CS302
Operating System

Lab 9

Disk Scheduling

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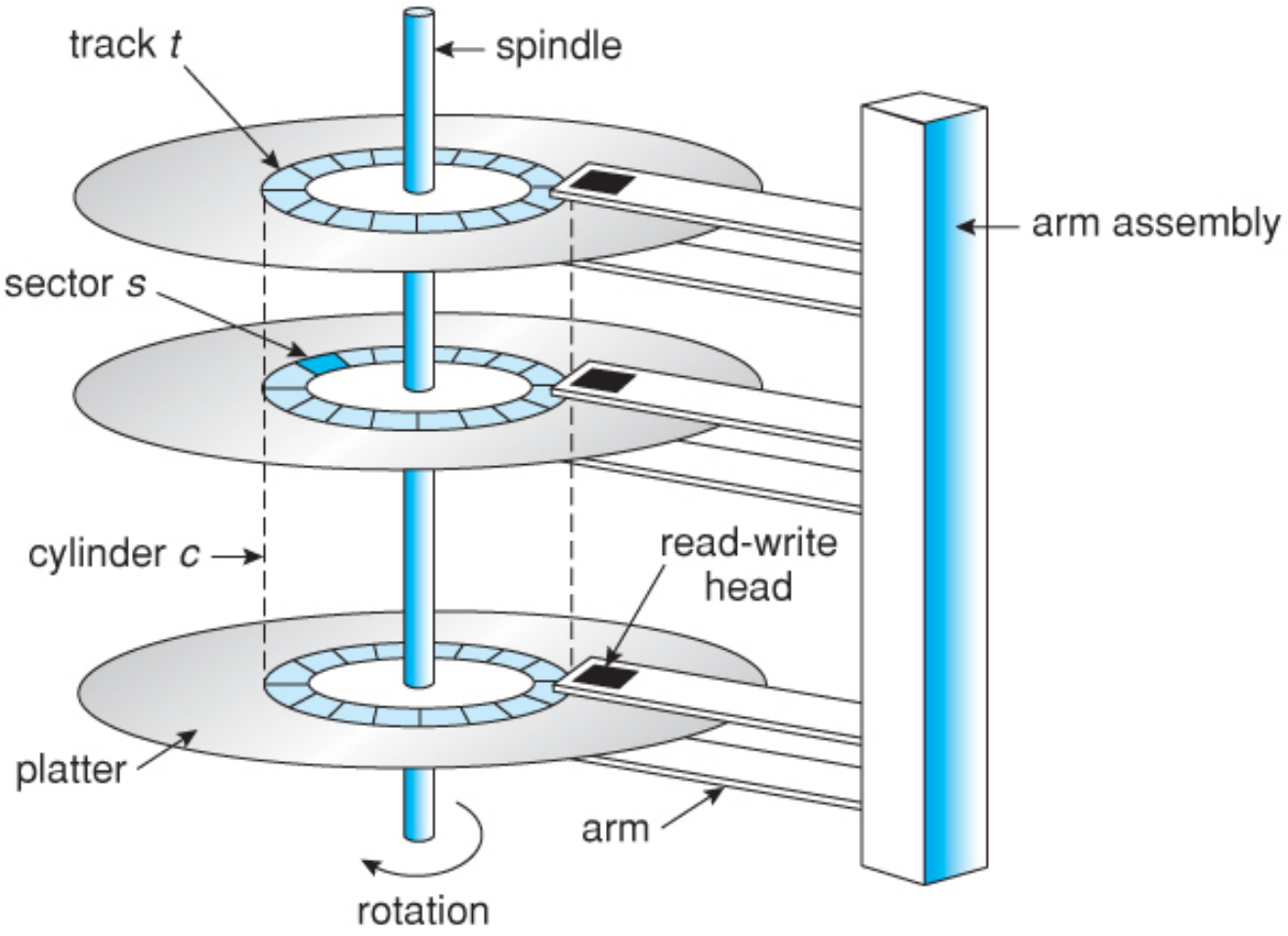
HDD Structure

