Storage Devices

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What is a Storage Device?

Definition: A storage unit stores information and instructions for processing in a computer system.

Purpose: Essential for storing data to process and retrieve computational results.

Integral Hardware: A core component of computer hardware for data storage, portability, and retrieval.

Functionality: Enables computers to boot and run.

- Stores data **temporarily** (e.g., RAM) and **permanently** (e.g., HDD, SSD).

Types of Computer Memory

1. Primary Memory
2. Secondary Memory

Primary Memory

- Primary Memory: It is also known as internal memory and main memory. This is a section of the CPU that holds program instructions, input data, and intermediate results. It is generally smaller in size. RAM (Random Access Memory) and ROM (Read Only Memory) are examples of primary storage.

Secondary Memory:

- Secondary storage is a memory that is stored external to the computer. It is mainly used for the permanent and long-term storage of programs and data. Hard Disks, CDs, DVDs, Pen/Flash drives, SSD, etc, are examples of secondary storage.

Types of Computer Storage Devices

Now we will discuss different types of storage devices available in the market. These storage devices have their own specification and use. Some of the commonly used storage devices are:

1. Primary Storage Devices
2. Magnetic Storage Devices
3. Flash memory Devices
4. Optical Storage Devices
5. Cloud and Virtual Storage

RAM

Definition: Stands for Random Access Memory, used for temporary data storage.

Functionality:

1. Stores data and instructions needed immediately.
2. Data is deleted when the computer is turned off.

Role in Computing: Enables multitasking (e.g., running applications, browsing, editing).

Facilitates quick switching between tasks.

RAM

1. **Applications:** Loads and runs software, processes commands, and toggles between programs.
2. **Capacity:** Typically ranges from 1GB to 32GB/64GB based on device specifications.
3. **Types:** Common RAM types include DRAM, SRAM, and DDR (DDR3, DDR4, DDR5).

Applications of RAM

1. **Loads and Runs Software**: Enables quick access to active programs.
2. **Processes Commands**: Executes user inputs and edits.
3. **Toggles Between Programs**: Facilitates seamless multitasking.

RAM

Capacity of RAM

1. **Ranges**: From **1GB to 32GB/64GB**, depending on device specifications.

Types of RAM

1. **DRAM (Dynamic RAM)**: Common and widely used.
2. **SRAM (Static RAM)**: Faster but more expensive.
3. **DDR (Double Data Rate)**: Includes **DDR3**, **DDR4**, and **DDR5** for advanced performance.

ROM

Definition: ROM stands for Read-Only Memory, a non-volatile memory type.

Characteristics:

1. Data is permanently stored and cannot be modified or deleted.
2. Used to store instructions for booting up a computer (bootstrap process).
3. Commonly used in electronic devices like washers and microwaves.
4. Storage Capacity: Typically stores between 4MB to 8MB per ROM chip.

ROM

Types of ROM

PROM (Programmable ROM):

- Can be programmed once using a special programmer.
- Data is non-volatile and cannot be altered after programming.

EPROM (Erasable Programmable ROM):

- Allows erasing and rewriting of data using ultraviolet light.

EEPROM (Electrically Erasable Programmable ROM):

- Can be erased and reprogrammed using electrical signals without UV light.

Magnetic Storage Devices

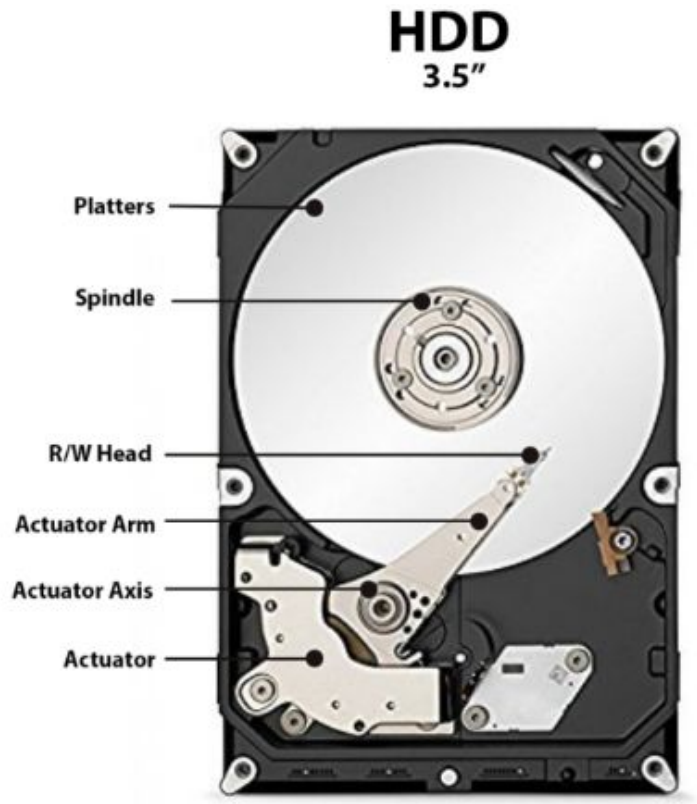
Floppy Disk

1. Also known as a **floppy diskette**.
2. Used to store data externally on personal computers.
3. Replaced by modern storage devices like **USB drives**.

