

# **Physical File Organization** **(The Organization of Hard Disk)**

## **Contents of Lecture:**

- ❖ Secondary Storage Devices.
- ❖ The Organization of Disks.
  - ✓ Platters
  - ✓ Read/Write heads
  - ✓ Arm assembly
  - ✓ Spindle
  - ✓ Arms

## **Secondary Storage Devices:**

Since secondary storage is different from main memory we have to understand how it works in order to do good file design. Two major types of secondary storage:

### **1) Direct Access Storage Devices (DASD):**

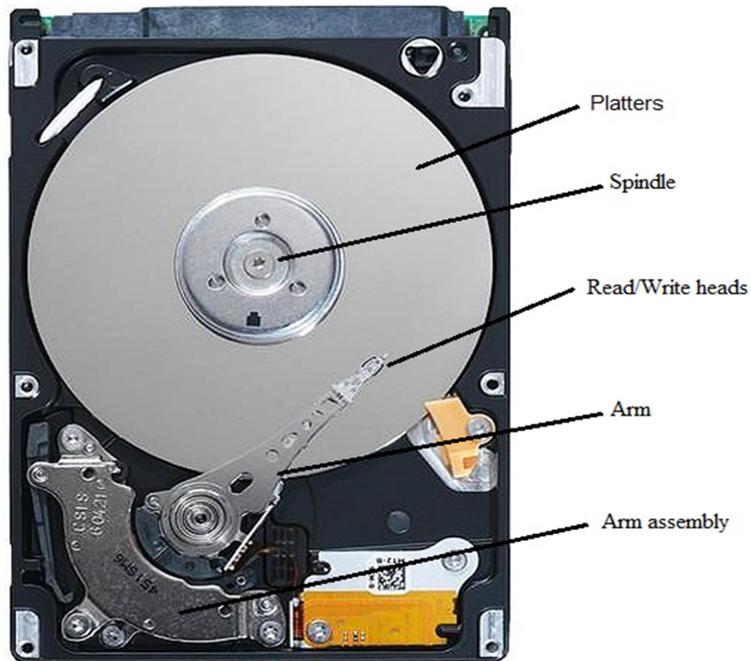
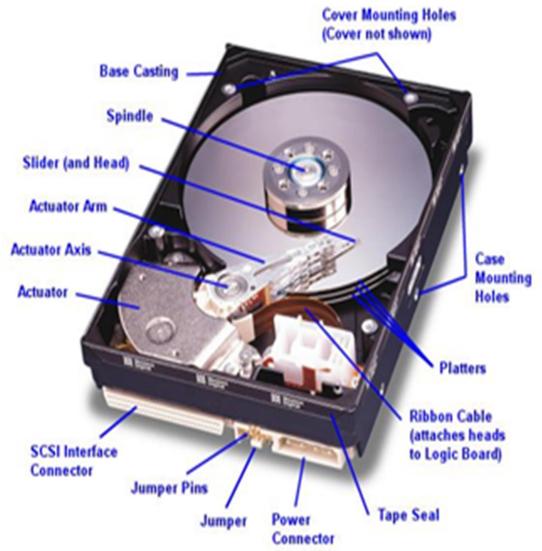
- ❖ **Magnetic Disks:**
  - ✓ Hard Disk.
  - ✓ Floppy Disk.
- ❖ **Optical Disks:**
  - ✓ CD-ROM (Compact Disk – Read Only Memory).
  - ✓ CD-R (Compact Disk – Recordable).
  - ✓ CD-RW (Compact Disk – ReWritable).
  - ✓ DVD (Digital Video Disk).

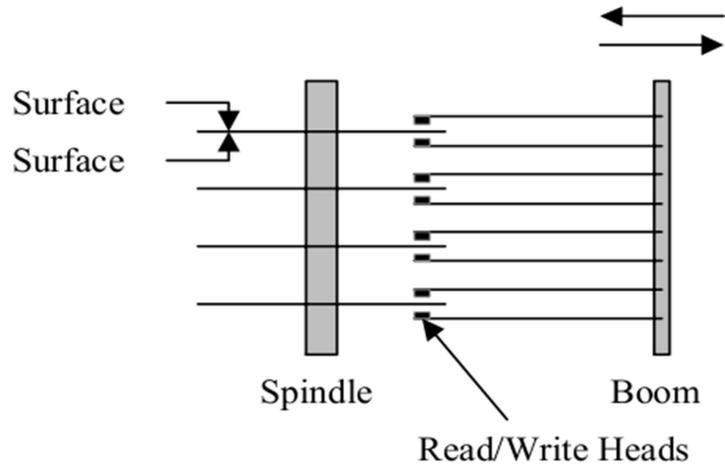
### **2) Serial Access Storage Devices (SASD):**

