

# **Working with Disks and Devices**

Lesson 4

## Objectives

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- Describe MBR and GPT partition styles
- Describe basic and dynamic disks
- Describe the 4 types of dynamic volumes
- Use the Disk Management snap-in to manage disks
- Create Virtual Hard Disks (VHDs)
- Describe the purpose of a Device Driver
- Use the Device Manager snap-in to manage your hardware

## Working with Disks

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- Select a partition style
- Select a disk type
- Divide the disk into partitions or volumes
- Format with a file system

# Understanding Partition Styles

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- MBR – Master Boot Record
- GPT – GUID (globally unique identifier) Partition Table

# Partition Style Comparison

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## MBR

- Supports up to 4 primary partitions, or 3 primary and an extended
- Supports volumes up to 2 terabytes
- Uses hidden sectors to store system information
- Replication and CRC are NOT features of MBR's partition table

## GPT

- Supports up to 128 primary partitions
- Supports volumes up to 18 exabytes
- Uses partitions to store system information
- Replication and cyclical redundancy check (CRC) protection of the partition table for reliability

## Disk Types – Basic Disk

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- Compatible with other versions of Windows
- Consists of primary and extended partitions
- Supports up to four partitions (per single hard drive)
- Windows can only be installed on basic storage type partitions

# Primary and Extended Partitions

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## PRIMARY

- Functions as a physically separate disk
- Can host an OS
- Can be marked as active (and used to boot from)
- Up to 4 are supported or 3 + 1 extended
- Each is formatted and assigned a drive letter

## EXTENDED

- Cannot host an OS
- Cannot be active partition
- Basic disk can only host 1 Extended but unlimited logical partitions
- Do not format extended partition, but only the logical drives

## Disk Types – Dynamic Disks

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- Supported by Windows 2000/XP/Vista/7
- Can combine two or more physical disks into one dynamic disk
- Are divided into volumes
- Unlimited number of volumes
- Not supported on:
  - Portable computers
  - Removable disks
  - External USB or Firewire Drives
  - Windows 7 Starter or Home editions



# Volume Types

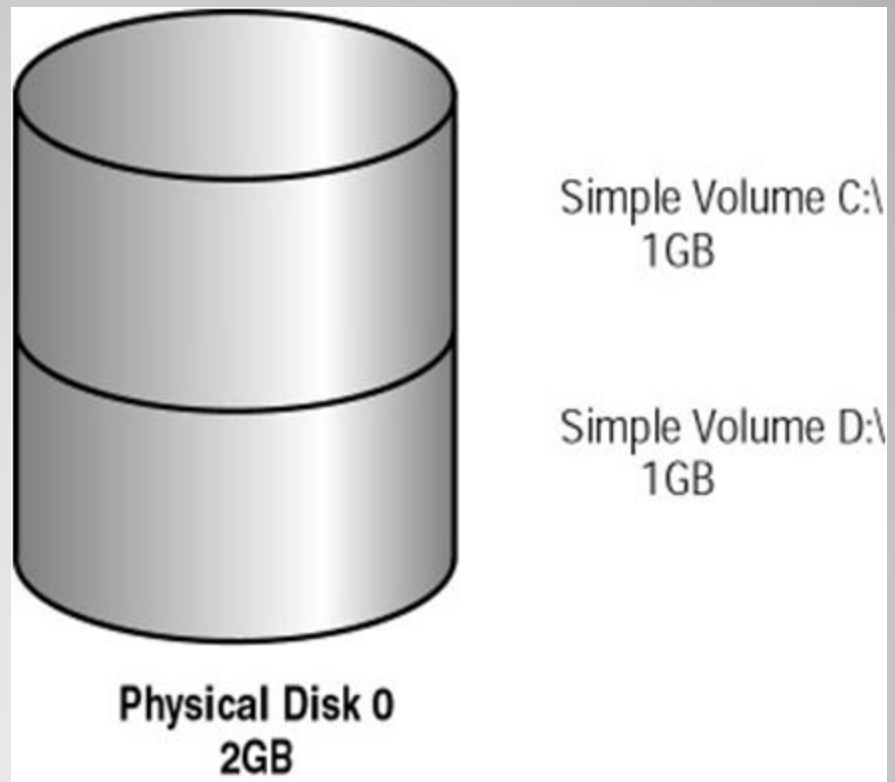
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- Simple volume
- Spanned volume
- Striped volume
- Mirrored volume

