

One Lenovo® ThinkServer® RD240 = 60 virtual desktops for your education environment



lenovo FOR
THOSE
WHO DO.



Powered by the Intel® Xeon® Processor X5660

When it comes to providing the best tools for students, textbooks alone no longer make the grade. Multimedia technology and other 21st century teaching and learning tools enhance student learning, but they also place increasing demands on information technology systems. The challenge is to find an efficient way to deliver these tools as schools become hubs of information for students, teachers, and parents. Virtual desktop infrastructure (VDI), where each student has his or her own virtual desktop hosted on a server, is one of the common technology solutions that schools are implementing. Students enjoy flexible and reliable access to “their computer” on any system, and schools enjoy decreased costs and increased control.

Selecting the right servers to host these virtual desktops is vital. The challenge is to balance performance with price to find the right solution for your school.

We set out to determine how many typical virtual desktop users the Lenovo ThinkServer RD240 could support with good performance. The answer? An impressive 60 virtual desktops.

VIRTUAL DESKTOPS—BRINGING EDUCATION INTO THE 21ST CENTURY

A hybrid approach to VDI

A hybrid approach in which a student's notebook combines with VDI lets schools deliver a flexible and satisfying computing experience. This approach can give students the benefits of mobility, flexibility, and offline performance with the security and management benefits of VDI. Lenovo offers notebooks featuring 2nd generation Intel Core™ i3, i5, and i7 Mobile Processors that let schools implement this hybrid approach.

Aware of the digital world we now inhabit, educators are pushing to bring the classroom into the 21st century. Educators need classrooms that are “always on,” providing a learning and teaching environment for students, teachers, and parents that is available 24/7, from any location.

To accomplish this goal, schools often implement VDI solutions, which use central servers to run dozens of virtual desktops, one for each student. Students can access their own personal session from any client system, and VDI solutions offer IT staff benefits in control, security, ease of management, and long-term cost savings. For maximum performance and flexibility, students can access the VDI sessions from their personal notebooks using the hybrid model. This model allows students to reap the benefits of local processing power, while providing IT staff the benefit of a secure and easy-to-manage education environment (please see the sidebar for more information).

As school systems implement VDI solutions, the choice of a server can be difficult to make. Many servers provide features that are irrelevant to the tasks school systems need them for, and schools pay a hefty price for these unneeded features. Luckily, Lenovo designed the Lenovo ThinkServer RD240 server with your education needs in mind. The Lenovo ThinkServer RD240 combines high performance with hefty storage capacity and helpful management tools that make it an excellent choice for a school implementing a VDI solution.

We tested the Lenovo ThinkServer RD240 to find out how many typical student users it could support. To do so, we used a workload that reflects typical student activities, including Web browsing, multimedia viewing, and performing various tasks in Microsoft® Office® applications.

In our tests, the Lenovo ThinkServer RD240 supported an impressive 60 virtual desktops. Each virtual desktop handled the typical student activities with solid performance and a good user experience, with every student action finishing within a few seconds. (We explain this in more detail [later in the report.](#))

The ability of the Lenovo ThinkServer RD240 to support 60 virtual desktops, each delivering solid performance, makes it an excellent VDI host for your school system.

WHY THE LENOVO THINKSERVER RD240?

The Lenovo ThinkServer RD240 provides schools with the performance and storage capacity they need to host a VDI environment, without unnecessary features that drive up cost. Lenovo designed the ThinkServer RD240 for value-conscious organizations that need robust performance, expansive storage capacity, and ease of use.

Performance and storage capacity. The ThinkServer RD240 features Intel® Xeon® 5500 and 5600 series processors, which offer a maximum of 12 CPU cores and a performance increase of up to 60 percent over previous-generation servers. The ThinkServer RD240 also supports eight memory slots and a maximum of 64 GB of ECC memory (a type of memory that detects and corrects memory errors, increasing reliability). Lenovo offers up to 16 TB of storage capacity, and also offers 15K SAS drives for greater performance.

Ease of use. The ThinkServer RD240 features an EasyStartup tool, which helps you get the server up and running within a few mouse clicks. Its Web-based remote management interface lets you monitor server status from any remote location, and sends alerts on any status changes. The iKVM Upgrade gives you remote control of keyboard, video, and mouse.

