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## Pano Express for SMB Architecture Redbook

Virtualized Desktops running a standard Windows operating system but hosted on centralized servers promises to radically reduce the ever-increasing drain on IT resources from deploying and supporting desktop computing. Pano Logic® is the first company to offer a complete, purpose-built solution for full native Windows® virtual desktops, combining a unique zero client endpoint with centralized management tools designed specifically for managing virtual desktops.

While many Pano Logic customers choose to configure and purchase server/storage infrastructure on their own, Pano Logic also provides Pano Express solutions to speed and simplify virtual desktop deployments. By providing a complete, rightsized, and preconfigured infrastructure, Pano Express helps you deploy virtual desktops with fewer IT resources and less time by eliminating many planning, configuration and installation steps.

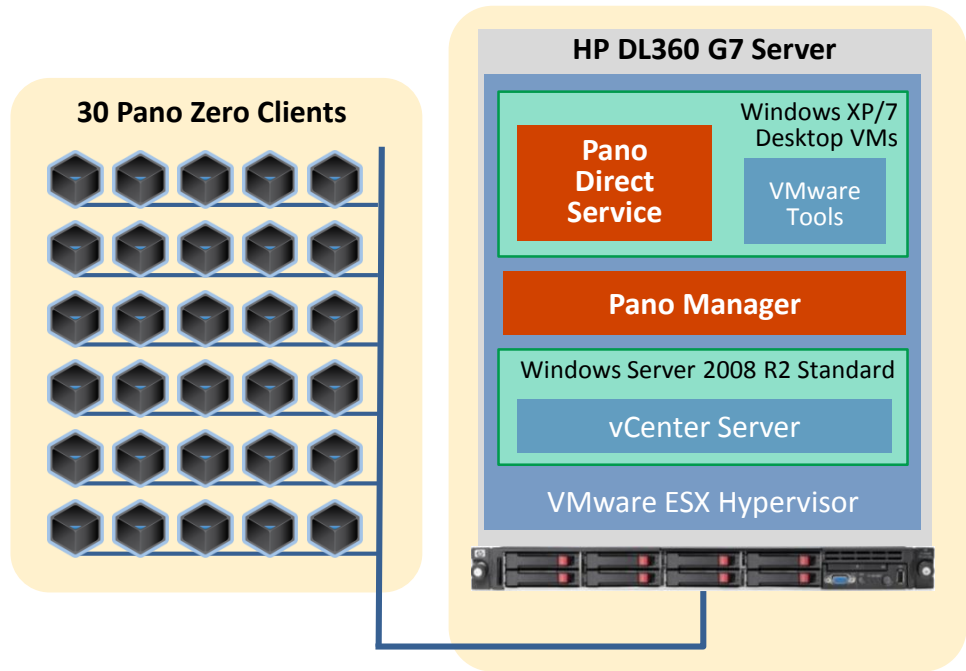
This redbook provides a detailed overview of Pano Express for SMB and for Education solution including server and storage hardware, VMware and Pano System configuration, followed by a detailed parts list. It provides sufficient detail on the Pano Express components to allow an equivalent Pano Zero Client solution to be configured by a knowledgeable Pano Logic channel partner, but with different hardware or software components.

Pano Logic redbooks assume readers have good familiarity with both their virtualization platform's operation and with the basic structure and operation of the Pano System. They are not intended to replace your platform vendor's documentation or the Pano Logic online help. This redbook is supplemented by the *Deployment Architecture Overview Redbook*, which provides more general deployment planning and sizing guidance, and the *Remote Deployments Redbook*, which provides more detailed information on network planning, sizing and troubleshooting.

This document describes the architecture for a standard 30-seat Pano Express for SMB deployment. Because it shares identical components and configuration, this same material applies to the Pano Express for Education solution.

**Figure 1:**

Architecture for 30-seat Pano Express for SMB/Education deployments



The general architecture for Pano Express for SMB (and Pano Express for Education) consists of a single server configured with VMware vSphere Essentials and Pano System 4.5, linked over the customer's 100 Mbps – 1 Gbps LAN to up to 30 Pano Zero Clients.

## Hardware Architecture

### SERVER ARCHITECTURE

Pano Express for SMB is deployed on a single HP server with the following components:

- 1U HP DL360 G7 chassis with eight 2.5" drive slots and no optical drive – this choice of chassis minimizes the rack space needed and provides enough drive slots to meet the server's IOPS requirements.
- Dual six-core E5645 Westmere CPUs for a total of 12 hyper-threaded cores.
- 72 GB ECC UDIMM unbuffered RAM configured symmetrically for both processors sharing a total of:
  - Six 4 GB UDIMMs for a total of 24 GB
  - Six 8 GB UDIMMs for a total of 48 GB
- Internal direct-attached storage system consisting of:
  - HP P-Series RAID Controller with 512MB Cache and Battery Backup
  - Seven internal 146 GB 15K rpm 2.5" SAS hard drives
- Dual redundant 460 watt power supplies – the server is able to operate on a single power supply if necessary.
- Internal USB Flash drive holding an 8 GB SD card, set as the boot device for the server (see below).

## STORAGE ARCHITECTURE

The server storage hardware is designed for a simple, cost-effective single-server deployment model that uses direct-attached internal storage rather than shared storage.

