

The HP Blade Workstation Solution—A new paradigm in workstation computing featuring the HP ProLiant xw460c Blade Workstation

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Executive overview

The HP Blade Workstation Solution represents a new paradigm in workstation computing. Rather than placing the workstation's computing power at the user's desk, the computing power, in the form of blade workstations, is moved to the data center where the workstations can be more easily, securely, and inexpensively managed. Centralizing an organization's workstations in the data center provides many benefits, including:

1. **Improved uptime and business continuity**—The next-generation remote management capabilities of the HP Blade Workstation Solution, along with its fault tolerant design and re-provisioning capabilities, deliver outstanding uptime. To maximize business continuity and interagency coordination, multi-site blade workstation installations can be created.
2. **Enhanced data security**—The HP Blade Workstation Solution ensures that your business-critical data remains in the data center.
3. **Reduced IT costs**—By centralizing your organization's workstations into the data center and by taking advantage of HP's robust set of remote management tools, your IT costs can be significantly reduced.

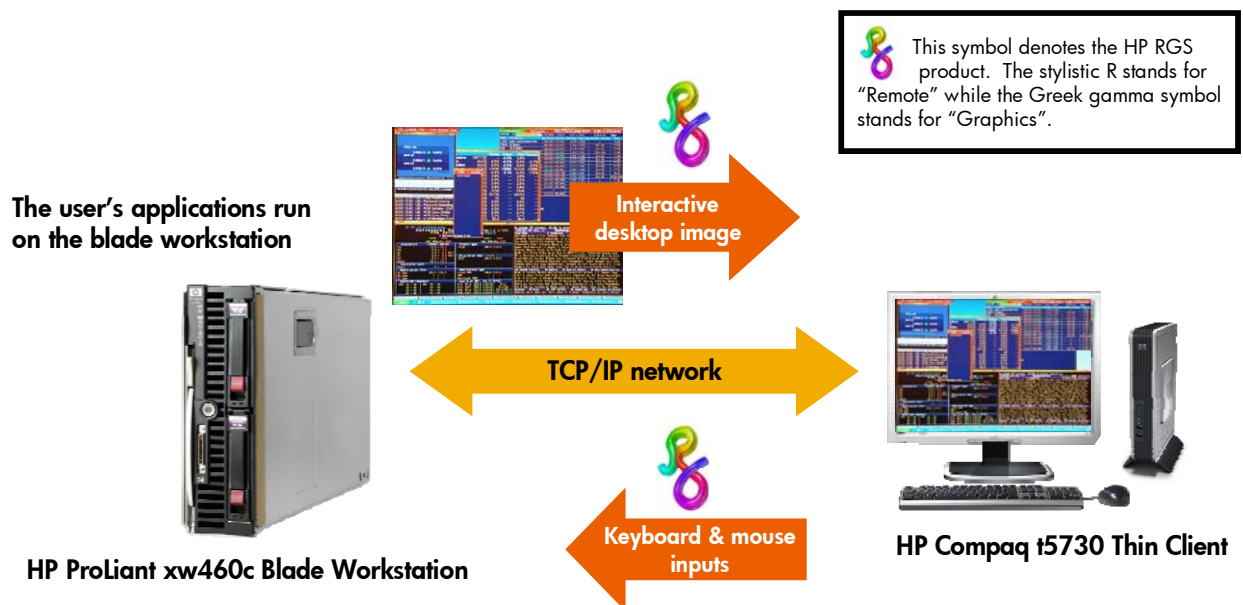
This paper describes the industry-leading HP Blade Workstation Solution and how this solution delivers the above benefits as well as many other important benefits. An overview of the solution is presented first followed by a more detailed description.

HP Blade Workstation Solution overview

The HP Blade Workstation Solution consists of three primary components, as shown in Figure 1:

- The rack-mounted HP ProLiant xw460c Blade Workstation
- The client computer (the HP Compaq t5730 Thin Client is shown)
- HP Remote Graphics Software (HP RGS)

Figure 1. The HP Blade Workstation Solution featuring the HP ProLiant xw460c Blade Workstation.



The blade workstation, which executes the user's applications, is designed for maximum performance and can be configured with one or two high-speed Intel® Xeon® Dual-Core or Quad-Core processors.¹ The blade workstation also includes up to 64 GB of high-speed ECC memory and a dedicated graphics card that computes and renders the interactive desktop image.

