Unit 4

Hard Disk Drive:

A computer hard disk drive (HDD) is a non-volatile memory hardware device that controls the positioning, reading and writing of the hard disk, which furnishes data storage.

Basically, structure of Hard Disk (HDD) in Two types

* Physical Structure
* Logical Structure

The main components of hard disk drive are:

* **Platters:** These are disk like structures present on the hard disk, stacked one above the other and store the data
* **Head:** It is a device present on the arm of the hard drive that reads or writes data on the magnetic platters, mounted on the surface of the drive
* **Spindle:** It is the spinning shaft on which holds the platters in a fixed position such that it is feasible for the read/write arms to get the data on the disks
* **Actuator:** It is a device, consisting of the read-write head that moves over the hard disk con to save or retrieve information
* **Cylinder:** These are the circular tracks present on the platters of the disk drive at equal distances from the center

4.2 Hard Disk Interfaces:

The hard disk interface is the connecting part between the hard disk and the host computer system, and its function is to transmit data between the hard disk cache and the host memory. Different hard disk interfaces determine the data transmission speed between the hard disk and the computer.

**Enhanced integrated drive electronics (EIDE):**

EIDE is an improved version of the IDE drive interface that provides faster data transfer rates than the original drive.

Enhanced integrated drive electronics (EIDE) is the hard drive interface also known as ATA or ATA-1. The interface acts as an intermediary between the computer and a mass storage device.

It is an extension to the integrated drive electronics interface standard for mass storage devices that supports higher data rates than the original standard.

**Serial ATA (Serial Advanced Technology Attachment or SATA):**

SATA, in full serial advanced technology attachment, also called serial ATA, an interface for transferring data between a computer's central circuit board and storage devices.

It is an interface used to connect ATA hard drives to a computer's motherboard.

**SCSI (Small Computer System Interface):**

The Small Computer System Interface is a set of American National Standards Institute (ANSI) standard electronic interfaces that allow personal computers (PCs) to communicate with peripheral hardware such as disk drives, tape drives, CD-ROM.

**-Use**

SCSI is used to increase performance, deliver faster data transfer transmission and provide larger expansion for devices such as CD-ROM drives, scanners, DVD drives and CD writers.

SCSI is useful in network servers

**Universal Serial Bus (USB)**

Universal Serial Bus (USB) is an industry standard that establishes specifications for cables and connectors and protocols for connection, communication and power supply (interfacing) between computers, peripherals and other computers.

The Universal Serial Bus was developed to simplify and improve the interface between personal computers and peripheral devices

**IEEE 1394**

The IEEE 1394 interface is an electronic standard that is used to connect computers.

The IEEE 1394 interface is commonly known as FireWire

IEEE 1394 is an interface standard for a serial bus for high-speed communications and isochronous real-time data transfer.

FireWire, which is also called IEEE 1394, is a connecting device used primarily for adding peripherals to a computer. FireWire is often used for connecting external hard drives and digital camcorders that benefit from a high transfer rate.

**RAID**

RAID **(Redundant Array of Inexpensive Disks / Redundant Array of Independent Disks)** is a data storage virtualization technology that combines multiple physical disk drive components into one or more logical units for the purposes of data redundancy, performance improvement, or both.

**Solid state drive (laptop):**

Solid-state drive, an SSD is a storage medium that uses non-volatile memory to hold and access data.

Unlike a hard drive, an SSD has no moving parts.

There are several types of SSDs with varying speed and connection types, including 2.5", mSATA, M.2, and PCIe. The following section briefly reviews each type.

**Advantages:**

Faster access time

Noiseless operation

Higher reliability

Lower power consumption.

Above advantages are because of no moving parts.

4.3 Terms related to HDD

**Tracks:**

A disk drive track is a circular path on the surface of a disk or diskette on which information is magnetically recorded and from which recorded information is read.

Tracks are subdivided into blocks (or sectors, pages) : Storage block and Virtual page.

**Sectors:**

In computer disk storage, a sector is a subdivision of a track on a magnetic disk or optical disc.

The sector is the minimum storage unit of a hard drive.

"sector" usually refers to the entire single arc.

**Cylinder:**

A cylinder is any set of all of tracks of equal diameter in a hard disk drive (HDD).

**Cluster:**

A cluster, in the context of a hard disk, is a group of sectors within a disk and is the grouping by which disk files are organized.

**Landing Zone:**

The data-free area on the surface of a hard disk over which the read-write head comes to rest when the computer is shut off and the disk stops rotating.

**Master Boot Record (MBR)**

The Master Boot Record (MBR) is the information in the first sector of any hard disk or diskette that identifies how and where an operating system is located so that it can be boot (loaded) into the computer's main storage or random access memory.

