Expand your communications server capacity and gain room to grow with IT payback in 16 months

$ Dell™ PowerEdge™ R720 ran four times the number of communications workloads*

*compared to the HP ProLiant DL380 G7 running a non-virtualized workload

powered by the Intel® Xeon® processor E5-2600 series

Your existing communications servers are doing their jobs but your company plans to grow. Consolidating these servers onto a single more powerful virtualized server, such as the new Dell PowerEdge R720 powered by the Intel Xeon processor E5-2600 series has the potential to benefit your business in a number of ways. You can decrease the amount of hardware you need to store, maintain, power, and cool, and you can support more users.

We measured communications performance with two solutions: a new Dell PowerEdge R720 server running Microsoft® Lync® Server 2010 in four virtual machines (VMs) and an HP ProLiant DL380 G7 server running Microsoft Office Communications Server 2007 R2. We chose to run a single 5,000-user workload on the HP server and on each of the four VMs on the Dell server. The virtualized solution supported all four workloads.

The savings in hardware, maintenance, power, and cooling costs make the Dell PowerEdge R720 a wise investment for any business. In a scenario where this server replaces four existing HP ProLiant DL380 G7 servers, purchasing the Dell PowerEdge R720 can pay back the investment in hardware and the migration effort in as little as 16 months.

A PRINCIPLED TECHNOLOGIES TEST REPORT

MEET YOUR GROWING COMMUNICATIONS NEEDS WITH FEWER SERVERS

Dedicated communications servers are an increasingly essential part of a business's infrastructure. Even if your current communications servers are meeting your needs, investing in a powerful new solution can be a smart move.

We looked at the scenario of a business with existing HP ProLiant DL380 G7 servers running Microsoft Office Communications Server 2007 R2 that is considering upgrading to a single new Dell PowerEdge R720 running Microsoft Lync Server 2010 in four virtual machines (VMs). (Note: Microsoft renamed Office Communications Server as Lync Server. These are two versions of the same application.)

As Figure 1 illustrates, the Dell PowerEdge R720 ran four virtual machines, each running a Microsoft Lync Server 2010 workload of 5,000 users. The HP ProLiant DL380 G7 ran a single non-virtualized instance of Microsoft Office Communications Server 2007 R2 with a workload of 5,000 users. Thus, the Dell PowerEdge R720 supported four times the total number of users in our scenario.

Figure 1: The Dell PowerEdge R720 ran four times the number of 5,000-user Lync Server or Office Communications Server workloads as the HP ProLiant DL380 G7. More workloads are better.
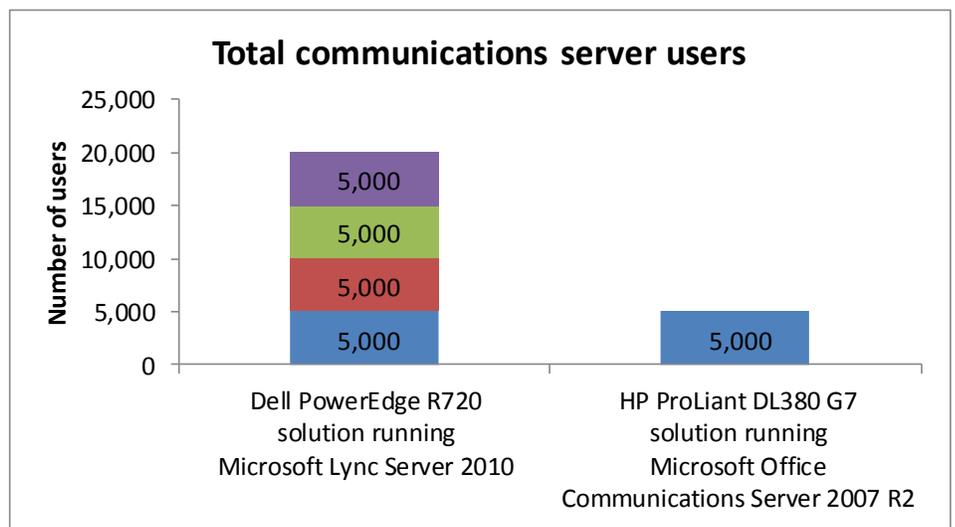
ABOUT OUR TESTING

Our premise for testing is that a customer has an existing older Office Communications server and plans to replace it with a new Dell server running a virtualized solution. We look at the 5,000-user workload that the older server supported and examine how many of these workloads the new server can run. The point is to show the consolidation possibilities in your environment that the new Dell PowerEdge R720 offers.

This representative test is only an approximation of what you might expect to see in your environment. Your actual configuration will differ greatly from this implementation and will include role separation, high-availability considerations, and other choices.

We used an HP ProLiant DL380 G7 server with Microsoft Windows Server® 2008 SP2 as our stand-alone Office Communications server. We used Hyper-V™ to create four VMs on our Dell PowerEdge R720 server, each of which ran a stand-alone Lync Server installation. Our tests results show that the Dell PowerEdge R720 was able to virtualize the same load as the HP ProLiant DL380 G7 in each of its four VMs without any performance degradation.

Microsoft Lync Server 2010 has many functions. When deploying a Lync Server configuration in a virtualized environment, there are many aspects you must consider to allow for proper high availability and failover. The goal of this test was to show the consolidation of an existing server to the latest Dell server. To do so, we configured the HP ProLiant DL380 G7 and each VM on the Dell PowerEdge R720 server as a standalone server. In a high-availability configuration, you would typically set up the following elements of Lync solution as individual servers or VMs:

- Front End Server and Back End Server
- A/V Conferencing Server
- Edge Server
- Mediation Server
- Monitoring Server
- Archiving Server
- Director

To simulate the traffic of Lync and Office Communications users, we used the Lync Server 2010 Stress and Performance tool, and the Office Communications Capacity Planning tool. These tools simulated users running various communication tasks simultaneously on their respective servers.

Using the workloads the test tools generated, we simulated 5,000 users per client performing Instant Messaging (IM), Audio/Video Conferencing, and Address book search functions simultaneously for 30 minutes. We ran the test three times on each server and reported the median runs. For more information on how we tested, see Appendix B.

ABOUT THE DELL POWEREDGE R720

According to Dell, the Dell PowerEdge R720 rack server is a general-purpose platform designed to excel at running a wide range of applications and virtualization environments for both mid-size and large enterprises. It has highly expandable memory (up to 768GB) and improved I/O capabilities to match. With Intel® Xeon® E5-2600 processors and the ability to support dual RAID controllers, the R720 can handle more demanding workloads, like Microsoft Lync Server 2010.

WHAT WE FOUND

Because we ran the tests simultaneously, the priority the tests were given fluctuated slightly so while neither server has better scores in every category, overall performance and stress on the two servers is equal.

Figure 2 shows the instant messages sent and received, by instance, for each server. The Intel Xeon processor E5-2680-powered Dell PowerEdge R720 server was able to support four VMs each with similar performance to the bare-metal HP ProLiant DL380 G7 performance.

Server	Messages sent	Messages sent/sec	Messages received	Messages received/sec
HP ProLiant DL380 G7	**51,810**	**28.78**	**51,810**	**28.78**
Dell PowerEdge R720 VM 1	49,193	27.33	49,193	27.33
Dell PowerEdge R720 VM 2	48,743	27.08	48,743	27.08
Dell PowerEdge R720 VM 3	48,516	26.95	48,516	26.95
Dell PowerEdge R720 VM 4	49,091	27.27	49,091	27.27
Dell PowerEdge R720 total	**195,543**	**108.64**	**195,543**	**108.64**

Figure 2: IM messages sent and received over a 30-minute period. Higher numbers are better.

Figure 3 shows the number of audio/video conferences created, by instance, for each server. The Intel Xeon processor E5-2680-powered Dell PowerEdge R720 server was able to support four VMs with better performance than the bare-metal HP ProLiant DL380 G7 server.

Server	Total active conferences	Conferences/sec
HP ProLiant DL380 G7	**13**	**0.01**
Dell PowerEdge R720 VM 1	48	0.03
Dell PowerEdge R720 VM 2	48	0.03
Dell PowerEdge R720 VM 3	48	0.03
Dell PowerEdge R720 VM 4	48	0.03
Dell PowerEdge R720 total	**192**	**0.11**

Figure 3: Total number of conferences created over a 30-minute period. Higher numbers are better.

Figure 4 shows the number of address book queries made, and the average latency of each query. The Intel Xeon processor E5-2680-powered Dell PowerEdge R720 server was able to support four VMs each with slightly lower performance, but better latency, than the bare-metal HP ProLiant DL380 G7 server.

Server	Total queries attempted	Queries attempted/sec	Average Latency(ms)
HP ProLiant DL380 G7	**407**	**0.22**	**55.07**
Dell PowerEdge R720 VM 1	358	0.20	28.38
Dell PowerEdge R720 VM 2	359	0.20	26.09
Dell PowerEdge R720 VM 3	362	0.20	26.94
Dell PowerEdge R720 VM 4	366	0.20	25.48
Dell PowerEdge R720 total	**1,445**	**0.80**	**26.72**

Figure 4: Total number of search queries attempted over a 30-minute period, higher is better. Average latency, lower is better.

ACHIEVE PAYBACK IN AS LITTLE AS 16 MONTHS BY CONSOLIDATING THE WORKLOAD OF FOUR HP PROLIANT DL380 G7 SERVERS

To show the total cost of ownership (TCO) savings the Dell PowerEdge R720 can deliver, we looked at replacing four existing HP ProLiant DL380 G7 servers running Microsoft Office Communications Server 2007 R2 with a single Dell PowerEdge R720 server running Microsoft Lync Server 2010 in four virtual machines.

To illustrate the cost savings this unified communications solution consolidation can provide, we calculated the costs for a hypothetical enterprise planning this migration and compared those costs to those of retaining the existing servers and software. We found that thanks to savings in software and hardware support, server administration, and data center costs for energy, port, and space, the Dell PowerEdge R720 can pay back the investment in hardware and the migration effort in as little as 16 months.

Figure 5 summarizes the costs for the two solutions.

