

LENOVO THINKSERVER TS430: SUPPORTING POINT-OF-SALE TRANSACTION WORKLOADS WITH ROOM TO SPARE



Lenovo® ThinkServer® TS430
performed up to

571

Point-of-sale
transactions per minute

in just one VM
and had plenty of capacity for more

powered by the Intel® Xeon® processor E3-1270



It's a business owner's worst nightmare: being unable to accept a customer's money due to inadequate server hardware. You need a highly reliable, powerful, and easily managed server that can support all of your point-of-sale transactions—even during the busiest times of the year.

To ensure good point-of-sale performance, you want a server that can handle heavy transaction workloads. You also want your server to have room for growth as your business expands. Desktop PCs running as servers just don't provide the performance capacity, reliability, and room to grow that your business needs, especially during peak retail periods.

We tested the performance of the Lenovo ThinkServer TS430 supporting the numbers of point-of-sale transactions that small, medium, and larger franchises might require in a virtualized environment. In addition, to make it realistic to a typical retail business scenario, we conducted these tests while simultaneously hosting other business applications in virtual machines (VMs).

The result? The Lenovo ThinkServer TS430 offered superb performance as we scaled the retail workload, supporting 571 transactions per minute with latency under one-tenth of a second. The proof is in the performance: The Lenovo ThinkServer TS430 can meet your point-of-sale transaction needs while having capacity to spare.



THE POWER TO HANDLE YOUR PEAK TRANSACTIONS

The ability of your server to handle large numbers of point-of-sale transactions makes a significant difference in how smoothly your business processes customer transactions.

In a retail environment, this ability lets your server support more cash registers, each handling more transactions (purchases, refunds, product lookups, sales price updates, or re-stocking updates). During even the busiest times of the year, the server powering your cash registers and inventory system continues working, free from any hiccups or downtime due to a server that cannot keep up.

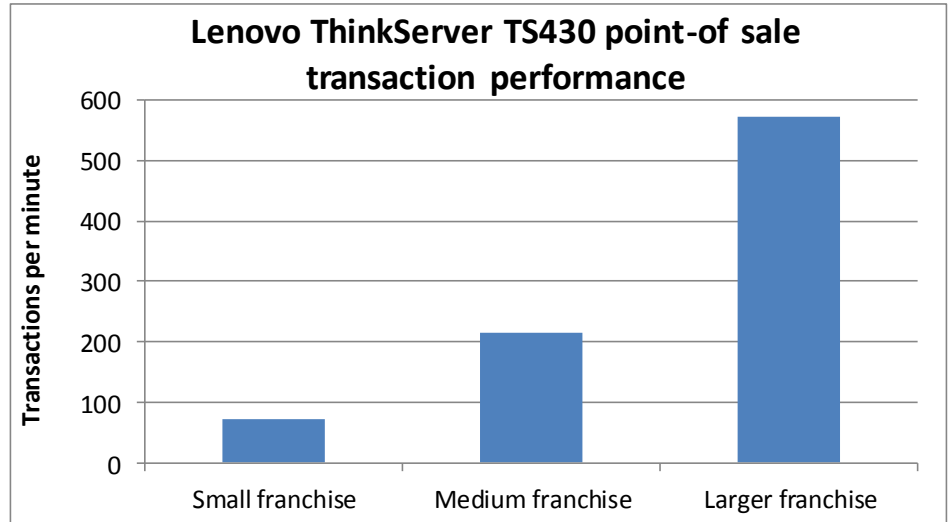
Choosing a real server solution to handle these point-of-sale transactions—while simultaneously hosting other business applications, such as email, file collaboration, or finance software—has considerable advantages. A server with sufficient performance capacity can handle your peak transactions, provide a consolidated hardware solution, and scale effortlessly from the needs of a single business location to those of a franchise serving multiple locations and many customers.

The Lenovo ThinkServer TS430 achieves this scaling with headroom to spare. You can use its additional headroom to support even more customer transactions as your business grows or you can run additional virtualized applications on VMs on the same server to better support the needs of your business in one or more locations.

Even during our stress test scenario that demonstrated the peak performance of the database VM, there was still 50 percent available processor headroom remaining. With the Intel Xeon processor E3-1270, this is ample processing power left over to handle any additional tasks, such as email, collaboration, or finance software running on the other VMs.

Figure 1 illustrates how well the server performed in three test scenarios. During the larger franchise scenario, which simulated 192 cash registers each running three transactions per minute, the Lenovo ThinkServer TS430 processed 571 transactions per minute with latency under that of one-tenth of a second. This means that each transaction occurred with no discernible hesitation and without interruption to the other VMs.

Figure 1: The Lenovo ThinkServer TS430 server excelled at supporting point-of-sale transactions.



ABOUT THE LENOVO THINKSERVER TS430

The Lenovo ThinkServer TS430 server provides businesses with the superior performance of the latest Intel Xeon processors, ample storage capacity of up to 16 TB, and 24/7 uptime reliability. It provides a combination of powerful manageability and hardware ideal for point-of-sale and retail environments. All this for an attractive price point that's great for tight budgets.

Performance and storage capacity. The Intel Xeon processor E3-1200 family that powers the ThinkServer TS430 provides a performance improvement of up to 30 percent over previous-generation Intel processors. Features such as Turbo Boost 2.0 further boost processor performance when you need it most. A storage capacity of 16TB SATA or 4.8TB SAS and eight hot-swap drives provides you with plenty of room to grow.

