

HP BladeSystem

Family guide



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HP BladeSystem: Architected for any workload from client to cloud

Do you spend too much time and resources maintaining the infrastructure you already have? Do you wish you had more time and budget to spend on helping your business enter new markets, become more efficient, and offer new services?

HP is delivering on this particular wish for millions of customers today. You may have heard of Converged Infrastructure from HP. We've been leading the way to IT convergence for some time, helping customers select the right architectural strategy to take maximum advantage of virtualization, cloud as a service, green IT, and other strategic initiatives.

With HP BladeSystem—the industry's only Converged Infrastructure architected for any workload from client to cloud—you can drive business innovation and eliminate IT sprawl. Imagine a change-ready infrastructure that can support all your applications—from infrastructure to mission-critical—on a single platform, with both ProLiant and Integrity server blades and a range of storage and networking options. Or putting up to 60 percent more servers in the same physical space. And finally, envision a modular, future proof design that takes advantage of proven innovations like Virtual Connect, Thermal Logic, and Insight Management and that can be quickly scaled, repurposed and upgraded to fit your changing business needs. Now that's simplifying your infrastructure—and more. It's having an infrastructure built for change—that's HP BladeSystem.

HP BladeSystem is engineered to maximize every hour, watt, and dollar, saving up to 56 percent total cost of ownership¹ over traditional infrastructures. How? Because core infrastructure is shared in an HP BladeSystem environment, capital costs can be significantly lower than traditional rack-based infrastructure. Blades share power, network, and storage infrastructure at the BladeSystem enclosure level. Since equipment is not needed for each server, there is a drastic reduction in Power Distribution Units, power cables, LAN and SAN switches, connectors, adapters, and cables. You can bring in the newest generation technologies by simply changing the components that need to be changed instead of the “rip and replace” approach used for traditional infrastructures and that have led to the present sprawl.

Making routine infrastructure changes take up to 90 percent² 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, up to 95 percent.³

HP BladeSystem technology allows you to double the capacity of your data center without adding power infrastructure.⁴ You can reclaim trapped capacity by dynamically “capping” power, so data center power and cooling are not over provisioned. This alone reduces blades power and cooling infrastructure requirements up to 50 percent, 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 Management software unlocks the potential of your HP BladeSystem, cutting management time in half.⁵ Compared to a rackmount environment, the time needed for routine server administrative tasks with HP BladeSystem can be reduced by up to 15 percent. With HP Insight Control, you can provision servers quickly, manage health proactively, control servers from anywhere, and manage power confidently. With over 4 million software licenses shipped, Insight Management is the most broadly used systems management platform in the industry.

If your business wants the efficiency of a shared services or private cloud model, then HP BladeSystem Matrix is the solution for you. Built on the industry-leading blade architecture—HP BladeSystem—Matrix can deliver services in minutes, double administrator productivity⁶ and instantly adjust to dynamic business demands. The ability to provision complete infrastructures and applications in minutes,⁷ not months, provides the flexibility needed to serve many different business needs from a single infrastructure pool. HP Cloud Maps accelerate automation of business applications by streamlining application delivery in a private cloud quickly, reliably and consistently. Moving to a shared services model or a private cloud can be accomplished incrementally. You can start your private cloud environment small and grow easily by adding “chunks” of infrastructure with HP BladeSystem Matrix expansion kits.

¹HP White Paper: The business case for HP BladeSystem Matrix, based on data from the HP BladeSystem and BladeSystem Matrix TCO Calculator,

<http://roianalyst.hp.com/bladesystemmatrixtco/launch.html>

²HP BladeSystem and BladeSystem Matrix TCO Calculator, <http://roianalyst.hp.com/bladesystemmatrixtco/launch.html>

³HP Virtual Connect Flex-10 product specs

⁴Dynamic Power Capping TCO and Best Practices White Paper, <http://h71028.www7.hp.com/erc/downloads/4AA2-3107ENW.pdf>

⁵IDC White Paper Sponsored by HP, Gaining Business Value and ROI with HP Insight Control, Doc # 218069, May 2009

⁶Micros Fidelio case study: grew 50% and only added 25% more staff; IDC White Paper Sponsored by HP, Gaining Business Value and ROI with HP Insight Control, Doc # 218069, May 2009

⁷Source: Based on experiences of HP customers and HP engineering.

One box, full of possibilities

When you are ready, our worldwide community of business technology experts and partners are here to help you build the ideal solution and support plan that is just right for you. We integrate the infrastructure essentials inside the BladeSystem so that before it ever arrives at your door, we do a lot of the hard work that you would have had to do on your own to deliver the best business results.

These eight easy steps are what you need to consider when building your ideal BladeSystem infrastructure solution.

Step 1: Choose your operating environment

Step 2: Choose your server blades

Step 3: Choose your storage infrastructure

Step 4: Choose your interconnects

Step 5: Choose your BladeSystem enclosure

Step 6: Choose your Infrastructure Management

Step 7: Choose your power and cooling configurations

Step 8: Choose your services

We also provide pre-integrated infrastructure solutions based on the BladeSystem modular architecture. From Integrity NonStop BladeSystem and High Performance Cluster Platforms to HP Workstation and Desktop solutions, HP is applying the power of blades to a variety of application and industry-specific challenges customized to your requirements. No wonder HP continues to be the industry leader in blades,⁸ the fastest growing segment in the server market.

Operating Systems

HP-UX 11i	Supported on Integrity server blades
HP OpenVMS	Supported on Integrity server blades
NonStop OS	Only available with Integrity NonStop NB5000c BladeSystem
Microsoft® Windows®	Supported on Integrity and ProLiant server blades
Linux	Supported on ProLiant server blades
Solaris	Supported on selected ProLiant server blades
NetWare	Supported on the ProLiant BL460c server blade

Virtualization Software

Microsoft Hyper-V	Supported on ProLiant server blades
VMware	Supported on ProLiant server blades
Citrix XenServer	Supported on ProLiant server blades

Step 1: Choose your Operating Environment: OS, virtualization software, and applications

Just like other HP servers, HP Integrity, and HP ProLiant server blades run most of the same operating environment, but with the advantages of a BladeSystem infrastructure. You can mix and match different Integrity and ProLiant server blades in the same enclosure and run many different operating environments in one enclosure. HP also offers the HP Integrity NonStop BladeSystem—a fully customized server solution with 24/7 availability and data integrity of transaction-intensive applications.

Find out which of your OS and virtualization software are supported

ProLiant and BladeSystem Servers—support and certification:

Microsoft Windows: www.hp.com/go/wincert

RHEL: www.hp.com/go/rhelcert

SLES: www.hp.com/go/slescert

Solaris: www.hp.com/go/solaris

OEL: www.hp.com/go/oelcert

NetWare: www.hp.com/go/novell

VMware: www.hp.com/go/vmware

Citrix: www.hp.com/go/citrix

For additional OS information:

www.hp.com/go/ossupport

Integrity certification:

www.hp.com/go/integrity/windows

www.hp.com/go/integrity/linux

www.hp.com/go/integrity/hpux

www.hp.com/go/integrity/nonstop

www.hp.com/go/integrity/openvms

Applications and virtual machines

The number of applications, virtual machines, and users supported by your solution will determine the number of server blades you need for the next step—where you choose your server blades. HP and our channel partners can help you choose the right number of blades with our solution-sizing tools and expertise. ActiveAnswers is an online resource with a variety of solutions to help you make the right choice. For more information on ActiveAnswers or to find simple solution help, visit: www.hp.com/go/activeanswers

To make sure we support the applications you rely on today as well as the new ones you will rely on tomorrow, we created the HP BladeSystem Solution Builder Program. This program brings together a worldwide community of technology and service providers that collaborate with HP and each other to define, deliver, and deploy application solutions as well as create new technology for the HP BladeSystem. To learn more about the BladeSystem Solution Builder Program, visit: www.hp.com/go/bladeSystem/solutions

Purchase your entire operating environment from HP

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

⁸IDC Worldwide Quarterly Server Tracker, May 2010

Step 2: Choose your server blades

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

Server blades



HP ProLiant BL2x220c G7

Enhanced performance and efficiency for high performance computing with 20X better bandwidth with integrated Infiniband in an ultra-dense blade form factor.



HP ProLiant BL280c G6

Delivers outstanding dual-processor performance per watt and price per watt to reduce overall data center power consumption while maintaining high performance.



HP ProLiant BL460c G7

The world's most popular server blade delivers the ideal balance of performance, scalability, and expandability to make it the standard for dense data center computing.

Number of processors	2 per node	1–2	1–2
Maximum number of cores	12 per node	12	12
Processors supported	4 or 6 core Intel® Xeon® processors: Up to 2.93 GHz	2, 4, or 6 core Intel Xeon processors: Up to 2.93 GHz	2, 4, or 6 core Intel Xeon processors: Up to 3.06 GHz
Cache	Up to 12 MB L3 per processor	Up to 12 MB L3 per processor	Up to 12 MB L3 per processor
Maximum memory (per server node)	96 GB	192 GB	192 GB
Network ports (per server node)	NC362i-2 NC543i-1	2	2
Drives supported (per server node)	Up to 1	Up to 2	Up to 2
Maximum internal storage (per server node)	250 GB	1 TB	1 TB
I/O expansion	Embedded IB/10GbE network controller	2 PCIe mezzanine expansion slots	2 PCIe mezzanine expansion slots
Form factor	10U enclosure	6U or 10U enclosure	6U or 10U enclosure
Warranty (parts/labor/onsite)	3-year/0/0	3-year/0/0	3-year/3-year/3-year

HP related offerings

Support services*	Recommended Installation and Startup for HP BladeSystem Infrastructure plus 3–5 year HP Support Plus 24 Care Pack
Storage	For internal enclosure storage, choose the HP StorageWorks SB40c Storage Blade or X1800sb Network Storage Blade For internal enclosure storage with a virtual server environment choose HP P4000 VSA alone, or with the HP SB40c Storage Blade External storage options include the HP X1000, P2000 G3, MSA2000, HP P4000, Enterprise Virtual Array (EVA), and MDS600 Protect your data with Ultrium Tape Blades or externally connected tape libraries and disk backup systems
Infrastructure Management	For essential server management: Insight Control with iLO Advanced (iLO 3) For advanced infrastructure management across ProLiant blades: Insight Dynamics for ProLiant For the latest product support, please refer to the product documentation

*All blades within a single HP BladeSystem enclosure must be at the same service level.

Server blade options—including memory DIMMs and hard drives—are available on select models.

For more information, visit: www.hp.com/go/proliantoptions or www.hp.com/go/integrityblades

Step 2: Choose your server blades (continued)

For different computing needs, HP now offers more than servers. We also offer workstation and virtual desktop blade solutions.



Server blades



HP ProLiant BL465c G7

The BL465c is an ideal choice for virtual workloads, yet flexible enough for any business application.



HP ProLiant BL490c G7

Reduce your cost per virtual machine (VM) with the high memory capacity of this virtualization blade.



HP ProLiant BL680c G5

Ideal for hosting larger databases, applications, and many virtual machines, the BL680c G5 delivers no-compromise performance and expansion in the densest 4P server blade form factor available.



