Hard Drives

How to Install

Hard Drives

•Hard disks were invented in the 1950s.

•They started as large disks up to 20 inches in diameter holding just a few megabytes.

•They were originally called "fixed disks" or "Winchesters" (a code name used for a popular IBM product).

•They later became known as "hard disks" to distinguish them from "floppy disks."

•Hard disks have a hard platter that holds the magnetic medium, as opposed to the flexible plastic film found in tapes and floppies.

Capacity and Performance

•A typical desktop machine will have a hard disk with a capacity of between 10 and 40 gigabytes.

•Data is stored onto the disk in the form of files.

•A file is simply a named collection of bytes. The bytes might be the ASCII codes for the characters of a text file, or they could be the instructions of a software application for the computer to execute, or they could be the records of a data base, or they could be the pixel colors for a GIF image.

•No matter what it contains, however, a file is simply a string of bytes. When a program running on the computer requests a file, the hard disk retrieves its bytes and sends them to the CPU one at a time.

Capacity and Performance

There are two ways to measure the performance of a hard disk:

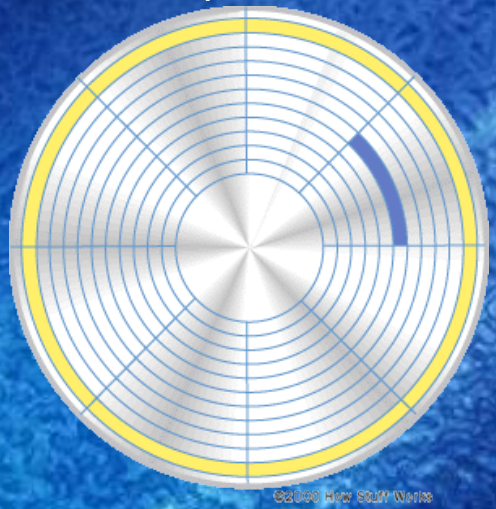
- **Data rate** - The data rate is the number of bytes per second that the drive can deliver to the CPU. Rates between 5 and 40 megabytes per second are common.

- **Seek time** - The seek time is the amount of time between when the CPU requests a file and when the first byte of the file is sent to the CPU. Times between 10 and 20 milliseconds are common.

The other important parameter is the **capacity** of the drive, which is the number of bytes it can hold.

Storing the Data

Data is stored on the surface of a platter in sectors and tracks. Tracks are concentric circles, and sectors are pie-shaped wedges on a track, like this:



A typical track is shown in yellow; a typical sector is shown in blue. A sector contains a fixed number of bytes -- for example, 256 or 512. Either at the drive or the operating system level, sectors are often grouped together into clusters.

Storing the Data

- The process of **low-level formatting** a drive establishes the tracks and sectors on the platter. The starting and ending points of each sector are written onto the platter. This process prepares the drive to hold blocks of bytes.

- **High-level formatting** then writes the file-storage structures, like the file-allocation table, into the sectors. This process prepares the drive to hold files.

How to Add a Hard Drive

Before we start the process of adding a drive, we need to do a small amount of research inside your machine.

The goal of the research is to find out if it will be easy or not so easy to add the new hard drive.

We also need to find out what kind of drive you need to buy.

You may be able to do this research by reading through your computer's manuals, but it is far easier to simply open the case and look inside.

How to Add a Hard Drive

- The first question to answer is: How many hard disk drives have already been installed inside the case?

- In the majority of machines, the answer to this question is "one." Having only one hard disk drive installed makes it easy to install another one.

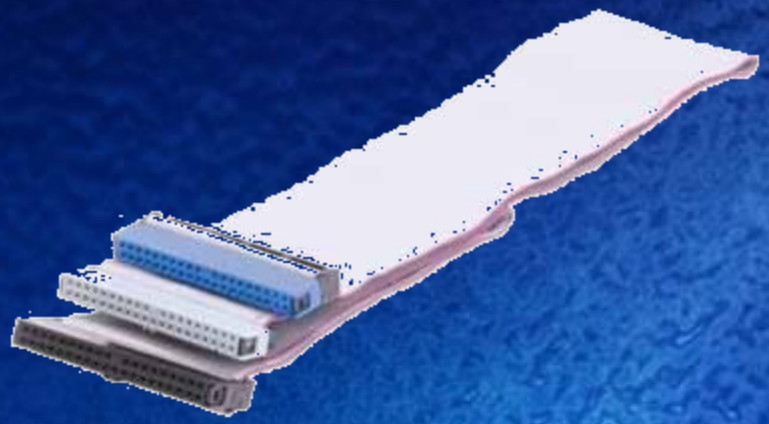
How to Add a Hard Drive

- Is there space available to add another hard-disk drive? Your current hard disk is probably mounted in a small metal cage or rack inside the machine.
- Make sure there is space available in the cage for another drive.
- If not, you would need an external drive