Reliability. Optional redundant power supplies and a selection of RAID adapters keep you protected from data loss.

Power efficiency and quiet operation. Intel Xeon E3-1200 family processors, rated at only 80 watts, are more energy efficient than previous generations. The ThinkServer TS430 is also certified with Energy Star 1.0, and Climate Savers. Because Lenovo designed the ThinkServer TS430 to perform at "whisper-quiet" noise levels, you can use your TS430 in a front office without introducing an unacceptable level of noise.

Ease of use. ThinkServer EasyStartup is a convenient software solution that enables you to easily install, maintain, and manage your ThinkServer TS430. Its intuitive design makes it suitable for businesses with minimal IT staff. Lenovo ThinkPlus® Productivity and ThinkPlus Priority Support further assist you in

installation and IT support, and the ThinkServer Management Module (an IPMI 2.0-based management subsystem with the ability to integrate into your existing management environments) makes remote management easy.

For detailed information about the Lenovo ThinkServer TS430, visit the [Lenovo server site at Lenovo.com](#). For details on the specific configuration we tested, see [Appendix A](#).

TESTING OVERVIEW

We set up a single Lenovo ThinkServer TS430 with an Intel Xeon E3-1270 processor running Microsoft® Windows Server® 2008 R2 Service Pack 1. We used Microsoft Hyper-V™ to host the virtual machines. We set up four virtual machines on the server, as a business is likely to do, to show that the ThinkServer TS430 can not only handle numerous point-of-sale transactions, but can also carry out day-to-day business functions at the same time. The remaining VMs ran the following applications: Microsoft Exchange Server 2010, Microsoft Dynamics GP, and Microsoft SharePoint Server 2010.

We ran three virtualized online transaction processing (OLTP) database scenarios common to small, medium, and larger franchise businesses. We assumed that each register should process three transactions per minute (though in reality, most transactions would take longer), and used this to determine how many transactions per minute the server should theoretically be able to complete in each scenario. We tested the following sample scenarios:

- **Small franchise scenario.** Four locations, each with six registers; maximum of 72 transactions per minute.
- **Medium franchise scenario.** Eight locations, each with nine registers; maximum of 216 transactions per minute.
- **Larger franchise scenario.** Sixteen locations, each with 12 registers; maximum of 576 transactions per minute.

Because the Lenovo ThinkServer TS430 was able to handle every scenario with strong performance at 99 percent of the theoretical maximum transactions per minute on all three scenarios and with headroom to spare, we also created a fourth test scenario. In this “stress-test” scenario, we configured the Benchmark Factory® workload to complete as many transactions per minute as the VM could handle, regardless of latency. While this scenario does not reflect a likely real-world scenario, it does show the considerable performance capabilities of the Lenovo ThinkServer TS430 and the remaining headroom you’re likely to have with it. For more details about the transactions and our workload, see [Appendix B](#), and for our step-by-step test methodology, see [Appendix D](#).

WHAT WE FOUND

Figure 2 shows that the Lenovo ThinkServer TS430 could complete the expected number transactions per minute for each size franchise, with latency under one-tenth of a second. The ThinkServer TS430 could support all of those point-of-sale transactions while running other business applications (email, file collaboration, and finance) in other VMs, and still maintain plenty of headroom to spare for future business growth. See [Appendix C](#) for more detailed utilization results.

Lenovo ThinkServer TS430	Number of cash registers simulated	Total transactions per minute	Average latency (seconds)
Small franchise scenario	24	71.4	0.072
Medium franchise scenario	72	214.2	0.077
Larger franchise scenario	192	571.2	0.085

Figure 2: Transactions per minute and latency for those transactions, for various sized businesses.

Figure 3 shows what happened when we put the Lenovo ThinkServer TS430 through our stress test. We assigned four virtual processors to the database VM, approximately half of the total logical processors available to the host server. Even under this extreme workload, 50 percent of the processor capacity was unused and remained to perform other tasks on other VMs. Additionally, despite completing 6,927.6 transactions per minute, the average latency remained less than 1 second.

Lenovo ThinkServer TS430	Average percentage CPU utilization of the VM	Average percentage CPU utilization of the host (total)	Total transactions per minute	Average latency (seconds)
Stress-test workload	91.49	48.69	6,927.6	0.831

Figure 3: Stress test median CPU utilization and results.

Figure 4 shows the remaining memory and disk capacity for the Lenovo ThinkServer TS430 configured with Hyper-V and four VMs. The database VM was configured with 4 GB of memory, the other three VMs were configured with 2 GB of memory each, and the host utilized approximately 2 GB of memory also. This would leave 4 GB of additional memory for a new VM or to allocate more memory to an existing VM as your business needs grow. Additionally, our internal storage volume had an additional 256 GB of space left over for backing up or adding new VMs.

Lenovo ThinkServer TS430	
Memory	
Used/configured	12 GB
Total	16 GB
Percentage of available memory	25.0%
Disk	
Used/configured	580 GB
Total	836 GB
Percentage of available space	30.6%

Figure 4: Remaining resource availability.

As Figures 3 and 4 show, the ThinkServer TS430 has plenty of resources to handle your point-of-sale-transactions on one VM and your other business applications on other VMs, all with room to grow.

