

Secondary Storage Devices

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CSED, TU

Disclaimer

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Content has been taken mainly from the following books:

Operating Systems Concepts By Silberschatz & Galvin,
Operating Systems: Internals and Design Principles By William Stallings

www.os-book.com

www.cs.jhu.edu/~yairamir/cs418/os2/sld001.htm

www.personal.kent.edu/~rmuhamma/OpSystems/os.html

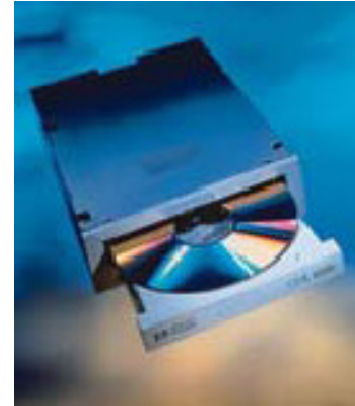
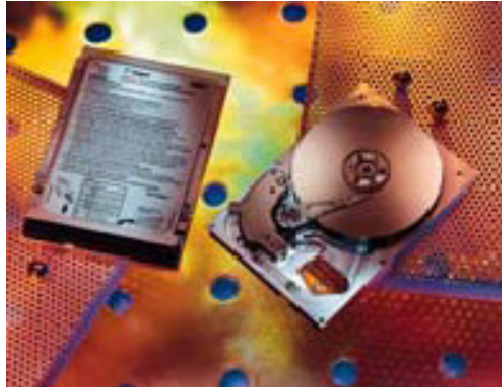
[http://msdn.microsoft.com/en-us/library/ms685096\(VS.85\).aspx](http://msdn.microsoft.com/en-us/library/ms685096(VS.85).aspx)

<http://www.computer.howstuffworks.com/operating-system6.htm>

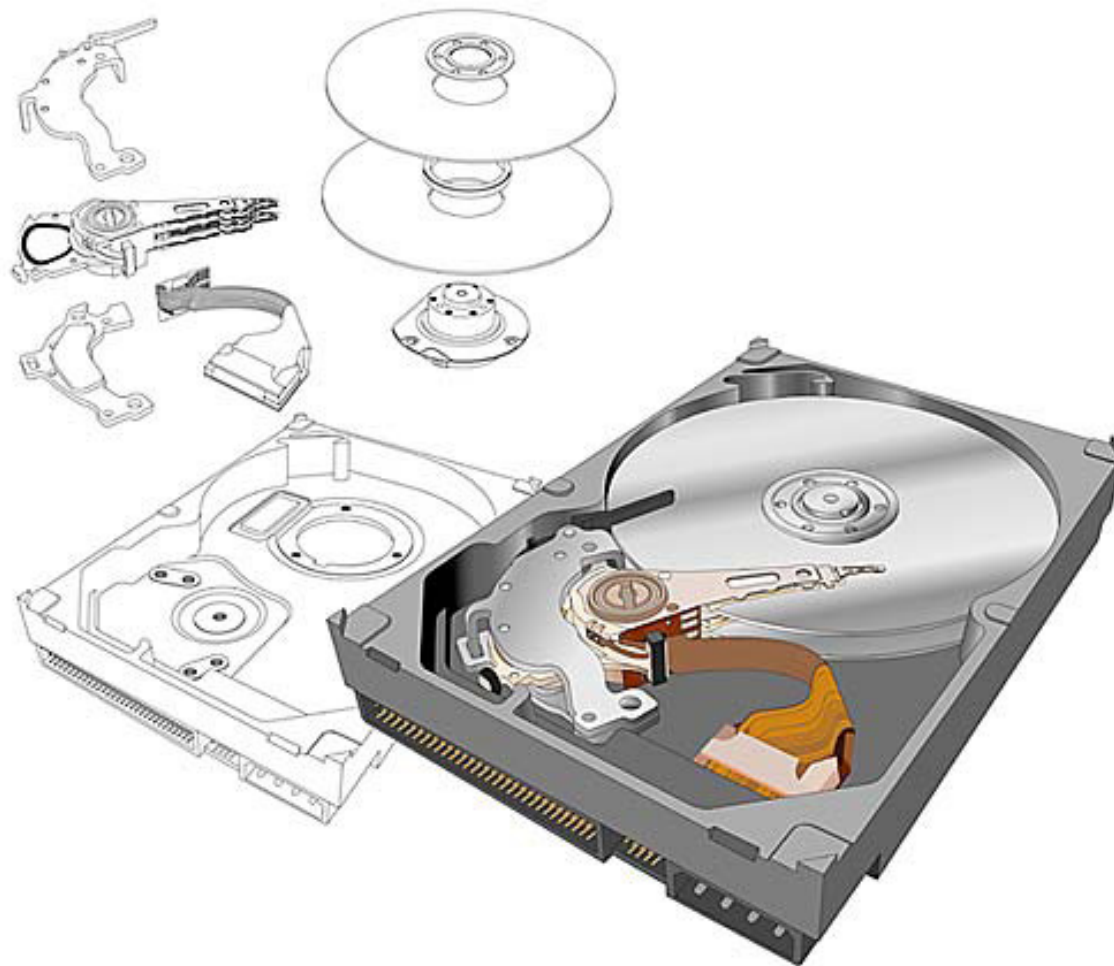
<http://williamstallings.com/OS/Animations.html>

Etc...