# Dynamic Disk - Simple Volume

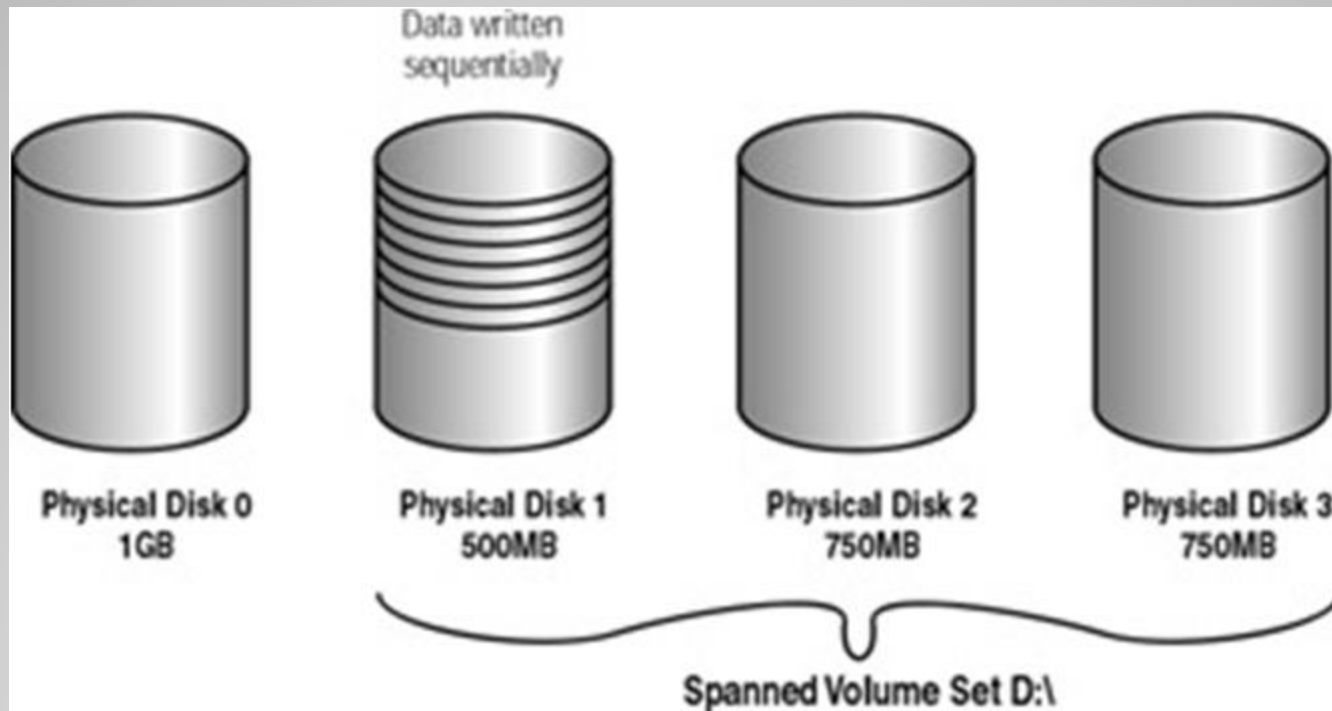
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- Contains space from a single dynamic drive



