Cisco® Virtual Machine Fabric Extender

compared to a traditional vSwitch

provided up to

29%

vSwitch

VM-FEX

more responsive Citrix® XenApp™ sessions

and up to

53%

vSwitch

VM-FEX

more efficient use of CPU resources under extreme network load

In an SBC (server-based computing) application, such as a Citrix® XenApp™ hosted shared desktop, session responsiveness is key to creating the best possible end-user experience. Under demanding network conditions, there can be many challenges to maintaining SBC responsiveness; choosing the right technologies can make significant steps in overcoming these challenges.

In the Principled Technologies labs, we used Login Consultants Virtual Session Indexer (Login VSI) 3.7 benchmark to compare the responsiveness of a Citrix XenApp hosted shared desktop farm using two switching methods: a traditional vSwitch and Cisco Virtual Machine Fabric Extender (VM-FEX). We found that the farm using Cisco VM-FEX provided a user experience that was up to 29 percent more responsive than the traditional vSwitch farm. In addition, under extreme network conditions, a Cisco VM-FEX-enabled virtual machine used resources more efficiently than the vSwitch-attached virtual machine, reducing CPU utilization by as much as 53 percent.

CISCO VM-FEX CAN DRIVE DOWN LATENCY

Using PCIe pass-through technology, Cisco VM-FEX connects the Cisco Unified Fabric directly to a virtual machine enabling VMware® DirectPath I/O. With a direct connection to the fabric, VM-FEX decreases network latency and places the switching load on the Cisco 1240 VIC (Virtual Interface Card), freeing compute resources on the server. By moving compute demand off the server CPU, VM-FEX enables more resources for applications, resulting in a more responsive application.

Figure 1 illustrates how Cisco VM-FEX PCIe Pass-Thru mode works in your environment.

VM-FEX PCIe Pass-Thru mode
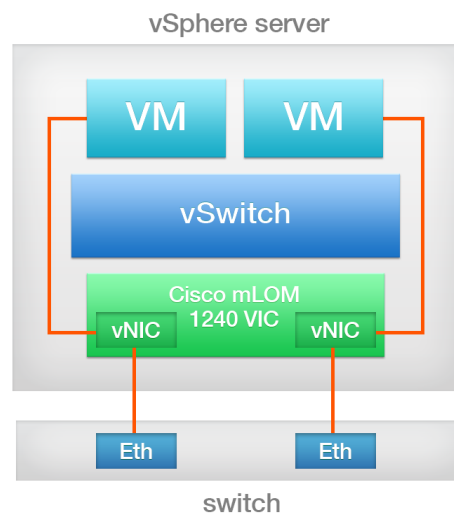
Figure 1: VM-FEX PCIe Pass-Thru mode.

We set up two Citrix XenApp hosted shared desktop farms on identical hardware. One farm made use of a VM-FEX-enabled vSwitch and the other was on a traditional vSwitch. We used a medium Login VSI 3.7 workload to simulate typical office users and to compare the hosted shared desktop performance of Cisco VM-FEX versus traditional vSwitch technology. While the Login VSI test ran, we used Iperf to simulate additional network traffic typically found in an organization. As we increased the number of user sessions to 140 (where we stopped because CPU percentage was mostly saturated), we compared the user response times for both farms. As the servers added more and more sessions, the VM-FEX solution provided a noticeable improvement in session responsiveness.

Figure 2 shows the VSI index average for both vSwitch and VM-FEX for a fully utilized host (75-90 percent CPU usage). While both solutions remained within an acceptable latency range throughout our tests, as we increased the number of sessions, the Cisco VM-FEX solution was noticeably more responsive than the traditional vSwitch solution.

Figure 2: Login VSI index average for both solutions at their respective session counts. The server is nearing the CPU saturation point at 140 users.
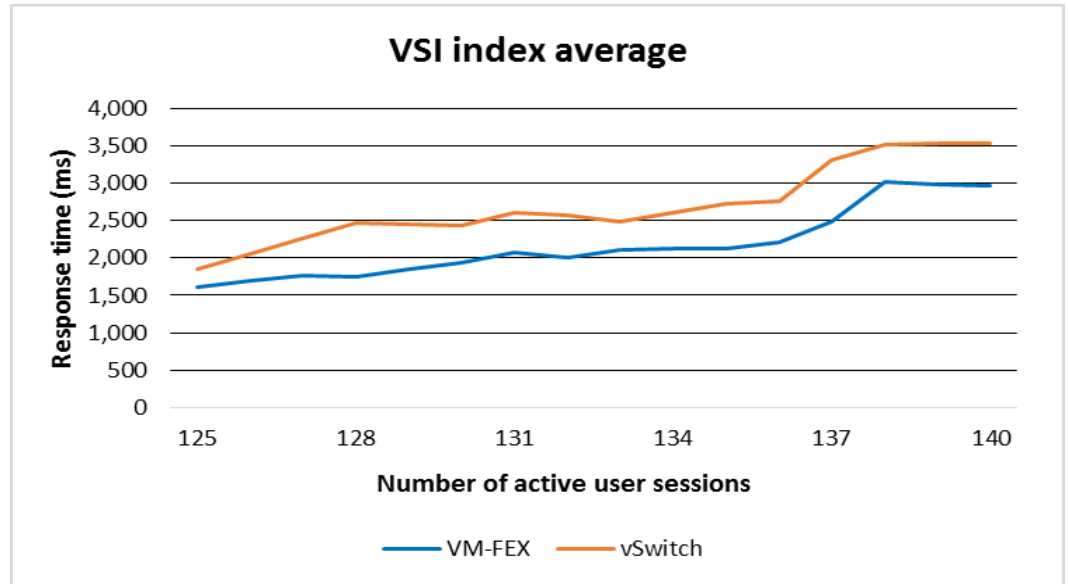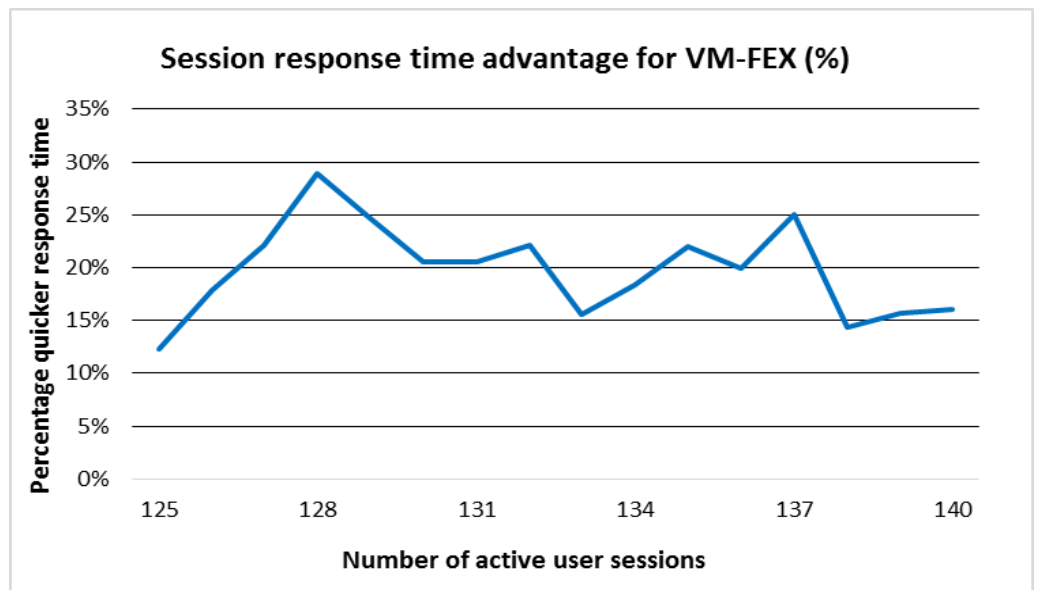

Figure 3 shows the response time improvement, expressed in percentages, of Cisco VM-FEX versus a traditional vSwitch during Login VSI testing.

Figure 3: Percentage improvement in latency of the Cisco VM-FEX solution over the vSwitch solution at their respective session counts. The server is nearing the CPU saturation point at 140 users.

BETTER RESOURCE UTILIZATION UNDER EXTEREME LOADS

The switching method you use can affect how efficiently your server-CPU resources are used. We used Iperf to push as much network traffic as the VM network adapter would allow. Because VM-FEX offloads the CPU switching overhead to the Cisco 1240 VIC, it is more efficient with server CPU, as Figure 4 clearly shows.

Figure 4: CPU utilization throughout our tests. Lower numbers are better.

Percentage server CPU consumption
(lower numbers are better)