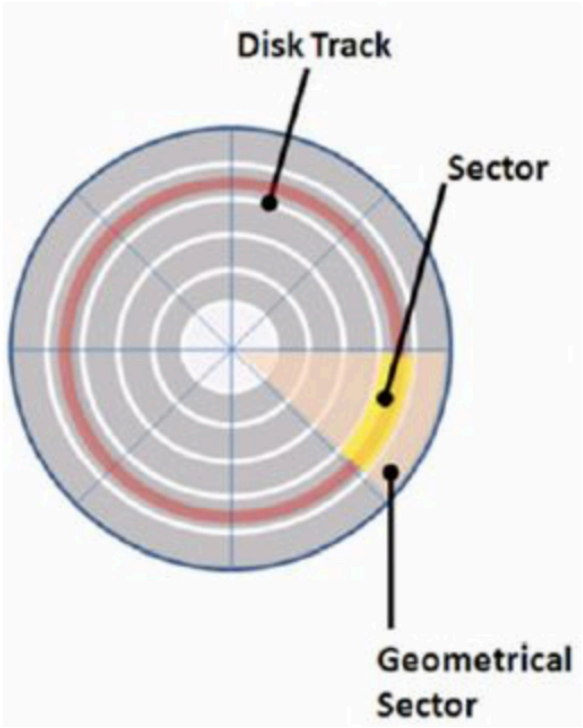


Disk Structure

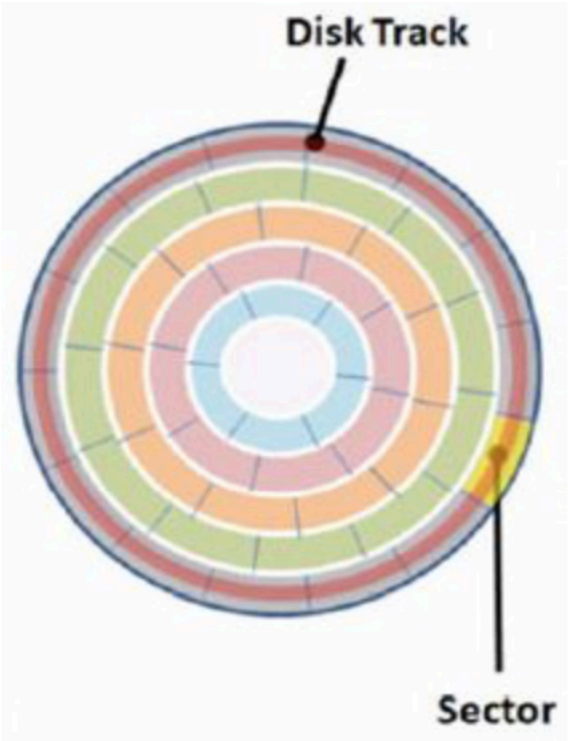
- Sector
  - the smallest physical storage unit on the disk.

- **Is the number of sectors same in outer and inner track?**

Zone Bit Recording(ZBR)



- Non ZBR
- Same Track Size
- Different Sector Density



- ZBR
- Different Track Size
- Same Sector Density

Zone Bit Recording(ZBR)

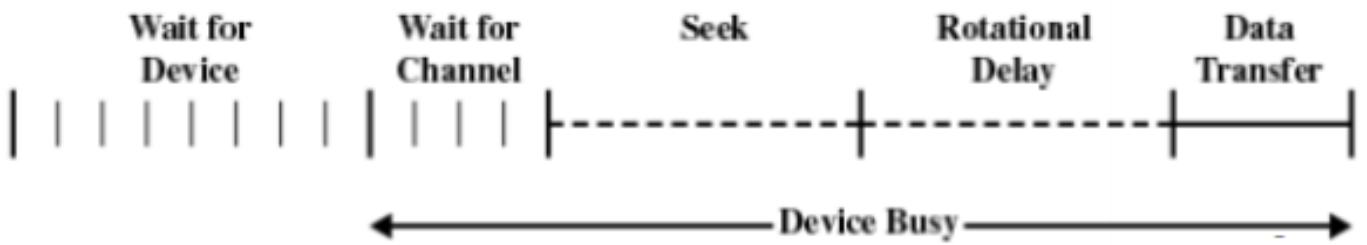
- What is the advantages of ZBR?
  - Make fully use of outer track
    - **Why your computer become slower and slower?**

