Expand your email capacity and gain room to grow with IT payback in less than 19 months

$ Dell™ PowerEdge™ R720xd server ran four times the number of Microsoft® Exchange workloads*

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

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

Your Exchange servers are doing their job but your company is growing. Using virtualization to consolidate these servers onto a single more powerful server, such as the new Dell PowerEdge R720xd powered by the Intel Xeon processor E5-2600 series, can benefit your business in a number of ways. With a 26-disk capacity, the Dell PowerEdge R720xd server allows increased expansion flexibility over previous-generation servers. You can support your current load with less hardware and support even more users in the future.

To test this, we measured performance and response time using a mid-range example Exchange workload on two solutions: an HP ProLiant DL380 G7 and a Dell PowerEdge R720xd running the same workload in each of four virtual machines (VMs). The virtualized solution supported four workloads while delivering a much shorter response time than the HP ProLiant DL380 G7 server's single workload.

The potential savings in hardware, maintenance, power, and cooling costs make the Dell PowerEdge R720xd a wise investment. In a scenario where this server replaces four HP ProLiant DL380 G7 servers, it can lower total cost of ownership (TCO) over three years by as much as $19,299 and pay back the investment in hardware and the migration effort in as little as 19 months.

MEET YOUR GROWING EMAIL NEEDS WITH FEWER SERVERS

Because running an Exchange server is a large, disk-intensive job, the more disks a server has, the more Exchange performance it can deliver. The Dell PowerEdge R720xd can support 26 disks, while the HP ProLiant DL380 G7 we used for testing can support only eight. (Note: The HP ProLiant DL380 G7[1] offers an optional second drive cage with an additional eight drives, for a total of 16 disks. We used the eight-drive configuration as shipped. The premise of this report is that an end user has existing HP servers in the eight-drive configuration and is looking to upgrade.) In our testing, we used 16 disks in the Dell server and maxed out the HP server with eight.

As Figure 1 illustrates, the Dell PowerEdge R720xd ran four virtual machines, each running a Microsoft Exchange 2010 workload of 1,000 users. The HP ProLiant DL380 G7 ran a single non-virtualized instance of Microsoft Exchange 2007 workload of 1,000 users. Thus, the Dell PowerEdge R720xd supported four times the total number of users in our scenario.
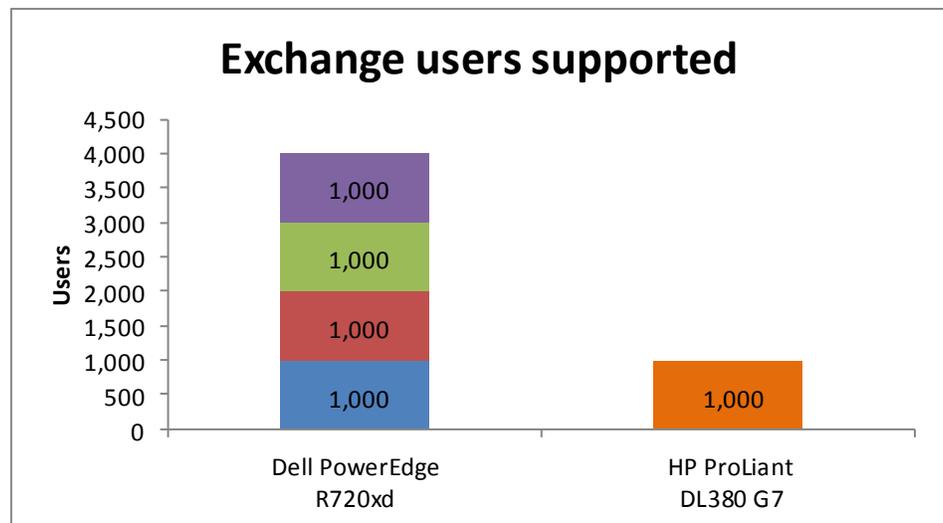

Figure 1: The Dell PowerEdge R720xd server ran four times the number of 1,000-user Exchange workloads as the HP ProLiant DL380 G7. More workloads are better.

It is important to consider not only how many users each solution can support, but also how well the solution supports each user. To gauge each solution's responsiveness, we used MSExchangeIS\RPC Average Latency counter to measure the average response time in milliseconds (ms) for all operations. Lower response times mean the server handles tasks more quickly and thus provides better performance.

---

[1] http://h18004.www1.hp.com/products/quickspecs/13595_na/13595_na.html

As Figure 2 shows, the response times for each of the VMs on the Dell PowerEdge R720xd were consistently lower than on the non-virtualized HP ProLiant DL380 G7. (It is worth noting that Microsoft recommends that for best performance the MSExchangeIS\RPC Average Latency counter stay below 10 milliseconds on Exchange 2010 and below 20 milliseconds on Exchange 2007.)

	Dell PowerEdge R720xd server				HP ProLiant DL380 G7 server
	VM 1	VM 2	VM 3	VM 4	
Response time (ms)	6.810	8.562	8.496	9.975	17.422

Figure 2: Response times, in milliseconds, for the two servers. Lower times are better.

ABOUT OUR TESTING

We used Microsoft Exchange Load Generator (LoadGen) 2010, a heavily disk-dependent workload which performs tasks to simulate a standard user generating mail activity, to test the Dell PowerEdge R720xd and the HP ProLiant DL380 G7 servers. For testing, we chose a 1,000-user workload as a mid-range example for comparison purposes. We used an Exchange 2007 cached average workload. We used a 100MB-per-user mailbox size and kept the default 8-hour day simulation. The test ran for 4 hours and we averaged the MSExchangeIS\RPC Average Latency for the entire run.

To learn more about LoadGen, visit http://www.microsoft.com/downloads/details.aspx?FamilyId=DDEC1642-F6E3-4D66-A82F-8D3062C6FA98&displaylang=en.

Our premise for testing is that a customer has an existing older Exchange sever and plans to replace it with a new Dell server running a virtualized solution. We look at the 1,000-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.

In the real world, your individual VMs and individual servers will host one or several of the many different Exchange roles. Because we are using LoadGen to emulate all Exchange work, we configured the HP ProLiant DL380 G7 and each VM on Dell PowerEdge R720xd as a standalone Exchange server. 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.

The configuration details of our test servers are in Appendix A, the details of our test procedure are in Appendix B and Appendix C, and the details of our TCO analysis are in Appendix D.

Microsoft Exchange consolidation and TCO: Dell PowerEdge R720xd vs.
HP ProLiant DL380 G7
A Principled Technologies test report 3

ABOUT THE DELL POWEREDGE R720XD

According to Dell, the Dell PowerEdge R720xd rack server is designed for workloads that are hungry for storage and I/O performance, such as Exchange servers. It combines highly expandable memory and improved I/O capabilities with large storage capacity. Powered by Intel® Xeon® E5-2600 processors and reinforced with reliability, availability, and serviceability (RAS) features like hot-plug fans, disks, and power supply units (PSUs), the Dell PowerEdge R720xd delivers strong performance and reliability.

ACHIEVE PAYBACK IN 19 MONTHS BY CONSOLIDATING THE EXCHANGE WORKLOAD OF FOUR HP PROLIANT DL380 G7 SERVERS

Tests in our labs using the LoadGen benchmark show that one Dell PowerEdge R720xd running Microsoft Exchange Server 2010 can run the same 1,000 user-workload of four existing HP ProLiant DL380 G7 servers running Microsoft Exchange Server 2007 and still maintain room for growth.