HP ProLiant BL685c G7

With a large memory footprint and multi-core processors, the BL685c G7 delivers cost-effective, dense 4 processor computing for virtualization and compute-intensive database applications.

Number of processors	1–2	1–2	2 or 4	2–4
Maximum number of cores	24	12	24	48
Processors supported	8 or 12-core AMD Opteron processors: Up to 2.4 GHz	4 or 6-core Intel Xeon processors: Up to 2.93 GHz	4 to 6-core Intel Xeon processors: Up to 2.4 GHz	8 or 12-core AMD Opteron processors: Up to 2.4 GHz
Cache	12 MB L3 per processor	Up to 12 MB L3 per processor	Up to 12 MB L3 per processor	12 MB L3 per processor
Maximum memory	256 GB	192 GB	128 GB	512 GB
Network ports	2	2	4	4
Drives supported	Up to 2	Up to 2	Up to 2	Up to 2
Maximum internal storage	1 TB	240 GB	1 TB	1 TB
I/O expansion	2 PCIe mezzanine expansion slots	2 PCIe mezzanine expansion slots	3 PCIe mezzanine expansion slots	3 PCIe mezzanine expansion slots
Form factor	6U or 10U enclosure	6U or 10U enclosure	6U or 10U enclosure	6U or 10U enclosure
Warranty (parts/labor/onsite)	3-year/3-year/3-year	3-year/3-year/3-year	3-year/3-year/3-year	3-year/3-year/3-year

HP related offerings

Support services*	Recommended Installation and Startup for HP BladeSystem Infrastructure plus 3–5 year HP Support Plus 24 Care Pack
Storage	For internal enclosure storage, choose the HP StorageWorks SB40c Storage Blade or X1800sb Network Storage Blade For internal enclosure storage with a virtual server environment choose HP P4000 VSA alone, or with the HP SB40c Storage Blade External storage options include the HP X1000, MSA2000, HP P4000, Enterprise Virtual Array (EVA), XP/P9500 and MDS600 Protect your data with Ultrium Tape Blades or externally connected tape libraries and disk backup systems
Infrastructure Management	For essential server management: Insight Control with iLO Advanced (iLO 3) For advanced infrastructure management across ProLiant blades: Insight Dynamics for ProLiant For the latest product support, please refer to the product documentation

*All blades within a single HP BladeSystem enclosure must be at the same service level.

Server blade options—including memory DIMM, hot-plug drives, solid state drives, and high-capacity SAS and SATA—are available on select models.

For more information, visit: www.hp.com/go/proliantoptions or www.hp.com/go/integrityblades

Step 2: Choose your server blades (continued)

Server blades



HP Integrity BL860c i2

Cost-effective mission-critical Converged Infrastructure—a versatile and expandable 2-socket blade that is ideal for application-tier and transaction workloads, database, Java™, and technical computing applications.



HP Integrity BL870c i2

Flexible mission-critical server blades, combined with the efficiency of BladeSystem—4-socket blade that is ideal for the database tier of multi-tiered enterprise applications such as SAP and Oracle.



HP Integrity BL890c i2

Kick off the mission-critical revolution with industry's first 8 socket UNIX® scale-up server blade—ideal for larger mission-critical workloads such as enterprise resource planning, customer relationship management, business intelligence, and large shared-memory applications.

Number of processors	2	4	8
Maximum number of cores	8	16	32
Processors supported	Intel Itanium® processor 9300 series (quad-core, dual-core)	Intel Itanium processor 9300 series (quad-core)	Intel Itanium processor 9300 series (quad-core)
Cache	Up to 24 MB L3 per processor	Up to 24 MB L3 per processor	Up to 24 MB L3 per processor
Maximum memory	192 GB (24 x 8 GB)	384 GB (48 x 8 GB)	768 GB (96 x 8 GB)
Network ports	4 NIC ports via 2 NC532i Dual-Port Flex-10, 10GbE Multifunction Server Adapters	8 NIC ports through 4 NC532i Dual-Port Flex-10, 10GbE Multifunction Server Adapters	16 NIC ports via 8 NC532i Dual-Port Flex-10, 10GbE Multifunction Server Adapters
Drives supported	Up to 2	Up to 4	Up to 8
Maximum internal storage	1.2 TB	2.4 TB	4.8 TB
I/O expansion	3 PCIe mezzanine expansion slots	6 PCIe mezzanine expansion slots	12 PCIe mezzanine expansion slots
Form factor	6U or 10U enclosure	6U or 10U enclosure	6U or 10U enclosure
Warranty (parts/labor/onsite)	3-year/3-year/3-year	3-year/3-year/3-year	3-year/3-year/3-year

HP related offerings

Support services*	Recommended Installation and Startup for HP BladeSystem Infrastructure plus 3–5 year HP Support Plus 24 Care Pack
Storage	For internal enclosure storage, choose the HP StorageWorks SB40c Storage Blade External options include the HP StorageWorks P2000 G3, HP P4000 SAN Solutions, Enterprise Virtual Array (EVA), XP/P9500, and MDS600 Protect your data with Ultrium Tape Blades or externally connected tape libraries and disk backup systems
Infrastructure Management	For essential server management: Insight Control with iLO Advanced (iLO 3) For advanced infrastructure management across Integrity blades: Insight Dynamics – VSE for Integrity For the latest product support, please refer to the product documentation

*All blades within a single HP BladeSystem enclosure must be at the same service level.

Server blade options—including memory DIMM, hot-plug drives, solid state drives, and high-capacity SAS and SATA—are available on select models.

For more information, visit: www.hp.com/go/proliantoptions or www.hp.com/go/integrityblades

Step 3: 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 add storage expansion and data protection quickly, without adding a single cable. The HP StorageWorks portfolio addresses diverse storage requirements and satisfies companies of all sizes:

X9000—highly dense scale-out NAS storage designed for organizations with extreme capacity needs

P2000 G3/MSA Disk Arrays—storage consolidation for small and mid-sized companies and remote locations

P4000—highly available storage for virtual server environments

EVA—reducing storage management burden for demanding application environments

XP and **P9500**—bulletproof storage for mission-critical applications that cannot afford downtime

MDS600—high density, cost-effective storage for BladeSystem

Did you know HP BladeSystem is the most affordable way to connect servers to your Fibre Channel-based SAN?

The BladeSystem architecture reduces cables and transceivers and can help you save up to 64 percent⁹ compared to traditional rack-mount environments.

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



HP StorageWorks blades

HP BladeSystem Storage options (external)



HP StorageWorks X9000 Network Storage System



HP StorageWorks P2000 G3 Modular Smart Arrays



HP StorageWorks P4000 G2 SAN Solutions



HP StorageWorks Enterprise Virtual Arrays (EVA)



HP StorageWorks P9500/XP Disk Arrays



HP StorageWorks 600 Modular Disk System

	HP StorageWorks X9000 Network Storage System	HP StorageWorks P2000 G3 Modular Smart Arrays	HP StorageWorks P4000 G2 SAN Solutions	HP StorageWorks Enterprise Virtual Arrays (EVA)	HP StorageWorks P9500/XP Disk Arrays	HP StorageWorks 600 Modular Disk System
Interconnect	Ethernet 1 Gb and 10 Gb, supports SMB/CIFS, NFS, NDMMP, HTTP, FTP, WebDAV Protocols	P2000 G3—Ethernet Fibre Channel; and 10GbE iSCSI MSA2000 G2—Ethernet, Fibre Channel; and SAS connect for Blades	Two 1 Gb iSCSI ports with each P4000 SAN node; optional field upgrade to 10GbE	Ethernet/iSCSI and Fibre Channel	Fibre Channel, FICON	Direct connect SAS*
Hard disk drives supported	82–656 LFF SAS drives per system depending on configuration	LFF: SAS, MDL SAS, SATA SFF: SAS, MDL SAS, SATA	Up to 384 LFF SAS or MDL SAS drives depending on model	LFF FC, FATA and solid state up to 324 drives	SFF SAS and SFF SSDs, up to 2048 drives	Up to 70 LFF SAS or SATA drives
Maximum capacity	3–16 Server Blades Up to 1.3 PB per system, 16 PB in a single namespace	LFF P2000 G3: 192 TB with LFF SATA drives LFF MSA2000 G2: 120 TB with LFF SATA drives SFF P2000 G3: 74.5 TB with SFF SAS drives SFF MSA2000 G2: 49.5 TB with SFF SAS drives	768 TB max depending on model. Capacity, performance, and redundancy increase as additional nodes are added to the P4000 SAN	Up to 324 TB	Up to 1.2 PB	Up to six MDS600 devices supported off a single BladeSystem enclosure
RAID levels supported	RAID 6	RAID 0, 1, 3, 5, 6, 10, and 50	RAID 10, 5, 6. In addition, Network RAID eliminates any single point of failure in the SAN	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 (parts/labor/onsite)	3-year/3-year/3-year next-day, 1-year software	3-year, next-day, parts exchange	3-year/3-year/3-year next-day	3-year/3-year/3-year	3 year, 24x7, 4 hour response for hardware	3-year, next-day, parts exchange

HP related offerings

Support services	HP StorageWorks X9000 Network Storage System	HP StorageWorks P2000 G3 Modular Smart Arrays	HP StorageWorks P4000 G2 SAN Solutions	HP StorageWorks Enterprise Virtual Arrays (EVA)	HP StorageWorks P9500/XP Disk Arrays	HP StorageWorks 600 Modular Disk System
	Recommended: Installation and Startup service, and 3-year Support Plus 24 service. Required: Installation and startup service	HP StorageWorks P2000 G3 Family Disk Array service, Installation and Startup service, and 3-year Support Plus 24 service	Recommended: Installation and Startup service, and 3-year Support Plus 24 service	Recommended: Installation and Startup service, and 3-year Support Plus 24 service	Required: Installation and Start up service. Recommended 3-year Critical Service	Recommended: Installation and Startup service, and 3-year Support Plus 24 service

⁹ Comparing all HBA, transceiver, cable, and switch requirements of 16 c-Class server blades versus 16 standard 1U servers.

* Note: Enable iSCSI SAN capability in virtual server environments by leveraging the HP MDS600 together with HP P4000 Virtual SAN Appliance.