SUMMARY

Whether your business is a single retail location or a franchise spanning multiple locations, the Lenovo ThinkServer TS430 can provide you with a powerful server solution—one capable of handling your peak point-of-sale transactions and scaling with your growing business.

In our tests, the Lenovo ThinkServer TS430 easily handled 571 transactions per minute for a larger franchise, with latency of less than one-tenth of a second. It accomplished this while having processor, memory, and disk capacity to spare for future growth.

APPENDIX A – DETAILED SYSTEM SPECIFICATIONS

Figure 5 presents detailed information for the ThinkServer TS430.

System	Lenovo ThinkServer TS430
Power supplies	
Total number	1
Vendor and model number	Delta Electronics GPS-400CB-B
Wattage of each (W)	385
Cooling fans	
Total number	2
Vendor and model number	AVC DS0922R12HP235
Dimensions (h x w) of each	3.5 x 3.5
Volts	12
Amps	0.41
General	
Number of processor packages	1
Number of cores per processor	4
Number of hardware threads per core	2
System power management policy	Balanced
CPU	
Vendor	Intel
Model number	Xeon E3-1270
Stepping	D2
Socket type	1155 LGA
Core frequency (GHz)	3.40
Bus frequency (GT/s)	5.0
L1 cache	32 KB + 32 KB (per core)
L2 cache	256 KB (per core)
L3 cache	8 MB (shared)
Platform	
Vendor and model number	Lenovo ThinkServer TS430
Motherboard model number	GA-6UASV2
Motherboard chipset	Intel ID0108
BIOS name and version	American Megatrend Inc. 2.0 (09/01/2011)
BIOS settings	Default
Memory module(s)	
Total RAM in system (GB)	16
Vendor and model number	Hynix HMT351U7BFR8C-H9
Type	PC3-10600R
Speed (MHz)	1,333
Speed running in the system (MHz)	1,333
Timing/Latency (tCL-tRCD-tRP-tRASmin)	9-9-9-24
Size (GB)	16
Number of RAM module(s)	4

System	Lenovo ThinkServer TS430
Chip organization	Double-sided
Rank	Dual
Hard disk	
Vendor and model number	Seagate ST3300657SS
Number of disks in system	8
Size (GB)	300
Buffer size (MB)	16
RPM	15,000
Type	SAS
Disk Controller	
Vendor and model	LSI™ MegaRAID® SAS 9240-8i
Controller cache	N/A
Controller driver	LSI Corp. 4.277.164 (6/11/2010)
Controller firmware	2.90.34-0978
RAID configuration	RAID 1 for OS, RAID 10 for VM data volumes
Operating system	
Name	Windows Server 2008 R2 Enterprise 64-bit
Build number	7601
Service pack	SP1
File system	NTFS
Kernel	ACPI x64-based PC
Language	English
Ethernet #1	
Vendor and model number	Intel 82579LM Gigabit Ethernet Adapter
Type	Integrated
Driver	Intel 11.8.74.0 (9/21/2010)
Ethernet #2	
Vendor and model number	Intel 82574L Gigabit Ethernet Adapter
Type	Integrated
Driver	Intel 11.7.32.0 (8/5/2010)
Optical drive(s)	
Vendor and model number	TSSTcorp TS-H353C
Type	SATA
USB ports	
Number	6
Type	2.0

Figure 5: Configuration information for the test server.

APPENDIX B – DETAILED WORKLOAD

Transaction details

Each transaction represents a complete customer-employee interaction. The 20 seconds between each transaction takes into account the user-generated latency for the employee and customer to interact with the point-of-sale interface. For example, a single purchase transaction in our workload involves scanning four items, processing total cost and tax, and processing payment.

Our workload also includes transactions that simulate refunds, product lookups (either a direct title or a keyword search), purchase record lookups, price checks, adding a new customer to the customer base, updating prices for a sale, or restocking the inventory. The workload is weighted so that purchases, refunds, and product lookups make up the majority of the transactions, followed by new customer entries and purchase record lookups. Finally, updates to product group price and store inventory are weighted to occur in limited instances during each run.

Setting up the sample workload database

We used SQL Server Management Studio, an integrated management environment that Microsoft includes with SQL Server, to design and implement our customer and order databases. The database had 11 tables, seven stored procedures, and was approximately 2GB in size. We used published best practices in our database design and normalized our data design to a reasonable extent. We used SQL Data Generator to load data and Benchmark Factory to drive the workload. We provide details on the full setup below.

Generating the database sample data

We used SQL Data Generator to create the data for the database tables that we created with SQL Server Management Studio. We used the SQL Data Generator tool for the following tasks:

- Specifying the number of rows in each table, either by exact count, or proportional to other tables
- Creating data using generators. SQL Data Generator includes built-in regular expression functionality, in other words, the ability to generate pseudo-random data to match specifically formatted strings such as name data, address data, email address data, and phone numbers. We used this functionality where possible.
- Where logical, changing the generators for certain columns, such as assigning dates within certain minimum and maximum bounds, and creating custom regular expression patterns (like the randomized name or address data mentioned above) for others.
- For longer text storage, substituting a longer English source text so that indexed searches of those fields would be more realistic.
- Running a pre-load and post-load custom SQL action. We used this feature to force some dependencies among databases, tables, and fields.

About Benchmark Factory

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.

