CS & IT ENGINEERING

Operating System

File System

Lecture - 01

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Recap of Previous Lecture

Topic Access Time in Multilevel Paging

Topic Inverted Paging

Topic Hashed Page Table

Topics to be Covered

- Topic: File System
- Topic: Directory
- Topic: Disk Blocks

Topic : File

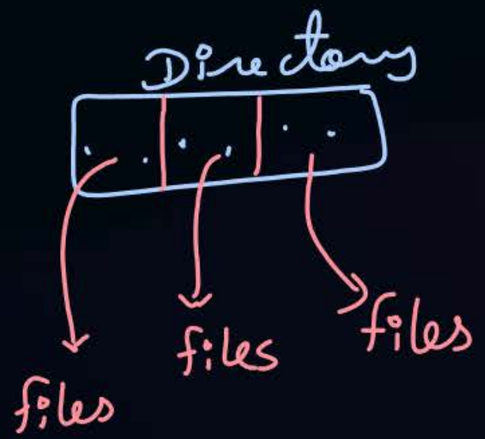
A file is a named collection of related information that is recorded on secondary storage.

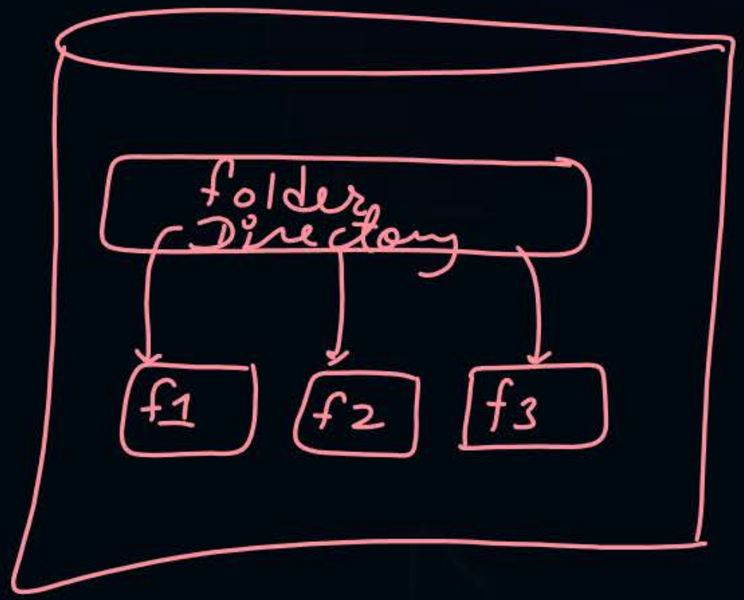
Topic : File Attributes

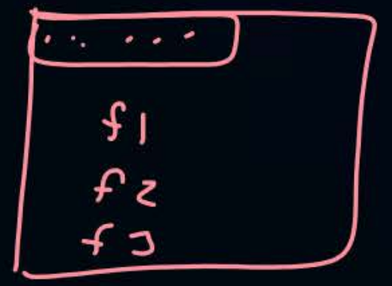
1. Name
2. Extension
3. Size
4. Date
5. Author
6. Created, Modified, Accessed
7. Attributes: Read-only, hidden
8. Default Program
9. Security Details

