

Dell™ PowerEdge™ 12G servers and Microsoft® Windows Server® 2012



Consolidated the workload of 8 older servers

Increased performance
by 412.4% per VM

Lowered power
consumption by 86.4%

If you're still using years-old servers running outdated software to power your database infrastructure, you aren't providing your employees and customers with the best possible performance, and you're likely wasting valuable resources.

Consolidating your physical servers into virtual machines (VMs) on a new, powerful virtualization platform reduces the number of physical servers in your infrastructure, saving physical space and reducing power, cooling, and administration costs. In addition to the benefits of consolidation, choosing the latest operating system and database software can simplify management and let you get the best performance out of your new server.

The new Dell PowerEdge R720 is one such virtualization platform. In our labs, we tested the performance of an older HP ProLiant DL360 G4p server running Microsoft Windows Server 2003 R2 and Microsoft SQL Server 2005 to see how many of these workloads the Dell PowerEdge R720 running Microsoft Windows Server 2012 and SQL Server 2012 could handle. We found that the Dell PowerEdge R720 could comfortably consolidate eight of the older workloads while increasing performance by an average of 412.4 percent and reducing latency by an average of 95.6 percent for each workload. Furthermore, we found that powering only one new server instead of eight older HP servers also lowered power consumption by a whopping 86.4 percent, which deliver an estimated savings of up to \$2,634.98 in the course of a year in power and cooling costs.



UPGRADE AND CONSOLIDATE

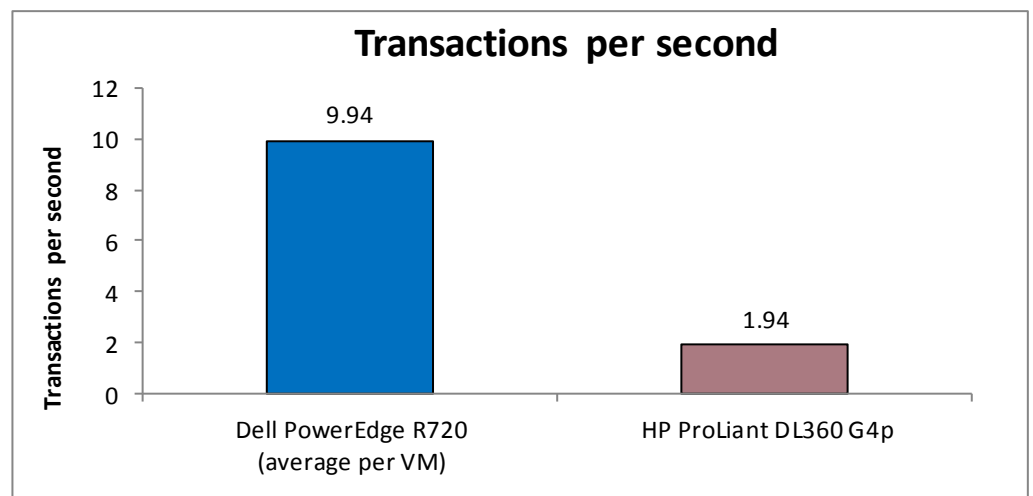
Newer technology, in both hardware and software, is better equipped to meet the demands of today's business. Virtualizing multiple older servers on a single new machine with innovative software, such as Microsoft Windows Server 2012 with Hyper-V™, is a great strategy to help you improve your business as well as your bottom line.

To show the dramatic performance benefits of upgrading an older server and legacy software solution to a new Dell PowerEdge R720 with Microsoft Windows Server 2012 and SQL Server 2012, we used an On-Line Transaction Processing (OLTP) workload on Benchmark Factory® for Databases. We scaled the workload to simulate 100 virtual users, each completing up to six database tasks per minute on the HP ProLiant DL360 G4p server and on each VM on the Dell PowerEdge R720. We completed three runs and took the median based on transactions per second. To calculate the percent win, we averaged the transactions per second and response time of all the VMs running on the Dell and compared them against the legacy HP server. For detailed configuration information, see [Appendix A](#). For step-by-step details on how we tested, see [Appendix B](#).

