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Fall 2006

High-Performance Computing Special Edition

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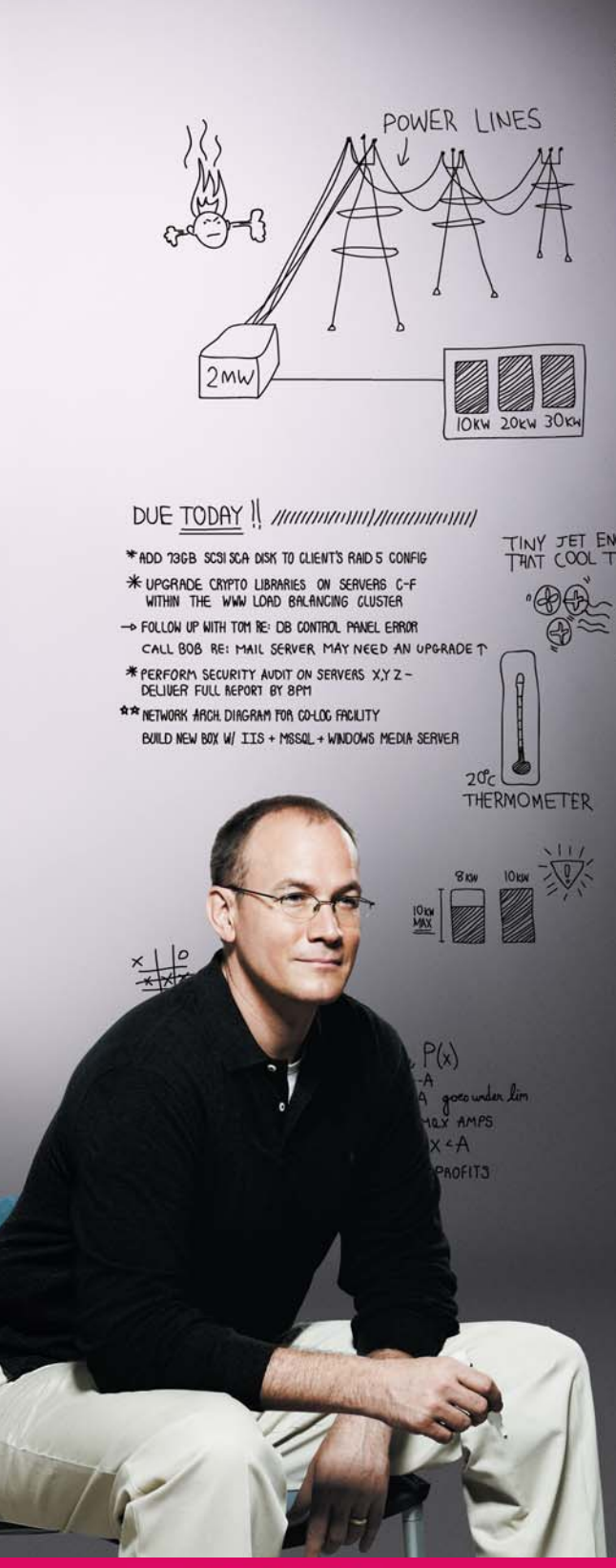

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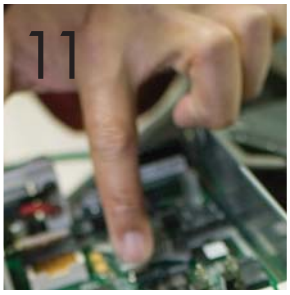

Simplifying cluster complexity

Winston Prather, VP and GM High-Performance Computing Division, HP

High-performance computing (HPC) used to be the domain of science, digital content creation, telecom and high-end engineering. But as technology evolves, HPC is becoming attainable for enterprises that want the power and sophistication without the cost and complexity.

In the past, companies were wary of HPC as an expensive, intricate initiative that compromises key requirements including density, disk space, processing power and memory. But all of that is quickly changing, alleviating concerns and enabling enterprises in the mainstream to realize the benefits of cluster technologies. And what's driving the change? Blade systems.

Leveraging blade-based cluster technologies simplifies deployment and management, making the cluster TCO story that much more compelling by targeting concerns around facilities-related operating expenses, system downtime costs and ongoing change management requirements.

In this special edition, we address some of the key issues surrounding cluster technologies and showcase how HP blade-based technologies address them. With industry standard technologies, consolidated design, reduced interconnect complexity, efficient power and cooling and simplified management, the HP cluster platform is a comprehensive solution designed for seamless functionality.

If your organization has contemplated cluster technology but discarded the idea as too expensive or complex, it may be time to reconsider your options. For more information follow the links inside, or contact your HP sales representative, your HP channel partner or the HP Welcome Center at 1.800.282.6672, press 5 and mention code BXJN.

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* **Page 6** — TheInfoPro, "Servers Wave 3," August 2006, http://tekrati.com/research/News.asp?id=7680
* **Page 6** — IDC White Paper sponsored by HP, "Forecasting Total Cost of Ownership for Initial Deployments of Server Blades," June 2006, Doc. #202092.
* **Page 8** — IDC Special Study, "The Cluster Revolution in Technical Computing Markets," May 2006, Doc. #06C4775.
* **Page 11** — "Datacom Equipment Power Trends and Cooling Applications," Association of Heating, Refrigeration and Air-Conditioning Engineers, 2005.
* **Page 12** — IDC, "Worldwide Sever Power and Cooling Expense 2006-2010 Forecast," Doc. #203598.

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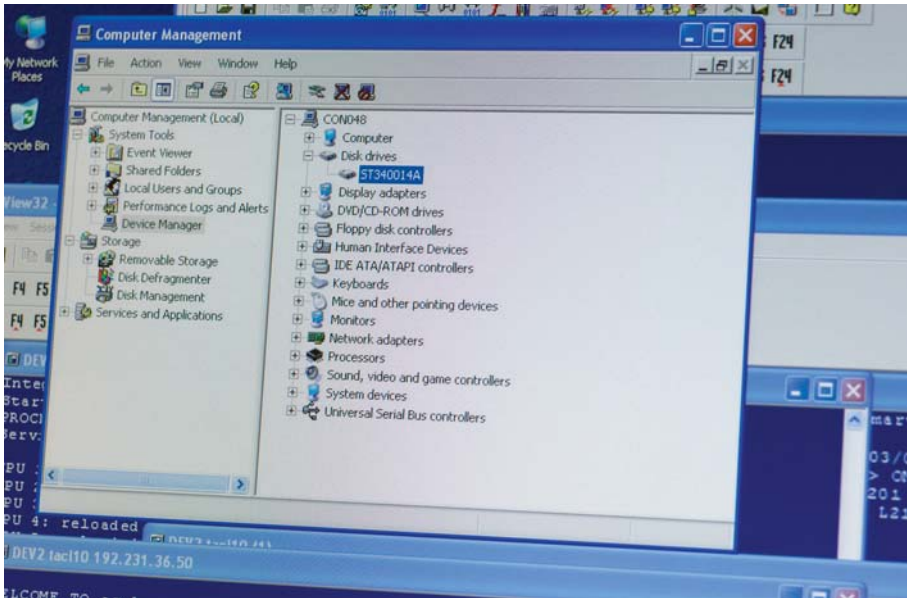
Opener

High-performance computing comes of age with blade technology advances

With a flexible platform and blueprint for success, organizations no longer have to compromise when it comes to high-performance computing clusters.