## Dynamic Disk - Spanned Volume

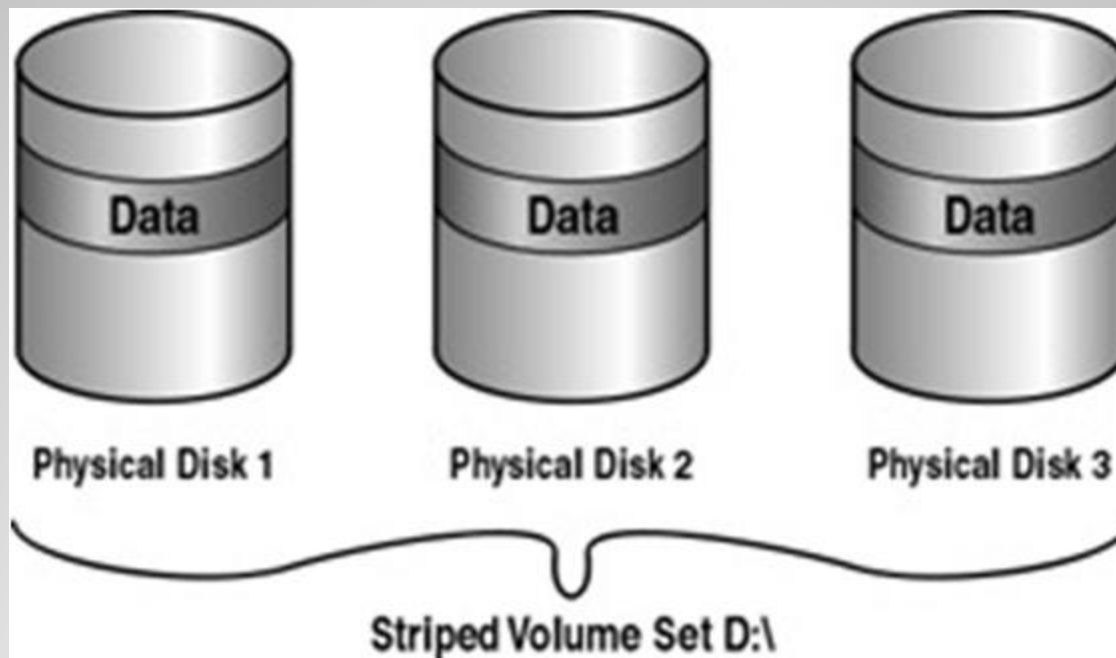
- Consists of disk space on 2 to 32 dynamic drives (any size)



## Dynamic Disk - Striped Volume

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- stores data in equal stripes on 2 - 32 dynamic drives (same size)



# Dynamic Disk – Mirrored Volume

The screenshot displays the Windows Disk Management console. At the top, a table lists the system's volumes. Below this, a graphical representation shows four disks: Disk 0 (Basic, 24.00 GB), Disk 1 (Basic, 50.00 GB), Disk 2 (Dynamic, 24.00 GB), and Disk 3 (Dynamic, 24.00 GB). Disk 0 contains a 100 MB System Reserved partition and a 23.90 GB (C:) NTFS partition. Disk 1 has a 32.23 GB (F:) exFAT partition and 17.77 GB of unallocated space. Disk 2 and Disk 3 each contain a 24.00 GB (E:) NTFS mirrored volume. A legend at the bottom identifies the colors: black for unallocated space, blue for primary partitions, and red for mirrored volumes.

Volume	Layout	Type	File System	Status	Capacity	Free Spa...	% Free	Fault Tolerance
(C:)	Simple	Basic	NTFS	Healthy (B...	23.90 GB	14.26 GB	60 %	No
GRMCENXVOL_EN...	Simple	Basic	UDF	Healthy (P...	2.91 GB	0 MB	0 %	No
New Volume (E:)	Mirror	Dynamic	NTFS	Healthy	24.00 GB	23.91 GB	100 %	Yes
New Volume (F:)	Simple	Basic	exFAT	Healthy (P...	32.22 GB	32.22 GB	100 %	No
System Reserved	Simple	Basic	NTFS	Healthy (S...	100 MB	72 MB	72 %	No

**Disk 0**  
Basic  
24.00 GB  
Online  
System Reserved  
100 MB NTFS  
Healthy (System, Active, Primary P  
(C:)  
23.90 GB NTFS  
Healthy (Boot, Page File, Crash Dump, Primary Partition)