Using HP RGS, the desktop image is transmitted over the network to the user's client computer, which displays the desktop image locally. HP RGS is designed to provide extremely fast capture, compression, and transmission of the desktop image over standard TCP/IP networks. HP RGS is also used to capture the user's keyboard and mouse inputs and send them to the blade workstation for processing by the operating system (OS) and the applications running on the blade workstation. For more information on HP RGS, visit www.hp.com/go/rgs.

The client computer can range from a thin client to a multi-display desktop computer. The HP dc73 Blade Workstation Client, shown in Figure 2, supports up to four displays, providing the performance and screen real estate for demanding, data-intensive applications. To minimize cost and maintenance, the OS of the HP dc73 Blade Workstation Client is installed on a solid-state disk. To improve data security, there are no floppy or optical drives.

Figure 2. The HP dc73 Blade Workstation Client supports up to four displays.

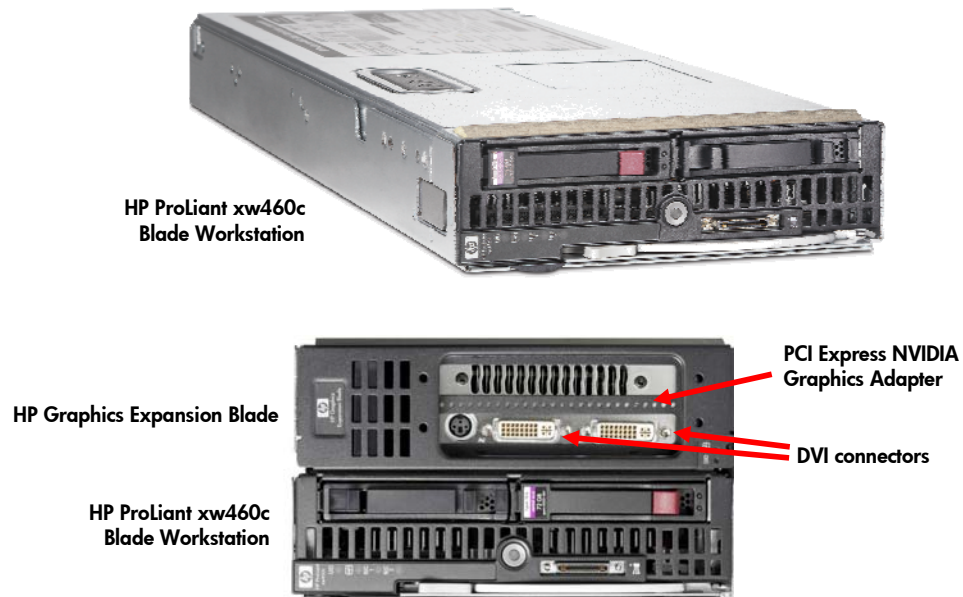


Because of the performance and features of HP RGS, client computers can be located anywhere, from near the data center to remote locations, while still providing a highly-interactive experience for the user. Additionally, HP RGS supports remote collaboration by permitting the desktop image from a single blade workstation to be sent to multiple client computers.

Details of the HP Blade Workstation Solution

At the heart of the HP Blade Workstation Solution is the HP ProLiant xw460c Blade Workstation— Figure 3 shows the blade workstation with and without the optional HP Graphics Expansion Blade attached.

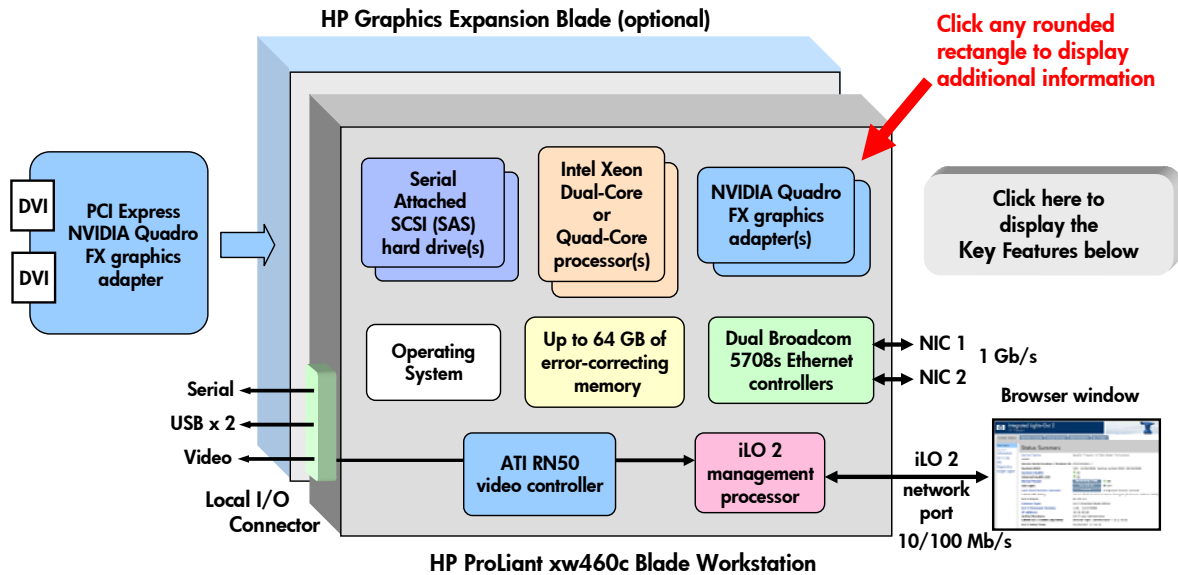
Figure 3. HP ProLiant xw460c Blade Workstation with and without the optional HP Graphics Expansion Blade.



