MICROSOFT
TRAINING
AND CERTIFICATION

Microsoft Official
Curriculum

BETA
MATERIALS
for Microsoft Certified Trainer preparation purposes only

Module 12: Managing Disks

Contents

Microsoft®

Instructor Notes

Presentation:
60 Minutes

Lab:
30 Minutes

This module provides students with knowledge and skills necessary to manage disks on computers running Microsoft® Windows® XP Professional.

After completing this module, the student will be able to:

- Describe the features provided by Disk Management and DiskPart.
- Determine when to use a basic versus dynamic disk.
- Convert a basic disk to a dynamic disk.
- Describe disk preparation tasks when upgrading to Windows XP Professional.
- Perform common disk management tasks.
- Identify different ways to defragment a volume.

Materials and Preparation

This section provides the materials and preparation tasks that you need to teach this module.

Required Materials

To teach this module, you need Microsoft PowerPoint® file 2272A_12.ppt.

Preparation Tasks

To prepare for this module, you should:

- Read all of the materials for this module.
- Complete the lab.
- Review the Delivery Tips and Key Points for each section and topic.
- Study the review questions and prepare alternative answers for discussions.
- Anticipate student questions about material and write out answers to those questions.

Instructor Setup for a Lab

This section provides setup instructions that are required to prepare the instructor computer or classroom configuration for a lab.

Lab 12A: Working with Dynamic Disks

► **To prepare for the lab**

1. The lab requires that the student computers are running Microsoft Windows XP Professional.

2. Partition the hard disks on the student computers with drive C as the primary partition, and a minimum of 2,000 megabytes (MB) of unallocated disk space.

3. Configure drive C on the student computers with the NTFS file system.

Module Strategy

Use the following strategy to present this module:

- Working with Disk Management

  This section introduces Disk Management and the command-line version of Disk Management, DiskPart. List the various tasks that can be performed by using Disk Management and DiskPart. Next demonstrate the Disk Management interface pointing out the disk object number, which is used by DiskPart commands to refer to the disk. Complete the section with a brief demonstration of DiskPart.

- Working with Basic Disks

  This section provides an overview of the characteristics and functions of basic disks. Begin by defining how basic disks are organized into partitions and logical drives. Define terminology relevant to configuring basic disks by demonstrating the options in Disk Management. Discuss adding a new basic disk to your computer.

- Working with Dynamic Disks

  In this section, distinguish between basic and dynamic disk. Demonstrate how to convert a basic disk using both Disk Management and DiskPart. Discuss the types of volumes that can be created on a Windows XP Professional dynamic disk and under what circumstances would you select one volume type over another. Demonstrate how you would create the various volume types. Next, introduce the concepts of disk groups and the dynamic disk database and the role both disk groups and the database play when moving dynamic disks between computers.

- Preparing Disks when Upgrading to Windows XP Professional

  This section describes the tasks to perform when upgrading to Windows XP Professional from a Microsoft Windows NT® Workstation or Microsoft Windows 2000 Professional computer with basic disks containing spanned volumes.

- Managing Disks

  This section is relevant to both basic and dynamic disk. Begin by viewing disk status and disk properties. Point out that information available in Disk Management and the Disk Properties sheet provides information useful when determining when additional disk space is required by the user and when troubleshooting disk problems. Next, focus on several tasks used when organizing disks including: extending a volume or partition, deleting a volume or partition, changing drive letters, and creating mount points. These tasks enable the user to organize disk space conducive to their work environment.

■ Lab 12A: Working with Dynamic Disks

In this lab, students convert a basic disk to a dynamic disk. They create a simple volume and extend that volume. Finally, students create and mount a simple volume. Students discuss the results of mounting a volume, including the transparency aspects of mount points.

■ Defragmenting Volumes

This section introduces the benefits of defragmenting volumes, including how to analyze and determine if system performance would benefit from disk defragmentation. Use this module to demonstrate defragmentation by using Disk Defragmenter and the command-line tool, Defrag.exe.

Customization Information

This section identifies the lab setup requirements for a module and the configuration changes that occur on student computers during the lab. This information is provided to assist you in replicating or customizing Training and Certification courseware.

Lab Setup

The following list describes the setup requirements for the lab in this module:

■ The lab in this module requires that the computers are running Microsoft Windows XP Professional.

■ Complete Module 1, "Installing Microsoft Windows XP Professional," in Course 2272A, *Implementing and Supporting Microsoft Windows XP Professional (Course Beta)*.

Lab Results

Performing the lab in this module introduces the following configuration changes:

■ Drive C is converted to a dynamic volume.

■ A new 100 MB simple volume is created.

■ A new 25 MB simple volume is created.

■ A folder call Mount is created on drive C and is used as the mount point for a 75 MB mounted volume on the students' hard disks.

Overview

- **Working with Disk Management**

- **Working with Basic Disks**

- **Working with Dynamic Disks**

- **Preparing Disks when Upgrading to Windows XP Professional**

- **Managing Disks**

- **Defragmenting Volumes**

Microsoft® Windows® XP Professional supports basic and dynamic disks. You must understand the differences and capabilities of both basic and dynamic disks before you can set up and manage hard disks on your computer.

Dynamic disks were introduced as a new storage type with Microsoft Windows 2000. Before Microsoft Windows 2000, all versions of Windows, Microsoft MS-DOS®, and Microsoft Windows NT® supported one type of disk storage: basic disks.

After completing this module, you will be able to:

- Describe the features provided by Disk Management and DiskPart.

- Determine when to use a basic versus dynamic disk.

- Convert a basic disk to a dynamic disk.

- Describe disk preparation tasks when upgrading to Windows XP Professional.

- Perform common disk management tasks.

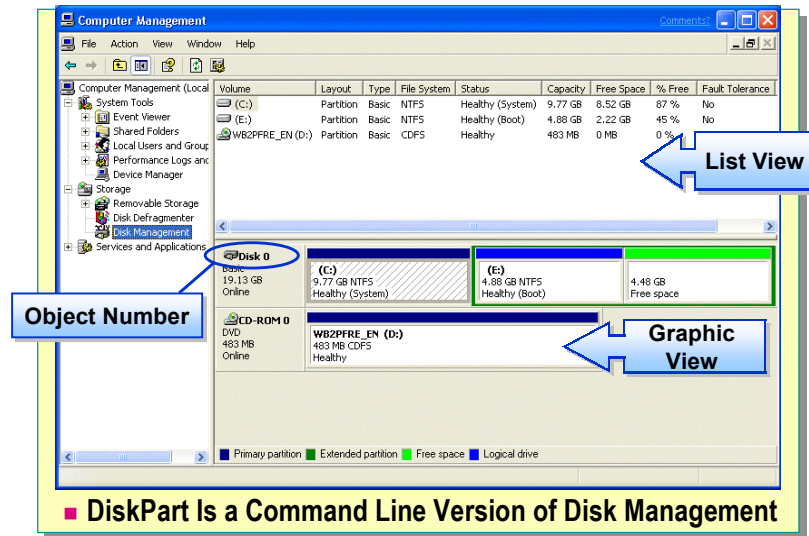- Identify different ways to defragment a volume.

Working with Disk Management

■ **DiskPart Is a Command Line Version of Disk Management**

In Microsoft Windows XP Professional you perform most disk management tasks by using Disk Management. *Disk Management*, a Microsoft Management Console (MMC) snap-in, is a tool that consolidates tasks for both local and remote disk administration. A command-line version of Disk Management, DiskPart, is also available in Windows XP Professional.

Use Disk Management and DiskPart to:

■ Convert disk types

■ Organize disk storage

■ Format disks

■ Add new disks

■ View disk status and properties

■ Troubleshoot disk problems

In Windows XP Professional, you can perform most disk related tasks without shutting down the computer. Most configuration changes take place immediately.