**Disk 1**  
Basic  
50.00 GB  
Online  
New Volume (F:)  
32.23 GB exFAT  
Healthy (Primary Partition)  
17.77 GB  
Unallocated

**Disk 2**  
Dynamic  
24.00 GB  
Online  
New Volume (E:)  
24.00 GB NTFS  
Healthy

**Disk 3**  
Dynamic  
24.00 GB  
Online  
New Volume (E:)  
24.00 GB NTFS  
Healthy

■ Unallocated ■ Primary partition ■ Mirrored volume

# File Systems

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- NTFS
  - Preferred file system for Windows 7
  - Partitions up to 4 TB
  - Security (encryption and permissions)
- FAT (FAT16) – Partitions up to 4 GB
- FAT32 – Partitions up to 32 GB (Windows 7 limitation)
- exFAT (FAT64) – Intended for large USB drives, not hard drives

# Disk Management Snap-In

**Disk Management**

File Action View Help

← → [Icons]

Disk	Type	Capacity	Unallocated Space	Status	Device Type	Partition Style
Disk 0	Basic	8.56 GB	3.55 GB	Online	SCSI	GPT
Disk 1	Basic	4.24 GB	0 MB	Online	SCSI	MBR
Disk 2	Basic	8.48 GB	0 MB	Online	SCSI	GPT
Disk 3	Dynamic	16.96 GB	8.83 GB	Online	SCSI	GPT
CD-ROM 0	CD-ROM (E:)	0 MB	0 MB	No Media	IDE	Not Applicable

<b>Disk 0</b> Basic 8.56 GB Online	102 MB FAT Healthy (System)	<b>(F:)</b> 4.88 GB NTFS Healthy (Boot)	3.55 GB Unallocated
<b>Disk 1</b> Basic 4.24 GB Online	<b>New Volume (C:)</b> 4.24 GB NTFS Healthy		
<b>Disk 2</b> Basic 8.48 GB Online	<b>New Volume (D:)</b> 8.45 GB NTFS Healthy		
<b>Disk 3</b> Dynamic 16.96 GB Online	<b>New Volume (H:)</b> 4.00 GB NTFS Healthy	<b>New Volume (I:)</b> 4.00 GB NTFS Healthy	8.83 GB Unallocated
<b>CD-ROM 0</b> CD-ROM (E:)  No Media			

Unallocated
  Primary partition
  Simple volume

## Using the Disk Management Snap-In

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- Initializing disks
- Selecting a partition style
- Converting basic disks to dynamic disks
- Creating partitions and volumes
- Extending, shrinking, and deleting volumes



## Using the Disk Management Snap-In (cont'd)

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- Formatting partitions and volumes
- Assigning and changing driver letters and paths
- Examining and managing physical disk properties such as disk quotas, folder sharing, and error checking

