

## Understanding Software Dynamics Ch 5 Lab Report

Notes:

- show a tree of block devices and their mount point:

```
$ lsblk
```

- mount a partition of a disk:

```
$ sudo mkdir /mnt/mydisk
```

```
$ sudo mount /dev/nvme0n1p1 /mnt/mydisk
```

- to ensure data is fully written to the disk but not in buffers

```
$ sync
```

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5.0) follow Book p.73

my mounted disk(SSD, not hard disk) directory: /mnt/synology

It is noted that makeself program should run in /postproc folder. And check that show\_disk.html is here too

And run export LC\_ALL=C in /postproc folder.

```
ubuntu@ubuntu2:/mnt/synology$ df -h /mnt/synology
Filesystem      Size  Used Avail Use% Mounted on
/dev/nvme0n1p2  468G  124G  321G   28% /

ubuntu@ubuntu2:~/Documents/github/KUtrace-experiments$ sudo ./mystery3 /mnt/synology/bobby.temp
[sudo] password for ubuntu:
TimeDiskRead opening /mnt/synology/bobby.temp for write
TimeDiskRead opening /mnt/synology/bobby.temp for read of 40960KB
Async read startusec 1758845413022649, stopusec 1758845413048608, delta 25959
scancount 747, changecount inside scan 10240
1615.742MB/sec overall

/mnt/synology/bobby_read_times.txt and /mnt/synology/bobby_read_times.json written
TimeDiskWrite to be completed
TimeDiskWrite opening /mnt/synology/bobby.temp for async write of 40960KB
Async write startusec 1758845413062247, stopusec 1758845413095331, delta 33084
1267.774MB/sec overall

TimeDiskWrite opening /mnt/synology/bobby.temp for read
/mnt/synology/bobby_write_times.txt and /mnt/synology/bobby_write_times.json written

ubuntu@ubuntu2:/mnt/synology$ ls
Bobby      bobby.temp      credentials
bobby_read_times.json  bobby_write_times.json  test.txt
bobby_read_times.txt  bobby_write_times.txt
ubuntu@ubuntu2:/mnt/synology$ export LC_ALL=C
ubuntu@ubuntu2:/mnt/synology$

ubuntu@ubuntu2:~/Documents/github/KUtrace/postproc$ cat /home/ubuntu/Documents/github/KUtrace-experiments/Solution/Ch5/InDisk/bobby_read_times.json | ./makeself show_disk.html > bobby_disk_read.html
ubuntu@ubuntu2:~/Documents/github/KUtrace/postproc$ cat /home/ubuntu/Documents/github/KUtrace-experiments/Solution/Ch5/InDisk/bobby_write_times.json | ./makeself show_disk.html > bobby_disk_write.html
```

I do not have a hard disk, so for 5.1-5.6 and 5.10. I can only predict what will happen.

5.1) [predict] track-to-track head switch and re-servo time.

5.2) [predict] because the filesystem logical block size does not align perfectly with disk sector size, or because of disk caches/ filesystem caches

5.3) [predict] smallest transfer time = 10-20 $\mu$ s  
seek and rotate time to get the very first block read = 10-15 $\mu$ s

5.4) [predict] large transfer time (like 1GB files) = 1-10s

5.5) [predict] 100-200MB/s

5.6) [predict] 250-300MB/s. It is because of the on-disk track buffer

5.7) seek time = 200 $\mu$ s  
transfer rate = 0.000195MB/s

5.8) bobby\_disk\_read.html, bobby\_disk\_write.html  
No observable discontinuities. Because SSD use NAND flash memory with no moving parts, and has DRAM caches to buffer writes and stage read.

5.9) mystery3\_time\_disk\_write.cpp

5.10) [predict] OS I/O scheduler may reorder or batch I/O requests to optimize.

5.11) bobby2\_read\_times.html, bobby2\_write\_times.html  
It takes 30ms to complete now at a rate of 0.003ms. Because the added code will update the buffer's timestamps periodically along with writes, these timestamps are read and plotted.