ISS Technology Update

Volume 6, Number 9

Keeping you informed of the latest ISS technology

I/O configuration for the HP ProLiant xw460c Blade Workstation

About the workstation

The HP ProLiant xw460c Blade Workstation (Figure 1-1) is a data center workstation that offers data center security, manageability, and remote multi-location access flexibility—all with a workstation-class user experience. With dual-core and quad-core Intel® Xeon™ processors and features similar to desktop workstations, the dual-processor-capable HP ProLiant xw460c combines power-efficient, high-density computing with expanded memory for maximum performance.

Figure 1-1. HP ProLiant xw460c Blade Workstation

Graphics traffic to remote workstations

The question has been asked, how is graphics data transmitted from the HP ProLiant xw460 Blade Workstation to remote workstations? Users may assume that since it is in a mezzanine slot, the graphics data goes to interconnect bays 3 and 4. However, there is no connection between the graphics mezzanine card and the interconnect slots; all output of the graphics card is captured by Remote Graphics Software (RGS) and sent over the network. The integrated NICs are routed to interconnect bays 1 and 2, the same as with the BL460c and BL465c half-height server blades.

Graphics output also depends on the remote console mode:

- Setup mode — Both the NVIDIA controller and embedded ATI controller are enabled, but the ATI is primary. In this mode, graphical console redirection through the iLO is possible.

NOTE

On initial boot, one must access BIOS under system options to set the remote console to Setup mode. To do so, reboot, press **F9** into BIOS, and then select **System Settings -> Remote Console Mode -> Setup**.

- Admin mode — Only the ATI controller is enabled, and the NVIDIA is disabled. In this mode, graphical console redirection through iLO is possible.
- User mode (normal use) — The NVIDIA controller is enabled and the embedded ATI controller is disabled. In this mode, graphical console redirection through iLO is NOT possible. A blinking cursor at the left top corner is the only thing visible from the system console and iLO console redirection is rendered unavailable due to a dependence on the ATI controller.

  At this point, the Workstation blade needs to be connected with an RGS receiver through the network. The graphics content is compressed and sent to the receiver over this network connection. One receiver can connect to multiple senders, or one sender can send to many receivers for session sharing.

Mixed configuration

The most common configuration question is this: can the HP ProLiant xw460 Blade Workstation be implemented with other devices (such as an InfiniBand or Fibre channel device in mezzanine 2)? The Workstation blade is designed for both flexibility and compatibility; it will work in harmony with all other HP BladeSystem products. Furthermore, Workstation blades, server blade, and storage blades can be housed in the same chassis without impacting operability of the server or storage blade.

NOTE

At this time, the Workstation blade does not support the entire ProLiant BladeSystem family. Further testing is required.

Future plans

There are future plans for the HP ProLiant xw460c Blade Workstation to support SB40c, PCI blades, tape blades, and shared storage blades. With the release of RGS 5.0, support of Insight Control Environment for BladeSystems has been added to the Blade Workstation's capabilities.

Additional resources

For additional information on the topics discussed in this article, visit the following links:

Resource	URL
HP ProLiant xw460c Blade Workstation QuickSpecs	http://h18000.www1.hp.com/products/quickspecs/12680_na/12680_na.PDF
HP ProLiant xw460c Blade Workstation - Business Support Center	http://h20000.www2.hp.com/bizsupport/TechSupport/Home.jsp?lang=en&cc=us&prodClassId=-1&prodTypeId=12454&prodSeriesId=3355016

Future of PCI-X slots in ProLiant servers

PCI Express (PCIe) is now becoming the predominant I/O bus for new server platforms. HP will continue, however, to provide legacy support for the different levels of PCI, including PCI-X. HP has introduced PCIe technology into ProLiant servers to coexist with PCI-X 133, allowing ProLiant server customers to install new higher bandwidth cards (for example, dual 4-Gb Fibre Channel, x4 InfiniBand, and 10-Gb Ethernet) using PCIe technology. At the same time, the continued commitment from HP to PCI-X allows ProLiant server customers to connect to their existing I/O cards.

Current ProLiant ML servers have a mix of PCI-X and PCIe slots, while ProLiant DL servers have optional riser boards to provide different combinations of PCI-X and PCIe slots. Table 2-1 shows the current ProLiant server models and their support for PCI-X.

