

Managing the Windows 7 Desktop Environment

INFORMATION IN THIS CHAPTER

- Local Management Tools
- Managing Hardware Devices and Drivers
- Managing Disks and File Systems
- Summary

Windows 7 comes with a variety of tools for managing your system. There are tools for managing the local system, managing hardware and devices, and managing disks and file systems. Some of these tools are new, and some have been around for a while. Windows 7 can be a quite complex operating system. So you need to make sure that you understand all the tools that have been created to make the job of managing systems easier.

LOCAL MANAGEMENT TOOLS

Windows 7 includes many management tools to help manage your system. We will review a few of the most commonly used ones. These are as follows:

- Control Panel
- Microsoft Management Console 3.0
- Computer Management Console
- Local Group Policy Editor
- Windows Registry

Each of these management tools serves a different purpose and provides different functionality. It's important that you have a good understanding of all these tools in order to properly manage your system.

Control Panel

The Control Panel has long been a central place to go to configure your Windows system. The look has changed over the years, but tools have stayed pretty similar, with a few additions. The Windows 7 Control Panel is broken down into several categories and subcategories. Control Panel is accessed from the Start menu. When you first open Control Panel, you see the main categories and some of the tasks within the subcategories. To see the entire list of subcategories, you must click on a category heading.

The categories and subcategories available in Control Panel are as follows:

- **System and Security** – Action Center, Windows Firewall, System, Windows Update, Power Options, Backup and Restore, BitLocker Drive Encryption, Administrative Tools
- **Network and Internet** – Network and Sharing Center, HomeGroup, Internet Options
- **Hardware and Sound** – Devices and Printers, AutoPlay, Sound, Power Options, Display, Windows Mobility Center, Biometric Devices
- **Programs** – Programs and Features, Default Programs, Desktop Gadgets
- **User Accounts and Family Safety** – User Accounts, Parental Controls, Windows CardSpace, Credential Manager, Mail
- **Appearance and Personalization** – Personalization, Display, Desktop Gadgets, Taskbar and Start Menu, Ease of Access Center, Folder Options, Fonts
- **Clock, Language, and Region** – Date and Time, Region and Language
- **Ease of Access** – Ease of Access Center, Speech Recognition

TIP

The Control Panel consists of two main views: Category view and Icon view. Icon view is further divided into small and large icons. When you set the Control Panel to Icon view, you are able to see all of the applets in the Control Panel.

System and Security

The **System and Security** category in Control Panel contains applets that allow you to secure, fine tune, and optimize your system. The subcategories under the **System and Security** category are Action Center, Windows Firewall, System, Windows Update, Power Options, Backup and Restore, BitLocker Drive Encryption, and Administrative Tools. We will briefly discuss each of these items.

Action Center

The Action Center helps you solve basic system issues. It can help troubleshoot security, maintenance, and performance issues. In the **Action Center** section of the Control Panel, you have four options: **Review your computer's status and solve issues**, **Change User Account Control settings**, **Troubleshoot common computer problems**, and **Restore your computer to an earlier time**.

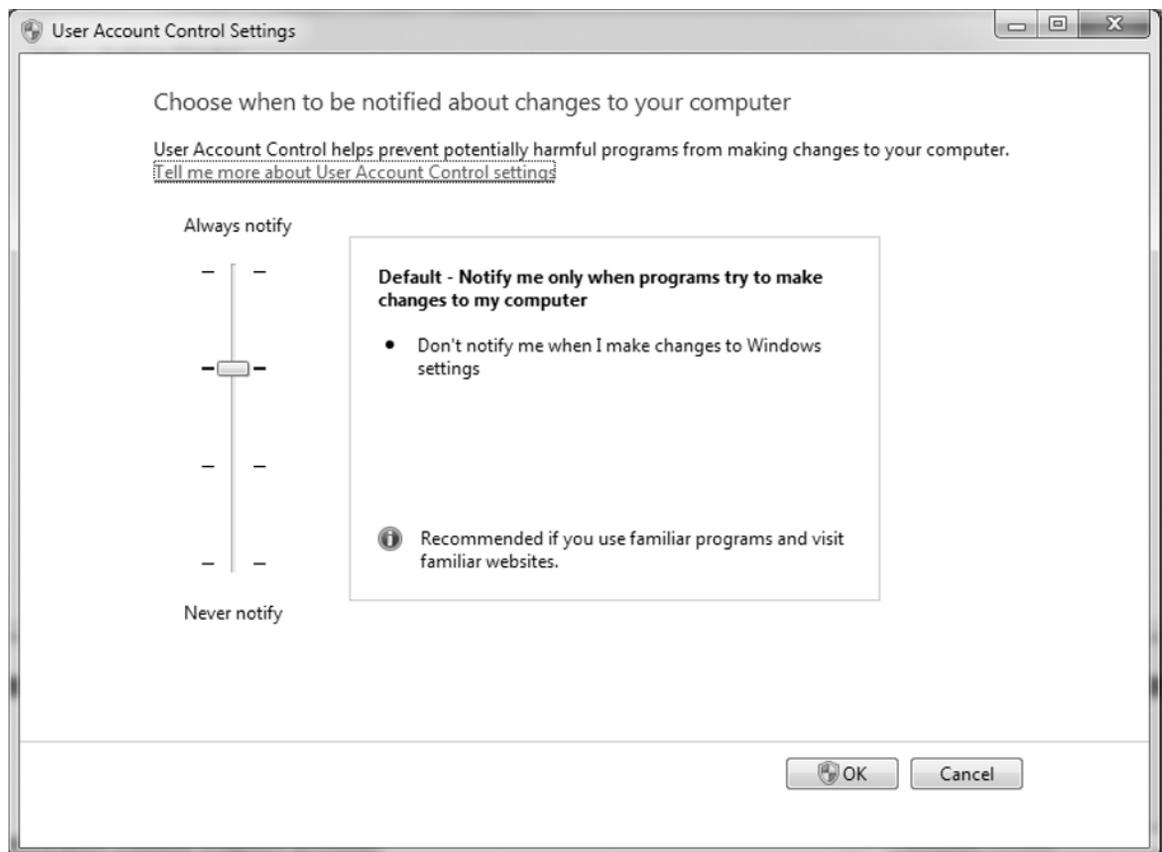
If you choose **Review your computer's status and solve issues**, the Action Center will open. It will display any issues that your system has detected. These could be issues with security, Windows Update, Windows Backup, or a host of other issues.

If you choose **Change User Account Control settings**, the User Account Control Settings window, as seen in Figure 5.1, will open. User Account Control (UAC) is used to control whether programs can make changes to your system. This is important because you don't want malicious programs to be able to make system changes.

The User Account Control Settings window includes four options:

- **Always notify** – The user will always be notified when either the user or a program attempts to make changes to the system.

■ **FIGURE 5.1** User Account Control Settings Window

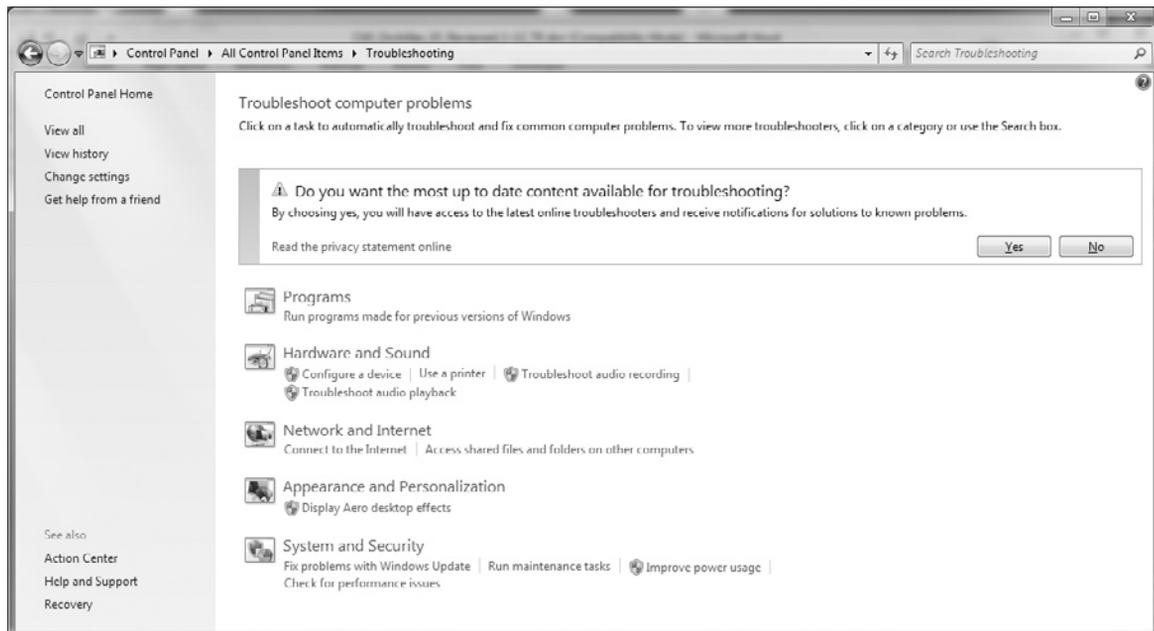


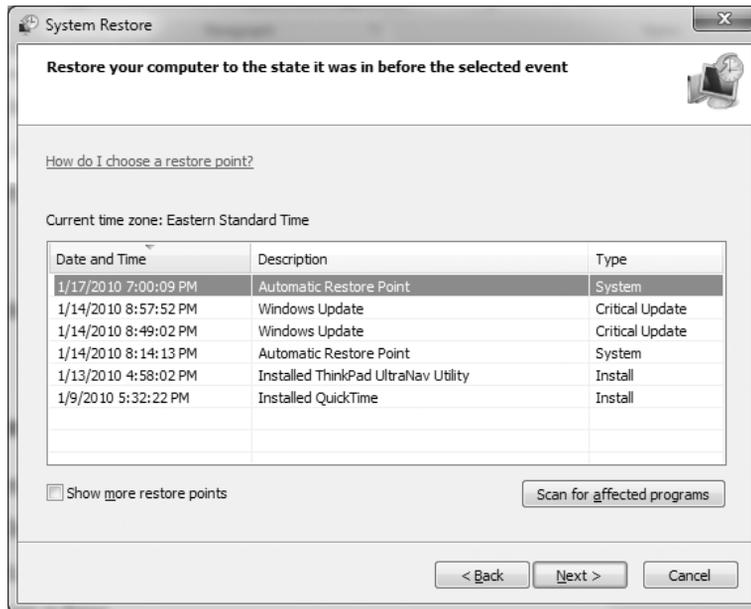
- **Notify me only when programs attempt to make changes to my desktop** – The desktop will be dimmed when these attempts are made. This is the default option.
- **Notify me only when programs attempt to make changes to my desktop (do not dim my desktop)** – The desktop will not be dimmed when these attempts are made.
- **Never notify** – The user is never be notified when either the user or programs attempt to make changes to the system.

If you choose **Troubleshoot common computer problems**, the troubleshooting applet will open. The troubleshooting applet, as seen in Figure 5.2, will allow you to troubleshoot issues with programs, hardware, internet connections, appearance, personalization, and security.

Choosing the option named **Restore your computer to an earlier time** will open the Recovery window. In the Recovery window, you can open the System Restore wizard. The System Restore wizard will allow you to restore system files and settings without losing your personal files and data. The System Restore wizard will allow you to select a restore point, as seen in Figure 5.3. Windows 7 will restore your system to the state it was when the restore point was created.

■ FIGURE 5.2 Troubleshooting Applet





■ FIGURE 5.3 Restore Point Selection Window

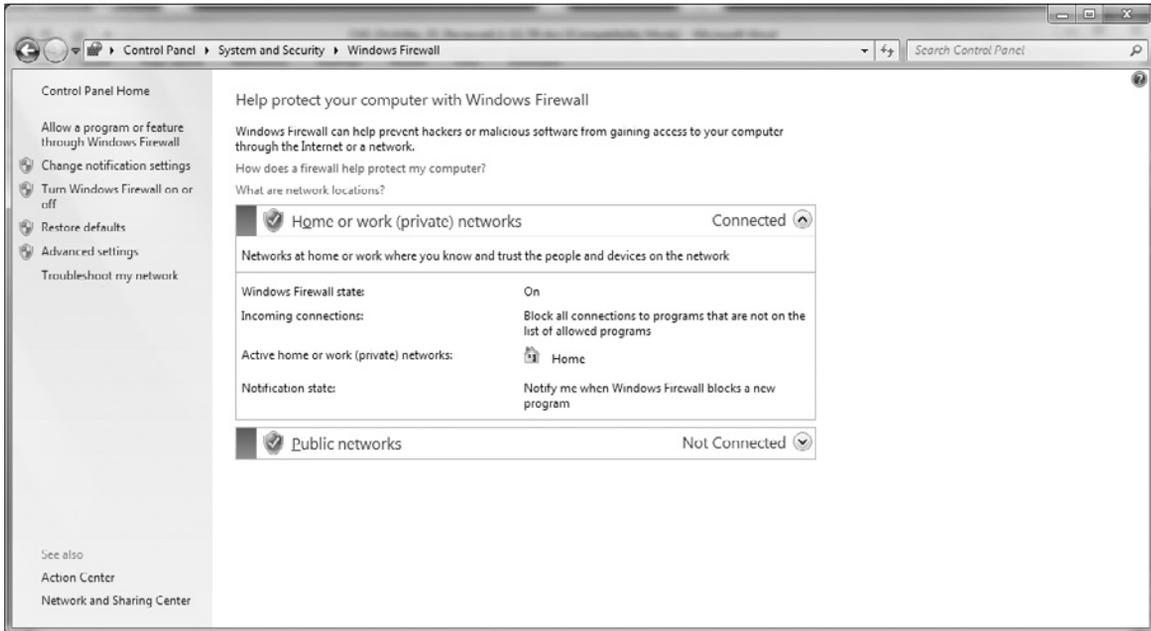
The Recovery window also includes an option for **Advanced Recovery Methods**. These **Advanced Recovery Methods** will restore your system, but everything will be replaced, including your personal files and data. You can restore your system using a previously created image. You can also choose to reinstall Windows 7, using the installation media. If you choose either of these methods, you are given the option to back up your important files and data.

Windows Firewall

The Windows Firewall is used to protect your Windows system from network-based threats. You can control who has access to your system, and what access they have. The Windows Firewall applet allows you to configure these firewall settings. In the **Windows Firewall** section of the Control Panel, you have two options: **Check firewall status** and **Allow a program through Windows Firewall**.

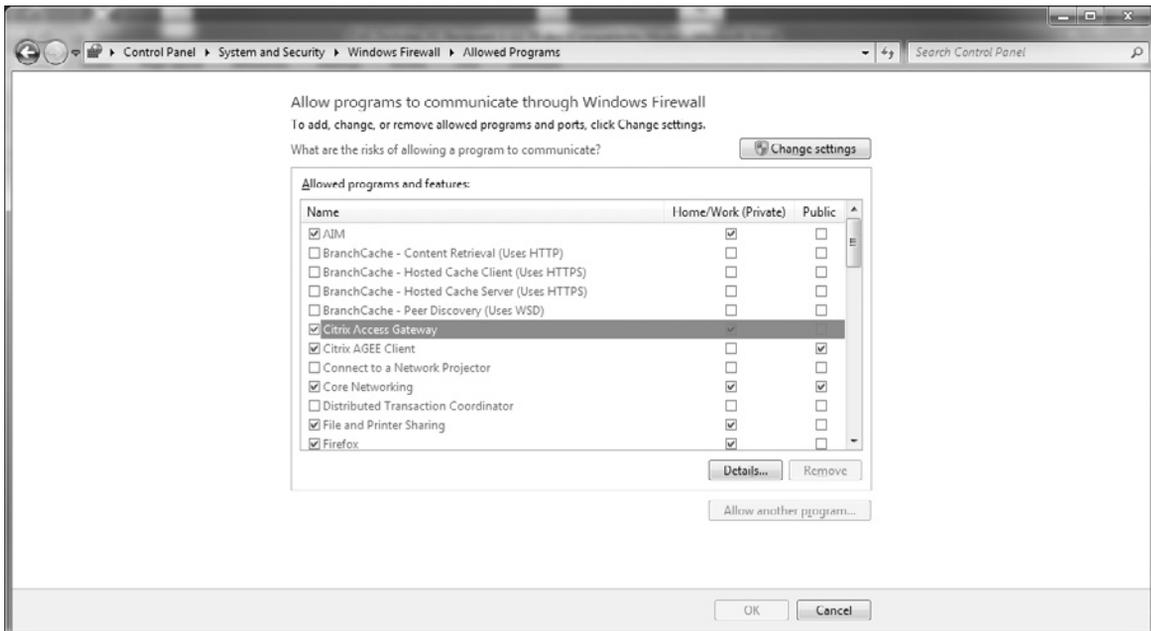
The **Check firewall status** option will bring up the Windows Firewall window, as seen in Figure 5.4. This option will allow you to see if Windows Firewall is enabled or disabled on your system. You can also see Windows Firewall settings for incoming connections and notifications.