Disk Organization

- Each physical record on the disk has a unique address. The address includes three parts: **Head identifier**, **Track identifier**, **Sector identifier**
- When the disk drive is operating, the disk is **rotating at constant speed**
- To read or write, the disk head must be positioned on the desired track and the beginning of the desired sector

Performance Parameters

- **Seek time** is the time it takes to position the head on the desired track
- **Rotational delay** or **rotational latency** is the additional time it takes for the beginning of the sector to reach the head once the head is in position
- **Transfer time** is the time for the sector to pass under the head



Disk Scheduling

- Seek time is the reason for differences in performance
- Disk Scheduling Algorithms are used to reduce the total seek time of any request

Disk Scheduling Algorithms

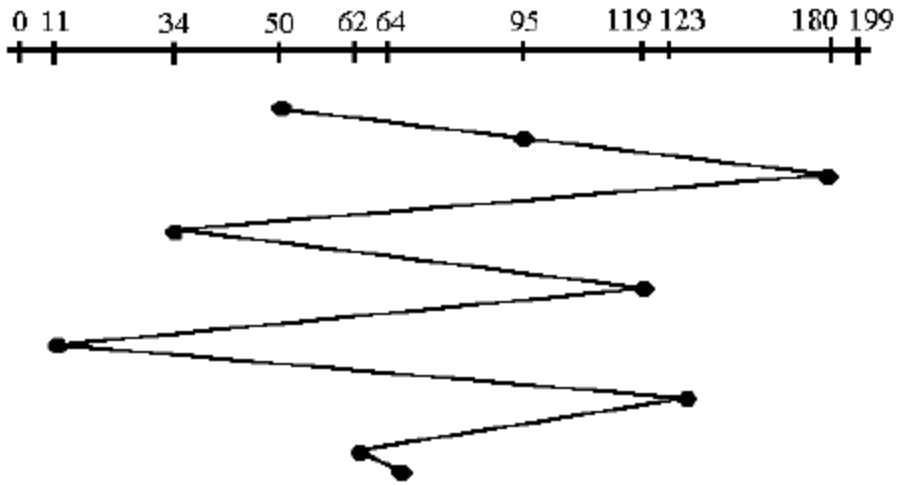
- First Come-First Serve (FCFS)
- Shortest Seek Time First (SSTF)
- Elevator (SCAN)
- Circular SCAN (C-SCAN)
- LOOK
- C-LOOK

Disk Scheduling - FCFS

- **First Come First Serve**
  - Process request sequentially
  - Fair to all processes
  - Approaches random scheduling in performance if there are many processes

Disk Scheduling - FCFS

- Given the following queue:
  - 95, 180, 34, 119, 11, 123, 62, 64
  - with the Read-write head initially at the track 50
  - the tail track being at 199



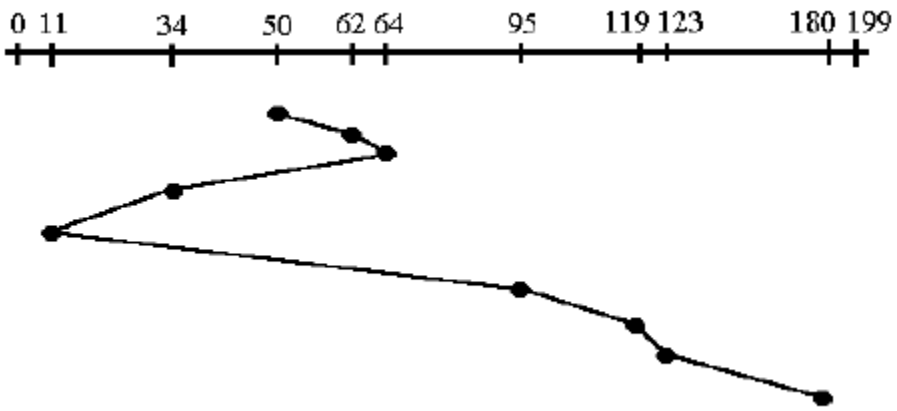
- |50-95|+|95-180|+|180-34|+|34-119|+|119-11|+|11-123|+ |123-62|+|62-64|
- Total: 45+85+146+85+108+112+61+2 = 644

