

Collin Paiz
Professor Al-Agtash
COEN 177L
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Lab 9 Report

The quickest step was step 2 and step 3 because the only requirement here was that the file was read. Time increased in step 4 and step 5 because now the program was copying (writing) to a new file. As the files got larger, it began to take longer to read/write each file, at every step. Also, in general, as the buffer increased in size, the real time slightly decreased. For step 5, as the thread count increased, the amount of time to perform its tasks increased significantly.

Step 2 Results

	Real (s)	User (s)	Sys (s)
File 1	0.029	0.002	0.001
File 2	0.029	0.001	0.003
File 3	0.111	0.003	0.007
File 4	0.877	0.017	0.007

Step2 file1.txt

```
real  0m0.029s
user  0m0.002s
sys   0m0.001s
```

Step2 file2.txt

```
real  0m0.029s
user  0m0.001s
sys   0m0.003s
```

Step2 file3.txt

```
real  0m0.111s
user  0m0.003s
```

sys 0m0.007s

Step2 file4.txt

real 0m0.877s

user 0m0.017s

sys 0m0.052s

Step 3 Results

	Real (s)	User (s)	Sys (s)
File 1, 100	0.021	0.000	0.003
File 1, 1000	0.015	0.000	0.002
File 1, 10000	0.015	0.002	0.000
File 1, 100000	0.014	0.000	0.002
File 2, 100	0.014	0.000	0.003
File 2, 1000	0.014	0.002	0.001
File 2, 10000	0.013	0.001	0.001
File 2, 100000	0.013	0.001	0.002
File 3, 100	0.020	0.006	0.004
File 3, 1000	0.017	0.002	0.004
File 3, 10000	0.017	0.001	0.005
File 3, 100000	0.015	0.000	0.005
File 4, 100	0.075	0.038	0.026
File 4, 1000	0.061	0.020	0.030
File 4, 10000	0.044	0.011	0.023
File 4, 100000	0.031	0.002	0.019

Step3 file1.txt 100

real 0m0.021s
user 0m0.000s
sys 0m0.003s

Step3 file1.txt 1000

real 0m0.015s
user 0m0.000s
sys 0m0.002s

Step3 file1.txt 10000

real 0m0.015s
user 0m0.002s
sys 0m0.000s

Step3 file1.txt 100000

real 0m0.014s
user 0m0.000s
sys 0m0.002s

Step3 file2.txt 100

real 0m0.014s
user 0m0.000s
sys 0m0.003s

Step3 file2.txt 1000

real 0m0.014s
user 0m0.002s
sys 0m0.001s

Step3 file2.txt 10000

real 0m0.013s
user 0m0.001s
sys 0m0.001s

Step3 file2.txt 100000

real 0m0.013s
user 0m0.001s
sys 0m0.002s

Step3 file3.txt 100

real 0m0.020s
user 0m0.006s
sys 0m0.004s

Step3 file3.txt 1000

real 0m0.017s
user 0m0.002s
sys 0m0.004s

Step3 file3.txt 10000

real 0m0.017s
user 0m0.001s
sys 0m0.005s

Step3 file3.txt 100000

real 0m0.015s
user 0m0.000s
sys 0m0.005s

Step3 file4.txt 100

real 0m0.075s
user 0m0.038s
sys 0m0.026s

Step3 file4.txt 1000

real 0m0.061s

user 0m0.020s
sys 0m0.030s

Step3 file4.txt 10000

real 0m0.044s
user 0m0.011s
sys 0m0.023s

Step3 file4.txt 100000

real 0m0.031s
user 0m0.002s
sys 0m0.019s

Step 4 Results

	Real (s)	User (s)	Sys (s)
File 1, 100	0.036	0.003	0.000
File 1, 1000	0.030	0.001	0.002
File 1, 10000	0.030	0.000	0.003
File 1, 100000	0.033	0.003	0.000
File 2, 100	0.055	0.000	0.006
File 2, 1000	0.048	0.000	0.005
File 2, 10000	0.050	0.000	0.005
File 2, 100000	0.047	0.000	0.005
File 3, 100	0.179	0.013	0.019
File 3, 1000	0.167	0.006	0.020
File 3, 10000	0.188	0.002	0.021
File 3, 100000	0.174	0.003	0.017
File 4, 100	1.412	0.069	0.147