Using Disk Management

To open Disk Management:

1. Click **Start**, right-click **My Computer** and then click **Manage**.

2. Under the **Storage** icon, click **Disk Management**.

   Disk Management displays disks in a graphical view and a list view. The first hard disk in your computer is labeled Disk 0. The first compact disc read-only memory (CD-ROM) device in your computer is labeled CD-ROM 0. The number, zero, is an object number and cannot be changed.

You can customize the display by changing the type of information that is displayed in the panes and by selecting the colors and patterns used to display the portions of the disk. To change the display options, click **View** and select the option.

Using DiskPart

DiskPart is an alternative means for setting up and managing disks. By using DiskPart, you can execute commands directly from the command prompt or create scripts to automate tasks. Consider running DiskPart scripts when automating the installation of Windows XP Professional.

Before executing a DiskPart command, specify the disk for the operation. You specify the disk by using the disk object number. Windows XP Professional assigns object numbers based on the order and type of the device within your system. The numbering always begins with zero; therefore the first disk into your system is Disk 0, commonly labeled drive C. The disk object number can be viewed in Disk Management or by issuing a DiskPart command, disk list.

For example, at the command prompt, type the following command:

```
diskpart
select disk 0
assign letter e
```

This sequence of commands begins the DiskPart utility and assigns the drive letter E to Disk 0.

Note When using DiskPart, once you have selected a disk, all subsequent DiskPart commands are executed on that active disk until you select another disk.

DiskPart does not have a Format command. You must terminate your script by using the **exit** command and then run the **format** command from the command prompt. For a complete list of DiskPart commands, click **Start**, and then click **Help and Support**. In the Help and Support Center, type DiskPart in the Search box, and then press ENTER.

◆ Working with Basic Disks

- **Organizing a Basic Disk**

- **Creating Partitions and Drives on a Basic Disk**

- **Adding a Basic Disk**

Basic disks are the default storage medium for Windows XP Professional.
When you install a new disk, Windows XP Professional configures it as a basic
disk. The advantage of using a basic disk is that it can be read locally by all
previous versions of Windows assuming that it is formatted with a file format
(that is, NTFS, FAT32, or FAT) that can also be read by the operating system.
If you are installing a dual boot system, and one of the operating systems can
only read basic disks, you need to install both operating systems on a basic disk.

By using Disk Management, you can perform many tasks with basic disks
including organizing the basic disk into partitions and logical drives and adding
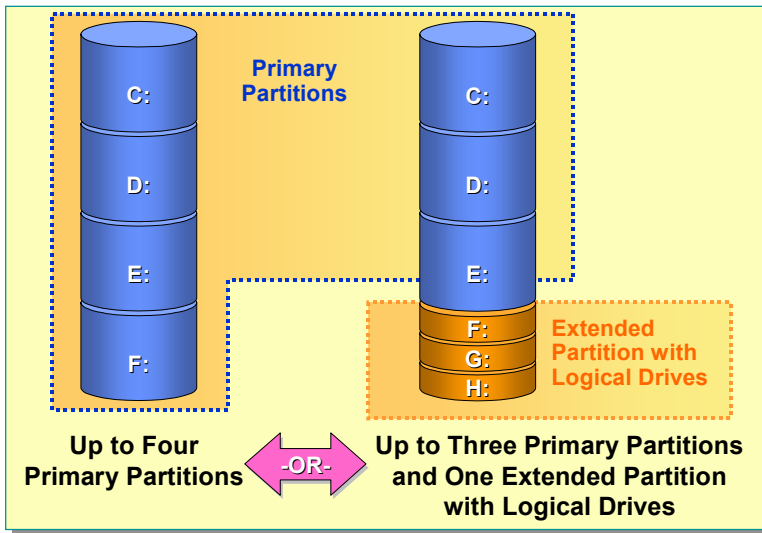new basic disks to your computer.

Organizing a Basic Disk

A basic disk can be divided into smaller portions of storage as a means to organize data on the disk. For example, you can divide your disk into two portions: one portion for your operating system and applications and a second portion for data. Another reason for dividing a disk into portions is for a dual boot system; each operating system is installed on a separate portion of the disk.

On a basic disk, portions of the disk are known as basic volumes or partitions. The types of partitions available on a basic disk are:

■ *Primary partition*. A portion of usable storage space that you create from unallocated space on a disk. A drive letter is assigned to each primary partition.

■ *Extended partition*. A portion of usable storage space that you create from unallocated space on a disk when you want to create more than four storage spaces on a basic disk.

You subdivide an extended partition into logical drives. A *logical drive* is a portion of usable storage space created within an extended partition. A drive letter is assigned to each logical drive. The extended partition is not assigned a drive letter, but rather drive letters are assigned to logical drives in that extended partition.

A basic disk can have up to four primary partitions or up to three primary partitions and one extended partition with logical drives. The reasons for organizing data into partitions and logical drives are dependent on individual and organizational needs.
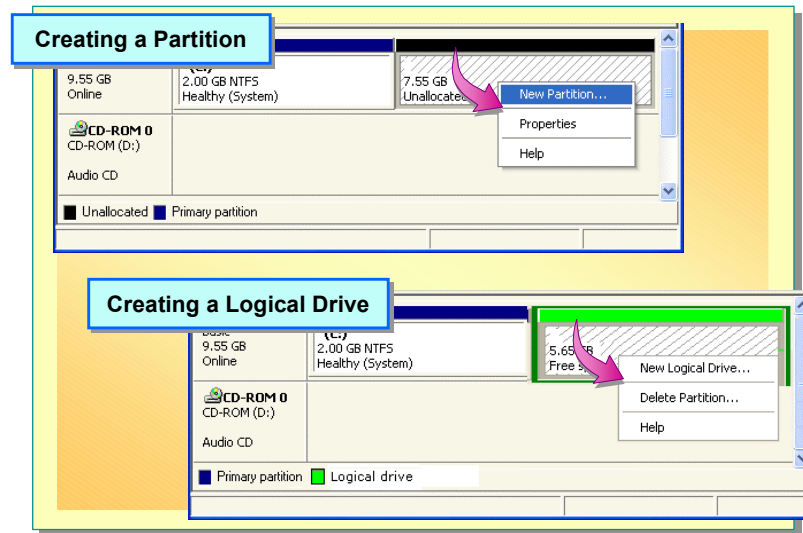
Creating Partitions and Drives on a Basic Disk

Before you create partitions and logical drives, you need to determine:

- The number of partitions and logical drives.

- The size (in MB) of each partition and/or logical drive.

- The drive letters to assign to the primary partitions and/or logical drives.

- The file format for each primary partition and/or logical drive. For more information on file formats, see Module 13, "Configuring and Managing File Systems" in Course 2272A, *Implementing and Supporting Microsoft Windows XP Professional (Course Beta)*.

To create partitions and drives, you must be logged on as Administrator or a member of the Administrators local group. If your computer is connected to a network, group policy settings may prevent you from completing this procedure.

Creating a Primary Partition

To create a primary partition:

1. Right-click **My Computer**, click **Manage**, and under Storage click **Disk Management**.

2. Right-click an unallocated region of a basic disk, and then click **Create Partition**. You must select an unallocated region of the disk to create a new partition. If you right-click on an existing logical drive or a volume or anything other than an unallocated region on a basic disk, the Create Partition option will not be available.

3. In the New Partition Wizard, click **Next**, and then click **Primary Partition**. Note that the logical drive option is not available because you can only create a logical drive from an extended partition.

4. Complete the wizard instructions, specifying the size, drive letter, and file format of the partition.

   The wizard provides an option to mount the partition to an empty NTFS folder. Information on this option is covered later in this module.

