

VDI PERFORMANCE COMPARISON: CISCO UCS SOLUTION VS. HP SOLUTION

20% more virtual desktops



with the **Cisco UCS B250 M2 Extended Memory Blade Server** vs. the HP ProLiant BL460c G7 Server

OUR FINDINGS

Organizations deploying a desktop virtualization solution benefit by using servers that support many users. Using servers with high memory capacity lets an IT department save money by requiring fewer servers to support their virtual desktop load. In Principled Technologies' tests in our labs, the Cisco Unified Computing System™ (UCS) B250 M2 Extended Memory Blade Server (Cisco UCS solution) supported 112 virtual desktops, while the HP ProLiant BL460c G7 Server (HP solution) supported 93 virtual desktops. Thus, the Cisco UCS solution supported 20.4 percent more virtual desktops. Both solutions ran Citrix® XenDesktop® 4 with Citrix XenServer® 5.6 hosting Microsoft® Windows® 7 virtual desktops on a NetApp® FAS3040 storage area network (SAN).

OUR PROCESS

To measure the virtual desktop capacity of the Cisco UCS solution and the HP solution, we used the Login Consultants Virtual Session Indexer (Login VSI) Beta3 benchmark. Login VSI consists of several workloads that perform a range of tasks to simulate a typical office user. The results show the maximum number of virtual desktops a server can support at a given memory configuration while giving an acceptable response time and user experience.



PROJECT OVERVIEW

This report highlights the benefits of using the Cisco UCS solution to support multiple virtual desktops, and compares the Cisco UCS solution's performance with 256GB of system memory to that of the HP solution with 192GB of system memory. Specifically, the Cisco UCS B250 M2 Extended Memory Blade Server has 48 memory slots, allowing a 256GB configuration of RAM using lower cost 8GB memory modules, while the HP ProLiant BL460c G7 Server has a maximum of 12 memory slots, requiring 16GB memory modules for the 192GB configuration.

We tested both solutions using Citrix XenDesktop 4 and the Streamed VHD FlexCast™ delivery model with Citrix XenServer 5.6 and Microsoft Windows 7 virtual desktops. We used the same NetApp FAS3040 storage array for both solutions.

Figure 1 shows the supported virtual desktops for both solutions while maintaining an acceptable response time. With 2GB RAM per virtual desktop configuration, we were able to test 112 virtual desktops for the Cisco UCS solution and 93 virtual desktops for the HP solution. We used the Login VSI benchmark to determine how many virtual desktops each server could support while maintaining an acceptable user response time. For more information, see the How We Tested section.

Please note that Microsoft Windows 7 system requirements specify a minimum of 1GB RAM per virtual desktop for the 32-bit version. Some manufacturers and independent studies suggest 2GB RAM or more for end users running heavier workloads. It is important to note that Login VSI does not test against memory other than to ensure basic memory requirements for its client emulation.

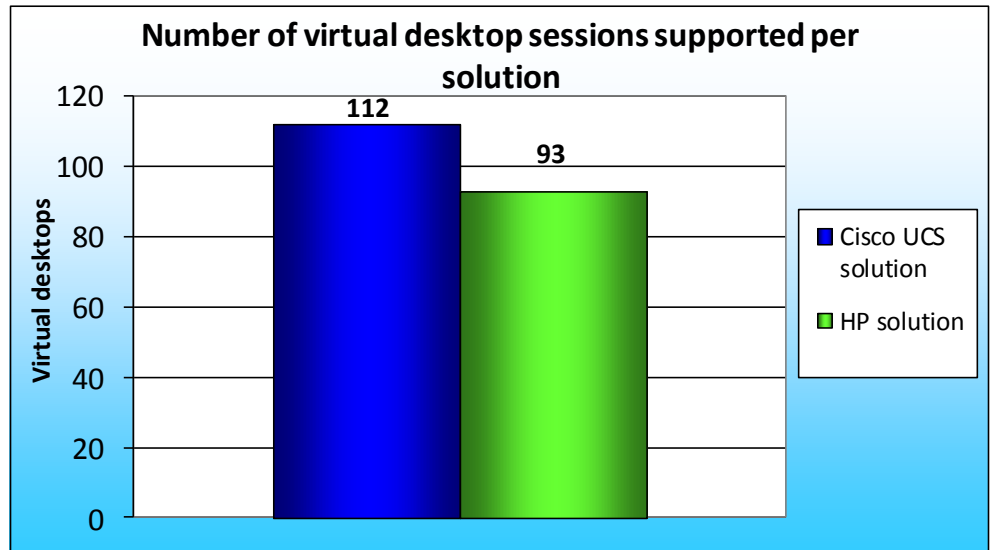


Figure 1: Number of virtual desktops the Cisco UCS solution and the HP solution supported. Higher numbers are better.

WHAT WE FOUND

Figure 2 compares the average response times for the Cisco UCS solution and the HP solution, and Figure 3 compares the VSI Index averages for the Cisco UCS solution and HP solution. For both charts, lower response times are better, while greater virtual desktop sessions are better.

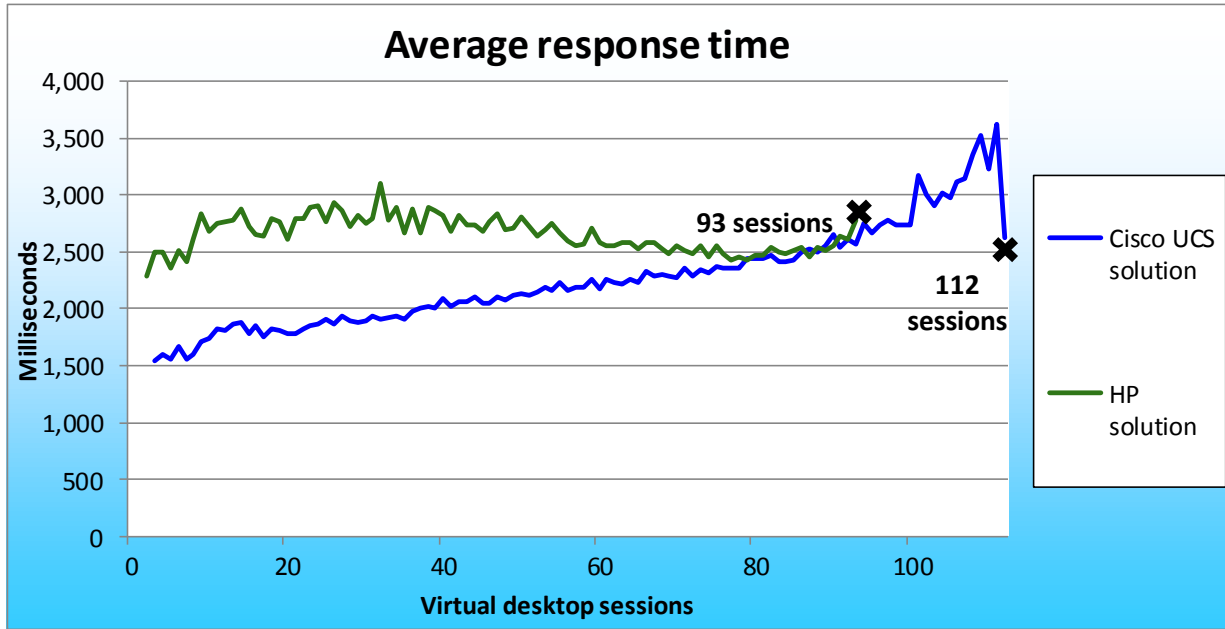


Figure 2: Average response times for the 112 virtual desktops on the Cisco UCS solution and the 93 virtual desktops on the HP solution. Lower response times are better, while greater virtual desktop sessions are better.

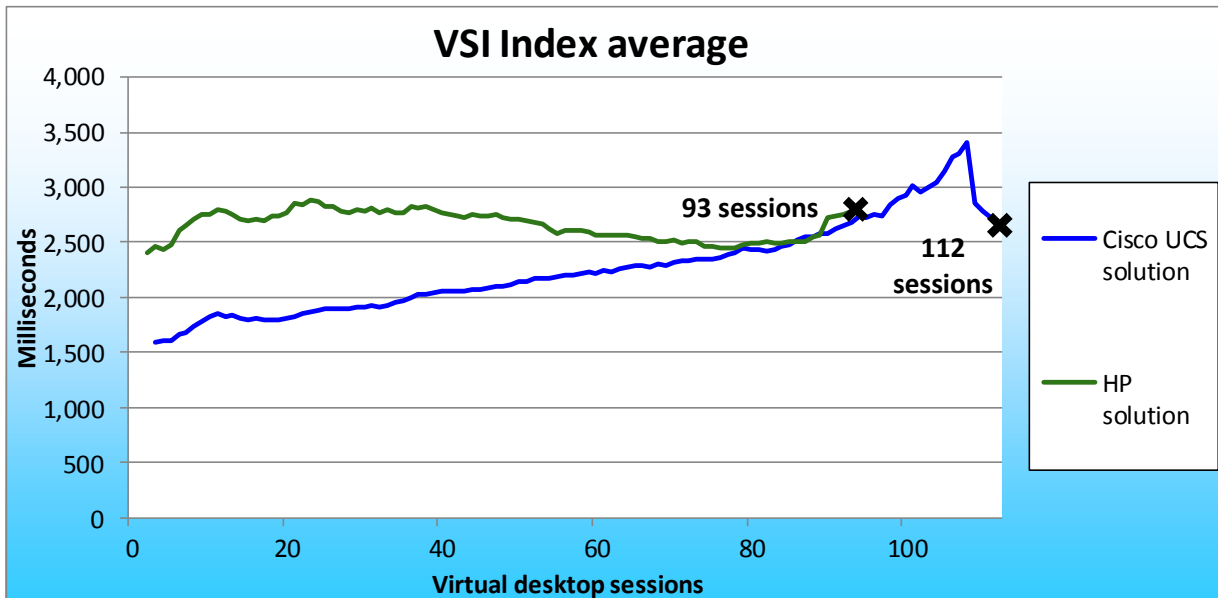


Figure 3: VSI Index average results for the 112 virtual desktops on the Cisco UCS solution and the 93 virtual desktops on the HP solution. Lower response times are better, while greater virtual desktop sessions are better.

Figure 4 provides the VSI Index average and average response time for the Cisco UCS solution running 112 virtual desktops. Lower response times are better, while greater virtual desktop sessions are better.

After confirming that all 112 sessions executed successfully on the Cisco UCS solution, we tested to ensure that the user experience would not degrade as the workload on the environment increased. The user response time, as reflected in Login VSI_{max} Pass or Fail rating, provides the necessary guidance to evaluate the user experience based on workload response time. As Figure 4 shows, the Cisco UCS solution supported a heavy 112-desktop load while retaining a VSI Index average and average response time significantly below the 4,000ms threshold.

Note that the Login VSI_{max} numbers differ slightly from the average response times due to the way Login VSI calculates results, removing 2 percent from the minimum and maximum response times before calculating the average.

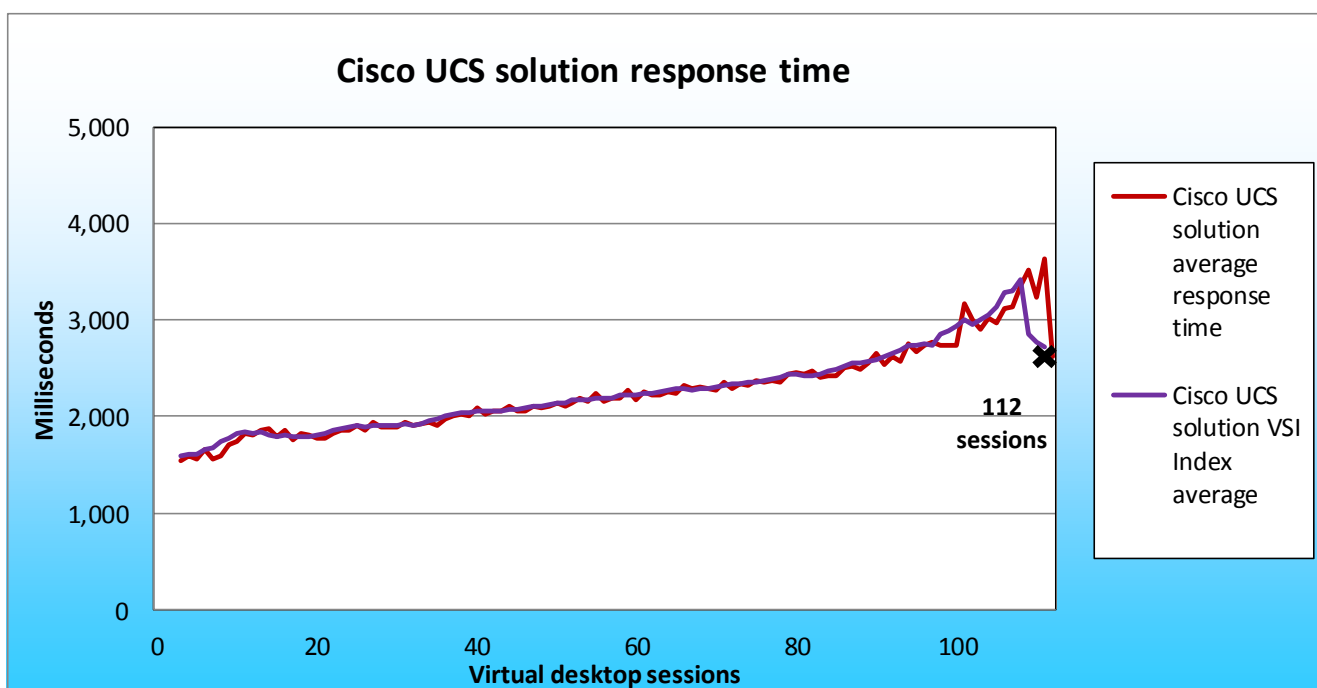


Figure 4: Response times for 112 virtual desktop sessions on XenServer below 4,000 milliseconds for the Cisco UCS solution. Lower response times are better, while greater virtual desktop sessions are better.

Figure 5 provides the VSI Index average and average response time for the HP solution for the 93 virtual desktops. Lower response times are better, while greater virtual desktop sessions are better.

After confirming that all 93 sessions executed successfully on the HP solution, we tested to ensure that the user experience would not degrade as the workload on the environment increased. The user response time, as reflected in Login VSI_{max} Pass or Fail rating, provides the necessary guidance to evaluate the user

experience based on workload response time. As Figure 5 shows, the HP solution supported a 93-desktop load while retaining a VSI Index average and average response time significantly below the 4,000ms threshold.