Secondary Storage Devices

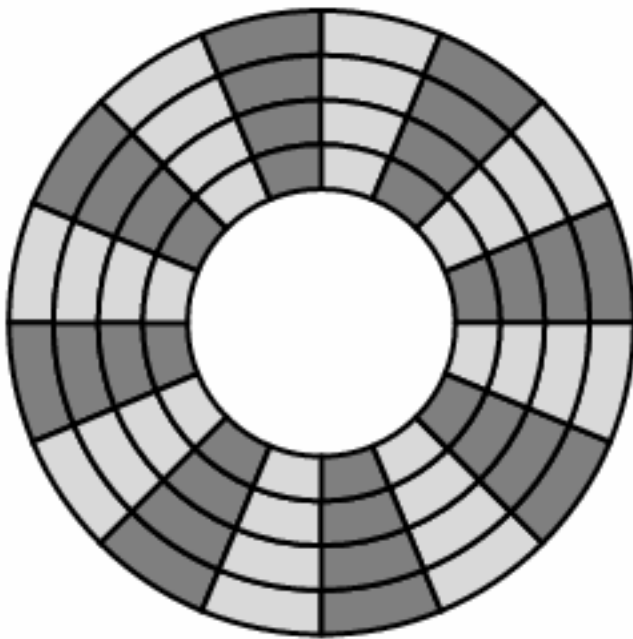


Hard Disk

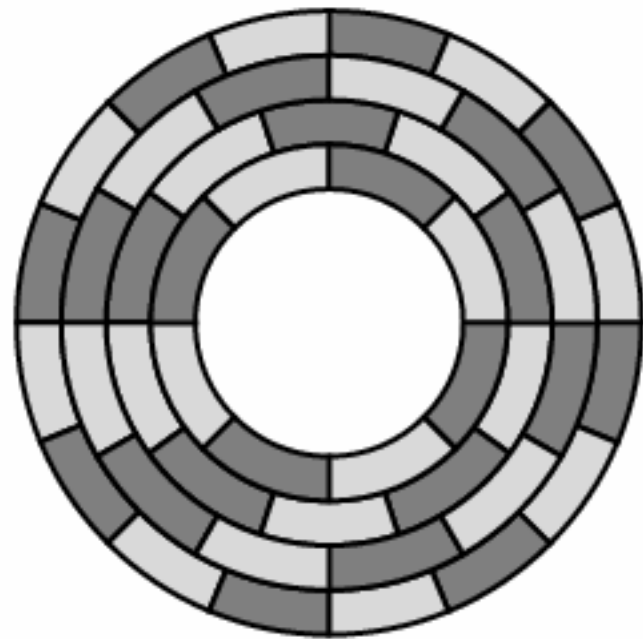


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Tracks & Sectors



(a) Constant angular velocity

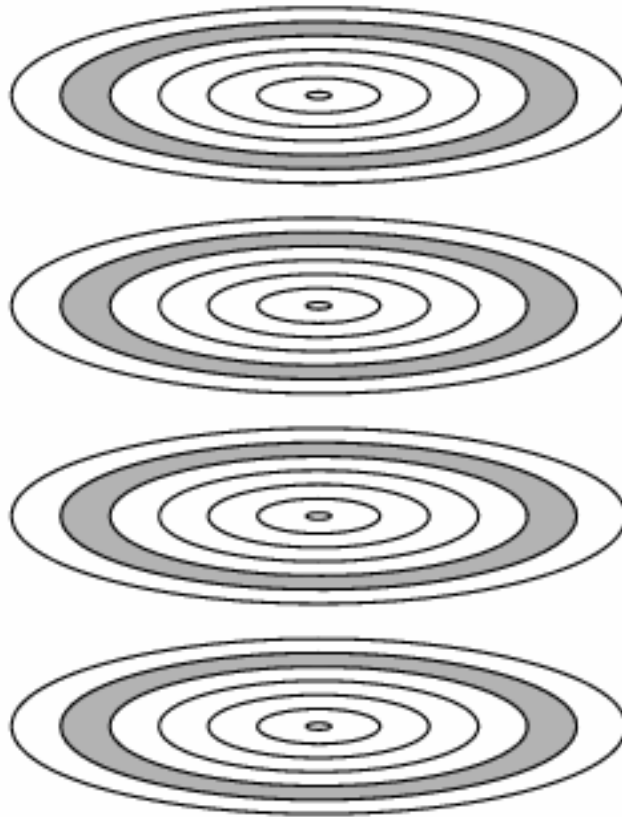


(b) Multiple zoned recording