To illustrate the cost savings this 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. We found that, thanks to savings in software and hardware support, server administration, and data center costs for energy, ports, and space, the Dell PowerEdge R720xd can pay back the investment in hardware and the migration effort in less than 19 months. Figure 3 summarizes the costs for the two solutions.
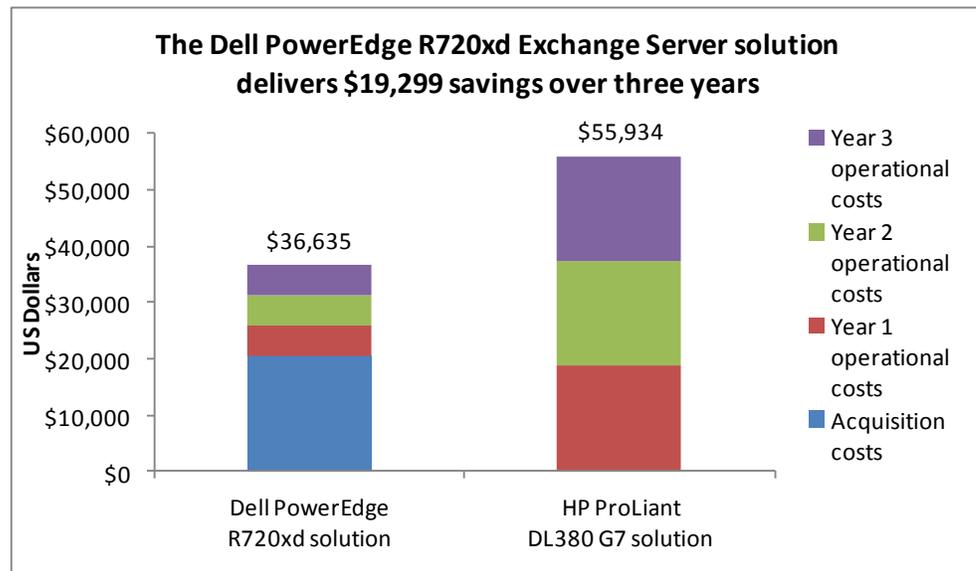

Figure 3: Breakdown of acquisition and operational costs for the two solutions over three years.

Microsoft Exchange consolidation and TCO: Dell PowerEdge R720xd vs. HP ProLiant DL380 G7

A Principled Technologies test report 4

Figure 4 shows that the Dell PowerEdge R720xd solution can deliver payback in as little as 19 months.

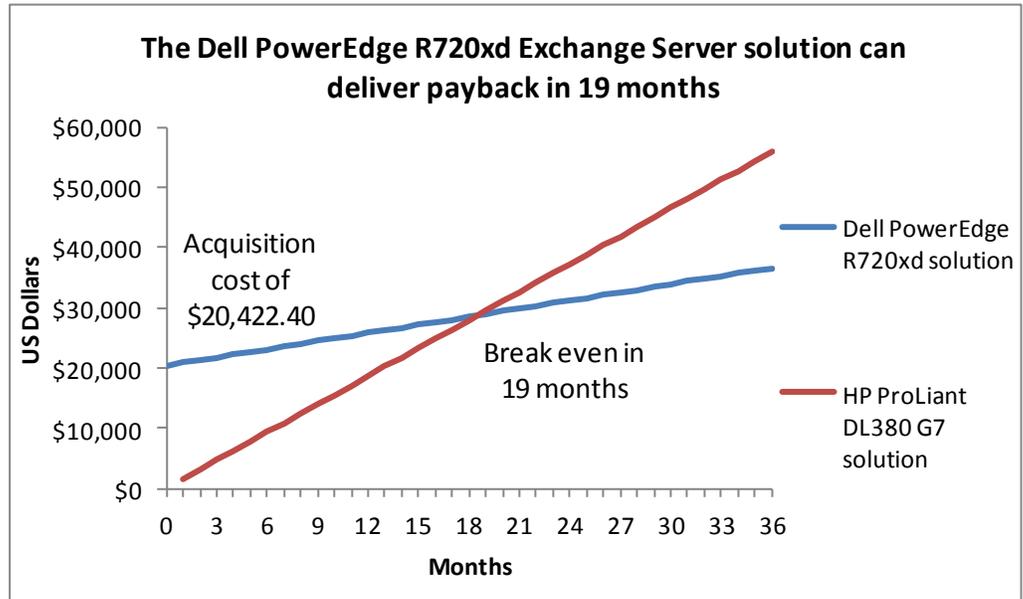**The Dell PowerEdge R720xd Exchange Server solution can deliver payback in 19 months**

Figure 4: Payback period for replacing four HP ProLiant DL380 G7 servers with a Dell PowerEdge R720xd server.

The Dell PowerEdge R720xd solution can save up to 71 percent of the annual operating costs of the HP ProLiant DL380 G7 solution

The Dell PowerEdge R720xd solution saves up to 71 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 5 summarizes the acquisition costs and annual operational costs of the two solutions and shows the operational cost savings for the Dell PowerEdge R720xd solution. For additional assumptions, see Appendix D.

	Dell PowerEdge R720xd solution	HP ProLiant DL380 G7 solution	Annual cost savings for Dell PowerEdge R720xd solution	Percentage savings
Acquisition costs				
Hardware cost	$14,522			
Migration cost	$5,900			
Total acquisition costs	$20,422			

Microsoft Exchange consolidation and TCO: Dell PowerEdge R720xd vs.
HP ProLiant DL380 G7

A Principled Technologies test report 5

	Dell PowerEdge R720xd solution	HP ProLiant DL380 G7 solution	Annual cost savings for Dell PowerEdge R720xd solution	Percentage savings
Annual operational costs				
OS software support Windows Server 2008 R2 Enterprise Edition (per server)	$590	$2,358	$1,769	75%
Exchange software support (Windows Exchange Standard Edition - 2007 for existing servers, 2010 for Dell PowerEdge R720xd server)	$708	$708	$0	0%
Hardware support	$966	$2,359	$1,392	59%
Administration costs	$2,324	$10,226	$7,902	77%
Energy costs	$369	$1,205	$836	69%
Port costs	$250	$1,000	$750	75%
Data center space costs	$197	$789	$592	75%
Total annual operational costs	$5,404	$18,645	$13,241	71%
Total 3-year operational costs	$16,213	$55,934	$39,722	71%
Total costs	**$36,635**	$55,934	$19,299	35%

Figure 5: Annual cost savings for the Dell PowerEdge R720xd solution.

The Dell PowerEdge R720xd solution requires one-fourth the number of Windows Server licenses

The Dell PowerEdge R720xd 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 R720xd 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 R720xd solutions.

Note that the Dell solution does not save on Microsoft Exchange licenses. Because Microsoft Exchange is licensed on a per-instance basis, the four physical server instances in the existing solution and the four virtual machine instances in the Dell PowerEdge R720xd solution have the same license count and cost.

The Dell PowerEdge R720xd solution can save up to 59 percent annually in hardware support costs

Hardware support costs for the Dell PowerEdge R720xd 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

Microsoft Exchange consolidation and TCO: Dell PowerEdge R720xd vs. HP ProLiant DL380 G7

A Principled Technologies test report 6

On-line store. For the Dell PowerEdge R720xd, 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 R720xd server are 59 percent lower than for the four existing servers.

The Dell PowerEdge R720xd solution can save as much as 77 percent annually in server administration costs

Even in a one-to-one server comparison, the manageability improvements of the Dell PowerEdge R720xd, including agentless management, would yield savings in administration costs. We estimate that a single administrator could manage 44 Dell PowerEdge R720xd servers compared to 40 existing servers, saving 9 percent for a single PowerEdge R720xd server compared to an existing server. Savings reach 77 percent when comparing management of one Dell PowerEdge R720xd to that of four existing servers.

