

DELL POWEREDGE R720 RACK SERVER SOLUTIONS FOR VIRTUAL DESKTOP INFRASTRUCTURES

Dell™ PowerEdge™ R720 delivered a lower-cost VDI solution

5.4% lower purchase cost per virtual desktop

3.8% lower power consumption per user



versus HP ProLiant DL380p Gen8

When looking for rack servers to host your virtual desktop infrastructure, you need to select a solution that delivers solid performance with high power efficiency and the most competitive pricing. Lower-priced servers that consume less power in your datacenter can save your organization money while providing an excellent virtual desktop experience for users.

In Principled Technologies labs, we tested the virtual desktop infrastructure (VDI) performance of two rack servers: the Dell PowerEdge R720 and the HP ProLiant DL380p Gen8. We found that the Dell PowerEdge R720 solution not only cost up to 5.4 percent less per virtual desktop user than its competitor, but it also lowered the average power consumption per user by as much as 3.8 percent.



GETTING MORE VALUE FOR YOUR VDI

Assessing the potential of a server to deliver a seamless VDI experience to a large number of end users is vital to planning your virtual desktop infrastructure, but why not save money in the process?

We compared two servers with identical processors and RAM amounts—the Dell PowerEdge R720 and HP ProLiant DL380p Gen8—and used the Login VSI 3.7 benchmark to determine that each was able to support approximately 190 Citrix® XenDesktop® 5.6 virtual desktops (the Dell server supported 190 while the HP server supported 184). Because the servers supported roughly the same number of virtual desktops, we assessed the value that the servers provided, both in initial hardware cost and in active power consumption. For detailed server configuration information, see [Appendix A](#). For detailed steps on how we tested, see [Appendix B](#). For detailed results of our Login VSI tests, see [Appendix C](#).

Lower cost/user and cost/watt

Figure 1 compares the cost per virtual desktop user, in US dollars, for the two servers. The Dell PowerEdge R720 solution cost 5.4 percent less per user than the HP solution.

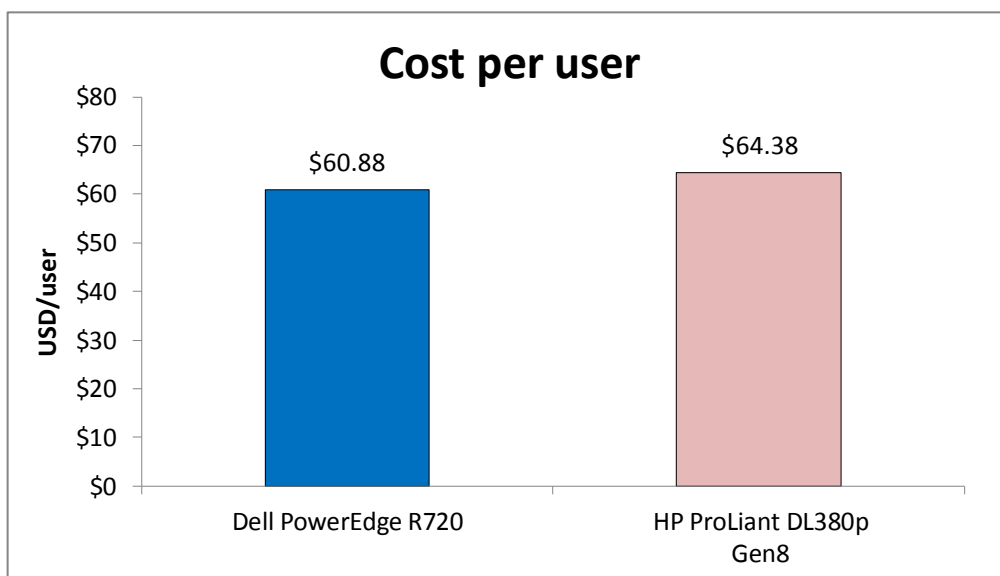
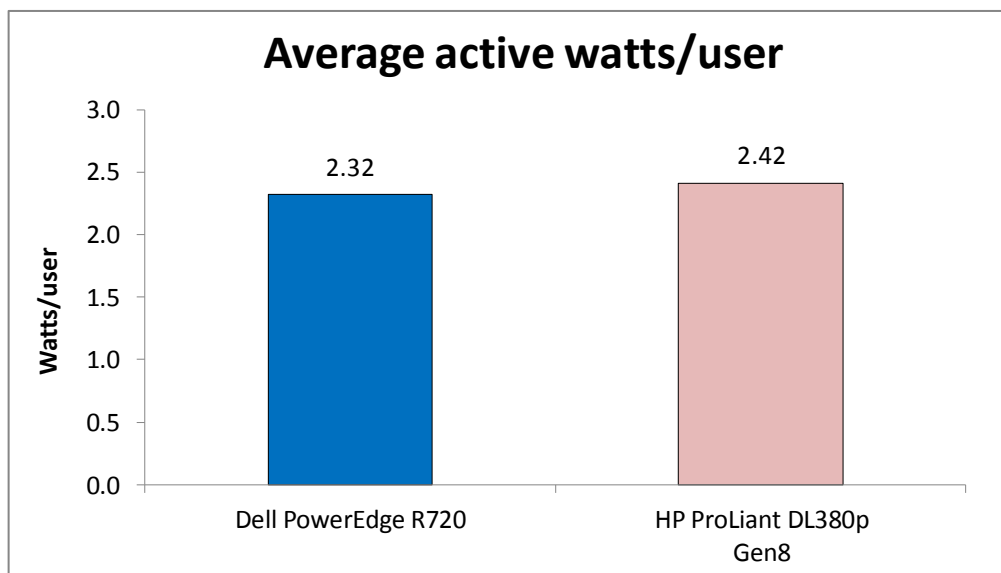


Figure 1: Cost per virtual desktop user, in USD, for the test servers.

The cost of powering your workloads can be great, so choosing a server that minimizes power consumption can really help your bottom line. While running typical workloads in all virtual desktops, the Dell PowerEdge R720 consumed 3.8 percent less watts/user than the HP ProLiant DL380p Gen8 (see Figure 2).

Figure 2: Average watt/user that the servers consumed while running our test workloads.



WHAT WE FOUND

Figure 3 compares the total cost and cost per user for the servers. Lower total costs and cost/user are better. Server prices are from the respective vendor Web sites and do not include any discounts, tax, or shipping costs.

	Total cost in USD	Cost/user	Percentage Dell savings
Dell PowerEdge R720	\$11,567.00	\$60.88	
HP ProLiant DL380p Gen8	\$11,845.00	\$64.38	5.4%

Figure 3: Comparison of server costs and cost/user for the solutions we tested.

Figure 4 details the wattage each server consumed while actively running our test workloads and the watts/user that each consumed. Lower watts and watts/user are better.

	Watts (active)	Watts/user	Percentage Dell win
Dell PowerEdge R720	441.4	2.3	
HP ProLiant DL380p Gen8	444.5	2.4	3.8%

Figure 4: Watts and watts/user that the servers consumed while running workloads.

WHAT WE TESTED

About the Dell PowerEdge R720

The new Intel® Xeon® processor E5-2680-powered Dell PowerEdge R720 2U rack server incorporates many enhancements and features designed to improve

performance, lower power consumption, and ease maintenance. Some of these features include the following:

- **Performance.** Dell engineered the PowerEdge R720 to handle complex workloads, with I/O and internal data management technologies (i.e., NSC, NPAR, CacheCade) to allow faster access to information and GPU accelerators for faster than ever computational performance.
- **Processors.** The Dell PowerEdge R720 is powered by two Intel Xeon processors E5-2680, which incorporate the very latest in technology from Intel. The powerful processors provide exceptional performance and make the PowerEdge R720 a solid virtualization platform.
- **Power efficiency.** Dell PowerEdge R720 servers implement industry-leading power efficiency standards, and are designed to optimize performance while maintaining low power consumption. Automated tracking and regulation of thermal activity, intelligent design of right-sized power options, and high efficiency fans and airflow management work to save power, saving you money in the process.
- **Management.** The Dell PowerEdge R720, like all late-model Dell servers, comes with the Dell Lifecycle Controller. This tool simplifies server management by providing a single interface for management functions and by storing critical system information in the system itself. There are no CDs or USB keys to keep track of for drivers or firmware.
- **Storage.** With impressive storage capacity for small business servers, the Dell PowerEdge R720 is available in both an 8-bay and 16-bay chassis.
- **Memory.** The Dell PowerEdge R720 holds up to 768GB of RAM, many times the memory capacity of older small business servers, allowing for powerful flexibility with virtualized database solutions.