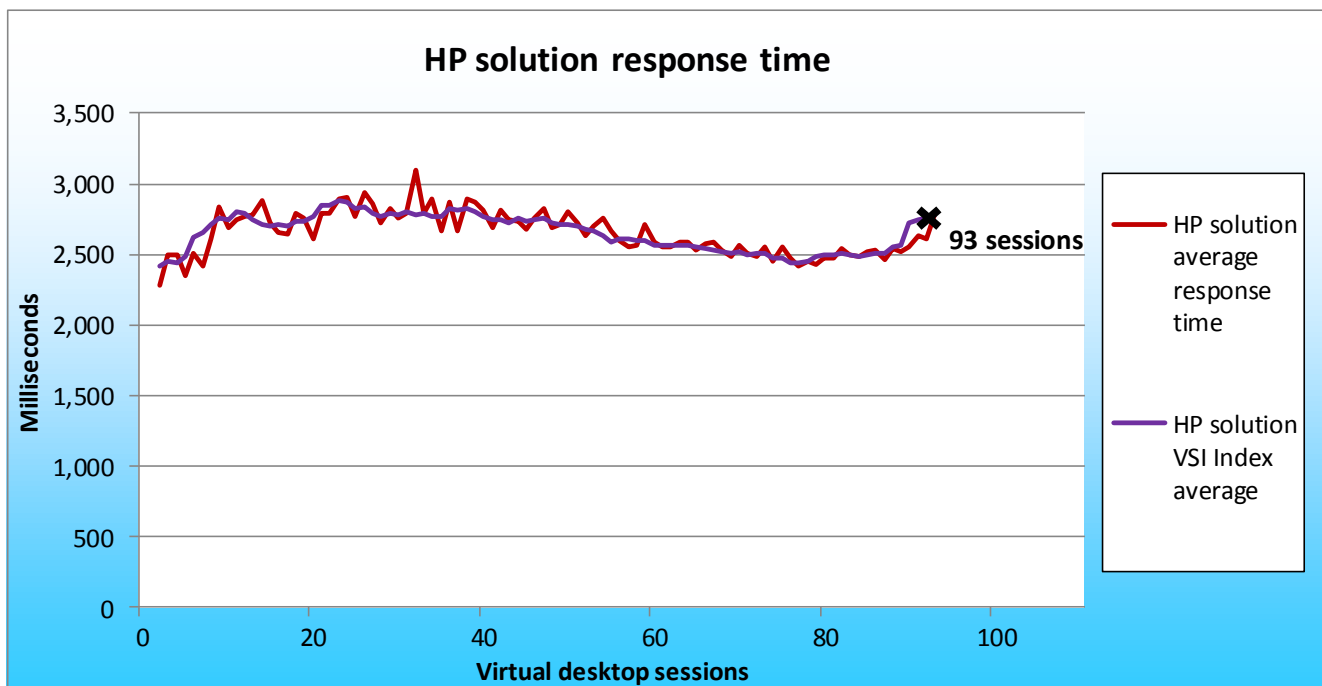


Figure 5: Response times for 93 virtual desktop sessions on XenServer below 4,000 milliseconds for the HP solution. Lower response times are better, while greater virtual desktop sessions are better.

SUMMARY

Organizations deploying VDIs wish to minimize the cost of such deployments, and seek a server that will support many virtual desktops. In our testing, the Cisco UCS B250 M2 Extended Memory Blade Server supported 20.4 percent more virtual desktops in a 256GB RAM configuration than the HP ProLiant BL460c G7 Server with a 192GB RAM configuration. Thus, the additional memory allowed for more supported virtual desktops.

The 256GB memory configuration only utilizes 32 of the 48 memory slots in the Cisco UCS B250 M2 Extended Memory Blade Server, thus allowing for a 384GB memory capacity with additional 8GB memory modules. The 192GB memory configuration fully utilized the HP ProLiant BL460c G7 Server's 12 memory slots. The HP ProLiant BL460c G7 Server does support a maximum of 384GB system memory, but requires replacing all 12 memory modules with more expensive 32GB sticks. At the time of testing, these 12 DIMMs would result in a cost of \$77,988.00.¹

¹ Based on HP's price of \$6,499.00 for one stick of PC3L-8500 memory as of April 1, 2011.

<http://h30094.www3.hp.com/product.asp?sku=10294825&sc=CNET&jumpid=ex%5Fr2910%5Fgps%252Fcompshop>

WHAT WE TESTED

About the Cisco UCS B250 M2 Extended Memory Blade Server

We used a dual-socket Cisco UCS B250 M2 Extended Memory Blade Server with Intel® Xeon® processor X5670s. The UCS B250 M2 Extended Memory Blade Server supports the higher frequency X5680 and X5690 processors, but the HP ProLiant BL460c G7 Server does not. Therefore, to make an even comparison, we chose a processor that both servers support. The blade had two 146GB SAS hard drives, but we configured the blades to boot from SAN for testing. We configured the blade with 256 GB of system memory. The Cisco UCS B250 M2 supports up to 384 GB, which allows VDI scaling when client memory requirements are higher, as we mentioned in the Project Overview section. See Appendix A for more detailed hardware specifications.

About the HP ProLiant BL460c G7 Server

We used a dual-socket HP ProLiant BL460c G7 Server with Intel Xeon processor X5670s. The blade had two 146GB SAS hard drives, but we configured the blades to boot from SAN for testing. We configured the blade with 192 GB of system memory. We used this amount of memory instead of the 384GB this server supports because using 384 GB of memory with the more expensive 32GB sticks is cost prohibitive and does not reflect a normal-usage scenario. See Appendix A for more detailed hardware specifications we used for testing.

About the Intel Xeon Processor 5600 Series

The Intel Xeon processor 5600 series—the next generation of intelligent server processors—automatically regulates power consumption to combine industry-leading energy efficiency with intelligent performance that adapts to your workload. Intel Xeon processor 5600 series-based servers deliver energy-efficient performance along with secure, flexible virtualization solutions for next-generation data centers.

About Citrix XenDesktop

Citrix XenDesktop quickly and securely delivers any type of virtual desktop for Windows, Web, and Software as a service (SaaS) application to all the latest PCs, tablets, smartphones, notebooks, and end user clients – all with a high-definition HDX™ user experience. For more information on XenDesktop, see <http://www.citrix.com/virtualization/desktop/xendesktop.html>.

About NetApp

NetApp storage systems utilize Data ONTAP operating system to provide SAN (Fibre Channel and iSCSI) and NAS (CIFS and NFS) setup. We used a NetApp FAS3040 filer with four disks shelves. Each shelf contained 14 300GB hard drives. We configured the Cisco UCS B250 M2 Blade Servers to boot from SAN using Fibre

Channel connections. We created a NFS share for all virtual desktops through a NetApp X1008A 10Gbps expansion card.

About Login VSI

Login VSI benchmarks these virtual desktop sessions to determine how scalable a particular virtualized system is. Specifically, it benchmarks a virtual desktop solution by simulating Windows-based Office user workloads. The Medium workload of Login VSI, which we tested, opens and closes the following applications and runs their respective tasks:

- Microsoft Outlook®: Browsing a message
- Microsoft Word® (TimerDoc): Initiate response timer to see how the program responds throughout the workload
- Microsoft Internet Explorer® instance one: Maximizing, scrolling, and minimizing
- Microsoft Internet Explorer instance two: Navigating a Web site, maximizing, and scrolling
- Microsoft Word (UserRead): Reading and typing text, and printing to PDF
- Bullzip: Generating a PDF
- Adobe® Reader®: Reading a PDF
- Microsoft PowerPoint®: Watching a presentation and adding a slide
- Microsoft Excel®: Reading and minimizing
- 7-Zip: Saving a zip file

Login VSI Beta3 benchmarks user experience more effectively than previous versions of Login VSI because its workloads and what the VSI Index measures more accurately reflect the tasks actual users perform on their virtual desktops. Reported response times are higher in Login VSI Beta3 than in Login VSI 2.0 and other previous versions because the benchmark uses this heavier workload. The Login VSI benchmark mandates the minimum acceptable response time for the testing.

The Login VSI Beta3 benchmark uses seven operations to determine the VSI_{max}, the maximum number of users the system can handle before suffering serious degradation in performance. By using seven operations instead of only two, as earlier versions of Login VSI used, Login VSI Beta3 better reflects what a user actually experiences. The seven operations as follows:

- Copying a new document from the document pool in the home drive
- Starting Microsoft Word
- Starting the File Open dialogue
- Starting the Search and Replace dialogue
- Starting the Print dialogue
- Starting Notepad
- Compressing the document into a ZIP file with 7-zip command line

Login VSI reports minimum, average, and maximum response times, as well as the VSI Index average while performing the workload. The Login VSI Index average is similar to the average response time, as it averages the maximum and minimum response times, but it removes 2 percent from the maximum and minimum response time before calculating the average. The response times are reported in time in milliseconds to perform the workload tasks. The Login VSImax is the total number of virtual desktops the server can support while still maintaining a response time of 4,000 milliseconds (4 seconds) or below, and is based on the VSI Index average. In our testing at 112 sessions for the Cisco UCS solution and at 93 sessions for the HP solution, each server still did not reach Login VSImax, indicating that each server could handle the load with processor and storage resources to spare.

For more information on Login VSI Beta3, see

http://www.loginconsultants.com/index.php?option=com_content&task=view&id=390.

HOW WE TESTED

Figure 6 illustrates our Cisco UCS solution test environment: a single Cisco UCS B250 M2 Extended Memory Blade Server and Cisco UCS B200 M2 Blade Server in a Cisco 5108 Blade Chassis connected by dual 4GB Fibre channel to a NetApp FAS3040 storage array to support a boot from SAN configuration for all UCS blades. All virtual machines, including XenDesktop infrastructure and virtual desktops, ran on NFS storage via a NetApp X1008A-R6 2-Port 10GbE NIC TOE FC card that we installed in the NetApp FAS3040.

Cisco UCS solution testbed

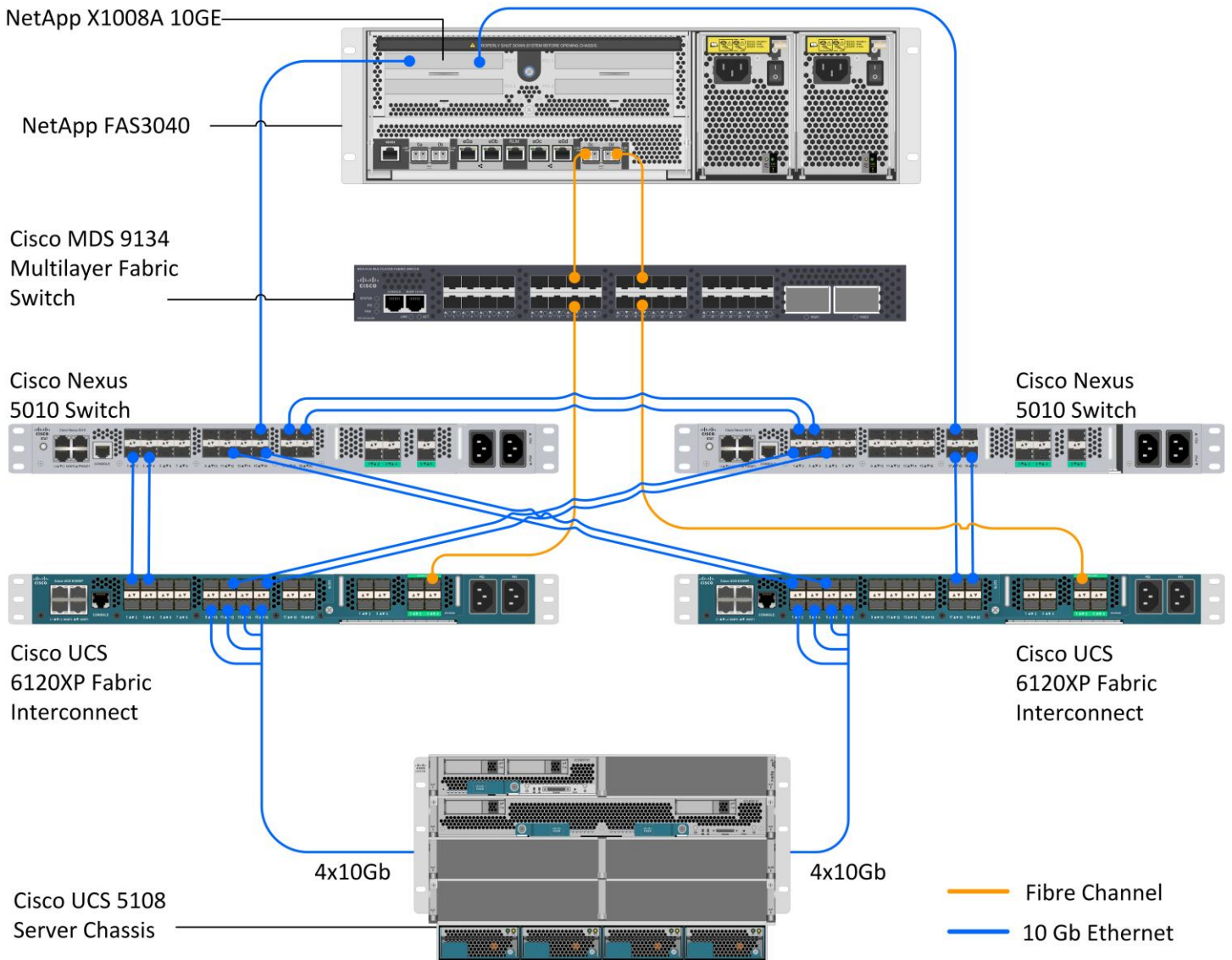


Figure 6: Our Cisco UCS solution test environment.

Figure 7 illustrates our HP solution test environment: two HP ProLiant BL460c G7 Servers in a HP BladeSystem c7000 Enclosure connected by dual 4GB Fibre channel to a NetApp FAS3040 storage array to support a boot from SAN configuration for all UCS blades. All virtual machines, including XenDesktop infrastructure and virtual desktops, ran on NFS storage via a NetApp X1008A-R6 2-Port 10GbE NIC TOE FC card that we installed in the NetApp FAS3040.

HP solution testbed

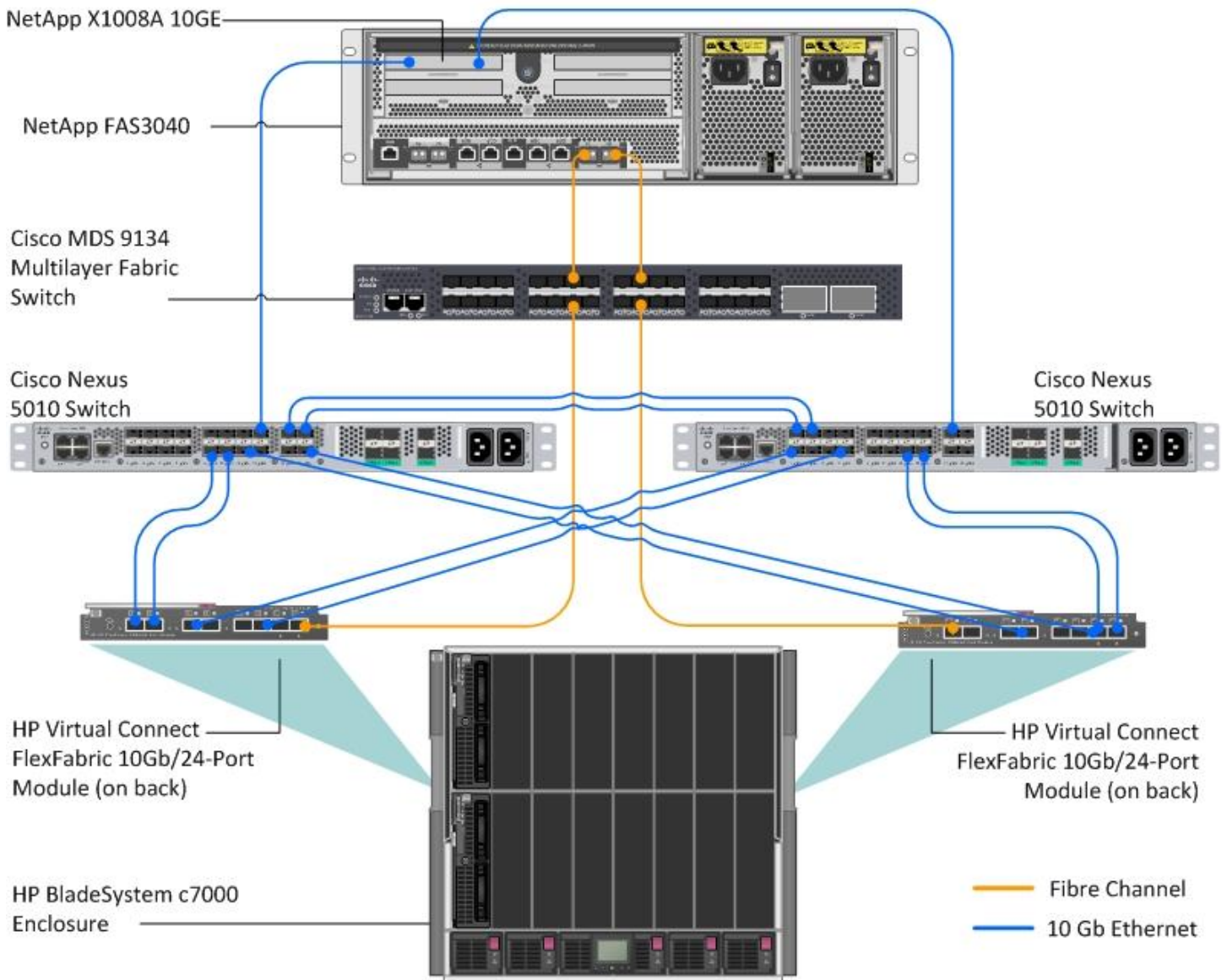


Figure 7: Our HP solution test environment.