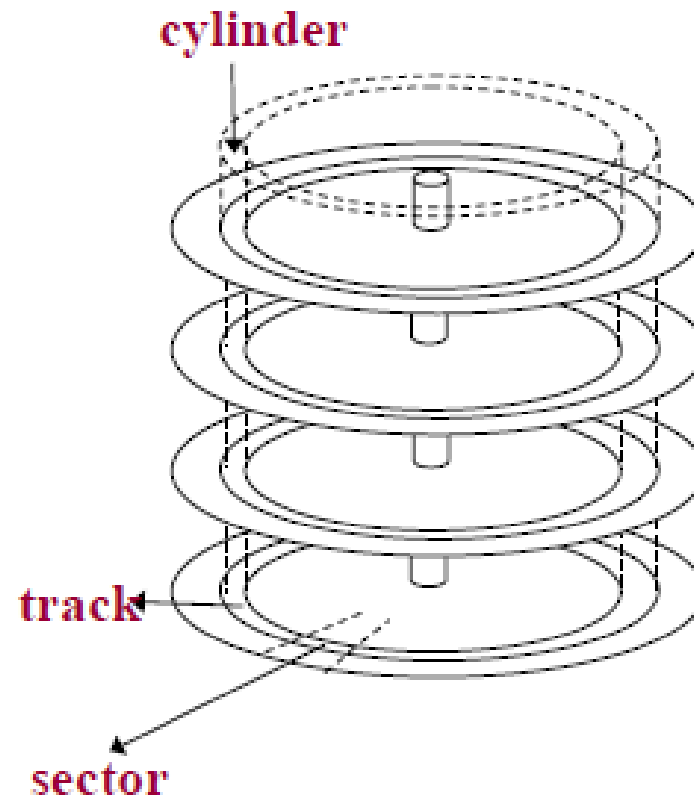
Removable & Non-Removable



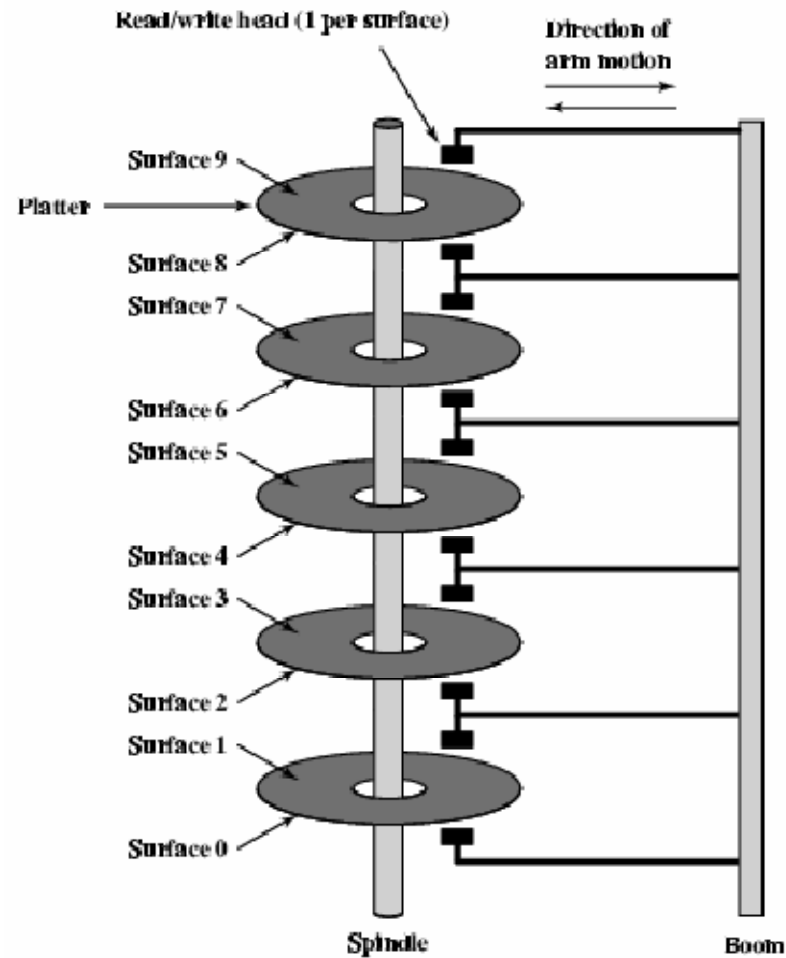
Group of Platters



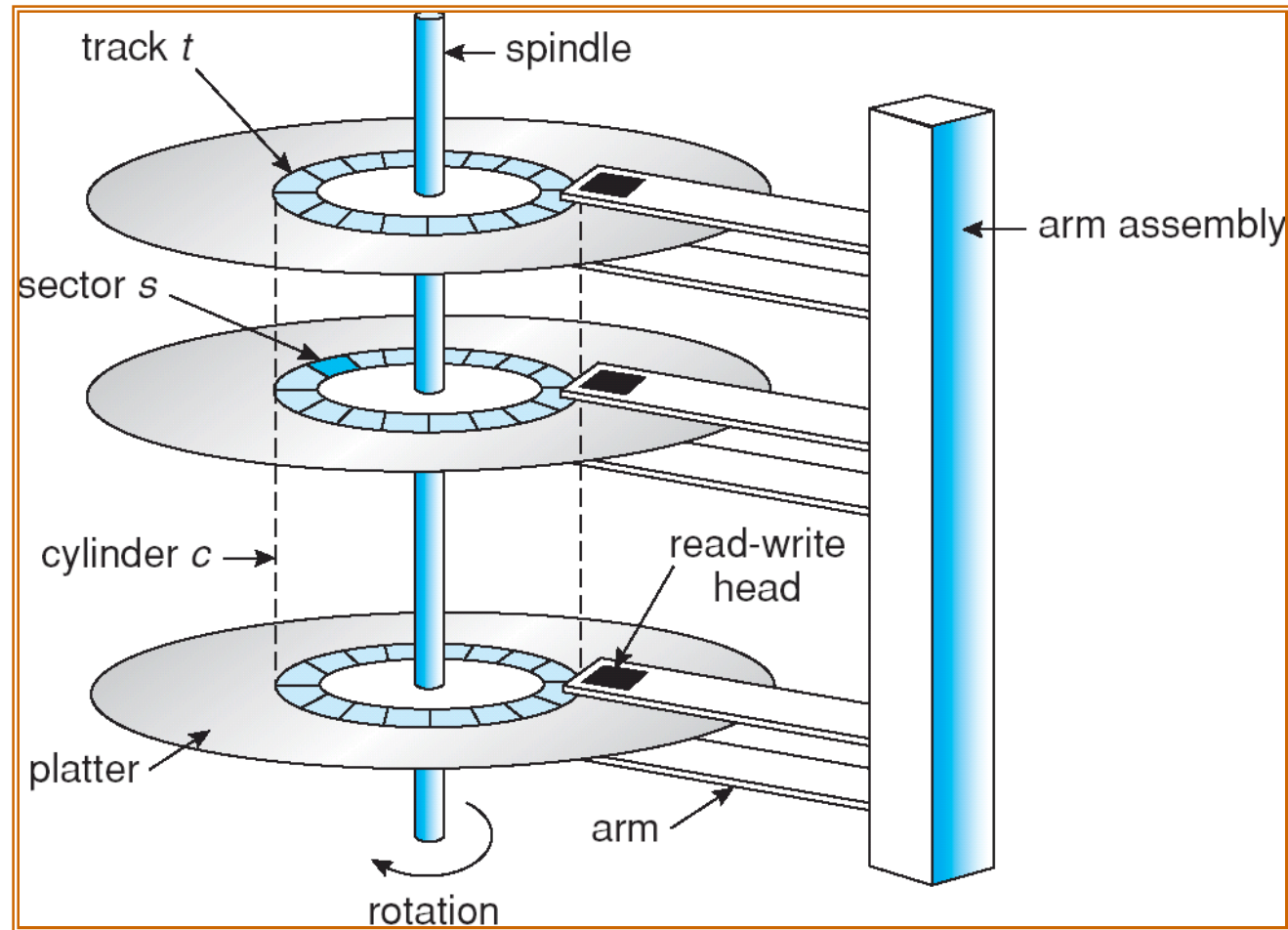
Cylinder



Disk & R/W Head



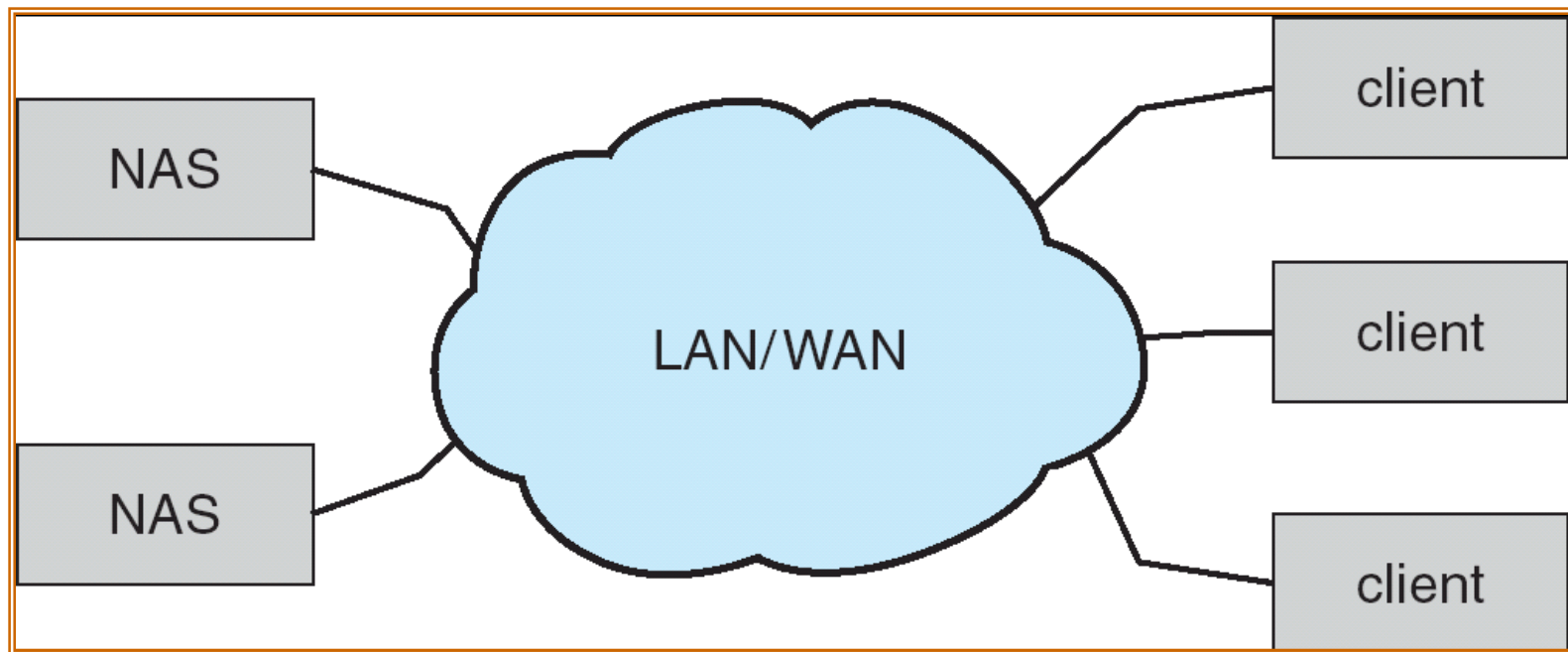
Moving Head Disk Mechanism



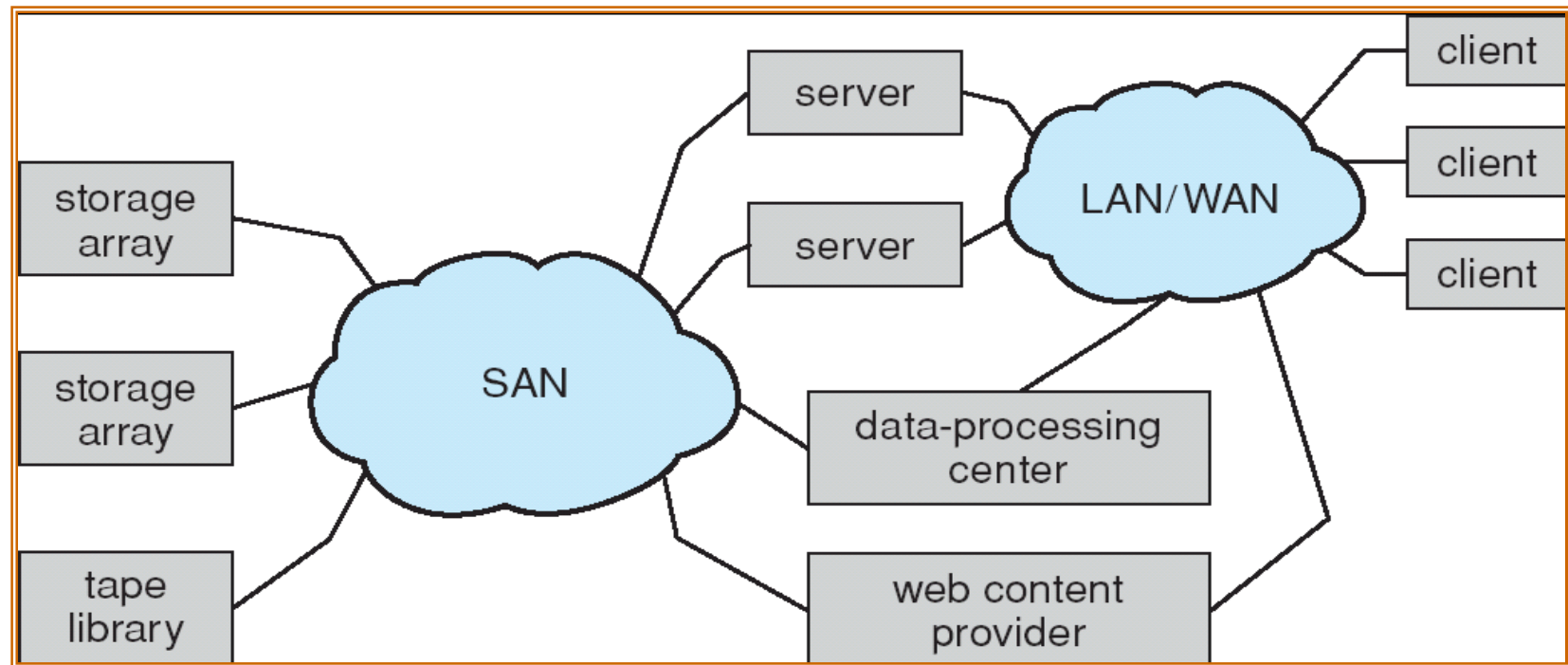
Disk Performance Parameters

- ***Seek time***
 - Moving head to target track
- ***Rotational delay*** or ***rotational latency***
 - Waiting for target sector to rotate under head
 - **rpm**, **RPM** (revolutions per minute)
- ***Access time*** = Seek + Latency
- ***Transfer time***