Disk Scheduling - SSTF

- **Shortest Seek Time First (SSTF)**
  - Select the disk I/O request that requires the least movement of the disk arm from its current position
  - Always choose the minimum seek time
  - Requests for tracks far away from the current position may never be served, if requests for closer tracks are issued continuously

Disk Scheduling - SSTF

- Given the following queue:
  - 95, 180, 34, 119, 11, 123, 62, 64
  - with the Read-write head initially at the track 50
  - the tail track being at 199



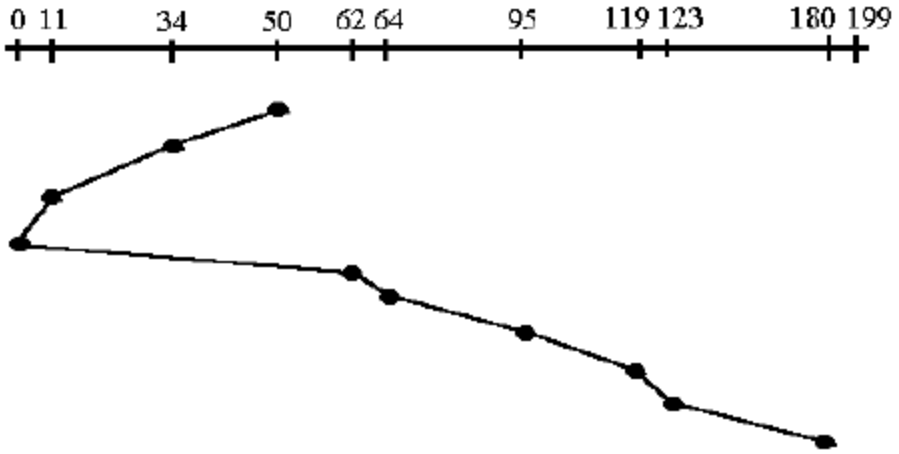
- Total: 236

Disk Scheduling - SCAN

- **SCAN (aka Elevator Algorithm)**
  - Arm moves in one direction only, satisfying all outstanding requests until it reaches the last track in that direction
  - This approach works like an elevator does.

Disk Scheduling – SCAN

- Given the following queue:
  - 95, 180, 34, 119, 11, 123, 62, 64
  - with the Read-write head initially at the track 50
  - the tail track being at 199



