

Managing and Troubleshooting Desktop Storage

Terms you'll need to understand:

- ✓ Basic versus Dynamic disks
- ✓ Partitions, volumes, and logical drives
- ✓ Simple, spanned, and striped volumes
- ✓ The **diskpart.exe** utility
- ✓ NT File System (NTFS) volumes
- ✓ The **convert.exe** utility
- ✓ Troubleshooting disk drives
- ✓ Troubleshooting removable storage
- ✓ Disk defragmentation

Techniques you'll need to master:

- ✓ Using the Disk Management console
- ✓ Monitoring and troubleshooting disks using the Performance console
- ✓ Using the Disk Defragmenter and Disk Cleanup Wizard
- ✓ Selecting a file system for Windows XP Professional
- ✓ Using **convert.exe** to convert a File Allocation Table (FAT) volume to NTFS
- ✓ Using **diskpart.exe** to manage disk drives and volumes from the command line
- ✓ Creating simple, spanned, and striped volumes
- ✓ Converting from Basic to Dynamic disks and back again
- ✓ Troubleshooting disk drives, CD-ROM, and Universal Serial Bus (USB)–based storage.

For a desktop support technician, the number of distress calls from wayward users who have lost their files can be daunting. However, the storage options supported in Windows XP combine a lot of the old and a bit of the new in terms of things Windows XP can do.

Disk storage is more than about finding lost files. In this chapter, we cover how to support and troubleshoot hard disks and explore available options under Windows XP for creating partitions, formatting drive volumes, and managing disk administration.

Disk Storage Administration

If you are familiar with managing and troubleshooting hard disks and volumes under Windows 2000, you'll be comfortable working with disk-storage administration in Windows XP. For desktop support technicians who are familiar with Windows NT 4, Windows XP Professional introduces some new concepts, such as *Basic* and *Dynamic disk storage*.

Basic Disks

A Windows XP Basic disk, similar to the disk configuration under earlier versions of Windows, is a physical disk with primary and extended partitions. As long as you use the FAT file system, Windows XP Professional and Home editions, Windows 2000, Windows NT, Windows 9x, and MS-DOS operating systems all can access Basic disks.

On a Basic disk, you can create up to three primary partitions and one extended partition, four primary partitions, or one extended partition with logical drives.

Windows XP supports FAT primary partitions up to 4GB in size. Windows 9x/Me and MS-DOS support only 2GB primary partitions.

If you discover you've created a partition that's too small, you cannot *extend* it using the Disk Management Microsoft Management Console. However, if you use the `DiskPart.exe` command-line utility shown in Figure 3.1, you can extend a Basic disk partition to contiguous unallocated space. The partition must use the NTFS format and cannot be the system or boot partition.

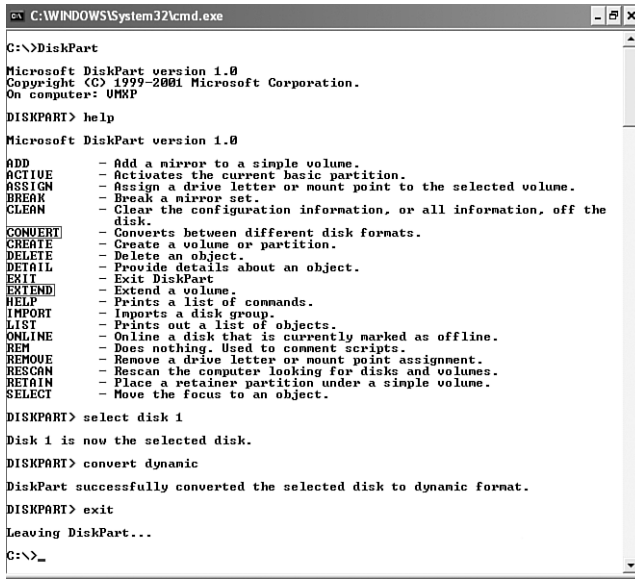

Figure 3.1 The DiskPart utility, which enables you to extend partitions and convert Basic disks to Dynamic disks.

Basic disks store their configuration information in the master boot record (MBR), which is stored on the first sector of the hard drive. The configuration information consists of the disk's partition information.

Basic disks support spanned volumes (volume sets), striped volumes (stripe sets), mirrored volumes (mirror sets), and Redundant Array of Independent Disks (RAID) Level 5 volumes (stripe sets with parity) that were created (and named) under Windows NT 4.

Mirrored and RAID-5 volumes are fault-tolerant volumes designed to withstand single disk failures. They are only available under the Windows 2000 Server or Windows Server 2003 family of server operating systems. Windows XP does not support these types of volumes on either Basic or Dynamic disks.

Dynamic Disks

A Windows XP Dynamic disk is a physical disk that does not use conventional *partitions* or *logical* drives. A Dynamic disk is a single partition that can be divided into separate *volumes*. You can even resize a volume "on the fly" (without a reboot).

Dynamic disks are combined into collective "disk groups," which helps to organize them. All Dynamic disks in a computer are members of the same disk group. Each disk in a disk group stores replicas of the group's configuration data in a region known as the Logical Disk Manager (LDM) metadata partition.

This configuration data is stored in a 1MB region at the end of each Dynamic disk and is the reason you must have at least 1MB of empty disk space for the LDM to convert a disk from Basic to Dynamic.

Dynamic disks can contain an unlimited number of volumes; you are not restricted to four volumes per disk, as you are with Basic disks, and those volumes can be extended if they are formatted with NTFS. To convert a volume from FAT to NTFS, use the `convert.exe` *`volume`*`: /FS:NTFS` command, where *`volume`* is the logical letter of the drive.

Locally, regardless of the type of file system, only computers running Windows XP Professional, Windows 2000, or Windows Server 2003 recognize Dynamic disks. Windows XP Home Edition does not offer Dynamic disks. Dynamic disks are not supported on portable computers.

Managing Basic and Dynamic Disks

Basic and Dynamic disks are Windows XP's way of managing hard disk configuration. If you're migrating to Windows XP from Windows NT 4, the Dynamic disk concept might seem unfamiliar in the beginning, but once you understand the differences, working with Dynamic disks is not complicated. You can format partitions with FAT16, FAT32, or NTFS on a Basic or a Dynamic disk. FAT and NTFS are discussed later in this chapter.

From the Disk Management console, you can only format a dynamic volume as NTFS. You must use Windows XP Explorer to format a dynamic volume as FAT or FAT32. Table 3.1 compares the terms used with Basic and Dynamic disks.

Table 3.1 A Cross-Reference of Terms Used with Basic and Dynamic Disks

Basic Disks	Dynamic Disks
Active partition	Active volume
Extended partition	Volume and unallocated space
Logical drive	Simple volume
Mirror set	Mirrored volume (server only)
Primary partition	Simple volume
Stripe set	Striped volume

Table 3.1 Continued

Basic Disks	Dynamic Disks
Stripe set with parity	RAID-5 volume (server only)
System and boot partitions	System and boot volumes
Volume set	Spanned volumes

You can convert a Basic disk to a Dynamic disk using the DiskPart command-line utility mentioned earlier or the Disk Management MMC shown in Figure 3.2.

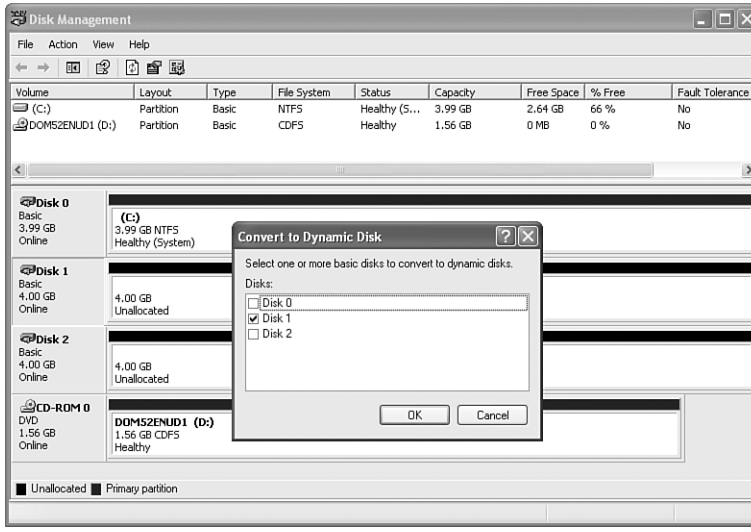

Figure 3.2 Converting a Basic disk to a Dynamic disk.

