Storage Devices

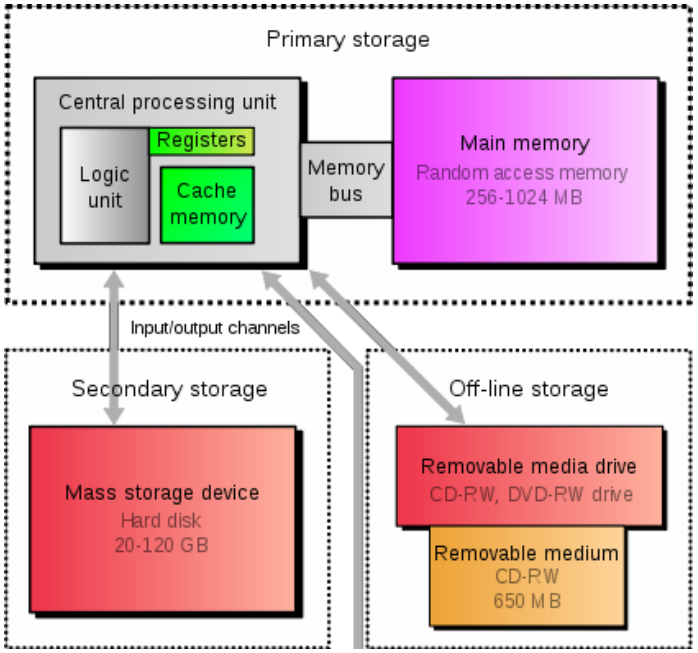
Storage Devices

- A **storage device** is used in the computers to store the data.
- It provides one of the core functions of the modern computer.

Types of Storage

There are four type of storage:

- Primary Storage
- Secondary Storage



Primary Storage

- Also known as **main memory.**
- Main memory is directly or indirectly connected to the central processing unit via a memory bus.
- The CPU continuously reads instructions stored there and executes them as required.
- Example:
  - RAM
  - ROM
  - Cache

Primary Storage

RAM

- It is called Random Access Memory because any of the data in RAM can be accessed just as fast as any of the other data.
- There are two types of RAM:
  - DRAM (Dynamic Random Access Memory)
  - SRAM (Static Random Access Memory)

Primary Storage

RAM

Static RAM	Dynamic RAM
• Faster • More expensive • More power consumption • does not need to be refreshed	• Slower • Less expensive • Less power consumption • needs to be refreshed thousands of times per second
	

Primary Storage

ROM

- This memory is used as the computer begins to boot up.
- Small programs called firmware are often stored in ROM chips on hardware devices (like a BIOS chip), and they contain instructions the computer can use in performing some of the most basic operations required to operate hardware devices.
- ROM memory cannot be easily or quickly overwritten or modified.

Primary Storage

Cache

- **Cache** is a high-speed access area that can be either a reserved section of main memory or a storage device.
- Most computers today come with L3 cache or L2 cache, while older computers included only L1 cache.

Secondary Storage

- It is not directly accessible by the CPU.
- Computer usually uses its input/output channels to access secondary storage and transfers the desired data using intermediate area in primary storage.
- Example:
  - Floppy disk, Hard disk, CD, DVD etc

Secondary Storage

Hard Disk

- The hard disk drive is the main, and usually largest, data storage device in a computer.
- It can store anywhere from 160 gigabytes to 2 terabytes.
- Hard disk speed is the speed at which content can be read and written on a hard disk.
- A hard disk unit comes with a set rotation speed varying from 4500 to 7200 rpm.
- Disk access time is measured in milliseconds.