Network Attached Storage



Storage Area Network



Disk Scheduling

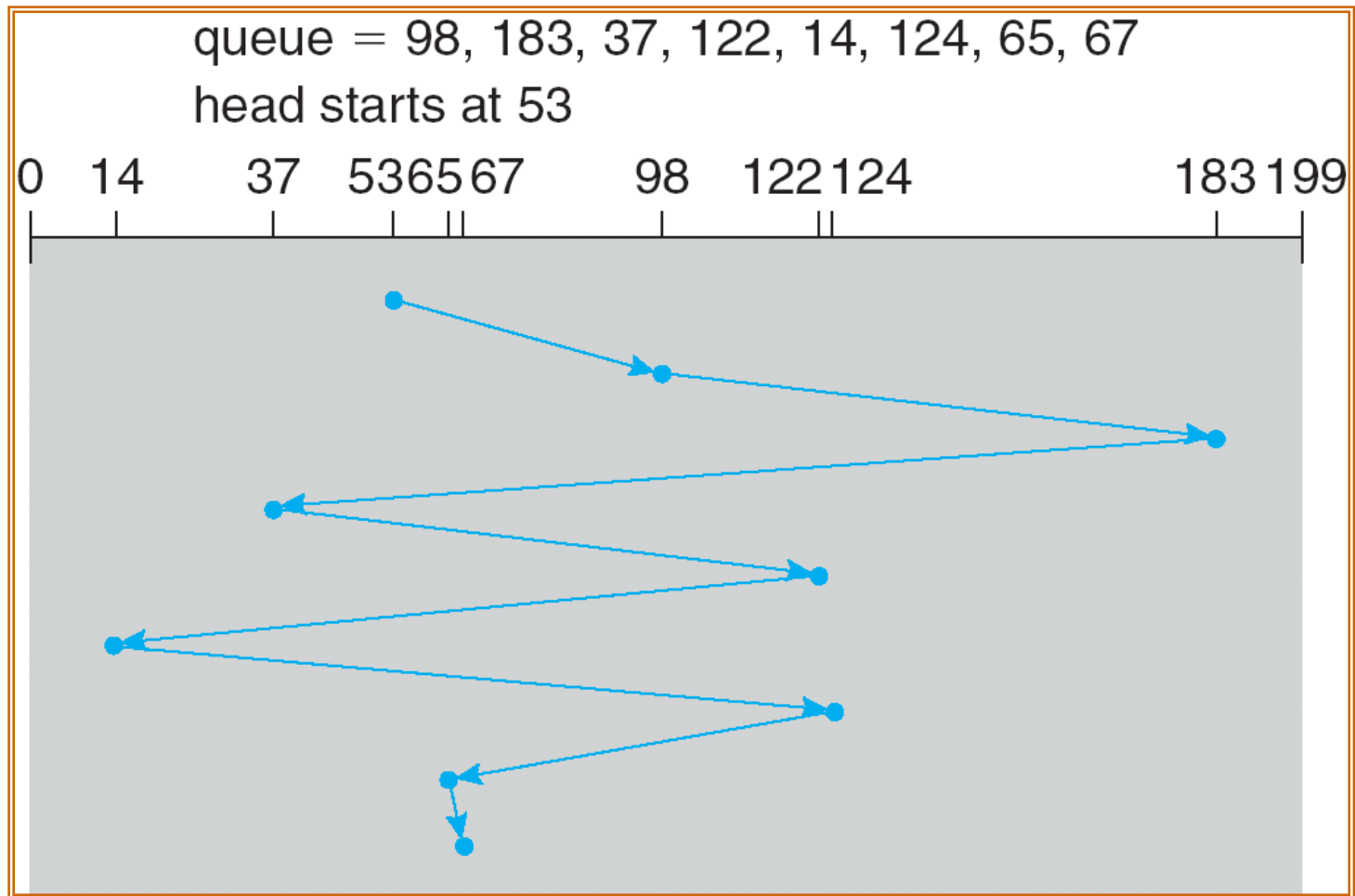
- Operating System is responsible for using hardware efficiently — for the disk drives, this means having a fast *access time*.
- *Access Time* has two major components
 - *Seek time* is the time for the disk are to move the heads to the cylinder containing the desired sector.
 - *Rotational latency* is the additional time waiting for the disk to rotate the desired sector to the disk head.
- Minimize Seek Time. Seek time \approx seek distance
- Disk bandwidth is the total number of bytes transferred, divided by the total time between the first request for service and the completion of the last transfer.

- Several algorithms exist to schedule the servicing of disk I/O requests.
- We illustrate them with a request queue (0-199).

