Secondary storage devices

Secondary storage

❖ Used in a computer system to overcome the limitations of primary storage
❖ Has virtually unlimited capacity because the cost per bit of storage is very low
❖ Has an operating speed far slower than that of the primary storage
❖ Used to store large volumes of data on a permanent basis
❖ Also known as auxiliary memory

Classification of Commonly Used Secondary Storage Devices
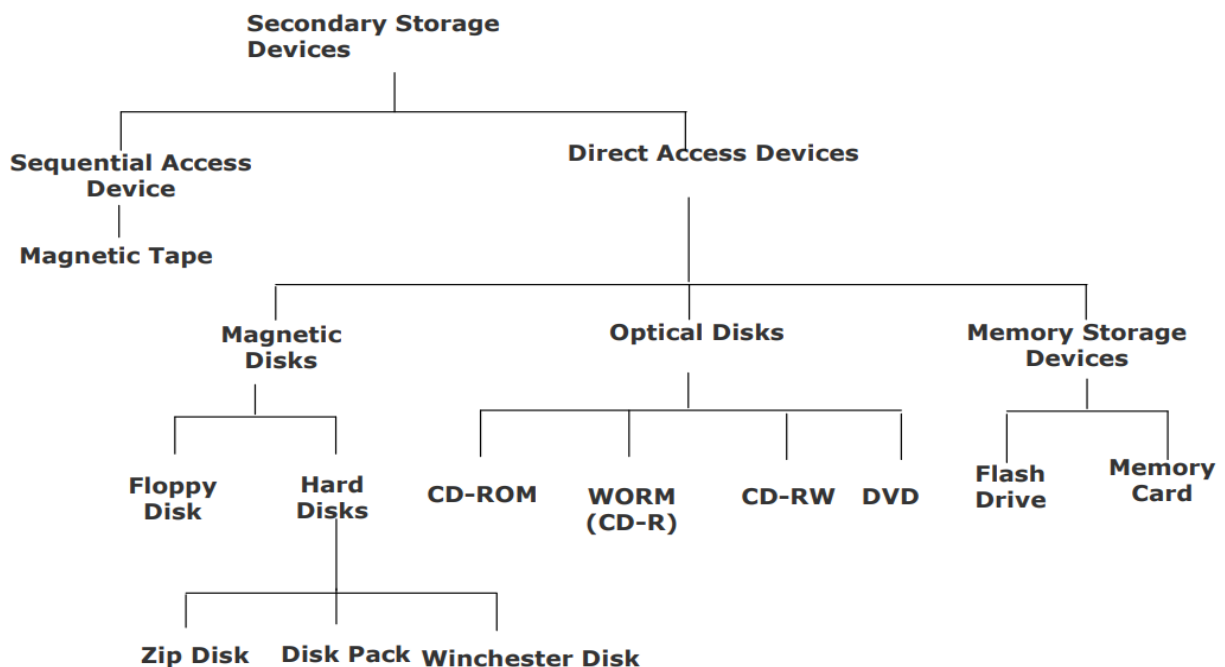
Sequential-access Storage Devices

➢ Arrival at the desired storage location may be preceded by sequencing through other locations
➢ Data can only be retrieved in the same sequence in which it is stored
➢ Access time varies according to the storage location of the information being accessed
➢ Suitable for sequential processing applications where most, if not all, of the data records need to be processed one after another

> ➢ Magnetic tape is a typical example of such a storage device

Direct-access Storage Devices

- ❖ Devices where any storage location may be selected and accessed at random
- ❖ Permits access to individual information in a more direct or immediate manner
- ❖ Approximately equal access time is required for accessing information from any storage location
- ❖ Suitable for direct processing applications such as online ticket booking systems, on-line banking systems
- ❖ Magnetic, optical, and magneto-optical disks are typical examples of such a storage device

Storage devices

Storage devices, although classified as I/O devices, can store large amounts of information to be retrieved at a later time. They are cheaper than main memory, and their contents are nonvolatile—that is, not erased when the power is turned off. They are sometimes referred to as auxiliary storage devices. We can categorize them as either magnetic or optical.

Magnetic storage devices

Magnetic storage devices use magnetization to store bits of data. If a location is magnetized, it represents 1, if not magnetized, it represents 0.

