

UNIT-2

→ File -

A file is a named collection of related information that is recorded on secondary storage.

① File concept -

- file attributes - Name, Identifier, Type, location, size, protection, time, date and user identification
- file operations - Create, write, read, move, delete, truncate
- file types - executable (exe, bin), object (obj, o), source code (c, java), batch (bat, sh), text (txt, doc), library (lib, dll), print or view (pdf, jpg), archive archive (zip, arc), multimedia (mpeg, avi)

② Access methods -

- sequential access - Information in the file is processed in order, one record after the other.
- Direct access - A file is made up of fixed length logical records that allow programs to read and write records rapidly in no particular order
- Other methods - Interleave

③ Free-space management -

- Bit-vector - If the block is free, the ht is 1, if the block is allocated, the ht is 0. For eg:- 2, 3, 4, 5, 8, 9, 10, 14, 15 are free and the rest of blocks are allocated then bit vector is 0011110011100011.
- linked list - link all the free blocks disk blocks, keeping a pointer to the first free block in a special location on the disk and caching it in memory.
- grouping - store addresses of n blocks in 1st free block then first n-1 block are free and nth block contains another n free blocks and so on.
- Counting - keep the address of first free block and the number n of free contiguous blocks that follow the first block.

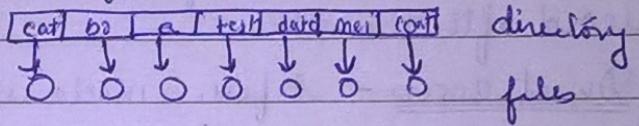
④ Allocation Methods -

- Contiguous Allocation - Each file occupy a set of contiguous block on the disk. Both sequential and direct access can be supported.
- External contiguous Allocation - finding new space, fragmentation.
- linked Allocation - Each file is a linked list of disk blocks.
- Disadvantage - Don't support direct access, space required for pointers.
- Indirect allocation - It brings all the pointers together into one block.
- Disadvantage - It is more complex.

⑤ Directory Systems -

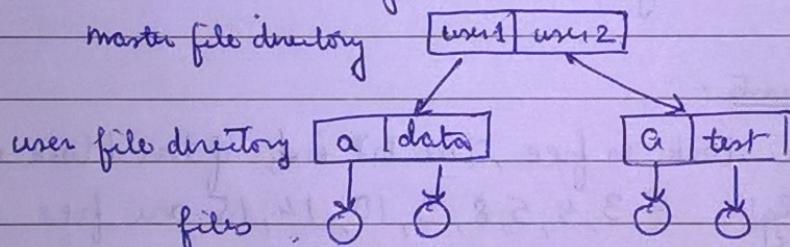
The directory can be viewed as a symbol table that translates file names into their directory entries.

- Single level directory - All files contains are contained in the same directory.



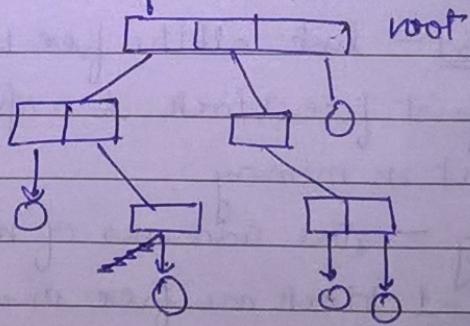
Disadvantage - leads to confusion of file names among different users.

- Two level directory - Create separate directory for each user.

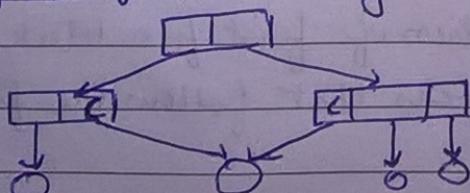


Disadvantage - Isolation of users.

- Tree-structured directory -

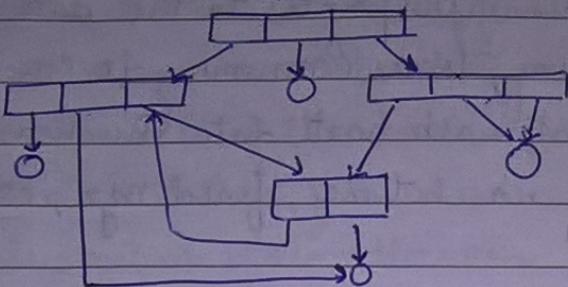


- Acyclic-Graph directory - A graph with no cycles.