Topic : File Directory

Collection of files







Assume a directory has 4 files

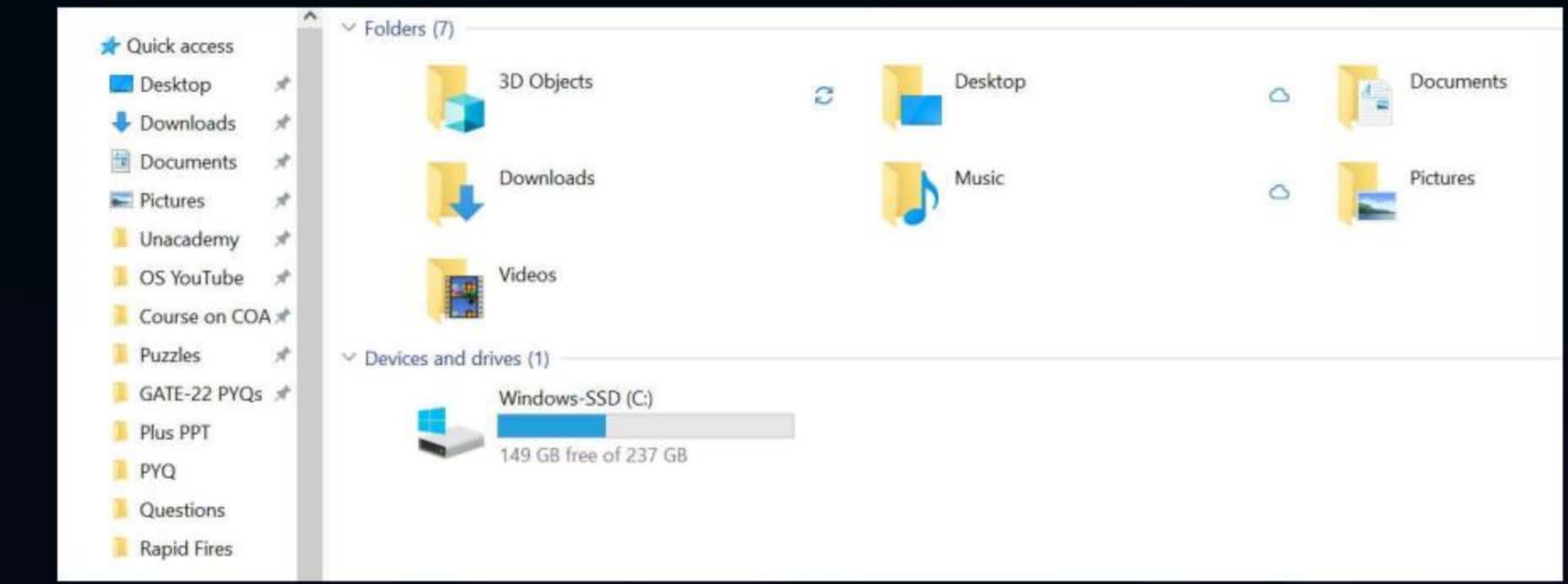
each file directory entry ⇒ 8 bytes long (pointer to file)