The HP Graphics Expansion Blade mounts on top of the blade workstation, and supports a full-length PCI Express graphics adapter. The HP ProLiant xw460c Blade Workstation can be ordered with or without the expansion blade. Without the expansion blade, small form-factor graphics adapters are installed internally in the blade workstation. With the expansion blade, full size PCI Express graphics adapters are installed in the expansion blade.

Figure 4 shows the block diagram of the blade workstation and the expansion blade. Following the block diagram is a summary of the key features of the system. To display additional information, click any rounded rectangle on the block diagram.

Figure 4. Block diagram of the HP ProLiant xw460c Blade Workstation and the HP Graphics Expansion Blade.

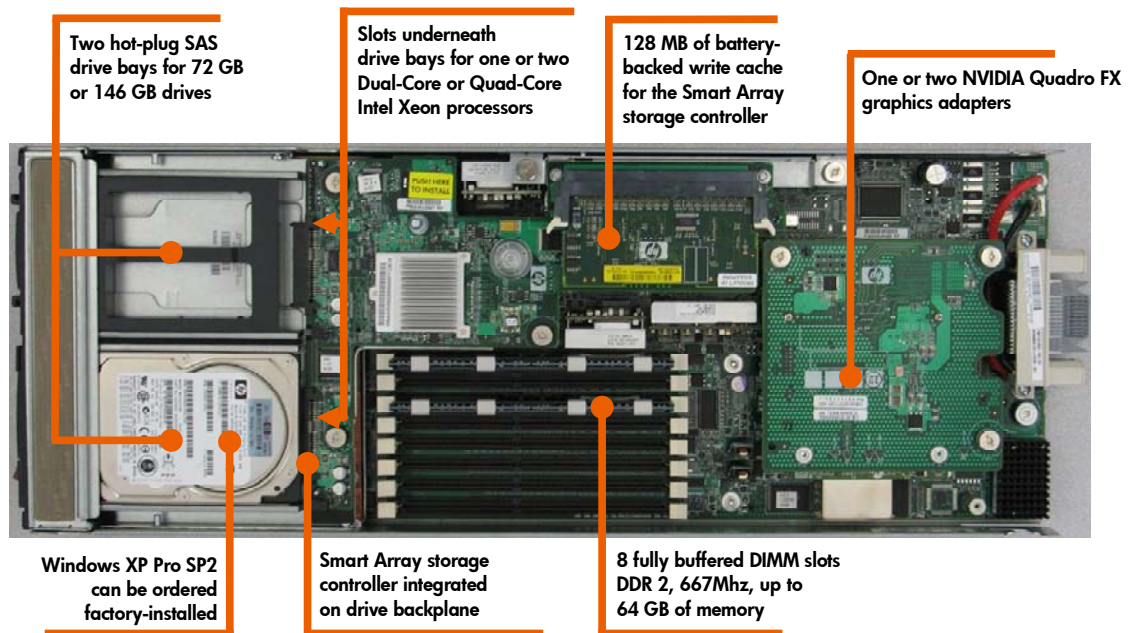


Key Features:

- **Operating system:** Windows Vista® Business Blade PC Edition with 1 RDL (Remote Desktop License) 32-bit with downgrade to Windows® XP Professional 32-bit SP2 custom installed can be ordered.² The following operating systems are also supported, and can be acquired and installed by the customer:
 - Windows® XP Professional x64 Edition
 - Red Hat Enterprise Linux® 4.5 (and later), 64-bit
 - Red Hat Enterprise Linux 5.2 (and later), 64-bit
- **Processors:** One or two Intel® Xeon® Dual-Core or Quad-Core processors running at speeds up to 3.33 GHz can be installed.
- **Memory:** Up to 64 GB of ECC, Double Data Rate 2 (DDR2)3 memory running at 667 MHz can be installed.
- **Internally-installed NVIDIA Quadro FX graphics adapters:** The NVIDIA Quadro FX 560M (single and dual), FX 770M (single and dual), FX 1600M (single only), and FX 3600M (single only) graphics adapters can be installed internally in the blade workstation (if the HP Graphics Expansion Blade is not attached—see next bullet).
- **HP Graphics Expansion Blade (optional):** The graphics expansion blade attaches to the top of the blade workstation, allowing the installation of high performance PCI Express NVIDIA graphics adapters.
- **Expansion Blade PCI Express graphics adapters:** The NVIDIA Quadro FX 3700 and FX 5600 PCI Express graphics adapters can be installed in the expansion blade. Attachment of the HP Graphics Expansion Blade to the blade workstation precludes graphics adapters being installed internal to the blade workstation.
- **ATI RN50 video controller:** The ATI video controller generates the boot console, which can be viewed using the video output of the Local I/O Connector or through the Integrated Lights-Out version 2 (iLO 2) network port.
- **Hard drives:** The blade workstation supports one or two Serial Attached SCSI (SAS) hard drives, either 72 GB or 146 GB per drive. The storage controller can be ordered with 64 MB of cache or 128 MB of battery-backed write cache.
- **Ethernet:** Two Ethernet ports are provided, each operating at a fixed speed of 1 Gb/s.
- **iLO 2 management processor:** The iLO 2 management processor provides an independent means to monitor and control the blade workstation.

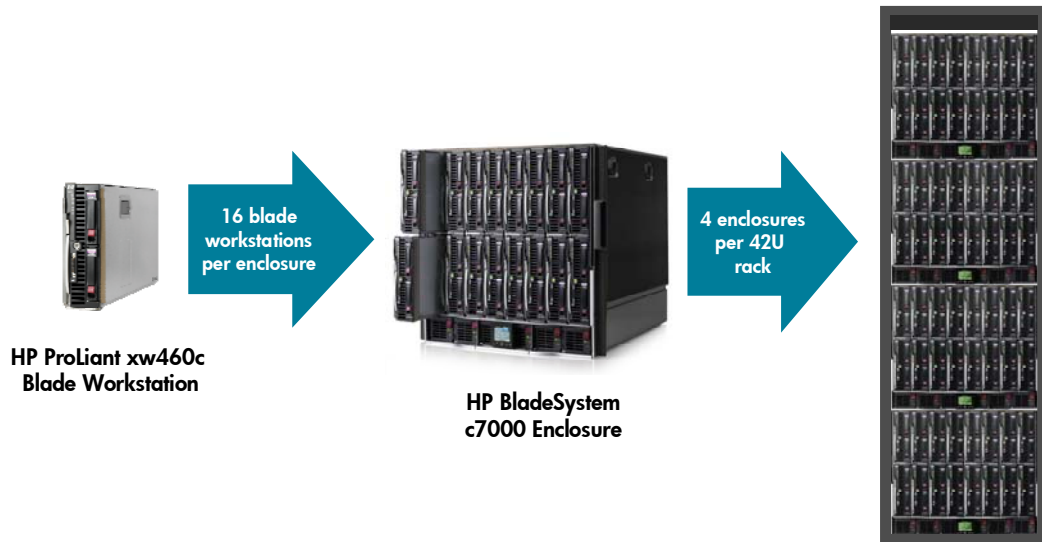
Figure 5 shows the internal view of the blade workstation and its high-density packaging. For optimum space utilization, the Intel Xeon processors are installed beneath the SAS drive bays.

Figure 5. Internal view of the HP ProLiant xw460c Blade Workstation.



The small form factor of the HP ProLiant xw460c Blade Workstation allows installation of up to 64 blade workstations in a single 42U rack, as shown in Figure 6.

Figure 6. Up to 64 HP ProLiant xw460c Blade Workstations can be installed in a single 42U rack.