By providing good performance, storage capacity, reliability, and ease of use at an affordable price point, the Lenovo ThinkServer RD240 powered by the Intel Xeon processor 5600 series is well qualified to host your VDI solution.

TEST APPROACH AND RESULTS

We set up a single Lenovo ThinkServer RD240 running Microsoft Windows Server® 2008 R2 Service Pack 1. We used Microsoft Hyper-V™ to host the virtual machines.

To measure the server's virtual desktop capacity, we employed the widely used Login Consultants Virtual Session Indexer (Login VSI) 3.0 benchmark. Login VSI consists of several workloads that perform a range of common desktop computing tasks. The results show the maximum number of virtual desktops a server can support at a given memory configuration while giving an acceptable response time and user experience on a particular workload.

As we mentioned above, in our testing the Lenovo ThinkServer RD240 ran 60 virtual desktop sessions while meeting the Login VSI standard requirements for acceptable response time and user experience. Login VSI sets the threshold for acceptable response time to a maximum of 4 seconds. To deliver acceptable

performance, each operation must complete in 4 seconds or less, and all the operations for all the virtual desktops in our test met this requirement.

We provide server configuration information in [Appendix A](#), our detailed workload and test descriptions in [Appendix B](#), and a detailed test methodology in [Appendix C](#).

SUMMARY

As your school system implements a virtual desktop solution, selecting the appropriate servers is critical. Both performance and price are key factors in finding the right combination for the particulars of your environment.

In our hands-on tests, the Lenovo ThinkServer RD240 supported 60 virtual desktops, making it an excellent choice for bringing your school into the 21st century with VDI.

APPENDIX A – DETAILED SYSTEM SPECIFICATIONS

Figure 1 presents detailed information for the servers in our test bed.

Servers	Lenovo ThinkServer RD240	Lenovo ThinkServer TD230
Power supplies		
Total number	1	1
Brand and model	Lite-On PS-2751-1F-LF	Delta Electronics, Inc. DPS-625AB A
Wattage (W)	750	625
Cooling fans		
Total number	4	2
Dimensions (h x w)	2 ½' x 2 ½'	3 ½" x 3 ½"
General processor setup		
Number of processor packages	2	2
Number of cores per processor package	6	6
Number of hardware threads per core	2	2
CPU		
Vendor	Intel	Intel
Name	Xeon X5660	Xeon X5670
Stepping	B1	B1
Socket type	LGA1366	LGA1366
Core frequency (GHz)	2.80	2.93
Bus Frequency	6.4 GT/s	6.4 GT/s
L1 cache	32 KB + 32 KB (per core)	32 KB + 32 KB (per core)
L2 cache	1.5 MB (6 x 256 KB)	1.5 MB (6 x 256 KB)
L3 cache (MB)	12	12
Thermal design power (TDP, in watts)	95	95
Platform		
Vendor and model number	Lenovo ThinkServer RD240	Lenovo ThinkServer TD230
Motherboard model number	Tyan Tank GT20-B7002LNV	Intel Corporation S5500BC
BIOS name and version	American Megatrends Inc. V2.4 (07/05/2010)	Intel Corporation S5500.86B.01.6.0050.081620101549 (08/16/2010)
BIOS Settings	Default	Default
Memory modules		
Memory type 1		
Total RAM in system (GB)	64	32
Vendor and model number	Samsung M393B1K70CH0-CH9	Samsung M393B5170FH0-CH9
Type	PC3-10600R DDR3	PC3-10600 DDR3
Speed (MHz)	1,333	1,333