(line chart: y-axis "Percentage CPU used" 0–20, x-axis "Elapsed time" 0:00–0:10; legend: Cisco VM-FEX (blue) ~5.5%, vSwitch (orange) ~12%)
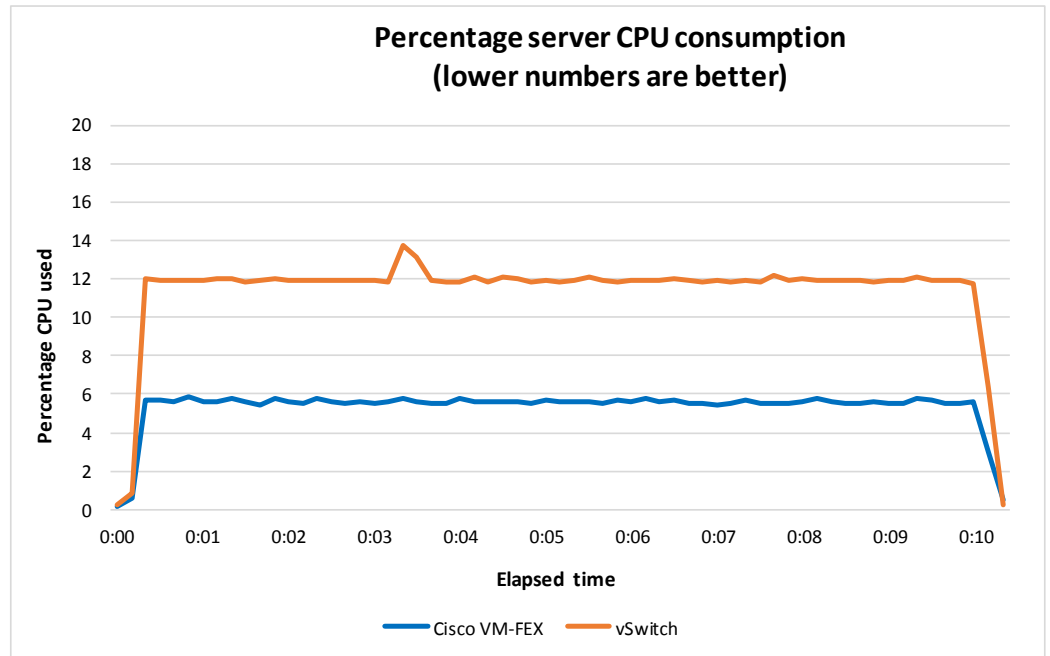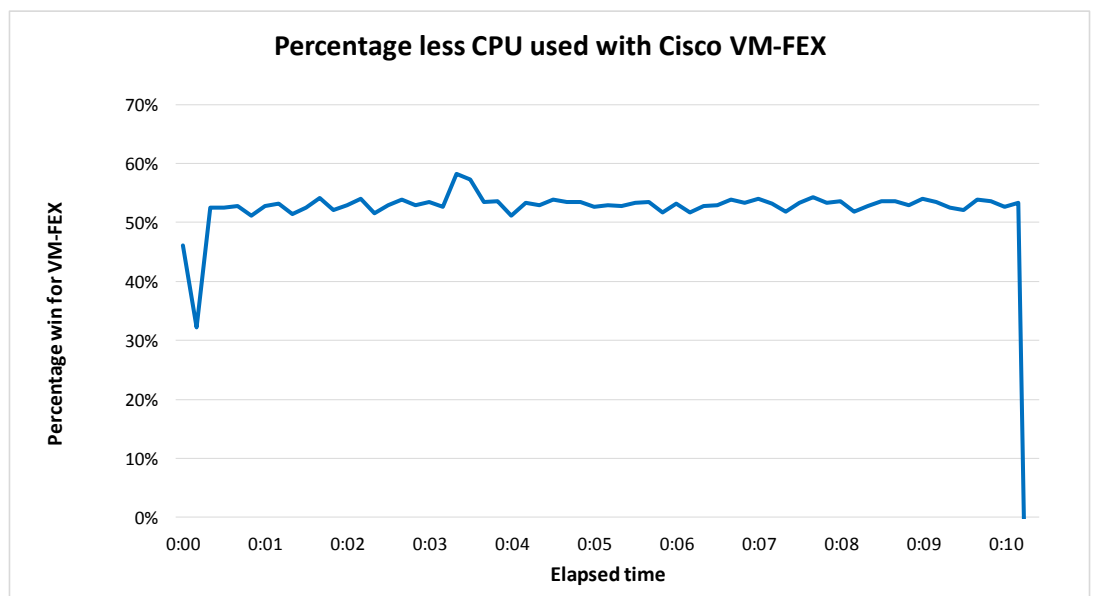
Figure 5 shows the total server CPU (expressed in percentages) that the Cisco VM-FEX solution used compared to the vSwitch solution. Throughout the test, the Cisco VM-FEX solution used as much as 53.1 percent less CPU than the vSwitch solution did.

Figure 5: Percentage lower CPU utilization for the solution using Cisco VM-FEX compared to the vSwitch solution.

Percentage less CPU used with Cisco VM-FEX

(line chart: y-axis "Percentage win for VM-FEX" 0%–70%, x-axis "Elapsed time" 0:00–0:10)

Figures 6 and 7 show the Iperf network traffic generated in our tests and the percentage increased network traffic that the Cisco VM-FEX solution allowed.

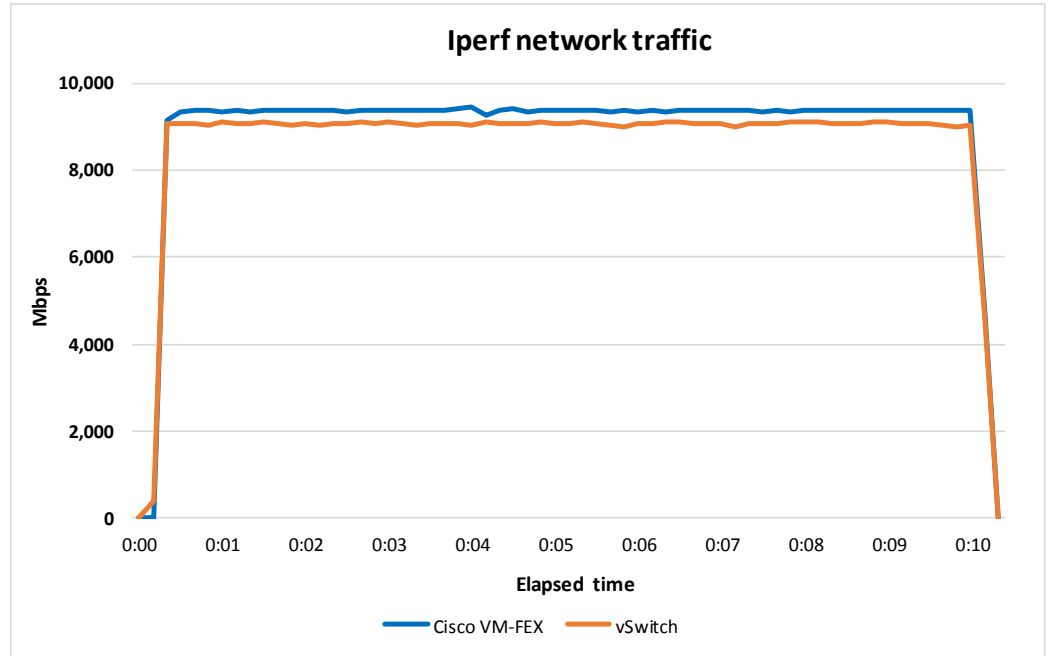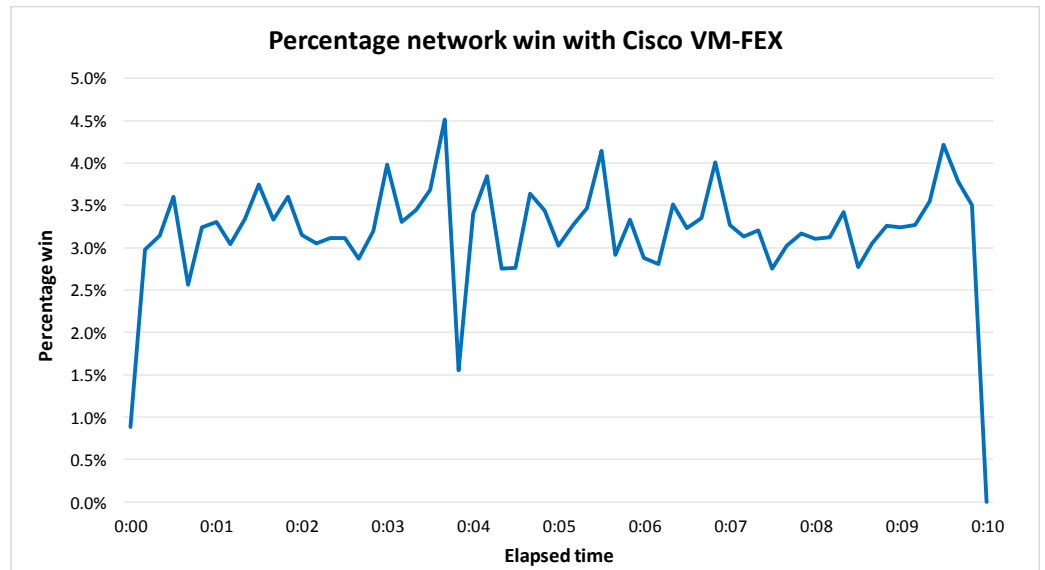**Figure 6: Iperf network traffic created throughout our tests. Higher numbers are better.**

Iperf network traffic

Figure 7: Percentage network win with Cisco VM-FEX compared to the vSwitch solution.

Percentage network win with Cisco VM-FEX

SIMPLIFIED OPERATIONS

In addition to performance advantages, Cisco VM-FEX offers simplified, central management capabilities within the Cisco UCS Manger. Using the Cisco UCS Manager, we set up our VM-FEX-enabled vSwitch and completed tasks such as setting VLAN access and MTU speeds without having to configure our hosts individually. Once we deployed our VM-FEX-enabled vSwitch, adding a vSphere host was simple and required very little configuration, ensuring minimal opportunity for manual error. Adding more vSphere hosts to the VM-FEX enabled vSwitch would be simple and require very little time or effort. By contrast, when we set up our traditional vSwitch, we had to manually set each individual vSwitch setting on the vCenter GUI or command line. Another problem with using a traditional vSwitch is that virtual machine networks and VMkernel names are case sensitive, and require special attention to detail to ensure proper host and VM communication. In addition, we had to configure several things, such as MTU speeds at the vSwitch and again at the individual virtual machine networks or VMkernel interfaces. With the vSwitch solution, you must repeat these processes again each time you add a host to a cluster, requiring administrative time and creating the potential for unwanted manual errors.

WHAT WE TESTED

About the Cisco UCS B200 M3 Blade Server

The Cisco UCS B200 M3 Blade Server is an enterprise-class blade server powered by the new Intel® Xeon® processor E5-2600 series to deliver high performance and outstanding I/O throughput for your applications. Supporting up to 768 GB of RAM with 24 DIMM slots, the Cisco UCS M200 M3 has expandable memory capabilities to support your heavy workloads.

To learn more, see Appendix A for more detailed hardware specifications, or visit www.cisco.com/en/US/products/ps12288/index.html.

About the Cisco UCS Manager

The Cisco UCS Manager enables unified, embedded management that integrates the management of both software and hardware on the Cisco UCS solution. The UCS Manager centralizes server management, making it easier in several key ways. First, role-based management makes it easy to assign unique management roles to different administrators (i.e., server, network, or storage admins) so that each can be assigned his or her own unique policies and permissions, while still being part of an integrated management environment. Policy-based provisioning provides managers with the ability to create service profile templates that they apply to one or 100 servers, making it easy to apply consistent policies. The Cisco USC Manager makes server

management less about managing isolated, single hardware components and more about managing many hardware components (up to 20 chassis and 160 blades per domain) as a single management domain. The use of service profiles allows managers to allocate and reallocate server resources, which the UCS Manager views as "raw computing capacity." This way, server capacity allocation becomes more dynamic and efficient, with managers able to deploy and reallocate server resources in a matter of minutes.

