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Lab assignment 9: File Performance Measurement

Step 2

Step 2 reads four files, each with increasing amount of data. The total real time and the CPU time spent in kernel mode and user mode (roughly) increases as the files increase in size.

```
[halbrigh@linux10625 halbrigh]$ sh ./step2.sh
Step2 file1.txt

real    0m0.010s
user    0m0.002s
sys     0m0.000s

Step2 file2.txt

real    0m0.010s
user    0m0.001s
sys     0m0.002s

Step2 file3.txt

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

Step2 file4.txt

real    0m0.054s
user    0m0.009s
sys     0m0.037s
```

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Step 3

In step three, the files are read and different buffer sizes (100, 1000, 10000, 100000) are tested. The buffersize is the number of bytes being read from the text file at a time. The real and CPU time in user mode decreases with increasing buffer. CPU time spent in system mode seems to be have erratic . The sys was still greater at buffer 100000 than 1000 however decreased from a buffersize of 100 to 100000 in larger files.

```
[halbrigh@linux10625 halbrigh]$ sh ./step3.sh
Step3 file1.txt 100

real    0m0.010s
user    0m0.000s
sys     0m0.002s

Step3 file1.txt 1000

real    0m0.009s
user    0m0.000s
sys     0m0.002s

Step3 file1.txt 10000

real    0m0.009s
user    0m0.001s
sys     0m0.001s

Step3 file1.txt 100000

real    0m0.008s
user    0m0.000s
sys     0m0.002s

Step3 file2.txt 100

real    0m0.009s
user    0m0.001s
sys     0m0.002s

Step3 file2.txt 1000

real    0m0.009s
user    0m0.002s
sys     0m0.000s

Step3 file2.txt 10000

real    0m0.008s
user    0m0.000s
sys     0m0.002s

Step3 file2.txt 100000

real    0m0.009s
user    0m0.000s
sys     0m0.002s

Step3 file3.txt 100

real    0m0.018s
user    0m0.005s
```

sys 0m0.004s

Step3 file3.txt 1000

real 0m0.014s
user 0m0.003s
sys 0m0.004s

Step3 file3.txt 10000

real 0m0.013s
user 0m0.000s
sys 0m0.006s

Step3 file3.txt 100000

real 0m0.011s
user 0m0.000s
sys 0m0.005s

Step3 file4.txt 100

real 0m0.076s
user 0m0.042s
sys 0m0.027s

Step3 file4.txt 1000

real 0m0.044s
user 0m0.020s
sys 0m0.018s

Step3 file4.txt 10000

real 0m0.036s
user 0m0.008s
sys 0m0.023s

Step3 file4.txt 100000

real 0m0.026s
user 0m0.002s
sys 0m0.019s

Step 4

In step 4, we are reading the files and writing them to another file while testing the various buffer sizes. So, the total time includes a combination of reading time and writing time. The real times, compared to the real times in step 3, have been at least doubled. Overall, reading files take less real time and CPU time in user and system mode than writing to a file. Also, the real time and (usually) the CPU time in user and system mode still decreases with an increasing buffer size.

```
[halbrigh@linux10610 halbrigh]$ sh ./step4.sh
Step4 file1.txt 100

real    0m0.060s
user    0m0.000s
sys     0m0.025s

Step4 file1.txt 1000

real    0m0.024s
user    0m0.001s
sys     0m0.002s

Step4 file1.txt 10000

real    0m0.023s
user    0m0.000s
sys     0m0.003s

Step4 file1.txt 100000

real    0m0.023s
user    0m0.001s
sys     0m0.002s

Step4 file2.txt 100

real    0m0.052s
user    0m0.002s
sys     0m0.004s

Step4 file2.txt 1000

real    0m0.066s
user    0m0.003s
sys     0m0.003s

Step4 file2.txt 10000

real    0m0.054s
user    0m0.003s
sys     0m0.002s

Step4 file2.txt 100000

real    0m0.055s
user    0m0.002s
sys     0m0.003s

Step4 file3.txt 100
```

```
real    0m0.154s
user    0m0.014s
sys     0m0.021s

Step4 file3.txt 1000

real    0m0.143s
user    0m0.007s
sys     0m0.015s

Step4 file3.txt 10000

real    0m0.144s
user    0m0.001s
sys     0m0.015s

Step4 file3.txt 100000

real    0m0.134s
user    0m0.004s
sys     0m0.013s

Step4 file4.txt 100

real    0m1.249s
user    0m0.054s
sys     0m0.099s

Step4 file4.txt 1000

real    0m1.268s
user    0m0.027s
sys     0m0.154s

Step4 file4.txt 10000

real    0m1.231s
user    0m0.020s
sys     0m0.140s

Step4 file4.txt 100000

real    0m1.277s
user    0m0.004s
sys     0m0.148s
```