Figure 8 shows the layout we used for our NetApp FAS3040 storage array, which was the same for both the Cisco UCS solution and for the HP solution.

NetApp FAS3040 storage array layout

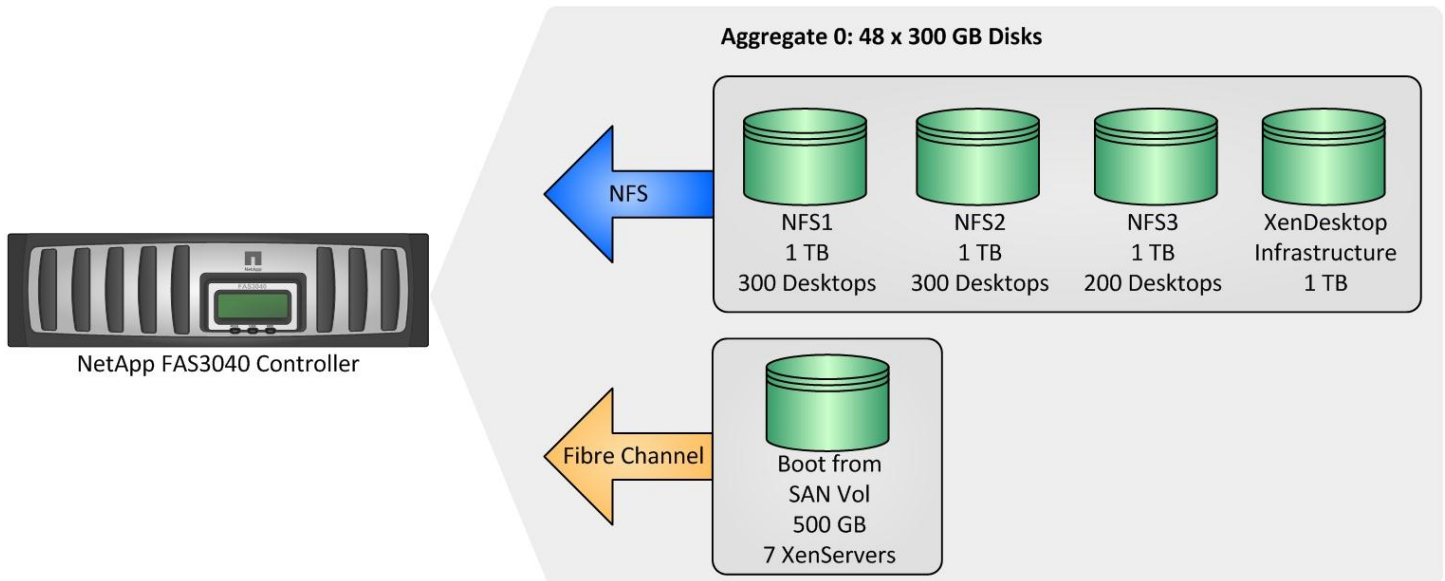


Figure 8: The layout for our NetApp FAS3040 storage array.

Setting up the NetApp storage array

The following steps explain how we set up the NetApp storage array. Note that we installed a NetApp X1008A-R6 2-Port 10GbE card in slot 4 of the filer prior to setting up anything on the NetApp FAS3040.

Initializing the NetApp FAS3040

1. Power up the array.
2. Connect to the Storage array via a notebook system and serial cable.
3. From the command line, type `setup`
4. For the name, type `fas3040`
5. For enabling IPv6, type `n`
6. To configure a virtual network interface, Type `n`
7. For the IP address of e0a, type `10.41.6.31`
8. For the subnet mask of e0a, type `255.255.248.0`
9. For the failover partner, type `n`
10. For media type of e0a, type `auto`
11. For flow control, type `full`
12. For Jumbo frames support, type `n`
13. Accept defaults for e0b.
14. Accept defaults for e0c.
15. Accept defaults for e0d.
16. For the IPv4 default gateway, type `10.41.0.1`
17. For the administrator host address, type `10.41.6.31`
18. Enter the time zone.
19. To save the changes, type `reboot`

20. When the array has rebooted, remove the serial cable.

Configuring the NetApp FAS3040 storage array: Setting up the 10G uplinks for NFS

1. With a notebook system connected to the management network (10.41.6.x), open a Web browser.
2. Type http://10.41.6.31/na_admin
3. Click the Network link.
4. Click the Manage Interfaces link.
5. Click the Add Virtual Interface link.
6. In the Add Virtual Interface wizard, select both 10G interfaces on the NetApp X1008-A-R6 card and add the properties as pictured in Figure 9 below.

Interface: vif-222	Status: Up	Type: Virtual Interface
IPv4 Address: Enter the IPv4 Address address of this interface.		192.168.100.101
Netmask: Enter the subnet mask for this interface.		255.255.255.0
Broadcast: Enter the Broadcast address of this interface. If left blank, the default is used. The current broadcast address is on.		
Media Type: Virtual Interfaces don't have a media type. However, you can modify the media type on the individual interfaces within the virtual interface.		
MTU size: Enter the MTU size (in bytes) for this interface. The default value is 1500.		9000
Trusted: Check this box if you want this interface to be trusted.		<input checked="" type="checkbox"/> Trust
WINS: Check this box if you want this interface to be used for WINS.		<input checked="" type="checkbox"/> Use WINS
Partner Enter the IPv4 address or network interface of the partner.		
Virtual Interface Links Check the links to include in this virtual interface.		<input checked="" type="checkbox"/> e4a <input checked="" type="checkbox"/> e4b <input type="checkbox"/> e0b <input type="checkbox"/> e0c <input type="checkbox"/> e0d
Trunk Mode Select the mode for this virtual interface.		Multiple

Figure 9: Add Virtual interface wizard.

Configuring the NetApp FAS3040 storage array: Setting up the aggregate

1. With a notebook system connected to the management network (10.41.6.x), open a Web browser.
2. Type http://10.41.6.31/na_admin
3. Click the Filer View link.
4. Click the aggregate link to expand options.
5. Click Add link under aggregate.
6. For aggregate name, type agg1
7. Leave the defaults (Double parity only), and click Next.
8. Leave the default (16) for the raid group size, and click Next.
9. Leave automatic for disk selection, and click Next.
10. Leave any type for disk type, and click Next.
11. Leave any size for disk size, and click Next.
12. Select 48 from the drop-down menu for number of disks, and click Next.
13. Click Commit to build the aggregate.

Configuring the NetApp FAS3040 storage array: Setting up the boot from SAN volume

1. With a notebook system connected to the management network (10.41.6.x), open a Web browser.

2. Type `http://10.41.6.31/na_admin`
3. Click the Filer View link.
4. To expand options, click the Volume link.
5. Under volumes, click the Add link.
6. In the Add Volume menu, click Next.
7. In the Volume Type box, click Flexible, and click Next.
8. In the Volume Parameters, type `BFS` for the volume name, and click Next.
9. In the Flexible Volume Parameters box, click `aggr1`, and none for space guaranteed, and click Next.
10. Type `500 GB` for Volume size and `0%` for snapshot reserve, and click Next.
11. Commit the volume.

Configuring the NetApp FAS3040 storage array: Setting up the boot from SAN LUNS

1. With a notebook system connected to the management network (10.41.6.x), open a Web browser.
2. Type `http://10.41.6.31/na_admin`
3. Click the Filer View link.
4. To expand options, click the LUNS link.
5. Under LUNS, click the Add link, and enter the following:
 - For Path, type `/BFS/UCS-infra1`
 - For LUN Protocol Type, select Xen.
 - For Description, type `BFS LUN UCS-infra1`
 - For Size, type `50`
 - Units=Gigabytes
 - Keep the space reserved check.
6. Click Add.
7. Repeat Steps 5 and 6 to create a 50 GB LUN for HP-infra1.
8. Under LUNS, click the Add link, and enter the following:
 - For Path, type `/BFS/XEN-VDI1`
 - For LUN Protocol Type, select Xen.
 - For Description, type `BFS LUN UCS-VDI1`
 - For Size, type `50`
 - Units=Gigabytes
 - Keep the space reserved check.
9. Click Add.
10. Repeat Steps 8 and 9 to create a 50 GB LUN for HP-VDI1.

Configuring the NetApp FAS3040 storage array: Setting up 1 TB volume for VDI infrastructure

1. With a notebook system connected to the management network (10.41.6.x), open a Web browser.
2. Type `http://10.41.6.31/na_admin`
3. Click the Filer View link.
4. To expand options, click the Volume link.
5. Under volumes, click the Add link.
6. In the Add volume menu, click Next.
7. In the volume type box, click Flexible, and click Next.
8. In the Volume Parameters box, type `NFS1` for the volume name, and click Next.
9. In the Flexible Volume Parameters box, click `aggr1`, click none for space guaranteed, and click Next.

10. For Volume size type 1 TB, for snapshot reserve type 0%, and click Next.
11. Commit the volume.

Configuring the NetApp FAS3040 storage array: Setting up 1 TB volume for VDI virtual machines

1. With a notebook system connected to the management network (10.41.6.x), open a Web browser
2. Type `http://10.41.6.31/na_admin`
3. Click the Filer View link.
4. To expand options, click the Volume link.
5. Under volumes, click the Add link.
6. In the Add Volume menu, click Next.
7. In the Volume Type box, click Flexible, and click Next.
8. In the Volume Parameters, type NFS2 for the volume name, and click Next.
9. In the Flexible Volume Parameters box, click aggr1, click none for space guaranteed, and click Next.
10. For Volume size type 1 TB, for snapshot reserve type 0%, and click Next.
11. Commit the volume.

Setting up the Cisco Unified Computing System

We used Cisco Unified Computing System guides to physically install and properly power the UCS chassis and fabric interconnects. For more information on the guide, see

http://www.cisco.com/en/US/docs/unified_computing/ucs/hw/chassis/install/ucs5108_install.html.

Cabling the UCS

1. Take one CAT6e cable, and connect the primary 6120XP L1 interface to the secondary L1 interface.
2. Take one CAT6e cable, and connect the primary 6120XP L2 interface to the secondary L2 interface.
3. Cable four SFP cables from Fabric A to chassis A 2104XP (left module):
 - FAB A port 8 → port 1
 - FAB A port 6 → port 2
 - FAB A port 4 → port 3
 - FAB A port 2 → port 4
4. Cable four SFP cables from Fabric A to chassis A 2104XP (right module):
 - FAB B port 16 → port 1
 - FAB B port 14 → port 2
 - FAB B port 12 → port 3
 - FAB B port 10 → port 4
5. Cable four SFP cables from Fabric B to chassis B 2104XP (left module):
 - FAB A port 7 → port 1
 - FAB A port 5 → port 2
 - FAB A port 3 → port 3
 - FAB A port 1 → port 4
6. Cable four SFP cables from Fabric B to chassis B 2104XP (right module):
 - FAB B port 9 → port 1
 - FAB B port 14 → port 2
 - FAB B port 11 → port 3

- FAB B port 15 → port 4

Cabling the MDS

1. Attach a fiber cable from MDS port 1 to NetApp FAS3040 onboard interface 0b.
2. Attach a fiber cable from MDS port 2 to NetApp FAS3040 onboard interface 0d.
3. Attach a fiber cable from MDS port 3 to UCS Fabric A Fiber Channel port 1.
4. Attach a fiber cable from MDS port 4 to UCS Fabric B Fiber Channel port 1.

Setting up Fabric A for a UCS cluster

After connecting via serial cable to the primary 6120XP Fabric interconnect, power on the unit, and provide the following answers to the following prompts:

1. Enter the installation method (console/gui)? `Console`
2. Enter the setup mode (restore from backup or initial setup) [restore/setup]? `Setup`
3. You have chosen to setup a new switch. Continue? (y/n): `Y`
4. Enter the password for admin: `PaSS1234`
5. Confirm the password for admin: `PaSS1234`
6. Do you want to create a new cluster on this switch (select 'no' for standalone setup or if you want this switch to be added to an existing cluster)? (yes/no) [n]: `Yes`
7. Enter the switch fabric (A/B): `A`
8. Enter the system name: `FAB-A`
9. Mgmt0 IPv4 address: `10.41.6.36`
10. Mgmt0 IPv4 netmask: `255.255.255.0`
11. IPv4 address of the default gateway: `192.168.0.1`
12. Virtual IPv4 address : `10.41.6.35`
13. Configure the DNS Server IPv4 address? (yes/no) [n]: `Yes`
14. DNS IPv4 address: `[none]`
15. Configure the default domain name? (yes/no) [n]: `Yes`
16. Default domain name: `domainname.com`
17. Apply and save the configuration (select 'no' if you want to re-enter)? (yes/no): `Yes`

Setting up Fabric B to join the UCS cluster

After connecting via serial cable to the secondary 6120XP Fabric interconnect, power on the unit, and enter the following:

1. Enter the installation method (console/gui)? `Console`
2. Installer has detected the presence of a peer switch. This switch will be added to the cluster. Continue?[y/n] `Y`
3. Enter the admin password of the peer switch: `PaSS1234`
4. Mgmt0 IPv4 address: `10.41.6.37`
5. Apply and save the configuration (select 'no' if you want to re-enter)? (yes/no): `Yes`

Opening the Unified Computing System Manager

1. From a client computer on the 10.41.6.x subnet, open a Web browser 10.41.6.35.
2. Click Launch.
3. When prompted for credentials, enter the following:
 - User ID= `admin`

- Password= PaSS1234

Checking firmware on all components

1. Open the equipment tree, install firmware, and verify the following are listed as running firmware:
 - a. Server CIMC= 1.3(1n)
 - b. Interface Card (all)= 1.3(1n)
 - c. IO modules = 1.3(1n)

Enabling server ports on Fabrics A and B

1. In UCS System Manager, open Equipment→Fabric Interconnect A (primary)→Fixed ports→unconfirmed ports.
2. Drag ports 1, 2, 3, 4, 5, 6, 7 and 8 from Unconfigured Ports to Server ports.
3. In UCS System Manager, open Equipment→Fabric Interconnect B (secondary)→Fixed ports→Unconfigured ports.
4. Drag ports 9, 10, 11, 12, 13, 14, 15 and 16 from Unconfigured Ports to Server ports.

Enabling Fiber ports from the MDS on Fabrics A and B

1. In UCS System Manager, open Equipment→Fabric Interconnect A (primary)→Expansion Module 2→Uplink FC, and select FC Port 1. Click Enable Port.
2. In UCS System Manager, open Equipment→Fabric Interconnect B (secondary)→Expansion Module 2→Uplink FC, and select FC Port 1. Click Enable Port.