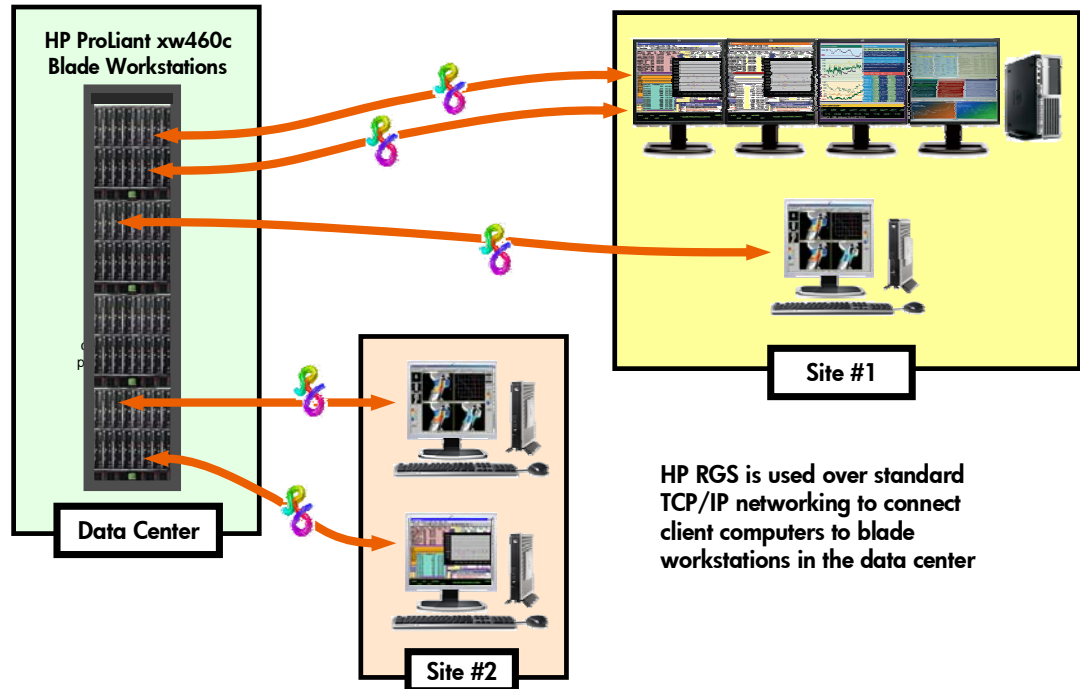
The innovative HP BladeSystem c7000 Enclosure, which accommodates 16 blade workstations, contains everything needed to support the blade workstations—hot-swappable power supplies, high-efficiency ducted cooling fans, and a next-generation blade management infrastructure. For usages such as remote offices that require fewer blades, HP offers the HP BladeSystem c3000 Enclosure. The c3000 enclosure supports eight blade workstations, and is available in both a rack mounted model and a tower model, as shown in Figure 7.

Figure 7. The c3000 enclosure is available in a rack mounted model and a tower model.



Once the blade workstations are installed, they can be allocated to local or remote users. A single data center can support users at multiple sites, as shown in Figure 8, providing a high degree of flexibility and ensuring optimal use of blade workstation resources.

Figure 8. The blade workstations in the data center can be allocated to users at multiple sites.



HP Session Allocation Manager

HP Session Allocation Manager (SAM) can be used to optimize your HP Blade Workstation Solution deployment by automatically provisioning the blade workstation resources to your users. HP SAM provides the following capabilities with the blade workstation solution:

- **Static and dynamic resource assignments**—HP SAM supports two types of resource assignments:
 - **Static resources**—With static resources, a user and the user's client computer are connected to a pre-defined set of remote computing resources, even when the user changes location.
 - **Dynamic resources**—With dynamic resources, users are assigned remote computing resources from a pool of available computing resources.

These two types of resource assignments provide significant flexibility in meeting the needs of your users.

- **Single log in**—HP SAM simplifies the user experience by allowing the user to log in just once, even if the user is connecting to multiple blade workstations. Furthermore, with a multi-monitor client computer, HP SAM will automatically position the user's windows on the monitors connected to the client computer based on pre-configured information. The net result is that logging into the blade workstation solution is as simple as logging into a single workstation.
- **Follow-me roaming**—This feature enables users to move to a different location, and automatically reconnect to the computing resources they used previously. In doing so, HP SAM automatically adapts to different monitor configurations. For example, let's assume that a user has four monitors in the office, each displaying the frame buffer from a different blade workstation. If the user relocates to home, where there is only one monitor, HP SAM will reconnect to the live sessions on

the same four blade workstations as before, but will stack the four frame buffer windows onto the single monitor for viewing. HP RGS can then be used to cycle between each of the four windows.