The option named **Allow a program through Windows Firewall** will bring up the Allowed Programs window, as seen in Figure 5.5. Here, you can see



■ FIGURE 5.4 Windows Firewall Window

■ FIGURE 5.5 Allowed Programs Window



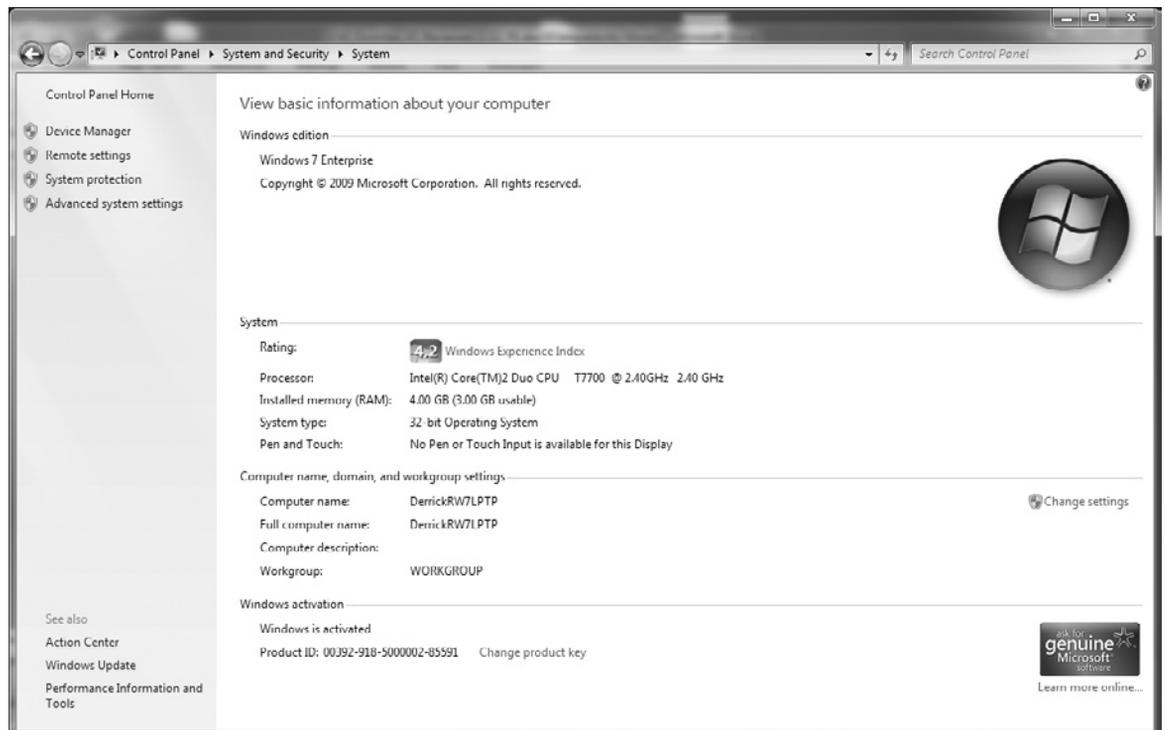
what programs are allowed by Windows Firewall. If you want to change these settings, you must choose the **Change settings** option. You can now select a program to allow and what networks the program is allowed to communicate on. The **Details** option will show you the path to the executable for the application being allowed. If you want to allow a program not listed, you can choose the **Allow another program** option. You can then specify the location of another program you want to allow through the firewall.

System

The **System** section of the Control Panel allows you to view and configure basic system settings. The **System** section has five options: **View amount of RAM and processor speed**, **Check the Windows Experience Index**, **Allow remote access**, **See the name of the computer**, and **Device Manager**.

The option named **View amount of RAM and processor speed** will launch the System window, as seen in Figure 5.6. Here, you can view basic system information. You can see the processor speed, the amount of RAM in the system, the system type, computer name, and other important information.

■ FIGURE 5.6 System Window

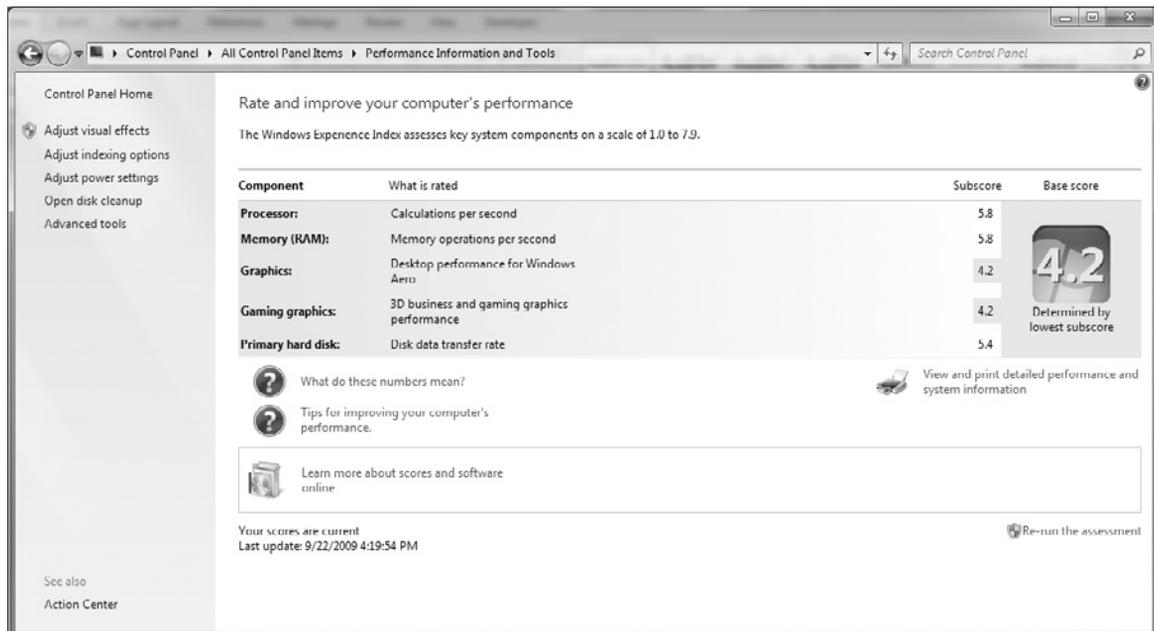


The option named **Check the Windows Experience Index** will launch the Performance Information and Tools window, as seen in Figure 5.7. You can see your system's Windows Experience Index. The Windows Experience Index is a number between 1.0 and 7.9 that represents the overall performance of your system. Your index is based on five components: processor, memory, graphics, gaming graphics, and primary hard disk. Each of these components is given a rating. Your index is based on the lowest individual score for the components. You can rerun the assessment any time you wish. This will help you determine if changes made to the system increased or decreased overall performance.

The option named **Allow Remote Access** will bring up the **Remote** tab of the System Properties window. You can use this tab to enable or disable **Remote Assistance**. You can also use it to enable or disable **Remote Desktop**.

Selecting the option named **See the name of this computer** will launch the System window. You can view the name and description of the computer. In addition, you can view the workgroup or domain the computer resides in. You can also use this window to change the name of the computer or change the workgroup or domain the computer resides in.

■ FIGURE 5.7 Performance Information and Tools Window



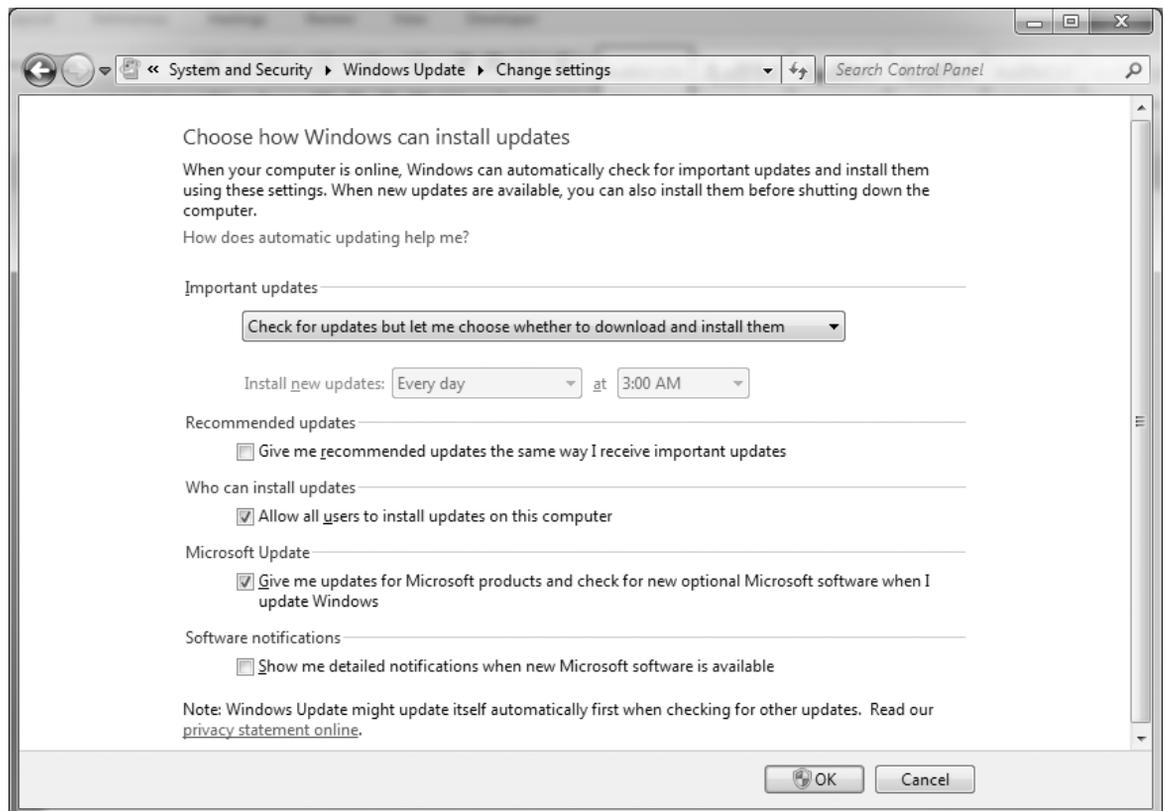
This **Device Manager** option will bring up the Device Manager window. Device Manager can be used to manage the hardware devices in your system. You can install, disable, and uninstall devices. You can update drivers. You can also use Device Manager to determine when there is a problem with one of your hardware devices and when one of your devices not functioning properly.

Windows Update

Windows Update is used to keep your system up-to-date with the latest updates and patches. Windows Update can automatically download and install device drivers, OS patches, and application patches. The **Windows Update** section of the Control Panel has three options: **Turn automatic updating on or off**, **Check for updates**, and **View installed updates**.

The option named **Turn Automatic Updating on or off** will bring up the Windows Update Change Settings window, as seen in Figure 5.8.

■ **FIGURE 5.8** Windows Update Change Settings Window

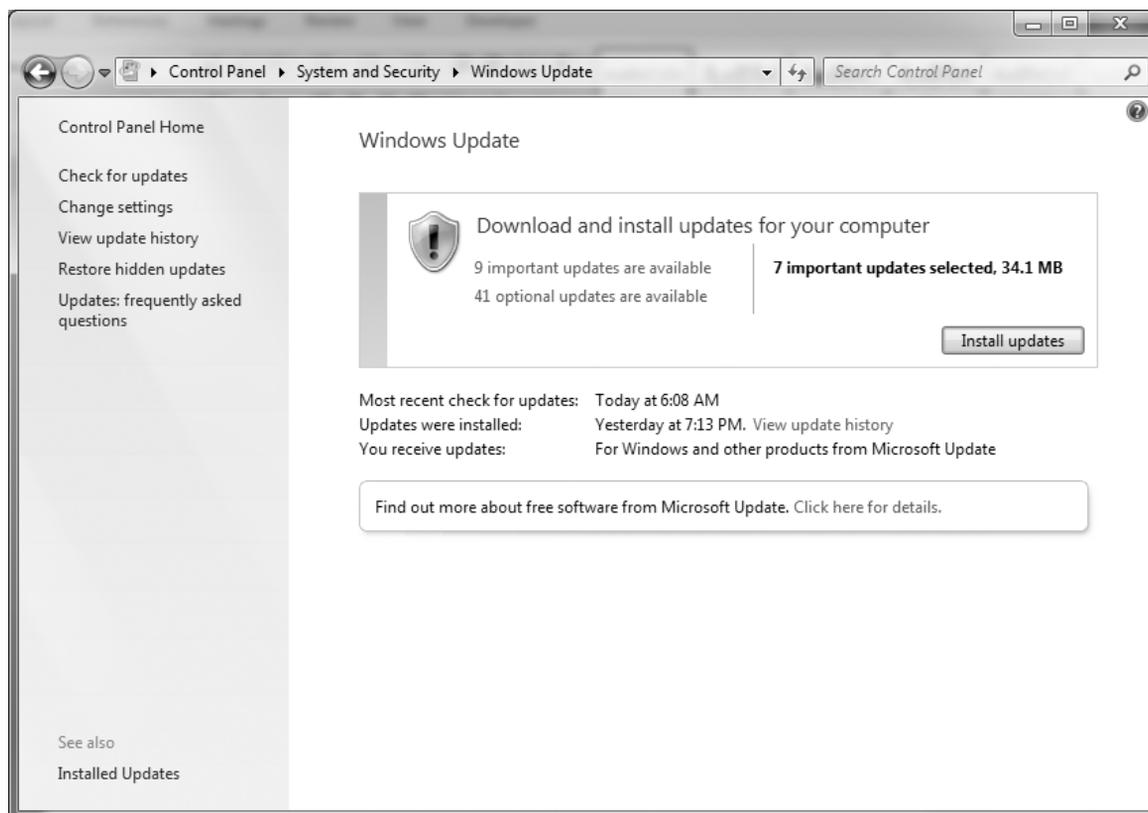


Here, you can enable or disable Windows Update on your system. You can also control how updates are handled. You can set whether updates are automatically downloaded and installed, or whether user intervention is necessary.

The **Check for updates** option brings up the Windows Update window, as seen in Figure 5.9. Windows Update will check and see what updates are available for your system. It will also let you know when your system was last updated.

Selecting **View installed updates** will bring up the Installed Updates window. The Installed Updates window will list all the updates that have been installed on your system. You can see operating system updates, application updates, and security updates. The Installed Updates window also allows you to uninstall updates that you would like to remove from your system.

■ FIGURE 5.9 Windows Update Window



Power Options

The **Power Options** section of the Control Panel includes the following options: **Change battery settings**, **Require a password when the computer wakes**, **Change what the power buttons do**, and **Change when the computer sleeps**.

The **Change battery settings** option will bring up the Power Options window. The Power Options window allows you to choose a power plan. Power plans determine how your system will manage energy consumption, especially when running on battery power. A good power plan will help extend the amount of time your system can run on battery power.

Choosing **Require a password when the computer wakes** brings up the Power Options System Settings window. This window will allow you to configure whether a user has to enter a password when the system comes out of sleep mode. Take note that in order to make changes to this setting, you have to first select the **Change settings that are currently unavailable** option.

Choosing **Change what the power buttons do** also brings up the Power Options System Settings window. You can configure what your system does when you press the **power** or **sleep** buttons. You can also configure what happens when you close the lid on your laptop.

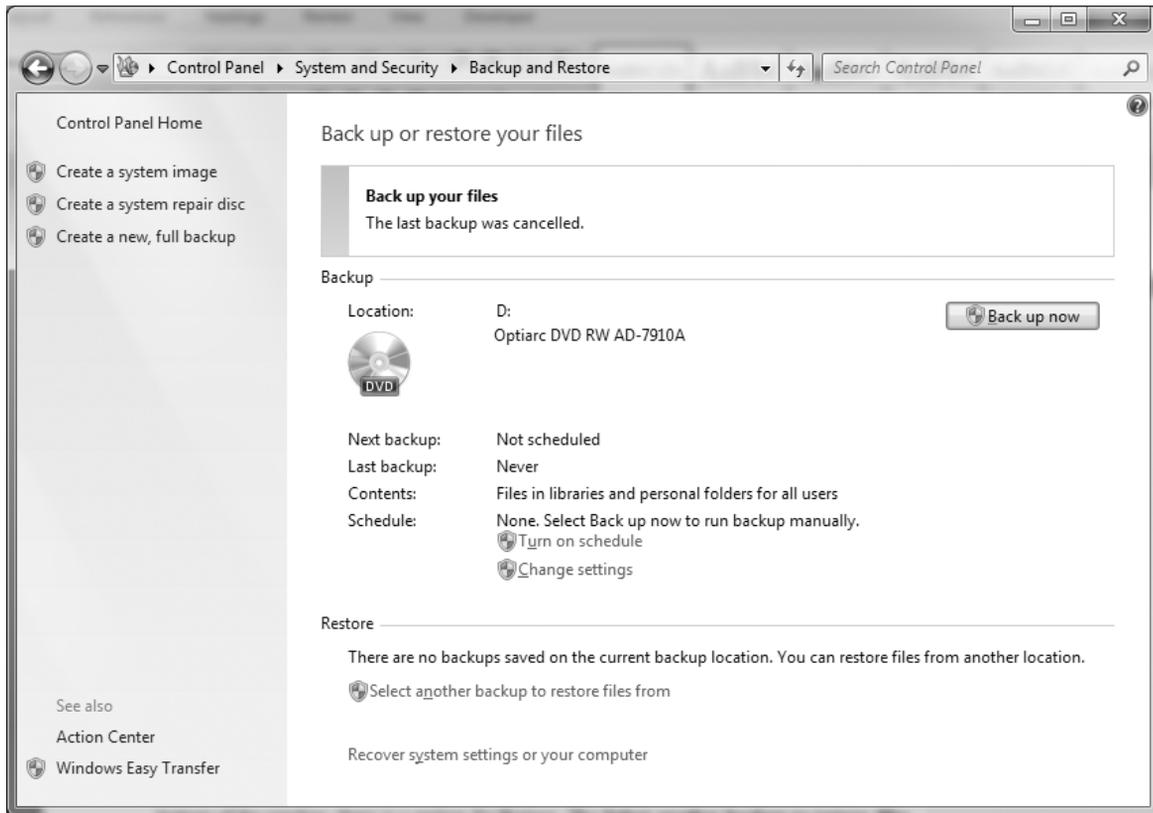
Choosing **Change when the computer sleeps** will launch the Edit Plan Setting window. This window will allow you to change the settings for your current power plan. You can control when the display will dim or turn off. You can configure when the system will enter sleep mode. You can also adjust the screen brightness.

Backup and Restore

The **Backup and Restore** section of the Control Panel includes two options: **Back up your computer** and **Restore files from a backup**.

The **Back up your computer** option will launch the Backup and Restore window, as seen in Figure 5.10. You can use the Backup and Restore window to create a system image, create a system repair, or to perform a backup of your system.

The **Back up now** option will start a new back up of your system. The backup will use your current backup device/location. The **Turn on schedule** option will allow you to set up periodic backups of your system. You should schedule these backups for a time when the system will be online, but not in use. The **Change settings** option will allow you to change the default settings for your backups. For example, you can use this to change the default backup location.