Acknowledging all UCS hardware

1. In UCS System Manager, open Equipment →Chassis→ Chassis 1→right-click Chassis1, and select Acknowledge chassis.
2. Click Yes to the Acknowledge Chassis message about active links.
3. In UCS System Manager, open Equipment →Chassis→ Chassis 2→right-click Chassis2, and select Acknowledge chassis.
4. Click Yes to the Acknowledge Chassis message about active links.

Defining all VLANs on the Cisco UCS

1. In the UCS Manager, go to the LAN tab.
2. Open LAN→LAN Cloud→VLANs, right-click, and select create VLAN.
 - Name =MGMT-NET
 - vlan ID=10
3. Open LAN→LAN Cloud→VLANs, right-click, and select create VLAN.
 - Name=VDI-NET
 - Vlan ID=100
4. Open LAN→LAN Cloud→VLANs, right-click, and select create VLAN.
 - Name=Storage
 - Vlan ID=222
5. Open LAN→LAN Cloud→VLANs, right-click, and select create VLAN.
 - Name=empty
 - Vlan ID=200

Configuring Cisco Unified Computing profiles polices

Configuring KVM for blades

1. After all Blades are discovered, go to the left pane in the UCS System Manager, and click the Admin tab→filter: Communication Management →Management IP address.

2. Click the General tab.
3. Click Create Block of IP addresses.
4. Enter the following:
 - From:10.41.6.50
 - Size=20
 - Subnet mask=255.255.248.0
 - Gateway=10.41.01
5. Click OK.

Creating a MAC pool

1. In the UCS Manager, go to the LAN tab.
2. Open Pools→root→MAC pools, and right-click and select Create WWPN Pool.
 - Name=XD-pool
 - From: 00:25:B5:AB:CD:01 To: 00:25:B5:AB:CD:20
 - From: 00:25:B5:AB:CD:21 To: 00:25:B5:AB:CD:48
 - From: 00:25:B5:AB:CD:49 To: 00:25:B5:AB:CD:88

Creating a WWPN pool

1. In the UCS Manager, go to the SAN tab.
2. Open Pools→root→WWPN pools, and right-click and select Create a block of addresses.
 - Name=XD-pool
 - From 20:00:00:25:B5:0A:AD:01 To: 20:00:00:25:B5:0A:AD:20
 - From 20:00:00:25:B5:0A:AD:01 To: 20:00:00:25:B5:0A:AD:20
 - From 20:00:00:25:B5:0A:AD:49 To: 20:00:00:25:B5:0A:AD:88

Creating a WWNN pool

1. In the UCS Manager, go to the SAN tab.
2. Open Pools→root→WWNN pools, and right-click and select Create WWNN Pool.
 - Name=XD-pool
 - From 20:00:00:25:B5:AB:CD:01 To: 20:00:00:25:B5:AB:CD:20

Creating a UUID pool

1. In the UCS Manager, go to the Server tab.
2. Open Pools→root→UUID Suffix Pools, and right-click and select Create a block of UUID suffixes.
 - Name=XD-UUID_POOL
 - From 1234-56789ABCDE1 To:1234-56789ABCDEF0

Creating vHBA template

1. In the UCS Manager, go to the SAN tab.
2. Open SAN→Policies→root→vHBA Templates, and right-click and select Create vHBA Template.
 - Name= XD-Fabric-A
 - Fabric ID=A
 - Template=Updating template
 - WWN Pool=XD-Pool
3. Open SAN→Policies→root→vHBA Templates, and right-click and select Create vHBA Template.
 - Name= XD-Fabric-B
 - Fabric ID=B

- Template=Updating template
- WWN Pool=XD-Pool

Creating vNIC template

1. Open LAN→Policies→root→vNIC Templates, and right-click and select Create vNIC Template.
 - Name= XD-Fabric-A
 - Adaptor=Fabric A
 - Target =Adaptor (*deselect VM*)
 - Template type=Updating template
 - MTU=9000
 - MAC pool=XD-pool
 - QOS Policy=Platinum-policy
 - VLANS=10, 100, 222 (10=native)
2. Open LAN→Policies→root→vNIC Templates, and right-click and select Create vNIC Template.
 - Name= XD-Fabric-B
 - Adaptor=Fabric N
 - Target =Adaptor (*deselect VM*)
 - Template type=Updating template
 - MTU=9000
 - MAC pool=XD-pool
 - QOS Policy=Platinum-policy
 - VLANS=10, 100, 222 (10=native)

Creating a boot from SAN policy

1. Connect to the MDS Switch putty (10.41.6.32).
 - Run the command `show flogi da`
 - You will need to copy the two NetApp target addresses to notepad (NetApp port names start with 50:0a)
2. In the UCS Manager, go to the Servers tab.
3. Open Servers→Policies→root→Boot Policies, and right-click and select Create boot policy, and click OK.
4. For the name, type NTAP-BFS
5. Click Add SAN Boot.
6. In the Add SAN Boot box window, leave the vHBA blank, select the type to be primary, and click OK.
7. Click Add San Boot again.
8. In the Add SAN Boot box window, leave the vHBA blank and the type will be forced to secondary, and click OK.
9. Under vHBAs, click Add SAN Boot Target.
10. Click Add SAN Boot to SAN Primary.
11. Enter the first WWPN address from Step 1, and click OK.
12. Under vHBAs, click Add SAN boot Target.
13. Click Add SAN Boot to SAN Secondary.
14. Enter the second WWPN address from Step 1, and click OK.
15. Click Add CD-ROM.

16. Click OK to finish the SAN Boot policy.

Creating BIOS policy

1. In the UCS Manager, go to the Servers tab.
2. Open Servers→Policies→root→BIOS Policies.
3. Right-click BIOS Policies, and select create BIOS policy.
4. Type `B250-M2-LVDDIMMS` for the policy name, and assign it the following properties:
 - Main Quiet Mode: platform default
 - Resume AC On Power loss: platform default
 - Front Panel Lockout: platform default
5. Click Next.
6. Keep platform defaults for all processor options, and click Next.²
7. Keep platform defaults for all Intel Directed I/O.
8. For RAS memory, select the following:
 - Memory RES Config: Maximum-performance
 - NUMA: Enabled
 - LV DDR Mode: performance mode
9. Click Finish.

Creating service profile templates for all blades

Creating profile template for Cisco UCS B250 M2 Extended Memory Blade Servers

1. In the UCS Manager, go to the Servers tab.
2. Open Servers→Service Profile Templates→Root, right-click root, and select Create Service Profile Template.
3. In the Create Service Profile Template page 1, enter the following:
 - Name: `B250-template`
 - Type: `updating template`
 - UUID: `XD-UUID pool`
 - Select Next
4. In the Create Service Profile Template page 2 (storage), select Expert for How would you like to configure LAN connectivity setup for LAN connectivity.
5. Under WWNN Assignment, click XD-Pool.
6. In the WWNN assignment box, click Add.
7. In the Create vHBA box for Name, type `f0` and check the Use SAN Connectivity Template.
8. In the vHBA Template, select vHBA-XD-Fabric-A, and click OK.
9. In the WWNN assignment Box, click Add.
10. In the Create vHBA box for Name, type `f1` and check the Use SAN Connectivity Template.
11. In the vHBA Template, select vHBA-XD-Fabric-B, and click OK.
12. In the WWNN assignment Box, click Add.
13. In the Create vHBA box for Name, type `f2` and check the Use SAN Connectivity Template.
14. In the vHBA Template, select vHBA-XD-Fabric-A, and click OK.
15. In the WWNN assignment Box, click Add.

² Note: The platform defaults for processor options enable these Intel® features: Turbo Boost Technology, Hyper Threading, and Virtualization Technology.

16. In the Create vHBA box for Name, type `fc4` and check the Use SAN Connectivity Template.
17. In the vHBA Template, select vHBA-XD-Fabric-B, and click OK.
18. Finish page 2 of the template by selecting Next.
19. In the Create Service Profile Template page 3 (Networking), select Expert for How would you like to configure LAN connectivity setup for LAN connectivity.
20. In the MAC Address box, click Add.
21. In the Create vNIC box, type `vNIC0` for Name.
22. Check the box that says Used LAN Connectivity Template.
23. Select FAB-A for vNIC Template.
24. Click OK.
25. In the MAC Address box, click Add.
26. In the Create vNIC box, type `vNIC1` for Name.
27. Check the box that says Used LAN Connectivity Template.
28. For vNIC Template, select FAB-B.
29. Click OK.
30. In the MAC Address box, click Add.
31. In the Create vNIC box, type `vNIC2` for Name.
32. Check the box that says used LAN Connectivity Template.
33. Select FAB-A for vNIC Template.
34. Click OK.
35. In the MAC Address box, click Add.
36. In the Create vNIC box, type `vNIC3` for Name.
37. Check the box that says used LAN Connectivity Template.
38. Select FAB-B for vNIC Template.
39. Click OK.
40. Finish page 3 of the template by selecting Next.
41. Leave defaults for placement and finish page 4 of the template by selecting Next.
42. In the Server Boot Order, select NTAP-BFS from the drop-down menu.
43. Finish page 5 by selecting Next.
44. On the server assignment page, select XenDesktop_Server-Pool from the Pool Assignment drop-down menu.
45. Finish page 6 by selecting Next.
46. In the operational policies, select B250-M2-LVDIMMS in the Boot policy drop-down menu.
47. To complete the template, select Finish.

Creating a service template for the Cisco UCS B200 M2 Blade Server

1. In the UCS Manager, go to the Servers tab.
2. Open Servers → Service Profile Templates → Root, right-click root and select Create Service Profile Template.
3. In the Create Service Profile Template page 1, enter the following:
 - Name: B200-template
 - Type: updating template
 - UUID: XD-UUID pool
 - Select Next.

4. In the Create Service Profile Template page 2 (storage), select Expert for How would you like to configure LAN connectivity setup for LAN connectivity.
5. Under WWNN Assignment, click XD-Pool.
6. In the WWNN assignment box, click Add.
7. In the Create vHBA box for Name, type `fc0` and check the Use SAN Connectivity Template.
8. In the vHBA Template, select vHBA-XD-Fabric-A, and click OK.
9. In the WWNN assignment box, click Add.
10. In the Create vHBA box for Name, type `fc1` and check the Use SAN Connectivity Template.
11. In the vHBA Template, select vHBA-XD-Fabric-B, and click OK.
12. Finish page 2 of the template by selecting Next.
13. In the Create Service Profile Template page 3 (Networking), select Expert for How would you like to configure LAN connectivity setup for LAN connectivity.
14. In the MAC Address box, click Add.
15. In the Create vNIC box, type `vNIC0` for Name.
16. Check the box that says used LAN Connectivity Template.
17. For vNIC Template, select FAB-A.
18. Click OK.
19. In the MAC Address box, click Add.
20. In the Create vNIC box, type `vNIC1` for Name.
21. Check the box that says used LAN Connectivity Template.
22. Select FAB-B for vNIC Template.
23. Click OK.
24. Finish page 3 of the template by selecting Next.
25. Leave defaults for placement and finish page 4 of the template by selecting Next.
26. In the Server Boot Order, select NTAP-BFS from the drop-down menu.
27. Finish page 5 by selecting Next.
28. On the server assignment page, select XenDesktop_Server-Pool from the Pool Assignment drop-down menu.
29. Finish page 6 by selecting Next.
30. In the operational policies, select B250-M2-LVDIMMS in the Boot policy drop-down menu.
31. To complete the template, select Finish.

Creating service profiles from template for all blades

Creating service profiles from template for the B200 M2 blade

1. In the UCS Manager, go to the Equipment tab.
2. Open Equipment→Chassis→Chassis1→Servers→Server 1.
3. Ensure this is a B200 by looking into the General tab on the right-side window under Part Detail. It should read Cisco B200-M2.
4. In the left window, right-click Server 1, and select Create Service Profile for Server.
5. Select the Template based Service profile option.
6. In the Service Profile box titled Name, type `UCS-infra1`
7. In the Service Profile Template menu, select b200-template.
8. To complete the profile, click OK.

Creating service profiles from template for the B250 M2 blade

1. In the UCS Manager, go to the Equipment tab.
2. Open Equipment→Chassis→Chassis1→Servers→Server 3.
3. Ensure this is a B250 by looking into the General tab on the right side window under part Detail. It should read Cisco B200-M2
4. In the left window, right-click Server 3, and select Create Service Profile for Server.
5. Select the Template based Service profile option.
6. In the Service Profile box titled Name, type UCS-VDI1
7. In the Service Profile Template menu, select b250-template.
8. To complete the profile, click OK.

Mapping the boot from SAN LUNs to the Xen Server vHBAs

Creating Initiator groups for all Xen Servers

1. In the UCS Manager, go to the Servers tab.
2. Open Servers→Server Profiles→root→Service profile infra1-xen→vhba.
 - Note all the WWPN's (10:00:00:25:B5:0a:xx:xx)
3. Open a Web browser, and type `http://10.41.6.31/na_admin`
4. Click the Filer View link.
5. Expand the LUNs Menu.
6. Click Initiator groups.
7. Click Add.
8. In the Add initiator group, type UCS-infra1
 - Type=FCP
 - Operating system=xen
 - Initiators enter the WWPN names from Step 2, and click Add.
9. Repeat Steps 1 through 8 for the following server:
 - UCS-VDI1

Mapping each Initiator group to the appropriate Boot from SAN LUN

1. Open a Web browser, and type `http://10.41.6.31/na_admin`
2. Click the Filer View link.
3. Expand the LUNs Menu.
4. Click Manage.
5. Click vol/BFS/UCS-infra1.
6. Click Map LUN.
7. Click Add Groups to Map.
8. Select xen-infra1, and click Apply.
9. Select the LUN ID as 0.
10. Repeat Steps 4 through 9, adding the following initiator group to Boot from SAN LUNs:
 - xen-VDI1→/vol/BFS/UCS-VDI1

Setting up the HP BladeSystem c7000 Enclosure

The HP BladeSystem c7000 Enclosure has configurable components that will need to be setup. The OA (Onboard Administrator) and HP FlexFabric modules are key to ensuring the HP blades are properly prepared for the Xen Server install.

Setting up the Onboard Administrator –Network

Each OA (Onboard Administrator) has a tag or sticker that denotes the module's factory set password. Before you begin setup, document this password. The OA has a 100 MB LAN connection, which will be used to configure the OA. All individual blade OOB (Out Of Band) communication such as HP ILO will communicate over this port, so connect this to a private network.

1. Power on the chassis.
2. On the front of the chassis's Insight display, select Enclosure settings, and press OK.
3. Select OA1 IPv4, and press OK.
4. Select the OA IPv4, and press OK.
5. Select Static IP, and press OK.
6. For OA1 IP enter 10.41.2.76, for Mask enter 255.255.248.0, and for the gateway enter 10.41.0.1, and press OK.
7. Press Accept, and press OK.
8. From a laptop or workstation open an Internet explorer session to 10.41.2.76
9. In HP Blade System Onboard Administrator login screen box Enter Administrator for user name and for password enter the Password that is on the OA tag (mentioned at the beginning of this section)

Setting up the Onboard Administrator –First Time Setup Wizard

1. At the Welcome screen, click Next.
2. At the Enclosure selection screen, click Next.
3. At the Configuration screen, click Next
4. At the Rack Enclosure screen, click Next.
5. At the Administrator Account Setup screen, enter Password1 in the Password box, and click Next.
6. At the Local User Accounts screen, click Next.
7. At the Enclosure Bay IP Addressing screen, click Next.
8. At the Directory Groups screen, click Next.
9. At the Directory Settings screen, click Next.
10. At the Onboard Administrator Network Settings screen, click Next.
11. At the SNMP Settings screen, click Next.
12. At the Power Settings screen, select AC Redundant, and click Next.
13. Complete the First Time Setup Wizard by clicking Finish.

