Storage Devices

Primary Storage Devices

1. **RAM (Random Access Memory)**
   o **Function:** Temporarily stores data and programs the CPU needs during operation.
   o **Capacity:** Ranges from 4GB to 128GB or more.
   o **Speed:** Extremely fast but volatile (loses data when power is off).
   o **Uses:** Running applications, loading files, and multitasking.
2. **ROM (Read only memory)**
3. **Cache Memory**
   o **Function:** High-speed memory located inside or very close to the CPU.
   o **Types:** L1, L2, and L3 cache.
   o **Uses:** Provides faster access to frequently used data and instructions.

Secondary Storage Devices

1. **Hard Disk Drive (HDD)**
   o **Technology:** Uses spinning magnetic platters to store data.
   o **Capacity:** Typically ranges from 500GB to 18TB.
   o **Speed:** Slower than SSDs; average 100–200 MB/s read/write speeds.
   o **Durability:** Sensitive to physical shock.
2. **Solid State Drive (SSD)**
   o **Technology:** Flash memory is used to store data, with no moving parts.
   o **Capacity:** Ranges from 128GB to 8TB or more.
   o **Speed:** Faster than HDDs; average 400–5000 MB/s read/write speeds (depending on type).
   o **Durability:** More robust and resistant to shocks compared to HDDs.

Portable Storage Devices

1. **USB Flash Drive**
   o **Technology:** Flash memory in a small, portable form factor.
   o **Capacity:** From 2GB to 2TB.
   o **Speed:** Depends on USB version (USB 2.0, 3.0, or 3.1).
2. **External Hard Drive**
   o **Technology:** Portable HDDs or SSDs connected via USB or Thunderbolt.
   o **Capacity:** Similar to internal drives, ranging from 500GB to 20TB.
3. **Memory Card (SD Card)**
   o **Technology:** Flash storage in a small card format.
   o **Uses:** Primarily for cameras, smartphones, and portable gaming devices.

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   - **Outdated:** Replaced by flash drives and cloud storage.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   - **Outdated:** Declining use due to streaming and larger USB drives.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.
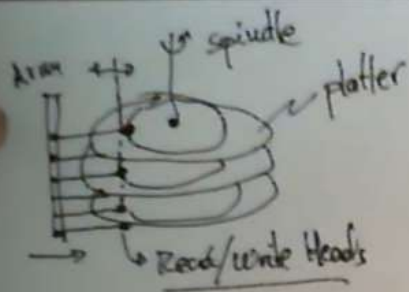   - **Uses:** High-definition video and large data backups.

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.
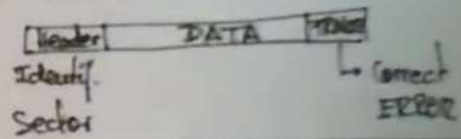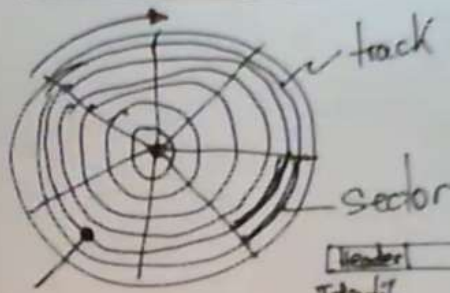   - **Limitations:** Dependent on internet speed and provider security.

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

spindle

arm

platter

Read/write Heads

track

Sector

| Header | DATA | Trailer |

Identif.
Sector

→ Correct
ERROR

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) Secto to reach head

Access time
+ Read time: time to read 1 sector

Transfer time

1. # of cylinders: # tracks per surface (platter)
- # tracks per cylinder ⇒ (# r/w head, platter x2)
- # sectors per track.
- bytes per sector

$$\frac{1}{3600\ RPM} \times \frac{60\ sec}{min}$$

232 msec

$$\frac{}{2}$$

⇓

Disk Capacity