12/4/18

File System Implementation

- Contiguous Allocation
- Linked List Allocation
- Linked list Allocation using an index
- I-nodes

Contiguous Allocation

Advantage –

- easy to implement
- easy access
- easy access only by knowing starting addr.
- performance ~~is~~ of system very ~~poor~~ good. as all files at the same place

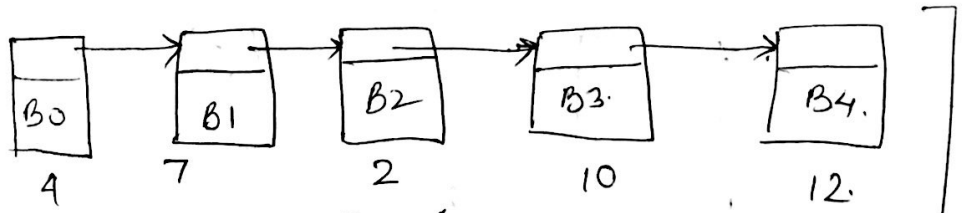
Disadvantages –

- external fragmentation (enough space in memory, but sometimes cannot be used as it is not contiguous)
  - solution : compaction
    - ↳ requires extra overhead

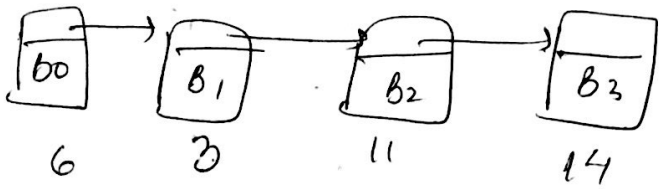
we should know the size of the file beforehand

so go for Linked List Allocation

Linked List Allocation



File 1



File 2

Physical blocks

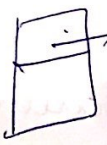
Improvement : allocate wherever space available

~~Disadvantage~~ :-

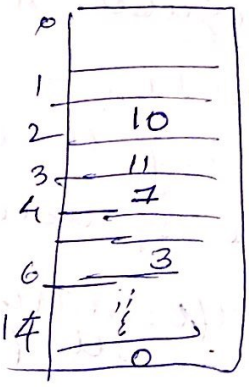
This solves external fragmentation but not internal fragmentation.

- Random access of data not possible.
- Some memory size is allocated for ptr. : Remaining memory size is $2^{something}$ – ptr. size. so, exact $2^{something}$ sized files cannot be allocated

Linked list allocation using an Index



This part now used to store data.



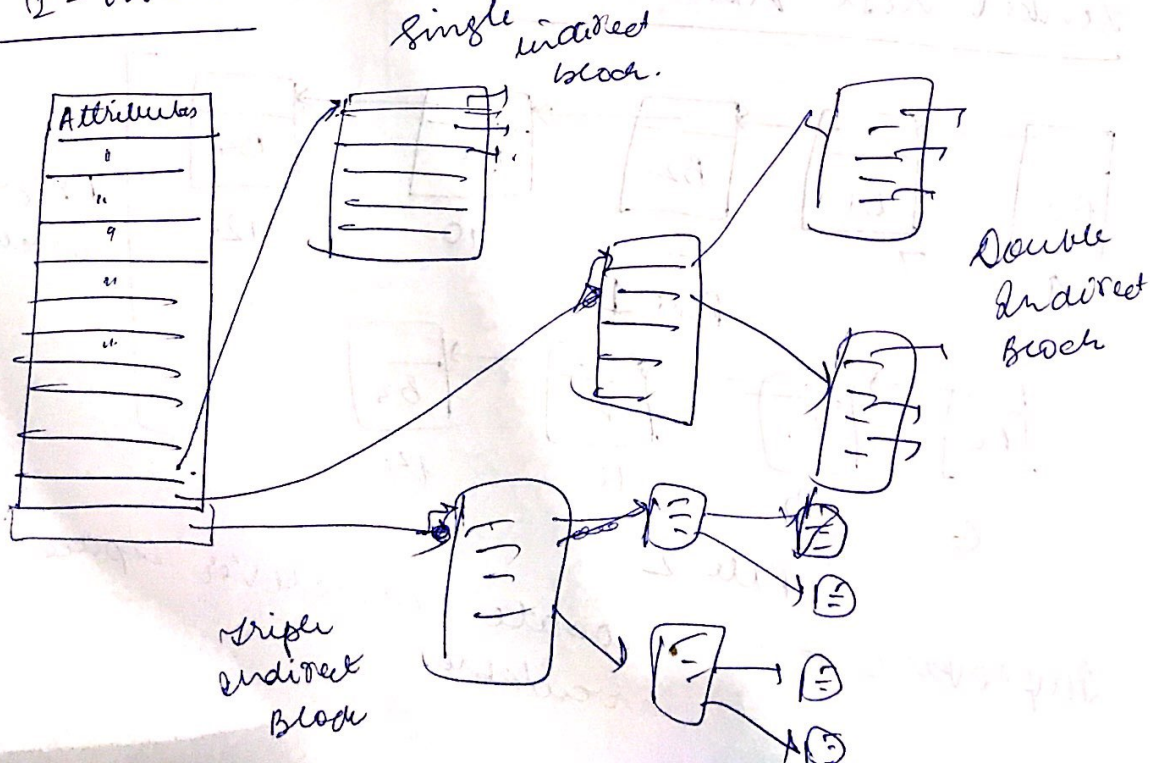
File 1, file 2 same as previous

FAT used in DOS system
↳ takes a lot of portion of memory. Small part is left to store the blocks.
→ so, I-node.

File Allocation Table (FAT) (maintains the pointer)

Galvin

I-nodes.



For allocation of 15

(a)

$= 12 + 15 + \underbrace{15 \times 15}_{\text{double indirect}} + \underbrace{15 \times 15 \times 15}_{\text{triple indirect}}$

↑ ∴ last 3 are used as ptr.

(12 used for data blocks)

(b) Consider a disk pack with a seek time of 4 ms and rotational speed of 10000 rpm. It has 600 sectors per track and each sector can store 512 bytes of data. Consider a file stored in the disk. The file contains 2000 sectors. Assume that every sector access requires a seek. The average rotational latency for accessing each sector is half of the time for one complete rotation. What is the total time needed to read the entire file?

Ans: Seek time = 4 ms.

RPM = 10000 rpm

⇒ Rotational latency = $\frac{1}{2}$ × 1 complete rotation

$= \frac{1}{2} \times 60/10000$

$= 3$ ms.

Sectors = 600 / track.

Storing capacity of each sector = 512 bytes

Transfer rate = bytes on track / rotation

$= \frac{512 \times 600}{6} = 51200$ B/ms. (Speed)

File access time = seek time + rotational latency + transfer rate (for file)

$= 14000 + (512 \times 20000)/51200$

$= 14020$

Movement of 1 sector = 7 ms.

" " 2000 " $= 2000 \times 7 = 14000$ ms.

Q. A hard disk system has the following parameters

No. of tracks = 500

No. of sectors per track = 100

No. of bytes per sector = 500

Time taken by the head to move from one track to adjacent track = 1 ms.

Rotation speed = 600 rpm

What is the average time taken for transferring 250 bytes from the disk?

[Ans.. 300]