manageability solutions for hp blade servers

manage multiple servers in multi-tiered, multi-OS environments
The special challenges of the web

Regardless of the type of business, success depends on how effectively that business can keep its customers satisfied. In today’s increasingly volatile economic climate, the challenges faced on the road to success can be overwhelming. Achieving maximum profitability involves growing the business, finding new revenue streams, and optimizing the customer experience while decreasing operational expenses.

The Web has special challenges. Demands for e-services are growing at such exponential rates that procurement, deployment, management, recovery and replacement, and support are nearly impossible to keep up with. As companies move business processes and customer services to the Web, they need flexibility when deploying Internet-edge applications in the data center. At the same time, administrators and managers are under constant pressure to slash the IT support budget. And the cost of configuring, deploying, maintaining, and fixing systems is usually several times higher than that of the systems themselves.

Management is another challenge. To manage multi-platform systems requires a powerful, end-to-end resource and performance management solution for the distributed environment. Whether the multi-platform environment consists of a single system or a large network of systems, the fundamental goal is the same—to offer the best possible level of service in a cost-effective manner.

Finally, there’s the need to make the most effective use of space. Real estate for the data center is getting more expensive. And with its massive requirements for servers, the Internet is requiring that more servers fit into smaller spaces. All companies want to boost computing performance while minimizing the use of space and power.

The answer: HP blade servers

High-density HP blade servers are ideal for service at the Internet access layers, where they are prized by businesses and enterprises, and by Internet service providers (ISPs) and telcos that are acting as service providers themselves. Look at some of the features of this remarkable suite of products:

- **All-inclusive blades**—Each HP blade server is an all-inclusive computing system that includes the processor, memory, network connections, and associated electronics, all on a single motherboard.

- **Shared resources**—The HP blade server is installed in the HP blade server chassis, an enclosure that allows multiple blades to be housed together in a server sub-rack and to share resources such as power supplies and cooling fans.

- **Easy accessibility**—HP blade servers are easily accessible, offer increased computing density, and have a modular architecture that ensures flexibility and scalability.

- **Easy deployment and servicing**—HP blade servers are easy to deploy, redeploy, and service. And since many blades come pre-configured to handle just one task, such as serving up streaming video or Web hosting, they can be set up in minutes. Service personnel can swap blades rapidly. And availability improves with blade servers because fewer single points of failure exist.

- **Efficient use of computing resources**—HP blade servers provision computing resources extremely efficiently. Combined with HP’s enterprise-level management solutions, HP blade servers enable businesses to easily deploy and reallocate computing resources. The result is a reduction in central and remote support requirements as well as a similar reduction in idle or stranded server resources.

- **Seamless multi-OS management**—HP management tools seamlessly control multiple servers in multi-tiered, multi-OS environments. HP blade servers include deployment and management products designed to ensure reliability, serviceability, and investment protection for a customer’s always-on Internet infrastructure.
The HP blade server management strategy is based on a single standards-based manageability infrastructure, with applications that provide the best customer experience at a lower total cost of ownership. By leveraging HP management software products such as HP OpenView Operations, HP OpenView Network Node Manager, HP OpenView Omniback II, and HP Toptools, and through strong partnerships with third-party vendors, HP is able to offer customers unified, best-of-breed manageability.

While the focus of this document is the manageability of HP blade servers, a short summary of the architecture will introduce some of the concepts specific to the HP blade server discussed later in this document. This summary will focus on the HP blade server bh7800 chassis and the accompanying HP blade server bc1100.

Blade servers are not new. The telecommunications and industrial control industries have been using them for many years for custom solutions. HP blade servers leverage this extremely robust technology and add the improved manageability and cost benefits demanded in the service provider and enterprise markets. This consolidation of trends in the computer and telecommunications industries, especially the adoption of standards from these realms, is of great benefit to customers.

HP’s blade server architecture is built on the well-established CompactPCI standard. The architecture incorporates network switching, storage interconnect, and multiple servers into a single highly available chassis infrastructure. For example, one HP blade server chassis, the bh7800, supports from 1 to 16 individual blade servers, 1 or 2 network switch blades, multiple types of storage or I/O blades, and an intelligent management blade.

