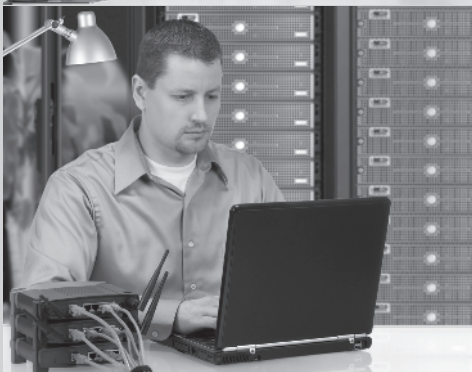


Chapter 1

Planning for the Installation of Windows 7

TOPICS COVERED IN THIS CHAPTER INCLUDE

- ✓ Choosing a Windows 7 edition
- ✓ Performing a local installation of Windows 7
- ✓ Designing User State Migration
- ✓ Considering virtualization
- ✓ Planning and managing client licensing and activation





One of the first steps you need to take when planning a migration to Windows 7 is choosing which edition of Windows 7 to deploy. For an enterprise, your choice is limited to Windows 7

Professional, Windows 7 Enterprise, or Windows 7 Ultimate. To make the right choice, you'll need to know what features are available in each edition.

Once you identify the edition you'll use, you need to come up with a migration plan. Because many organizations will be upgrading existing Windows XP computers to Windows 7, having a solid plan to migrate users' data is very important. The User State Migration Tool (USMT) can simplify this process for you with the use of ScanState and LoadState.

Although virtualization wasn't common on end users' desktops in the past, the new Windows XP Mode available in Windows 7 is sure to change this for many users. It's now possible for end users to run applications on a Windows 7 system in a transparent virtual instance of Windows XP.

Activation of Windows 7 can be done individually, with a Multiple Activation Key or with a Key Management Service server. Whereas home users will always use individual activation, you may need to use one of the other methods in larger or isolated enterprises.

Choosing a Windows 7 Edition

When planning a migration or tech refresh, a simple question to ask is what Windows 7 edition is needed. Windows 7 offers six editions, but you'll quickly whittle down the choice to just three for an enterprise because the first three are too basic for a work environment.



Microsoft lists this topic in some documentation as "Choosing a SKU (Stock Keeping Unit)." An SKU is the number associated with the bar code you see on just about any product these days.

These are the three basic editions that you won't see in an enterprise:

Windows 7 Starter Some original equipment manufacturers (OEMs) preinstall this edition on specialized computers. It includes the fewest features, and it will not be available in 64-bit versions.

Windows 7 Home Basic This is available only in certain countries referred to as emerging markets, and it includes very limited capabilities. It will not be available in the United States.

Windows 7 Home Premium *Windows 7 Home Premium* is designed for home users. It includes the Windows Media Center, which can be used to record and play back TV shows or other media. It can also easily integrate on a home network with other devices such as Xbox gaming systems. Systems running this edition can't join a domain.

If you're a desktop support technician or desktop administrator working in an enterprise, you'll focus on the following three editions used in work environments:

Windows 7 Professional *Windows 7 Professional* is intended for high-end home users and small-business users. It can join a domain, support a remote desktop, and run applications in a virtual environment using Windows XP Mode. It does lack some of the more advanced features.

Windows 7 Enterprise The *Windows 7 Enterprise* edition is available only to organizations that have a Software Assurance contract with Microsoft and is purchased through a volume license. Home users won't have access to this, but businesses with as few as five PCs can purchase Software Assurance.

Some key features included in this edition are BitLocker, AppLocker, and BranchCache. Each of these will be explored in greater depth in later chapters. BitLocker (covered in Chapter 11, "Managing Security in Windows 7") can be used to protect data on both internal and external drives, including USB flash drives. AppLocker (covered in Chapter 6, "Configuring and Troubleshooting Application Issues") can be used to prevent unauthorized software from running. BranchCache (covered in Chapter 12, "Supporting Mobile Windows 7 Users") allows clients in remote locations to cache data used by others in the same location.

Windows 7 Ultimate The *Windows 7 Ultimate* edition includes all of the features found in the Enterprise edition, and home users using a single license can purchase it instead of going through the Software Assurance program. Home users can upgrade to Windows 7 Ultimate from either Windows 7 Home Premium or Windows 7 Professional.



Windows 7 Ultimate doesn't include any "ultimate extras" as Windows Vista Ultimate did. These "extras" in Windows Vista were advertised to entice some users to purchase Windows Vista Ultimate. Instead of getting extras not available elsewhere, the reason to purchase Windows 7 Ultimate is to have the features found in the Enterprise edition, such as BitLocker, AppLocker, and BranchCache.

Table 1.1 shows a comparison of many of the features included in Windows 7 Professional, Windows 7 Enterprise, and Windows 7 Ultimate. Since there is very little difference between Enterprise and Ultimate, they are shown in the same column. Some of the features that are more relevant for desktop administrators working in an enterprise environment are covered after the table.

TABLE 1.1 Windows 7 versions and features

Feature	Windows 7 Professional	Windows 7 Enterprise and Ultimate
32-bit and 64-bit versions	Yes	Yes
AppLocker	No	Yes
Backup and Restore center	Yes	Yes
BitLocker Drive Encryption	No	Yes
BranchCache Distributed Cache	No	Yes
DirectAccess	No	Yes
Fast user switching	Yes	Yes
File and printer sharing connections	20	20
Home Group	Yes	Yes
Subsystem for UNIX-based applications	No	Yes
Virtual hard disk booting	No	Yes
Volume licensing keys	Yes	Enterprise only
Windows Aero	Yes	Yes
Windows Media Center	Yes	Yes
Windows XP Mode	Yes	Yes

x86 vs. x64

Windows 7 comes in both 32-bit (x86) and 64-bit (x64) editions. Let me state the obvious—you must have 64-bit hardware in order to install the 64-bit edition. It is also possible to install the 32-bit edition on 64-bit hardware.

The biggest benefit of using a 64-bit edition over a 32-bit edition is RAM (random access memory). With a 32-bit system, you're limited to addressing and using no more than 4 GB of RAM. But even that is limited. Because of the way that RAM is addressed and used in Windows operating systems, only about 3.3 GB of RAM is actually available when 4 GB is installed; the rest of the RAM is unused because of how address space is reserved.

However, Windows 7 Professional, Enterprise, and Ultimate all support as much as 192 GB of RAM on 64-bit systems. This gives you enough RAM to support multiple virtual environments hosted on a single system and also to support even the most demanding applications.

Years ago, many applications didn't run effectively on 64-bit editions of Windows because of various compatibility issues. However, the era of 64-bit systems has arrived. Many programs have both 32-bit and 64-bit versions, and those that don't have a separate 64-bit edition usually work on a 64-bit system without any problems.

AppLocker

AppLocker is a new feature in Windows 7 that can be used to control what software is allowed to run on individual PCs using either Local Security Policy (nondomain computer) or Group Policy in Active Directory. It can be used to restrict unauthorized software from running on systems.

Although software restriction policies existed in previous versions of Windows, AppLocker provides improvements that solve many of the problems with these software restriction policies. For example, a software restriction policy could be used to prevent an application from running. However, when some applications were updated, the software restriction policy no longer recognized the application and no longer restricted the application.

AppLocker uses a rule-based structure that an administrator can build to ensure that the policy doesn't need to be rewritten each time an application is updated. Group Policy and AppLocker will be covered in greater depth in Chapter 10, "Managing Windows 7 with Group Policy."

BitLocker

BitLocker Drive Encryption allows you to protect entire drives by encrypting them. This can be especially useful on disks in mobile computers when the data needs to be protected. When BitLocker is implemented, the entire drive is encrypted. It can be configured to unlock the drive automatically after the system verifies the drive is in the same computer or configured so that users enter a passphrase to unlock access to the drive.

The BitLocker to Go feature is new to Windows 7. BitLocker to Go can be used to encrypt and lock removable drives, including USB flash drives.

Both BitLocker and BitLocker to Go will be explored in greater depth in Chapter 11.

BranchCache

BranchCache is useful for clients in remote offices that access data over virtual private network (VPN) links. When data is stored on a Windows Server 2008 R2 server at the main office and BranchCache has been enabled, users in the remote office are able to store a cached copy of the data on their local computers. This is similar to Offline Folders, which has been available for many versions of Windows, but has a distinct difference. Data cached on one Windows 7 computer can now be shared with other Windows 7 users.

As an example, consider several users connected in a remote office over a very slow 56KB wide area network (WAN) link to the corporate office. Sally and Joe are users in the remote office, and their computers are connected to each other using 100MB network interface cards (NICs). Sally downloads an 8MB file from a Windows Server 2008 R2 server. Later, Joe wants to view the file and tries to access it from the same Windows Server 2008 R2 server. BranchCache verifies that Joe has permission to access the file, recognizes that the file is cached on Sally's computer, and recognizes that Sally's version is the most recent version. BranchCache then redirects Joe's computer to retrieve the file from Sally's computer instead of over the slow WAN link.

Users in remote offices can experience much greater speed when accessing commonly used files over the WAN link. However, only Windows 7 computers can take advantage of BranchCache. BranchCache will be explained in greater depth in Chapter 12.

Windows XP Mode

Windows XP Mode is a virtualization application that allows users to run a completely separate instance of Windows XP within Windows 7. This can be especially useful for applications that aren't compatible with Windows 7 but will run in Windows XP.

Applications installed in Windows XP Mode will appear on the user's Windows 7 Start menu. While they appear to run on the Windows 7 desktop, they are actually running in the virtual Windows XP Mode environment. Windows XP Mode is covered in more depth later in this chapter, including how to install it.

Software Assurance

Windows 7 Enterprise is available only to businesses that have purchased the Software Assurance program, so you may be interested in knowing a little about it. It's a Microsoft program offered to organizations that purchase licenses through a volume-licensing program. Volume licensing allows a company to purchase licenses in bulk at a discount instead of purchasing multiple individual copies.

Organizations that can purchase Software Assurance include businesses with as few as five employees, government entities, schools, and campuses. It is actually purchased through Microsoft partners, and the benefits are coordinated through Microsoft once they are activated. Benefits differ based on how many clients and licenses are purchased.

The benefits may include

- Free upgrades to newer versions of the software during the licensing period
- The option to spread payments over a longer period of time (as opposed to the initial cost of purchasing all the licenses)
- Training vouchers for Microsoft courses taught by Microsoft partners
- Access to e-learning courses
- 24x7 telephone and web support

Local Installation

It's possible that you'll need to install Windows 7 from the installation media at some point. You'll learn about Lite Touch Installation (LTI) and Zero Touch Installation (ZTI) in Chapter 2, "Automating the Deployment of Windows 7," but you may occasionally need to do a "heavy touch" installation. No, there's no acronym for heavy touch installation, mostly because you don't want to be doing it that often.

Installing one or two systems manually is no big deal, but if you have to install 5, 50, or more, you'll want to automate the process. For the most part, the installation of Windows 7 is straightforward with few surprises. The biggest challenge may come if you have to change partitions on the hard disk or add additional disk drivers.

Exercise 1.1 will walk you through the steps needed to install Windows 7 from the installation DVD.

EXERCISE 1.1

Installing Windows 7 from the Installation DVD

1. Place the Windows 7 installation DVD in the DVD drive and boot the system. After a moment, the Install Windows screen will appear, as shown in the following graphic.



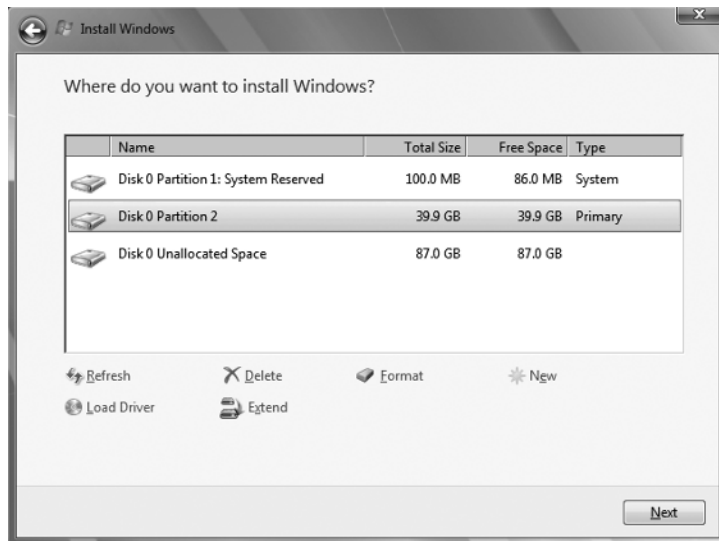
Although it looks like you have minimal choices here, you can press Shift+F10 to access the command line from this menu. In the "Creating a Bootable VHD" exercise later in this chapter, you'll access the command line to create and configure a VHD file.

EXERCISE 1.1 (continued)

2. Select the appropriate Language To Install, Time And Currency Format, and Keyboard Or Input Method, and click Next.
3. Click Install Now.
4. Review the license terms, and select I Accept The License Terms. Click Next.
5. Select Custom (Advanced) to install a new copy of Windows. If an existing version exists that can be upgraded to Windows 7, you can select Upgrade.
6. Select the partition where you want to install Windows.

Notice that you can create additional partitions from this screen. However, if you start with anything other than a single precreated partition, Windows will create a partition labeled System Reserved of about 100 MB, as shown in the following graphic. This partition includes the Windows Recovery Environment (WinRE) and ensures that all Windows features can work correctly. Also, once it's created, you can't get rid of the partition without reinstalling the OS.

If you don't want this partition added, you must format the entire drive as a single partition before starting the installation. You can do so by accessing the command prompt by pressing Alt+F10 at the Install Now page and using DiskPart. You can later shrink the volume to create additional partitions.