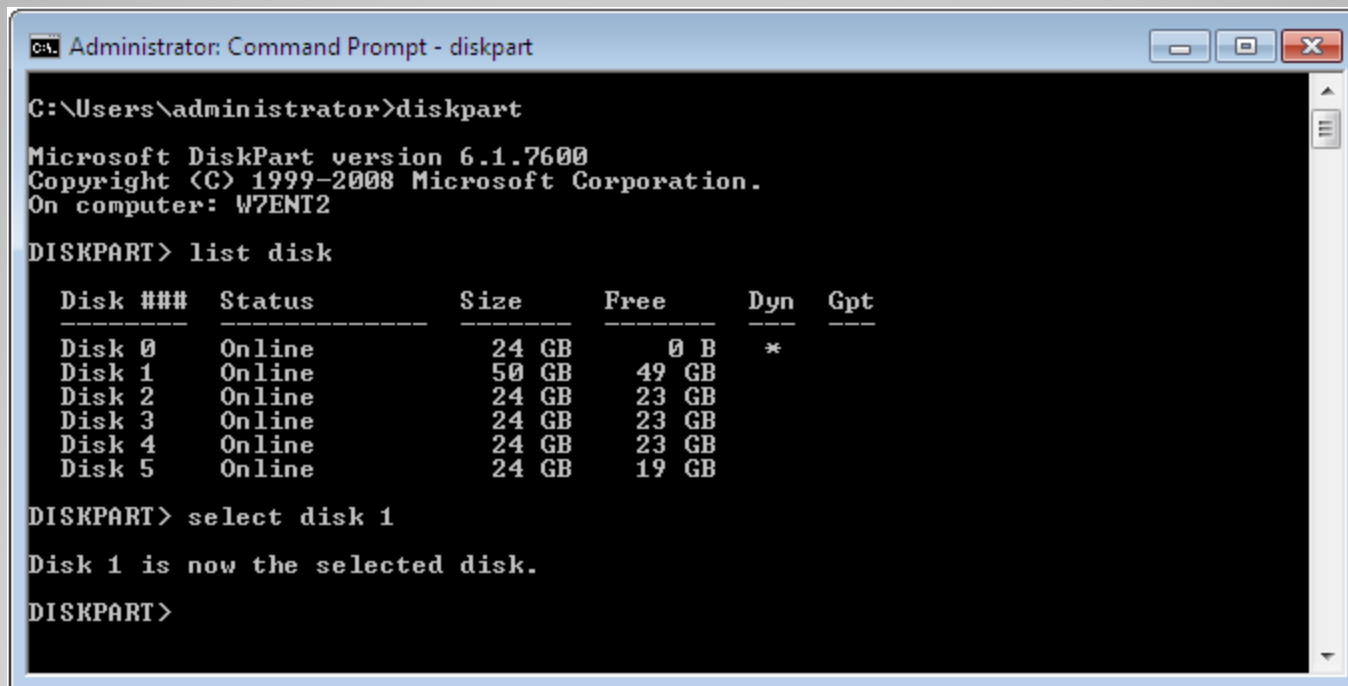
## Using Disk Tools

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- Disk Cleanup
- Defragmenting disks
- Checking for disk errors

# Diskpart.exe

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```
Administrator: Command Prompt - diskpart
C:\Users\administrator>diskpart
Microsoft DiskPart version 6.1.7600
Copyright (C) 1999-2008 Microsoft Corporation.
On computer: W7ENT2

DISKPART> list disk

   Disk ###  Status         Size           Free           Dyn  Gpt
   -----  -
   Disk 0    Online         24 GB          0 B            *
   Disk 1    Online         50 GB          49 GB
   Disk 2    Online         24 GB          23 GB
   Disk 3    Online         24 GB          23 GB
   Disk 4    Online         24 GB          23 GB
   Disk 5    Online         24 GB          19 GB

DISKPART> select disk 1

Disk 1 is now the selected disk.