Step 3: Choose your storage infrastructure (continued)

VLS—Data deduplication Fibre Channel appliance with multi-node support for cost-effective backup of data centers and remote offices

D2D—Data deduplication appliance enabling low bandwidth replication for cost-effective backup of data centers and remote offices

Tape Automation—Tape autoloaders for efficient, unattended, and cost-effective backups

Data Protector—HP data backup and protection suite of software for complete end-to-end data protection

HP StorageWorks Blades

HP BladeSystem Data Protection options



HP StorageWorks Virtual Library Systems



HP StorageWorks D2D Backup Systems with Deduplication



HP StorageWorks Tape Automation



HP Data Protector Software

Interconnect	4 x 4 Gb Fibre Channel	2 x 8 Gb Fibre Channel, 2 x 1 Gb iSCSI, 2*10 GbE	4 x 4 Gb Fibre Channel, 2 x 8 Gb Fibre Channel, 6 Gb SAS	Obtain 24/7 information access and quick disaster recovery
Capacity	Scalable up to 640 TB usable capacity, 768 TB raw	Scalable up to 36 TB usable capacity, 48 TB raw	Up to 3 TB per drive, up to 6 drives per autoloader Up to 12 TB usable capacity, 18 TB raw	<ul style="list-style-type: none"> Reduce risks by avoiding the loss of business-critical information that impacts your ability to run the business
Transfer rate	Up to 17.2 TB/hr	Up to 2.4 TB/hr	Up to 3 TB/hr	<ul style="list-style-type: none"> Achieve business-driven recovery objectives with recovery of data in minutes
Format	N/A	N/A	N/A	<ul style="list-style-type: none"> Manage data effectively within existing budgets and infrastructure, even as the quantity of data grows
Media compatibility/RAID levels supported	Hardware RAID 6	Hardware RAID 6 and 5. 1 hot spare per shelf	LTO-5 LTO-4 LTO-3	<ul style="list-style-type: none"> Protect data on the physical and virtual infrastructures from one centralized platform
Form factor	Rack-based external data protection	Rack-based. 1U, 2U, and 4U depending on model	Rack-based external data protection	
Warranty	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	Recommended: 3-year, 24x7 hardware support	Recommended: 3-year, 24x7 hardware support depending on model	Recommended: 3-year, 24x7 hardware support	Recommended: HP Software Support 9x5 HP Software Support 24x7
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* Note: Enable iSCSI SAN capability in virtual server environments by leveraging the HP MDS600 together with HP P4000 Virtual SAN Appliance.

Step 3: Choose your storage infrastructure (continued)

HP StorageWorks SB40c—Delivers direct attached and shared storage within a c-Class BladeSystem half-height enclosure

HP StorageWorks X1800sb—Combine the X1800sb with the SB40c Storage Blade to enable file serving and iSCSI shared storage inside the BladeSystem enclosure.

HP StorageWorks X3800sb—Flexible SAN gateway built for HP BladeSystem, consolidates file-serving access onto FC, SAS, or iSCSI storage.

HP StorageWorks Blades

HP BladeSystem Storage options (internal)



HP StorageWorks SB40c Storage Blade

HP StorageWorks X1800sb Network Storage Blade

HP StorageWorks X3800sb Network Storage Gateway

HP StorageWorks Tape Blades

	HP StorageWorks SB40c Storage Blade	HP StorageWorks X1800sb Network Storage Blade	HP StorageWorks X3800sb Network Storage Gateway	HP StorageWorks Tape Blades
Interconnect	Direct attach over PCIe or iSCSI when virtualized with HP P4000 VSA	SAN connect: iSCSI, FC, SAS	SAN connect: iSCSI, FC, SAS	3 Gb/sec SAS
Drives supported	Up to 6 SFF SAS or SATA drives	Two local 146 GB SFF SAS drives are pre-installed with Microsoft Windows Storage Server 2008, Standard x64 Edition	Two local 146 GB SFF SAS drives are pre-installed with Microsoft Windows Storage Server 2008, Enterprise x64 Edition	LTO-4 Ultrium (read and write) LTO-3 Ultrium (read and write) LTO-2 Ultrium (read only) Up to 576 GB per hour at 2:1 compression
Maximum capacity	Up to 1.8 TB RAW SAS Up to 1.5 TB RAW SATA	Combine with the SB40c Storage Blade to create shared storage inside the enclosure or use as a gateway to unlimited external storage	Gateway to unlimited external storage	800 GB–1.6 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, 6 with Advanced Data Guarding	OS configured with RAID 1	OS configured with RAID 1	N/A
Warranty (parts/labor/onsite)	3-year parts/3-year labor/3-year DB onsite	Hardware—3-year/3-year/3-year Software—1-year, 9x5 NBD	Hardware—3-year/3-year/3-year Software—1-year, 9x5 NBD	3-year, next-day, parts exchange

HP related offerings

Support services

Recommended: Installation and Startup for HP BladeSystem Infrastructure and 3-year, 24x7 hardware support

Recommended: 3-year, Support Plus 24 and Enhanced 3-year, Proactive 24 service

Recommended: 3-year, Support Plus 24 and Enhanced 3-year, Proactive 24 service

Recommended: 3-year, 24x7 hardware support

Solid State Storage Mezzanines



HP StorageWorks IO Accelerator for HP BladeSystem c-Class

Ideal for organizations faced with increasing demands for better application performance from their technology infrastructure.

Capacity (Native)	80, 160, and 320 GB
Servers supported	BL2x220c G5, BL260c G5, BL280c G6, BL460c, BL460c G6, BL490c G6, BL465c G5, BL465c G6, BL480c, BL495c G5, BL495c G6, BL680c G6, BL685c G5, BL685c G6
Maximum IOPS	100,000 IO/sec
Supported operating systems	RHEL 4, 5 (64-bit support only); SLES 10 (64-bit support only), Windows Server x86-64 2003, 2008 (64-bit support only)
Warranty (parts/labor/onsite)	3-year/0/0

*Note: Enable iSCSI SAN capability in virtual server environments by leveraging the HP MDS600 together with HP P4000 Virtual SAN Appliance.

Step 4: Choose your interconnects

Reduce your Ethernet, Fibre Channel, or InfiniBand cables, switch ports, and other network equipment by up to 90 percent¹⁰ by using fewer cables between your server and the network.

Interconnects

Virtual Connect modules



HP Virtual Connect FlexFabric 10 Gb/24-port Module

HP Virtual Connect Flex-10 10 Gb Ethernet Module

HP Virtual Connect 1/10 Gb-F Ethernet Module

Blade type	Single bay	Single bay	Single bay
Network connections	16 x 10 Gb downlinks to servers; 2 x 10 Gb cross connects; 4 x 10 Gb external SR, LR fiber and copper uplinks SFP+ (Enet/FC); 4 x 10 Gb external SR, LRM and LR fiber and copper uplinks SFP+ (Enet); 1 internal interface to c-Class Onboard Administrator Module	16 x 10 Gb downlinks to server NICs; 2 x 10 Gb cross connects; 1 x 10 Gb copper uplink CX-4 8 x 10 Gb SFP+ (or 1 Gb SFP) SR, LR, or LRM fiber and copper cables (10 Gb) or RJ-45 copper (1 Gb); 1 management USB port; 1 internal interface to c-Class Onboard Administrator Module	16 x 1 Gb downlinks midplane; 1 x 10 Gb cross connect; 1 x 10 Gb copper uplinks CX-4; 2 x 10 Gb SR or LR fiber uplinks XFP; 2 x 1 Gb SX or RJ-45 fiber uplinks SFP; 4 x 1 Gb 1000/100/10 Gb copper uplinks RJ-45; 1 management USB port; 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+ 0 GbE SR, LR, and LRM; 10GbE copper direct attached cable; 1GbE SX; 1GbE 1000Base-T copper	Twinax CX-4 (IB4x), SFP+ copper cables	SFP SX, RJ-45, FX SR and LR Copper RJ-45 100 Ohm 2-pair, Cat5 UTP, Twinax CX-4 (IB4x)
Performance	Line Rate, full-duplex; 240 Gbps bridging fabric; 1.2 μs on Ethernet; only ports; 1.7μs 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 240 Gbps bridging fabric, 2 μsec latency	Line Rate, full-duplex 62 Gbps bridging fabric Less than 4 μsec latency
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; Command Line Interface; 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, Command Line Interface, 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, Command Line Interface, 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) 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, SNMP	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, SNM	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, SNM
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 avoidance, Mirrored profile database, multi-path heartbeat between redundant modules
Security	LDAP, SSL, role-based management	LDAP, SSL, role-based management	LDAP, SSL, role-based management
Maximum per enclosure	8	8	8
Warranty (parts/labor/onsite)	1-year/1-year/1-year	1-year/1-year/1-year	1-year/1-year/1-year
Part number	571956-B21	455880-B21 591973-B21 (Dual Module with VCEM)	447047-B21

HP related offerings

Support services*

Recommended: Enhanced Network Installation and Startup service for HP BladeSystem interconnect modules

Software

Virtual Connect Enterprise Manager centralizes connection management and workload mobility for thousands of servers

External storage

iSCSI storage such as HP StorageWorks P4000 G2 SAN Solutions or P2000 G3

P2000 G3, EVA, XP, P9500

*All blades within a single HP BladeSystem enclosure must be at the same service level.

¹⁰ Comparing all cable requirements of 16 c-Class server blades versus 16 standard 1U servers.

Step 4: Choose your interconnects (continued)

Interconnects (continued)

Virtual Connect modules



HP Virtual Connect 8Gb 20-Port Fibre Channel Module for BladeSystem



HP Virtual Connect 8Gb 24-Port Fibre Channel Module

Blade type	Single bay	Single bay
Network connections	16 internal 8 Gb downlinks presented as F_Ports 4 external 8 Gb uplinks presented as N_Ports	16 internal 8 Gb downlinks presented as F_Ports 8 external 8 Gb uplinks presented as N_Ports
Media types	8 Gb Optical Short Wave Transceiver (SFP+) 4 Gb Optical Short Wave Transceiver (SFP)	4/8 Gb Optical Short Wave Transceiver (SFP+) 4/8 Gb Optical Long Wave Transceiver up to 10 km (SFP+)
Performance	Up to 1600 MBps throughput per port Maximum frame size 2148 bytes (2112 byte payload) Bandwidth of 852 MB @ 8 Gbps Full Duplex Aggregate Bandwidth up to 17.04 GB Full Duplex Fabric Latency < 0.1 μsec @ 8 Gbps	Up to 1600 MBps throughput per port Maximum frame size 2148 bytes (2112 byte payload) Bandwidth of 852 MB @ 8 Gbps, 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
Extended management features	Virtual Connect Enterprise Manager (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 moves 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 moves 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 (parts/labor/onsite)	1-year/1-year/1-year	1-year/1-year/1-year
Part number	572019-B21	466482-B21

HP related offerings

Support services*	
	Recommended: 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 StorageWorks P4000 G2 SAN Solutions or P2000 G3, EVA, XP, P9500

*All blades within a single HP BladeSystem enclosure must be at the same service level.