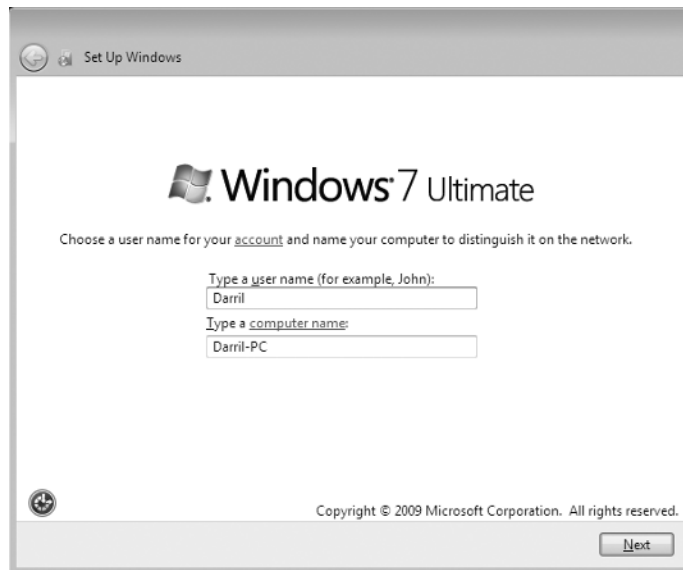


Notice that you can also delete, extend, and format partitions from this page. You can also load a driver from this page if your hard drive isn't recognized. Beware though—if you repartition the drive, you'll lose access to data that would normally be stored

EXERCISE 1.1 (continued)

in the `Windows.old` folder after the installation. Once you have selected the partition, click Next.

7. The installation will take several minutes to complete, but it will be automated from this point.
8. When the installation completes and reboots, you will be prompted to type a user name, as shown in the following graphic. As you enter the user name, the computer name will be created by appending the user name with `-PC`. You can accept this computer name or type in a different computer name. Click Next once you're satisfied with the user name and computer name.



9. The Set A Password For Your Account page screen prompt will appear. This password is for the account you created in the previous step. You need to type in a password, retype the same password for confirmation, and type a password hint. Once you've entered this information, click Next.
10. Enter the product key for your edition of Windows on the Type Your Windows Product Key screen. The check box Automatically Activate Windows When I'm Online is checked by default. Leave it checked and click Next.
11. You'll be prompted to configure the computer for automatic updates. The Use Recommended Settings selection will automate the download and installation of updates, but you can choose Only Install Important Updates or set it to ask you later. Select one of the choices.

EXERCISE 1.1 (continued)

12. Choose your time zone on the time zone and clock screen. Make sure the time and date are accurate, and click Next.
 13. Select Work Network as the computer's current location.
 14. The Windows 7 desktop will appear. The installation is complete.
-

Designing User State Migration

The majority of Microsoft installed clients are Windows XP. Thus, if you're considering adding Windows 7, you probably have many Windows XP clients. Unfortunately, there isn't a direct upgrade path from Windows XP to Windows 7.



If you can do a direct upgrade, you won't need to worry about migration. An upgrade will retain all of the installed applications and all of the user's data. An upgrade is still considered a risky operation, and it's possible that things can go wrong, so you should always have a backup of the user's data in case the worst happens.

If you've looked at the upgrade paths from earlier versions of Windows to Windows 7, you may have been a little surprised. There are very few upgrade choices. Some of the possible upgrade paths to versions likely to be used in the Enterprise are

- Vista Business to Windows 7 Professional, Enterprise, and Ultimate
- Vista Enterprise to Windows 7 Enterprise
- Vista Ultimate to Windows 7 Ultimate

If you're migrating other existing Windows clients, you probably won't be able to do an upgrade. This doesn't have to be as painful as it sounds. The User State Migration Toolkit has undergone significant changes and improvements and will make your job a lot easier.

USMT can be used in three types of migrations. Each one assumes that you have files and settings from a Windows XP, Windows Vista, or Windows 7 installation that you want to restore to a new installation of Windows 7.

In-place migration An in-place migration uses the same hardware for the old and new installations of Windows. Hard drive partitions are not modified, and files and settings from the previous installation are automatically retained in the `Windows.old` folder.

Wipe-and-load migration A wipe-and-load migration uses the same hardware. However, partitions on the hard drive holding the original operating system need to be modified, which will prevent the `Windows.old` folder from being created during the new installation. Instead, you must use USMT before the installation to save the files and settings to a migration store from the previous installation. This migration store can then be restored to the new installation of Windows 7.

Side-by-side migration A side-by-side migration uses two computers. You can use USMT to save the files and settings to a migration store from the original computer before it's decommissioned. You can then use USMT to restore the migration store to Windows 7 on the new computer.

In this section, you'll learn where to get the USMT, how to install it, and how to use it in each of the different types of migration.

User State Migration Toolkit

If you used the *User State Migration Toolkit (USMT)* from previous operating systems, you may not have been overjoyed by the performance. I know I wasn't. However, you'll find significant improvements in the USMT on Windows 7. In addition, the time required to perform a migration has been substantially reduced.

The User State Migration Toolkit is a part of the *Windows Automated Installation Kit (AIK)* for Windows 7. Older versions of the AIK exist, so you need to ensure you have the version specifically designed for Windows 7.

You can use the USMT to migrate data from Windows XP, Windows Vista, or Windows 7. It supports the following migration paths:

- Windows XP to Windows Vista
- Windows XP to Windows 7
- Windows Vista to Windows 7
- Windows 7 32-bit to Windows 7 64-bit

The Windows AIK is available as a free download from Microsoft's download site (www.microsoft.com/downloads) by searching for "Windows Automated Installation Kit (AIK) for Windows 7." This download is an `.iso` file, so you'll need to burn it to a DVD.



Burning a CD or a DVD from an `.iso` file is built into Windows 7. Place the disk in the drive and then use Windows Explorer to browse to the `.iso` file. Right-click the file and select Burn Disc Image. Windows 7 will do the rest.

Once you download the Windows AIK for Windows 7 and burn the image to a DVD, insert the DVD into your computer's drive. You can then follow the steps in Exercise 1.2 to install the Windows AIK, which includes the USMT.

EXERCISE 1.2**Installing Windows AIK Including the USMT**

1. If prompted after inserting the DVD, select Run The StartCD.exe. If not prompted, browse to the StartCD.exe file using Windows Explorer and double-click it to start Windows AIK. The installation screen appears, as shown in the following graphic.



2. Select the Windows AIK Setup link on the left.
3. On the Welcome screen, click Next.
4. Review the license agreement, select I Agree, and click Next.
5. Accept the default installation folder of C:\Program Files\Windows AIK and the choice Install This For Everyone. Click Next.
6. On the Confirm Installation screen, click Next.
7. When the installation completes, click Close.
8. The Microsoft Windows AIK folder is available in the All Programs menu.

Once the Windows AIK is installed, you'll have several program links on the Start menu within the Microsoft Windows AIK Start menu folder. These include

Deployment Tools Command Prompt This launches a command prompt at the C:\Program Files\Windows AIK\Tools\PETools folder, which gives you access to many of the files used when creating a Windows Preinstallation Environment (Windows PE or WinPE).

Windows System Image Manager This is used to create an `unattend.txt` text file that can be used to automate an installation and to open images.

Documentation This provides links to several help files including the Unattended Windows Setup Reference, the Windows Automated Installation Kit, and the Windows PE User's Guide. Not all help files are available here. Notably for this chapter, the help file for the USMT isn't accessible here even though it was installed. The USMT help file is available in the `C:\Program Files\Windows AIK\Docs\CHMs` folder and is named `WAIK.chm`.

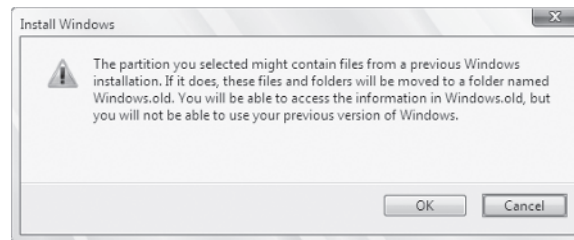
VAMT 1.2 The VAMT 1.2 folder includes a help file for the Volume Activation Management Tool (VAMT) and a link to launch the Volume Activation Management Tool.

You'll use more of these tools later in this chapter and in Chapter 2. For now, the focus is on the USMT tools `ScanState` and `LoadState`.

Performing In-Place Migration

When you do the installation of Windows on a computer running Windows XP, Windows Vista, or Windows 7, you can do a Custom (Advanced) installation. A message will appear similar to Figure 1.1, informing you that you can access files from the previous installation in a folder named `Windows.old`.

FIGURE 1.1 Windows installation notification



Files from the previous installation will be gone if you do any advanced repartitioning of the existing hard drive. The `Windows.old` folder will be created only if you use the partition as it exists when the install is started.

Now all you have to do is get the data out of the `Windows.old` folder and back to the original location. You can spend hours cutting, pasting, and adjusting permissions, or you can automate the process with the User State Migration Tool.

Running ScanState and LoadState

Two important files that are added to your system with USMT are ScanState and LoadState. You can use these two files from the command prompt or in batch files to automatically examine your system and restore user accounts, files, and settings in a very short time.

ScanState **ScanState** will collect files and settings from a previous installation or from the `Windows.old` folder. It will store these files and settings in a migration store.

LoadState **LoadState** can read the files and settings from the migration store and restore them to the current computer.



When you install the Windows AIK, it includes two folders for USMT: `USMT\x86\` and `USMT\AMD64\`. The `x86` folder is for 32-bit systems, and the `AMD64` folder is for 64-bit systems. While the `AMD64` folder implies it's only for AMD 64-bit processors, you also use files within this folder for 64-bit Intel processors.

User profiles include a significant amount of data, including the desktop, document folders, Registry settings, and much more. When you use USMT for an in-place migration, it uses a hardlink migration store when the data is migrated from the `Windows.old` folder. This significantly reduces the time and space required to migrate all of this data. Instead of actually copying the data from one place to another on the hard drive, it just changes the links to where the data is located.

This is similar to what happens when you move a file from one location to another using drag and drop in Windows Explorer. For example, imagine a project on which you are working includes several files, so you decide to create a folder named `Project` and drag and drop all the files into that folder. The system doesn't create a brand-new copy of these files and then delete the originals. Instead, it just changes the file system links to these files so that they are now "located" in the `Project` folder.

Similarly, the hardlink migration feature in ScanState and LoadState will change the location of these files without having to copy all of the data. This can be significant if you're dealing with several GB of data.

It's fairly easy to put the ScanState and LoadState commands into a batch file that you can use to automate the migration of files and settings for multiple computers in your network. However, before automating ScanState and LoadState, it's good to know what the commands are doing.

The ScanState command is executed first. The following line shows how it may be executed to retrieve the migration data from the `Windows.old` folder. Note that even though it shows on more than one line in this book, you should enter it as a single command without any returns.

```
ScanState.exe c:\store /v:13 /o /c /hardlink /nocompress /efs:hardlink  
/i:MigApp.xml /i:MigDocs.xml /offlineWinDir:c:\windows.old\windows
```

I realize it's long, but the good news is that you don't need to modify it at all. Just copy it from the book, and it'll work for many common migrations. The following bullets break down the command:

- `ScanState` is the name of the command.
- `c:\store` is the location where the migration data will be stored.
- `/v:13` indicates the highest level of verbosity. It will provide a significant amount of output to the log that can be viewed later. The lowest level is 0, which logs only errors and warnings.
- `/o` causes it to overwrite an existing migration store (if one exists).
- `/c` tells `ScanState` to continue to run even if errors are encountered.
- `/hardlink` is used for in-place migrations to retrieve the data from the `Windows.old` folder. It requires the use of the `/nocompress` switch.
- `/nocompress` specifies that data is not compressed.
- `/efs:hardlink` specifies that encrypted file system (EFS) files will be moved using hardlink migration. The `/hardlink` switch must be used for this to succeed.
- `/i:MigApp.xml` specifies that the `MigApp.xml` file (which is included in the USMT folder) will be used to identify application settings to migrate.
- `/i:MigDocs.xml` specifies that the `MigDocs.xml` file (which is included in the USMT folder) will be used to identify document types to migrate.
- `/offlineWinDir:c:\windows.old\windows` is used to specify the location of the files from the original installation.

After the `ScanState` command is executed to capture the migration data, the `LoadState` command is executed to restore the migration data to the current installation.

When performing in-place migrations, you can enter the `LoadState` command with the following switches. Just as the `ScanState` command should be entered as a single line, the following `LoadState` command should be entered as a single line even though it spans more than one line in this book.

```
LoadState.exe c:\store /v:13 /c /lac:P@ssw0rd /lae /i:MigApp.xml
/i:MigDocs.xml /sf /hardlink /nocompress
```

- `LoadState.exe` is the command.
- `c:\store` is the location of the migration store created by `ScanState`.
- `/v:13` indicates the highest level of verbosity. It will provide a significant amount of output to the log that can be viewed later. The lowest level is 0, which logs only errors and warnings.
- `/c` tells `ScanState` to continue to run even if errors are encountered.

- `/lac:P@ssw0rd` specifies that local accounts should be created if they don't already exist. If the `/lac` switch is not used, local accounts will not be migrated. The same password will be used for all migrated accounts, and if a password is not specified, the password will be empty. You should use caution if using the password in a batch file because it will be stored in clear text, and anyone with access to the batch file can read the password.
- `/lae` specifies that local accounts should be enabled. The `/lac` switch must be used to migrate the accounts. When it is used, all migrated accounts will be enabled.
- `/i:MigApp.xml` specifies that the `MigApp.xml` file (which is included in the USMT folder) will be used to identify application settings to migrate.
- `/i:MigDocs.xml` specifies that the `MigDocs.xml` file (which is included in the USMT folder) will be used to identify document types to migrate.
- `/sf` restores shell folder redirection if a user had previously used folder redirection on any of their user folders. For example, a user may have redirected the My Documents folder to be stored on a server share or on a different partition.
- `/hardlink` is used for in-place migrations to retrieve the data from the `Windows.old` folder. It requires the use of the `/nocompress` switch.
- `/nocompress` specifies that data is not compressed.



More details on both the `ScanState` and `LoadState` commands, including a full listing of all the switches, are included in the `USMT.chm` help file included with the Windows AIK. You can access this help file in the `C:\Program Files\Windows AIK\Docs\CHMS\` folder.

Exercise 1.3 will lead you through the process of creating a batch file and running it to migrate user data for in-place migrations. This assumes that the computer was running Windows XP, Windows Vista, or Windows 7 and that a clean installation of Windows 7 was then performed on the system. Data from the previous installation is stored in the `Windows.old` folder of the C: drive. Last, the Windows AIK for Windows 7 is also assumed to have been installed on this system.