Creating an Extended Partition

You can create an extended partition when you intend to divide the partition into one or more logical drives. To create an extended partition, you use the New Partition Wizard and are prompted to specify only the size of the partition. Drive letter and file format are specified when you create the logical drives.

Creating a Logical Drive

To create a logical drive, from Disk Management you right-click the free space of an extended partition, click **Create Logical Drive**, and then complete the instructions in the New Partition Wizard.
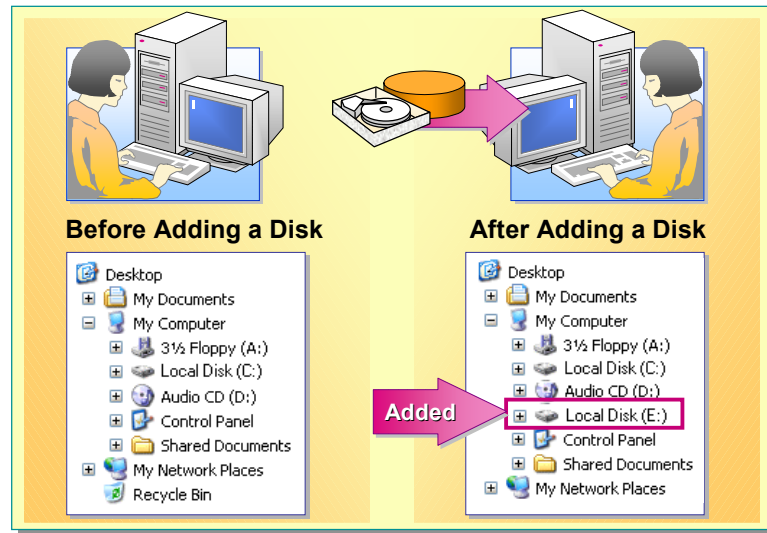

For Your Information
The option to not assign a drive letter is selected if you are not sure what letter at this time to assign the partition or drive and wish to do so later directly from Disk Management.

Adding a Basic Disk

If you need to add a new disk, Windows XP Professional automatically adds it as a basic disk. To add a hard disk from one computer to another:

1. As a precaution, back up the data on the disk.

2. Remove the disk from the original computer.

3. Install the disk to a computer that is running Windows XP Professional.

4. Log on to Windows XP Professional by using an account with administrative privileges, and then start Disk Management.

5. If the disk does not appear in the list, on the **Action** menu, click **Rescan Disks**.

    If the disk still does not appear in Disk Management, click Device Manager from the Computer Management console tree, right-click **Disk drives**, and then click **Scan for hardware changes**.

When the new disk appears in Disk Management, the drive letters will be assigned using the first available drive letters on the target computer. Note that drive letters can be deleted and reassigned. They do not need to be sequential. This is not true with the device's object number.

If there is a problem with a disk when moving it from one computer to another, Windows XP Professional may display the disk status as unreadable or unrecognized. An *unrecognized* disk is a disk whose signature is not recognized by Windows XP Professional, for example, a disk from a UNIX computer. If the disk is *unreadable*, this may be because of hardware failure, corruption, or input/output (I/O) errors. You can attempt to rescan the disk or restart the computer to see if the disk status changes.

◆ Working with Dynamic Disks

- **Converting from a Basic Disk to a Dynamic Disk**

- **Organizing a Dynamic Disk**

- **Creating a Volume**

- **Moving Dynamic Disks**

The type of disk that you select in Windows XP Professional, basic or dynamic, determines how you use and manage the space on your hard disk.

When working with dynamic disks:

- You can create volumes that can span multiple disks. A *volume* is a portion of a dynamic disk. Partitions on a basic disk cannot be larger than a single disk and a single basic disk cannot exceed 2 terabytes. With dynamic disks, you can have volumes that exceed the 2 terabyte limitation by creating volumes that span multiple disks.

- There is no requirement for contiguous space when increasing the size of a volume. To increase the size of a partition, the additional space must be unallocated and contiguous.

- Only Windows XP Professional and Windows 2000 can access a dynamic disk. If you require a dual boot system, you must use a basic disk. This is true even if the two operating systems can read dynamic disks. The reason for this is the dynamic disk database, which is discussed in greater detail later in this module.

Key Point
A hard disk can be either basic or dynamic, but not both. Windows XP Professional supports both basic and dynamic disks on the same computer.

When adding a new unformatted disk, the default disk type is a basic disk. To create a dynamic disk, you must first convert a basic disk to a dynamic disk.

Dynamic disks are not supported on portable computers, removable disks, or on disks using Universal Serial Bus (USB) or IEEE 1394 (also called FireWire) interfaces.

A hard disk can be basic or dynamic, but not both. You cannot combine storage types on a single disk. However, if your computer has multiple hard disks, you can configure each hard disk in a computer as either basic or dynamic, and therefore have both types within a single system.

When adding a new unformatted disk, the default disk type is a basic disk. To create a dynamic disk, you must first convert a basic disk to a dynamic disk.

Important   Dynamic disks are not supported on portable computers, removable disks, or on disks using Universal Serial Bus (USB) or IEEE 1394 (also called FireWire) interfaces. Windows XP Professional does not support dynamic disks if the sector size on the disk is less than 512 bytes or on clusters disks. A *cluster disk* is a group of disks that function as a single disk.

Note that dynamic disks require a minimum of 1 MB of space for the dynamic disk database. This amount of space is normally available with any type of partitioning scheme.
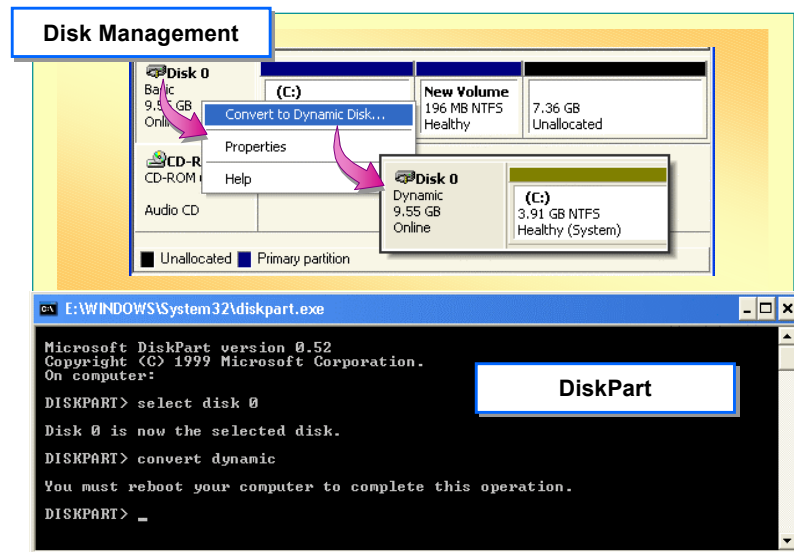
Converting from a Basic Disk to a Dynamic Disk

You can convert basic disks to dynamic disks at any time, and in most cases, you do not need to restart your computer to complete the conversion. However, if the disk that you are upgrading contains the boot or system partition, or an active paging file, you must restart the computer two times, as prompted, to complete the conversion.

Important You should always back up the data on a disk before you convert from a basic to dynamic disk to ensure that you do not lose data if there is a problem with the conversion.