If you are upgrading from Windows 98 or Windows Me to Windows XP Professional, do not make changes to your disk configuration, such as converting to Dynamic disks and volumes, if you ever want to uninstall XP and revert back to the previous operating system.

Dynamic disks have some additional limitations. You can install Windows XP on a dynamic volume that you converted from a Basic disk, but you can't extend either the system or the boot partition. Additionally, any disk troubleshooting tools you've used might not be able to read the dynamic Disk Management database!

Dynamic disks are only supported on desktop or server systems that use Small Computer System Interface (SCSI), Fibre Channel, Serial Storage Architecture (SSA), Integrated Drive Electronics (IDE), Enhanced IDE

(EIDE), Ultra Direct Memory Access (DMA), or Advanced Technology Attachment (ATA) interfaces.

Dynamic disks are not supported on portable computers, removable disks (such as Jaz or Zip drives), and disks connected via USB or FireWire (IEEE 1394) interfaces. If you need to configure an IEEE 1394 disk drive to dynamic, see Knowledge Base Article 299598. They are also not supported on Windows XP Home Edition.

They are also not supported on hard drives with a sector size larger than 512 bytes. Cluster disks—groups of several disks that serve to function as a single disk—are not supported either.

Converting Basic Disks to Dynamic Disks

When you perform a new installation of Windows XP Professional or when you perform an upgrade installation from Windows 98, Windows Me, or Windows NT Workstation 4.0, the computer system defaults to Basic disk storage.

If you upgrade from Windows 2000 Professional (or if you import a "foreign disk" from Windows 2000 Server or a later version), you can configure one or more of the disk drives as Dynamic. You can use Windows XP's Disk Management console (an MMC snap-in), shown in Figure 3.2, to convert a Basic disk to a Dynamic disk. To access Disk Management, click Start, All Programs, Administrator Tools, Computer Management. Or simply right-click the My Computer icon from the Start menu and click Manage. You'll find Disk Management by expanding the Disk Management category.

You must be a member of the local Administrators group to make any changes to the computer's disk management configuration. Before you upgrade disks, close any programs that are running on those disks.

As mentioned earlier, for the conversion to succeed, any disks to be converted must contain at least 1MB of unallocated space. Disk Management automatically reserves this space when creating partitions or volumes on a disk, but disks with partitions or volumes created by other operating systems might not have this space available. (This space can exist even if it is not visible in Disk Management.)

Windows XP requires this minimal amount of disk space to store an LDM database, which is maintained by the operating system that created it.



Because the LDM is maintained by Windows XP Professional, you cannot multiboot Windows XP Professional with any other operating system if you have only one disk.

To convert a Basic disk to a Dynamic disk using the Disk Management console, perform the following steps:

1. Open the Disk Management tool.
2. Right-click the Basic disk you want to change to a Dynamic disk and then click Convert to Dynamic Disk.

Because the conversion from Basic to Dynamic is per physical disk, all volumes on a physical disk must be either Basic or Dynamic. When converting from a Basic to a Dynamic disk, you do not need to restart your computer unless you are converting the system or boot partitions or if the partition contained the page file.

To change or convert a Basic disk to a Dynamic disk from the Windows XP command line, perform these steps:

1. Open a command prompt window, type **`diskpart`**, and press Enter.
2. Type **`commands`** or **`help`** to view a list of available commands.
3. Type **`select disk 0`** to select the first hard disk (`select disk 1` to select the second hard disk, and so on) and press Enter.
4. Type **`convert dynamic`** and press Enter.
5. Type **`exit`** to quit the `diskpart.exe` tool and then restart the computer to have the new configuration take effect (see Figure 3.1).

You can use the DiskPart utility to create mount points for hard drives through empty folders on NTFS drives. In other words, rather than define a volume with a drive letter, you can link it back to an empty folder on an NTFS formatted drive.

You also can use DiskPart to import foreign disks into computers running XP. This technique is explained in the section "Moving Disks to a Different Computer."

In addition to using `diskpart.exe`, you can manage FAT, FAT32, and NTFS file systems with the `fsutil.exe` command-line utility.

`Fsutil.exe` manages disk quotas, reparses (mount) points, and performs several other advanced disk-related tasks. Type **`fsutil`** at a command prompt to view a list of supported commands (see Figure 3.3).

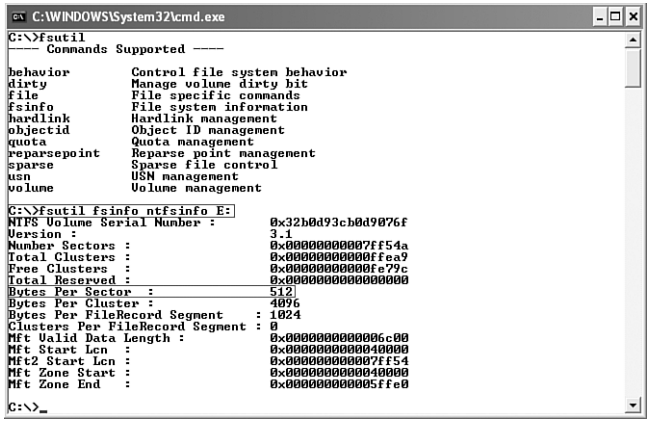

Figure 3.3 The Windows XP **fsutil.exe** command provides file system information, including sector size.

When you convert a Basic disk to a Dynamic disk, any existing partitions on the Basic disk become simple volumes on the Dynamic disk. Any existing striped volumes or spanned volumes become dynamic striped volumes or dynamic spanned volumes.

Reverting Dynamic Disks to Basic Disks

To revert from a Dynamic disk back to a Basic disk, you must remove all volumes from the Dynamic disk first. After you change a Dynamic disk back to a Basic disk, you can create only partitions and logical drives on that disk.



Converting to a Dynamic disk is effectively a one-way trip. To convert from a Dynamic disk back to a Basic disk, you must delete all dynamic volumes. This is a considerable downside! If you find yourself needing to do it, however, first back up your data, convert the disk to Basic, and then restore your data.

To convert a Dynamic disk to a Basic disk, perform the following steps:

1. Open Disk Management.
2. Right-click the Dynamic disk you want to change back to a Basic disk and then click Convert to Basic Disk.

Moving Disks to a Different Computer

When you relocate a Dynamic disk from one computer to another, you are moving the disk from one disk group to another. Initially, the disk is perceived as "foreign" when it is connected.

When you connect a foreign Dynamic disk, you need to rescan all drives and then *import* the *foreign* disk. This procedure updates the disk's metadatabase. Importing a disk merges the disk's information with the LDM database on the host computer.

Along with disk configuration information, the LDM database stores drive letter assignments. Imported drives keep their original drive letters unless the letters are used by the new host system. If a driver letter is already in use, the system assigns the next available drive letter. To eliminate conflicts, you can remove the drive letters from the volumes before moving the disk.

Because volumes can span multiple disks, when you move multidisk volumes, always move all the disks that compose the volume.

Don't move a disk that contains system or boot volumes to another computer unless you need to recover data. You might also encounter problems if you attempt to move the Dynamic disk back to its original computer. However, you can successfully move Basic disks that have system or boot volumes in this manner because they don't contain a dynamic LDM database.

You can use the `diskpart.exe` command-line tool or Disk Management to import disks.

To relocate disks to another computer, perform the following steps:

1. First, before you disconnect the disks, look in Disk Management and make sure the status of the volumes on the disks is "healthy." If the status is not healthy, repair the volumes before you move the disks.
2. Turn the source computer off, remove the physical disks, and then install the physical disks on the target computer. Restart the target computer.
3. Open Disk Management.
4. Click Action and then click Rescan Disks.
5. The disk that you move is designated Dynamic/Foreign instead of Dynamic. Right-click the disk and click Import Foreign Disks.
6. The Foreign Disk Volumes dialog box appears, indicating the size, condition, and type of the volume on the imported drive.
7. Click OK to add the disks.



Be sure to move all disks that are part of a volume set or a stripe set. If you move only some of the disks that are members of a volume set or stripe set, you render the set unusable. You might even damage the set and lose the data stored on the set if you do not move all the set's disks.

Reactivating Missing or Offline Disks

With LDM, every disk knows about every other disk in your system. When a disk can't be located, it does not disappear from Disk Management. It is simply designated "missing," as shown in Figure 3.4.