Secondary Storage

Hard Disk

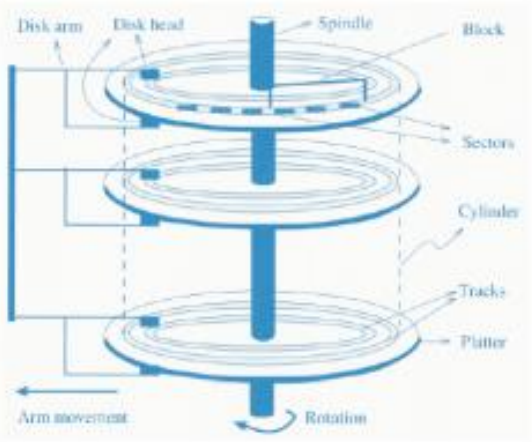
Internal Hard disk

External Hard disk

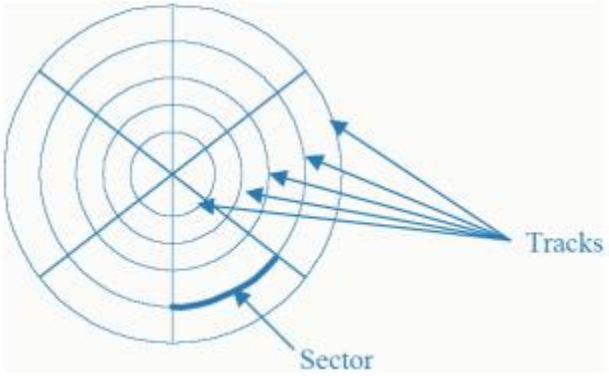
Secondary Storage

Hard Disk

- Magnetic disks support direct access to a desired location
- Simplified structure of a disk
  - Disk blocks
  - Tracks
  - Platters
  - Cylinder
  - Sectors
  - Disk heads
  - Disk Controller
  - Seek Time
  - Rotational delay

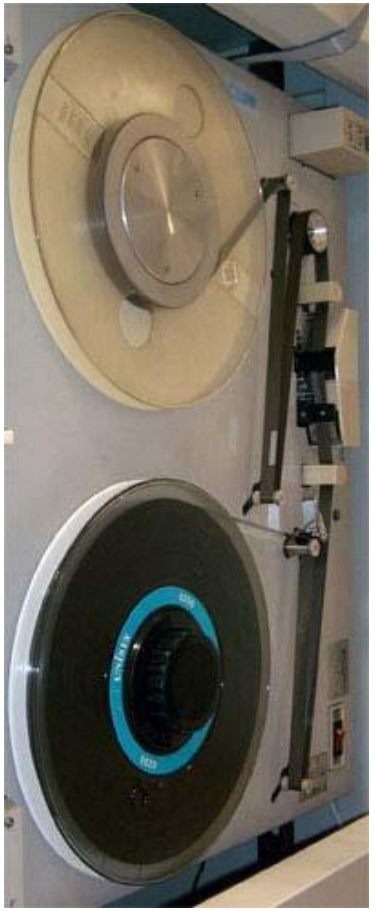


- Disk contains concentric **tracks**
- **Tracks** are divided into **sectors**
- A sector is the smallest addressable unit in disk



Magnetic Tape

- A magnetically coated strip of plastic on which data can be encoded.
- Tapes for computers are similar to tapes used to store music.
- Tape is much less expensive than other storage mediums but commonly a much slower solution that is commonly used for backup.



