

Operating System: Disk Structure

By: Vishvadeep Gothi



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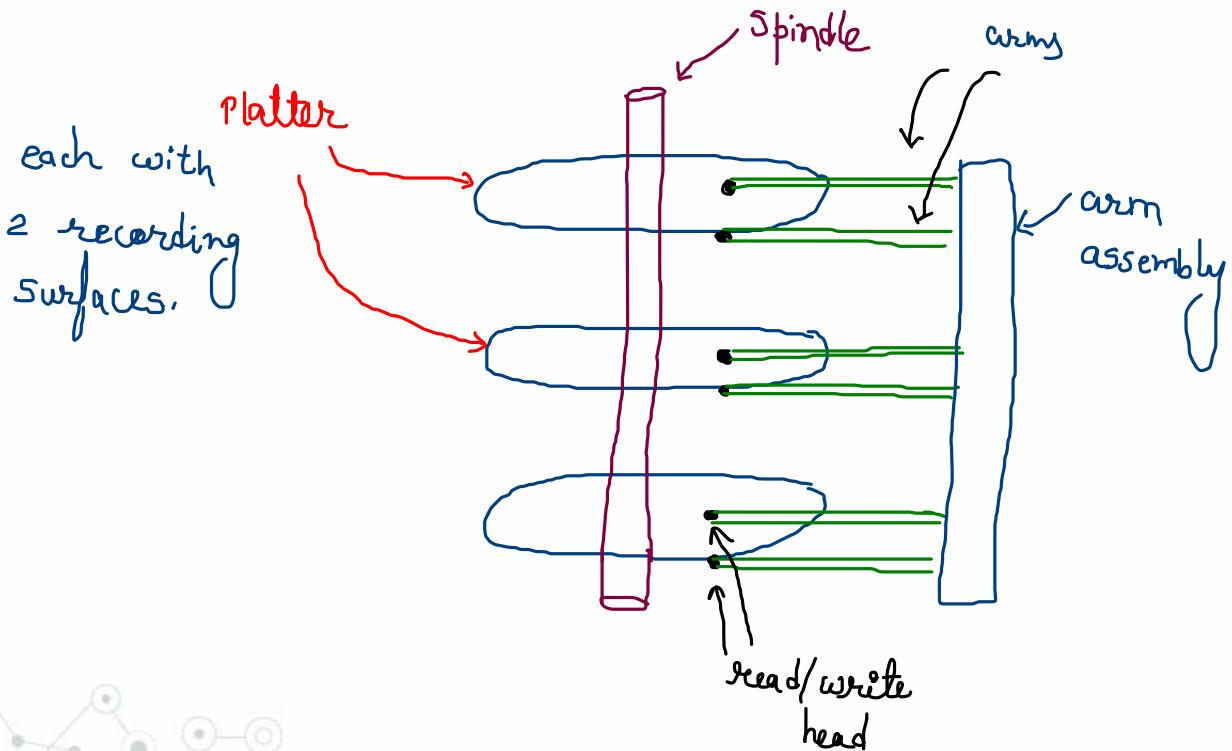
HDD → magnetic disk