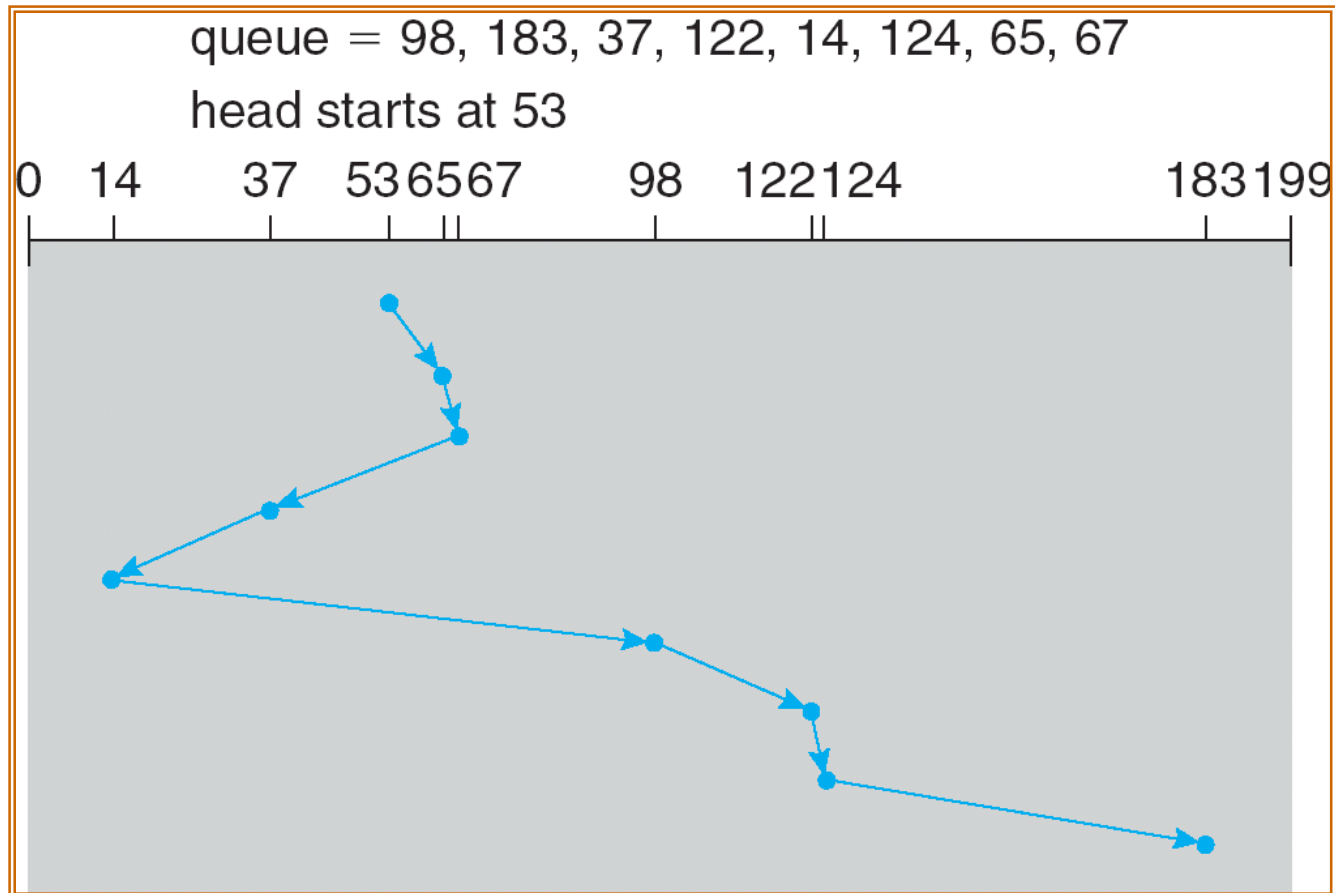
98, 183, 37, 122, 14, 124, 65, 67

Head pointer 53

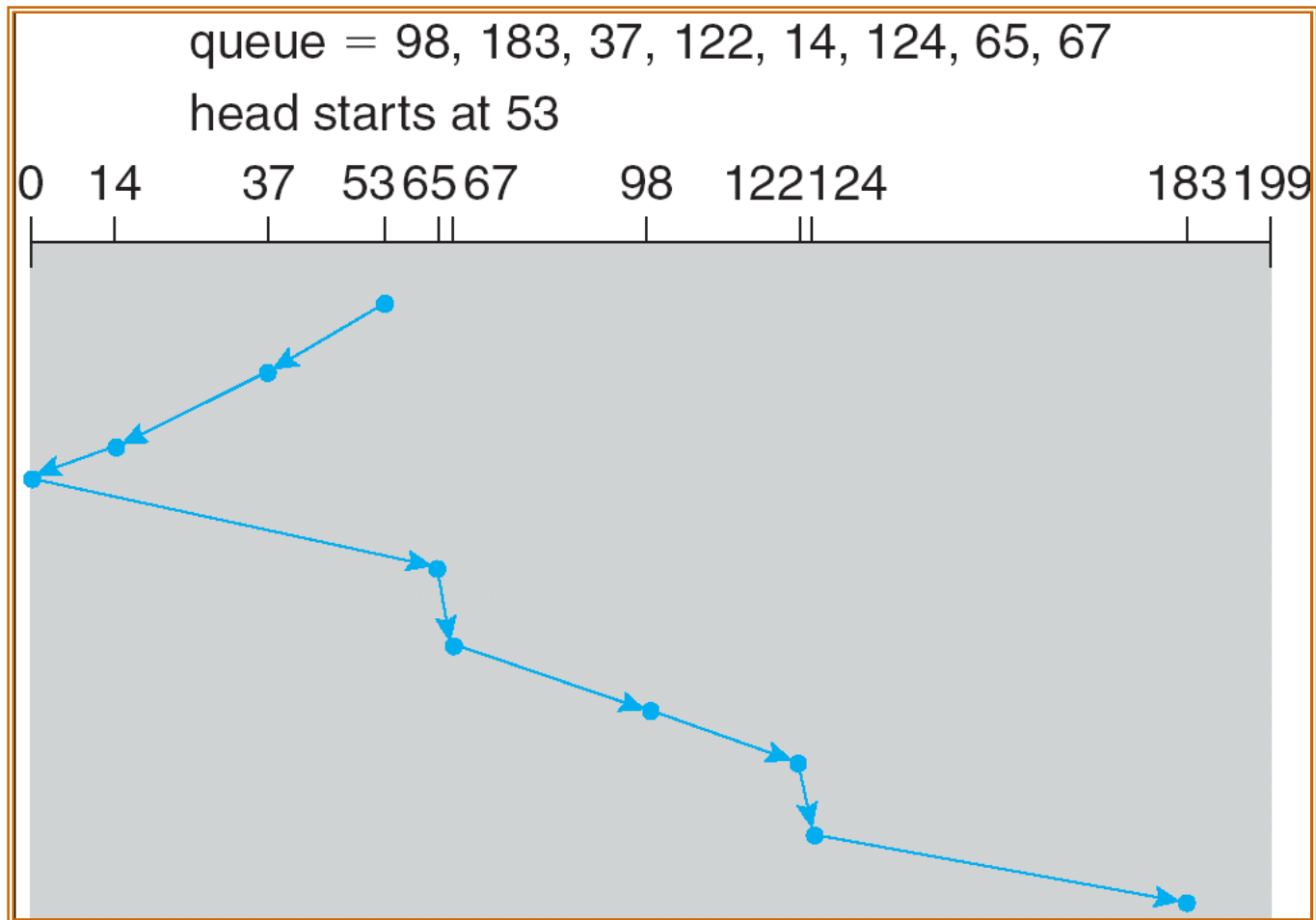
FCFS (640 moves)



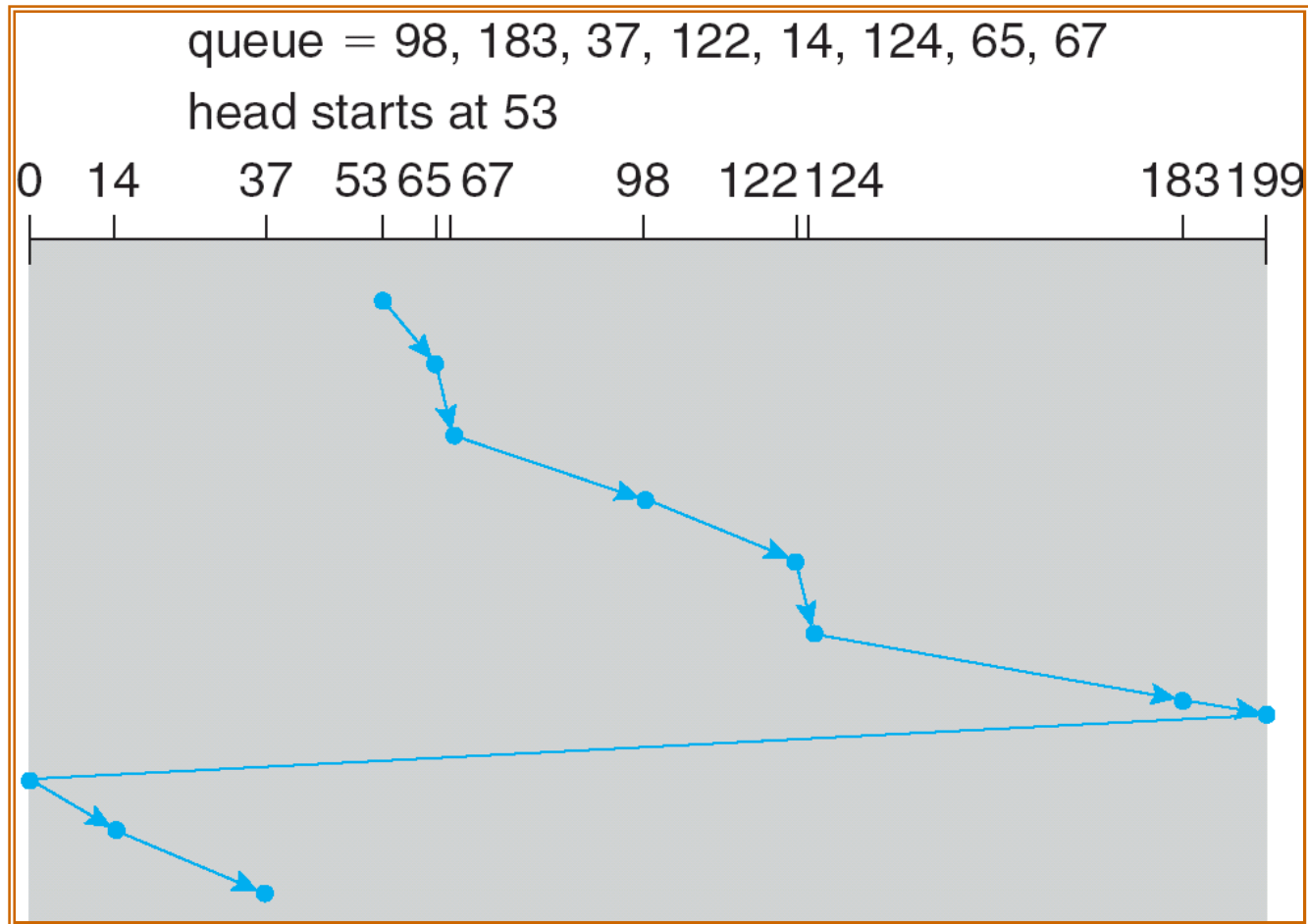
SSTF (236 moves)