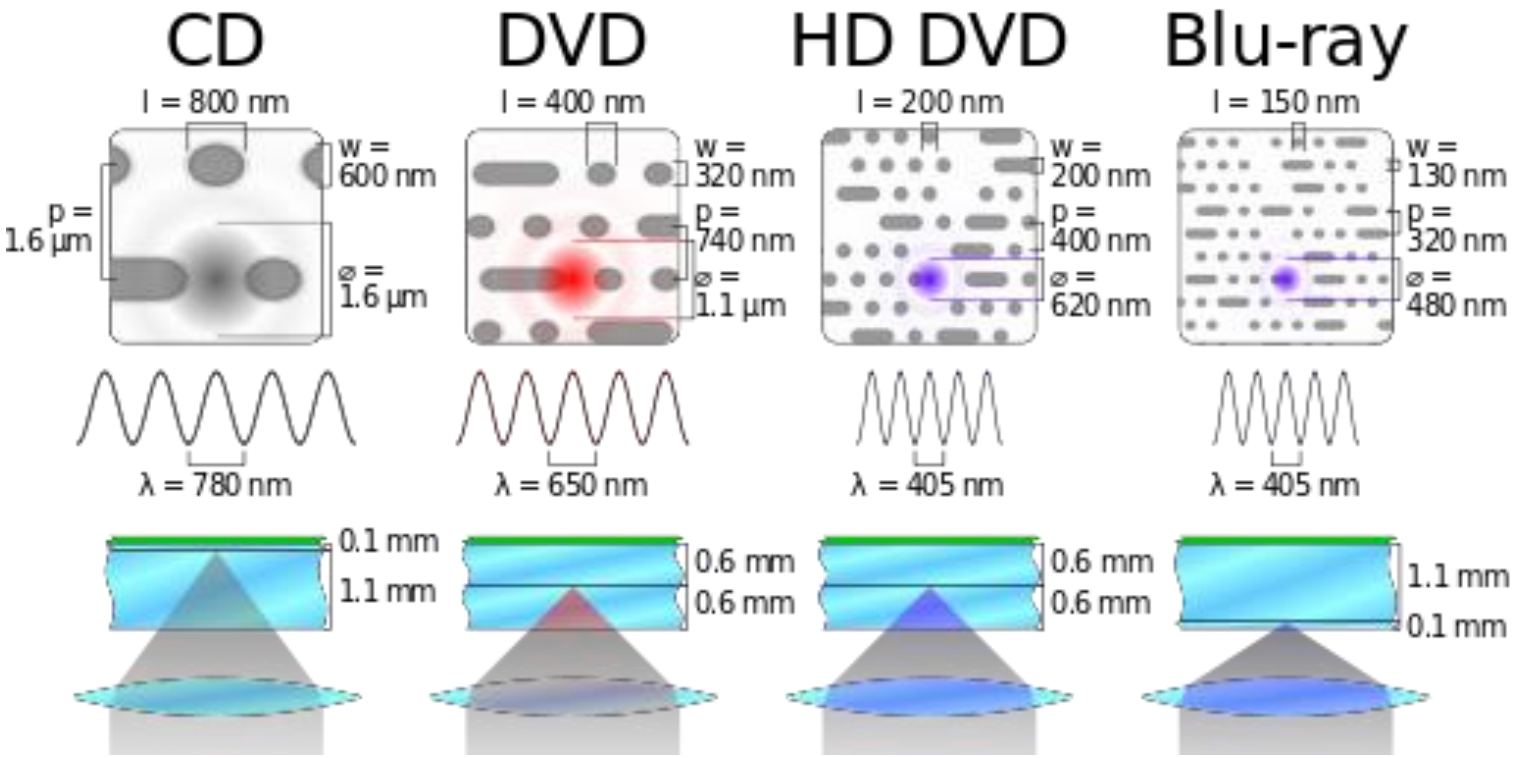
Optical Disc

- **Optical disc** is any storage media that holds content in digital format and is read using a laser assembly is considered optical media.
- The most common types of optical media are
  - Blu-ray (BD)
  - Compact Disc (CD)
  - Digital Versatile Disc (DVD)

Optical Disc

	CD	**DVD**
Capacity	700MB	4.7GB – 17GB
Read/Write Speed	1200KB/s	10.5MB/s
Example	• CD-ROM, • CD-R • CD-RW	• DVD-ROM • DVD+R/RW • DVD-R/RW • DVD-RAM

Optical Disc



Floppy Disk

- A soft magnetic disk.
- Floppy disks are portable.
- Floppy disks are slower to access than hard disks and have less storage capacity, but they are much less expensive.
- Can store data up to 1.44MB.
- Two common sizes: 5 ¼” and 3 ½”.

Floppy Disk

5 ¼ inch Floppy Disk

3 ½ inch Floppy Disk

USB Flash Drive

- A small, portable flash memory card that plugs into a computer's USB port and functions as a portable hard drive.
- Flash drives are available in sizes such as 256MB, 512MB, 1GB, 5GB, and 16GB and are an easy way to transfer and store information.