EXERCISE 1.3

Running USMT in a Batch File

1. Launch Windows Explorer, and browse to the C: drive. Create a folder called **MyUSMT**.
2. Right-click within the folder, and select **New** > **Text Document**. Press Enter to open the text document.

EXERCISE 1.3 (continued)

3. Type the following lines in the text document. Note that the ScanState and LoadState commands span two lines in this book, but they should be entered as a single command in the document.

```
Cd "c:\Program Files\Windows AIK\Tools\USMT\x86"  
rem  
ScanState.exe c:\store /v:13 /o /c /hardlink /nocompress /efs:hardlink  
  /i:MigApp.xml /i:MigDocs.xml /offlineWinDir:c:\windows.old\windows  
rem  
LoadState.exe c:\store /v:13 /c /lac:P@ssw0rd /lae /i:MigApp.xml  
  /i:MigDocs.xml /sf /hardlink /nocompress
```

The first command changes the directory to the `...\USMT\x86` folder on the C: drive. If you are running a 64-bit system, you can substitute this with `...\USMT\amd64` instead. The `rem` lines are remark or comment lines I added to separate the ScanState and LoadState commands for easier readability.

4. Select File > Save As.
5. Type in **usmt.bat** and click Save. By adding the `.bat` extension, you tell Notepad to save the file as a batch file (with a `.bat` extension) that can be executed instead of a text file (with a `.txt` extension). Close the file.
6. Click Start > Accessories, right-click the command prompt, and select Run As Administrator. If prompted by User Account Control, click Yes to continue.
7. Type in the following command to change the directory to the `C:\MyUSMT` directory you created earlier:

```
Cd \MyUSMT
```

8. Type in **usmt** and press Enter to run your batch file. This will take several minutes to complete, and the output will appear on the screen. When you've finished, the migration is complete.
 9. Using Windows Explorer, browse to the `C:\Program Files\Windows AIK\Tools\USMT\x86` folder (or the `C:\Program Files\Windows AIK\Tools\USMT\amd64` if you used that folder in your batch file. Locate and open the `loadstate.log` file and the `scanstate.log` file. With a verbosity level of 13 used in the commands, you'll see that a lot of data has been logged and can be reviewed to view the activity of both commands.
-

While the previous exercise had you create a batch file with the ScanState and LoadState commands, it is possible just to execute the commands at the command prompt. However, if you have created the batch file, you can create your own portable tool that can be easily executed on any system to perform an in-place migration.

Creating a Portable USMT Batch File

If desired, you can make your batch file a little more portable. Instead of installing the Windows AIK for Windows 7 on every computer that you are migrating, you can copy the appropriate files to a USB flash drive or CD. These files consume only about 50 MB.

You can then bring your USB flash drive or CD to any computer that has had an in-place migration, run the batch file, and the migration will be done in minutes.



For more on this process, check out the TechNet article “Building a USB Drive to Store USMT 4.0 Files and Simple Commands.” You can read it here: <http://technet.microsoft.com/library/dd940094.aspx>.

You’ll still need to install the Windows AIK onto a Windows 7 computer. Once it’s installed on any Windows 7 computer, you can use Windows Explorer to copy the USMT folder onto the portable media such as a USB flash drive.

- Browse to the C:\Program Files\Windows AIK\Tools\USMT folder.
- Right-click the USMT folder and select Copy.
- Insert a USB flash drive.
- Browse to the USB flash drive using Windows Explorer, right-click, and select Paste.

At this point, you’ll have the entire contents of the USMT folder on the flash drive. This includes the USMT folder used for 64-bit systems (\USMT\amd64\) and the folder used for 32-bit systems (\USMT\x86).

Now you’ll need to create a batch file that can be used on any system. The batch file used in the previous exercise can be used as a starting point, but it will need to be slightly modified.

The USMT files need to be copied to the C: drive on the system that is being migrated, so the first step in the batch file is to copy these files. This sounds simple enough, but it’s impossible to tell what the letter of the USB drive will be when it’s plugged in on any given system. That is, when you plug the USB into Sally’s computer, the USB disk may be assigned the letter E:, but when you plug it into Joe’s computer, it might be assigned the letter F:.

You can use the following `If exist` statement in the batch file to check to see if the USB flash drive is assigned the letter D:. It checks for the USMT folder at the root of D:. If it exists, it assumes this is the USB flash drive and copies the USMT folder from the flash drive to the Windows folder on the C: drive.

```
If exist D:\USMT\*.* XCopy /e /v /y C:\Windows\USMT\
```

The `/e` switch specifies that all directories should be copied—even empty ones. The `/v` switch is used to verify the files, and the `/y` switch is used to suppress prompting if any files are overwritten.



Chapter 3 covers the XCopy command and other elements of the command prompt in more depth.

Unfortunately, this works only if the USB flash drive is assigned the letter D:. It could be assigned other letters such as E:, F:, and so on. You can add multiple lines to your batch file to check for which letter is actually assigned to the USB flash drive. Simply copy and paste the following line, changing only the letter of the drive:

```
If exist E:\USMT\*.* XCopy /e /v /y C:\Windows\USMT\  
If exist F:\USMT\*.* XCopy /e /v /y C:\Windows\USMT\  

```

Once you have added the extra lines, the rest of the batch file becomes a little easier. You now know your USMT files exist in the `C:\Windows\USMT\x86` and the `C:\Windows\USMT\AMD64` folders. You simply change to the appropriate directory and run the `ScanState` and `LoadState` commands.

For example, if you were migrating data to a 32-bit installation of Windows 7, you'd use the following batch file shown in Listing 1.1.

Listing 1.1: Batch file for 32-bit data migration

```
If exist D:\USMT\*.* XCopy /e /v /y C:\Windows\USMT\  
If exist E:\USMT\*.* XCopy /e /v /y C:\Windows\USMT\  
If exist F:\USMT\*.* XCopy /e /v /y C:\Windows\USMT\  
If exist G:\USMT\*.* XCopy /e /v /y C:\Windows\USMT\  
If exist H:\USMT\*.* XCopy /e /v /y C:\Windows\USMT\  
If exist I:\USMT\*.* XCopy /e /v /y C:\Windows\USMT\  
rem  
Cd "c:\Windows\USMT\x86"  
ScanState.exe c:\store /v:13 /o /c /hardlink /nocompress /efs:hardlink  
/i:MigApp.xml /i:MigDocs.xml /offlineWinDir:c:\windows.old\windows  
LoadState.exe c:\store /v:13 /c /lac:P@ssw0rd /lae /i:MigApp.xml  
/i:MigDocs.xml /sf /hardlink /nocompress
```

This batch file checks to see if the USB drive has been assigned letters D: through I:, but if you want to check for all possible drive letters just copy an `If exist` line, paste it, and modify the letter in the new line. You can check for all drive letters up to Z: if desired.

You could save this file as `usmt32.bat`.

However, if you needed to run the migration on a 64-bit system, you could replace `x86` with `amd64` in the change directory line and save the file as `usmt64.bat`.

```
Cd "c:\Windows\USMT\amd64"
```

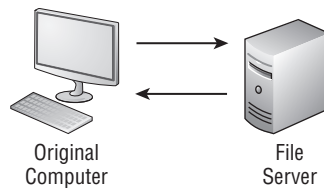
Wipe-and-Load Migration vs. Side-by-Side Migration

The majority of this section has covered an in-place migration. A common scenario is where a Windows XP system has the hardware to support Windows 7. Windows 7 is installed, and the user's data and settings are then migrated from the Windows.old folder.

However, there are some scenarios where the existing system needs to be wiped clean or completely replaced. In these scenarios, you can still use the USMT commands to capture the files and settings and then later restore them, but the process is a little different. The two possible scenarios are a wipe-and-load migration or a side-by-side migration.

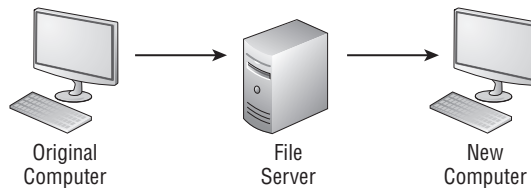
Wipe-and-load migration A wipe-and-load migration uses the same hardware but removes all data on the partitions. A simple example would be a system that has multiple partitions that aren't needed in Windows 7, so the drive is reconfigured as a single partition. Repartitioning the disk will result in the loss of all the data, so before this is done ScanState is run to capture all the files and settings. The ScanState data can be stored on a server, as shown in Figure 1.2, stored on an external USB drive, or even stored on a USB flash drive if the user doesn't have much data. After Windows 7 is installed, LoadState is executed to restore these settings from the server (or the external USB or flash drive). Figure 1.2 shows a wipe-and-load migration.

FIGURE 1.2 Wipe-and-load migration



Side-by-side migration In a side-by-side migration, a user has an older computer system that will be replaced. ScanState is run on the older system, and this older system is then decommissioned. The ScanState data can be stored on a server, as shown in Figure 1.2, stored on an external USB drive, or stored on a USB flash drive if the user doesn't have much data. A newer system with Windows 7 is provided, and LoadState is executed on it to restore the files and settings. Figure 1.3 shows a side-by-side migration.

FIGURE 1.3 Side-by-side migration



In both scenarios, the process is similar:

1. Run `ScanState` on the original computer, and store the files and settings externally, such as on a network share or an external USB drive. The `ScanState` version that comes with the Windows AIK for Windows 7 can be run on Windows XP, Windows Vista, and Windows 7 operating systems.
2. Install Windows 7. A wipe-and-load installation will install Windows 7 on the same computer, whereas a side-by-side installation will install Windows 7 on a separate computer.
3. Run `LoadState` on the Windows 7 system using the externally stored files and settings.

When `ScanState` is run for wipe-and-load and side-by-side migrations, the `/offlineWinDir:c:\windows.old\windows` switch is omitted. Instead of capturing the files and settings from the `Windows.old` folder, `ScanState` will retrieve the migration data from the actual system. In addition, instead of storing the results in the `C:\Store` folder, you could map a Universal Naming Convention (UNC) path to a share on a server or connect an external USB drive.

As an example, imagine that you have connected an external USB drive, and it is assigned the letter G:. The following `ScanState` command could be used:

```
ScanState.exe g:\store /v:13 /o /c /hardlink /nocompress /efs:hardlink
/i:MigApp.xml /i:MigDocs.xml
```

The captured files and settings can be restored to the Windows 7 operating system with the following command. The only thing that will change is the letter of the drive where the `\store` folder is stored. For example, it may be G: on the original installation that had multiple partitions, but the external drive may be E: on a system that has Windows installed with only a single partition and a single DVD drive.

```
LoadState.exe e:\store /v:13 /c /lac:P@ssw0rd /lae /i:MigApp.xml
/i:MigDocs.xml /sf /hardlink /nocompress
```

Determining Which User Data and Settings to Preserve

When running `ScanState`, you have some choices for which data and settings to preserve. The easiest choice is to accept the defaults, as we've done in this chapter. If your environment is typical and doesn't include any critical one-of-a-kind applications, this choice will meet most, if not all, of your needs. You can modify the defaults with the following files:

MigDocs.xml This file includes rules used to find user documents on a computer. Some of the common file types identified in this document are `.accdb`, `.ch3`, `.csv`, `.dif`, `.doc*`, `.dot*`, `.dqy`, `.iqy`, `.mcw`, `.mdb*`, `.mpp`, `.one*`, `.oqy`, `.or6`, `.pot*`, `.ppa`, `.pps*`, `.ppt*`, `.pre`, `.pst`, `.pub`, `.qdf`, `.qel`, `.qph`, `.qsd`, `.rqy`, `.rtf`, `.scd`, `.sh3`, `.slk`, `.txt`, `.vl*`, `.vsd`, `.wk*`, `.wpd`, `.wps`, `.wq1`, `.wri`, `.xl*`, `.xla`, `.xlb`, and `.xls*`.

MigApps.xml This file includes the rules used to migrate application settings. It will migrate many common applications published by Apple, Google, IBM, Intuit, Microsoft, and others.

MigUser.xml This file includes rules that can be used to identify different elements of user profiles to include or exclude from the migration. By default, all users are migrated. This file is *not* used to specify which users to migrate.

Config.xml The Config.xml file is optional and is created using the /genconfig switch with ScanState. It can be used specifically to exclude certain components or operating system settings from the migration.



If you want to limit the users who are migrated, you can do so only from the command line. The /ui switch (user include) can be used to specify accounts with both ScanState and LoadState. When used, only the specified accounts will be migrated. You can't specify which users are migrated using any .xml files.

The User State Migration Tool (USMT) 4.0 User's Guide includes the article "What Does USMT Migrate?" which includes all the details of exactly what is migrated by default. This user guide is in the form of a help file named USMT.chm located in the C:\Program Files\Windows AIK\Docs\CHMs folder when the Windows AIK is installed.

Local vs. Remote Storage Considerations

When creating the migration store, you can use ScanState to store it locally or remotely. *Locally* means you're storing the migration store on a removable USB drive or on an internal drive for a side-by-side migration. *Remotely* means you're storing the migration data in a shared folder on a server in your network.

Storing data on a network share can be very convenient, but it can also result in a significantly slower migration process. A migration store can hold a large amount of data. With the size of files and the abundance of hard drive space, it would be easy for a user to accumulate 10 GB of data or more. If you're saving this to a network share over a 10Mbps or even a 100Mbps network connection, you'll be waiting awhile.

Not only will *you* be waiting, but users on the network may also find themselves waiting longer than normal. You should consider how storing the data on network shares affects the rest of the network. If the network is already busy and you begin moving gigabytes of storage over it, things may slow to a crawl and users will start complaining.

If your network infrastructure is reliably running with GB network interface cards, routers, and switches, you will probably be able to use network storage without any problem.

Securing Migrated Data

The amount of data included in a migration store can be considerable and, depending on the user's job responsibilities, the data can be sensitive. Any migration stores with sensitive data should be protected until they are used to restore the user's files and settings. They should be destroyed after the user's files and settings have been restored.

Sensitive data contained in the migration store could include the following:

- Classified information such as secret data
- Company secrets such as financial data, future product details, or plans for mergers
- Personally identifiable information (PII) on customers and employees, including names, addresses, phone numbers, social security numbers, and credit card information

At the very least, migration stores should be treated with the same level of protection as the original data. For example, if a user has secret data on her system, the migration store obtained from this system should be treated with the same level of protection used to protect the source data.