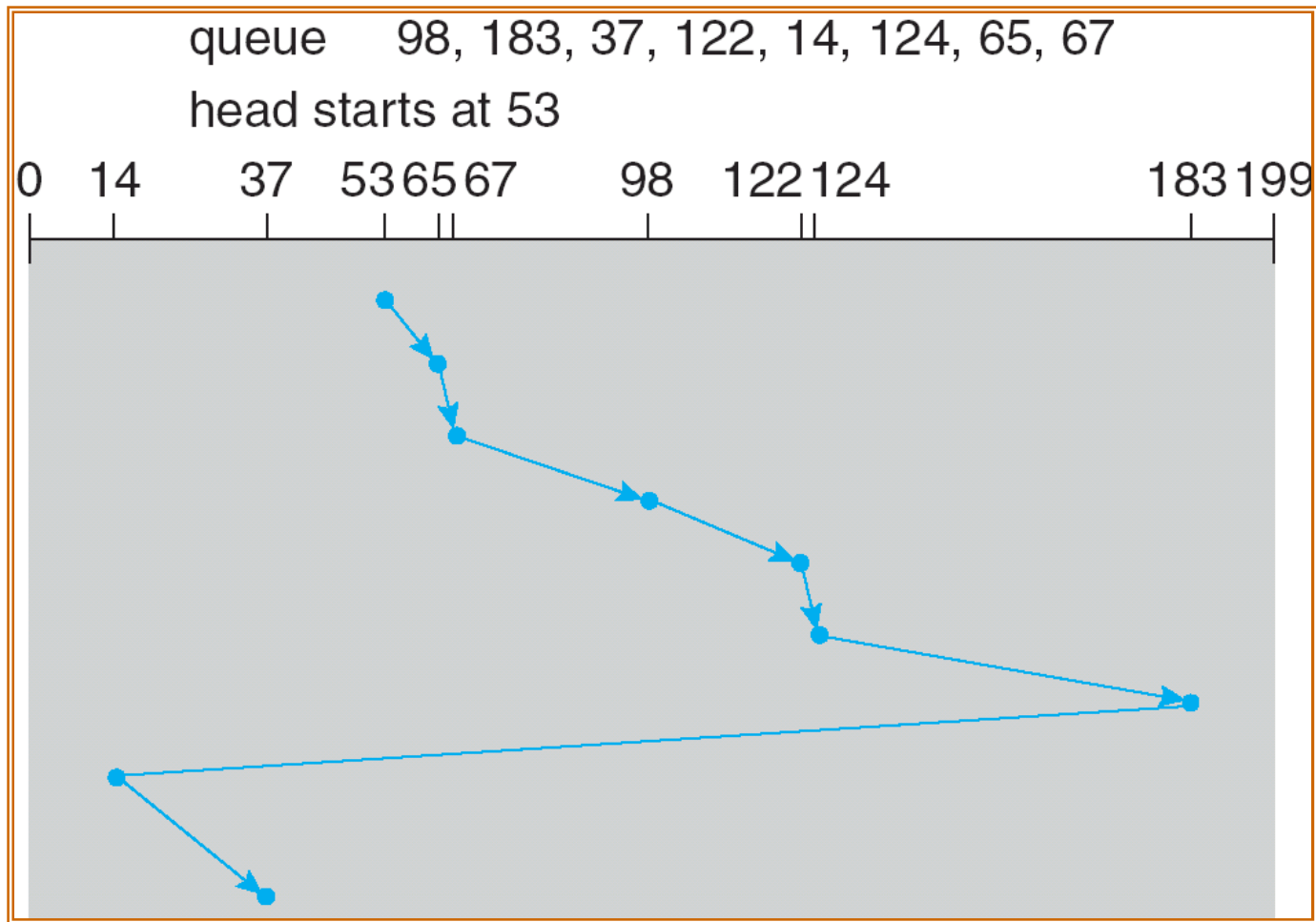
SCAN / Elevator (208 moves)



C-SCAN



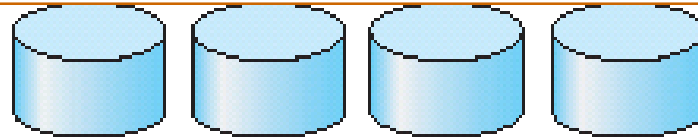
C-LOOK



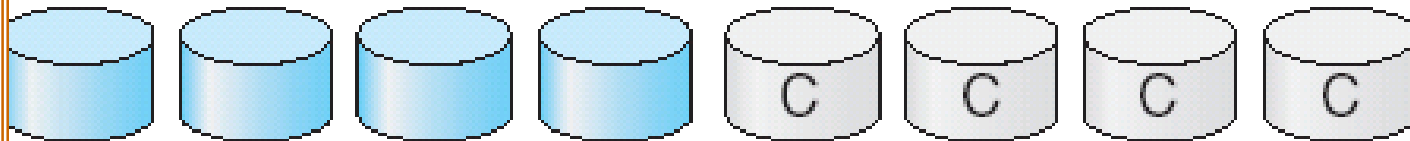
RAID (Redundant Array of Inexpensive Disk)

- *RAID* – Multiple Disk drives provides Reliability via Redundancy.
- *RAID* is arranged into *SIX* different Levels.
- Data Striping
- Bit-Level Striping/Block Level Striping

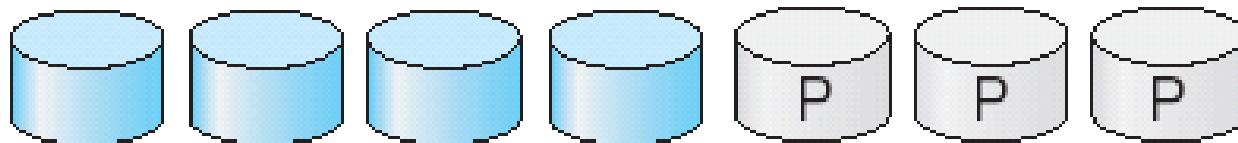
RAID (contd.)