**ZBR (Zone Bit Recording)**

Alternatively referred to as ZBR (Zone Bit Recording), zoned recording is a method of increasing available hard drive space by increasing the amount of sectors per track.

**Interleaving**

Interleaving is a process or methodology to make a system more efficient, fast and reliable by arranging data in a noncontiguous manner.

Interleaving is a technique used to convert a transmission channel with memory into one that is memory less.

4.4 Disk performance parameters Characteristics:

**Seek Time:**

With rotating drives, the seek time measures the time it takes the head assembly on the actuator arm to travel to the track of the disk where the data will be read or written.

**Latency:**

Disk latency is the time that it takes to complete a single I/O operation on a block device.

**Data Transfer Rate:**

The data transfer rate of a drive (also called throughput) covers both the internal rate (moving data between the disk surface and the controller on the drive) and the external rate (moving data between the controller on the drive and the host system).

The measurable data transfer rate will be the lower (slower) of the two rates.

4.5 File System

**FAT 16:**

Before introducing FAT16 file system, users must know what FAT is. FAT is abbreviation of File Allocation Table.

The configuration files of every sector are expressed by 16 bytes in FAT16 and this is why it is named FAT16.

**FAT 32:**

FAT32 is a file system used for storage devices, and file systems are ways of organizing storage on devices such as hard drives, SSDs, memory sticks, microSD cards, and so on.

**NTFS (New Technology File System):**

NT file system (NTFS), which is also sometimes called the New Technology File System, is a process that the Windows NT operating system uses for storing, organizing, and finding files on a hard disk efficiently.

**UNIX:**

The Unix file system is a methodology for logically organizing and storing large quantities of data such that the system is easy to manage

**EXT2/EXT3:**

EXT2:

Ext2 stands for second extended file system. The ext2 or second extended file system is a file system for the Linux kernel. It was initially designed by French software developer Rémy Card as a replacement for the extended file system (ext).

EXT3:

Ext3, or third extended filesystem, is a journaled file system that is commonly used by the Linux kernel. It used to be the default file system for many popular Linux distributions.

**RAID:**

RAID (Redundant Array of Independent Disks) is a method of storing data combines multiple physical drives into one unit. Data is distributed and duplicated across the drives in various ways.

**CD/DVD**

**CD:**

CD is an abbreviation for 'compact disc. '

A compact disc is a portable storage medium that can be used to record, store and play back audio, video and other data in digital form.

**DVD**

It is a type of compact disc able to store large amounts of data, especially high-resolution audiovisual material.

A Digital Versatile Disc or Digital Video Disc (DVD) is similar to a CD-ROM in that you can only read data from it. The main difference is that the DVD can store much more data than a CD-ROM

CD and DVD both are high definition, high storage devices.

Following are the important differences between CD and DVD.

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No.** | **Key** | **CD** | **DVD** |
| 1 | Definition | CD stands for Compact Disk. | DVD stands for Digital Versatile Disk. |
| 2 | Size | CD size is 700 MB. | DVD size ranges from 4.7 GB to 17 GB. |
| 3 | Recording Layer | Recording layer or metal layer is close to top of the disk. | Recording layer or metal layer is close to middle of the disk. |
| 4 | Pits | CD have single layer of pits. | DVD have double layers of pits. |
| 5 | Space between loops | Space between spiral loops is 1.6 micrometer in CD. | Space between spiral loops is 0.74 micrometer in DVD. |
| 6 | Space between pits | Space between pits is 0.834 micrometer in CD. | Space between pits is 0.40 micrometer in DVD. |
| 7 | Correction code | CIRC and EFMP are used as error correction code. | RS-PC and EFMplus are used as error correction code. |
| 8 | Data Transfer Rate | Data Transfer Rate is 1.4 to 1.6 Mb/Sec. | Data Transfer Rate is 11 Mb/Sec. |
| 9 | Channel Bit Length | Channel Bit Length in CD is 300 nanometer. | Channel Bit Length in CD is 113 nanometer. |
| 10 | Numeric Aperture | Numeric Aperture of CD is 0.45. | Numeric Aperture of DVD is 0.6. |
| 11 | Thickness | CD thickness is 1.2 mm. | DVD thickness is 0.6 mm. |

A compact disc is a portable storage medium that can be used to record, store and play back audio, video and other data in digital form.

**USB storage drive:**

A USB flash drive is a device used for data storage that includes a flash memory and an integrated Universal Serial Bus (USB) interface. Most USB flash drives are removable and rewritable.

Aur agar pucha……..ki what is **flash drive**

Flash Drive is a small electronic device containing flash memory that is used for storing data or transferring it to or from a computer, digital camera, etc.

Aur Agar Pucha……..ki what is **flash memory**

Flash Memory is a kind of memory that retains data in the absence of a power supply.