More performance using less power

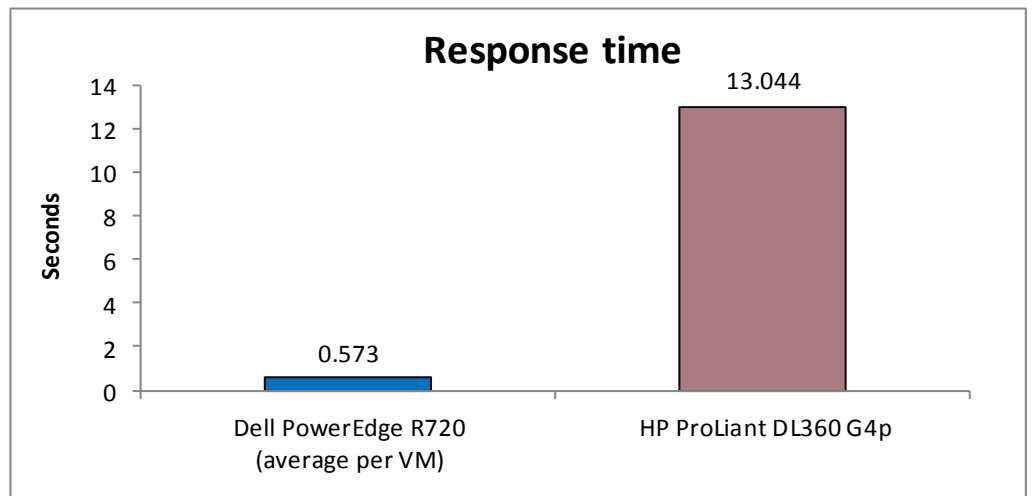
The more transactions a server can process, the better the experience for your users and the more business you can complete. As Figure 1 shows, each Hyper-V VM on the Dell PowerEdge R720 achieved an average of 9.94 transactions per second (TPS), a 412.4 percent performance increase over the 1.94 TPS of the HP ProLiant DL360 G4p server. That means that the Dell PowerEdge R720 could comfortably consolidate the workload of eight HP legacy servers while also greatly improving performance for each of them.

Figure 1: Average transactions per second that each VM on the Dell PowerEdge R720 delivered compared to the HP ProLiant DL360 G4p.



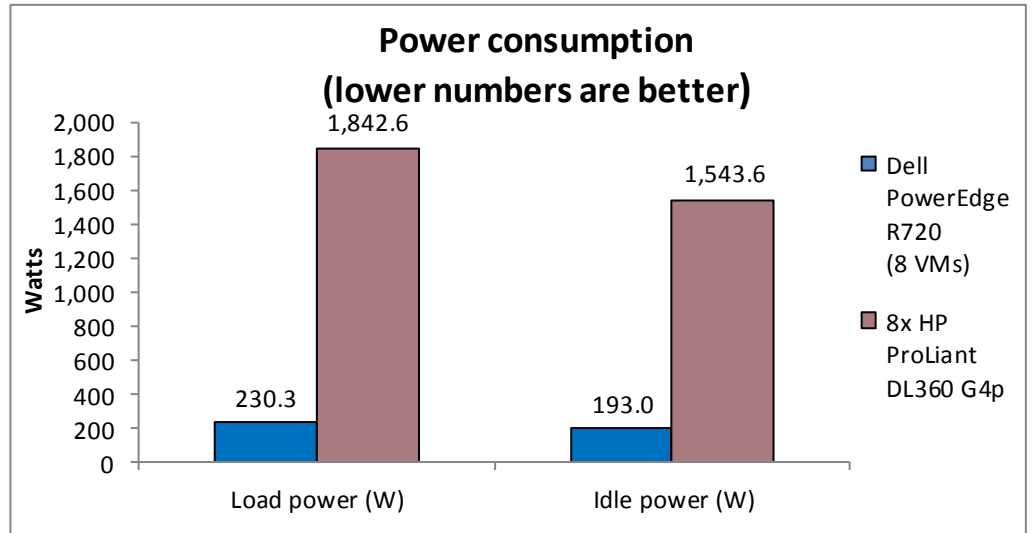
In addition to dramatically greater performance, the Dell PowerEdge R720 also achieved an average of 95.6 percent lower response times across the eight VMs than the HP ProLiant DL360 G4p (see Figure 2). Much of this reduction in response time can be attributed to great improvements in both RAID controller and drive technology over the years, as well as the ability of newer servers to increase the number of drives they can support. By upgrading from legacy servers to the new Dell PowerEdge R720, your business is able to take advantage of these improvements in storage technology, resulting in a better user experience for employees and customers accessing the database.

Figure 2: Average response time comparison for each VM on the Dell PowerEdge R720 vs. a HP ProLiant DL360 G4p server.



Replacing many older servers with just one physical server reduces the power consumed by your infrastructure, which means great savings in power and cooling costs. A single Dell PowerEdge R720 used 86.3 percent less load power than eight legacy HP servers would use, while providing the greater performance and lower latencies we described above. Figure 3 compares the load and idle power measurements, in watts, for a single Dell PowerEdge R720 running eight VMs and the power that would be required to run eight HP ProLiant DL360 G4p servers.