Setting up HP VC FlexFabric 10Gb/24-Port Module – Network setup and fiber channel setup

1. Log into the OA.
2. In the Systems and devices windows, click Virtual Connection Manager.
3. Click the Network setup wizard.
4. In the Welcome screen, click Next.
5. Click Yes, I would like to use Virtual Connect assigned MAC addressed, and click Next.

6. In the Assigned MAC Addresses, click HP pre-defined one, and click Next.
7. In the Server VLAN Tagging Support window, click Map VLAN Tags, and click Next.
8. In the Define Network connection window, click Connection with uplink(s) carrying multiple networks (using VLAN tagging), and click Next.
9. For Uplink Set Name, type `Data Trunk`
10. Click Add Port, and add the following ports to Data Trunk:
 - `Bay1:Port X5`
 - `Bay2:Port X5`
 - `Bay1:Port X6`
 - `Bay2:Port X6`
11. In the Associated Networks (VLAN tagged), add the following to Data Trunk:
 - `Public, VLAN 10`
 - `VDI-NET, VLAN 100`
 - `NFS-NET, VLAN 222`
12. To create the Shared Uplink Set, click Apply.
13. Leave the Start Fiber Channel Setup wizard box checked, and click Finish.
14. In the Fiber Channel Wizard welcome screen, click Next.
15. In WWN settings, click Yes, I would like to use the Virtual Connect assigned WWNs, and click Next.
16. In the Assigned WWNs screen select HP pre-defined, and Range 1, click Next.
17. In the Define Fabric window, click Define Fabric, and click Next.
18. In the Define San Fabric window, type `FAB-A`, and select Bay1, port x1. Click Apply.
19. To define additional fabrics, click Next.
20. In the Define Fabric window, click Define Fabric, and click Next.
21. In the Define San Fabric window, type `FAB-B`, and select Bay2, port x1. Click Apply.
22. Click No, I have define all available fabrics, and click Next.
23. Click Finish.
24. Click Sign Out.

Creating the profile template for the HP ProLiant BL460c G7

1. Connect to the MDS Switch via putty (10.41.6.32).
2. Run the command `show flogi da`
3. Copy the two NetApp target addresses to Notepad (NetApp port names start with 50:0a).
4. Log into the OA.
5. In the Systems and Devices window, click Virtual Connection Manager.
6. Click Define server profile.
7. Right-click and select Add to begin a new profile.
8. In the Profile name box, enter `INFRA1` and select the following values:
 - Ethernet port 1: `PT-NET`
 - Ethernet port 2: `Multiple networks`
 - i. `VDI-NET, vlan 100`
 - ii. `NFS-NET, vlan 222`
 - FCoE HBA 1: `FAB-A`
 - FCoE HBA 2: `FAB-B`
 - Fibre Channel boot Primary: (enter the primary address from Step 3)

- Fibre Channel boot Secondary: (enter the primary address from Step 3)
 - Assign to Bay1
9. In the Server profiles window, right-click the INFRA1 policy and select Copy.
 10. In the copy of INFRA1 profile, rename the profile to VDI1, and assign to bay2.

Mapping the boot from SAN LUNs to the Xen Server vHBAs

Creating Initiator groups for all Xen Servers

1. Log into the OA.
2. In the Systems and Devices window, click Virtual Connection Manager.
3. In the Server Profile window, click INFRA1.
4. In the Edit Server Profile window, record the two WWPN names for the server profile. These will be needed to set up the NetApp Boot from SAN LUNs in this section
5. In the Server Profiles window, click VDI1.
6. In the Edit Server Profile window, record the two WWPN names for the server profile.
7. Close the OA window.
8. Open a Web browser, and type `http://10.41.6.31/na_admin`
9. Click the Filer View link.
10. Expand the LUNs Menu.
11. Click Initiator groups.
12. Click Add.
13. In the Add initiator group box, type `HP-infra1`
 - Type=FCP
 - Operating system=xen
 - Initiators enter the two WWPN names from Step 4. Click Add.
14. Click Add.
15. In the Add initiator group box, enter `HP-vdi1`
 - Type=FCP
 - Operating system=xen
 - Initiators enter the two WWPN names from Step 6. Click Add.

Mapping each Initiator group to the appropriate Boot from SAN LUN

1. Open a Web browser, and type `http://10.41.6.31/na_admin`
2. Click the Filer View link.
3. Expand the LUNs Menu.
4. Click Manage.
5. Click `vol/BFS/HP-infra1`.
6. Click Map LUN.
7. Click Add Groups to Map.
8. Select `infra1`, and click Apply.
9. Select the LUN ID as 0.
10. Click Manage.
11. Click `vol/BFS/HP-vdi1`.
12. Click Map LUN.
13. Click Add Groups to Map.

14. Select vdi1, and click Apply.
15. Select the LUN ID as 0.

Installing XenServer 5.6

Installing XenServer 5.6

We installed the XenServer OS on one blade. Note that XenServer is effectively an operating system, and installing it removes any existing operating system from a server. (Steps 6, 7, 8, 9, 26 and 27 apply to the HP setup only.) Figure 10 shows the Citrix XenServer management addresses.

Server type	Xen Server name	XEN IP address/sub net mask
B200 M2	UCS-infra1	10.41.2.41/255.255.248.0
B250 M2	UCS-VDI1	10.41.2.42/255.255.248.0
BL460c G7	HP-Infra1	10.41.2.51/255.255.248.0
BL460c G7	HP-VDI1	10.41.2.52/255.255.248.0

Figure 10: Citrix XenServer management addresses.

1. Download XenServer 5.6 .ISO file from <http://www.citrix.com/English/ss/downloads/index.asp>, and burn to a disk.
2. Connect a monitor, keyboard, and DVD drive via HP c-Class Blade SUV Cable connector.
3. Insert the disk in the DVD drive, and boot from the disk.
4. Press any key to begin the installation.
5. At the Select Keymap screen, choose your key map or accept the default of QWERTY US, and press Enter.
6. At the Welcome to XenServer screen, press F9 to load a device driver, and insert driver disk in the DVD drive.
7. At the Select Driver Source screen, select Local media, and select OK.
8. At the Load Repository screen, select all the Emulex drivers, and select Use.
9. At the Drivers Loaded screen, select OK. Remove the drivers disk and re-insert the XenServer 5.6 disk in the DVD drive
10. At the Welcome to XenServer Setup screen, press OK.
11. At the End User License Agreement screen, read the agreement, select Accept EULA, and press Enter.
12. To install XenServer on the SAN, select the first NetApp LUN drives. (Note: There are multiple paths to each LUN, so it appears that there is more than one 50GB LUN, but this is OK.)
13. At the Select Installation Source screen, press Enter to accept the default setting, which is Local media.
14. At the Verify Installation Source screen, press Enter to accept the default setting, which is Verify installation source.
15. At the Verification Successful screen, press Enter.
16. At the Set Password screen, enter a root password, enter it again to confirm, and press Enter.
17. At the Networking screen, the application may prompt you to select a management network interface if your computer has multiple network interface cards (NICs). If so, select a NIC, and press Enter. If your computer has a single NIC, the application selects this NIC.
18. Select Static configuration, and specify the IP and Subnet from the table above (see Figure 10).
19. Press Enter.
20. At the Hostname and DNS Configuration screen, specify the name of the server you are installing.

21. At the Select Time Zone screen, select your geographical area, and press Enter. Then, select a specific locale in your time zone, and press Enter.
22. At the System Time screen, select use NTP time server, and press Enter.
23. At the Confirm Installation screen, select Install XenServer, and press Enter.
24. At the Set Local Time screen, enter the correct date and time, and press Enter.
25. At the Installation Complete screen, press OK. The system will automatically restart.
26. At the New Media screen, re-insert the drivers disk and press OK.
27. At the Load Repository screen, select all available drives and select Use.
28. When the server reboots, log in as root.
29. Repeat steps 1 through 29 to Install Xen server on both UCS blades, and both HP blades.

Installing XenCenter® and creating pools for the XenServers

1. On a client PC, open a Web browser and connect to `http://10.41.6.41`
2. Click install XenCenter.
3. Select Run.
4. After the file downloads, select Run when the Windows security warning prompts you.
5. At the Welcome to the Citrix XenCenter Setup Wizard screen, click Next.
6. At the Custom Setup screen, accept the default features, and click Next.
7. At the Destination Folder screen, accept the default path of `C:\Program Files(x86)\Citrix\XenCenter\`.
8. Under the Install for tab, select All Users, and click Next.
9. At the Ready to install Citrix XenCenter screen, click Install.
10. When the installation completes, click Finish.
11. Open XenCenter.
12. At the Welcome screen, click Add a Server.
13. Enter the server's IP address and password, and then click Add.
14. Click the root of the XenCenter in the left window, and select New pool...
15. For name, type `Infra` and click Next.
16. Select UCS-infra1 as the pool master, and click the checkbox next to HP-infra1 under Select members.
17. Click Finish to create the infra pool.
18. Click the root of the XenCenter in the left window, and select New pool...
19. For name, type `VDI` and click Next.
20. Select UCS-VDI1 as the pool master, and click the checkboxes next to HP-VDI1 under Select members.
21. Click Finish to create the VDI pool.

Managing networks in XenCenter for both pools

1. Select the pool called Infra → Networks Tab.
2. Click Add Network.
3. Click External Network.
4. In the Create network box, type `VDI-NET` for name, and click Next.
5. In the location box, select NIC1 and type `100` for the VLAN, and click Finish.
6. Click Add Network.
7. Click External Network.
8. In the Create network box, type `NFS` for name, and click Next.
9. In the location box, select NIC1, type `222` for the VLAN, and click Finish.
10. Select the pool called VDI → Networks Tab.
11. Click Add Network.

12. Click External Network.
13. In the Create network box, type VDI-NET for name, and click Next.
14. In the Location box, select NIC1 and type 100 for the VLAN, and click Finish.
15. Click Add Network.
16. Click External Network.
17. In the Create network window, type VDI-NET for name, and click Next.
18. In the location box, select NIC1, type 222 for the VLAN, and click Finish.

Managing storage in XenCenter for the Infra pool: Setting up NFS interfaces

We configured one additional management interface for each server to access the NFS exports on the NetApp FAS3040. See Figure 11 for the blade slot names and NFS addresses. We connected two blades from both the UCS, and the HP c7000 to the NFS volumes.

Server type	Xen Server name	NFS IP address/sub net mask
B200 M2	UCS-infra1	192.168.100.1/255.255.255.0
B250 M2	UCS-VDI1	192.168.100.2/255.255.255.0
BL460c G7	HP-Infra1	192.168.100.3/255.255.255.0
BL460c G7	HP-VDI1	192.168.100.4/255.255.255.0

Figure 11: Blade slot names and NFS addresses.

1. Open XenCenter→infra→UCS-infra1, and click the network tab
2. In the Management Interfaces section, click the boxed marked Configure...
3. Create a new interface by clicking New Interface and enter the following:
 - Name: NFS
 - Network: NFS
 - IP address: 192.168.100.1 (see the table above)
 - Subnet mask: 255.255.255.0
4. Repeat steps 1 through 3 to create NFS interfaces for all four servers.

Managing storage in XenCenter for the Infra pool

1. Select the pool called infra→Storage tab.
2. Click New SR...
3. In the New Storage Repository, NFS VHD, and click Next.
4. In The Name box, type
 - Name: NFS1
 - Share name 192.168.100.101 :vol/NFS1
5. Click Finish.

Managing storage in XenCenter for the VDI pool

1. Select the pool called VDI→Storage tab.
2. Click New SR...
3. In the New Storage Repository, click NFS VHD, and click Next.
4. In the Name box, type
 - Name: NFS2
 - Share name 192.168.100.101 :vol/NFS2
5. Click Finish.

Setting up the infrastructure virtual machines

To support all the features of XenDesktop 4, we created several virtual machines in an Infrastructure pool. Figure 12 shows a diagram of our infrastructure pool, and Figure 13 shows a breakdown of our infrastructure pool. Note that we used this infrastructure pool for both the Cisco UCS solution and the HP solution.

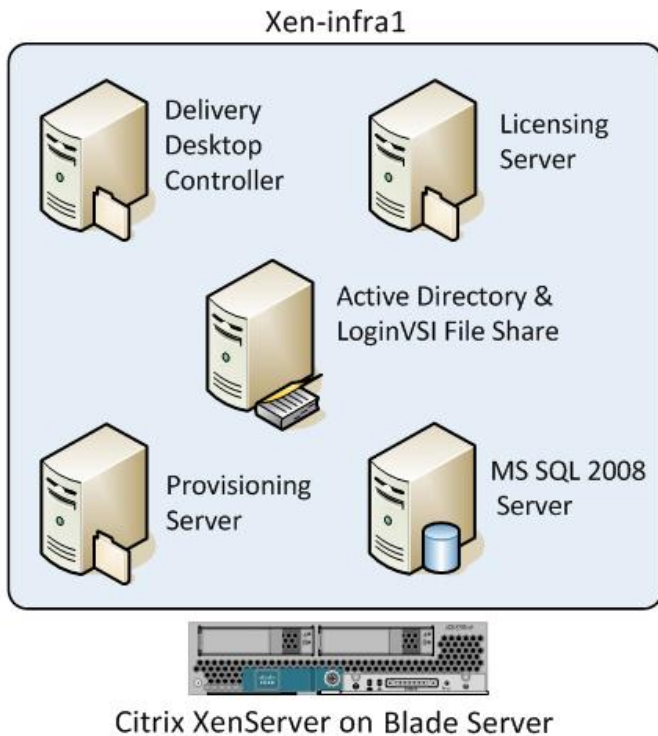


Figure 12: A diagram of our infrastructure pool.

VM name Hosted OS	Role (s)	Memory	#vCPUs	(VLAN) Address(s)	VLAN	Storage
DC1 Win 2008 R2 x64 Enterprise	AD Domain controller VSI Share, DHCP,DNS	4 GB	2	172.100.0.100/16 (10.41.6.39/21 (*)	100 10	C:\=50GB D:\=50GB
XD-SQL Win 2008 R2 x64 Enterprise	SQL server for Desktop Meta Data	4 GB	2	172.100.0.103/16	100	C:\24 GB
XD-LIC1 Win 2008 R2 x64 Enterprise	XenDesktop License server	1 GB	1	172.100.0.101/16 (10.41.6.39)/21(*)	100	C:\=24GB
XD-DDC1 Win 2003 R2 x64 Enterprise	XenDesktop Delivery Controller	4 GB	4	172.100.0.102/16 10.41.6.71/21(*)	100 10	C:\50GB
XD-PS1	XenDesktop	4 GB	4	172.100.0.104/16	100	C:\70GB

VM name Hosted OS	Role (s)	Memory	#vCPUs	(VLAN) Address(s)	VLAN	Storage
Win 2008 R2 x64 Enterprise	Provisioning Services					
L1 Win2003 R2 x64 Enterprise	Login VSI Master Launcher	4 GB	2	DHCP assigned	100	C:\12GB

Figure 13: The breakdown of our infrastructure pool.

(*) Secondary address, no default gateway.