The Dell PowerEdge R720 Lync Server solution delivers $22,655.68 savings over three years
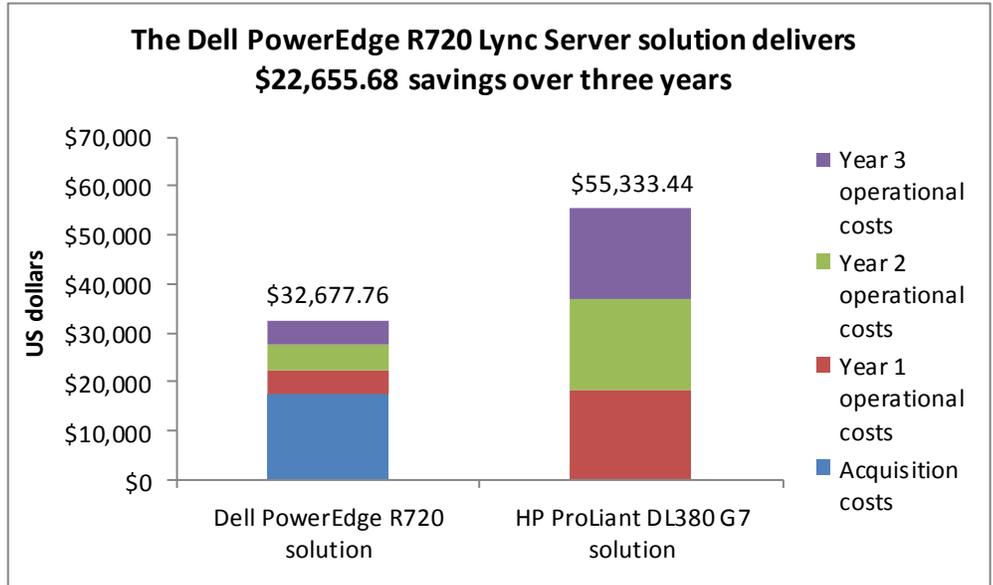
Figure 5: Breakdown of acquisition and operational costs for the two solutions over three years.

Figure 6 shows that the Dell PowerEdge R720 solution can deliver payback in as little as 16 months.

The Dell PowerEdge R720 Lync Server solution can deliver payback in 16 months
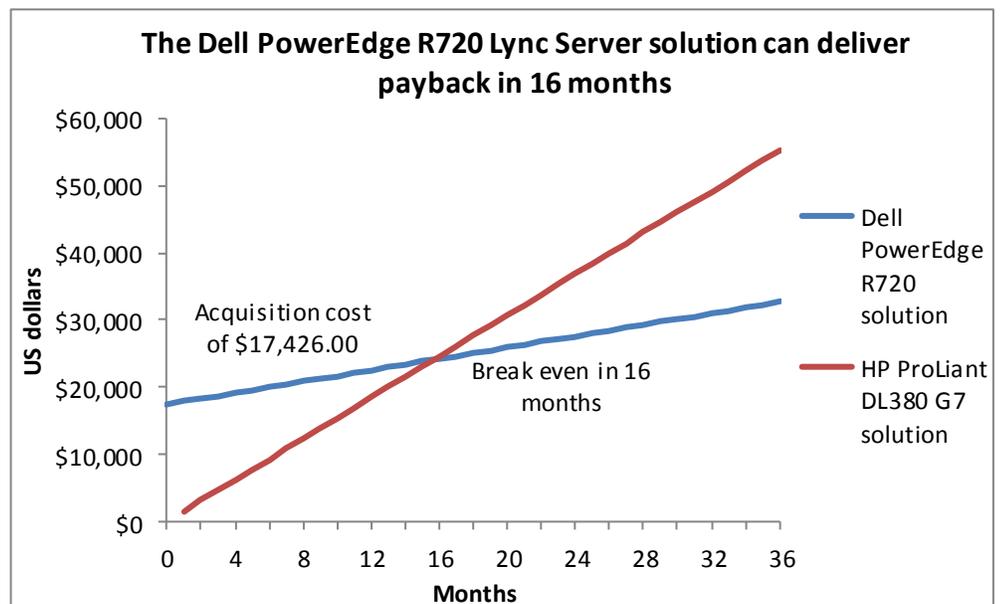
Figure 6: Payback period for replacing four HP ProLiant DL380 G7 servers with a single Dell PowerEdge R720 server.

Microsoft Lync Server consolidation and TCO: Dell PowerEdge R720 vs. HP ProLiant DL380 G7

A Principled Technologies test report **6**

The Dell PowerEdge R720 solution can save up to 72 percent of the annual operating costs of the HP ProLiant DL380 G7 solution

The Dell PowerEdge R720 solution can save up to 72 percent of the annual operating costs of the HP ProLiant DL380 G7 solution through savings in software and hardware support, server administration, and data center costs for energy, ports, and space.

Figure 7 summarizes the acquisition costs and annual operational costs of the two solutions and shows the operational cost savings for the Dell PowerEdge R720 solution. For additional assumptions, see Appendix D.

	Dell PowerEdge R720 solution	HP ProLiant DL380 G7 solution	Savings for Dell PowerEdge R720 solution	Percentage savings
Acquisition costs				
Hardware cost	$12,509.00			
Migration cost	$4,917.00			
Total acquisition costs	$17,426.00			
Annual operational costs				
OS Software support -- Windows Server 2008 R2 Enterprise Edition (licensed per server) for Dell PowerEdge R720 solution and Windows Server 2008 Enterprise Edition (licensed per server) for existing solution	$589.50	$2,358.00	$1,768.50	75%
Unified communications software support: Microsoft Lync Server 2010 Standard Edition (licensed per instance) for Dell PowerEdge R720 solution and Office Communications Server 2007 R2 Standard Edition (licensed per instance) for existing solution	$699.00	$699.00	$0.00	0%
Hardware support	$833.00	$2,358.68	$1,525.68	65%
Administration costs	$2,324.18	$10,226.40	$7,902.22	77%
Energy costs	$190.96	$1,013.28	$822.32	81%
Port costs	$250.00	$1,000.00	$750.00	75%
Data center space costs	$197.28	$789.12	$591.84	75%
Total operational costs	$5,083.92	$18,444.48	$13,360.56	72%
Total 3-year operational costs	$15,251.76	$55,333.44	$40,081.68	72%
Total costs	**$32,677.76**	**$55,333.44**	**$22,655.68**	**41%**

Figure 7: Cost savings for the Dell PowerEdge R720 solution.

The Dell PowerEdge R720 solution requires one-fourth the number of Windows Server licenses

The Dell PowerEdge R720 solution consolidates the workloads of four HP ProLiant DL380 G7 servers onto four VMs running under Microsoft Windows Server 2008 R2 with Hyper-V. Using the per-server with CAL licensing model, the Dell PowerEdge R720 solution reduces the four Windows Server licenses needed to a single license. We assign the annual Software Assurance costs for the three unused licenses as savings for the Dell PowerEdge R720 solutions. Software Assurance allows a no-cost upgrade from the Windows Server 2008 Enterprise Edition on the existing servers to the Microsoft Windows Server 2008 R2 Enterprise Edition on the Dell PowerEdge R720 server.

Note that the Dell solution does not save on Microsoft Lync Server licenses. We include Software Assurance costs in this model. We assume that the enterprise pays Software Assurance for its Microsoft Office Communications Server 2007 R2 Standard Edition licenses and will be able to extend their software assurance throughout the three years of this model. For the Dell PowerEdge R720 solution, we assume the enterprise upgrades licenses on the existing systems to Microsoft Lync Server 2010 Standard Edition using Software Assurance upgrade privileges. Based on Microsoft Open pricing, the per-license cost and Software Assurance costs are the same for the Standard Edition of both products. Because both products license on a per-instance basis, the four physical server instances in the existing solution and the four VMs in the Dell PowerEdge R720 solution have the same license count and cost.

We tested with SQL Server Express Editions distributed with the Lync Server and Communications Server software. We do not include any additional costs for SQL Server in this analysis.

The Dell PowerEdge R720 solution saves up to 65 percent annually in hardware support costs

Hardware support costs for the Dell PowerEdge R720 solution are considerably lower than for the four HP ProLiant DL380 G7 servers it replaces. For the existing servers, we use the costs of the HP Care Pack, 3 Years, 6-hour 24x7 CTR, Defective Media Retention Hardware Support, for the HP ProLiant DL380 from the HP On-line store. For the Dell PowerEdge R720, we use the costs of 3 Year ProSupport and Mission Critical 4HR 7x24 Onsite Pack provided to us by Dell. For each solution, we convert the three-year costs into annual costs. The hardware support costs for the single Dell PowerEdge R720 server are 65 percent lower than for the four existing servers.

The Dell PowerEdge R720 solution can save up to 77 percent annually in server administration costs

Even in a one-to-one server comparison, the manageability improvements of the Dell PowerEdge R720, including agentless management, would yield savings in administration costs. We estimate that a single administrator could manage 44 Dell servers such as the Dell PowerEdge R720 compared to 40 existing servers, saving 9 percent for a single Dell PowerEdge R720 solution server compared to an existing server. Savings reach 77 percent when comparing management of one Dell PowerEdge R720 to that of four existing servers.

Dell PowerEdge R720 solution can save up to 81 percent annually in energy costs

We measured the power usage of the two server models and used those results to estimate energy costs for the two solutions. We estimate that the servers run full time at the tested load. We include costs for cooling as well as powering the servers. We assume the cost to cool existing servers is the same as the cost to power them, so we double the power cost to get the cost for power and cooling. We assume the cooling efficiencies of the Dell PowerEdge R720 servers would save on power for cooling; we multiply the power cost for the Dell PowerEdge R720 by 1.8 to get the cost for power and cooling. We estimate a per KWH hour cost of 10.39 cents based on the US average commercial price for September 2011 as reported by the U.S. Energy Information Administration.[1] The Dell PowerEdge R720 solution saves by doing the work of four existing servers on a more energy efficient single server.

Additionally, although we did not perform extreme temperature testing, Dell is the only server manufacturer that warrantees its mainstream servers for excursion-based operation up to 45C/113F, which according to Dell white papers can yield operational savings of up to $250,000 annually per megawatt of IT equipment or a one-time capital expenditure savings of approximately $3M per megawatt of IT equipment.[2]

Dell PowerEdge R720 solution saves 75 percent annually in data center costs for ports and space

We assume the enterprise charges for rack space on a per-rack unit basis and for data center ports on a per-port basis. The four existing servers take up four times the space of the Dell PowerEdge R720, eight rack units vs. two rack units and require four times as many ports.