DISKPART>
```

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# **WORKING WITH VHDS**

## Virtual Hard Disk (VHD)

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- VHD file format
  - Contains the entire contents of a hard disk in a single, portable file
  - Can be used to move entire virtual machines (VMs) from one host computer to another
  - VHD functions exactly like a hard disk drive does in a physical machine
  - Can be created with Disk Management tool or Diskpart.exe

## Other Uses for VHDs

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- Moving files between a VHD and the host file system
- Backup and recovery
- Antivirus and security
- Image management and patching

## Native Boot

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- Supported by Windows 7 Enterprise, Ultimate, and all versions of Windows Server 2008
- Enables you to create and modify VHDs
- Boot Windows 7 from a VHD without having to run a virtual machine manager

## **Advantages of Native Boot**

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- Offline image updates
- Image format
- Image deployment testing
- Workstation configuration management

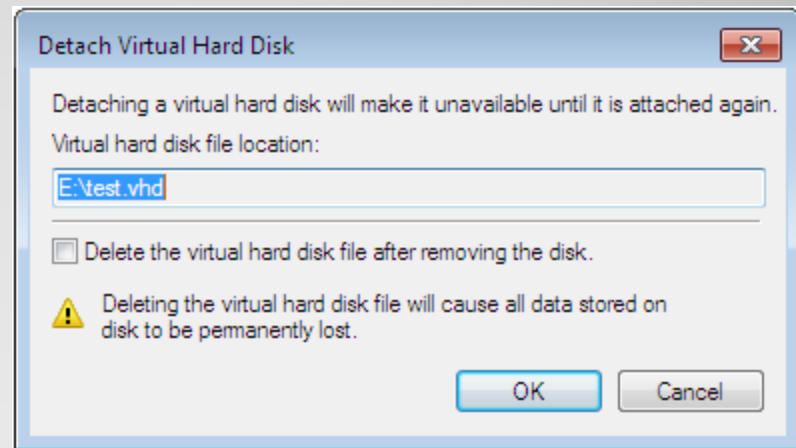
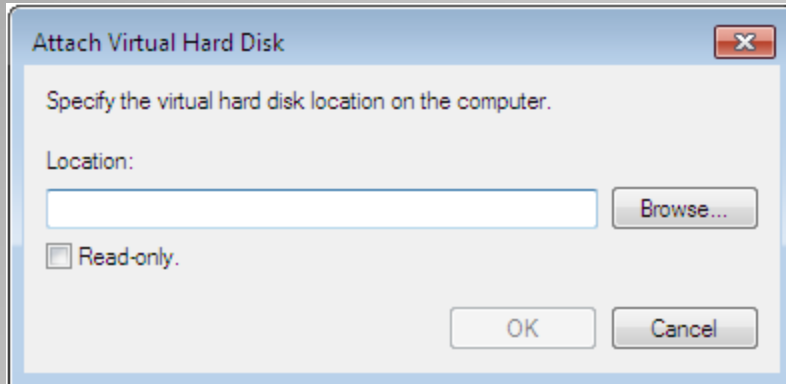


## Attaching and Detaching VHDs

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- Creating a new VHD automatically mounts it into the Windows 7 file system
- Mounting of a VHD is not persistent
  - Each time you restart Windows 7, you must attach the VHD using the Disk Management snap-in before you can access its contents.

# Attaching and Detaching VHDs



## Booting from a VHD

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- Booting directly from a VHD is a new feature of Windows 7
- Deploy an image to a VHD file just like to a physical disk
- Add the VHD to the boot menu using BCDedit

# Using BCDedit to Add VHD to Boot Menu

Administrator: Command Prompt

```
C:\Users\administrator>bcdedit /copy {default} /d "vhd boot <locate>"  
The entry was successfully copied to {935ab72e-09ac-11df-af4d-9f91bcd98fb5}.  
C:\Users\administrator>
```

Administrator: Command Prompt