About Login VSI 3.7

Login Virtual Session Indexer (Login VSI) 3.7 is a tool that assesses the virtual desktop performance, capacity, and scalability of a server. Login VSI incrementally logs users into virtual desktop sessions and measures the total response times of seven typical office operations from each session to calculate the VSI Index Average.

As more sessions begin to consume system resources, response times degrade and the VSI Index Average increases until it is above the Dynamic VSImax. When this condition is met, the benchmark records a Login VSImax, which is the maximum number of sessions that the platform can support. The average response time of the first 15 sessions determines a baseline; the VSImax is $\text{baseline} \times 125\% + 3000\text{ms}$. Not reaching VSImax is an indication of satisfactory end user response time.

Login VSI 3.7 includes client-side performance testing that tests character response, large text response, mouse-click feedback, and image quality and loading times on clients to ensure good end-user performance.

For more information about Login VSI 3.7, see www.loginvsi.com/product-overview.

IN CONCLUSION

Getting more value out of your servers is a smart way to reduce datacenter and VDI costs. In our tests, the Dell PowerEdge R720 server not only cost up to 5.4 percent less per user than the HP server, it also consumed 3.8 percent less power per virtual desktop user than the HP server when running workloads. When extrapolated over an entire rack of servers and with datacenters full of these racks, the potential savings both in hardware costs and in power costs could be dramatic.

APPENDIX A – SYSTEM CONFIGURATION INFORMATION

Figure 5 provides detailed configuration information for the test systems.

System	Dell PowerEdge R720	HP ProLiant DL380p Gen8
General		
Number of processor packages	2	2
Number of cores per processor	8	8
Number of hardware threads per core	2	2
System power management policy	Performance	Maximum performance
Power supplies		
Number of power supplies	2	2
Wattage of each (W)	750	750
Model number	Dell D750E-S2	HP HSTNS-PL29
CPU		
Vendor	Intel	Intel
Name	Xeon	Xeon
Model number	E5-2680	E5-2680
Socket type	FCLGA2011	FCLGA2011
Core frequency (GHz)	2.7	2.7
Bus frequency (GT/s)	8	8
L1 cache	8 x 32 KB instruction 8 x 32 KB data	8 x 32 KB instruction 8 x 32 KB data
L2 cache	8 x 256 KB	8 x 256 KB
L3 cache	20 MB (shared)	20 MB (shared)
Platform		
Vendor and model number	Dell PowerEdge R720	HP ProLiant DL380p Gen8
Motherboard model number	GP9S7S1	SGH247FSW7
BIOS name and version	Dell 1.6.0	HP P70
BIOS settings	Default	Default
Memory module(s)		
Total RAM in system (GB)	192	192
Vendor and model number	Hynix HMT31GR7BFR4A-H9	Samsung® M393B1K70DH0-YH9Q9
Type	PC3L-10600R	PC3L-10600R
Speed (MHz)	1,333	1,333
Speed running in the system (MHz)	1,333	1,333
Timing/Latency (tCL-tRCD-tRP-tRASmin)	9-9-9-36	9-9-9-36
Size (GB)	8	8
Number of RAM module(s)	24	24
Chip organization	Double-sided	Double-sided

System	Dell PowerEdge R720	HP ProLiant DL380p Gen8
Rank	Dual	Dual
OS/hypervisor		
Name	VMware® ESXi 5.1.0	VMware ESXi 5.1.0
Build number	1065491	1065491
File system	VMFS	VMFS
Kernel	ACPI x64-based PC	ACPI x64-based PC
Language	English	English
RAID controller		
Vendor and model number	Dell PERC H710P Mini	HP Smart Array P420i
Firmware version	3.130.05-1796	3.42
Cache size	1 GB	1 GB
Ethernet adapter		
Vendor and model number	Intel X540 10 DP 10Gb BT + I350 1Gb BT DP	Intel X520 Dual Port 10Gbe SFP+ Adapter
Number of ports	4	2
Type	Integrated	PCI Express
USB ports		
Number	4	4
Type	2.0	2.0

Figure 5: System configuration information for our test servers.

APPENDIX B – HOW WE TESTED

Figure 6 presents the infrastructure layout we used to configure the Citrix® XenDesktop® environment.

VM name	Hosted OS	Role (s)	Server	Memory	# of vCPUs
AD01	Microsoft® Windows® 2008 R2 x64 Enterprise	AD Domain controller VSI Share, DHCP, DNS, NTP	Infrastructure	4 GB	2
XenDesktop	Windows 2008 R2 x64 Enterprise	XenDesktop Delivery Controller, Licensing Services	Infrastructure	4 GB	4
PVS	Windows 2008 R2 x64 Enterprise	XenDesktop Provisioning Services	Infrastructure	4 GB	4
vCenter	Windows 2008 R2 x64 Enterprise	VMware Virtual Center, SQL server	Infrastructure	8 GB	4
Launcher	Windows 7 x 64 Enterprise	Login VSI master launcher	Infrastructure	4 GB	2
XD-vDT's	Windows 7 x 86 Enterprise	XenDesktop virtual desktops	Servers under test	1 GB	1

Figure 6: Layout of the infrastructure environment we used.

We used generic NAS for the infrastructure VMs and a Dell EqualLogic PS6110XS array, cabled to a Dell PowerConnect 6200 series switch, to provide storage for the servers under test. We configured the Dell EqualLogic PS6110XS array in a single-member group with the RAID policy set at RAID 6. The PS6110XS array contained 7 SSD disks and 17 SAS disks with one disk reserved as a spare. Using the default storage pool, we created four 1TB high-performance iSCSI volumes that hosted the virtual machines we used during testing. We installed the operating system on an internal SD card on both servers under test.

Configuring power management policy in Dell PowerEdge R720

1. Power on the server, and press F2 to enter Setup.
2. Select System BIOS.
3. Select System Profile Settings.
4. Under System Profile, select Performance.
5. Click Back and Finish, and select Yes to save changes.
6. Reboot the server.

Configuring power management policy in HP ProLiant DL380p Gen8

1. Power on the server, and press F9 to enter Setup.
2. Select Power Management Options, and press enter.
3. Select HP Power Profile, and press enter.
4. Select Maximum Performance.
5. Press F10 to save changes, and exit utility.
6. Reboot the server.

Installing VMware ESXi 5.1 on servers under test and infrastructure server

1. Insert the installation media, and select Boot from disk.
2. At the VMware Installer screen, press Enter.
3. At the EULA screen, press F11 to Accept and Continue.

4. Under Storage Devices, select the appropriate virtual disk, and press Enter.
5. Select US as the keyboard layout, and press Enter.
6. Enter the Root password twice, and press Enter.
7. Press F11 to start installation.
8. After the server reboots, press F2 to configure the network settings.
9. Log into infra as `root` with the vSphere client.
10. Select the Configuration tab, and click Networking.
11. Click Add Networking...
12. Create a virtual machine network called `PRIV-NET` and select the appropriate adapter.
13. Click OK.

Configuring datastores on servers under test and infrastructure server

1. In the vSphere client, under Storage Adapter click Add..., and select Add Software iSCSI Adapter.
2. Select the iSCSI adapter, and click Properties...
3. Under Dynamic configuration, click Add..., and enter the iSCSI server location.
4. Click on the Configuration tab → Storage, and click add storage.
5. Select the first available LUN, and click Next.
6. Select VMFS-5, and click Next.
7. Review the disk layout, and click Next.
8. Enter a Datastore name, and click Next.
9. Select Maximum available space, and click Next.
10. Click Finish to create the Datastore.
11. Repeat steps 4 – 10 to configure all available LUN's.