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[1] http://www.eia.gov/electricity/monthly/index.cfm (report epmxlfile5_6_b.xls)

[2] http://content.dell.com/us/en/enterprise/by-need-efficient-infrastructure-data-center-energy-efficiency-energy-management.aspx

CONCLUSION

Regardless of the age of the servers in your data center, upgrading to newer, more powerful Intel Xeon processor E5-2600 series-powered Dell PowerEdge R720 servers can improve performance and lower your total cost of ownership. In our tests, we found that the Dell PowerEdge R720 could support four of the 5,000-user workloads of the previous-generation HP ProLiant DL380 G7 server while delivering equal performance.

Not only did the Intel Xeon processor E5-2600 series-based Dell PowerEdge R720 server outperform the HP ProLiant DL380 G7, it also has the potential to reduce the cost of operating your data center, reducing TCO in our test scenario by 40.9 percent, or $22,655.68. It reduces cost of ownership by lowering costs in a number of areas: Windows Server licensing, server administration, energy usage, and data center ports and space.

Upgrading your data center now with Dell PowerEdge R720 servers can boost the performance of your IT infrastructure, and save you money over the next three years.

APPENDIX A – SERVER AND STORAGE CONFIGURATION INFORMATION

Figure 8 provides configuration information for the two servers we tested.

System	Dell PowerEdge R720	HP ProLiant DL380 G7
Power supplies		
Total number	2	2
Vendor and model number	Dell D750E-S1	HP DPS-750RB A
Wattage of each (W)	750	750
Cooling fans		
Total number	6	6
Vendor and model number	AVC DBTC0638B2V	Nidec UltraFlo
Dimensions (h x w) of each	2-1/2" x 2-1/2"	2-3/8" x 2-5/8"
Volts	12	12
Amps	1.20	2.45
General		
Number of processor packages	2	2
Number of cores per processor	8	4
Number of hardware threads per core	2	2
System power management policy	Balanced	Balanced
CPU		
Vendor	Intel	Intel
Name	Xeon	Xeon
Model number	E5-2680	X5570
Stepping	6	D0
Socket type	LGA2011	FCLGA1366
Core frequency (GHz)	2.70	2.93
Bus frequency	8.0 GT/s	6.4 GT/s
L1 cache	32 KB + 32 KB (per core)	32 KB + 32 KB (per core)
L2 cache	256 KB (per core)	256 KB (per core)
L3 cache (MB)	20	8
Platform		
Vendor and model number	Dell PowerEdge R720	HP ProLiant DL380 G7
Motherboard model number	00W9X3	ProLiant DL380 G7
BIOS name and version	Dell 0.3.37	HP P67 (5/5/2011)
BIOS settings	Default	Default
Memory module(s)		
Total RAM in system (GB)	64	12
Vendor and model number	Hynix HMT31GR7BFR4A-H9	Micron MT18JSF25672PDZ-1G4F1DD
Type	PC3-10600R	PC3-10600R
Speed (MHz)	1,333	1,333
Speed running in the system (MHz)	1,333	1,333
Timing/Latency (tCL-tRCD-tRP-tRASmin)	9-9-9-36	9-9-9-24
Size (GB)	8	2

System	Dell PowerEdge R720	HP ProLiant DL380 G7
Number of RAM module(s)	8	6
Chip organization	Double-sided	Double-sided
Rank	Dual	Dual
Operating system		
Name	Windows Server 2008 R2 SP1	Windows Server 2008 R2 SP1
Build number	7601	7601
File system	NTFS	NTFS
Kernel	ACPI x64-based PC	ACPI x64-based PC
Language	English	English
Graphics		
Vendor and model number	Matrox® G200eR	ATI ES1000
Graphics memory (MB)	16	64
Driver	Matrox Graphics, Inc 2.4.1.0 (9/8/2011)	Microsoft 6.1.7600.16385 (6/21/2006)
RAID controller		
Vendor and model number	PERC H710P Mini	HP Smart Array P410i
Firmware version	3.130.05-1311	5.14
Driver version	Dell 5.1.90.64 (3/2/2011)	6.20.2.64 (8/10/2010)
Cache size	1 GB	512 MB
Hard drive		
Vendor and model number	Dell Savvio ST9300605SS	HP EH0146FAWJB
Number of disks in system	2	2
Size (GB)	300	146
Buffer size (MB)	64	16
RPM	10,000	15,000
Type	SAS	SAS
Ethernet adapters		
Vendor and model number	Intel Gigabit 4P I350-t rNDC	HP NC382i Multifunction Gigabit Server Adapter
Type	PCI-E	PCI-E
Driver	Intel 11.14.42.0 (9/13/2011)	6.2.9.0 (2/4/2011)
Optical drive(s)		
Vendor and model number	TEAC DV-28SW	N/A
Type	DVD-ROM	N/A
USB ports		
Number	4 external, 1 internal	4 external, 1 internal
Type	2.0	2.0

Figure 8: Configuration information for the two servers.

APPENDIX B - HOW WE TESTED

Our test scenario required each instance of Lync Server and Office Communications Server to have both a dedicated client and Active Directory® server. Our test bed consisted of an isolated network with six servers—the Dell PowerEdge R720 with four Lync Server VMs, the HP ProLiant DL380 G7 Office Communications Server, two virtualized Active Directory servers, and two virtualized client servers. The Active Directory and client servers were basic servers configured with defaults, Windows Hyper-V, and enough processor cores and RAM to support the VM requirements. We gave all servers and VMs appropriate IP addresses and logged them in on their individual domains. We installed Windows Server 2008 x64 SP2 on all servers and VMs related to Office Communications Server, and Windows Server 2008 R2 SP1 on all servers and VMs related to Lync. For comparison purposes, we installed all Lync Server 2010 roles inside each VM so they ran as a standalone configuration. This approach allowed us a modular method to determine an exact increase in identical virtual machines. Results in your specific environment will vary. We installed Active Directory on a separate system. For comparison purposes, we configured each VM as a standalone Exchange server environment with all roles included on each. We configured Office Communications Server in the same standalone server configuration. Each client VM had the Lync or Office Communicator performance tool installed, and ran the test scripts against the servers. Figures 9 and 10 show our test bed set ups for the two solutions.
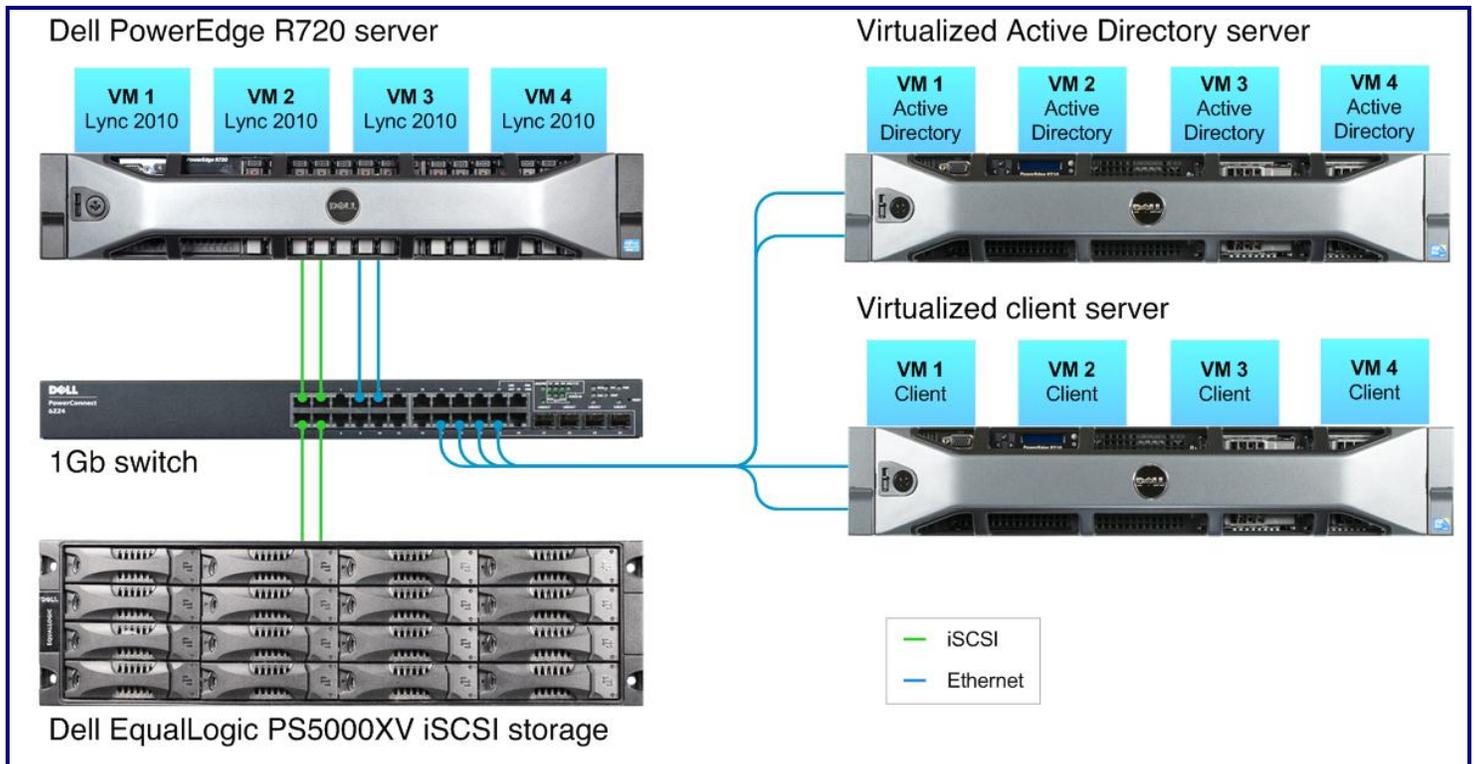
Figure 9: Our test bed setup for the Dell PowerEdge R720 solution.
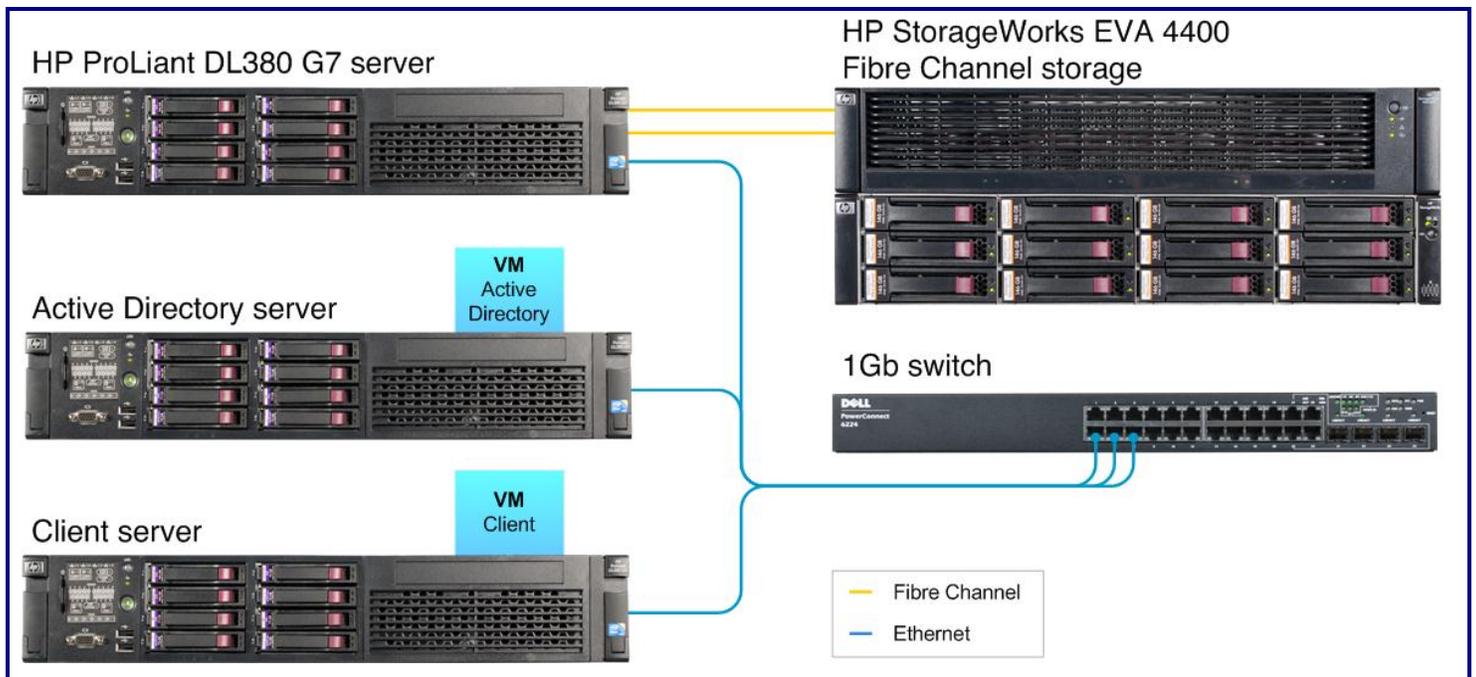
Figure 10: Our test bed setup for the HP ProLiant DL380 G7 solution.