Step 5

In step five, we have all the tests for step 4 and additionally tests the time for using a different amount of threads (2,8,32,64). Each thread will create their own file, read from the test file, and write to the new file they created. CPU time in user mode is the variable most strongly affected by the buffer size, whereas the real time and CPU time in system mode are only affected by a few percents at most. For example, with the file4.txt going from buffersize 10000 to 100000, the CPU time in user mode decreases by about 5 times when the buffer size gets increased by 10 times and the number of threads stays the same.
Real/system time change by only a few percent.

```
[halbrigh@linux10610 halbrigh]$ sh ./shell5.sh
Step5 file1.txt 100 2

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

Step5 file1.txt 100 8

real    0m0.131s
user    0m0.003s
sys     0m0.010s

Step5 file1.txt 100 32

real    0m0.501s
user    0m0.011s
sys     0m0.035s

Step5 file1.txt 100 64

real    0m0.999s
user    0m0.013s
sys     0m0.077s

Step5 file1.txt 1000 2

real    0m0.035s
user    0m0.000s
sys     0m0.005s

Step5 file1.txt 1000 8

real    0m0.127s
user    0m0.001s
sys     0m0.012s

Step5 file1.txt 1000 32

real    0m0.492s
user    0m0.005s
sys     0m0.037s

Step5 file1.txt 1000 64

real    0m1.003s
user    0m0.011s
sys     0m0.072s

Step5 file1.txt 10000 2

real    0m0.037s
user    0m0.002s
sys     0m0.003s

Step5 file1.txt 10000 8
```

```
real    0m0.127s
user    0m0.000s
sys     0m0.013s

Step5 file1.txt 10000 32

real    0m0.505s
user    0m0.003s
sys     0m0.040s

Step5 file1.txt 10000 64

real    0m1.016s
user    0m0.013s
sys     0m0.072s

Step5 file1.txt 100000 2

real    0m0.037s
user    0m0.000s
sys     0m0.005s

Step5 file1.txt 100000 8

real    0m0.128s
user    0m0.002s
sys     0m0.011s

Step5 file1.txt 100000 32

real    0m0.497s
user    0m0.003s
sys     0m0.041s

Step5 file1.txt 100000 64

real    0m1.001s
user    0m0.003s
sys     0m0.082s

Step5 file2.txt 100 2

real    0m0.105s
user    0m0.008s
sys     0m0.004s

Step5 file2.txt 100 8

real    0m0.431s
user    0m0.017s
sys     0m0.025s

Step5 file2.txt 100 32

real    0m1.782s
user    0m0.064s
sys     0m0.091s

Step5 file2.txt 100 64
```

```
real    0m3.612s
user    0m0.132s
sys     0m0.177s

Step5 file2.txt 1000 2

real    0m0.104s
user    0m0.004s
sys     0m0.007s

Step5 file2.txt 1000 8

real    0m0.411s
user    0m0.007s
sys     0m0.027s

Step5 file2.txt 1000 32

real    0m1.740s
user    0m0.021s
sys     0m0.102s

Step5 file2.txt 1000 64

real    0m3.486s
user    0m0.036s
sys     0m0.210s

Step5 file2.txt 10000 2

real    0m0.102s
user    0m0.002s
sys     0m0.008s

Step5 file2.txt 10000 8

real    0m0.420s
user    0m0.004s
sys     0m0.028s

Step5 file2.txt 10000 32

real    0m1.705s
user    0m0.014s
sys     0m0.103s

Step5 file2.txt 10000 64

real    0m3.675s
user    0m0.032s
sys     0m0.201s

Step5 file2.txt 100000 2

real    0m0.101s
user    0m0.000s
sys     0m0.009s
```

```
Step5 file2.txt 100000 8

real    0m0.420s
user    0m0.003s
sys     0m0.024s

Step5 file2.txt 100000 32

real    0m1.691s
user    0m0.008s
sys     0m0.092s

Step5 file2.txt 100000 64

real    0m3.431s
user    0m0.008s
sys     0m0.188s

Step5 file3.txt 100 2

real    0m0.322s
user    0m0.031s
sys     0m0.045s

Step5 file3.txt 100 8

real    0m1.273s
user    0m0.111s
sys     0m0.188s

Step5 file3.txt 100 32

real    0m5.132s
user    0m0.499s
sys     0m0.648s

Step5 file3.txt 100 64

real    0m10.114s
user    0m0.978s
sys     0m1.303s

Step5 file3.txt 1000 2

real    0m0.292s
user    0m0.008s
sys     0m0.045s

Step5 file3.txt 1000 8

real    0m1.184s
user    0m0.043s
sys     0m0.173s

Step5 file3.txt 1000 32

real    0m4.754s
user    0m0.190s
sys     0m0.695s
```