Figure 3: Power consumption comparison for a single Dell PowerEdge R720 (with 8VMs) vs. eight HP ProLiant DL360 G4p servers.



To look at our results in more detail, see the [Detailed test results](#) section of this report. Figure 4 shows how this decrease in power consumption can translate into savings over the course of a year. Using an average eight-hour workday, we calculated the average power consumption, including idle and load power combined, to be 212W for the Dell PowerEdge R720 and 1,672W for eight legacy HP ProLiant DL360 G4p servers. Our estimates in power and cooling show that the Dell PowerEdge R720 server can save you up to \$2,634.98 per year in power and cooling costs over eight HP ProLiant DL360 G4p servers.

Energy costs	Dell PowerEdge R720	8x HP ProLiant DL360 G4p
Per server estimate (W)	212	1,672
Cost per year per server for power and cooling	\$360.86	\$374.48
Cost per year per solution	\$360.86	\$2,995.84
Dell savings		\$2,634.98

Figure 4: Energy cost statistics for the two solutions.

For more information on our calculations and how upgrading to the Dell PowerEdge R720 server can save your organization in a number of areas, see our TCO report at http://www.principledtechnologies.com/clients/reports/Dell/R720_Consolidation_TCO_Server2012_SQL2012_1112.pdf.

A CLOSER LOOK AT OUR CONSOLIDATION PLATFORM

Features of the new Dell PowerEdge R720

The new Intel® Xeon® processor E5-2680-powered Dell PowerEdge R720 2U rack server incorporates many enhancements and features designed to improve performance, lower power consumption, and ease maintenance. Some of these features include the following:

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

About Microsoft Windows Server 2012

Windows Server 2012, the latest release of this server OS from Microsoft, includes many new features and enhancements. According to Microsoft, Windows Server 2012 focuses on four core areas:

- **Beyond virtualization.** Windows Server 2012 provides a robust and dynamic virtualization platform through Hyper-V, and includes new features that provide flexible options for delivering cloud services.

- **The power of many servers, the simplicity of one.** Windows Server 2012 offers improvements in its features that allow for better-than-ever high availability and ease of management for multiple-server infrastructures.
- **Every app, any cloud.** Windows Server 2012 delivers a scalable and flexible Web and application platform by providing a consistent and open set of tools and frameworks that apply to applications on-premises, in the cloud, or in a hybrid environment.
- **Modern work style, enabled.** Microsoft Windows Server 2012 empowers users and IT staff with remote access to data, applications, and simpler management tools while strengthening security and compliance.

About Microsoft SQL Server 2012

SQL Server 2012 is the latest release of Microsoft’s database management platform. Microsoft has added new features to enhance performance, security, and management. SQL Server 2012 introduces Data Quality Services (DQS) to improve the usability of collected data, both locally and from cloud-based data service providers. In addition, SQL Server 2012 is more tightly integrated with both Microsoft Office client applications and with SharePoint Server, providing greater ease-of-use to users.

DETAILED TEST RESULTS

We used the resource utilization data that Figure 4 presents to determine how many VMs we could successfully consolidate on the Dell PowerEdge R720. In database tests, the bottleneck on servers is usually disk utilization rather than capacity, so we pushed the disk utilization as high as possible while maintaining an acceptable response time, or latency, on each virtualized database instance on the Dell PowerEdge R720. Following the parameters of the legacy HP server, the Dell PowerEdge R720 could support eight VMs, each with 100 simulated users. As Figure 5 shows, the increased I/O capacity of the Dell PowerEdge R720 and the virtualization capabilities of Windows Server 2012 use CPU and memory resources more efficiently by handling eight times the workload of a single HP ProLiant DL360 G4p, all while delivering considerably better performance.

Average utilization	Dell PowerEdge R720	HP ProLiant DL360 G4p
CPU % utilization	16.7%	1.1%
RAM % utilization	80.6%	60.2%
Data disk % utilization	99.1%	100.0%

Figure 5: Average utilization statistics for the servers in our tests.

Figure 6 details the transactions per second and response times for each database instance while running the OLTP workload in Benchmark Factory for Databases, broken down by VM on the Dell PowerEdge R720, compared to the results for the bare-metal HP ProLiant DL360 G4p server.