The hp blade server bh7800 chassis delivers a high availability infrastructure to support multiple server, storage, and network switch blades. The network, power, storage interconnect, and management interfaces to the servers are protected by redundant components. Each HP blade server comes with two switch cards to support dual-payload LANs and a management LAN interface on the backplane of the chassis for isolation of hardware management data and traffic. It should be noted that these LANs are internal to the blade server, providing a significant reduction in cabling requirements. The first blade server employs an Intel® Pentium® processor, and an HP PA-RISC blade server will be available in the second quarter of 2002. Each of these blades comes with an embedded “Guardian Service Processor” providing blade manageability over the dedicated management LAN, even with no operating system running on the blade.

Each blade server comes standard with either an embedded RMC (remote management card for IA-32) or a GSP (guardian service processor for PA-RISC) for management and service processing. The management capabilities of the RMC device can be remotely accessed through the management LAN by using a browser.

Additional information on HP blade servers can be obtained from the following URL: www.hp.com/go/blades
By nature HP blade servers are extremely flexible and diverse in their configuration and the environments they support. And HP has developed a management solution that supports the flexibility and diversity of the HP blade server environment.

HP blade servers reduce cost of ownership by improving the density of computing resources and taking up less real estate than other solutions. This is especially important for service providers that offer computing resources to businesses, as well as for corporate data centers that need to achieve greater computing power without expanding the physical size of their data centers.

Customers or users of these environments often require service level agreements (SLAs) to maintain an expected level of uptime and performance, ensuring rapid response times. The SLA defines customer expectations. HP management solutions are designed to support the success of HP customers in meeting today’s service level agreements.

Security is another critical issue, especially in a leasing situation: when corporations lease computing resources from a service provider there exists a significant need for the corporation to feel confident its data is highly secure. This means that one customer’s data cannot share any communication pathways with another customer’s data. HP blade servers allow the provider to monitor and proactively manage the server while providing a completely secure environment for its customers. A separate management LAN (internal to the chassis) has been implemented to provide advanced security in environments where a blade server might support a shared environment.

However, simply providing a separate management LAN is not enough to be a comprehensive management solution because it fails to allow the customers of the service provider to access inventory and to monitor and manage their individual leased resources. So the HP blade server management solution also provides agents that can be installed on the blade components. The agents can be accessed on one of the payload LANs while allowing the service provider to manage the hardware via the management LAN.

In an enterprise environment, the isolation of customer data from management data is not as critical, but manageability is more important. So HP blade server manageability is configurable, making it easy for administrators to have easy access to all management traffic from any location on a single network.

In any densely populated environment, whether at a service provider or in a corporate data center, rapid identification of failed or problematic components is imperative. The HP blade server management solution includes turning on indicator lights that reveal the location of problematic components in the chassis or individual blades, speeding the process of replacement and recovery. Coupled with the easy accessibility of the HP blade server chassis, this clear identification of failed components makes it possible for companies to reduce support costs by employing non-IT personnel to handle replacement.

The following section examines the environments for which the HP blade servers were designed and the management scenarios that apply. Also, refer to Appendix A of this document to see a table of the management functions of each of the following components.

Blade servers have very specific management needs and customer requirements. And HP has built a management solution that provides secure yet flexible management of the blade environment. Included with each HP blade server are essential management components such as a separate management LAN that allows for the isolation of management data from the production LAN. In addition, there are additional, separate components that form the management solution for the HP blade server environment.