To convert a basic disk to a dynamic disk by using Disk Management:

1. Open Disk Management.

2. Right-click the basic disk that you want to convert, and then click **Convert to Dynamic Disk**.

3. In the **Convert to Dynamic Disk** dialog box, select the disk that you want to convert.

You can also convert a basic disk to a dynamic disk using the command-line version of Disk Management, DiskPart. To convert from a basic disk to a dynamic disk by using DiskPart:

1. Open a command prompt, and then type:

```
diskpart
```

2. To convert the first basic disk (disk 0) to a dynamic disk, at the DiskPart command prompt, type the following commands:

```
select disk 0
convert dynamic
exit
```

3. Restart your computer.

Note   To see a list of DiskPart commands, type **commands** at the diskpart command prompt.

Conversion Results

Converting a basic disk to a dynamic disk changes the partitions to simple volumes. The disk receives a copy of the dynamic disk database.

Whenever new dynamic volumes are created on the dynamic disk, or when volumes are deleted or extended, only the dynamic disk database is updated. The partition table on the disk is not updated.

Important   You cannot use a dual boot configuration on a system that is using dynamic disks. If you convert a basic disk to a dynamic disk, only the operating system that is currently running would be aware of the new dynamic disk. If multiple operating systems are required on a single computer, configure the computer by using basic disks.

Converting a Dynamic Disk to a Basic Disk

You can convert a dynamic disk back to a basic disk; however, all volumes must be deleted before the conversion.

Caution   Before you convert from a dynamic disk to a basic disk, transfer data on the disk to another computer, because all volumes are deleted on a dynamic disk before conversion.

To convert a dynamic disk to a basic disk:

1. Back up any data that you wish to retain to removable media or another disk.

2. In Disk Management, right-click the dynamic disk that you want to convert.
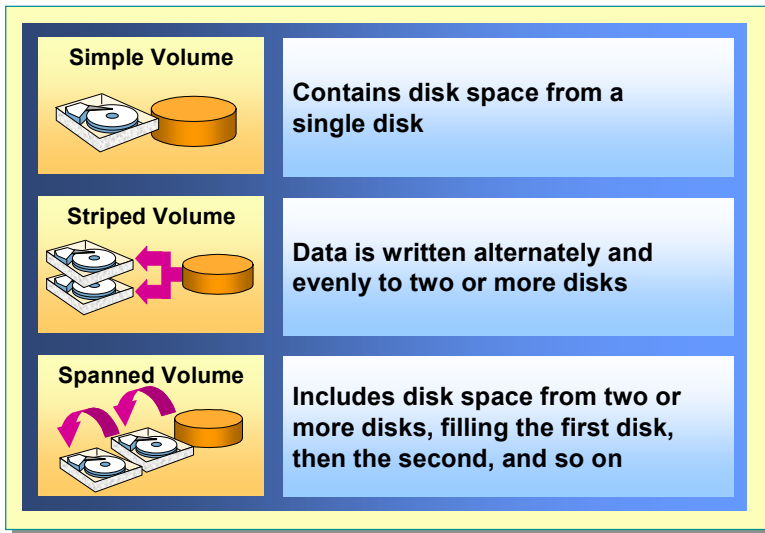
3. Click **Convert To Basic Disk**.

Organizing a Dynamic Disk

Simple Volume

Contains disk space from a single disk

Striped Volume

Data is written alternately and evenly to two or more disks

Spanned Volume

Includes disk space from two or more disks, filling the first disk, then the second, and so on

---

On a dynamic disk, storage is organized into volumes instead of partitions. You can create the following volume types on a dynamic disk:

- A *simple volume*. This contains disk space from a single disk. Simple volumes are the dynamic disk equivalent of the primary partition on a basic disk.

- A *striped volume*. This combines areas of free space from two or more disks into one volume. When data is written to a striped volume, it is allocated alternately and evenly to these disks. This process of dividing data across a set of disks improves disk performance. *Disk performance* is the speed with which the computer can gain access to data on one or more disks. However, if a particular disk in a striped volume fails, the data on the entire striped volume is inaccessible.

- A *spanned volume*. This includes disk space from two or more disks. When data is written to a spanned volume, the portion of the spanned volume residing on the first disk is filled up first, and then data is written to the next disk in the volume. If a particular disk fails in the spanned volume, then all data stored on that disk is lost. Similar to a volume set in earlier versions of Windows NT, a spanned volume enables you to combine disk storage but does not improve disk performance.

Simple volumes are typical for desktops that are used to accomplish daily tasks, and when more complex disk structures are not required. Striped volumes are typically found in power workstations that require large local storage and require the best possible disk performance. Spanned volumes are typically used in situations where the size of the hard disk is no longer sufficient and needs to be expanded by using the least amount of effort.

Note   You cannot create fault-tolerant volumes on computers running Windows XP Professional. Fault tolerance is the ability of a computer or operating system to respond to a catastrophic event, such as a hard disk failure, without loss of data. You can create fault tolerant volumes on computers running Windows 2000 Server.
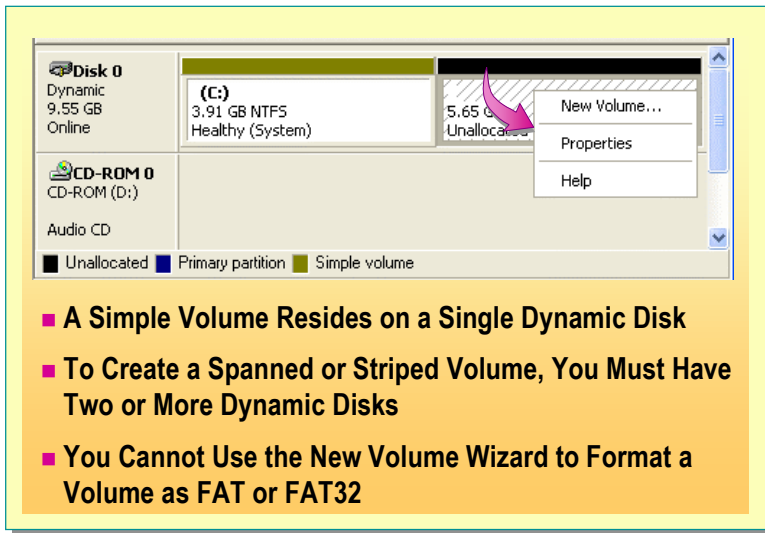
Creating a Volume

- **A Simple Volume Resides on a Single Dynamic Disk**
- **To Create a Spanned or Striped Volume, You Must Have Two or More Dynamic Disks**
- **You Cannot Use the New Volume Wizard to Format a Volume as FAT or FAT32**

Before creating volumes, you need to determine the following:

- Number and type of volumes to create
- Size (in MB) of each volume
- For spanned and striped volume, the number of disks (a minimum of two dynamic disks and up to 32 dynamic disks) to assign to the volume
- Drive letters to assign to the volume
- File format for the volume

To create partitions or volumes, you must be logged on as Administrator or a member of the Administrators group. If your computer is connected to a network, network policy settings may prevent you from creating partitions and volumes. If you have administrator privileges but cannot create dynamic volumes, speak with your Network Administrator.

Creating a Simple Volume

To create a simple volume:

1. Open Disk Management, right-click the unallocated space on the dynamic disk where you want to create the simple volume, and then click **New Volume**.

2. In the New Volume Wizard, click **Next**.

3. Click **Simple**, and then follow the on-screen instructions.

Creating a Spanned or Striped Volume

You need at least two dynamic disks to create a spanned or striped volume. You can extend a striped or spanned volume onto a maximum of 32 dynamic disks.

To create a spanned or striped volume:

1. Open Disk Management, right-click the unallocated space on the dynamic disk where you want to create the volume, and then click **New Volume**.

2. In the New Volume Wizard, click **Next**.

3. Click **Spanned** to create a spanned volume or **Striped** to create a striped volume, and then follow the on-screen instructions.

   Creating striped volumes requires you to select two or more areas of unallocated space. These areas of unallocated space must be on different disks.