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

Configuring Benchmark Factory for workload operation

We used the Benchmark Factory configuration editor to model typical operations on the customer and order databases. We imported stored procedures from our database design to incur activity against both the customer and order databases. We assigned a weight to each stored procedure so that the ratio of procedures performing read-like operations to those performing write-like operations approximated that of a typical customer-center application. Our goal was to achieve approximately a 75 percent write and 25 percent read ratio for each database, as this general pattern of I/O activity is reasonable for a retail scenario.

We defined parameters to pass to each procedure that Benchmark Factory generated from numerical values or passed from a randomized predefined file. To simulate each of our scenarios, we kept a think time for the transactions at 10 seconds and used 12 virtual Benchmark Factory users for the small scenario (for 72 transactions per minute), 36 virtual Benchmark Factory users for the medium scenario (for 216 transactions per minute), and 96 virtual Benchmark Factory users for the large scenario (for 576 transactions per minute).

To perform the stress test, we kept think time for the transactions at zero and assigned the user count to 96 virtual Benchmark Factory users. This provided suitable system stress in a compressed testing time window. We ran each simulation for 30 minutes, as each environment reached steady state within that time period. We ran this simulation three times on each configuration and collected data for this report, reporting the median outputs.

APPENDIX C – DETAILED TEST RESULTS

Figures 6 and 7 show detailed results from each of our test scenarios.

Lenovo ThinkServer TS430	Percentage VM CPU utilization	Percentage VM RAM utilization	Percentage VM disk utilization	Transactions per minute	Latency (seconds)
Small franchise					
Run 1	10.21	24.04	1.95	71.4	0.072
Run 2	13.41	23.88	1.82	71.4	0.069
Run 3	9.64	24.10	1.91	71.4	0.072
Median run	10.21	24.04	1.95	71.4	0.072
Medium franchise					
Run 1	11.08	28.43	3.85	214.2	0.077
Run 2	9.58	28.55	3.52	214.2	0.071
Run 3	12.01	28.41	3.46	214.2	0.072
Median run	11.08	28.43	3.85	214.2	0.077
Large franchise					
Run 1	14.96	32.58	6.39	571.2	0.085
Run 2	13.46	32.67	6.41	571.2	0.082
Run 3	15.07	32.74	6.86	571.2	0.082
Median run	14.96	32.58	6.39	571.2	0.085

Figure 6: Detailed performance results. Lower resource utilization and latency are better, while higher transactions per second or minute are better.

	Percentage host CPU utilization	Percentage host RAM utilization	Percentage host disk utilization	Percentage VM CPU utilization	Percentage VM RAM utilization	Percentage VM disk utilization	Transactions per minute (TPM)	Latency (seconds)
Stress-test workload								
Run 1	48.69	71.37	20.63	91.49	40.18	15.27	6,927.6	0.831
Run 2	49.04	71.33	20.75	91.96	40.07	15.04	6,876.6	0.837
Run 3	48.45	71.28	21.58	91.6	39.99	15.56	6,931.2	0.831
Median run	48.69	71.37	20.63	91.49	40.18	15.27	6,927.6	0.831

Figure 7: Detailed performance results for the stress test workload. Lower resource utilization and latency are better, while higher transactions per second or minute are better.

APPENDIX D – DETAILED METHODOLOGY

Setting up and configuring an Active Directory machine

We configured a client machine as an Active Directory® server.

Installing Windows Server 2008 R2 SP1

1. Insert the installation DVD for Windows Server 2008 R2 into the DVD drive.
2. Choose the language, time and currency, and keyboard input. Click Next.
3. Click Install Now.
4. Choose Windows Server Standard (Full Installation), and click Next.
5. Accept the license terms, and click Next.
6. Click Custom.
7. Click the Disk, and click Drive options (advanced).
8. Click New→Apply→Format, and click Next.
9. After the installation completes, click OK to set the Administrator password.
10. Enter the administrator password twice, and click OK.
11. Click Start, type `change power-saving settings` and press Enter.
12. Click Change plan settings.
13. Change the Turn off the display drop-down selection to Never.
14. Click Save changes, and close the Power Options, Screen Saver Settings, and Personalization windows.
15. Run automatic updates. We applied the following updates to our test bed:
 - Update for Windows Server 2008 R2 x64 Edition (KB2607576)
 - Update for Windows Server 2008 R2 x64 Edition (KB2515325)
 - Update for Windows Server 2008 R2 x64 Edition (KB2505438)
 - Update for Windows Server 2008 R2 x64 Edition (KB2492386)
 - Update for Windows Server 2008 R2 x64 Edition (KB2506928)
 - Update for Windows Server 2008 R2 x64 Edition (KB2529073)
 - Update for Windows Server 2008 R2 x64 Edition (KB982018)
 - Update for Windows Server 2008 R2 x64 Edition (KB2522422)
 - Update for Windows Server 2008 R2 x64 Edition (KB2570791)
 - Security Update for Windows Server 2008 R2 x64 Edition (KB2503665)
 - Security Update for Windows Server 2008 R2 x64 Edition (KB2570947)
 - Security Update for Windows Server 2008 R2 x64 Edition (KB2617657)
 - Security Update for Windows Server 2008 R2 x64 Edition (KB2425227)
 - Cumulative Security Update for Internet Explorer 8 for Windows Server 2008 R2 x64 Edition (KB2586448)
 - Security Update for Windows Server 2008 R2 x64 Edition (KB2511455)
 - Update for Windows Server 2008 R2 x64 Edition (KB2603229)
 - Update for Windows Server 2008 R2 x64 Edition (KB2563227)
 - Security Update for Internet Explorer 8 for Windows Server 2008 R2 x64 Edition (KB2544521)
 - Update for Windows Server 2008 R2 x64 Edition (KB2511250)
 - Security Update for Windows Server 2008 R2 x64 Edition (KB2536275)
 - Update for Windows Server 2008 R2 x64 Edition (KB2506014)
 - Update for Internet Explorer 8 Compatibility View List for Windows Server 2008 R2 x64 Edition (KB2598845)
 - Security Update for Windows Server 2008 R2 x64 Edition (KB2556532)
 - Update for Windows Server 2008 R2 x64 Edition (KB2488113)
 - Security Update for Windows Server 2008 R2 x64 Edition (KB2560656)