This becomes especially important when storing the data on external USB drives. Because these drives are highly portable, it's possible for an administrator to migrate secret data to an external USB drive and then use this migration store to restore the files and settings on a new computer. If the administrator stops there, the USB drive will still hold the secret data. If an educated user later comes across this USB drive and sees the migration store, he could run the `LoadState` command and restore all the data to his computer.

Destruction of the migration store can take several different forms depending on the type of data used. Some programs will erase the data and overwrite random patterns of 1s and 0s to ensure there isn't any data remaining on the drive that can be recovered.

Testing Designed Strategy

Once you've identified what strategy you'll use to migrate the user's data (in-place migration, wipe-and-load migration, or side-by-side migration), you should do some testing.

Except for the wipe-and-load migration, you'll have the original data that can be used to try to save the migration data over and over again. The in-place migration retains the original files and settings in the `Windows.old` folder, so if you're not happy with the results of either `ScanState` or `LoadState`, you can simply rerun the commands. Similarly, as long as you keep the original computer in a side-by-side migration, you can rerun both of the commands. However, you have only one chance to run `ScanState` with a wipe-and-load migration.

After testing and determining the best method, it's worth your time to document the procedure in a batch file that can easily be run without your having to struggle to remember the exact commands and the specific switches.

Virtualization Considerations

Virtual Desktop Infrastructure (VDI) has come a long way in the past few years. In short, VDI is the practice of hosting one or more virtual desktop operating systems on a desktop operating system. The desktop operating system is referred to as the host, and the virtual systems are referred to as virtual machines, virtual images, and sometimes just virtual applications.

As an example, you can run an instance of Windows 7 as the host operating system. Then, within the Windows 7 host, you can run other operating systems such as Windows XP, another virtual machine running Windows 7, and a third running Windows Server 2008.

With the cheap but abundant processing power built into desktop PCs, using VDI is now being seriously considered an alternative to Remote Desktop Services (RDS). Desktop PCs rarely use much of their processing power, and VDI applications and operating systems can provide distinct isolation from the host operating system.



Remote Desktop Services (previously known as Terminal Services in Windows) can be configured on a server to allow users to run individual applications or entire desktops over a network. From the users' perspective, the application or desktop appears to be running on their individual system but is actually running on a server.

Microsoft introduced Windows Virtual PC (VPC) with Windows 7. This was previously known as *Microsoft Virtual PC* and was often used by administrators, technical trainers, and students. It's been available as a free download for years. If you've used Microsoft Virtual PC, you'll notice similarities with Windows Virtual PC, but the underlying technology provides some significant improvements.

VPC is not just for techies anymore. It can be installed and configured for regular users to run applications in virtual isolated environments using Windows XP Mode. It can be used to host applications running on other operating systems. It can even be used to host a dual-boot system using virtual hard disk files. You'll see all of this in this section.

Considering a VDI Environment

The choice between a complete physical environment and a hybrid physical and VDI environment requires considering several different elements related to how the VDI environment will be used. These include the following:

Existing hardware There are several things to consider with existing hardware. First, if it's 32-bit, you're limited to no more than 4 GB of RAM, as discussed earlier. You're much better off if the hardware is 64-bit and has more than 4 GB of RAM.

Second, if the processor doesn't support virtualization, or the BIOS doesn't support virtualization, you won't be able to use Windows XP Mode. However, you can still use virtual machines.

Tradeoffs between physical and VDI environments VDI environments require more resources. These include newer processors and more RAM. However, if the PC supports it, the environment may allow you to remove another PC. I've worked in some environments where users had to maintain two PCs—one to do most of their work and another for legacy applications. Two PCs cost more to maintain than one; this includes more electricity and more cooling power. Many companies consider VDI environments a “greener” alternative.

Network load considerations Most PCs will have only a single network interface card (NIC). This NIC will be shared with the VDI machines. If the virtual machines are connected to the network and have a lot of network activity, you may want to consider upgrading the NIC.

Disk space Windows XP Mode requires a minimum of 1.6 GB of disk space. If you start adding additional virtual machines, you'll find that they take significantly more. For example, a Windows Server 2008 virtual hard disk takes about 6 GB with an initial installation, and Windows 7 takes about the same. These are dynamically expanding disks, so as more is installed or added to the virtual systems, they will take more and more space.

This can be critical if the virtual hard disks are stored on the boot or system partition. If they are stored on one of these partitions, you should monitor disk space usage closely.



Real World Scenario

Using Virtual PC for Mini Labs

I've been using Virtual PC (VPC) for many years to create virtual desktops and even virtual networks where I could test and learn different technologies.

As a simple example, when first learning Windows Server 2008 and Windows Vista, I was running Windows XP as my desktop operating system. I created two VPC images—one of Windows Server 2008 and another of Windows Vista. I was able to load these two systems, configure the server as a domain controller in a domain, and configure Windows Vista to join the domain. I now had a mini-network with a server and a client.

One of the greatest benefits of this virtual setup is that if I crashed the system, I could easily rebuild it and start over.

Similarly, that's what I've created for this book. While I'm running Windows 7 on my PCs, I also have a virtual network consisting of a virtual Windows Server 2008 server and another of a virtual Windows 7 client. With the knowledge you gain from this chapter, you can do the same thing.

Direct Connection vs. Brokered Connection

In the context of VDI, connections can either be direct or brokered. Direct would be directly within a virtual machine, and brokered would be indirectly through the virtual machine.

Direct connection The user launches the virtual machine from within the host system, logs on to the virtual machine, and starts the application within the virtual machine.

Brokered connection The user launches the application directly from the host machine. Even though it's running within the virtual machine, this is transparent to the user. Windows XP Mode (shown later in this chapter) uses a brokered connection, and this can be used with other virtual machines.

Imagine a user needs to launch an instance of an older application named LegacyApp. She can launch this in a direct connection or a brokered connection. In both instances, the application would be installed on a virtual machine, but the difference is in how it's delivered to the user. Brokered connections are easier for end users.

Determining a VHD Strategy

A cool feature available with Windows 7 is the ability to boot to a virtual hard drive (VHD). The VHD format has been used with Virtual PC for many years, but the abilities have been expanded significantly. This can be done only with Windows 7 or Windows Server 2008 R2, but it can be a useful feature.

Dual-boot environments allow you to boot to different operating systems. One of the challenges with traditional dual-boot environments is that you needed to ensure each operating system was installed on its own partition. If not, one OS could (and usually did) corrupt the other OS.

Now you can have multiple operating systems available on a single machine with a single partition. When you've finished with the operating system, simply delete the VHD file. You'll see how to create a bootable VHD later in this chapter.

The process creates a VHD file (with an extension of `.vhd`) at the root of `C:`. You can name the file whatever you want (the following exercise names it `Windows7.vhd`). The size of the file should be at least 20 GB and is expressed in MB. You can make it larger to accommodate more data and files: 10 GB is 10240, so 20 GB would be 20480, 30 GB 30720, and so on.

You can have the `.vhd` file either fixed or expandable. A 20GB fixed size will always take up 20 GB of space, while a 20GB expandable file will start at less than 100 MB and expand as data is added to the file. The fixed size is quicker since it doesn't need to expand dynamically, while the expandable size consumes only the space needed.

Exercise 1.4 shows how you can configure a system to boot to a virtual hard drive hosting Windows 7. In the exercise, the host system is running 64-bit Windows Vista and the installation DVD is 64-bit Windows 7.

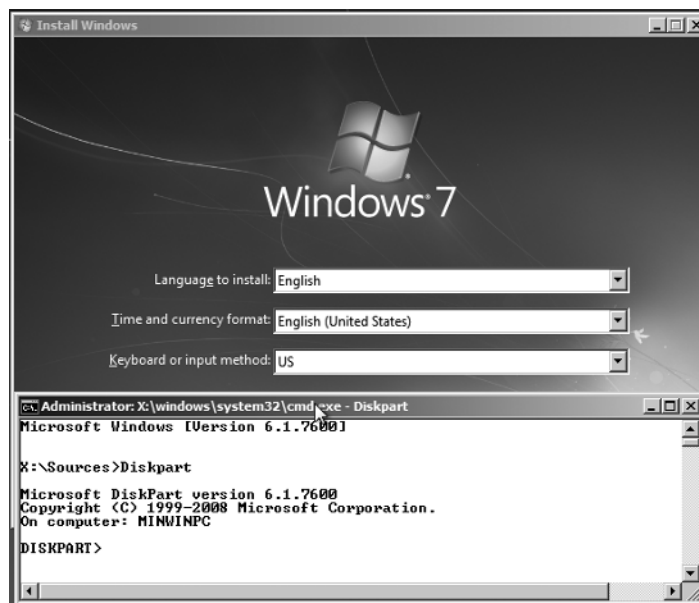
EXERCISE 1.4**Creating a Bootable VHD**

1. Turn on the Windows Vista system and place the Windows 7 installation DVD in the system. When the system starts, select the option to boot from the DVD.
2. When the initial installation screen appears prompting you to select a language, time and currency format, and keyboard or input method, press Shift+F10. This will launch a command-prompt window with the prompt

X:\Sources>

X: is mapped to the DVD drive, and it is pointed to the Sources folder in the drive.

3. At the command prompt, type **diskpart** and press Enter. After a moment, the command prompt will change to DISKPART> and your display will look similar to the following graphic.



4. Type the following command, and press Enter to create a 40GB expandable virtual disk file.

```
Create vdisk file = c:\Windows7.vhd maximum=40960 type=expandable
```

You can name the .vhd file anything you want, enter a different maximum size, or omit the type=expandable statement to create a fixed-size file. If you choose a fixed size, it will take several minutes to complete and will show the progress. After the file is created, Diskpart will display the message "Diskpart successfully created the virtual disk file."

EXERCISE 1.4 (continued)

5. Type the following command and press Enter.
Select `vdisk file=c:\Windows7.vhd`
Diskpart will indicate it has successfully selected the virtual disk file.
6. Type the following command and press Enter:
Attach `vdisk`
Diskpart will indicate it has successfully attached the virtual disk file.
7. Type **Exit** and press Enter to exit Diskpart.
8. Type **Exit** and press Enter to exit the command-prompt window.
9. You will now see the Install Windows screen you saw before pressing Shift+F10. Make sure the correct language, time and currency, and keyboard or input method are selected and click Next.
10. Click the Install Now button.
11. Review the license terms, select the check box **I Accept The License Terms**, and click Next.
12. Click the Custom (Advanced) type of installation.
13. The Where Do You Want To Install Windows screen will appear with at least two disks showing. Below the physical disks and partitions, you will see the virtual disk file represented as a disk with a total size of 40 GB and free space of 40 GB (unless you created it as a different size). In my test system, it has one physical disk shown as Disk 0 and the .vhd disk as Disk 1 Unallocated Space. Select the virtual disk and click Next.

At this point, the installation of Windows will progress as would a normal Windows 7 installation. You can follow the exercise earlier in this chapter to install Windows 7 from the DVD if desired.

When it completes and reboots, you'll see a dual-boot screen. The Windows 7 choice will be first and, if you don't take any action, it will boot to the Windows 7 VHD file in 30 seconds. You can modify this behavior with `bcdedit`, which is covered in more depth in Chapter 5, "Maintaining and Troubleshooting Windows 7."



A warning may appear saying, "Windows cannot be installed to this disk. (Show Details)," indicating the hardware is not compatible. Don't believe it. Continue on. I've seen that message on two different systems, but the installation and operation worked without any problems I could identify.

Windows XP Mode

Windows XP Mode is a virtualization technology that addresses a specific problem that prevented many people from moving from Windows XP to Windows Vista. Many applications worked well in Windows XP but would not work in Windows Vista.

Interestingly, this problem prevented people from moving to Windows XP from Windows 2000 in the early XP days. It seems to be a common problem, but Windows XP Mode may be a definitive solution for those considering Windows 7.



Microsoft spent a lot of time and effort on Windows XP Mode, and from everything I've seen it looks like it'll be a success. It's not uncommon for Microsoft to use test topics to amplify the importance of features they've added. If you're preparing for the 70-685 and 70-686 Windows 7 exams, make sure you understand the benefits and requirements for Windows XP Mode.

Windows XP Mode is a virtual instance of Windows XP running within Windows 7. Applications that won't run in Windows 7 can be installed in this instance of Windows XP. However, Microsoft has engineered a great solution that doesn't require the user to launch Windows XP. When Windows XP Mode is configured, the user simply launches the legacy application from their Start menu, and it appears as though it's running just as any other application would run.

Although Windows XP Mode is free with Windows 7, there are some requirements you need to worry about. These include the following:

- The processor must be capable of hardware virtualization.
- Virtualization must be enabled in the BIOS.
- At least 1.6GB free hard drive space must be available.

If your system will support it, you can download and install Virtual PC for Windows 7 and then download and install Windows XP Mode for Windows 7.

Analyzing Your Existing Hardware Environment

Windows XP Mode originally required a processor that supports virtualization that needed to be enabled in the BIOS. However, Microsoft later released an update with KB 977206 that allows Windows XP Mode to work without hardware assisted virtualization (HAV). Intel refers to HAV as Intel VT, and AMD calls it AMD-V. Both companies include utilities you can download and run to determine if your processor has this capability.