The Dell PowerEdge R720xd solution can save 69 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 PowerEdge R720xd servers would save on power for cooling; we multiply the power cost for the Dell PowerEdge R720xd by 1.8 to get the cost for power and cooling. We estimate a per-kWh cost of 10.39 cents based on the US average commercial price for September 2011 as reported by the U.S. Energy Information Administration.[2]

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.[3]

---

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

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

Microsoft Exchange consolidation and TCO: Dell PowerEdge R720xd vs. HP ProLiant DL380 G7

A Principled Technologies test report 7

The Dell PowerEdge R720xd solution save up to 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 R720xd, eight rack units vs. two rack units and require four times as many ports.

CONCLUSION

Regardless of the age of the Exchange servers in your data center, upgrading to the newer, more powerful Intel Xeon processor E5-2600 series-powered Dell PowerEdge R720xd server can boost the performance of your IT infrastructure and lower your total cost of ownership.

With a 26-disk capacity, the Dell PowerEdge R720xd server provides increased flexibility for your current needs and future expansion. As our tests results indicate, it supported four of our 1,000-user workloads, while delivering a faster response time to those users than the existing server, thus allowing you to replace four existing servers with better 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. By lowering costs in a number of areas—Windows Server licensing, server administration, energy usage, and data center ports and space—the Dell PowerEdge R720 server pays back its initial investment in as little as 19 months.

APPENDIX A – SERVER CONFIGURATION INFORMATION

Figure 6 provides detailed configuration information for the test servers.

System	Dell PowerEdge R720xd	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 Power	Balanced Power
CPU		
Vendor	Intel	Intel
Name	Xeon	Xeon
Model number	E5-2660	X5570
Stepping	6	D0
Socket type	2011LGA	LGA 1366
Core frequency (GHz)	2.20	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	256KB (per core)	256 KB (per core)
L3 cache (MB)	20	8 MB (shared)
Platform		
Vendor and model number	Dell PowerEdge R720xd	HP ProLiant DL380 G7
Motherboard model number	OM1GCR	599038-001
BIOS name and version	Dell 0.3.37	Intel 5520
BIOS settings	Default	HP P67 (05/5/11)
Memory module(s)		
Total RAM in system (GB)	64	12
Vendor and model number	Hynix HMT31GR7BFR4A-H9	Micron 18JSF25672PDZ1G4F1
Type	PC3L-10600R	PC3-10600
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

Microsoft Exchange consolidation and TCO: Dell PowerEdge R720xd vs.
HP ProLiant DL380 G7

A Principled Technologies test report **9**

System	Dell PowerEdge R720xd	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
Build number	7601	7600
File system	NTFS	Service Pack 1
Kernel	ACPI x64-based PC	NTFS
Language	English	ACPI x64-based PC
Graphics		
Vendor and model number	Matrox® G200eR	ATI ES1000
Graphics memory (MB)	16	64
Driver	Matrox Graphics, Inc 2.3.3.0 (8/19/11)	Microsoft 6.1.7600.16385 (06/21/06)
RAID controller		
Vendor and model number	PERC H710P Mini	HP Smart Array P410i
Firmware version	3.130.05-1311	8.40.30.02
Driver version	Dell 5.1.90.64 (3/2/11)	HP 6.20.2.64 (8/10/10)
Cache size	1 GB	512 MB
RAID configuration	2 disks RAID 1 for OS, 14 disks RAID 5 for Exchange database and logs	2 disks RAID 1 for OS, 6 disks RAID 5 for Exchange database and logs
Hard drive		
Vendor and model number	Dell WD3000BKHG-18A29V0	HP EH0146FAWJB
Number of disks in system	16	8
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 DP Multifunction Gigabit Server Adapter
Type	PCI-E	PCI Express
Driver	Intel 11.14.48.0 (11/28/11)	HP 6.2.9.0 (2/4/11)
Optical drive(s)		
Vendor and model number	TEAC DV-28SW	N/A
Type	DVD-ROM	N/A
USB ports		
Number	4 external, 1 internal	2
Type	2.0	2.0

Figure 6: Configuration details for the two test servers.

Microsoft Exchange consolidation and TCO: Dell PowerEdge R720xd vs.
HP ProLiant DL380 G7

A Principled Technologies test report **10**

APPENDIX B – TEST PROCEDURE FOR THE DELL POWEREDGE R720XD

Figure 7 illustrates our Dell test bed setup. For comparison purposes, we configured each VM as a standalone Exchange server environment with all roles included on each. This approach allowed us a modular method to determine an exact increase in identical virtual machines. Results in your specific environment will vary. We used a separate server for Active Directory on each VM configuration. In Figure 7, VM1 connects to AD1 and uses client 1, VM2 connects to AD2 and uses client 2, and so forth.
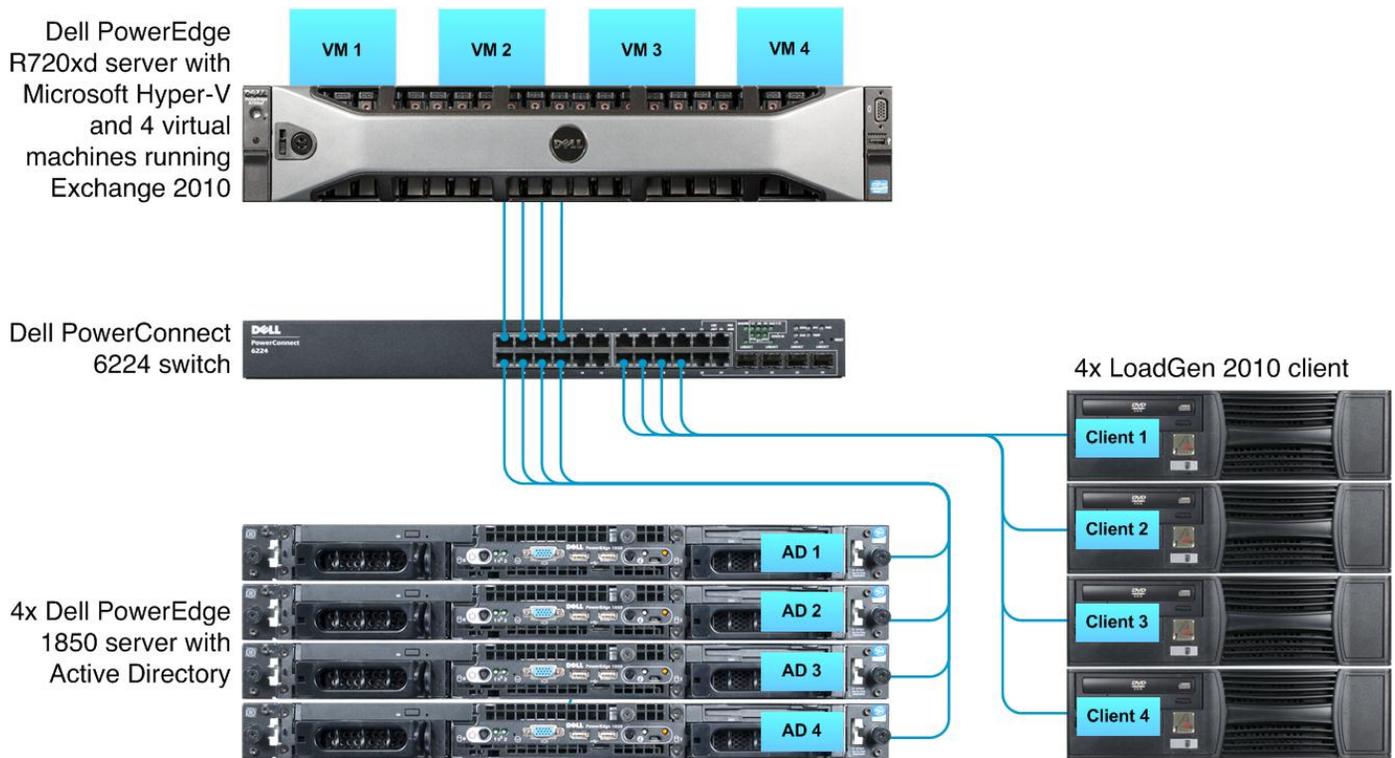
Figure 7: The Dell test bed we used.

