# HP BladeSystem c-Class: an Adaptive Infrastructure out of the box

# What if you could:

- Deploy new servers and their connections to LAN and SAN in minutes, not weeks
- Wire your infrastructure once and change on the fly to meet current business priorities
- Cut system administrator time spent on many common IT tasks by 90 percent or more
- Reduce power up to 40 percent without sacrificing application performance
- Turn high density into a cooling advantage and use less than half the power to do it
- Provide high availability for every application at a negligible cost
- Cut the number and cost of cables out of each rack by 94 percent or more

Redesigned from the start to deliver a bold agenda for the future of blade computing, the new HP BladeSystem c-Class tackles the toughest problems facing today's IT organizations—cost, time, energy and change. Plus, it includes flexibility, scalability and support for future technologies so it's not only easier to create, change and manage, but also helps your business take full advantage of new things to come.

HP BladeSystem c7000 Enclosure with ProLiant BL460c and BL480c server blades

"Cerner faced many of the same datacenter challenges day-to-day as other companies. We were running out of floor space but increasing our demand for compute capabilities at the same time. Once we realized the bottom line benefits of the new HP BladeSystem c-Class infrastructure compared to the costs of simply buying more and more rack-mount servers, it became clear what the future direction would be. We anticipate the cost saving of the blade-based infrastructure to help us improve the business results while allowing us to manage growth more effectively."

Tony Linville
Sr. Manager, Infrastructure Services, Cerner

The fundamental goals of business never change. The ability to serve customers better. To stand out above the competition. To lower costs and raise productivity. To be profitable.

Now more than ever, a company's IT infrastructure forms the foundation for the difference between leadership and mediocrity. But too often, the technology that should accelerate success simply gets in the way. The businesses that use IT most effectively in their business often spend far less on infrastructure than their competitors. Why is that? The answer is because they get more value out of what they spend.

These leaders have adaptive infrastructures that HP describes as "best-run." Meaning they run their IT assets and organizations with high levels of productivity, at low operational costs, high utilization and extreme flexibility—all aimed at delivering superior service quality to their users.

Unfortunately, the only thing keeping the rest of the world from having a best-run adaptive infrastructure is that too many continue to build IT with the same static and hardwired components that create a racked and stacked model of inefficiency. In almost all cases, the common limitations of an infrastructure trace back to the way it's built, the silos it creates and the inefficient management processes behind it.

Enter the next-generation HP BladeSystem c-Class.

The new HP BladeSystem is a modular evolution of today's racked, stacked and wired infrastructure. It consolidates from the start with the essential elements of a modern datacenter—power, cooling, management, connectivity, redundancy, security—into a modular, self-tuning unit wrapped with intelligence. It's expandable with a variety of server, storage and interconnect choices to build solutions for any business.

With unique innovations built-in, HP BladeSystem delivers more value back to your business and gives you the freedom to focus on what matters most so you can take on the increasing demand for IT services with confidence.

- **Cost-savvy**—The consolidated design is more affordable to buy and efficient to own than conventional IT
- **Change-ready**—HP Virtual Connect and modular system approach reduces barriers to change
- **Energy-thrifty**—HP Thermal Logic technology increases energy efficiency by managing power and cooling as a resource
- **Time-smart**—HP Insight Control for unified infrastructure management to save valuable time

Built to support a wider variety of applications and mission-critical environments, the new BladeSystem includes more features that don't compromise performance, reliability, cost or energy efficiency. With a strong alliance of industry partners and HP Services, the new BladeSystem can reduce costs and inefficiency, get new applications to market faster, scale applications more quickly, and meet service-level agreements for availability and performance.