- Security Update for Microsoft .NET Framework 3.5.1 on Windows 7 and Windows Server 2008 R2 SP1 for x64-based Systems (KB2539635)
- Update for Windows Server 2008 R2 x64 Edition (KB2547666)
- Cumulative Security Update for ActiveX Killbits for Windows Server 2008 R2 x64 Edition (KB2508272)
- Security Update for Windows Server 2008 R2 x64 Edition (KB2507618)
- Security Update for Windows Server 2008 R2 x64 Edition (KB2510531)
- Security Update for Windows Server 2008 R2 x64 Edition (KB2544893)
- Update Rollup for ActiveX Killbits for Windows Server 2008 R2 x64 Edition (KB2562937)
- Update for Windows Server 2008 R2 x64 Edition (KB2533552)
- Security Update for Windows Server 2008 R2 x64 Edition (KB2588516)
- Security Update for .NET Framework 3.5.1 on Windows 7 and Windows Server 2008 R2 SP1 for x64-based Systems (KB2518869)
- Update for Windows Server 2008 R2 x64 Edition (KB2484033)
- Security Update for Windows Server 2008 R2 x64 Edition (KB2509553)
- Security Update for Microsoft .NET Framework 3.5.1 on Windows 7 and Windows Server 2008 R2 SP1 for x64-based Systems (KB2572077)
- Security Update for Windows Server 2008 R2 x64 Edition (KB2536276)
- Security Update for Windows Server 2008 R2 x64 Edition (KB2506212)
- Update for Windows Server 2008 R2 x64 Edition (KB2641690)
- Update for Windows Server 2008 R2 x64 Edition (KB2552343)
- Security Update for Windows Server 2008 R2 x64 Edition (KB2567680)
- Security Update for Windows Server 2008 R2 x64 Edition (KB2564958)
- Security Update for Windows Server 2008 R2 x64 Edition (KB2620704)
- Update for Windows Server 2008 R2 x64 Edition (KB2541014)
- Windows Malicious Software Removal Tool x64 - November 2011 (KB890830)
- Update for Windows Server 2008 R2 x64 Edition (KB2545698)

Configuring TCP/IP and computer name on the Active Directory server

1. After the initial installation, the Initial Configuration Tasks window appears. Click Configure networking.
2. In Network Connections, right-click Local Area Connection, and click Properties.
3. Click Internet Protocol Version 4 (TCP/IPv4), and click Properties.
4. Select Use the following IP address, and enter an appropriate IP address, subnet mask, and Preferred DNS.
5. Close the Network Connections window.
6. In Initial Configuration Tasks, click Provide computer name and domain.
7. In System Properties, click Change. In Computer name, type the name of the domain controller machine, click OK twice, and click Close. When you are prompted to restart the computer, click Restart Now.
8. After restarting, log in using the local administrator account.
9. In Initial Configuration Tasks, click Do not show this window at logon, and click Close.

Configuring the Active Directory server as a domain controller and DNS server

1. In the console tree of Server Manager, click Roles. In the Details pane, click Add Roles, and click Next.
2. On the Select Server Roles page, click Active Directory Domain Services, click Add Required Features, click Next twice, and click Install. When installation is complete, click Close.
3. To start the Active Directory Installation Wizard, click Start, type `dcpromo` and press Enter.
4. In the Active Directory Installation Wizard dialog box, click Next twice.
5. On the Choose a Deployment Configuration page, click Create a new domain in a new forest, and click Next.
6. On the Name the Forest Root Domain page, type the desired domain name, and click Next.
7. On the Set Forest Functional Level page, in Forest Functional Level, click Windows Server 2008 R2, and click Next.

8. On the Additional Domain Controller Options page, click Next, click Yes to continue, and click Next.
9. On the Directory Services Restore Mode Administrator Password page, type a strong password twice, and click Next.
10. On the Summary page, click Next.
11. Wait while the wizard completes the configuration of Active Directory and DNS services, and click Finish.
12. When the wizard prompts you to restart the computer, click Restart Now.
13. After the computer restarts, log into the domain using the Administrator account.

Preparing the ThinkServer TS430

Installing Windows Server 2008 R2 SP1

1. Insert the installation DVD for Windows Server 2008 R2 into the DVD drive.
2. Choose the language, time and currency, and keyboard input. Click Next.
3. Click Install Now.
4. Choose Windows Server 2008 R2 Enterprise (Full Installation), and click Next.
5. Accept the license terms, and click Next.
6. Click Custom.
7. Click the Disk, and click Drive options (advanced).
8. Click New→Apply→Format, and click Next.
9. After the installation completes, click OK to set the administrator password.
10. Enter the administrator password twice, and click OK.
11. Click Start, type `change power-saving settings` and press Enter.
12. Click Change plan settings.
13. Change the Turn off the display drop-down selection to Never.
14. Click Save changes, and close the Power Options, Screen Saver Settings, and Personalization windows.