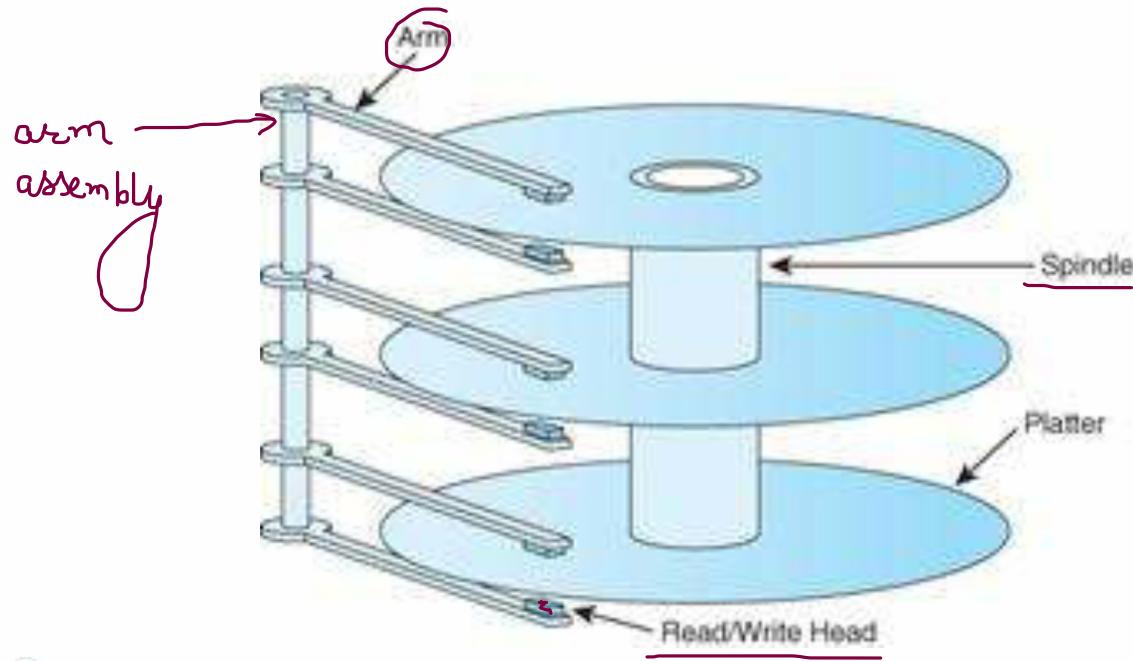
Magnetic Disk



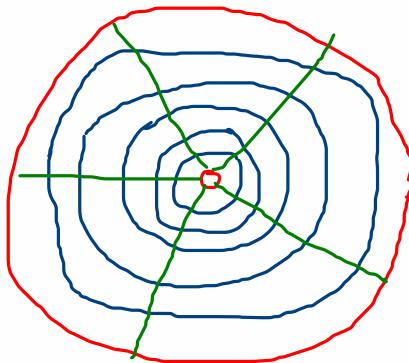
Magnetic Disk



Magnetic Disk



Top View of Magnetic Disk



Sector is the smallest unit of disk which can be read or written at once.

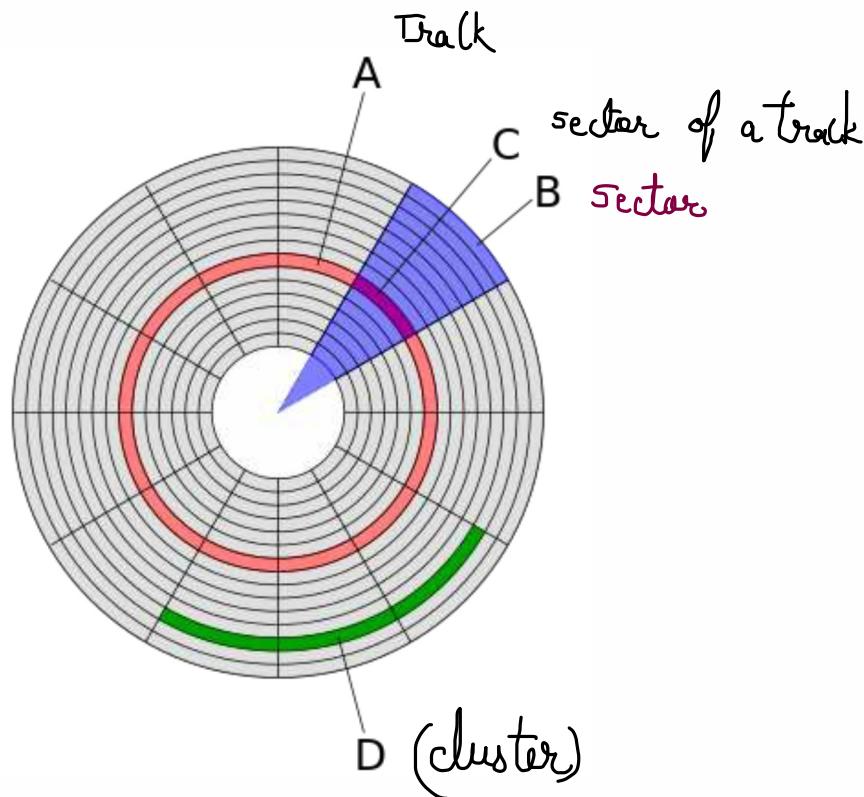
Sector is addressable unit of disk

$$\text{no. of sectors in disk } (n_s) = 2 * \text{no. of platters} * \frac{\text{no. of tracks per surface}}{\text{per track}} * \frac{\text{no. of sectors per track}}{\text{per track}}$$