**Build a cost-savvy infrastructure with the HP BladeSystem**

Because the HP BladeSystem pools and shares common resources like connectivity, power and cooling and decreases the need for others, it is less expensive to purchase up front than traditional infrastructures. For example:

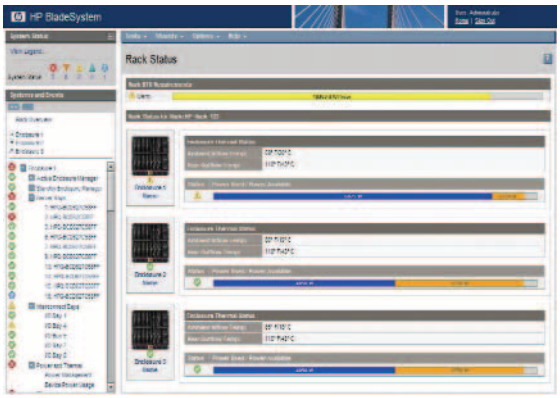
- Save up to 42 percent on purchase cost for servers and their supporting Ethernet and Fibre Channel connectivity, power cables, PDU's and racks
  - For 320 servers, the total infrastructure savings can be up to US$1,972,376
- Power, power cable and cooling savings up to 60 percent
  - Save US$440,677 on the average cost of power, cooling and pulling power cables for 320 servers
- Reduce electricity up to 40 percent
  - Over three years at US$0.10/kW, save US$67,092 to power and cool 320 servers

With a consolidated design, built-in control and integrated software tools designed for unified infrastructure management, the HP BladeSystem is also more efficient to manage and easier to change. One reason a BladeSystem lowers total cost of ownership is because you can perform tasks automatically and across many devices at one time, through one console with a common set of tools that also manage the rest of your IT infrastructure. You can:

- Cut the time of a variety of IT maintenance tasks from 50 to 90 percent or more.
  - By configuring up to 64 servers at a time in 15 minutes or less, you can save more than US$194,000 in system administrator time on initial setup and software deployment.
- Reduce the time to perform upgrades and patches from 10 minutes to 20 seconds per server
  - Time savings for 18 patches per server for 320 servers can be US$46,416
- Implement N+1 redundancy to provide high availability to all applications in a rack
  - Recovery of up to 63 server blades with one spare.

**Thermal Logic**
One click puts essential thermal information at your fingertips.

**Active Cool fan**
A single jet-inspired Active Cool fan moves enough air to cool up to five rack servers but uses half the power.




## Be energy-thrifty with HP Thermal Logic technologies

The quest for more powerful processors has brought higher energy bills, a bigger load to cool, and the ever-present threat of overheating. The new HP BladeSystem with built-in Thermal Logic technology gives you a powerful ally to overcome the power and cooling dilemma and keep your datacenter within your power budget.

- Real-time power and cooling dashboard gives instant insight
- Automatically adjust and shift power and cooling based on load
- More efficient fans pull more air to the right place while using less electricity
- Save 33 percent* in annual power costs vs. 1U rack-mount servers
- Choose from single- or 3-phase power options
- N+N and N+1 power supply redundancy for configuration flexibility
- All power and cooling components are hot-pluggable for easy upgrades

## Instant insight to all thermal data

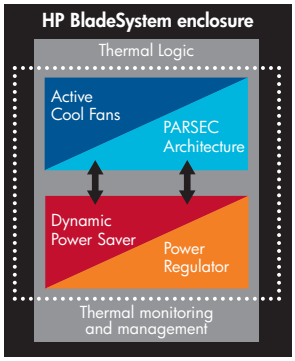
Hundreds of embedded sensors placed throughout the enclosure enable HP Thermal Logic's monitoring and management and report that data to the HP Onboard Administrator and HP Systems Insight Manager. With this thermal monitoring, it's simple to actively track the heat output for each enclosure in every rack, the air temperature in and out, and power used and power available. This gives you the insight you need to match your system performance demands, while balancing set temperature thresholds—manually or automatically.

*Based on HP Lab power measurements of equally configured 16 ProLiant BL460c server blades versus 16 ProLiant DL360 rack servers.

## Turning density into a cooling advantage

Density, once a barrier to cooling, is now turned into an advantage with HP Thermal Logic technology like HP Active Cool fans and the HP PARSEC architecture. With these innovations, server blades get more cooling airflow where it's needed most and use less power to do it than traditional rack servers. In fact with HP Thermal Logic technology 16 server blades requires up to 50 percent less airflow and up to 70 percent less power for cooling than the equivalent number of rack servers all while taking up less rack space.