Next generation ProLiant servers will no longer feature PCI-X slots as standard offerings. However, PCI-X will continue to be supported on these servers through the use of the appropriate optional riser boards.

For the latest information, go to www.hp.com/go/proliant and check the QuickSpecs for a specific server.

Table 2-1. Number of PCI-X slots in ProLiant DL and ML servers

Server series	Server model	Standard	Optional	Total
ML 300	ML 310 G4	2	0	2
	ML 350 G5	3	2	5
	ML 370 G5	2	0	2
ML 500	ML 570 G4	4	0	4
DL 100	DL 140 G3	0	2	3
	DL 145 G3	0	1	1
DL 300	DL 320 G5	0	1	1
	DL 380 G5	0	2	2
	DL 385 G2	0	2	2
DL 500	DL 580 G5	0	3	3
	DL 580 G4	1	2	3
	DL 585 G2	2	0	2

Customers requiring peripheral bandwidth in excess of 1 GB/s will most likely find those peripherals implemented with PCIe technology. It is expected that most device manufacturers will use PCIe technology for higher bandwidth peripheral devices such as 10-Gb Ethernet. For peripherals that require bandwidth less than 1 GB/s, PCI and PCI-X remain viable technologies

and continue to provide backward compatibility, although it is expected that almost all future discrete I/O devices, regardless of their bandwidth requirements, will be developed to the PCIe standard.

HP has been a leader in the development and implementation of industry-standard I/O technology and continues to be a core member of the PCI Special Interest Group. HP is committed to delivering industry-leading products that meet customer requirements for flexibility, performance, and investment protection.

Port monitoring in Virtual Connect for the c-Class BladeSystem

The ability to monitor Ethernet settings (port monitoring) is available in a free Virtual Connect (VC) firmware update. This feature is available to users with server and network administrator privileges. All other users will have read-only access. To use port monitoring, all modules within the domain must be using Virtual Connect Manager 1.20a[1] or higher.
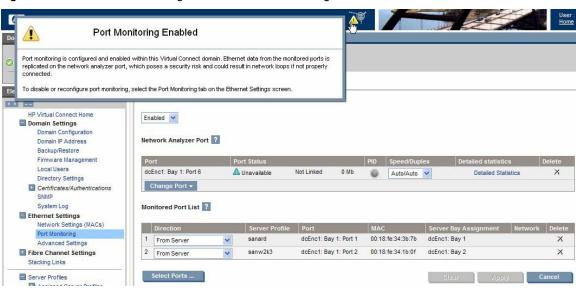
There are two steps to monitoring an Ethernet port.

1. Configure Virtual Connect to mirror to the desired server NIC traffic to an "analyzer" port (available in 1.20a and higher)

2. Connect a network sniffer or analyzer to the analyzer port

Port monitoring allows an administrator to duplicate the network traffic over a set of server ports and send it to an unused uplink port for the purpose of monitoring or debugging network traffic.

- Any unused port on a VC-Ethernet module can be specified as the port monitoring port (one per enclosure).
- Any server Network Interface card's ingress or egress (or both) traffic can be mirrored to that port.

Administrators can access port monitoring through the Virtual Connect Manager over the same Ethernet connection used to access the HP Onboard Administrator and iLO connections (Figure 3-1).

Figure 3-1. Virtual Connect Manager screen for Ethernet settings

---

When port monitoring is enabled, a warning icon appears on the Virtual Connect Manager page, as shown in Figure 3-1.

If port monitoring is configured and enabled within the Virtual Connect domain, Ethernet data from the monitored ports is replicated on the network analyzer port, for that reason it is important to verify the Network Analyzer is set up properly to avoid passing traffic back onto the network.

Up to 16 ports can be monitored, which are chosen from the Select Monitored Ports screen in Virtual Connect, as shown in Figure 3-2.

Figure 3-2. Select Monitored Ports screen in Virtual Connect

To capture Local Area Network (LAN) traffic for a monitored port, a program that monitors data traveling over the network, typically referred to as a network sniffer (such as WireShark, www.wireshark.org) is also required. A network sniffer captures every Ethernet frame it sees and displays it on a screen. It is up to an administrator to create filters to look for specific patterns within that traffic. Instead of using a sniffer program, a network analyzer could be used, which is a piece of hardware specifically dedicated to this function

Detailed instructions about using Port Monitoring can be found in the "HP Virtual Connect for c-Class BladeSystem User Guide" at http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00865618/c00865618.pdf.