How to Add a Hard Drive

- Find out what type of cable system is used to connect drives to the motherboard.
- There are two systems in common use: IDE drives (also known as PATA, or Parallel ATA), and SATA (Serial ATA) drives.
- PATA drives have wide, flat cables or thick cables as wide as your finger, while SATA drives have thin cables about the diameter of a pencil. You will need to know whether to buy an IDE or SATA drive, and you should be able to tell by looking at the cables.

How to Add a Hard Drive



An IDE, or PATA hard drive, uses a wide, flat or thick cable to connect to the computer's motherboard.

A SATA hard drive uses thin cables about the diameter of a pencil to connect to the computer's motherboard

Adding a new Hard Drive

- You have five basic steps:
  - setting the **jumpers**
  - mounting the drive
  - plugging in the **power connector**
  - connecting the cable
  - configuring the drive

Formatting & Partioning

- Once you have successfully installed a hard drive there are two steps to make the drive usable
  - Partioning
  - Formatting

- Partioning is the process of electronically subdividing the physical hard drive into partitions

- Formatting puts a file system onto the drive that organizes each partition in such a way that the operating system can store files and folders on the drive

Partitioning Hard Drives

- Partions are electronic, logical divisions of a hard drive into groups of cylinders
  - A computer can have from 1 to 24 logical drives, which are assigned the drives C: to Z:
  - You must partition the hard drive before you can use it

Partioning

- There are two styles of partitioning
  - Basic Disks
  - Dynamic Disks

Partitioning Basic Disk

- Partitioning creates
  - A master boot record (MBR) and a partition table
  - The boot sector contains the MBR and the partition table
- The MBR is a tiny bit of code that takes control of the boot process from the system BIOS
- The MBR has one job, to look for a partion in the partition table with a valid operating system

Partitioning

- Every partition in the partition table that contains a valid OS has a special setting called active that the MBR uses to determine which OS to load.
- Only one partition at a time can be mad the active partition

Partition Types

- There are two types of partitions:
  - Primary
  - Extended

- No matter how many drive letters you see, there are never more than four partitions per drive

Primary Partitions

- Primary partitions store the OS(s). If you want to boot from a hard drive, it must have a primary partition
- In Windows 9x/Me and NT/2000/XP, the primary partition is c: and that cannot be changed
- The A+ exam expect you to know that you can add more than one primary partition to a hard drive

Active Partition

- When you create a single partition, you must set the partition as active
- A Hard Drive must have an Active Partition to be Bootable

Extended Partition

- Extended partitions are not bootable, and a hard drive can only have one extended partition.
- You may only have up to three primary partitions on a drive with an extended partition
- You can use extended partitions when you want to chop a drive into multiple drive letters
- An extended partition has a maximum of 24 logical drives on one system