Memory Card

- An electronic flash memory storage disk commonly used in consumer electronic devices such as digital cameras, MP3 players, mobile phones, and other small portable devices.
- Memory cards are usually read by connecting the device containing the card to your computer, or by using a USB card reader.

Memory Card

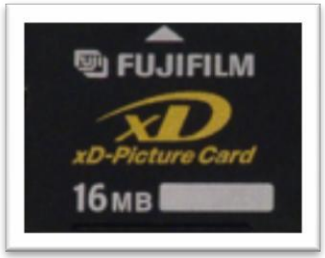
Secure Digital card (SD)

MiniSD

Compact Flash

Memory Stick

MultiMedia card



XD-Picture card

Memory card reader

Storage Device Features

- Volatility
- Accessibility
- Mutability

Volatility

- Two types of volatility:
  - Volatile Memory
  - Non-Volatile Memory

Volatility

Volatile Memory

- Requires constant power to maintain the stored information.
- The fastest memory technologies.
- All contents are erased when the system's power is turned off or interrupted.
- It has been more popularly known as **temporary memory**.

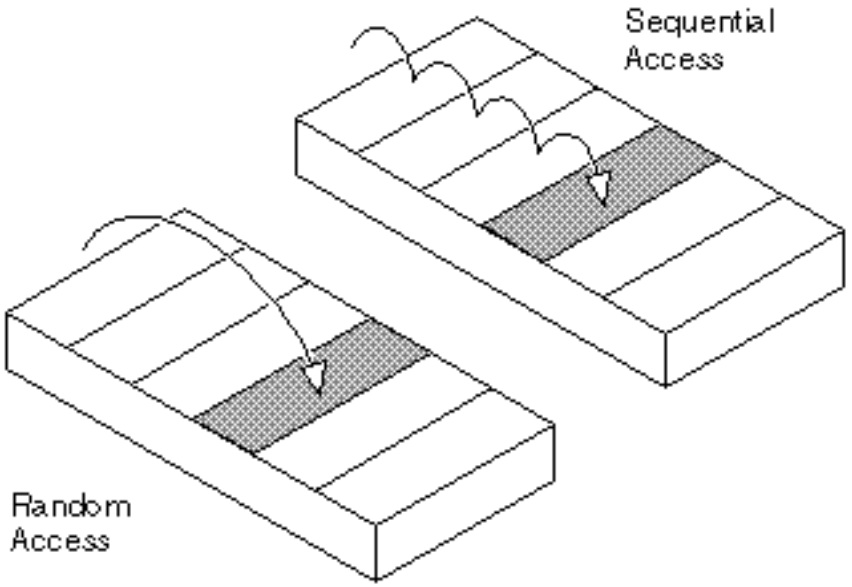
Volatility

Non-Volatile Memory

- Will retain the stored information even if it is not constantly supplied with electric power.
- Non volatile memory is the device which keeps the data even when the current is off.
- It is suitable for long-term storage of information.

Accessibility

- Refers to reading or writing data records
- Two types of accessibility:
  - Random access
  - Sequential access



Accessibility

Random Access

- Any location in storage can be accessed at any moment in approximately the same amount of time.
- Such characteristic is well suited for primary and secondary storage.

Accessibility

Sequential Access

- The accessing of pieces of information will be in a serial order, one after the other; therefore the time to access a particular piece of information depends upon which piece of information was last accessed.
- Such characteristic is typical of off-line storage.

Mutability

- Allows information to be overwritten at any time.
- A computer without some amount of read/write storage for primary storage purposes would be useless for many tasks.
- Three types of mutability:
  - Read/write storage or mutable storage
  - Read only storage
  - Slow write, fast read storage

Mutability

Read/Write Storage or Mutable Storage

- Allows information to be overwritten at any time.
- A computer without some amount of read/write storage for primary storage purposes would be useless for many tasks.

Mutability

Read Only Storage

- Retains the information stored at the time of manufacture, and **write once storage** (WORM) allows the information to be written only once at some point after manufacture.
- These are called **immutable storage**.

Mutability

Slow Write, Fast Read Storage

- Read/write storage which allows information to be overwritten multiple times, but with the write operation being much slower than the read operation.