■ FIGURE 5.10 Backup and Restore Window

The **Restore files from a backup** option will bring up the Backup and Restore window. At the bottom of the window, there is a Restore section. The **Select another backup to restore files from** option will bring up the Restore Files wizard. The Restore Files wizard will walk you through while doing a restore. You will have to specify the location of the backup to restore from, the files you want to restore, and what you want to do with the restored files.

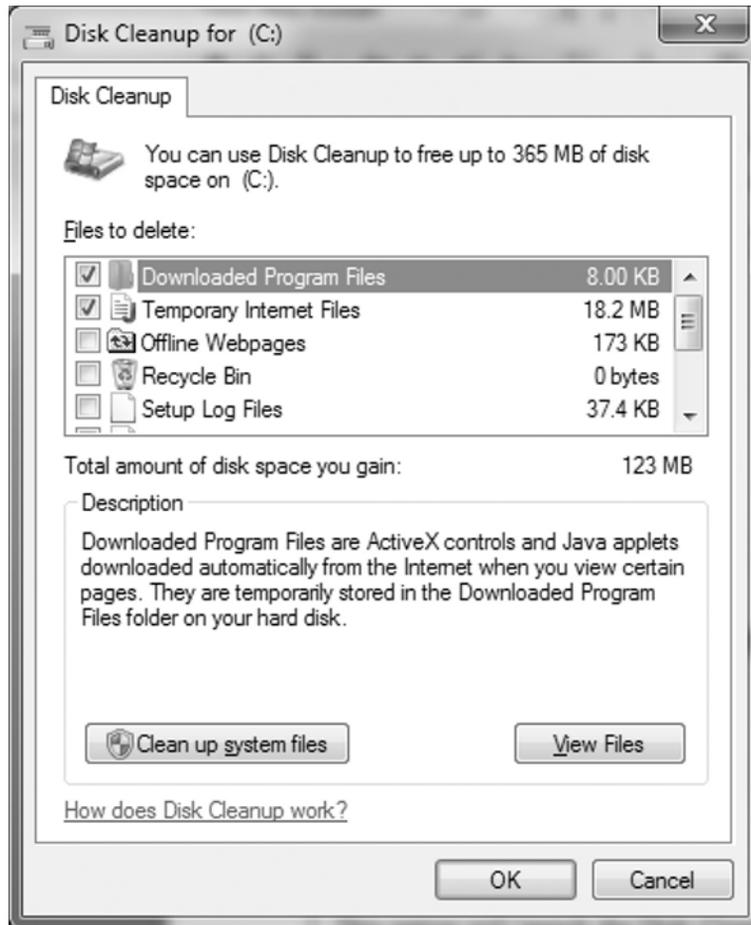
BitLocker Drive Encryption

BitLocker is covered in depth in Chapter 8, “Securing Windows 7.”

Administrative Tools

The **Administrative Tools** section includes the following options: **Free up disk space**, **Defragment your hard drive**, **Create and format hard disk partitions**, **View event logs**, and **Schedule tasks**.

Choosing **Free up disk space** will launch the Disk Cleanup applet, as seen in Figure 5.11. The Disk Cleanup applet will scan your system and determine



■ FIGURE 5.11 Disk Cleanup

what can be done to free up space on your disks. You can delete Downloaded Program Files, Temporary Internet Files, Offline Webpages, files in the Recycle Bin, Setup Log Files, Temporary Files, Thumbnails, Per user archived Windows Error Reports, and System archived Windows Error Reports.

The Disk Cleanup applet also includes an option to **Clean up system files**. This option will cause the Disk Cleanup applet to open with a tab called **More Options**. On the **More Options** tab you have the option to remove programs that you do not use. You also have to option to remove older system restore points.

Choosing the **Free up disk space** option will bring up the Disk Defragmenter. The Disk Defragmenter can help improve performance of your

drives. Fragmentation occurs when files split all over your disks. When this happens, your disk has to do more work to access files. The Disk Defragmenter will move your files to a contiguous location. This will speed disk access performance.

Choosing the **Create and format hard disk partitions** option will bring up the Disk Management console. You can use the Disk Management console to manage your hard disks and disk partitions. You can create partitions and format partitions. You can also configure fault tolerance for your disks.

Choosing the **View event logs** option will open the Windows Event Viewer. You can view the Windows logs: Application, Security, Setup, and System. You can also view individual logs for certain Windows applications and Windows services. You can use Event Viewer to view logs on the local system or a remote system.

Choosing the **Schedule tasks** option will launch Task Scheduler, as seen in Figure 5.12. Using Task Scheduler, you can schedule tasks to run at specified times. This is great for administrative and maintenance tasks that must be run on a regular basis.

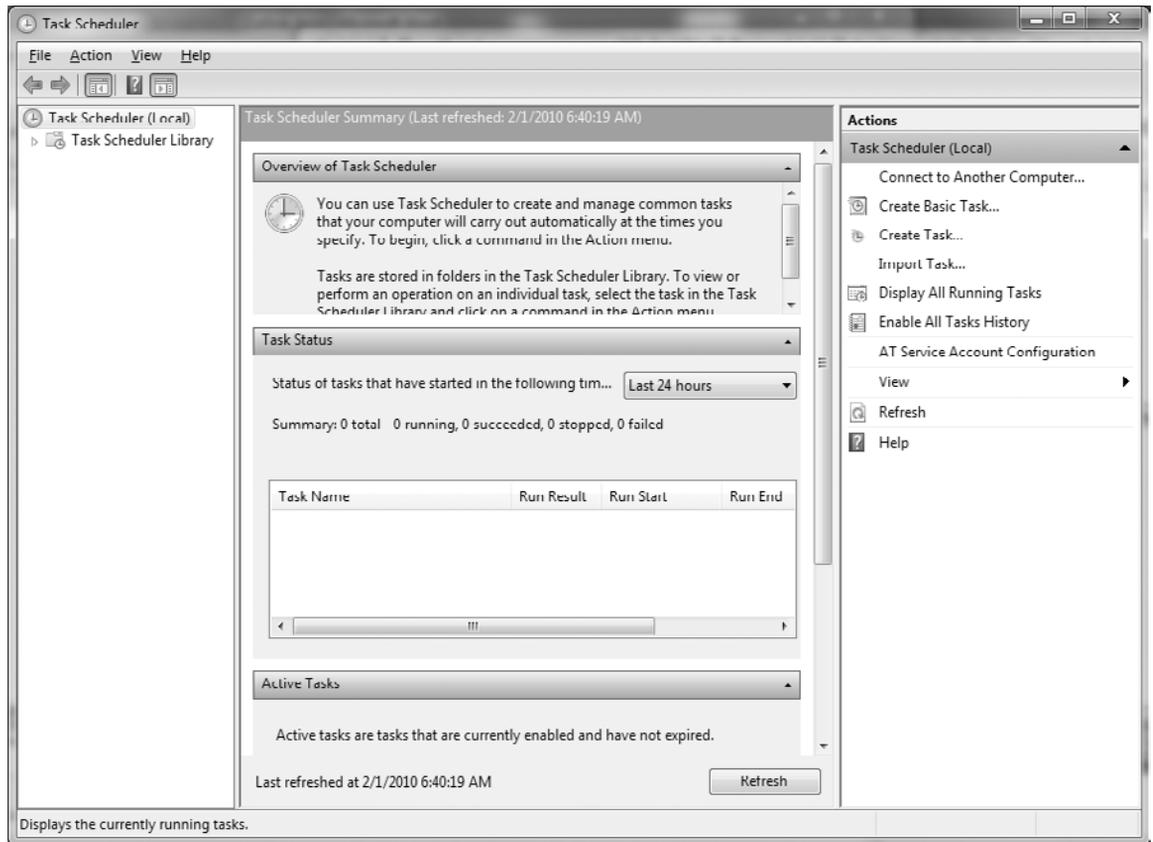
Task Scheduler offers great flexibility. You can use the Create Basic Task wizard or manually create a task. You can schedule tasks to run once, daily, weekly, monthly, when the computer starts, when a user logs on, or when a specific event is logged. The task can be to run a program or script, send an email, or display a message. Task Scheduler also allows you to import and export tasks. This is useful if you want to run the same task on multiple systems.

Network and Internet

The **Network and Internet** category in the Control Panel contains applets that let you configure your network settings and your Internet settings. You can connect to wired and wireless networks. You can configure sharing permissions. You can configure the behavior of Internet Explorer and other applications. The subcategories under the **Network and Internet** category are Network and Sharing Center, HomeGroup, and Internet Options.

Network and Sharing Center

The Network and Sharing Center allows you to configure local network settings for your system. You can connect to a network and determine what resources can be accessed by other computers. The Network and Sharing Center contains four options: **View network status and tasks**, **Connect to a network**, **View network computers and devices**, and **Add a wireless device to the network**.



■ FIGURE 5.12 Task Scheduler

Choosing the **View network status and tasks** option will bring up the Network and Sharing Center. The Network and Sharing Center lets you configure all aspects of your system networking. You can view the status of your active networks. You can also configure settings for your network adapters.

Choosing the **Connect to a network** option brings up the wireless network connection dialog. You can see what wireless network you're currently connected to, if any. You can also connect to a network or disconnect from a network.

Choosing the **View network computers and devices** option will bring up the Network window. You can use this to view the other computers and media devices on your network. You can also use the Network window to connect to these computers and devices.

Choosing **Add a wireless device to the network** will bring up the Add a Device wizard. It will scan your network for wireless devices that you can connect to your system.

HomeGroup

You can configure a HomeGroup on your home network. A HomeGroup is a collection of computer on the network. Your HomeGroup makes it easy to share files and media with other computers. You can configure sharing settings for your HomeGroup, and other computers that are a member of your HomeGroup will be governed by these settings when they attempt to connect to your computer. The **HomeGroup** section of the Control Panel contains one option: **Change homegroup and sharing options**.

Change homegroup and sharing options will bring up the HomeGroup window. The HomeGroup window allows you to configure settings for your HomeGroup. You can configure what libraries and media other members of your HomeGroup can access.

Internet Options

The **Internet Options** section of Control Panel allows you to manage Internet and Internet Explorer settings for your computer. You can configure security settings and access settings. You can control add-ons, Active-X controls, and other components.

The **Change your homepage** option brings up the **General** tab of the Internet Properties window. Here, you can configure the home page for Internet Explorer. You can use the current page, the default, a blank page, or type in a page.

The **Manage browser add-ons** option brings up the **Programs** tab of the Internet Properties window. You can use the **Manage add-ons** option to launch the Manage Add-ons window. Here, you can configure toolbars, search providers, accelerators, and InPrivate Filtering.

The **Delete browsing history and cookies** option brings up the **General** tab of the Internet Properties window. The Browsing History section allows you to view temporary internet files, cookies, and downloaded program files. You can delete your history, form data, and temporary files.

User Accounts and Family Safety

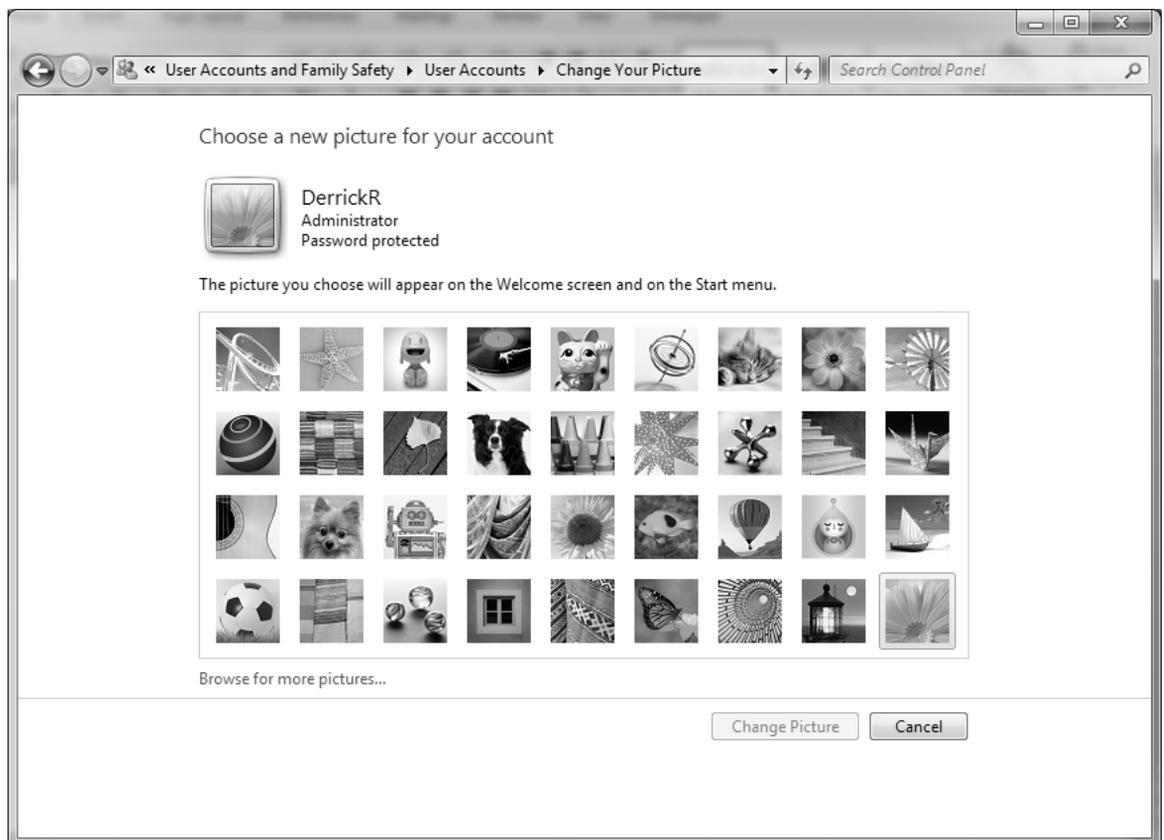
The **User Accounts and Family Safety** section of Control Panel allows you to configure user settings and controls for your system. You can add and edit user accounts. You can also specify what access different members of your family will have.

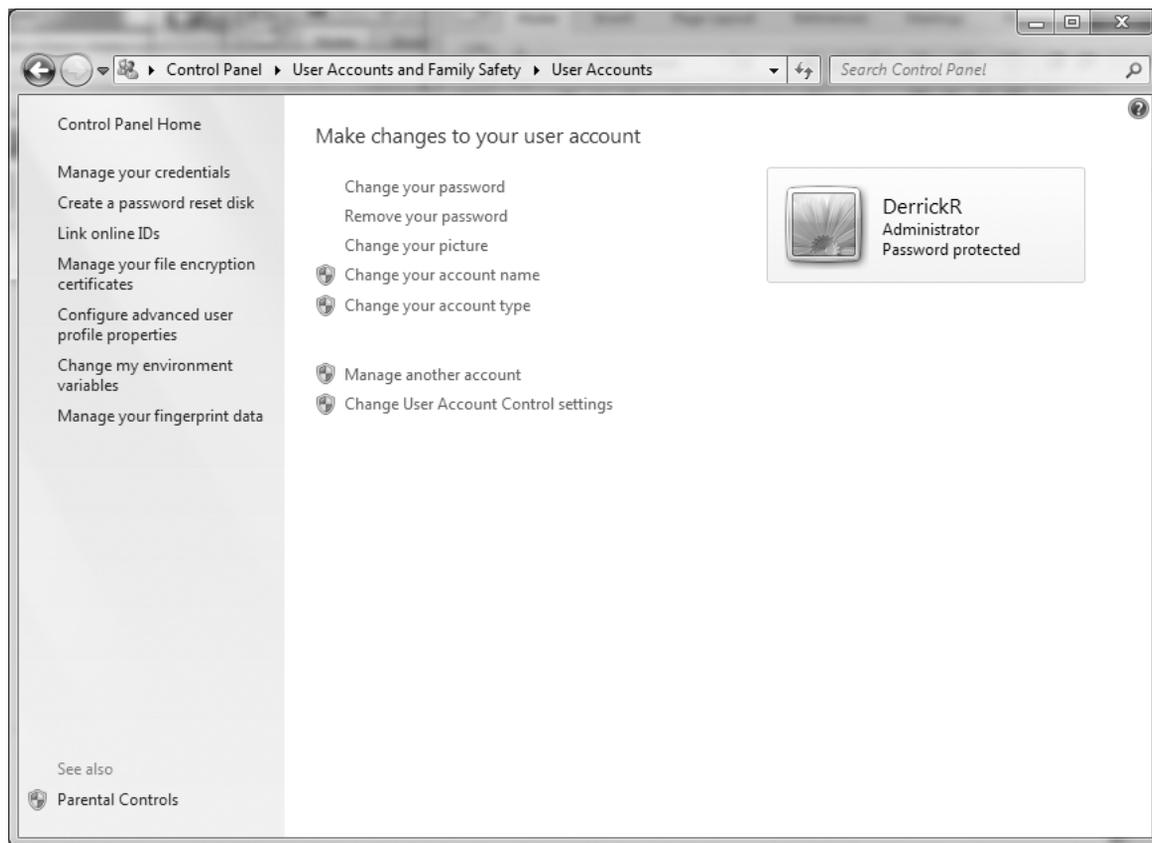
User Accounts

The **User Accounts** section of Control Panel allows you to control Windows user settings. User accounts determine who can and cannot access the system. User accounts are also used to determine what rights a user will have on the system. The **User Accounts** section of Control Panel has three options: **Change your account picture**, **Add or remove user accounts**, and **Change your Windows password**.

Change your account picture enables you to associate a picture with your user account. This picture will appear on the Start menu and on the Welcome screen next to your user name. The **Change your account picture** option will bring up the Change Your Picture window, as seen in Figure 5.13. You can use this window to change the picture associated with your user account. You can use one of the preselected pictures or add your own picture.

■ FIGURE 5.13 Change Your Picture Window





■ FIGURE 5.14 User Accounts Window

The **Add or remove user accounts** option will bring up the User Accounts window, as seen in Figure 5.14. The User Accounts window allows you to change your password, remove your password, change your picture, change your account name, change your account type, manage another account, or change UAC settings.

The **Change Your Windows Password** option will also bring up the User Accounts window. Selecting the **Change your password** option will bring up the Change Your Password window. Here, you can change your current password. You can also set up a password hint, just in case you forget your password.