**An environmental enclosure**

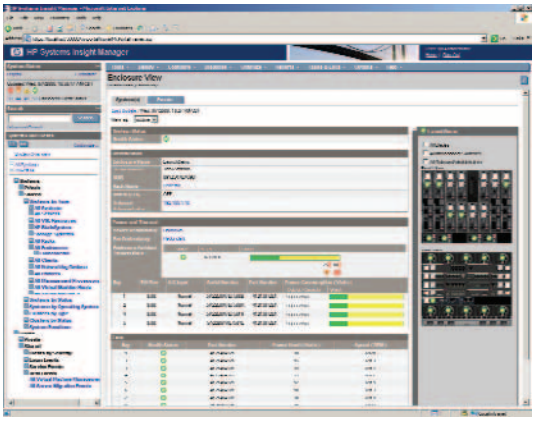



## Pooled power increases power efficiency

The HP Dynamic Power Saver feature runs continuously in the background, pooling power distribution to maintain system performance at higher application loads, and to provide power savings at lower application loads. It automatically distributes or balances the pooled power supplies to keep them working at their most efficient level, even turning some off when not needed, while maintaining full power redundancy. Dynamic Power Saver works with HP Power Regulator, which works at the processor level to reduce processor power consumption at low loads, to match the system power consumption to the workload.

**HP Onboard Administrator**
Plug it in. Follow the wizard. And in less than 15 minutes—configure up to 64 servers—ready to load OS and applications.

**SIM blade Insight Control management**
Unified infrastructure management control from a single console.


## Work time-smart with Insight Control

With thousands of points of instrumentation and data collected throughout, you can control every aspect of your blade infrastructure from the enclosure-mounted display or any web browser. From power and cooling, to connectivity and performance every aspect is continually monitored and adapted. HP Insight Control management puts that information at your fingertips, saving time with simple and reliable provisioning, monitoring, change management and control across your infrastructure.

- Reduce the time needed for many common IT tasks as much as 90 percent
- Remote access through one link to all iLO 2 controllers built-in to each server blade
- Choice of Insight Control software for end-to-end infrastructure control with a built-in automation, wizard-driven interface, and single sign-on role-based security
- Delivers system health and performance monitoring, simple provisioning and recovery, and vulnerability scanning and patching

## Built-in insight and control at every point

Each BladeSystem c7000 enclosure has a built in HP Onboard Administrator which includes a simple LCD screen on the front for rapid setup and daily maintenance and redundant modules in the rear for advanced system administrator operations. Each server blade also includes the Integrated Lights-Out management processor (iLO 2) which delivers total control of individual blade servers through virtual KVM for remote administration. Combined, these tools streamline setup, troubleshooting and maintenance.

## Powerful, pre-integrated software for control over everything

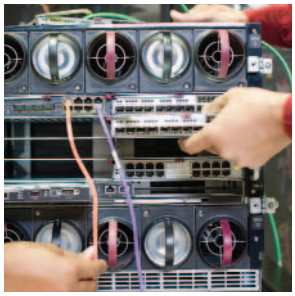
Insight Control Data Center Edition software—designed for environments with a mix of Windows and Linux applications—provides total control over your blade infrastructure and to streamline operations across virtual or physical environments for provisioning, monitoring, and server failover. The Data Center Edition package includes Systems Insight Manager, the ProLiant Essentials Rapid Deployment Pack, Performance Management Pack, and Vulnerability and Patch Management Pack so you can provision, monitor health and performance, and strengthen security.

### Insight Control

- Greatly simplifies the process of provisioning OS and applications and can execute unattended image- or script-based deployment of operating systems and applications.
- Automatically initiate server deployments as soon as new blades are loaded in the enclosure and replace failed or distressed blades quickly by simply inserting a new blade in the location of the failed server.
- Monitors performance and provides simple recommendations to alleviate performance bottlenecks.
- Identifies security vulnerabilities on servers running Windows or Linux and facilitates deployment of patches to those systems.

While enhanced for the unique capabilities of the HP BladeSystem c-Class, Insight Control software is based on Systems Insight Manager and supports other HP server, storage and blade environments. The environment is fully expandable with ProLiant, Integrity and Storage Essentials, and OpenView, a more comprehensive, unified infrastructure management.