Setting up a VM to host Microsoft Windows Active Directory® server (AD01) on (infrastructure server)

1. Connect to the `infrastructure` server via the VMware vSphere client.
2. Log in as `root`.
3. In the vSphere client, under Basic Tasks, select Create a new virtual machine.
4. Choose Custom, and click Next.
5. Assign the name `AD01` to the virtual machine, and click Next.
6. Select `infrastructure` as the host, and click Next.
7. Select the appropriate storage, and click Next.
8. Choose Virtual Machine Version 8, and click Next.
9. Choose Windows, choose Microsoft Windows Server® 2008 R2 (64-bit), and click Next.
10. For CPUs, select one virtual processor socket, and 2 cores per virtual socket, and click Next.
11. Choose 4 GB RAM, and click Next.
12. Click 1 for the number of NICs, select VMXNET3, connect to the `PRIV-NET` network, and click Next.
13. Leave the default virtual storage controller, and click Next.
14. Choose to create a new virtual disk, and click Next.
15. Make the OS virtual disk size 40 GB, choose thick-provisioned lazy zeroed, specify external storage, and click Next.
16. Keep the default virtual device node (0:0), and click Next.
17. Click Finish.
18. Right-click the VM, and choose Edit Settings.
19. On the Hardware tab, click Add...
20. Click Hard Disk, and click Next.
21. Click Create a new virtual disk, and click Next.

22. Specify 40 GB for the virtual disk size, choose thick-provisioned lazy zeroed, specify external storage, and click Next.
23. Choose SCSI (0:1) for the device node, and click Next.
24. On the Hardware tab, click Add...
25. Click Create a new virtual disk, and click Next.
26. Specify 40GB for the virtual disk size, choose thick-provisioned lazy zeroed, specify external storage, and click Next.
27. Choose SCSI (0:2) for the device node, and click Next.
28. On the Hardware tab, click Add...
29. Click Create a new virtual disk, and click Next.
30. Specify 40GB for the virtual disk size, choose thick-provisioned lazy zeroed, specify external storage, and click Next.
31. Choose SCSI (0:3) for the device node, and click Next.
32. Click Finish, and click OK.
33. Click the Resources tab, and click Memory.
34. Select Reserve all guest memory, and click OK.
35. Connect the VM virtual CD-ROM to the Microsoft Windows Server 2008 R2 installation disk.
36. Start the VM.

Installing the Microsoft Windows Server 2008 R2 operating system on the VM

1. Open a virtual machine console on AD01.
2. Choose the language, time and currency, and keyboard input. Click Next.
3. Click Install Now.
4. Choose Windows Server 2008 R2 Enterprise (Full Installation), and click Next.
5. Accept the license terms, and click Next.
6. Click Custom.
7. Click the Disk, and click Drive options (advanced).
8. Click New→Apply→Format, and click Next.
9. After the installation completes, click OK to set the Administrator password.
10. Enter the administrator password twice, and click OK.
11. Install VMware Tools. For more information, see kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=340.
12. Reboot the server.
13. Connect the machine to the Internet, and install all available Windows updates. Restart as necessary.
14. Enable remote desktop access.
15. Change the hostname to AD01 and reboot when the installation prompts you.
16. Click Start→Run, type `diskmgmt.msc`
17. Select a 40 GB volume, name it `profiles`, format it NTFS, and assign it drive letter E.
18. Select another 40 GB volume, name it `share`, format it NTFS, and assign it drive letter F.
19. Select the last 40 GB volume, name it `folders`, format it NTFS, and assign it drive letter G.
20. Set up networking for the data network:
 - a. Click Start→Control Panel, right-click Network Connections, and choose Open.
 - b. Right-click the VM traffic NIC, and choose Properties.
 - c. Uncheck TCP/IP (v6).
 - d. Select TCP/IP (v4), and choose Properties.
 - e. Set the IP address as `172.0.0.10/255.255.0.0`

Installing Active Directory and DNS services on AD01

1. Click Start→Run, type `dcpromo` and click OK.

2. At the Active Directory Domain Services Installation Wizard welcome screen, check the Use advanced mode installation option, and click Next.
3. In the Choose a Deployment Configuration dialog box, select Create a new domain in a new forest, and click Next.
4. At the FQDN page, type `vdi.com`, and click Next.
5. At the NetBIOS name prompt, leave the name `VDI`, and click Next.
6. At the Forest Functionality level, select Windows Server® 2008 R2, and click Next.
7. At the additional Domain Controller Options, leave DNS server selected, and click Next.
8. At the System Folder Location screen, change to `E:\`, leave the default options, and click Next.
9. Assign a Directory Services Restore Mode Administrator account password, and click Next.
10. At the Summary screen, review your selections, and click Next.
11. Once Active Directory Domain Services finishes installing, click Finish, and restart the system.
12. Click Start→Run, type `dnsmgmt.msc`
13. Create a reverse lookup zone for `AD01`.
14. Create static entries for the `infrastructure` server and the `servers` under `test`.

Configuring the Windows time service on AD01

To ensure reliable time, we pointed our Active Directory server to a physical NTP server.

1. Open a command prompt.
2. Type the following:


```

W32tm /config /syncfromflags:manual /manualpeerlist:"<ip address of a NTP server>"
W32tm /config /reliable:yes
W32tm /config /update
W32tm /resync
Net stop w32time
Net start w32time
      
```

Setting up DHCP services on AD01

1. Click Start→Administrative Tools→Server Manager→Add Roles.
2. Select DHCP Server, and click Next.
3. At the Introduction to DHCP Server screen, click Next.
4. At the Specify IPv4 DNS Settings screen, type `vdi.com` for the parent domain.
5. Type the preferred DNS server IPv4 address, and click Next.
6. At the Specify IPv4 WINS Server Settings screen, select WINS is not required for applications on the network, and click Next.
7. At the Add or Edit DHCP Scopes screen, click Add.
8. At the Add Scope screen, enter the Name DHCP Scope name.
9. In the next box, set the following values, and click OK.
 - Start IP address=`172.0.0.20`
 - End IP address=`172.0.3.200`
 - Subnet mask=`255.255.252.0`
10. Check the Activate This Scope box.
11. At the Add or Edit DHCP Scopes screen, click Next.
12. Click the Enable DHCP v6 Stateless Mode radio button, and click Next.
13. Leave the default IPv6 DNS Settings, and click Next.
14. At the Authorize DHCP server dialog box, select Use current credentials.

15. At the Confirm Installation Selections screen, click Next. If the installation is set up correctly, a screen displays saying that DHCP server install succeeded.
16. Click Close.
17. Click Start→Run and type `DHCPmgmt .msc`
18. DHCP→AD01.vdi.com→IPv4→Server Options.
19. Right-click Server Options, and select Configure options.
20. Activate option 66 Boot Server Host Name.
 - String value=<ip of the Provisioning server>
21. Activate option 67 Boot file Name.
 - String value= `ARDBP32.BIN`
22. Click OK.

Setting up the Login VSI share and Active Directory users

For Login VSI to work correctly, you must create a CIFS share, Active Directory OU, and Active directory. For more information on Login VSI, see www.loginvsi.com/en/admin-guide/installation.html. Open Windows Explorer, and create the following folders: `f:\share`, `e:\profiles` and `g:\folderredirect`

1. Assign permissions of read/write to the `vdi/everyone` group.
2. Right-click the `f:\share`, `e:\profiles` and `g:\folderredirect` folders, and select Properties.
3. Click the Sharing tab, and click Share...
4. Add everyone, system and administrators to the Read/Write group, and click Share.
5. Right-click the `g:\folderredirect` folder and select Properties→Sharing→Advanced Sharing→Caching, and select No files or programs from the Share Folder are available offline.
6. Click OK, Apply, OK, and Close.
7. From the Login VSI 3.7 media, run the Login VSI AD Setup.
8. Keep the default settings, and click Start.

Setting up roaming profiles for users

1. Open Active Directory Users and Computers.
2. Browse to `vdi.com`→Login_VSI→Users→Target.
3. Select all Login VSI users, and right-click Properties.
4. Click the Profiles tab.
5. Check box Profile path, and type `e:\profiles\%username%`
6. Click OK.

Configuring folder redirection

1. Log into DC1 as administrator
2. Open the Group Policy Editor.
3. Open Forest→Domains→vdi.com, right-click Group Policy Objects, and select New.
4. Type `folder redirection`, leave source starter GPO as None, and click OK.
5. Right-click the folder redirection GPO, and click Edit.
6. Browse User Configuration→Policies→Windows Settings→Folder Redirection, and right-click AppData (roaming).
7. In the AppData (roaming) Properties, target-tab select the following:
 - Setting = select Basic = Redirect everyone's folders to the same location
 - Target folder location = Create a folder for each user under the root path
 - Root Path = `\\DC1\folderredirection`
8. In the AppData (roaming) Properties→Setting tab, remove the checkbox for Grant the user exclusive right to AppData (Roaming), and click OK.