The following is a summary of the management components in HP blade servers:

- Payload LANs and management LAN—Used for customer data, with a separate LAN for management data
- Management blade (also referred to as the Server Management Card or SMC)—Chassis management, including power and cooling, hardware event management, and switch configuration
- Remote management card (also referred to as the RMC)—Embedded on each IA-32 blade server, the RMC provides individual hardware management functions
- Guardian Service Processor (GSP)—Embedded on each PA-RISC blade server, the GSP provides individual hardware management functions
• Blade server management agents—Installed for each server and switch, these agents provide enhanced management
• Switch blade management—An embedded Web server providing configuration and management of the switch blades in the HP Blade Server
• HP Toptools Device Manager—Provides a central Web-based management console, usually on the management LAN
• HP Toptools Enterprise Integration—Provides integration of HP Toptools functions with enterprise platforms such as HP OpenView
• SystemImager—Bundled with HP blade servers as an essential management tool

Payload LANs and management LAN

The management LAN is an additional network designed to provide secure access to hardware data, monitoring, and event management while leaving two payload LANs for individual corporate communications. The management blade and the remote management cards (discussed later in this document) communicate on this management network. For security, this network cannot be accessed by applications or the operating system running on the blade servers. It should be noted that, if desired, the payload LANs and the management LAN can be connected via a switch or router—for example, when the customer does not need separation of the management and payload LAN, or has in place safeguards such as a firewall.

Management blade

The management blade or SMC can be considered the central component in the HP blade server management architecture. Each chassis contains one management blade to manage the overall health of the system. This blade is connected to the management LAN and can be accessed through the HP Toptools Device Manager (discussed later in this document) or through a telnet session.

The following are the functions of the management blade:
• Supervises the operation of the other components within the chassis (for example, fan speed, temperature, and blade presence) and reports their health to a central location
• Reports any failures to a central management system, such as HP Toptools or HP OpenView
• Provides the initial bootstrap configuration for the chassis
• Provides configuration of the switches in the chassis
• Inventories all blade server components
• Brings up, shuts down, or restarts blade servers
• Receives events from individual blade servers in a chassis and forwards them to a management application such as HP OpenView or HP Toptools Device Manager (discussed later in this document)
• Controls the indicator lights located on the HP blade server chassis for each blade, making faulty blades easy to physically locate in the data center
Administrators using the HP Toptools Device Manager can access the management blade and obtain vital data, such as identification and configuration information, relative to the HP blade server chassis. Access to the management blade can also be established through a telnet session with the blade.

An RMC included with each IA-32 blade (Linux and Windows®) provides LAN-based system console access as well as remote system management functions. Remote system management functions include power on/off, reboot, and inventory control.

The RMC separates out console access and system management from the rest of the system. This is accomplished by a dedicated processor and microcontroller within the RMC. The RMC also includes a dedicated management LAN port.

The following is a list of specific functions provided by the RMC:

- LAN-based text mode VGA access during self-test and boot
- LAN-based access to the system console
- LAN-based boot from a “virtual floppy”
- LAN-based remote firmware update using TFTP
- Support for remote power on and off via the CompactPCI high availability hot-swap specification
- Support for remote reset and reboot
Remote management card (RMC) functions such as console access, blade server reset, sensor monitoring, and RMC configuration can be accessed from the HP Toptools Device Manager or through HTTP.

The GSP provides functionality similar to that of the RMC, but it is designed for PA-RISC server blades (available in the second quarter of 2002).

Management software agents can be installed on blade servers to provide management functions over the payload LAN. The agents can access information about the health of the blade’s hardware and software, and they can generate alerts over the payload LAN. SNMP-based Toptools agents are provided for hardware instrumentation. Alerts generated by these agents can be received by management applications such as HP Toptools, OpenView Network Node Manager, or OpenView Operations.
In Figure 3, where detailed status and configuration information is required, HP Toptools can provide a wealth of information for each blade server. Information is organized into tabbed properties pages, allowing easy browsing of information on every monitored component. Configuration, status, capacity, and event information is provided for HP blade products in categories such as storage capacity, disk errors, and NIC performance.

**Storage Blade Management**

The HP IDE storage blade contains two IDE drives and is an extension of the IDE bus for a specific blade server. Management of the storage blade is accomplished through both the blade server agent and the operating system running on the blade server. In addition, the Server Management Card (SMC) monitors the IDE storage blade and can be used to power it up and down and initiate the hot-swap procedure.