Servers	Lenovo ThinkServer RD240	Lenovo ThinkServer TD230
Speed in the system currently running @ (MHz)	1,333	1,333
Timing/latency (tCL-tRCD-iRP-tRASmin)	9-9-9-24	9-9-9-24
Size (GB)	8	4
Number of RAM modules	4 x 8 GB	8 x 4 GB
Chip organization	Double-sided	Double-sided
Memory type 2		
Vendor and model number	Hynix HMT31GR7AFR4C-H9	N/A
Type	PC3-10600R DDR3	N/A
Speed (MHz)	1,333	N/A
Speed in the system currently running @ (MHz)	1,333	N/A
Timing/latency (tCL-tRCD-iRP-tRASmin)	9-9-9-24	N/A
Size (GB)	8	N/A
Number of RAM modules	4 x 8 GB	N/A
Chip organization	Double-sided	N/A
Hard disk		
Vendor and model number	Seagate ST3300657SS	Seagate ST3300657SS
Number of disks in system	8	3
Size (GB)	300	300
Buffer size (MB)	16	16
RPM	15,000	15,000
Type	SAS	SAS
Vendor and model number	N/A	Hitachi HUS153030VLS300
Number of disks in system	N/A	1
Size (GB)	N/A	300
Buffer size (MB)	N/A	16
RPM	N/A	15,000
Type	N/A	SAS
Controller	LSI MegaRAID SAS 8708ELP LSI RAID Controller	LSI MegaRAID SAS 9240-8i RAID Controller
Driver version	4.5.0.64	4.23.0.64
Operating system		
Name	Windows Server 2008 R2 Enterprise SP1	Windows Server 2008 SP2 Enterprise SP1
Build number	7601	7061
File system	NTFS	NTFS
Language	English	English

Servers	Lenovo ThinkServer RD240	Lenovo ThinkServer TD230
Network card/subsystem		
Vendor and model number	Intel 82574L Gigabit Dual Port Network Adapter	Intel 8247L Gigabit Network Adapter
Type	Integrated	Integrated
Driver version	Intel 11.7.32.0 (9/29/2010)	Intel 11.7.32.0 (9/29/2010)
Vendor and model number	N/A	Intel 82567LM-2 Gigabit Network Adapter
Type	N/A	Integrated
Driver version	N/A	Intel 10.0.6.0 (6/12/09)
USB ports		
Number	7	6
Type	2.0	2.0

Figure 1: Detailed system configuration information for the two servers in our test bed.

APPENDIX B – DETAILED WORKLOAD AND TEST DESCRIPTIONS

About Login VSI 3.0

Login VSI 3.0 stresses virtual desktops by simulating typical desktop computer functions. To do so, the tool opens applications inside multiple virtual desktops. We used its multimedia workload, which has the following characteristics:

- Once a session starts, the multimedia workload repeats approximately every 12 minutes.
- During each loop, the benchmark measures response time every 2 minutes.
- The medium workload opens up to five applications simultaneously.
- The typing rate is 160 ms for each character.
- The workload includes approximately 2 minutes of idle time to simulate real-world use.
- The workload opens and closes the following applications and runs tasks in them:
 - Outlook 2007. The workload browses 10 messages.
 - Internet Explorer®. One instance stays open (BBC.co.uk), and another instance browses to Wired.com, Lonelyplanet.com, and a heavy Flash site with a 480p Flash format (.flv) movie trailer.
 - Windows Media Player. An mp3 is started after the Flash format movie trailer plays. Once the mp3 is started and minimized, the workload continues.
 - Word 2007. One instance lets the benchmark measure response time, and another instance reviews and edits a document.
 - Bullzip PDF Printer and Acrobat® Reader®. The tool prints a Word document to PDF and reviews it.
 - Windows Media Player. A 20 second 720p WMV is started and viewed full-screen.
 - PowerPoint® 2007. The tool reviews and edits a presentation.
 - 7-zip. Using the command-line version of 7-zip, the tool zips the output of a session.

Login VSI measures the response time of these virtual desktop sessions to determine how many a particular server can handle. It reports a Virtual Session Index (VSI) score as the maximum number of users the system supported while maintaining the 4,000-millisecond (4-second) response time. It refers to this point as VSImax. The workload begins by stressing a single virtual desktop and then increases the number of virtual desktops by one at 1-minute increments. For our tests, we had 60 virtual desktops powered on and sitting idle before we started the Login VSI multimedia workload. For more information on Login VSI 3.0, see

http://www.loginconsultants.com/index.php?option=com_content&task=view&id=231&Itemid=279

About the servers we used

In addition to the Lenovo ThinkServer RD240 we tested, we also used a ThinkServer TD230 to support the infrastructure required to run this benchmark. This server hosted Active Directory and DHCP services. It also hosted the virtual machines that launched Login VSI.