To learn more about the Cisco UCS Manager, visit www.cisco.com/en/US/products/ps10281/index.html.

VM Fabric Extender (VM-FEX) technology

VM-FEX technology allows administrators to manage VM network traffic and bare metal (i.e., physical) network traffic all from a single unified infrastructure. The advantages are that UCS Manager bypasses the vSwitch and attaches the VM directly to the card (or fabric). In addition, VM-FEX offers per-port QoS policies allowing you to prioritize traffic for each PCI device. Essentially, VM-FEX lets you eliminate the intermediary and obtain faster performance.

To learn more about VM-FEX, visit www.cisco.com/en/US/netsol/ns1124/index.html#~overview.

About Login VSI 3.7

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

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

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

About Citrix XenApp 6.5

Citrix XenApp is an application delivery solution that virtualizes Windows applications and delivers them to users on various devices, while keeping data centralized in the datacenter for simplified management. XenApp 6.5 includes many updated features to improve on-demand application experience, including Instant App Access, which reduces the time it takes for users to launch applications; Citrix Receiver,

which provides access from over a billion devices; and Desktop Director, which helps IT manage applications and hosted share desktops on a large scale.

For more information about Citrix XenApp 6.5, visit www.citrix.com/products/xenapp/whats-new.html.

IN CONCLUSION

The switching method you choose for your SBC environment can help determine performance and the experience that end-users have. We found that unifying switching with Cisco VM-FEX resulted in up to 29 percent lower latency than a solution using a traditional vSwitch when running a Citrix XenApp hosted shared desktop farm. Furthermore, the Cisco VM-FEX solution used up to 53 percent less CPU than the vSwitch solution did under extreme network conditions. In addition to these performance advantages, Cisco UCS Manager provides a central point of management and a simplified method to add vSphere hosts to the VM-FEX-enabled vSwitch, which can reduce management time and costs.

As our results show, switching to Cisco VM-FEX can provide your users with a more responsive environment.

APPENDIX A – SYSTEM CONFIGURATION INFORMATION

Figure 8 provides detailed configuration information for the test systems.

System	Cisco UCS B200 M3 server	2x Cisco UCS B200 M2 servers
General		
Number of processor packages	2	2
Number of cores per processor	8	6
Number of hardware threads per core	2	2
System power management policy	OS Control	OS Control
CPUs		
Vendor	Intel	Intel
Name	Xeon	Xeon
Model number	E5-2690	X5670
Stepping	6	CO
Socket type	LGA2011	LGA 1366
Core frequency (GHz)	2.90	2.93
Bus frequency	8.0 GT/s	6.4
L1 cache	32 KB + 32 KB	32 KB+ 32 KB (per core)
L2 cache	256 KB (per core)	256 KB (per core)
L3 cache	20 MB	12 MB
Platform		
Vendor and model number	Cisco UCS B200 M3 Blade Server	Cisco UCS B200 M2 Blade Server
Motherboard model number	Cisco FCH153271DA	N20-B6625-1
BIOS name and version	Cisco B200M3.2.1.1.0.100520121419	Cisco S5500.2.1.1.0.100520.121338
BIOS settings	Default	Default
CIMC version	2.1(1a)	2.1(1a)
Memory module(s)		
Total RAM in system (GB)	128	96
Vendor and model number	Samsung® M393B2G70BH0-YK0	Samsung M393B5170FH0-YH9
Type	PC3L-12800R	DDR3 PC3-10600
Speed (MHz)	1,600	1,333
Speed running in the system (MHz)	1,600	1,333
Size (GB)	16	8
Number of RAM module(s)	8	12
Chip organization	Double-sided	Double-sided
Rank	Dual	Dual
Hard disk		
Vendor and model number	Seagate® ST9146803SS	Seagate ST9146803SS
Number of disks in system	2	2
Size (GB)	146	146
RPM	15,000	10,000
Type	SAS	SAS

System	Cisco UCS B200 M3 server	2x Cisco UCS B200 M2 servers
RAID controller		
Vendor and model	LSI™ MegaRAID® SAS 2004 ROMB	LSI Logic® SAS 1064E
Controller firmware	23.2.1-0056|5.32.00	01.32.04.00
Operating system		
Name	VMware vSphere® 5.1	VMware vSphere 5
Build number	914609	914609
Language	English	English
Operating system power profile	Maximum Performance	Maximum Performance
I/O Adapters		
Vendor and model number	Cisco UCS-MLOM-40G-01 (1240 VIC)	UCS M71KR-Q QLogic® Converged Network Adapter
Type	mLOM	Mezzanine

Figure 8: Detailed configuration information for the servers we used in our tests.

APPENDIX B - HOW WE TESTED

INSTALLING AND CONFIGURING INFRASTRUCTURE

Using Cisco UCS manager, we deployed a Cisco UCS B200 M2 (infra), and Cisco UCS B200 M3 (SUT), and installed vSphere 5.1 on both. We installed Microsoft® Windows Server® 2008 R2 on four virtual machines housed on an ESXi host (infra). We configured one as an Active Directory® domain controller, DNS server, DHCP server, file server, and NTP server, one as a vCenter™ server, one as a XenDesktop® licensing server, and one as a XenDesktop Provisioning services server. We configured AD roaming profiles and folder redirection for all user data and profile management. We then deployed two more Microsoft Windows Server 2008 R2 virtual machines, one on infra and one on SUT. We configured these to run Iperf. All storage in testing was generic 10 Gbps NFS. Figure 9 illustrates our setup.
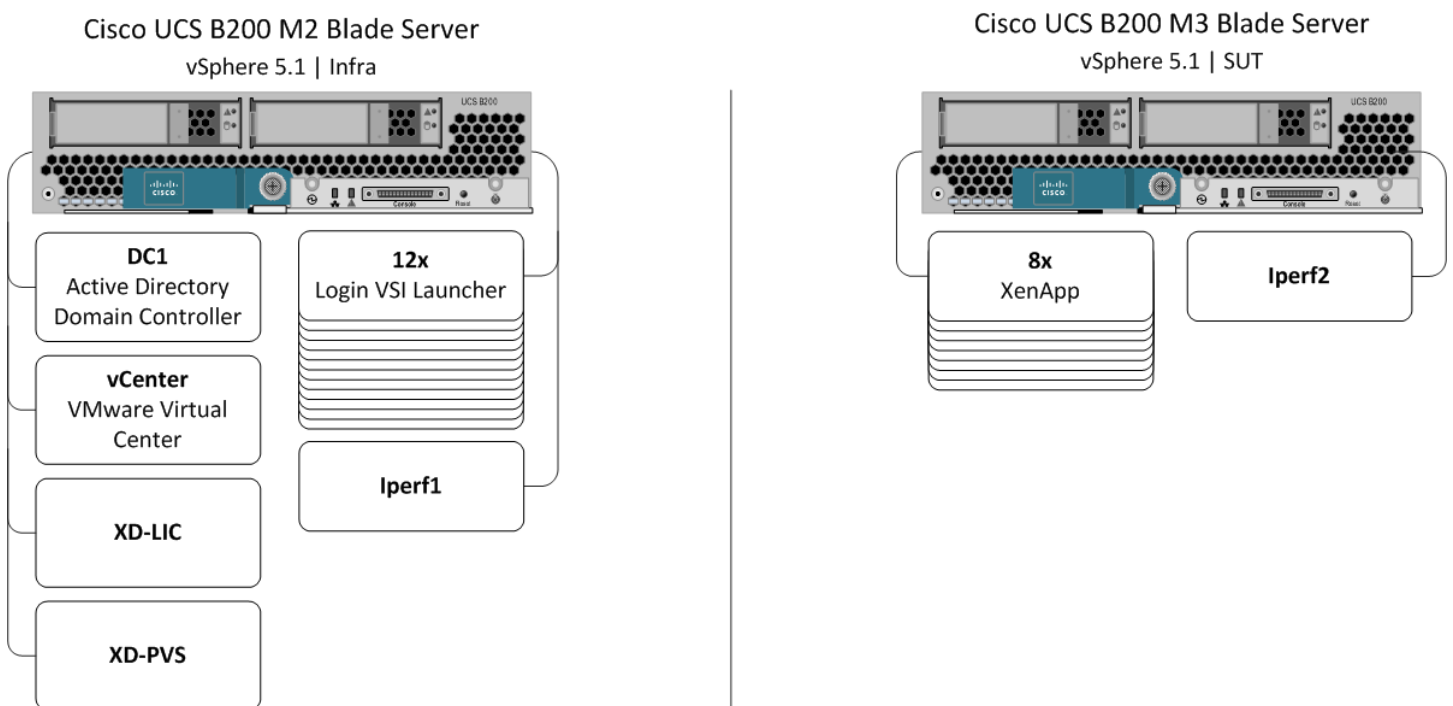

Figure 9: Our test setup.

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

We configured a UCS cluster with two fabrics and defined a cluster IP address to enable the use of the Cisco UCS Manager. In the UCS Manager, we set up network VLANs, QoS policies, and service profiles for our two blades.

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=`200`

Defining all QoS classes

1. In the UCS Manager, go to the LAN tab.
2. Open LAN→LAN cloud→QoS system class.
3. Enable Platinum.

   - COS=`5`
   - Weight=`10`
   - MTU=`9000`

Defining Dynamic vNIC policy

1. In the UCS Manager, go to the LAN tab.
2. Open LAN→Policies→root→Dynamic vNIC Policies, right-click Create Dynamic vNIC Connection Policy.
3. For name, type `VM-FEX`
4. For Number of Dynamic vNICs, select 9.
5. For adapter Policy, select VMware PassThru.
6. For Protection, select Protected Perf B, click OK to create the Create Dynamic vNIC Connection Policy.

Configuring Cisco Unified Computing profiles policies

Configuring KVM for blades

1. In the UCS System Manager, click the Admin tab→filter: Communication Management→Management IP address.
2. Click the General tab.
3. Click Create Block of IP addresses.
4. Create a block of 10 addresses on the management network.