File 4, 1000	1.276	0.036	0.145
File 4, 10000	1.450	0.019	0.161
File 4, 100000	1.441	0.003	0.150

Step4 file1.txt 100

```
real  0m0.036s
user  0m0.003s
sys   0m0.000s
```

Step4 file1.txt 1000

```
real  0m0.030s
user  0m0.001s
sys   0m0.002s
```

Step4 file1.txt 10000

```
real  0m0.030s
user  0m0.000s
sys   0m0.003s
```

Step4 file1.txt 100000

```
real  0m0.033s
user  0m0.003s
sys   0m0.000s
```

Step4 file2.txt 100

```
real  0m0.055s
user  0m0.000s
sys   0m0.006s
```

Step4 file2.txt 1000

```
real  0m0.048s
user  0m0.000s
sys   0m0.005s
```

Step4 file2.txt 10000

real 0m0.050s
user 0m0.000s
sys 0m0.005s

Step4 file2.txt 100000

real 0m0.047s
user 0m0.000s
sys 0m0.005s

Step4 file3.txt 100

real 0m0.179s
user 0m0.013s
sys 0m0.019s

Step4 file3.txt 1000

real 0m0.167s
user 0m0.006s
sys 0m0.020s

Step4 file3.txt 10000

real 0m0.188s
user 0m0.002s
sys 0m0.021s

Step4 file3.txt 100000

real 0m0.174s
user 0m0.003s
sys 0m0.017s

Step4 file4.txt 100

real 0m1.412s

user 0m0.069s
sys 0m0.147s

Step4 file4.txt 1000

real 0m1.276s
user 0m0.036s
sys 0m0.145s

Step4 file4.txt 10000

real 0m1.450s
user 0m0.019s
sys 0m0.161s

Step4 file4.txt 100000

real 0m1.441s
user 0m0.003s
sys 0m0.150s

Step5 Results

	Real (s)	User (s)	Sys (s)
File 1, 100, 2	0.042	0.000	0.005
File 1, 100, 8	0.065	0.000	0.014
File 1, 100, 32	0.251	0.010	0.046
File 1, 100, 64	0.472	0.022	0.103
File 1, 1000, 2	0.039	0.001	0.004
File 1, 1000, 8	0.045	0.001	0.012
File 1, 1000, 32	0.197	0.006	0.037
File 1, 1000, 64	0.475	0.016	0.085
File 1, 10000, 2	0.033	0.000	0.004

File 1, 10000, 8	0.088	0.000	0.013
File 1, 10000, 32	0.342	0.005	0.049
File 1, 10000, 64	0.613	0.010	0.100
File 1, 100000, 2	0.040	0.001	0.003
File 1, 100000, 8	0.075	0.004	0.008
File 1, 100000, 32	0.179	0.002	0.044
File 1, 100000, 64	0.440	0.001	0.097
File 2, 100, 2	0.050	0.004	0.006
File 2, 100, 8	0.082	0.020	0.028
File 2, 100, 32	0.417	0.070	0.114
File 2, 100, 64	0.804	0.128	0.230
File 2, 1000, 2	0.093	0.001	0.008
File 2, 1000, 8	0.215	0.009	0.037
File 2, 1000, 32	0.557	0.030	0.123
File 2, 1000, 64	0.949	0.038	0.246
File 2, 10000, 2	0.076	0.000	0.008
File 2, 10000, 8	0.141	0.006	0.032
File 2, 10000, 32	0.541	0.015	0.146
File 2, 10000, 64	1.000	0.022	0.264
File 2, 100000, 2	0.054	0.000	0.008
File 2, 100000, 8	0.130	0.001	0.036
File 2, 100000, 32	0.559	0.007	0.099
File 2, 100000, 64	0.918	0.011	0.180
File 3, 100, 2	0.273	0.039	0.038
File 3, 100, 8	0.383	0.178	0.245