Beyond essential management is the need to address data integrity and loss prevention. HP offers HP OpenView Omniback II to provide this level of enhanced data protection and disaster recovery. Omniback II is discussed in greater detail later in this document.

**Network Switch Blade Management**

Configuration and management of the network switch blade for the initial release of the HP blade server product is handled through a telnet interface that is accessible from the management blade. The network switch blade also includes an SNMP agent that is accessed over the payload LAN. Future enhancements will include an embedded Web server, accessible over the payload LAN.
HP Toptools Device Manager is an all-in-one, browser-based management application for configuration, administration, and monitoring of HP devices, including HP blade servers. The HP Toptools Device Manager provides a birds-eye view of all the devices on the network. With its one-to-many architectural design, Device Manager allows administrators to perform actions on entire groups of devices simultaneously.

HP Toptools automatically discovers, identifies, and inventories all HP blade server components on the network, making it easy to keep tabs on an entire installed base. Once the blades are discovered, key environmental events and critical blade server system components are continuously monitored. Color-coded visual indicators provide quick, at-a-glance operational status.

For additional information on HP Toptools, including installation and deployment guides, visit the following URL: http://www.hp.com/toptools/

**Figure 4.** The HP Toptools Device Manager inventory screen informs administrators of installed management agents and versions and provides an overall view of alert conditions of devices.

**Figure 5.** HP server agents report significant system events, giving continuous assurance that all critical components are being monitored. Should problems arise, Toptools Device Manager can notify the administrator with problem details, helping to get the systems back up and running with minimum disruption to users.
Integration of HP Toptools functionality into leading enterprise management solutions such as HP OpenView, CA Unicenter TNG, Microsoft® SMS, and Tivoli Enterprise Management is included with the HP Toptools CD set. Customers who have deployed these enterprise management solutions along with the HP Toptools enterprise integration will benefit from seamless management from their chosen enterprise management console. (Later in this document are specific details on HP Toptools for Network Node Manager.)

Figure 6. HP OpenView Network Node Manager with HP Toptools integration provides HP blade servers specific manageability to Network Node Manager.

SystemImager

SystemImager is an open source tool that provides an easy method of software distribution, configuration, and systems updates to multiple devices with very few steps required by the administrator. Built on top of the rsync utility, SystemImager provides quick and efficient updates because only changes in an image must be transferred over the network. SystemImager uses a command line interface and is ideal for single systems and small numbers of multiple system installations.

Using SystemImager, HP customers reap the benefits of a lower cost of ownership, higher end-user satisfaction, and ultimately, higher levels of productivity through fast and consistent image deployment. SystemImager is included with all HP blade servers.

Additional information on SystemImager can be found at the following URL: http://www.systemimager.org

Management Configurations for HP Blade Servers

HP’s management solutions for blade servers take advantage of the flexibility inherent in the blade server design. The blade server environment can quickly be configured for service providers, with an emphasis on security, or for corporate and enterprise customers who want to take advantage of the superior manageability. In fact, management configurations for HP blade servers can be remarkably diverse and application-specific.

While designing the management solution for blade servers, HP considered not only the needs of the service provider evaluated but also the needs of the service provider’s customer. The xSP customer is likely to have a service and support subscription that defines processing power, storage space, and specific service level criteria. This customer often wants to have control over applications, services, and data while depending on the service provider to keep the hardware available and running at peak performance.

HP blade servers provide high-density computing with the potential for one single blade server chassis to support several customers. Such density and multi-customer support drive the need for a very secure management environment. The blade server’s separate management LAN helps ensure security by isolating management traffic and data. At the same time, installation
of Toptools agents on each blade server allows access and individual management by the service provider’s customer who is leasing the use of that blade server. The agents provide inventory, monitoring, and event management capabilities that are accessible from the payload LANs by the network administrators of individual companies. This dual-LAN architecture provides security and separation of servers while ensuring that each customer’s network administrator is empowered to meet that customer’s specific management requirements.