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 MAC Pool.

   - Name=`VDI`
   - From: `00:25:B5:AB:CF:01`   To: `00:25:B5:AB:CF:20`

Creating a vNIC template

1. Open LAN→Policies→root→vNIC Templates, and right-click and select Create vNIC Template.

   - Name=`FAB-A`
   - Adaptor=`Fabric A`
   - Target=`Adaptor`

- Template type=`Updating template`
- MTU=`9000`
- MAC pool=`MAC-pool`
- QoS Policy=`none`
- VLANS=`10,100,200` (10=native)

2. Open LAN→Policies→root→vNIC Templates, right-click, and select Create vNIC Template.

- Name=`FAB-B`
- Adaptor=`Fabric B`
- Target=`Adaptor`
- Template type=`Updating template`
- MTU=`9000`
- MAC pool=`MAC-pool`
- QoS Policy=`none`
- VLANS=`10,100,222` (10=native)

Creating BIOS policies

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 `B200-M2` for the policy name and assign all platform defaults.
5. Right-click BIOS Policies, and select Create BIOS policy.
6. Type `VM-FEX` for the policy name and enable the following:
   - Intel Directed IO - VT for Directed IO, Enable Interrupt Remap, Coherency Support, and ATS Support.

Creating service profile templates for all blades

Creating a profile 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 (expert).
3. In the Create Service Profile Template page 1, enter the following:
   - Name: `B200M2`
   - Select the UUID pool.
4. Select Next.
5. In the Create Service Profile Template page 2 (Networking), do not select a dynamic vNIC policy, and click the button next to Expert to view more options.
6. Click the Add button to add a vNIC.
7. In the Create a vNIC workspace, select use a vNIC template.
8. Name the vNIC `vNIC0`, for vNIC Template, select FAB-A, and for Adaptor policy, select VMware. Click OK.
9. Click the Add button to add a second vNIC.
10. In the Create a vNIC workspace, select use a LAN connectivity template.
11. Name the vNIC `vNIC1`, for vNIC Template, select FAB-B, and for Adaptor policy, select VMware. Click OK.
12. Click Next to finish networking.

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13. In the Create Service Profile Template page 3 (storage), select default for local storage, WWNN pool and both vHBA fabrics, and click Next.
14. In the Create Service Profile Template page 4 (zoning), click Next.
15. In the Create Service Profile Template page 5 (vNIC/vHBA Placement), click Next.
16. In the Create Service Profile Template page 6 (Server Boot Order), select cd-local, and click Next.
17. In the Create Service Profile Template page 7 (maintenance policy), click Next
18. In the Create Service Profile Template page 8 (server assignment) assign the policy to the Cisco UCS B200 M2 and click Finish.

Creating a profile for the Cisco UCS B200 M3 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 (expert).
3. In the Create Service Profile Template page 1, enter the following:
   - Name: `B200M3`
   - Select the UUID pool.
4. Select Next.
5. In the Create Service Profile Template page 2 (Networking), select the dynamic vNIC policy named VM-FEX, and click the button next to Expert to view more options.
6. Click the Add button to add a vNIC.
7. In the Create a vNIC workspace, select use a vNIC template.
8. Name the vNIC `vNIC0`, for vNIC Template, select FAB-A, and for Adaptor policy, select VMware. Click OK.
9. Click the Add button to add a second vNIC.
10. In the Create a vNIC workspace, select use a LAN connectivity template.
11. Name the vNIC `vNIC1`, for vNIC Template, select FAB-B, and for Adaptor policy, select VMware. Click OK.
12. Click Next to finish networking.
13. In the Create Service Profile Template page 3 (storage), select default for local storage, WWNN pool and both vHBA fabrics, and click Next.
14. In the Create Service Profile Template page 4 (zoning), click Next.
15. In the Create Service Profile Template page 5 (vNIC/vHBA Placement), click Next.
16. In the Create Service Profile Template page 6 (Server Boot Order), select cd-local, and click Next.
17. In the Create Service Profile Template page 7 (maintenance policy), click Next.
18. In the Create Service Profile Template page 8 (server assignment), assign the policy to the Cisco B200 M3 server, and click Finish.

Setting up a VM to host Microsoft Windows Active Directory® server (DC1)

1. Connect to `infra` via the VMware vSphere client.
2. Log in as root.
3. Click the Virtual Machines tab.
4. Right-click, and choose New Virtual Machine.
5. Choose Custom, and click Next.
6. Assign the name DC1 to the virtual machine and click Next.
7. Select `infra` as the host, and click Next.
8. Select the appropriate datastore for storage and click Next.

9. Choose Virtual Machine Version 8, and click Next.
10. Choose Windows, choose Microsoft Windows Server® 2008 R2 (64-bit), and click Next.
11. For CPUs, select one virtual processor socket and four cores per virtual socket, and click Next.
12. Choose 4 GB RAM and click Next.
13. Click 1 for the number of NICs, select VMXNET3, connect to the VDI network, and click Next.
14. Leave the default virtual storage controller, and click Next.
15. Choose to create a new virtual disk, and click Next.
16. Make the OS virtual disk size 40 GB, choose thick-provisioned lazy zeroed, specify external storage, and click Next.
17. Keep the default virtual device node (0:0) and click Next.
18. Click Finish.
19. Right-click the VM and choose Edit Settings.
20. On the Hardware tab, click Add….
21. Click Hard Disk, and click Next.
22. Click Create a new virtual disk, and click Next.
23. Specify 40 GB for the virtual disk size, choose thick-provisioned lazy zeroed, specify external storage, and click Next.
24. Choose SCSI (0:1) for the device node, and click Next.
25. On the Hardware tab, click Add….
26. Click Create a new virtual disk, and click Next.
27. Specify 40 GB for the virtual disk size, choose thick-provisioned lazy zeroed, specify external storage, and click Next.
28. Choose SCSI (0:2) for the device node and click Next.
29. On the Hardware tab, click Add….
30. Click Create a new virtual disk, and click Next.
31. Specify 40 GB for the virtual disk size, choose thick-provisioned lazy zeroed, specify external storage, and click Next.
32. Choose SCSI (0:3) for the device node, and click Next.
33. Click Finish and click OK.
34. Click the Resources tab, and click Memory.
35. Select Reserve all guest memory and click OK.
36. Connect the VM virtual CD-ROM to the Microsoft Windows Server 2008 R2 installation disk.
37. Start the VM.

Installing the Microsoft Windows Server 2008 R2 operating system on the VM
1. Choose the language, time and currency, and keyboard input. Click Next.
2. Click Install Now.
3. Choose Windows Server 2008 R2 Enterprise (Full Installation) and click Next.
4. Accept the license terms and click Next.
5. Click Custom.
6. Click the Disk, and click Drive options (advanced).
7. Click New→Apply→Format and click Next.
8. After the installation completes, click OK to set the Administrator password.

9. Enter the administrator password twice and click OK.
10. Install VMware Tools. For more information, see
    kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=340.
11. Reboot the server.
12. Connect the machine to the Internet and install all available Windows updates. Restart as necessary.
13. Enable remote desktop access.
14. Change the hostname to `DC1` and reboot when the installation prompts you.
15. Run diskmgmt.msc.
16. Select a 40 GB volume, name it `profiles`, format it NTFS, and assign it drive letter `E`.
17. Select another 40 GB volume, name it `share`, format it NTFS, and assign it drive letter `F`.
18. Select the last 40 GB volume, name it `folders`, format it NTFS, and assign it drive letter `G`.
19. Set up networking for the data network:
    a. Click Start→Control Panel, right-click Network Connections, and choose Open.
    b. Right-click the VM traffic NIC and choose Properties.
    c. Uncheck TCP/IP (v6).
    d. Select TCP/IP (v4), and choose Properties.
    e. Set the IP address.

Installing Active Directory and DNS services on DC1
1. Click Start→Run, type `dcpromo`, and click OK.
2. At the Active Directory Domain Services Installation Wizard welcome screen, check the Use advanced mode installation option and click Next.
3. In the Choose a Deployment Configuration dialog box, select Create a new domain in a new forest, and click Next.
4. At the FQDN page, type `vdi.local` and click Next.
5. At the NetBIOS name prompt, leave the name VDI, and click Next.
6. At the Forest Functionality level, select Windows Server 2008 R2 and click Next.
7. At the additional Domain Controller Options, leave DNS server selected and click Next.
8. At the System Folder Location screen, change to `E:\` leave the default options, and click Next.
9. Assign a Directory Services Restore Mode Administrator account password, and click Next.
10. At the Summary screen, review your selections, and click Next.
11. Once Active Directory Domain Services finishes installing, click Finish and restart the system.
12. Run dnsmgmt.msc.
13. Create a reverse lookup zone for the subnet.

Configuring the Windows time service on DC1
To ensure reliable time, we pointed our Active Directory server to a physical NTP server.
1. Open a command prompt.
2. Type the following:
```
W32tm /config /syncfromflags:manual /manualpeerlist:"<ip address of a NTP
server>"
W32tm /config /reliable:yes
W32tm /config /update
W32tm /resync
```

```
Net stop w32time
Net start w32time
```

Setting up DHCP services on 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 `vdi.local` for the parent domain.
5. Enter the preferred DNS server IPv4 address and click Next.
6. At the Specify IPv4 WINS Server Settings screen, select WINS is not required for applications on the network and click Next.
7. At the Add or Edit DHCP Scopes screen, click Add.
8. At the Add Scope screen, enter the Name DHCP Scope name.
9. In the next box, set the following values and click OK.
    - Start IP address=`172.0.1.0`
    - End IP address=`172.0.10.0`
    - Subnet mask=`255.255.0.0`
10. Check the Activate This Scope box.
11. At the Add or Edit DHCP Scopes screen, click Next.
12. Click the Enable DHCP v6 Stateless Mode radio button, and click Next.
13. Leave the default IPv6 DNS Settings and click Next.
14. At the Authorize DHCP server dialog box, select Use current credentials.
15. At the Confirm Installation Selections screen, click Next. If the installation is set up correctly, a screen displays saying that DHCP server install succeeded.
16. Click Close.