9. Repeat steps 6 through 8 for all subfolders in the folder redirection tree.
10. Close the Folder Redirection group policy.
11. In the Group Policy Editor, right-click the folder redirection policy, and select →GPO status→Computer Configuration Settings Disabled.
12. In the Group Policy Editor, drag the folder redirect GPO to Forest→Domains→vdi.com→Login_VSI→Users→Target.

Setting up a VM to host the vCenter® server (vCenter)

1. Log into the `infrastructure` server with the VMware vSphere client.
2. In the vSphere client, under Basic Tasks, select Create a new virtual machine.
3. Choose Custom, and click Next.
4. Assign the name `vCenter` to the virtual machine, and click Next.
5. Select `infrastructure` as the host, and click Next.
6. Select the appropriate storage, and click Next.
7. Choose Virtual Machine Version 8, and click Next.
8. Choose Windows, choose Microsoft Windows Server 2008 R2 (64-bit), and click Next.
9. For CPUs, select one virtual processor socket, and 4 cores per virtual socket, and click Next.
10. Choose 4GB RAM, and click Next.
11. Click 1 for the number of NICs, select VMXNET3, connect to the `PRIV-NET` port group, and click Next.
12. Leave the default virtual storage controller, and click Next.
13. Keep the default virtual device node (0:0), and click Next.
14. Connect the VM virtual CD-ROM to the Microsoft Windows 2008 R2 installation disk.
15. Click Finish.
16. Right-click the vCenter VM, and click Edit settings.
17. Click the Resources tab, click Memory, check the Reserve all guest memory checkbox, and click OK.
18. Start the VM.

Installing the Microsoft Windows Server 2008 R2 operating system on the VM

1. Open a virtual machine console on vCenter.
2. Choose the language, time and currency, and keyboard input. Click Next.
3. Click Install Now.
4. Choose Windows Server 2008 R2 Enterprise (Full Installation), and click Next.
5. Accept the license terms, and click Next.
6. Click Custom.
7. Click the Disk, and click Drive options (advanced).
8. Click New→Apply→Format, and click Next.
9. After the installation completes, click OK to set the Administrator password.
10. Enter the administrator password twice, and click OK.
11. Install VMware Tools. For more information, see kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=340.
12. Reboot.
13. Connect the machine to the Internet, and install all available Windows updates. Restart as necessary.
14. Enable remote desktop access.
15. Change the hostname to `vCenter` and reboot when the installation prompts you.
16. Set up networking for the data network:
 - a. Click Start, Control Panel, right-click Network Connections, and choose Open.
 - b. Right-click the VM traffic NIC, and choose Properties.
 - c. Uncheck TCP/IP (v6).
 - d. Select TCP/IP (v4), and choose Properties.

- e. Set the IP address, subnet, gateway, and DNS server.
17. Join the VDI domain.
18. Reboot the system.

Installing Microsoft SQL Server 2008 R2

1. Insert installation media, and click OK to install .NET framework.
2. Wait for the SQL Installer to launch. On the left menu, click Installation.
3. Click New installation or add features to an existing installation. Click OK.
4. Enter the Product Key, and click Next.
5. Check the I accept the license terms checkbox, and click Next.
6. Click Install to install the Setup Support Files (required).
7. Resolve any issues displayed in the setup wizard, and click Next.
8. At the Setup Role screen select SQL Server Feature Installation and click Next.
9. Select the Database Engine Services, Full-Text Search, Client tools Backwards Compatibility, Management Tools Basic and Complete, and click Next twice.
10. Accept instance configuration defaults, and click Next.
11. Accept defaults for disk space requirements, and click Next.
12. Click Use the same account for all SQL Server services, select NT Authority\System, and click OK. Click Next.
13. Select Mixed Mode and enter a password for the SA account. Click Add Current User, and click Next.
14. Accept defaults for error reporting, and click Next.
15. Review installation configuration rules check, and click Next.
16. To begin installation, click Install.
17. At completion screen, click Close.
18. Run Windows Update to receive all updates and security patches.

Setting up a database and ODBC DSN for vCenter

1. From the server desktop, open Start→All Programs→Microsoft SQL Server 2008 R2→Configuration Tools→SQL Server Configuration Manager.
2. Click SQL Server Network Configuration→Protocols for MSSQLSERVER.
3. Right-click TCP/IP, and select Enabled.
4. Click SQL Services→right-click SQL Server Browser, and select Properties.
5. In the SQL Server Browser Properties, select the Services tab, change the Start mode to Automatic, and click OK. Repeat this step for the SQL Server Agent service.
6. Start the SQL Server browser service and the SQL Server Agent service.
7. From the SQL server desktop, open Start→All Programs→Microsoft SQL Server 2008 R2→Configuration Tools→SQL Server Management Studio
8. Click Connect.
9. Select the Databases folder, right-click, and select New Database
10. Provide the name `vcenter` for the new database.
11. Click Options and change the recovery model from full to simple, and click OK.
12. From the desktop of the vCenter server, select Start→Run→`odbcad32.exe`
13. Click the system DSN tab.
14. Click Add.
15. Click SQL Server Native Client 10.0, and click Finish.
16. In the Create a New Data Source to SQL Server text box, enter the connection name type: `vcenter`
17. For Server, select SQL, and click Next.
18. Change authentication to With SQL Server authentication using a login ID and password entered by the user, enter `sa` as the Login ID, use the password you defined in SQL server setup for the SA account, and click Next.

19. Select the Change the default database to: checkbox, choose `vCenter` from the pull-down menu, and click Next.
20. Click Finish.
21. Click Test Data Source... to confirm correct configuration.
22. Click OK to create the vCenter ODBC connection.

Installing VMware vCenter 5.1

1. Log onto the vCenter as `VDI\administrator`
2. From the VMware vCenter 5.1 install media, click Autorun.
3. Click Run to start the install wizard.
4. Click the Install button on the VMware vSphere 5.1 Simple Install wizard.
5. Select the Install wizard language as English, and click OK.
6. At the Install wizard welcome screen, click Next.
7. At the End User Patent Agreement, click Next.
8. Agree to the License Agreement, and click Next.
9. Enter and confirm the password you wish to use with the Administrator account for vCenter Single Sign On, and click Next.
10. Select Install a local Microsoft SQL Server 2008 R2 Express Instance, and click Next.
11. Enter and confirm the passwords for the DBA and SQL user accounts, and click Next.
12. Confirm the Fully Qualified Domain Name or IP address is correct, and click Next.
13. Check the Use network service account checkbox, and click Next.
14. Accept the default installation path, and click Next.
15. Accept the default https port, and click Next.
16. Click Install.
17. After Single Sign On completes, and vCenter Server installation begins, enter user information and a license key, and click Next.
18. Select "Use an existing supported database" and select the Data Source Name (DSN) for the connection to the SQL Server: `vcenter`
19. Enter `sa` as the database username, provide the password for the SA account, and click Next.
20. Select the system account for the vCenter Server service account, and click Next.
21. Keep the vCenter default ports, and click Next.
22. Select 1024 MB for the JVM memory, and click Next.
23. Click Install to finish the vCenter server installation.
24. Click Finish to exit the wizard.
25. Click OK to confirm completion.
26. Click Exit on the installer.
27. Restart the server.
28. Using the vSphere client, log into the vCenter server as `VDI\administrator`
29. Right-click the root of vCenter, and click New Datacenter.
30. Name the New datacenter `vdi`
31. Add the `infrastructure` server to the datacenter.
32. Add the `servers under test` to the datacenter.

Editing the vCenter prox.xml file to allow http access

1. Open a console to the vCenter Server, and login as `VDI\administrator`
2. Open Wordpad, and edit the file `C:\Users\All Users\VMware\VMware VirtualCenter\proxy.xml`.
3. Find the `/sdk` entry.
4. Change `httpsWithRedirect` to `httpAndHttps`.
5. Save the proxy/xml file, and reboot the vCenter.

Setting up a VM to host Citrix XenDesktop

1. Log into the `infrastructure` server with the VMware vSphere client.
2. In the vSphere client, under Basic Tasks, select Create a new virtual machine.
3. Choose Custom, and click Next.
4. Assign the name `XenDesktop` to the virtual machine, and click Next.
5. Select `infrastructure` as the host, and click Next.
6. Select the appropriate storage, and click Next.
7. Choose Virtual Machine Version 8, and click Next.
8. Choose Windows, choose Microsoft Windows Server 2008 R2 (64-bit), and click Next.
9. For CPUs, select one virtual processor socket, and two cores per virtual socket, and click Next.
10. Choose 4GB RAM, and click Next.
11. Click 1 for the number of NICs, select VMXNET3, connect to the `PRIV-NET` port group, and click Next.
12. Leave the default virtual storage controller, and click Next.
13. Keep the default virtual device node (0:0), and click Next.
14. Connect the VM virtual CD-ROM to the Microsoft Windows 2008 R2 installation disk.
15. Click Finish.
16. Right-click the vCenter VM, and click Edit settings.
17. Click the Resources tab, click Memory, check the Reserve all guest memory checkbox, and click OK.
18. Start the VM.