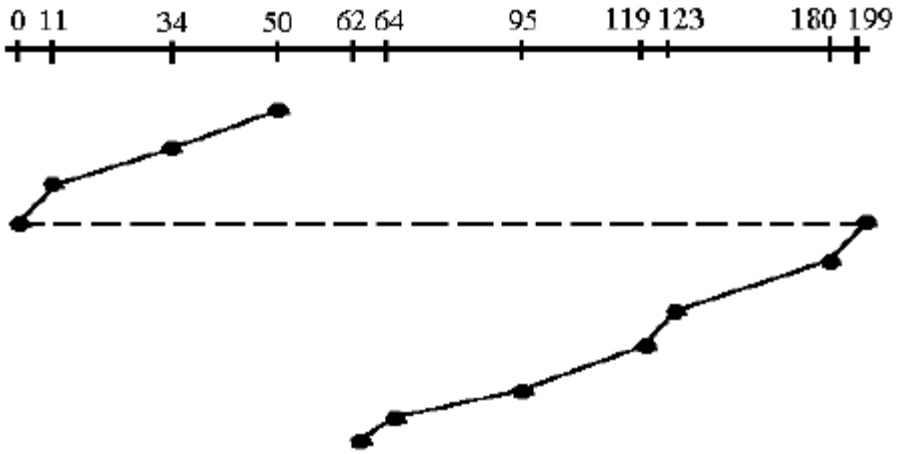
- Total: 230

Disk Scheduling – C-SCAN

- **C-SCAN**
  - Restricts scanning to one direction only
  - When the last track has been visited in one direction, the arm is returned to the opposite end of the disk and the scan begins again

Disk Scheduling – C-SCAN

- Given the following queue:
  - 95, 180, 34, 119, 11, 123, 62, 64
  - with the Read-write head initially at the track 50
  - the tail track being at 199

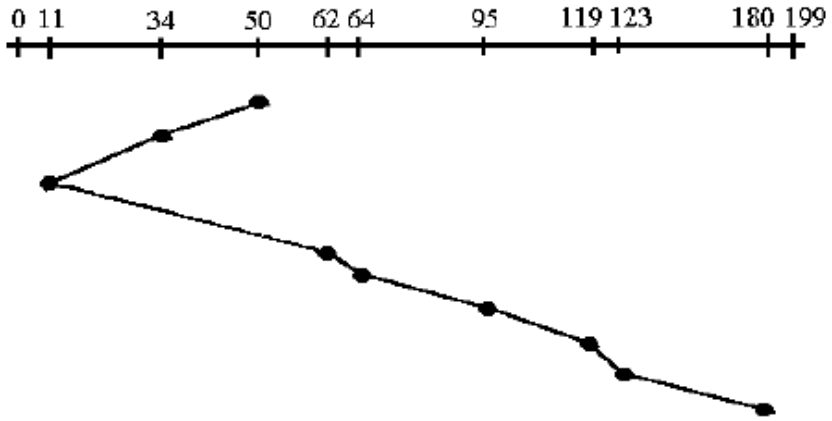


Disk Scheduling – LOOK

- **LOOK**
  - This is just an enhanced version of SCAN.
  - The magnetic arm only moves to the furthest requested position.

Disk Scheduling – LOOK

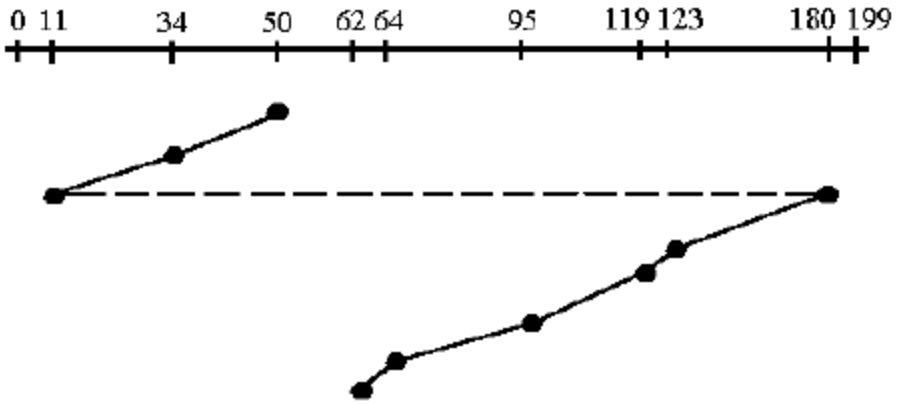
- Given the following queue:
  - 95, 180, 34, 119, 11, 123, 62, 64
  - with the Read-write head initially at the track 50
  - the tail track being at 199



- Total: 208

Disk Scheduling – C-LOOK

- **C-LOOK**
  - This is just an enhanced version of C-SCAN.
  - It too jumps to the other end but not all the way to the end. Just to the furthest request.



Thanks