Installing Windows Server 2008 R2 SP1 Enterprise Edition on DellAD1 (PowerEdge 1850)

1. Boot the server, and insert the Windows Server 2008 R2 SP1 installation DVD in the DVD-ROM drive.
2. At the Language Selection screen, click Next.
3. Click Install Now.
4. Select Windows Server 2008 R2 Enterprise (Full Installation), and click Next.
5. Click the I accept the license terms checkbox, and click Next.
6. Click Custom.
7. At the Where to Install Windows screen, click Drive options (advanced).
8. Ensure that you select the proper drive, and click New.
9. Enter the partition size, and click Apply. (We used the entire disk.)
10. At the pop-up informing you Windows will create additional partitions, click OK.
11. At the Where to Install Windows screen, click Next.
12. At the User's password must be changed before logging on warning screen, click OK.
13. Enter a password as the new password in both fields, and click the arrow to continue.
14. At the Your password has been changed screen, click OK.

Microsoft Exchange consolidation and TCO: Dell PowerEdge R720xd vs.
HP ProLiant DL380 G7

A Principled Technologies test report **11**

15. Open the control panel.
16. Double-click User Accounts.
17. Click Turn User Account Control on or off.
18. Beside Use User Account Control (UAC), uncheck the checkbox.
19. Open Server Manager, in the right pane, select Go to Windows Firewall.
20. At the Windows Firewall with Advanced Security, select Windows Firewall Properties.
21. At the Domain Profile screen, select the firewall state to off., do this for Private Profile, Public Profile and click OK.
22. Reboot the system.
23. Click Start→Administrative Tools→Server Manager.
24. In the right pane, click Change System Properties.
25. Under the Computer Name tab, click Change…
26. Change the Computer name to DellAD1
27. Reboot the system.

Assigning static IPs to the NIC

1. Click Start→Network.
2. Click Network and Sharing Center.
3. Click Manage Network Connections.
4. Right-click Local Area Connection.
5. Click Properties.
6. Click Internet Protocol Version 4 (TCP/IPv4), and click Properties.
7. Select Use the following IP Address, and input the following numbers:
   - IP Address: 192.168.10.100
   - Subnet mask: 255.255.255.0
8. Click OK to close the window.
9. At the Local Area Connection Properties window, click Close.
10. Close the Network Connection window.

Setting up the domain

1. Click Start, type cmd in the prompt, and press Enter.
2. Type dcpromo and press Enter.
3. Click Next.
4. Click Next.
5. Click Next.
6. Select Create a new domain in a new forest, and click Next.
7. Type Dell.Cressida as the FQDN (Fully Qualified Domain Name), and click Next.
8. Set the forest functional level to Windows Server 2008, and click Next.
9. Set the domain functional level to Windows Server 2008, and click Next.
10. Leave defaults on the Additional Domain Controller Options screen, and click Next.
11. If a warning window appears asking about dynamically assigned IP addresses, click Yes.
12. Click Yes to continue.
13. Leave defaults at the Location for Database, Log Files, and SYSVOL screen; and click Next.
14. At the Directory Services Restore Mode Administrator Password screen, type Password1 and click Next.
15. At the Summary screen, click Next.
16. Click Finish.
17. Click Restart now.

Configuring DellAD2 (PowerEdge 1850)

1. Install Windows Server 2008 R2 SP1 using steps 1-27.
2. When prompted for the Computer Name enter `DellAD2`
3. Set the NIC IP to the following:
   - IP Address: `192.168.20.100`
   - Subnet mask: `255.255.255.0`
4. Use the steps in the Setting up the domain section above to configure the domain.
5. When prompted, set the FQDN as Dell2.Cressida

Configuring DellAD3 (PowerEdge 1850)

1. Install Windows Server 2008 R2 SP1 using steps 1-27.
2. When prompted for the Computer Name enter `DellAD3`
3. Set the NIC IP to the following:
   - IP Address: `192.168.30.100`
   - Subnet mask: `255.255.255.0`
4. Use the steps in the Setting up the domain section above to configure the domain.
5. When prompted, set the FQDN as Dell3.Cressida

Configuring DellAD4 (PowerEdge 1850)

1. Install Windows Server 2008 R2 SP1 using steps 1-27.
2. When prompted for the Computer Name enter `DellAD4`
3. Set the NIC IP to the following:
   - IP Address: `192.168.40.100`
   - Subnet mask: `255.255.255.0`
4. Use the steps in the Setting up the domain section above to configure the domain.
5. When prompted, set the FQDN as Dell4.Cressida

Configuring the Dell PowerEdge R720xd

We used the BIOS RAID configuration utility to create one two-disk RAID 1 and one RAID 5 consisting of 14 disks, one for the operating system and the others for the LoadGen databases. Following the operating system installation, we installed all recommended Windows Updates through 1/9/2012.

Configuring R720xd network adapters

1. Start→Network→Network and Sharing Center→Change Adapter settings
2. Rename Local Area Connections 1-4 Exchange1, Exchange2 , Exchange 3, Exchange 4.

Adding the Hyper-V R2 SP1 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 Virtual Network Manager

1. At the Hyper-V Manager Screen, in the right pane, click Virtual Network Manager.
2. At the Virtual Network Manager screen, select Internal, and click Add 4 times.
3. At the Virtual Network Manager Screen, select New Virtual Network, and rename it to exchange1.
4. At the Virtual Network Manager Screen, select New Virtual Network, and rename it to exchange2.
5. At the Virtual Network Manager Screen, select New Virtual Network, and rename it to exchange3.
6. At the Virtual Network Manager Screen, select New Virtual Network, and rename it to exchange4.
7. At the Virtual Network Manager Screen, click Apply, and then click OK.

Creating the database VHD

1. Open Hyper-V.
2. Right-click the server, and select new Hard Disk.
3. At the Choose Disk type screen, select Fixed size, and click Next.
4. At the specify name and location screen, enter `DB1.vhd` for the name and `D:` for the location.
5. At the Configure Disk screen, set the VHD size to 900GB, and click Finish.
6. Repeat this until you have four 900GB VHDs.

Configuring the first Hyper-V VM

In our testing, we created four VMs running Windows Server 2008 R2 SP1. We created one VM, cloned it on each platform, and modified the computer name and network settings. We chose to have the VM location on the root of C: with the Exchange Database on the 900 GB VHD created from our 14-disk RAID 5.

1. On the Hyper-V host, click Action→New→Virtual Machine.
2. On the Before You Begin window, click Next.
3. Enter the name of the VM dexchange1, 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. Choose to attach a virtual hard drive later.
7. Click Finish.
8. Right-click the VM, and choose Settings.
9. Add the VM OS VHD (40GB) to the IDE controller.
10. Add the 900 GB VHD called DB1 to the SCSI controller.
11. Click Processors, and adjust the number of virtual processors to 4.
12. Start the VM, and install Windows Server 2008 R2 SP1.

Configuring networking for VM1

1. Right-click Local Area Connection.
2. Click Properties.
3. Click Internet Protocol Version 4 (TCP/IPv4), and click Properties.
4. Select Use the following IP Address,:
   - IP address: `192.168.10.100`
   - Subnet mask: `255.255.255.0`
   - Default Gateway: `192.168.10.110`
5. Click OK, and close local area network settings.