High-performance computing (HPC) is shining brightly these days, thanks to the improved performance and low cost of modern processors and clustering technologies. Today, HPC is helping bolster numerous fields of innovation, from the design of more fuel efficient planes and safer cars, to the development of more effective vaccines and the identification of financial market imbalances. In addition, industry and research organizations are recognizing that HPC can reduce product development cycles, speed time to profit, improve the accuracy and rate of simulations and foster better understanding of complex business and technical models.

"Without the encumbrance of compromise, high-performance computing is hitting its stride in the mainstream," says Ed Turkel, Manager of the Product and Technology Group for HP's High-Performance Computing Division. He explains that in the past, only extremely well funded projects could afford truly effective HPC systems. And in the more recent past, companies could attain HPC capabilities, but were forced to make concessions between density, disk space, processing power, I/O and memory. "Even today, there are several concerns about deploying HPC technologies using blades, including interconnect performance and availability, processor support and node performance, power and cooling and total cost of ownership," Turkel reveals.

Experts at industry analyst firm IDC agree that high-performance clusters often present a double-edged sword. "Cluster sales into the technical server market have grown in revenue at double digit rates for the last several years, and now account for over half of the market. We

believe that cluster type systems have become the preferred architecture for HPC, based on their ability to leverage commodity technology, deliver strong node level performance, and scale capacity with user requirements," says Christopher Willard, Research Vice President at IDC. "That said, users also report challenges to clustering in such areas as system complexity and management, and physical system support."

Matt Foley, an HP BladeSystem Program Manager, indicates these problems are often exacerbated as companies scale their clusters. "In pursuit of 'better, faster' results and compelling economics, many organizations want to expand their HPC systems, with hundreds of nodes common and thousand node clusters not unusual," he claims. "However, there are significant challenges when attempting to build solutions with more and more servers and nodes."

that IT teams take a closer look at the latest server technologies. "We are now in the second generation of blade systems, which have been designed from the ground up to support the density, simplicity and flexibility that blades originally promised," says Turkel.

Through its Cluster Platform CP3000BL and CP4000BL, HP has brought together the blueprint, technologies and expertise to solve HPC clustering challenges, says Guodong Zhang, Product Manager for High-Performance Computing at HP. "Due to their chassis-based design, the CP3000BL and CP4000BL can support any number of technologies and applications and a range of processors from both Intel® and AMD®," he says. "It's a single, holistic platform with a wide choice of supported technologies and the flexibility to facilitate emerging technologies."

These challenges include the administration, cable complexity, and power and cooling requirements of amassing so many systems together in an integrated solution. Clusters contain many pieces, and the challenge is to put it all together to ensure optimum manageability, scalability, reliability and software performance.

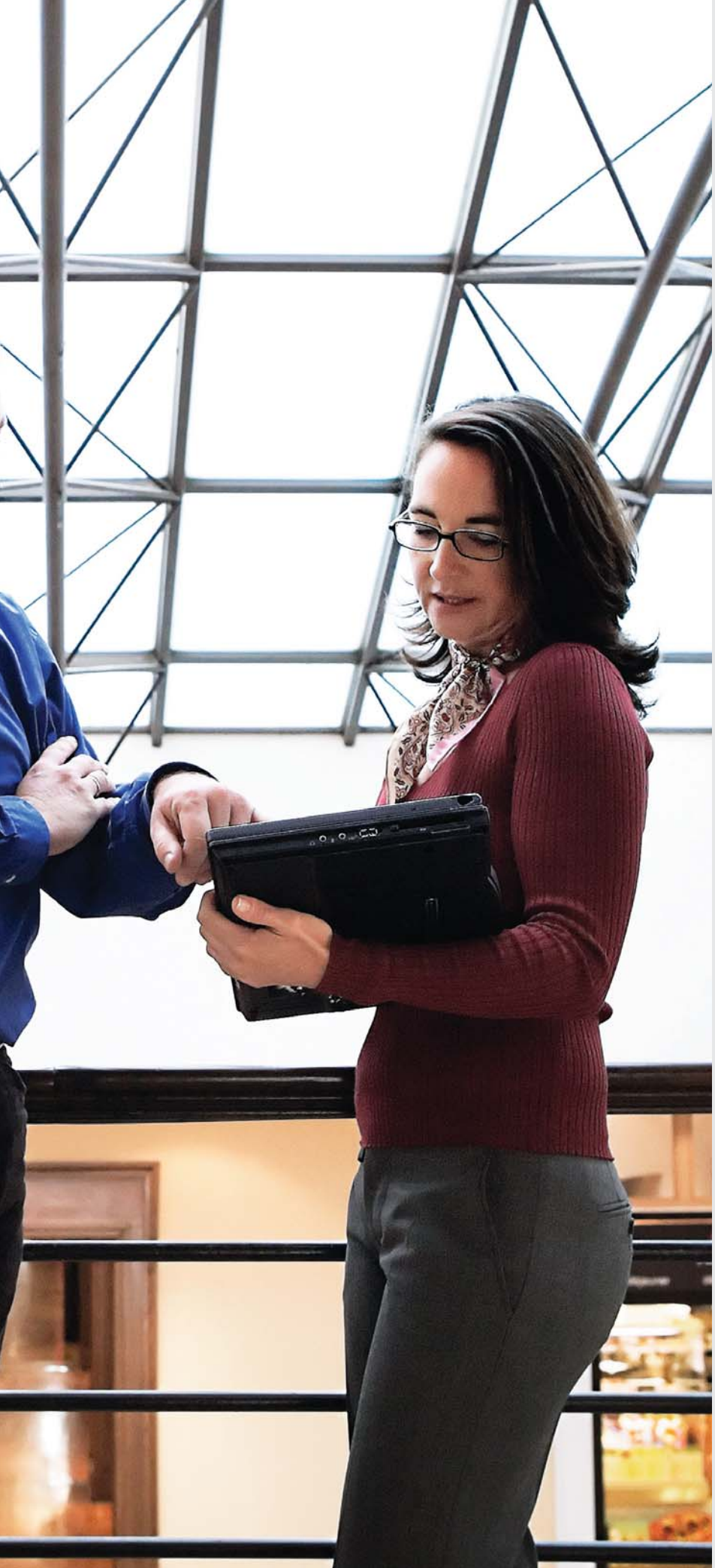
"Companies not only need the hardware, software and middleware pieces, but also the blueprint and design that will make certain a cluster environment is easily and cost-effectively deployed, administered and scaled," Foley says. "They need a standard, proven hardware configuration and a standards-based, proven software configuration as well as the right components and management capabilities."