Formatting a Dynamic Disk

Disk Management does not offer FAT or FAT32 formatting for dynamic disks. To format a dynamic disk as FAT or FAT 32, in Microsoft Windows Explorer, right-click the disk to format, and then select **Format**.
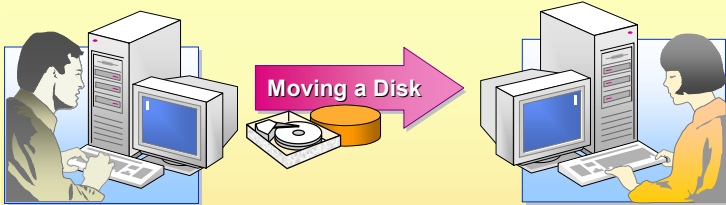
Moving Dynamic Disks

- **When Moving a Dynamic Disk, Select Import Foreign Disk to Update the Dynamic Database on the Newly Added Disk**

- **When Moving Multidisk Volumes, Move All Disks in the Volume at the Same Time**

All dynamic disks in a computer are members of a *disk group*. Each disk in a disk group stores a replica of the same dynamic disk database. A disk group uses a name consisting of the computer name plus a suffix of Dg0, and the disk group name is stored in the registry. The failure of a single disk in a disk group will not affect access to data on other disks in the group.

The disk group name on a computer never changes as long as the disk group contains dynamic disks. If you remove the last disk in the disk group or convert all dynamic disks to basic, the registry entry remains. However, if you then create a dynamic disk again on that computer, a new disk group name is generated that uses the same computer name but adds a suffix of Dg1.

When moving a dynamic disk to a computer that contains existing dynamic disks, the dynamic disk new to the computer is considered foreign because the database on the moved disk does not yet match the database on the existing dynamic disks in the computer.

When Disk Management displays the status of a new disk as **Foreign**, you must right-click the representation of the disk, and click **Import Foreign Disk**. Import Foreign updates the database on the moved disk with the database on the existing disks.

Dynamic disks can be moved and used between Windows 2000 and Windows XP Professional. A dynamic disk cannot be used with any other previous version of Windows, including Windows NT. The procedure for moving a dynamic disk is the same procedure for moving a basic disk with the additional step to select the **Import Foreign Disk** option to update the dynamic disk database.

Important   When moving a disk, as a precaution, back up the data on the disk.

Moving Multidisk Volumes

When moving multidisk volumes from a computer running Windows 2000 or Windows XP Professional to a computer running Windows XP Professional, you must simultaneously move all disks that are part of these volume sets. If you move only one or some of these disks and leave the other disks in the original computer, the disks becomes inaccessible on both computers.

To move disks containing volume or striped sets from a computer running Windows NT 4.0 to a computer running Windows XP Professional, you must:

1. Back up the data.
2. Delete the volume or striped sets.
3. Move the disks.
4. Convert the disks to dynamic and create the appropriate volume types.
5. Restore the data.

Moving Dynamic Disks That Contain System or Boot Volumes

Do not move a dynamic disk that contains the system or boot volume to a computer that has existing dynamic disks, unless you have no other way to recover data.

Because you must import the disk before you can gain access to it, its disk group name changes to match the disk group name on the local computer. If you try to move the disk back to the original computer and start Windows XP Professional from the moved disk, the disk group name does not match the original computer's registry settings and you can no longer start Windows XP Professional from the disk.

You can move a dynamic disk that contains a system or boot volume to another computer if the local computer does not have any dynamic disks. In this case, the local computer uses the same disk group name as the moved disk.

Preparing Disks When Upgrading to Windows XP Professional

Upgrading from Windows NT 4.0 with Volume Sets on a Basic Disk

1   **Back up data**

2   **Delete volumes**

3   **Install Windows XP Professional**

4   **Convert basic disks to dynamic disks**

5   **Create volume types**

6   **Restore data**

Upgrading from Windows 2000 Professional with Volume Sets on a Basic Disk

1   **Back up data**

2   **In Windows 2000, use Disk Management to convert basic disks to dynamic disks**

3   **Install Windows XP Professional**

Before the introduction of Windows 2000, Windows NT 4.0 enabled the creation of volume sets (that is, striped and spanned volumes) on a basic disk. The following table displays the types of volumes and partitions that can be created on various versions of Windows.

	MS-DOS, Microsoft Windows 95, Microsoft Windows 98, Microsoft Windows ME, Microsoft Windows XP Home Edition	Windows NT 4.0 Workstation	Windows 2000 Professional, Windows XP Professional
Basic Disk: Partitions	Supported	Supported	Supported
Basic Disk: Volume Sets and Striped Sets	Not supported	Supported	Not supported
Dynamic Disk: Simple, Striped, and Spanned Volumes	Not supported	Not supported	Supported

When upgrading a system that contains basic disks with either striped sets or spanned volumes, you must perform one of the following procedures:

- If upgrading to Windows XP Professional from Windows NT 4.0 , you must back up and then delete all multidisk volumes. Be sure to verify that your backup was successful before deleting the volumes. After you finish upgrading to Windows XP Professional, create new dynamic disks and volumes and then restore the data.

- If you are upgrading to Windows XP Professional from Microsoft Windows 2000 Professional, you must use Disk Management to convert all basic disks that contain striped or volume sets to dynamic disks before beginning Setup, or the Setup will not complete and you will need to begin Setup again.

◆ Managing Disks

- **Viewing Disk Status and Properties**

- **Extending a Volume or Partition**

- **Deleting a Volume or Partition**

- **Changing a Drive Letter**

- **Creating Mount Points**

You can manage disks by using Disk Management, or DiskPart, which allow you to:

- View the status and properties of a disk. This is useful when troubleshooting disk problems and organizing disk partitions and volumes.

- Extend a volume or partition to increase the usable space assigned to that volume or partition.

- Delete a volume or partition when reorganizing a disk.

- Change a drive letter to improve the organization of your disk to better match your work requirements.

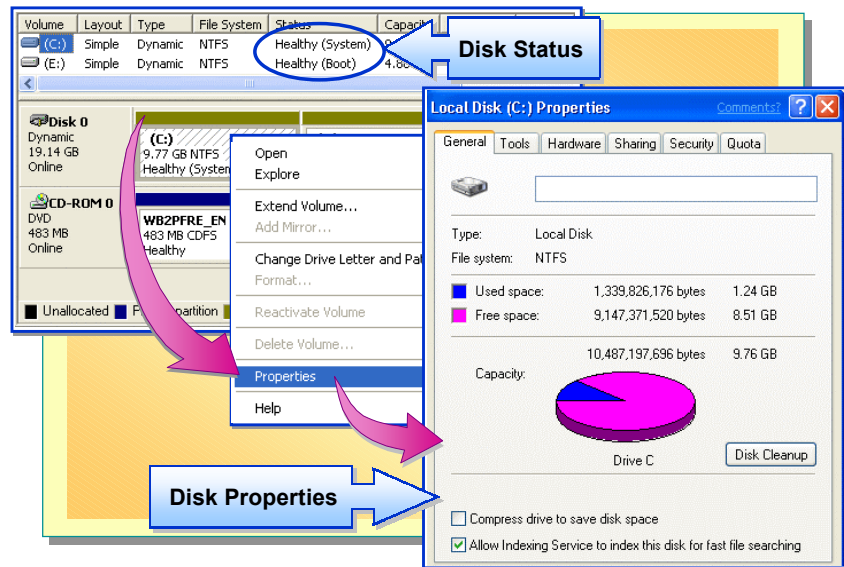- Create a mount point to easily extend a volume or partition.