Setting up the Login VSI share and Active Directory users

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

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

Setting up roaming profiles for users

1. Open Active Directory Users and Computers.
2. Browse to vdi.local→Login_VSI→Users→Target.

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3. Select all Login VSI users and right-click Properties.
4. Click the Profiles tab.
5. Check box Profile path and type `e:\profiles\%username%.`
6. Click OK.

Configuring folder redirection

1. Log into DC1 as `administrator.`
2. Open the Group Policy Editor.
3. Open Forest→Domains→vdi.local, right-click Group Policy Objects, and select New.
4. Type `folder redirection,` leave source starter GPO as None, and click OK.
5. Right-click the folder redirection GPO and click Edit.
6. Browse User Configuration→Policies→Windows Settings→Folder Redirection and right-click AppData (roaming).
7. In the AppData (roaming) Properties, target-tab select the following:
   - Setting = select Basic = Redirect everyone's folders to the same location
   - Target folder location = Create a folder for each user under the root path
   - Root Path = \\DC1\folderredirection
8. In the AppData (roaming) Properties→Setting tab, clear the checkbox for Grant the user exclusive right to AppData (Roaming) and click OK.
9. Repeat steps 6 through 8 for all subfolders in the folder redirection tree.
10. Close the Folder Redirection group policy.
11. In the Group Policy Editor, right-click the folder redirection policy and select →GPO status→Computer Configuration Settings Disabled.
12. In the Group Policy Editor, drag the folder redirect GPO to Forest→Domains→vdi.local→Login_VSI→Users→Target.

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

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

17. Click the Resources tab, click Memory, check the Reserve all guest memory checkbox, and click OK.
18. Start the VM.

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

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

Installing Microsoft SQL Server 2008 R2

1. Insert installation media and click OK to install .NET framework.
2. Wait for the SQL Installer to launch. On the left menu, click Installation.
3. Click New installation or add features to an existing installation. Click OK.
4. Enter the Product Key and click Next.
5. Check the I accept the license terms checkbox and click Next.
6. Click Install to install the Setup Support Files (required).
7. Resolve any issues displayed in the setup wizard and click Next.
8. At the Setup Role screen select SQL Server Feature Installation and click Next.
9. Select the Database Engine Services, Full-Text Search, Client tools Backwards Compatibility, Management Tools Basic and Complete, and click Next twice.
10. Accept instance configuration defaults and click Next.
11. Accept defaults for disk space requirements and click Next.
12. Click Use the same account for all SQL Server services, select NT Authority\System, and click OK. Click Next.

13. Select Mixed Mode and enter a password for the SA account. Click Add Current User and click Next.
14. Accept defaults for error reporting and click Next.
15. Review installation configuration rules check and click Next.
16. To begin installation, click Install.
17. At completion screen, click Close.
18. Run Windows Update to receive all updates and security patches.

Setting up a database and ODBC DSN for vCenter

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

Installing VMware vCenter 5.1

1. Log onto the vCenter as `VDI\administrator`.
2. From the VMware vCenter 5.1 install media, click Autorun.
3. Click Run to start the install wizard.
4. Click the Install button on the VMware vSphere 5.1 Simple Install wizard.
5. Select the Install wizard language as English and click OK.

Citrix XenApp hosted shared desktop performance on Cisco UCS:
Cisco VM-FEX vs. traditional vSwitch
A Principled Technologies test report 20

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

Setting up a VM to host the Citrix Licensing Server

1. Log into the `infra` server with the VMware vSphere client.
2. In the vSphere client under Basic Tasks, select Create a new virtual machine.
3. Choose Custom and click Next.
4. Assign the name `CitrixLIC` to the virtual machine and click Next.
5. Select `infra` as the host and click Next.
6. Select the appropriate storage and click Next.
7. Choose Virtual Machine Version 8 and click Next.
8. Choose Windows, choose Microsoft Windows Server 2008 R2 (64-bit), and click Next.
9. For CPUs, select one virtual processor socket and two cores per virtual socket, and click Next.
10. Choose 1GB RAM and click Next.

11. Click 1 for the number of NICs, select VMXNET3, connect to the `vdi-net` port group, and click Next.

12. Leave the default virtual storage controller and click Next.

13. Keep the default virtual device node (0:0) and click Next.

14. Connect the VM virtual CD-ROM to the Microsoft Windows 2008 R2 installation disk.

15. Click Finish.

16. Right-click the vCenter VM and click Edit settings.

17. Click the Resources tab, click Memory, check the Reserve all guest memory checkbox, and click OK.

18. Start the VM.

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

1. Open a virtual machine console on `CitrixLIC`.

2. Choose the language, time and currency, and keyboard input. Click Next.

3. Click Install Now.

4. Choose Windows Server 2008 R2 Enterprise (Full Installation), and click Next.

5. Accept the license terms and click Next.

6. Click Custom.

7. Click the Disk and click Drive options (advanced).

8. Click New→Apply→Format and click Next.

9. After the installation completes, click OK to set the Administrator password.

10. Enter the administrator password twice and click OK.

11. Install VMware Tools. For more information, see
    kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=340.

12. Reboot.

13. Connect the machine to the Internet and install all available Windows updates. Restart as necessary.

14. Enable remote desktop access.

15. Change the hostname to `CitrixLIC` and reboot when the installation prompts you.

16. Set up networking for the data network:

    a. Click Start, Control Panel, right-click Network Connections, and choose Open.

    b. Right-click the VM traffic NIC and choose Properties.

    c. Uncheck TCP/IP (v6).

    d. Select TCP/IP (v4) and choose Properties.

    e. Set the IP address, subnet, gateway, and DNS server.

17. Join the VDI domain.

18. Reboot the system.

Installing Citrix Licensing Server

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

2. Select .NET Framework 3.5.1 Features and click Add Required Role Services.

3. Click Next on the Web Server (ISS) screen.

4. Click Next on the Select Role Services screen and then click Install.

5. Click Close on the successful installation screen.

6. Insert XenApp 6.5 media.

7. Click on Manually install components→Common Components→Citrix Licensing.

8. Click I accept the terms in the license agreement and click Next.
9. At the Destination Folder, screen-click Install.
10. Click Finish on the Installation completed screen.
11. At the Configuration screen select the default ports and enter Administrator password.
12. Click on Start→All Programs→Citrix→Management Consoles→License Administrator Console.
13. Click on Administration and enter user credentials.
14. Click on Vendor Daemon Configuration and click on Import License.
15. Browse to location of the license and click on Import License.

Setting up a VM to host the Citrix Provisioning Server

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

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

1. Open a virtual machine console on `PVS`.
2. Choose the language, time and currency, and keyboard input. Click Next.
3. Click Install Now.
4. Choose Windows Server 2008 R2 Enterprise (Full Installation) and click Next.
5. Accept the license terms and click Next.
6. Click Custom.
7. Click the Disk and click Drive options (advanced).
8. Click New→Apply→Format, and click Next.
9. After the installation completes, click OK to set the Administrator password.
10. Enter the administrator password twice and click OK.
11. Install VMware Tools. For more information, see
    kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=340.
12. Reboot.

13. Connect the machine to the Internet and install all available Windows updates. Restart as necessary.
14. Enable remote desktop access.
15. Change the hostname to PVS and reboot when the installation prompts you.
16. Set up networking for the data network:
    a. Click Start, Control Panel, right-click Network Connections, and choose Open.
    b. Right-click the VM traffic NIC and choose Properties.
    c. Uncheck TCP/IP (v6).
    d. Select TCP/IP (v4) and choose Properties.
    e. Set the IP address, subnet, gateway, and DNS server.
17. Join the VDI domain.
18. Reboot the system.

Installing SQL Express on Provisioning Services server

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

1. Insert the media for Citrix Provisioning services 6.5.
2. Browse to the SQL Express 2005 Express directory and run SQLEXPR.exe.
3. Accept the End user agreement, and click Next.
4. To install prerequisites, click Install.
5. At the Welcome screen, click Next.
6. Verify the system passes the system configuration check, and click Next.
7. Enter a name and organization, and click Next.
8. Select the default features, and click Next.
9. Select Windows authentication, and click Next.
10. Check both boxes to Enable user instances, add user to the SQL Server administrator Role, and click Next.
11. Click Next for error usage reporting, and click Next.
12. Click Install.
13. When completed, click Next, and click Finish.
14. From the vCenter desktop, open Start→All Programs→Microsoft SQL Server 2005→Configuration Tools→SQL Server Configuration Manager.
15. Click SQL Server Network Configuration→Protocols for SQLEXPRESS.
16. Right-click TCP/IP, and select Enabled.
17. Click SQL Services→right-click SQL Server browser, and select Properties.
18. In the SQL Server Browser properties, select the services tab, change the start mode to Automatic, and click OK.
19. Start the SQL Server browser service.

Installing Citrix Provisioning Services

1. Click on Start→Administrative Tools→Server Manager→Features→Add Features.
2. Select .NET Framework 3.5.1 Features, and click Add Required Role Services.
3. On the Web Server (ISS) screen, click Next.
4. On the Select Role Services screen, click Next, and click Install.
5. On the successful installation screen, click Close.
6. Execute Citrix Provisioning Services x64.exe.

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

Installing Citrix Provisioning Services Administrative Console

1. Execute Citrix Provisioning Services Console x64.exe.
2. At the welcome screen, click Next.
3. Accept the licensing agreement and click Next.
4. Enter a user name and organization name and click Next.
5. Accept the default install path and click Next.
6. Accept the default install type and click Next.
7. Click Install and Finish.

Configuring Citrix Provisioning Services.

1. Click on Start→All Programs→Citrix→Provisioning Services→Provisioning Services Console.
2. Right-click Provisioning Services Console and select Connect to farm.
3. Enter IP of provisioning server and click Connect.
4. Under Farm→Stores right click on Store and select Create a vDisk.

5. Enter a filename, adjust the size select Fixed as the type and click Create vDisk.
6. Under Farm→Sites→Site→Device Collections right click on Collection and select Create Device.
7. Enter a name for the new device, under Type select `Maintenance`, under Boot from select `Hard Disk`, and enter the MAC address of the XenApp master image.
8. Click on the vDisk tab and under vDisk for this Device select Add….
9. Select the vDisk previously created and click OK twice.