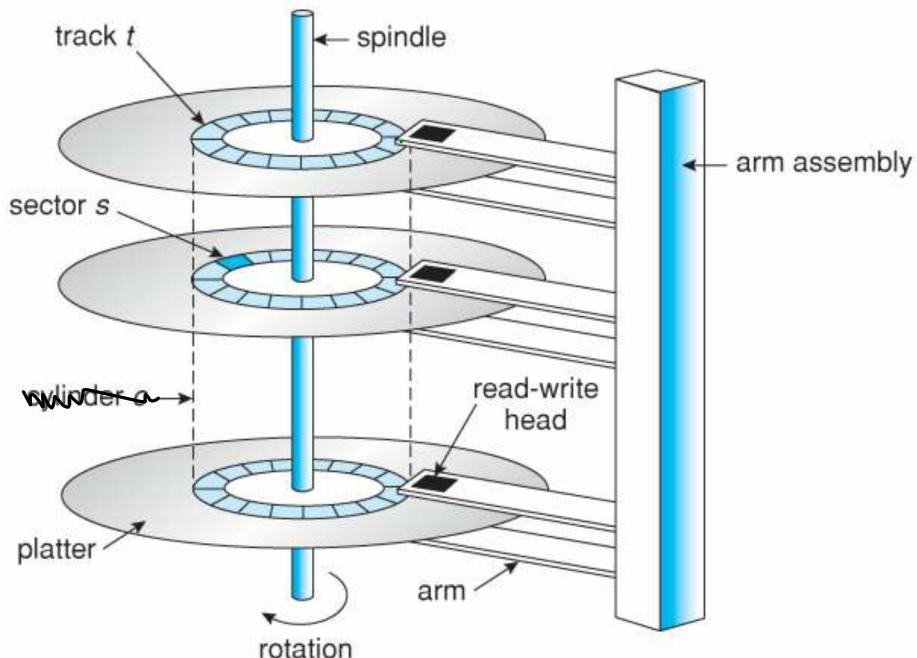
$$\text{add. size} = \log_2(n_s) - \text{bits}$$



Top View of Magnetic Disk



Magnetic Disk



Sector Capacity

→ each sector has constant storage capacity

$$= 2 * \frac{\text{no. of platters}}{\text{per surface}} * \frac{\text{no. of tracks}}{\text{per track}} * \frac{\text{no. of sectors}}{\text{per track}} * \text{1 sector capacity}$$



Disk Capacity



Disk Access Time

= seek time + rotational latency + 1 sector transfer time + additional delay

$$\text{avg rotational latency} = \frac{1 \text{ disk rotation time}}{2}$$

$$1 \text{ sector transfer time} = \frac{1 \text{ disk rotation time}}{\text{no. of sectors per track}}$$

Disk Access Time

* **Seek Time:** Time required to position the arm over the desired track

Rotational Latency: time required to rotate desired sector under R/W head

Transfer Time: Time required to read or write 1 sector

Question

Consider a disk with 16 platters, 2 surfaces per platter, 1K tracks per surface, 2K sectors per track and 2048 Bytes per sector. Disk rotates with 3000 rpm. Seek time is 10ms.

1. Find capacity of disk $= 2 * 16 * 1K * 2K * 2KB = 2^{37} B = 128 GB$
2. Number of bits required for addressing the disk? $\text{no. of sectors} = 2 * 16 * 1K * 2K = 2^{26}$
add. = 26 - bits
3. Find disk access time? 20.01 msec
4. ~~Find the disk transfer rate?~~

Solution

Disk access time = seek time + rotational latency + $\frac{1}{\text{sector transfer time}}$

$$= 10 \text{ msec} + \frac{20 \text{ msec}}{2} + \frac{20 \text{ msec}}{2k}$$

$$= 20.01 \text{ msec}$$

In 3000 rotations, disk takes = 1 min = 60 sec = 60000 msec

$$\text{in 1 rotation, disk takes} = \frac{60000 \text{ msec}}{3000}$$

$$= 20 \text{ msec}$$

Solution



Next Class

Disk Blocks

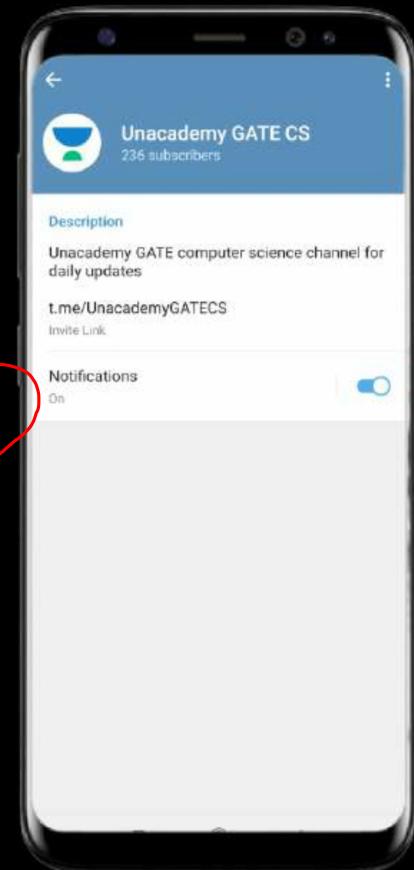


Disk Scheduling





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