Harun Uğurlu
28532046358

CMPE 382 Homework-2 Report

For this experiment, I have modified the original script to increase both the number of files and the amount of integer numbers within each file in order to better observe the runtime. The revised Bash script generates between 21 and 30 files, with each file containing up to 9,999 random integers.

Here are the hardware specifications of the computer this experiment has been run on:
- **CPU:** Intel(R) Core(TM) i7-10750H CPU @ 2.60GHz, 6 cores

- **Memory:** 16384MB RAM

- OS: Windows 10, I have used WSL with Ubuntu distribution

THREADS	REAL	USER	SYS
1	1.734s	1.318s	0.011s
2	0.966s	1.581s	0.010s
3	0.879s	1.981s	0.021s
5	0.0634s	2.389s	0.030s
6	0.592s	2.520s	0.031s
7	0.525s	2.720s	0.041s
8	0.484s	2.797s	0.050s
9	0.535s	2.981s	0.061s

Based on the above results, we can see that as the number of threads increases, the real time (REAL) decreases due to parallelization of the task. However, since the computer this program has been run on has a CPU with 6 cores, at most 6 threads can execute in parallel. Therefore, as the number of threads exceeds the number of cores, the task is not all done in parallel. As a result, the real time is not constantly decreasing anymore as the overhead of thread creation, switching between them starts to overcome the benefits of parallelization.

As for the user time (USER), it is on a constant increase as the number of threads increases. User time refers to the CPU time used directly by the processes initiated by this program. When more threads are used, they can run concurrently, which accumulates more CPU time in parallel. Hence, even if the real time decreases or stabilizes due to parallel execution, the user time can increase as it accounts for the total time consumed by all cores cumulatively.

For the system time (SYS), as the number of threads increases, the system time increases as well. SYS is the measurement of CPU time spent in kernel-mode and as the number of threads increases, there is more context-switching and file handling involved by the operating system.