

CENG 322

HOMEWORK 3 REPORT

In this assignment, we learned and gained experience what and how to find optimum number of threads. We observe the performance differences each number of threads. And also we observed how to decrease total time when we use different number of threads.

Before find the result, we remind “Each thread has its own stack, since thread will generally call different procedures and thus a different execution history.”(1) and lasty we should exactly to know “Threads provide a way to improve application performance through parallelism. Threads represent a software approach to improving performance of operating system by reducing the overhead thread is equivalent to a classical process.”(2).

In my method, I observed these

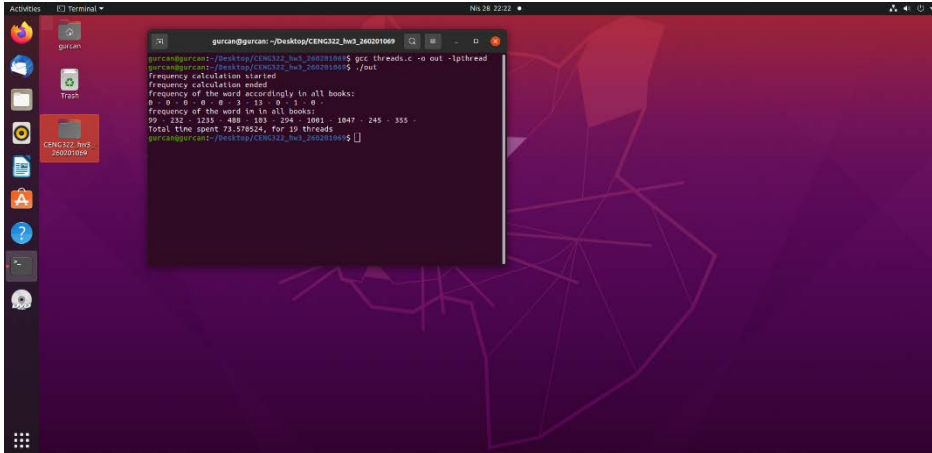
1. the minimum total time when I define MAX_THREAD as “19”. And the total time spent 73.570524.
2. When I define MAX_THREAD as “18”, the total time was 75.364518.
3. When I define MAX_THREAD as “16”, the total time was 76.063274.
4. When I define MAX_THREAD as “20”, the total time was 81.441219.
5. When I define MAX_THREAD as “27”, the total time spent 106.525273.
6. When I define MAX_THREAD as “6”, the total time spent 97.302320.
7. When I define MAX_THREAD as “1”, the total time spent 238.648033.
8. When I define MAX_THREAD as “3”, the total time spent 114.334432.

I think, when add more threads usually helps, but after some point, they cause some performance degradation. And also there are 4 advantages in multithreaded application: responsiveness, scalability, resource sharing, economy(3). But for being “economical this does not come free - the biggest drawback is that there is no protection between threads.

Performance depends on how much voluntary efficient each thread will do. For instance, if threads without I/O at all and use no system services (100% CPU bounded) then one thread per core is the optimal. If threads do anything that requires waiting, so we must experiment to find optimal number of threads.

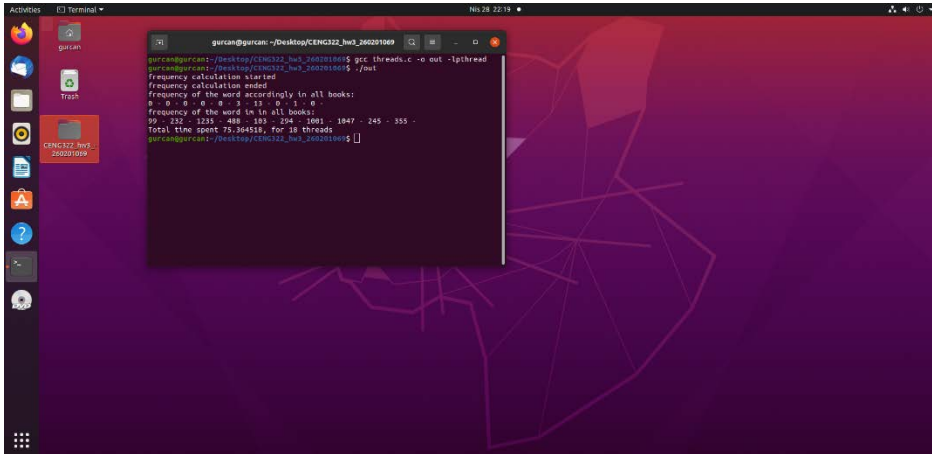
OUTPUTS

1.



```
gurkan@gurkan:~/Desktop/CENG322_hw3_260201909$ gcc threads.c -o out -lpthread
gurkan@gurkan:~/Desktop/CENG322_hw3_260201909$ ./out
frequency calculation started
frequency calculation ended
frequency of the word accordingly in all books:
a - 0 - 0 - 0 - a - 9 - 11 - 0 - 1 - 0
frequency of the word tm in all books:
19 - 121 - 1225 - 488 - 183 - 204 - 1081 - 1847 - 245 - 355 -
Total time spent 73.578524, for 19 threads
gurkan@gurkan:~/Desktop/CENG322_hw3_260201909$
```