Licensing ports on the Brocade 4/12 SAN Switch for HP c-Class BladeSystem

The Brocade 4/12 SAN Switch for HP c-Class BladeSystem is provided with 12 port licenses, two of which are pre-reserved for external ports. This article focuses on port licensing as it relates to the many questions that HP representatives encounter at technical events. Here are two such questions:

- Can more than 8 servers be licensed with each Brocade 4/12 SAN switch (Figure 4-1) at the expense of external ports (for example, 10 server ports and 2 external ports)?
- Are there any rules determining which bay's ports get licensed (for example, only servers in bays 1 through 8), or can one manually assign licenses to any server port in the enclosure, regardless of bay number?

Figure 4-1. Brocade 4GB SAN switch*

* This illustration shows 4 SFPs. However, out-of-the-box the Brocade 4/12 SAN switch has 2 SFPs in the left-most slots.

We'll share what we know about these licensing questions from both a practical field perspective and a product feature vantage point.

Quick answers

In addressing the first question, the proposed scenario is permitted. The only requirement is to maintain at least one licensed external port. However, if the configuration contains two HP c-Class Brocade 4/12 SAN Switches side-by-side in a dual path configuration, the servers on the top of the enclosure should use Host Bus Adapter (HBA) port 1 and servers on the bottom should use port 2. This will split the load between the two paths.

As for the second question, licenses are granted on a first-request basis; any of the 16 internal ports can request and be granted a license. It is possible to turn off dynamic license allocation in the Fabric OS (FOS) and assign licenses manually if desired, as described in the Command Line Interface (CLI) guide for Brocade FOS. Ultimately, licensing is not dependent on bay numbers.

NOTE
If more than 11 servers are plugged into the Blade System, all the ports can be automatically assigned to internal servers with no external connections.

About port management

In the past, Ports On Demand (POD) functionality was static. A preset group of ports was individually enabled per each POD license. In contrast, the new Dynamic Ports On Demand (DPOD) feature does not require predefined port assignment. Port assignment is determined by the discovery of active HBA ports, but is limited to the quantity of purchased ports.

If DPOD has been turned off, simply use the licensePort command to initiate it.

Dynamic licensing

Today, the concept of dynamic licensing is really quite flexible, enabling users to license any port and move licenses around from port to port. In fact, they can allocate a license to a port, and then later de-allocate that license, putting it back in the pool of available licenses.

A 12-port switch has 24 physical connections, but a maximum of 12 can be used at any given time. Licenses can be pre-reserved for any port. Two external ports are pre-reserved as an out-of-box default, leaving 10 available for dynamic port assignment. Customers are allowed to change this assignment ratio if desired (1:11 or 3:9 for example).

If DPOD is enabled, ports are assigned as activity is detected. Removing a connection does not de-allocate the port—this allows maintenance removal and replacement without the license being given away to another port. As such, license persistence can sometimes exhaust the pool of licenses. For instance, moving a server with an HBA across four server bays will result in licenses being allocated to all four of those bays. Users are advised to occasionally review license assignments made by DPOD to free up unneeded license associations; this will return them to the available license pool.

Brocade Access Gateway feature

Users might also wonder if a license is required to enable the Brocade Access Gateway feature. Since this is a feature of the FOS that is user-enabled through Brocade Web Tools or the Brocade CLI, no additional license is required. The number of port licenses is still controlled by the switch's number of DPOD licenses.

Summary

Flexibility is the hallmark of port licensing; it can be assigned automatically or manually. The DPOD feature simplifies port management:

- Automatically detects HBA connected server ports or cabled ports
- Automatically enables ports
- Automatically assigns port licenses

Additional resources

For additional information on the topics discussed in this article, visit the following links:

Resource	URL
Brocade 4Gb SAN Switch for HP c-Class BladeSystem – user guide and other reference manuals	http://h20000.www2.hp.com/bizsupport/TechSupport/DocumentIndex.jsp?contentType=SupportManual&lang=en&cc=us&docIndexId=64179&taskId=101&prodTypeId=12169&prodSeriesId=3185340
HP Brocade 4/12 SAN Switch – QuickSpecs	http://h18006.www1.hp.com/products/quickspecs/12480_na/12480_na.html
Brocade 4Gb SAN Switch for HP c-Class BladeSystem – overview & features	http://h18004.www1.hp.com/storage/saninfrastructure/switches/b4gbsscblade/index.html?jumpid=reg_R1002_USEN

Frequently asked questions regarding the adoption of HP VDI

This is the second in a series of several newsletter articles about HP Virtual Desktop Infrastructure (VDI), in which we will continue to address more of the frequently asked questions (FAQs) that our technical staff receives. It is our goal to share these answers publicly as the HP knowledge base for VDI environments keeps expanding.