Formatting

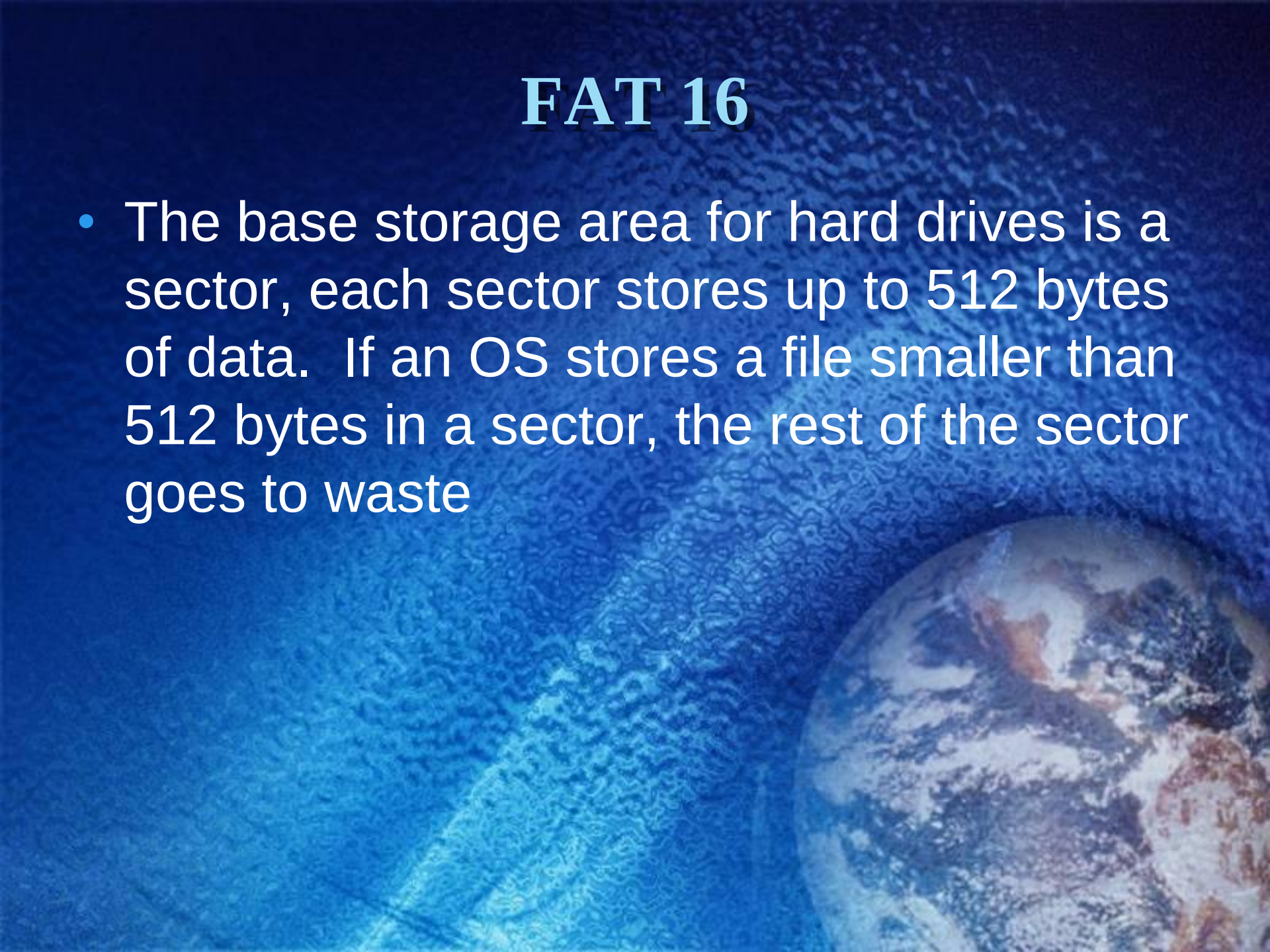
- Every partition have to be formatted to enable it to hold data
- Formatting does two things
  - Create a file system - like a card catalog
  - Makes the root directory in the file system
- C:\ is the root directory of the primary master hard drive

Files Systems in Windows

- FAT16 (File Allocation Table)
- FAT32
- NTFS4
- NTFS5

FAT 16

- The base storage area for hard drives is a sector, each sector stores up to 512 bytes of data. If an OS stores a file smaller than 512 bytes in a sector, the rest of the sector goes to waste



FAT 32

- Supports partitions up to 2 terabytes (more than 2 trillion bytes) FAT 32 uses 32 bits to describe each cluster, Which means cluster can drop to more reasonable sizes

NTFS 4

- Utilizes an enhanced file allocation table called the Master File Table (MFT).
- Keeps a backup copy of the most critical parts of the MFT
- Views individual files and folders as objects and provides security for those objects through Access Control List (ACL)
- Enable you to compress individual files and folders to save space on a hard drive

NTFS 5

- Window 2000 and XP offer NTFS 5, an upgraded version of the NT file system that enable encryption of files, setting limits on the amount of hard drives space taken by any one user and mounting a volume as a folder in another drive

Formatting a partition

- You can format a hard drive simply by typing format x: at the command prompt
- Format a new drive in windows
- Boot for a different drive and then format from the command prompt

Maintaining & Troubleshooting

- ScanDisk
  - Used to check for bad cluster. When it finds band clusters, it puts the electronic equivalent of orange cones around them so that the system wont try to place data in those bad clusters
    - Right click on the drive you want to check, select properties, select the tools tab

Maintaining & Troubleshooting

- Defragmentation
  - Start – Programs- Accessories – System tools
  - Optimizes space used on a drive

Disk Cleanup

- Gets rid of four types of files:
  - Recycle bin
  - Temporary Internet Files
  - Downloaded Program Files
  - Temporary Files

  Start – Program- Accessories – System Tools – Disk Cleanup