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A file is a recorded collection of recorded information that is recorded.
On secondary storage such as Magnetic disc, magnetic tape & Optical disc. In general a file is a sequence of bits, byte, lines or records whose meaning is defined by the files creator & user.

File Structure.
A file structure should be according to a required format that the OS can understand.

- A file has a certain defined structure according to its type
- A Text file is a sequence of characters organised into lines
- A source file is a sequence of procedures & functions.
- An Object files is a sequence of bytes organised into blocks that are understandable by the Machine.
- When OS define different file structure, it also contains the code to support this file structure. Unix, Ms dos support minimum number of file structure.

File Type.
File type refers to the ability of the OS to distinguish different types of file such as text files, source files & binary files etc.

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Many OS support many types of files. OS like MS dos & Unix have the following types of files

1. Ordinary files
   - These are the files that contain user information
   - These may have text, databases or executable programs.
   - The user can apply various operations on such files like add, modify, delete, or even remove the entire file

2. Directory files
   - These files contains list of file names & other information related to these files

3. Special files
   - These files are also known as device files
   - These files represent physical device like disc, terminals, printers, networks, tape drive etc.

   Special files are of 2 types

1. Character Special files

Data is handled character by character as in case of terminals or printers

2. Block Special files

Data is handled in blocks as in case of disc & tapes.

Users and system programmers view of file system.

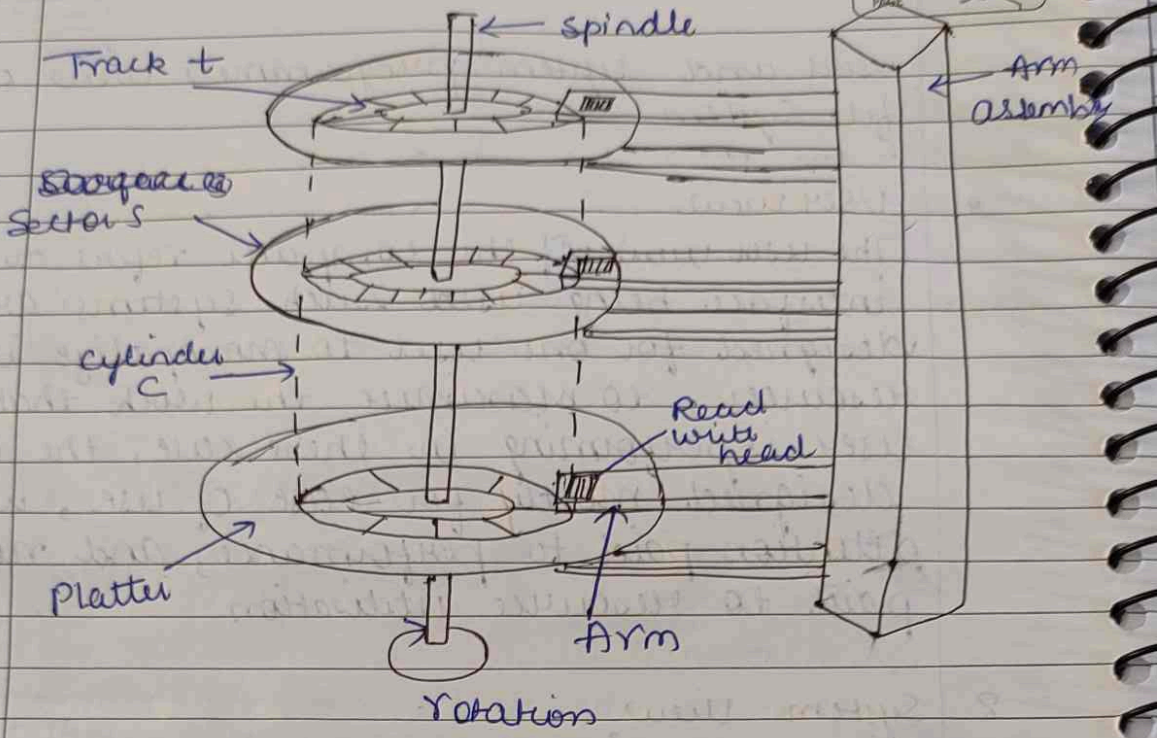
1. User view
The user view of the computer refers to the interface being used. Such systems are designed for one user to monopolize its resources, to maximize the work that the user is performing in these case, the OS is designed mostly for ease of use, with some attention paid to performance, and non paid to resource utilisation