Magnetic Storage Devices

Hard Disk (HDD)

1. Non-volatile storage used for **data storage and retrieval**.
2. Made of **stacked disks** with data recorded in **concentric tracks**.
3. Read-write speed is decent, but slower than newer technologies.
4. Storage capacity ranges from **a few GBs to several TBs**.



Magnetic Storage Devices

Magnetic Card

1. A **swipe card** with data stored by altering the magnetism of iron-based particles.
2. Used for **passcodes**, **credit cards**, **identity cards**, etc.

Magnetic Storage Devices

Tape Cassette

1. Also known as a **music cassette**, stores data on an **analog magnetic tape**.
2. Primarily used for **audio recordings**.

Magnetic Storage Devices

SuperDisk (LS-240/LS-120)

1. Developed by **Imation Corporation**.
2. Storage capacity of up to **240 MB**, used primarily in OEM computers.

Flash Memory Devices

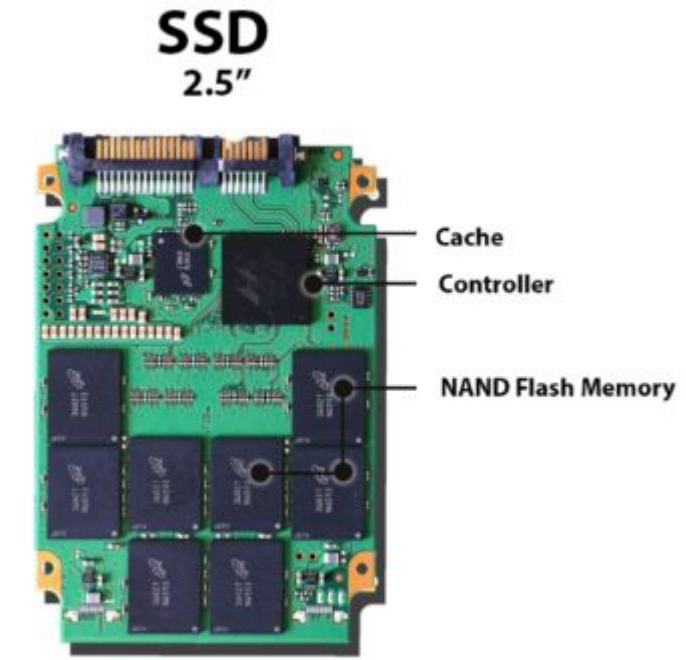
Pen Drive (USB Flash Drive)

1. Portable storage with **flash memory** and integrated **USB interface**.
2. Connects directly to computers and laptops for fast data read/write.
3. Storage capacity typically ranges from **1GB to 256GB**.

Flash Memory Devices

SSD (Solid State Drive)

1. A **durable, fast storage device** with no moving parts.
2. **Faster** (10x read/write speed) and **more power-efficient** than HDDs.
3. Storage capacity ranges from **150GB to several TBs**.
4. **Costlier** than HDDs due to advanced technology.



Flash Memory Devices

SD Card (Secure Digital Card)

1. Used in devices like **phones**, **digital cameras** for storing data.
2. **Small and portable**; available in sizes like **2GB**, **4GB**, **8GB**.
3. Used in devices like digital cameras, printers, and game consoles.
4. Requires a memory card reader to be used with computers.
5. Available in various storage sizes.

Flash Memory Devices

Multimedia Card (MMC)

1. Integrated circuit used in devices like **car radios** and **digital cameras**.
2. External device for **data storage**.

Optical Storage Devices

CD (Compact Disc)

1. Made of polycarbonate plastic; circular in shape.
2. Stores up to 700MB of data.

CD Has two types:

1. CD-R: Read-only, data cannot be erased.
2. CD-RW: Read/write, allows multiple writes and erasures.

Optical Storage Devices

DVD (Digital Versatile Disc)

Stores more data than CDs:

1. **4.7GB** for single-layer.
2. **8.5GB** for double-layer.

Two types:

1. **DVD-R**: Read-only, data cannot be erased.
2. **DVD-RW**: Read/write, allows multiple writes and erasures.

Optical Storage Devices

Blu-ray Disc

1. Similar to **CD** and **DVD** but with much higher storage capacity (up to **25GB**).
2. Uses **blue-violet laser** for higher data density.
3. Requires a **Blu-ray reader** to use.

Cloud and Virtual Storage

Cloud Storage

1. A form of **virtual storage** where data is stored remotely in **data centers**.
2. **Companies** like **Google**, **Amazon**, and **Microsoft** provide cloud services.
3. Users can pay for the storage space they need, offering **flexibility** and **scalability**.

Cloud and Virtual Storage

Benefits

1. **Data is stored remotely, not on local physical devices.**
2. **Users don’t need to manage the physical storage hardware.**
3. **Example: Amazon Web Services (AWS) offers S3 for virtual data storage.**

Innovations

1. **Cloud storage represents the future of storage media, allowing easy access,**
2. **management, and sharing of data online.**

Characteristics of Computer Storage Devices

Data Flexibility:

1. Data can be changed or replaced as needed due to the mobility of storage devices.

Read/Write/Rewritable

1. Storage devices allow data to be replaced or deleted easily, making them readable, writable, and rewritable.

Ease of Access

1. Storage devices are easy to use and convenient to access, requiring minimal technical expertise.

Characteristics of Computer Storage Devices

Storage Capacity

1. They provide significant storage capacity, adding extra value to the system.

Improved Performance

2. Storage devices offer better performance, enabling easy data transfer between devices.