1- Magnetic disks

A magnetic disk consists of one or more disks stacked on top of each other. The disks are coated with a thin magnetic film. Information is stored on and retrieved from the surface of the disk using a read/write head for each magnetized surface of the disk. Figure 5.1 shows the physical layout of a magnetic disk drive and the organization of a disk.
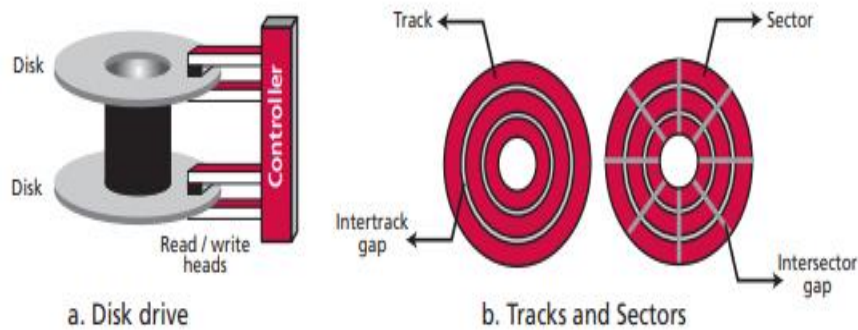
Figure 5.1 Magnetic disks

❑ **Surface organization**. To organize data stored on the disk, each surface is divided into tracks, and each track is divided into sectors (Figure 5.1). The tracks are separated by an **intertrack gap**, and the sectors are separated by an **intersector gap.**

❑ **Data access.** A magnetic disk is considered a random access device. In a random access device, a data item can be accessed randomly without the need to access all other data items located before it.

❑ **Performance**. The performance of a disk depends on several factors, the most important being the rotational speed, the seek time, and the transfer time. The rotational speed defines how fast the disk is spinning. The seek time defines the time to move the read/write head to the desired track where the data is stored. The transfer time defines the time to move data from the disk to the CPU/memory.

Commonly used direct-access secondary storage device. Magnetic Disk – Storage Capacity: -

Storage capacity of a disk system = Number of recording surfaces

*Number of tracks per surface

* Number of sectors per track

* Number of bytes per sector

2- Magnetic tape

Magnetic tape comes in various sizes. One common type is half-inch plastic tape coated with a thick magnetic film. The tape is mounted on two reels and uses a

read/write head that reads or writes information when the tape is passed through it. Figure 5.2 shows the mechanical configuration of a magnetic tape drive.
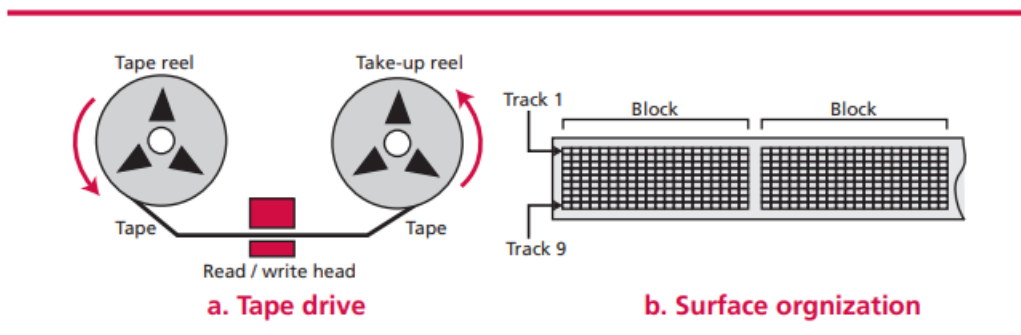

Figure 5.2 Magnetic tape

❑ **Surface organization**. The width of the tape is divided into nine tracks, each location on a track storing 1 bit of information. Nine vertical locations can store 8 bits of information related to a byte plus a bit for error detection (Figure 5.2).

❑ **Data access**. A magnetic tape is considered a sequential access device. Although the surface may be divided into blocks, there is no addressing mechanism to access each block. To retrieve a specific block on the tape, we need to pass through all the previous blocks.

❑ **Performance**. Although magnetic tape is slower than a magnetic disk, it is cheaper. Today, people use magnetic tape to back up large amounts of data.

Storage capacity is virtually unlimited because as many tapes as required can be used for storing very large data sets

Optical storage devices

Optical storage devices, a relatively recent technology, use laser light to store and retrieve data. The use of optical storage technology followed the invention of the compact disk (CD) used to store audio information. Today, the same technology—slightly improved—is used to store information in a computer. Devices that use this technology include CD-ROMs, CD-Rs, CD-RWs, and DVDs.