2. System view
OS can be viewed as a resource allocator also. A computer system consist of many resources like hardware & software that must be managed efficiently. The OS act as the manager of the resources, resolves b/w conflicting requests, control execution of programs etc.

DISC ORGANISATION

A hard disc is a memory storage device which looks like the below picture.

The disc is divided into tracks each track is further divided into sectors. The point to note here is that outer tracks are bigger in size than the inner tracks but they contain the same number of sectors and hence



Hard disc

equal storage capacity this is because the storage density is high in sectors of the inner track whereas the bits are sparsely arranged in sectors of the outer tracks some space of every sector is used for formatting so the actual capacity of a sector is less than the given capacity

Read write (R-W) head moves over the rotating hard disc. It is these read write head that performs all the read & write operations on the disc so the position of the read write head is a major concern. To perform a read or write operation on a memory location we need to place the

R-W head over that position

Some important terms are.

1. Seek time
The time taken by the R-W head to reach the desired track from its current position

2. Rotational latency
Time taken by the sector to come under the R-W head

3. Data transfer time
Time taken to transfer the required amount of data. It depends upon the rotational speed.

4. Controller time
The processing time taken by the controller

5. Average excess time
Seek time + average rotation latency + Data transfer time + controller time

DIFFERENT MODULES OF A FILE SYSTEM

The basic file System level.
works directly with the device drivers in terms of retrieving & Storing raw blocks of data, without any consideration for what is in each block. Depending on the system blocks may be reffered to with a single block number or with head sector cylinder combinat

The file organisation module.
Knows about files and their logical blocks and how they map to physical blocks on the disc. In addition to translating from logical to physical blocks, the file organisation module also maintains the list of free blocks and allocates free blocks to file as needed

The logical file System
Deals with all of the meta data associated with the file i.e everything about the file except the data itself this level manages the directory structure and the mapping of file names to file control block (FCB), FCB's which contain all of the meta data as well as block number information for finding the data on the disc

The layered approach to file systems means that much of the code can be used uniformly for a wide variety of different file systems, and only certain layers need to the file system specific

Common file System in use include the Unix file system, Window's file System etc.

Application Programs
⇓
Logical File System
⇓
File Organisation Module
⇓
Basic File System
⇓
I/O Control
⇓
Devices

Layered File System.

FILE SYSTEM IN LINUX AND WINDOWS

- LINUX

Linux is one of popular version of UNIX OS it is open source as its source code is freely available. It is free to use. LINUX was designed considering UNIX compatibility its functionality list is quiet similar to that of UNIX