Both Turkel and Foley agree that now is the time to look at blade-based cluster technologies with a fresh eye. Foley indicates that power and cooling have been critical issues recognized by leading vendors, including the processor suppliers and system vendors such as HP. Turkel points to core components that have new capabilities and suggests

The HP Cluster Platform removes the burden of compromise when implementing or growing a blade-based cluster, adds Turkel. Whether it is total cost of ownership (see page 5), power and cooling (see page 11), cluster management (see page 8), blade server administration (see page 14) or interconnect performance and availability (see page 16), the HP cluster platforms address the complexity, scalability and management issues with which organizations have been struggling.

"The HP Cluster Platform enables organizations to effectively establish critical performance requirements, reduce power consumption and thermal levels, improve management and lower total cost of ownership," Turkel concludes. "It's not just a menu of parts, but an entire system designed so that the various pieces of a high-performance cluster, no matter what those pieces might be, will all function seamlessly."

For special promotional offers on the HP BladeSystem c-Class, white papers and product information, visit: www.hp.com/go/transformHPC



Feature

Dispelling the myth: Blade server TCO lower than you think

IT organizations shouldn't be fooled into thinking rack-mounted servers are cheaper propositions than blade servers for building high-performance computing environments. Advancements that reduce operating expenses make blades a compelling proposition.

There's a longtime misconception about blade server technology—that it's an expensive solution for high-performance computing (HPC) environments. But that perception is disappearing as IT organizations are realizing that while the acquisition costs of feature-rich blade servers can be higher than traditional rack-

optimized server clusters; other elements can push the cost pendulum in favor of blade technology, making it an economical and efficient option.

In fact, more than 85 percent of users polled in a recent study about blade server deployment view blade servers as "valuable" and "critical" to long-term server plans. Market research firm TheInfoPro reports that users are "evenly divided between scaling out and scaling up" with blade servers*. A primary driver is the fact that the price difference between blade servers and rack-mount servers becomes negligible when configured with extra features, such as management modules.

"User opinion of blade servers has shifted from disappointment over unfulfilled promise, to acceptance and understanding just where blades fit in the enterprise," said Bob Gill, TheInfoPro's Chief Research Officer.

Understanding the full TCO picture

A big reason for the mindset change is that more IT organizations understand the true total-cost-of-ownership (TCO) of blade servers and how far TCO extends beyond hardware costs. In addition to the upfront hardware, there are facilities-related operating expenses, system downtime costs and ongoing change management requirements, and, of course, initial deployment costs. It's the latter element—deployment—where savings can be substantial.

According to an IDC report, which compared the cost of 320 installations of rack-optimized servers versus blades, blade server deployment brought a $59,200 savings in system and software deployment hours, and a whopping $212,400 cost reduction related to cable pull requirements*.

"Blades tell a good story [TCO wise] because when you look at additional issues such as power, cooling, and floor space requirements their price point normalizes," says George Nielsen, Worldwide High-Performance Computing Blade Cluster Platform Product Manager for HP.

As Nielsen explains, blades are a compelling story if all the elements and related costs are factored in for a true TCO analysis. For example, in a rack server environment where servers are integrated with local area networks (LANs) and storage area networks (SANs), there are adapters, cable, supporting switches and substantial floor space requirements. In comparison, a blade server environment featuring an integrated backplane not only requires significantly less real estate, it reduces manpower needs as blades can consolidate LAN and SAN access. That's because there are fewer interconnecting cables and devices to deploy and manage.

>> IDC estimates that blades can lower facilities costs by an estimated 25 percent, and the research firm forecasts a 69 percent reduction in energy consumption over a three-year period for IT organizations that migrate to blade architectures*. <<

A server to server comparison

When it comes to energy costs, which includes power and cooling systems, a blade server is more economical as it requires less energy to run due to a high power conversion efficiency (see "Manifest density," page 11). Power saving also comes from a more efficient cooling system than found on rack-mount servers. Additionally, a blade server farm can scale more efficiently than a rack-mount server environment, providing greater cost savings each year. IDC estimates that blades can lower facilities costs by an estimated 25 percent, and the research firm forecasts a 69 percent reduction in energy consumption over a three-year period for IT organizations that migrate to blade architectures*.

For example, HP estimates that in a cost analysis example of an HP 2-processor, dual-core blade server and a comparative rack server setup, the rack server WATTS per node and BTU requirements per node are significantly higher which can offset any initial

savings on hardware over time.

And, according to HP estimates that cost trend continues as the rack server farm expands to a 128-node setup. In an example solution configuration comparing equivalent featured blades and rack servers, including interconnect switches, the blade system uses just 263 amortized WATTS per node, while the rack server uses nearly double. It's those operating costs that can make a rack-mount server environment a less attractive proposition compared to a blade server solution for high-performance computing.

New features further reduce blade TCO

The best news may be that advancements in blade server technology are reducing the TCO even more. For example, the HP BladeSystem c-Class, housed in a petite 17-inch high cabinet, offers a slew of new functionality that drives down the cost of a server farm. Three new technologies are specifically tied directly to reducing overall datacenter operating expenses.

The first is HP's Thermal Logic Technology featuring breakthrough fan technology—representing a first for the industry—that cuts server airflow by 30 percent and energy consumption by 50 percent compared to traditional fans. The HP Active Cool Fan technology not only provides up to 66 percent power reduction, it requires 50 percent less airflow due to its high-pressure capability compared to traditional server fans. The patented technology not only monitors air flow, but continually adjusts it to changing conditions so less power is wasted.

The second advancement is the HP Virtual Connect Architecture, a unique interconnect technology that virtualizes the server connections to data center SAN and LAN networks. It provides a simple view of server blades to outside domains while enabling flexibility inside the environment. This functionality gives administrators the capability to manage resources on the fly using Ethernet and Fibre Channel connectivity, and eliminates the need for any rewiring.

The third technology, HP Insight Control, can reduce one of the primary costs in the datacenter—management and administration. The software serves as the management link between the Thermal Logic and the Virtual Connect technologies to provide single standardized management of datacenter infrastructure. This can lead to higher staff productivity as less manpower is needed on mundane maintenance operations that can now be automated.

Insight Control also enables cost-effective blade server deployment—an HP server can be up and running in as little as three mouse clicks thanks to the software's Onboard Administrator module. The feature cuts set-up time for a single enclosure of blades and lets administrators configure server, storage, network, and power settings locally through an interactive LCD panel or remotely through an easy-to-use web interface (for more on Insight Control, see page 14).