Figure 7 shows a configuration with one or two payload LANs and a separate management LAN. The customer data and traffic are carried on the payload LANs, while management for the HP blade server chassis and RMC management and monitoring functions are provided by the management LAN.

Payload LAN connections are made from the link port on the network switch blade. The management LAN connections are made from the management blade to one of its rear transmission modules (RTMs), which are network interfaces used to connect the management card to the management LAN on the backplane of the chassis. Traffic flow is from RMC to management blade to RTM and back.

This configuration requires at least two HP Toptools Device Managers. One Device Manager is needed for the management LAN that the service provider uses to monitor the hardware, and one Device Manager is used for each individual customer of the service provider who wants to manage individual blade servers and storage blades. This configuration ensures that each customer’s management data is secure even though multiple customers are being supported out of a single HP blade server.

A Toptools Device Manager installed on the payload LAN is used to access data from the Toptools agents installed on each blade server. And a Toptools Device Manager installed on the management LAN is used to access data from the RMC and management blade.

In a corporate or enterprise environment, the HP blade server chassis and all servers are owned and operated by a single company. For this reason, the environment does not require the security and isolation of management traffic and data. The flexibility of the management solution for HP blade servers allows administrators to connect the management LAN to one of the payload LANs, resulting in all traffic and data being available from one network.

Figure 8 illustrates one type of corporate data center configuration. This configuration uses one combined payload LAN and one management LAN. The payload LAN connections are made from a link port on the network switch blade.

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management LAN to the payload LAN, providing complete management of the chassis and all blades from one network. This configuration requires only one HP Toptools Device Manager.

communication between management LAN and payload LAN

setting up HP Toptools device manager for the single-LAN configuration

corporate data center scenario 2

An external cable connection is made from the management blade RTM to the switch. This connection allows traffic to be directed to the payload LAN. The management blade makes its communication to the RTM, and the RMCs communicate through the backplane to the management blade.

This configuration requires only one Toptools Device Manager, which is installed on the management/payload LAN. The Device Manager receives all management data from the Toptools agents, remote management card, and management blade.

Sometimes in a corporate environment, the administrator prefers to maintain the independent management LAN even though the HP blade server chassis and all servers are owned and operated by a single company.
Figure 9 shows one way of configuring a corporate environment for a separate management LAN and payload LAN while requiring only a single HP Toptools Device Manager. In this case, a router is used. Payload LAN connections are made from a link port on the network switch blade; there are no management LAN connections.

**figure 9.** Customers who wish to isolate management traffic and install only one HP Toptools Device Manager can do so by routing the traffic between the management LAN and one of the payload LANs. The Device Manager can be located on either the payload or management LAN.

This configuration requires only one Toptools Device Manager, which can be installed on either the payload or the management LAN. The Device Manager receives all management data from the agents installed on each individual blade server, the remote management card, and the server management card.

HP offers the following solutions to meet customer-specific management requirements above and beyond the management included with each HP blade server.

Nothing is more labor-intensive than deploying operating systems and other software on new servers. Manually setting up and configuring each server takes valuable time and resources. HP can provide tools to automatically install servers and configure the operating system on all servers at once—saving time and money. Fast deployment is especially important to service providers, where reducing “time to service” is imperative for success.

Turbolinux PowerCockpit is a deployment tool for Linux systems. It differs from SystemImager in that Turbolinux PowerCockpit provides multicasting support, making it a scalable solution for pushing images out to multiple machines. The benefit is that configuration and even reconfiguration of multiple devices is fast and painless.

Turbolinux resides on a Linux server, has a graphical user interface, and is ideal for scenarios where large numbers of devices need to be installed quickly and at a single time.
figure 10. Turbolinux PowerCockpit image collection screen is used to obtain an image of a configured server that can later be used to configure or reconfigure other servers to be used in the same manner.

A white paper on how to use HP's hardware configuration tools with Turbolinux PowerCockpit can be found on the HP Web site.
network management with network node manager

HP OpenView Network Node Manager (NNM) is a comprehensive network management solution that provides network views in an intuitive graphical format. Network Node Manager discovers network devices and provides a map to illustrate the structure of the network and the status of devices and segments.