- Use ProLiant Essentials Virtual Machine Management Software (PEVMS) to unify the management of physical and virtual resources and move applications easily between physical and virtual servers.
- Use the ProLiant Essentials Server Migration Pack–Physical to ProLiant Edition to quickly and reliably migrate from older servers to the latest BladeSystem c-Class.

**Become change-ready with HP Virtual Connect**
The built-in Virtual Connect architecture delivers extreme flexibility for the server administrator to connect and manage servers the way they want to the existing standards and with the familiar brands in their datacenter. It connects 16 bays of the c7000 enclosure together and to outside networks. With Virtual Connect, your applications have increased bandwidth for high performance and room for future expansion with no single point of failure—while decreasing cables by 94 percent or more.

Plug in your favorite brands of Ethernet and Fibre Channel switches such as Cisco, Brocade or Blade Technology Networks to extend your networks to the servers with four redundant, high-performance interconnect fabrics. In Q3 2006, an Infiniband interconnect module will be available, ideal for high performance cluster solutions. Or, take full advantage of the architecture with HP Virtual Connect Ethernet and Fibre Channel modules currently scheduled for release in Q3 2006. Either way, HP BladeSystem c-Class delivers the high-performance connectivity you need, while stripping away the interdependence and manual coordination that has plagued server maintenance productivity.

- Deploy new servers and their connections to LAN and SAN in minutes, not weeks
- Wire your infrastructure once and change on the fly to business priorities
- Fault-tolerant, 5 Terabit/per second (Tbps) midplane protects your investment with four independent, high performance I/O fabrics capable of 1 to 10 Gb Ethernet, 4 Gb Fibre Channel, 20 Gb Infiniband, RMDA, TCP Offload and iSCSI while providing the scalability to support future I/O connections.
- Eight high-speed interconnect bays support a choice of industry standard interconnect options from your familiar brands and consolidates cables for LAN, SAN and management connectivity up to 94 percent.
- All BladeSystem interconnect options are hot-pluggable and can be installed in pairs for full redundancy.

**A new way to connect the way you want**
A 30-minute process isn't done in 30 minutes, it takes three people more than three days or weeks to schedule it. Taking advantage of the unique capabilities of the Virtual Connect architecture, HP will also deliver a breakthrough approach to connect servers to the LAN and SAN that simplifies operations between domains and reduces barriers to change. With HP Virtual Connect Ethernet currently scheduled to be available in Q3 2006, you can simplify and virtualize server connections to your LAN and SAN. These modules cleanly separate the server/LAN/SAN domains to reduce cables without adding switches to manage. That means you can add, move, or replace your servers quickly, without impacting your LAN or SAN connections.

Combining HP's new Virtual Connect architecture with Insight Control management you can easily re-configure compute resources based on application requirements without rewiring. This capability can also enable systems administrators to automatically recover from system failures without resorting to expensive clustering technology or to over-provisioning server infrastructure.

**Step 1: Start with a modular foundation.**
Select the HP BladeSystem c7000 enclosure to simplify building your infrastructure.

**Step 2: Select your HP server blades.**
Mix and match HP server blades for your applications.

# What are the basic components of the new portfolio?

**Consolidated from the ground up**
Affordable and facility-friendly, modular and virtualized, the HP BladeSystem c7000 enclosure is the first step toward building a best-run IT infrastructure. Use it as the foundation to streamline IT operations in large datacenters, remote distributed offices and small server rooms.