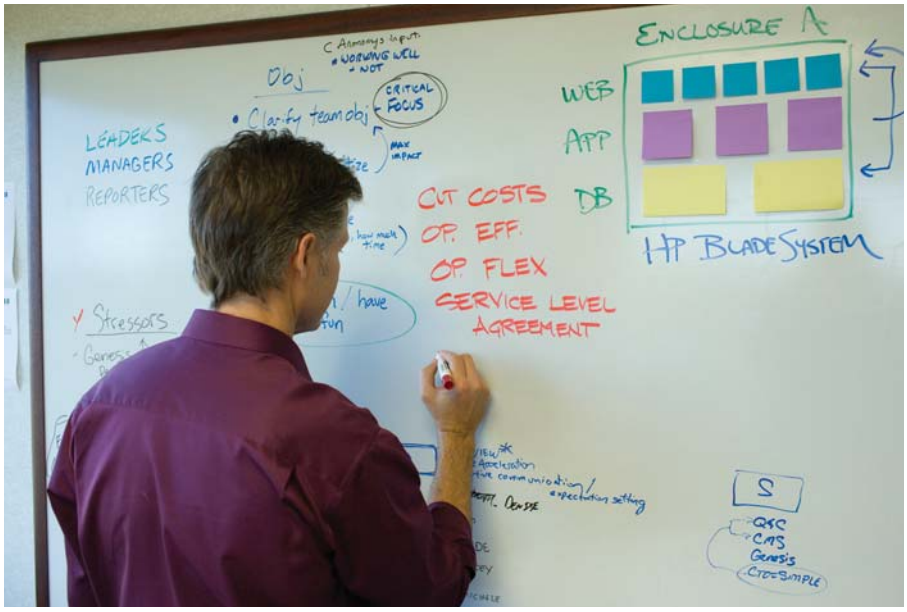
HP's Thermal Logic Technology features breakthrough fan technology—representing a first for the industry—that cuts server airflow by 30 percent and energy consumption by 50 percent compared to traditional fans. The HP Active Cool Fan technology not only provides up to 66 percent power reduction, it requires 50 percent less airflow due to its high-pressure capability compared to traditional server fans.

Thanks to all of the new blade server advancements, c-Class blades configured for high-performance computing environments can achieve system acquisition cost parity with feature equivalent rack-mount servers. It's that cost savings, from deployment to maintenance and support, that make blade servers such a compelling proposition, says Nielsen.

"It really dispels the myth that blades are more expensive. The bottom line is that the hardware price isn't the only issue when evaluating server environment TCO. You save on every level, from operating costs to labor costs as you cut the time to get the job done," he says.

For an IDC white paper on forecasting TCO for initial deployments of blade servers, special promotional offers on the HP BladeSystem c-Class, and other information, visit: www.hp.com/go/transformHPC

Technologies



Regaining control of the cluster

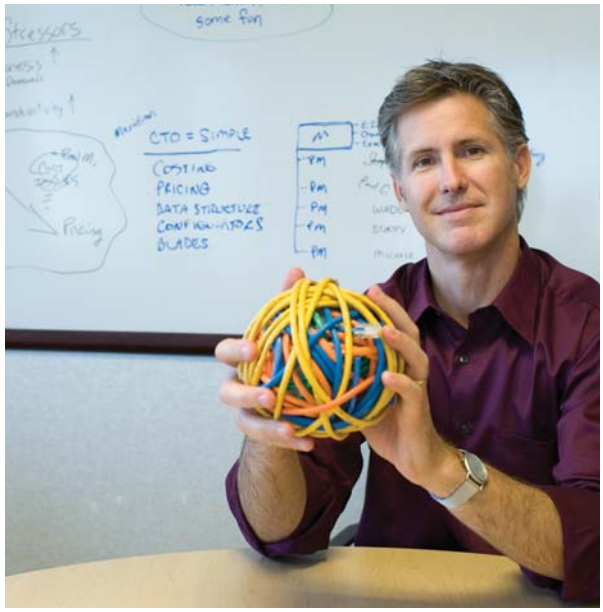
Comprehensive management software can help monitor, maintain and update a diverse and often growing cluster environment.

High-performance computing has recently become viable for companies of all shapes and sizes, due in large part to the increased performance and affordability of Intel® Xeon® and AMD® Opteron™ processor-based systems. Manifesting in cluster and blade technologies that deliver an unbeatable combination of dense packaging, low cost and superior performance, these systems are quickly becoming "industry standard" and replacing proprietary supercomputers that were once relegated to the privileged few. Today, high-performance cluster and blade technologies are being widely used for a multitude of compute-intensive applications, from digital content creation to design automation to scientific research.

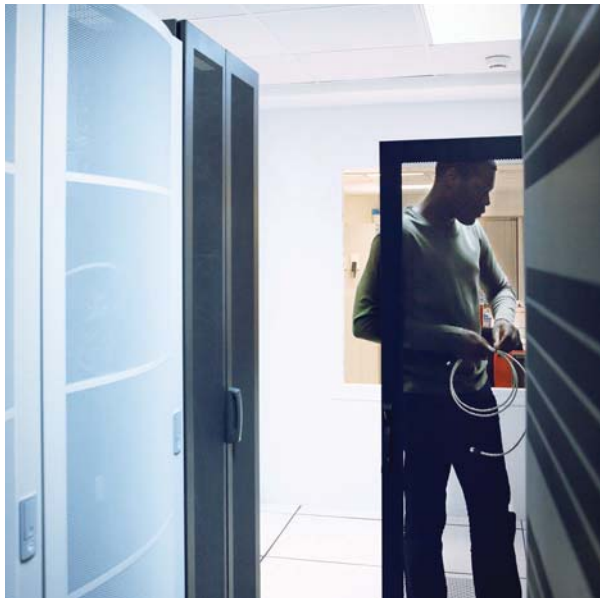
Unfortunately, one of the prime advantages cluster technologies proffer can also be their undoing, suggests Alanna Dwyer, HP Program Manager for High-Performance Computing Clusters. "In addition to their inherent cost and performance attributes, cluster technologies are beneficial because they are highly scalable," she says. "However, as organizations add more and more hardware and software to their cluster environment, they often run into administration, monitoring and maintenance problems."

A recent IDC Special Study, "IDC MCS: The Cluster Revolution in Technical Computing Markets*," mirrors her stance. The study states, "By almost any measure, technical clusters have been enormously successful" and "are growing at a strong rate." Yet the same study indicates system management capability remains one of the primary concerns of those utilizing cluster technologies.

A common attribute of clusters is their fairly large number of individual—and largely independent—platforms. Dwyer reveals that while this type of environment provides



"These tested and supported management solutions from HP enable organizations with blade-based clusters running Linux® and Windows® to quickly and easily monitor, manage and maintain their clusters."



excellent price and performance, it also introduces management and usability issues because each node independently runs a local image with an operating system, drivers and daemons necessary to support system and job management. "To make the promise of clustering a reasonable proposition, their systems must be easy to use and manage," she says. "Otherwise, a cluster can quickly become an IT administration nightmare."