Configuring Boot Server option on Domain Controller

1. Click Start→Run and type `DHCPmgmt.msc`.
2. DHCP→dc1.vdi.com→IPv4→Server Options.
3. Right-click Server Options, and select Configure options.
4. Activate option 66 Boot Server Host Name.
   - String value = `<ip of the provisioning server>`
5. Activate option 67 Boot file Name.
   - String value = `ARDBP32.BIN`
6. Click OK.

Setting up a VM to host Iperf1 and Iperf2

1. Log into the `infra` server with the VMware vSphere client.
2. In the vSphere client under Basic Tasks, select Create a new virtual machine.
3. Choose Custom and click Next.
4. Assign the name `vCenter` to the virtual machine and click Next.
5. Select `infra` as the host and click Next.
6. Select the appropriate storage and click Next.
7. Choose Virtual Machine Version 8 and click Next.
8. Choose Windows, choose Microsoft Windows Server 2008 R2 (64-bit), and click Next.
9. For CPUs, select one virtual processor socket and one core per virtual socket, and click Next.
10. Choose 4GB RAM and click Next.
11. Click 1 for the number of NICs, select VMXNET3, connect to the `vdi-net` port group, and click Next.
12. Leave the default virtual storage controller and click Next.
13. Keep the default virtual device node (0:0) and click Next.
14. Connect the VM virtual CD-ROM to the Microsoft Windows 2008 R2 installation disk.
15. Click Finish.
16. Right-click the vCenter VM and click Edit settings.
17. Click the Resources tab, click Memory, check the Reserve all guest memory checkbox, and click OK.
18. Start the VM.
19. Repeat steps 1-18 on the SUT server to create Iperf2.

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

1. Open a virtual machine console on `Iperf1`.
2. Choose the language, time and currency, and keyboard input. Click Next.
3. Click Install Now.
4. Choose Windows Server 2008 R2 Enterprise (Full Installation), and click Next.
5. Accept the license terms and click Next.

6. Click Custom.
7. Click the Disk and click Drive options (advanced).
8. Click New→Apply→Format and click Next.
9. After the installation completes, click OK to set the Administrator password.
10. Enter the administrator password twice and click OK.
11. Install VMware Tools. For more information, see
    kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=340.
12. Reboot.
13. Connect the machine to the Internet and install all available Windows updates. Restart as necessary.
14. Enable remote desktop access.
15. Change the hostname to `vCenter` and reboot when the installation prompts you.
16. Set up networking for the data network:
    a. Click Start→Control Panel, right-click Network Connections, and choose Open.
    b. Right-click the VM traffic NIC and choose Properties.
    c. Uncheck TCP/IP (v6).
    d. Select TCP/IP (v4), and choose Properties.
    e. Set the IP address, subnet, gateway, and DNS server.
17. Join the VDI domain.
18. Reboot the system.
19. Download and extract sourceforge.net/projects/iperf/files/ to the c:\ directory.
20. Repeat steps 1-18 on the SUT server to create Iperf2.

Configuring VM-FEX

We configured Cisco UCS Manager to communicate with the vCenter. Once linked a distributed vSwitch was created and a VM-FEX port group was registered for use.

Configuring Cisco UCS integration with the vCenter
1. Open UCS Manager.
2. Select the VM tab, and click VMware in the right pane.
3. Click Configure VMware integration.
4. In the Configure VMware integration box, click Export to export the vCenter extension plugin.
5. Choose a save location and click OK.
6. Open vSphere client, select the Plug-ins drop down menu, and select Manage plug-ins….
7. Right-click the Plugin manager and select New plug-in….
8. Browse to the location specified in step 5 and click Register plug-in.
9. Ignore the certificate error.

Configuring a DVS for VM-FEX
1. Open UCS Manager.
2. Select the VM tab, and click VMware in the right pane.
3. Select VMware, right-click and select configure vCenter.
4. Type `vCenter` for name and type the IP of the vCenter.
5. Do not add a folder and click Next.
6. Do not add a Datacenter and click Next.

7. Right-click vCenter and select Create datacenter.
8. Name the Data Center and click Next.
9. Click Add to add a folder.
10. Name the folder and click Next.
11. Click add DVS.
12. Name the DVS and click enable and OK.
13. Click Finish.

Creating port profiles on the Distributed vSwitch
1. In the UCS Manager, right-click Port Profiles.
2. Create a port profile:
    - Name: `platinum`
    - QoS policy = platinum
    - Select VLAN 100 and select native vlan
    - For Host Network I/O performance, select High performance.

Creating Profile clients on the Distributed vSwitch
1. In the UCS Manager, expand the Port profiles icon.
2. Right-click Port profile named platinum and select Create profile client.
3. Name the Port profile client `platinum`, select the appropriate folder and DVS, and click OK.

SETTING UP THE XENAPP HOSTED SHARED DESKTOP FARM

To create an 8 node Citrix hosted shared desktop farm on our Cisco UCS B200 M3 server (SUT), we created a gold image virtual machine, installed Microsoft Windows 2008 R2 and installed Citrix XenApp with all applications necessary for testing. We created streaming vDisk from the gold image with Citrix Provisioning Services. We then deployed eight Citrix XenApp Virtual machines using the Provisioning services streamed VM setup Wizard.

Setting up a VM to host Citrix XenApp
1. Log into the `SUT` server with the VMware vSphere client.
2. In the vSphere client under Basic Tasks, select Create a new virtual machine.
3. Choose Custom and click Next.
4. Assign the name `XenAppGold` to the virtual machine and click Next.
5. Select `infra` as the host and click Next.
6. Select the appropriate storage, and click Next.
7. Choose Virtual Machine Version 8, and click Next.
8. Choose Windows, choose Microsoft Windows Server 2008 R2 (64-bit), and click Next.
9. For CPUs, select one virtual processor socket and four cores per virtual socket, and click Next.
10. Choose 12GB RAM, and click Next.
11. Click 12 for the number of NICs, select VMXNET3, connect to the `vdi-net` port group, and click Next.
12. Leave the default virtual storage controller, and click Next.
13. Keep the default virtual device node (0:0), and click Next.
14. Connect the VM virtual CD-ROM to the Microsoft Windows 2008 R2 installation disk.
15. Click Finish.

16. Right-click the vCenter VM, and click Edit settings.
17. Click the Resources tab, click Memory, check the Reserve all guest memory checkbox, and click OK.
18. Start the VM.

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

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

Installing XenApp Server 6.5

1. Insert media for Citrix Provisioning services 6.5.
2. Click on Install XenApp Server.
3. Click OK to install .NET 3.5 SP1 Framework.
4. At the XenApp Server Role Manager, screen click on Add server roles.
5. Select Platinum Edition.
6. Select I accept the terms of this license agreement and click Next.
7. Under Common Roles, select XenApp and click Next.
8. At the roles subcomponents screen, click Next.
9. At the Review prerequisites screen, click Next.
10. At the Ready to install screen, click Install.
11. Click Finish and restart the server.
12. After the server restarts, click on Resume Install.

13. At the ready to Install screen, click on Install.
14. Click Finish after the server roles install.
15. Under Server Configuration Task, click on Specify Licensing.
16. Enter the License server name and test the connection, click Next.
17. Select XenApp as the licensing mode and click Apply.
18. Under Server Configuration Task, click on Configure.
19. Click on Create a new server farm.
20. Enter NewFarm under farm name and VDI\administrator under administrator account, click Next.
21. Click on Existing Microsoft SQL Server database and click Next.
22. Enter the Database server name and Database name and click Next.
23. Enter administrator credentials, test the connection, and click Next.
24. At the Configure shadowing screen, click Next.
    a. At the Specify advanced server settings screen, click Next.
    b. At the ready to configure screen, click Apply.
    c. At the Server configured successfully screen, click Finish.
    d. Reboot the server.

Installing Applications on XenApp Server 6.5
1. Click Start→Control Panel→Install Application on Remote Desktop Server.
2. At the Install program from floppy disk or CD-ROM, click Next.
3. Click Browser and select Office 2010.exe, click Open, click Next, and run Setup.
4. Enter the product key for Office 2010 and click Continue.
5. Accept the licensing agreement.
6. Select Install Now.
7. Click Start→Control Panel→Install Application on Remote Desktop Server.
8. At the Install program from floppy disk or CD-ROM, click Next.
9. Click Browser and select Login VSI Target Setup.exe, click Open, click Next, and run Setup.
10. In the Target Setup wizard, specify the VSI share \\DC1\share.
11. Click Start.
12. At the security warnings, click OK.
13. When the installation is complete, reboot the system.

Installing Provisioning Services Target Device on XenApp Server 6.5
1. Execute Citrix Provisioning Services Target Device x64.exe.
2. At the welcome screen, click Next.
3. Accept the licensing agreement and click Next.
4. Enter a user name and organization name, and click Next.
5. Accept the default install path and click Next.
6. At the Ready to Install the Program screen, click Install.
7. At the Installation Wizard Completed, click Finish.
8. Restart the server.
9. Install the Windows6.1 KB2550978-x64 Microsoft Update Standalone Package.
10. Restart the server.

Creating a VM template for Provisioning Services

1. Shut down `XenAppGold` Virtual Machine.
2. On vCenter clone the Virtual Machine and name it `GoldTemplate`.
3. Before cloning, edit the virtual hardware and click Continue.
4. Select Hard disk 1 and click Remove.
5. Select Remove from virtual machine and delete files from disk, click OK.
6. Right click on `GoldTemplate` and select Template→Covert to template.

Provisioning Services Imaging Wizard

1. Launch the Citrix XenApp Server Role Manager.
2. Under Server Configuration Tasks select Edit Configuration.
3. Select Prepare this server for imaging and provisioning.
4. Select Remove the current server instance from the farm and clear database location settings from this server, and click Next. Click Apply.
5. Click Start→Imaging Wizard.
6. At the Welcome screen, click Next.
7. At the Connect to Farm screen, enter the Provisioning Services Server information and click Next.
8. Select use existing vDisk and choose the previously created vDisk. Click Next.
9. At the Microsoft Volume Licensing screen, select None and click Next.
10. At the Configure Image Volumes, click on Autofit and click Next.
11. At the Existing Target Device screen, click Next.
12. At the Summary of Farm Changes screen, click Optimize for Provisioning Services, and click OK.
13. Click Finish, and shut down the server.
14. In vCenter, right-click the XenApp master image VM and click Edit settings.
15. Click Options tab→Boot options, check the box to force BIOS Setup, and click OK.
16. In the VM BIOS, tab to the Boot menu and change the boot order to:
    a. Network boot from VMware VMXNET3
    b. Removable Devices
    c. Hard Drive
    d. CD-ROM Drive
17. Tab to Exit and save exiting changes.
18. On the boot menu, select the vDisk and hit enter.
19. When the VM boots, it will boot from PXE and Provisioning services will stream the vDisk to the device.
20. Log in as VDI\administrator.
21. Provisioning services will now copy XenApp master image to the vDisk.
22. Click Finish.
23. Shut down XenApp master image.