Disabling Internet Explorer Enhanced Security Configuration (IE ESC)

1. Start the Server Manager, and click Configure IE ESC.
2. On the Internet Explorer Enhanced Security Configuration screen, select the Off radio buttons for administrators and users, and click OK.

Disabling the firewall

1. Start the Server Manager, scroll down to Security Information, and select Go to Windows Firewall.
2. Select Windows Firewall Properties.
3. At the Windows Firewall and Advanced Security Properties, select the domain profile, change the firewall state to off (this is for the private profile and public profile), and click OK.

Enabling remote access

1. Click Start, select My computer, right-click, and select Properties.
2. Select Remote Settings.
3. Select the Remote tab, select Allow connections from computers using any version of remote desktop, and click OK.

Enabling the Hyper-V role in Windows Server 2008 R2

1. Click Start→Administrative Tools→Server Manager.
2. Click Roles.
3. Click Add Roles, and click Next.
4. Select the Hyper-V role by checking the box beside it, and click Next.
5. Check the box beside the Ethernet Card you wish to use for client/server traffic, and click Next.
6. Click Install to begin the Hyper-V installation.
7. When the installation finishes, click Close.
8. When the installer prompts you to restart now, click Yes.

9. Follow the prompt to log onto the system.
10. Enter the password, and click the arrow to continue. The Resuming Configuration Wizard should start automatically.
11. Once the Resuming Configuration Wizard completes, the installation results should appear with a message that the installation succeeded.
12. Click Close.

Creating the virtual disks for the VMs

1. Click Start.
2. Expand Administrative Tools, and click Hyper-V Manager.
3. From the Action menu, select New→Virtual Hard Disk.
4. On the Before you begin screen, click Next.
5. On the Choose Disk Type screen, select Fixed Size, and click Next.
6. On the Specify Name and Location screen, place the VHD on the D: drive, select VM1 as the Name, and click Next.
7. On the Configure Disk screen, select Create a new blank virtual hard disk, assign 70 GB for the size, and click Next.
8. On the Completing the New Virtual Hard Disk Wizard, click Finish.
9. Repeat steps 1-8 three more times.

Creating the additional virtual disks

1. In the Hyper-V Manager, select New→Virtual Hard Disk.
2. On the Before you begin screen, click Next.
3. On the Choose Disk Type screen, select Fixed Size, and click Next.
4. On the Specify Name and Location screen, place the VHD on the D: drive, select a Name, and click Next.
5. On the Configure Disk screen, select Create a new blank virtual hard disk, assign 100GB for the size, and click Next.
6. On the Completing the New Virtual Hard Disk Wizard screen, click Finish.
7. Repeat steps 1 through 6 twice, for the additional data drives for VMs 2 and 3.

Creating the virtual machines in Hyper-V

1. On the Hyper-V Manager, select New→Virtual Machine.
2. On the Before You Begin screen, select Next.
3. On the Specify Name and Location screen, enter VM1, and click Next.
4. On the Assign Memory screen, select 4096, and click Next.
5. On the Configure Network screen, select Local Area Connection – Virtual Network, and click Next.
6. On the Connect Virtual Hard Disk screen, select Use an existing virtual hard disk, and select the location of the 70 GB blank hard disk.
7. On the Install options screen, select Install an operating system later.
8. On the Summary screen, click Finish.
9. In the Hyper-V Manager, right-click VM1, and select Settings.
10. In the Settings for VM1, select the Memory tab to verify it is set to 4 GB.
11. Select the Processor tab, and verify it is set to 4 VCPU, and click OK.
12. Click the virtual IDE controller 0.
13. Click the SCSI Controller.
14. Click Add, and click Hard Drive.
15. Browse to the 100GB VHD you created, and choose that VHD for the guest SQL Server log VHD.
16. Click Apply.
17. Repeat steps 1-16 three times for the remaining VMs, but only assigning 2GB memory and 1 virtual CPU. The fourth VM does not require step 15.

Installing the VM operating system

1. Insert the installation DVD for Windows Server 2008 R2 into the DVD drive.
2. In Hyper-V Manager, right-click the virtual machine, and choose Connect.
3. On the media menu, choose DVD Drive→Capture D:.
4. On the Action menu, choose Start.
5. At the Language Selection Screen, click Next.
6. Click Install Now.
7. Select Windows Server 2008 R2 Standard (Full Installation), and click Next.
8. Click the I accept the license terms check box, and click Next.
9. Click Custom.
10. Click Drive options (advanced).
11. Ensure you select the proper drive, and click New.
12. Click Apply.
13. Click Next.
14. At the User's password must be changed before logging on warning screen, click OK.
15. Type Password1 as the new password in both fields, and click the arrow to continue.
16. At the Your password has been changed screen, click OK.
17. Repeat steps 1-16 for the three remaining VMs

Setting up network configuration on the VMs

1. Click Start→Control Panel→Network and Internet→Network Connections, and double-click the Local Area Connection assigned to client/server network traffic.
2. Select Internet Protocol Version 4 (TCP/IPv4), and click Properties.
3. At the Internet Protocol Version 4 (TCP/IPv4) Properties screen, select the radio button beside Use the following IP address.
4. Enter a valid static IP address, subnet mask, and default gateway.
5. Click OK, and click Close to exit.
6. Repeat steps 1 through 5 for the remaining VMs.