Setting up and configuring the Dell PowerEdge R720 solution

Installing and Configuring the Active Directory Host server

Installing Windows Server 2008 R2 SP1

We installed Windows Server 2008 R2 SP1 on all of our test servers in our Dell PowerEdge R720 test bed using the following steps:

1. Insert the installation DVD for Windows Server 2008 R2 with SP1 into the DVD drive.
2. Choose the language, time and currency, and keyboard input. Click Next.
3. Click Install Now.
4. Choose Windows Server 2008 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. Click Start, type `change power-saving settings` and press Enter.
12. Click Change plan settings.
13. Change the Turn off the display drop-down menu to Never.
14. Click Save changes, and close the Power Options, Screen Saver Settings, and Personalization windows.
15. Run Windows Update to install the latest updates.

Adding the Hyper-V role

1. Open Server Manager, and click Roles.
2. Click Add Roles.
3. On the Before You Begin page, check the Skip this page by default box, and click Next.
4. Select Hyper-V, and click Next.
5. On the Hyper-V Introduction page, click Next.

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6. On the Create Virtual Networks page, click Next.
7. Confirm installation selections, and click Install.
8. Once the installation is complete, click Close.
9. When the system prompts a restart, click Yes.
10. Allow the system to fully reboot, and log in using the administrator credentials.
11. Once the desktop loads, the Hyper-V Installation Results window will finish the installation.
12. Click Close. The Hyper-V role will now be available in Server Manager under Roles.

Configuring the virtual network

1. Right-click the server name in the list on the left side of Hyper-V, and choose Virtual Network Manager…
2. Choose External, and click Add.
3. Name the Virtual Network, and choose the appropriate NIC for your test bed network from the drop-down menu.
4. Click OK.

Creating the VMs

1. Click Action→New→Virtual Machine.
2. On the Before You Begin window, click Next.
3. Enter the name of the VM, and click Next.
4. Assign 4GB of memory, and click Next.
5. Choose the virtual network you created from the drop-down menu, and click Next.
6. Create a 30GB virtual hard disk with a name and location, and click Next.
7. Choose Install an operation System later, and click Next.
8. Click Finish.
9. Right-click the VM, and choose Settings.
10. Change the number of Virtual processors to 2.
11. Install Windows Server 2008 R2 SP1 on your VM.
12. Install Windows updates.

Creating a second VM

1. With your original VM turned off, navigate to the VHD storage drive.
2. Create a copy of the VHD, and rename it.
3. Using the steps above, create a new VM with one exception: Instead of creating a new VHD, choose Use an existing virtual hard disk and navigate to the VHD you copied and renamed. Continue the VM creation as normal.
4. Follow steps 1 through 3 until you have four VMs.

Installing Active Directory

1. Set a static IP on your VM, and be sure to set the preferred DNS to 127.0.0.1.
2. Click Start→Run, and type `DCPROMO` in the Run field.
3. Leave defaults, and click Next on the Welcome window.
4. Click Next on the Operating System Compatibility window.
5. Choose Create a new domain in a new forest, and click Next.
6. Type in the name of your domain, and click Next.
7. At the Domain NetBIOS name, enter a name and click Next.
8. Set the Forest Functional Level to Windows Server 2003, and click Next.
9. Set the Domain Functional Level to Windows Server 2003, and click Next.
10. Leave defaults on the Additional Domain Controller Options window, and click Next.
11. Choose Yes on the pop-up asking if you want to continue.
12. Leave defaults on the Location for Database, Log Files and SYSVOL window, and click Next.

13. Enter a domain password, and click Next.
14. Click Next on the summary page.
15. Click Finish.
16. Click Restart Now.

Installing IIS on Active Directory server

1. Click Start→Administrative Tools→Server Manager.
2. Click Roles→Add Roles.
3. At the Before You Begin screen, click Next.
4. Check Web Server (IIS) and click Next.
5. At the Introduction screen, click Next.
6. At the Select Role Services screen, click Next.
7. Click Install.
8. Click Close.

Installing Certificate Services on Active Directory server

1. Click Start→Administrative Tools→Server Manager.
2. Click Roles→Add Roles.
3. Click Next on the Before You Begin window.
4. Check Active Directory Certificate Services, and click Next.
5. Click Next on the Introduction window.
6. Check Certification Authority and Certification Authority Web Enrollment, and click Add Required Role Services on the pop-up window. Click Next.
7. Choose Enterprise, and click Next.
8. Choose root CA, and click Next.
9. Choose Create a new private key, and click Next.
10. Leave defaults on the Configure Cryptography for CA window, and click Next.
11. Leave defaults on the Configure CA Name window, and click Next.
12. Leave defaults on the Set Validity Period, and click Next.
13. Leave defaults on the Configure Certificate Database window, and click Next.
14. Click Next on the Web Server (IIS) window.
15. Leave defaults on the Select Role Services window, and click Next.
16. Click Install.
17. Click Close.

Prepping Schema on the Active Directory server

1. Insert the Lync Server 2010 disc into your optical drive.
2. Double-click the CD-DVD drive in Windows to start the installation wizard.
3. Click Yes on the prompt to install Visual C++.
4. When prompted, click Install to start the Deployment Wizard.
5. Accept the terms in the license agreement, and click OK
6. Click Prepare Active Directory.
7. Click Run for Step 1: Prep Schema.
8. Click Next on the wizard welcome screen.
9. Click Finish.

Prepping Forest on the Active Directory server

1. Back on the Active Directory Preparation window, click Run for Step 3: Prep Forest.
2. Click Next on the Wizard welcome window.
3. Leave the local domain selected on the Universal Group Location window, and click Next.

4. Click Finish.

Verifying replication in the domain

1. On the domain controller, click Start→Administrative Tools→Active Directory Users and Computers
2. Expand the domain name and click Users.
3. In the right pane, confirm that there are nine CS groups (shown below) within the Users to verify that the replication of the Forest Preparation was successful.
   - CSAdministrator
   - CSArchivingAdministrator
   - CSHelpDesk
   - CSLocationAdministrator
   - CSResponseGroupAdministrator
   - CSServerAdministrator
   - CSUserAdministrator
   - CSViewOnlyAdministrator
   - CSVoiceAdministrator

Prepping current domain

1. Back on the Active Directory Preparation window, click Run for Step 5: Prep Current Domain.
2. Click Next on the Wizard welcome window.
3. Click Finish.

Providing administrative access to the Lync Server Control Panel

1. Click Start→Administrative Tools→Active Directory Users and Computers.
2. Expand Forest, and select Users.
3. Right-click CSAdministrator, and select Properties.
4. Select the Members tab and add user from Domain that needs rights to make changes on the Lync Server. (i.e., administrator). Click OK.
5. Click OK and close the window.

Modifying password complexity

1. Click Start→Run.
2. Type gpmc.msc and click OK.
3. Expand the Forest and Domain Tabs.
4. Click your domain.
5. In the right pane, under the Linked Group Policy Objects, right-click the Default Domain Policy, and click Edit.
6. Expand Policies→Windows Settings→Security Settings, and click Account Policies.
7. Right-click Password Policy, and click Open.
8. Right-click Password must meet complexity requirements, and click Properties.
9. Change the properties to Disabled, and click OK.
10. Close the Management Editor.

Running Exchange AD prep

1. Mount an Exchange 2007 ISO to the VM's virtual drive.
2. Open a command window, and navigate to the CD drive.
3. Type setup /prepareAD /Oragnaizationname:<insert any organization name here>
4. Press Enter.
5. When the preparation is finished, close the command window and eject the ISO.

Configuring Lync Server Host

Installing Windows 2008 R2 SP1

1. Insert the installation DVD for Windows Server 2008 R2 with SP1 into the DVD drive.
2. Choose the language, time and currency, and keyboard input. Click Next.
3. Click Install Now.
4. Choose Windows Server 2008 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. Click Start, type `change power-saving settings` and press Enter.
12. Click Change plan settings.
13. Change the Turn off the display drop-down menu to Never.
14. Click Save changes, and close the Power Options, Screen Saver Settings, and Personalization windows.
15. Run Windows Update to install the latest updates.