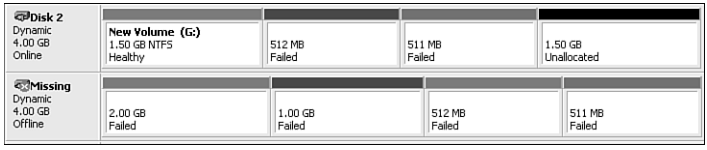

Figure 3.4 A drive designated as missing.

A Dynamic disk might be labeled missing when it is corrupted, powered down, or disconnected. Only Dynamic disks can be reactivated—not Basic disks.

Disks are labeled missing because other disks in the disk group share LDM information that *expects* the disk to be connected and functioning.

To reactivate a missing or offline disk, perform the following steps:

1. Open Disk Management.
2. Right-click the Offline disk whose status is missing and then click Reactivate Disk.
3. The disk should be titled Online after the disk is reactivated.

Working with Basic Partitions

Windows XP Basic disks support partitions and logical drives and recognize volumes created using Windows NT 4 or earlier operating systems.

Before Windows 2000, Basic disks supported all volume types: basic volumes, volume sets, stripe sets, mirror sets, and stripe sets with parity (also known as RAID-5 sets).

Under Windows XP, you can create Basic partitions only on Basic disks. Because Windows XP Professional is considered a desktop (client-side) network operating system, it does not support any type of fault-tolerant volumes—even on Dynamic disks. Only Microsoft server operating systems support fault-tolerant features such as mirrored volumes and RAID-5 volumes (stripe sets with parity), and those configurations can only reside on Dynamic disks.

Keep in mind that these Windows fault-tolerant configurations are operating system features. Independent, non-OS RAID arrays, such as Serial ATA RAID host adapters, provide similar benefits with much less system overhead.

Using Partitions and Logical Drives on Basic Disks

To *extend* a Basic partition, the partition must be formatted as NTFS, it must be adjacent to contiguous unallocated space on the same physical disk, and it can be extended only onto unallocated space that resides on the *same physical disk*. You can only extend a Basic partition with the `diskpart.exe` utility, as shown in Figure 3.5, and not through the Management Console.

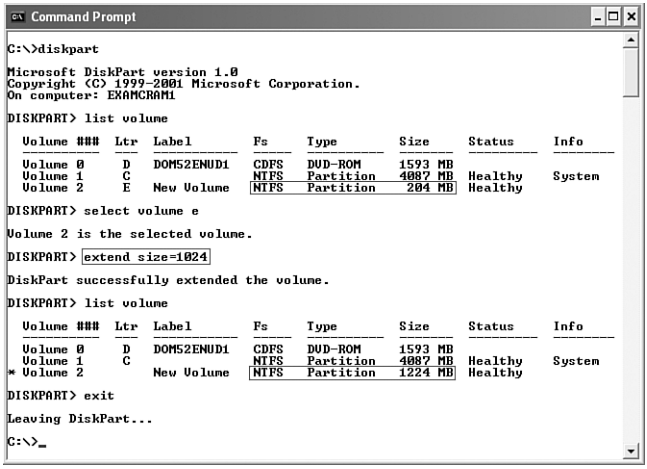

Figure 3.5 Using the **diskpart.exe** utility to extend partition E.

Creating or Deleting a Partition or Logical Drive

To create or delete a partition or logical drive, you can use the `diskpart.exe` command-line tool, shown in Figure 3.1, or use the Disk Management console, shown in Figure 3.6.

To create or delete a partition of logical drive, follow these steps:

1. Open the Disk Management console.
2. To create a new partition, right-click an unallocated region of a Basic disk and then click New Partition.

To create a new logical drive, right-click an area of free space in an extended partition and then click New Logical Drive to start the Create Partition Wizard.

3. Select Primary Partition, Extended Partition, or Logical Drive as appropriate and follow the instructions presented by the wizard to define the size and format of the new storage space.

4. To remove a partition, select Delete Partition from the partition's context menu.

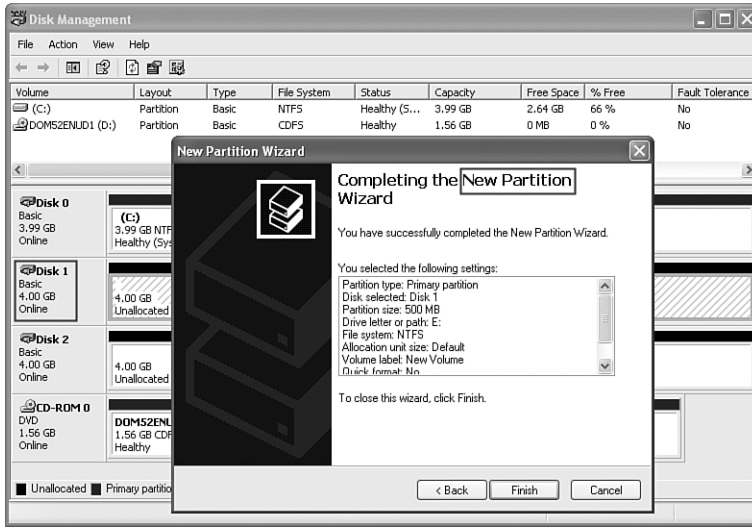

Figure 3.6 Dividing Basic disks into partitions using the New Partition Wizard.

In Windows XP, you must delete all logical drives or other volumes in an extended partition before you can delete the extended partition.

Be careful. If you choose to delete a partition or logical drive, all the data on the deleted partition or logical drive is lost. You cannot recover data stored on deleted partitions or logical drives. You cannot delete the system partition, boot partition, or any partition that contains an active paging file.

Dynamic Volumes

What were once called *sets* (such as mirror sets and stripe sets) under earlier operating systems are called *volumes* (such as mirrored volumes and striped volumes) in Windows XP.

Dynamic volumes are the only type of volume you can create on Dynamic disks.

Dynamic disks eliminate the four partitions per disk limitation of Basic disks. You can install Windows XP Professional onto a dynamic volume; however, the volume must already contain a partition table. (It must have been converted from Basic to Dynamic under Windows XP or Windows 2000.)



You cannot install Windows XP onto *dynamic volumes* that were created under Windows 2000, Windows XP, or Windows Server 2003 *from unallocated space*.

Only computers running Windows XP Professional, Windows 2000, or Windows Server 2003 can access dynamic volumes. The five types of dynamic volumes are simple, spanned, mirrored, striped, and RAID-5. Windows XP Professional supports only simple, spanned, and striped dynamic volumes, shown in Figure 3.7.

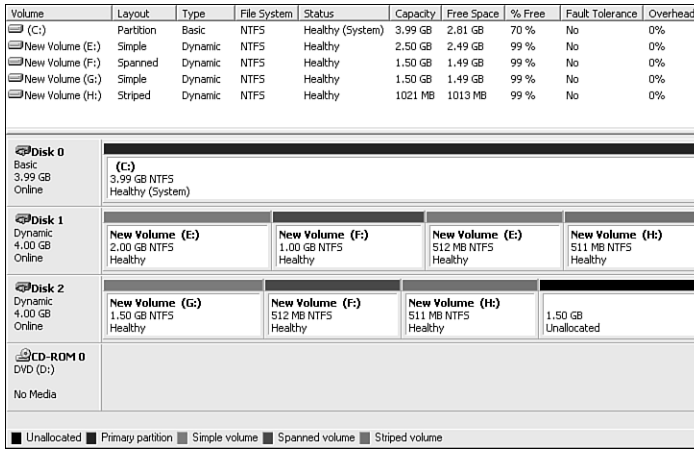

Figure 3.7 Simple (E, G); spanned (F); and striped (H) dynamic volumes displayed in Disk Management.

By default, Disk Management uses solid colors to represent the five different types of dynamic volumes. Table 3.2 lists the colors Disk Management uses by default.

Table 3.2 Colors Used by Disk Management to Represent Drives	
Object	**Color**
Unallocated	Black
Extended partition	Green
Logical drive	Blue
Mirrored volume	Brick (server only)
Primary partition	Dark blue
Striped volume	Cadet blue
RAID-5 volume	Cyan (server only)
Free space	Light green
Simple volume	Olive
Spanned volume	Purple

You must be an administrator or a member of the Administrators group to create, modify, or delete dynamic volumes.

Simple Volumes

A *simple volume* consists of disk space on a single physical disk. It can consist of a single area on a disk or multiple areas on the same disk that are linked together.