The challenge, Dwyer explains, has little to do with putting a cluster together; rather, it is keeping the sum of its components—beyond the hardware and operating system—together and working seamlessly to meet service levels. Typical components include application software, monitoring engines, a library to support parallel jobs, workload management tools, firewall and network addressing. To complicate matters further, these components usually come from various sources and are generally updated or patched at different times.

"What's needed is overarching management software," explains Dan Cox, Manager of High-Performance Computing Programs for the Industry Standard Server group at HP. "Although each cluster is unique, there are three universal requirements. Organizations need to quickly provision software across many nodes, whether it is cloning, imaging or distributing applications. They also need to monitor and administer the entire environment, with the ability to issue commands across all nodes. And they need help with workload management and resource scheduling to ensure availability, reliability and application performance—especially as these systems scale."

HP has always been at the forefront of management middleware technology, Cox claims. He highlights HP OpenView, which was introduced in 1996 and has more than 135,000 total installations, as a prime example of HP's management software leadership. "Cluster management is no exception," Cox says. "We strive to deliver maximum choice and flexibility, enabling organizations to get a supported and qualified solution that meets their particular site requirements."

He points to the cluster management offerings in the HP Unified Cluster Portfolio for addressing today's blade-based administration requirements and challenges. These tested and supported management solutions enable organizations with blade-based clusters running Linux® and Windows® to quickly and easily monitor, manage and maintain their clusters.

A comprehensive solution for managing a Linux cluster stack is HP's XC System Software. Engineered and fully supported by HP, XC System Software includes the operating system, workload management and cluster management components necessary for efficient and scalable cluster operations, as well as ongoing maintenance. For pure provisioning and monitoring of Linux-based clusters, HP offers the HP Cluster

"Choice is great, but it's what we do to support and help our customers with that choice that makes a big difference."

Management Utility (CMU), primarily for rack-based environments, and the HP Insight Control Linux Edition for blade-based systems. Organizations running multi-vendor environments may opt for Scali Manage, a cluster management tool developed by HP strategic partner Scali. And for companies utilizing Windows-based clusters, HP offers the newly announced Windows® Compute Cluster Server (CCS). All of these management solutions are available as factory installable options with the HP Cluster Platform CP3000BL and CP4000BL, utilizing HP BladeSystem servers.

Dwyer is quick to point out that HP's cluster management portfolio is designed to deliver the "right fit" for any environment, not just a long menu of options. "Choice is great, but it's what we do to support and help our customers with that choice that makes a big difference," she notes. "Some organizations want a lightweight utility while others want a complete package that includes ongoing service. Many will choose different processors, or even a mix of them, to maximize the price and performance for their unique set of applications. And most customers want to continue using their infrastructure and operating system of choice."

No matter what the environment or need, Dwyer says HP has a proven solution that can be delivered quickly, anywhere in the world. The Unified Cluster Portfolio offers solutions that have been qualified with high-performance computing cluster tools and applications to enable efficient deployment and seamless operation with a variety of platforms. In addition, organizations can have their new cluster solutions pre-configured and factory installed with their preferred default setting, further easing installation time and complexity. For the customer, this enables rapid deployment and increased uptime, lowering the cost of supporting and administering a high-performance environment and regaining control of the cluster.

For IDC and HP white papers on the enabling HP technologies for blade management, HP Unified Cluster Portfolio and Cluster Manager Utility, special promotional offers on the HP BladeSystem c-Class, and other information, visit: www.hp.com/go/transformHPC

Manifest density

Collaboration between IT organizations and facilities teams coupled with an integrated strategy and the capabilities of the HP BladeSystem c-Class, can help break the expensive cycle caused by limited budgets and growing power demands.

Ben Franklin wrote, "In this world nothing is certain but death and taxes." You can add to that list the demand for power and density. It will not let up. A typical North American power circuit, such as a 30A 3-Phase line, offers 8640W of power. In 2000, this was sufficient to power a full rack of 42 servers. Today, due to the increase in power consumption of CPUs and memory, it would only run 13 similar servers.

Over the last 10 years the uneasy collaboration between IT organizations (who want high performance and performance density) and facility management teams (who fight to keep up) has been even more strained. More performance and density draws more power which generates more heat which requires more cooling which hits performance, reliability and cost. Today, rack level power density is five times what it was in 1995 and as processor level power consumption has risen, so has the cost of energy*. In 2002, when HP released its p-Class BladeSystem, 35W to 40W was the standard for a high-end CPU. The norm is now 85W to 95W, with some high performance processors reaching up to 130W.

Power is not the only concern: cooling the heat generated by a server can be an expensive and complex challenge. For instance, simply increasing the airflow through a server will keep it cooler, but this will have knock on effects into the datacenter as air handlers may have to be upgraded to cope with the increased airflow, and power costs to run the cooling systems will increase. The result? Facility teams scramble to find innovative ways to cut power and cooling costs and increase efficiency.

Blade myths

When assessing cooling and power issues, it is tempting for some to blame the blade bogeyman, but a clear analysis of the facts shows that this is not a blade problem—this is a power density problem. In fact, blades consume less power server for server than rack-mounted servers and can actually reduce costs (see "Dispelling the myth: Blade server TCO lower than you think," page 5). "Five years ago blades were a little more expensive," admits Tony Harvey, an HP Product Manager for BladeSystem Infrastructure, Power and Cooling. "However, as blades have become more prevalent, their price has come down."

So without blades to blame, what does an IT executive do? When it comes to power and cooling solutions there are five main areas to consider:

1) Increase facility efficiency (manage all openings, close off unused cable openings, reduce cable opening sizes)