Deploying a XenApp pool with the Streamed VM Setup Wizard.

1. Open the Provisioning services console→Farm→sites→site→vDisk Pool and right click the vDisk.
2. Select Properties and change the Access mode to Standard Image and Cache type to Cache on server. Click OK.
3. Go to Farm→sites, right-click Site, and select XenDesktop Setup Wizard.
4. At the welcome screen, click Next.

5. At the Hypervisor connection, select VMware vSphere/ESX and enter credentials for the vCenter VM. Click Next.
6. Select the Cluster or Host and click Next.
7. Select `GoldTemplate` and click Next.
8. Select the Provisioning services collection and vDisk, and click Next.
9. Enter the following and click Next:
    a. Number of virtual machines=6
    b. vCPUs=4
    c. Memory=12288 MB
    d. Active Directory=Create New accounts
10. For Active directory location, click VDI.com→Login_VSI→computers.
11. For Base name, type `XenApp#`, and click Next.
12. Click Finish and click Done.

Configuring the XenApp Server Farm
1. On the Provisioning Server VM, put the vDisk in Private Access mode.
2. Power on `XenApp1` VM.
3. Click on Start→Administrative Tools→Citrix→XenApp Server Role Management→ XenApp Server Role Manager.
4. Under Server Configuration Task, click on Configure.
5. Click on Create a new server farm.
6. Enter `XenAppFarm` under farm name and `VDI\administrator` under administrator account, click Next.
7. Click on Existing Microsoft SQL Server database and click Next.
8. Enter the Database server name and Database name, and click Next.
9. Enter administrator credentials, test the connection, and click Next.
10. At the Configure shadowing screen, click Next.
11. At the Specify advanced server settings screen, click Next.
12. At the ready to configure screen, click Apply.
13. At the Server configured successfully screen, click Finish.
14. Restart the server.
15. Click on Start→Administrative Tools→Citrix→Management Consoles→Citrix AppCenter.
16. Click on Disable Authenticode signature checking.
17. At the Configure and run discovery screen, click Next.
18. At the Select Products or Components screen select XenApp and click Next.
19. At the Select Servers screen, Click Add Local Computer and Click Next.
20. At the Preview Discovery screen, click Next. Click Finish.

Joining the XenApp Server Farm
1. On the Provisioning Server VM, put the vDisk in Standard Access mode.
2. Power on all XenApp servers.
3. Log into all the XenApp servers and click on Start→Administrative Tools→Citrix→Management Consoles→Citrix AppCenter.
4. At the Welcome screen, click Next.
5. At the Select Products or Components screen, select XenApp and click Next.
6. At the Select Servers screen, Click Add…, type `XenApp1`, click OK, and Click Next.

7. At the Preview Discovery screen, click Next. Click Finish.

Publishing Applications on the XenApp Server Farm

1. On Citrix AppCenter, go to XenAppFarm and right-click Applications.
2. Click on Publish application.
3. At the welcome screen, click Next.
4. Enter a Display name and click Next.
5. Under Choose the type of application to publish, select Server desktop and click Next.
6. At the Servers screen, click Add…, select all XenApp Servers, and click Next.
7. Under users, click Add…, select the Login_VSI_TS group, and click Next.
8. At the Shortcut presentation screen, click Next.
9. Click Finish.

Creating a load-balancing policy on XenApp Server Farm

1. On Citrix AppCenter, go to XenAppFarm and right-click Load-Balancing Policies.
2. Select Create load-balancing policy.
3. Enter a name for the policy.
4. Under Filters, select Client IP Address.
5. Select Filter based on client IP address and select Apply to all client IP addresses.
6. Click Ok and verify the policy is Enabled.

CREATING WINDOWS 7 ENTERPRISE X64 IMAGE VSI LAUNCHERS

Using the vSphere client, we created a Windows 7 Enterprise x64 VM with the Login VSI launcher software and cloned it to create twelve Login VSI launchers on the infrastructure server that was not under test.

Setting up a VM to use as a Windows 7 Enterprise (x64) Login VSI launcher

1. Log into the vCenter.
2. In the vSphere client, connect to the vCenter Server and browse to the ESXi host named infra.vdi.local.
3. Click the Virtual Machines tab.
4. Right-click and choose New Virtual Machine.
5. Choose Custom and click Next.
6. Assign the name `Launcher` to the virtual machine and click Next.
7. Select the appropriate datastore and click Next.
8. Choose Virtual Machine Version 8 and click Next.
9. Choose Windows, choose Microsoft Windows 7 (64-bit), and click Next.
10. Choose 1 virtual socket, 2 cores per virtual socket, and click Next.
11. Choose 4 GB RAM and click Next.
12. Click 1 for the number of NICs, select VMXNET3 and VDI-NET, and click Next.
13. Leave the default virtual storage controller and click Next.
14. Choose to create a new virtual disk and click Next.
15. Make the OS virtual disk size 32 GB, choose thin provision, and click Next.
16. Keep the default virtual device node (0:0), and click Next.
17. Click Finish.

18. Click Finish and click OK.
19. Click the Resources tab and click Memory.
20. Click Reserve all guest memory.
21. Click the Hardware tab.
22. Connect the VM virtual CD-ROM to the Microsoft Windows 7 x64 installation disk.

Installing Windows 7 Enterprise (x64)

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

Adjusting page file on the launcher

1. Log in as vdi\administrator.
2. Right-click Computer→Properties→Change settings→Advanced→Performance→Settings.
3. In Performance settings, select the Advanced tab and select Change for Virtual Memory.
4. Deselect Automatically manage page file.
5. Select Custom size, type 6144 for both values, and select Set.

Disabling Windows Firewall

The domain GPO automatically disables the Windows Firewall.

Installing the Citrix Receiver for Windows (ver 3.4)

1. Download the Citrix receiver for Windows (www.citrix.com/downloads/citrix-receiver/receivers-by-platform/receiver-for-windows-34.html).
2. Click Launch and OK.
3. At the welcome screen, click Install.
4. Click Finish.

Installing Virtual Audio Cables

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

1. Download and extract the media.

2. Click Setup.
3. Click Yes to begin the install.
4. Click I accept to accept the software license agreement.
5. Click Install.

Installing Login VSI target software on the launcher

1. Browse to VSIinstall media\setups\Launcher\.
2. Run the setup.exe.
3. In the Target Setup wizard, specify the VSI share (\\dc1\share).
4. Click Start.
5. Reboot the system.
6. Shut down the launcher VM.

Cloning the launcher

We created a template from the VM named launcher and deployed twelve launchers using the sysprep functionality built into vCenter. For more information on how to clone virtual machines in VMware vCenter, please read www.vmware.com/support/pubs/vsphere-esxi-vCenter-server-pubs.html.

Login VSI testing pre-configuration

Before running the tests, we created 140 roaming profiles on the \\dc1\profiles share, and 140 redirected folders the \\dc1\folders share.

Running the Login VSI benchmark

We used twelve launchers configured in parallel to run a medium workload of up to 140 user sessions on the Citrix XenApp Farm. Before we tested, we changed the adaptor of all 8 XenApp VMs and Iperf2 to use the vdi-net portgroup. We started the Iperf job, and then ran the login VSI test. After the test had completed, we rebooted our launchers and XenApp servers, waited for both to become idle, and then re-ran our tests to confirm our results. We then set all XenApp VMs and Iperf2 to use the VM-FEX port group and reran our test and confirmation tests.

For more information on how to run a Login VSI test, see: www.loginvsi.com/en/admin-guide/performing-tests.

Running the Iperf tests

We powered off all XenApp VMs and Launchers from previous testing. We changed the adaptor on Iperf2 to use the vdi-net port group. We ran 3 Iperf tests, changed the Iperf2 adaptor to use the VM-FEX port group and reran our tests.

- From the server (Iperf2), run "c:\bin\iperf.exe -s -P 0 -i 60 -p 5001 -N -f m"
- For client (Iperf), run "c:\bin\iperf.exe -c [ipaddress of dest] -P 4 -i 60 -p 5001 -w 8972.0b -N -l 8.0M -f m -t 600 -d -r –L"

Login VSI testing (4 Gbps)
- From the server (Iperf2) run "\bin\iperf.exe -s -P 0 -i 60 -p 5001 -N -f m"
- For client (Iperf), run " c:\bin\iperf.exe -c [ipaddress of dest] -P 8 -i 60 -p 5001 -N -f m -t 5400 -d -r -L 5001

Extreme conditions (10 Gbps)"
- From the server (Iperf2), run "c:\bin\iperf.exe -s -P 0 -i 60 -p 5001 -N -f m"
- For client (Iperf), run "c:\bin\iperf.exe -c [ipaddress of dest] -P 4 -i 60 -p 5001 -w 8972.0b -N -l 8.0M -f m -t 600 -d -r –L"

APPENDIX C - LOGIN VSI INI AND CSV FILES USED FOR TESTING

[Launcher]
Servername=
Username=
Password=
Domain=
CommandPassword=
ConnectionType="Custom with CSV file"
ConnectionNumber=User
CCL="\\dc1\share\ICAConnect\ICAConnect.exe" /uselb /server xenapp1 /user %CSV_user% /application pool /password
Password1 /domain ferber /encryption RC5-128 /color 24Bit /resolution 1024x768
CSV=\\dc1\share\csv\user.csv
Launchmode=Parallel
PreTestScript=
PostTestScript=
ParallelDelay=10
ParallelTimeframe=2520
InitialStartNumber=1
NumberOfSessions=140
SequentialInterval=10
Fancy_number=1
Autologoff=1
LogoffTimeOut=900
CreateProfile=0
UseLocalLauncher=0

[user.csv]
target,User
xenapp1,login_vsi1
xenapp2,login_vsi2
xenapp3,login_vsi3
xenapp4,login_vsi4
xenapp5,login_vsi5
xenapp6,login_vsi6
xenapp7,login_vsi7
xenapp8,login_vsi8
xenapp1,login_vsi9
xenapp2,login_vsi10
xenapp3,login_vsi11
…
xenapp1,login_vsi137
xenapp2,login_vsi138
xenapp3,login_vsi139
xenapp4,login_vsi140

[Iperf commands]

Login VSI testing (4 Gbps)
- From the server (Iperf2) run "\bin\iperf.exe -s -P 0 -i 60 -p 5001 -N -f m"
- For client (Iperf), run " c:\bin\iperf.exe -c [ipaddress of dest] -P 8 -i 60 -p 5001 -N -f m -t 5400 -d -r -L 5001

Extreme conditions (10 Gbps)"
- From the server (Iperf2), run "c:\bin\iperf.exe -s -P 0 -i 60 -p 5001 -N -f m"
- For client (Iperf), run "c:\bin\iperf.exe -c [ipaddress of dest] -P 4 -i 60 -p 5001 -w 8972.0b -N -l 8.0M -f m -t 600 -d -r –L"

APPENDIX D – CPU AND NETWORK UTILIZATION STATISTICS.

