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COEN 177L - Thursday 5:15PM
Lab 9 - File Performance Measurement

Report

Step 2 - Reading files with buffer size = 10,000 bytes

Time to run program

	file100K	file1M	file10M	file100M
real	0.009s	0.042s	0.317s	3.190s
user	0.003s	0.010s	0s	0.086s
sys	0s	0s	0.069s	0.602s

Step 3 - Reading files with variable buffer sizes

Times to run program

Buffer size = 100				
	file100K	file1M	file10M	file100M
real	0.011s	0.052s	0.446s	4.304s
user	0.003s	0.011s	0s	0.309s
sys	0s	0s	0.093s	0.618s

Buffer size = 1000				
	file100K	file1M	file10M	file100M
real	0.010s	0.052s	0.464s	4.163s
user	0.002s	0.011s	0s	0.173s
sys	0s	0s	0.096s	0.693s

Buffer size = 10,000				
	file100K	file1M	file10M	file100M
real	0.010s	0.044s	0.358s	3.771s
user	0.002s	0s	0s	0.123s

sys	0s	0.010s	0.075s	0.677s
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Buffer size = 100,000				
	file100K	file1M	file10M	file100M
real	0.007s	0.013s	0.067s	0.623s
user	0.002s	0s	0.013s	0.040s
sys	0s	0.003s	0s	0.081s

Step 4 - Reading and writing files with variable buffer sizes

Times to run program

Buffer size = 100				
	file100K	file1M	file10M	file100M
real	0.017s	0.112s	1.049s	9.942s
user	0.001s	0.001s	0.027s	0.258s
sys	0.004s	0.023s	0.187s	1.800s

Buffer size = 1000				
	file100K	file1M	file10M	file100M
real	0.019s	0.104s	0.939s	10.669s
user	0.005s	0.026s	0.029s	0.599s
sys	0s	0s	0.171s	1.538s

Buffer size = 10,000				
	file100K	file1M	file10M	file100M
real	0.017s	0.083s	0.888s	7.272s
user	0.004s	0s	0s	0.206s
sys	0s	0.018s	0.179s	1.327s

Buffer size = 100,000				
	file100K	file1M	file10M	file100M
real	0.010s	0.024s	0.173s	1.492s
user	0.003s	0.005s	0s	0.001s
sys	0s	0s	0.033s	0.277s

Step 5 - Reading and writing files with variable buffer sizes and multiple threads

Times to run program

Buffer size = 100																
	file100K				file1M				file10M				file100M			
threads	2	8	32	64	2	8	32	64	2	8	32	64	2	8	32	64
real (s)	.042	.175	.774	1.5	.242	.953	3.85	7.40	2.11	8.07	35.3	75.5	20.7	83.7	322	664
user (s)	.008	.031	.046	.074	.000	.066	.207	.333	.101	.661	2.02	3.82	.974	5.51	18.8	37.5
sys (s)	.001	.001	.092	.185	.051	.132	.579	1.19	.351	1.09	5.58	12.0	3.55	12.9	51.8	107

Buffer size = 1000																
	file100K				file1M				file10M				file100M			
threads	2	8	32	64	2	8	32	64	2	8	32	64	2	8	32	64
real (s)	.049	.197	.735	1.45	.209	.938	3.65	7.22	2.42	8.67	34.5	61.4	20.8	82.1	337	643
user (s)	.011	.000	.000	.127	.000	.000	.098	.369	.208	.354	1.15	2.31	1.08	3.43	13.0	25.2
sys (s)	.000	.035	.129	.127	.045	.200	.648	1.10	.291	1.47	6.10	10.9	3.38	14.3	59.6	114

Buffer size = 10,000																
	file100K				file1M				file10M				file100M			
threads	2	8	32	64	2	8	32	64	2	8	32	64	2	8	32	64
real (s)	.041	.158	.678	1.61	.191	.735	3.03	6.19	2.05	6.67	27.9	51.5	17.7	63.8	265	557
user (s)	.009	.026	.000	.025	.000	.075	.176	.143	.078	.041	1.18	1.35	.580	1.96	6.18	16.6
sys (s)	.000	.000	.111	.224	.040	.075	.438	1.09	.350	1.38	4.63	9.58	3.19	11.7	49.4	99.7

Buffer size = 100,000																
	file100K				file1M				file10M				file100M			
threads	2	8	32	64	2	8	32	64	2	8	32	64	2	8	32	64
real (s)	.034	.122	.382	.918	.049	.214	.877	1.76	.316	1.24	4.97	10.1	3.52	12.9	50.8	101
user (s)	.000	.000	.001	.032	.000	.001	.030	.047	.021	.040	.147	.226	.028	.211	.973	2.57
sys (s)	.007	.019	.053	.092	.010	.038	.117	.255	.042	.199	.785	1.69	.624	2.22	8.65	16.6

As shown in the above tables, a bigger buffer generally results in faster I/O performance. However, with smaller files a bigger buffer has negligible gains in performance. It is only with larger files ($\geq 10\text{MB}$) that the performance gains of a large buffer are noticeable. The optimal buffer size for a file that is 100MB or greater is 100,000 bytes as that had the most significant gains. Furthermore, the impact of reading and writing files simultaneously is noticeable with the largest file (100MB) taking about twice as long to execute compared to reading only.