2.



```
gurkan@gurkan:~/Desktop/CENG322_hw3_260201909$ gcc threads.c -o out -lpthread
gurkan@gurkan:~/Desktop/CENG322_hw3_260201909$ ./out
frequency calculation started
frequency calculation ended
frequency of the word accordingly in all books:
a - 0 - 0 - 0 - a - 9 - 11 - 0 - 1 - 0
frequency of the word tm in all books:
19 - 121 - 1225 - 488 - 183 - 204 - 1081 - 1847 - 245 - 355 -
Total time spent 75.364518, for 18 threads
gurkan@gurkan:~/Desktop/CENG322_hw3_260201909$
```

3.

```

gurkan@gurkan:~/Desktop/CENG322_hw3_26020109$ gcc threads.c -o out -lpthread
gurkan@gurkan:~/Desktop/CENG322_hw3_26020109$ ./out
Frequency calculation started
Frequency calculation ended
Frequency of the word according to all books:
0 0 0 0 0 3 15 0 3 0
Frequency of the word in all books:
99 232 1235 488 189 254 1081 1047 245 355
Total time spent 79.863274, for 16 threads
gurkan@gurkan:~/Desktop/CENG322_hw3_26020109$

```

4.

```

gurkan@gurkan:~/Desktop/CENG322_hw3_26020109$ gcc threads.c -o out -lpthread
gurkan@gurkan:~/Desktop/CENG322_hw3_26020109$ ./out
Frequency calculation started
Frequency calculation ended
Frequency of the word according to all books:
0 0 0 0 0 3 15 0 3 0
Frequency of the word in all books:
99 232 1235 488 189 254 1081 1047 245 355
Total time spent 81.441219, for 26 threads
gurkan@gurkan:~/Desktop/CENG322_hw3_26020109$

```

5.

```

gurkan@gurkan:~/Desktop/CENG322_hw3_26020109$ gcc threads.c -o out -lpthread
gurkan@gurkan:~/Desktop/CENG322_hw3_26020109$ ./out
Frequency calculation started
Frequency calculation ended
Frequency of the word according to all books:
0 0 0 0 0 3 15 0 3 0
Frequency of the word in all books:
99 232 1235 488 189 254 1081 1047 245 355
Total time spent 186.325275, for 27 threads
gurkan@gurkan:~/Desktop/CENG322_hw3_26020109$

```

6.

```

gurkan@gurkan: ~/Desktop/CENG322_hw3_260201099
gurkan@gurkan:~/Desktop/CENG322_hw3_260201099$ gcc threads.c -o out -lpthread
gurkan@gurkan:~/Desktop/CENG322_hw3_260201099$ ./out
Frequency calculation started
Frequency calculation ended
Frequency of the word accordingly in all books:
0 - 0 - 0 - 0 - 3 - 15 - 0 - 3 - 0
Frequency of the word in all books:
99 - 232 - 1235 - 488 - 189 - 254 - 1081 - 1846 - 245 - 355 -
Total time spent 97.382328, for 8 threads
gurkan@gurkan:~/Desktop/CENG322_hw3_260201099$
  
```

7.

```

gurkan@gurkan: ~/Desktop/CENG322_hw3_260201099
gurkan@gurkan:~/Desktop/CENG322_hw3_260201099$ gcc threads.c -o out -lpthread
gurkan@gurkan:~/Desktop/CENG322_hw3_260201099$ ./out
Frequency calculation started
Frequency calculation ended
Frequency of the word accordingly in all books:
0 - 0 - 0 - 0 - 3 - 15 - 0 - 3 - 0
Frequency of the word in all books:
99 - 232 - 1235 - 488 - 189 - 254 - 1081 - 1846 - 245 - 355 -
Total time spent 238.648933, for 1 threads
gurkan@gurkan:~/Desktop/CENG322_hw3_260201099$
  
```

8.

```

gurkan@gurkan: ~/Desktop/CENG322_hw3_260201099
gurkan@gurkan:~/Desktop/CENG322_hw3_260201099$ gcc threads.c -o out -lpthread
gurkan@gurkan:~/Desktop/CENG322_hw3_260201099$ ./out
Frequency calculation started
Frequency calculation ended
Frequency of the word accordingly in all books:
0 - 0 - 0 - 0 - 3 - 15 - 0 - 3 - 0
Frequency of the word in all books:
99 - 232 - 1235 - 488 - 189 - 254 - 1081 - 1846 - 245 - 355 -
Total time spent 114.334432, for 3 threads
gurkan@gurkan:~/Desktop/CENG322_hw3_260201099$
  
```

FURTER READING

- 1) *This is from our lab 5, shared by ...*
- 2) https://www.tutorialspoint.com/operating_system/os_multi_threading.htm.
- 3) *Operating System Concepts Tenth Edition Avi Silberschatz Peter Baer Galvin Greg Gagne John Wiley & Sons, Inc. ISBN 978-1-118-06333-0*