Adding the Hyper-V role

1. Open Server Manager, and click Roles.
2. Click Add Roles.
3. On the Before You Begin page, check the Skip this page by default box, and click Next.
4. Select Hyper-V, and click Next.
5. On the Hyper-V Introduction page, click Next.
6. On the Create Virtual Networks page, click Next.
7. Confirm installation selections, and click Install.
8. Once the installation is complete, click Close.
9. When the system prompts a restart, click Yes.
10. Allow the system to fully reboot, and log in using the administrator credentials.
11. Once the desktop loads, the Hyper-V Installation Results window will finish the installation.
12. Click Close. The Hyper-V role will now be available in Server Manager under Roles.

Configuring the virtual network

1. Right-click the server name in the list on the left side of Hyper-V, and choose Virtual Network Manager…
2. Choose External, and click Add.
3. Name the Virtual Network, and choose the appropriate NIC for your test bed network from the drop-down menu.
4. Click OK.

Creating the VMs

1. Click Action→New→Virtual Machine.
2. On the Before You Begin window, click Next.
3. Enter the name of the VM, and click Next.
4. Assign 8GB of memory, and click Next.
5. Choose the virtual network you created from the drop-down menu, and click Next.
6. Create a 30GB virtual hard disk with a name and location, and click Next.
7. Choose Install an operation System later, and click Next.
8. Click Finish.
9. Right-click the VM and choose Settings.

10. Change the number of Virtual processors to 4.
11. Install Windows Server 2008 R2 SP1 on your VM.
12. Install Windows Updates.

Creating a second VM

1. With your original VM turned off, navigate to the VHD storage drive.
2. Create a copy of the VHD, and rename it.
3. Using the steps above, create a new VM with one exception: Instead of creating a new VHD, choose Use an existing virtual hard disk and navigate to the VHD you copied and renamed. Continue the VM creation as normal.
4. Follow steps 1 through 3 until you have four VMs.

Joining the domain

1. Set a static IP on your VM, and be sure to set the preferred DNS to the IP of the domain controller.
2. Click Start, and right-click Computer, and choose Properties.
3. Click Change settings→Change.
4. Choose Domain, and enter the name of your domain. Press OK.
5. Click OK on the restart prompt.
6. Restart the system.
7. Log in on the domain.

Installing Web Server (IIS)

1. Click Start→Administrative Tools→Server Manager.
2. Click Roles, scroll to Web Server (IIS), and click Add Role Services
3. Select the following:
   - Windows Authentication
   - IIS 6 Management Compatibility
   - ASP.NET
   - Client Certificate Mapping Authentication
   - IIS Management Scripts and Tools with any required services they need, and Click Next.
4. Click Install.
5. Click Close.

Adding Desktop Experience

1. Click Start→Administrative Tools→Server Manager.
2. Click Features→Add Features.
3. Select Desktop Experience, add the required role services, and click Next.
4. Click Install.
5. Reboot when prompted
6. Click Close after rebooting.

Adding Directory Service Integration

1. Click Start→Administrative Tools→Server Manager.
2. Click Features→Add Features.
3. Expand Message Queuing, expand Message Queuing Services, and check Directory Service Integration and HTTP Support.
4. Click Add Required Features on the pop-up windows.
5. Click Next.
6. Click Next on the IIS introduction window.
7. Click Next on the Role selection window.

8. Click Install.
9. Reboot when prompted.
10. Close Server Manager.

Installing .NET Framework 3.5.1 Features

1. Click Start→Administrative Tools→Server Manager.
2. Click Features.
3. Click Add Features.
4. At the Select Features screen, select .NET Framework 3.5.1 Features, and add the required features when prompted. Click Next.
5. Click Install.
6. Click Close.

Starting the Lync Server Pre-installation menu

1. Insert the Microsoft Lync Server 2010 disc into your optical drive.
2. Double-click the CD-DVD drive in Windows to start the installation wizard.
3. Click Yes on the prompt to install Visual C++.
4. Leave the default Installation Location, and click Install.
5. Accept the terms of the License Agreement, and click OK.

Preparing the single Standard Edition Server

1. In the Lync Server 2010 Deployment Wizard menu, click Prepare first Standard Edition server.
2. Click Next to start installation.
3. Click Finish.

Creating a share for the topology

1. Go to My Computer→C:
2. Right-click and select New→Folder.
3. Name the folder `share`.
4. Right-click the newly created folder, and select Share with → Specific people…
5. Enter `Everyone`, and click Add.
6. Change the permission level for Everyone to Read/Write.
7. Click Share.
8. Click Done.

Installing the Topology Builder and preparing the topology

1. Install Topology Builder, and click Next.
2. Click Start→ All Programs→Microsoft Lync Server 2010, and launch Lync Server Topology Builder.
3. Select New Topology, and click OK.
4. Name file, and choose location to save file.
5. Enter primary SIP domain, and click Next.
6. At the Specify additional supported domains screen, click Next.
7. In Define First site enter site name, and click Next.
8. At the Specify site details screen, click Next.
9. Click Finish, leaving the Open the New Front End Wizard when this wizard closes box checked.
10. At the Define the New Front End pool, click Next.
11. Enter FQDN, select Standard Edition Server, and click Next.
12. At the Select Features screen, Check Conferencing, which includes audio, video and application sharing.
13. Click Next.
14. At the Select collocated server roles screen, accept the default selection, and click Next.

15. At the Associate server roles with this Front End pool screen accept defaults, and click Next.
16. At the Define the SQL store screen, click Next.
17. At the Define the file share screen, leave the defaults, and click Next.
18. At the Specify the Web Services URL, leave the default ,and click Finish.
19. Right-click Lync Server 2010 and select Edit Properties.
20. Enter URL for administrative access, select the Central Management Server, and click OK.
21. Right-click Lync Server 2010 and select Publish Topology.
22. Click Next on Publish the topology screen.
23. On the Select Central Management Server screen, click Next.
24. When publishing is completed, click Finish, and close the Lync Server Topology builder application.

Installing Lync Server

1. Back in the Deployment wizard, click Install or Update Lync Server System to launch the Lync Server deployment wizard.
2. Click Run on Step 1 – Install Local Configuration Store.
3. On Configure Local Replica or Central Management Store screen, keep defaults and click Next.
4. When installation is complete, click Finish.
5. Click Run on Step 2 – Setup or Remove Lync Server Components
6. Click Next.
7. When installation is complete, click Finish.
8. Click Run on Step 3 – Request, Install or Assign Certificates.
9. Keep defaults, and click Request.
10. At the Certificate Request screen, click Next.
11. On Delayed or Immediate Request screen, accept the default and click Next.
12. Leave the default selection in the Choose a Certification Authority (CA) screen, and click Next.
13. At the Certification Authority Account, click Next.
14. At the Specify Alternate Certificate Template screen, click Next.
15. Enter a name for your certificate, and click Next.
16. On the Organization Information screen enter organizational information, and click Next.
17. Enter Geographical information on Geographical Information screen, and click Next.
18. Accept defaults on Subject Name/Subject Alternate Names screen, and click Next.
19. At the SIP Domain setting on Subject Alternate Names (SANs) screen, select the SIP domain, and click Next.
20. At the Configure additional Subject Alternate Names screen, click Next.
21. On the Certificate Request Summary screen, click Next.
22. When request for certificates has completed, click Next.
23. Click Finish.
24. At the Certificate Assignment screen, click Next.
25. At the Certificate Assignment Summary screen, click Next.
26. Click Finish.
27. At the Certificate Wizard screen, click Close.
28. Click Run on Step 4 – Start Services.
29. At the Start Services screen, click Next.
30. After services are started, click Finish.
31. Click Exit to close the Deployment Wizard.

Configuring Web Component certificate

1. Click Start→Administrative Tools→Server Manager.
2. Expand Roles, expand Web Server (IIS) and click Internet Information Services.
3. Expand your server list and the sites folder, and click Default Web Site.

4. Under IIS, click Authentication.
5. Under the actions menu on the right, choose Bindings…
6. Click Add…
7. Change the Type to https.
8. Choose the certificate you made in the last section from the SSL certificate drop-down menu, and click OK.
9. Click Close.
10. Close the Server Manager window.

Installing Lync Stress and Performance tool

1. Download the stress and performance tool here
   http://www.microsoft.com/download/en/details.aspx?id=25005
2. Double-click the .msi file, and click Run.
3. Click Next on the Welcome window.
4. Accept the license agreement, and click Next.
5. Keep the default location, and click Next.
6. Leave defaults to install all features, and click Next.
7. Click Next on the Confirmation window.
8. Click Close.

Running the stress configuration

1. Navigate to C:\Program Files\Microsoft Lync Server2010\LyncStressAndPerfTool\StressConfig.
2. Double-click the StressConfig application.
3. Click Load Configuration File.
4. Choose the SampleData files, and click Open.
5. On the Server tab, enter your FQDN, and your lync server name in the SQL BE Machine field.
6. On the General Settings tab, enter your domain in the SIPDomain for users' URI and User account domain fields.
7. On the General Settings tab, change the Max number of contacts per user to 2500.
8. On the VoIP tab, enter your Area Code, and change the UC Policy to Default Policy.
9. On the Users Tab, click Create Users.
10. On the Contacts Tab, click Create Contacts.
11. Click OK.
12. On the distribution list type 2000 in the DistributionListNumber field, MyDL in the DistributionListPrefix field, and OCSUsers in the DistributionListOU field.
13. Click Create Distribution Lists.
14. Click Save&Exit.

Generating test scripts

1. Navigate to C:\Program Files\Microsoft Lync Server2010\LyncStressAndPerfTool \LyncStress.
2. Double-click User Profile Generator.
3. Make the following changes on the Common Configuration tab:
   - Set Client Machine Settings to 1.
   - Type OCSUser in the Prefix for User Names field.
   - Change Number of users to 5000.
   - Enter your domain in the User and Account domain fields.
   - Enter the FQDN of your server in the Access Proxy or Pool FQDN field.
4. On the General Scenarios tab, change the following fields from None to High:
   - Instant Messaging
   - Audio Conferencing
   - Address Book Web Query

5. Leave defaults on the Voice Scenarios tab.
6. Click Generate Files on the Summary tab.
7. Choose where the generated files should be save, and click OK.
8. Click OK.
9. Click Exit, and click Yes on the prompt to save the form.
10. Enter a name, and click Save.
11. Copy the generated files to the appropriate client machine.