Step 4: Choose your interconnects (continued)

Interconnects

Ethernet switches



Cisco Catalyst Blade Switch 3020 for HP c-Class BladeSystem

Cisco Catalyst Blade Switch 3120G/3120X

HP GbE2c Layer 2/3 Ethernet Blade Switch

	Cisco Catalyst Blade Switch 3020 for HP c-Class BladeSystem	Cisco Catalyst Blade Switch 3120G/3120X	HP GbE2c Layer 2/3 Ethernet Blade Switch
Performance	48 Gb switching fabric 128 Mb DDR SDRAM 32 Mb Flash memory	80 Gb switching fabric 256 Mb SDRAM 64 Mb Flash memory	48 Gb switching fabric 128 Mb SDRAM 16 Mb Flash memory
Port configuration	16 internal 1 Gb downlinks 8 external 10/100/1000 SFP/BASE-T uplinks (2 configurable as cross-connects) 1 management console port	16 internal 1 Gb downlinks 4 external 10/100/1000/ BASE-T uplinks 2 internal cross connects 4 optional external 10/100/1000 SFP uplinks 2 external 10 Gb X2 uplinks (3120X only)	16 internal 1 Gb downlinks 5 external 10/100/1000 BASE-T uplinks 2 internal cross-connects 1 management console port
Management features	CiscoWorks, SNMP v1, v2, v3, Telnet, CLI	CiscoWorks SNMP v1, v2, v3, Telnet, CLI,	Dual-mode CLI - AOS and iSCLI, SNMP v1, v2, v3, HTTP, HTTPS, NTP server support, RMON
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)
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, 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, 802.3z	SSH v2, TACACS, TACACS+, RADIUS, 802.3, 802.3u, 802.3ab, 802.1d, 802.1s, 802.1w, 802.1p, 802.3ac, 802.1x
Warranty (parts/labor/onsite)	1-year/1-year/1-year 3-year software updates	1-year/1-year/1-year 3-year software updates	1-year/1-year/1-year

HP related offerings

Support services	Recommended: HP BladeSystem Enclosure service		
Options	1000 Base SX Fibre SFP Module	IP Services Software upgrade license for Cisco 3120 Series, 1000 Base SX Fibre SFP Module, 10 Gb CX4 X2 Module (3120X), 10 Gb SR X2 Module (3120X), 10 Gb LRM X2 Module (3120X), 0.5, 1.0, and 3.0 meter stacking cables	Fibre SFP module kit (maximum 2 per switch), Premium Software Subscription service
External storage	iSCSI with HP StorageWorks P4000 G2 SAN Solutions or P2000 G3		

Step 4: Choose your interconnects (continued)

Interconnects (continued)

Ethernet switches



HP ProCurve 6120G/XG Blade Switch



HP ProCurve 6120XG Blade Switch

Performance	106 Gb switching fabric 512 Mb SDRAM 256 Mb Flash memory	480 Gb switching fabric 512 Mb SDRAM 640 Mb Flash memory
Port configuration	16 internal 1 Gb downlinks 4 external 10/100/1000BASE-T uplinks 2 external SFP Uplinks 2 external SFP uplinks 1 external 10 Gb CX4 uplink 2 external 10 Gb XFP ports 1 internal 10 Gb cross-connect 1 management console port	16 internal 10 Gb downlinks 8 external 10 Gb SFP+ (1 Gb SFP) ports including one shared CX-4 Port-Supports SR/LR/LRM Up to two internal 10 Gb cross-connects 1 management console port
Management features	ProCurve Manager PCM/PCM+, SNMP v1, v2, v3, HTTP, HTTPS, NTP server support, RMON	ProCurve Manager PCM/PCM+, SNMP v1, v2, v3, HTTP, HTTPS, NTP server support, RMON
High-availability features	Link Aggregation Protocol Uplink failure detection Spanning Tree	Link Aggregation Protocol Uplink failure detection Spanning Tree
Protocols supported	SSH v2, TACACS, TACACS+, RADIUS, 802.3, 802.3u, 802.3ab, 802.1d, 802.1s, 802.1w, 802.1p, 802.1q, 802.3ac, 802.1x	SSH v2, TACACS, TACACS+, RADIUS, 802.3, 802.3u, 802.3ab, 802.1d, 802.1s, 802.1w, 802.1p, 892.1q, 802.3ac, 802.1x
Warranty (parts/labor/onsite)	1/1/1 Lifetime ProCurve replacement	1/1/1 Lifetime ProCurve replacement

HP related offerings

Support services	Recommended: HP BladeSystem Enclosure service
Options	SFP+/XFP/SFP Modules, DAC Cables modules
External Storage	iSCSI storage such as HP StorageWorks P4000 G2 SAN Solutions or P2000 G3

Step 4: Choose your interconnects (continued)

Interconnects

Fibre Channel switches



Brocade 8Gb SAN Switch for HP BladeSystem c-Class



Cisco MDS 9124e Fabric Switch for HP c-Class BladeSystem

Performance	8 Gbps, non-blocking and auto-sensing 2/4/8 Gb	4 Gbps, non-blocking and auto-sensing 1/2/4 Gb
Port configuration	384 Gbps (end-to-end)	192 Gbps (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; Data Center Fabric Manager (optional)	Cisco MDS 9000 Family Command Line Interface (CLI), Cisco Fabric Manager, Cisco Fabric Manager Server (optional), Cisco Enterprise Package (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 (parts/labor/onsite)	1-year/1-year/1-year	1-year/1-year/1-year

HP related offerings

Support services	Recommended 3-year, 24x7 hardware support service	
Options	SFP+ (short wave) SFPs (short wave, long wave)	SFPs (short range, medium range, long range)
External Storage	HP P2000 G3/MSA2000 G2, EVA, and XP/P9500 disk arrays	

Step 4: Choose your interconnects (continued)

Interconnects (continued)

Fibre Channel HBA mezzanine cards



HP B1c Emulex LPe1205-HP 8 Gb FC HBA for HP BladeSystem**



QLogic QMH2562 8 Gb FC HBA for HP BladeSystem**



Emulex LPe1105-HP 4 Gb FC HBA for HP BladeSystem



HP QLogic QMH2462 4 Gb FC HBA for HP BladeSystem



Brocade 804 8 Gb FC HBA for HP BladeSystem c-Class

Performance	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
Port configuration	Dual 8 Gb Fibre Channel ports	Dual 8 Gb Fibre Channel ports	Dual 4 Gb Fibre Channel ports	Dual 4 Gb Fibre Channel ports	Dual 8 Gb Fibre Channel ports
Management features	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	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 StorageWorks Data Center Fabric Manager
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
Protocols supported	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
Warranty (parts/labor/onsite)	1-year/1-year/1-year	1-year/1-year/1-year	1-year/1-year/1-year	1-year/1-year/1-year	1-year/1-year/1-year

Ethernet network adapter mezzanines



NC325m Quad-Port 1GbE Adapter



NC326m Dual-Port 1GbE Adapter



NC360m Dual-Port 1GbE Adapter



NC364m Quad-Port 1GbE Adapter



NC382m Dual Port Multifunction GbE Adapter

Hardware features					
IEEE compliance	802.1p, 802.1Q, 802.3, 802.3ad	802.1p, 802.1Q, 802.3, 802.3ad	802.1p, 802.1Q, 802.3, 802.3ad	802.1p, 802.1Q, 802.3, 802.3ad	802.1p, 802.1Q, 802.3, 802.3ad
Ports and transfer rate	4 @ 2,000 Mbps	2 @ 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	x4 PCIe, type I card
Network controller	Dual Broadcom 5715S	Broadcom 5715S	Intel 82571EB	Dual Intel 82571EB	Dual Broadcom 5709S
Software features					
PXE	•	•	PXE boot with VC modules only	PXE boot with VC modules only	
TOE, accelerated iSCSI, and iSCSI boot	N/A	N/A	TOE (Windows)	TOE (Windows)	TOE (Windows), Accelerated iSCSI and iSCSI boot (Windows and Linux)
Adapter teaming	•	•	•	•	•
Warranty* (parts/labor/onsite)	1-year/0/0*	1-year/0/0*	1-year/0/0*	1-year/0/0*	1-year/0/0*

* Or the warranty of the server that holds the adapter, whichever is greater.

** Not supported on any G5 Blade server, nor the BL465c G6, nor the BL495c G6

Step 4: Choose your interconnects (continued)

Ethernet network adapter mezzanines (continued)



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 10 Gb Converged Network Adapter



HP NC552m 10Gb 2-port Flex-10 Ethernet Adapter



NC522m Dual Port Flex-10 10GbE Multifunction BL-c Adapter



QLogic QMH4062 1GbE iSCSI Adapter

Hardware features

IEEE compliance	802.1p, 802.1q, 802.3u, 802.3ad, 802.3ae, 802.3x and 802.3z	802.3u, 802.3x, 802.3ad, 802.1p, 802.1q, 802.3z, 802.3ae	802.3ae, 802.3az, 802.3ap, 802.1q, 802.1qau, 802.3x, 802.1p, 802.3ad	802.1p, 802.3, 802.3ad, and 802.3x 802.1Qbb, 802.1Qaz, INCITS FC-BB-5 Rev 2.00	802.3ae, 802.3az, 802.3ap, 802.1q, 802.1qau, 802.3x, 802.1p, 802.3ad	802.1p, 802.3, 802.3ad, 802.3x	802.1p (QoS), 802.1Q (VLANs) (Linux only), 802.3 (Ethernet), 802.3ad Link aggregation (Linux only), and 802.3x (Flow control)
Ports and transfer rate	2 @ 10,000 Mbps	2 @ 10,000 Mbps	2 @ 20,000 Mbps	20,000 Mbps full duplex Ethernet transfer rate per port	2 @ 20,000 Mbps	2 @ 10,000 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	Type 2 mezzanine card	x8 PCIe 2.0 type 1 card	x8 PCIe 2.0, type II card	x4 PCIe type I card
Network controller	Mellanox ConnectX-2EN	Broadcom 57711	BladeEngines 2	BladeEngines 2	BladeEngines 3	NetXen NX3031	QMH 4062

Software features

PXE			Yes	Yes	Yes		
TOE, accelerated iSCSI, and iSCSI boot	TOE (Windows)	TOE (Windows), Accelerated iSCSI (Windows and Linux)	TOE (Windows)	TOE (Windows)	TOE (Windows)	TOE (Windows)	TOE, Accelerated iSCSI and iSCSI boot (Windows, Linux, and VMware ESX)
Adapter teaming	•	•	•	•	•	•	•
Warranty* (parts/labor/onsite)	1-year/0/0*	1-year/0/0*	1-year/0/0*	1-year/0/0	1-year/0/0*	1-year/0/0*	1-year/0/0*

InfiniBand switch module



HP BLc 4X QDR IB Switch



HP BLc 4X DDR IB G2 Switch

Performance	40 Gbps (QDR) per port, 2.5 Tbps switching capacity	20 Gbps (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 (parts/labor/onsite)	1-year part exchange	1-year part exchange

* Or the warranty of the server that holds the adapter, whichever is greater

Step 4: Choose your interconnects (continued)

HP direct connect storage extends BladeSystem storage options by directly connecting the BladeSystem chassis to external shared storage.

The 3 Gb SAS Switch is a double wide interconnect module that enables each server blade with a Smart Array P700m controller card to communicate with the HP StorageWorks MSA2000sa. And the HP Smart Array P700m controller is one of the highest performing controllers in the SAS portfolio, providing new levels of reliability for HP blade servers.