Attaching the additional virtual disks

1. In the Hyper-V Manager, right-click VM1, and click Settings.
2. On the settings for VM1 screen, select IDE Controller 0, and click Add hard drive.
3. Select the 100 GB VHD for the SQL Server Data, click OK, and click Apply.
4. Repeat steps 1 through 3 twice for VM2 and VM3.

Configuring VM 1

Installing SQL Server 2008 R2

1. Insert the installation DVD for SQL Server 2008 R2 into the DVD drive.
2. Click Run SETUP.EXE. If Autoplay does not begin the installation, navigate to the SQL Server 2008 R2 DVD, and double-click.
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 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. You may see a Computer domain controller warning and a Windows Firewall warning. For now, ignore these.

11. At the Setup Role screen, choose SQL Server Feature Installation.
12. At the Feature Selection screen, select Database Engine Services, Full-Text 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 when 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 AUTHORITY\SYSTEM for SQL Server Agent, and choose NT AUTHORITY\SYSTEM 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 Next.
25. Click Close.
26. Place the DVD Store backup file you prepared in the default location for SQL Server: C:\Program Files\Microsoft SQL Server\MSSQL10.MSSQLSERVER\MSSQL\Backup.
27. Click Start→All Programs→Microsoft SQL Server 2008 R2→Configuration Tools, and click SQL Server Configuration Manager.
28. Expand SQL Server Network Configuration, and click Protocols for MSSQLSERVER.
29. Right-click TCP/IP, and select Enable.

Preparing the Benchmark Factory client

We completed the following steps on a separate desktop client.

Installing Windows Server 2008 R2 SP1

1. Insert the installation DVD for Windows Server 2008 R2 SP1 Enterprise into the DVD 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 check box, and click Next.
6. Click Custom.
7. Click Next.
8. At the User's password must be changed before logging on warning screen, click OK.
9. Enter the desired password for the administrator in both fields, and click the arrow to continue.
10. At the Your password has been changed screen, click OK.
11. Click Start, type `change power-saving settings` and press Enter.
12. Click Change plan settings.
13. Change the Turn off the display drop-down menu to Never.
14. Click Save changes, and close the Power Options, Screen Saver Settings, and Personalization windows.

Installing Client Connectivity Tools/SQL Server Management Studio

1. Insert the SQL Server 2008 disk.
2. Select New SQL Server Stand-alone installation or Add features to existing installation.
3. On the Setup Support Rules screen, click OK.
4. On the Setup Support Files screen, click Next.
5. On the Installation Type screen, click Next.

6. On the Product Key screen, click Next.
7. At the License agreements screen, click Next.
8. On the Feature selection screen, check Management Tools Basic, and click Next.
9. On the Error and Usage Reporting screen, click Next.
10. On the Installation Rules screen, click Next.
11. On the Ready to Install screen, click Install.
12. On the Complete screen, click Close.

Installing SQL Data Generator

1. Download the SQL Toolbelt file.
2. Once the file has finished downloading, double-click the SQL Toolbelt.exe file.
3. In the Selecting the Tools to install box, uncheck all of the boxes, and click Next.
4. On the new page, uncheck everything **except** SQL Data Generator 1.2, and click Next.
5. Uncheck all of the boxes, and click Next.
6. Check the I accept the terms in the license agreement box, and click Next.
7. Install the program into the default location.
8. When the program is finished installing, click Close.

Installing Benchmark Factory 6.6.1

1. Double-click the exe to start the installation.
2. At the Welcome to the installer screen, click Next.
3. At the License Agreement, select I accept the terms, and click Next.
4. On the Destination Screen, select Next.
5. On the Ready to install program screen, select Yes install the default repository database, and click Install.

Configuring VM 2

Installing SharePoint Server 2010

1. Insert the installation DVD, and capture the DVD drive in the VM session.
2. Launch setup.exe, and click Install software prerequisites.
3. At the Welcome to the Microsoft SharePoint 2010 Products Preparation Tool screen, click Next.
4. Accept the EULA, and click Next.
5. When the prerequisites finish installing, click Finish.
6. On the main SharePoint installation menu, click Install SharePoint Server.
7. Enter your product license key, and click Continue.
8. Accept the EULA, and click Continue.
9. Choose the Stand-Alone server type, and click Install.
10. When the installation finishes, check the box for Run the SharePoint Products Configuration Wizard now, and click Close.
11. On the Welcome to SharePoint Products screen, click Next.
12. On the pop-up warning about services that will need to be restarted during the configuration, click Yes.
13. When the wizard has completed the configuration, click Finish.

Configuring VM 3

Setting up prerequisites to Exchange Server 2010

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, and Dynamic content Compression checkboxes, and click Next.
9. At the Confirm Installation Selections screen, click Install.
10. At the Installation Results screen, click Close.
11. Select Start→Administrative Tools→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 when installation is complete.
26. Click Start→Administrative Tools→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.
29. Open a command prompt, type `ServerManagerCmd -i RSAT-ADDS` and press Enter.
30. Reboot the server.