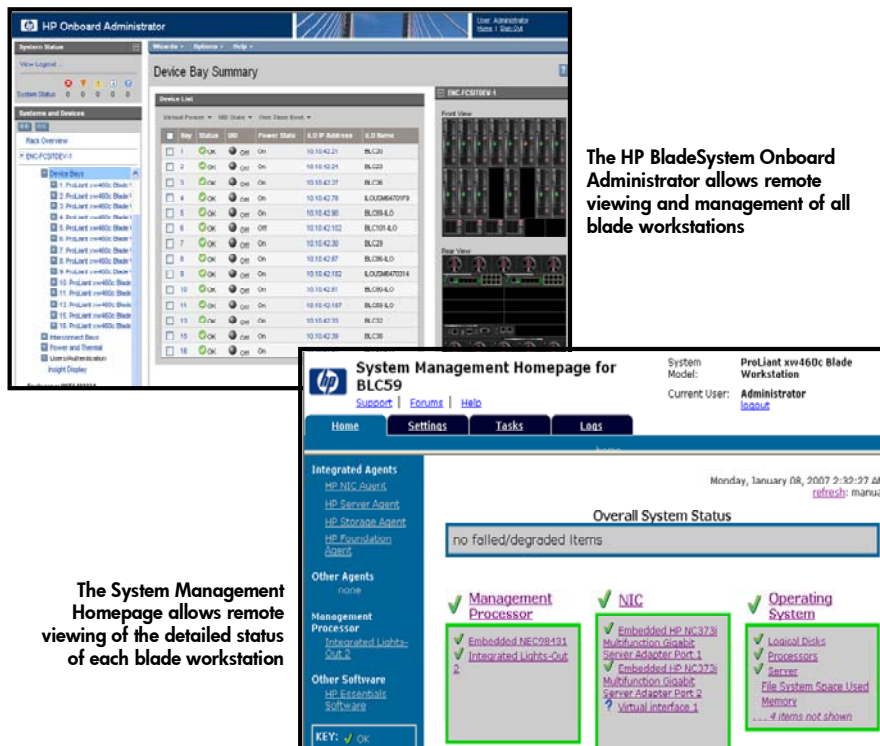
- **Automatic failover**—HP SAM can be configured so that if a blade workstation fails, another blade workstation will be automatically assigned to the task performed by the failed unit. This feature works for both static and dynamic connections, maximizing the uptime of the blade workstation solution and the user's productivity.
- **Automatic client aggregation**—The blade workstation solution allows multiple client computers to be aggregated together to form a single virtual client device, operated by a single keyboard and mouse. HP SAM can be configured to perform client aggregation automatically, while ensuring that each client computer connects to its pre-configured set of blade workstations.
- **Ease of administration**—HP SAM provides a web interface that allows all parameters of HP SAM operation to be easily monitored and changed from a central location. This is much more efficient than configuring the blade workstation solution by separately logging into each solution component.

For more information on HP SAM, visit www.hp.com/go/sam.

Management capabilities

The HP Blade Workstation Solution contains extensive built-in management capabilities, most of which are accessible over the network. For example, as shown in Figure 4, the blade workstation contains the iLO 2 management processor, which provides an independent means of monitoring and controlling each blade. Furthermore, the blade enclosure contains the HP BladeSystem Onboard Administrator, which allows IT personnel to collectively monitor and manage all of the blades in an enclosure, such as viewing the operating status of each blade. Figure 9 shows two sample management screens for the blade workstation solution.

Figure 9. HP's blade workstations provide industry-leading remote management capabilities.