Viewing Disk Status and Properties

Occasionally, you may encounter a failed disk or volume that needs to be repaired or deleted. Disk Management enables you to find disk storage problems quickly. You can view the status of a disk or volume, repair a disk if it is possible, or delete the disk if it cannot be repaired.

Viewing Disk Status

View the status of a disk in Disk Management under the Status column. The following table lists the different types of disk status and the actions to perform for each status.

Disk status	Action
Healthy (for volumes) or Online (for disks)	No action required
Failed: Incomplete Volume	Import remaining disks in set
Foreign	Import foreign disk

Viewing Disk Properties

Disk Management also enables you to view the Properties sheet for each disk. Disk Properties provides information on:

- *Label*. Provide a user-friendly name to the volume, partition, or drive that describes its content or the device itself.

- *Used and available disk space*. This information is useful in maintaining a disk, deleting files from the recycle bin to gain additional space, determining when to extend a volume or partitions, and other space maintenance tasks.

- *Drive compression*. For NTFS formatted disks only, this option specifies to compress the disk. By default, only files in the root directory are compressed automatically. To have Windows XP Professional compress all folders on this drive, select the **Also compress subfolders** check box in the box that appears when this option is enabled.

- *Indexing Service*. This option specifies that the contents of the drive be indexed, which improves the speed of your searches. Indexing enables you to search for information such as text in the document, or properties, such as creation date, of the document. The entire contents of the drive are not indexed unless you elect to index files and subfolders when prompted.

Other options available from the Disk Properties sheet include file system options and tools for troubleshooting and maximizing disk usage.

To view disk properties:

- Open **Disk Management**, right-click the desired disk, and then click **Properties**.

Reactivating a Disk

If a disk goes offline because of corruption, power interruption, or disconnection, the disk cannot be accessed. If this occurs, you may need to repair the partitions or volume. To repair a partition or volume, open Disk Management, right-click the partition or volume that is marked Missing or Offline, and then click **Reactivate Disk**. The disk should be marked **Online** after the disk is reactivated.
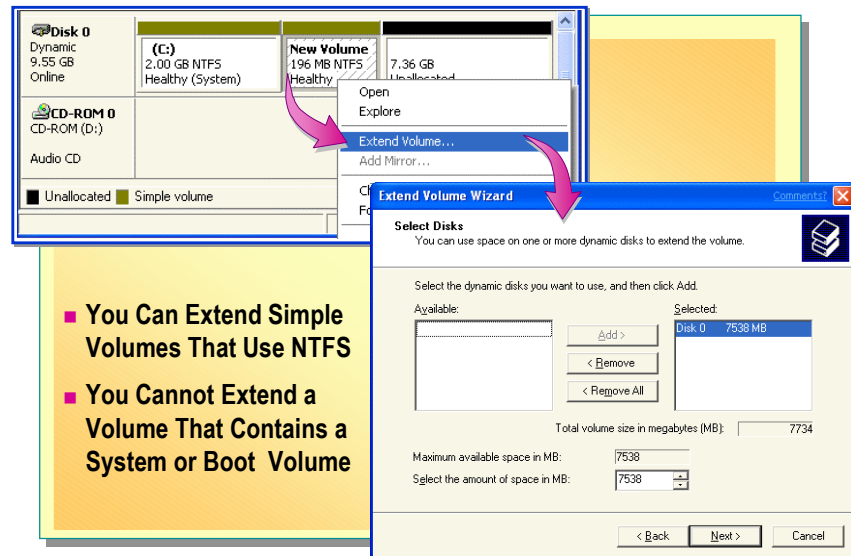
Extending a Volume or Partition

- **You Can Extend Simple Volumes That Use NTFS**
- **You Cannot Extend a Volume That Contains a System or Boot Volume**

If there is unallocated space on a disk, extending a partition or volume increases the accessible portion of the disk.

Partitions or logical drives on a basic disk can be extended if:

- The disk is formatted as NTFS.
- There is available space on the same disk and the partition or drives on the basic disk is followed by contiguous unallocated space.

Volumes on a dynamic disk can be extended if:

- The disk is format as NTFS.
- The extended space must be unallocated, but it need *not* be on the same disk or contiguous. Note that extending a simple volume onto another disk is the same as creating a spanned volume.

You cannot extend the following types of dynamic volumes:

- System volumes or boot volumes.
- Known Original Equipment Manufacturer (OEM) partitions, which are shown in Disk Management as Extended Industry Standard Architecture (EISA) configuration partitions.
- Unrecognized partitions (shown in Disk Management as Unknown partitions).

To extend a volume or partition in Disk Management:

1. Right-click the volume, primary partition, or logical drive that you want to extend.

2. Click **Extend Volume**, and then follow the on-screen instructions.

The only way to add more space to the system or boot volume on a dynamic disk is to back up all data on the disk, repartition and reformat the disk, reinstall Windows XP Professional, convert the disks to dynamic, and then restore the data from backup.
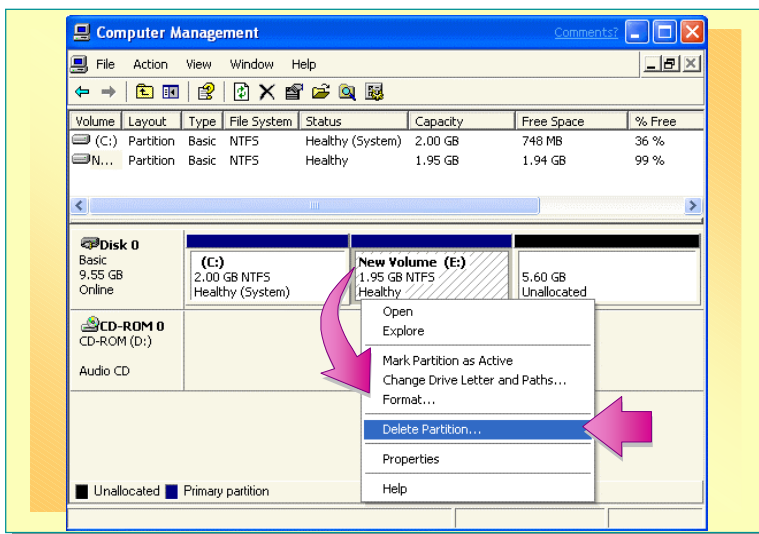
Deleting a Volume or Partition

In the event that you want to reorganize your disk, you may need to delete a volume or partition.

You can delete any basic disk partitions or dynamic disk volumes, except for the system partition or volume, boot partition or volume, or any partition or volume that contains an active paging file. In addition, Windows XP Professional requires that you delete all of the logical drives or other volumes before you delete the extended partition or volume.

- To delete a partition, open Disk Management, right-click the partition that you want to delete, and then click **Delete Partition**.

- To delete a volume, open Disk Management, right-click the volume that you want to delete, and then click **Delete Volume**.

