**Map Reduce Report**

**Problems:**

I mainly had issues with deadlocks. It was because I was getting confused on where they should be locked and when to be released. I also had a weird bug where some threads were not initialized correctly when doing the search.

**Solution:**

To be able to have a good use of shared memory and still have good locks and releases I created a temp dictionary inside the parallel section of the code that will later transfer its data to the shared one. I placed the lock and release in between when the data was transferred to the shared dictionary.

**Bugs:**

For some reason when reading the files and placing them into strings and a list the file didn’t properly transfer, and some words got mixed up not giving me exact word count as the professors, but it was close enough result.

**Time:**

The actual coding part took an approximate of 2-3 hours and one more for debugging.

**Performance:**

1 Thread: ~1.342 s

2 Threads: ~0.059 s

4 Threads: ~0.055 s

8 Threads: ~0.094 s

**Analysis:**

When using less threads, the time was exponentially decreased. When more threads were used, the time started to increase.

**Observations:**

I realized that adding more threads doesn’t necessary mean that the time will always decrease. In this case the job each thread is doing is shorter the task all the other threads are waiting, ending up extending the execution time. It all depends in the problem we are trying to accomplish. This is something important because before adding lots of threads we need to understand the problem and see if its beneficial.

**CPU Info:**

processor: 0

vendor\_id: GenuineIntel

cpu family: 6

model: 142

model name: Intel(R) Core(TM) i7-7500U CPU @ 2.70GHz

stepping: 9

microcode: 0xb4

cpu MHz: 2904.004

cache size: 4096 KB

physical id: 0

siblings: 4

core id: 0

cpu cores: 4

apicid: 0

initial apicid: 0

fpu: yes

fpu\_exception: yes

cpuid level: 22

wp: yes

flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ss ht syscall nx pdpe1gb rdtscp lm constant\_tsc arch\_perfmon nopl xtopology tsc\_reliable nonstop\_tsc cpuid pni pclmulqdq ssse3 fma cx16 pcid sse4\_1 sse4\_2 x2apic movbe popcnt tsc\_deadline\_timer aes xsave avx f16c rdrand hypervisor lahf\_lm abm 3dnowprefetch cpuid\_fault invpcid\_single pti ssbd ibrs ibpb stibp fsgsbase tsc\_adjust bmi1 avx2 smep bmi2 invpcid rdseed adx smap clflushopt xsaveopt xsavec xsaves arat md\_clear flush\_l1d arch\_capabilities

bugs: cpu\_meltdown spectre\_v1 spectre\_v2 spec\_store\_bypass l1tf mds swapgs itlb\_multihit

bogomips: 5808.00

clflush size: 64

cache\_alignment: 64

address size: 43 bits physical, 48 bits virtual

power management:

processor: 1

vendor\_id: GenuineIntel

cpu family: 6

model: 142

model name: Intel(R) Core(TM) i7-7500U CPU @ 2.70GHz

stepping: 9

microcode: 0xb4

cpu MHz: 2904.004

cache size: 4096 KB

physical id: 0

siblings: 4

core id: 1

cpu cores: 4

apicid: 1

initial apicid: 1

fpu: yes

fpu\_exception: yes

cpuid level: 22

wp: yes

flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ss ht syscall nx pdpe1gb rdtscp lm constant\_tsc arch\_perfmon nopl xtopology tsc\_reliable nonstop\_tsc cpuid pni pclmulqdq ssse3 fma cx16 pcid sse4\_1 sse4\_2 x2apic movbe popcnt tsc\_deadline\_timer aes xsave avx f16c rdrand hypervisor lahf\_lm abm 3dnowprefetch cpuid\_fault invpcid\_single pti ssbd ibrs ibpb stibp fsgsbase tsc\_adjust bmi1 avx2 smep bmi2 invpcid rdseed adx smap clflushopt xsaveopt xsavec xsaves arat md\_clear flush\_l1d arch\_capabilities

bugs: cpu\_meltdown spectre\_v1 spectre\_v2 spec\_store\_bypass l1tf mds swapgs itlb\_multihit

bogomips: 5808.00

clflush size: 64

cache\_alignment: 64

address sizes: 43 bits physical, 48 bits virtual

power management:

processor: 2

vendor\_id: GenuineIntel

cpu family: 6

model: 142

model name: Intel(R) Core(TM) i7-7500U CPU @ 2.70GHz

stepping: 9

microcode: 0xb4

cpu MHz: 2904.004

cache size: 4096 KB

physical id: 0

siblings: 4

core id: 2

cpu cores: 4

apicid: 2

initial apicid: 2

fpu: yes

fpu\_exception: yes

cpuid level: 22

wp: yes

flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ss ht syscall nx pdpe1gb rdtscp lm constant\_tsc arch\_perfmon nopl xtopology tsc\_reliable nonstop\_tsc cpuid pni pclmulqdq ssse3 fma cx16 pcid sse4\_1 sse4\_2 x2apic movbe popcnt tsc\_deadline\_timer aes xsave avx f16c rdrand hypervisor lahf\_lm abm 3dnowprefetch cpuid\_fault invpcid\_single pti ssbd ibrs ibpb stibp fsgsbase tsc\_adjust bmi1 avx2 smep bmi2 invpcid rdseed adx smap clflushopt xsaveopt xsavec xsaves arat md\_clear flush\_l1d arch\_capabilities

bugs: cpu\_meltdown spectre\_v1 spectre\_v2 spec\_store\_bypass l1tf mds swapgs itlb\_multihit

bogomips: 5808.00

clflush size: 64

cache\_alignment: 64

address sizes: 43 bits physical, 48 bits virtual

power management:

processor: 3

vendor\_id: GenuineIntel

cpu family: 6

model: 142

model name: Intel(R) Core(TM) i7-7500U CPU @ 2.70GHz

stepping: 9

microcode: 0xb4

cpu MHz: 2904.004

cache size: 4096 KB

physical id: 0

siblings: 4

core id: 3

cpu cores: 4

apicid: 3

initial apicid: 3

fpu: yes

fpu\_exception: yes

cpuid level: 22

wp: yes

flags: fpu vme de pse tsc msr pae mce cx8 adpe1gb rdtscp lm constant\_tsc arch\_perfmon nopl xtopol\_2 x2apic movbe popcnt tsc\_deadline\_timer aes xsave avi ssbd ibrs ibpb stibp fsgsbase tsc\_adjust bmi1 avx2 s flush\_l1d arch\_capabilities

bugs: cpu\_meltdown spectre\_v1 spectre\_v2 s

bogomips: 5808.00

clflush size: 64

cache\_alignment: 64

address sizes: 43 bits physical, 48 bits virtual