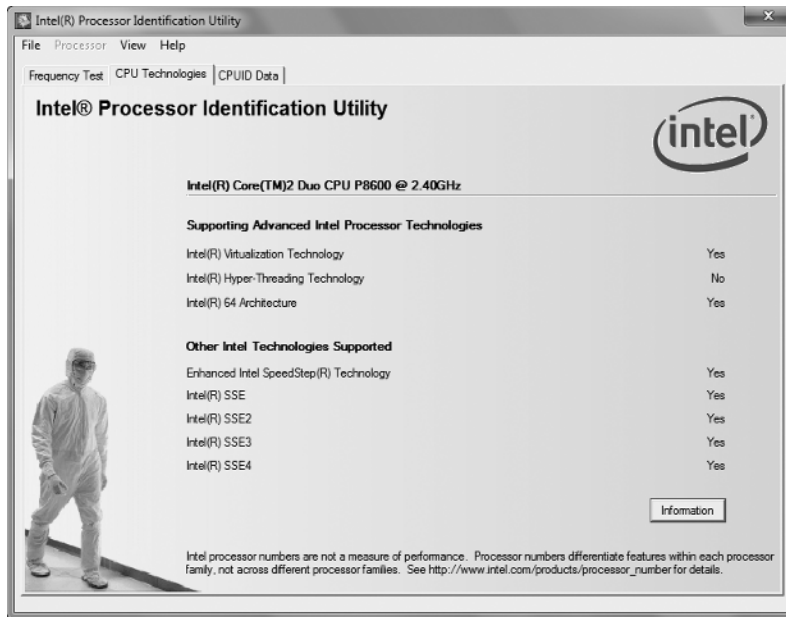


Windows XP Mode works best if your processor supports virtualization. However, if the processor doesn't support virtualization or it isn't enabled in the BIOS, you can still use Windows XP Mode. Check out KB article 977206 at <http://support.microsoft.com/kb/977206>.

Figure 1.4 shows the Intel® Processor Identification Utility with the middle tab selected. Notice that the Intel(R) Virtualization Technology is listed as Yes, verifying that Windows XP Mode can be used on this system. This utility can be downloaded from Intel's website here:

<http://www.intel.com/support/processors/tools/piu/>

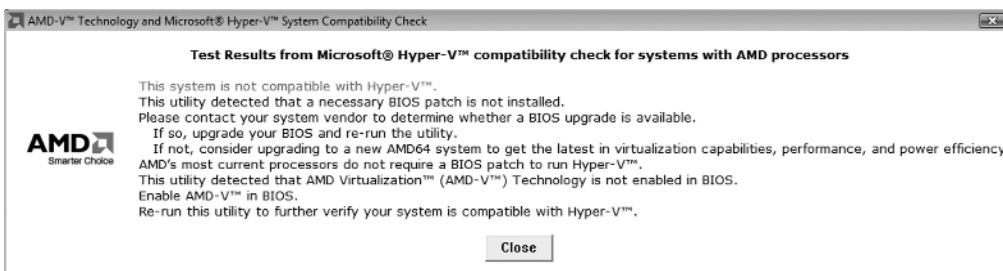
FIGURE 1.4 Intel® Processor Identification Utility



I have an older AMD system that doesn't support virtualization. After running the AMD Virtualization Compatibility Check Utility, the screen shown in Figure 1.5 appeared. This utility can be downloaded from AMD's support site at this address:

http://support.amd.com/us/Processor_TechDownloads/AMD-V_Hyper-V_Compatibility_Check_Utility_V2.zip

FIGURE 1.5 AMD Virtualization Compatibility Check Utility



Next you'll need to enable the virtualization option in the BIOS. My experience is that this is not enabled by default, so you'll need to reboot your system, read the screen to see what key to use to enter BIOS, and then search for the virtualization option.

Many versions of BIOS are available, and there's no standard of how to access BIOS. Sometimes you're prompted to press F10, sometimes the Delete key, and at other times you're prompted just to press any key at the appropriate time. The only thing that is consistent is that a message will appear telling you what key to press to enter the setup mode that allows access to the system BIOS.

The virtualization setting can be called AMD-V or Intel VT or simply Virtualization Technology. Find the setting and enable it.

If the processor is capable, but the BIOS doesn't have the Virtualization Technology setting, it's possible you'll need to upgrade or flash the BIOS. Access the command prompt and enter **SystemInfo**. This takes a minute to complete, but it will list a significant amount of information about your system including the BIOS version. You can search the Internet using this information for a possible upgrade. Follow the manufacturer's instructions to complete this process.

Downloading the Software

Once you've verified your processor is capable and you've configured the BIOS, you can begin downloading the software needed for Windows XP Mode. You'll need at least 1.6 GB of free space. The space can be on any available partition.

The two files you'll need to download and install are as follows:

Windows Virtual PC This is actually a Windows Update labeled as KB 958559. Both an x86 version (for 32-bit systems) and an x64 version (for 64-bit systems) exist. Make sure you install the one that's right for your system. This will require rebooting your system.

Windows XP Mode This file is about 480 MB. It's a self-extracting executable that will add Windows XP Mode to your system and install the instance of Windows XP that can be used to run legacy applications. There is only one version of this file, and it will work for both 32-bit and 64-bit systems.

You can find both Windows Virtual PC and Windows XP Mode at Microsoft's download site at www.download.microsoft.com. Search for "Windows Virtual PC" and "Windows XP Mode."



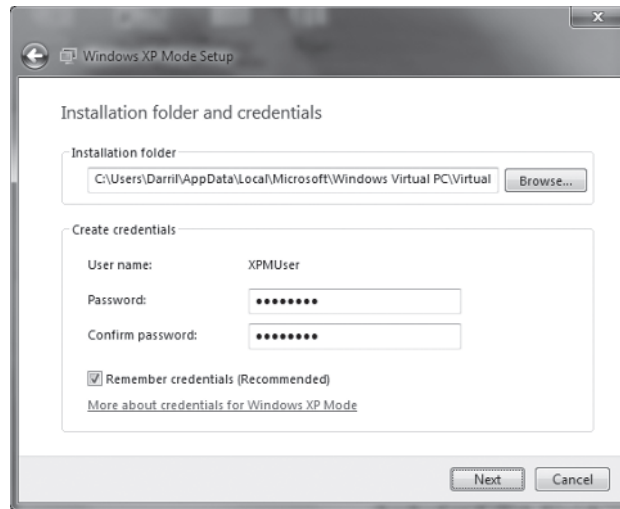
You'll need the version of Virtual PC designed to work with Windows 7 and Windows XP Mode. If you have an older version of Virtual PC, you'll need to uninstall it first. An easy way to see if you have a compatible version is by the name; if you're running a version called Windows Virtual PC, it'll work because Windows Virtual PC was released with Windows 7. If you're running a version named Microsoft Virtual PC, you'll need to uninstall it first.

Exercise 1.5 will walk you through the steps to install Windows Virtual PC and Windows XP Mode.

EXERCISE 1.5

Installing Windows Virtual PC and Windows XP Mode

1. Install Windows Virtual PC with the following steps:
 - a. Launch Windows Explorer. Browse to where you downloaded Windows Virtual PC and double-click the executable. This actually installs update KB958559. If it is already installed, it will inform you that it is installed and you can continue with step 2.
 - b. At the prompt to install the Windows software update, click Yes.
 - c. Review the license terms and click I Accept. The installation will start and take a few minutes to complete.
 - d. When the installation is complete, you'll be prompted to restart the computer. Click Restart Now.
2. Install Windows XP Mode with the following steps:
 - a. Launch Windows Explorer. Browse to where you downloaded the Windows XP Mode file and double-click it.
 - b. When prompted by the Security Warning to run the file, click Run.
 - c. On the Welcome screen, click Next.
 - d. If your C: drive has at 1.6 GB of free space, you can accept the default location of C:\Program Files\Windows XP Mode\ and click Next. Otherwise, choose another location.
 - e. When prompted by User Account Control to continue, click Yes.
 - f. The installation will complete, and the Setup Completed screen will appear. Leave Launch Windows XP Mode checked, and click Finish.
 - g. Review the Windows XP Mode License Agreement. Click the check box I Accept The License Terms and click Next.
 - h. You will be prompted to identify the installation folder and enter credentials for an XP Mode user account, as shown in the following graphic. Accept the default installation folder, and enter a password in the Password and Confirm Password text boxes. Make sure that the Remember Credentials (Recommended) check box is checked. Click Next.

EXERCISE 1.5 (continued)

With Remember Credentials checked, users won't be prompted to enter credentials when using Windows XP Mode.

- i. Enable automatic updates by selecting Help Protect My Computer By Turning On Automatic Updates Now, and click Start Setup. It will take several minutes for the setup to complete. Once it completes, a window will open with the Windows XP Mode desktop.

Windows XP Mode is now installed on your system. However, it won't be of much use until you install some applications and configure them to run within your Windows 7 system. The next section leads you through this process.

Running Applications from Windows XP Mode

Although the previous exercise showed you how to install Windows XP Mode, the real value comes in using this to run applications in a virtual environment.

As an example, imagine that a user has a program she uses quite a bit, works well in Windows XP, but does not work at all in Windows 7. You can add Windows XP Mode to her Windows 7 desktop and then install the legacy application in the Windows XP Mode virtual environment.



This feature is most valuable for applications that work in Windows XP but not in Windows 7. However, you can install any application in Windows XP Mode that will work in Windows XP. The point of the exercise is not what you install but instead how it's accessed after it is installed.

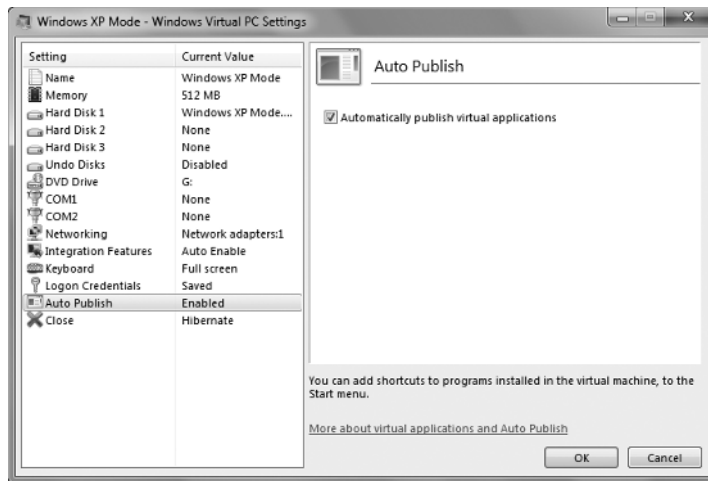
Exercise 1.6 will lead you through the steps to make an application available to end users. As preparation for this exercise, I downloaded IrfanView (a freeware image viewer) created by Irfan Skiljan. However, you can use any program and, if you want to install another program, substitute your program where I refer to IrfanView in the exercise.



EXERCISE 1.6

Publishing Applications from Windows XP Mode

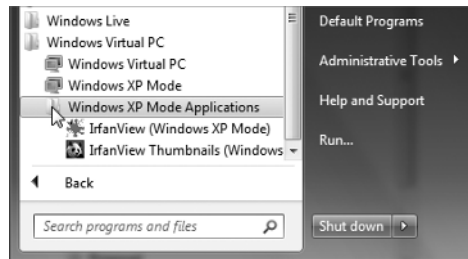
1. From the Windows 7 host machine, click Start > All Programs > Windows Virtual PC > Windows Virtual PC. This will launch the Windows Virtual PC console.
2. Right-click the Windows XP Mode .vmcx file and select Settings.
3. Select Auto Publish, and verify that Auto Publish is set to Automatically Publish Virtual Applications, as shown in the following graphic.



4. Click OK to close the Settings page, and then double-click the Windows XP Mode .vmcx file to start the Windows XP Mode VPC.
5. After Windows XP Mode starts, install the application you downloaded. Copy a shortcut for this program (many applications including IrfanView place a shortcut on the desktop that you can copy).
6. Right-click the Start menu within Windows XP, and select Explore All Users. This will open Windows Explorer in this folder:
 C:\Documents and Settings\All Users\Start Menu
7. Double-click Programs, and then paste the shortcut for the program that you installed into this folder. After a moment, this application will be available on your host system.

EXERCISE 1.6 (continued)

8. Click Windows 7 and select Start > All Programs > Windows Virtual PC > Windows XP Mode Applications. You'll see that the program that you installed in Windows XP Mode is now available on the Windows 7 menu, as shown in the following graphic.



While this shows how applications published from Windows XP Mode will appear, you can also publish applications from other Windows VPC programs. For example, if you install a virtual instance of Windows 7 and published an application from there, the published application will appear in a folder named Windows 7 Applications.

9. Try to launch the application by selecting Start > All Programs > Windows Virtual PC > Windows XP Mode Applications > IrfanView (Windows XP Mode). It will fail and inform you that you must close Windows XP Mode first.
10. Return to Windows XP Mode, and select Start > Log Off. After you are logged off, select Action > Close. This will cause Windows XP Mode to go into Hibernate mode.
11. Once the system finishes hibernating, try to start the program from the Windows 7 Start menu by selecting Start > All Programs > Windows Virtual PC > Windows XP Mode Applications > IrfanView (Windows XP Mode).

Windows XP Mode will awaken from Hibernate mode, and the application will launch in its own window. Note that the full Windows XP desktop does not launch but only the application.

12. Browse to the Virtual PC console by clicking Start > All Programs > Windows Virtual PC > Windows Virtual PC. You'll see that the Windows XP Mode VPC has a status of Running.
 13. Close the IrfanView application.
 14. Click Start > All Programs > Windows Virtual PC > Windows XP Mode Applications. Right-click IrfanView PC, and select Copy to copy the shortcut to this program.
 15. Access the Windows 7 desktop. Right-click and select Paste Shortcut to paste the program shortcut.
 16. Double-click the shortcut on the desktop to launch it. You'll see that it launches the application just the same as it did from the Start menu.
-

This exercise shows you how easily you can integrate virtual applications into a user's desktop. Users don't have to know all the details of how the virtual applications are installed or how they work, and many end users don't want to know. They just want to be able to access an application when it's needed.

If an administrator configured the virtual application to run from a shortcut like this, the user will have very little indication that anything is different. They can still run their legacy application, and you are still able to migrate your older systems to Windows 7.

Using Windows XP Mode allows you to run legacy applications on a Windows 7 system easily. However, you can also use VPC to run other desktops that you create.

Running Applications from Other VPCs

The previous example showed you how to install applications in Windows XP Mode and make them available from the Windows 7 Start menu, but you aren't restricted to doing this with only Windows XP Mode.

Developers are notorious for crashing their systems. They develop applications and, during the test-and-debugging process, things sometimes go wrong. For example, an operating system that once worked now no longer works. Not only is the developer unable to continue the development of the application, but they can't even access email or do other day-to-day work. While you can't prevent a developer from crashing a development environment, you can isolate the problem by creating a virtual environment for development work.