Setting up DC1 (infrastructure server)

Installing Windows Server 2008 R2 Enterprise Edition

1. Boot the VM called DC1 and use the virtual media application to map the Windows Server 2008 R2 installation DVD ISO.
2. At the Language Selection Screen, click Next.
3. Click Install Now.
4. Select Windows Server 2008 Enterprise Edition R2 (Full Installation), and click Next.
5. Click the I accept the license terms checkbox, and click Next.
6. Click Custom.
7. Click Drive options (advanced).
8. Ensure you select the proper drive, and click New.
9. Click Apply.
10. Click Next.
11. When the installation completes, open Server Manager → Configuration → Local Users and Computers → Users, select Administrator, and right-click the Administrator.
12. Set Password to `Password1`
13. In the DVD Drive 1 drop-down menu, select `xstools.iso`.
14. Install xentools.
15. Reboot the system.
16. Log in as `Administrator`
17. Open Server Manager.
18. Select Change System Properties.
19. In the Systems Properties dialog box, rename the computer to `DC1`
20. Reboot the system.
21. Set the password to `Password1`
22. At the Your password has been changed screen, click OK.

Installing system updates in Windows Server 2008 R2

We used the Windows Update feature to install all required updates as of 2/01/2011.

Setting up network configuration on DC1

1. Click Start → Run, and type `ncpa.cpl`
2. Right-click the active adaptor, and click Properties.
3. Select Internet Protocol Version 4 (TCP/IPv4), and click Properties.
4. At the Internet Protocol Version 4 (TCP/IPv4) Properties screen, select the Use the following IP address radio button.

5. Type `172.100.0.100` for the IP, and type `255.255.0.0` for the default subnet mask and type `172.100.0.1` for the gateway.
6. Click OK, and click Close to exit.

Installing Active Directory and DNS services on DC

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 `verne.com` and click Next.
5. At the NetBIOS name prompt, leave the name VERNE, 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, 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. When DC1 restarts, log in as `verne\administrator`.
13. Click Start→Run, and type `dsa.msc` to open Active Directory Users and Computers.
14. In the left pane, open Active Directory Users and Computers, and right-click the Verne icon. Select New→Organization Unit.
15. In the new Object –Organizational Unit Name field, type `XenDesktop` and click OK.
16. Close Active Directory Users and Computers.

Setting up DHCP services on DC1

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 `verne.com` for the parent domain.
5. Type the preferred DNS server IPv4 address, `172.100.0.100` 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.
 - Starting IP Address
 - Ending IP Address
 - Subnet mask
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 → dc1.verne.com → IPv4 → Server Options.
19. Right-click Server Options and select configure options.
20. Activate option 66 Boot Server Host Name.
 - String value= `172.100.0.104`
21. Activate option 67 Boot file Name.
 - String value= `ARDBP32.BIN`
22. Click OK.

Preparing the domain for Login VSI

Creating the VSI share

1. Log onto DC1.
2. Open Windows Explorer, navigate to `C:\`, click New Folder, and name it VSI-Share.
3. Right-click the new folder, and select Properties.
4. Click Sharing → Advanced sharing, and check Share this folder.
5. Open Permissions.
6. Check Allow Full Control to everyone, click Apply, and click OK.
7. At the Advanced Sharing screen, click Apply, and click OK.
8. Create a folder in the VSI-Share called `Install Media`
9. Extract the login-vsi install media into the install `C:\VSI-Share\install media\VSI` folder. (Available at <http://www.loginconsultants.com>.)
10. Extract the Citrix Provisioning services 5.6.1 media into `c:\VSI-Share\install media\XD-PVS` folder. (Available at <http://www.citrix.com/English/ss/downloads/index.asp>.)
11. Extract the Microsoft Office 2007 setup files into `C:\VSI-Share\install media\Office 2007`.
12. Download Microsoft Office 2007 SP2 from <http://www.microsoft.com/downloads/en/default.aspx>, and save it into `C:\VSI-Share\install media\Office 2007`.
13. In Windows Explorer, create the folder `D:\Profiles`.
14. Run the Login VSI setup on DC1.
15. Set the amount of users to `1,000`
16. Set your username to `Login_VSI`
17. For your password, enter the password you set up earlier, `Password1`
18. Click Start. A command prompt appears and you see the setup creating users.
19. Once the script finishes, the command prompt displays AD preparation is completed. Click OK, and click Exit.

Adding users to AD group and enabling roaming profiles

1. Go to Start → Administrative Tools, and select Active Directory Users and Computers.
2. Expand `loginvsi.com`.
3. Expand `Login_VSI`.
4. Select all 1,000 VSI users, and click Properties.
5. In the Properties for Multiple items box, check the profile path, and type `\\dc1\profiles\%username%`

6. Right-click Login_VSI.
7. Select New, and select Group.
8. Set Group Name to `loginvsigroup` select Global for Group Scope, and leave Group Type as Security. Click OK.
9. Select all the users, and right-click select add to group. Type `loginvsigroup` for the name of the group, and check name. Click OK and the users will have joined the group.

Setting up an ISO repository for install media

1. Click Start→Computer→C:\.
2. Right-click, and select New folder.
3. Type ISO and click Enter.
4. Right-click ISO, and select Properties.
5. Click the Sharing tab.
6. Click Share...
7. In the dialog box, type `everyone` and click Add.
8. Click Share.
9. Click Done.
10. Copy the following .ISO files to C:\iso. You will need these later.
 - Microsoft Windows 7 Professional x86
 - Microsoft Windows Server 2008 R2
 - Citrix XenDesktop DDC.iso
 - Microsoft SQL Server 2008 Enterprise Edition
 - Microsoft Windows Server 2003 x64 R2 Enterprise Edition Disk 1
 - Microsoft Windows Server 2003 x64 R2 Enterprise Edition Disk2

Configuring the XenServer pools to connect to the ISO CIFS Share

1. Open XenCenter.
2. Click XenCenter→Infra, and click the Storage tab.
3. Click New SR.
4. Click Windows File Sharing (CIFS), and click Next.
5. In the New Storage repository dialog box, type the following, and click Finish:
 - ISO for Name
 - `\\DC1\ISO` for Share
 - `verne\administrator` for Username
 - `Password1` for Password
6. Click XenCenter→VDI, and click the Storage tab.
7. Click New SR.
8. Click Windows File Sharing (CIFS), and click Next.
9. In the New Storage repository dialog box, type the following, and click Finish:
 - ISO for Name
 - `\\DC1\ISO` for Share
 - `verne\administrator` for Username
 - `Password1` for Password

Installing the license server

Installing Windows Server 2008 R2 Enterprise Edition

1. Open XenCenter.
2. Select the VM called XD-LIC1, and click the Console tab.
3. In the DVD Drive 1 drop-down menu, select Windows Server 2008 R2.ISO.
4. Start the VM.
5. At the Language Selection Screen, click Next.
6. Click Install Now.
7. Select Windows Server 2008 Enterprise Edition R2 (Full Installation), and click Next.
8. Click the I accept the license terms check box, and click Next.
9. Click Custom.
10. Click Drive options (advanced).
11. Ensure you select the proper drive, and click New.
12. Click Apply.
13. Click Next.
14. When the installation completes, open Server Manager → Configuration → Local Users and Computers → Users, select Administrator, and right-click the Administrator. Set Password to Password1
15. In the DVD Drive 1 drop-down menu, select xstools.iso.
16. Install xen-tools.
17. Reboot the system.
18. Log in as Administrator
19. Open Server Manager.
20. Select Change System Properties.
21. In the Systems Properties dialog box, rename the computer name to XD-LIC1
22. Reboot the system.
23. Set the password to Password1
24. At the Your password has been changed screen, click OK.
25. Join the Verne domain.
26. Reboot the system.

Installing system updates in Windows Server 2008 R2

We used the Windows Update feature to install the required updates as of 2/01/2011.

Configuring the XenDesktop license server

1. Run \\dc\share\XD-PVS\ps5.6install\licensing\licensing.msi
2. Accept the License agreement, and click Next.
3. Accept the default install, Directory Install.
4. Accept defaults for Ports in the Licensing Configuration wizard.
5. Type Password1 for Password and again to confirm, and click OK.
6. Activate and copy 800 valid seat licenses to the server from <https://www.citrix.com/login?url=http://support.citrix.com/pages/licensing/>
7. Install the license files by opening Start → Citrix → Management Consoles → License Administration Console.

Configuring all XenServers to use the newly created license server

1. In XenCenter, go to →XenCenter→Infra→xen-Infra1.
2. In the Tools menu, click License Manager...
3. Select xen-infra1, and click Assign License.
4. In the Apply license screen, click Citrix XenServer for XenDesktop, and enter the following:
 - Name=10.41.6.39
 - Port=27000
5. Click OK.
6. Repeat steps 1 through 5 for all other XenServers.

Installing SQL Server for XenDesktop Meta Data

Installing Windows Server 2008 R2 Enterprise Edition

1. Open XenCenter.
2. Select the VM called XD-SQL, and click the Console tab.
3. In the DVD Drive 1 drop-down menu, select Windows Server 2008 R2.ISO.
4. Start the VM.
5. At the Language Selection Screen, click Next.
6. Click Install Now.
7. Select Windows Server 2008 Enterprise Edition R2 (Full Installation), and click Next.
8. Click the I accept the license terms check box, and click Next.
9. Click Custom.
10. Click Drive options (advanced).
11. Ensure you select the proper drive, and click New.
12. Click Apply.
13. Click Next.
14. When the installation completes, open Server Manager→Configuration→Local Users and Computers→Users, select Administrator, and right-click the Administrator. Set Password to Password1
15. In the DVD Drive 1 drop-down menu, select xstools.iso.
16. Install xen-tools.
17. Reboot the system.
18. Log in as Administrator
19. Open Server Manager.
20. Select Change System Properties.
21. In the Systems Properties dialog box, rename the computer name to XD-SQL
22. Reboot the system.
23. Set the password to Password1
24. At the Your password has been changed screen, click OK.
25. Join the Verne domain.
26. Reboot the system.

Installing system updates in Windows Server 2008 R2

As we did for DC1, we used the Windows Update feature to install required updates as of 2/01/2011.

Installing SQL Server 2008 Enterprise Edition

1. In the DVD Drive 1 drop-down menu, select Microsoft-sql2008.ISO.

2. Click Run SETUP.EXE on the AutoPlay menu.
3. If the application prompts you to install the .NET Framework, click OK.
4. Select the Accept radio button, and click Install.
5. When the installation finishes, click Exit.
6. If any warnings appear about compatibility, accept them (installing SP1 in the next section should solve any compatibility issues).
7. If the application prompts you, click OK to install a hotfix for Windows (KB942288).
8. Click Restart now to restart the server upon completion.
9. After rebooting, log into the server.
10. Click Start, and click Computer.
11. Double-click the CD/DVD drive.
12. Click Installation.
13. Click New SQL Server stand-alone installation.
14. On the Setup support rules screen, click OK.
15. Specify the Enterprise Evaluation Free Edition, and click Next.
16. Click the check box to accept the license terms, and click Next.
17. To install the setup support files, click Install.
18. You may see a Windows Firewall warning. For now, ignore this, and click Next.
19. On the Feature Selection screen, select Database Engine Services, Full-Text Search, Client Tools Connectivity, Client Tools Backward Compatibility, Management Tools –Basic, and Management Tools.
20. Click Complete, and click Next.
21. On the Instance configuration screen, leave the default selection of default instance, and click Next.
22. On the Disk space requirements screen, click Next.
23. On the Server configuration screen, choose NT AUTHORITY\SYSTEM for SQL Server Agent, and choose NT AUTHORITY\SYSTEM for SQL Server Database Engine. Click Next.
24. On the Database Engine Configuration screen, select Mixed Mode.
25. Enter a password for the system administrator (sa) account.
26. Click Add Current user. This may take several seconds.
27. Click Next.
28. On the Error and usage-reporting screen, click Next.
29. On the Installation rules screen, click Next.
30. On the Ready to Install screen, click Next.
31. After installation completes, click Start→All Programs→Microsoft SQL Server 2008→Configuration Tools→SQL Server Configuration Manager.
32. Expand the Network Configuration node, and select the relevant instance.
33. In the right pane, right-click TCP/IP, and choose Enable.
34. In the left pane, click SQL Server Services.
35. In the right pane, right-click the SQL Server service, and select Restart.

Installing SQL Server 2008 Service Pack 1

Service Pack 1 is available for download from

<http://www.microsoft.com/downloads/details.aspx?FamilyID=66ab3dbb-bf3e-4f46-9559-ccc6a4f9dc19&displaylang=en>.

1. Run SQLServer2008SP1-KB968369-x64-ENU.exe.
2. On the Welcome screen, click Next.
3. On the License terms screen, accept the license terms, and click Next.
4. On the Features screen, select available features, and click Next.
5. On the Check files in use screen, click Next.
6. On the Update screen, click Next.
7. When the update completes, click Next, and click Close.

Installing the Desktop delivery controllers: DDC1

Installing Windows Server2003 Enterprise Edition (x64) on the virtual machines XD-DDC1

1. Open XenCenter.
2. Select the VM called XD-DDC1, and click the Console tab.
3. In the DVD Drive 1 drop-down menu, select Windows Server 2003 R2 X64 Enterprise CD1.ISO.
4. Start the VM.
5. Begin the Windows Server 2003 R2 Enterprise Edition (x64) Setup.
6. Press Enter to begin.
7. Read the licensing agreement, and press F8 to accept the terms.
8. Select the 50GB partition to install Windows Server 2003.
9. Select format in NTFS quick. Setup begins copying necessary files from the installation.
10. The machine reboots and loads a GUI mode phase.
11. Change your regional settings to accommodate your location, language, and time zone.
12. Enter your name and organization, and click Next.
13. Enter the appropriate license, and click Next.
14. Enter the computer name and password.
15. Select the date, time, and time zone settings. The setup installs the networking components.
16. Continue with the default network settings.
17. The setup process finishes copying files and configuring the setup.
18. Setup finishes and boots Windows Server 2003.
19. Log in as Administrator
20. Windows Setup requires Windows Server 2003 Enterprise Edition (x64) R2 CD2 to complete the installation; change the virtual media in XenCenter to insert CD 2 when it prompts you, and click OK.
21. At the Welcome screen, click Next.
22. Accept the End-user License Agreement, and click Next.
23. The setup copies files and completes the installation.
24. Click Finish.
25. In the DVD Drive 1 drop-down menu, select xstools.iso.
26. Install xen-tools.
27. Reboot the system.
28. Join the Verne domain.
29. Reboot the system.
30. After the system has rebooted, log in and click Start → Windows Update.

Installing system updates in Windows Server 2003 R2 x64

We used the Windows Update feature to install required updates as of 2/01/2011.

Installing updated Windows 2003 Enterprise Edition (x64) on the virtual machines XD-DDC1

1. Select Express, and install all available patches.
2. Reboot the system.
3. Log into XD-DDC1 as `Administrator`
4. Click Start → Control Panel → Network Connections, right-click Local Area Connection, and select Properties.
5. Rename Connection 1 to be `VDI-NET`
6. Rename Connection 2 to be `Public`
7. In the Local Area Connection Properties screen, select Internet Protocol (TCP/IP).
8. At the Internet Protocol Properties screen, complete these fields:
 - IP address
 - Subnetmask
 - Default Gateway
 - DNS=172.100.0.100
9. Click OK.
10. Click Start, right-click My Computer, and select Properties.
11. In the System Properties box, select the Computer Name tab.
12. On the Computer Name tab, select Change.
13. To join the Verne domain, select Domain, specify Verne, and click OK.
14. When prompted for credentials, use the following, and select OK:
 - Username: `Verne\administrator`
 - Password: `Password1`
15. At the Welcome to the Verne domain screen, select OK.
16. To exit the Computer Name window, select OK.
17. To reboot the XD-DDC server to finish the domain join, select Yes.