Configuring Computer Name

1. Click Start→Administrative Tools→Server Manager.
2. In the right pane, click Change System Properties.
3. Under the Computer Name tab, click Change…

Microsoft Exchange consolidation and TCO: Dell PowerEdge R720xd vs.
HP ProLiant DL380 G7

A Principled Technologies test report 14

4. Change the Computer name to `dexchange1`
5. Reboot the system.

Cloning the VM

1. In Hyper-V, ensure VM1 is powered down.
2. Navigate to C:\VM\1 where the VHD is stored.
3. In C:\VM\ create three new folders: VM2, VM3, and VM4.
4. Copy Exchange_1.vhd and paste it into folders VM2, VM3, and VM4.
5. In Hyper-V, right-click the server, select New virtual machine, enter `Exchange_2` for the name, and click Next.
6. On the Assign Memory screen, select 12288, and click Next.
7. On the Configure Networking screen, select Exchange2, and click Next.
8. At the connect Virtual Hard Disk screen, select Use an Existing, and browse to C:\VM\VM2\Exchange_1.vhd.
9. Repeat these steps for VM3 and VM4.

Configuring the VM storage on VM1

1. At the Hyper-V console, power on VM1.
2. Click the Server Manager icon in the taskbar.
3. In the left pane, expand Storage, and click Disk Management.
4. Right-click the first volume, and choose Initialize Disk.
5. In the right pane, right-click the volume, and choose New Simple Volume…
6. At the Welcome screen, click Next.
7. At the Specify Volume Size screen, leave the default selection, and click Next.
8. At the Assign Drive Letter or Path screen, choose a drive letter, and click Next.
9. At the Format Partition screen, choose NTFS and 64K allocation unit size, and click Next.
10. At the Completing the New Simple Volume Wizard screen, click Finish.

Joining VM1 to the domain

1. Start→right-click My computer→ Properties→Change.
2. At the Computer Name/Domain Changes select Domain and enter in Dell1.Cressida.com
3. Click OK.
4. Click OK to close system properties. When prompted, click Yes to reboot.

Configuring VM2

1. Click Start→Administrative Tools→Server Manager.
2. In the right pane, click Change System Properties.
3. Under the Computer Name tab, click Change…
4. Change the Computer name to `dexchange2`
5. Reboot the system.

Assigning static IP to VM2

1. Click Start→Network.
2. Click Network and Sharing Center.
3. Click Manage Network Connections.
4. Right-click Local Area Connection.
5. Click Properties.
6. Click Internet Protocol Version 4 (TCP/IPv4), and click Properties.
7. Select Use the following IP Address, and input the following numbers:
   - IP address: `192.168.20.100`
   - Subnet mask: `255.255.255.0`
   - Default Gateway: `192.168.20.110`

Microsoft Exchange consolidation and TCO: Dell PowerEdge R720xd vs.
HP ProLiant DL380 G7

A Principled Technologies test report **15**

8. Click OK to close the window.
9. At the Local Area Connection Properties window, click Close.
10. Close the Network Connection window.

Joining VM2 to the domain

1. Click Start→right-click my computer→ Properties→Change.
2. At the Computer Name/Domain Changes screen, select Domain, and enter `Dell2.Cressida.com`
3. Click OK.
4. Click OK to close system properties. When prompted, click Yes to reboot.

Configuring VM3

1. Click Start→Administrative Tools→Server Manager.
2. In the right pane, click Change System Properties.
3. Under the Computer Name tab, click Change…
4. Change the Computer name to `dexchange3`
5. Reboot the system.

Assigning static IP to VM3

1. Click Start→Network.
2. Click Network and Sharing Center.
3. Click Manage Network Connections.
4. Right-click Local Area Connection.
5. Click Properties.
6. Click Internet Protocol Version 4 (TCP/IPv4), and click Properties.
   Select Use the following IP Address, and input the following numbers:
   - IP address: `192.168.30.100`
   - Subnet mask: `255.255.255.0`
   - Default Gateway: `192.168.30.110`
7. Click OK to close the window.
8. At the Local Area Connection Properties window, click Close.
9. Close the Network Connection window.

Joining VM2 to the domain

1. Click Start → right-click my computer→ Properties→Change.
2. At the Computer Name/Domain Changes select Domain and enter `Dell3.Cressida.com`
3. Click OK.
4. Click OK to close system properties. When prompted, click Yes to reboot.

Configuring VM4

1. Click Start→Administrative Tools→Server Manager.
2. In the right pane, click Change System Properties.
3. Under the Computer Name tab, click Change…
4. Change the Computer name to `dexchange4`
5. Reboot the system.

Assigning static IP to VM4

1. Click Start→Network.
2. Click Network and Sharing Center.
3. Click Manage Network Connections.
4. Right-click Local Area Connection.

Microsoft Exchange consolidation and TCO: Dell PowerEdge R720xd vs.
HP ProLiant DL380 G7

A Principled Technologies test report **16**

5. Click Properties.
6. Click Internet Protocol Version 4 (TCP/IPv4), and click Properties.
7. Select Use the following IP Address, and input the following numbers:
   - IP address: `192.168.40.100`
   - Subnet mask: `255.255.255.0`
   - Default Gateway: `192.168.40.110`
8. Click OK to close the window.
9. At the Local Area Connection Properties window, click Close.
10. Close the Network Connection window.

Joining VM4 to the domain

1. Click Start→ right-click my computer→ Properties→Change.
2. At the Computer Name/Domain Changes select Domain and enter `Dell4.Cressida.com`
3. Click OK.
4. Click OK to close system properties. When prompted, click Yes to reboot.

Installing Exchange 2010 SP2 prerequisites on VM1

After completing the following steps for VM1, repeat them for VM2, VM3, and VM4.

1. Select Start→Administrative Tools→Server Manager.
2. Click Add Roles.
3. At the Before You Begin screen, click Next.
4. At the Select Server Roles screen, click Web Server (IIS).
5. If prompted by an Add features required for Web Server (IIS) pop-up window, click Add Required Features.
11. Click Next.
12. At the Web Server (IIS) screen, click Next.
13. At the Select Role Services screen, select the IIS 6 Metabase Compatibility, IIS WMI Compatibility, HTTP Errors, HTTP Redirection, IIS 6 Management Console, Basic Authentication, Windows Authentication, Tracing, Digest Authentication, and Dynamic and Static content Compression checkboxes, and click Next.
14. At the Confirm Installation Selections screen, click Install.
15. At the Installation Results screen, click Close.
16. Select Start→Administrative Tools→Server Manager.
17. Click Features.
18. Click Add Features.
19. Select .NET Framework 3.5.1 Features.
20. When the Add Features Wizard pop-up window prompts you, click Add Required Role Services.
21. Click Next.
22. At the Introduction to Web Server (IIS) screen, click Next.
23. At the Select Role Services screen, click Next.
24. Click Install.
25. At the Installation Results screen, click Close.
26. Download the Microsoft Filter Pack 2.0. (http://www.microsoft.com/downloads/en/details.aspx?FamilyID=5cd4dcd7-d3e6-4970-875e-aba93459fbee)
27. Run FilterPackx64.EXE.
28. Click Next.
29. Click I accept the terms in the License Agreement, and click Next.
30. Click OK once installation is complete.
31. Click Start→Administrative Tools→Services.
32. Right-click the Net.Tcp Port Sharing service, and click Properties.

Microsoft Exchange consolidation and TCO: Dell PowerEdge R720xd vs.
HP ProLiant DL380 G7

A Principled Technologies test report 17

33. Change the Net.Tcp Port Sharing startup type to Automatic, and click OK.
34. Open command prompt, type `ServerManagerCmd –i RSAT-ADDS`, and press Enter.
35. Reboot the server.

Installing Exchange2010 SP2 on VM1

After completing the following steps for VM1, repeat them for VM2, VM3, and VM4.