components Of LINUX

Linux OS has primarily 3 components

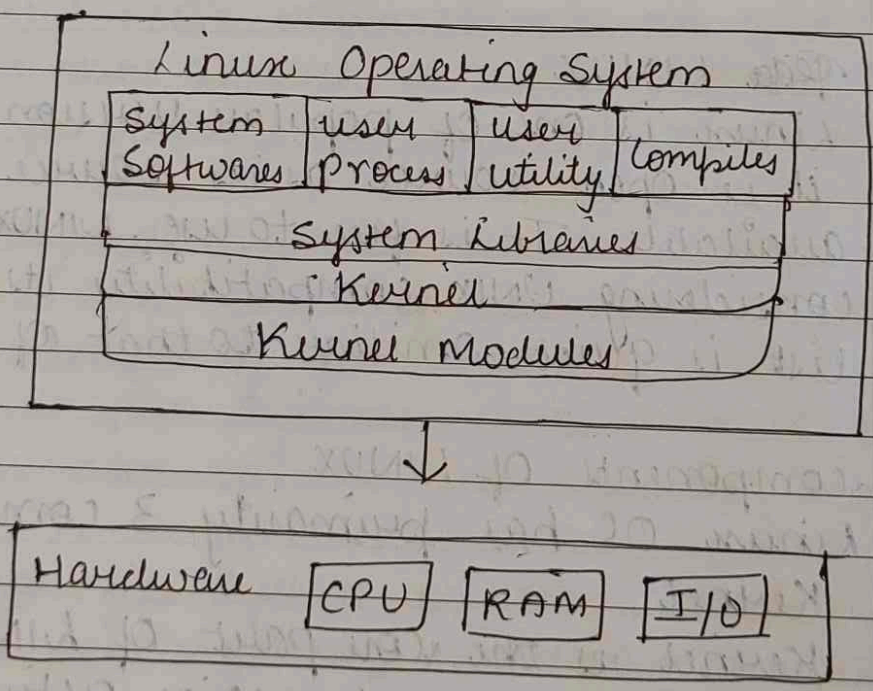
1. Kernel

Kernel is the core part of LINUX it is responsible for all major activities Of this OS. It consist of various modules and it interacts directly with the underlined hardware Kernel provides the required abstraction to high low level hardware

details to system or application programs.

2. System Library
System libraries are special functions or programs using which application programs or system utilities ~~exec~~ access Kernel's features. These libraries implement most of the functionalities of the OS and do not require Kernel module's code access rights

3 System Utility
System utility programs are responsible to do specialised, individual level task



Linux Operating System.

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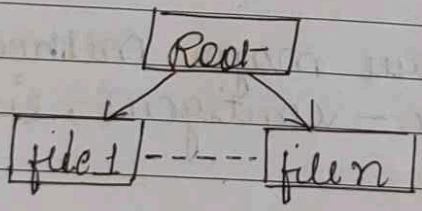
DIRECTORY SYSTEM

A directory is a location for storing files on your computer. Directories are found in a hierarical file system such as LINUX, MS-DOS, UNIX etc

1. A collection of nodes containing information about all files
2. A directory system can be classified into single level and hierarical directory system

Single level directory system

In this type of directory system, there is a root directory which has all files it has a simple architecture and there are no sub directories. Adventage of SLDS is that it is easy to find a file in the directory. these type of directory system is used in cameras & phones.

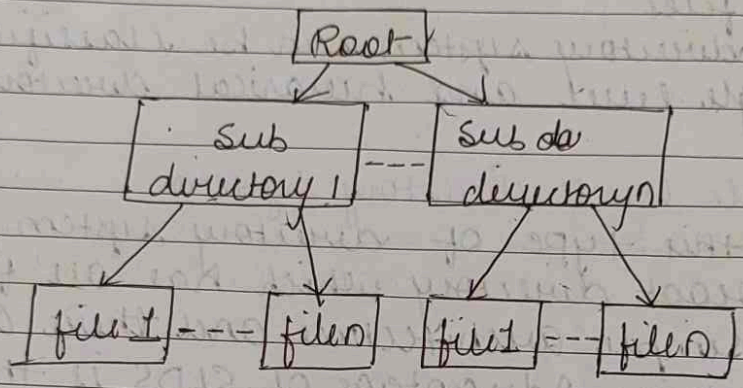


Directory System

Hierarical Directory System

In a hierarical directory system, files are groupe together to form a subdirectory at the top of the hierarchy is the root directory & then there are sub directories which has files

Advantage Of HDS is that users can be provided access to a sub directory rather than the entire directory. it provides a better structure to file system also managing millions of files is easy with this Architecture. Personal computers use hierarical directory system for managing files



Hierarchical Directory System

DISC SPACE ALLOCATION METHOD

There are three major methods of storing files on disc - contigous, linked and indexed

Contigous Allocation

- contigous allocation requires that all blocks of a file be capped together contigously
- Performance is very fast because reading successive blocks of the same file generally requires no movement of the disc

fragmentation is loss of memory

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heads a almost one small step to the next adjacent cylinder

- Storage allocation involves the same issues for the allocation of continous blocks of memory (first fit, fragmentation problems etc)
  The distinction is that the high time penalty required for moving the disc head from spot to spot may now justify the benefits of keeping files contigously when possible.