Installing the Microsoft Windows Server 2008 R2 operating system on the VM

1. Open a virtual machine console on `XenDesktop`.
2. Choose the language, time and currency, and keyboard input. Click Next.
3. Click Install Now.
4. Choose Windows Server 2008 R2 Enterprise (Full Installation), and click Next.
5. Accept the license terms, and click Next.
6. Click Custom.
7. Click the Disk, and click Drive options (advanced).
8. Click New→Apply→Format, and click Next.
9. After the installation completes, click OK to set the Administrator password.
10. Enter the administrator password twice, and click OK.
11. Install VMware Tools. For more information, see kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=340.
12. Reboot.
13. Connect the machine to the Internet, and install all available Windows updates. Restart as necessary.
14. Enable remote desktop access.
15. Change the hostname to `XenDesktop` and reboot when the installation prompts you.
16. Set up networking for the data network:
 - a. Click Start, Control Panel, right-click Network Connections, and choose Open.
 - b. Right-click the VM traffic NIC, and choose Properties.
 - c. Uncheck TCP/IP (v6).
 - d. Select TCP/IP (v4), and choose Properties.
 - e. Set the IP address, subnet, gateway, and DNS server.
17. Join the VDI domain.
18. Reboot the system.

Installing Citrix XenDesktop 5.6

1. Insert XenDesktop 5.6 media.
2. Click on Install XenDesktop and prerequisites.

3. Click I accept the terms in the license agreement, and click Next.
4. At the Select Components screen, select all the components and select Install the SQL Express, click Next.
5. Check the Enable these ports option, and click Next.
6. Click Install.
7. At the Installation Successful screen, select Configure XenDesktop after closing and click Close.
8. In Citrix Desktop Studio, click Desktop deployment.
9. Type `XD-site` for site name, use the default database option, and click Next. Click OK to create the database automatically.
10. At the Licensing screen, choose Select from existing licenses, and click on Add license file...
11. Browse to the location of the license, and click Open.
12. Select Citrix XenDesktop Platinum, and click Next.
13. At the Connection screen, select VMware virtualization and fill out the following fields:
 - a. Enter the host address as `http://vcenter.vdi.com/sdk`
 - b. Enter the username as `administrator`
 - c. Enter the administrator password.
 - d. Enter the connection name as `vCenter`
 - e. Select Manually create virtual machines.
14. Click Next.
15. Click Finish to create the site.
16. Open the Citrix Desktop Studio.
17. Select Browser → Desktop Studio → Configuration → Hosts, and click Add Host.
18. In Add Host Wizard, ensure vCenter is selected, and click Next.
19. For cluster select the server under test cluster, for guest network select `PRIV-NET`, for storage selects Vol1 – Vol4, and click Next.
20. Name the Host, and click Finish.

Setting up a VM to host the Citrix Provisioning Server

1. Log into the `infrastructure` server with the VMware vSphere client.
2. In the vSphere client, under Basic Tasks, select Create a new virtual machine.
3. Choose Custom, and click Next.
4. Assign the name `PVS` to the virtual machine, and click Next.
5. Select `infrastructure` as the host, and click Next.
6. Select the a Datastore on external storage, and click Next.
7. Choose Virtual Machine Version 8, and click Next.
8. Choose Windows, choose Microsoft Windows Server 2008 R2 (64-bit), and click Next.
9. For CPUs, select one virtual processor socket and two cores per virtual socket, and click Next.
10. Choose 4GB RAM, and click Next.
11. Click 1 for the number of NICs, select VMXNET3, connect to the `PRIV-NET` port group, and click Next.
12. Leave the default virtual storage controller, and click Next.
13. Keep the default virtual device node (0:0), and click Next.
14. Connect the VM virtual CD-ROM to the Microsoft Windows 2008 R2 installation disk.
15. Click Finish.
16. Right-click the vCenter VM, and click Edit settings.
17. Click the Resources tab, click Memory, check the Reserve all guest memory checkbox, and click OK.
18. Start the VM.

Installing the Microsoft Windows Server 2008 R2 operating system on the VM

1. Open a virtual machine console on `PVS`.
2. Choose the language, time and currency, and keyboard input. Click Next.

3. Click Install Now.
4. Choose Windows Server 2008 R2 Enterprise (Full Installation), and click Next.
5. Accept the license terms, and click Next.
6. Click Custom.
7. Click the Disk, and click Drive options (advanced).
8. Click New→Apply→Format, and click Next.
9. After the installation completes, click OK to set the Administrator password.
10. Enter the administrator password twice, and click OK.
11. Install VMware Tools. For more information, see kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=340.
12. Reboot.
13. Connect the machine to the Internet, and install all available Windows updates. Restart as necessary.
14. Enable remote desktop access.
15. Change the hostname to PVS, and reboot when the installation prompts you.
16. Set up networking for the data network:
 - a. Click Start, Control Panel, right-click Network Connections, and choose Open.
 - b. Right-click the VM traffic NIC, and choose Properties.
 - c. Uncheck TCP/IP (v6).
 - d. Select TCP/IP (v4), and choose Properties.
 - e. Set the IP address, subnet, gateway, and DNS server.
17. Join the VDI domain.
18. Reboot the system.

Installing SQL Express on Provisioning Services server.

A SQL database is required for Provisioning Services; we used the included SQL express installation files on the Citrix Provisioning Service media to create a database on the Provisioning server.

1. Insert the media for Citrix Provisioning services 6.1
2. Browse to the SQL Express 2005 Express directory, and run SQLEXPRESS.exe.
3. Accept the End user agreement, and click Next.
4. Click Install to install prerequisites.
5. At the Welcome screen, click Next.
6. Verify the system passes the system configuration check, and click Next.
7. Enter a name and organization, and click Next.
8. Select the default features, and click Next.
9. Select Windows authentication, and click Next.
10. Check both boxes to Enable user instances, add user to the SQL Server administrator Role, and click Next.
11. Click Next for error usage reporting.
12. Click Install.
13. When completed, click Next, and Finish.
14. Open Start→All Programs→Microsoft SQL Server 2005→Configuration Tools→SQL Server Configuration Manager.
15. Click SQL Server Network Configuration→Protocols for SQLEXPRESS.
16. Right-click TCP/IP, and select Enabled.
17. Click SQL server 2005 Services→right-click SQL server browser, and select Properties.
18. In the SQL Server Browser properties, select the services tab, change the start mode to Automatic, and click OK.
19. Start the SQL server browser service.

Installing Citrix Provisioning Services

1. Click on Start→Administrative Tools→Server Manager→Features→Add Features.

2. Select .NET Framework 3.5.1 Features and click Add Required Role Services.
3. Click Next on the Web Server (ISS) screen.
4. Click Next on the Select Role Services screen, and then click Install.
5. Click Close on the successful installation screen.
6. Execute Citrix PVS_Server_x64.exe.
7. Click Install to install the required items.
8. At the Welcome Screen, click Next.
9. Click I accept the terms in the license agreement, and click Next.
10. Enter a user name and organization, select all users, and click Next.
11. Select a destination folder, and click Next.
12. On the Setup Type screen select Complete and click Next, and click Install.
13. Click Finish on the Installation completed screen.
14. Click OK on the PVS Console warning.
15. Click Next on the Provisioning Services Configuration Wizard.
16. At the DHCP Services screen, select The service that runs on another computer.
17. At the PXE Services screen, select The services that runs on this computer.
18. At the Farm Configuration screen, select Create a farm, and click next.
19. At the Database Server Screen click Browse..., select the local SQLEXPRESS instance, and click Next.
20. At the New Farm screen, enter the following, and click Next:
 - a. Database name= ProvisioningServices
 - b. Farm= farm
 - c. Site= site
 - d. Collection name= Collection
 - e. Farm Administrator group= vdi.local/Builtin/Administrators
21. At the New Store screen, enter Store name= Store and for Path, browse to the root of e:\ , and click Next.
22. Enter the License Server name, and click Next.
23. At the User account screen, select Specified user account, enter administrator, vdi.com and Password twice, and click the checkbox next to Configure the database for the account, click Next.
24. Keep the default number of days between password updates, and click Next.
25. Keep the primary interface and communication ports, and click Next.
26. Select Use the Provisioning Services TFTP service, and click Next.
27. Leave the stream service at default, and click Next.
28. Click Finish, and click Done.