Interconnects (continued)

InfiniBand mezzanine HCA



HP 4X QDR IB Dual Port Mezzanine HCA

HP IB 4X DDR Dual Port Mezzanine HCA

	HP 4X QDR IB Dual Port Mezzanine HCA	HP IB 4X DDR Dual Port Mezzanine HCA
Performance	4x quad data rate (40 Gbps)	4x double data rate (20 Gbps)
Port configuration	dual-port	dual-port
Management features	OFED driver stack	OFED driver stack
Supported ProLiant BL	BL280c G6, BL460c G6, BL490c G6	BL260c G5, BL280 G6, BL2x220c G5, BL460c, BL460c G5, BL460c G6, BL465c G5, BL480c, BL490c G6, BL495c G5, BL680c G5, BL685c, BL685c G5, BL685c G6
Supported Integrity BL	N/A	BL860c
Warranty (parts/labor/onsite)	1-year part exchange	1-year part exchange

Direct connect SAS controller and switch



HP StorageWorks 3 Gb SAS BL Switch

HP Smart Array P700m Controller

HP Smart Array P712m Controller*

	HP StorageWorks 3 Gb SAS BL Switch	HP Smart Array P700m Controller	HP Smart Array P712m Controller*
Performance	3 Gbps	3 Gbps and 512 MB BBWC	3.0 Gb/6.0 Gb SAS capable (up to 600 MB/s bandwidth per physical link)
Port configuration	Eight 3 Gbps SAS ports	4 x 2 SAS port connections through the Blade mezzanine connector	2 internal connections
Management features	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)
Availability features	Redundant switches for high availability and path failover	Battery backed write cache, RAID (including RAID 6 with ADG, RAID migration Recovery ROM)	Online RAID Level Migration (0,1 only with BBWC upgrade)
Protocols supported	SAS	SAS	3/6G SAS (Serial Attached SCSI) and 1.5G SATA (Serial AT Attachment)
Warranty (parts/labor/onsite)	1-year/1-year/1-year	3-year, next-day, parts exchange	3-year parts only

HP related offerings

Capacity for blade servers	<p>Shared SAS storage: Each BladeSystem enclosure supports up to four MSA2000 G2 storage arrays configured with three additional drive enclosures, for up to 192 LFF SAS or SATA drives</p> <p>Zoned SAS storage: Each BladeSystem enclosure supports up to six MDS600 storage devices, for up to 420 LFF SAS or SATA drives</p>
Data protection	HP StorageWorks 1/8 G2 Autoloader and MSL Tape Libraries with SAS tape drives connect to the direct connect SAS switch to protect data on your blade servers

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

* Supports the BL280c G6 only

Step 5: Choose your BladeSystem enclosure

Now that you have a good idea of the number of server and storage blades and interconnect modules you may need, it's time to choose the right enclosure for the size of your solution and your environment.

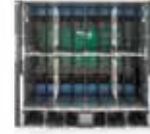
HP BladeSystem enclosures come in two sizes and share the same server, storage, and networking components.

BladeSystem enclosure



HP BladeSystem c3000 enclosure

This smaller, versatile design is ideal for small sites like business offices or branch locations that only need up to 8 server or storage components at a time. It is ideal because it plugs right into the wall, uses standard power, and does not need special air conditioning. It also includes many useful features to help a small staff be more productive with less effort.



HP BladeSystem c7000 enclosure

A larger, modular block of infrastructure is ideal for bigger data centers. It holds up to 16 different types of server and storage blades with twice as many interconnect expansion slots available 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 x 1,200 W	Up to 6 x 2,400 W
Fans	Up to 6 hot plug Active Cool fans	Up to 10 hot plug Active Cool fans
BladeSystem onboard administrator	Up to 2	Up to 2
Height	6U rack model or tower model	10U
Warranty (parts/labor/onsite)	3-year/3-year/3-year	3-year/3-year/3-year

HP related offerings

Support services	Recommended 3-year, Support Plus 24 and Proactive Select	
Options	10000 G2 Series rack, Active Cool 100 fans, c3000 Power Supplies 10000 G2 Series rack, Active Cool 200 fans, c7000 Power supplies	
HP BladeSystem devices supported	All ProLiant, Integrity and NonStop Blade servers All c-Class Interconnect modules All c-Class Storage Blades All HP StorageWorks MSA2000 G2, selected P2000 G3, HP StorageWorks P4000 G2, EVA, and XP/P9500 products	

For a complete list of supported options, please visit: www.hp.com/go/productbulletin

HP BladeSystem Onboard Administrator is the enclosure management processor, subsystem, and firmware base used to support the HP BladeSystem c-Class enclosures and all the managed devices contained within the enclosure.

Onboard Administrator provides a single point from which to perform basic management tasks on server blades or switches within the enclosure. Onboard Administrator performs configuration steps for

the enclosure, enables run-time management and configuration of the enclosure components, and informs you of problems within the enclosure through e-mail, SNMP, or the Insight Display.

The BladeSystem enclosures can be configured with redundant Onboard Administrator modules to provide uninterrupted manageability of the entire enclosure and blades in the event of a failure of a single Onboard Administrator module.

Step 6: Choose your Insight Management

HP Insight Software, unlock the potential of your infrastructure.

HP Insight Software suites

		HP Insight Control	HP Insight Control for Linux	HP Insight Dynamics for ProLiant	HP Insight Dynamics – VSE and OE options for Integrity
CMS operating system:		Windows	Linux	Windows	HP-UX
Advanced Infrastructure Mgmt	Protect continuity of services			X	O
	Optimize infrastructure (plan and balance)			X	X
	Provision infrastructure			X	X
Essential Infrastructure Mgmt	Deploy and Migrate Servers	X	X	X	X
	Optimize power	X	X	X	X
	Remote management	X	X	X	X
	Manage health and performance	X	X	X	X
Integration with Enterprise Mgmt Consoles	Microsoft System Center extension	X		X	N/A
	VMware vCenter extension	X		X	N/A
	Virtual Machine Software	O	O	O	X
Learn more		www.hp.com/go/insightcontrol	www.hp.com/go/insightcontrolforlinux	www.hp.com/go/insightdynamics	

O = Optional

To see how other customers have benefited by implementing HP Insight Software, read the IDC white paper at www.hp.com/go/iceroipaper. To learn how HP Insight software can help you unlock the potential of your infrastructure, contact your local HP sales representative or authorized HP partner, or visit www.hp.com/go/insight

Enclosure Dynamic Power Capping, introduced in Onboard Administrator firmware version 2.31, is only available in HP BladeSystem enclosures with redundant Onboard Administrator modules installed.

Unlock the potential of your infrastructure with HP Insight Software

HP Insight Software provides the most efficient, in-depth way to understand, manage, and potentially control your infrastructure—in real-time and over time. HP Insight Software works hand-in-hand with HP platforms to give you:

- **Deep insight** to make more informed decisions
- **Precise control** to accomplish more in less time
- **Ongoing optimization** to deliver better services to your business

HP Insight Control, an integrated management toolset, provides essential infrastructure management to save you time and money, while giving you the ability to enhance infrastructure ROI. You can deploy servers quickly, manage system health and performance proactively, improve power consumption, control servers from anywhere, and manage virtual machines. If you've standardized on Microsoft System Center

or VMware vCenter Server, you can access ProLiant management capabilities directly from your management console of choice by utilizing the Insight Control extensions.

What's more, your Insight Software can be integrated to work with other enterprise management tools. For a broader view of your total environment, Insight Control integrates with HP Software and Microsoft System Center and VMware vCenter Server, as well as other enterprise-wide tools.

Building on Insight Control, HP Insight Dynamics for ProLiant provides advanced infrastructure management to analyze and enhance physical and virtual environments in the same way. With Insight Dynamics for ProLiant and Insight Dynamics – VSE for Integrity, you can provision infrastructure in minutes, optimize infrastructure confidently, and protect continuity of services.

For more details on software for HP ProLiant and Integrity blades, visit:

www.hp.com/go/insight
www.hp.com/go/insightcontrol
www.hp.com/go/insightcontrolforlinux
www.hp.com/go/insightdynamics
www.hp.com/go/insightdynamics/integrity

Step 7: Choose your power and cooling configurations

Save power every second with power configurations and redundancy levels to suit your needs.

HP Thermal Logic technology makes it a reality.

HP Thermal Logic 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 and by doing so, save you money. 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 is provided for improved efficiency and reliability. It improves power supply efficiency to provide real customer power savings and, therefore, 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	The 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 used 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.
Add 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 fast-acting, hardware-based capping algorithm. Reclaim more power with Blades by dynamically controlling power limits based on workload demand.

Reduce energy consumption with efficient product design

Find products designed for energy efficiency and learn how we consider energy efficiency at every step of the design phase.

- Efficient server choices for different workloads
- Power-efficient components inside every blade
- Add-on technologies to extend power savings

Reclaim power capacity with HP Insight Control

Find solutions to help you monitor, track, report, and cap your power consumption.

- Cap and limit enclosure power, not performance
- Comprehensive energy monitoring and control
- Accurate measurement in every system

Extend the life of your data center with a power-efficient ecosystem

Learn how you can reclaim a big chunk of your power and cooling capacity and extend the life of your data center.

- A complete portfolio of infrastructure products and solutions across the data center
- EYP Data Center Design and assessment services
- HP commitment to the environment

It is often said that you cannot control what you cannot measure. But now you can do both using HP Thermal Logic technology, which combines energy-efficient design with accurate measurement and control without sacrificing performance.

How does this benefit you? You can double the capacity of HP blades servers in the data center with a combination of Dynamic Power Capping delivered through Insight Control, and the BL460c G6. If you are running different blades in your data center, you can optimize them as well.

Step 7: Choose your power and cooling configurations (continued)

HP Thermal Logic capabilities (continued)

Run your numbers through our Cost and Power Savings Calculator to find out how Thermal Logic can help you save money by enhancing power and cooling for blades.

With your power and cooling needs met through Thermal Logic, how about reducing your cabling and networking headaches? Learn how HP Virtual Connect makes virtualization a reality.

This is not all. Combine Thermal Logic with Insight Software to manage all your HP servers and storage environments from a single console—so that you can easily do more with less headcount.

To stay competitive, your organization needs an IT environment that is right for today and ready to evolve as business needs change. HP Technology Services helps you meet this challenge. Our services are designed to lower your IT costs, increase availability, improve service quality, reduce the complexity of multi-vendor services, and accelerate system implementation.

- To break down costly technology silos, we deliver consulting and integration services that allow you to access, share, and synchronize applications and data across your existing heterogeneous environment.
- One of the keys to business success is an Agile IT infrastructure that is poised to adapt to changing needs while keeping your business running smoothly. You need to maintain predictable service levels. That is one of the benefits of comprehensive HP support services. We cover the entire IT solution lifecycle, to help you design, deploy, integrate, and manage an Agile IT infrastructure—including convenient pre-packaged HP Care Pack Service options and custom support solutions.

- Take advantage of HP Insight Remote Support software, providing round-the-clock server and storage monitoring, along with problem resolution and notification, generating service dispatches for issues on HP BladeSystem servers and storage. Helping resolve technical issues quickly and accurately without the need to place support phone calls. Available at no additional cost.
- To speed product implementation, look to our factory-direct capabilities. We offer plug-and-play solutions that are integrated, tested, and shipped in a fully configured rack. These services include pre-delivery site review, factory installation and configuration, onsite installation, and product orientation.