Total directory entry space needed = 8 * 4 = 32 Bytes

Topic : File System

Module of OS which manages, controls and organizes files and related structures

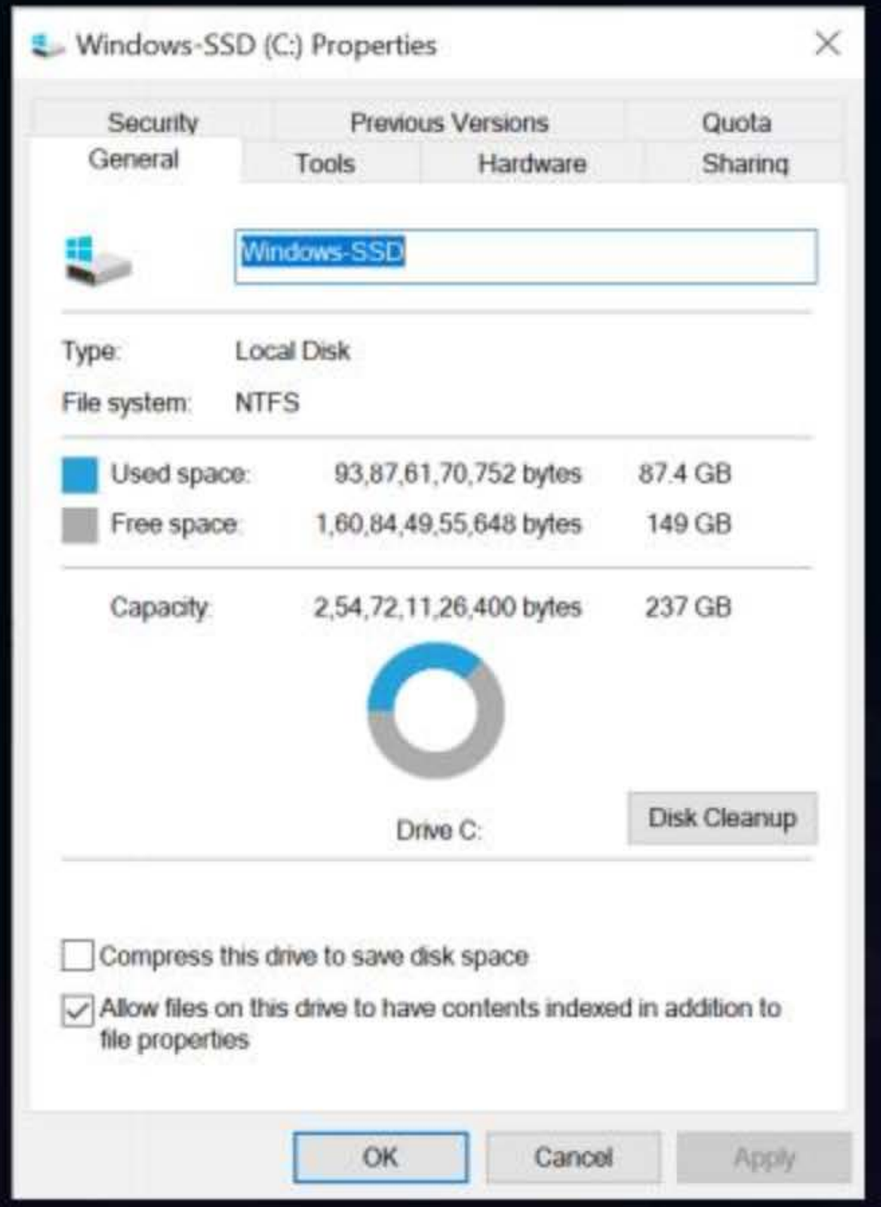
Topic : File System



Topic : Types of File Systems

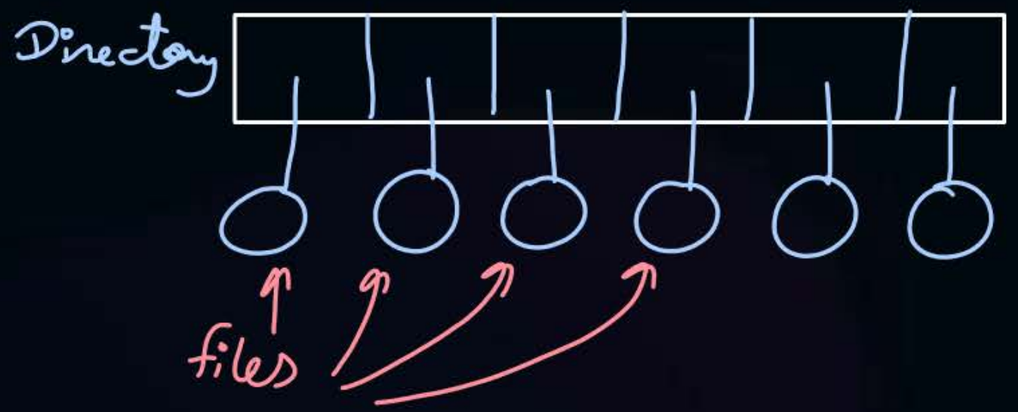
1. FAT32
2. NTFS
3. HFS+
4. Ext2 / Ext3 / Ext4
5. Swap