File 3, 100, 32	1.730	0.487	0.700
File 3, 100, 64	3.560	0.979	1.463
File 3, 1000, 2	0.184	0.008	0.035
File 3, 1000, 8	0.595	0.051	0.374
File 3, 1000, 32	1.752	0.148	0.794
File 3, 1000, 64	3.660	0.346	1.817
File 3, 10000, 2	0.212	0.014	0.036
File 3, 10000, 8	0.374	0.031	0.339
File 3, 10000, 32	1.818	0.100	1.047
File 3, 10000, 64	3.144	0.182	1.822
File 3, 100000, 2	0.166	0.002	0.024
File 3, 100000, 8	0.473	0.009	0.306
File 3, 100000, 32	1.925	0.013	0.860
File 3, 100000, 64	3.551	0.036	1.633
File 4, 100, 2	1.648	0.180	0.256
File 4, 100, 8	1.681	1.045	1.752
File 4, 100, 32	6.772	3.791	5.266
File 4, 100, 64	15.124	7.037	8.886
File 4, 1000, 2	1.169	0.049	0.230
File 4, 1000, 8	1.965	0.304	1.668
File 4, 1000, 32	5.990	1.229	6.143
File 4, 1000, 64	14.711	2.597	13.974
File 4, 10000, 2	1.294	0.030	0.293
File 4, 10000, 8	1.592	0.190	2.209
File 4, 10000, 32	7.093	0.679	6.691

File 4, 10000, 64	12.663	1.304	12.944
File 4, 100000, 2	1.245	0.009	0.322
File 4, 100000, 8	2.579	0.036	1.807
File 4, 100000, 32	12.247	0.131	6.714
File 4, 100000, 64	24.884	0.259	12.429