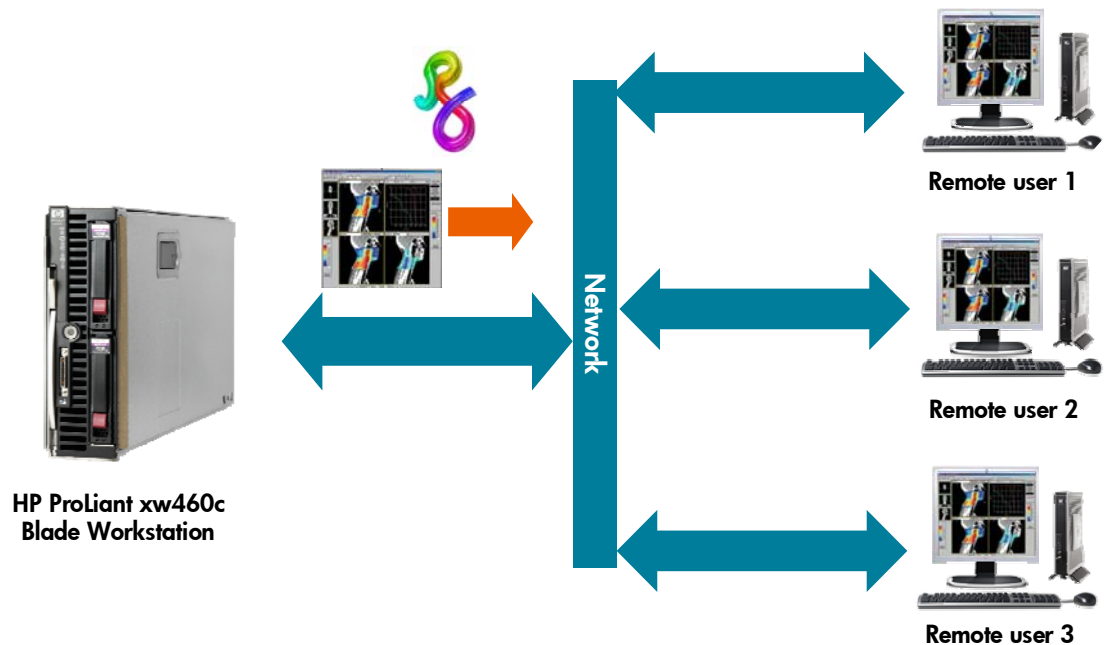


The blade workstation remote management capabilities are critical to providing superior uptime and reducing IT costs by allowing support personnel to quickly detect, diagnose, and resolve problems. For example, if a user experiences a blade failure, IT personnel can quickly and remotely assign a new blade workstation to the user from a spare pool, reducing the user's total downtime to minutes.

Additional HP RGS capabilities

HP RGS is more than just a mechanism for sending the blade workstation's desktop image to the client access device—it is a full-function, real-time collaboration tool. In Figure 10, the desktop image is shared with three remote users, all of whom can interact with the same application running on the blade workstation.

Figure 10. HP RGS can be used in a collaborative environment to share the desktop with remote users, all of whom can view and interact with the same application running on the blade workstation.



The HP Blade Workstation Solution ensures that your application data never leaves the data center—only the desktop image is exported to the users via HP RGS. Furthermore, the pixels in the desktop image are encrypted for added security. The interactivity and security provided by HP RGS make it ideal for uses such as:

- **Financial trading**—stream video, market data, and financial trading applications from multiple workstations to a multi-display trading desk, remote office, or disaster recovery site.
- **Natural resource exploration**—visualize large datasets from remote access points.
- **Classified research and defense**—enable highly-secure, high-performance access to sensitive data and applications.
- **Command and control centers**—enable a highly-secure, continuous-operation environment by providing multi-location access to blade workstation resources located in redundant data centers.
- **Mobile professionals**—enable professionals to efficiently work locally or remotely so they can live where they choose and work conveniently through an Internet connection.
- **Scientific research and visualization**—interact with high-performance compute and visualization simulations from an office and collaborate with colleagues in real-time.
- **Support**—provide application support to end users by connecting to existing user sessions with system administrator rights to troubleshoot and resolve issues.
- **Classroom training**—share live training sessions with one or many students at local or remote campuses.

A real-life example: Deployment of HP blade workstations in the finance industry

HP blade workstations have been deployed at a number of firms in the finance industry, specifically for use on the trading floor. In a detailed follow-up study, the measured benefits included:

- Trader productivity was increased by 68%.
- IT productivity was increased by 32%.
- Disaster recovery and contingency planning were significantly simplified.
- Deployment and installation of blade workstations was simpler and more trouble-free than installing individual workstations.
- The trading floor work environment was markedly improved—less noise, heat, and clutter.
- Traders were more easily able to work remotely.

For a copy of this study, *Blade Workstations in the Securities Industry—An ROI Study*, see h71028.www7.hp.com/ERC/downloads/c00834884.pdf.

Benefits of the HP Blade Workstation Solution

Summarized below are the benefits of the HP Blade Workstation Solution, and how these benefits are provided.

