

Homework

Part 3: Persistence –

10) I/O Devices

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1 Hard Disk Drives

Suppose we have the same HDDs as discussed during lecture:

	Cheetah	Barracuda
Capacity	300 GiB	1 TiB
RPM	15'000	7'200
Average Seek	4 ms	9 ms
Max Transfer	125 MiB/s	105 MiB/s
Platters	4	4
Cache	16 MiB	16/32 MiB
Interface	SCSI	SATA

1.1 Sequential Read of 20 MiB

Compute $T_{I/O}$ and $R_{I/O}$ for both disks when sequentially reading 20 MiB of data.

1.2 Sequential Read of 16 KiB

Compute $T_{I/O}$ and $R_{I/O}$ for both disks when sequentially reading 16 KiB of data.

2 Scheduling Strategies

Conduct parts of the simulation homework from *OSTEP, Chapter 37*, found at [ost] (“Hard Disk Drives”). Run `disk.py` in graphical mode to get an animation of a rotating HDD!

🔗 In order to use `disk.py` in graphical mode, you may need to install `python-tk` on your system first (e.g. “`sudo apt install python-tk`”).

2.1 Shortest Seek-Time First (SSTF)

Answer question 4 from the chapter homework:

FIFO is not always best, e.g., with the request stream “-a 7,30,8”, what order should the requests be processed in? Run the shortest seek-time first (SSTF) scheduler (“-p SSTF”) on this workload; how long should it take (seek, rotation, transfer) for each request to be served?

2.2 Shortest Access-Time First (SATF)

Answer question 5 from the chapter homework:

Now use the shortest access-time first (SATF) scheduler (“-p SATF”). Does it make any difference for “-a 7,30,8” workload? Find a set of requests where SATF outperforms SSTF; more generally, when is SATF better than SSTF?

2.3 Skew

Answer question 6 from the chapter homework:

Here is a request stream to try: “-a 10,11,12,13”. What goes poorly when it runs? Try adding track skew to address this problem (“-o skew”). Given the default seek rate, what should the skew be to maximize performance? What about for different seek rates (e.g., “-S 2,-S 4”)? In general, could you write a formula to figure out the skew?

References

[ost] *GitHub.com*, [remzi-arpacidusseau/ostep-homework](https://github.com/remzi-arpacidusseau/ostep-homework), <https://github.com/remzi-arpacidusseau/ostep-homework>.