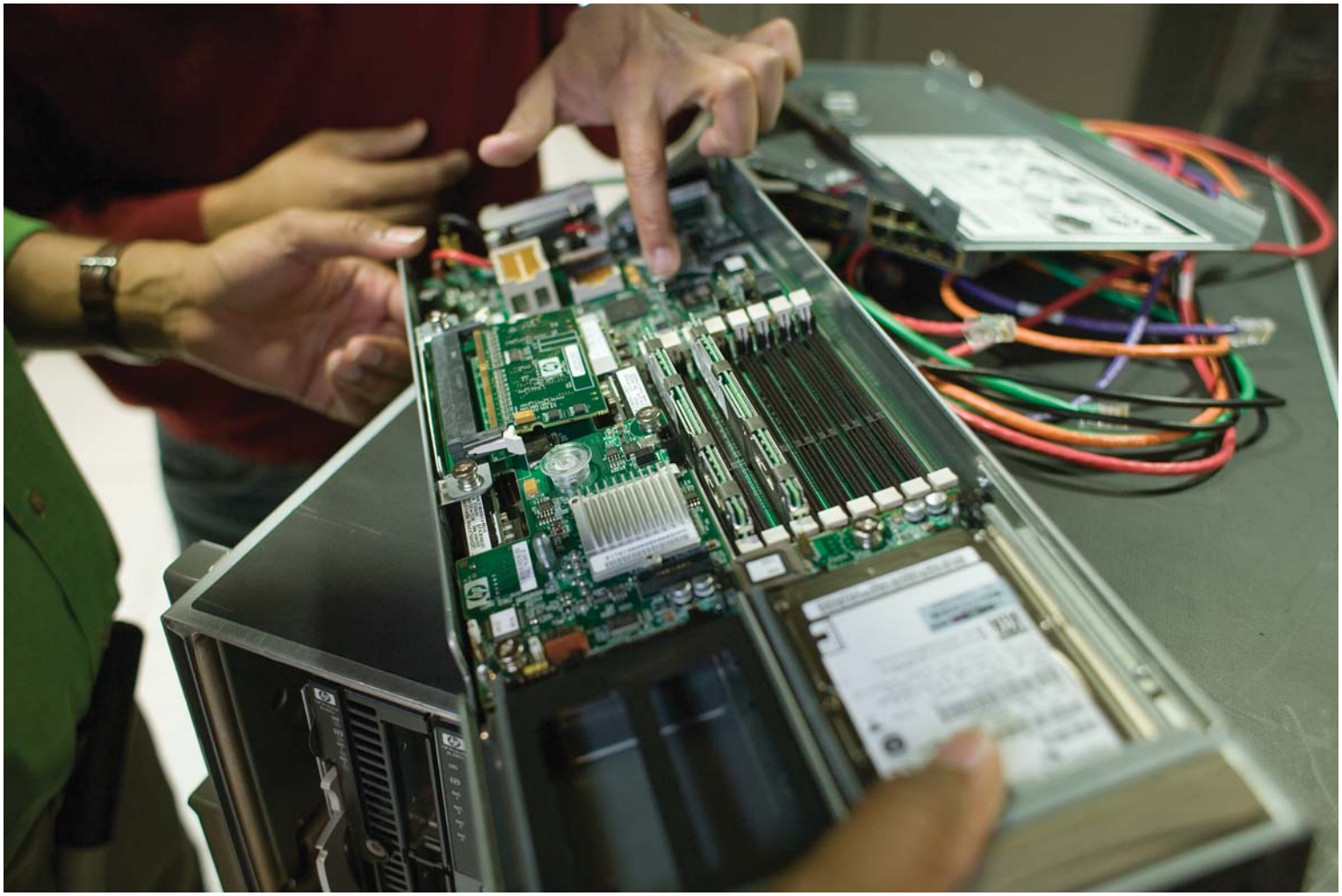
2) Manage the loads (implement policy-based management, and the right processor for the application)

3) Deploy high density suites (avoid load spreading and poor geometries)

4) Deploy modern cooling technologies (a combination cooling upflow and downflow and proper tile format)

5) Develop a useable cost model to improve operational costs

For all these measures, good old-fashioned teamwork is critical, something that is not always present in some enterprises. A 2006 IDC report found that there is an



"organizational disconnect with most companies between IT purchasers and the facilities personnel who are responsible for utilities in the datacenter."*

"This collaboration has been standard in mainframe and storage environments and it is a practice that those in PC-based environments may want to adopt,"

According to IDC, "Proactive companies are merging facilities with IT to better measure and manage datacenter operation costs."*

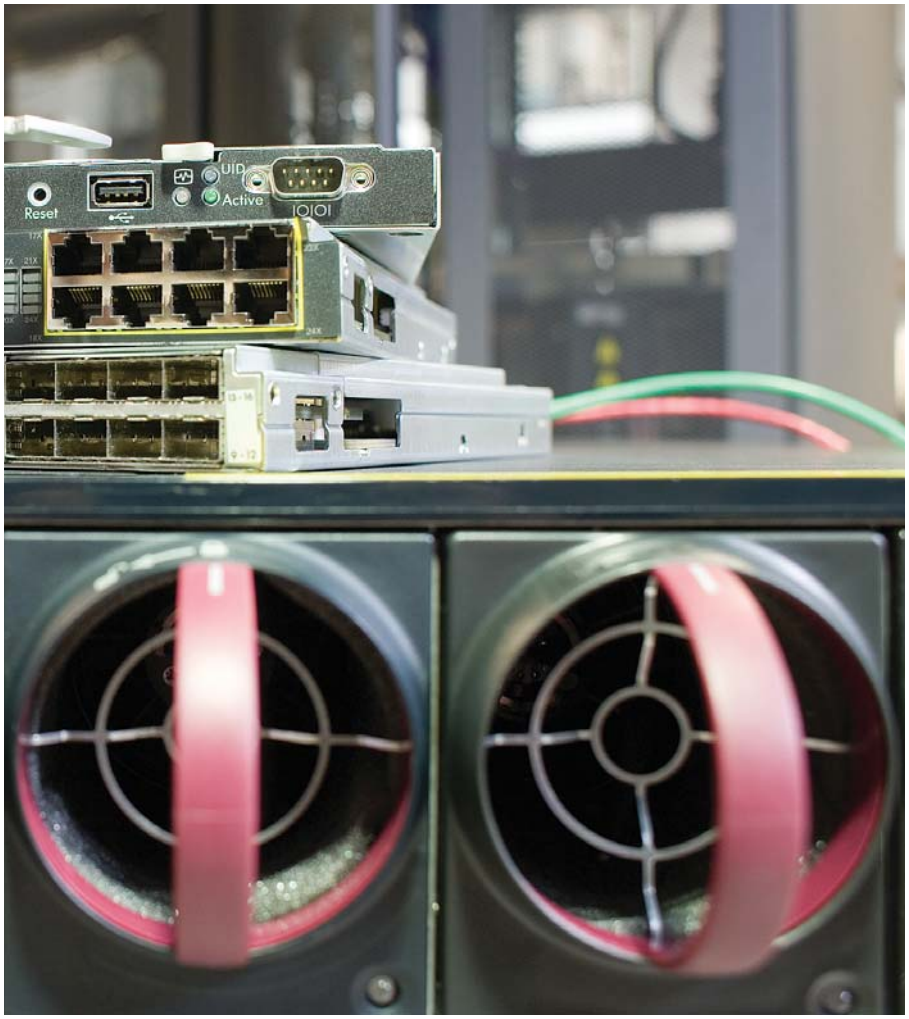
says Harvey. "It requires a mindset change. IT and facility teams must understand that the need to be efficient across the entire system is key to designing an effective solution."