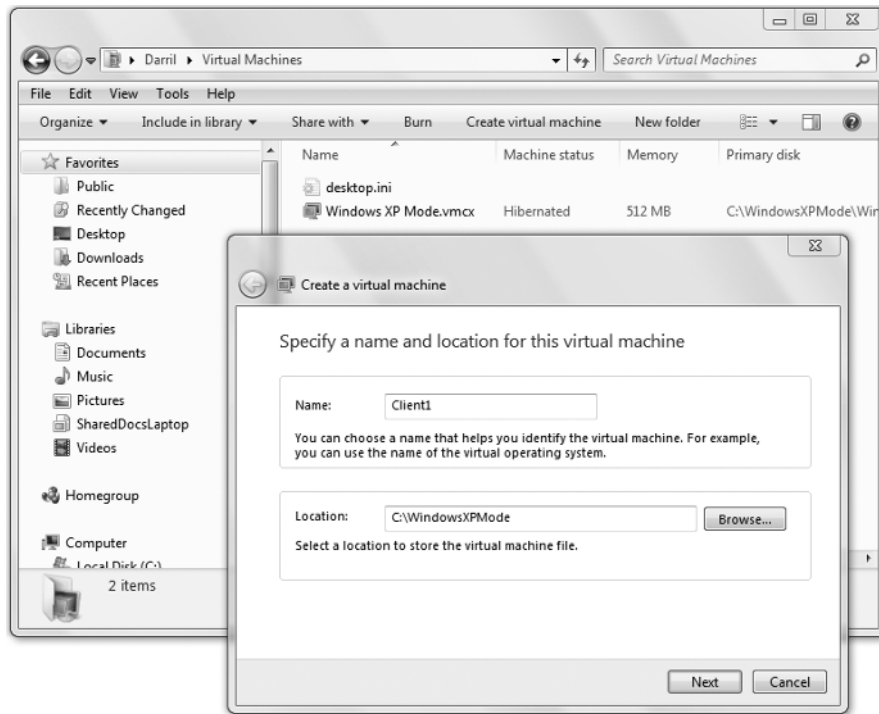
You start with a regular Windows 7 desktop. You can then install another instance of Windows 7 in a virtual machine and install applications within the virtual machine. As long as the Auto Publish settings are set to Enabled, the applications will automatically appear on the host machine's Start menu for that PC once the shortcuts are copied to the Start menu on the virtual machine. Hibernate the VPC, and you can then launch the programs in the same manner as you did with Windows XP Mode.

The only pieces that are missing from this puzzle are the steps you need to take to create a Virtual PC image. Exercise 1.7 shows you the steps needed to create a virtual PC machine. You can then install an operating system within this virtual machine.

EXERCISE 1.7

Creating Other Virtual PC Machines

1. Launch the Virtual PC console by clicking Start > All Programs > Windows Virtual PC > Windows Virtual PC.
2. Click Create Virtual Machine in the title bar.
3. Enter a name for your VPC in the Name text box. You can either accept the default location for the VPC or select another location. Your display will look similar to the following graphic. Click Next.

EXERCISE 1.7 (continued)

- Adjust the size of memory for the PC. For Windows XP, you can get away with 512 MB, but if you're running more applications, add more RAM. Similarly, you can start with 1 GB of RAM for Windows 7 and add more depending on the applications you're running. You can always adjust the RAM later when the virtual machine is turned off. Leave the networking check box enabled to Use Computer Network Connections unless you specifically don't want the VPC to have access to the network. Click Next.
- The Add A Virtual Hard Disk page appears. Since this is a new VPC, accept the default of Create A Dynamically Expanding Virtual Hard Disk. Leave Enable Undo Disks unchecked and click Create.

You'll be returned to the Virtual PC console. At this point, you have a Virtual PC image, although it's empty. The next step is to load an operating system into it.

- Load the Windows installation DVD into the host system DVD drive.
- Double-click the VPC image you just created to start it. It will boot from the DVD. At this point, follow the procedure to install the operating system. If you're installing Windows 7, you can use the installation steps from the exercise earlier in this chapter. If it's another operating system, use the steps for that OS.

Installing Integration Components

After installing an operating system using Virtual PC, you may notice that things aren't running as smoothly as you'd like them to be. For one thing, every time you click within a Virtual PC environment, your mouse gets trapped there. You can press Ctrl+Alt+left arrow to get it out, but it'd be a lot easier if your mouse moved in and out of this window just as it can do with other windows.

You can install the Integration Components after the operating system has been installed on the VPC. In addition to helping your mouse work a little better, they'll also give access to the following resources:

Clipboard You will be able to copy and paste data back and forth from the host operating system to the virtual machine. Data copied in one environment is available on the clipboard in the other environment.

Hard drives You'll have access to all of the hard drives on the host system from within the virtual machine. The drives appear as shares within Windows Explorer in the format of *X on ComputerName* where X is the actual drive letter and *ComputerName* is the name of the host computer. For example, if the host computer is named Client1, the C: drive would appear in Windows Explorer on the virtual machine as C on Client1.

Printers Printers available to the host system are available to the virtual machine. This allows you to print to a printer from the virtual machine.

USB devices USB devices plugged into the host system can be accessed from the virtual machine.

You can install the Integration Components by following the steps in Exercise 1.8.

EXERCISE 1.8

Installing Integration Components

1. With a Windows Virtual PC console open, click the Tools drop-down menu and select Install Integration Components. An AutoPlay box will pop up.
2. Click Run Setup.exe within the AutoPlay dialog box.
3. A Welcome page will appear. Click Next on the Welcome page, and click Yes when prompted by User Account Control. After a moment, the installation will complete.
4. Click Finish, and then click Yes to restart your computer.

After you reboot and log onto the system, you'll find that your mouse now treats the VPC environment just like any other window, but you're not finished yet.

EXERCISE 1.8 (continued)

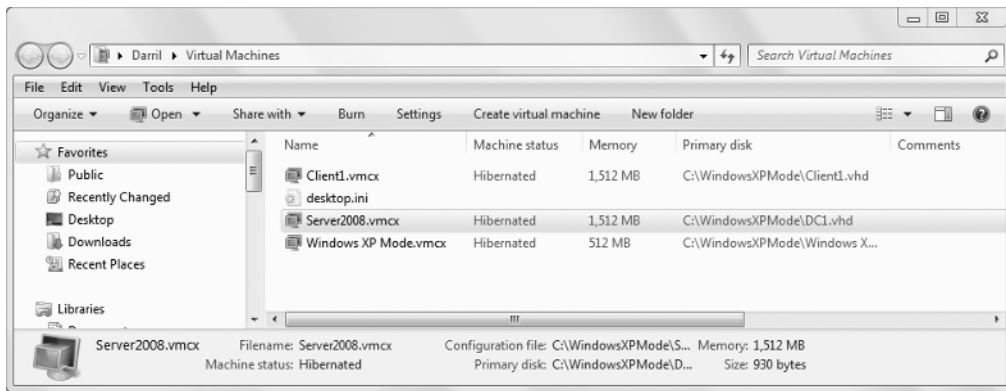
5. Select the Tools drop-down menu, and select Enable Integration Features. You'll be prompted to provide credentials that will be used on your system. Enter the user name and password you used when creating the VPC image, and click OK.

Windows Virtual PC Menu

The Windows Virtual PC interface is different from the Microsoft Virtual PC interface. As a matter of fact, it doesn't look like an interface at all. Instead, it looks like Windows Explorer with a couple extra menu items.

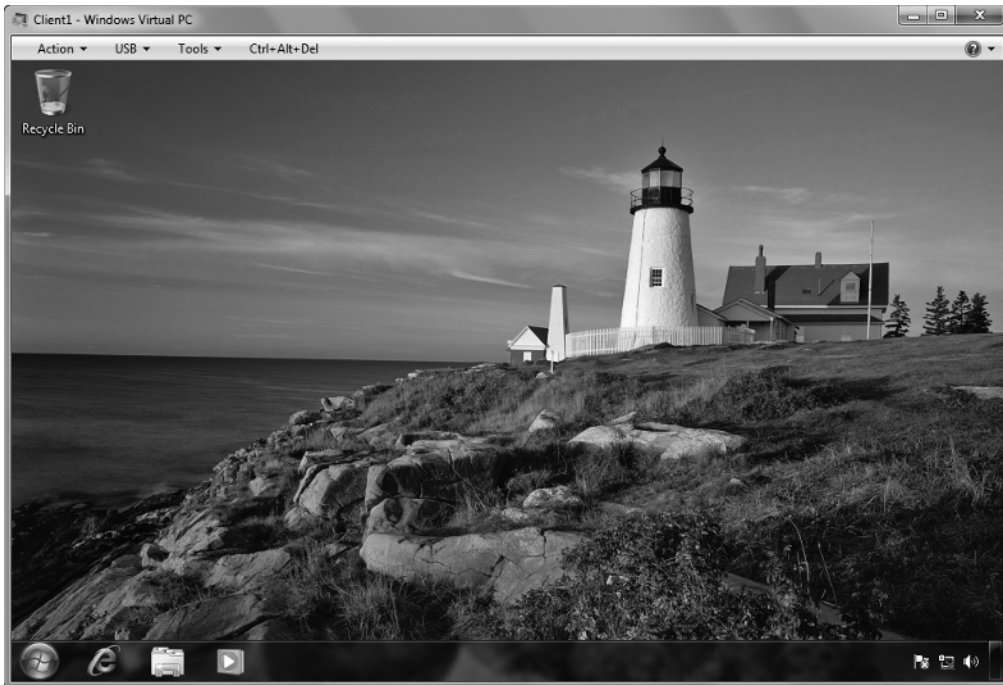
Figure 1.6 shows the Windows Virtual Machines console. It shows the virtual machines I have added to my system: one for Windows XP Mode, one Windows 7 client named Client1, and one Server 2008 system I'm using as a domain controller in the virtual environment.

FIGURE 1.6 Windows Virtual Machines console



You can launch any virtual machine console from here by double-clicking it. You can also access the settings for any of the virtual machines by selecting the virtual machine and clicking Settings. Some settings can be manipulated while the system is running or hibernated. Other settings require you to shut down the virtual machine before you can modify them.

Once the virtual machine is launched, you'll see that it has a menu across the top, as shown in Figure 1.7. Figure 1.7 is a virtual instance of Windows 7 running within Windows Virtual PC. As you can see, there are four menu choices. Each one is explained in the following section.

FIGURE 1.7 Windows 7 launched within a Virtual PC machine

Action

The Action menu includes four choices:

View Full Screen No surprise here. Selecting this option maximizes the VPC window to full screen. When set to full screen, a Title tab is pinned to the top of the window. This tab includes many of the same choices as the full menu. To the far right are icons reminiscent of minimize, maximize, and close icons but labeled as Switch To Your Computer Desktop, Exit Full Screen, and Close.

Sleep Selecting Sleep puts the VPC into a power-saving sleep mode. Once Sleep is selected, the menu item changes to Wake Up. If you select Wake Up, the VPC will exit the sleep mode.

Restart Selecting Restart forces a system restart. If you have programs running, you will be prompted that they are open, and you may lose work if you continue. You can click Force Restart or click Cancel to return to the desktop.

Close The Close menu gives the choices Hibernate, Shut Down, or Turn Off. Hibernate will cause the current state to be saved—open windows and files remain open and, when you launch this VPC image again, everything is returned to the exact same state. Shut Down performs a logical shut down, and Turn Off simulates pressing the power button on the PC.

USB

The USB drop-down menu shows all the USB devices attached to your host system. As devices are added or removed from the host system, they will be added or removed from this menu.

Devices aren't automatically available in the VPC, though. If you want the device to be available, you need to select it from the menu, as shown in Figure 1.8. Devices that are attached to the VPC are removed from the host system.

FIGURE 1.8 Selecting USB devices in the Virtual PC



Once a device is attached to the VPC, you can release it by selecting it from the menu and choosing Release.

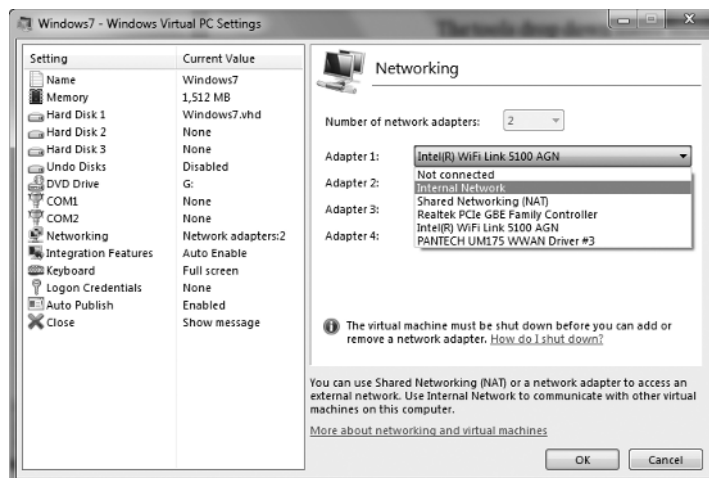
Tools

The Tools drop-down menu includes two choices: Integration Components and Settings.

Once you add and enable the Integration Components, you'll be able to work with VPC images in a more seamless manner. The mouse will easily move in and out of the VPC window, and you can easily cut and paste data from your host system into the VPC window.

If you select Settings, the VPC will launch a window similar to the one shown in Figure 1.9 that you can use to modify many of the environment settings for the VPC. Some settings (such as the Networking setting) can be configured while the VPC is running. Other settings (such as Memory) can be configured only when the VPC is turned off.

FIGURE 1.9 Windows Virtual PC Settings



As an example, the network adapters will start as being configured to use the network adapters on your system. In the figure, the VPC network adapter is currently configured to share the WiFi network adapter connected to my system. It will have access to my system on a simulated network and can access the Internet.

However, if I select Not Connected, it will be completely isolated. If the VPC isn't fully protected with anti-malware software, this is one way to isolate it. In addition, I could select Internal Network. The VPC would be able to communicate with other VPCs that are active on my system but not the host machine or any systems external to the host machine.

Ctrl+Alt+Del

You can't press the Ctrl+Alt+Del keys on a virtual system because this key combination is always trapped by the host system. Windows Virtual PC provides the Ctrl+Alt+Del menu item that can be used to simulate pressing the Ctrl+Alt+Del keys on the virtual machine.

Figure 1.7 and Figure 1.8 shown earlier both show the Ctrl+Alt+Del menu item to the right of the Tools menu. Clicking this item on a virtual system is the same as pressing the keys on a nonvirtual system.