	TPS	Response time (s)
Dell PowerEdge R720 - VM 1	8.75	0.682
Dell PowerEdge R720 - VM 2	10.88	0.418
Dell PowerEdge R720 - VM 3	10.87	0.420
Dell PowerEdge R720 - VM 4	7.69	0.822
Dell PowerEdge R720 - VM 5	9.03	0.845
Dell PowerEdge R720 - VM 6	10.79	0.450
Dell PowerEdge R720 - VM 7	10.71	0.507
Dell PowerEdge R720 - VM 8	10.80	0.441
Dell PowerEdge R720 - Average per VM	9.94	0.573
HP ProLiant DL360 G4p	1.94	13.044
Percentage Dell win	412.4%	95.6%

Figure 6: Transactions per second and response times for the Dell PowerEdge R720 VMs and the HP ProLiant DL360 G4p. Higher TPS are better, and lower response times are better.

Figure 7 presents the power consumption data for the two servers. A single Dell PowerEdge R720 used only slightly more power than a single legacy HP ProLiant DL360 G4p server (20 watts under load), while doing the work of eight legacy servers. The data below shows how we extrapolate the power utilization of one HP ProLiant DL360 G4p to determine the power savings of consolidating eight of these HP servers to a new Dell PowerEdge R720 server running Windows Server 2012.

	Dell PowerEdge R720 (eight VMs on one server)	HP ProLiant DL360 G4p (one server)	HP ProLiant DL360 G4p (eight servers)	Percentage less power with Dell
Load power (W)	230.3	211.0	1,687.8	86.4%
Idle power (W)	193.0	207.3	1,658.6	88.4%

Figure 7: Power consumption information for the servers while under load and idle.

WHAT WE TESTED

To measure database performance, we used the Benchmark Factory for Databases tool, which lets you conduct database workload replay, industry-standard benchmark testing, and scalability testing. It enables you to deploy changes to your database environment with confidence by reducing the risks associated with patches, upgrades, migrations, and adjustments to virtual machine configurations. With this workload replay and scheduling software, you can eliminate slow SQL database performance and dramatically simplify high-performance database management. We used an OLTP database test in Benchmark Factory to run a TPC-E-like workload. To

simulate 100 users hitting each database instance, we modified the workload with an 8,000-ms think time in between each task. This meant that, for a server that can handle the workload, each user would be completing approximately 5 to 6 database-related tasks per minute. We ran the workload on each server three times, and chose the median run based on transactions per second.

More information on Benchmark Factory is available at <http://www.quest.com/benchmark-factory/>.

IN CONCLUSION

Consolidating older servers onto a new system running virtual machines can greatly affect the performance your infrastructure delivers to users and provide a number of benefits such as space savings, power and cooling savings, and more.

In our tests, the Dell PowerEdge R720 running Microsoft Windows Server 2012 and Microsoft SQL Server 2012 was able to consolidate eight legacy servers in Hyper-V VMs, with each VM improving performance by an average of 412.4 percent over the HP ProLiant DL360 G4p server. The PowerEdge R720 provided this performance increase while reducing latencies by an average of 95.6 percent and reducing power consumption by 86.4 percent, which can potentially save up to \$2,634.98 per year in power and cooling costs when replacing eight legacy HP servers.

APPENDIX A – SYSTEM CONFIGURATION INFORMATION

Figure 8 provides detailed configuration information for the test systems.

System	Dell PowerEdge R720	HP ProLiant DL360 G4p
General		
Number of processor packages	2	2
Number of cores per processor	8	1
Number of hardware threads per core	2	2
CPU		
Vendor	Intel	Intel
Name	Xeon	Xeon
Model number	E5-2680	3.40E
Stepping	C1	N0
Socket type	LGA2011	PPGA604
Core frequency (GHz)	2.70	3.40
Bus frequency	8.0 GT/s	800 MHz
L1 cache	32 KB + 32 KB (per core)	16 KB + 16 KB (per core)
L2 cache	256 KB (per core)	2 MB
L3 cache (MB)	20	N/A
Platform		
Vendor and model number	Dell PowerEdge R720	HP ProLiant DL360 G4p
Motherboard model number	0M1GCR	382134-001
BIOS name and version	Dell 1.2.6	HP P54
BIOS settings	Default	Default
Memory module(s)		
Total RAM in system (GB)	64	4
Vendor and model number	Hynix HMT31GR7BFR4A-H9	Elpida EBE10RD4ABFA-4A-E
Type	PC3L-10600R	PC2-3200R
Speed (MHz)	1,333	400
Speed running in the system (MHz)	1,333	400
Timing/Latency (tCL-tRCD-tRP-tRASmin)	9-9-9-36	3-3-3-8
Size (GB)	8	1
Number of RAM module(s)	8	4
Chip organization	Double-sided	Double-sided
Operating system		
Name	Windows Server 2012 Datacenter Edition	Windows Server 2003 R2 Enterprise Edition (32-bit)
Build number	9200	3790
File system	NTFS	NTFS
Service Pack	N/A	SP2
Language	English	English