In fact, according to IDC "Proactive companies are merging facilities with IT to better measure and manage datacenter operation costs."*

Dynamic IT power

One obstacle to teamwork can stem from IT's need for power which can make it tough for facility managers who must deal with the cooling demands created by server power consumption. In an attempt to lessen the burden, system administrators can try to control processor power states through the operating system, but this will likely require an OS-upgrade and driver installation or they can use a ROM-based firmware solution, such as the HP Power Regulator which is available on the HP BladeSystem c-Class.

HP Power Regulator provides for dynamic or static changes in CPU performance and power states. In dynamic mode, it is designed to automatically adjust the server's processor power usage and performance to match CPU application activity and increases server energy efficiency by giving CPUs full power when needed and reducing power consumption during slower periods. It performs automated policy-based power management at the individual server



level. In addition, a static low power mode allows servers to run continuously in a system's lowest power state. IT gets its power and facility managers are not pushed to the brink. IDC calls this kind of dynamic IT the "next style" of computing and maintains that it will support both business strategy and IT operational efficiency*.

Using innovations in the HP BladeSystem c-Class, managers can unify infrastructure management with Insight Control (see "Say good-bye to 'blinking lights,'" page 14) and measure capability at the enclosure rack using Thermal Logic Management. In fact, the Active Cool fans and PARSEC architecture in the BladeSystem c-Class can actually turn density into an advantage by providing more airflow where it's needed and using less power than traditional rack servers. With HP Thermal Logic, 16 server blades require 30 percent less airflow and up to 50 percent less power for cooling than the equivalent number of rack servers, all while using less rack space.

So, with the right combination of an integrated strategy, the capabilities of the HP BladeSystem c-Class and a holistic approach to finding the right cooling and power solution, the expensive cycle caused by limited budgets and growing power demands can be broken. "But you have to have the political will to go forward," says Harvey. "All of us who come from a PC background need to think about big power and the challenges and possibilities that it offers."

For an IDC white paper on the enabling HP technologies for power and cooling, special promotional offers on the HP BladeSystem c-Class, and other information, visit: www.hp.com/go/transformHPC

HP-MPI gets the message across

Building clustered systems is so much easier than it was just a few years ago. There are many reasons for the transformation. But perhaps few are more important than the emergence of industry standards and closer vendor cooperation. Back in 1992 an industry consortium formed to hammer out a common way to write programs that could send messages from one processor to the next in a shared memory environment. Portability and efficiency would be key. So would performance and flexibility.

The end result was a de-facto standard called the Message Passing Interface (MPI), which today is widely used to help eliminate much of the complexity in building or running applications on massively parallel or clustered systems. MPI makes it easier for multiple processors in a cluster to work on the same problem together by taking the guesswork out of how they communicate with each other. That means scientists and lab technicians can solve larger or even more problems in less time, while better simulating real world events "in-silico."

Such capabilities have prompted numerous vendors to jump onto the MPI bandwagon. But the HP implementation goes even one step further by allowing customers and application developers to run the same MPI-based applications across multiple platforms and interconnects. "Dozens of leading Independent Software Vendors (ISVs) are standardizing on HP-MPI to simplify support for multiple platforms," says Alanna Dwyer, HP Program Manager for High-Performance Computing Clusters. "This allows users to run a mix of applications on a single cluster, as they all support HP-MPI," she adds.

"HP-MPI is an absolute Godsend," notes Keith Glassford, Director of the Materials Science Division at Accelrys Software Inc. "It allows us to focus our energy and resources on doing what we're good at, which is developing scientific and engineering software to solve customer problems."

HP-MPI supports multi-protocol execution of MPI applications on clusters of shared memory servers and provides the most transparent implementation supporting the broadest range of interconnects and architectures. Application developers only need to build a single executable for each program.

HP-MPI transparently runs across HP-UX, Linux®, and Tru64 UNIX® operating systems while supporting multiple interconnects such as TCP/IP, InfiniBand from Voltaire, Cisco, Silverstorm and Mellanox, Myrinet GM-2 and Myrinet MX, HyperFabric2 and Level 5 Etherfabric from Level 5 Networks. It is thread-safe and supports shared memory for intra-host transfers as well as Quadrics Ltd. QsNet on Linux Intel® Itanium® 2-based systems.

HP recently ported its implementation of MPI to Microsoft® Windows® Compute Cluster Server 2003 and is working with Microsoft and other ISVs to port and optimize 64-bit applications to Microsoft Windows Compute Cluster Server 2003.

"HP is really becoming something of a conduit to bringing all the pieces for a clustering environment together," Glassford adds. "What they're essentially building is an ecosystem made up of different vendor solutions that will help drive clustering even more into the mainstream and push it down even further into the lab."

For more information, visit: www.hp.com/go/transformHPC2

Say good-bye to 'blinking lights'

HP innovations bring intelligence to the datacenter, converging network, storage and server management onto a single console.

Behind every innovation is that "light bulb" moment—the instant when you find the answer—and sometimes it comes when you least expect it.

In the case of the HP Onboard Administrator for BladeSystem, a breakthrough innovation that serves as the "brains" of the newly-designed HP BladeSystem c7000 Enclosure, it happened one day while a member of the HP design team was standing in front of an office printer, fixing a paper jam. As he followed the play-by-play instructions on the unit's small LCD screen, he couldn't help but wonder why troubleshooting and repairing problems in a datacenter infrastructure couldn't be just as straightforward.

It turns out, it could be. Inspired by the engineer's musings, the HP design team went on to develop HP Onboard Administrator, a "marquee" area of innovation that represents "the management brains of a BladeSystem enclosure," says Brad Kirby, Marketing Manager for Systems Management, HP Industry Standard Servers group (ISS).

A key part of HP Insight Control Management for BladeSystem, Onboard Administrator reduces set-up time for blade enclosures by enabling IT administrators to configure server, storage, network, and power settings locally through an interactive LCD panel or remotely through an easy-to-use web interface. In addition to providing key information about the "health" of the resources in a BladeSystem enclosure, it offers detailed information about energy consumption and thermal output, and can also assist in troubleshooting by providing a single point of access to each blade server's virtual KVM console.

"Onboard Administrator allows a remote IT administrator to take control of an asset like a blade server and then indicate to somebody on-site, through a chat session, which component is experiencing the problem and what they have to do to fix it," explains Kirby. "This means second or third level support teams can easily work with datacenter technicians even if they are separated by hundreds of miles," he adds.

As Jason Newton, HP BladeSystem Program Manager, points out, Onboard Administrator provides far more intelligence than the blinking LED lights

most IT datacenter administrators are used to, that blink slow or fast, red or green to indicate trouble. "Just as the LCD screens on a printer help to simplify operations, the display included in Onboard Administrator provides words and graphics along with a wizard to guide you," he says. "It allows you to perform a variety of operations right there in front of the BladeSystem."