Windows Virtual PC does not support 64-bit operating systems. Since Windows Server 2008 R2 only comes in 64-bit versions, it won't run in VPC.

Planning and Managing Client Licensing and Activation

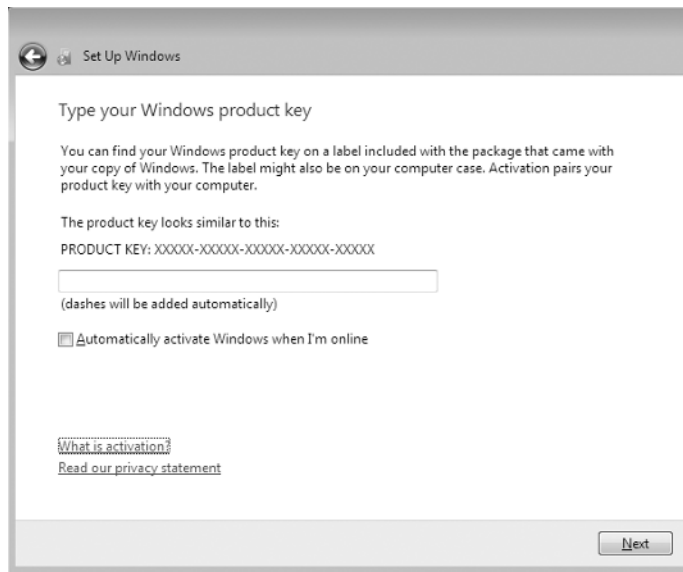
Software developers have been battling software counterfeiting (often called pirating or software piracy) since the very first operating system or application was sold. When it's easy to copy the software without paying for it, some people do just that.

Client licenses, product keys, and activation work together to help ensure that a software program that is being used is a valid copy. The goal is to make it more difficult for software counterfeiters to copy and sell the software to unsuspecting users while also making the process smooth for users who have purchased valid versions.

With this in mind, administrators have a responsibility to their company to help it develop sound licensing strategies and ensure they remain compliant with license agreements. You should understand the basics of client activation that can be implemented in an organization.

Licensing Strategy and Compliance

Windows 7 uses a product key and an *activation* process to help thwart counterfeiting. Figure 1.10 shows the product key screen from the installation process. You can still install Windows 7 without the product key by clicking Next on the installation screen, but it won't successfully activate without the key.

FIGURE 1.10 Entering the product key

Some product keys are designed for a single product, and some product keys are designed for multiple products. A Multiple Activation Key (MAK) uses a single key purchased for many clients. In larger organizations, MAKs or Key Management Service (KMS) servers could be used for activation, or a combination of the two can be used. MAK and KMS require a more complex license infrastructure and will be explored in greater depth later in this chapter.

Activation will ultimately be paired with the product key and your computer. The activation process collects information on the computer to uniquely identify it, but it does not collect any information on the user.

When installing Windows, you'll receive the prompt Automatically Activate Windows When I'm Online. If this box is checked, activation will be attempted three days after the user logs on the first time. If it is not checked, the user will be prompted to activate before the grace period expires.

Windows 7 Activation Grace Period

Windows 7 has a grace period of 30 days before it needs to be activated. During this time, users will see a pop-up reminding them they need to activate. This starts as a once-a-day pop-up four days after the installation and increases to as often as once an hour on day 30.

On day 31, a message will appear indicating that you must activate Windows to continue using all Windows features. A logical question is, "What features can't be used?" In past versions of Windows, Microsoft introduced a reduced-functionality mode where users can browse the Internet for one hour before having to log off and back on again.

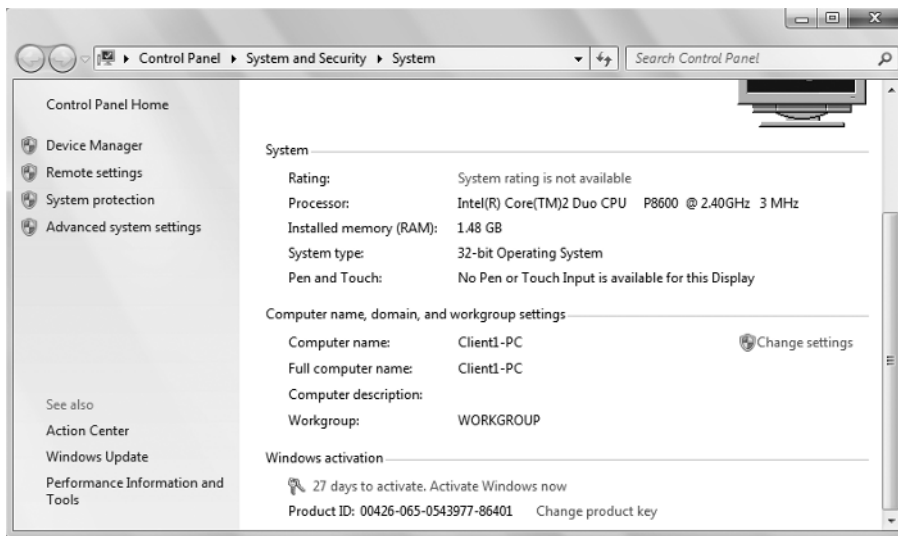
At this writing, it appears as though everything in Windows 7 still works in this reduced-functionality mode. The desktop background goes black with text indicating the copy of Windows is not genuine. You can change the background, but it will change back within about an hour. Periodically, an Activation window appears, informing you the activation period has expired and prompting you to activate, buy a new product key online, retype your product key, or view other ways to activate.

On Windows Server 2008 R2 (the server companion to Windows 7), the server shuts down hourly after the activation period expires.

All of this can be frustrating when you use a system that isn't activated, but there is a simple solution—ensure the software is genuine and activate it.

You can activate Windows from the System page. Click Start, right-click Computer, and select Properties. If you scroll down to the bottom of the page, you'll see a Windows Activation menu similar to Figure 1.11.

FIGURE 1.11 Viewing the Windows Activation status



If your system is connected to the Internet, you can simply click this link. Your system will connect to Microsoft's servers, some information on your computer will be transferred back and forth, and a moment later you'll be notified that activation was successful. Microsoft stresses that the information transferred during the activation process can be used to identify your computer, but it does not include any information on the user.

Once the system is activated, the countdown to activate will be replaced with a message saying, "Windows is Activated." Windows activation is considered permanent, although Windows does periodically check to ensure that the system is the same.

Detecting Changes

Periodically, Windows 7 will verify that the copy of Windows is valid and is operating on the same system where it was originally installed. If significant changes are detected, the activation will be reversed and the system will need to be reactivated.

The most common scenario where this occurs is when imaging software such as Symantec's Ghost is used. It is possible to make an image copy or clone of a system and then use this cloned copy on other computers. The license for the original system wasn't purchased for the other computers, and Windows 7 will detect that the operating system that was activated on the original system is now located on a different computer. Once the change is detected, activation will be revoked and the client will need to be reactivated.

This can also occur if too many changes are made to the hardware of a system. For example, if the motherboard of a system is replaced, Windows 7 may assume it's been moved to a different computer. This can usually be resolved with a phone call to a Microsoft help center to obtain a new key.



Cloning systems can also result in duplicate security identifiers (SIDs). To prevent duplicate SIDs on a network, the Sysprep program is run before capturing the image. Sysprep *sanitizes* the system by removing unique information such as the computer name and SIDs. It also resets the licensing information used for activation, requiring computers receiving the image to be activated separately.

Software Manager Licensing Manager Tool

The Software Licensing Management Tool is a built-in Visual Basic script (`s1mgr.vbs`) program that can be used for licensing and activation tasks. It includes several options that are entered as a switch. Some of the options directly relate to the clients (and are covered in this section), and some of the options directly relate to KMS (and are covered later in this chapter).

The `s1mgr` tool must be run from an elevated command prompt. Click Start > All Programs > Accessories, right-click Command Prompt, and select Run As Administrator.

Many of the common `s1mgr` switches are shown in the following sections. Some `s1mgr` switches are more commonly used with the KMS server and are mentioned later in this chapter.

Reset Grace Period

You can extend the initial 30-day grace period using the `s1mgr /rearm` command. In other words, if the 30-day grace period has expired, the background has gone black, and the reminder screens are coming up hourly, you can execute this command at the command prompt to give yourself another 30 days. This command can be executed three times.



The Windows 7 activation limit can be extended to a total of 120 days. When the 30-day limit is reached, you can run `s1mgr -rearm` from an administrator command prompt, which resets the activation limit for another 30 days. This command can be executed three times. Thus, if it is run at the end of each 30-day period, you'll get a total of 120 days.

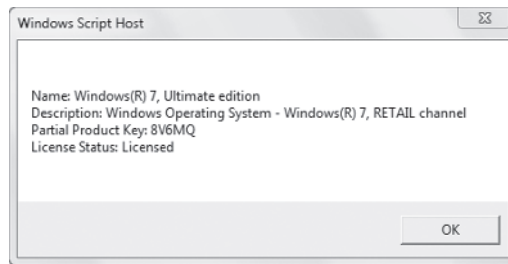
Activate Windows

You can use `s1mgr /ato` command to cause the system to activate right away. As a reminder, activation won't normally be done until three days after the user first logs on. If you are building computers that you'll move to an isolated environment without Internet access, you can use this command to force activation right away.

Display License Information

The `s1mgr /dli` command can be used to display information on the license used for this system. When executed, it will show the name, description, a partial product key, and the license status of the current license. As an example, Figure 1.12 shows what it looks like on one of my systems:

FIGURE 1.12 Displaying license information



You can also execute it as `s1mgr /dli all` to display information on all licenses on the system. Other licenses will indicate they are not in use and the status is Unlicensed.

Install Product Key

The `s1mgr /ipk <Product Key>` command can be used to install a new product key. This can be useful if the system is configured to use a KMS but you want to switch it to use a MAK.

Display Detailed License Information

You can use the `s1mgr /d1v` command to get more detailed information on the license. The result includes several identification numbers and certificate URLs. It will also show the status of the license and the remaining rearm count.

Expiration Data for Current License

The command `s1mgr /xpr` can be used to indicate the expiration date for the current license. If the system has not been activated, this will indicate the date and time when the 30-day grace period expires.

If the license has been permanently activated, it will say, “The Machine is Permanently Activated.” If the system has been activated by KMS, it will indicate the expiration of the KMS activation.

Volume Activation Methods

For smaller businesses, Windows 7 is purchased on an individual basis, and the clients are automatically activated three days after the installation. For larger enterprises, volume-activation methods are used to activate multiple clients with a single key. There are two methods of volume activation.

- *Multiple Activation Key (MAK)*
- *Key Management Service (KMS)*

KMS is used when the clients can't access the Internet and require the use of a KMS server. KMS requires significantly more administration than other methods of activation.

As an overview, Table 1.2 shows some of the comparisons between MAK activation and KMS server activation. It's important to realize that MAK keys and KMS keys are different. A MAK key can't be activated with a KMS server, and a KMS key won't be activated over the Internet.

TABLE 1.2 Comparing MAK and KMS

MAK	KMS
Activation is permanent.	Clients must connect to a KMS server periodically to renew activation.
Used when access to the Internet is possible (or manual phone method is desirable).	Used in isolated networks where Internet access is not possible (and manual activation via the phone is not desirable).
Can be used for any number of clients.	Requires a minimum of 5 servers, 25 clients, or a combination of 25 servers and clients.
Volume Activation Management Tool (VAMT) can be used with a MAK proxy.	Although a KMS server is used, it's not referred to as a proxy.
Supports clients duplicated from a single image.	Supports clients duplicated from a single image.



Microsoft has published the Volume Activation Planning Guide for Windows 7 and Windows 2008 R2. It includes some great explanations and a lot more detail on both the KMS and MAK processes. You can access it here: <http://technet.microsoft.com/library/dd878528.aspx>.

Multiple Activation Key

Large enterprises can purchase a Multiple Activation Key (MAK), which is a single key that can be used to activate many clients. For example, a company could purchase 100 licenses using a MAK. This single key is used for the image, and activation over the Internet is automatic.

A common method used to deploy the operating system to multiple computers is the use of imaging technologies. Chapter 2 will cover different imaging technologies, including Windows Deployment Services (WDS), in more depth. A single MAK is used and doesn't need to be reentered for each installation.

MAKs are purchased from Microsoft partners for a specific number of clients. They should be used only for these clients and no others.

If your clients cannot access the Internet, you can use a KMS server, as will be explained later in this chapter. You can also use the Volume Activation Management Tool with a MAK proxy to activate clients that can't access the Internet. The most common scenario where clients can't access the Internet is when they host or access sensitive data, and company policy specifically restricts them from accessing the Internet.

Volume Activation Management Tool

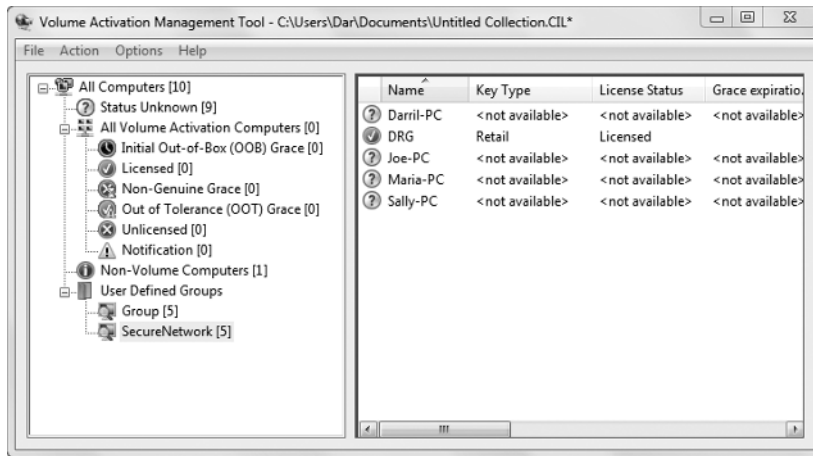
The Volume Activation Management Tool (VAMT) version 1.2 is part of the Microsoft Windows Automated Installation Kit for Windows 7, covered earlier in this chapter. It can be used to manage activation of Windows Vista, Windows 7, Windows Server 2008, and Windows Server 2008 R2.