- Even file systems that do not by default store files contigously can benifit from certain utilities that compact the disc and make all files contigous in the process

- Problems can arise when files grow or if the exact size of a file is unknown at creation time

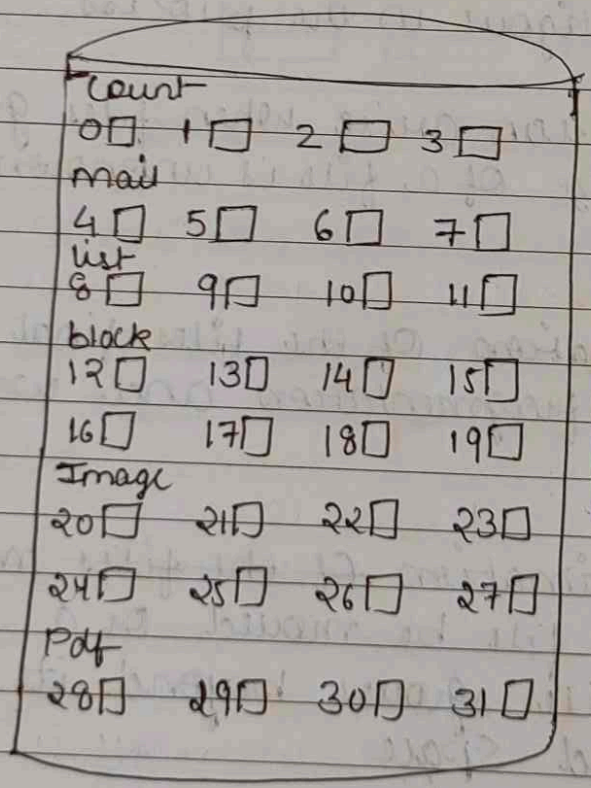
- Overestimation of the files final size increases external fragmentation and waste disc space.

- Underestimation of the files may require that a file be moved or a process aborted if the file grows beyond its originally allocated space

- If a file grows slowly over a long time period and the total final space must

be allocated initially, then a lot of space becomes unusable before the file fills the space.

- A variation is to allocate file space in large contigous chunks, called extends when a file outgrows its original extent then an additional one is allocated for eg:- An extent may be the size of a complete track or even cylinder, aligned on an appropriate track or cylinder boundary the high performance file system variates usage extents to optimize performance.



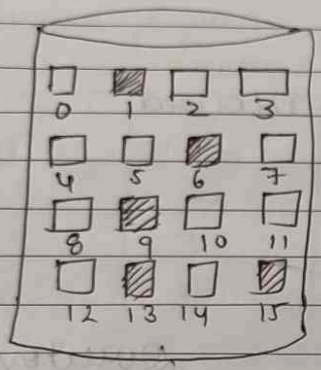
file	Start	length
count	0	2
mail	6	1
list	10	2
block	14	4
Image	22	5

Contigous Allocation Of Disc Space.

Advantage :-
- easy to implement
- excellent read performance and direct access

Disadvantage :-
- Disc will become fragmented / fragmentation occurs
- Difficult to grow file.

Linked Allocation



Directory

file	start
A	1
B	6
C	9
D	15

- Disc files can be stored as linked list, with the expense of the storage space consumed by each link
- Linked allocation involves no external fragmentation does not require pre known file size & allows files to grow dynamically at any time
- unfortunately linked allocation is only efficient for sequential excess files as random access requires starting at the begining of the list for each new location access