```
C:\Users\administrator>bcdedit /set {935ab731-09ac-11df-af4d-9f91bcd98fb5} device vhd=[locate]\test.vhd  
The operation completed successfully.  
C:\Users\administrator>bcdedit /set {935ab731-09ac-11df-af4d-9f91bcd98fb5} osdevice vhd=[locate]\test.vhd  
The operation completed successfully.  
C:\Users\administrator>
```

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# **WORKING WITH DEVICES AND DRIVERS**

## Device Drivers

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- Software that provides the operating system with information about the devices
- Vary in complexity depending on the complexity of the device
- Signed drivers assure that a driver comes from an authentic publisher and has not been altered (to include malware).

## Creating a Driver Update Policy

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- Hardware manufacturers release driver updates to:
  - Address problems with the previous driver release(s)
  - Implement new features
  - Enhance performance of the device

## Understanding Driver Signing

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- Windows 7 will give one of the following messages if it perceives a problem:
  - Windows can't verify the publisher of this driver.
  - The driver has been altered.
  - Windows cannot install this driver.



## Supplying Drivers During Installation

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- When the installation program fails to identify a device:
  - A generic driver is installed.
  - The device is left without a driver.
  - Permits you to supply an alternate driver or halts.

## Updating Drivers with Windows Update

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- Windows Update Web site contains a large library of device driver updates
- Passed Windows Hardware Quality Labs (WHQL) testing
- **Manual update** – Supplies a list of updated drivers for installed hardware (optional)
- **Automatic update** – Downloads device drivers only for hardware with no drivers installed

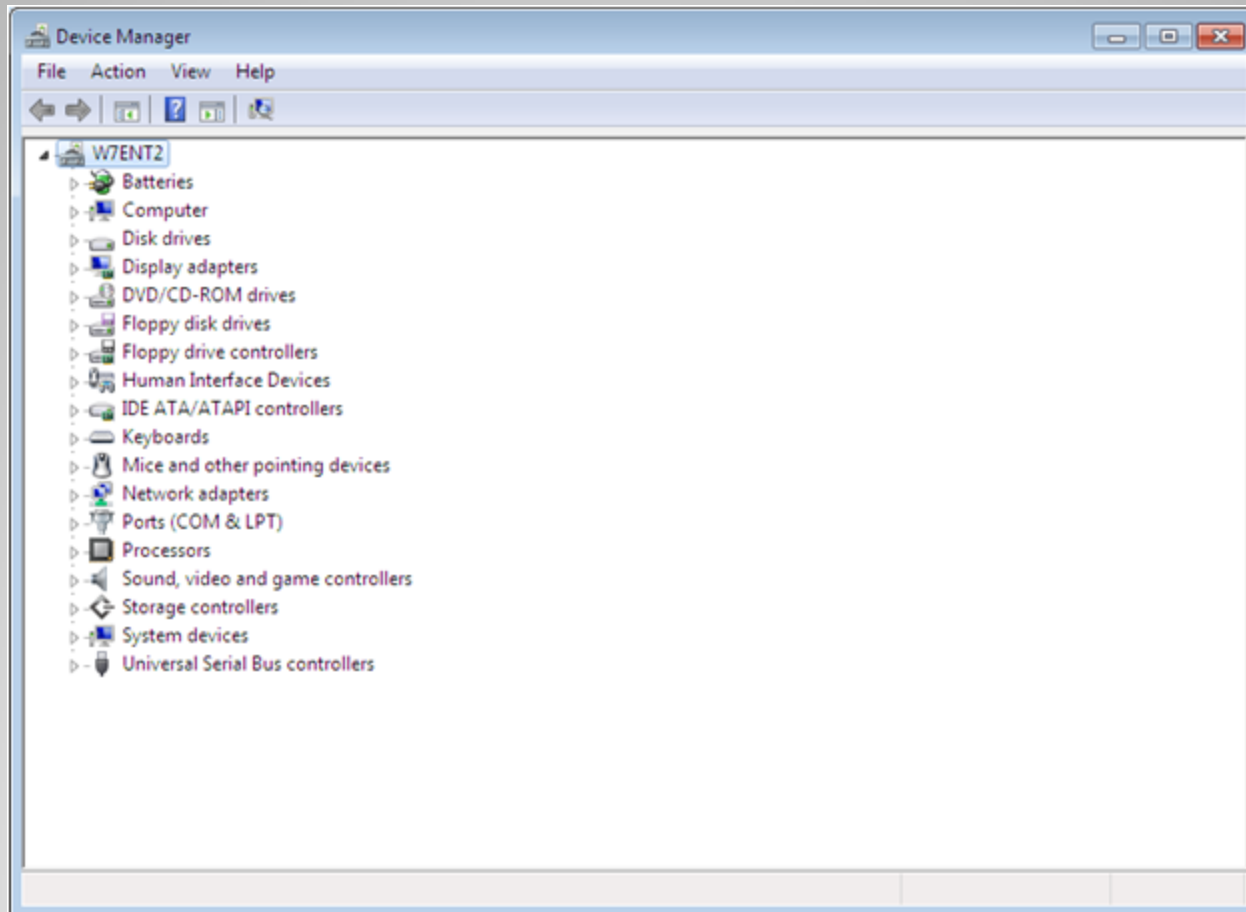
## Using Device Manager

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- Tool for managing devices and their drivers