Step5 file3.txt 1000 64

real 0m9.408s
user 0m0.336s
sys 0m1.369s

Step5 file3.txt 10000 2

real 0m0.293s
user 0m0.010s
sys 0m0.045s

Step5 file3.txt 10000 8

real 0m1.166s
user 0m0.030s
sys 0m0.175s

Step5 file3.txt 10000 32

real 0m4.601s
user 0m0.096s
sys 0m0.677s

Step5 file3.txt 10000 64

real 0m9.288s
user 0m0.213s
sys 0m1.395s

Step5 file3.txt 100000 2

real 0m0.277s
user 0m0.001s
sys 0m0.036s

Step5 file3.txt 100000 8

real 0m1.123s
user 0m0.004s
sys 0m0.160s

Step5 file3.txt 100000 32

real 0m4.512s
user 0m0.023s
sys 0m0.616s

Step5 file3.txt 100000 64

real 0m8.910s
user 0m0.031s
sys 0m1.225s

Step5 file4.txt 100 2

real 0m2.761s
user 0m0.193s

```
sys     0m0.302s

Step5 file4.txt 100 8

real    0m10.512s
user    0m0.798s
sys     0m1.195s

Step5 file4.txt 100 32

real    0m44.232s
user    0m3.206s
sys     0m4.682s

Step5 file4.txt 100 64

real    1m26.898s
user    0m6.359s
sys     0m9.562s

Step5 file4.txt 1000 2

real    0m2.744s
user    0m0.081s
sys     0m0.340s

Step5 file4.txt 1000 8

real    0m10.519s
user    0m0.293s
sys     0m1.365s

Step5 file4.txt 1000 32

real    0m41.792s
user    0m1.249s
sys     0m5.335s

Step5 file4.txt 1000 64

real    1m23.380s
user    0m2.334s
sys     0m10.797s

Step5 file4.txt 10000 2

real    0m2.502s
user    0m0.046s
sys     0m0.349s

Step5 file4.txt 10000 8

real    0m10.315s
user    0m0.194s
sys     0m1.387s

Step5 file4.txt 10000 32

real    0m40.489s
```

```
user    0m0.780s
sys     0m5.494s

Step5 file4.txt 10000 64

real    1m21.326s
user    0m1.568s
sys     0m10.682s

Step5 file4.txt 100000 2

real    0m2.643s
user    0m0.011s
sys     0m0.325s

Step5 file4.txt 100000 8

real    0m10.558s
user    0m0.041s
sys     0m1.287s

Step5 file4.txt 100000 32

real    0m40.959s
user    0m0.137s
sys     0m5.077s

Step5 file4.txt 100000 64

real    1m20.808s
user    0m0.286s
sys     0m10.075s

[halbrigh@linux10610 halbrigh]$
```