Topic : File System



Topic : File Directory Structure

1. Single-Level Directory



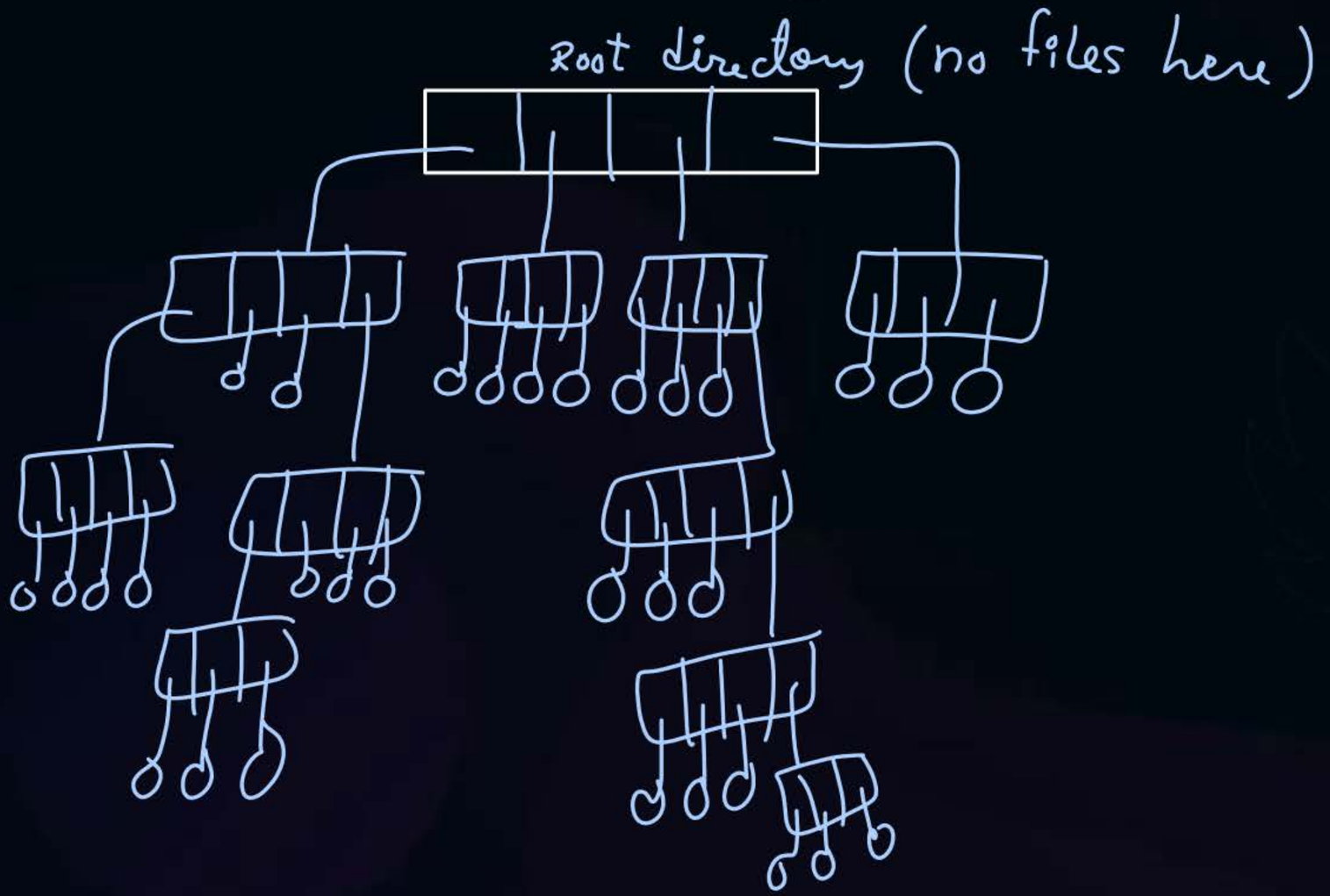
2 files can not have same name.
(even if type of files are different)

Topic : File Directory Structure

2. Two-Level Directory (for multiple User)

Topic : File Directory Structure

3. Tree Structure Directory (Latest)



Topic : Disk Formatting

After this OS is stored (installed) in one of the drives

Low-level formatting (Physical formatting)

Creating tracks, sectors

Done by menufecturer

Logical formatting (High-level formatting)

Logical portions of disk

→ creating drives C:\>, E:, F:..