This set of FAQs includes, but is not limited to, the following VDI-related topics:

- What happens if you use sound? (see Question #1)
- A success story to tell your customers or stakeholders (see Question #2)
- The scoop about connection brokers (see Questions #3 and #4)
- Multi-monitor support (see Question #5)

To read the first article in this series that includes a brief introduction to VDI technology, go to http://h20000.www2.hp.com/bc/docs/support/SupportManual/c01278462/c01278462.pdf.

FAQs

Question #1_____

Q. Is it possible to use sound in a VDI environment?

A. Yes. You may run sound in a VDI environment. Depending on the display protocol, however, the quality of sound may vary. For example, with Microsoft Remote Desktop Protocol (MS RDP), the sound is unidirectional, but functional in most circumstances. You would not want to record audio over the protocol, yet a user could certainly listen to an audio podcast without resulting in obvious degradation of sound quality.

Question #2_____

Q. Are there any VDI success stories available?

A. Yes. HP has perhaps the biggest success story in the industry regarding the practical application of VDI technology. Collier County Schools in Collier County, Florida, has a very large implementation based on HP p-Class and c-Class server blades, and they have been successfully running their VDI environment for over a year. A video of this success story is available at www.hp.com/go/vdi. You can check this website for regular updates of success stories, demos, and other general information about VDI.

Question #3_____

Q. Is it required to use a connection broker in a VDI environment?

A. No. Many customers implement VDI without using a connection broker. The ability to hand an end user a dedicated resource may make sense in smaller environments, developer environments, and in Business-to-Business (B2B) connections. As the environment grows and becomes more complex, the disadvantages may then be more pronounced in a non-brokered environment. Items such as centralized management are invariably compromised when a connection broker is absent in large environments. Connection tracking (the ability of a connection broker to decipher whether a discreet connection is active and functioning) also becomes more critical as the implementation grows. Insuring that an end user always has a resource is a benefit of connection-brokered environments that is not easy to attain in a non-brokered environment. Finally, a connection broker provides a "big picture" overview of the utilization of the VDI environment.

Question #4_____

Q. What connection brokers does HP recommend?

A. Ultimately, HP leaves connection broker selection up to its customers. However, we do have partnerships, and where it makes sense, HP can offer a broad range of choices based on customer needs. These choices are quickly becoming the standard in proof-of-concept implementations. Provision Networks, HP Session Allocation Manager (SAM), and VMware's upcoming Virtual Desktop Manager are all available from HP for VDI support—and in some cases (Provision Networks and SAM), the same connection brokers also support other technologies, such as Consolidated Client Infrastructure (CCI) and HP Workstation Blades. For software quotes from third-party vendors, such as Provision Networks, call HP Software and Licensing Management Solutions toll-free line at 1-800-597-4622, or access one of the URLs listed below in "Additional resources."

Question #5_____

Q. Does VDI support multi-monitor deployments to the end user?

A. VDI supports monitor spanning rather than true multi-monitor deployment. The main differences are as follows:

- **Multi-monitor** capability allows end users to maximize an application in one window while leaving another monitor completely available for work.
- **Monitor spanning** allows a single desktop to be spread across two or more physical display devices, with non-maximized applications displaying separately on each monitor.

VDI using HP Remote Graphics Software PC (RGS-PC) edition supports monitor spanning with a cumulative resolution of 3840x1200. This allows for up to two spanned monitors, as long as the access device supports such a configuration.

Question #6_____

Q. How much memory should be installed in a system that will be a VDI host?

A. Much like consolidation from virtualization, VDI does not have strict rules about how much memory to use; however, there are excellent guidelines that will greatly increase the chances of a successful deployment. With regards to memory, more is better only to a point. VMware supports up to 64 GB on a single server and up to 16 GB on a single VM. A better rule of thumb than loading every system with 64 GB of memory is to follow a ratio of 4 GB of memory for every processing core on a system when the virtual machines are running Windows XP. An eight-core system, such as a DL585 G2 or BL480c with quad-core, would be outfitted with 32 GB of RAM; and a DL380 G5 with dual-core processors would be fine with 16 GB under most circumstances.