APPENDIX C – DETAILED TEST METHODOLOGY

Setting up the infrastructure server ThinkServer TD230

Installing Windows Server 2008 R2 Enterprise Edition Service Pack 1

1. Insert the Microsoft Windows Server 2008 R2 SP1 into the DVD drive, and reboot the system.
2. Boot from the DVD drive.
3. At the Language Selection Screen, click Next.
4. Click Install Now.
5. Select Windows Server 2008 Enterprise Edition R2 (Full Installation), and click Next.
6. Click the I accept the license terms checkbox, and click Next.
7. Click Custom.
8. Click Drive options (advanced).
9. Delete any existing partitions, recreate a partition, and format it. Highlight the partition, and click Next to start the installation.
10. When the system indicates that you must change the user's password before you log on the first time, click OK.
11. Set Password to `Password1`
12. Reboot the system.
13. Log in as `Administrator`
14. Open Server Manager.
15. Select Change System Properties.
16. In the Systems Properties dialog box, rename the computer to `Infra`
17. Reboot the system.

Installing system updates in Windows Server 2008 R2 SP1

We used the Windows Update feature to install the following updates:

- Security Update for Microsoft .NET Framework 4 Client Profile (KB2446708)
- Update for Microsoft .NET Framework 4 Client Profile (KB2473228)
- Security Update for Microsoft .NET Framework 4 Extended (KB2416472)
- Security Update for Microsoft Windows (KB2425227)
- Security Update for Microsoft Windows (KB2446710)
- Security Update for Microsoft Windows (KB2497640)
- Security Update for Microsoft Windows (KB2503658)
- Security Update for Microsoft Windows (KB2506212)
- Security Update for Microsoft Windows (KB2506223)
- Security Update for Microsoft Windows (KB2507618)
- Security Update for Microsoft Windows (KB2508272)
- Security Update for Microsoft Windows (KB2508429)
- Security Update for Microsoft Windows (KB2509553)
- Security Update for Microsoft Windows (KB2510531)
- Security Update for Microsoft Windows (KB2511455)
- Security Update for Microsoft Windows (KB2524375)
- Update for Microsoft Windows (KB976902)
- Update for Microsoft Windows (KB2484033)
- Update for Microsoft Windows (KB2488113)
- Update for Microsoft Windows (KB2505438)
- Update for Microsoft Windows (KB2506014)

- Update for Microsoft Windows (KB2511250)
- Windows Internet Explorer 9

Setting up network configuration on infrastructure server

1. Click Start→Run, and type `ncpa.cpl`
2. Right-click the active adaptor, and click Properties.
3. Select Internet Protocol Version 4 (TCP/IPv4), and click Properties.
4. At the Internet Protocol Version 4 (TCP/IPv4) Properties screen, select the Use the following IP address radio button.
5. Type `192.168.1.220` for the IP, and type `255.255.248.0` for the default subnet mask and type `192.168.1.220` for the gateway.
6. Click OK, and click Close to exit.

Installing Active Directory and DNS services on infrastructure server

1. Click Start→Run, type `dcpromo` and click OK.
2. At the Active Directory Domain Services Installation Wizard welcome screen, check the Use advanced mode installation option, and click Next.
3. In the Choose a Deployment Configuration dialog box, select Create a new domain in a new forest, and click Next.
4. At the FQDN page, type `waters.com` and click Next.
5. At the NetBIOS name prompt, leave the name WATERS, and click Next.
6. At the Forest Functionality level, select Windows Server 2008 R2, and click Next.
7. At the additional Domain Controller Options, leave DNS server selected, and click Next.
8. At the System Folder Location screen, leave the default options, and click Next.
9. Assign a Directory Services Restore Mode Administrator account password, and click Next.
10. At the Summary screen, review your selections, and click Next.
11. Once Active Directory Domain Services finishes installing, click Finish, and restart the system.
12. When the system restarts, log in as `waters\administrator`.

Setting up DHCP services on infrastructure server

1. Click Start→Administrative Tools→Server Manager→Add Roles.
2. Select DHCP Server, and click Next.
3. At the Introduction to DHCP Server screen, click Next.
4. At the Specify IPv4 DNS Settings screen, type `waters.com` for the parent domain.
5. Type the preferred DNS server IPv4 address, `192.168.1.220`, and click Next.
6. At the Specify IPv4 WINS Server Settings screen, select WINS is not required for applications on the network, and click Next.
7. At the Add or Edit DHCP Scopes screen, click Add.
8. At the Add Scope screen, enter the Name DHCP Scope name.
9. In the next box, set the following values, and click OK.
 - Starting IP address
 - Ending IP address
 - Subnet mask
10. Check the Activate This Scope box.
11. At the Add or Edit DHCP Scopes screen, click Next.
12. Click the Enable DHCP v6 Stateless Mode radio button, and click Next.
13. Leave the default IPv6 DNS Settings, and click Next.