- Get information about the devices installed on the computer
- Install, update, roll back, and troubleshoot device drivers

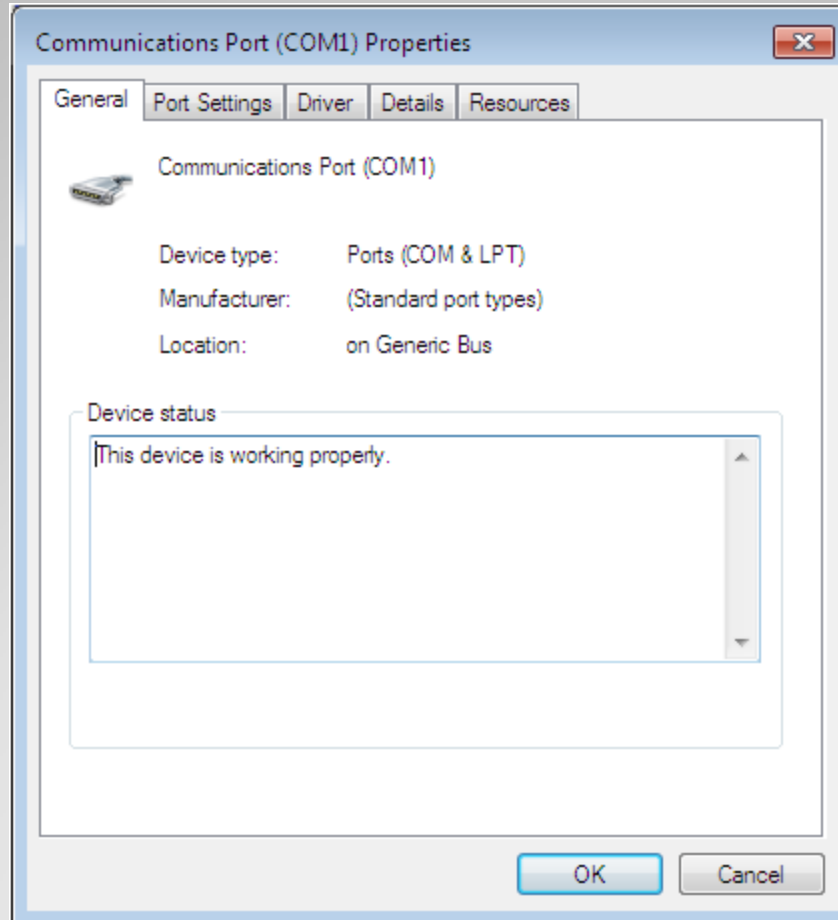
# Device Manager

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# Viewing Device Properties

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## Troubleshooting Drivers

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- Techniques for troubleshooting hardware or driver problems:
  - Launch a troubleshooter from inside the Properties sheet of the device
  - Delete the device in the Device Manager and restart to allow it to be detected again
  - Use Safe Mode to load generic drivers to allow you into the system to troubleshoot

## Skills Summary

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- There are two hard disk partition styles that you can use in Windows 7: MBR and GPT.
- Windows 7 supports two disk types: basic disks and dynamic disks.
- Basic disks can have up to four partitions: three primary partitions and a fourth usually being an extended partition on which you can create multiple logical drives.
- Windows 7 supports four types of dynamic volumes: simple, spanned, striped, and mirrored.

## Skills Summary (cont.)

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- You use the Disk Management snap-in for MMC to manage disks.
- The Virtual Hard Disk (VHD) format defines a file that contains the entire contents of a hard disk in a single, portable file that administrators can use to move entire virtual machines (VMs) from one host computer to another.
- Native boot enables you to create and modify VHDs and even boot Windows 7 from a VHD, all without having to run Virtual PC or Hyper-V.



## Skills Summary (cont.)

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- Device drivers are software components that applications and operating systems use to communicate with specific hardware devices.
- Plug and Play is a standard that computers use to detect and identify hardware devices, and then install and configure drivers for those devices.
- Using Device Manager, you can enable and disable devices, update and roll back drivers, and manage device and device driver properties.