The internal storage uses a RAID controller to both improve performance and to provide a level of fault tolerance:

- The RAID controller features a battery backup and is configured for both read and write caching for optimum performance.
- The seven SAS hard drives are configured as a single RAID5 volume with 876 GB of available storage. RAID5 allows a single drive to fail without any loss of data and without the server's operation being interrupted.
- To meet the target DVM allocations the aggregate cold cache IOPS performance needs to be 1080.
- Inside the RAID5 volume, a single ESX datastore is configured to hold the system and desktop virtual machines.

To allow all of the internal drives to be used for desktop and system VMs, the server is set to boots off an internal USB flash drive that contains a 4 GB SD card. This card holds a boot image of VMware ESXi 4.0.

**Table 1: Summary of Hardware for a Pano Express for SMB/Education**

Component	Amount	Description
Pano Express for SMB/Education Server	1	Dual six-core Intel Westmere CPU and 72 GB RAM. Server hosts ESX hypervisor software, Windows DVMs, Pano Manager, and VMware DVM-management tools.
Storage – Direct-Attached, Internal to Server	Available Capacity: 0.8 TB	Allows 25 GB per DVM, one DVMs per user, plus 50 GB overhead for Pano Manager and vCenter VMs.
	IOPS: 1,080	From seven 15K RPM SAS drives in RAID5 volume as direct-attached storage internal to server.
Pano Zero Clients	30	Pano zero client endpoints, black finish, for deployment on customer LAN.
<b>Provided by customer:</b>		
Networking	1	1 Gbps/100 Mbps switch for edge network
	1-2	1 Gbps connections in the core network – the second connection is optional unless redundant switches are being used.

## Software Architecture

### VMWARE CONFIGURATION

Pano Express for SMB uses the very cost-effective VMware vSphere 4 Essentials package which includes the VMware ESXi hypervisor and VMware vCenter Server. vSphere Essentials is licensed for 3 hosts (maximum of 2 processors per host) and 192 GB vRAM entitlement, more than adequate for a 30-seat single server deployment.

Two system virtual machines (VMs) are run inside ESX to support Pano Manager and vCenter Server:

- vCenter is hosted inside a Windows Server 2008 R2 virtual machine.
- Pano Manager runs as a self-contained appliance inside a Linux-based VM.

Because the LAN IP address ranges will vary between customer sites, the Windows Server VM hosting vCenter Server is left set to use DHCP initially. During the setup process a static IP address should be manually applied to this VM.

The ESXi host hypervisor is also initially configured to use DHCP and should also have a static IP number manually applied during the setup process.

#### PANO SYSTEM CONFIGURATION

One instance of Pano Manager is included in the 30-seat Pano Express deployment. The Pano Manager VM is installed in the same datastore as vCenter's Windows Server VM and the desktop VMs.

As with vCenter's VM, Pano Manager is left set to use DHCP initially. During the setup process a static IP address should be applied to the Pano Manager VM.

## Appendix – Parts List

**Table 2: Parts List for 30 Seat Pano Express for SMB/Education**

Vendor	Description	Qty
HP	HPQ DL360R07 CTO CHASSIS (rack-mount chassis)	1
	HPQ E5645 2.4GHz-12MB Six-Core PROC DL360 G7 (CPUs)	2
	HPQ 4GB 2RX4 PC3-10600R-9 MEM KIT (24 GB/servers)	6
	HPQ 8GB 2RX8 PC3-10600R-9 MEM KIT (48 GB/server)	6
	HPQ 512MB P-SERIES BBWC UPG (RAID w/Battery Backup)	1
	HPQ 146GB 6G SAS 15K SFF DP HDD (2.5" SAS Drives)	7
	8 GB SD Flash drive for ESX boot image on internal USB port	1
	HPQ 460W CS HE HS POWER SUPPLY (Redundant PS's)	2
	HPQ DL360G6 SFF DH BACKPLANE KIT	1
Pano Logic	Pano System Package — North America (G2) — Black Finish	30
	Pano System Maintenance Subscription (1 Year)	30
VMware	VMware vSphere 4 Essentials (licensed for 3 hosts)	1
Microsoft	Windows Server 2008 R2 Standard (for vCenter Server VM)	1

## More Information

For more information on setting up and managing Pano System and the Pano Express for SMB/Education, consult the online help available at [help.panologic.com](http://help.panologic.com) and the support knowledgebase in the Pano Logic Customer Center at [support.panologic.com](http://support.panologic.com).

More detailed information and help is available from:

- Product information and technical specifications on the ***Pano Express for SMB Data Sheet*** at [www.panologic.com/datasheet/pano-express/smb](http://www.panologic.com/datasheet/pano-express/smb) and the ***Pano Express for Education Data Sheet*** at [www.panologic.com/datasheet/pano-express/education](http://www.panologic.com/datasheet/pano-express/education)
- Installation help from the ***Pano Express for SMB/Education Installation Checklist*** at [www.panologic.com/pano-express-checklist](http://www.panologic.com/pano-express-checklist)
- Detailed network, peripheral, and power requirements on the ***Pano Express for SMB/Education System Requirements page*** at [www.panologic.com/pano-express-requirements](http://www.panologic.com/pano-express-requirements)
- Technical support details on the ***Pano Express for SMB/Education Support and Maintenance page*** at [www.panologic.com/pano-express-support-maintenance](http://www.panologic.com/pano-express-support-maintenance)

For more information on the Pano System, please visit [www.panologic.com](http://www.panologic.com) or call us at 650-454-8940.

Pano Logic, Inc.  
2000 Seaport Blvd, Suite 200  
Redwood City, CA 94063

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