1. Insert the Exchange Server 2010 installation DVD, and capture the DVD drive in the VM session. When the Autoplay window appears, click Run Setup.EXE.
2. The installer should consider steps 1 and 2 to be complete (they appear grayed out). Click the link to Step 3: Choose Exchange Language Option.
3. Click Install only languages from the DVD.
4. Click the link to Step 4: Install Microsoft Exchange Server.
5. To go past the introduction screen, click Next.
6. Accept the license agreement, and click Next.
7. Select No for error reporting, and click Next.
8. Select Typical Exchange Server Installation, and click Next.
9. Leave the organization name at default (First Organization), and click Next.
10. At the question about client computers running Outlook 2003 or Entourage, select No, and click Next.
11. To accept defaults for Configure Client Access server external domain, click Next.
12. At the Customer Experience Improvement Program screen, select I don't wish to join the program at this time, and click Next.
13. Click Install to start the installation process.
14. Once the installation has completed, click Finish. Exchange should automatically open the Exchange Management Console.

Configuring LoadGen 2010 Clients

All the clients used have Windows Server 2008 R2 SP1 installed on it. We installed the latest updates on as of 1/17/2012.

Configuring Client 1

1. Change the Computer name to Client 1
2. Set NIC to the following:
   - IP address: `192.168.10.120`
   - Subnet mask: `255.255.255.0`
   - Default Gateway: `192.168.10.110`
3. Join the domain Dell.Cressida.com.
4. Reboot when necessary.

Installing .Net 3.5.1

A pre-req for LoadGen is that you have .NET 3.5.1 Installed on the client. Repeat these steps for each client after joining the domain.

1. On Client1, click Server Manager.
2. On Server Manager, expand Features.
3. At Features, click Add.
4. At the Features screen, check .Net Framework 3.5.1.
5. At the Add Features Wizard, click Add Required Role Services.
6. At the Select Features screen, click Next.
7. At the Web Server (ISS), screen click Next.

Microsoft Exchange consolidation and TCO: Dell PowerEdge R720xd vs.
HP ProLiant DL380 G7

A Principled Technologies test report 18

8. At the Select Role Services screen, click Next.
9. At the Confirm Installation Selections screen, click Install.

Installing LoadGen 2010

Repeat this for each client after joining the domain.

1. Double click loadgen2010.exe.
2. At the Welcome screen, click Next.
3. At the EULA screen, accept, and click Next.
4. At the Select Installation Folder screen, click Next.
5. At the Confirm Installation screen, click Next
6. At the Installation Complete screen, click Close.
7. At the Restart Your System prompt, click Yes.

Configuring Client 2

1. Change the Computer name to Client 2.
2. Set a NIC to the following:
   - IP address: `192.168.20.120`
   - Subnet mask: `255.255.255.0`
   - Default Gateway: `192.168.20.110`
3. Join the domain Dell2.Cressida.com.

Configuring Client 3

1. Change the Computer name to Client 3.
2. Set a NIC to the following:
   - IP address: `192.168.30.120`
   - Subnet mask: `255.255.255.0`
   - Default Gateway: `192.168.30.110`
3. Join the domain Dell3.Cressida.com.

Configuring Client 4

1. Change the Computer name to Client 4.
2. Set a NIC to the following:
   - IP address: `192.168.40.120`
   - Subnet mask: `255.255.255.0`
   - Default Gateway: `192.168.40.110`
3. Join the domain Dell4.Cressida.com.

Preparing Load Generator on the Clients

1. Select Start→All Programs→Microsoft Exchange→Exchange Load Generator.
2. When the Load Generator window appears, select Start a new test.
3. Select Create a new test configuration, and click Continue.
4. In the Specify test settings window, type Password1 as the Directory Access Password and Mailbox Account Master Password, and click Continue with recipient management.
5. Make 1000 users in the Mailbox Database, and click Continue.
6. To accept defaults for Advanced recipient settings, click Continue.
7. In the Specify test user groups window, select the plus sign (+) to add a user group.
8. Change the Client Type to Outlook 2007 Cached and the Action Profile to Average, 100MB and click Continue.
9. Leave defaults in Remote configurations, and click Continue.
10. Click Save the configuration file as, and name it 100x1000.cfg

11. Click Start the initialization phase (recommended before running the test) to start initialization. The initialization process might take a few hours.

Backing up the mail database on Client 1

On the test server, once you have set up LoadGen and created its initial mail database, you need to back up that database so you can have clean copies for each test. Use this process to back up that database:

1. Select Start→All Programs→Microsoft Exchange Server 2010→Exchange Management Console in the mail server.
2. In the left pane, under Server Configuration, click Mailbox.
3. In the right pane, right-click Mailbox Database, and select Dismount Database from the menu.
4. At the Do you want to continue? pop-up message, click Yes.
5. Right-click Public Folder Database, and select Dismount Database from the menu.
6. At the Do you want to continue? pop-up message, click Yes. The red arrow appears when you have dismounted the Public Folder Store.
7. Using Windows Explorer, create two new folders: C:\backup\mailstore and C:\backup\publicstore.
8. With Windows Explorer, copy all files from D:\DB\Mailbox\First Storage Group to D:\backup. This process may take several minutes.
9. Close Windows Explorer.
10. In Exchange Management Console, right-click Mailbox Database, and select Mount Database from the menu.
11. Right-click the Public Folder Database, and select Mount Database from the menu.
12. Close Exchange System Manager.

APPENDIX C – TEST PROCEDURE FOR THE HP PROLIANT DL380 G7
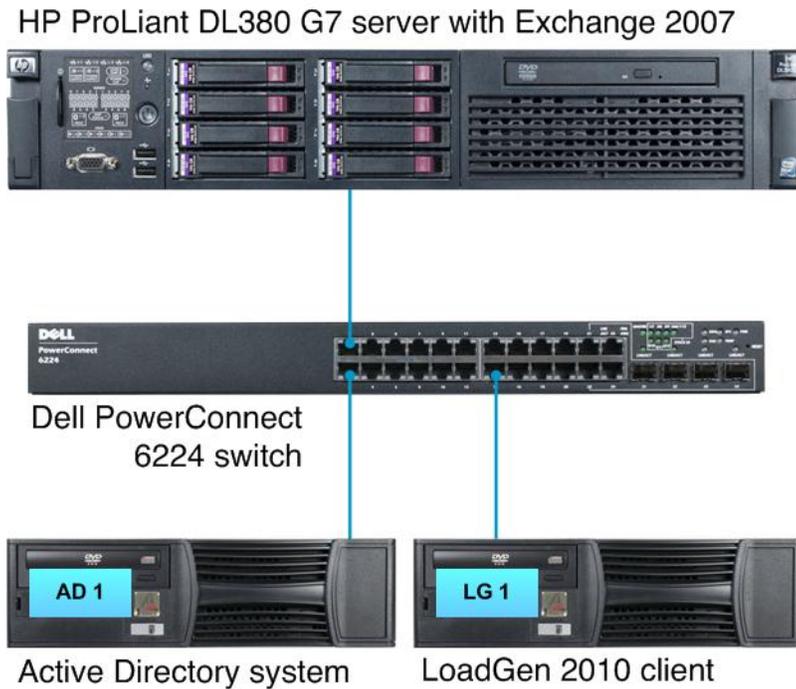
Figure 8 illustrates our HP test bed setup.

Figure 8. The HP test bed we used.

Configuring HPAD1 (PowerEdge 1850)

We installed Windows Server 2008 R2 SP1 and applied all critical updates as of 1/9/2012.

Setting the computer name

1. Click Start→Administrative Tools→Server Manager.
2. In the right pane, click Change System Properties.
3. Under the Computer Name tab, click Change…
4. Change the Computer name to `DL380`
5. Reboot the system.