To create a simple volume, perform the following steps:

1. Open Disk Management.
2. Right-click the unallocated space on the Dynamic disk where you want to create the simple volume and then click New Volume.
3. Using the New Volume Wizard, shown in Figure 3.8, click Next, click Simple, and then provide the volume's size and formatting details.

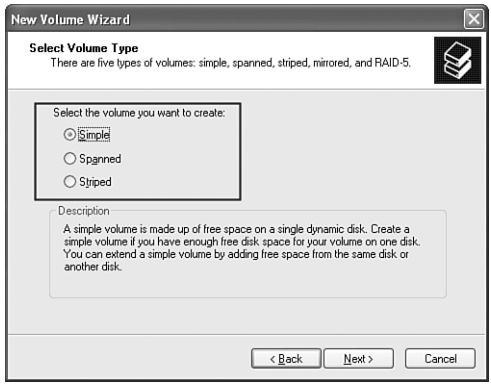

Figure 3.8 Using the New Volume Wizard for Dynamic disks to create different types of dynamic volumes.

Spanned Volumes

A spanned volume consists of disk space from more than one physical disk. You can add more space to a spanned volume by extending it at any time.

To create a spanned volume, perform the following steps:

1. Open Disk Management.
2. Right-click the unallocated space on one of the Dynamic disks where you want to create the spanned volume and then click New Volume.
3. Using the New Volume Wizard, click Next, click Spanned, and then follow the instructions on your screen.

Here are guidelines for spanned volumes:

- ➤ You can create spanned volumes on Dynamic disks only.
- ➤ You need at least two Dynamic disks to create a spanned volume.
- ➤ You can extend a spanned volume onto a maximum of 32 Dynamic disks.
- ➤ Spanned volumes cannot be striped.
- ➤ Spanned volumes are not fault-tolerant.

Extending Simple or Spanned Volumes

To extend a simple or spanned volume, perform the following steps:

1. Open Disk Management.
2. Right-click the simple or spanned volume you want to extend, click Extend Volume, and then follow the instructions on your screen.

In general, you cannot extend a volume that maintains its entries in the partition table. This includes the system and boot volumes of the operating system used to convert the disk from Basic to Dynamic.

Here are guidelines for extending a simple or a spanned volume:

- You cannot extend *volumes* formatted using FAT or FAT32. You can extend a volume if it is formatted using NTFS or contains no file system.
- You cannot extend a volume that was converted from Basic to Dynamic by the Windows 2000 Disk Management tool.
- If you extend a simple volume across multiple disks, it becomes a spanned volume.
- After you extend a Windows XP dynamic volume onto multiple disks, you cannot stripe it.
- You cannot extend a system volume or boot volume.
- After a spanned volume is extended, deleting any portion of it deletes the entire spanned volume.
- You can extend both simple and spanned volumes onto a maximum of 32 Dynamic disks.
- Spanned volumes write data to subsequent disks as each disk volume fills up. Therefore, a spanned volume writes data to physical disk 0 until it fills up, then writes to physical disk 1 and so on. If a single disk in the spanned volume fails, only the data contained on that failed disk is lost.

Striped Volumes

Striped volumes store data in stripes across two or more physical disks. Data in a striped volume is allocated evenly and across (in stripes) the disks of the striped volume. Storing files in this manner increases the write/read speed to and from your disks.

To create a striped volume, perform the following steps:

1. Open Disk Management.
2. Right-click unallocated space on one of the Dynamic disks where you want to create the striped volume and then click New Volume.
3. Using the New Volume Wizard, click Next, click Striped, and then follow the instructions on your screen.

Here are the guidelines for striped volumes:

- You need at least two physical, Dynamic disks to create a striped volume.
- You can create a striped volume onto a maximum of 32 disks.
- Striped volumes are not fault-tolerant and cannot be extended or mirrored.

Troubleshooting Issues on Basic and Dynamic Disks

As a desktop support technician, you configure Dynamic disks and dynamic volumes in specific circumstances; you need to be aware when each is appropriate and be prepared to recover data should the disks or volumes fail.

If you upgrade a computer running Windows 2000 Professional that has hard drives configured as volume sets or stripe sets, you must back up all the data stored on each volume set or stripe set first because Windows XP Professional does not support volume sets or stripe sets on a Basic disk.

- Under Windows 2000 Professional, volume sets and stripe sets are supported on Basic disks for backward compatibility to NT 4.0 workstations. However, you cannot create such sets on Basic disks in Windows 2000.
- Under Windows XP Professional, volume sets and stripe sets are strictly not supported during installations. Windows XP Professional Setup does not allow an installation to complete if stripe sets or volume sets are present on Basic disks.

To migrate data on volume sets or stripe sets stored on Basic disks from Windows 2000 Professional to Windows XP Professional, perform the following steps:

1. Under Windows 2000, back up the data.
2. Under Windows 2000, use the Disk Management console to convert the Basic disks to Dynamic disks.
3. Upgrade the operating system to Windows XP Professional.

Installing Windows XP on a Dynamic Disk

If you create a dynamic volume from unallocated space on a Dynamic disk, you cannot install Windows XP on that volume because Windows XP Setup recognizes only dynamic volumes that are in the volume's partition table.

(Partition tables exist on basic volumes and in dynamic volumes that are the result of an upgraded Basic disk. They do not appear on new dynamic volumes.)

Wait, there's more!

Let's say you are able to upgrade a basic volume to dynamic (by converting the Basic disk to a Dynamic disk). You can install Windows XP on that volume, but you cannot extend the volume because the volume information lives in the partition table.

You can install Windows XP onto a dynamic volume if

- The volume was upgraded from Basic to Dynamic by Windows 2000.
- The volume is one on which you've run `diskpart retain` to add an entry to the partition table.
- The volume is a simple volume that is the boot or system volume.

Extending a Volume on a Dynamic Disk

After you convert a Basic disk to Dynamic, you can extend dynamic volumes that you create. In fact, you can extend volumes and make changes to disk configuration in most cases without rebooting your computer.

If you want to take advantage of these features in Windows XP, you must change or upgrade a disk from Basic to Dynamic status, as covered earlier in this chapter.

Therefore, if you want to create more than four volumes per disk or want to extend, stripe, or span volumes onto one or more Dynamic disks, and your computer runs only Windows XP, use Dynamic disks.

Upgrading from Windows NT 4 with Basic Disks

Windows XP Professional does not support volume sets or stripe sets on a Basic disk.

If you need to upgrade a computer running Windows NT 4 that has hard drives already configured as volume sets or stripe sets, you must first back up all the data stored on each volume set or stripe set.

To migrate data on volume sets or stripe sets from Windows NT 4 to Windows XP Professional, perform the following steps:

1. Under Windows NT 4, back up the data.
2. Delete the volumes.
3. Upgrade the operating system to Windows XP Professional.
4. Convert the appropriate hard disks from Basic to Dynamic disks.
5. Create the appropriate volumes.
6. Restore the backed-up data.

Diagnosing Hard-Disk Problems

As a desktop support technician, when a disk or volume fails, you want to know how to detect the failure and how to recover the data quickly.

The Disk Management snap-in makes it easy to locate problems. In the Status column of the list view, you can view the status of a disk or volume. The status also appears in the graphical view of each disk or volume, as shown in Figure 3.9.

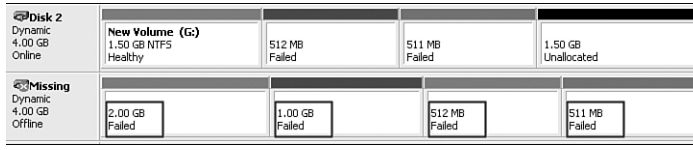

Figure 3.9 A failed drive affecting spanned and striped volumes but not a simple volume on a healthy drive. (Disk 3 is missing.)

To diagnose disk and/or volume problems, perform the following steps:

1. Open Add Hardware in the Control Panel. Click Next. Windows XP tries to detect new Plug and Play devices.

2. Click "Yes, I Have Already Connected the Hardware", and then click Next.
3. Choose the device you want to diagnose and fix, and then click Next.
4. The Add Hardware Wizard informs you of the device's current status. Click Finish to invoke the Hardware Troubleshooter as part of the Help and Support Center, or click Cancel to exit the Add Hardware Wizard.

You can also troubleshoot hardware problems using the Device Manager.

To access the Device Manager, right-click the My Computer icon from the Start menu and select Properties. Click the Hardware tab and then click the Device Manager button. Expand the hardware category that you need to troubleshoot and right-click the device that you want to inquire about.