Installing Citrix Provisioning Services Administrative Console

1. Execute Citrix PVS_Console_x64.exe.
2. At the welcome screen, click Next.
3. Accept the licensing agreement, and click Next.
4. Enter a user name and organization name, and click Next.
5. Accept the default install path, and click Next.
6. Accept the default install type, and click Next.
7. Click Install and Finish.

Setting up a Windows 7 Enterprise x86 base image

Using the vSphere client, we created a Windows Enterprise X86 VM base image. We later used that image to create desktop pools for testing.

On the base image we installed Microsoft Office 2010, installed the Login VSI target software, added it to the vdi domain, added it to the Login VSI OU, and installed the respective Citrix XenDesktop agent.

Setting up a Windows 7 Enterprise (x86) base image VM

1. In the vSphere client, connect to the vCenter Server, and browse to the `infrastructure` host.
2. Click the Virtual Machines tab.
3. Right-click, and choose New Virtual Machine.
4. Choose Custom, and click Next.
5. Assign the name as `XD_gold`, and click Next.
6. Select the `infrastructure` host, and click Next.
7. Select the appropriate storage.
8. Choose Virtual Machine Version 8, and click Next.
9. Choose Windows, choose Microsoft Windows 7 (32-bit), and click Next.
10. For CPUs, select one virtual processor socket and one core per virtual socket, and click Next.
11. Choose 1GB RAM, and click Next.
12. Click 1 for the number of NICs, select VMXNET 3, and click Next.
13. Leave the default virtual storage controller, and click Next.
14. Choose to create a new virtual disk, and click Next.
15. Make the OS virtual disk size 20GB, choose Thin Provision, specify the OS datastore on the external storage, and click Next.
16. Keep the default virtual device node (0:0), and click Next.
17. Select Edit the virtual machine settings before completion.
18. Click Continue.
19. Click Add..., select Hard Disk, and click Next.
20. Select Create a new virtual disk, and click Next.
21. Select 4GB, Thin Provision, and click Next.
22. Keep the default virtual device node (0:1), and click Next.
23. Click Finish.
24. Click the Resources tab, click Memory, and check the Reserve all guest memory checkbox.
25. Click the Hardware tab, CD/DVD Drive, and Connect the VM virtual CD-ROM to the Microsoft Windows 7 x86 installation disk.
26. Click OK.

Installing Windows 7 Enterprise (X86) on the base image VM

1. When the installation prompts you, press any key to begin setup.
2. Enter your language preferences, and click Next.
3. Click Install.
4. Accept the license terms, and click Next.
5. Select Custom, and select the drive that will contain the OS.
6. Click Install.
7. Type `user` for the username, and click Next.
8. Enter no password, and click Next.
9. At the system protection screen, select Use recommended settings, and click Next.
10. Enter your time zone, and click Next.
11. Select the Work Network setting, and click Next.
12. Install VMware Tools. For more information, see kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=340.
13. Reboot.
14. Connect the machine to the Internet, and install all available Windows updates. Restart as necessary.
15. Join the domain, and restart the VM.

Adjusting page file

1. Log in as `administrator`
2. Right-click Computer→Properties→Change settings→Advanced→Performance→Settings.
3. In Performance Settings, select the Advanced tab, and select Change for Virtual Memory.
4. Deselect Automatically manage page file.
5. Select Custom size, type `2048` for both values, and select Set.
6. Restart the VM.

Installing Office 2010 Professional

1. From the Office 2010 media, run Setup.
2. Enter the product key for Office 2010, and click Continue.
3. Accept the licensing agreement.
4. Select Install Now.
5. Reboot the system.

Installing Login VSI target software

1. Log into the `XD_gold` VM as `vdi\administrator`
2. Browse to `\vsi-install\Target setup`.
3. Run the `setup.exe`.
4. In the Target Setup wizard, specify the VSI share `\\AD01\share`.
5. Click Start.
6. At the security warnings, click OK.
7. When the installation is complete, reboot the system.

Installing the XenDesktop agent

1. Browse to the Citrix XenDesktop media, and run the `XdAgent_86.msi` file.
2. Click I accept the terms in the license agreement.
3. Click Install.
4. Click Finish.

Creating a ListOfDDCs entry in the registry on XD_gold

1. Click Start→Run, and type `regedit`
2. Browse to `HKEY_LOCAL_MACHINE\Software\Citrix\VirtualDesktopAgent`.
3. Create a string value called `ListOfDDCs`
4. Right-click the `ListOfDDCs` string, and click Modify...
5. Type `XenDesktop.vdi.com`, and click OK.
6. Close the registry editor.

Installing Device Identity Manager

1. Log into `XD_gold` as `VDI\Administrator`
2. Browse to the Provisioning services media.
3. Execute the `autorun.exe`.
4. Click Target Device Installation.
5. Click Install DIM (Device Identity Management).
6. To Being the DIM wizard, click Next.
7. Accept the License agreement, and click Next.
8. Click Install, and Finish when completed.
9. Click Yes to reboot.

Installing Provisioning Services Target Device on XD_gold and creating a vDisk

1. Browse to the Citrix XenDesktop media, and run the `PVS Target Device_32.msi` file.

2. At the welcome screen for Provisioning Service Target Device Wizard, click Next.
3. Accept the License agreement, and click Next.
4. Enter user name and organization name, and click Next.
5. Accept the default path, and click Next.
6. Click Install.
7. Select Launch Imaging Wizard, and click Finish.
8. At the Welcome screen, click Next.
9. For server, type PVS, and click Next.
10. Select Create new vDisk, and click Next.
11. Name the vDisk XD_gold_vdisk, and click Next.
12. For Microsoft Volume Licensing, click None, and click Next.
13. Under Source Volume, ensure the Capacity is 20GB for the C:Boot disk, and the free space is greater than 30 percent.
14. Change the E: (new Volume) to None. Click Next.
15. For target device name, type PVS_XD_gold and click Next.
16. Click on Optimize for Provisioning Services. Click OK.
17. Click Finish to begin creating the empty vDisk.
18. When the vDisk has been completed, click No to Reboot the XD_gold VM and shutdown instead.

Creating a VM template for Provisioning Services

1. Shutdown XD_gold Virtual Machine.
2. In vCenter, clone the Virtual Machine, and name it GoldTemplate.
3. Select the appropriate server under test to host the new template.
4. Before cloning, edit the virtual hardware, and click Continue.
5. Select Hard disk 1, and click Remove.
6. Select Remove from virtual machine and delete files from disk, click OK.
7. Right click on GoldTemplate, and select Template→Covert to template

Enabling XD_Gold to boot from Network.

1. In vCenter, right-click XD_gold, and click Edit settings.
2. Click Options tab→Boot options, check the box to force BIOS Setup, and click OK.
3. In the VM BIOS, tab to the Boot menu, and change the boot order to:
 - a. Network boot from VMware VMXNET 3
 - b. Removable Devices
 - c. Hard Drive
 - d. CD-ROM Drive
4. Tab to Exit, and select Exit Saving Changes.
5. When the VM boots, it will boot from PXE and Provisioning services will stream the vDisk to the device.
6. Log in as VDI\administrator.
7. Provisioning services will now copy XD_gold to the vDisk.
8. Click Finish.
9. Shut down XD_gold.

Enabling the 4GB local disk as cache

1. Open Provisioning Services→Farm→Site→Device Collections→Collections, and right- click PVS_XD_gold.
2. Change mode from private mode to standard image mode.
3. Change the cache type to Cache on device hard drive.
4. Click OK.

Deploying a XenDesktop pool with the XenDesktop Setup wizard

1. Open the Provisioning services console→Farm→sites→site, right click and select XenDesktop Setup Wizard.
2. At the welcome, screen click Next.
3. Type XenDesktop for the XenDesktop Controller, and click Next.
4. Click the host server under test, and click Set Template.
5. Type the administrator Password, and click get templates.
6. Click VM_gold_template, and click OK, and Click Next.
7. Select the Provisioning services collection as collection and XD_gold_vdisk as the assigned vDisk, and click Next.
8. Select Create a new catalog, enter the following, and click Next:
 - Machine type= Streamed
 - Catalog name=XD-Catalog
9. Enter the following, and click Next:
 - Number of virtual machines= 1
 - vCPUs=1
 - Memory=1024 MB
 - Active Directory= Create New accounts
10. For Active directory location click VDI.com→Login_VSI→computers.
11. For Base name type XD-0#,and click Next.
12. Click Finish.