Assigning static IP to the NIC

1. Click Start→Network.
2. Click Network and Sharing Center.
3. Click Manage Network Connections.
4. Right-click Local Area Connection.
5. Click Properties.
6. Click Internet Protocol Version 4 (TCP/IPv4), and click Properties.
7. Select Use the following IP Address, and input the following numbers:
   - IP address: `192.168.5.100`
   - Subnet mask: `255.255.255.0`
8. Click OK to close the window.
9. At the Local Area Connection Properties window, click Close.
10. Close the Network Connection window.

Microsoft Exchange consolidation and TCO: Dell PowerEdge R720xd vs.
HP ProLiant DL380 G7

A Principled Technologies test report **21**

Setting up the domain

1. Click Start, type `cmd` in the prompt, and press Enter.
2. Type `dcpromo` and press Enter.
3. Click Next.
4. Click Next.
5. Click Next.
6. Select Create a new domain in a new forest, and click Next.
7. Type `HP.Cressida` as the FQDN (Fully Qualified Domain Name), and click Next.
8. Set the forest functional level to Windows Server 2008, and click Next.
9. Set the domain functional level to Windows Server 2008, and click Next.
10. Leave defaults on the Additional Domain Controller Options screen, and click Next.
11. If a warning window appears asking about dynamically assigned IP addresses, click Yes.
12. Click Yes to continue.
13. Leave defaults at the Location for Database, Log Files, and SYSVOL screen; and click Next.
14. At the Directory Services Restore Mode Administrator Password screen, type `Password1` and click Next.
15. At the Summary screen, click Next.
16. Click Finish.
17. Click Restart now.

Installing system updates in Windows Server 2008 R2

We installed all critical updates as of 1/9/2012 on the server using the Windows Update feature.

Configuring the HP ProLiant DL380 G7

We used the BIOS RAID configuration utility to create one 2 disk RAID 1 and 1 RAID 5 consisting of 6 disks, one for the operating system and the other for the LoadGen databases. We installed Windows Server 2008 R2 SP1 with the latest updates as of 1/9/2012.

Setting the computer name

1. Click Start→Administrative Tools→Server Manager.
2. In the right pane, click Change System Properties.
3. Under the Computer Name tab, click Change…
4. Change the Computer name to `DL380`
5. Reboot the system.

Adding DB drives to Windows

1. Click Start→ right-click My Computer and select Manage.
2. Expand Storage and select disk management.
3. Select the Offline Drive and right-click and select Online.
4. Right the volume and select New Simple Volume.
5. Name the new volume DB and click OK.

Setting up the network configuration on the server

1. Click Start→Network.
2. Click Network and Sharing Center.
3. Click Manage Network Connections.
4. Right-click Local Area Connection.
5. Click Properties.
6. Click Internet Protocol Version 4 (TCP/IPv4), and click Properties.

Microsoft Exchange consolidation and TCO: Dell PowerEdge R720xd vs. HP ProLiant DL380 G7

A Principled Technologies test report 22

7. Select Use the following IP Address, and input the following numbers:
   - IP address: `192.168.5.105`
   - Subnet mask: `255.255.255.0`
8. Click OK to close the window.
9. At the Local Area Connection Properties window, click Close.
10. Close the Network Connection window.

Joining the domain

1. Click Start→ right-click My Computer→Properties.
2. Click Change settings.
3. On the system properties screen click Change.
4. On the Computer Name/domain changes click Domain radio and type `HP.Cressida`
5. Enter in the credentials to the AD machine.
6. At the welcome prompt click OK.
7. Close the computer Name/Domain Changes screen.
8. At the reboot prompt click Yes.

Installing Exchange 2007 SP3

1. Select Start Administrative Tools Server Manager.
2. Click Add Roles.
3. At the Before You Begin screen, click Next.
4. At the Select Server Roles screen, click Web Server (IIS).
5. If prompted by an Add features required for Web Server (IIS) pop-up window, click Add Required Features.
6. Click Next.
7. At the Web Server (IIS) screen, click Next.
8. At the Select Role Services screen, select the IIS 6 Metabase Compatibility, IIS 6 Management Console, Basic Authentication, Windows Authentication, Digest Authentication, Static and Dynamic content Compression checkboxes, Static Content, Directory Browsing, HTTP Logging, Request Filtering and click Next.
9. At the Confirm Installation Selections screen, click Install.
10. At the Installation Results screen, click Close.
11. Select Start→Administrative Tool→Server Manager.
12. Click Features.
13. Click Add Features.
14. Select .NET Framework 3.5.1 Features.
15. When the Add Features Wizard pop-up window prompts you, click Add Required Role Services.
16. Click Next.
17. At the Introduction to Web Server (IIS) screen, click Next.
18. At the Select Role Services screen, click Next.
19. Click Install.
20. At the Installation Results screen, click Close.
21. Download the Microsoft Filter Pack 2.0. (http://www.microsoft.com/downloads/en/details.aspx?FamilyID=5cd4dcd7-d3e6-4970-875e-aba93459fbee)
22. Run FilterPackx64.EXE.
23. Click Next.
24. Click I accept the terms in the License Agreement, and click Next.
25. Click OK once installation is complete.
26. Click Start→Administrative Tool→Services.
27. Right-click the Net.Tcp Port Sharing service, and click Properties.
28. Change the Net.Tcp Port Sharing startup type to Automatic, and click OK.

Microsoft Exchange consolidation and TCO: Dell PowerEdge R720xd vs. HP ProLiant DL380 G7

A Principled Technologies test report **23**

29. Open command prompt and type ServerManagerCmd –i RSAT-ADDS, and press Enter.
30. Reboot the server.
31. Insert the Exchange Server 2007 SP3 installation DVD, and capture the DVD drive in the VM session. When the Autoplay window appears, click Run Setup.EXE.
32. The installer should consider steps 1 and 2 to be complete (they appear grayed out). Click the link to Step 3: Choose Exchange Language Option.
33. Click Install only languages from the DVD.
34. Click the link to Step 4: Install Microsoft Exchange Server.
35. To go past the introduction screen, click Next.
36. Accept the license agreement, and click Next.
37. Select No for error reporting, and click Next.
38. Select Typical Exchange Server Installation, and click Next.
39. Leave the organization name at default (First Organization), and click Next.
40. At the question about client computers running Outlook 2003 or Entourage, select No and click Next.
41. To accept defaults for Configure Client Access server external domain, click Next.
42. At the Customer Experience Improvement Program screen, select I don't wish to join the program at this time, and click Next.
43. Click Install to start the installation process.
44. Once the installation has completed, click Finish. Exchange should automatically open the Exchange Management Console.
45. If Exchange does not automatically open the Exchange Management Console, click Start All Programs Microsoft Exchange Server 2007 Exchange Management Console.

Enabling circular logging
1. Click Start→All Programs→Microsoft Exchange Server 2007→Exchange Management Console.
2. Expand Server Configuration, and click Mailbox.
3. Right-click First Storage Group, and click Properties.
4. Check the box beside Enable circular logging, and click OK.

Disabling Maintenance Schedule
1. Click Start→All Programs→Microsoft Exchange Server 2007→Exchange Management Console.
2. Expand Server Configuration, and click Mailbox.
3. Right-click Mailbox Database, and click Properties.
4. Click Customize.
5. Double-click the empty gray box above Sunday.
6. Ensure that all cells on the graph turn white, and click OK.
7. Click OK.

Disabling Microsoft Search Indexer Service
1. Click Start→Administrator tools→Services.
2. Select Microsoft Exchange Search Indexer, and right-click Properties.
3. On the Properties screen, change Startup Type to disabled, and click Stop.
4. Click OK and close the Services screen.

Changing the default Mailbox Database drive location
1. Click Start, and click Exchange Management Console.
2. Right-click Mailbox Database.
3. Select Move Database Path.
4. Click Browse, navigate to E:\Database, and click Save.
5. Click Move.