In today's fast-paced business environment, your employees need to quickly assimilate new IT skills. To help you achieve this goal, we offer a variety of HP training services, including instructor-led courses, customized onsite training and innovative remotely assisted courses. Visit: www.hp.com/learn

To capitalize fully on the capabilities of your IT environment, you need a service partner who thoroughly understands server, storage, and network technology and how it behaves in a multi-vendor environment. HP Technology Services working in partnership with HP Authorized Channel Partners has this expertise and skill. Whether your company is a medium-size business or a large global corporation, our service portfolio can help you speedily deploy, improve IT operational efficiency, and boost system uptime. For more information, visit:

www.hp.com/services/bladesystemsolutions or www.hp.com/services/storage

Step 8: Choose services

Keep your blades infrastructures running with the best possible performance.

HP BladeSystem services for better business outcomes

When you buy HP BladeSystem hardware and software, it's also a good time to think about services. With the right services, you can more effectively plan, deploy, and manage IT solutions based on the HP BladeSystem environment. We can help you access the broadest possible range of services. Covering the entire solution lifecycle, HP BladeSystem services include solution design, installation, optimization, and management. We can also provide a single point of contact for all your service requirements. And we can help you choose a support package that strikes the right balance between affordability and guarantee. With HP, you can design the right BladeSystem infrastructure for your IT and business needs, implement it faster, and manage it more effectively. The end result is typically lower costs, higher availability, and easy access to service when you need it. You get a truly responsive IT environment that's easy and cost-effective to manage, and fosters better business outcomes.

HP Services

Installation and Startup for HP BladeSystem c-Class Infrastructure	The HP Installation and Startup Service for HP BladeSystem c-Class Infrastructure provides for the installation of an HP BladeSystem c-Class enclosure, c-Class ProLiant and Integrity 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 StorageWorks MSA Family Disk Array Installation and Startup Service	Includes service planning, service deployment, installation verification tests, and customer-oriented sessions.
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 StorageWorks 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.
3–5 year, 24x7, same business-day hardware support	Integrated hardware and software support includes proactive and reactive services to improve stability and availability across your environment.
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—storage, server, network performance optimization, and more.
Services for NonStop BladeSystem	<p>HP Service Solutions for NonStop BladeSystem through three pre-defined service levels provide quick installation, customized configuration, rapid start-up, and 24x7 support:</p> <ul style="list-style-type: none">– Critical Service Solution– Proactive Service Solution– Foundation Service Solution <p>HP Evolution Services for NonStop BladeSystem mission-critical support from HP Evolution Services for NonStop servers features a holistic approach that addresses all of the diverse factors that affect 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. Visit HP's Evolution services website to understand how HP enhances uptime, performance, operations, and security across your NonStop system environment. Ease your transition to the Intel Itanium 2 HP NonStop platform</p> <p>HP Education Services for NonStop BladeSystem HP NonStop Technology Education is your source for training on HP Integrity NonStop servers and software. A broad range of courses is available, and you can choose from numerous locations and training media to make sure your HP NonStop system education is perfectly tailored to your requirements, operations and security. HP NonStop Education</p>

HP Services-NonStop BladeSystem

Whether adopting HP SIM software for the first time, or upgrading an existing infrastructure, HP Technology services can help you manage change, cut operating costs, and deliver continuous care.

Available services include:

HP ProLiant Essentials portfolio of Installation and Startup services

Include options for HP System Insight Manager with HP Insight Remote Support Advanced. Also available are more comprehensive implementation services that can be tailored to meet your specific requirements.

HP Software Technical Support Service

Covers all the key modules of the ProLiant Essentials portfolio, including for HP System Insight Manager with Insight Remote Support Advanced. You receive expert assistance through telephone and online access to experienced HP support professionals, rapid problem diagnosis and resolution, product and support information, and software patches.

To fully capitalize on your technology solution, you need a partner who thoroughly understands your multi-vendor IT environment. HP Technology Services has those unique insights and can provide services designed to help you get the most from your technology.

Specialized blade infrastructure solutions

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. The following solutions are available fully customized and delivered to you built according to your unique specifications.

HP BladeSystem Matrix



HP BladeSystem Matrix: the foundation for private cloud

Instantly adjust to dynamic business demands

The HP BladeSystem Matrix lets you deploy a complete infrastructure and applications in minutes, not months. One-touch provisioning across infrastructure, applications, and business services is available with BladeSystem Matrix, enhanced with HP Cloud Service Automation software (an option available for HP ProLiant blade servers). The highly automated Matrix Operating Environment instantly adjusts to dynamic business demands by provisioning and modifying complex infrastructure in minutes. It then optimizes IT capacity across physical and virtual environments, while ensuring predictable quality of service. A multi-tier e-shopping application was provisioned in less than two hours.*

Integrated capacity planning and rebalancing tools in the Matrix Operating Environment let you quickly adjust and optimize your infrastructure over its lifecycle, so you can confidently make changes without time-consuming analysis. Key data for power, CPU, and network utilization are captured every five minutes and used to generate best-fit consolidation scenarios. When combined with built-in rebalancing tools, this can eliminate weeks or months of tedious planning and implementation.

The BladeSystem Matrix has built-in disaster recovery so you can quickly move workloads to other servers or sites with the click of a mouse. You can fail over workloads in as few as five minutes on ProLiant** and in as few as four seconds on Integrity*** across physical and virtual servers, while maintaining service levels.

*Source: Based on experiences of HP customers and HP engineering

**HP engineering testing

***Source: HP Serviceguard product specifications

Transform the economics of your data center

BladeSystem Matrix helps you double administrator productivity and triple the capacity of your data center, without adding power infrastructure. This is particularly important as server management and administration personnel costs comprise over 80% of the costs of a typical IT organization today.

Integrated Virtual Connect technology, only from HP, lets you provision server, network, and storage connections upfront for your entire environment. HP Virtual Connect eliminates up to 95 percent of network sprawl at the server edge.* Only one interconnect is needed to connect servers to Ethernet, Fibre Channel or iSCSI fabrics. Removing the need for coordination among server, storage, and network administrators for everyday tasks can help your administrators save time and you save money.

Flexible architecture for shared services, integrated by design

The modular, standards-based HP BladeSystem Matrix is integrated by design, delivering efficiencies of standardization without sacrificing flexibility.

Matrix runs any application workload out-of-the-box and integrates seamlessly with existing storage and network fabrics and into most IT service management platforms. Naturally, it works with the leading virtualization platforms from HP, VMware, and Microsoft.

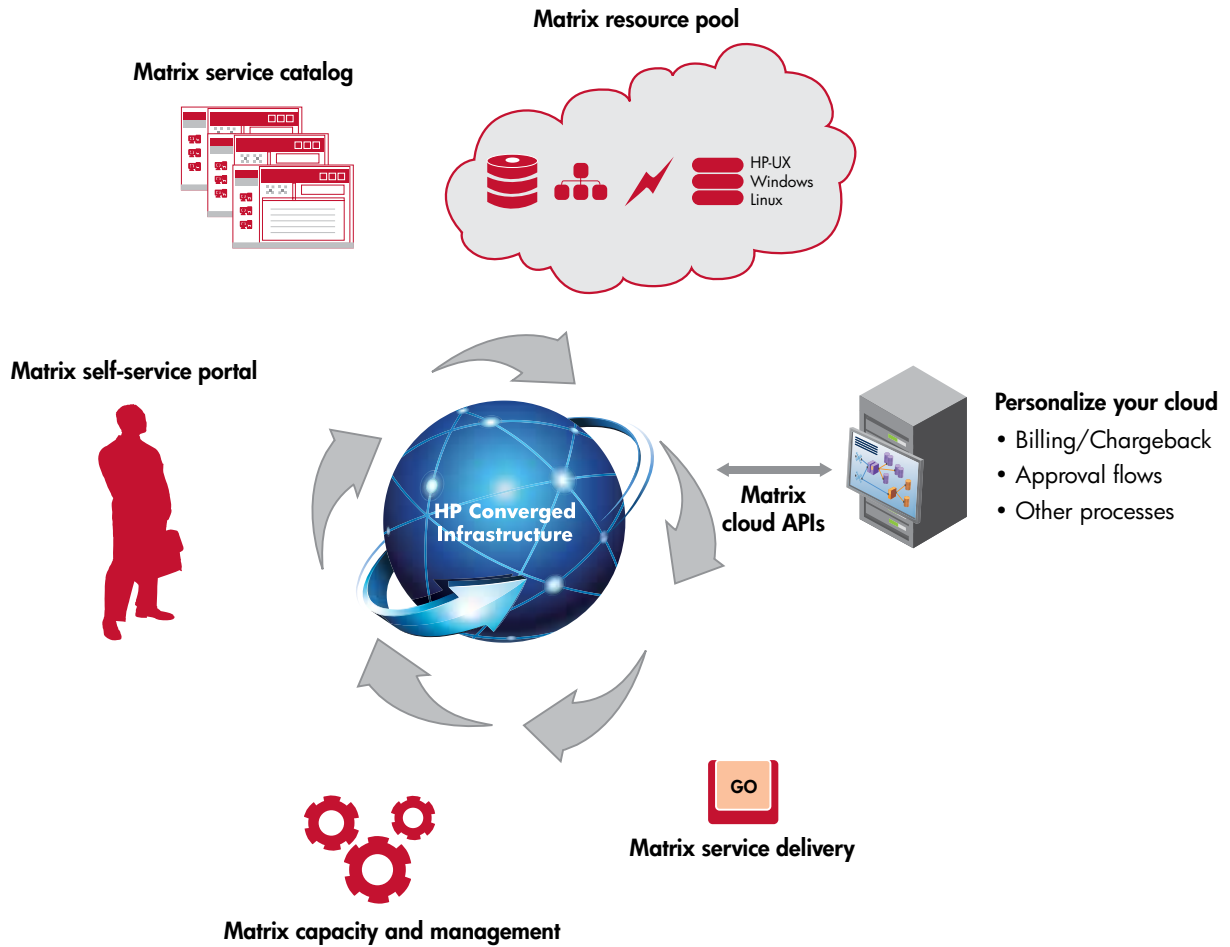
HP Cloud Maps accelerate the deployment and automation of business applications by streamlining application delivery in a private cloud quickly, reliably and consistently. Cloud Maps are best-practices guides for building services catalogs, which include infrastructure templates and workflows for leading partner business applications that can be imported directly into your Matrix environment. You can deploy private clouds more quickly and with more confidence.

With BladeSystem Matrix you can easily get started without risk. Pools of compute, storage, virtual fabrics, and power and cooling can be purchased and delivered as “chunks” of capacity as large as a rack at a time. Matrix is shipped to your door where it is fully installed and integrated into your data center by our experts. The BladeSystem Matrix Starter Kit includes all software, networking, and infrastructure for up to 16 ProLiant blade servers or 8 Integrity blade servers, and it supports any Fibre Channel SAN and iSCSI supported by HP Virtual Connect. The Starter Kit is ideal for evaluation or to tackle a server consolidation project. Matrix Expansion Kits let you quickly and confidently add capacity to your Matrix environment as needed.