Caution   Back up data on partitions or volumes before deleting them. All data on the deleted partition or volume is lost.
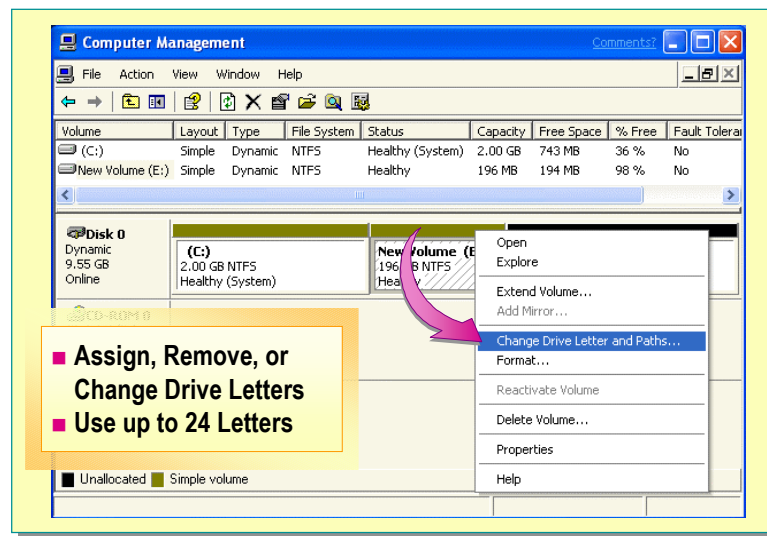
Changing a Drive Letter

Windows XP Professional enables static assignment of drive letters to partitions, volumes, CD-ROM, DVD, and removable disk drives. You can use up to 24 drive letters, from C through Z. Drive letters A and B are typically reserved for removable disk drives. When you add a new hard disk to an existing computer, it does not affect previously assigned drive letters because it is automatically assigned a letter that is not currently in use. However, you may wish to reassign letters so that the sequence of letters is conducive for work.

Tip   It is often convenient to assign drive letters to removable devices in such a way that the removable devices are listed after the permanent partitions and volumes on the computer.

To assign, change, or remove a drive letter:

1. Open Disk Management.

2. Right-click a partition, logical drive, or volume, and then click **Change Drive Letter and Paths**.

3. In the **Change Drive Letter and Paths** dialog box, do one of the following:

   • Assign a drive letter. To assign a drive letter, click **Add**, click a drive letter, and then click **OK**.

   • Remove a drive letter. To remove a drive letter, click the drive letter, and then click **Remove**.

   • Modify a drive letter. To modify a drive letter, click the drive letter that you want to modify, and then click **Change**. Click the drive letter that you want to use, and then click **OK**.

Creating a Mount Point

Mount points, also referred to as mounted drives, enable you to graft access to the root of one local volume on the folder structure of another local volume. When you mount a drive, Windows XP Professional assigns a drive path, rather than a drive letter, to the drive.

In addition, mounting a drive to a folder enables you to use an intuitive name for the folder, such as Project Data. Users would then save their documents in the Project Data folder rather than to a drive letter. Windows XP Professional ensures that drive paths retain their association to the drive so that you can add or rearrange storage devices without the drive path failing.

A useful example of mount points is illustrated in the following scenario.

A user recently installed Windows XP Professional onto a relatively small disk, drive C, and is concerned about using storage space unnecessarily. The user knows that the default document folder, My Documents, is on drive C, and she needs to use My Computer to store digital photos and desktop publishing files that she creates on the computer. Knowing that these types of documents can quickly consume storage space, the user creates a mounted volume by using an additional disk and mounts it to the folder called Publish on drive C. All files that she saves to the Publish folder actually reside on the new additional disk, saving space on drive C.

A mount point can be placed in any empty folder in an NTFS volume. The volume to be mounted can be formatted in any Windows XP Professional-accessible file system including NTFS, FAT16, FAT32, CDFS, or UDF. You can have multiple mount points for the same drive. Multiple mount points provide you a single drive from which to manage your files that are actually stored on various separate volumes.

Creating a New Mount Point

To create a new mount point:

1. Identify the empty folder on an NTFS partition or volume for your mount point.

2. Right-click the partition or volume you want to mount, and then click **Change Drive Letter and Path**.

3. Click **Add**.

4. Click **Mount in the following empty NTFS folder**.

5. Type the path to an empty folder on an NTFS volume, or click **Browse** to locate it. When the correct path is entered, click **OK**.

<table>
<tr><td>

Delivery Tip
Demonstrate this process to students by creating a folder on an existing partition or volume. Browse to the folder rather than typing the path to help students visualize the connection.

</td><td>

You must be logged on as Administrator or a member of the Administrators group in order to complete this procedure. If your computer is connected to a network, network policy settings may also prevent you from completing this procedure. If you are administering a local computer, you can browse folders on that computer to locate the folder to which you want to mount the disk. If you are administering a remote computer, browsing is disabled and you must type the path to an existing folder.

</td></tr>
</table>

Changing a Drive Path for a Mount Point

You cannot modify a drive path. If you need to change a drive path, you must remove it and then create a new drive path with the new information. You can view all drive paths in Disk Management by clicking **View**, and then clicking **Drive Paths**.

To remove a drive path, click the drive path, and then click **Remove**.

Lab 12A: Working with Dynamic Disks

Objectives

After completing this lab, you will be able to:

- Upgrade a basic disk to a dynamic disk.
- Create a new volume.
- Extend a simple volume.
- Mount a simple volume.

Prerequisites

Before working on this lab, you must have:

- Knowledge about the different types of disks in Microsoft Windows XP Professional.
- Experience using Microsoft Management Console (MMC).

Lab Setup

To complete this lab, you need the following:

- A computer running Microsoft Windows XP Professional.
- A single hard disk partitioned with drive C as the primary partition, and a minimum of 100 MB of unallocated disk space.

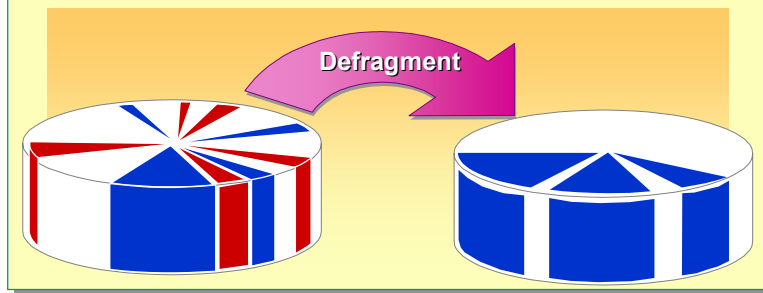**Estimated time to complete this lab: 30 minutes**

◆ Defragmenting Volumes

- **Using Disk Defragmenter**

- **Using Defrag.exe**

Defragment

Windows XP Professional attempts to save files in locations on the hard disk that are large enough to accommodate the entire file. If there is no suitable location, Windows XP Professional saves fragments of the file in several locations. This fragmentation of files on the hard disk decreases system performance because the computer must read file data from various locations on the hard disk.

Windows XP Professional provides two methods of defragmenting:

- Disk Defragmenter a snap-in tool

- The new **defrag** command-line tool.

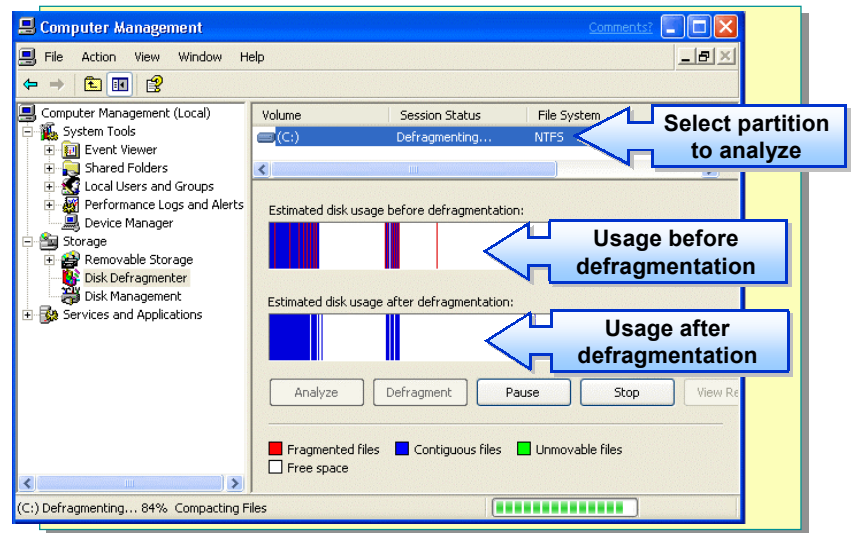Both tools enable you to defragment files or volumes of any cluster size.