- ❖ **Magnetic Tape**

## **The Organization of Disks:**

- ❖ We can use disks or Hdd to refer to the hard disks.
- ❖ The important components in disks are:
  1. **Platters**
  2. **Read/Write heads**
  3. **Arm assembly**
  4. **Spindle**
  5. **Arms**
- ❖ Figure below show the component inside the disks.





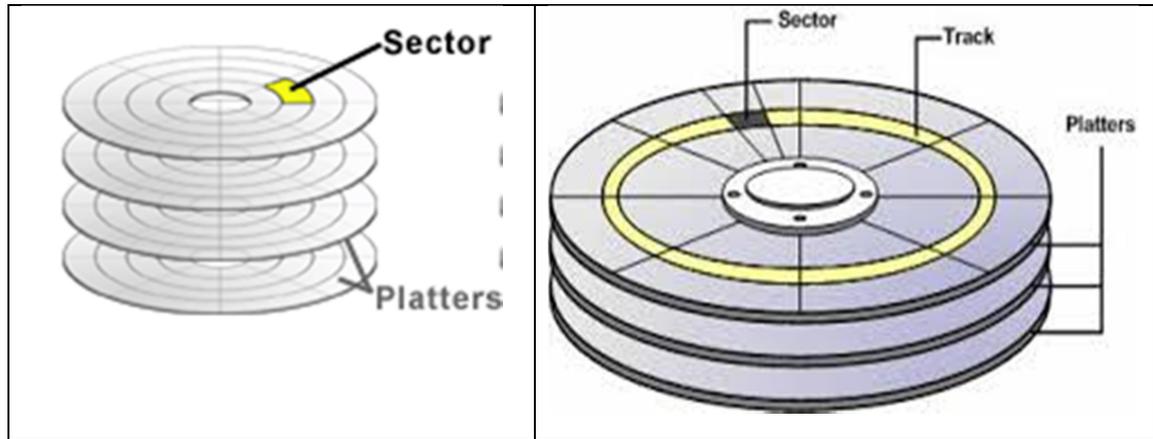
Disk drive with 4 platters and 8 surfaces

## 1. Platter:

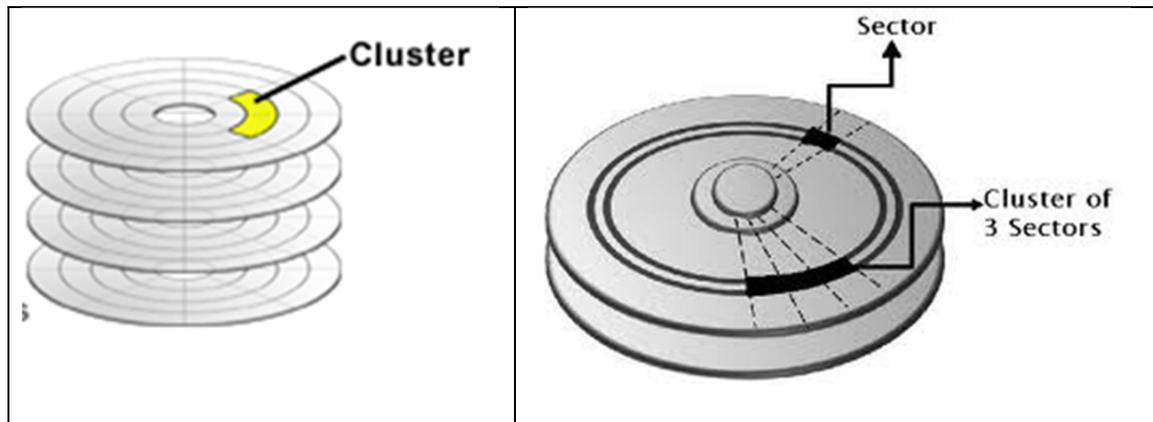
- ❖ Platter is the circular disk on which magnetic data is stored in a hard disk drive.
- ❖ Platter can store information on both sides (surface) of one or more platters.
- ❖ All surfaces have the same components at the same position.
- ❖ The platters inside a hard disk are structured to facilitate to storage and retrieval of data.
  