Select Properties from the context menu to display the properties window for that device, as shown in Figure 3.10. All the pertinent information about the device is available from this window, including its device status as determined by the operating system.



Figure 3.10 The properties sheet for a hard disk that shows its device usage as "disabled" in Device Manager.

Deteriorating performance is sometimes a precusor to hardware failure. You can monitor disk performance with the Performance console.

The Windows XP performance-monitoring tool, shown in Figure 3.11, consists of two parts: *System Monitor* and *Performance Logs and Alerts*. The MMC snap-in is simply named Performance. With System Monitor, you can collect and view real-time data about disk performance and activity in graph, histogram, or report form. Performance Logs and Alerts enables you to configure logs to record performance data and to set system alerts to notify you when a specified counter's value is above or below a defined threshold.

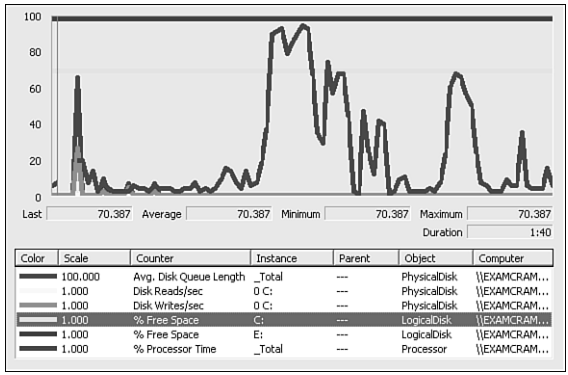

Figure 3.11 The Windows XP System Monitor.

To open Performance, perform the following steps:

1. Click Start, Control Panel.
2. In the Control Panel, double-click Administrative Tools, and then double-click Performance. You use System Monitor within Performance to monitor disk activity.

For measuring disk performance, Windows XP maps physical drives to logical drives by applying the same instance name. For example, if a computer contains a dynamic volume that consists of two physical hard disks, the logical drives might appear as `Disk 0 C:` and `Disk 1 C:`, which denotes that drive C spans physical disks 0 and 1.

For a PC that has three logical volumes on one physical disk, the instance appears as `0 C: D: E:`.

Detecting and Repairing Disk Errors

In the Windows 2000 operating systems, the ScanDisk utility detected and fixed disk errors. In Windows XP, desktop support technicians can use the Error-checking tool (`chkdsk.exe`) to check for file-system errors and bad sectors on your hard disk. To run the Error-checking tool, perform the following steps:

1. Open My Computer and right-click the local disk you want to check.
2. Select Properties.
3. Click the Tools tab.
4. Under Error-checking, click Check Now.
5. Under Check Disk Options, select Automatically Fix System Errors, Scan for and Attempt Recovery of Bad Sectors, and click Start.

If the volume to be checked has files that are currently in use, such as some of the operating system files, you are asked whether you want to reschedule the disk checking for the next time you restart your computer. If you say yes, when you restart your computer, Windows checks the disk, as shown in Figure 3.12.

If the volume being checked is NTFS, Windows XP automatically logs all file transactions, replaces bad clusters automatically, and stores copies of key information for all files on the NTFS volume.

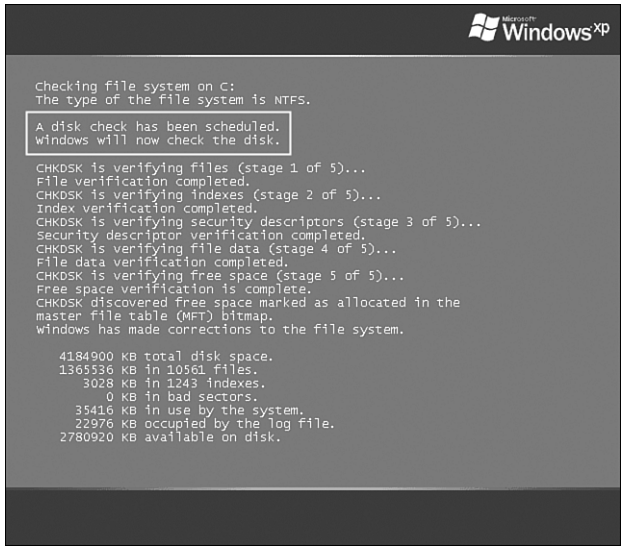

Figure 3.12 Error-checking process running on drive C: upon a system restart. (This is a composite screen shot.)

Supporting CD and DVD Playback and Recording Devices

With Windows XP Professional, users can save information such as photos and software to a compact disc (CD) without installing third-party software. Because CD-recordable (CD-R) and CD-rewritable (CD-RW) drives have become standard parts of the desktop architecture, desktop support technicians need to understand their capabilities and limitations.

Writing Files and Folders to CD-R and CD-RW Media

To copy files or folders to a CD, follow these steps:

Insert a blank, writable CD into the CD recorder. (You need a blank, writable CD and a CD drive [CD burner] that has the capability of writing CDs.)

Open My Computer and then select the files and folders you want to write to the CD.

In the My Computer task pane under File and Folder Tasks, click Copy This File, Copy This Folder, or Copy the Selected Items.

In the Copy Items dialog box, click the CD recording drive and then click Copy.

In My Computer, double-click the CD recording drive. Under CD Writing Tasks, click Write These Files to the CD.



Standard CDs hold 650MB of information. High-density CDs hold at least 700MB of information. You must have enough space on your hard drive to temporarily hold the files you want to copy to the CD or the operation will fail. The local hard drive serves as Windows XP's temporary staging area for data being written to recordable or rewritable CD media.

When you are writing files, to optimize your computer for optimal writing speed, Microsoft recommends that you redirect the temporary files created by the write process to another local drive or partition, as shown in Figure 3.13.

When the process of copying is complete, the last page of the CD Writing Wizard, shown in Figure 3.14, enables you to create another CD like the one you just created.

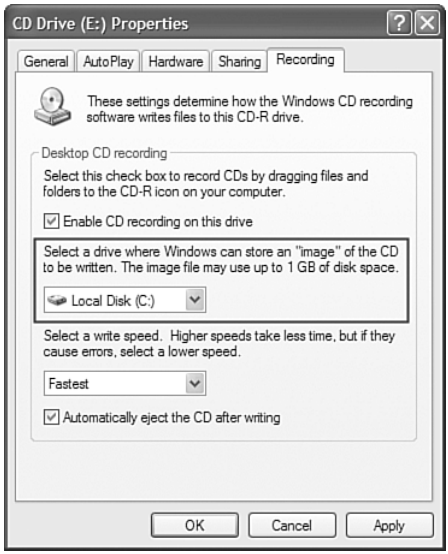

Figure 3.13 How to modify the location for temporary CD files.

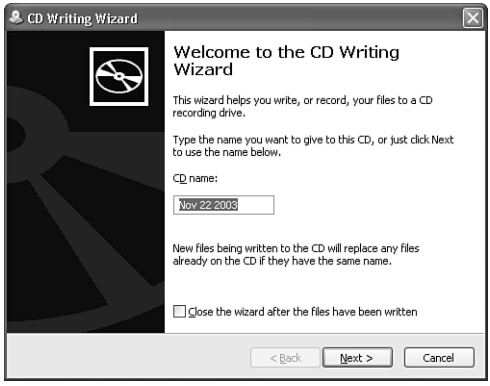

Figure 3.14 The CD Writing Wizard copying files to a CD.

To create multiple CDs with the same files, click Yes, Write These Files to Another CD, and insert another blank, writable CD into the CD recording drive.

To erase files from a CD, follow these steps:

1. Double-click the CD recording drive to display the content.
2. Under CD Writing Tasks, click Erase This CD-RW.
3. The CD Writing Wizard enables you to delete the content of the CD-RW.



Erasing a CD-RW deletes all the files on the CD. You cannot specify individual files. Not all CDs are erasable; a CD-R disc is not erasable.

Many software programs like Roxio's Direct CD and Copy-to-Disk use the Universal Disk Format (UDF), which is a standard published by the Optical Storage Technology Association (OSTA). Windows XP reads UDF versions up to 2.01 using the `udfs.sys` driver.

Windows XP writes data to CDs using the Joliet and International Organization for Standardization (ISO) 9660 CD File System (CDFS) formats. When Windows XP writes audio to CD, it uses the Red Book format. UDF is a successor to the ISO 9660 CDFS.

Therefore, if you are using a CD-RW disk, you can erase files and append files to a disk that already has files if the disk was originally formatted using Windows XP. However, to modify existing CD-RW disks formatted with UDFS, you need extra software.