Question #7_____

Q. Where is user data stored in a VDI environment?

A. Administrators actually have a choice of where they can store end-user data in a VDI environment. It is possible, especially in non-brokered environments, to place user data within the virtual machine itself. This is very much like a traditional desktop model. For a more robust solution, end-user data should be redirected using Active Directory policies and, potentially, Roaming Profiles.

Question #8_____

Q. How are activities such as virus scans handled in a shared environment?

A. I/O-intensive activities (for example, full-system virus scans) create a huge impact on end users in a VDI environment. To counteract the effects of hundreds of individual virus scans launching simultaneously, some best practices should be followed:

- Run real-time virus scanning within the Virtual Machines (VM), but do not require a full-system scan to be done on the virtual machine itself.
- Redirect user data to Network Attached Storage (NAS) or other lower-cost, centralized storage solution, and run full-system scans on this device. Active Directory simplifies this process (see Question #7).
- Minimize user-write permissions to the VM. Many security risks operate at the access level of the end user. Reducing end-user permissions on the local disk drive also reduces the damage potential of a user-level threat.

Question #9_____

Q. What operating systems are acceptable for the end user to connect to in a VDI environment?

A. The buying market points to what is most popular, but operating system choice really depends on the connection broker, the connection protocol, and the expected return on investment.

- **Windows XP Professional** is the desired OS for VDI implementations. This operating system is supported on all popular display protocols (Virtual Network Computing (VNC), RGS-PC, and MS RDP and fulfills recommendations made by multiple vendors as far as sizing and management. There are few known limitations with Windows XP, and support is currently available.
- **Linux** is supported by VNC and some open source protocols. Connection broker support appears to be nominal for Linux operating systems in a desktop VM as well.
- **Windows Vista** is supported by the latest versions of MS RDP and has sparked interest in VDI as a tool for desktop OS migrations from 2000/XP to Vista.

As with all VDI implementations, a proof of concept is recommended before proceeding, with special attention paid to sizing (scalability) and functionality.

Summary

Like any emerging technology, VDI presents certain challenges to which there are viable (and often preferred) solutions. The myriad of support services available from HP, along with website information (including success stories) and third-party-vendor resources, are meant to help address these issues. Our continuing series of articles on VDI-related FAQs is another source of useful explanations to common technical difficulties. Watch for the next article to find out more answers.

Additional resources

For additional information on the topics discussed in this article, visit the following links:

Resource	URL
HP VDI	www.hp.com/go/vdi
HP RGS PC trial site	http://h20293.www2.hp.com/portal/swdepot/displayProductInfo.do?productNumber=GN038AAT
HP RGS PC edition site	http://h20293.www2.hp.com/portal/swdepot/displayProductInfo.do?productNumber=GN038AA&jumpid=reg_R1002_USEN
HP Software Licensing & Management Solutions (SLMS)	www.hp.com/software/slms

ProLiant management tip of the month

Troubleshooting HP SIM connections

Frequently troubleshooting why a system is unable to launch a tool or why clicking the hardware status icon does not launch the System Management Homepage boils down to answering the dual question, "What services are running on the target? and has HP SIM discovered them?" Sure, it's possible to visit each system's information page in HP SIM, and then expand the "Product Description" to look at the protocols, but that can be a time-consuming process for a lot of systems (see Figure 5-1). You may even have visited the Reports section to see if you can generate a report on each system and the protocols discovered only to be disappointed.

Figure 5-1. Product description

Product Description	
Product Number	404664-B21
System Type	Server
System Subtype	Blade, HP BladeSystem c-Class, Virtual Machine Host
Product Model	ProLiant BL460c G1
Hardware Description	Linux esxserver2.bladesystem.net 2.4.21-37.0.2.ELvmnix #1 Mon Sep 25 22:18:34 PDT 2006 i686
OS Name	Linux - VMware ESX Server
OS For Tool Filtering	LINUX
OS Description	Kernel Release: 2.4.21-37.0.2.ELvmnix
OS Version	3
Management Protocols	HTTP:, SMH:2.0, SNMP:1.0, SSH:SSH-2.0-OpenSSH_3.6.1p2

Well, the good news is that you actually can do what you want, but not in the way you expected. A little known fact about HP SIM collections is that when you create a collection using attributes specified by you, those attributes become available for display as columns in the table view. Therefore, if you were to create a new collection and specify "Management Protocol" with all of the possible options, you would get a collection definition that would look like Figure 5-2.