Using Disk Defragmenter

Disk Defragmenter first analyzes the hard disk to determine the amount of file fragmentation. Based on the analysis report, you decide whether you will benefit from defragmenting the hard disk. Unless system performance will be significantly improved, you may want to wait before defragmenting the hard disk. Defragmenting a hard disk can take several hours, depending on the size of the hard disk.

If you decide to defragment the hard disk, the defragmenter moves the pieces of each file to one location, so that each file occupies a single, contiguous space on the hard disk. Consequently, your computer can read and save files more efficiently. By consolidating files, Disk Defragmenter also consolidates free space, making it less likely that new files will be fragmented.

Volumes might become excessively fragmented when you delete a large number of files or folders, so be sure to analyze volumes after deleting large amounts of data. Generally, volumes on busy file servers should be defragmented more often than those on single-user workstations.

Disk Defragmenter can defragment volumes or partitions formatted as FAT, FAT32, and NTFS. The Disk Defragmenter window has three panes that provide the following information:

■ The upper pane lists the partitions that you can select to analyze and defragment.

■ The middle pane provides a graphical representation of the estimated disk usage before defragmentation.

■ The lower pane provides a graphical representation of the estimated disk usage after defragmentation.

To start Disk Defragmenter, open Computer Management, and under Storage, click **Disk Defragmenter**. To analyze and defragment a partition by using Disk Defragmenter, select the options that are described in the following table.

Option	Description
Analyze	Click this button to analyze the disk for fragmentation. After the analysis, there is graphic representation of how fragmented the partition is, and a dialog box appears informing you if the disk should be defragmented or not.
Defragment	Click this button to defragment the disk. During defragmentation, there is a graphic representation of the defragmented partition.
Pause	Click this button to temporarily stop analyzing a volume.
Stop	Click this button to interrupt and stop analyzing a volume.
View Report	Click this button to view additional information about the files and folders that were analyzed.

By comparing Analysis display to Defragmentation display, you can quickly see the improvement in the partition after defragmentation.

Note   Although you can use a computer while its hard disk is undergoing defragmentation, there will be a serious deterioration in disk performance and the time that it takes to perform the defragmentation will significantly increase.
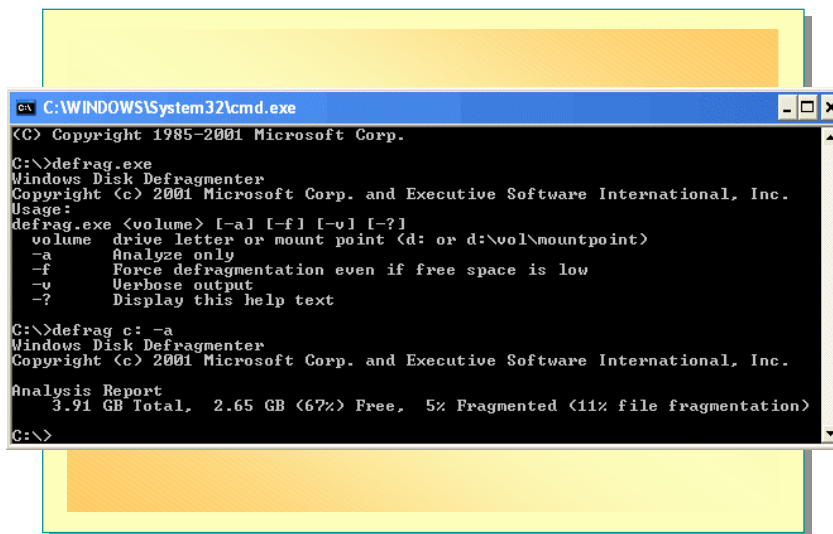
Using Defrag.exe

```
C:\WINDOWS\System32\cmd.exe                                               _ □ ✕
(C) Copyright 1985-2001 Microsoft Corp.

C:\>defrag.exe
Windows Disk Defragmenter
Copyright (c) 2001 Microsoft Corp. and Executive Software International, Inc.
Usage:
defrag.exe <volume> [-a] [-f] [-v] [-?]
  volume   drive letter or mount point (d: or d:\vol\mountpoint)
  -a       Analyze only
  -f       Force defragmentation even if free space is low
  -v       Verbose output
  -?       Display this help text

C:\>defrag c: -a
Windows Disk Defragmenter
Copyright (c) 2001 Microsoft Corp. and Executive Software International, Inc.

Analysis Report
    3.91 GB Total,  2.65 GB (67%) Free,  5% Fragmented (11% file fragmentation)

C:\>
```

A command-line version of Disk Defragmenter is available in Windows XP, Defrag.exe. You can use the command line version as part of a batch process to be executed when the disk is not in use. To use Defrag.exe:

1. At a command prompt, change to the disk that you want to defragment by typing **cd** *n***:** where *n* is the letter of the disk to defragment.

2. Type **defrag** <volume> (where volume is the driver letter or mount point, for example, d: or d:\Vol\Mountpoint).

   Additional parameters that can be appended to the command include:

   /a Analyze only
   /f Force defragmentation even if free space is low
   /v Verbose output
   /? Display this Help text

3. To exit the command prompt window, type **exit**.

Review

- **Working with Disk Management**

- **Working with Basic Disks**

- **Working with Dynamic Disks**

- **Preparing Disks when Upgrading to Windows XP Professional**

- **Managing Disks**

- **Defragmenting Volumes**

1. You are responsible for supporting a number of Windows XP Professional based computers. A user calls and says that she is running out of disk space on her data drive. This user is required to store a large amount of data on her local computer. You examine the computer and notice that the partition is compressed already, and is very low on available space. The computer is configured with a single hard disk that is divided into two partitions on a basic disk. All of the user's data is stored on the second partition. How do you correct this issue while affecting the user's environment as little as possible?

   The quickest and least disruptive solution is to create a spanned volume. Begin by converting the basic disk to a dynamic disk. Install an additional hard disk, convert this new disk from basic to dynamic, and then extend the user's data volume to include the free space available on this new dynamic disk.

2. Use the same scenario in question one, but now also consider that the user's hard disk is configured as follows:

   - Single basic disk

   - Single partition

   - NTFS file system, compressed

   What can you do to correct the issue described in the question one scenario, while affecting the user's environment as little as possible?

   Create a volume mount point to a new disk. Begin by installing an additional hard disk. Create a folder on drive C and mount this new partition to that folder. Another method may be to use an additional drive letter for the new volume, but that could possibly be disruptive to the user's environment by requiring the user to change where that user stores files. All shortcuts, automatic file saves, and program default folders that are affected would need to be changed.

3. You support a computer running Windows XP Professional that needs to be configured so that five different users can log in to this computer by using their own custom user settings and private data storage locations. You have decided to use a unique drive letter for each user's data storage. How would you configure this computers disk?

   Create single partition during setup for the operating system. After the installation, convert the basic disk to a dynamic disk. Create five additional volumes and assign drive letters to each volume.
   Optional: To complete the task, log on as each user and set the My Documents target folder location to their assigned drive letter, and configure NTFS permissions to only allow access to the assigned user.

4. A user reports that since a new hard disk was installed in his computer, he has not able to gain access to that disk. When you examine his computer, you notice that the new disk that was installed displays a status of Foreign. What can you surmise about this disk's origin, and what do you do to fix this issue?

   The disks may have originated from a computer running Windows 2000 and had been configured as a dynamic disk. To correct this issue, use the Import Foreign Disk option in Disk Management.