Disadvantage - ensure no cycle

→ General graph directory - have cycles



⑥ Protection - To save file from improper access

→ Types of Access - Read, Write, Execute, Append, Delete, List, renaming, copying, editing (controlled access)

→ Access Control - Access control list → Owner, group & Universe

→ Other protection approaches - associate password with each file

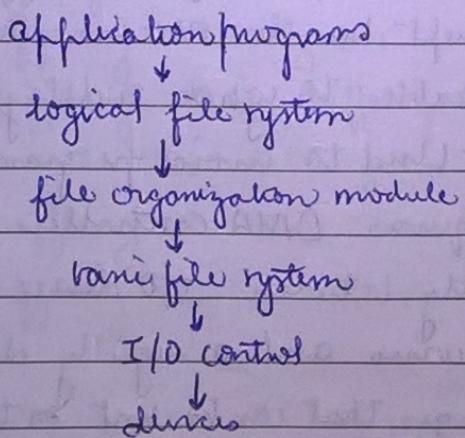
⑦ File sharing -

→ Multiple users - User ID, Group ID

→ Remote file systems - Uses networking to allow file system access between systems → manually via programs like FTP, automatically, recently using distributed file systems, semi automatically via the world wide web

⑧ File System Implementation -

→ Layered file system -



→ File control block -

file permission
file dates (create, access, write)
file owner, group, ACL
file size
file data blocks & pointers to file data blocks

⑨ Directory Implementation -

→ linear list of file names with pointers to the data blocks

↳ simple to program, time consuming to execute.

→ Hashtable - linear list with hash data structures

↳ decreases directory search time, fixed size, collisions

⑩ Disk and drum Scheduling -

Improving access time and bandwidth, calculate total head movement

F CFS scheduling - first come first serve algorithm

SSTF scheduling - shortest seek time first

SCAN scheduling - start at one end and moves towards the other hand

C-SCAN scheduling - ^(always goes right) Circular - SCAN, When the head reaches the

other end, however, it immediately returns to the beginning of the disk

LOOK scheduling - same as SCAN but do not get to the end,

C-LOOK scheduling - same as C-SCAN but do not get to the end.

⑪ I/O device organization hardware -

I/O buffering, I/O hardware,

→ I/O port typically consists of four registers -

(1) Status (2) Control, (3) data-in, (4) data-out.

→ Polling - Busy - Waiting.

→ Interrupt - CPU interrupt - request triggered by I/O devices
Interrupt handler receives interrupts

Markable to ignore or delay some interrupts

→ Direct Memory Access - Used to avoid programmed I/O for large data movement, requires DMA controller, bypasses CPU to transfer data directly between I/O device and memory.

→ Bus - It is a set of wires and a rigidly defined protocols that specifies a set of messages that can be sent on the wires.

→ Controller - It is a collection of electronics that can operate a port, a bus or a device.

⑫ Kernel I/O subsystem - (software)

Services → scheduling, buffering, caching, spooling, device reservation and error handling.

- Management of the name space for files and devices
- Access control to file and devices
- File-system space allocation
- Device driver configuration and initialization
- Device allocation

⑬ Transforming I/O request to hardware operations -

Consider reading a file from disk for a process -

- Determine device holding file
- Translate name-to-device representation
- Physically read data from disk into buffer
- Make data available to requesting process
- Return control to process.

→ Device Drivers -

⑭ I/O buffering -

Buffering is a technique by which the device manager can keep slower I/O devices busy during times when a process is not requiring I/O operation.

Types of I/O buffering schemes -

(1) Single buffering → only one buffer

(2) Double buffering → One buffer for driver or controller to store data
other buffer is to store data from the lower level module.

(3) Circular buffering → more than two buffers are used.

(4) No buffering

→ Device Driver -