Parental Controls

Parental Controls are used to limit access on your system. You can limit the access other members of your family have. For example, you can prevent

younger members of your family from accessing sites that you might deem inappropriate. The **Parental Controls** section of the Control Panel has one option: **Set up parental controls for any user**.

The **Set up parental controls for any user** option will bring up the Parental Controls window. Here, you can select which account you want to set parental controls for. Once you enable Parental Controls for the user, you can control when the user uses the computer and what games they can play, and you can block the use of specific programs.

Windows CardSpace

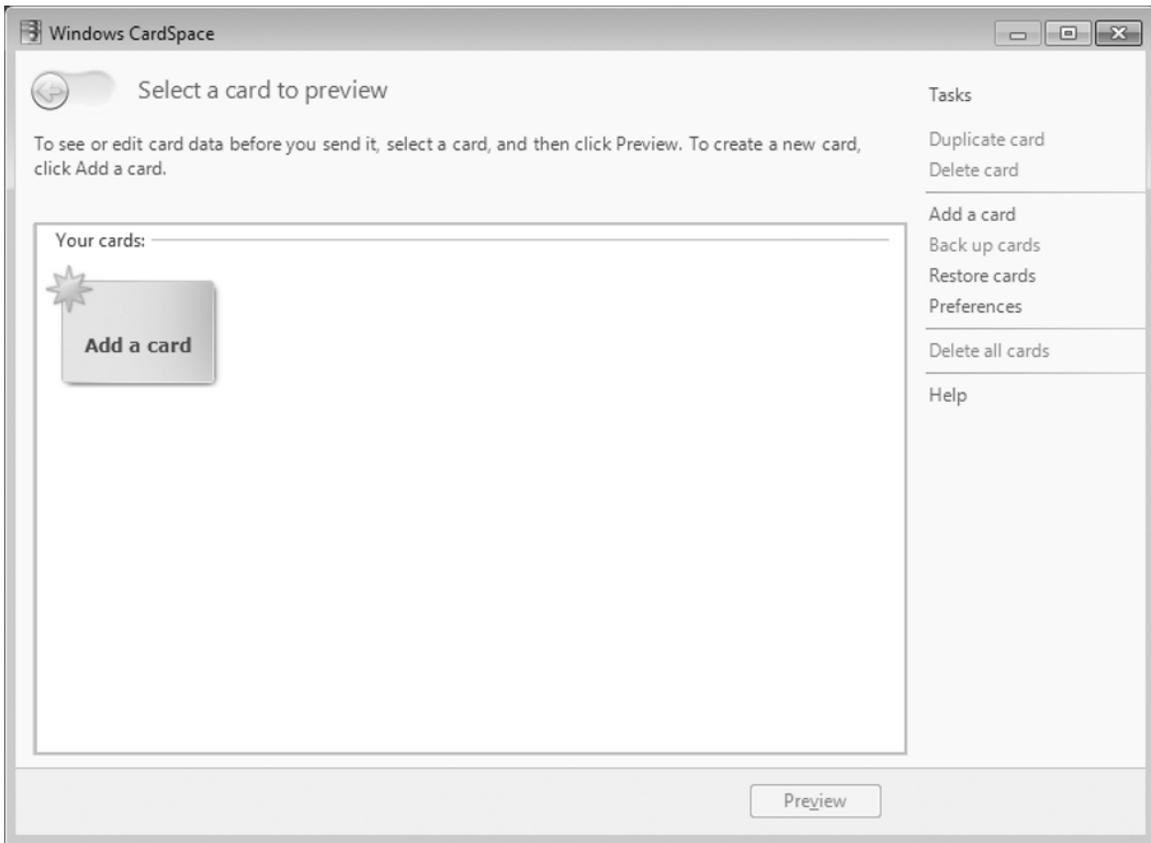
Windows CardSpace is a system for managing Information Cards. Information Cards can be used to represent a user's identity to Web sites. Each card has a digital signature that is used to keep the card unique for each user and the Web site it's used for. A single user may have many different Information Cards. That's why it's important to have a system to manage and keep track of these cards. The **Windows CardSpace** section of the Control Panel has one option: **Manage Information Cards that are used to log on to online services**.

The **Manage Information Cards that are used to log on to online services** option will launch the Windows CardSpace window, as seen in Figure 5.15. You must then specify if you want to create a personal card or install a managed card. If you create a personal card, then you will be asked what information you want to have presented with the card. If you already have a card and choose to install a managed card, you will be asked for the location of the card.

Once you have the card installed on your system, the CardSpace window will allow you to back them up. You can use this backup to move the card to a different system, or to do a restore if your cards or your system become corrupt.

Credential Manager

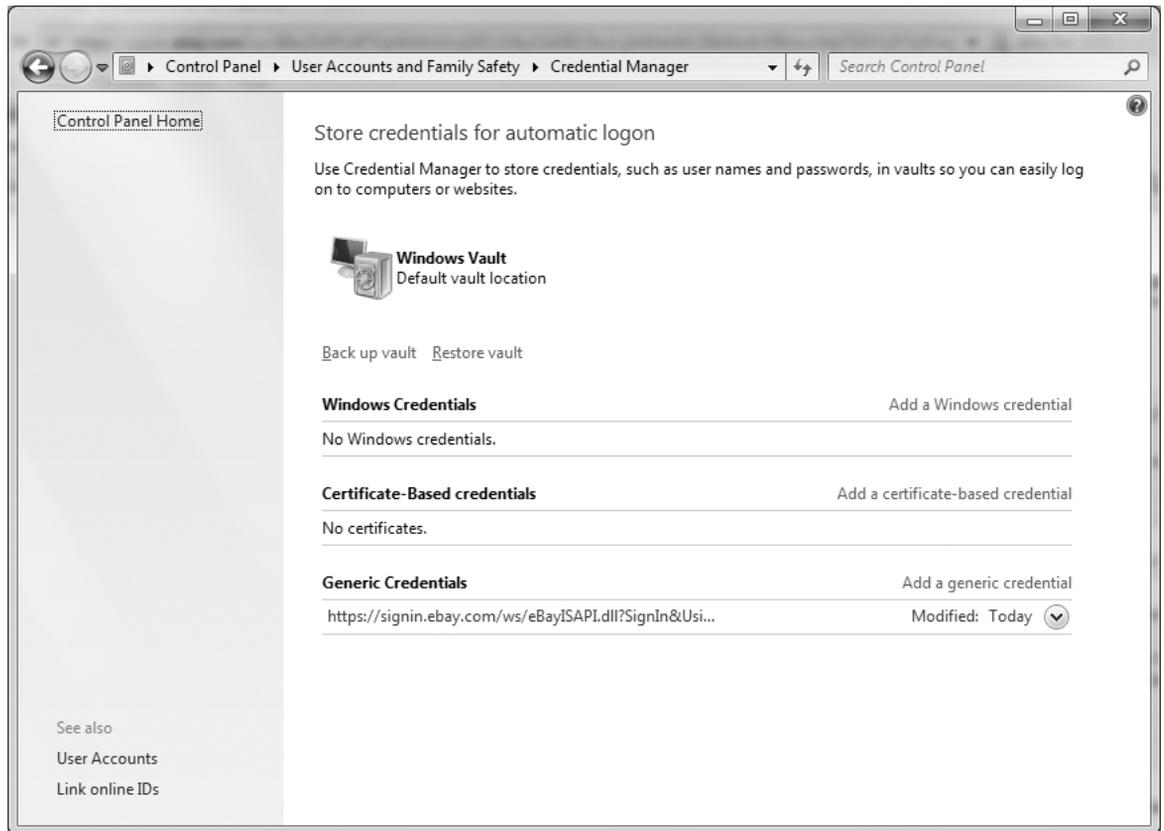
Nowadays, in order to ensure security, many sites are password protected. Passwords help prevent unwanted users from accessing confidential or private information. With the abundance of password-protected sites, users are finding it difficult to keep track of all these passwords. Windows 7 makes this a little easier with Credential Manager. Credential Manager is used to store passwords for various sites in one place. Instead of remembering all the passwords, the user can simply store them in Credential Manager, and have Windows submit the passwords to the appropriate site. These could be Web sites or network locations. The **Credential Manager** section of Control Panel has one option: **Manage Windows credentials**.



■ FIGURE 5.15 Windows CardSpace Window

The **Manage Windows credentials** option will bring up the Credential Manager window, as seen in Figure 5.16. Credential Manager will allow you to save Windows credentials, certificate-based credentials, and generic credentials. If you choose to save Windows or generic credentials, you will be prompted to enter the Internet or network address, the user name, and the password. If you choose to save certificate-based credentials, you will have to enter the Internet or network and select the appropriate certificate from your certificate store.

Credential Manager also gives you the ability to back up and restore your credential vault. This is useful if your credential vault becomes corrupted for any reason. Your vault backups will be protected with a password. This password must be supplied before a restore is allowed. This helps to prevent unwanted users from accessing your credentials.



■ FIGURE 5.16 Credential Manager Window

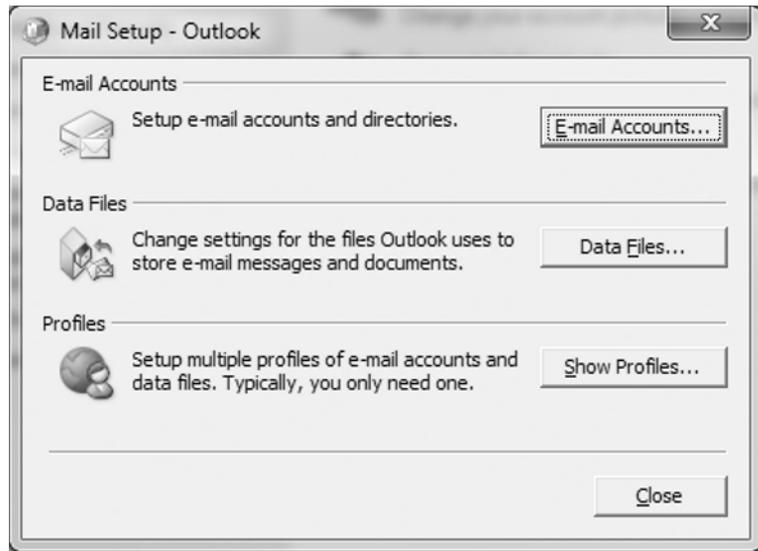
Mail

The **Mail** section of Control Panel allows you to configure Microsoft Outlook profiles. You can have multiple profiles for a single version of Microsoft Outlook. This is very useful if you need to have multiple Outlook identities. Perhaps you want to have one setup for work, and one setup for home. You can have different settings for each of these identities.

If you select the **Mail** option of Control Panel, it will bring up the Mail Setup window, as seen in Figure 5.17. The Mail Setup window allows you to configure e-mail accounts, data files, and profiles. You can associate the e-mail accounts and data files you have created with the desired profile.

Clock Language and Region

Windows 7 is used all over the world. Different regions, countries, and so on have different ways of presenting and displaying information. Different



■ FIGURE 5.17 Mail Setup Window

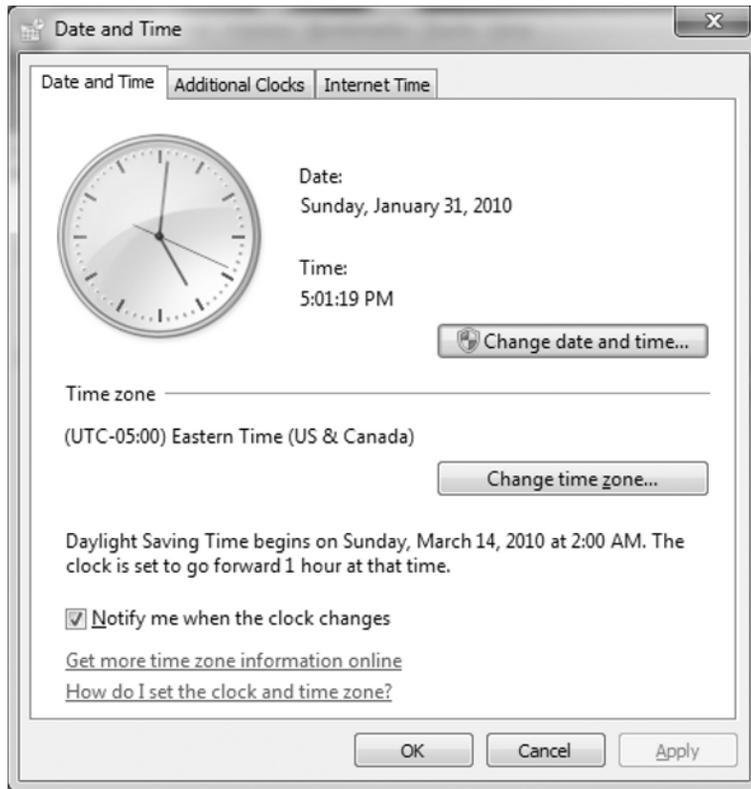
regions have different languages that they communicate in. They have different ways of displaying numbers, dates, and currencies. It's important that Windows 7 allows users to display information in the way that's best for them. The **Clock Language and Region** category of the Control Panel allows you to configure these settings. The **Clock Language and Region** category contains two subcategories: **Date and Time** and **Region and Language**.

Date and Time

The **Date and Time** option in Control Panel allows you to configure time and date information for your system. You can also add the Clock gadget to your desktop, so you can see time from different regions right on your desktop. The **Date and Time** section of Control Panel has four options: **Set the time and date**, **Change the time zone**, **Add clocks for different time zones**, and **Add the Clock gadget to the desktop**.

The **Set the time and date** option will bring up the **Date and Time** tab of the Date and Time window, as seen in Figure 5.18. Here, you can change the current date and time. You can also change the time zone of your system. The **Date and Time** tab also allows you to configure whether or not you want to be warned when the clock changes. This is for Daylight Savings Time. Windows will notify you when your clock needs to change for Daylight Savings Time.

Selecting the **Change date and time** option will bring up the Date and Time Settings window. You can use the calendar to change the current date



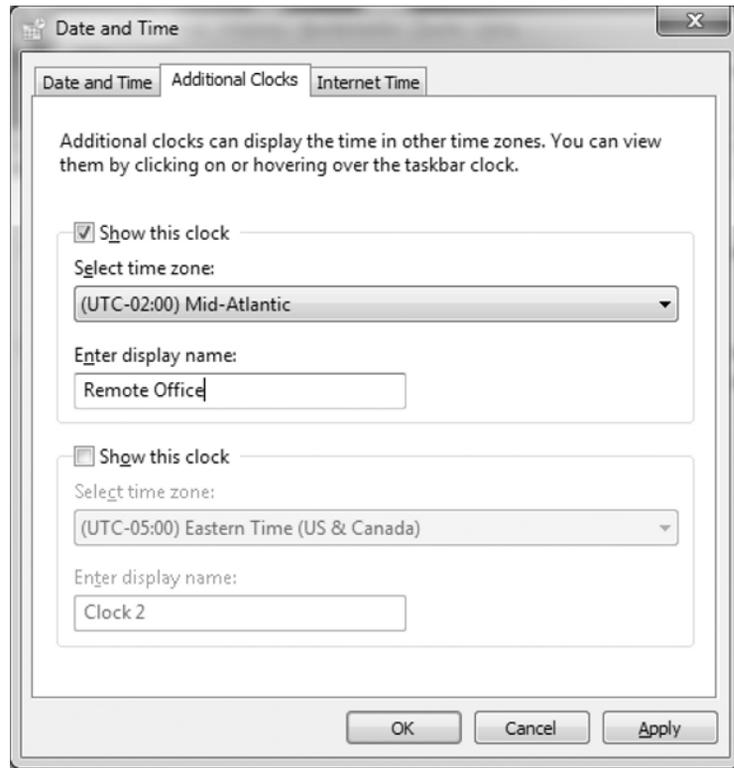
■ FIGURE 5.18 Date and Time Tab

for the system. You can also change the current time for the system. The Date and Time Settings window also includes an option to change calendar settings. With this option, you can change the format used for the time and the date.

The **Change the time zone** option will also bring up the **Date and Time** tab of the Date and Time window. In the Time Zone section, select the option for **Change time zone**. This will bring up the Time Zone Settings window. Here, you can choose the appropriate time zone and select whether your clock will be automatically adjusted for Daylight Savings Time.

Sometimes, you need to see time for more than one time zone. Let's say your company has multiple offices. You may want to be able to see the time at that office, in addition to the time at your current office. The **Add clocks for different time zones** option allows you to do that. It will bring up the **Additional Clocks** tab of the Date and Time window, as

■ FIGURE 5.19 Additional Clocks Tab



seen in Figure 5.19. You have the option to add two additional clocks to your system. These clocks will appear when you select the clock area of the system tray.

The **Add the Clock gadget to the desktop** option will bring up the Gadgets window, as seen in Figure 5.20. There is a gadget for the system clock. You can use the Gadgets window to add the Clock gadget to your desktop. If you want, you can add multiple Clock gadgets to your desktop. You can add a gadget for each time zone you would like to see time for.

Region and Language

The **Region and Language** section of the Control Panel allows you to control the format and display of information on your system. You can alter your format and language to be better aligned with the region in which you are most comfortable. The **Region and Language** section of the Control Panel has five options: **Install or uninstall display languages**, **Change display language**, **Change location**, **Change the date, time, or number format**, and **Change keyboards or other input methods**.



■ **FIGURE 5.20** Adding a Gadget to Your Desktop

The **Install or uninstall display languages** option will bring up the Install or Uninstall Display Languages wizard. First, you must choose if you want to install or uninstall a display language. If you choose to install a display language, you must select the location of the display language install package. The language pack will be installed and will be available for you to use. If you choose to uninstall a display language, simply select the display language you want to uninstall, and it will be removed for you.

The **Change display language** option will bring up the **Keyboards and Languages** tab of the Region and Language window. Here in the Display language section, you can choose which display language you would like to use. You can choose from any language for which a display pack has been installed. Windows will now be able to display text for that language.

Some applications and Web sites will display specific information based on what location you have selected. You can use the **Change location** option to specify a particular location for your system. This option will take you to the **Location** tab of the Region and Language window. You can change your current location to whatever location best fits your region.