Configuring Microsoft Lync Client

Installing Windows Server 2008 R2 SP1

1. Insert the installation DVD for Windows Server 2008 R2 with SP1 into the DVD drive.
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). 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. Click Start, type `change power-saving settings` and press Enter.
12. Click Change plan settings.
13. Change the Turn off the display drop-down menu to Never.
14. Click Save changes, and close the Power Options, Screen Saver Settings, and Personalization windows.
15. Run Windows Update to install the latest updates.

Adding the Hyper-V role

1. Open Server Manager, and click Roles.
2. Click Add Roles.
3. On the Before You Begin page, check the Skip this page by default box, and click Next.
4. Select Hyper-V, and click Next.
5. On the Hyper-V Introduction page, click Next.
6. On the Create Virtual Networks page, click Next.
7. Confirm installation selections, and click Install.
8. Once the installation is complete, click Close.
9. When the system prompts a restart, click Yes.
10. Allow the system to fully reboot, and log in using the administrator credentials.
11. Once the desktop loads, the Hyper-V Installation Results window will finish the installation.
12. Click Close. The Hyper-V role will now be available in Server Manager under Roles.

Configuring the virtual network

1. Right-click the server name in the list on the left side of Hyper-V, and choose Virtual Network Manager…
2. Choose External, and click Add.
3. Name the Virtual Network, and choose the appropriate NIC for your test bed network from the drop-down menu.
4. Click OK.

Creating the VMs

1. Click Action→New→Virtual Machine.
2. On the Before You Begin window, click Next.

3. Enter the name of the VM, and click Next.
4. Assign 12GB of memory, and click Next.
5. Choose the virtual network you created from the drop-down menu, and click Next.
6. Create a 30GB virtual hard disk with a name and location, and click Next.
7. Choose Install an operation System later, and click Next.
8. Click Finish.
9. Right-click the VM and choose Settings.
10. Change the number of Virtual processors to 4.
11. Install Windows Server 2008 R2 SP1 on your VM.
12. Install Windows Updates

Creating a second VM

1. With your original VM turned off, navigate to the VHD storage drive.
2. Create a copy of the VHD, and rename it.
3. Using the steps above, create a new VM with one exception: Instead of creating a new VHD, choose Use an existing virtual hard disk and navigate to the VHD you copied and renamed. Continue the VM creation as normal.
4. Follow steps 1 through 3 until you have four VMs.

Joining the domain

1. Set a static IP on your VM, and be sure to set the preferred DNS to the IP of the domain controller.
2. Click start, and right-click Computer and choose Properties.
3. Click change settings→Change.
4. Choose Domain and enter the name of your domain. Press OK.
5. Click OK on the restart prompt.
6. Restart the system.
7. Log in on the domain.

Installing .NET 3.5

1. Open Server Manager.
2. Click Features→Add Features.
3. Check .NET 3.5 and accept the required features. Click Next.
4. Click Next on the welcome window.
5. Click Next on Select Role Services.
6. Click Install.
7. Click Close.

Enabling Desktop Experience

1. Open Server Manager.
2. Click Features→Add Features.
3. Check Desktop Experience, and click Next.
4. Click Install.
5. Click Close.
6. Click Yes on the prompt to reboot.
7. When the installation finishes, click Close.

Installing Microsoft Visual C++

1. Download Visual C++ here http://www.microsoft.com/download/en/confirmation.aspx?id=15336
2. Double-click the application to start the install.
3. Click Run.
4. Click Next on the Welcome window.

5. Accept the license agreement, and click Install.
6. Click Finish.

Installing Lync Server Stress and Performance Tool.

1. Download the stress and performance tool here
    http://www.microsoft.com/download/en/details.aspx?id=25005
2. Double-click the .msi file, and click Run.
3. Click Next on the Welcome window.
4. Accept the license agreement, and click Next.
5. Keep the default location, and click Next.
6. Leave defaults to install all features, and click Next.
7. Click Next on the Confirmation window.
8. Click Close.

Running MaxUserPorts

1. Navigate to Microsoft Lync Server 2010→LyncStressAndPerfTool→LyncStress.
2. Double-click MaxUserPorts.
3. Click Yes on the Registry Editor warning.
4. Click OK.

Registering the perfmon counters

1. Open a command window, and navigate to the LyncStress folder.
2. Type `regsvr32 /i /n LyncPerfToolPerf.dll`, and press Enter.
3. Click OK on the confirmation popup window.
4. Type `regsvr32 /i /n S4Perf.dll`, and press Enter.
5. Click OK on the confirmation popup window.
6. Close the command window.

Setting up and configuring the Office Communicator test bed

Installing and Configuring the Active Directory Host server

Installing Windows Server 2008 SP2

We installed Windows Server 2008 x64 SP2 on all of our HP ProLiant DL380 G7 servers using the following steps:

1. Insert the installation DVD for Windows Server 2008 x64 with SP2 into the DVD drive.
2. Choose the language, time and currency, and keyboard input. Click Next.
3. Click Install Now.
4. Choose Windows Server 2008 Enterprise (Full Installation). 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. Click Start, type `change power-saving settings` and press Enter.
12. Click Change plan settings.
13. Change the Turn off the display drop-down menu to Never.
14. Click Save changes, and close the Power Options, Screen Saver Settings, and Personalization windows.
15. Run Windows Update to install the latest updates.

Adding the Hyper-V role

1. Open Server Manager, and click Roles.

2. Click Add Roles.
3. On the Before You Begin page, check the Skip this page by default box, and click Next.
4. Select Hyper-V, and click Next.
5. On the Hyper-V Introduction page, click Next.
6. On the Create Virtual Networks page, click Next.
7. Confirm installation selections, and click Install.
8. Once the installation is complete, click Close.
9. When the system prompts a restart, click Yes.
10. Allow the system to fully reboot, and log in using the administrator credentials.
11. Once the desktop loads, the Hyper-V Installation Results window will finish the installation.
12. Click Close. The Hyper-V role will now be available in Server Manager under Roles.

Configuring the virtual network

1. Right-click the server name in the list on the left side of Hyper-V, and choose Virtual Network Manager…
2. Choose External, and click Add.
3. Name the Virtual Network, and choose the appropriate NIC for your test bed network from the drop-down menu.
4. Click OK.

Creating the VMs

1. Click Action→New→Virtual Machine.
2. On the Before You Begin window, click Next.
3. Enter the name of the VM, and click Next.
4. Assign 4 GB of memory, and click Next.
5. Choose the virtual network you created from the drop-down menu, and click Next.
6. Create a 30GB virtual hard disk with a name and location, and click Next.
7. Choose Install an operation System later, and click Next.
8. Click Finish.
9. Right-click the VM and choose Settings.
10. Change the number of Virtual processors to 2.
11. Install Windows Server 2008 SP2 on your VM.
12. Download and install Windows Updates.

Installing Active Directory

1. Set a static IP on your VM, and be sure to set the preferred DNS to `127.0.0.1`.
2. Click Start→Run, and type DCPROMO in the run field.
3. Leave defaults, and click Next on the Welcome window.
4. Click Next on the Operating System Compatibility window.
5. Choose Create a new domain in a new forest, and click Next.
6. Type in the name of your domain, and click Next.
7. Set the Forest Functional Level to Windows Server 2003, and click Next.
8. Set the Domain Functional Level to Windows Server 2003, and click Next.
9. Leave defaults on the Additional Domain Controller Options window, and click Next.
10. Choose Yes on the popup asking if you want to continue.
11. Leave defaults on the Location for Database, Log Files and SYSVOL window, and click Next.
12. Enter a domain password, and click Next.
13. Click Next on the summary page.
14. Click Finish.
15. Click Restart Now.

Installing IIS on Active Directory server

1. Click Start→Administrative Tools→Server Manager.
2. Click Roles→Add Roles.
3. Click Next on the Before You Begin window.
4. Check Web Server (IIS) and click Add Required Features on the pop-up window. Click Next.
5. Click Next on the Introduction window.
6. Click Next on the Select Role Services window.
7. Click Install.
8. Click Close.

Installing Certificate Services on Active Directory server

1. Click Start→Administrative Tools→Server Manager
2. Click Roles→Add Roles.
3. Click Next on the Before You Begin window.
4. Check Active Directory Certificate Services, and click Next.
5. Click Next on the Introduction window.
6. Check Certification Authority and Certification Authority Web Enrollment, and click Add Required Role Services on the pop-up window. Click Next.
7. Choose Enterprise, and click Next.
8. Choose root CA, and click Next.
9. Choose Create a new private key, and click Next.
10. Leave defaults on the Configure Cryptography for CA window, and click Next.
11. Leave defaults on the Configure CA Name window, and click Next.
12. Leave defaults on the Set Validity Period, and click Next.
13. Leave defaults on the Configure Certificate Database window, and click Next.
14. Click Next on the Web Server (IIS) window.
15. Leave defaults on the Select Role Services window, and click Next.
16. Click Install.
17. Click Close.

Prepping Schema on the Active Directory server

1. Insert the Office Communicator 2007 R2 disc into your optical drive.
2. Double-click the CD-DVD drive in Windows to start the installation wizard.
3. Click on the Standard Edition link.
4. Click Run.
5. Click Yes on the prompt to install Visual C++.
6. Click Prepare Active Directory.
7. Click Run for Step 1: Prep Schema.
8. Click Next on the wizard welcome screen.
9. Leave the default selection for the Directory Location, and click Next.
10. Click Next on the Ready to Prepare Schema window.
11. Click Finish.

Prepping Forest on the Active Directory Server

1. Back on the Active Directory Preparation window, click Run for Step 3: Prep Forest.
2. Click Next on the Wizard welcome window.
3. Leave defaults on the Location selection window, and click Next.
4. Choose your domain in the drop-down menu, and click Next.
5. Again, choose your domain in the drop-down menu, and click Next.

6. Click Next on the Ready to Prepare Forest window.
7. Click Finish.

Verifying replication in the domain

1. Click Start→Run
2. Type cmd and press Enter.
3. Navigate to the CD drive→Setup→amd64 folder.
4. Type LcsCmd /forest /action:CheckForestPrepState /PDCRequired:FALSE, and press Enter.
5. Open the HTML file you created, and expand Execute Action.
6. Verify that Forest Settings is labeled as Ready, and that "Success" appears under the execution result column.