Step5 file1.txt 100 2

```
real  0m0.042s
user  0m0.000s
sys   0m0.005s
```

Step5 file1.txt 100 8

```
real  0m0.065s
user  0m0.000s
sys   0m0.014s
```

Step5 file1.txt 100 32

```
real  0m0.251s
user  0m0.010s
sys   0m0.046s
```

Step5 file1.txt 100 64

```
real  0m0.472s
user  0m0.022s
sys   0m0.103s
```

Step5 file1.txt 1000 2

```
real  0m0.039s
user  0m0.001s
sys   0m0.004s
```

Step5 file1.txt 1000 8

real 0m0.045s
user 0m0.001s
sys 0m0.012s

Step5 file1.txt 1000 32

real 0m0.197s
user 0m0.006s
sys 0m0.037s

Step5 file1.txt 1000 64

real 0m0.475s
user 0m0.016s
sys 0m0.085s

Step5 file1.txt 10000 2

real 0m0.033s
user 0m0.000s
sys 0m0.004s

Step5 file1.txt 10000 8

real 0m0.088s
user 0m0.000s
sys 0m0.013s

Step5 file1.txt 10000 32

real 0m0.342s
user 0m0.005s
sys 0m0.049s

Step5 file1.txt 10000 64

real 0m0.613s
user 0m0.010s
sys 0m0.100s

Step5 file1.txt 100000 2

real 0m0.040s
user 0m0.001s
sys 0m0.003s

Step5 file1.txt 100000 8

real 0m0.075s
user 0m0.004s
sys 0m0.008s

Step5 file1.txt 100000 32

real 0m0.179s
user 0m0.002s
sys 0m0.044s

Step5 file1.txt 100000 64

real 0m0.440s
user 0m0.001s
sys 0m0.097s

Step5 file2.txt 100 2

real 0m0.050s
user 0m0.004s
sys 0m0.006s

Step5 file2.txt 100 8

real 0m0.082s
user 0m0.020s
sys 0m0.028s

Step5 file2.txt 100 32

real 0m0.417s
user 0m0.070s

sys 0m0.114s

Step5 file2.txt 100 64

real 0m0.804s

user 0m0.128s

sys 0m0.230s

Step5 file2.txt 1000 2

real 0m0.093s

user 0m0.001s

sys 0m0.008s

Step5 file2.txt 1000 8

real 0m0.215s

user 0m0.009s

sys 0m0.037s

Step5 file2.txt 1000 32

real 0m0.557s

user 0m0.030s

sys 0m0.123s

Step5 file2.txt 1000 64

real 0m0.949s

user 0m0.038s

sys 0m0.246s

Step5 file2.txt 10000 2

real 0m0.076s

user 0m0.000s

sys 0m0.008s

Step5 file2.txt 10000 8

real 0m0.141s
user 0m0.006s
sys 0m0.032s

Step5 file2.txt 10000 32

real 0m0.541s
user 0m0.015s
sys 0m0.146s

Step5 file2.txt 10000 64

real 0m1.000s
user 0m0.022s
sys 0m0.264s

Step5 file2.txt 100000 2

real 0m0.054s
user 0m0.000s
sys 0m0.008s

Step5 file2.txt 100000 8

real 0m0.130s
user 0m0.001s
sys 0m0.036s

Step5 file2.txt 100000 32

real 0m0.559s
user 0m0.007s
sys 0m0.099s

Step5 file2.txt 100000 64

real 0m0.918s
user 0m0.011s
sys 0m0.180s

Step5 file3.txt 100 2

real 0m0.273s
user 0m0.039s
sys 0m0.038s

Step5 file3.txt 100 8

real 0m0.383s
user 0m0.178s
sys 0m0.245s

Step5 file3.txt 100 32

real 0m1.730s
user 0m0.487s
sys 0m0.700s

Step5 file3.txt 100 64

real 0m3.560s
user 0m0.979s
sys 0m1.463s

Step5 file3.txt 1000 2

real 0m0.184s
user 0m0.008s
sys 0m0.035s

Step5 file3.txt 1000 8

real 0m0.595s
user 0m0.051s
sys 0m0.374s

Step5 file3.txt 1000 32

real 0m1.752s
user 0m0.148s

sys 0m0.794s

Step5 file3.txt 1000 64

real 0m3.660s

user 0m0.346s

sys 0m1.817s

Step5 file3.txt 10000 2

real 0m0.212s

user 0m0.014s

sys 0m0.036s

Step5 file3.txt 10000 8

real 0m0.374s

user 0m0.031s

sys 0m0.339s

Step5 file3.txt 10000 32

real 0m1.818s

user 0m0.100s

sys 0m1.047s

Step5 file3.txt 10000 64

real 0m3.144s

user 0m0.182s

sys 0m1.822s

Step5 file3.txt 100000 2

real 0m0.166s

user 0m0.002s

sys 0m0.024s

Step5 file3.txt 100000 8

real 0m0.473s
user 0m0.009s
sys 0m0.306s

Step5 file3.txt 100000 32

real 0m1.925s
user 0m0.013s
sys 0m0.860s

Step5 file3.txt 100000 64

real 0m3.551s
user 0m0.036s
sys 0m1.633s

Step5 file4.txt 100 2

real 0m1.648s
user 0m0.180s
sys 0m0.256s

Step5 file4.txt 100 8

real 0m1.681s
user 0m1.045s
sys 0m1.752s

Step5 file4.txt 100 32

real 0m6.772s
user 0m3.791s
sys 0m5.266s

Step5 file4.txt 100 64

real 0m15.124s
user 0m7.037s
sys 0m8.886s

Step5 file4.txt 1000 2

real 0m1.169s
user 0m0.049s
sys 0m0.230s

Step5 file4.txt 1000 8

real 0m1.965s
user 0m0.304s
sys 0m1.668s

Step5 file4.txt 1000 32

real 0m5.990s
user 0m1.229s
sys 0m6.143s

Step5 file4.txt 1000 64

real 0m14.711s
user 0m2.597s
sys 0m13.974s

Step5 file4.txt 10000 2

real 0m1.294s
user 0m0.030s
sys 0m0.293s

Step5 file4.txt 10000 8

real 0m1.592s
user 0m0.190s
sys 0m2.209s

Step5 file4.txt 10000 32

real 0m7.093s
user 0m0.679s

sys 0m6.691s

Step5 file4.txt 10000 64

real 0m12.663s

user 0m1.304s

sys 0m12.944s

Step5 file4.txt 100000 2

real 0m1.245s

user 0m0.009s

sys 0m0.322s

Step5 file4.txt 100000 8

real 0m2.579s

user 0m0.036s

sys 0m1.807s

Step5 file4.txt 100000 32

real 0m12.247s

user 0m0.131s

sys 0m6.714s

Step5 file4.txt 100000 64

real 0m24.884s

user 0m0.259s

sys 0m12.429s