When a major device fails, NNM’s event correlation engine evaluates the event stream to pinpoint the root cause of the failure. Other capabilities help network administrators prevent problems by identifying potential trouble spots before a failure occurs. Administrators are able to manage the network more intelligently, leading to increased network uptime and lower costs.

figure 12. HP OpenView Network Node Manager UNIX® view provides management functions, such as alert threshold violations indicating potential problems, network view, and condition maps from a UNIX management console.

Here are some of the features of HP OpenView Network Node Manager:

- **automated device discovery and layout**—Discovers TCP/IP, IPX, and level 2 devices on both LANs and WANs and presents this information in a graphical format. Continuously monitors the network for new devices and for the status of previously discovered equipment.

- **event correlation technology**—Pinpoints the cause of network problems by letting the administrator drill down to see all events that contributed to an alarm. Includes out-of-the-box correlation logic for some of the most common network management problems.

- **user interface based on Java™**—Provides easy access to network maps and enables management of data from anywhere on the Web.

figure 13. Network Node Manager Alarm Log provides detail about error conditions and correlation for root cause analysis.
figure 14. Network Node Manager map provides high-level views of the network and the status of devices in various locations. Administrators can drill down from these maps to a specific device for quick identification of problems.

• **proactive management through reporting and data warehousing**—Pre-configured Web-based reports enable historical data analysis, which provides a unique view of the devices on the network and helps administrators take actions that prevent problems from occurring. Topology, event, and SNMP-collected data is exported to NNM’s data warehouse where it is collected and summarized.

• **fault-tolerance capabilities**—Users can schedule backups of business-critical network management information to occur while they continue to manage the network. Also, NNM management stations can be configured to take over the functions of the collection stations if one or more collection stations fail.

• **scalability**—Windows and UNIX collection stations can be distributed throughout the environment so that data can be collected locally and forwarded to one or more management stations. Windows remote consoles connected to UNIX management and collection stations allow multiple-operator access at a lower cost. The Java-based Web user interface increases the number of supported operators and offers connectivity over WAN links.
The HP blade server management may be one of many different device types in a much larger network with many different vendors’ equipment and software solutions. For these large deployments, HP OpenView Operations is a distributed client/server software solution for managing multiple operating systems, applications, and databases. HP OpenView Operations provides visibility into the total environment by consolidating the information retrieved by HP Toptools with information gathered by its own agents. Clients, called intelligent agents, and the central management console (the server) work together to provide a mission control center for the entire distributed environment.
HP OpenView Operations provides relational views of devices and the ability to isolate devices with problems. This is accomplished by correlating the connectivity polling done by Network Node Manager and the event driven alerts from deployed agents. From the central management console, IT staff can take full control of distributed IT resources across the enterprise, identifying potential problems before they occur and resolving them before end users are affected. Administrators and IT staff can also configure the powerful intelligent agents to solve problems immediately, without having to interact with the central management console—a major step towards a self-managing system.

HP OpenView Operations offers management add-ons and integration to other OpenView tools for extended functionality, including the following:

- HP OpenView Operations advanced security
- HP OpenView Operations developer’s toolkit
- HP OpenView Java-based user interface
- Application and database smart plug-ins for specific monitoring and management characteristics
- HP OpenView Reporter for customized reports
- HP OpenView Network Node Manager (an integral part of HP OpenView Operations)
- HP OpenView Event Correlation Services (ECS) Designer
- HP OpenView Web Transaction Observer for transaction monitoring

HP OpenView Omniback II version 4.1 software provides automated data protection and media management for organizations with heterogeneous data center environments and 24x7 data availability needs. Through its easy-to-use interface, Omniback schedules and automates the regular backup of business data from many different server environments onto a broad range of storage devices and automated libraries. Omniback also offers centralized media management to keep track of all backup media, files, and library information so that in case of disaster, data files can be quickly recovered and made available.
HP OpenView Omniback II provides data protection for the HP blade server environment as well as for application servers running a large number of other operating environments. It offers online application backups, together with traditional and clustered backups, to meet the operating requirements for the blade server environment.