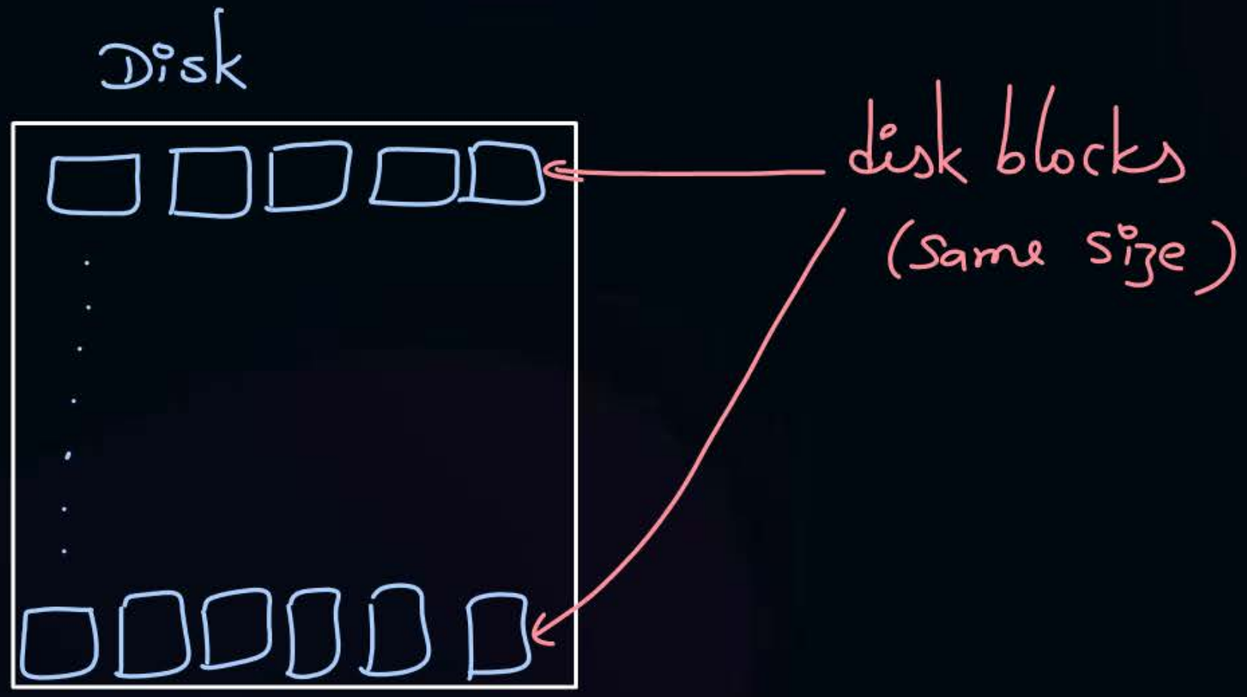
→ Creating disk blocks

→ installing file system

Logical partitions :-

1. Primary partition (one or 2) ⇒ OS + user files
2. Extended partition (as many as you want) ⇒ user files

Topic : Disk Blocks



Assume

Disk ⇒ 64 disk blocks

$= 2^6$

⇓

disk block address = 6 bits

Topic : Disk Blocks

Number of disk blocks = 2^{16}

Size of each block = 1KB

Total Size of disk? $2^{16} * 1KB$

$= 64 MB$

Topic : Disk Blocks

Disk block address= 24-bits $\Rightarrow$ no. of blocks $= 2^{24}$

Size of each block = 2KB

Total Size of disk? $= 2^{24} * 2kB$

$= 2^{35} B$

$= 32 GB$

Topic : Disk Blocks

Total disk size = 256GB

Block Size = 2KB

Disk block address? $\Rightarrow$ 27 bits

no. of blocks in disk = $\frac{256\,GB}{2\,KB} = \frac{2^8 \cdot 2^{30}}{2^1 \cdot 2^{10}}$

