CSC617M - AdvanOS

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Homework #1

**Processor Used:** Intel i7 4700MQ Overclocked

**Clock Speed:** 2.4ghz (3.6ghz max turbo boost)

**Cores:** 4 physical cores (8 virtual cores [hyperthreaded])

**Tested on the 17 Digit Prime number: 10000000002065383**

**Compared to running with a single thread,** Performance improves linearly with the number of threads until the number of threads matches the number of cores (4 in this case) in the following manner: “*(single thread time)/ (number of threads)”*; performance continues to increase slightly until 8 threads which is above the number of cores. At 4 threads the CPU’s 4 physical cores are fully loaded but its 4 virtual cores are essentially unloaded, yielding about 89% maximum performance with a CPU load reading of about 50%. This occurs because all physical cores are fully utilized but hyperthreading is not used at all since 4 threads is not enough to load all 8 virtual cores. At 8 threads, all the processor’s 4 physical cores, which act as 8 virtual cores, are fully saturated and work at maximum efficiency (100% CPU usage) as well as making use of Intel’s HyperThreading. Increasing the number of threads beyond this point do not offer any further improvement, since all the cores are already working at maximum efficiency, and in fact lead to an increased number of anomalous results with a very high number of threads (1024+) possibly due to the complexity involved in creating, running and stopping a very large number of threads. All of the times have been recorded in milliseconds

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| # of threads | Time | %Usage | Time 2 | %Usage2 | Time 3 | %Usage3 | Ave Time | Ave Usage |
| 1 | 45689 | 13 | 45748 | 14 | 46461 | 13 | 45966 | 13.33333 |
| 2 | 23725 | 26 | 23533 | 27 | 23832 | 26 | 23697 | 26.33333 |
| 4 | 14517 | 51 | 14501 | 50 | 14598 | 51 | 14539 | 50.66667 |
| 8 | 13378 | 100 | 12837 | 100 | 13128 | 100 | 13114 | 100 |
| 16 | 13839 | 100 | 13775 | 100 | 14321 | 100 | 13978 | 100 |
| 32 | 12982 | 100 | 13322 | 100 | 13061 | 100 | 13122 | 100 |
| 64 | 13220 | 100 | 13594 | 100 | 13347 | 100 | 13387 | 100 |
| 128 | 14314 | 100 | 12657 | 100 | 13579 | 100 | 13517 | 100 |
| 256 | 13610 | 100 | 15298 | 100 | 14125 | 100 | 14344 | 100 |
| 512 | 13501 | 100 | 13328 | 100 | 15688 | 100 | 14172 | 100 |
| 1024 | 15557 | 100 | 25456 | 100 | 15326 | 100 | 18780 | 100 |
| 2048 | 14751 | 100 | 13813 | 100 | 14767 | 100 | 14444 | 100 |
| 4096 | 14282 | 100 | 14485 | 100 | 13735 | 100 | 14167 | 100 |
| 8192 | 15721 | 100 | 15931 | 100 | 15325 | 100 | 15659 | 100 |
| 16384 | 15172 | 100 | 41234 | 100 | 15016 | 100 | 23807 | 100 |