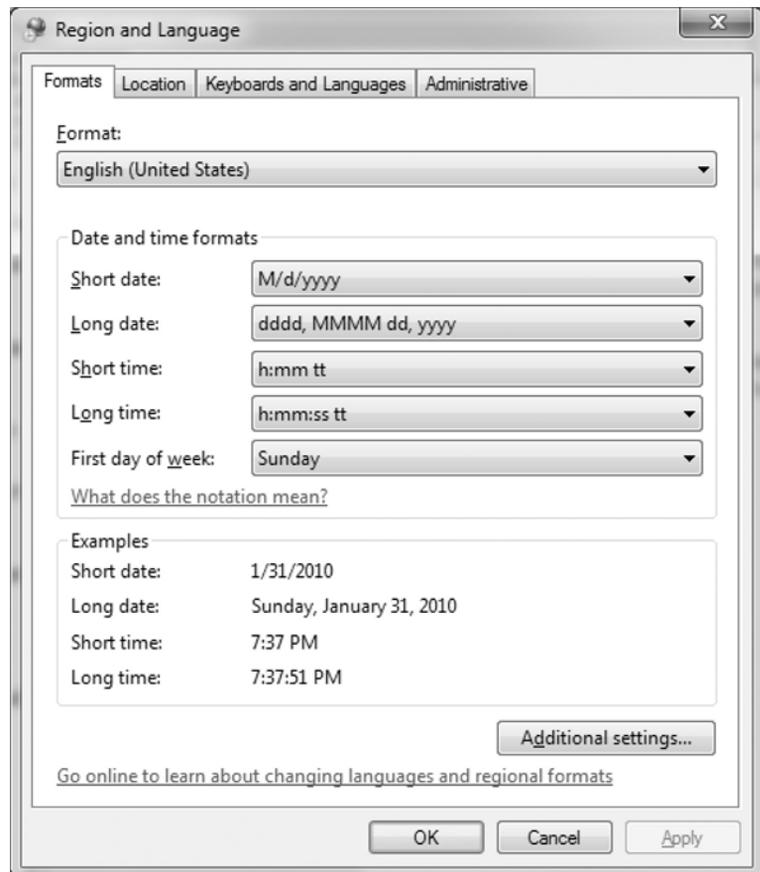
INSTALLING LANGUAGE PACKS

The easiest way to install a language pack is through Windows Update. Language packs are listed under the Optional Updates section of Windows Update. You can use Windows Update to download the language pack and then kick off the language package installation wizard.

Dates, times, and numbers can appear in many different formats. Often different regions will have different ways of displaying this information. You can use the **Change the date, time, or number format** option to change the way this information is displayed on your system. This option will bring up the **Formats** tab of the Region and Language window, as seen in Figure 5.21. You can choose what format you want to use for the date, the time, and what day is considered the first day of the week.

First, you can choose a region from the **Format** drop-down list. This will adjust all the formats to those most commonly used by that region. Now, if you want to change the format for an individual item, you can do that also. You will have examples of the different formats in the bottom section of the window. If you select the **Additional settings** option, you will be given a chance to set more settings for numbers, currency, time, and date.

■ FIGURE 5.21 Formats Tab



The **Change keyboards and other input methods** option will bring up the **Keyboards and Languages** tab of the Region and Language window. In the keyboards and other input languages section, choosing the **Change keyboards** option will bring up the Text Services and Input Languages window. You can change the input languages used by your devices. You can also change specific items like the keyboard that is used by your system. If you have multiple input languages specified, you must specify the default language for your system to use.

Ease of Access

The **Ease of Access** category of the **Control Panel** does just that. It provides ways of making your computer easier to use. In some cases, these are convenience features. In other cases, without these settings, some people wouldn't be able to use the system at all. The **Ease of Access** category of the Control Panel includes two subcategories: Ease of Access Center and Speech Recognition.

Ease of Access Center

The **Ease of Access Center** section of the Control Panel contains several items for making your system easier to use. You can configure visual modifications, sound modifications, and input modifications. The **Ease of Access Center** section has five options: **Let Windows suggest settings**, **Optimize visual display**, **Replace sounds with visual cues**, **Change how your mouse works**, and **Change how your keyboard works**.

The **Let Windows suggest settings** option will bring up a wizard that Windows will use to determine what settings should be set on your system. The wizard will ask you a series of questions. There will be questions on eyesight, dexterity, hearing, speech, and reasoning. Based on your answers to these questions, Windows will propose a set of settings. Select all the settings that you would like to apply and then click **OK**. The settings will automatically be applied to your system.

The **Optimize visual display** option will bring up the Make the computer easier to see window. Here, you can adjust settings that will make it easier to view information on your screen. You can turn the high contrast theme **on** or **off**. You can have text and descriptions read aloud using **Narrator and Audio Description**. You can make things on the screen larger using **Magnifier**. You can also make the focus rectangle thicker, change the thickness of the blinking cursor, turn off unnecessary animations, and remove background images.

The **Replace sounds with visual cues** option will open the Use text or visual alternatives for sounds window. Here you can set certain visual cues to be used instead of sounds. This is especially useful for the hearing

impaired. You can have the system flash the active caption bar, flash the active window, or flash the desktop instead of giving a sound notification. You can also set text captions to be used instead of spoken dialog.

The **Change how your mouse works** option will bring up the Make the mouse easier to use window. You can use this window to configure settings to make it easier to control your mouse. You can change your mouse pointer to something easier to view. You can configure so that you can control your mouse with your keyboard. You can set your system so that a window can be activated by hovering over it with the mouse. You can also set your system so that windows will not be automatically arranged when moved to the edge of the screen.

The **Change how your keyboard works** option will launch the Make the keyboard easier to use window. Here, you can allow the mouse to be controlled by the keyboard. You can turn on sticky keys, toggle keys, and filter keys. You can also have Windows underline keyboard shortcuts and access keys.

Speech Recognition

Speech Recognition can make using your computer much easier. With Speech Recognition, you can control your computer using your voice. You can start programs, dictate into documents, and send e-mails. The **Speech Recognition** section of Control Panel allows you to make this happen, and this section has two options: **Start speech recognition** and **Set up a microphone**.

If Speech Recognition has already been set up, the Speech Recognition application will open. If it has not been set up, then the **Start speech recognition** option will bring up the Set up Speech Recognition wizard. This wizard will take you through a series of questions to properly configure your system. First, your microphone will be set up and then speech recognition will be set up.

To use the Set up Speech Recognition wizard, follow these steps:

1. First, select which type of microphone you will be using. Click **Next**.
2. Properly position your microphone according to the on-screen recommendations. Click **Next**.
3. Read the dialog displayed on the screen. Click **Next**.
4. You should receive a message saying your microphone has been set up. Click **Next**.
5. Enable or disable **document review**. Click **Next**.
6. Choose an activation mode. Click **Next**.
7. View and/or print the **Speech Reference Card**. Click **Next**.
8. Select whether or not to run Speech Recognition at startup. Click **Next**.
9. Speech recognition should now be set up. Select to either run or skip the tutorial.

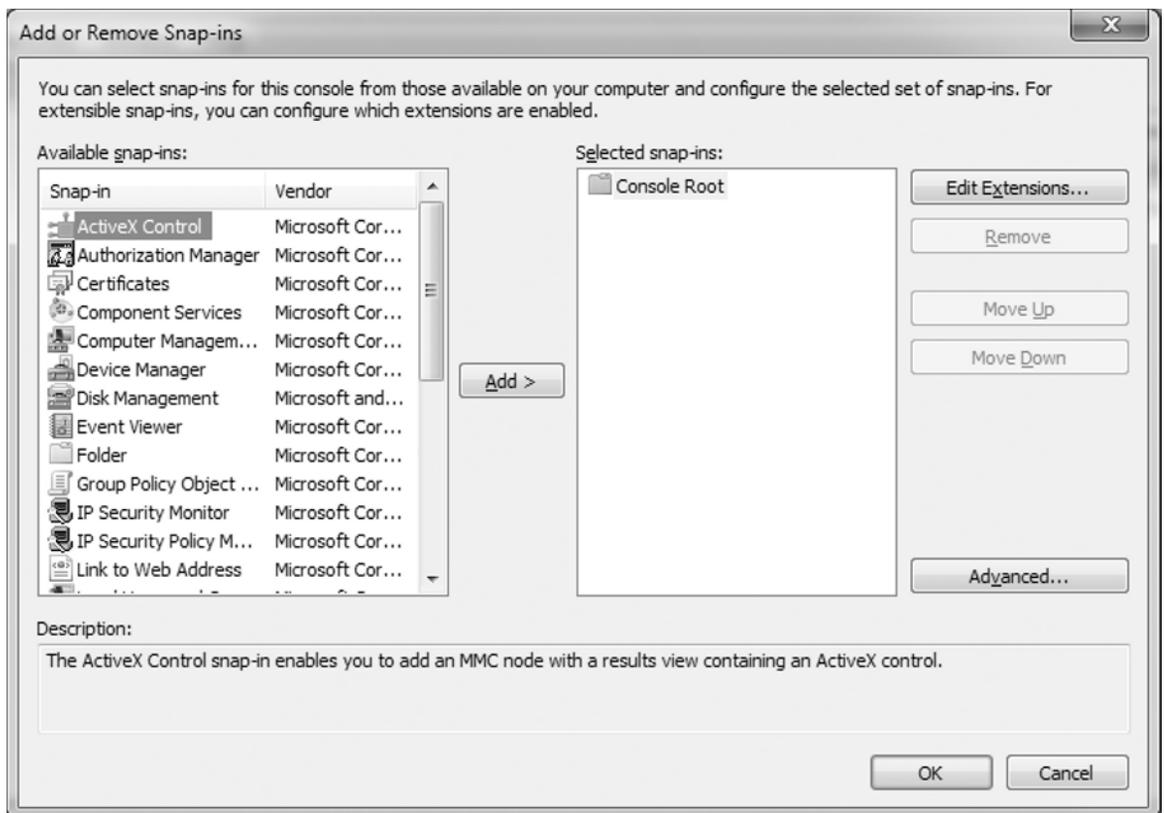
The **Set up a microphone** option will launch the Microphone Setup wizard. This wizard is the same as the beginning of the wizard used when you first set up Speech Recognition.

Microsoft Management Console 3.0

Microsoft has based most of its management applications on the Microsoft Management Console, or the MMC. The MMC provides a framework for building management consoles. This framework has been used by Microsoft and many third-party application vendors for creating their management consoles. In fact, many of configuration tools available in Windows 7 are really MMC consoles with preadded snap-ins. The consoles are then saved in such a way that they cannot be directly altered by users.

The MMC contains snap-ins that are used for system and application management. As seen in Figure 5.22, Windows 7 comes with many built-in MMC snap-ins that can be used to manage the system. These snap-ins can

■ FIGURE 5.22 Windows 7 MMC Snap-ins



be used to manage user settings, Windows applications, security, and many other vital aspects of the system.

Windows 7 contains the following built-in MMC snap-ins:

- **ActiveX Control** – This snap-in allows you to add individual ActiveX controls to view and configure. ActiveX controls are Internet Explorer plug-ins that are used to add functionality to the browser.
- **Authorization Manager** – This snap-in allows you to set permissions for Authorization Manager-enabled applications.
- **Certificates** – This snap-in allows you to configure the different certificate stores available on the system. Certificates help provide a secure operating environment for your system. You can use them for identification, securing data, and securing communications. There are certificate stores in place for users, applications, and the system itself.
- **Component Services** – This snap-in is used to manage the system's COM+, or Component Services configuration. You can also configure Distributed Computer Object Model (DCOM) and Distributed Transaction Coordinator (DTC) settings using this snap-in. These are especially important when programs need to communicate between multiple computers.
- **Computer Management** – This snap-in is actually a collection of snap-ins used for task scheduling, disk management, performance monitoring, and many other configuration and management tasks. These snap-ins are grouped together under **Computer Management** for ease of use.
- **Device Manager** – This snap-in is used for viewing and configuration of hardware devices installed on the system. You disable devices, update drivers, and troubleshoot potential issues with your hardware devices.
- **Disk Management** – This snap-in is used for disk and volume management. You can create volumes, format disks, and enable fault tolerance.
- **Event Viewer** – This snap-in is used to view the system event logs. These logs can help you determine if your system or applications are having problems. The Security log can also be used to determine if there is unauthorized access to your system.
- **Folder** – This snap-in is used to add a folder that can be used for organizing your snap-ins. This can come in very handy if you have added many snap-ins to a single MMC console.
- **Group Policy Object Editor** – This snap-in is used for configuring the Group Policy Objects on the system. Group policies are used to provide a centralized way for managing your systems.
- **IP Security Monitor** – This snap-in is used to monitor the status of your IP Security (IPsec) configuration. IPsec is used to secure

communications between computers. This snap-in can help you determine which IPsec policies are being applied to your systems.

- **IP Security Policy Management** – This snap-in is used to understand and configure the settings in your IPsec policy.
- **Link to Web Address** – This snap-in allows you to add a Web page to the MMC. This can be useful for applications and systems with Web-based management.
- **Local Users and Groups** – This snap-in allows you to configure users and groups on the local system. You can add user accounts, delete user accounts, and configure various user properties.
- **NAP Client Configuration** – This snap-in allows you to configure Network Access Protection (NAP) client configuration settings. NAP is a security feature that is used to limit who can gain access to your network.
- **Performance Monitor** – This snap-in allows you to monitor your system performance, including memory, hard disks, processors, and many other components.
- **Print Management** – This snap-in is used to manage print servers and printers connected to the system.
- **Resultant Set of Policy** – This snap-in is used to show what settings will be applied to the system after all policies have been applied. This helps when you want to test out your Group Policy settings without actually applying them to the system.
- **Security Configuration and Analysis** – This snap-in provides configuration and analysis of security templates being applied to the system.
- **Security Templates** – This snap-in allows you to edit the security templates that can be applied to the system.
- **Services** – This snap-in allows to you view and configure the properties for services running on the system. You can disable, start, stop, or restart services. You can also configure authentication and fault tolerance for services.
- **Shared Folders** – This snap-in allow you to view properties and status information for file shares that exist on the system. You can see what folders are beings shared and who is accessing them.
- **Task Scheduler** – This snap-in allows you to schedule tasks to be automatically run at specified times and/or at specified intervals.
- **TPM Management** – This snap-in allows you to configure the Trusted Platform Module, if one exists in the system. Trusted Platform Modules are used to generate keys for cryptographic operations.
- **Windows Firewall with Advanced Security** – This snap-in allows you to configure Windows Firewall settings on the system. You can control what processes, applications, and systems can access your system or generate network traffic from your system.

- **WMI Control** – This snap-in allows you to configure and manage the Windows Management Instrumentation (WMI) service. WMI is used for management and monitoring of Windows systems.

To add snap-ins to an MMC console, do the following:

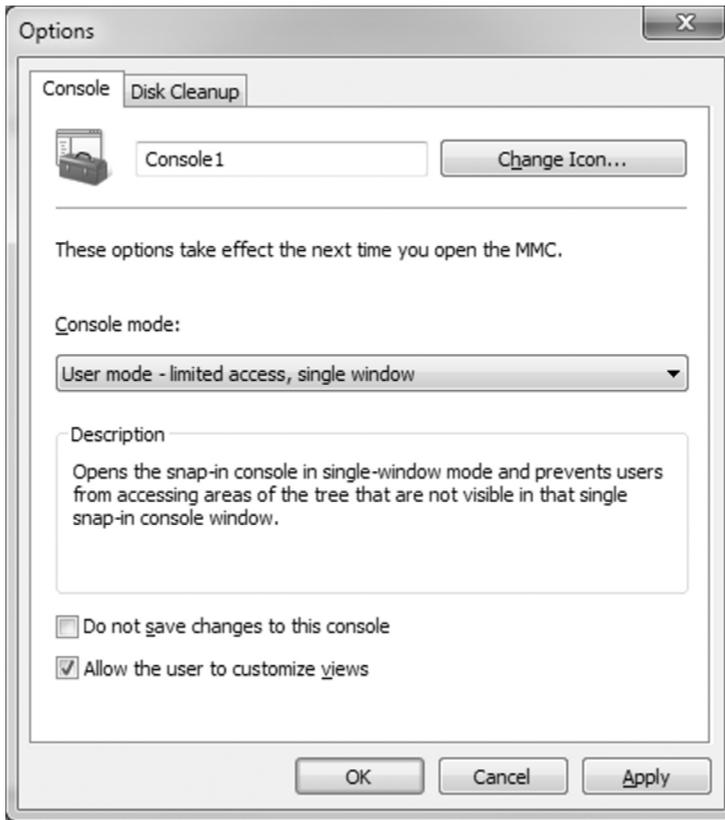
1. Run the command **MMC.exe** from a command prompt or from the Windows 7 Search bar.
2. If prompted by UAC to allow the MMC to make changes to the computer, click **Yes**. This should bring up a blank MMC console.
3. From the **File** menu, select **Add/Remove Snap-in**.
4. From the Add or Remove Snap-ins window, choose the snap-in you want to add. Click **Add**. Depending on the snap-in you add, you may be prompted for additional information.
5. After you have added all your snap-ins, click **OK**. Your snap-ins should now appear in the MMC.

The MMC can be very flexible. You can add whatever snap-ins you want to a blank MMC console. You can also modify one of the predefined management tools that use the MMC. After you have modified an MMC console, you have the option to save your changes. Simply select **File | Save** or **File | Save As**, whichever is appropriate.

There are also other options available for controlling what can and cannot be done inside an MMC console. If you choose **File | Options**, you will be presented with the MMC Options window, as seen in Figure 5.23. Here, you can change the icon used for console, or set the console mode. The console mode determines what users can and cannot see within the console and what changes they can make. The following are the four basic console modes available for the MMC:

- **Author mode** – This mode gives you full access to do anything in the MMC. You can add and remove snap-ins, create views, and open new windows.
- **User mode – full access** – This mode give you full access to the tree within the MMC. But, you cannot add or remove snap-ins.
- **User mode – limited access, multiple window** – This mode prevents you from being able to view contents of the tree that are not visible in the console window.
- **User mode – limited access, single window** – This mode opens the console with just a single window. Users cannot view items that do not appear in that window.