14. At the Authorize DHCP server dialog box, select Use current credentials.
15. At the Confirm Installation Selections screen, click Next. If the installation is set up correctly, a screen displays saying that DHCP server install succeeded.
16. Click Close.
17. Click OK.

Preparing the domain for Login VSI

Creating the VSI share

1. Log onto the infrastructure server.
2. Open Windows Explorer, navigate to C:\, create a new folder, and name it VSI-Share
3. Right-click the new folder, and select Properties.
4. Click Sharing→Advanced sharing, and check Share this folder.
5. Open Permissions.
6. Check Allow Full Control to everyone, click Apply, and click OK.
7. At the Advanced Sharing screen, click Apply, and click OK.
8. Create a folder in the VSI-Share called Software
9. Extract the login-vsi install media into the install C:\VSI-Share\Software .(Available at <http://www.loginconsultants.com>.)
10. Download Microsoft Office 2007 SP2 from <http://www.microsoft.com/downloads/en/default.aspx>, and save it to C:\VSI-Share\Software.
11. Run the Login VSI setup on the infrastructure server.
12. Set the amount of users to 60 .
13. Set your username to Login_VSI
14. For your password, enter the password you set up earlier, Password1
15. Click Start. A command prompt appears and you see the setup creating users.
16. Once the script finishes, the command prompt displays AD preparation is completed. Click OK, and click Exit.

Adding users to AD group

1. Go to Start→Administrative Tools, and select Active Directory Users and Computers.
2. Expand waters.com.
3. Right-click Login_VSI.
4. Select New, and select Group.
5. Set Group Name to loginvsigroup select Global for Group Scope, and leave Group Type as Security. Click OK.
6. Select all the users, right-click, and select Add to group. Type loginvsigroup for the name of the group, and check name. Click OK and the users will have joined the group.

Setting up the server under test ThinkServer RD240

Configuring RAID level

1. Boot the server.
2. Press Ctrl+H to enter the RAID controller setup.
3. Select Configuration Wizard.
4. Click New Configuration.
5. Follow the steps on the screen and create a RAID 5 virtual disk with all available hard drives.
6. Format the new virtual drive.
7. Click Home to return to the WebBios home page.
8. Under Logical View, click on the new virtual drive.

9. Under Policies ensure the following setting are selected:

- Access: RW
- Read: Adaptive
- Default Write: Always Write Back¹
- IO Policy: Cached
- Disk Cache: Enable

10. Click Change to accept any changes.

11. Select Home to return to the home page.

12. Click Exit and reboot the system.

Installing Windows Server 2008 R2 Enterprise Edition Service Pack 1

1. Insert the Microsoft Windows Server 2008 R2 SP1 into the DVD drive, and reboot the system.
2. Boot from the DVD drive.
3. At the Language Selection Screen, click Next.
4. Click Install Now.
5. Select Windows Server 2008 Enterprise Edition R2 (Full Installation), and click Next.
6. Click the I accept the license terms checkbox, and click Next.
7. Click Custom.
8. Click Drive options (advanced).
9. Delete any existing partitions, recreate a partition, and format it. Highlight the partition, and click Next to start the installation.
10. When the system indicates that you must change the user's password before you log on the first time, click OK.
11. Set Password to `Password1`
12. Reboot the system.
13. Log in as `Administrator`
14. Open Server Manager.
15. Select Change System Properties.
16. In the Systems Properties dialog box, rename the computer to `SUT`
17. Reboot the system.

Installing system updates in Windows Server 2008 R2 SP1

We used the Windows Update feature to install the following updates:

- Security Update for Microsoft .NET Framework 4 Client Profile (KB2446708)
- Update for Microsoft .NET Framework 4 Client Profile (KB2473228)
- Security Update for Microsoft .NET Framework 4 Extended (KB2416472)
- Security Update for Microsoft Windows (KB2425227)
- Security Update for Microsoft Windows (KB2446710)
- Security Update for Microsoft Windows (KB2497640)
- Security Update for Microsoft Windows (KB2503658)
- Security Update for Microsoft Windows (KB2506212)
- Security Update for Microsoft Windows (KB2506223)
- Security Update for Microsoft Windows (KB2507618)
- Security Update for Microsoft Windows (KB2508272)
- Security Update for Microsoft Windows (KB2508429)

¹ Note: If you turn on Write-back, we recommend that you either purchase the available ThinkServer 8708ELP RAID battery, or have the system on an Uninterruptible Power Supply (UPS).