*A traditional server blade configuration would typically require a dual port LOM, an extra quad port NIC mezzanine, and a dual port HBA along with switch modules (6 Ethernet and 2 Fibre Channel). The total traditional configuration components come up to 40 vs. the VC FlexFabric module solution. The VC FlexFabric solution requires only embedded dual port FlexFabric Adapters on servers (no mezzanine cards) and two VC FlexFabric modules. This simple calculation will help you understand it better, $(40-2)/40=95\%$.

HP BladeSystem Matrix

The foundation for your private cloud



HP Integrity NonStop BladeSystem

Robust servers that deliver continuous availability, unrivaled data integrity, and virtually unlimited scalability.

HP Integrity NonStop NB5000c BladeSystem



HP Integrity NonStop NB5000c BladeSystem

Highest performance and scalability with industry-leading 24x7 availability and data integrity

Number of processors	2–16 per node
Processors supported	Intel Itanium processor 9100 series (dual-core)
Clustering	Supports ServerNet clustering, scalable up to 4,080 processors
Operating system supported	NonStop OS
Maximum memory	191 TB
ServerNet processor connectivity	InterConnect ServerNet switches
Maximum ServerNet I/O adapters	60
Maximum CLIMs	48 per node
Internal hard disk drives	3,248 FC disks with all IOAME-based storage and IP connectivity; no CLIMs 9,200 SAS disks with all CLIM-based storage and IP connectivity; no IOAME
I/O infrastructure	IP CLIM, storage CLIM, Telco protocols CLIM (clustered I/O module)
Management	NonStop System Console (NSC), HP Systems Insight Manager
Rack height (EIA unit)	Delivered in modular cabinet(s)

HP related offerings

Support services	Recommended: Critical Service Solution and Proactive Service Solution
Options	Fibre Channel ServerNet Adapter (FCSA), Ethernet ServerNet Adapter (G4SA) Fibre Channel Host Bus Adapter, SAS Host Bus Adapter
Storage	300 GB FC internal hard disk drive 72 GB, 146 GB, and 300 GB SAS internal hard disk drives HP StorageWorks P9500/XP Disk Arrays
Software	HP NonStop SQL database software, HP NonStop RDF/ZLT replication software

The HP Integrity NonStop NB5000c BladeSystem is 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. With today's sophisticated architectures, decision makers often

compromise between availability and scalability, and are still left with complex, expensive-to-manage infrastructures. HP Integrity NonStop BladeSystem platform delivers these capabilities out-of-the-box significantly simplifying the infrastructure and reducing costs.

High-performance compute 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.

HP Cluster Platform 3000BL, 4000BL, and 6000BL

	HP Cluster Platform 3000BL	HP Cluster Platform 4000BL	HP Cluster Platform 6000BL
Processor	Intel Xeon Processors 5500 Series	AMD Opteron 2400 Series: Six core, up to 2.6 GHz	Intel Itanium: up to 1.6 GHz/18 MB cache Dual-core
Compute node	ProLiant BL2x220c, BL280c, BL460c	ProLiant BL465c, ProLiant BL685c	Integrity BL860c
Utility/control node	ProLiant BL2x220c, BL280c, BL460c, ProLiant DL380 or DL160	ProLiant BL465c, ProLiant BL685c, ProLiant DL165 G6 or ProLiant DL385 G6	Integrity BL860c, Integrity rx2660 or Integrity rx3600
BladeSystem enclosure	c7000	c7000	c7000
Number of processors (sockets) per node	2	DL165, DL385: two BL685, DL585: four	2
Number of nodes	Minimum: 1 utility node, and 4 compute nodes; maximum: total of 512 nodes (utility + compute nodes)	Minimum: 1 utility node, and 4 compute nodes; maximum: total of 512 nodes (utility + compute nodes)	Minimum: 1 utility node, and 4 compute nodes; maximum: total of 512 nodes (utility + compute nodes)
Memory per node	BL2x220c: Up to 32 GB, BL280c: Up to 96 GB BL460c: Up to 192 GB, DL160: Up to 144 GB, DL380: Up to 144 GB	BL465c: Up to 64 GB, BL685c: Up to 64 GB, DL165: Up to 64 GB, DL385: Up to 128 GB, DL585: Up to 256 GB	BL860c: Up to 48 GB, rx2660: Up to 32 GB, rx3600: Up to 96 GB
Number of I/O slots	BL2x220c: Two mezzanine per blade (one per node) BL280c: Up to two mezzanine choices BL460c: Up to two mezzanine choices DL160: 2 PCI-E x16 Gen2 DL380: 6 PCI-E (PCI-X optional)	BL465c: Up to two mezzanine choices BL685c: Up to three mezzanine choices DL165: 2 PCI-E (optional HTX and PCI-X), DL385: 6 PCI-E (PCI-X optional) DL585: 9 (mix of PCI-E/PCI-X)	BL860c: Up to three mezzanine choices rx2660: choice of 2 PCI-E + 1 PCI-X, or 3 PCI-X rx3600: 8 PCI-X slots or 4 PCI-Express slots + 4 PCI-X slots
Disk/media bays	BL2x220c: 2 SATA or SSD drives per blade (one per node) BL280c: 2 drives (SAS, SATA, or SSD) BL460c: 2 drives (SAS or SATA) DL380: 16 drives (SATA or SAS)	BL465c/BL685c: 2 drives (SAS or SATA) DL165: 4 drives (SAS or SATA) DL385: 16 drives (SAS or SATA) DL585: 8 drives (SAS or SATA SFF)	BL860c: 2 SAS drives rx2660 and rx3600: 8 SAS drives
Cluster interconnect	InfiniBand 4x QDR/DDR; Gigabit Ethernet	InfiniBand 4x DDR; Gigabit Ethernet	InfiniBand 4x DDR; Gigabit Ethernet
Management network	10/100 network or Gigabit Ethernet; 10/100 console network to node-based embedded management interfaces. ProCurve switches	10/100 network or Gigabit Ethernet; 10/100 console network to node-based embedded management interfaces. ProCurve switches	10/100 network or Gigabit Ethernet; 10/100 console network to node-based embedded management interfaces. ProCurve switches
SAN storage in cabinet	Optional P2000 G3	Optional P2000 G3	Optional P2000 G3
Operating system options	Linux: Red Hat Enterprise Linux 4 or 5; SUSE SLES 10, Windows Server 2008 R2	Linux: Red Hat Enterprise Linux 4 or 5; SUSE SLES 10, Windows Server 2008 R2	Linux: Red Hat Enterprise Linux 4 or 5; and SUSE, SLES 10
Operating environment options	HP-MPI across all operating systems	HP-MPI across all operating systems	HP-MPI across all operating systems
Cluster management software options	Linux: HP Cluster Management Utility (CMU) Windows: Windows HPC Server 2008	Linux: HP CMU Windows: Windows HPC Server 2008	Linux: HP CMU
Warranty	Standard hardware warranties; software warranty specific to product options	Standard hardware warranties; software warranty specific to product options	Standard hardware warranties; software warranty specific to product options

HP related offerings

Support services

Recommended: 3-year, 24x7 Hardware Support, and proactive BladeSystem service

HP Cluster Platform Workgroup System

Small technology sites, branch offices, and workgroups can accelerate their innovation and productivity with the super computer-in-a-box. Delivering almost a teraflop per second of computing in a footprint of only two square feet, the HP Cluster Platform Workgroup System is available for the BladeSystem c3000 rack or tower models with up to eight blades.

HP Cluster Platform Workgroup System

	Intel Xeon-based system	AMD Opteron-based system
Processor	Intel Xeon Processors 5x00 Series	Quad-Core AMD Opteron 2400 Series: Six Core
Compute node	ProLiant BL2x220c G6, ProLiant BL280c G6, ProLiant BL460c	ProLiant BL465c G6
Control node	ProLiant BL280c G6, BL2x220c G5, ProLiant BL460c, ProLiant DL380 G6, or DL160 G6	ProLiant BL465c, ProLiant DL165 G6, or ProLiant DL385 G6
BladeSystem enclosure	c3000 tower or rack model	c3000 tower or rack model
Number of processors (sockets) per node	2	2
Number of blades	Up to eight half-height server blades	Up to eight half-height server blades
Number of servers per blade	BL2x220c: Two; others: One	1
Memory per node	BL2x220c: Up to 32 GB DDR2 memory, BL280c: up to 96 GB DDR2 memory, BL460c: Up to 192 GB FB DDR2 memory, DL160: Up to 144 GB FB DDR2 memory, DL380: Up to 144 GB FB DDR2 memory	BL465c: Up to 64 GB DDR2 memory, DL165: up to 64 GB DDR2 memory, DL385: Up to 128 GB DDR2 memory
Storage	Extend control node storage (when a BL460c or BL280 is used as the control node): optional SB40c with up to six drives	Extend control node storage (when a BL465c or is used as the control node): optional SB40c with up to six drives
Number of I/O slots	BL2x220c: 1 PCI-E x8 mezzanine slot per server, BL280c: and BL460c: mezzanine connectors, DL160: 2 PCI-E x16 G2, DL380: 6 PCI-E (PCI-X optional)	BL465c: 2 PCI-E mezzanine connectors (x8 and x4), DL165: 2 PCI-E (optional HTX and PCI-X), DL385: 4 PCI-E (PCI-X optional)
Disk/media bays	BL2x220c: 1 Non hot-plug SATA drive, BL280c: 2 non hot-plug SATA, SAS or SSD drives, BL460c: 2 hot-plug SFF drives (SAS or SATA), DL160: 4 drives (SAS or SATA), DL380: 16 (SATA or SAS)	BL465c: 2 hot-plug SFF drives (SAS or SATA), DL165: 4 drives (SAS or SATA), DL385: 6 hot-plug SFF drives (SAS or SATA)
Cluster interconnect	InfiniBand 4x DDR2; Gigabit Ethernet	InfiniBand 4x DDR2; Gigabit Ethernet
Operating system options	Linux: Red Hat Enterprise Linux 4 or 5; SUSE SLES 10, Windows: Windows HPC Server 2008	Linux: Red Hat Enterprise Linux 4 or 5; SUSE SLES 10, Windows Compute Cluster Server 2003, Windows HPC Server 2008
Operating environment options	HP-MPI across all operating systems	HP-MPI across all operating systems
Cluster management software options	Linux: HP CMU, or Platform Manager (formerly Scali Manage), Microsoft Windows: Windows HPC Server 2008	Linux: HP CMU, or Platform Manager (formerly Scali Manage), Microsoft Windows: Windows HPC Server 2008
Warranty	Standard hardware warranties; software warranty specific to product options	Standard hardware warranties; software warranty specific to product options

HP related offerings

Support services

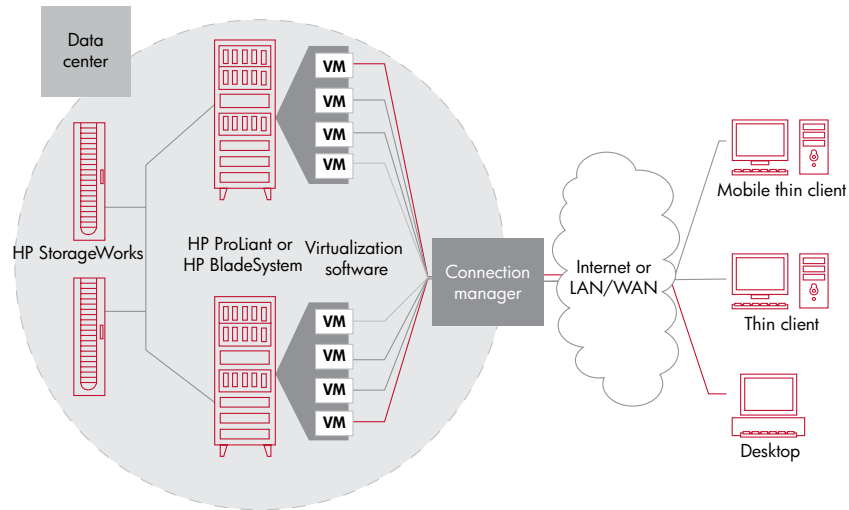
Recommended: 3-year, 24x7 Hardware Support, and proactive BladeSystem service

HP Virtual Desktop Solutions

HP Virtual Desktop Infrastructure (VDI) is a desktop replacement solution that increases security, decreases cost, and delivers higher availability for the desktop while continuing to provide end-users with the functionality of a standalone desktop. HP VDI comprises servers, storage, software, management, and access devices and is delivered through a combination of HP and partner delivered services.