- ❖ Each platter is divided into concentric rings called **Tracks**.
  - ✓ There are thousands of tracks on each platter.
  - ✓ They look like the rings.
  - ✓ The information is stored in successive tracks on the surface of the disk.
  - ✓ **Track Capacity = number of sectors per track \* bytes per sector**



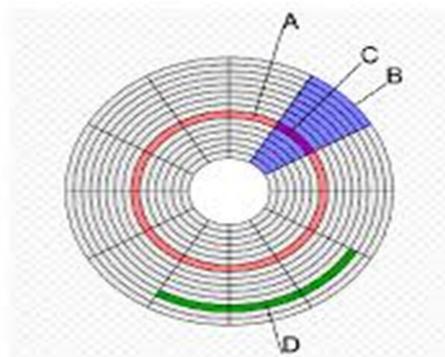
- ❖ Each track is divided into a number of **Sectors**.
  - ✓ A sector is the smallest addressable portion of a disk.
  - ✓ As a rule; sector holds **512 byte** of data.



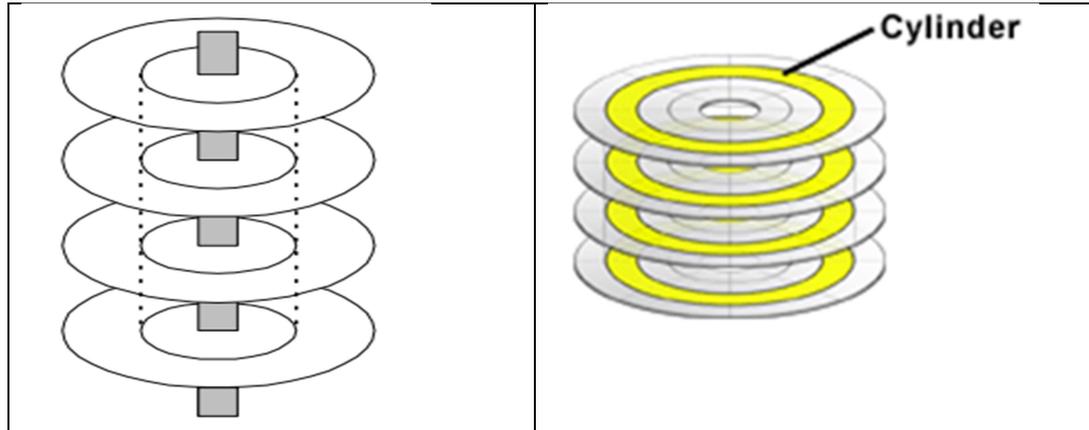
- ❖ Another view of sector organization is the one maintained by the O.S.'s file manager. It views the file as a series of **Clusters** of sectors.
  - ✓ A cluster is fixed numbers of contiguous sectors.
  - ✓ **Example:** if sectors size = 512 byte and cluster size = 2 sectors  
the cluster size =  $2 * 512 = 1024$  byte



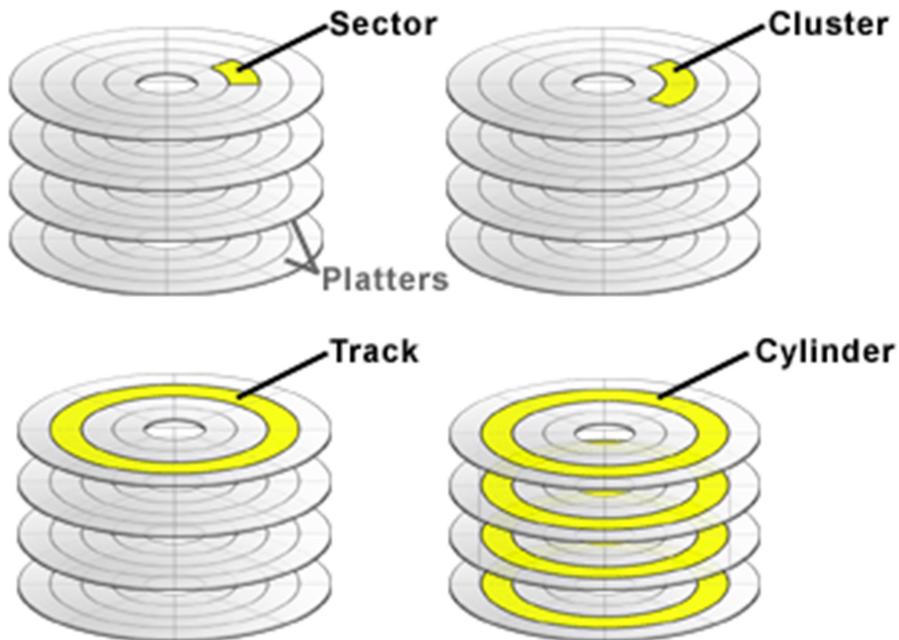
A : Track  
B : Geometrical Sector  
C : Track Sector  
D : Cluster