- Security Update for Microsoft Windows (KB2509553)
- Security Update for Microsoft Windows (KB2510531)
- Security Update for Microsoft Windows (KB2511455)
- Security Update for Microsoft Windows (KB2524375)
- Update for Microsoft Windows (KB976902)
- Update for Microsoft Windows (KB2484033)
- Update for Microsoft Windows (KB2488113)
- Update for Microsoft Windows (KB2505438)
- Update for Microsoft Windows (KB2506014)
- Update for Microsoft Windows (KB2511250)
- Windows Internet Explorer 9

Setting up network configuration on server under test

1. Click Start→Run, and type `ncpa.cpl`
2. Right click on the active adaptor, and click Properties.
3. Select Internet Protocol Version 4 (TCP/IPv4), and click Properties.
4. At the Internet Protocol Version 4 (TCP/IPv4) Properties screen, select the Use the following IP address radio button.
5. Type `192.168.1.1` for the IP address, `255.255.254.0` for the default subnet mask, and `192.168.1.220` for preferred DNS server.
6. Click OK, and click Close to exit.

Enabling the Hyper-V role on server under test

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 appear with a message that the installation succeeded.
12. Click Close.

Configuring virtual networks

1. Open Hyper-V Manager.
2. From the Actions menu, click Virtual Network Manager.
3. Under Create virtual network, select External network. Use one physical NIC that is connected to the private `192.168.1.x` network. Click Add, and the New Virtual Network page appears.
4. For the new network, type the name `Waters-net`
5. Review the other properties and modify them if necessary.
6. Click OK to create the virtual network and close Virtual Network Manager, or click Apply to create the virtual network and continue using Virtual Network Manager.

7. Repeat steps 1 through 6 and create a public network on the Internet-accessible interface.

Installing the Windows 7 Enterprise (32-bit) virtual machine

1. Open the Hyper-V manager.
2. Right-click SUT, and select New Virtual Machine.
3. Name the virtual machine WIN7EE1
4. Assign Memory, and click Next.
5. Configure networking change connection to local area connection – Virtual network.
6. Click Create virtual hard disk.
7. Set size to 15GB, and click Next.
8. From Install options, select Install media.
9. Click Finish.
10. Right click the Windows 7 VM, and select Settings.
11. Click Memory, under Memory Management, select Static, and enter 1024MB²
12. Click Processor, and enter 1 as the number of logical processors.
13. Start your VM with media ready.
14. When the installation prompts you, press any key to begin setup.
15. Enter your language preferences, and click Next.
16. Click Install.
17. Accept the license terms, and click Next.
18. Select Custom, and select the drive that will contain the OS.
19. Click Install. Setup begins.
20. Type WIN7EE1 for the username, type WIN7EE1-PC for computer, and click Next.
21. Enter no password, and click Next.
22. For system protection, select Use recommended settings, and click Next.
23. Enter your time zone, and click Next.
24. Select the Work Network setting, and click Next.
25. We used the Windows Update feature to install the following updates:
 - Security Update for Microsoft .NET Framework 4 Client Profile (KB2446708)
 - Security Update for Microsoft Windows (KB2425227)
 - Security Update for Microsoft Windows (KB2446710)
 - Security Update for Microsoft Windows (KB2479943)
 - Security Update for Microsoft Windows (KB2491683)
 - Security Update for Microsoft Windows (KB2497640)
 - Security Update for Microsoft Windows (KB2503658)
 - Security Update for Microsoft Windows (KB2506212)
 - Security Update for Microsoft Windows (KB2506223)
 - Security Update for Microsoft Windows (KB2507618)
 - Security Update for Microsoft Windows (KB2508272)
 - Security Update for Microsoft Windows (KB2508429)
 - Security Update for Microsoft Windows (KB2509553)
 - Security Update for Microsoft Windows (KB2510531)

² Windows Server 2008 R2 SP1 supports both Static and Dynamic memory allocation. The best option for you will depend on your VDI implementation strategy and specific environment.

