Dania Dababo
Github: dania-d
ID: 922001571
CSC415 Operating Systems

Assignment 4 – Word Blast

Description:
This assignment is to write a C program that reads War and Peace and counts and tallies each word that is 6 or more characters long.

Approach / What I Did:
Prior to accepting the assignment, I watched the lecture videos that covered unit 4. After I accepted the assignment, I read it and took notes on the instructions. I created steps and numbered them so I could refer to them while coding.

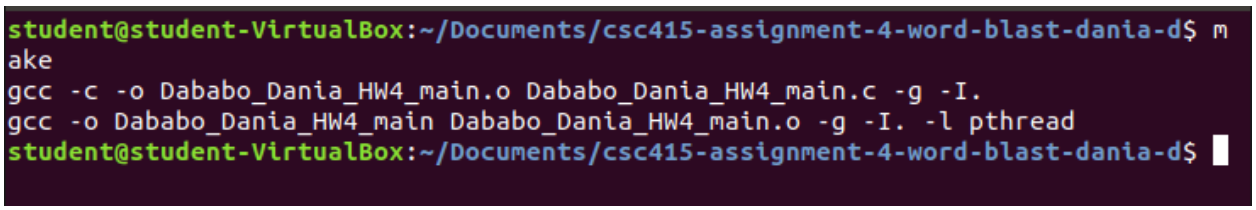
Issues and Resolutions:

My first issue was that I was getting the error “Makefile:60: recipe for target 'run' failed. Segmentation fault core dumped.” After changing the size of my array that holds word structs from 1,000,000 to 200,000 I no longer got the error. 1,000,000 was most likely too much memory for the virtual machine to handle, which is why I was getting the segmentation fault error.

The next issue I had was another segmentation fault. At this point, I had all of my code implemented, except for my mutex locks. I thought maybe the error was because I hadn’t yet protected the critical sections of my code. To resolve the issue, I used locks around the lines of code that added new words to my array or updated the frequency of those words. This fixed the issue, so I concluded that my threads were possibly accessing the array at the same time which caused an error.

Analysis: (If required for the assignment)

Screen shot of compilation:



Screen shot(s) of the execution of the program:

Show all necessary screen shots (some assignments require more than one).

These should be in the Linux Terminal window and not visual studio.

```
student@student-VirtualBox:~/Documents/csc415-assignment-4-word-blast-dania-d$ .
/Dababo_Dania_HW4_main WarAndPeace.txt 1

Word Frequency Count on WarAndPeace.txt with 1 Threads
Number 1 is Pierre with a count of 1963
Number 2 is Prince with a count of 1928
Number 3 is Natásha with a count of 1213
Number 4 is Andrew with a count of 1143
Number 5 is himself with a count of 1020
Number 6 is Princess with a count of 916
Number 7 is French with a count of 881
Number 8 is before with a count of 833
Number 9 is Rostóv with a count of 776
Number 10 is thought with a count of 767
Total Time was 7.408823275 seconds
student@student-VirtualBox:~/Documents/csc415-assignment-4-word-blast-dania-d$
```

```
student@student-VirtualBox:~/Documents/csc415-assignment-4-word-blast-dania-d$ .
/Dababo_Dania_HW4_main WarAndPeace.txt 2

Word Frequency Count on WarAndPeace.txt with 2 Threads
Number 1 is Pierre with a count of 1963
Number 2 is Prince with a count of 1928
Number 3 is Natásha with a count of 1213
Number 4 is Andrew with a count of 1143
Number 5 is himself with a count of 1020
Number 6 is Princess with a count of 916
Number 7 is French with a count of 881
Number 8 is before with a count of 833
Number 9 is Rostóv with a count of 776
Number 10 is thought with a count of 767
Total Time was 4.668202227 seconds
student@student-VirtualBox:~/Documents/csc415-assignment-4-word-blast-dania-d$
```

```
student@student-VirtualBox:~/Documents/csc415-assignment-4-word-blast-dania-d$ .
/Dababo_Dania_HW4_main WarAndPeace.txt 4

Word Frequency Count on WarAndPeace.txt with 4 Threads
Number 1 is Pierre with a count of 1963
Number 2 is Prince with a count of 1928
Number 3 is Natásha with a count of 1212
Number 4 is Andrew with a count of 1143
Number 5 is himself with a count of 1020
Number 6 is princess with a count of 916
Number 7 is French with a count of 881
Number 8 is before with a count of 833
Number 9 is Rostóv with a count of 776
Number 10 is thought with a count of 767
Total Time was 3.679500102 seconds
student@student-VirtualBox:~/Documents/csc415-assignment-4-word-blast-dania-d$
```

```
student@student-VirtualBox:~/Documents/csc415-assignment-4-word-blast-dania-d$ .
/Dababo_Dania_HW4_main WarAndPeace.txt 8

Word Frequency Count on WarAndPeace.txt with 8 Threads
Number 1 is Pierre with a count of 1963
Number 2 is Prince with a count of 1928
Number 3 is Natásha with a count of 1213
Number 4 is Andrew with a count of 1143
Number 5 is himself with a count of 1020
Number 6 is princess with a count of 916
Number 7 is French with a count of 881
Number 8 is Before with a count of 833
Number 9 is Rostóv with a count of 776
Number 10 is thought with a count of 767
Total Time was 3.682707597 seconds
student@student-VirtualBox:~/Documents/csc415-assignment-4-word-blast-dania-d$
```

The time for 1 thread is roughly 7.41 seconds. When 2 threads are used, the time is roughly 4.67 seconds, which is a decrease of 36.98% when compared to 1 thread. The time for 4 threads is about 3.68 seconds, which is a decrease of 21.2% when compared to 2 threads. The time for 8 threads is also 3.68 seconds; there is no difference in times between 4 and 8 threads.

To explain why the times only improve for 1→ 2→ 4 threads, it is because of the number of CPU cores that are available to the program. The number of CPU cores that are available correlates to how much parallel processing can take place.