$= 2^{27}$

$\Downarrow$

D.B.A. = 27 bits

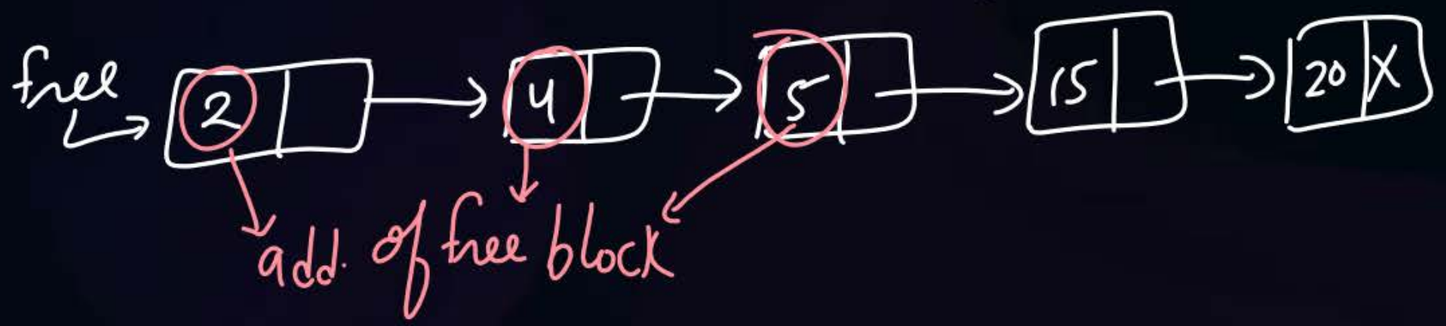
Topic : Free Space Management

↳ How file system keeps track of free disk blocks.

1. Free List
2. Bitmap Method

1. Free List :-

A list of free block addresses is maintained.



2 :- Bitmap method :-

1 bit for each block stored to denote if block is free or occupied

ex:- Disk has 16 blocks = 2^4 blocks

⇓

16 bit bitmap

0 1 0 | 1 0 0 0 | 1 0 | 0 0 0 0 0 0

Assume ⇒ 0 = free

1 = occupied

Topic : Free Space Management

To search free block

1. No searching in free list, but in bitmap we search for first zero
2. Free list is faster in allocating a free block
3. Free list size is variable, where as bitmap size is constant

Topic : Question

A particular disk unit uses a bit string to record the occupancy or vacancy of its disk blocks with '0' denoting vacant block and '1' denoting occupied block. A 32-bit part of this string has Hexadecimal value of D4F2A001. The percentage of occupied blocks on the disk for this part is ?

1101	0100	1111	0010	1010	0000	0000	0001
3	1	4	1	2	0	0	1

Total occupied blocks = 12

% of occupied blocks = $\frac{12}{32} * 100\% = 37.5\%$ Ans.

Ques)

no. of blocks = 2^{18}

1 block size = 1K bytes

no. of disk blocks used to store free space bitmap ?

Soln no. of bits needed to store bitmap = 2^{18} bits

bitmap size = $\frac{2^{18}}{8} = 2^{15}$ bytes = 32KB

no. of blocks needed to store bitmap = $\frac{32\,KB}{1\,KB}$ = 32 blocks

Topic : Question

H.W.

A system directory is kept in 4 disk blocks each of size 2Kbytes. It is a single level-directory and each directory entry is of size 32-bits.

1. The maximum number of files possible in this system is ?
2. The maximum size of any file is?

2 mins Summary

Topic File System

Topic Directory

Topic Disk Blocks

Happy Learning

THANK - YOU