- Security Update for Microsoft Windows (KB2511455)
- Security Update for Microsoft Windows (KB2524375)
- Update for Microsoft Windows (KB971033)
- Update for Microsoft Windows (KB976902)
- Update for Microsoft Windows (KB2484033)
- Update for Microsoft Windows (KB2488113)
- Update for Microsoft Windows (KB2502285)
- Update for Microsoft Windows (KB2505438)
- Update for Microsoft Windows (KB2511250)

26. Click Start, right-click Computer, click Properties→Remote settings, and select Allow connections from any version of Remote Desktop. Click OK.

Joining the waters domain

1. Click Start, right-click Computer, and click Properties→Advanced system settings→Computer Name tab.
2. Select Change.
3. Select Domain under Member of.
4. Enter the domain name as `waters.com`, and click OK.
5. Enter the domain administrator account and password for the domain.
6. Reboot the system.

Windows 7 guest: Installing Office 2007 Professional SP2

1. From the Office 2007 media, run Setup.
2. Enter the product key for Office 2007, and click Continue.
3. Accept the licensing agreement.
4. Select Custom install.
5. As the root of the installation options, ensure that all Office components are set to Run from My Computer.
6. Click Install.
7. Download and run Office 2007 Service Pack 2.
8. Reboot the system.

Windows 7 guest: Turning off system restore

1. Click Start, right-click Computer, click Properties→Advanced system settings→System Protection→Configure→Turn off system protection, and click OK.

Windows 7 guest: Disabling IPv6

1. Click Start→Run, and type `ncpa.cpl`
2. Right-click Local Area Connection, and click Properties.
3. Uncheck Internet Protocol Version 6 (TCP/IP), and select OK.

Windows 7 guest: Adjusting page file

1. Right-click Computer→Properties→Change settings→Advanced→Performance→Settings.
2. In Performance settings, select the Advanced tab, and select Change for Virtual Memory.
3. Deselect Automatically manage page file.
4. Select Custom size, 1024 MB for both values, and select Set.

Windows 7 guest: Disabling Windows Firewall

The domain GPO automatically disables the Windows Firewall.

Windows 7 guest: Installing login VSI target software

1. Browse to `\\Infra\VSI-Share\Software\30Release\Target setup`.

2. Run the setup.exe.
3. In the Target Setup wizard, specify the vsi share (\\infra\VSI-Share)
4. Click Start.
5. When prompted with security warnings, click OK.
6. Reboot the system.

Deploying virtual desktops (60 total desktops)

1. We used Windows AIK and sysprep to create 60 virtual desktops. For more information on how to use sysprep on Windows 7, see [http://technet.microsoft.com/en-us/library/cc766514\(WS.10\).aspx](http://technet.microsoft.com/en-us/library/cc766514(WS.10).aspx).
2. Ensure that all 60 virtual desktops are members of the login-vsi domain, and are moved to the login_vsi\computers OU.
3. Reboot the 60 virtual desktops to ensure that the GPO linked to the OU are effective.

Setting up Login VSI

Enabling the Hyper-V role on infrastructure server

Installing launchers on infrastructure server: Windows 7 Enterprise (32 bit)

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 appear with a message that the installation succeeded.
12. Click Close.

Configuring virtual networks

1. Open Hyper-V Manager.
2. From the Actions menu, click Virtual Network Manager.
3. Under Create virtual network, select External network. Use one physical NIC that is connected to the private 192.168.1.x network. Click Add, and the New Virtual Network page appears.
4. For the new network, type the name `Waters-net`
5. Review the other properties and modify them if necessary.
6. Click OK to create the virtual network and close Virtual Network Manager, or click Apply to create the virtual network and continue using Virtual Network Manager.
7. Repeat steps 1 through 6 and create a public network on the Internet-accessible interface.

Installing launchers on infrastructure server: Windows 7 Enterprise (32 bit)

1. Open the Hyper-V manager.
2. Right-click Infra, and select New Virtual Machine.
3. Name the virtual machine `L1`
4. Assign Memory to 4096 MB, and click Next.