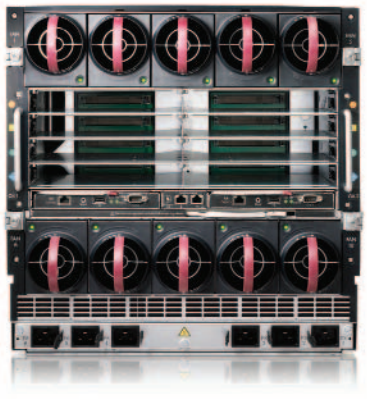
- **Modular, hot-plug expandability**—Blade servers, storage, and other modular components can be easily added or removed without having to power down
- **Integrated, shared power and cooling**—Simplifies upfront planning and provides increase energy efficiency and cooling effectiveness
- **Beyond server blades**—Integrates all of the essential elements of a datacenter with less planning up front—redundancy, power/cooling and management—expandable with modular server, storage and networking devices all managed from one console
- **Simple start-up**—Built-in HP Onboard Administrator facilitates set-up and configuration of up to 64 servers in 15 minutes—locally or remotely—and it is wizard-driven interfaces simplify daily tasks and speed troubleshooting and repair
- **Highly efficient**—Use up to 30 percent less power, 40 percent less space, and reduce cables up to 94 percent versus equivalent 1U rack mounted servers

**Server blade performance without compromise**
Delivering excellent performance, choice, and reliability the HP portfolio of server blades supports a variety of application requirements for scale-out architectures. Server blades from other vendors often force a compromise of density, performance, or efficiency. HP server blades offer the same enterprise class features of standard HP rack servers. Versus other blade choices, the HP BladeSystem c-Class server blades include more robust features to support a wider variety of applications and demanding virtualized environments.

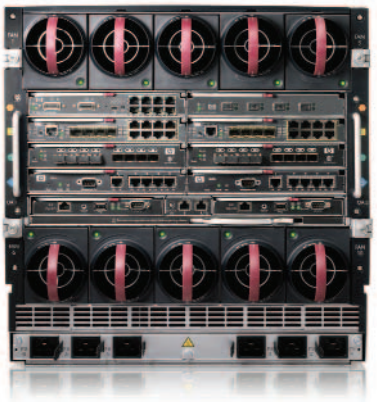
- **More memory for better performance, expandability**—two to three times the memory capacity vs. the IBM HS20
- **More reliability**—Unlike other server blades, all ProLiant server blades support hot-plug drives

| Workload | Server | Best for... |
|---|---|---|
| Front- and mid-tier infrastructure applications<br>HPC/HA Clustering | ProLiant BL460c<br>1–2P Intel® Xeon® | • Basic infrastructure applications<br>• Cache advantaged applications<br>• Small mail and messaging, and databases<br>• Web applications<br>• Compute-intensive applications |
| Large mail and messaging, e-commerce databases, data warehouse and mining<br>HPC/HA Clustering | ProLiant BL480c<br>1–2P Intel Xeon | • Largest memory footprint, excellent price/performance<br>• Compute-intensive applications<br>• Compute clusters |

**Step 3: Add management and cooling.**
Add HP Insight Control Data Center Edition software, insert a redundant Onboard Administrator module and Active Cool fans to suit your infrastructure needs.



**Step 4: Connect the way you want to HP storage and networks.**
Select from a variety of interconnect options from switches for Ethernet, Fibre Channel or Infinifand to HP Virtual Connect modules.



- **More connectivity options**—two to four times the I/O expansion vs. the IBM HS20
- **Better management**—iLO 2 integrated into all ProLiant server blades
- **Better data protection**—Integrated RAID with Battery-backed write cache on each ProLiant server blade

### Flexible connections to your networks

With up to eight high-speed interconnect bays and the Virtual Connect architecture built in, the HP BladeSystem c-Class offers one of the broadest selections of Gigabit Ethernet and Fibre Channel connectivity options to provide network, SAN, network attached storage (NAS) and cluster connectivity.

- **Seamless integration**—Standard-based connectivity options include Cisco, Brocade, and Blade Network Technologies (formerly Nortel), Mellanox (Q3 2006), and HP Virtual Connect modules that integrate within existing standards.
- **Built-in redundancy**—Hot-plug modules can be installed in pairs and removed and replaced without the need to cable or re-cable network connections.

### Extensive data storage solutions

BladeSystem solutions fully support boot-from-SAN capabilities and are tightly integrated to the HP StorageWorks family, providing a comprehensive portfolio of storage solutions that include industry leading storage array systems, storage area networks (SAN) and networked attached storage (NAS). In addition, BladeSystem supports HP backup, tape storage systems, and active archiving solutions to provide complete information lifecycle management as well as support for other third party storage technology.