Figure 5-2. Table view

Once you display the collection, you can click the **[Customize…]** link to the upper right of the table and hide columns that do not need to be displayed for this purpose such as the non-hardware status columns, system type, and so forth. You will then have a table that looks like Figure 5-3.

The first thing you might notice is that there are two columns with the simple heading 'label.' This is because the entries would be longer than HP SIM would allow. The first one would correspond to "WS-Management" and the second to "Systems Management Home Page." Other than that, the list is self-explanatory and it provides a truth table of sorts that lets you see exactly what protocols HP SIM has been able to identify on a target. This can be a very effective tool in fine-tuning your HP SIM infrastructure and remediating the managed targets.

Figure 5-3. Non-hardware status

View as: [table ▼]   Customize...

☐ Select "Protocols" itself

Summary: ❌ 3 Critical   ▼ 5 Major   ⚠ 3 Minor   ✅ 17 Normal   ▨ 2 Disabled   ❓ 0 Unknown   Total: 30

☐	HS	System Name ↑	Product Name	label	WBEM	label	HTTP	DMI	SNMP	SSH
☐	▼	192.168.1.101 in Server windemo3	Remote Insight Lights-...	No	No		No	No	Yes	No
☐	▨	192.168.1.104 in Encl. C-Class	Server Enclosure	No	No	2.0	Yes	No	Yes	Yes
☐	❌	bladesystemdc Hosted by virtualserver	Virtual Machine	No	Yes		No	No	Yes	Yes
☐	▼	blmaster	ProLiant DL360 G4	No	Yes	2.0	Yes	No	Yes	Yes
☐	▼	esxserver1 in Encl. C-Class	ProLiant BL460c G1	No	No	2.0	Yes	No	Yes	Yes
☐	⚠	esxserver2 in Encl. C-Class	ProLiant BL460c G1	No	No	2.0	Yes	No	Yes	Yes
☐	✅	hp	HP ProCurve Switch 252...	No	No		No	No	Yes	No
☐	✅	ilo-blmaster in Server blmaster	Integrated Lights-Out ...	No	No		No	No	No	Yes
☐	✅	ilo-slotc1 in Server esxserver1	Integrated Lights-Out ...	Yes	No		No	No	No	Yes
☐	✅	ilo-slotc10 in Server 192.168.1.104_10-FRONT	Integrated Lights-Out ...	Yes	No		No	No	No	Yes
☐	✅	ilo-slotc2 in Server esxserver2	Integrated Lights-Out ...	Yes	No		No	No	No	Yes
☐	✅	ilo-slotc3 in Server virtualserver	Integrated Lights-Out ...	Yes	No		No	No	No	Yes
☐	✅	ilo-slotc4 in Server tuxdemo1	Integrated Lights-Out ...	Yes	No		No	No	No	Yes
☐	✅	ilo-slotc5 in Server windemo1	Integrated Lights-Out ...	Yes	No		No	No	No	Yes
☐	✅	ilo-slotc9	Integrated Lights-Out...	Yes	No		No	No	No	Yes

[Save As Collection...] [Delete] [Print]

Recently published industry standard server technology communications

Title	URL
The AMD processor roadmap for industry-standard servers – Technology Brief	http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00428708/c00428708.pdf
Critical factors in intra-rack power distribution planning for high-density systems – Technology Brief Podcast	http://h10068.www1.hp.com/blogpost/Podcast/Server_IntraRack.mp3
High-Density Server Deployment Demonstration: Power and Cooling Considerations – Video	http://h18004.www1.hp.com/products/servers/technology/whitepapers/datacenter.html#power
Implementing Microsoft Windows Server Virtualization CTP release on HP ProLiant servers – Integration Note	http://h20000.www2.hp.com/bc/docs/support/SupportManual/c01286554/c01286554.pdf
Power basics for IT professionals – Technology Brief	http://h20000.www2.hp.com/bc/docs/support/SupportManual/c01234421/c01234421.pdf
Technologies for HP ProLiant 300-series servers – Technology Brief	http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00502616/c00502616.pdf

Industry standard server technical communications can be found at www.hp.com/servers/technology.

Contact us

Send comments about this newsletter to TechCom@HP.com.