Onboard Administrator is just one of a series of innovations from HP intended to ease customer management concerns in a bladed environment. Others include: a new generation of the Integrated Lights-Out management processor (iLO2) that provides powerful remote administration through a new high-performance virtual KVM as well as the ability to mount "virtual media" to remote servers for simple server deployment and update; HP Insight Control Data Center Edition, software that simplifies the management of a BladeSystem server, storage and networking infrastructure, and rapidly provisions server hardware, operating systems and applications to multiple BladeSystem enclosures; and, a new migration tool, the ProLiant Essentials Server Migration Pack–Physical to ProLiant Edition, that allows customers to easily migrate from their current rack-mount servers (HP or non-HP) to an HP BladeSystem infrastructure.

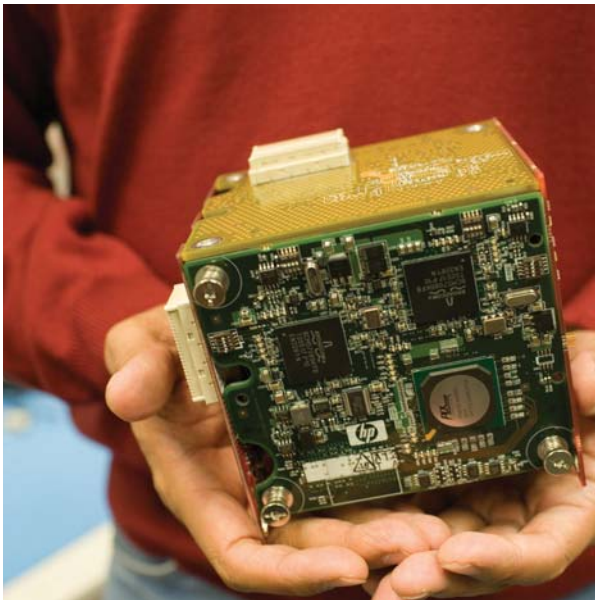
Insight Control Data Center Edition brings flexibility to BladeSystem management because it is able to comprehend BladeSystem location, detecting the bays within the blade enclosure as well as the blade enclosure and the blade servers themselves. This means remote administrators can assign images to bays within an enclosure prior to a blade being inserted. Then, once a blade resource is added, or a failed blade replaced, it will automatically receive the image intended for it.

"You don't have to have your highly paid systems architect waiting for the blades to be put into an enclosure in order to deploy them," says Kirby. "It helps eliminate dependencies within the IT organization, so people aren't waiting on each other to get their particular portion of the job done."

The real innovation delivered with HP Insight Control Management, he adds, is that HP is offering an intelligent BladeSystem environment that understands more than just servers. "We're finding more and more that the blade story isn't just about servers; it's about the network, power and storage infrastructures that go along with those blades," Kirby says. "The beautiful thing about our next-generation HP BladeSystem is that with Onboard Administrator, iLO2 and Insight Control Data Center Edition, you can manage all of those components through a single console, saving valuable time and resources, and, with technologies like Virtual Connect, making changes to the BladeSystem infrastructure safely without creating panic within your networking and storage teams."

For IDC and HP white papers on the enabling HP technologies for blade management, special promotional offers on the HP BladeSystem c-Class, and other information, visit: www.hp.com/go/transformHPC

The best of both worlds



HP delivers the industry's first support for next-generation Double Data Rate interconnect technology on its flexible and cost-effective blade platform.

Let's admit it right up front. Blades are an excellent building block for helping you build out your clustered high-performance computing environment. So, how do you improve on a good thing? More performance might be nice. And, you've certainly heard about Double Data Rate (DDR) InfiniBand.

Only rack-mount servers normally support the next-generation high-speed DDR interconnect. But wouldn't it be great if you could get the extra bandwidth on a blade server as well? Wouldn't that give you the performance boost you need without sacrificing the lower operating costs, smaller footprint and ease of management that come with blades?

That's the thinking behind a solution from HP that marries the two technologies to give you the ideal blade server for high-performance computing. The HP BladeSystem c-Class enclosure features a mid-plane that boasts a whopping five terabits per second of aggregate throughput and is the first in the industry to support 4X DDR InfiniBand—which means it delivers an eye popping 20Gbps of signaling rate in each direction.

"We're looking at a system that's really capable of tackling the most challenging high-performance computing workloads out there especially for the Computer Aided Engineering (CAE), life and material sciences, oil and gas, financial services, and scientific research and development sectors," says Guodong Zhang, Product Manager for High-Performance Computing at HP.

"Parallel applications that do a lot of message passing between the nodes are going to benefit from DDR InfiniBand and in many cases customers will be moving from Gigabit Ethernet so that's a big advance," he says. Integrating HP-MPI—HP's implementation of Messaging Passing Interface standards—the HP BladeSystem c-Class with 4x DDR InfiniBand offers an ideal building block for customers to deploy HPC clusters (see "HP-MPI gets the message across," page 13).

InfiniBand is an industry-standard, channel-based architecture that features a high-speed, low latency interconnect for distributed computing infrastructures. Blade servers recently began adding support for Single Data Rate InfiniBand but none until now have supported the higher bandwidth and lower latency DDR InfiniBand which runs at 20Gbps signaling rate in each direction.

The HP BladeSystem c-Class enclosure c7000 supports up to 16 half-height or 8 full-height blade servers and includes rear mounting bays for management and interconnect components. Each blade server includes both PCIe x8 and x4 mezzanine slots for I/O options such as the HP 4x DDR IB HCA mezzanine card.

The HP 4x DDR IB HCA mezzanine card features a memory-free design that lowers costs and saves on power. The HP 4x DDR IB Interconnect Switch Module and the HP 4x DRR IB HCA mezzanine card run at 20Gbps signaling rate per link in each direction. The solution is fully compatible with applications currently running on Intel® Xeon® blades as well as with those running on AMD® Opteron™ blades, and will soon be compatible with the yet to be released dual core Intel® Itanium® 2 blades.

"We're ready for customers that want to move now since this is a fully industry standard solution," notes Zhang. "For new clusters it makes a lot more sense for organizations to select InfiniBand rather than staying with one of the older interconnects that is either proprietary or won't support their needs going forward."

Customers replacing their legacy HPC environment for a new system, he adds, can either choose to build their own clusters, based on disparate components, or take advantage of the bundled systems offered by HP. The HP BladeSystem c-Class is offered as part of the HP Unified Cluster Portfolio, which is a comprehensive and modular package of hardware, software, and services for high-performance computing. The portfolio's HP Cluster Platform CP3000BL and CP4000BL integrates the HP BladeSystem c-Class into high-performance computing environments with a choice of factory-installed cluster software to allow rapid and easy deployment.

"DDR InfiniBand is the fastest industry standard-based interconnect and we're delivering it on blades as a complete turnkey solution," Zhang adds. "That means organizations can get up and running quickly with improved application performance as well as all the cost and management benefits of blades."

For special promotional offers on the HP BladeSystem c-Class, white papers and product information, visit: www.hp.com/go/transformHPC

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