Storage environment benefits include:

- **Stateless computing**—BladeSystem fully supports boot from SAN capabilities to improve storage consolidation and efficiency of overall system deployment.
- **Extend virtualization**—Utilize more resources and automate more processes more efficiently by sharing and pooling servers, storage, and network.
- **Commonality**—The ability to buy HP BladeSystem and StorageWorks solutions from a single vendor provides common server and storage management tools and a complete services organization.

**Interconnect modules**

- Cisco Catalyst Blade Switch 3020
- Brocade 4 Gb SAN Switch
- HP 4X DDR IB Switch Module (scheduled to be available Q3 2006)
- HP 1 Gb Virtual Connect Ethernet Module (scheduled to be available Q3 2006)
- HP 4 Gb Virtual Connect Fibre Channel Module (scheduled to be available Q1 2007)
- HP GbE2c Ethernet Blade Switch
- HP 1 Gb Ethernet Pass-Thru Module
- HP 4 Gb Fibre Channel Pass-Thru Module

**Network adapters**

- HP NC373m PCI Express Dual Port Multifunction Gigabit Server Adapter
- HP NC326m PCI Express Dual Port 1 Gb Server Adapter
- HP NC325m PCI Express Quad Port 1 Gb Server Adapter

**Host Bus Adapters**

- Emulex LPe1105-HP 4 Gb FC HBA
- QLogic QMH2462 4 Gb FC HBA
- HP 4X DDR IB Mezzanine HCA

**HP StorageWorks portfolio of solutions for the HP BladeSystem c-Class**

| Solution | Best for... |
|---|---|
| HP StorageWorks storage blade | • Adds additional storage to individual server blades (scheduled to be available Q4 2006) |
| MSA family | • Smaller deployments, including remote office locations<br>• Most affordable data protection and performance features in their class |
| EVA family | • Moderate to large size datacenters running key business applications<br>• High-performance data protection<br>• Powerful storage management and virtualization |
| XP family | • Mission-critical applications<br>• Most extensible, resilient, and controllable storage<br>• Best data protection and disaster-tolerant features |
| HP ProLiant storage servers (NAS) | • File serving and exchange environments for small businesses, branch offices, and enterprise datacenter customers |

Some vendors make claims about forwards/backwards compatibility put they don't tell the full story. You can put old blades in new enclosures but they can't take advantage of added bandwidth of the latest Ethernet, Fibre Channel or Infiniband standards. And if you put new blades in old enclosures there can be power or cooling problems to limit use of future processors. In almost any scenario, customers can only get limited functionality, increase their average cost per server—plus have to deal with re-qualification headaches.

# Which HP blade solution is right for me?

The current p-Class offers a complete portfolio of server, storage and switch options today suitable for a variety of applications. In addition, the portfolio has plenty of power and cooling headroom for the next-generation of Intel and AMD processor technologies. For most workloads and customer environments, the p-Class is an attractive solution.

Clearly the HP BladeSystem c-Class is the most advanced blade solution from HP and it includes the latest innovations available today—but for existing p-Class customers, there is no rush to add it to their environment until the time is right. When you're ready to bring c-Class in, HP uses industry standards and leveraged the same management tools, cabling, connects and cords, making the transition smooth and easy.

**Parallel roadmaps**

Through the end of 2007, HP will offer the same generation server blade processor technology—identical processors, memory, and disk components—on both p- and c-Class. During the coexistence, customers can prototype c-Class and complete full qualification. HP will continue to service and support all p-Class products through 2012.

**Interoperability and investment protection**

Although server or interconnect switches cannot be swapped between p- and c-Class enclosures, they share critical areas of compatibility and commonality.

- Manage both environments with the same HP management tools, from one console
- Both run all the same applications, OS and use the same industry standard components
- Maintains common connections to datacenter LAN and SAN networks and power infrastructure
- Both p-Class and c-Class fit in the same industry standard racks

If you're a p-Class customer, but need the following technologies now, c-Class may be the right solution for immediate evaluation and deployment.