Prepping current domain

1. Back on the Active Directory Preparation window, click Run for Step 5: Prep Current Domain.
2. Click Next on the Wizard welcome window.
3. Click Next on the Domain Preparation Information window.
4. Click Next on the Ready to Prepare Domain window.
5. Click Finish.

Modifying password complexity

1. Click Start→Run.
2. Type gpmc.msc and click OK.
3. Expand the Forest and DomainTabs.
4. Click your domain.
5. Right-click the domain, and click Edit.
6. Expand Policies→Windows Settings→Security Settings, and click Account Policies.
7. Right-click Password Policy and click Open.
8. Right-click Password must meet complexity requirements, and click Properties.
9. Change the properties to Disabled, and click OK.
10. Close the management editor.

Installing PowerShell

1. Open Server Manager.
2. Click Features→Add features.
3. Check Windows PowerShell, and click Next.
4. Click Install.
5. Click close.

Running Exchange AD prep

1. Mount and Exchange 2007 ISO to the VM's virtual drive.
2. Open a command window and navigate to the CD drive.
3. Type setup /prepareAD /Oragnaizationname:<insert any organization name here>
4. Press Enter.
5. When the preparation is finished, close the command window and eject the ISO.

Configuring Office Communicator Server

Installing Windows 2008

1. Insert the installation DVD for Windows Server 2008 x64 with SP2 into the DVD drive.
2. Choose the language, time and currency, and keyboard input. Click Next.
3. Click Install Now.
4. Choose Windows Server 2008 Enterprise (Full Installation). 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. Click Start, type change power-saving settings and press Enter.
12. Click Change plan settings.
13. Change the Turn off the display drop-down menu to Never.
14. Click Save changes, and close the Power Options, Screen Saver Settings, and Personalization windows.
15. Run Windows Update to install the latest updates.

Joining the domain

1. Set a static IP on your server, and be sure to set the preferred DNS to the IP of the domain controller.
2. Click Start, right-click Computer, and choose Properties.
3. Click Change settings→Change.
4. Choose Domain, enter the name of your domain, and click OK.
5. Click OK on the restart prompt.
6. Restart the system.
7. Log in on the domain.

Installing Web Server (IIS)

1. Click Start→Administrative Tools→Server Manager.
2. Click Roles→Add Roles.
3. Click Next on the Before You Begin window.
4. Check Web Server (IIS) and click Add Required Features on the pop-up window. Click Next.
5. Click Next on the Introduction window.
6. In addition to defaults, choose to install Windows Authentication, IIS 6 Management Compatibility, and ASP.NET with any required services they need, and Click Next.
7. Click Install.
8. Click Close.

Adding Directory Service Integration

1. Click Start→Administrative Tools→Server Manager.
2. Click Features→Add Features.
3. Expand Message Queuing and check Directory Service Integration and HTTP Support.
4. Click Add Required Features on the popup windows.
5. Click Next.
6. Click Next on the IIS introduction window.
7. Click Next on the Role selection window.
8. Click Install.
9. Reboot when prompted.
10. Close Server Manager.

Applying Hotfix

1. Click Start→Control Panel→Programs and Features.
2. Click View Installed Updates.
3. Remove Security Update for Microsoft Windows (KB974571).
4. Reboot the server.
5. Download osscanfix.exe from http://go.microsoft.com/fwlink/?linkId=168248

6. Install Office Communication server according to the instructions below.
7. When finished, run the osscanfix.exe you downloaded.
8. Run Windows Update to re-install Update KB974571.

Installing Office Communication Server

1. Insert the Office Communicator 2007 R2 disc into your optical drive.
2. Double-click the CD-DVD drive in Windows to start the installation wizard.
3. Click the Standard Edition link.
4. Click Run.
5. Click Yes on the prompt to install Visual C++.
6. Click the Deploy Standard Edition Server link.
7. Click Run on Step 1: Deploy Server.
8. Click OK on the Windows Media Format Runtime required pop-up window.
9. Click OK on the prompt to restart the system.
10. Reboot the server.
11. Double-click the CD-DVD drive in Windows to start the installation wizard.
12. Click the Standard Edition link.
13. Click the Deploy Standard Edition Server link.
14. Click Run on Step 1: Deploy Server.
15. Click Next on the Wizard welcome window.
16. Accept the EULA, and click Next.
17. Accept the default location for the files, and click Next.
18. Leave defaults on the Application Configuration screen, and click Next.
19. Enter a password, and click Next.
20. Again, enter a password, and click Next.
21. Leave defaults on the Web Farm FQDNs screen, and click Next.
22. Point the Database files to your external storage.
23. Click Next on the Ready to Deploy Server window.
24. Click Finish.

Configuring Office Communication Server

1. Back at the Deploy Standard Edition window, click Run for Step 2: Configure Server.
2. Click Next on the Wizard welcome window.
3. Leave defaults on Server or Pool to Configure, and click Next.
4. Leave defaults on SIP domains, and click Next.
5. Leave defaults on Client Logon Settings, and click Next.
6. Check the box for your domain, and click Next.
7. Leave defaults for External User Access Configuration, and click Next.
8. Click Next for Ready to Configure Server or Pool.
9. Click Finish.

Configuring the certificate

1. Back at the Deploy Standard Edition window, click Run for Step 3: Configure Certificate.
2. Click Next on the Wizard welcome window.
3. Choose Create a new certificate, and click Next.
4. Leave defaults for Delayed or Immediate Request, and click Next.
5. Leave defaults for Name and Security Settings, and click Next.
6. Enter your organization and organizational unit, and click Next.
7. Leave defaults for Your Server's Subject Name, and click Next.

8. Enter your location, and click Next.
9. Leave defaults for Choose a Certificate Authority, and click Next.
10. Click Next on Request Summary window.
11. Choose Assign certificate immediately, and click Next.
12. Click Next on Configure the Certificate(s) of your Server window.
13. Click Finish.

Configuring Web Component certificate

1. Click Start→Administrative Tools→Computer Management.
2. Expand Services and Applications and click Internet Information Services.
3. Expand your server list and the sites folder, and click Default Web Site.
4. Click IIS Authentication.
5. Under the actions menu on the right, choose Edit Site→ Bindings.
6. Click Add…
7. Change the Type to https.
8. Choose the certificate you made in the last section from the SSL certificate drop-down menu, and click OK.
9. Click Close.
10. Close the computer management window.

Verifying replication

1. Open a command window and change to the DVD drive.
2. Navigate to the setup\amd64 folder.
3. Type LcsCmd /server /action:CheckLCServerState /role:se /PDCRequired:FALSE, and press Enter.
4. Open the XML the command created, and click Expand All.
5. Verify that Check Server State is marked with Success.
6. Close the log.

Installing Admin Tools

1. Back on the Deploy Standard Edition Server window, click Back.
2. Click Administrative Tools in the column on the right.
3. Accept the license agreement, and click OK.

Starting services

1. Click Deploy Standard Edition Server.
2. Click Run for Step 6: Start Services.
3. Click Next on the Wizard welcome window.
4. Click Next on the Start Office Communications Server 2007 R2 services window.
5. Click Finish.

Enabling Desktop Experience

1. Open Server Manager.
2. Click Features→Add Features.
3. Check Desktop Experience, and click Next.
4. Click Install.
5. Click close.
6. Click Yes on the prompt to reboot.
7. When the installation finishes, click Close.

Installing Ocsstress tool

1. Download the Capacity Planning Tool here
   http://www.microsoft.com/download/en/details.aspx?displaylang=en&id=2250

2. Double-click the .msi file, and click Run.
3. Click Next on the Welcome window.
4. Accept the license agreement, and click Next.
5. Keep the default location, and click Next.
6. Leave defaults to install all features, and click Next.
7. Click Next on the Confirmation window.
8. Click Close.

Running the stress configuration

1. Navigate to C:\Program Files\Microsoft Office Communications Server 2007 R2\CapacityPlanningTool\StressConfig
2. Double-click the StressConfig application.
3. Click Load Configuration File.
4. Choose the SampleData files, and click Open.
5. On the Server tab, enter your FQDN.
6. On the General Settings tab, enter your domain in the SIPDomain for users' URI and User account domain fields.
7. On the General Settings tab, change the Max number of contacts per user to 5000.
8. On the VoIP tab, enter your Area Code, and change the UC Policy to Default Policy.
9. On the Users Tab, click Create Users.
10. On the Contacts Tab, click Create Contacts.
11. Click OK.
12. On the distribution list type `2000` in the DistributionListNumber field, `MyDL` in the DistributionListPrefix field, and `OCSUsers` in the DistributionListOU field.
13. Click Create.
14. Click Save&Exit.

Generating test scripts

1. Navigate to C:\Program Files\Microsoft Office Communications Server 2007 R2\CapacityPlanningTool\Ocsstress
2. Double-click User Profile Generator.
3. Make the following changes on the Common Configuration tab:
   - Set Client Machine Settings to 1.
   - Type OCSUser in the Prefix for User Names field.
   - Change Number of users to 5000.
   - Enter your domain in the User and Account domain fields.
   - Enter the FQDN of your server in the Access Proxy or Pool FQDN field.
4. On the General Scenarios tab, change the following fields from None to Low:
   - Instant Messaging
   - Audio Conferencing
   - Address Book Server
5. Leave defaults on the Voice Scenarios tab.
6. Click Generate Files on the Summary tab.
7. Choose where the generated files should be save, and click OK.
8. Click OK.
9. Click Exit, and click Yes on the prompt to save the form.
10. Enter a name, and click Save.
11. Copy the generated test scripts to the appropriate client.

Configuring audio/video and Web conferencing

1. Click Start→Administrator Tools→Microsoft Office Communications Server 2007 R2.

2. Right-Click the Forest, and choose Properties→Global Properties.
3. On the Meetings tab, choose Allow Users to invite anonymous participants in the drop-down menu.
4. Click Edit…
5. Check the boxes to enable web conferencing, IP audio and IP video, and click OK.
6. Click OK.
7. Close the OCS manager.

Configuring Office Communicator Client

Installing Windows Server 2008 x64 SP 2

1. Insert the installation DVD for Windows Server 2008 x64 with SP2 into the DVD drive.
2. Choose the language, time and currency, and keyboard input. Click Next.
3. Click Install Now.
4. Choose Windows Server 2008 Enterprise (Full Installation). 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. Click Start, type `change power-saving settings` and press Enter.
12. Click Change plan settings.
13. Change the Turn off the display drop-down menu to Never.
14. Click Save changes, and close the Power Options, Screen Saver Settings, and Personalization windows.
15. Run Windows Update to install the latest updates.