HP OpenView Omniback II is a single backup solution for small, medium, and large enterprises. It covers an extensive range of operating environments, applications, and storage configurations with a consistent look and feel across different operating systems. Omniback delivers on HP's FSAM (Federated Storage Area Management) strategy to enable a tenfold increase in storage scale with the same number of people.

HP OpenView Omniback II provides data protection with all of the following capabilities.

- **scalability to grow with business needs**—Omniback II version 4.1 delivers new levels of scalability with Omniback's internal database. This allows backing up more data and managing the entire environment from one management server with less disk space consumption and less user maintenance. Omniback II is the key to managing a continuously growing storage infrastructure with the same amount of IT resources. Omniback II 4.1 has broad support for direct backup, network backup, network-attached storage (NAS) backup, and SAN (LAN-free) backup configurations.

- **efficiency to manage growth within the same people-print**—Omniback II helps leverage the IT infrastructure for maximum operational efficiency through media management and cost-effective multi-drive connectivity for library sharing, and by taking advantage of today's latest SAN and NDMP technologies. Staff efficiency is also improved through automated backups (managed centrally or locally through a single GUI, even across platforms), which require less training time and less specialization in software operation.

- **availability to keep data and applications running 24x7x365**—Omniback utilizes a broad range of techniques to keep data available even during backup. It offers online and open-file backups, online incremental backups (Oracle®), clustered backups, and serverless backups. Plus Omniback II is the only solution today to deliver full integration with zero-downtime, zero-impact backups.

- **choices to support current and future business environments**—HP’s commitment in delivering quality and freedom of choice is demonstrated by Omniback’s extensive support for a wide variety of storage, SAN, and backup devices, as well as different host operating systems, applications, and databases to match specific business needs.

- **blade-friendly licensing**—Omniback supports the blade server environment with a licensing structure that minimizes the impact of growing processing requirements. For example, there are no added license fees when adding servers to a data protection environment!
blade-friendly deployment—Omniback incorporates automatic software distribution to push agent software from the central management server and to automatically install the required agent components when additional servers are configured. To optimize performance, Omniback offers broad configuration flexibility to optimize infrastructure efficiency. It also offers features such as library sharing, load balancing, data compression, and simultaneous backup streams.

pulling it all together with seamless end-to-end management

The bottom line for all consumers of networked resources is the availability and responsiveness of resources. This is why seamless end-to-end and top-to-bottom management is imperative.

today’s companies recognize the importance of a comprehensive management solution, especially the contribution it makes to reducing their total cost of ownership, and ultimately the long-term impact it has on their profitability. And HP management solutions are comprehensive. They are designed to optimize not only the customer’s hardware but also the entire computing environment.

easier management

As the number of servers grows, IT professionals have come to realize that the cost of managing these servers can add up to many times the actual cost of hardware. The HP blade server provides features to make management easier and less taxing. HP’s remote application deployment solution simplifies blade software provisioning and speeds deployment of off-the-shelf applications. And the addition of HP management software that interfaces seamlessly with HP blade servers helps deliver a lower total cost of ownership (TCO) and higher overall efficiency.

Management of HP blade servers begins with the features built into hardware. Installing HP Toptools hardware monitoring agents when setting up hardware can provide detailed inventory, monitoring, and event management specific to HP hardware. And once a server is booted with a minimum configuration (that can be as simple as an MS-DOS® network boot using PXE technologies), administrators can use HP rapid deployment solutions to quickly push pre-defined OS and application images out to servers.

Advanced management such as automatic process restart when a service fails, predictive notification of potential problems, and event correlation across multiple servers and applications as provided by HP OpenView products provide an easy route to full systems management.

integrated management

At the very foundation of every network is a solid infrastructure; this includes the networking, servers, storage, and operating systems. Health maintenance of these devices and operating systems is paramount. HP management applications and services provide the essential management tools to ensure our customers of a healthy foundation upon which to run their businesses.