The Options window allows you to specify if changes to the console can be saved. There is also an option for whether or not to allow the user to customize the console views.



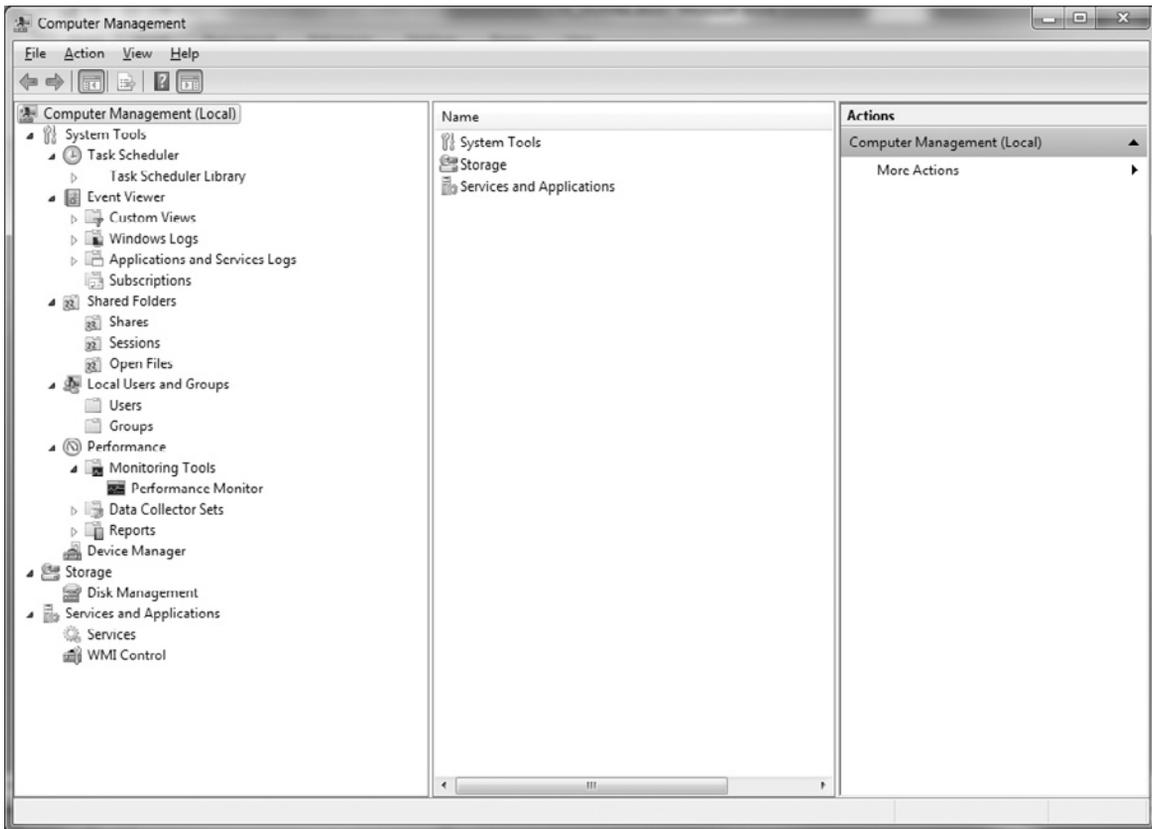
■ FIGURE 5.23 MMC Options Window

Computer Management Console

The Computer Management console is a predefined MMC-based management tool. It contains several snap-ins that aid in managing your system. These snap-ins are available individually, but are put together in one console to make management easier. The Computer Management console can be accessed by right-clicking on **Computer** on the Start menu and selecting **Manage**. Or you can add the Computer Management snap-in to your own customized MMC console.

As seen in Figure 5.24, the Computer Management console contains three categories that contain the actual snap-ins: **System Tools**, **Storage**, and **Services and Applications**.

- **System Tools** – Task Scheduler, Event Viewer, Shared Folders, Local Users and Groups, Performance, Device Manager
- **Storage** – Disk Management
- **Services and Applications** – Services, WMI Control



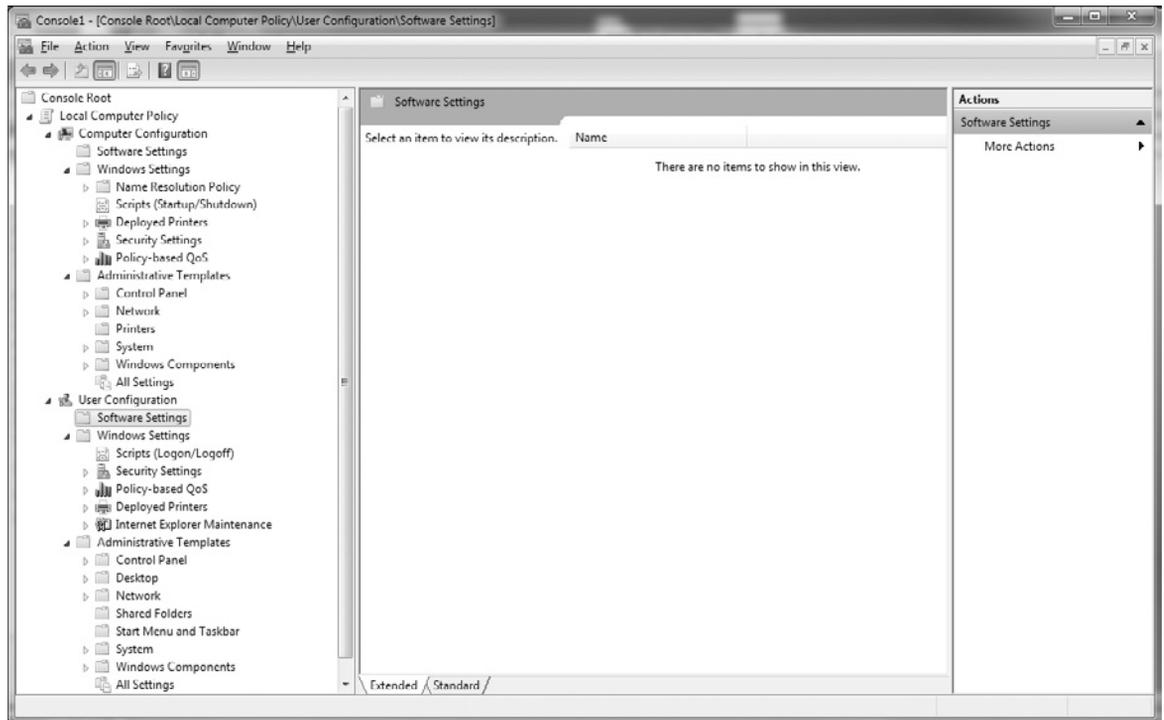
■ FIGURE 5.24 Computer Management Console

These snap-ins are used to manage the system. Again, these snap-ins can be used individually. The Computer Management console just puts them all together to make management easier. If you need to, you can create a custom MMC console with these snap-ins in addition to others.

Local Group Policy Editor

Setting individual settings can be quite cumbersome. To help Windows uses the concept of group policies. Group policies can be used to easily set multiple settings. Windows 7 comes with an MMC snap-in called Group Policy Object Editor. You can add this snap-in to the MMC and choose **Local Computer** when asked which Group Policy Object to edit. Now, you can edit the computer's local group policy.

As seen in Figure 5.25, the local computer policy is divided into two main sections: **Computer Configuration** and **User Configuration**.



■ **FIGURE 5.25** Local Computer Policy Snap-in

Computer Configuration

The **Computer Configuration** section is used for computer-wide settings. Many of these settings are applied when the system first boots up. These settings will apply to any user who logs into the system. The **Computer Configuration** section contains three subfolders:

- **Software Settings** – By default, there is nothing to be configured here.
- **Windows Settings** – These are general Windows settings that can be configured for all users. There are subnodes for **Name Resolution Policy**, **Scripts(Startup/Shutdown)**, **Deployed Printers**, **Security Settings**, and **Policy-based QoS**.
- **Administrative Templates** – These are registry-based settings that can be set for the system. There are subnodes for **Control Panel**, **Network**, **Printers**, **System**, and **Windows Components**.

User Configuration

The **User Configuration** section is used for user-specific settings. Most of these settings are not applied until a user logs into a system. These settings

will apply no matter what system a user logs into. The **User Configuration** section contains three subfolders:

- **Software Settings** – By default, there is nothing to be configured here.
- **Windows Settings** – These are general Windows settings that can be configured for all users. There are subnodes for **Scripts(Logon/Logoff)**, **Security Settings**, **Policy-based QoS**, **Deployed Printers**, and **Internet Explorer Maintenance**.
- **Administrative Templates** – These are registry-based settings that can be set for the system. There are subnodes for **Control Panel**, **Desktop**, **Network**, **Shared Folders**, **Start Menu**, and **Taskbar**, **System**, and **Windows Components**.

Windows Registry

The registry has long been the central configuration store for Windows systems. The registry is divided in categories called *hives*. These hives are where the actual configuration settings are stored.

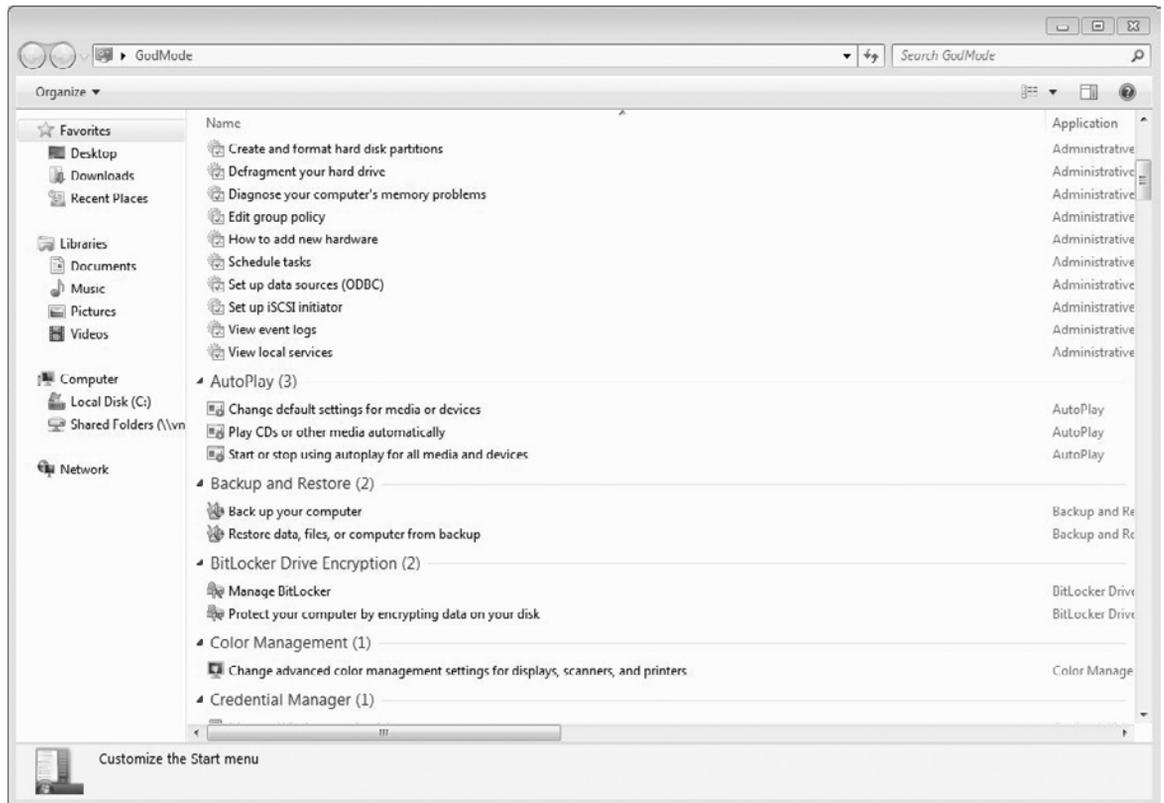
There are five main hives in the registry are as follows:

- **HKEY_CLASSES_ROOT** – This maintains file type associations.
- **HKEY_CURRENT_USER** – This maintains user settings for the user currently logged into the system.
- **HKEY_LOCAL_MACHINE** – This maintain system-wide settings.
- **HKEY_USERS** – This maintains user settings for all users.
- **HKEY_CURRENT_CONFIG** – This maintains information about the current hardware configuration.

The registry can be modified directly or indirectly. You must be careful when modifying the registry directly. Any misconfigurations or typos can severely affect the functioning of your system. Regedt32 is the primary tool provided with Windows 7 for modifying the registry. You can use Regedt32 to configure registry settings and to set registry permissions.

Simplified Configuration and Management of Desktops

Microsoft developers included an undocumented method for simplifying administration by combining shortcuts. It is a simple and single container with multiple shortcuts to Windows 7 options that are available through other methods as seen in Figure 5.26. This may be helpful for administrators and power users alike to configure and manage single Windows 7 desktops.



■ FIGURE 5.26 Combined Shortcut Window

To create a Combined Shortcut window:

1. Right-click on the desktop or anywhere in Windows Explorer where you would like this shortcut.
2. Select **New | Folder**
3. Name the folder: <Name>.{ED7BA470-8E54-465E-825C-99712043E01C}
4. The folder icon will change to a **Control Panel** icon, as seen in Figure 5.27.

To use the combined folder, simply double-click the **Control Panel** icon just created for your new applet. A Windows Explorer window will open with shortcuts for many different configuration options in Windows 7. All of these options are available through other methods, mostly through the standard Control Panel shortcuts.

■ FIGURE 5.27 Control Panel Icon



WARNING

The combined shortcut hack appears to work on Windows 7 32-bit and 64-bit versions. It also seems to work on 32-bit versions of Windows Vista and Windows Server 2008. Many users have reported problems using it in 64-bit editions of Windows Vista and Windows Server 2008. If it crashes the system, rebooting to safe mode and removing the shortcut should solve the issues. One documented cause of the failure is that fact that Windows Vista and Windows Server 2008 have a different set of Class Identifiers (CLSIDs).

MANAGING HARDWARE DEVICES AND DRIVERS

Windows 7 provides several tools and utilities for configuring and managing hardware devices and printers. You have several options for configuring devices and installing the necessary drivers. Without the proper drivers and the proper configuration, your devices will not function properly.

Install Devices

Installing hardware devices and drivers is much simpler in Windows 7 than in previous versions of Windows. There are several different types of hardware devices that may be installed on Windows 7 computers:

- **Internal Drives** – hard drives, CD drives, DVD drives, Blu-Ray drives, floppy drives, Zip drives, and any other internal drive that is released can be installed on Windows 7. These devices generally include a data cable (Integrated Drive Electronics [IDE], Serial Advanced Technology Attachment [SATA]) that attaches to the motherboard and a power cable that attaches to the power supply.
- **Internal Cards** – Adapters or expansion cards that are plugged into the desktops motherboard's expansion slots (Peripheral Component Interconnect Express [PCIe], Peripheral Component Interconnect [PCI], Accelerated Graphics Port [AGP]) including video cards, Redundant Array of Inexpensive Disks (RAID), and SATA controllers. Expansion cards for laptops are also considered internal cards. Generally, these cards are used to connect another device through a cable.
- **External Devices** – Any external device that connects to the computer through the available ports including universal serial bus (USB), IEEE-1394 (FireWire), Line Printer Terminal (LPT), Computer Object Model (COM), and so on. These ports can be connected to printers, scanners, external hard drives, media devices, and so on through the appropriate cable.
- **Memory** – Memory may be added to the computer's motherboard to expand the amount of memory the computer has access to.

Windows 7 automatically detects any hardware recently installed and attempts to automatically install the driver. Additionally, after Windows 7 Setup completes, if some drivers were not installed by default, Windows 7 will attempt to find the device and respective driver. This is possible through Windows Update. This section will cover basic methods of installing hardware devices including internal and external devices, printers, wireless devices, and so on.

Install Drivers with Windows Update

Windows 7 detects hardware that was not automatically installed with Windows 7 Setup; most of the time this will occur if the Windows 7 media did not include the driver for the hardware. The built-in hardware diagnostics

will, generally, detect that hardware that is installed on the computer that has no drivers are installed for it. It will attempt to identify the hardware and then use Windows Update to search for the correct driver. Windows Update will automatically download the driver but will not install it.

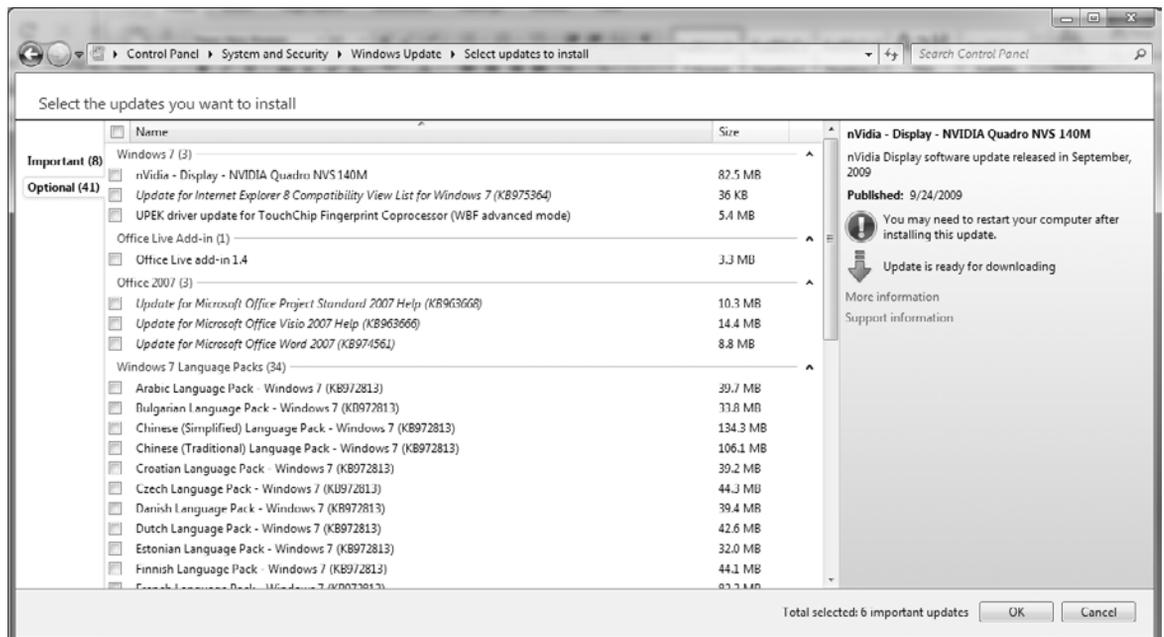
Open Windows Update in any of the following ways to check for new drivers or updated drivers:

- Click **Start | Control Panel | System and Security | Windows Update**
- Click **Start | Control Panel | Windows Update**
- Type **windows update** on Start menu Search.
- Right-click **Action Center | Open Windows Update** on the notification area.
- After opening Windows Update, click **Check for updates** on the left pane.