Configuring CD-R/CD-RW Device Settings

You can limit a user's ability to burn CDs using Windows Explorer.

By configuring the group policy value `User Configuration /Administrative Templates/Windows Components/Windows Explorer/Remove CD Burning Features`, you can prevent users from using the Windows Explorer CD burning features.

This setting does not prevent third-party CD burners.

If you are trying to troubleshoot reading and writing problems, you can stop the drive from automatically ejecting the CD and you can change the speed with which data is written to the drive. Each of these are hardware properties, shown in Figure 3.13.

Following is a list of other troubleshooting solutions:

1. Don't interrupt the flow of data to the CD recorder.
2. When creating a CD, the CD recorder must receive a *constant* flow of data from the hard disk. If the flow of data is interrupted, the CD continues to spin but the writing laser does not have any information to copy onto the disc. When this happens, the writing process stops and users end up with a useless CD. To maintain a constant flow of data, heed these guidelines:

- ➤ Record at a lower write speed.
- ➤ Close any other programs that are running.
- ➤ Disable any screen savers that might begin suddenly during writing.

3. Don't run out of available disk space for the CD recording process:
   - ➤ When creating a CD, Windows uses available free space on the hard disk to store temporary files.
   - ➤ To free up disk space, run the Disk Defragmenter tool, run the Disk Cleanup Wizard, delete unneeded data files, and empty the Recycle Bin.
   - ➤ If you have more than one partition or disk drive, select one for the temporary file storage area that has sufficient disk space.
4. Ensure that the CD and the CD recorder are clean and dust free.
5. If the CDs from one manufacturer keep failing, try a different brand.

Configuring and Troubleshooting Removable Storage

Pen drives, thumbnail drives, flash drives, and memory cards are all data storage destinations.

Windows XP provides numerable drivers for such devices; however, because they are relatively new, they might come with interesting "challenges."

For example, you can extend the Disk Quotas feature of Windows XP to apply to removeable media using a group policy. This might frustrate users attempting to store files, such as MP3 files, on removable media. The value is stored in Group Policies under `Computer Policy/Administrative Templates/System/Disk Quotas/Apply Policy to Removable Media`. Use `gpedit.msc` to edit the local policy.

Saving files to removable media can create other challenges, as shown in Figure 3.15. For example, to avoid errors when writing to media, don't disconnect FAT16-formatted removable storage devices prematurely. If a user ejects a FAT16-formatted removable-storage device, problems could be caused by the 8-second write-flush delays—a delay originally created on those file systems for performance reasons.



FAT16 partitions range from 16MB to 2GB. This size was once common for hard disks and has become popular again as removable-storage sizes increase. (FAT12 volumes do not have this problem because they are primarily used for floppy disks and are not designed to use a write-behind delay.)



Figure 3.15 The CD Writing Wizard—unable to write to a disc.

If a removable-storage device is formatted with the FAT16 file system and users eject the device approximately 5–8 seconds after data was written to the device, they will have abandoned the write-flush delay on FAT16 file systems. This can lead to unexpected consequences:

- A user's storage device might remain in a "nonflushed" state.
- Users might lose data that is stored on their removable-storage device.
- Users might experience problems or receive error messages when they insert the removable-storage device into other host devices.

In short, don't eject removable media prematurely.

In addition, not everyone is permitted to format and eject removable media. The local policy `Computer Configuration/Windows Settings/Security Settings/Local Policies/Security Options/Devices:Allowed to Format and Eject Removable Objects` controls those privileges. By default, only administrators are allowed to format and eject removable objects.

When users work with disks, disk-reading problems can occur when they try to open a file, execute a program from disk, or switch disks while using programs that require multiple disks. They might receive error messages referring to problems reading the disk or copying specific files. Following are examples of Microsoft error messages:

- A device attached to the system is not functioning.
- Unable to read drive letter.
- A required file, `kernel32.dll`, was not found.
- Application name is not a valid WIN32 application.
- An error reading from file [Installer Error 1305].
- Insufficient memory.

Other problems users might experience include the following:

- When they insert the disc in the drive or read a disc, the computer freezes or hangs (see "dies").
- The disc does not eject from the drive.
- Reading from the disc takes an *unbelievably* long time.

As a desktop support technician, what can you do? The following troubleshooting guidelines might provide some ideas:

- Don't forget the obvious. If you experience problems with a DVD disc, make sure that you insert the DVD into a DVD drive, not a CD-ROM drive.
- Examine the disc for obvious physical damage such as warping or large scratches. If the disc is damaged, contact the manufacturer for a replacement CD.
- Clean the CD-ROM or DVD-ROM disc using a disc cleaning kit or gently wipe the silver side of the disc with a soft, lint-free cotton cloth. Do not use paper cloth because it can scratch the disc. Resist the temptation to use a circular motion because it also can scratch the disc. Wipe the disc from the center outward.
- Clean the disc by using a water-dampened cloth or a commercial CD cleaning solution or DVD cleaning solution. Dry the disc thoroughly before you put it into the drive.
- If your computer has multiple CD-ROM drives, CD-R drives, CD/RW drives, or DVD drives, test the disc in another drive. For DVDs, make sure that the drive has a DVD logo. If the disc works in another drive, the original drive might be faulty.
- If the disc appears clean yet does not work in another drive, it is probably damaged and must be replaced.

- You can clean the disc drive by using a CD-ROM drive cleaning disc or DVD drive cleaning disc.

If users are experiencing problems with a CD-ROM drive in Windows XP, you can also consider the following actions:

Verify that the hardware is compatible with Windows XP by making sure that the CD-ROM drive is listed on the Windows hardware compatibility list (HCL).

- For a SCSI CD-ROM drive, make sure that the SCSI controller is listed on the Windows HCL.
- If the CD-ROM drive or SCSI controller is not listed on the Windows HCL, contact the device manufacturer, obtain a Windows-compatible device driver, or consider replacing the device.

You should also verify that the CD-ROM drive is installed according to the manufacturer's specifications. Don't forget to open the case and check master/slave/cable-select jumpering on the drive and for the proper cabling.

If it is a SCSI CD-ROM drive, check the following:

- Is the SCSI bus is terminated correctly? On a SCSI bus, the last SCSI device needs a special terminator.
- Verify the CD-ROM SCSI ID. The SCSI ID of the CD-ROM drive is normally set to SCSI ID 2 or higher. Ensure that the CD-ROM drive is not configured to use a SCSI ID already assigned to another device.
- Verify that the SCSI ID of the SCSI controller is set to SCSI ID 7.
- Verify that no other adapters are configured with settings that conflict with the SCSI controller's settings.
- Search the Windows XP Event Viewer for error messages related to the CD-ROM drive or SCSI controller.
- Open Device Manager to see whether it detects the SCSI controller and the CD-ROM drive. Does Device Manager indicate that the devices are working properly?

If users have installed an IDE CD-ROM drive, make sure they are using a device driver that is designed for the IDE controller to which the CD-ROM drive is attached.

If the manufacturer does not provide a specific driver for the IDE controller, install the IDE controller driver that comes with Windows XP. This driver

is compatible only with IDE CD-ROM drives that are Advanced Technology Atachment Packet Interface (ATAPI) 1.2–compliant. By contacting the CD-ROM's manufacturer, you should be able to verify the ATAPI compliance level of the CD-ROM drive.

If you are trying to install a CD-ROM drive that uses a proprietary, non-SCSI interface, check the following:

- Make sure that the correct device driver is installed by running Windows XP Setup and selecting Add/Remove SCSI Adapters on the Options menu.
- Review the Windows XP "read me" file (`readme.wri`) and the Windows XP catalog, available online at `http://www.microsoft.com/windows/catalog/`.

Users might report that Windows does not recognize their CD-ROM drives. Start Windows Explorer and look for a drive letter assigned to the CD-ROM drive.

If the CD-ROM drive does have a drive letter, try to view a folder by using the CD-ROM drive. Make sure that you insert a data CD into the CD-ROM drive.

If AutoPlay is enabled on a drive, there might a short delay of up to 10 seconds before the CD or DVD is recognized and displayed in My Computer. Try disabling AutoPlay on the drive.

If you can read a data CD but cannot play a music CD, use one of the following strategies:

- In Control Panel, start Sounds and Audio Devices, click the Hardware tab, and then make sure that the CD/DVD drive is listed along with Audio Codecs.
- If these items are not listed, use the Add/Remove Hardware program in Control Panel to reinstall necessary drivers.
- If the system is configured to dual-boot to another operating system, check whether the CD-ROM drive functions in the other operating system. If the CD-ROM drive does not function properly in MS-DOS or in another operating system, contact the drive manufacturer.