System	Dell PowerEdge R720	HP ProLiant DL360 G4p
RAID controller		
Vendor and model number	Dell PERC H710P	N/A
Firmware version	5.2.112.0	N/A
Cache size	1 GB	N/A
Hard drive 1		
Vendor and model number	Dell ST9300605SS	HP WD5000AAKS
Number of drives	16	1
Size (GB)	300	500
RPM	10,000	7,200
Type	SAS	SATA
Hard drive 2		
Vendor and model number	N/A	HP ST3500630AS
Number of drives	N/A	1
Size (GB)	N/A	500
RPM	N/A	7,200
Type	N/A	SATA
Ethernet adapter		
Vendor and model number	Intel I350 Quad Port Gigabit Network Daughter Card	HP NC7782 Dual Port Gigabit Network Adapter
Type	Integrated	Integrated
Power supplies		
Total number	2	1
Vendor and model number	Dell DPS-750AB-2 A	HP DPS-460BB B
Wattage of each (W)	750	460
Cooling fans		
Total number	6	7
Vendor and model number	San Ace 60 0GA0612P1K641	Sunon PMD1204PJB2-A
Dimensions (h x w) of each	2-1/2" x 2-1/2"	1-1/2" x 1-1/2"
Volts	12	12
Amps	0.95	0.95
Optical drive		
Vendor and model number	TEAC DV-28SW	HDLS GCR-8240N

Figure 8: System configuration information for the test servers.

APPENDIX B - HOW WE TESTED

Configuring the Dell PowerEdge R720

We used sixteen 300GB 10k SAS drives in the Dell PowerEdge R720. We configured one RAID1 volume with two drives for the OS, VM OS virtual drives, and SQL log virtual drives, and one RAID10 volume with the remaining fourteen drives to host the VM database virtual drives.

Installing Microsoft Windows Server 2012 Datacenter on the Dell PowerEdge R720

1. Insert the installation media into the CD/DVD drive, and restart the server.
2. When the option appears, press F11 to enter the Boot Manager.
3. Select SATA Optical Drive, and press Enter.
4. Press any key when prompted to boot from DVD.
5. When the installation screen appears, click My language is English.
6. Leave language, time/currency format and input method as default, and click Next.
7. Click Install now.
8. When the Windows Setup window appears, click No thanks when it prompts you to go online to install updates.
9. Select Windows Server 2012 Datacenter (Server with a GUI), and click Next.
10. Check I accept the license terms, and click Next.
11. Click Custom: Install Windows only (advanced).
12. Press Alt+A to open advanced partition options. Delete any partitions until there is only Drive 0 Unallocated Space.
13. Select Drive 0 Unallocated Space, and click Next, at which point Windows will begin installing, and will restart automatically after completing.
14. When the Settings page appears, fill in the Password and Reenter Password fields with the same password.
15. Log in with the password you set up previously.

Creating new disks in Windows Server 2012 Datacenter Edition

1. In the Server Manager window, click Tools, and click Computer Management.
2. In the left pane, click Disk Management.
3. On the unallocated disk, right-click the disk name, and click Online. Right-click the disk name again, and click Initialize Disk. When the Initialize Disk window pops up, select MBR (Master Boot Record), and click OK.
4. After the disk initializes, right-click the shaded area, and click New Simple Volume.
5. On the New Simple Volume Wizard that pops up, click Next.
6. Select a size (maximum, in our case), and click Next.
7. Assign a drive letter, and click Next.
8. Select Format this volume with the following settings, and leave the default settings. Click Next.
9. Click Finish.

Configuring Windows Update

1. In the left pane of the Server Manager window, click Local Server.
2. In the main frame, next to Windows Update, click Not configured.
3. In the Windows Update window, in the main pane, click Let me choose my settings.
4. Under Important updates, select Never check for updates (not recommended), and click OK.
5. In the left pane, click Check for updates, and install all available updates.
6. Close the Windows Update window.

Configuring Windows Firewall

1. In Server Manager, click Tools→Windows Firewall with Advanced Security.
2. In the Overview section, click Windows Firewall Properties.
3. In the Domain Profile tab, for Firewall state, click Off.

4. In the Private Profile tab, for Firewall state, click Off.
5. In the Public Profile tab, for Firewall state, click Off.
6. Click OK.
7. Close the Windows Firewall Properties window.