Essential drivers for video, sound, or hard disk controllers may appear as important updates. Other device drivers will appear in the optional updates section. Click the link on the main Windows Update console titled **[X] optional updates are available**, as shown in Figure 5.28.

By default, optional updates will not be selected to install. Check the box to the left of each driver you wish to install, and then click **OK** to download and install the update. Once the driver is installed, Windows will automatically detect the hardware device and install it.

■ **FIGURE 5.28** Windows Update Console – View Optional Updates Available



Device Manager

Device Manager is the central location to view, configure, and manage hardware devices. It is critical to understand how the Device Manager works before working on hardware devices.

There are multiple ways to open the Device Manager:

- In the Start menu, right-click **Computer | Manage**, expand **Computer Management** on the console tree, and then select **System Tools | Device Manager**.
- Enter the Start menu, right-click **Computer Properties**, then click **Device Manager** on the left pane.
- **Control Panel | Device Manager**
- **Control Panel | Hardware and Sound | Device Manager**

Notice the Device Manager is a MMC 3.0 Console. Expanding the device view is similar to any other MMC 3.0 console, simply click the arrow to the left of the device to expand the node. Devices with issues are displayed with a small symbol next to the device icon. A red X indicates the device is not installed correctly or disabled by the user or administrator. A yellow exclamation point indicates a problem with the device.

To change the view select **View** on the **Menu bar**.

- **Devices by Type** – This is the default view, which displays the devices by the type of hardware; devices are under the name of the device type.
- **Devices by Connection** – This displays devices by the connection each device is connected to.
- **Resources by Type** – This displays the devices by resource type. There are four resource types: direct memory access (DMA), input/output (IO), interrupt request IRQ, and memory.
- **Resources by Connection** – This displays the devices by the type of resource it is connected to. There are four resource types: DMA, IO, IRQ, and memory. This allows for tracing resources by the connection.
- **Show Hidden Devices** – This displays devices that have been removed but drivers have not been uninstalled, as well as non-plug-and-play devices.

To view options or actions for each device, either right-click the device or click on the device, and then click **Action** on the Menu bar. The options for each device are as follows:

- **Update Driver Software** – This initiates the Hardware Update wizard.
- **Disable** – This disables the selected driver.
- **Enable** – This enables the selected driver.

- **Uninstall** – This uninstalls the device and respective driver.
- **Scan for Hardware Changes** – This initiates a Windows 7 scan for new hardware devices or changes.
- **Properties** – This initiates the Properties window for the selected device.

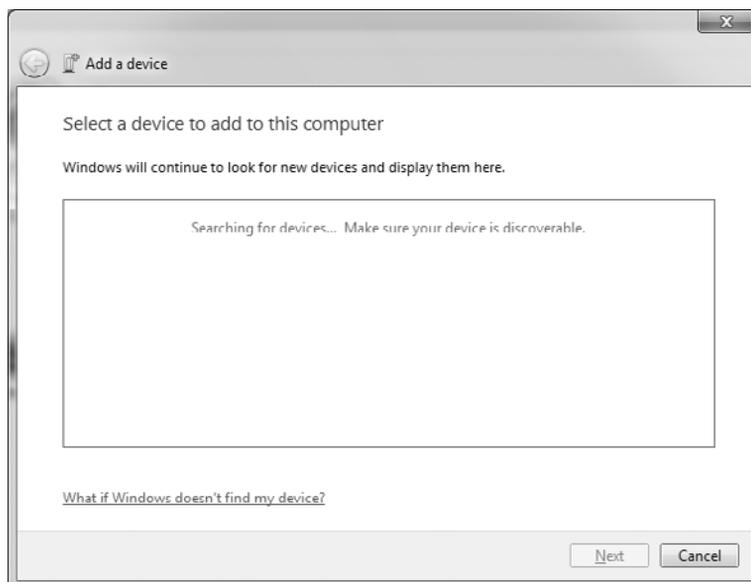
Devices and Printers

The Devices and Printers applet allows you to configure devices and printers attached to your system. You can configure device properties, your default printer, and many other settings. The Devices and Printers applet gives you the ability to **Add a device** or **Add a printer**.

Add a device – Selecting this option will kick off the Add a Device wizard as seen in Figure 5.29. Windows 7 will automatically attempt to detect devices that have been added to the system. If the system cannot automatically detect the device, you will be given the option to manually add it.

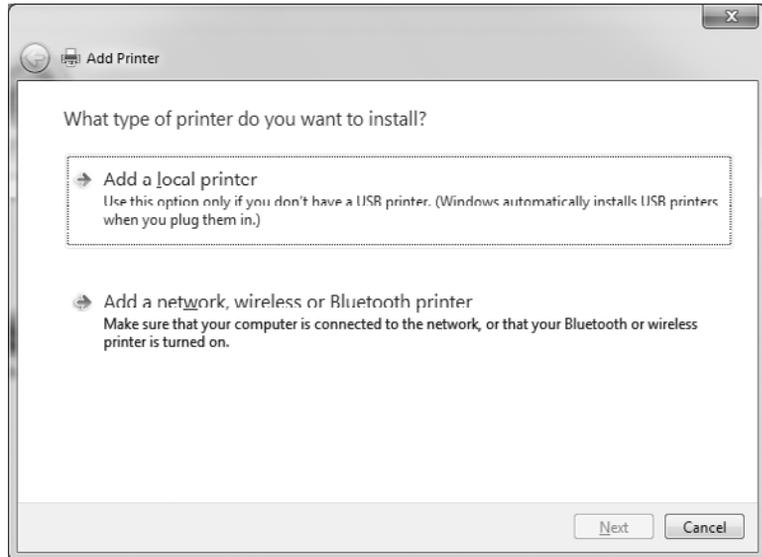
Add a printer – Selecting this option will kick off the Add Printer wizard, as seen in Figure 5.30. You can use it to install a local printer, network printer, wireless printer, or Bluetooth printer.

There are two sections in the applet: **Devices** and **Printers and Faxes**.



■ **FIGURE 5.29** Add a Device Wizard

■ FIGURE 5.30 Add Printer Wizard



Devices

The **Device** section is used to configure devices attached to the system. The system seen in Figure 5.31 has a biometric coprocessor and an integrated camera. There is also a device listed representing the system itself.

If you select the device representing the system, you get two device options:

Browse files – You can use this option to view files on the disk drives attached to the system. These could be hard drives, disk drives, or removable media.

Eject – You can use this object to remove hot-pluggable hardware and removable media.

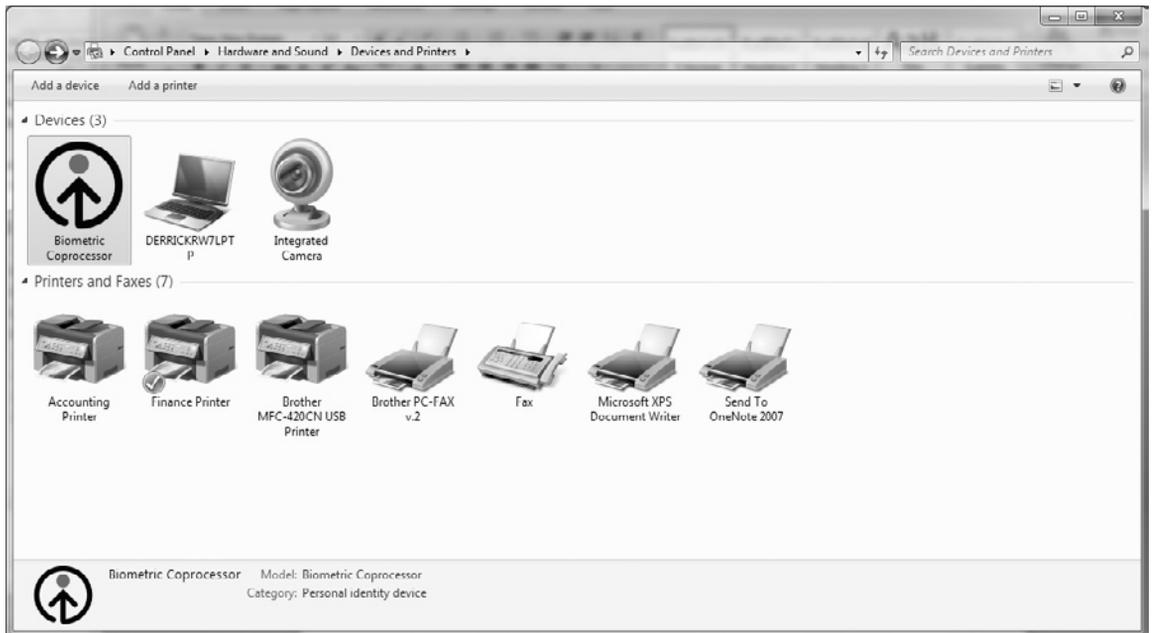
Printers and Faxes

The **Printers and Faxes** section contains all of the printers connected to the system. You can configure printer properties and your default printer.

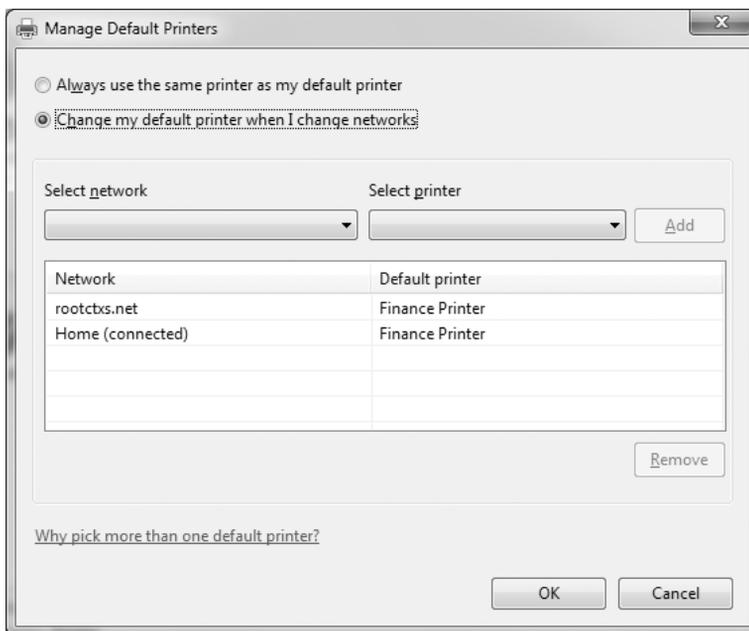
If you select one of the printers you have configured, you get four options:

See what's printing – This option allows you to view print jobs being serviced by the printer. You can view, cancel, or restart print jobs.

Manage default printers – This option will bring up the Default Printers window, as seen in Figure 5.32. The Default Printers window allows you to set an overall default printer. Or you can set a different default printer for each network your system connects to.



■ FIGURE 5.31 Devices and Printers Applet



■ FIGURE 5.32 Manage Default Printers Window

Print server properties – The Print server properties application allows you to configure system-wide print server properties. These print server properties are used by all printers configured on the system. You can configure printer forms that are available and configure printer ports to be used on the system. You can also add and remove printer drivers.

Remove device – This option allows you to remove a printer from the system.

MANAGING DISKS AND FILE SYSTEMS

The disks and the file system are at the center of Windows 7. It's important that your disks and file system are correctly configured. If not, your system might not function properly, or it may not function at all. The disks are where all your information is stored; the operating system files, the applications, your data, everything. The file system determines how this information is stored on your disks.

Partitions

Partitions are basically used to divide and segment your disks. Your disks can have either a single partition or multiple partitions. Even though having a single partition is the simplest way to configure your disk, there are several reasons why you might want to have more than one partition. Having multiple partitions can allow you to separate your operating system files, applications files, and data files. Sometimes, you must have multiple partitions because of size limitations for a partition. You may also need multiple partitions to run a multiboot system. This would especially be the case if different operating systems used different file systems. You would need to have a different partition for each of the different file systems.

MBR and GPT

MBR stands for Master Boot Record. Most legacy disks are MBR disks. MBR disks store partition information in the MBR, hence the name. This information is generally stored in the first sector of the disk.

GPT stands for GUID Partition Table. GPT disks store partition information in the GPT header. For compatibility with MBR systems, GPT disks continue to store the MBR entry as the first sector of the disk. After this entry is the start of the GPT. It is called the *Primary Partition Table Header*. For redundancy, the GPT header and partition table are also written at the end of the disk.

Choose between MBR and GPT

In Windows 7, you can have MBR or GPT disks. When a new disk is first added, you must choose between making it an MBR or GPT disk. It's important that you understand the differences between these two types of disks. Because the GPT format is newer, you may run into compatibility issues if you choose this format. MBR disks have a wider range of compatibility. GPT disks, however, support larger partition sizes.

Convert from MBR to GPT

You can convert a MBR disk to a GPT disk. In order to convert a disk to GPT format, the disk cannot have any volumes. If the disk has volumes, you should remove them.

To convert a MBR disk to a GPT disk, do the following:

1. Open the **Disk Management MMC** snap-in.
2. Right-click on the disk and select **Convert to GPT disk**.
3. The disk will be converted, and should show as Online.

Convert from GPT to MBR

You can also convert a GPT disk to an MBR disk.

To convert a disk from GPT to MBR, do the following:

1. Open the **Disk Management MMC** snap-in.
2. Right-click on the disk and select **Convert to MBR disk**.
3. The disk will be converted, and should show as Online.

Basic and Dynamic Disks

There are two types of disks available in Windows 7: *basic disks* and *dynamic disks*. You can think of basic disks as the traditional technology used for Windows disks.

When disks are first created, they are created as basic disks. In the original Disk Creation wizard, you can convert the disk to a dynamic disk. You can also convert to a dynamic disk later.

To convert a basic disk to a dynamic disk, do the following:

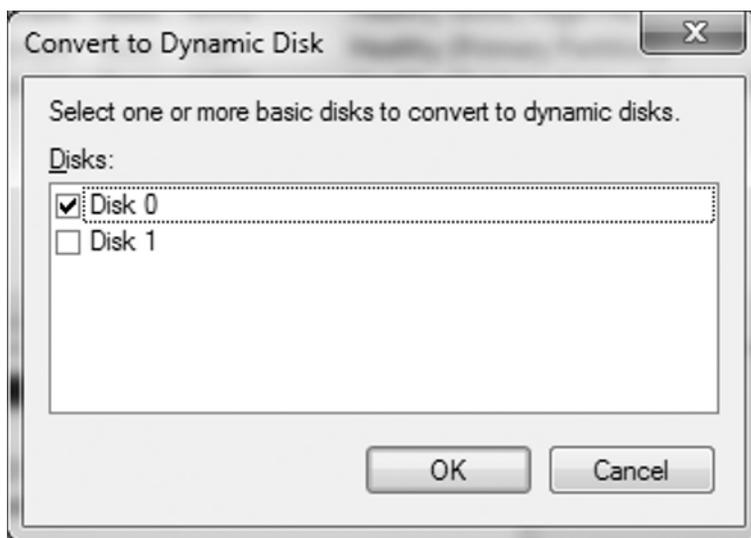
1. Open the **Disk Management MMC** snap-in.
2. Right-click on the disk and select **Convert to Dynamic Disk**, and as seen in Figure 5.33, the Convert to Dynamic Disk window will appear.
3. Select the basic disks you want to convert to dynamic disks.
4. Click **OK**. The disks are converted to dynamic disks.

CONVERTING BETWEEN MBR AND GPT FORMAT

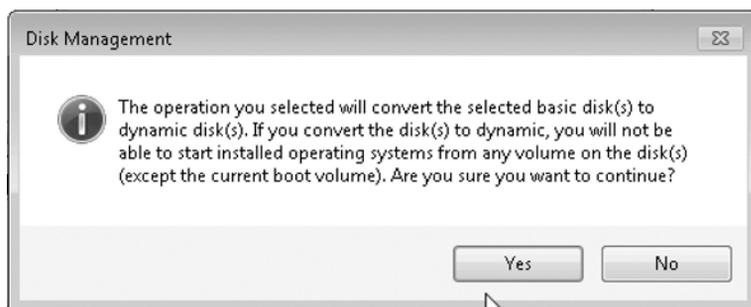
When you convert a disk from MBR format to GPT format, you will notice the amount of unallocated disk space on the disk decreased. This is because of the additional space used to hold disk and partition information on GPT disks. When you convert from GPT format to MBR format, you will notice a reverse effect.

WARNING

It is possible to convert a basic disk with a volume configured on it, but you will receive the Disk Management warning as seen in Figure 5.34.



■ FIGURE 5.33 Convert to Dynamic Disk Window



■ FIGURE 5.34 Disk Management Warning Window

To convert a dynamic disk back to a basic disk, do the following:

1. Open the **Disk Management MMC** snap-in.
2. Right-click on the disk and select **Convert to Basic Disk**.
3. Click **OK**. The disk is converted back to a basic disk.

If the disk has a volume on it, you cannot convert it back to a basic disk. You must delete the volume before attempting to convert the disk back to a basic disk.

Volumes

Once you have your disks created and configured, you need to create volumes on them. You cannot store information on your disks until volumes

are created. There are several different types of volumes you can choose to create. You can create simple volumes, spanned volumes, striped volumes, or mirrored volumes.