- ❖ Cylinder is a set or number of tracks that are directly above /below each other.
  - ✓ All the information on a single cylinder can be accessed without moving the arm that holds the read/write heads.
  - ✓ **Number of cylinder = the number of tracks in a surface.**
  - ✓ **Cylinder Capacity = number of tracks per cylinder \* track capacity**



- ❖ So, platter has four components:
  - ✓ Sector
  - ✓ Cluster
  - ✓ Track
  - ✓ Cylinder



## 2. Read/Write heads:

- ❖ Read/write heads are the small part of the disk, that move above the disk platter.
- ❖ Heads only fly above the platter surface with clearance of as little as 3 nanometers.
- ❖ A read-write head moves to the track that contains the data to be transferred.
- ❖ Each surface has its own read/write head.

## 3. Arm assembly:

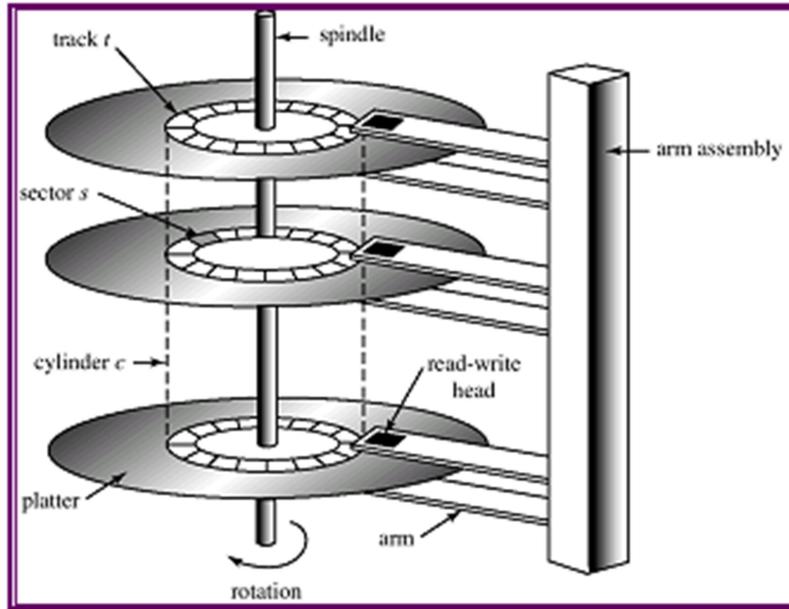
- ❖ Arm assembly is an internal set of hard disk component containing arms which contain the read/write head.
- ❖ The role of the arm assembly is to read and write information from a set of platters that are coated with a thin magnetic material.
- ❖ When arm assembly stops working the drive is failure.
  
- ❖ When a read statement calls for a particular byte from a disk file, the computer's operating system finds the correct platter, track and sector, reads the entire sector into a special area in memory called a **buffer**, and then finds the requested byte within that buffer.

## 4. Spindle:

- ❖ Spindle holds the platters in a fixed position with enough space for the read/write arms to get the data on the disks.
- ❖ Also, spindle used to rotate the platters.
- ❖ Spindle rotation moves the sector under the read-write head for reading or writing.

## 5. Arms:

- ❖ Arms are used to carry, Gide and move the read/write head.
- ❖ Moving this arm is called **seeking**.
- ❖ The arm movement is usually the **slowest** part of reading information from a disk.



**Figure 13.1**

(a) A single-sided disk with read/write hardware. (b) A disk pack with read/write hardware.