Setting up Remote Desktop

1. In the Local Server tab of the Server Manager window, next to Remote Desktop, click Disabled.
2. In the System Properties window that appears, in the Remote Desktop section, select the Allow remote connections to this computer radio button, and click OK when the warning message appears.
3. Uncheck Allow connections only from computers running Remote Desktop with Network Level Authentication (recommended), and click OK.

Disabling IE Enhanced Security Configuration

1. In the Local Server tab of the Server Manager window, next to IE Enhanced Security Configuration, click On.
2. In the Internet Explorer Enhanced Security Configuration window, select the Off radio buttons for both Administrators and Users, and click OK.

Configuring a NIC team with the Public-VM NICs

1. In Server Manager, in the left pane, click Local Server.
2. In the Properties frame, next to NIC Teaming, click Disabled.
3. In the TEAMS section of the NIC Teaming window that pops up, click the Tasks menu, and click New Team.
4. Assign a name to the team, and check the boxes for the four appropriate 1G adapters to add them to the team. For our testing, we named this the NICTeam.
5. When finished, click OK.
6. Assign an appropriate IP address to the teamed NIC, and join the server to the domain.

Adding the Hyper-V role

1. In Server Manager, click Manage→Add Roles and Features.
2. At the Before you begin screen, click Next.
3. At the Select installation type, leave the default selection of Role-based or feature-based installation, and click Next.
4. At the Select destination server screen, leave the default selection, and click Next.
5. At the Select server roles screen, check the box for Hyper-V, and click Next.
6. When the Add Roles and Features Wizard window pops up, click Add Features.
7. Click Next.
8. At the Select features screen, click Next.
9. At the Hyper-V screen, click Next.
10. At the Create Virtual Switches screen, select the teamed NIC multiplexor driver, and click Next.
11. At the Virtual Machine Migration screen, leave the checkbox unselected, and click Next.
12. At the Default Stores screen, leave the default locations, and click Next.
13. At the Confirm installation selections screen, check Restart the destination server automatically if required and click Install.
14. When the installation completes, click Close.

Creating and configuring the virtual machines

In our testing, we created eight VMs running Windows Server 2012, giving each VM four logical processors and 6GB RAM. Figure 9 shows the virtual disk settings we used for each of the eight VMs on the Dell PowerEdge R720.

Dell PowerEdge R720 VM virtual disk settings	Host volume	Size (GB)
OS.vhdx	C:	30
SQLData.vhdx	E:	50
SQLLog.vhdx	C:	20

Figure 9: Virtual disk settings.

We installed Windows Server 2012 Datacenter on each VM OS virtual disk, using the same steps that we followed above for the Dell PowerEdge R720 host server.

Installing SQL Server 2012 on the virtual machines

For each VM, we installed an instance of Microsoft SQL Server 2012 by following these steps below.

1. Connect and log into the virtual machine.
1. Insert the installation DVD for SQL Server 2012 into the DVD drive and attach it to the virtual machine.
2. Click Run SETUP.EXE. If Autoplay does not begin the installation, navigate to the SQL Server 2012 DVD, and double-click it.
3. If the installer prompts you with a .NET installation prompt, click Yes to enable the .NET Framework Core role.
4. In the left pane, click Installation.
5. Click New SQL Server stand-alone installation or add features to an existing installation.
6. At the Setup Support Rules screen, wait for the check to complete. If there are no failures or relevant warnings, click OK.
7. Select the Enter the product key radio button, and enter the product key. Click Next.
8. Click the checkbox to accept the license terms, and click Next.
9. Click Install to install the setup support files.
10. If there are no failures displayed, click Next.
11. At the Setup Role screen, choose SQL Server Feature Installation.
12. At the Feature Selection screen, select Database Engine Services, Full-Text and Semantic Extractions for Search, Client Tools Connectivity, Client Tools Backwards Compatibility, Management Tools –Basic, and Management Tools – Complete. Click Next.
13. At the Installation Rules screen, click Next once the check completes.
14. At the Instance configuration screen, leave the default selection of default instance, and click Next.
15. At the Disk space requirements screen, click Next.
16. At the Server Configuration screen, choose NT Service\SQLSERVERAGENT for SQL Server Agent, and choose NT Service\MSSQLSERVER for SQL Server Database Engine. Click Next.
17. At the Database Engine Configuration screen, select Mixed Mode.
18. Enter and confirm a password for the system administrator account.
19. Click Add Current user. This may take several seconds.
20. Click Next.
21. At the Error and usage reporting screen, click Next.
22. At the Installation Configuration Rules screen, check that there are no failures or relevant warnings, and click Next.
23. At the Ready to Install screen, click Install.
24. After installation completes, click Close.
25. Close the installation window.

