[CS-GY 6233](#) Operating Systems Final Project

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Instructions to compile and Run the Project:

Compile: Run `./build.sh` to compile the all the the c programs in the project

Run:

Part 1: `./run <filename> [-r|-w] <block_size> <block_count>`
Part 2: `./run2 <filename> <block_size>`
Part 6: `./fast <filename>`

Note:

- All the units used to represent the results are explicitly stated in the table header of the respective columns.

Part 1:

Code required for this part is attached in the folder under the filename run.c.

Output: `./run <filename> [-r|-w] <block_size> <block_count>`

Write Flag:

```
pragnavi@Pragnavis-MBP documents % cd OS_Project
pragnavi@Pragnavis-MBP OS_Project % ls
build.sh          fast.c            run.c             run2.c
pragnavi@Pragnavis-MBP OS_Project % ./build.sh
pragnavi@Pragnavis-MBP OS_Project % ./run test.txt -w 1024 5
Write
Time taken to write 5 blocks of each size 1024 is 0.000 seconds
Performance : 59.546 Mb/s
pragnavi@Pragnavis-MBP OS_Project % ls
build.sh          fast.c            run.c             run2.c
fast              run               run2              test.txt
pragnavi@Pragnavis-MBP OS_Project % cat test.txt
?1?n?1?n???????6?n?KG?? ????4?L? 8?n???d??`???5?n?9d?ot
???????
       ?1?n?1?n???????6?n?KG??  ????4?L? 8?n???d??`???5?n?9d?ot
???????
       ?1?n?1?n???????6?n?KG??  ????4?L? 8?n???d??`???5?n?9d?ot
???????
       ?1?n?1?n???????6?n?KG??  ????4?L? 8?n???d??`???5?n?9d?ot
???????
       ?1?n?1?n???????6?n?KG??  ????4?L? 8?n???d??`???5?n?9d?ot
???????
       %
pragnavi@Pragnavis-MBP OS_Project %
```

Read Flag:

```
pragnavi@Pragnavis-MBP OS_Project % ./run test.txt -r 1024 5
Read
xor value of the file is 55ae5d6f
Time taken to read 5 blocks of each size 1024 is 0.000 seconds
Performance : 25.699 Mb/s
[pragnavi@Pragnavis-MBP OS_Project % ./run
```

Part 2:

Code required for this part is attached in the folder under the filename run2.c.

Output: `./run2 <filename> <block_size>`

```
[pragnavi@Pragnavis-MBP OS_Project % ./run2 test.txt 1024
Time taken : 10.000 seconds
Block size : 1024 Bytes
Block count : 22823879
File size 0.005 MB
Performance : 0.001 Mb/s
pragnavi@Pragnavis-MBP OS_Project %
```
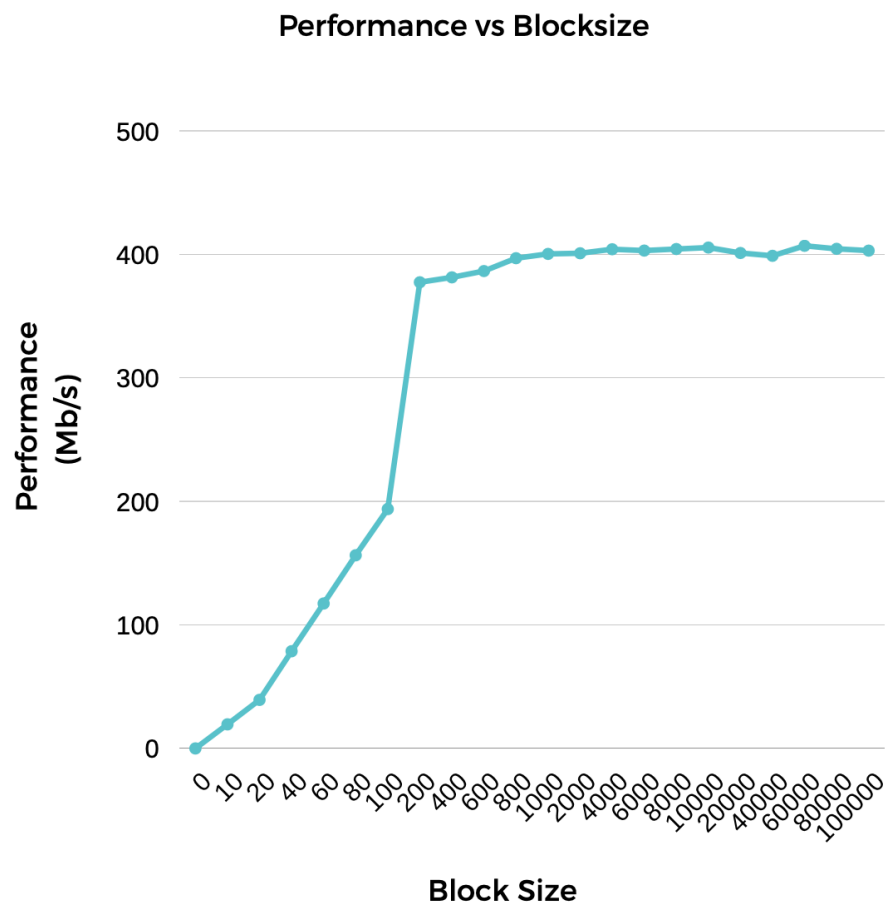
Part 3:

Result:

Block Size	Trial 1	Trial 2	Trial 3	Average Performance (Mb/s)
0	0	0	0	0
10	19.637	19.19	19.668	19.49833333
20	39.402	39.222	39.328	39.31733333
40	78.706	78.752	78.63	78.696
60	117.592	116.812	117.606	117.3366667
80	156.839	155.716	156.585	156.38
100	193.839	195.582	191.964	193.795
200	377.752	379.26	375.231	377.4143333
400	381.264	382.683	380.23	381.3923333
600	388.714	386.333	384.41	386.4856667
800	394.42	399.932	396.32	396.8906667
1000	399.233	401.42	400.445	400.366
2000	400.988	401.234	400.454	400.892

4000	401.403	404.56	406.45	404.1376667
6000	399.233	402.398	407.556	403.0623333
8000	404.746	402.578	405.634	404.3193333
10000	409.098	405.95	401.485	405.511
20000	396.23	401.24	405.872	401.114
40000	402.698	392.53	401.245	398.8243333
60000	409.952	410.597	400.25	406.933
80000	408.93	405.043	399.466	404.4796667
100000	401.482	405.342	402.235	403.0196667

Plot:

Performance vs Blocksize

Part 4:

File Used: Ubuntu 22.04 desktop iso disk image - 3.83 GB
For a block size of 600:

- After deleting the cache, the performance was 81.103 Mb/s
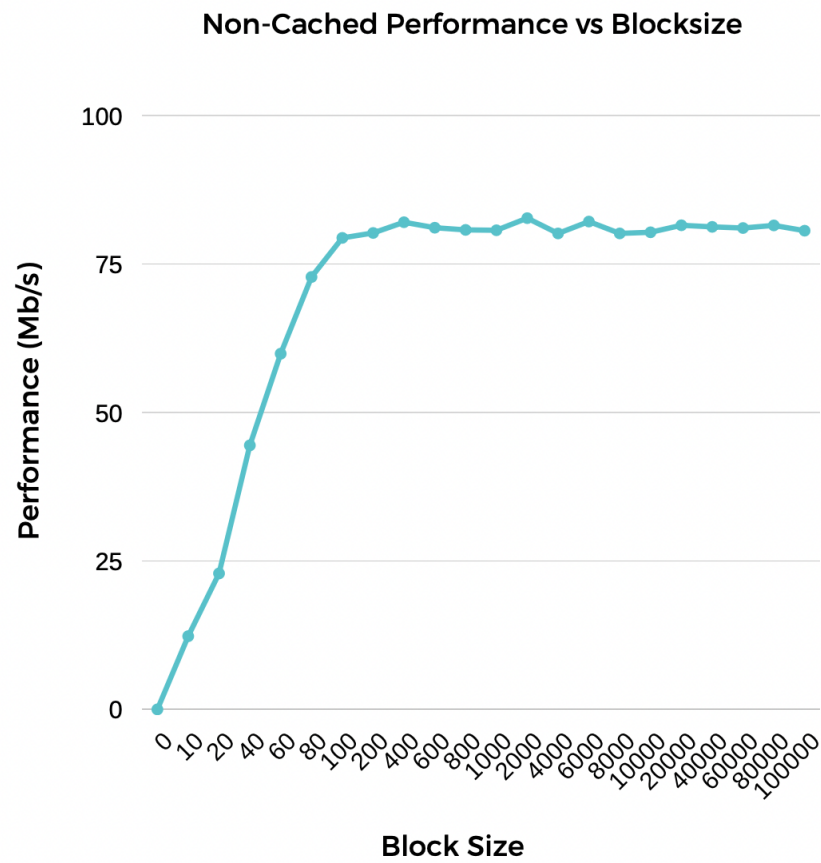- Running read immediately after raised the performance to 386.486 Mb/s

