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## Lab1c Report

I ran 3 benchmarks using a0.txt (a very large file) for bash, dash, and simpsh. They are found in the README and also listed below:

bash/dash 1: `cat a0.txt | grep [A-Za-z] | sort > benchmark1.txt`

simpsh 1: `./simpsh --rdonly a0.txt --creat --wronly benchmark1.txt \  
--creat --wronly benchmark1err.txt --pipe --pipe --profile \  
--command 0 4 2 cat --command 3 6 2 grep [A-Za-z] \  
--command 5 1 2 sort --wait`

bash/dash 2: `cat a0.txt | tr A-Z a-z | uniq > benchmark2.txt`

simpsh 2: `./simpsh --rdonly a0.txt --creat --wronly benchmark2.txt \  
--creat --wronly benchmark2err.txt`

bash/dash 3: `cat a0.txt | uniq | wc > benchmark3.txt`

simpsh 3: `./simpsh --rdonly a0.txt --creat --wronly benchmark3.txt \  
--creat --wronly benchmark3err.txt --pipe --pipe \  
--profile --command 0 4 2 cat --command 3 6 2 uniq \  
--command 5 1 2 wc --wait`

Each benchmark was run 3 times per shell and the average time was calculated and input into the tables below for user time and system time. Command 'times' was used to time the benchmarks.

USER TIME	bash	dash	simpsh
Benchmark 1	6.282 s	6.057 s	6.188 s
Benchmark 2	0.585 s	0.609 s	0.591 s
Benchmark 3	2.028 s	2.033 s	2.027 s

SYSTEM TIME	bash	dash	simpsh
Benchmark 1	0.389 s	0.404 s	0.380 s
Benchmark 2	0.250 s	0.233 s	0.229 s
Benchmark 3	0.166 s	0.154 s	0.151 s

TOTAL TIME	bash	dash	simpsh
Benchmark 1	6.671 s	6.461 s	6.568 s
Benchmark 2	0.835	0.842 s	0.820 s
Benchmark 3	2.194	2.187 s	2.178 s

Looking at USER TIME, dash has the slowest time for benchmarks 2 and 3 and bash has the slowest time for benchmark 1. I can conclude from this data that simpsh performed the most efficient since it was always had the first or second fastest time for user time.

Looking at SYSTEM TIME, simpsh had the fastest time for all 3 benchmarks so we can conclude that simpsh is the most efficient with system time. We can also say that bash is the least efficient since it had the slowest system time for benchmarks 2 and 3.

Looking at TOTAL TIME, simpsh had the fastest time for benchmarks 2 and 3 while bash has the slowest time for benchmarks 1 and 3. To conclude, simpsh seems to be the fastest and most efficient according to this data since it usually had the quickest times. The least efficient seems to be bash because it came in last in more benchmarks. However these differences in time are in the milliseconds and may be irrelevant depending on the type of work one is doing.