1. **Benefit:** Improved uptime and business continuity.

How provided: The HP Blade Workstation Solution maximizes uptime by providing a number of fault-tolerant features such as redundant network switches, RAID, error correcting memory, and hot-swappable power supplies. Furthermore, HP's advanced management features enable quick detection and correction of hardware problems. In the event of a blade workstation failure, another blade workstation can be rapidly provisioned to the end user. Business continuity can be further optimized by employing a distributed data center strategy, and routing activity to a fallback data center if the primary data center experiences problems.

2. **Benefit:** Enhanced data security for your company-critical data.

How provided: With the HP Blade Workstation Solution, your sensitive data is locked in the data center—only the encrypted desktop image is exported to the users via HP RGS. In addition, HP's blade workstation client contains no removable storage media, further protecting your data.

3. **Benefit:** Reduced IT costs.

How provided: HP's innovative blade workstation solution reduces IT costs in a number of ways, including:

- By centralizing your workstation resources, support personnel will be able to more easily manage and support your workstations.
- HP's leading-edge blade workstation management tools enable support personnel to quickly detect, diagnose, and resolve problems.
- If a blade workstation goes down, IT can quickly provision another blade workstation to the user without needing to physically visit the user.

4. **Benefit:** Reduced noise, heat, and clutter.

How provided: Moving your workstations into the data center will eliminate the noise, heat, and clutter associated with having workstations distributed about in an office environment, providing your users with a much friendlier work environment.

5. **Benefit:** Simplified load balancing of the workstation demands within your organization.

How provided: The flexibility to quickly re-assign workstation resources is often necessary, ranging from a situation where a single user's workstation goes down to a situation where many workstations need to be re-allocated to handle computationally-intensive task such as a computer simulation. With the HP Blade Workstation Solution, reassigning workstation resources can be done remotely and without needing to physically move any equipment or wires. Incorporation of HP Session Allocation Manager provides additional capabilities to load-balance your workstations and respond quickly to new requirements.

6. **Benefit:** Support for users working locally or remotely.

How provided: Because of the performance provided by HP RGS, users are able to work locally or remotely with comparable efficiency.

7. **Benefit:** The ability for teams to securely collaborate from remote locations while allowing the owner of the data to retain complete control of it.

How provided: With HP RGS, the desktop image from the blade workstation can be sent to multiple users, allowing them to view and interact with the same applications. In doing this, the application data remains securely on the blade workstation.

Conclusion

The HP Blade Workstation Solution is an industry-leading workstation infrastructure that delivers many important benefits compared to distributed workstations, including improved uptime/business continuity, enhanced data security, and reduced IT costs. The solution also provides improved user comfort, better resource utilization, ease of working remotely, and real-time, remote collaboration between individuals and teams. The HP Blade Workstation Solution, 5+ years in the making, is the only solution of its kind, and has successfully proven itself in very demanding environments, including on the financial trading floor.

For more information

For more information on the HP Blade Workstation Solution, visit the blade workstation solution home page at www.hp.com/go/bladeworkstation. A number of papers on the blade workstation solution are located under the **Learn more** tab. For further information on the following products, visit the websites listed:

HP ProLiant xw460c Blade Workstation: www.hp.com/support/xw460c_manuals

HP dc73 Blade Workstation Client: www.hp.com/support/dc73_manuals

HP Remote Graphics Software: www.hp.com/support/rgs_manuals

Certain Windows Vista product features require advanced or additional hardware. See www.microsoft.com/windowsvista/getready/hardwarereqs.msp and www.microsoft.com/windowsvista/getready/capable.msp for details. Windows Vista Upgrade Advisor can help you determine which features of Windows Vista will run on your computer. To download the tool, visit www.windowsvista.com/upgradeadvisor. Windows Vista Business disk also included for future upgrade if desired.

¹ 64-bit computing on Intel architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers and applications enabled for Intel 64 architecture. Processors will not operate (including 32-bit operation) without an Intel 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software. Quad-Core and Dual Core are new technologies designed to improve performance of multithreaded software products and hardware-aware multitasking operating systems and may require appropriate operating system software for full benefits. Not all customers or software applications will necessarily benefit from use of these technologies.

² To qualify for this downgrade an end user must be a business (including governmental or educational institutions) and is expected to order at least 25 customer systems with the same custom image.

³ Dual Channel is only supported when the system is configured with DDR2 symmetric memory (i.e. 2 x 256).

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