Creating Desktop group and adding the XD-01 VM

1. Log into XenDesktop.
2. Open the Citrix Desktop Studio→assignments, and click Create Desktop Group.
3. Select the catalog and add all machines. Click Next.
4. For users add the VDI\Login_VSI_TS group, and select one desktop per user. Click Next.
5. Leave delegations as default, and click Next.
6. Enter pool as a Display name and desktop group name. Click Finish.

Configuring the power policy for the pool desktop group

1. Right-click pool, and click Edit Desktop Group.
2. Click power management, for weekdays select all hours, no action, and position the power on machines line to be uniform across all hours on the graph.
3. Click weekends and select all hours, no action, and position the power on machines line to be uniform across all hours on the graph, and click OK.

Configuring the Citrix XenDesktop

1. Open the Citrix Desktop Studio.
2. Click desktop studio, select the PowerShell tab, and click Launch PowerShell.
3. In PowerShell, type `Set-BrokerDesktopGroup -Name "pool" -ShutdownDesktopsAfterUse $False`
4. Browse Desktop Studio→Assignments, and verify that there is 1 desktop available.

Creating Windows 7 Enterprise x64 image VSI Launchers

Using the vSphere client, we created a Windows 7 Enterprise x64 VM with the Login VSI launcher software, and cloned it to create five Login VSI launchers on the infrastructure server.

Installing the Windows 7 Enterprise (x64) Login VSI launcher

1. Log into the vCenter.

2. In the vSphere client, connect to the vCenter Server, and browse to the `infrastructure` server.
3. Click the Virtual Machines tab.
4. Right-click, and choose New Virtual Machine.
5. Choose Custom, and click Next.
6. Assign the name `Launcher` to the virtual machine, and click Next.
7. Select the appropriate datastore, and click Next.
8. Choose Virtual Machine Version 8, and click Next.
9. Choose Windows, choose Microsoft Windows 7 (64-bit), and click Next.
10. Choose 1 virtual socket, 2 cores per virtual socket, and click Next.
11. Choose 6GB RAM, and click Next.
12. Click 1 for the number of NICs, select VMXNET3, and click Next.
13. Leave the default virtual storage controller, and click Next.
14. Choose to create a new virtual disk, and click Next.
15. Make the OS virtual disk size 32GB, choose thin provision, and click Next.
16. Keep the default virtual device node (0:0), and click Next.
17. Click Finish.
18. Click Finish, and click OK.
19. Click the Resources tab, and click Memory.
20. Click Reserve all guest memory.
21. Click the Hardware tab.
22. Connect the VM virtual CD-ROM to the Microsoft Windows 7 x64 installation disk.

Installing Windows 7 Enterprise (x64)

1. Start the VM.
2. When the installation prompts you, press any key to begin setup.
3. Enter your language preferences, and click Next.
4. Click Install.
5. Accept the license terms, and click Next.
6. Select Custom, and select the drive that will contain the OS.
7. Click Install, and the setup begins.
8. Type `user` for the username, change the computer name, and click Next.
9. Enter a password, and click Next.
10. For system protection, select Use recommended settings, and click Next.
11. Enter your time zone, and click Next.
12. Select the Work Network setting, and click Next.
13. Use Windows Update to patch the Windows 7 installation.
14. Install VMware Tools. For more information, see kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=340
15. Reboot.
16. Join the `vdi.com` domain, and reboot.

Disabling Windows Firewall

The domain GPO automatically disables the Windows Firewall.

Installing the Citrix Receiver™ 13.0.0

1. Download the latest Citrix Receiver from www.citrix.com/receiver.
2. Double click on CitrixReceiverWeb.
3. At the welcome screen, click on Install.

Installing Virtual Audio Cables

By default, the virtual launchers cannot render audio so we installed Virtual Audio Cables version 4.10 software.muzychenko.net/eng/vac.htm.

1. Download and extract the media.
2. Click Setup.
3. Click Yes to begin the install.
4. Click I accept to accept the software license agreement.
5. Click Install.

Installing Login VSI target software on the launcher

1. Browse to VSIinstall media\setups\Launcher\.
2. Run the setup.exe.
3. In the Target Setup wizard, specify the VSI share.
4. Click Start.
5. Reboot the system.
6. Shutdown the launcher VM.

Converting the launcher VM to a template

1. In vSphere Client, right-click `launcher` VM, and select Template → Convert to Template.

Deploying the launchers VM from launcher template

1. In vSphere Client, browse to Home → VMs and Templates.
2. Right-click `launcher` to deploy a virtual machine from template.
3. Type `launcher_1` as the new VM name, and click Next.
4. Click Datacenter, and click Next.
5. Click on the launcher server, and click Next.
6. Select the appropriate storage, and click Next.
7. Select customization using existing customization specifications, select the appropriate file, and click Next.
8. Click Finish to deploy the new VM.
9. Repeat steps 1 through 8 to deploy more launchers.

APPENDIX C – DETAILED TEST RESULTS

Figures 7 and 8 show the Login VSI response times throughout our tests at varying user counts. From these results, we determined that the Dell server could comfortably support 190 virtual desktops and the HP server could support 184 virtual desktops while maintaining acceptable response times.

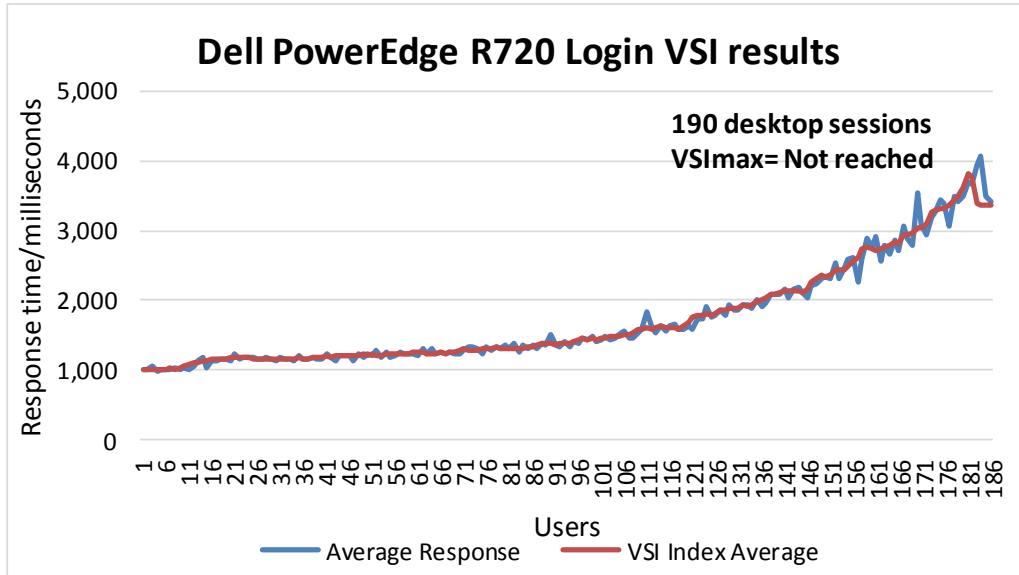


Figure 7: Login VSI response times for the Dell PowerEdge R720.