With HP VDI, the typical heterogeneous desktop environment is replaced with HP Thin Clients on the front end, and HP ProLiant or HP BladeSystem servers with HP StorageWorks external storage or local storage on the back end. For each desktop, an OS is virtualized on the server using virtualization software.

HP Virtual Desktop Solutions



Virtual Desktop Storage Solution



HP StorageWorks P4800 BladeSystem SAN—Client Virtualization simplified

Interconnect	10GigE
Hard disk drives supported	140 x 450 GB 15K SAS disk drives
Maximum capacity	252 TB with 4 P4800 SANs
RAID levels supported	Hardware RAID. In addition, Network RAID 10 ensures SAN data high availability
Warranty (parts/labor/onsite)	3-year/3-year/3-year next-day

HP related offerings

Support services	Recommended: Installation and Startup service, and 3-year Support Plus 24 service
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HP Workstation Blade Solutions

By combining the centralized security and control of a data center with seamless workstation performance and the flexibility to support professionals in multiple locations, the HP Workstation Blade Solution revolutionizes the business workplace with a new way of working. Solution components include:

- **HP ProLiant WS Series Workstation Blade:** Outstanding performance and scalability with Intel Xeon 5600, and 5500 series processors and multi-display hardware accelerated graphics performance for 2D, 3D, and streaming video applications. NVIDIA Quadro FX 770M [256 MB/512 MB, NVIDIA Quadro FX 880M (1 GB), NVIDIA Quadro FX 2800M (1 GB)] and NVIDIA Quadro FX 3600M (512 MB) adapter, up to four-display support
- **HP WS460c G6 Graphics Expansion Blade:** Provides outstanding graphics performance with NVIDIA PCI express graphics cards. Three choices are offered and recommended based on business environment and applications used: NVIDIA Quadro FX 3800, NVIDIA Quadro FX 4800, or the NVIDIA Quadro FX 5800
- **HP BladeSystem c-Class Data Center Infrastructure:** Consolidates your workstations into a secure, modular unit, packed with intelligence and managed within the data center
- **HP Insight Control:** Install, configure, monitor, update, and troubleshoot ProLiant Workstations Blade remotely from a standard Web browser, command line, or script
- **HP Remote Graphics Software Workstation Edition:** Delivers a true workstation experience with full utilization of workstation blade hardware and graphics resources
- **HP Session Allocation Manager:** Maps available resource to users and streamlines login process
- **Access Clients:** High performance dual-display, with up to quad-display graphics support and removable media for increased data security

HP Workstation Blade Solution



HP ProLiant WS460c Workstation Blade

The newest generation of uncompromised workstation-class compute power with data center class security, high density, and scalability.

Number of processors per node	1–2
Maximum number of cores per node	12
Processors supported	Dual-core and Hex-core Intel Xeon processors: Up to 2.93 GHz
Cache	Up to 24 MB L3 (2 x 12 MB) 5600 Series Quad-core
Maximum memory per node	192 GB
Network ports per node	2
Drives supported per node	Up to 2
Maximum internal storage per node	1 TB
I/O expansion	2 PCIe mezzanine expansion slots (May be occupied by graphics)
Graphics	NVIDIA Quadro FX 770M/FX 880M/FX 2800M/FX 3600M
Form factor	6U or 10U enclosure
Warranty (parts/labor/onsite)	3-year/3-year/3-year

HP related offerings

Support services	Recommended 3-year, 24x7 hardware support
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HP WS460c G6 Graphics Expansion Blade

The newest generation of uncompromised workstation-class graphics performance.

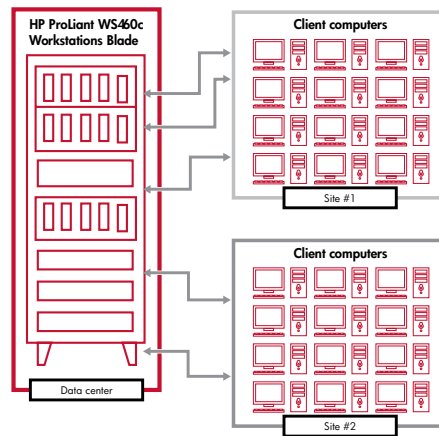
Graphics	2 PCIe graphics expansion slots to host NVIDIA Quadro FX 5800 (4.0 GB) for ultra high-end 3D apps, NVIDIA Quadro FX 4800 (1.5 GB) for high-end 3D apps, or NVIDIA Quadro FX 3800 (1.0 GB) for mid-range to high-end 2D/3D apps
Form factor	6U or 10U enclosure
Warranty (parts/labor/onsite)	3-year/3-year/3-year

HP related offerings

Support services	Recommended 3-year, 24x7 hardware support
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HP Workstation Blade Solutions

The HP Workstation Blade Solution consists of rack-mounted workstation blades, client computers, remote access software, and resource allocation manager



HP puts it all together

To gain the full value from your investments, you need expert services across the IT lifecycle, intelligent software, advanced storage devices, and system-enhancing options. HP is committed to meet your exact needs.

- **Services:** How important is it that your service partner provides a single point of ownership and accountability? Are your service needs met across your enterprise? Have you reached the mission-critical reliability you require to meet your business needs? From training and basic product support to selective outsourcing, our services help you realize the full potential of your technology and keep your environment up and running.
- **Management software:** Do you need an efficient, in-depth way to understand, manage, and optimize your infrastructure? Get more from every hour, watt, and dollar you invest in your infrastructure with HP Insight Software.

- **Storage devices:** Do you need help optimizing your storage resources, managing multi-vendor environments, and evolving to open architectures? Our network and direct-attached storage devices help you keep large amounts of information protected and readily accessible to people when needed.
- **Server options:** Do you have everything you need to meet your infrastructure needs? Our server options—including memory, drives, processors, racks, operating system software, power and cooling—help fine-tune your solution by enhancing system performance and functionality.

To learn more about other HP server, workstation, and storage products, contact your local HP representative, your authorized HP reseller or visit:

- www.hp.com/go/proliant
- www.hp.com/go/integrity
- www.hp.com/go/nonstop
- www.hp.com/go/arrays
- www.hp.com/go/san
- www.hp.com/go/insight
- www.hp.com/go/storageblades
- www.hp.com/go/virtualization

HP BladeSystem Telecom Solutions

HP BladeSystem carrier grade platform, first and foremost, meets the telecom specific needs for a rugged platform, while at the same time providing an adaptable infrastructure that can accommodate different and continually evolving requirements. HP BladeSystem provides technology building blocks which reduce 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 -48VDC 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 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.

The HP Seismic Rack—HP carrier grade solutions include a 36U x 1 meter deep, fully hardened cabinet system designed to withstand the rigors of the telecom environmental and seismic events. The cabinet can support payloads up to 1200 lb, and can house the full line of carrier grade products, including the HP BladeSystem c7000, HP ProLiant DL380, HP P2000 G3 storage array. The cabinet can support two -48VDC breaker systems, rated at 240 amps each.

HP BladeSystem c7000 carrier grade enclosure



HP BladeSystem c7000—NEBS tested components

Server Blades	HP ProLiant BL460c G6, two Intel Xeon processor 5500 or 5600 series, up to 96 GB memory HP Integrity BL860c, two Intel Itanium processors 9100 series, up to 48 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 8Gb FC HBA HP BLc Emulex LPe 1205-HP 8Gb FC HBA NC542m Dual Port Flex-10 Mezz HP PCI Expansion Blade, for use with BL460c
Interconnect Modules	HP Virtual Connect Flex-10 10 Gb Ethernet Module HP ProCurve 6120XG HP GbE2c Layer 2/3 Ethernet Blade Switch Cisco Catalyst Blade Switch 3020 for HP BladeSystem c-Class HP 10 Gb Ethernet BLc Switch HP 1/10 Gb Virtual Connect Ethernet Module HP BLc 1 Gb Ethernet pass Thru Module Brocade BLc 8Gb SAN Switch

Carrier grade server blades



HP ProLiant BL460c G6



HP Integrity BL860c

Number of processes	1–2	1–2
Maximum number of Cores	12	4
Processors supported		Intel Itanium 9100 series
Maximum memory (per blade)	96 GB	48 GB
Network ports	2	4
Internal Storage	2 hot plug	2 hot plug
I/O expansion	2 PCIe mezz exp slots	3 PCIe mezz exp slots
Support	3-year/3-year/3-year	3-year/3-year/3-year

Interconnects (NEBS tested)

Brocade B1c 8Gb SAN Switch

HP Virtual Connect Flex-10 10 Gb Ethernet Module for the c-Class BladeSystem

HP 1/10 Gb Virtual Connect Ethernet Module

HP ProCurve 6120G/XG

HP ProCurve 6120XG

HP GbE2c Layer 2/3 Ethernet Blade Switch

Cisco Catalyst Blade Switch 3020 for HP c-Class BladeSystem

The HP Seismic Rack—HP carrier grade solutions include a 36Ux1 meter deep, fully hardened cabinet system designed to withstand the rigors of the formidable environmental and seismic events. The cabinet can support payloads up to 1200 lb, and can house the full line of carrier grade products, include the HP BladeSystem c7000, HP ProLiant DL380 G6, HP P2000 G3 storage array. The cabinet can support two -48VDC breaker systems, rated at 240 amps each.

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: www.hp.com/go/hpfinancialservices

Evaluate

The BladeSystem Evaluation Center contains interactive demos, videos, webinars, TCO calculators, detailed technical data, and more. For more information, visit: www.hp.com/go/bladesystem/evaluate

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 topline 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.

To learn how HP BladeSystem can help you drive business innovation and eliminate IT sprawl, please visit: www.hp.com/go/bladesystem

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