Installing Desktop Delivery Controller software on DDC1

Installing Desktop Delivery Controller automatically installs all the prerequisite Delivery Controller components. When installing Terminal Services and Internet Information Services (IIS), the installation program prompts you to insert the Windows Server 2003 installation disc when appropriate.

1. Log into the XD-DDC1 as `Verne\administrator`
2. In the Console tab of XenCenter, select the DDC media for DVD Drive1.
3. From the Desktop Delivery Controller media, run `autorun.exe` on the installation disc.
4. At the Welcome screen of the Desktop Delivery Controller installer, select Install Server Components, read and accept the license agreement, and click Next.
5. At the Select Components screen, uncheck Citrix License Server, and click Next.
6. At the Create or Join a Farm screen, select Create new farm, and specify the farm name `VDI-pool`
7. At the Specify Farm Edition screen, select Platinum Edition.
8. At the Optional Server Configuration screen, click Next.
9. At the Start Installation screen, specify the database server `XD-SQL`
10. In the Database Configuration screen, set up an ODBC connection to the SQL server, and click Configure...
11. In the New Data Source Wizard, select XD-SQL, and click Next.

12. In the New Data Source to SQL screen, click With SQL Server authentication using a login ID and password entered by the user, type `sa` for the user ID and `Password1` for the password, and click Next.
13. Do not change the ANSI Defaults, and click Next.
14. Do not change the log settings, and click Finish.
15. Click Test Data Source, and click OK when SQL connectivity has been verified.
16. Follow the onscreen instructions. Note that when the installation program prompts you to restart the server, you must log in as `Verne\administrator` to continue.
17. At the Setup Complete page, click Finish.
18. At all hardware installation notifications, select Continue anyway.
19. The system will reboot again. Log into XD-DDC1 as `Verne\administrator` again.
20. The Active Directory Configuration Wizard will start.

Configuring the Active Directory organizational unit for XenDesktop

Use the Active Directory Configuration Wizard to configure the default population of the Active Directory organizational unit (OU) specifically for running Desktop Delivery Controller. The wizard begins automatically after you complete the previous procedure.

1. At the first screen of the Active Directory Configuration Wizard, click Next.
2. At the Configure Farm OU in Active Directory screen, click Browse, and navigate to the XenDesktop OU.
3. Click OK, and click Next.
4. At the Summary screen, click Finish, and once the application has applied the settings, click Close.
5. When the application prompts you to start the Delivery Services Console, click Yes. Leave the console running for the next procedure.

Configuring Delivery Services

When the Delivery Services Console starts for the first time, the Configure and Run Discovery wizard starts automatically.

1. At the Welcome screen, click Next.
2. At the Select Product or Components screen, ensure that all the check boxes are selected, and click Next.
3. At the Select Controllers screen, click Add Local Computer, and click Next.
4. At the Preview Discovery screen, click Next.
5. Wait until discovery is complete, and click Finish. In the Delivery Services Console, the Desktop Delivery Controller VM (XD-DDC1) is added to the left pane under Citrix Resources → Desktop Delivery Controller → farm name → Controllers → XD-DDC1.
6. Right-click the XD-DDC1 icon, and select Properties.
7. Select Farm-wide → License Server.
8. In the License Server box, enter `10.41.6.39` for Name and `27000` for the port number. Click OK.
9. Close the Delivery Services Console.

Installing provisioning services server

Installing Windows Server 2008 R2 Enterprise Edition

1. Open XenCenter.
2. Select the VM called XD-PS1, and click the console tab.

3. In the DVD Drive 1 dropdown screen, select Windows Server 2008 R2.ISO.
4. Start the VM.
5. At the Language Selection Screen, click Next.
6. Click Install Now.
7. Select Windows Server 2008 Enterprise Edition R2 (Full Installation), and click Next.
8. Click the I accept the license terms check box, and click Next.
9. Click Custom.
10. Click Drive options (advanced).
11. Ensure you select the proper drive, and click New.
12. Click Apply.
13. Click Next.
14. When the installation completes, open Server Manager→Configuration→Local Users and Computers→Users, select Administrator, and right-click the Administrator. Set Password to Password1
15. In the DVD Drive 1 dropdown screen, select xs-tools.iso.
16. Install xentools.
17. Reboot the server.
18. Log in as Administrator
19. Open Server Manager.
20. Select Change System Properties.
21. In the Systems Properties dialog screen, rename the computer name to XD-PS1
22. Reboot the system.
23. Set the password to Password1
24. At the Your password has been changed screen, click OK.
25. Join the Verne Domain.
26. Reboot the Server.
27. Log in as verne\administrator
28. In server manager, expand the features menu, and click Add features.
29. Click .NET Framework 3.5.1 Features.
30. Click add required Role Services to add necessary prerequisite role services.
31. To install NET Framework 3.5.1 Features and required Role Services, click Next.
32. To confirm NET Framework 3.5.1 Features, click Next.
33. To confirm Role Features, click Next.
34. To confirm all changes, click Install.
35. When .NET Framework is installed, click Close.
36. Create a folder for VHD images called c:\PS-store

Installing system updates in Windows Server 2008 R2

As we did for DC1, we used the Windows Update feature to install required updates as of 2/01/2011.

Installing provisioning services software on XD-PS1

1. Connect to \\dc1\share\install files\ps5.6-install\autorun.exe
2. Click Server Installation.
3. Click Install Server.
4. Click Install to add the SQLncx64 component.
5. To confirm Step 4, click Yes.

6. At the Provisioning Services welcome screen, click Next.
7. Accept the licensing agreement, and click Next.
8. In the Customer information dialog screen, keep defaults, and click Next.
9. Keep the default folder C:\program files\citrix\provisioning services\, and click Next.
10. In the Setup type screen, select Complete, and click Next.
11. In the Ready to install screen, click Install.
12. When the installation wizard is complete, click Finish.

Configuring provisioning services on XD-PS1: XD-PSFARM

1. After the Provisioning Services Configuration wizard launches, click Next.
2. In the DHCP configuration screen, select The service that runs on another computer, and click Next.
3. For PXE services, select The service that runs on this computer, and click Next.
4. For the Farm configuration box, click Create farm.
5. In the Database Server screen, browse to the XD-SQL server, and click Next.
6. In the New Farm screen, type XD-PSFARM for both the database name and for the farm name, and click Next.
7. In the New Store screen, keep the store name as store and the default path as c:\PS-Store.
8. In the License server screen, type XD-LIC and leave the port as 27000, and click Next.
9. In the user account screen, select specified user, add the following credentials, and click Next.
 - Username: Administrator
 - Domain: Verne
 - Password: Password1
10. Click Yes to configure the database with the domain admin account.
11. In the Active Directory computer account password automate password updates using 7 days between updates screen, click Next.
12. In the Network communications screen, ensure that only the 172.100.0.104 address is checked, and click Next.
13. In the TFTP setting screen, check the box to use the Provisioning service TFTP service, keep the default path of c:\programData\citrix\Provisioning Services\Tftpboot\ARDBP32.bin, and click Next.
14. In the stream Server Boot list, keep the default 172.100.0.104, add the following, and click Next.
15. Click Finish to create the Provisioning service farm.

Configuring provisioning services: Optimizing the provisioning services server

1. Click Provisioning Services → XD-PSFARM → Sites → Site → Servers.
2. Select XD-PS1, and right-click Properties.
3. Click the Advanced tab.
4. In the Advanced Server Properties box, select the Server tab, and move the slide bar for Thread per port from 8 to 31.
5. Click OK.

Creating a XenDesktop group

1. Log into XD-DDC1 as verne\administrator
2. Click Start → All Programs → Citrix → Management Consoles → Delivery Services Console.
3. Go to Citrix Delivery Services Console → Citrix Resources → Desktop Delivery Controller → XENDESKTOP.
4. Right-click Desktop Groups, and click All Tasks → Create Desktop Group.
5. In the Welcome screen for Create Desktop Group, click Next.

6. Select Assigned, click Assign on first use, and click Next.
7. For hosting infrastructure, choose Citrix Xen VM infrastructure (included with XenDesktop).
8. To specify the hosting infrastructure, enter the following values for the VDI pool master, and click Next:
 - Address: `http://10.41.6.42`
 - Username: `root`
 - Password: `Password1`
9. Do not add any virtual desktops at this time.
10. To add users, click Add...
11. In the Users and Groups box, type `domain users; domain admins` and click OK.
12. Ensure that the two groups are present in the Users box, and click Next.
13. For display name, type `VDI-pool` and click Next.
14. Keep the Default icon, and click Next.
15. Leave both checkboxes in the Publishing Options box unselected, and click Finish to create the desktop group.

Creating the Windows 7 virtual machine for VHD creation

Installing the Windows 7 Professional (32-bit) virtual machine

1. Open XenCenter.
2. In the VDI pool Right-click `xen-VDI1`, and select New VM.
3. In the Select a VM template box, scroll to the bottom, Windows 7 (32-bit), and click Next.
4. In the Name the New Virtual Machine box, type `win7-32-gold` and click Next.
5. In the Locate the Operating System Installation Media box, select the Windows 7 professional Edition `x86.iso`, and click Next.
6. In the Select a Home Server box, do not select a home server, and click Next.
7. In the Allocate Processor and Memory Resources screen, select 1 vCPU and 2048 MB, and click Next.
8. In the Configure Storage for the New VM box, click Add...
9. In the Add Virtual Disk box, type `disk0` for name and 16384 MB for size, and click Add.
10. At the Configure Storage for the New VM screen, click Next.
11. In the Configure Networking screen, ensure that only the public network is present, delete any others, and click Next.
12. At the Ready to Create the New Virtual Machine screen, click Next.
13. The new VM called `win7-32-gold` should appear on the left pane of XenServer. Click it, and click the Console tab.

Windows 7 guest: Installing Windows 7 Professional (x86) on the newly-created 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, and the setup begins.
7. Type `user` for the username and `win7-32-gold` for the computer, and click Next.
8. Enter no password, and click Next.
9. For system protection, 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. Use Windows Update to patch the Windows 7 installation.

Windows 7 guest: Installing xen-tools

1. In XenCenter, click the drop-down menu for DVD Drive 1:, and click xs-tools.iso.
2. When the installation prompts you, click Run xensetup.exe.
3. When the User Account Control notification prompt appears, click Yes.
4. Accept the license agreement, and click Next.
5. Accept the default installation location, and click Install.
6. Click Finish to reboot.
7. When the VM reboots, it detects new hardware and prompts you to reboot again. Click OK.

Windows 7 guest: Turning off system restore

1. Click Start, right-click Computer, click Properties→Advanced system settings→System Protection→Configure →Turn off system protection, and click OK.

Windows 7 guest: Disabling IPv6

1. Click Start→Run, and type `ncpa.cpl`
2. Right-click on Local Area Connection, and click Properties.
3. Uncheck Internet Protocol Version 6 (TCP/IP), and select OK.

Windows 7 guest: Adjusting page file

1. Right-click Computer→Properties→Change settings→Advanced→Performance→ Settings.
2. In Performance settings, select the Advanced tab, and select Change for Virtual Memory.
3. Deselect Automatically manage page file.
4. Select Custom size, type 1536 for both values, and select Set.

Windows 7 guest: Joining the AD domain

1. Right-click Computer→Properties→Change settings→Computer name.
2. Select Change.
3. In the Member of section, select Domain.
4. Enter the domain name: `verne.com` and click OK.
5. Enter the domain admin account and password for the login-vsi domain.
6. Reboot the system.

Windows 7 guest: Disabling Windows Firewall

The domain GPO automatically disables the Windows Firewall.

Windows 7 guest: Installing Office 2007 Professional

1. From the Office 2007 media, run Setup.
2. Enter the product key for Office 2007, and click Continue.
3. Accept the licensing agreement.
4. Select Custom install.
5. At the root of the installation options, ensure that all Office components are set to Run from My Computer.
6. Click Install.
7. Download and run Office 2007 Service Pack 2.
8. Reboot the system.

Windows 7 guest: Installing the XenDesktop agent

1. Browse to `\\dc1\share\install files\xendesktop\x86agent\XDE400VDAWX86004\`.
2. Run `xdsagent.msi`.
3. When the Windows Security warning prompts you, click Run.
4. At the XenDesktop agent welcome screen, click Next.
5. Accept the license agreement, and click Next.
6. Accept the default port, 8080, and click Next.
7. Accept Firewall defaults, and click Next.
8. In Farm Selection, select VDI-POOL, and click Next.
9. In the Ready to install box, click Install.
10. When the installation completes, click Finish.
11. Click Yes to reboot the system.

Windows 7 guest: Installing login VSI target software

1. Browse to `\\dc1\share\install files\vsi-install\Target setup`.
2. Run the `setup.exe`.
3. In the Target Setup wizard, specify the vsi share (<\\dc1\share>).
4. Click Start.
5. When prompted with security warnings, click OK.
6. Reboot the system.

Windows 7 guest: VM final cleanup

1. Click Start → Run → `services.msc`.
2. In the Services menu, select Windows Search, and change it from Disabled to Automatic (delayed start).
3. Close the Services menu.
4. Click Start → Control Panel → View Devices and Printers.
5. In the Services and Printers window, delete the following:
 - XPS printers and document writers
 - Faxes

Using Provisioning Services to capture the Windows 7 vDisk

Creating and formatting an aligned 16GB vDisk

1. Open XenCenter and log onto XD-PVS1 as `Verne\administrator`
2. Click Start → All Programs → Citrix → Management Console → Desktop Delivery Console.
3. Open XD-PSFARM → Site → vDiskPool, right-click, and select Create vDisk.
4. In the Create vDisk box, name the file `win7-32-gold-Disk0`, type 16384 for size, and click Create Fixed Disk.
5. When the disk is fully created, right-click the newly created vDisk, and click Mount vDisk.
6. Select the Properties of the vDisk, select the High Availability and Active Directory Account Password Management checkboxes in the Options tab, and click OK.
7. Windows automatically prompts you to format the disk, but do not format the disk yet. Instead, click Start → Run → `cmd`.
8. In the command prompt window, type `diskpart`
9. At the Disk Part prompt, type `list disk`
10. Note the disk number of the 16GB disk.

11. Type `select disk 1` (or use the disk number from Step 9 if other than 1).
12. When the disk is selected, type `create partition primary align=1024`
13. If successful, a message appears stating that DiskPart succeeded in creating the specified partition.
14. Type `exit`
15. Format the 16GB drive with NTFS.
16. Open XD-PSFARM→Site→vDiskPool→win7-32-gold-disk0, right-click, and select Unmount.