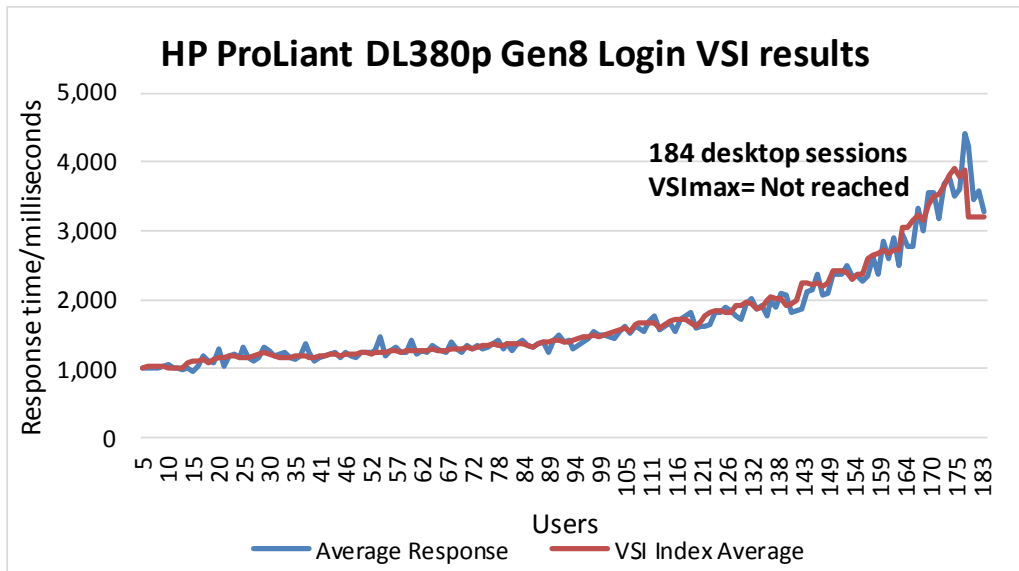


Figure 8: Login VSI response times for the HP ProLiant DL380p Gen8.

Figures 9 and 10 show the processor utilization for the servers throughout the duration of the test.

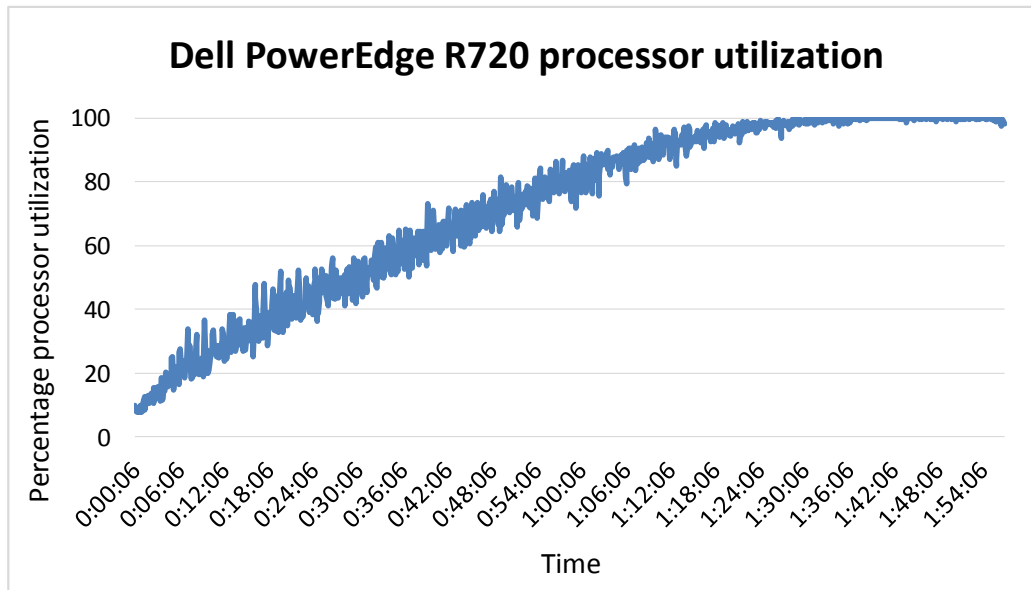


Figure 9: Processor utilization percentages for the Dell PowerEdge R720 throughout the test.

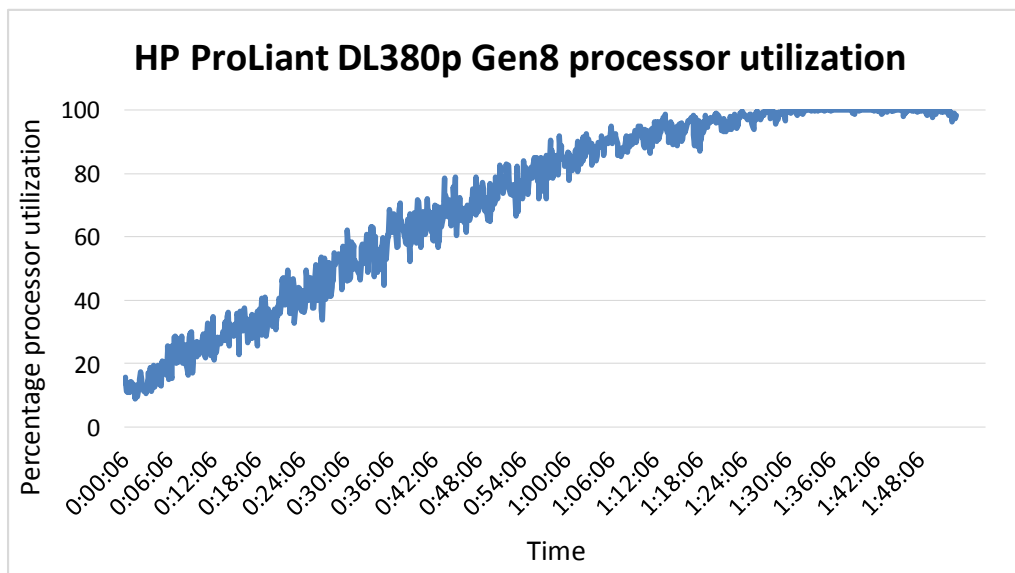


Figure 10: Processor utilization percentages for the HP ProLiant DL380p Gen8 throughout the test.

ABOUT PRINCIPLED TECHNOLOGIES



Principled Technologies, Inc.
1007 Slater Road, Suite 300
Durham, NC, 27703
www.principledtechnologies.com

We provide industry-leading technology assessment and fact-based marketing services. We bring to every assignment extensive experience with and expertise in all aspects of technology testing and analysis, from researching new technologies, to developing new methodologies, to testing with existing and new tools.

When the assessment is complete, we know how to present the results to a broad range of target audiences. We provide our clients with the materials they need, from market-focused data to use in their own collateral to custom sales aids, such as test reports, performance assessments, and white papers. Every document reflects the results of our trusted independent analysis.

We provide customized services that focus on our clients' individual requirements. Whether the technology involves hardware, software, Web sites, or services, we offer the experience, expertise, and tools to help our clients assess how it will fare against its competition, its performance, its market readiness, and its quality and reliability.

Our founders, Mark L. Van Name and Bill Catchings, have worked together in technology assessment for over 20 years. As journalists, they published over a thousand articles on a wide array of technology subjects. They created and led the Ziff-Davis Benchmark Operation, which developed such industry-standard benchmarks as Ziff Davis Media's Winstone and WebBench. They founded and led eTesting Labs, and after the acquisition of that company by Lionbridge Technologies were the head and CTO of VeriTest.

Principled Technologies is a registered trademark of Principled Technologies, Inc.
All other product names are the trademarks of their respective owners.

Disclaimer of Warranties; Limitation of Liability:

PRINCIPLED TECHNOLOGIES, INC. HAS MADE REASONABLE EFFORTS TO ENSURE THE ACCURACY AND VALIDITY OF ITS TESTING, HOWEVER, PRINCIPLED TECHNOLOGIES, INC. SPECIFICALLY DISCLAIMS ANY WARRANTY, EXPRESSED OR IMPLIED, RELATING TO THE TEST RESULTS AND ANALYSIS, THEIR ACCURACY, COMPLETENESS OR QUALITY, INCLUDING ANY IMPLIED WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE. ALL PERSONS OR ENTITIES RELYING ON THE RESULTS OF ANY TESTING DO SO AT THEIR OWN RISK, AND AGREE THAT PRINCIPLED TECHNOLOGIES, INC., ITS EMPLOYEES AND ITS SUBCONTRACTORS SHALL HAVE NO LIABILITY WHATSOEVER FROM ANY CLAIM OF LOSS OR DAMAGE ON ACCOUNT OF ANY ALLEGED ERROR OR DEFECT IN ANY TESTING PROCEDURE OR RESULT.

IN NO EVENT SHALL PRINCIPLED TECHNOLOGIES, INC. BE LIABLE FOR INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH ITS TESTING, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL PRINCIPLED TECHNOLOGIES, INC.'S LIABILITY, INCLUDING FOR DIRECT DAMAGES, EXCEED THE AMOUNTS PAID IN CONNECTION WITH PRINCIPLED TECHNOLOGIES, INC.'S TESTING. CUSTOMER'S SOLE AND EXCLUSIVE REMEDIES ARE AS SET FORTH HEREIN.