Figures 10 through 12 present network and CPU utilization statistics throughout our tests.
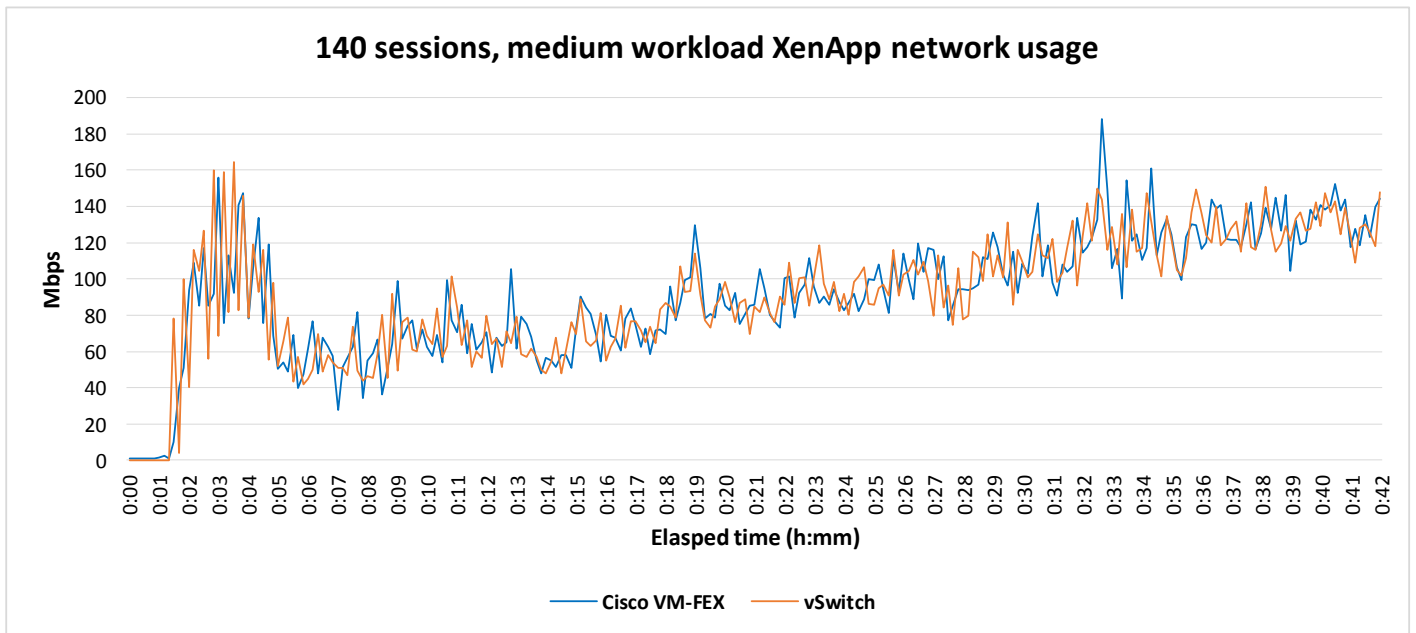
Figure 10: XenApp network usage.
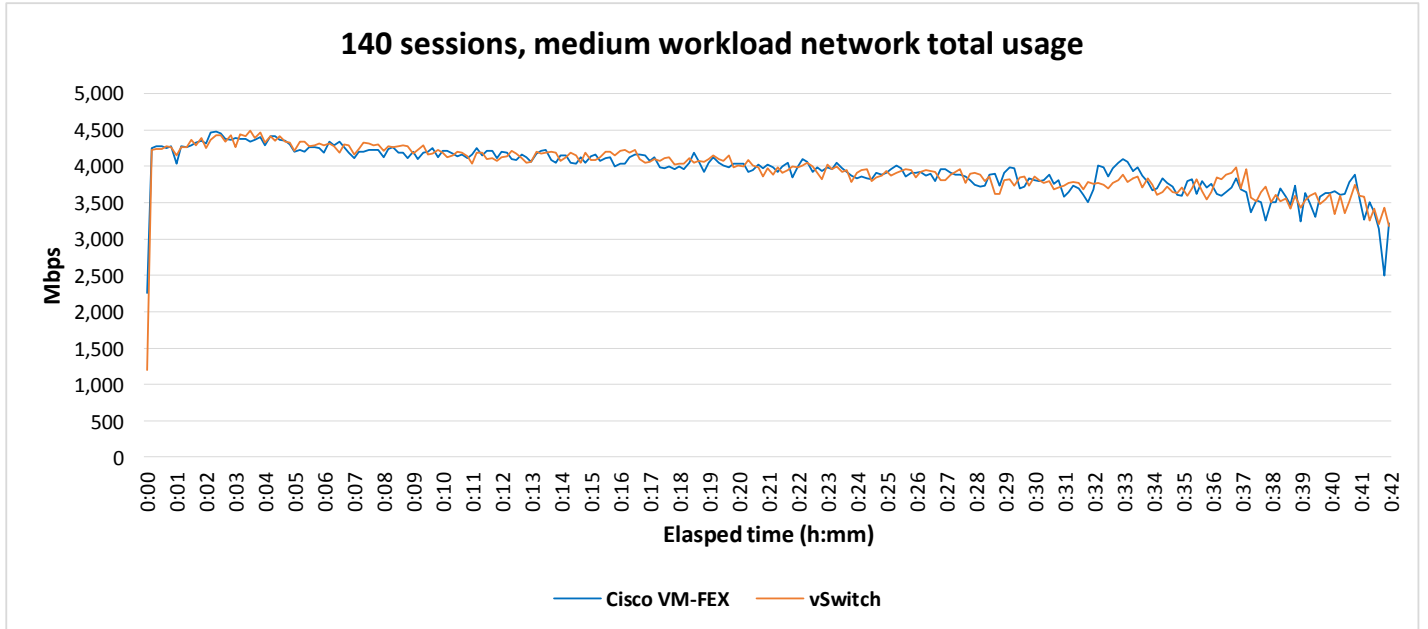
Figure 11: Total network usage.
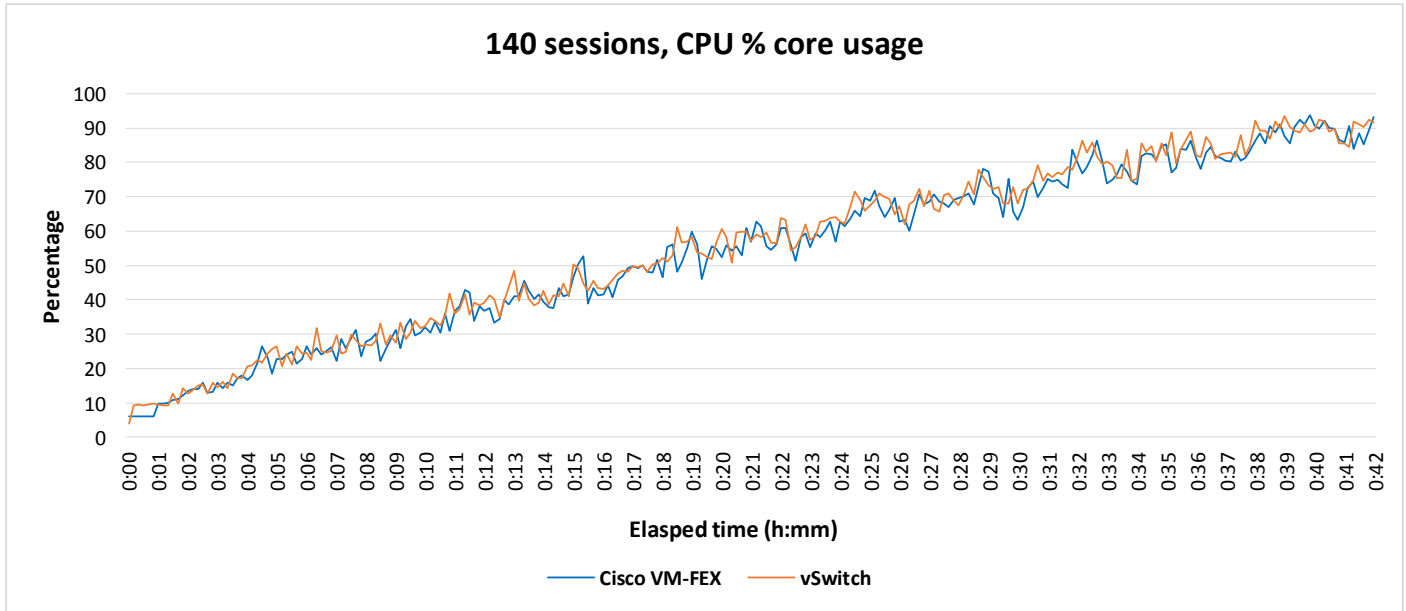
Figure 12: CPU utilization throughout our test. When we reached between 80 and 90 percent utilization, we stopped adding sessions and ended the test.

ABOUT PRINCIPLED TECHNOLOGIES

Principled Technologies®

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