The desktop support technician needs a few tricks up his or her sleeve to test the CD further. Here are a few sleights of hand:

- Turn off all other programs. Software might be interfering with reading the disc. This problem can occur with anticrash software, antivirus

software, or firewall software running in the background. Starting the computer without unnecessary software might enable you to read from the disk.

To eliminate interfering programs, do a clean boot of XP and quit any remaining programs:

1. Close all programs that are running.
2. Press Ctrl+Alt+Del. In the Windows Security dialog box, click Task Manager.
3. In Windows Task Manager, click Applications.
4. No programs should appear under the Task list. If any programs appear, click the program name, and then click End Task.

Again, attempt to read from or write to the media.

If a user installed the Windows XP upgrade over Windows 95, 98, or Me, and the DVD-ROM stopped working after the upgrade, it might be that the drive is being treated as DMA (direct memory access). Switch the CD-ROM drive or DVD drive to DMA mode from Programmed Input/Output (PIO), as shown in Figure 3.16.

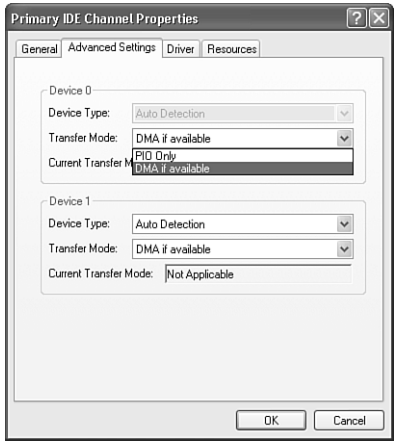

Figure 3.16 Drive configuration changes, mode options: DMA and PIO.

PIO is a method of moving data between devices that sends data through the processor. DMA is a newer alternative to PIO in which data from an attached device goes directly to memory, bypassing the processor. To switch between PIO to DMA mode, follow these steps:

1. In Control Panel, double-click Administrative Tools, and then click Computer Management.
2. Click System Tools, and then click Device Manager.
3. Click to expand IDE ATA/ATAPI controllers.
4. Click the specific controller for which you want to configure DMA/PIO settings.
5. Click the Advanced Settings tab.
6. In the Transfer Mode box, click either PIO Only or DMA if available.

The Disk Defragmenter Tool

Disk Defragmenter rearranges files, programs, and unused space on your computer's hard disks, allowing programs to run faster and files to open more quickly. Putting the pieces of files and programs in a more contiguous arrangement on disk reduces the time the operating system needs to access them.

To run Disk Defragmenter, perform the following steps:

1. Click Start, (All) Programs, Accessories, System Tools, and then click Disk Defragmenter. Alternatively, you can right-click a drive letter in My Computer, select Properties, click the Tools tab, and click Defragment Now.
2. Select which disks you want to defragment and any additional options you want to set.
3. Click the Defragment button to start the defragmentation process.



Windows XP Professional ships with a command-line version of the disk defragmenter—**defrag.exe**. You can run this program within a batch file or inside of a Windows script, which in turn can be scheduled to run automatically using the Scheduled Tasks folder.

On NTFS volumes, Windows XP reserves a portion of the free space for a system file called the master file table (MFT). The MFT is where Windows stores all the information it needs to retrieve files from the volume. Windows stores part of the MFT at the beginning of the volume. Windows reserves the MFT for exclusive use, so Disk Defragmenter cannot and does not move files to the beginning of volumes.

Disk Cleanup helps free up space on your hard drive by searching your drives and then showing you a list of temporary files, Internet cache files, and potentially unnecessary program files that you can safely delete. You can instruct Disk Cleanup to delete none, some, or all of those files. To use the Disk Cleanup Wizard, perform the following steps:

1. Click Start, (All) Programs, Accessories, System Tools.
2. Click the Disk Cleanup icon and follow the onscreen instructions.

Exam Prep Questions

1. You are a desktop support technician, and you support computers running Windows XP in a Windows Server 2003 domain. Domain policy explicitly prohibits using Windows Explorer burn CDs. However, Mary Ann is able to burn a CD. What is the most likely reason?
   - ❑ A. Mary Ann is using a third-party application to create or modify CDs using a CD writer.
   - ❑ B. Mary Ann is using Internet Explorer to create a CD.
   - ❑ C. Mary Ann is a member of the Power Users group.
   - ❑ D. The policy only applies to Windows Server operating systems.

   Answer A is correct. The group policy value `User Configuration, /Administrative Templates/Windows Components/Windows Explorer/Remove CD Burning Features` prevents users from being able to use the Windows Explorer CD burning features. It does not prevent users from using third-party applications to create or modify CDs using a CD writer. Answer B is incorrect because Internet Explorer, with the policy enabled, explicitly prevents copying information to a CD. Answer C is incorrect because being a member of the Power Users group does not eliminate the effect of the policy. Answer D is incorrect because the policy applies to Windows Server and Windows XP operating systems.

2. You are a desktop support technician for a large company and you support computers running Windows XP. A user, Joshua, wants to convert one of the hard drives connected to his Windows XP Professional desktop computer from a Basic disk to a Dynamic disk. In the Disk Management console, he right-clicks the physical disk designated as Disk 1, but the option to Convert to Dynamic Disk is unavailable. Why would the option to convert the drive to a Dynamic disk be disabled?
   - ❑ A. There are already drive volumes with data stored on that physical disk.
   - ❑ B. The drive is an external drive connected via USB or IEEE 1394 (FireWire) bus connections.
   - ❑ C. The drive is an external Fibre Channel device.
   - ❑ D. The drive has a sector size of 512 bytes.

   Answer B is correct. Hard disks connected via USB or FireWire (IEEE 1394) buses are not supported for Dynamic disks by default. Answer A is incorrect because you are allowed to convert disks with existing drive volumes and data to Dynamic disks; you cannot convert back to a Basic disk without deleting all existing volumes (and therefore the data on those volumes). Answer C is incorrect because Dynamic disks do support Fibre Channel drives. Answer D is incorrect because Dynamic disks require drives with 512 or fewer bytes per sector.

3. You are a desktop support technician. A user, Toby, wants to convert physical hard disk 2 on his Windows XP Professional desktop computer from a Basic disk to a Dynamic disk using only the command line. Is a command-line tool available to accomplish this task? If so, what is the name of this utility and does it differ from the Disk Management console?

   ❑ A. The command-line tool is called **diskperf.exe**. Only administrative users may use it.

   ❑ B. No command-line tool equivalent to the Disk Management MMC exists.

   ❑ C. The command-line tool is called **diskpart.exe**. You must restart the computer for the conversion process to take effect.

   ❑ D. The command-line tool is called **convert.exe**. You do not need to restart the computer for the conversion to take place unless you are converting the boot disk.

   Answer C is correct. `Diskpart.exe` is the command-line equivalent to Disk Management. You must restart the computer for the conversion to take effect. Answer A is incorrect because `diskperf.exe` enables and disables hard disk performance counters on earlier versions of Windows; it does nothing for converting Basic disks to Dynamic disks. Answer B is incorrect because a command-line utility with functionally equivalent to Disk Management does exist—`diskpart.exe`. Answer D is incorrect because you use the `convert.exe` command-line tool to convert a FAT or FAT32 volume to NTFS.

4. You are a desktop support technician. A user complains that he is running low on available disk space for critical database records he is importing into his sales database. The data resides in a partition on a Basic disk on a computer running Windows XP. If you suggest converting to a Dynamic disk, what types of storage solutions would the conversion provide? (Select all correct answers.)

   ❑ A. Spanned volumes

   ❑ B. Extended volumes

   ❑ C. RAID-5 volumes

   ❑ D. Simple volumes

   ❑ E. Volume sets

   ❑ F. Striped volumes

   ❑ G. Mirrored volumes

Answers A, D, and F are correct. Spanned volumes enable you to store data sequentially over two or more physical disks, but Windows XP displays the disks as one logical drive volume. Simple volumes are the most fundamental dynamic volumes, with each simple volume residing on only one physical disk. Striped volumes are also supported under Windows XP, enabling you to store data in stripes across two or more physical disks, but Windows XP displays the disks as one logical drive volume. Answer B is incorrect because there is no such volume as an extended volume on a Dynamic disk. Answer C is incorrect because Windows XP Professional does not support the fault-tolerant RAID-5 volume configuration. Answer E is incorrect because volume sets were supported for Basic disks under Windows NT; they are known as spanned volumes under Windows XP. Answer G is incorrect because Windows XP Professional does not support the fault-tolerant mirrored volume configuration.