- High-performance technical computing requiring InfiniBand, iSCSI, RDMA
- Large Oracle® rack configuration requiring InfiniBand
- High-bandwidth network fabric requiring > 1 GB, Ethernet and/or > 4 GB Fibre Channel

Likewise, a traditional HP ProLiant or Integrity server may be a better choice if:

- Low server volume deployment (fewer than four servers)
- Special PCI slot card requirements
- Requirements are for large local tape streaming
- Requirements for highest reliability and performance of HP Integrity servers with more than four processors

HP didn't force a compromise when designing the new c-Class, but rather gave their engineers total freedom to solve issues toughest issues facing today's IT organizations. The only mandate—"no compromises." HP's new blade roadmap extends from desktop to datacenter, and it was built to conceive of a bold future where any component and any infrastructure solution can be "bladed." That's why the new c-Class enclosure was built to tune itself to the needs of 1 to 16 blades of all kinds—storage blades, PC and workstation blades—not just server blades.

Regardless of what you decide to build with the new BladeSystem, the innovations built-in out of the box help you build solutions that are cost-savvy, change-ready, energy-thrifty and time-smart.

# A broad ecosystem for complete blade solutions

The HP BladeSystem Solution Builder Alliance Program is an expansion of HP's alliance program to create a comprehensive community of technology and service providers working with HP to accelerate the development and deployment of HP BladeSystem solutions. It connects hundreds of the leading ISVs, IHVs, services providers and VARs to collaboratively build and deliver to customers a broad set of valuable, add-on and solution offerings. From day one, a wide variety of interconnect options were available because HP made the specifications for HP's next generation BladeSystem architecture openly available based on computing, technical and datacenter standards to leading component vendors such as Cisco, Brocade, QLogic, and Emulex, as well as software vendors (ISVs).

With these components, HP created a global solution development and delivery program that provides the broadest set of blade-based solutions on Windows, Linux and HP-UX. For broad delivery and deployment, the HP Solution Builder program also includes System Integrators and VARs so that customers benefit from a tailored solution for their needs.

Solution Builder combines a solution development and delivery program, built on joint solution engineering and delivery, to create a broad set of solutions to meet individual customer needs. It includes System integrators and VARs so that customers benefit from a focus on solution delivery and deployment.

## HP Services

The most critical aspects of adopting a BladeSystem and undertaking a consolidation and simplification project are addressing datacenter readiness and understanding the current cost drivers and change barriers in your current environment. HP offers complete datacenter assessment and site planning services, covering security issues, hardware and software support requirements, enterprise management, mission critical support, data migration and more.

To help you get the most from your new BladeSystem, HP Services—together with HP's global network of partners—can help you build and support your adaptive infrastructure and increase power and cooling efficiency, up time and IT administrator productivity. To simplify ordering, configuration, and deployment of complete BladeSystem solutions, customers may choose HP Factory Express services to speed project implementation, delivering integrated solutions and shipped fully configured and ready to deploy.

HP Services professionals have extensive experience in designing, delivering, and managing blade solutions built for business in a variety of environments.

With 65,000 service professionals in 170 countries, HP provides one of the largest IT customer support organization in the world. Moreover, with HP's in-depth technology expertise, global strategic partnerships, and more than 40 years of IT experience, IT organizations are assured of obtaining a quality solution that delivers higher levels of performance and flexibility at a lower cost.

# HP Financial Services

HP makes it easy on the balance sheet to put the power of the HP portfolio to work for you through HP Financial Services. HP Financial Services offers a complete array of leasing and financial lifecycle management services in over 50 countries around the world. HP can help you transition from existing equipment to the latest technology, acquire a new solution cost-effectively, and manage that solution throughout its life cycle. HP's goal is to help you increase the return on your IT investment, reduce risk, and get the most from your HP solution.

# Summary

The HP BladeSystem and services delivers the future of datacenter computing—today—helping you build a best-run Adaptive Infrastructure—out of the box.

To learn more about the new HP BladeSystem c-Class portfolio, please visit **www.hp.com/go/bladesystem/evaluate**

For more information, visit www.hp.com/go/bladesystem/evaluate



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