Setting up Exchange Server 2010

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 Yes, 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. If a warning about a lack of SMTP appears after the check finishes, ignore it for now. We address this issue in steps 17-26 below.
14. Click Install to start the installation process.
15. When the installation has completed, click Finish. Exchange should automatically open the Exchange Management Console.

16. If Exchange does not automatically open the Exchange Management Console, click Start→All Programs→Microsoft Exchange Server 2010→Exchange Management Console.
17. In the left pane, expand Microsoft Exchange On-Premises, expand Organization Configuration, and select Hub Transport.
18. In the Actions pane on the far right, select New Send Connector.
19. Name the send connector SMTP, select the intended use as Internet, and click Next.
20. In the Address space window, click Add.
21. In the SMTP Address Space window, type * as the address, ensure that the installer has checked Include all subdomains, and click OK.
22. Click Next.
23. On the Network settings page, select Use domain name system (DNS) "MX" records to route mail automatically, and click Next.
24. Accept the defaults in the Source Server window, and click Next.
25. At the New Connector page, click New to create the connector.
26. Click Finish to close the New SMTP Send Connector wizard.

Configuring VM 4

Installing SQL Server 2008 R2

1. Insert the installation DVD for SQL Server 2008 R2 into the DVD drive.
2. Click Run SETUP.EXE. If Autoplay does not begin the installation, navigate to the SQL Server 2008 R2 DVD, and double-click.
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 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 radio button beside Enter the product key, 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. You may see a Computer domain controller warning and a Windows Firewall warning. For now, ignore these.
11. At the Setup Role screen, choose SQL Server Feature Installation.
12. At the Feature Selection screen, select Database Engine Services, Full-Text 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 AUTHORITY\SYSTEM for SQL Server Agent, and choose NT AUTHORITY\SYSTEM 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 Next.

25. Click Close.
26. Place the DVD Store backup file you prepared in the default location for SQL Server: C:\Program Files\Microsoft SQL Server\MSSQL10.MSSQLSERVER\MSSQL\Backup.
27. Click Start→All Programs→Microsoft SQL Server 2008 R2→Configuration Tools, and click SQL Server Configuration Manager.
28. Expand SQL Server Network Configuration, and click Protocols for MSSQLSERVER.
29. Right-click TCP/IP, and select Enable.

Installing Microsoft Dynamics GP

1. Log into Windows as a user with system administrator privileges.
2. Double-click the Setup.exe file to open the Microsoft Dynamics GP installation window from the Microsoft Dynamics GP2010 installation media.
3. If one or more of the following components isn't installed, the Microsoft Dynamics GP 2010 Bootstrapper Setup window opens to install the missing component or components.
 - Microsoft Windows Installer 4.5
 - Microsoft .NET Framework 3.5 SP1
 - Microsoft SQL Server Native Client 10.0
 - Dexterity Shared Components 11.0
 - Microsoft Application Error Reporting 11.0
 - Open XML SDK 2.0 for Microsoft Office
 - Microsoft Lync 2010 SDK Runtime
4. Click Microsoft Dynamics GP.
5. Select the Create new instance option, enter a name for the new instance, and click Next.
6. Select United States in the Country/Region Selection window, and click Next.
7. Accept the software license agreement, and click Next.
8. Select the features in the Select Features window, and click Next.
9. Accept the default installation folder, and click Next.
10. To set up an ODBC data source, enter the name you assigned to the SQL Server when you installed Microsoft SQL Server, and click Next.
11. In the Install Program window, click Install.
12. In the Installation Complete window, click Exit.
13. Before you start Microsoft Dynamics GP Utilities, check for and install the current service pack for Microsoft Dynamics GP 2010.

Setting up Microsoft Dynamics GP 2010 using Microsoft Dynamics GP Utilities

1. Start Microsoft Dynamics GP Utilities (Start→Programs→Microsoft Dynamics→GP 2010→GP Utilities).
2. Verify your server name, enter a system administrator user ID and password in the Welcome to Microsoft Dynamics GP Utilities window, and click OK.
3. The Additional Tasks window opens. In the Additional Tasks window, you can choose to do the following:
 - add sample data
 - create a company
 - remove SOP message and Invoicing message
 - update modified forms and reports
 - synchronize forms and reports dictionaries
 - start Microsoft Dynamics GP
 - end the installation
4. If you select a task, click Process; otherwise, click Exit.

Creating a company

1. Select the Create a company option in the Additional Tasks window, and click Process.
2. In the Create Company window, enter a company ID and name, and select Additional options.
3. Click Next.

4. In the Database Setup window, select a default location for new files that will be created.
5. The Confirmation window appears. Confirm your selections. If the selections are correct, click Finish.
6. The Server Installation Progress window appears, showing progress as tables loaded.
7. In the Business Intelligence Reports Setup window, select the business intelligence components to deploy. Click Next. The window that opens depends on the components selected.
8. Leave the components unmarked, and click Next. The Company Setup Options window appears, where you can do one of the following:
 9. select to use a wizard to migrate data from QuickBooks or Peachtree
 10. use a wizard to enter basic configuration options
 11. configure the company later using the Setup Checklist window in Microsoft Dynamics GP
12. Click Next. If you decided to configure your company later, the Additional Tasks window reappears. You can click Create a company to set up a second company, start Microsoft Dynamics GP, or Exit.
13. If you decided to use a wizard to migrate or configure your company data, the Rapid Migration Tool or the Rapid Configuration Tool starts.

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