5. You are a desktop support technician. A user, Hazel, has a Windows XP Professional computer that has two physical hard drives installed. Both disks have been converted to Dynamic disks. The first disk (disk 0) has a capacity of 20GB with a drive C (system and boot) volume of 2GB, a drive D volume of 7GB, and 11GB of unallocated free space. The second disk (disk 1) has a capacity of 30GB with 20GB of unallocated free space. Hazel needs to extend drive D (a simple volume) on her computer so that the volume has an increased amount of total disk space—from 7GB to 14GB. How can you accomplish this without deleting any existing data? (Select all correct answers.)

   - ❑ A. Repartition and reformat drive C.
   - ❑ B. Extend drive D to an area of free space on disk 1.
   - ❑ C. Extend drive D to an area of free space on disk 0.
   - ❑ D. Convert disk 1 to Basic and extend the volume.

   Answers B and C are correct. You can extend a simple volume on a Dynamic disk onto unallocated free space of additional Dynamic disks up to a maximum of 32 Dynamic disks; this process automatically turns the volume into a spanned volume. You can also extend a simple volume on a Dynamic disk onto an area of unallocated free space on the same Dynamic disk. Answer A is incorrect because repartitioning and reformatting a disk deletes any data stored on the disk. Answer D is incorrect because converting a disk from Dynamic to Basic deletes any data stored on the disk.

6. You are a desktop support technician. To make accessing several different hard drive volumes and removable drives easier on a local Windows XP computer, you want your users to be able to access each drive volume through different folder names located on the same drive letter. How can you accomplish this?
   - ❑ A. Use the **subst.exe** command-line utility to specify each folder as a unique drive letter.
   - ❑ B. Use the Disk Management console to create mount points for each hard drive volume letter through empty folders on the same FAT or FAT32 volume.
   - ❑ C. Use **diskpart.exe** to create mount points for each hard drive volume letter through empty folders on the same NTFS volume.
   - ❑ D. Use **diskperf.exe** to create mount points for each hard drive volume letter through empty folders on the same NTFS volume.

   Answer C is correct. You can use either `diskpart.exe` or the Disk Management MMC snap-in to create mount points for a drive letter through empty NTFS folders. Answer A is incorrect because the `subst.exe` command associates a specific drive letter path with a different drive letter root folder. Answer B is incorrect because you can only create mount points on empty NTFS folders. Answer D is incorrect because `diskperf.exe` enables and disables hard-disk performance counters on earlier versions of Windows.

7. You are a desktop support technician. What is the easiest way to convert an NTFS drive volume configured as drive D to the FAT32 file system without losing any existing data? Assume that the volume is not the system or boot volume.
   - ❑ A. Use the command **convert d: /fs:fat32**.
   - ❑ B. Use the command **convert d: /fs:-ntfs**.
   - ❑ C. Use the Disk Management console to revert the volume back to FAT or FAT32.
   - ❑ D. Back up all the data stored on the NTFS drive volume, use **diskpart.exe** or the Disk Management console to delete the volume, create a new volume, format the volume as FAT32, and then restore the backed-up data.

Answer D is correct. Windows XP does not offer a conversion tool for converting an existing NTFS volume to FAT, to FAT32, or to any other file system. You must back up all the data on the volume, create a new volume, format it, and restore the data. Answer A is incorrect because the `convert.exe` command does not support the conversion to the FAT or FAT32 file systems. Answer B is incorrect because the `convert.exe` command-line tool only supports a conversion to NTFS; prepending a minus sign (-) to the NTFS parameter is not supported. Answer C is incorrect because the Disk Management console only supports reformatting an existing NTFS drive volume to convert it to the FAT or FAT32 file system.

8. You are a desktop support technician. A user complains that she cannot copy a 100MB folder onto a USB 2.0 pen drive that she has been issued for transferring files. What is the most likely reason she is unable to store the files on the pen drive?
   - ❑ A. You have a strict disk quota policy that uses default settings.
   - ❑ B. Because you cannot limit the enforcement of a disk quota on removable media, the drive must be faulty.
   - ❑ C. You have enabled the Apply Policy to removable media policy.
   - ❑ D. She is logged on with local administrator privileges.

   Answer C is correct. In the group policy feature, you can enable the computer policy `Administrative Templates/System/Disk Quotas/Apply Policy to Removable Media`. This policy extends disk quotas to include removable media. Answer A is incorrect. By default, disk quota policies do not apply to removable media. Answer B is incorrect. You *can* apply disk quotas to removable media. There is no evidence that the pen drive is faulty. Answer D is incorrect; logging on with local administrator privileges does not necessarily prohibit a user from being able to store files to removable media.

9. You are a desktop support technician. Layla is attempting to format a USB 2.0 pen drive in her computer. However, the format option is not available. How can you make the format option available to her?
   - ❑ A. Using group policies, enable the program **format.exe** for Layla's account.
   - ❑ B. Using group policies, remove Layla's name from Restricted Groups.
   - ❑ C. Add Layla's name to the local Administrators group on her computer.
   - ❑ D. Modify the local policy on the machine, Allowed to Format and Eject Removable Objects.

Answer D is correct. By modifying the local policy `Computer Configuration/Windows Settings/Security Settings/Local Policies/Security Options/Devices:Allowed to Format and Eject Removable Objects` (administrators). By default, only administrators are allowed to format and eject removable media. Answer A is incorrect; there is no program named `format.exe`. Answer B is incorrect. Restricted Groups is designed to control membership in local groups on computers running Windows XP. Removing Layla's name from the Administrators group does not elevate his privileges; more than likely, it reduces them. Answer C is incorrect; adding Layla's name to the local Administrators group will possibly enable him to use the format option, provided that the policy in the local machine is configured to allow administrators to format removable media. However, it is not advisable to add users to the local administrators group to provide them with specific privileges; it is more secure to elevate their permissions in a more specific way.

10. You are a desktop support technician. When Bob attempts to install a software program from CD and is unable to do so, a message appears that says "the feature cannot be found".

    The CD is visible in Explorer. He can copy files from the CD to the hard drive.

    Bob tries to install the program on another computer, and when he double-clicks the program **setup.exe**, the program proceeds successfully.

    Bob's original computer has sufficient disk space on which to install the software. What is a possible reason for Bob's inability to install the software on his computer running Windows XP?

    - ❑ A. A policy that prevents installation from removable media is in place on Bob's computer.
    - ❑ B. This function is not supported by Windows XP.
    - ❑ C. The CD is corrupt and unreadable.
    - ❑ D. It's a faulty driver. Use driver rollback to replace the CD-ROM driver.

    Answer A is correct. If the policy User `Configuration/Administrative Templates/Windows Components/Windows Installer/Prevent Removable Media Source for Any Install` is enabled, when a user tries to install a program from removable media, the process fails. If you disable the setting, or do not configure it, users can install from removable media. Answer B is incorrect; Windows XP supports CD-based software installation, by default. Answer C is incorrect; the CD is readable in other computers and can be used to copy files. Answer D is incorrect. There is no evidence of a driver problem.

Need to Know More?



Wallace, Rick. *Microsoft Windows XP Professional Academic Learning Series*. Redmond, Washington: Microsoft Press, 2001.



Balter, Dan. *MCSE Exam Cram 2 Windows XP Professional*. Indianapolis, Indiana: Que Certification, 2002.



Bott, Ed and Carl Siechert. *Microsoft Windows XP Inside Out, Deluxe Edition*. Redmond, Washington: Microsoft Learning, 2002.



Simmons, Curt and James Causey. *Microsoft Windows XP Networking Inside Out*. Redmond, Washington: Microsoft Learning, 2002.



Stanek, William R. Microsoft Windows XP Professional Administrator's Pocket Consultant. Redmond, Washington: Microsoft Press, 2003.



Search the Microsoft Product Support Services Knowledge Base on the Internet: `http://support.microsoft.com`. You can also search Microsoft TechNet on the Internet: `http://www.microsoft.com/technet`. Find technical information using keywords from this chapter, such as FAT, FAT32, NTFS, Basic disk, Dynamic disk, drive partition, drive volume, simple volume, spanned volume, striped volume, managing digital media, and disk management.