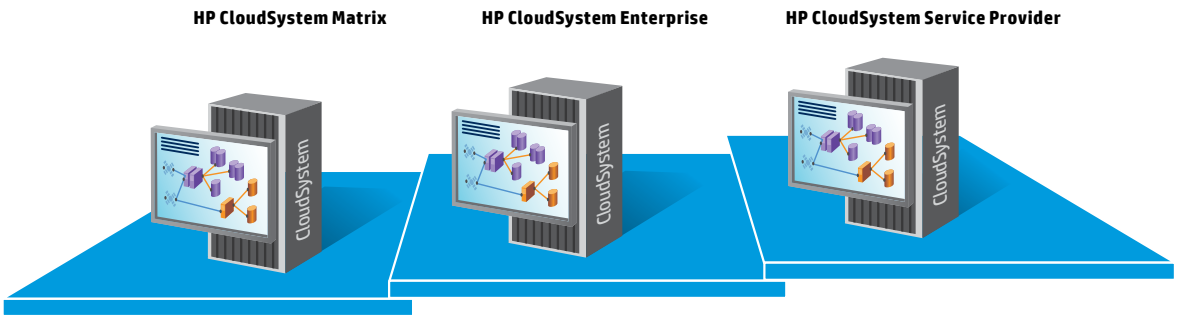


Figure 3: CloudSystem offerings



- Infrastructure and basic application provisioning in minutes

- Unify management of all services, both cloud-based and traditional IT
- Advanced application-to-infrastructure lifecycle management

- Aggregate cloud services for public and hosted private clouds
- Optimized for multi-tenancy
- Customer-unique portal experience

HP Financial Services

Not every technology acquisition has to be a traditional cash-and-carry transaction. HP Financial Services offers a variety of customized leasing and financing options to facilitate your HP BladeSystem purchase and keep your technology expenditures in line with your overall budget. For more information, visit **hp.com/go/hpfinancialservices**.

HP BladeSystem: your ultimate converged infrastructure

HP BladeSystem not only can handle any workload, but can also deliver the best value across workloads of any converged infrastructure on the market today. You will be able to transform the economics of your IT investment, large or small.

All of this adds up to big savings for your IT budget that can be re-invested back into your business. With your HP Converged Infrastructure in place, you can also deliver top-line business results to grow, get to market faster, and empower your employees, partners, and customers more effectively.

Wherever you plan to take your business in the future, HP BladeSystem is ready to get you there. Learn how HP BladeSystem can help you drive business innovation by visiting **hp.com/go/bladesystem**.

† Available with Insight Remote Support and customer opt-in

[1] HP BladeSystem and CloudSystem Matrix TCO calculator: **roianalyst.hp.com/bladesystemmatrixtco/launch.html**

[2] HP Virtual Connect Flex-10 product specifications

[3] Dynamic Power capping TCO and Best Practices , HP white paper, **http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA2-3107ENW.pdf**

[4] Gaining Business Value and ROI with HP Insight Control, Doc #224704, IDC, September 2010

[5] HP Virtual Connect Flex-10 product specifications

[6] All blades within a single HP BladeSystem enclosure must at the same service level

[7] Not supported on and G5 server blade, nor the BL465c G6, or the BL495c G6

[8] Not supported on any G7 or earlier generation server blade

[9] Or the warranty of the server that holds the adapter, whichever is greater

[10] Enable iSCSI SAN capability in virtual server environments by leveraging the HP P4800 standalone, or with HP MDS600, together with HP P4000 Virtual SAN Appliance

[11] StoreOnce is a family of products. Specifications represent maximum values

[12] Windows and Linux managed nodes

[13] Available with standard HP contract, warranty and Care Pack services in the HP Support Center Portal

[14] HP iLO Management Engine, in all HP ProLiant Gen8 servers, includes: HP iLO (HP iLO Mobile App, Sea of Sensors Thermal management), HP Intelligent Provisioning, HP Agentless Management, HP Active Health System

[15] Based on HP data

[16] Based on comparison of BL460 G7 vs. Cisco UCS B200 M2. (See also, customer viewable: **http://storage.corp.hp.com/Document_Storage/Competitive_library/Why_HP_BladeSystem_v_CiscoA.pptx**)

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