HP blade servers offer painless and pervasive system and network management through HP OpenView and HP Toptools, which means that enterprises, telcos, and service providers can integrate monitoring and control across all compute, storage, software, and network infrastructure resources. HP blade servers seamlessly manage multiple systems in multi-tiered, multi-OS environments using sophisticated HP management tools to ensure reliability, serviceability, and investment protection for a customer’s always-on Internet infrastructure.

cost-effective management

HP provides industry-leading management solutions to meet the specific needs of diverse computing environments. With the integration of HP Toptools and HP OpenView in HP blade servers, customers gain a winning combination of hardware and management software that ensures the highest possible return on investment.
Today the bottom line of a company is dramatically affected by the ability of computing devices to deliver as “expert systems,” rather than simple hardware and software components. Today’s companies recognize the importance of a comprehensive management solution, the contribution it makes to reduce their total cost of ownership, and ultimately the long-term impact it has on their bottom line.

HP blade servers are designed for manageability. And HP management solutions are designed to optimize not only this hardware but also the complete computing infrastructure. Taken as a whole, HP blade servers and HP management tools provide high availability, high reliability, high performance, rapid deployment, catastrophic failure prevention, and rapid recovery from failures. All this contributes to greater operating efficiently and an optimal end-user experience.

Looking for more information about HP blade servers? See the URLs and other sources listed below.

HP Toptools Web site—http://www.hp.com/toptools/
HP OpenView Web site—http://www.openview.hp.com

Or contact any of our worldwide sales offices or HP Channel Partners (in the U.S., call 1-800-637-7740).
## Appendix A: Management Capabilities Included with all HP Blade Servers

<table>
<thead>
<tr>
<th>Component</th>
<th>Inventory Data/Reports</th>
<th>Monitoring/Events</th>
<th>Actions</th>
<th>Supported Interfaces</th>
</tr>
</thead>
</table>
| Management Card | • Blade server components  
• Details of each blade in the chassis | • Fan speed  
• Temperature  
• Blade presence  
• Blade health | • Power on/off blades  
• Reset individual blades  
• Provides initial bootstrap configuration  
• Configuration for switches  
• Turn on/off indicator lights and control front-panel LCD | • Telnet and Toptools Device Manager  
• RS-232 with modem paging  
• LCD panels (13U only) |
| Remote Management Card | • Card identification | | • Individual blade server console access during self-test and boot  
• Individual blade server remote firmware updates  
• Individual blade server remote power on/off  
• Individual blade server remote reset and reboot  
• Boot floppy images over the network  
• Group actions via RMC  
• Change users and passwords  
• Power off server  
• Reset blade server | • HTTP and Toptools Device Manager |
| Toptools Agents for IA-32 Server Blades | • Name  
• Processor  
• Processor speed  
• BIOS version  
• RAM size in MB  
• Disk capacity  
• IP address  
• MAC address  
• Location  
• Contact  
• OS  
• NIC information  
• I/O port information | • Network interface statistics  
• CPU utilization  
• SMART disk error reporting  
• Storage capacity monitoring | | • SNMP  
• Toptools Device Manager |
## Appendix B: Rapid Deployment Solutions

<table>
<thead>
<tr>
<th>Function</th>
<th>SystemImager</th>
<th>*Turbolinux PowerCockpit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capture images</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Deploy software image (basic)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Redeploy software images</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Multicast</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>PXE boot</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Windows images</td>
<td>Limited (disk clone only)</td>
<td>Yes</td>
</tr>
<tr>
<td>Linux images</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>HP-UX images</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Linux management server</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>IPF plans</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Out-of-box GUI</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Integrates with pre-boot firmware</td>
<td>Limited</td>
<td>Limited</td>
</tr>
<tr>
<td>flashing tools from hardware vendor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e.g., inventory flash, config)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-deployment image updates</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Remote application installations</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*Not included with HP blade server*