6. When the application prompts you to dismount the mailbox database, click Yes.
7. Click Finish.

Installing LoadGen 2010 on HP Client

On a client with 2008 R2 SP2 that is already part of the domain, perform the following steps:

1. Select Start→Administrative Tool→Server Manager.
2. Click Features.
3. Click Add Features.
4. Select .NET Framework 3.5.1 Features.
5. When the Add Features Wizard pop-up window prompts you, click Add Required Role Services.
6. Click Next.
7. At the Introduction to Web Server (IIS) screen, click Next.
8. At the Select Role Services screen, click Next.
9. Click Install.
10. At the Installation Results screen, click Close.
11. Select the Loadgen2010 .EXE
12. At the Welcome screen, click Next.
13. Accept the EULA, and click Next.
14. On the Select Installation Folder screen, click Next.
15. At the Confirm Installation screen, click Next.
16. At the Installation Complete screen, click Next.
17. On the Restart your systems prompt, click Yes.

Preparing Load Generator

1. Select Start→All Programs→Microsoft Exchange→Exchange Load Generator.
2. When the Load Generator window appears, select Start a new test.
3. Select Create a new test configuration, and click Continue.
4. In the Specify test settings window, type Password1 as the Directory Access Password and Mailbox Account Master Password, and click Continue with recipient management.
5. Make 1000 users in the Mailbox Database, and click Continue.
6. To accept defaults for Advanced recipient settings, click Continue.
7. In the Specify test user groups window, select the plus sign (+) to add a user group.
8. Change the Client Type to Outlook 2007 Cached and the Action Profile to Average, 100MB and click Continue.
9. Leave defaults in Remote configurations, and click Continue.
10. Click Save the configuration file as, and name it 100x1000.cfg
11. Click Start the initialization phase (recommended before running the test) to start initialization. The initialization process might take a few hours.

Backing up the mail database on the HP ProLiant DL380 G7

On the test server, once you have set up LoadGen and created its initial mail database, you need to back up that database so you can have clean copies for each test. Use this process to back up that database:

1. Select Start→All Programs→Microsoft Exchange Server 2007→Exchange Management Console in the mail server.
2. In the left pane, under Server Configuration, click Mailbox.
3. In the right pane, right-click Mailbox Database, and select Dismount Database from the menu.
4. At the Do you want to continue? pop-up message, click Yes.
5. Right-click Public Folder Database, and select Dismount Database from the menu.

6. At the Do you want to continue? pop-up message, click Yes. The red arrow appears when you have dismounted the Public Folder Store.
7. Using Windows Explorer, create two new folders: C:\backup\mailstore and C:\backup\publicstore.
8. With Windows Explorer, copy all files from D:\DB\Mailbox\First Storage Group to D:\backup. This process may take several minutes.
9. Close Windows Explorer.
10. In Exchange Management Console, right-click Mailbox Database, and select Mount Database from the menu.
11. Right-click the Public Folder Database, and select Mount Database from the menu.
12. Close Exchange System Manager.

APPENDIX D - TCO DETAILS

Hardware costs

Dell provided us with hardware costs for the Dell PowerEdge R720xd , 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 $14,552 for the following configuration of the Dell PowerEdge R720xd :

- 2x Intel Xeon processor E5-2660s (2.20GHz)
- 64 GB (8 x 8GB) Dual Rank- PC3L-10600R (HMT31GR7BFR4A-H9)
- PERC H710P Mini Controller
- 16 x 300GB 10K SAS 6Gbps drives
- Four-port 1GB NIC
- 8GB iDRAC SD Card, including iDRAC7 Enterprise

Migration costs

We assume that the migration from the existing servers to the Dell PowerEdge R720xd will take three weeks. Migration includes the staff costs of planning the migration, ordering the hardware, setting up the server, and migrating software and databases. We estimate 80 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 $5,900.49 based on 120 hours of a server administrator 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.[4] 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.[5]

Software licenses

For each solution, we assume the enterprise maintains current Microsoft Software Assurance on the Microsoft Windows Server software and Microsoft Exchange software and that their licensing allows them to migrate the software between servers. We also assume they can renew the Software Assurance agreements for the three 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.

We used software pricing from the Microsoft License Advisor tool[6] 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

---

[4] http://www.bls.gov/oes/current/oes151142.htm
[5] 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.
[6] http://www.microsoft.com/licensing/mla/default.aspx

prices quoted there are $2,358 per Windows Server 2008 R2 Enterprise Edition and $708 per Microsoft Exchange 2010 Standard Edition. Annual Software Assurance is one-fourth the license cost.

The Dell PowerEdge R720xd solution saves the Software Assurance costs of three existing licenses that solution doesn't need. 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 R720xd solution does not need or can use the licenses elsewhere.

The Dell PowerEdge R720xd 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 R720xd uses only one of the four licenses on the existing model. We assign savings to the Dell PowerEdge R720xd solution equal to the Software Assurance payments on the unused three licenses from the existing solution.

The Microsoft Exchange 2010 Standard Edition supports up to five databases and the Enterprise edition supports more. The Standard edition is the choice for the single database used by the hypothetical enterprise.

Microsoft Exchange Standard Edition per-license costs are the same for the two solutions. Microsoft Software Assurance includes upgrade options that will allow an upgrade from Microsoft Exchange 2007 to Microsoft Exchange 2010 at no additional license cost. List prices and costs for Software Assurance coverage were the same for Windows Exchange 2007 as they are for Windows Exchange 2010.

Microsoft Exchange is priced on a per-instance basis. We assume the enterprise would migrate and upgrade the Microsoft Exchange licenses from the existing servers to the Dell PowerEdge R720xd servers. As a result, the four physical instances on the existing solution and the four virtual machine instances on the Dell PowerEdge R720xd solution both have the same license count and same ongoing Software Assurance cost.

Hardware support

Dell provided a quote of $2,899 for three-year support for the Dell PowerEdge R720xd server. We base the HP support estimate on the support for the HP ProLiant DL380 G7 on the three-year support cost listed on the HP Store for the HP ProLiant DL380 models. Figure 9 shows the hardware support costs for each solution.

	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 G7	$1,769	$590	$2,359	59%
Dell Support: 3 Year ProSupport and Mission Critical 4HR 7x24 Onsite Pack	$2,899	$966	$966	

Figure 9: Hardware support for the two solutions.

Microsoft Exchange consolidation and TCO: Dell PowerEdge R720xd vs. HP ProLiant DL380 G7

A Principled Technologies test report 28

Energy costs

Figure 10 shows the calculations for the annual energy cost estimates.

Annual costs - Energy costs	Dell PowerEdge R720xd	HP ProLiant DL380 G7
Cost per kWh	0.1039	0.1039
Typical watts	225.2	165.4
Annual kWh per server	1,972.75	1449.17
Multiplier for cooling	1.8	2.0
Total kWh for power and cooling one server	3,551.0	2898.3
Annual energy cost per server	**$369**	**$301.14**
Annual energy cost for solution	**$369**	**$1,204.56**

Figure 10: 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 cost of $2,170 or $98.64 per rack unit based on each rack holding 22u of servers.

Microsoft Exchange consolidation and TCO: Dell PowerEdge R720xd vs.
HP ProLiant DL380 G7

A Principled Technologies test report 29

ABOUT PRINCIPLED TECHNOLOGIES

![Principled Technologies logo]

Principled Technologies, Inc.
1007 Slater Road, Suite 300

Durham, NC, 27703

www.principledtechnologies.com

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

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

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

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

Microsoft Exchange consolidation and TCO: Dell PowerEdge R720xd vs.
HP ProLiant DL380 G7

A Principled Technologies test report 30