

Storage Devices

Primary Storage Devices

1. **RAM (Random Access Memory)**

- **Function:** Temporarily stores data and programs the CPU needs during operation.
- **Capacity:** Ranges from 4GB to 128GB or more.
- **Speed:** Extremely fast but volatile (loses data when power is off).
- **Uses:** Running applications, loading files, and multitasking.

2. **ROM (Read only memory)**

3. **Cache Memory**

- **Function:** High-speed memory located inside or very close to the CPU.
- **Types:** L1, L2, and L3 cache.
- **Uses:** Provides faster access to frequently used data and instructions.

Secondary Storage Devices

1. **Hard Disk Drive (HDD)**

- **Technology:** Uses spinning magnetic platters to store data.
- **Capacity:** Typically ranges from 500GB to 18TB.
- **Speed:** Slower than SSDs; average 100–200 MB/s read/write speeds.
- **Durability:** Sensitive to physical shock.

2. **Solid State Drive (SSD)**

- **Technology:** Flash memory is used to store data, with no moving parts.
- **Capacity:** Ranges from 128GB to 8TB or more.
- **Speed:** Faster than HDDs; average 400–5000 MB/s read/write speeds (depending on type).
- **Durability:** More robust and resistant to shocks compared to HDDs.

Portable Storage Devices

1. **USB Flash Drive**

- **Technology:** Flash memory in a small, portable form factor.
- **Capacity:** From 2GB to 2TB.
- **Speed:** Depends on USB version (USB 2.0, 3.0, or 3.1).

2. **External Hard Drive**

- **Technology:** Portable HDDs or SSDs connected via USB or Thunderbolt.
- **Capacity:** Similar to internal drives, ranging from 500GB to 20TB.

3. **Memory Card (SD Card)**

- **Technology:** Flash storage in a small card format.
 - **Uses:** Primarily for cameras, smartphones, and portable gaming devices.
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Optical Storage Devices

1. **CD (Compact Disc)**
 - **Capacity:** 700MB.
 - **Uses:** Storing music, software, or small amounts of data.
 - **Outdated:** Replaced by flash drives and cloud storage.
2. **DVD (Digital Versatile Disc)**
 - **Capacity:** 4.7GB for single-layer and 8.5GB for dual-layer.
 - **Uses:** Movies, software, and games.
 - **Outdated:** Declining use due to streaming and larger USB drives.
3. **Blu-ray Disc**
 - **Capacity:** 25GB for single-layer, 50GB for dual-layer.
 - **Uses:** High-definition video and large data backups.

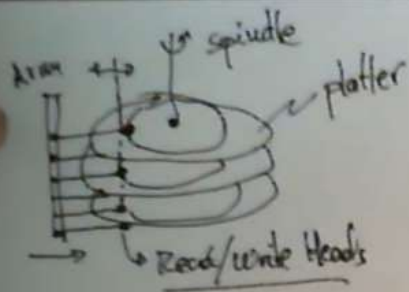
Network Storage Devices

1. **Network Attached Storage (NAS)**
 - **Technology:** Dedicated storage accessible over a network.
 - **Uses:** File sharing, backups, and media streaming for multiple users.
2. **Cloud Storage**
 - **Examples:** Google Drive, Dropbox, iCloud.
 - **Advantages:** Accessible from anywhere with internet.
 - **Limitations:** Dependent on internet speed and provider security.

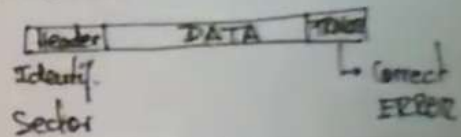
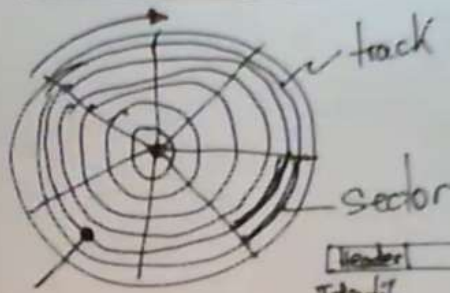
HDD details

<https://www.linkedin.com/pulse/hdd-platter-cylindrical-head-sector-rehan-shivani/>

<https://www.helpwithpcs.com/jargon/sector-track-cluster.htm>



HARD DISK DRIVES



CYLINDER: Set of tracks, one from each surface that are at the same distance from the spindle.

- Seek time: Head to reach cylinder
- + • Rotational Delay: Sector to reach head

Access time
+ Read time: time to read 1 sector

Transfer time

232ms

- # of cylinders: # tracks per surface (platters)
- # tracks per cylinder \Rightarrow (# read head, # platters $\times 2$)
- # sectors per track
- bytes per sector

$$\frac{1}{3600 \text{ RPM}} \times \frac{60 \text{ sec}}{\text{min}} \downarrow \text{Disk Capacity}$$