Create a Simple Volume

Creating a simple volume is easy. Just do the following:

1. Right-click on **Unallocated space**. Select **New Simple Volume**.
2. The New Simple Volume wizard appears. Click **Next**.
3. On the Specify Volume Size screen, enter the desired size of the new volume. Click **Next**.
4. On the Assign Drive Letter or Path screen, choose the desired drive letter for the new volume. Click **Next**.
5. On the Format Partition screen, choose the option for **Format this volume using the following settings**.
6. Choose the **NTFS file system**. Enter a volume label. Select the option for **Perform a Quick Format**. Click **Next**.
7. On the Completing the new Simple Volume Wizard screen, click **Finish**. The new volume will be formatted and should show a status of *Healthy*.

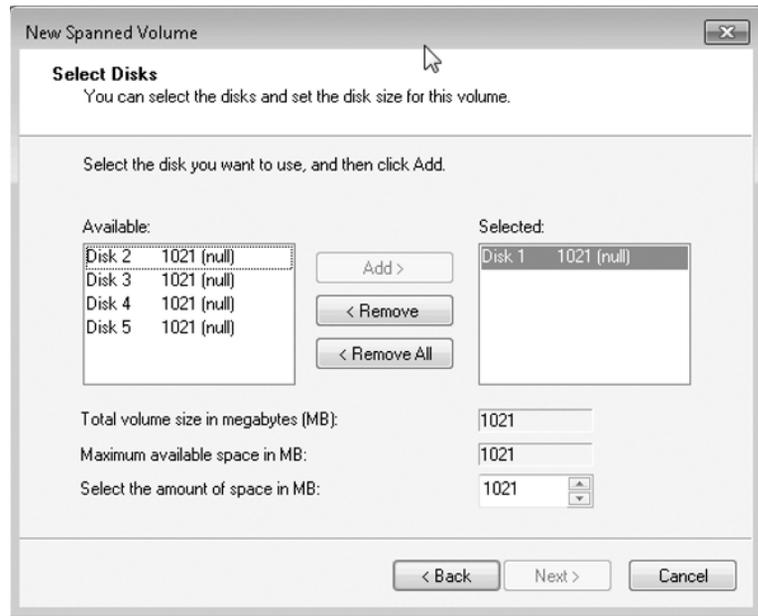
Create a Spanned Volume

To create a new spanned volume, do the following:

1. Right-click on **Unallocated space**. Select **New Spanned Volume**.
2. The New Spanned Volume wizard appears. Click **Next**.
3. As seen in Figure 5.35, the Select Disks screen appears.
4. Select the disk you want to add to the spanned volume. Click **Add**.
5. Once the disk is added, you can specify how much disk space from the disk you want to add to the spanned volume. Click **Next**.
6. On the Assign Drive Letter or Path screen, choose the desired drive letter for the new volume. Click **Next**.
7. On the Format Partition screen, choose the option for **Format this volume using the following settings**.
8. Choose the **NTFS file system**. Enter a volume label. Select the option for **Perform a Quick Format**. Click **Next**.
9. On the Completing the new Simple Volume Wizard screen, click **Finish**. The new volume will be formatted and should show a status of *Healthy* on each of the disks it was added to.

Create a Striped Volume

Striped volumes and spanned volumes are similar to each other, but there is one big difference. Both types of volumes can stretch across multiple



■ FIGURE 5.35 Select Disks Screen

disks. Striped volumes, however, use the same amount of disk space on all disks, whereas spanned volumes can use a different amount of space on each disk.

To create a new striped volume, do the following:

1. Open the **Disk Management MMC** snap-in.
2. Right-click **Unallocated space**. Select **New Striped Volume**.
3. The New Striped Volume wizard appears. Click **Next**.
4. The Select Disks screen appears. Select the disks you want to add to the spanned volume. Click **Add**.
5. Once the disks are added, you can specify how much disk space from the disk you want added to the striped volume. (Note: This will be the same for all disks.)
6. Click **Next**.
7. On the Assign Drive Letter or Path screen, choose the desired drive letter for the new volume. Click **Next**.
8. On the Format Partition screen, choose the option for **Format this volume using the following settings**.
9. Choose the **NTFS file system**. Enter a volume label. Select the option for **Perform a Quick Format**. Click **Next**.

10. On the Completing the new Striped Volume Wizard screen, click **Finish**. The new volume will be formatted and should show a status of *Healthy* on each of the disks it was added to.

Create a Mirrored Volume

Windows 7 has the ability to create mirrored volumes. Mirroring volumes is done for fault tolerance and redundancy. When a volume is mirrored, a copy of the data written to one volume is also written to a second volume. This way, if one of the volumes becomes corrupted or a disk fails, you can still access your files and data using the copy of the data stored on the other half of the mirror.

To create a new mirrored volume, do the following:

1. Open the **Disk Management MMC** snap-in.
2. Right-click on **Unallocated space**. Select **New Mirrored Volume**.
3. The New Mirrored Volume wizard appears. Click **Next**.
4. The Select Disks screen appears. Select the disks you want to add to the mirrored volume. Click **Add**.
5. Once the disks are added, you can specify how much disk space from the disks you want to be mirrored. (Note: This will be the same for all disks.)
6. Click **Next**.
7. On the Assign Drive Letter or Path screen, choose the desired drive letter for the new volume. Click **Next**.
8. On the Format Partition screen, choose the option for **Format this volume using the following settings**.
9. Choose the **NTFS file system**. Enter a volume label. Select the option for **Perform a Quick Format**. Click **Next**.
10. On the Completing the new Mirrored Volume Wizard screen, click **Finish**. The new volume will be formatted and should show a status of *Healthy* on each of the disks the mirror was added to.

Resize a Volume

Sometimes, when you create a volume, you will later be faced with the need to change the size of that volume. Luckily, once you have created a volume with a certain size, you are not limited to that size. You can either extend or shrink a volume, if necessary.

To extend a volume, do the following:

1. Open the **Disk Management MMC** snap-in.
2. Right-click on the volume to be extended. Select **Extend Volume**.
3. The Extend Volume wizard appears. Click **Next**.

WARNING

Dynamic disks are required to create spanned volumes, striped volumes, and mirrored volumes. If you attempt to create any of these volume types on basic disks, the disks will automatically be converted to dynamic disks.

WARNING

If you choose to extend a volume to another disk, a spanned volume will be created. If the disk is a basic disk, it will be converted to a dynamic disk.

4. The Select Disks screen appears. You can choose to extend the volume on the current disk or extend it to another disk.
5. Click **Next**.
6. Click **Finish**. The volume is extended and maintains the same file system as the original volume.

To shrink a volume, do the following:

1. Open the **Disk Management MMC** snap-in.
2. Right-click on the volume to be shrunk. Select **Shrink Volume**.
3. As seen in Figure 5.36, the Shrink Volume window appears. Enter the amount of space by which you would like to shrink the volume.
4. Click **Shrink**. The volume is shrunk and the freed up space is seen as unallocated space.

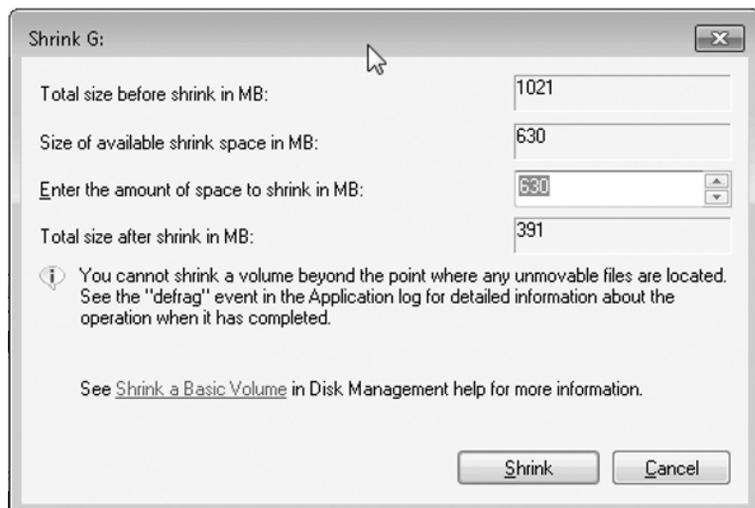
Delete a Volume

There are several instances where you may have to remove a volume. For example, you may need to remove a volume if you want to convert a disk to a different format.

To delete a volume, do the following:

1. Open the **Disk Management MMC** snap-in.
2. Right-click on the volume to be deleted and select **Delete Volume**. You will receive a warning that all your data will be erased.
3. Click **Yes** to continue. The volume will be deleted and the freed disk space will be returned to unallocated space.

■ FIGURE 5.36 Shrink Volume Window



Virtual Hard Disk

The Virtual Hard Disk or VHD format is basically a hard drive that actually exists as a file. VHDs are generally used with virtual machines. But, they can also be used with physical machines. VHDs have the .vhd file extension.

Create VHD

VHDs can be created in the **Disk Management MMC** snap-in.

To create a VHD, do the following:

1. Right-click the **Disk Management MMC** snap-in and select **Create VHD**. As seen in Figure 5.37, the Create and Attach Virtual Hard Disk window will appear.
2. Specify a location for the hard disk file.
3. Specify a size for the VHD.
4. Choose whether you want to create a dynamically expanding VHD or a fixed-size VHD.
5. Click **OK**. The VHD is created.



■ **FIGURE 5.37** Create and Attach Virtual Hard Disk Window

Use VHD

Before a VHD can be used by a system, it must be attached to the system. VHDs that you create on a system, like in the previous example, are automatically attached. But, you must manually attach other VHDs to your system.

To attach a VHD to a system, do the following:

1. Right-click the **Disk Management MMC** snap-in and select **Attach VHD**. The Attach Virtual Hard Disk window will appear.
2. Specify the location of the VHD you would like to use.
3. Specify whether you would like the VHD to be mounted as read-only or not.
4. Click **OK**. The VHD will be attached to your system.

Once VHDs are attached to your system, they appear in the **Disk Management** snap-in, just like any other disk. If the VHD is new, it will have to be initialized. After the disk is initialized and Online, you can create a volume on the disk. The disk is then ready for use.

File System Fragmentation

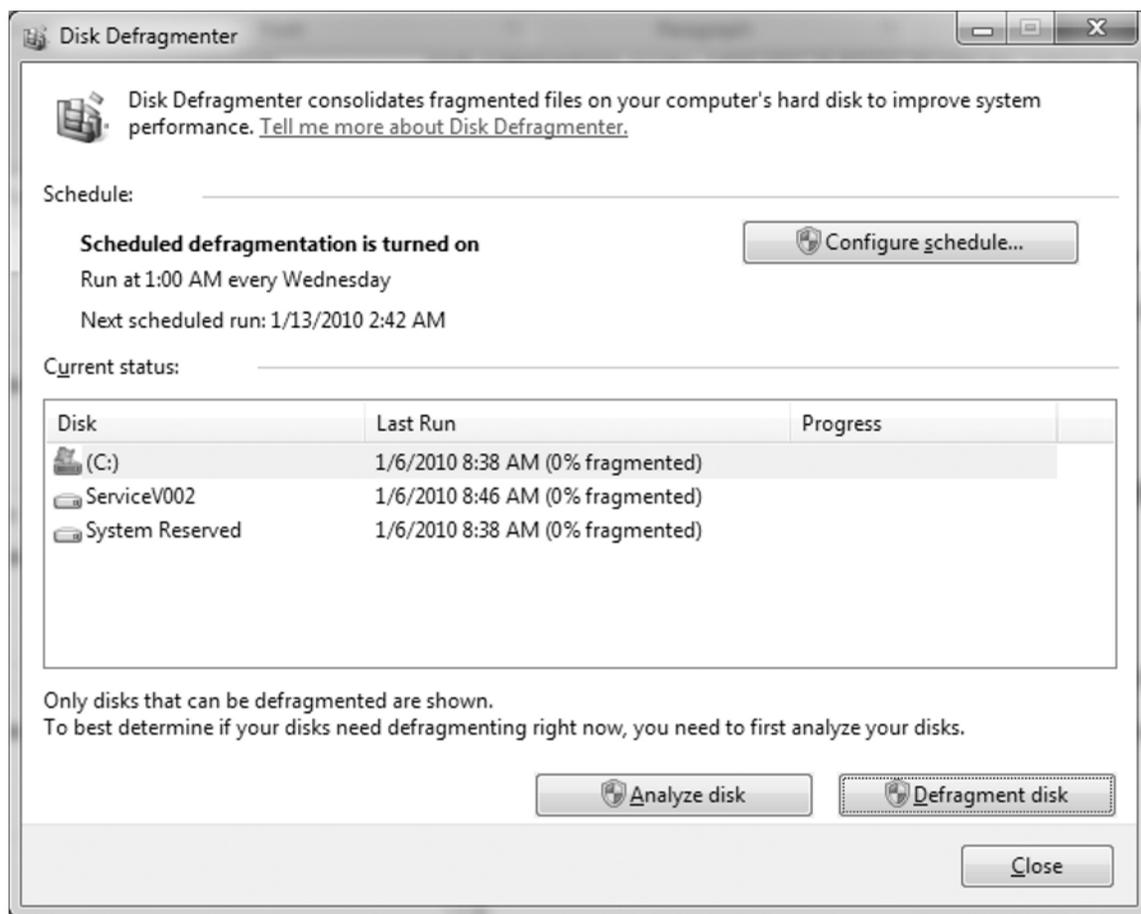
Disk fragmentation occurs when files or pieces of files get scattered throughout your disks. Not only do hard disks get fragmented, but removable storage can also become fragmented. This can cause poor disk performance and overall system degradation.

Windows 7 includes a disk defragmentation utility that can defrag your disks and restore system performance. The tool is called *Disk Defragmenter*. Disk Defragmenter can be accessed from **Start | All Programs | Accessories | System Tools**. Disk Defragmenter can also be accessed by right-clicking on a disk in Windows Explorer, selecting **Properties**, and then going to the **Tools** tab.

Disk Defragmenter, as seen in Figure 5.38, allows you to defragment your disks now, or schedule defragmentation for later, or schedule periodic defragmentation. Disk Defragmenter also includes an option for **Analyze Disk**. If you choose this option, Disk Defragmenter will determine if your system can benefit from running the defragmentation process. This is important because, sometimes, defragmentation can take a very long time to complete. If it's not going to benefit your system, there is no reason to run a defragmentation.

Symbolic Links

A *symbolic link* is a pointer that redirects to another location. When a symbolic link is accessed, a user or system is automatically sent to the file or folder referenced in the symbolic link. Symbolic links are generally done for ease of use or application compatibility.



■ FIGURE 5.38 Disk Defragmenter

Create Symbolic Links

The *mklink* command is used to create symbolic links in Windows 7. The syntax and usage of *mklink* is as follows:

MKLINK [[/D] | [/H] | [/J]] **Link Target**

/D – creates a directory symbolic link. Default is a file symbolic link.

/H – creates a hard link instead of a symbolic link

/J – creates a *Directory Junction*

Link – specifies the new symbolic link name

Target – specifies the path (relative or absolute) that the new link refers to

Create Relative or Absolute Symbolic Links

Symbolic links can be either absolute or relative. Absolute links specify the entire path in the link. Relative links only contain the latter portion of

the link. With relative links, the beginning portion of the link is based on the location of the link.

Relative links generally begin with one of the following or use one of the following formats:

- **Dots** – Either (.) or (..). For example, \test.txt or ..\test.txt
- **Root relative** – For example, \test.txt
- **Current directory relative** – For example, c:\test.txt
- **Just the file name** – For example, test.txt

Use Hard Links

A *hard link* is a link between two files on a hard disk. When you click a hard link to a file, the operating system and applications will behave as though you are accessing the file itself. Hard links can be used to link files on the same volume only.

Windows ReadyBoost

Windows ReadyBoost can be used to speed up the performance of your Windows 7 system. When your system runs out of RAM, it begins using the hard disk to store files it needs to use. This disk access can impact the performance of your system. To help with this, Microsoft developed ReadyBoost. ReadyBoost allows Windows 7 to use a flash drive instead of the hard disk for this storage. This flash drive access can be much faster than hard disk access.

To enable ReadyBoost, do the following:

1. In Windows Explorer, right-click the drive representing the flash drive and select **Properties**.
2. Go to the **ReadyBoost** tab.
3. Select **Use this device**.
4. Specify how much of the drive you want to set aside for ReadyBoost.
5. Click **OK**.

WARNING

Windows ReadyBoost requires at least 235 MB of free space on the flash drive. Without it, you will not be able to configure ReadyBoost on the drive. It is recommended, however, that you set aside at least 1 GB of space for ReadyBoost usage.

Disk Quotas

Disk quotas allow you to specify a limit to the amount of disk space a user can use. This is very useful if you have limited disk space available for use. You can control how much disk space is used by everyone, and ensure that you have enough space left over for the system to use for things like application installation, system file storage, and paging.

Configure Disk Quotas

You can configure Disk Quotas on the various disk volumes within your system. You can actually have two volumes on the same disk with different quotas.

To enable Disk Quotas, do the following:

1. In the **Disk Management** MMC snap-in or Windows Explorer, right-click the volume you want to enable quotas for and select **Properties**.
2. Go to the **Quota** tab. (Note: If you are using Windows Explorer, you will also have to click **Show Quota Settings**.)
3. Check the box for **Enable quota management**.

Once you have enabled quota management, there are several possible configuration options:

- **Deny disk space to users exceeding quota limit** – If you select this option, once a user exceeds their quota, they will no longer be able to write to the disk. This will help prevent users from going over their quota. But, it can cause applications not to perform properly.
- **Limit disk space to** – By default, disk space is not limited. You can specify the limit for the amount of disk space the user can use.
- **Set warning level to** – Once you set a disk space limitation, you can then set a warning level. The option allows you to specify at what level of disk usage the user will begin receiving disk-space warnings.
- **Log event when a user exceeds their quota limit** – This option specifies whether an event will be logged to the system log when the user exceeds his or her amount of allocated disk space.
- **Log event when a user exceeds their warning level** – This option specifies whether an event will be logged to the system log when a user exceeds the amount of disk space usage designated at the warning level.
- **Quota Entries** – This option allows you to specify quota options for different users and groups.

■ SUMMARY

Windows 7 includes a variety of local management tools. There is Control Panel, the MMC, the Computer Management Console, the Local Group Policy Editor, and the Windows Registry. Each of these management tools provides a different function. They all come together to provide a total management solution for your Windows 7 system.