Using Provisioning Services to capture the Windows 7 VM to vDisk

1. In XenCenter, select the Console tab of the win7-32gold VM and log in as `Verne\administrator`
2. Connect to `\\dc1\share\install media\xendesktop\ps5.6-install\autorun.exe`.
3. In the main install menu of Provisioning Services, click Target device installation.
4. When the Welcome screen for Provisioning Services target device appears, click Next.
5. Accept the License Agreement.
6. In the Customer Information screen, type `User` for user name, click Anyone who uses this computer, and click Next.
7. In the destination folder, keep the default `C:\Program Files\Citrix\Provisioning Services`, and click Next.
8. On the Ready to Install screen, click install.
9. When the installer is finished, click Finish to launch the imaging wizard.
10. In the Network Interface Binding configuration screen, select ONLY the network adaptor on the 172.100.x.x network (Citrix PV Ethernet adaptor). De-select any others (if applicable), and click OK.
11. When the Provisioning Services imaging wizard welcome screen appears, click Next.
12. In the Connect to Farm field, type `172.100.0.104` for the Server address, keep Use my Windows credentials selected, and click Next.
13. When the setup prompts you for a new or existing vDisk, select Use existing, choose win-32-gold-disk0, and click Next.
14. In the New vDisk screen, name the new vDisk `win7-32-gold`, keep the vDisk type as fixed, and click Next.
15. In the Microsoft Volume Licensing screen, keep the settings as None, and click Next.
16. In the Configure Image Size of Each Volume menu, leave the disk as is, and click Next.
17. In the Add Target Device menu, name the device `win7-disk0`, select the collection as collection, and click Next.
18. In the Summary screen, click the Optimize for Provisioning services box.
19. In the Provisioning Services Device Optimization tool, keep all 18 optimization boxes checked, and click OK.
20. In the Summary screen, after all optimizations are complete, click Finish.
21. Before rebooting, change from the Console tab in XenCenter to the General tab, and click Properties.
22. In the Properties menu for win7-32-gold, click Startup Options.
23. Enable PXE boot by clicking Network, click Move up until Network is the first boot device, and click OK.
24. In XenCenter, go back to the Console tab for the win7-32-gold VM.
25. To finish the imaging process, the Windows 7 VM must be rebooted; select Yes to begin this process.
The Windows7 VM reboots via PXE attached to the 16GB vDisk created earlier.
26. After the Windows 7 VM reboots, log in and the imaging process automatically starts.
27. When the imaging process completes, shut down the Windows 7 VM.

Using Provisioning Services to configure the Windows 7 VM to boot from vDisk

1. In the XenCenter, select XD-PS1, and open the Console tab.
2. Go to Start→All Programs→Citrix→Provisioning Services→Provisioning Services Console.
3. In the Provisioning Services Console, open VDI-POOL→ Device collection→Collection, highlight the win7-32-gold icon, and click Properties.
4. In the General tab of the Target Device Properties page, the Boot From: option will be set to Hard drive. Change this by clicking the drop-down option beside Boot From: to vDisk, and click OK.
5. Remove the Windows 7 hard drive In XenCenter. Go to the Storage tab, select the local 16GB disk, and click Detach.
6. Click Yes for the detach warning.
7. Click the Console tab, and start the Windows 7 VM.
8. Click Add to create a cache disk.
9. In the Add Virtual Disk dialog box, name the new disk cache and make the size 3072 on NFS1.
10. To create the new cache disk, click Add.
11. Click the Console tab and start the Windows 7 VM. Note that the VM is booting from the vDisk.
12. Log in as Verne\administrator
13. Open Disk Manager.
14. Mount the new disk as E and do not format it.
15. Click Start→Run, and type `cmd`
16. At the command prompt, type `diskpart`
17. At the disk part prompt, type `list disk`
18. Note the disk number of the 3GB disk.
19. Type `select disk #` (#= disk number from Step 18).
20. When the disk has been selected, type `create partition primary align=1024`
21. If successful, a message appears stating that Diskpart succeeded in creating the specified partition.
22. Type `exit` and close the command window.
23. Format the 3GB partition.
24. Shut down the Win7-32-gold VM.
25. In XenCenter, go to the Storage tab, select the 3GB drive, and select Detach (do not delete).
26. In XenCenter, change to the XD-PS1 VM.
27. Click Start→All Programs→Citrix→Provisioning Services→Provisioning Services Console.
28. In the Provisioning Services Console, open VDI-POOL→Site→vDisk pool.
29. Select win7-32-gold, and right-click Properties.
30. In the Mode tab, change the vDisk to: Standard Image (multi device, write cache enabled).
31. In the Mode tab, change the cache type to Cache on the device's HD.
32. Click OK.

Deploying virtual desktops

Creating the Windows 7 template in XenCenter

1. Open XenCenter.
2. In the VDI pool, right-click Xen-VDI1, and select New VM.
3. In the Select a VM template screen, scroll to the bottom, select Windows 7 (32-bit), and click Next.
4. In the Name the new virtual machine screen, type `win7-template-NFS2`, and click Next.
5. In the Locate the operating system installation media screen, select Boot From Network.

6. In the Select a Home Server screen, click Xen-VDI1, and click Next.
7. In the Allocate Processor and Memory Resources screen, select 1 vCPU and 2048 MB, and click Next.
8. In the Configure Storage for the New VM screen, click Create a diskless VM that boots from the network.
9. In the Configure storage for the new VM screen, click Next.
10. In the Configure Networking screen, ensure only one network device is present, connect it to the VDI-NET network, and click Next.
11. At the Ready to Create the New Virtual Machine screen, uncheck the box beside Start VM automatically, and click Finish.
12. In XenCenter, click the newly created win7-template.
13. In the Storage tab for the template, click Attach...
14. Select the 3GB cache drive, and click OK.
15. Right-click the win7-template, and select Convert to template.
16. When prompted with the warning that the conversation cannot be undone, select Convert.

Deploying virtual desktops

1. Open XD-PS1 in XenCenter.
2. Go to Start → All Programs → Citrix → Administrative tools → XenDesktop Setup Wizard.
3. At the XenDesktop setup wizard welcome screen, click Next.
4. In the Farm to Use screen, click VDI-pool, and click Next.
5. In the hosting infrastructure, select Citrix Xen VM infrastructure with XenDesktop) in the address field, type `http://10.41.6.42` and click Next.
6. For XenServer authentication, type `root` and `Password1`
7. In the Virtual Machine Template screen, select the win7-template-NFS2, and click Next.
8. In the vDisk selection screen, click the win7-32-gold vDisk, and click Next.
9. In the Specify Names for the Virtual Desktops screen, type the following:
 - number of desktops:112
 - Common name: XD-
 - Start from 1
10. In the Organization unit, select OU=computers, OU=Login_VSI,DC=verne, DC=com, and click Next.
11. In the Desktop Group section of the Setup wizard, click Use Existing Desktop Group, click NFS-pool in the drop-down menu, and click Next.
12. In the Desktop Creation section of the Setup wizard, click Next to begin the virtual desktop creation.

Configuring the desktop delivery controllers to start all virtual desktops

1. In XenCenter, open →infra→infra1→XD-DDC1.
2. Open the Console tab.
3. Log into XD-DDC1, and open Start → All Programs → Citrix → Management Console → Desktop Delivery Console.
4. In the Desktop Delivery Console, open Citrix Delivery Services Console → Citrix Resources → Desktop Delivery Controller → VDI-pool → Desktop Groups → right-click the icon for NFS-pool, and select Properties.
5. In the Desktop Group Properties screen, go to Advanced → Idle Pool Settings.
6. In the Idle Pool Settings screen, change Business hours and Peak time.

7. In the Desktop Group Properties screen, go to Advanced → Logoff Behavior, select Do Nothing, and click OK.
8. Wait for all VMs to power up.
9. In the Desktop Delivery Console screen, open Citrix Delivery Services Console → Citrix Resources → Desktop Delivery Controller → VDI-pool → Desktop Groups → NFS-Pool.
10. In the right pane, sort by desktop state.
11. At this point, you are ready to test all virtual desktops with by Login VSI.

Testing Login VSI

Installing launchers: Windows 2008 R2 X64 Master Launcher (L1)

1. Open XenCenter.
2. Select the VM called L1, and click the Console tab.
3. In the DVD Drive 1 drop-down menu, select Windows Server 2003 R2 X64 Enterprise CD1.ISO.
4. Start the VM.
5. Begin the Windows Server 2003 R2 Enterprise Edition (x64) Setup.
6. Press Enter to begin.
7. Read the licensing agreement, and press F8 if you accept it.
8. Select the 12 GB partition to install Windows Server 2003 on.
9. Select format in NTFS quick. Setup begins copying necessary files from the installation.
10. The machine reboots and loads a GUI mode phase.
11. Change your regional settings to accommodate your location, language, and time zone.
12. Enter your name and organization, and click Next.
13. Enter the appropriate license, and click Next.
14. Enter the computer name and password.
15. Select the date, time, and time zone settings. Setup installs the networking components.
16. Continue with default network settings.
17. The setup process finishes copying files and configuring the setup.
18. Setup finishes and boots Windows Server 2003.
19. Log in as Administrator.
20. Windows Setup will require Windows 2003 Enterprise Edition (x64) R2 CD2 to complete the installation; change the virtual media in XenCenter to insert CD 2 when it prompts you, and click OK.
21. At the Welcome screen, click Next.
22. Accept the End-user License Agreement, and click Next.
23. The setup copies files and completes the installation.
24. Click Finish.
25. In the DVD Drive 1 drop-down menu, select xs-tools.iso.
26. Install xen-tools.
27. Reboot the system.
28. Join the Verne domain.
29. Reboot the system.
30. After the system has rebooted, log in and click Start → Windows Update.
31. Select Express and install all available patches.
32. After the reboots, log into L1 as Administrator

33. Click Start → Control Panel → Network Connections, right-click Local Area Connection, and select Properties.
34. Rename connection 1 to be VDI-NET.
35. Go to Start, right-click My Computer, and select Properties.
36. In the System Properties screen, select the Computer Name tab.
37. On the Computer Name tab, select Change.
38. To join the Verne domain, select Domain, specify Verne, and click OK.
39. When prompted for credentials, use the following, and select OK:
 - Username: Verne\administrator
 - Password: Password1
40. At the Welcome to the Verne domain screen, select OK.
41. Select OK again to exit the Computer Name window.
42. Select Yes to reboot the VM to finish the domain join.

Installing the Login VSI Launcher software

1. Install the VSI media\launcher\setup.exe

The Launcher should have XenDesktop Web agent installed. For more information on integration of XenDesktop and Login-VSI, please refer to <http://support.citrix.com/servlet/KbServlet/download/24130-102-647344/XenDesktop%20with%20Login%20Consultants%20VSI%20-%20Guide.pdf>.

APPENDIX A – SERVER CONFIGURATION INFORMATION

Figure 14 provides detailed configuration information about the test servers. Note that we used the Cisco UCS B250 M2 Extended Memory Blade Server for the Cisco systems under test and used the Cisco UCS B200 M2 Blade Server for our Cisco testbed infrastructure. We used a HP ProLiant BL460c G7 Server for the HP systems under test and used an additional HP ProLiant BL460c G7 Server for our HP testbed infrastructure.

System	Cisco UCS B250 M2 Extended Memory Blade Server	Cisco UCS B200 M2 Blade Server	HP ProLiant BL460c G7 Server	HP ProLiant BL460c G7 Server (infrastructure)
Enclosure				
Blade enclosure	Cisco UCS 5108	Cisco UCS 5108	HP BladeSystem c7000 Enclosure	HP BladeSystem c7000 Enclosure
Power supplies				
Total number	4	4	6	6
Wattage of each (W)	2,500	2,500	2400	2400
Cooling fans				
Total number	8	8	10	10
Dimensions (h x w) of each	3-5/8" x 5-1/2"	3-5/8" x 5-1/2"	4" x 4"	4" x 4"
General				
Number of processor packages	2	2	2	2
Number of cores per processor	6	6	6	6
Number of hardware threads per core	2	2	2	2
CPU				
Vendor	Intel	Intel	Intel	Intel
Name	Xeon	Xeon	Xeon	Xeon
Model number	X5670	X5670	X5670	X5670
Stepping	C0	C0	C0	C0
Socket type	LGA 1366	LGA 1366	LGA 1366	LGA 1366
Core frequency (GHz)	2.93	2.93	2.93	2.93
Bus frequency (GT/s)	6.4	6.4	6.4	6.4

System	Cisco UCS B250 M2 Extended Memory Blade Server	Cisco UCS B200 M2 Blade Server	HP ProLiant BL460c G7 Server	HP ProLiant BL460c G7 Server (infrastructure)
L1 cache	32 KB+ 32 KB (per core)	32 KB+ 32 KB(per core)	32 KB+ 32 KB (per core)	32 KB+ 32 KB (per core)
L2 cache	256 KB (per core)	256 KB (per core)	256 KB (per core)	256 KB (per core)
L3 cache (MB)	12	12	12	12
Platform				
Vendor and model number	Cisco UCS B250 M2 Extended Memory Blade Server	Cisco UCS B200 M2 Blade Server	HP ProLiant BL460c G7 Blade Server	HP ProLiant BL460c G7 Blade Server
Motherboard model number	N20-B6625-2	N20-B6625-1	HP 4K10B5	HP 4K10B5
Motherboard chipset	Intel 5520	Intel 5520	Intel 5520	Intel 5520
BIOS name and version	Cisco S5500.1.3.1C.0.0520 20102031	Cisco S5500.1.3.1C.0.05 2020101544	HP I27 12/01/2010	HP I27 12/01/2010
BIOS settings	Default	Default	Default	Default
Memory module(s)				
Total RAM in system (GB)	256	48	192	48
Vendor and model number	Samsung M393B1K70BH1-CH9	Samsung M393B5170FH0-YH9	Hynix HMT42GR7BMR4C	Samsung M393B5170EH1-CH9Q1
Type	DDR3 PC3-10600R	DDR3 PC3-10600	DDR3 PC3-8500	DDR3 PC3-10600R
Speed (MHz)	1,333	1,333	1,066	1,333
Speed running in the system (MHz)	1,333	1,333	1,066	1,333
Size (GB)	8	4	16	4
Number of RAM module(s)	32	12	12	12
Chip organization	Double-sided	Double-sided	Double-sided	Double-sided
Hard disk				
Vendor and model number	Seagate ST9146803SS	Seagate ST9146803SS	Seagate ST9146803SS	Seagate ST9146803SS
Number of disks in system	2	2	2	2
Size (GB)	146	146	146	146
Buffer size (MB)	N/A	N/A	16	16
RPM	10,000	10,000	10,000	10,000
Type	SAS	SAS	SAS	SAS

System	Cisco UCS B250 M2 Extended Memory Blade Server	Cisco UCS B200 M2 Blade Server	HP ProLiant BL460c G7 Server	HP ProLiant BL460c G7 Server (infrastructure)
Controller	LSI™ Logic SAS 1064E	LSI Logic SAS 1064E	HP Smart Array P410i	HP Smart Array P410i
Operating system				
Name	Citrix XenServer 5.6	Citrix XenServer 5.6	Citrix XenServer 5.6	Citrix XenServer 5.6
File system	EXT3	EXT3	EXT3	EXT3
Kernel	2.6.27.42-0.1.1.xs5.6.0.44.11158xen	2.6.27.42-0.1.1.xs5.6.0.44.11158xen	2.6.27.42-0.1.1.xs5.6.0.44.11158xen	2.6.27.42-0.1.1.xs5.6.0.44.11158xen
Language	English	English	English	English
Network adapter (mezzanine card)				
Vendor and model number	2 x Cisco UCS M71KR-Q Qlogic Converged Network Adapter	1 x Cisco UCS M71KR-Q Qlogic Converged Network Adapter	HP VC FlexFabric 10Gb/24 Port Module	HP VC FlexFabric 10Gb/24 Port Module
USB ports				
Number	0	0	0	0
Type	N/A	N/A	N/A	N/A

Figure 14: Detailed configuration information for the servers.

APPENDIX B – STORAGE CONFIGURATION INFORMATION

Figure 15 provides detailed configuration information about the test storage.

System	NetApp FAS3040
Storage	
Filer	NetApp Fabric-Attached Storage FAS3040
Power supplies	
Total number	2
Shelves	
Vendor and model number	DS14MK4 w/14x 300GB 15K X279A-R5
Total number of shelves	4
Disks	
Total number of disks	56 x 300 GB
Total storage capacity (GB)	16,800
Operating system	
Name	Data ONTAP 7.3.3
Network	
Vendor and model number	NetApp X1008A-R6 2-Port 10GbE NIC TOE FC Fiber Channel

Figure 15: Detailed configuration information for the storage.

ABOUT PRINCIPLED TECHNOLOGIES



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

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