(a) RAID 0: non-redundant striping.

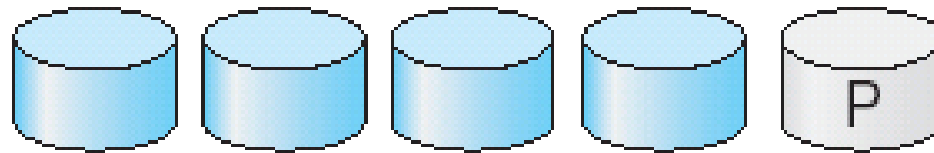


(b) RAID 1: mirrored disks.

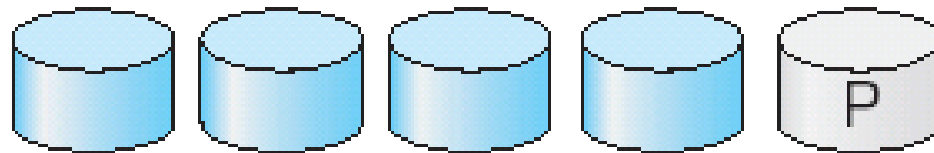


(c) RAID 2: memory-style error-correcting codes.

RAID (contd.)

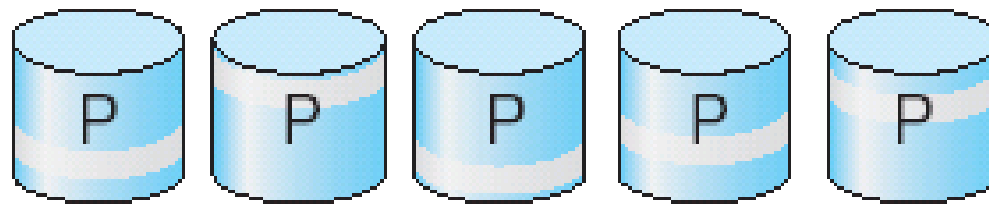


(d) RAID 3: bit-interleaved parity.

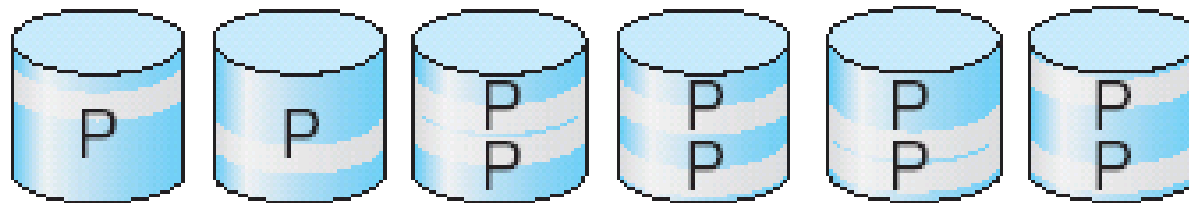


(e) RAID 4: block-interleaved parity.

RAID (contd.)

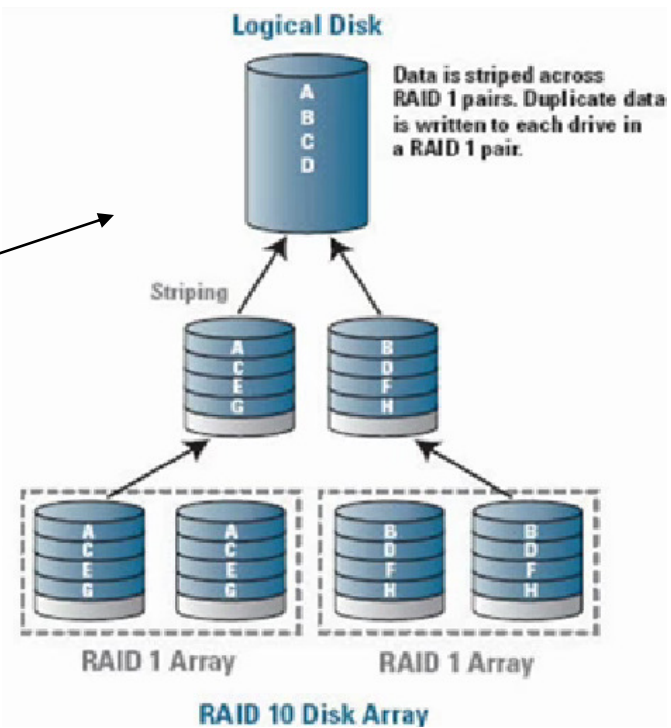
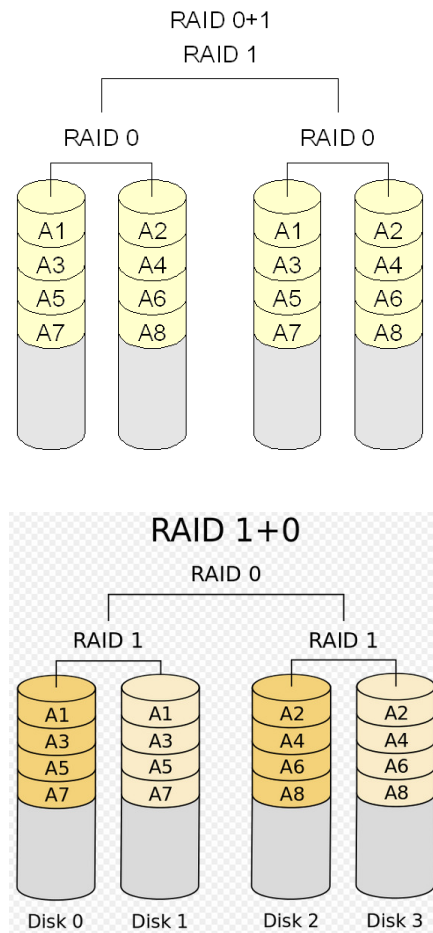


(f) RAID 5: block-interleaved distributed parity.



(g) RAID 6: P + Q redundancy.

RAID 0+1 and RAID 1+0



Reference List

Operating Systems Concepts By Silberschatz & Galvin,
Operating systems By D M Dhamdhere,
System Programming By John J Donovan,

www.os-book.com

www.cs.jhu.edu/~yairamir/cs418/os2/sld001.htm

<http://gaia.ecs.csus.edu/~zhangd/oscal/pscheduling.html>

http://www.edugrid.ac.in/iitmk/os/os_module03.htm

<http://williamstallings.com/OS/Animations.html>

etc...



Thnx...