Adding the Hyper-V role

1. Open Server Manager, and click Roles.
2. Click Add Roles.
3. On the Before You Begin page, check the Skip this page by default box, and click Next.
4. Select Hyper-V, and click Next.
5. On the Hyper-V Introduction page, click Next.
6. On the Create Virtual Networks page, click Next.
7. Confirm installation selections, and click Install.
8. Once the installation is complete, click Close.
9. When the system prompts a restart, click Yes.
10. Allow the system to fully reboot, and log in using the administrator credentials.
11. Once the desktop loads, the Hyper-V Installation Results window will finish the installation.
12. Click Close. The Hyper-V role will now be available in Server Manager under Roles.

Configuring the virtual network

1. Right-click the server name in the list on the left side of Hyper-V, and choose Virtual Network Manager…
2. Choose External, and click Add.
3. Name the Virtual Network, and choose the appropriate NIC for your test bed network from the drop-down menu.
4. Click OK.

Creating the VM

1. Click Action→New→Virtual Machine.
2. On the Before You Begin window, click Next.
3. Enter the name of the VM, and click Next.

4. Assign 4GB of memory, and click Next.
5. Choose the virtual network you created from the drop-down menu, and click Next.
6. Create a 24GB virtual hard disk with a name and location, and click Next.
7. Choose Install an operation System later, and click Next.
8. Click Finish.
9. Right-click the VM and choose Settings.
10. Change the number of Virtual processors to 4.
11. Install Windows Server 2008 SP2 on your VM.
12. Install Windows Updates.
13. Join the VM to the domain.

Joining the domain

1. Set a static IP on your VM, and be sure to set the preferred DNS to the IP of the domain controller.
2. Click start, and right-click Computer and choose Properties.
3. Click Change settings→Change,
4. Choose Domain, enter the name of your domain, and click OK.
5. Click OK on the restart prompt.
6. Restart the system.
7. Log in on the domain.

Enabling Desktop Experience

1. Open Server Manager.
2. Click Features→Add Features.
3. Check Desktop Experience, and click Next.
4. Click Install.
5. Click close.
6. Click Yes on the prompt to reboot.
7. When the installation finishes, click Close.

Installing Microsoft Visual C++

1. Download Visual C++ here http://www.microsoft.com/download/en/confirmation.aspx?id=15336
2. Double-click the application to start the install.
3. Click Run.
4. Click Next on the Welcome window.
5. Accept the license agreement, and click Install.
6. Click Finish.

Installing Office Communications Server Capacity Planning Tool

1. Download the Capacity Planning Tool here
   http://www.microsoft.com/download/en/details.aspx?displaylang=en&id=2250
2. Double-click the .msi file, and click Run.
3. Click Next on the Welcome window.
4. Accept the license agreement, and click Next.
5. Keep the default location, and click Next.
6. Leave defaults to install all features, and click Next.
7. Click Next on the Confirmation window.
8. Click Close.

Running MaxUserPorts

1. Navigate to the Office Communications Server 2007 R2 folder.
2. Click CapacityPlanningTool→Ocsstress.

3. Double-click MaxUserPorts.
4. Click Yes on the Registry Editor warning.
5. Click OK.

Running the test

We ran a load test composed of three of the most commonly used tasks that Office Communicator and Lync provide: IM messaging, Audio/Video conferencing, and Address Book Search functionality. We ran 5,000 users, the maximum recommended for Standard installations, against each server with 4,800 users dedicated to IM messaging, 150 users dedicated to Audio/Video conferencing, and 50 users dedicated to searching. This was the default user breakdown by the Office Communications tool generator. We ran the test for 30 minutes and calculated the total number of actions completed for each task. We used Windows Performance Monitor to record results using the Office Communicator and Lync counters provided by the testing software. Where appropriate, we divided the number of tasks by the 1,800 second run time to get a task/second score. We determined the median run using the messages sent score.

APPENDIX D - TCO DETAILS

Hardware costs

Dell provided us with hardware costs for the Dell PowerEdge R720, which had not been released at the time of this report. Our testing was on a pre-release model. Costs do not include discounts, shipping, or taxes. Dell quoted a price of $12,509 for the following configuration of the Dell PowerEdge R720:

- 2x Intel Xeon processor E5-2680s (2.70 GHz)
- 128 GB (16 x 8 GB) dual-rank PC3L-10600R memory (M/N HMT31GR7BFR4A-H9)
- PERC H710P Mini Controller
- Dual eight-port disk backplane (16 hard drive slots available)
- No internal hard drives
- Four-port NIC card (dual-port 1GB/dual-port 10GB)
- Redundant 1GB SD card with ESXi 5.0 installed
- 8GB iDRAC SD card, including iDRAC Enterprise

Migration costs

We assume that the migration from the existing servers to the Dell PowerEdge R720 will take 2.5 weeks. Migration includes the staff costs of planning the migration, ordering the hardware, setting up the server, and migrating software and databases. We estimate 60 hours for the migration and 40 hours for the other tasks, with all tasks carried out by a server administrator or equivalent. We estimate this cost at $4,917.00 based on 100 hours of a server administrator's time, with an hourly cost of $49.17. To calculate the hourly rate, we used the mean annual wage of $72,200 for a network and computer systems administrator as reported in the Bureau of Labor Statistics Occupational Employment and Wages for May 2010.[3] We added an additional 41.64 percent to cover benefits for total annual salary cost of $102,264.08, which would have an equivalent hourly full time wage equivalent of $49.17. We estimated the benefits rate using data in another Bureau of Labor Statistics report, Employer Costs for Employee Compensation – September 2011.[4]

Software licenses

We assume the enterprise maintains current Microsoft Software Assurance on the Microsoft Windows Server software for both solutions, Microsoft Lync Server 2010 Standard Edition for the 12G solution, and Office Communications Server 2007 R2 Standard Edition for the legacy solution, and that their licensing allows them to migrate the software between servers. We also assume they can renew the Software Assurance agreements for the 3 years in this analysis.

We assume the existing solution runs Windows Server 2008 R2 Enterprise using per-server licensing. This license model requires CAL licenses. We do not include CAL costs in this analysis because the number of users or devices and therefore Windows CALS would be the same for both solutions.

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[3] http://www.bls.gov/oes/current/oes151142.htm
[4] http://www.bls.gov/news.release/ecec.t05.htm, Bureau of Labor Statistics report: Employer Costs –September 2011, Table 5. Private industry, by major occupational group and bargaining status, Management, Professional and Related column. That report estimates that salary is 70.6 percent and benefits are 29.4 percent of total compensation for Management, Professional, and Related employees in private industry. Using those numbers, we calculate benefits as 41.64% of salary.

We used software pricing for Windows Server from the Microsoft License Advisor tool[5] and used the Quick Quote option there to find the single license price for a Microsoft Open License for corporate organizations with the No Level pricing level. The prices quoted there are $2,358.00 per Windows Server 2008 R2 Enterprise Edition.

We used software pricing on the Pricing and Licensing page for Microsoft Lync. That showed $699.00 per Microsoft Lync Server 2010 Standard Edition.[6]

Annual Software Assurance is one-fourth the license cost. We assume our hypothetical enterprise paid for the original license upfront and makes annual Microsoft Software Assurance payments. We also assume they can either cancel the Software Assurance agreements for licenses that the Dell PowerEdge R720 solution does not need or can use the licenses elsewhere.

The Dell PowerEdge R720 solution requires only one Windows Server 2008 R2 Enterprise Edition license. One license supports an instance of the server software in one physical and four virtual operating system environments. The existing environment also needed one license per server. The Dell PowerEdge R720 uses only one of the four licenses on the existing model. The Dell PowerEdge R720 solution saves the costs of the Software Assurance payments on the unused three licenses from the existing solution.

Microsoft communications software per-license costs are the same for the two solutions. Microsoft Software Assurance includes upgrade options that will allow an upgrade from Office Communications Server 2007 Standard Edition to Microsoft Lync Server 2010 Standard Edition at no additional license cost. List prices and costs for Software Assurance coverage are the same for both packages.

Both Microsoft Communications Server and Microsoft Lync Server license on a per-instance basis. We assume the enterprise would migrate and upgrade the Microsoft Communications Server licenses from the existing servers to the Dell PowerEdge R720 servers. As a result, the four physical instances on the existing solution and the four virtual machine instances on the Dell PowerEdge R720 solution both have the same license count and same ongoing Software Assurance cost.

Hardware support

Dell provided a quote of $2,499 for 3-year support for the Dell PowerEdge R720 server. We base the HP support estimate on the support for the HP ProLiant DL380 G7 on the 3-year support cost listed on the HP Store for the HP ProLiant DL380 models. Figure 11 shows the hardware support costs for each solution.

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[5] http://www.microsoft.com/licensing/mla/default.aspx
[6] http://lync.microsoft.com/en-in/HowToBuy/pages/pricing-licensing.aspx

	3-year	1-year	Annual cost per solution	Percentage Dell savings
HP Support: HP Care Pack, 3 Years, 6-hour 24x7 CTR, Defective Media Retention Hardware Support, ProLiant DL380 G6	$1,769.00	$589.67	$2,358.68	65%
Dell Support: 3 Year ProSupport and Mission Critical 4HR 7x24 Onsite Pack	$2,499.00	$833.00	$833.00	

Figure 11: Hardware support for the two solutions.

Energy costs

Figure 12 shows the calculations for the annual energy cost estimates. We estimate typical watts using active and idle power measurements taken during our benchmark testing. The typical estimate assumes the servers run year round, running at the active power 20 percent of the time and at the idle power the rest of the time.

Annual costs - Energy costs	Dell PowerEdge R720	HP ProLiant DL380 G7
Cost per kWh	0.1039	0.1039
Typical watts	116.56	139.16
Annual kWh per server	1,021.07	1,219.04
Multiplier for cooling	1.80	2.00
Total kWh for power and cooling one server	1,837.93	2,438.08
Annual energy cost per server	**$190.96**	**$253.32**
Annual energy cost for solution	**$190.96**	**$1,013.28**

Figure 12: Energy cost calculations for the two solutions.

Rack and space costs

We assume each server has a single port out and that the data center charges an annual per-port cost of $250. We assume an annual data center per-rack space cost of $2,170, or $98.64 per rack unit, based on each rack holding 22u of servers. We assign $197.28 per year in space costs to each of these 2u servers.

ABOUT PRINCIPLED TECHNOLOGIES

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

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