Non-Cached Performance:

Result:

Block Size	Trial 1	Trial 2	Trial 3	Average Performance (Mb/s)
0	0	0	0	0
10	12.34	12.1	12.54	12.32666667
20	22.568	22.14	23.973	22.89366667
40	44.783	47.239	41.353	44.45833333
60	60.497	63.934	55.24	59.89033333
80	69.984	73.25	75.183	72.80566667
100	79.387	78.342	80.437	79.38866667
200	78.449	80.84	81.368	80.219
400	81.493	80.749	83.84	82.02733333
600	78.83	82.734	81.745	81.103
800	80.383	82.475	79.347	80.735
1000	78.457	82.197	81.372	80.67533333
2000	79.384	85.59	83.171	82.715
4000	80.871	78.372	81.174	80.139
6000	82.73	84.349	79.347	82.142
8000	78.724	81.283	80.425	80.144
10000	79.234	83.487	78.283	80.33466667
20000	84.142	78.282	82.116	81.51333333
40000	80.87	83.72	79.148	81.246
60000	83.479	78.207	81.47	81.052

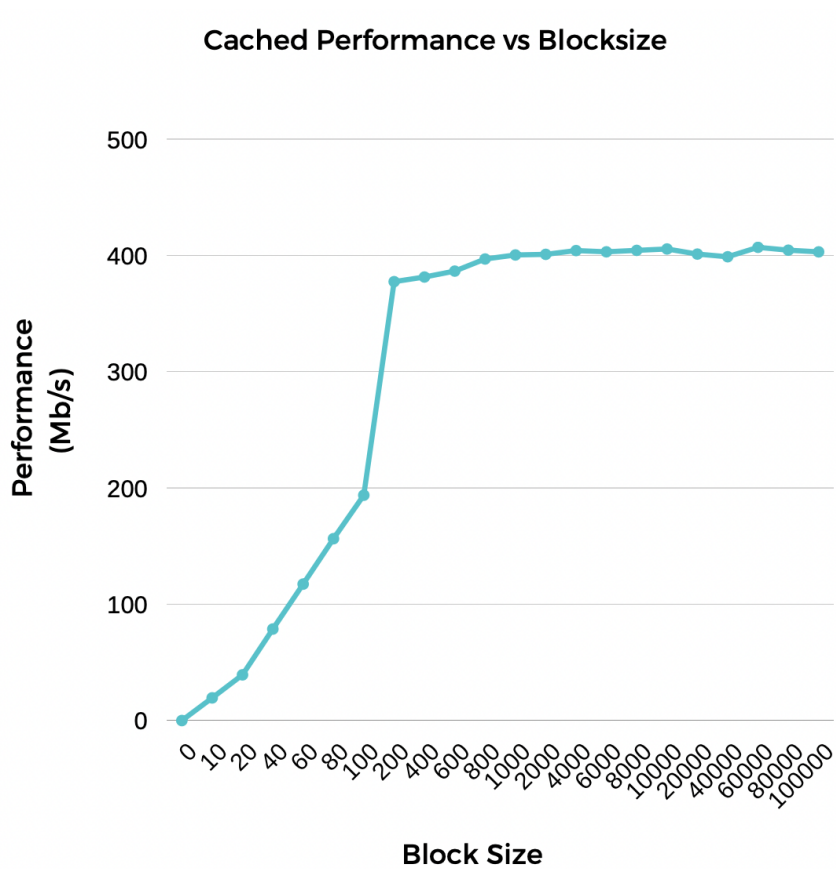|				
80000	79.872	84.309	80.297	81.49266667
100000	80.161	83.214	78.426	80.60033333

Plot:

Non-Cached Performance vs Blocksize

Cached Performance:

Result:

Block Size	Trial 1	Trial 2	Trial 3	Average Performance (Mb/s)
0	0	0	0	0
10	19.637	19.19	19.668	19.49833333
20	39.402	39.222	39.328	39.31733333
40	78.706	78.752	78.63	78.696
60	117.592	116.812	117.606	117.3366667
80	156.839	155.716	156.585	156.38
100	193.839	195.582	191.964	193.795
200	377.752	379.26	375.231	377.4143333
400	381.264	382.683	380.23	381.3923333
600	388.714	386.333	384.41	386.4856667
800	394.42	399.932	396.32	396.8906667
1000	399.233	401.42	400.445	400.366
2000	400.988	401.234	400.454	400.892
4000	401.403	404.56	406.45	404.1376667
6000	399.233	402.398	407.556	403.0623333
8000	404.746	402.578	405.634	404.3193333
10000	409.098	405.95	401.485	405.511
20000	396.23	401.24	405.872	401.114
40000	402.698	392.53	401.245	398.8243333
60000	409.952	410.597	400.25	406.933
80000	408.93	405.043	399.466	404.4796667
100000	401.482	405.342	402.235	403.0196667

Plot:

Cached Performance vs Blocksize

Performance (Mb/s) vs Block Size

Part 5:

Block Size	Trial	Performance (Mb/s)	Performance (B/s)
1	1	1.992	1992000
1	2	1.987	1987000
1	3	1.996	1996000
Average		1.991666667	1991666.667

lseek():

File Used: Ubuntu 22.04 desktop iso disk image - 3.83 GB

Results after running the loop for a million times:

S.No	Processing Time (lseek())
1	0.405
2	0.409
3	0.411
4	0.406
5	0.414
Average	0.409

```
[pragnavi@Pragnavis-MBP OS_PROJECT % ./a.out ubuntu-22.04.1-desktop-amd64.iso    ]
 Time taken to reach the end of the file ubuntu-22.04.1-desktop-amd64.iso of size
  3830.00 MB is 0.405 seconds
[pragnavi@Pragnavis-MBP OS_PROJECT % gcc lseek.c                                 ]
[pragnavi@Pragnavis-MBP OS_PROJECT % ./a.out ubuntu-22.04.1-desktop-amd64.iso    ]
 Time taken to reach the end of the file ubuntu-22.04.1-desktop-amd64.iso of size
  3830.00 MB is 0.409 seconds
[pragnavi@Pragnavis-MBP OS_PROJECT % gcc lseek.c                                 ]
[pragnavi@Pragnavis-MBP OS_PROJECT % ./a.out ubuntu-22.04.1-desktop-amd64.iso    ]
 Time taken to reach the end of the file ubuntu-22.04.1-desktop-amd64.iso of size
  3830.00 MB is 0.411 seconds
[pragnavi@Pragnavis-MBP OS_PROJECT % gcc lseek.c                                 ]
[pragnavi@Pragnavis-MBP OS_PROJECT % ./a.out ubuntu-22.04.1-desktop-amd64.iso    ]
 Time taken to reach the end of the file ubuntu-22.04.1-desktop-amd64.iso of size
  3830.00 MB is 0.406 seconds
[pragnavi@Pragnavis-MBP OS_PROJECT % gcc lseek.c                                 ]
[pragnavi@Pragnavis-MBP OS_PROJECT % ./a.out ubuntu-22.04.1-desktop-amd64.iso    ]
 Time taken to reach the end of the file ubuntu-22.04.1-desktop-amd64.iso of size
  3830.00 MB is 0.414 seconds
```

Part 6: `./fast <filename>`

File Used: Ubuntu 22.04 desktop iso disk image - 3.83 GB

S.No	Cached Performance (Mb/s)	Non-Cached Performance (Mb/s)
1	1572	77.56
2	1559	75.893
3	1583	79.021
Average	1571.333333	77.49133333

Extra Credit Section:

Part 1: Works on Anubis for files with very small size.

Part 4: `sudo sh -c "/usr/bin/echo 3 > /proc/sys/vm/drop_caches"` Why "3"?

In this command, the significance of "3" is to ensure that pagecache, inodes and dentries are all cleared at once.

dd command:

S.No	dd (Mb/s)	My Program (Mb/s)
1	519	993
2	515	1052
3	523	1035
Average	519	1026.666667