Creating a blank database

1. Click Start → SQL Server Management Studio.
2. Log into the default instance using the appropriate credentials.
3. Right-click Databases, and select New Database.

4. Enter `Testdb` for the database name.
5. Set the Initial Size of the data file to 20,480 MB, and the log file size to 8,192 MB.
6. Change the path of the data file by clicking ... , select `E:\SQLData`, and click OK. Repeat for the log file, and select `C:\SQLLog`.
7. Click OK to begin the database creation.

Configuring the legacy server

We installed Windows Server 2003 R2 with all available service packs and applied and applicable updates using Windows Update. We used one 500GB SATA drive for the OS, and an additional 500GB SATA drive for the SQL Server 2005 database. Through Disk Management, we used the New Simple Volume wizard to create a new volume for the database on the unallocated disk. We also disabled Windows Firewall, enabled Remote Desktop, and uninstalled Internet Explorer Enhanced Security Configuration through the Windows Components Wizard.

Installing Windows Server 2003 R2 Enterprise Edition

1. Insert the first installation CD into the drive, and boot the system.
2. At the Welcome to Setup screen, press Enter.
3. At the Windows Licensing Agreement screen, press F8 to agree to the terms.
4. Select the appropriate unpartitioned space, and press C to create a partition on the first drive.
5. Select Format the partition using the NTFS file system (quick format), and press Enter.
6. At the Regional and Language Options screen, click Next.
7. Enter Name and Organization, and click Next.
8. At the Your Product Key screen, enter your product key, and click Next.
9. At the Licensing Modes screen, click Next.
10. At the Computer Name and Administrator Password screen, choose an appropriate name and password, and click Next.
11. At the Date and Time Settings screen, change the Date & Time and Time Zone if appropriate, and click Next.
12. After the system restarts automatically, follow the prompt to log into the server.
13. At the Windows Setup screen, insert the second installation CD when prompted, and click OK.
14. At the Windows Server 2003 R2 Setup Wizard Welcome screen, click Next.
15. At the Windows Server 2003 R2 Setup Wizard Summary screen, click Next.
16. Click Finish.

Installing Microsoft SQL Server 2005 SP4

1. Insert the installation DVD for SQL Server 2005 into the DVD drive.
2. Click Run SETUP.EXE. If Autoplay does not begin the installation, navigate to the SQL Server 2005 DVD, and double-click.
3. Click Install Server components, tools, Books Online, and Samples.
4. Accept the licensing terms and conditions, and click Next.
5. At the Installing Prerequisites screen, click Install.
6. After the required components are installed successfully, click Next.
7. At the Welcome screen, click Next.
8. After the System Configuration Check screen, click Next.
9. At the Registration Information screen, click Next.
10. At the Components to Install screen, click Advanced, and select SQL Server Database Services, Data Files, Replication, Full-Text Search, Shared Tools, Client Components, Connectivity Components, Management Tools, and Legacy Components. Click Next.
11. At the Instance Name screen, leave the default selection of Default instance, and click Next.
12. At the Service Account screen, select the Use the built-in System account radio button and click Next.

13. At the Authentication Mode screen, select Mixed Mode.
14. Enter and confirm a password for the system administrator account, and click Next.
15. At the Collation Settings screen, click Next.
16. At the Error and Usage Report Settings screen, click Next.
17. At the Ready to Install screen, click Install.
18. After installation completes, click Next.
19. Click Finish.
20. Download and install Microsoft SQL Server 2005 SP4.

Creating a blank database

1. Click Start→All Programs→Microsoft SQL Server 2005→SQL Server Management Studio.
2. Log into the default instance using the appropriate credentials.
3. Right-click Databases, and select New Database.
4. Enter `Testdb` for the database name.
5. Set the Initial Size of the data file to 20,480 MB, and the log file size to 8,192 MB.
6. Change the path of the data file by clicking ... , select E:\SQLData, and click OK. Repeat for the log file and select C:\SQLLog.
7. Click OK to begin the database creation.

Preparing the Benchmark Factory for Databases test clients

We prepared a Benchmark Factory client for each SQL Server instance in our environment. For the Dell PowerEdge R720, we set up eight client VMs on a system running Windows Server 2008 R2 SP1. For the HP ProLiant DL360 G4p, we set up one client VM on a system running Windows Server 2008 R2 SP1. We completed the following steps on each client VM.