5. Configure networking change connection to local area connection – Virtual network.
6. Click Create virtual hard disk.
7. Set size to 20 GB, and click Next.
8. From Install options, select Install media.
9. Click Finish.
10. Right-click the Windows 7 VM, and select Settings.
11. Click Processor, and enter 2 as the number of logical processors.
12. Start your VM with media ready.
13. When the installation prompts you, press any key to begin setup.
14. Enter your language preferences, and click Next.
15. Click Install.
16. Accept the license terms, and click Next.
17. Select Custom, and select the drive that will contain the OS.
18. Click Install. Setup begins.
19. Type `administrator` for the username, type `L1` for computer, and click Next.
20. Enter no password, and click Next.
21. For system protection, select Use recommended settings, and click Next.
22. Enter your time zone, and click Next.
23. Select the Work Network setting, and click Next.
24. We used the Windows Update feature to install the following updates:
 - Security Update for Microsoft .NET Framework 4 Client Profile (KB2446708)
 - Security Update for Microsoft Windows (KB2425227)
 - Security Update for Microsoft Windows (KB2446710)
 - Security Update for Microsoft Windows (KB2479943)
 - Security Update for Microsoft Windows (KB2491683)
 - Security Update for Microsoft Windows (KB2497640)
 - Security Update for Microsoft Windows (KB2503658)
 - Security Update for Microsoft Windows (KB2506212)
 - Security Update for Microsoft Windows (KB2506223)
 - Security Update for Microsoft Windows (KB2507618)
 - Security Update for Microsoft Windows (KB2508272)
 - Security Update for Microsoft Windows (KB2508429)
 - Security Update for Microsoft Windows (KB2509553)
 - Security Update for Microsoft Windows (KB2510531)
 - Security Update for Microsoft Windows (KB2511455)
 - Security Update for Microsoft Windows (KB2524375)
 - Update for Microsoft Windows (KB971033)
 - Update for Microsoft Windows (KB976902)
 - Update for Microsoft Windows (KB2484033)
 - Update for Microsoft Windows (KB2488113)
 - Update for Microsoft Windows (KB2502285)
 - Update for Microsoft Windows (KB2505438)
 - Update for Microsoft Windows (KB2511250)
25. Click Start, right-click Computer, click Properties→Remote settings, and select Allow connections from any version of Remote Desktop. Click OK.

26. Navigate to <http://software.muzychenko.net/eng/vac.htm#download>, and download the audio cables driver.
27. Run setup.exe
28. Accept the Licensing agreement.
29. Install to the default directory.
30. Repeat steps 1 through 29 and create two more launchers.

Installing the Login VSI Launcher software

1. Browse to \\Infra\VSI-Share\Software\30Release\Launcher setup.
2. Run the setup.exe.
3. In the Target Setup wizard, specify the vsi share (\\infra\VSI-Share)
4. For more information on the master/slave relationship, refer to the Login VSI 3.0 Admin Guide.

Setting up the .rdp file for each RDS session

For each of the 60 Windows 7 sessions to be launched, we configured an .rdp file. See

[http://technet.microsoft.com/en-us/library/ff393699\(WS.10\).aspx](http://technet.microsoft.com/en-us/library/ff393699(WS.10).aspx) for more details. We used an rdp file with the following values:

- screen mode id:i:1
- use multimon:i:0
- desktopwidth:i:1024
- desktopheight:i:768
- session bpp:i:16
- winposstr:s:0,1,1956,24,3817,1184
- compression:i:1
- keyboardhook:i:2
- audiocapturemode:i:1
- videoplaybackmode:i:1
- connection type:i:6
- displayconnectionbar:i:1
- disable wallpaper:i:0
- allow font smoothing:i:1
- allow desktop composition:i:1
- disable full window drag:i:0
- disable menu anims:i:0
- disable themes:i:0
- disable cursor setting:i:0
- bitmapcachepersistenable:i:1
- audiomode:i:0
- redirectprinters:i:1
- redirectcomports:i:0
- redirectsmartcards:i:1
- redirectclipboard:i:1
- redirectposdevices:i:0
- redirectdirectx:i:1
- autoreconnection enabled:i:1
- authentication level:i:2

- prompt for credentials:i:0
- negotiate security layer:i:1
- remoteapplicationmode:i:0
- alternate shell:s:
- shell working directory:s:
- gatewayhostname:s:
- gatewayusagemethod:i:4
- gatewaycredentialssource:i:4
- gatewayprofileusagemethod:i:0
- promptcredentialonce:i:1
- use redirection server name:i:0
- drivestoredirect:s:
- username:s>Login_VSI1
- full address:s:MS1-PC

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