You would use the VAMT if clients can't access the Internet or to manage MAK keys. The overall process to use VAMT is as follows:

1. Install VAMT on a host computer, which can be any Windows Vista, Windows 7, Windows Server 2008, or Windows Server 2008 R2 computer.
2. Configure the Windows Management Instrumentation (WMI) firewall exception on all clients (if not already configured and if the firewall is running).
3. Create a Computer Information List (CIL) as a group within VAMT.
4. Have VAMT collect license status information for clients in the CIL using WMI.
5. Add a MAK to the VAMT. The number of computers activated with the MAK is tracked by Microsoft, and you can query Microsoft to determine how many operating system activations are left using the MAK.
6. Install the MAK on the client computers and then activate them.

Figure 1.13 shows the VAMT with several computers added to a group named SecureNetwork. In the figure, one computer has already been activated with a retail (non-MAK) key. The other computers have not been activated yet.

FIGURE 1.13 Using VAMT to manage activation



Inventory and Licensing Compliance Audits

The biggest benefit of using VAMT with MAK is the ability to inventory your licenses and help with licensing audits. A license audit is accomplished by identifying what software is installed and then comparing it to what software has been purchased.

Once you add MAKs to VAMT, you can access the Refresh Remaining Count command to query the Microsoft licensing site and identify exactly how many remaining activations exist for the MAK. This tells you both how many licenses are purchased for any MAK you add to VAMT and how many remain.

In large organizations, license audits will often be accomplished using advanced tools such as System Center Configuration Manager (SCCM).

Using a MAK Proxy

Although you can use VAMT to activate clients with a MAK, you may have noticed a problem for the computers working in an isolated network. By definition, the isolated network wouldn't have access to the Internet. On one hand, you would use VAMT for activation of computers in isolated networks, but on the other hand, the VAMT computer accesses both the network and the Internet, which would violate the security rules of ensuring the isolated network remains isolated.

Instead, you can use VAMT as a MAK proxy. One instance of VAMT is in the secure network and captures data from the secure computers. Another instance of VAMT is installed on a computer with access to the Internet. It acts as a proxy to connect to the

Microsoft licensing site, presents the data from the secure computers, and receives activation data. This activation data is then copied to the instance of VAMT in the secure environment.



A MAK proxy is used to activate clients in a secure network when KMS is not being used. This would be common in secure networks with fewer than 5 servers or fewer than 25 clients.

The following steps outline the process of using VAMT as a MAK proxy:

1. Install VAMT on a computer in the secure network *and* in a network that has access to the Internet.
2. Perform the following steps on the computer hosting VAMT in the secure network:
 - a. Collect the status of the computers in the secure network using VAMT. This data is referred to as a Computer Information List (CIL) and can be exported as a file.
 - b. Copy the CIL to removable media such as a CD.
3. Transfer the removable media to the computer hosting VAMT with access to the Internet and complete the following steps:
 - a. Import the CIL using VAMT.
 - b. Use VAMT to connect to Microsoft and request Computer Identification numbers (CIDs) using this CIL.
 - c. Export the CIL with the CIDs from Microsoft. Copy the new CIL to removable media.
4. Transfer the removable media holding the new CIL to the computer hosting the VAMT in the secure network and complete the following steps:
 - a. Import the new CIL.
 - b. Apply the new CIDs using MAK Proxy Activate.

While this process will work for networks of any size, there is an easier and more automated method for larger networks. In any isolated network with more than 5 servers, more than 25 clients, or a combination of more than 25 clients and servers, you can use the Key Management Service. MAK keys cannot be used with the Key Management Service, but instead KMS keys are used.

Key Management Service and Licensing Infrastructure

The Key Management Service is used for enterprises with a large number of clients in secure networks. Clients will access the KMS server for temporary activation instead of connecting to Microsoft's activation servers for permanent activation.

Two important concepts are worth repeating with KMS:

Activation is temporary. Clients are not permanently activated. Instead, they must periodically connect to the KMS server to be reactivated. Temporary activation will last for 180 days.

KMS is used for a large number of clients. Specifically, KMS can be used only if there are five or more servers or 25 or more clients and servers that need to be activated by KMS. If the numbers fall below this threshold, KMS will stop reactivating clients.

You can download KMS for free. Go to www.microsoft.com/downloads, and search for “Key Management Service.” You can install it on Windows Server 2003, Windows Server 2008, or Windows Server 2008 R2.

If you’re running a KMS server on a Windows Server 2008 server, you can update it to provide activation for Windows 7 and Windows Server 2008 R2. Knowledge Base article 968915 (<http://support.microsoft.com/kb/968915>) provides the information on this extension and links for the download.



At this writing, there isn’t a single download for KMS to support Windows 7 and Server 2008 R2. You must install the earlier version and then extend it using KB 968915. However, I expect it’s just a matter of time before Microsoft releases a single-version download.

KMS Activation Terms

When discussing the Key Management Service (KMS), it helps first to understand the different terms associated with KMS. Once you grasp the terms, the process is much easier to understand. I’ve outlined many of the basic terms here:

KMS host The server hosting the KMS service is commonly referred to as the KMS host.

KMS client Clients configured to contact the KMS host are referred to as KMS clients.

DNS publication A KMS host can publish Domain Name System (DNS) SRV records (server records) to the DNS server using dynamic DNS within a Microsoft domain. If DNS isn’t configured to allow dynamic updates, the SRV records must be manually configured on the DNS server so that KMS clients can locate the KMS host.

Activation threshold The minimum number of clients a network must have for KMS activation to work is referred to as the activation threshold. A network must have at least 5 servers for server activation to work or a combination of at least 25 servers and clients for client activation to work. The KMS host tracks this threshold, and if the threshold isn’t reached or the number of clients falls below this threshold, it will no longer activate the clients. KMS clients that aren’t activated because the activation threshold is not met will request activation every two hours.

Activation validity interval After activation by a KMS host, KMS clients will remain activated for 180 days. If the KMS client has not connected to a KMS server within 180 days, the activation will be invalidated. Clients attempt to connect every seven days, and when they connect, this 180-day counter is reset.

Activation count The current number of clients that are being activated by KMS is tracked using unique client machine identification designation (CMID) records. Clients attempt to contact the KMS server every seven days, and the KMS server renews this CMID when the client activates or reactivates. If the client doesn't renew within 30 days, the CMID is discarded and is no longer counted toward the activation threshold.

This is an important concept. Your network may have reached the threshold of 25, and then two systems are decommissioned or taken on the road by sales people. Within 30 days, the CMID for these two systems will be removed from the KMS host, and the count will be at 23. Clients will no longer be activated, and within seven days all 23 remaining systems will be trying to activate every two hours. Even though the clients will stay activated for 180 days, these failures will result in errors in the event logs. Once two new clients are added to the network, everything will normalize.

KMS Activation Process

The KMS activation process is ongoing, requiring the KMS clients to connect to the KMS host periodically. Before the process can start, an SRV record must exist in DNS so the clients can reach the KMS server.

Normally, dynamic update will be configured in DNS, which allows the KMS service on a KMS host to publish SRV records automatically to DNS. Once this is configured, no further steps are required. KMS clients then query DNS to locate the KMS host.



DNS is a critical component of the KMS activation process. If KMS clients can't locate the KMS host because the SRV records aren't published in DNS, activation won't occur. If KMS was working and has stopped, DNS should be checked to ensure the KMS host record exists. These records will be in the `_VLMCS._TCP` folder on the DNS server.

Once the KMS client has located the KMS host, the following process is used to temporarily activate the client:

1. Every seven days, KMS clients query DNS for the IP of a KMS host.
2. KMS clients then try to renew their activation with KMS.
 - a. If the activation fails, clients continue to try every two hours.
 - b. If clients can't connect to the KMS host for 30 days, the record for the client in the activation count is deleted on the KMS server. If the activation count falls below the activation threshold, the KMS host will stop activating clients.
 - c. If clients can't connect for 180 days, client activation expires.

3. If the client succeeds in reaching the KMS host, the activation will be renewed.
 - a. Once the client is activated, the seven-day counter will be reset on the KMS client.
 - b. The 180-day counter for the KMS client activation is renewed.
 - c. The KMS host creates a new record for this client for the activation count (which is kept for 30 days). The original record is deleted.
4. Seven days after the client is temporarily activated, the process starts again.

Working with KMS

In order for the KMS to respond to activation requests, the firewall needs to be properly configured on the KMS server. If the Windows firewall is being used, the KMS Traffic exception can be enabled. If a third-party firewall is being used, you'll need to open port 1688.

In addition, you can use the Software Licensing Management Tool (`slmgr.vbs`) to configure and manage specific settings on the KMS server. Table 1.3 shows some of the common switches used with KMS.

TABLE 1.3 Slmgr switches used with KMS

Switch	Description
<code>/sprt #####</code>	Use this switch to change the default port number if necessary. The default port number is 1688.
<code>/cdns</code>	This will disable automatic DNS publishing by a KMS host. The SRV records must be manually created on DNS.
<code>/cpri</code>	This will reduce the priority of host processes. Use this if the KMS host needs more processing power for other server roles.
<code>/spri</code>	This returns the priority of host processes to normal on the KMS server.
<code>/sai #</code>	You can use this to change how often a KMS client tries to connect to a KMS if activation fails. The number is provided in minutes, and the default is 120 (two hours).
<code>/sri #</code>	This will change how often a KMS client contacts the KMS host to renew the activation. The number is provided in minutes, and the default is 10080 (seven days).
<code>/dli</code>	When executed on the KMS server, this provides the current activation count on the KMS server.
<code>/skms</code>	You can use this to set the name and the port of the KMS server for non-domain computers.

Virtualization Licensing

If your company is considering a Virtual Desktop Infrastructure (VDI) solution, you'll need to understand the licensing requirements. It's important to realize that licenses are needed for the virtual machines just as they are needed for a regular installation.

Virtual computers can be activated using MAK keys or KMS servers. In addition, Microsoft recently announced the Virtual Enterprise Centralized Desktop (VECD), which can be used specifically for VDI licensing. VECD allows an organization to license virtual copies of Windows client operating systems at a lower cost than a full version of the operating system. VECD uses a device-based subscription license and is available with two configurations:

- VECD for Software Assurance (SA), currently priced at \$23/year
- VECD, currently priced at \$110/device/year

Once VECD is purchased, you can deploy as many as four virtual desktops on any single system. This doesn't include the cost of the host operating system. The host operating system could be Windows 7, Windows Server 2008, Windows Server 2008 R2, or other operating systems.

VECD offers many benefits, including these:

- Rights to move virtual machines between systems for increased reliability
- Unlimited backup of virtual machines
- Ability to access up to four running VM instances per device
- Rights to access corporate desktops from home for a user who has already been licensed at work

Licensing of Microsoft products can easily get complicated, and pricing often changes. When you're looking at purchasing licenses, you should locate a Microsoft Licensing Specialist through a Microsoft partner.

Remember these two key points, however:

- No additional licenses are needed to use Windows XP Mode with the built-in Windows XP client.
- VECD includes licenses for up to four virtual machines.

Summary

In this chapter, you learned about the different editions of Windows 7 that will be used in an enterprise, including many of their different features and capabilities. Once Windows 7 is installed, you'll often have to migrate users' files and settings using an in-place, wipe-and-load, or side-by-side migration. USMT can help with all types of migrations.

Windows 7 supports a rich virtual desktop infrastructure including Windows XP Mode. Windows XP Mode can be used to run applications transparently in a virtual isolated Windows XP environment. You can also run full-blown operating systems in a virtual environment using Windows Virtual PC.

Finally, you learned about the different tools used for activation and managing licensing. Windows 7 licenses can be purchased individually or in bulk using either MAK or KMS. The VAMT provides additional tools that can be used to manage licenses and activation.

Chapter Essentials

Choosing a Windows 7 edition Know the features available in the different Windows 7 editions used in the enterprise. The three Windows 7 editions you'll see in an enterprise are Windows 7 Professional, Windows 7 Enterprise, and Windows 7 Ultimate. Windows 7 Enterprise is available only to organizations that purchase Software Assurance and includes additional features beyond Windows 7 Professional. Windows 7 Ultimate has all of the features of Windows 7 Enterprise but can be purchased without Software Assurance.

Performing a Local Windows 7 Installation Know how to install Windows 7 from the DVD. While most of the deployments in large organizations will use automated methods, you should be able to install Windows 7 from the DVD and know what to do with issues that may appear.

Designing User State Migration Be familiar with the User State Migration Tools (USMT) ScanState and LoadState. The USMT are part of the Windows Automated Installation Kit (Windows AIK) for Windows 7. The two most important tools are ScanState and LoadState. ScanState can collect user state data, including files and settings, and put it in a migration store. LoadState can then read the migration store and apply it to a new installation of Windows 7.

USMT can be used to migrate data using in-place migrations, wipe-and-load migrations, and side-by-side migrations. In-place migrations can be automated with a batch file that will retrieve data from the `Windows.old` folder created when Windows 7 is installed on a computer with a previous version of Windows.

Considering virtualization Know how to use Windows XP Mode and Windows Virtual PC. Windows 7 introduces Windows Virtual PC. Entire operating systems can be hosted in Windows Virtual PC, and you can use Windows XP Mode to host specific applications. Applications hosted in Windows XP Mode can be launched from the Windows 7 Start menu or configured to start from shortcuts. Windows XP Mode works best when processor virtualization technologies are used, and virtualization is enabled in the BIOS. KB 977206 provides a workaround. Intel calls this Intel VT, and AMD calls this AMD-V.

Planning and managing client licensing and activation Be familiar with different licensing and activation methods used in an enterprise. Windows clients should be activated within 30 days of installation. If access to the Internet is available, activation can be configured to occur automatically and will normally occur three days after the install. Large organizations can use a Multiple Activation Key (MAK), which is a single key that includes licenses for multiple clients.

If clients will never have access to the Internet, a Key Management Service (KMS) server can be used to activate clients. KMS requires a minimum of 5 servers or any combination of 25 clients and servers. Clients will periodically contact the KMS server to renew their activation. If you have fewer than 25 clients, you can use the Volume Activation Management Tool (VAMT) with a MAK proxy to activate the clients. The VAMT can also be used to identify how many licenses remain on a MAK.