Installing Windows Server 2008 R2 SP1

1. Capture the physical DVD drive in the virtual machine, and insert the installation DVD for Windows Server 2008 R2 SP1 Enterprise into the DVD drive.
2. Start the virtual machine.
3. At the Language Selection Screen, click Next.
4. Click Install Now.
5. Select Windows Server 2008 R2 Enterprise (Full Installation), and click Next.
6. Click the I accept the license terms checkbox, and click Next.
7. Click Custom.
8. Click Next.
9. At the User's password must be changed before logging on warning screen, click OK.
10. Enter the desired password for the administrator in both fields, and click the arrow to continue.
11. At the Your password has been changed screen, click OK.
12. Click Start, type `change power-saving settings` and press Enter.
13. Click Change plan settings.
14. Change the Turn off the display drop-down menu to Never.
15. Click Save changes, and close the Power Options, Screen Saver Settings, and Personalization screens.

Installing Client Connectivity Tools/SQL Server Management Studio

1. Insert the SQL Server 2008 R2 disk.
2. If prompted, click OK to enable the .NET Framework Core role.
3. In the left pane, click Installation.
4. Select New installation or add features to an existing installation.
5. On the Setup Support Rules screen, click OK.

6. On the Setup Support Files screen, click Install to install the setup support files.
7. At the Setup Support Rules screen, click Next.
8. On the Product Key screen, click Next.
9. At the License Terms screen, check to accept the license terms, and click Next.
10. On the Setup Role screen, click Next.
11. On the Feature Selection screen, check Management Tools - Basic, and click Next.
12. On the Installation Rules screen, click Next.
13. On the Disk Space Requirements screen, click Next.
14. On the Error Reporting screen, click Next.
15. On the Installation Configuration Rules screen, click Next.
16. On the Ready to Install screen, click Install.
17. On the Complete screen, click Close.
18. Download and install SQL Server 2008 R2 SP1.

Installing Benchmark Factory for Databases 6.7

1. Double-click the exe to start the installation.
2. At the Welcome to the Install Wizard screen, click Next.
3. At the License Agreement screen, select I accept the terms, and click Next.
4. At the Destination Folder screen, select Next.
5. At the Ready to Install the Program screen, click Install.
6. Click Finish to close the window.
7. Click Start→All Programs→Quest Software→Benchmark Factory for Databases (64-bit)→Benchmark Factory for Databases.
8. When the Benchmark Factory screen pops up, click Yes to create the tables.
9. When the Load Scenario Wizard screen pops up, click Next.
10. At the Select Load Scenario screen, select Industry standard benchmarks (TPC-C, TPC-E, TPC-H...), and click Next.
11. At the Select Benchmark screen, select TPC-E, and click Next.
12. At the Select Profile screen, click New.
13. At the Welcome screen, click Next.
14. At the Driver Selection screen, select Microsoft SQL Server (ODBC) from the drop-down menu, and click Next.
15. At the Connection Information screen, click Add DSN.
16. Select System Data Source, and click Next.
17. Select SQL Server Native Client 10.0, and click Next.
18. Click Finish.
19. Enter Test for the file data source, and click Next.
20. For Which SQL Server do you want to connect to? enter the name of the database server and click Next.
21. For How should SQL Server verify the authenticity of the login ID? select With SQL Server authentication using a login ID and password entered by the user, enter `sa` for the Login ID and `Password1` for the password, and click Next.
22. At the next screen, check the Change the default database to checkbox and select Testdb from the drop-down menu. Click Next.
23. Click Finish.
24. Click Test Data Source...
25. Click OK.
26. Click OK.
27. Click Next.
28. Select Test from the drop-down menu for the Data Source Name. Enter `sa` for the Login ID and `Password1` for the password, and click Next.

29. Enter Test for the Profile Name, and click Next.
30. Click Finish.
31. At the Select Profile screen, click Next.
32. At the Benchmark Scale screen, change Benchmark Scale to 2 and click Next.
33. At the Measurement Intervals screen, click Delete All to remove the default selected user loads, enter 100 under Add Single User Load, and click Add. Click Next.
34. At the Enter Script Name screen, select Create a new Benchmark Factory Script file, enter TPC-E, and click Next.
35. At the next screen, uncheck the box beside Do you want the job to be automatically submitted to the jobs Queue? and click Finish.
36. Right-click the newly created job, and click Copy.
37. Right-click TPC-E above the job, and click Paste. You should see identical copies of the newly created job. Rename the first to TPC-E Job – Create, and the second to TPC-E Job – Test
38. On TPC-E Job - Create, right-click TPC-E Transaction Mix, and click Remove. Click Yes to confirm.
39. On TPC-E Job – Test, right-click Create Objects for TPC-E, and click Remove. Click Yes to confirm.
40. Right-click TPC-E Job – Create, and click Submit Job.
41. Click Submit.

ABOUT PRINCIPLED TECHNOLOGIES



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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.

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