COMP8005 Assignment 1

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# Design

The CPU task the prime decomposition function provided in lab was used for both threading and processing tests.

## Psudo code

Multithreading  
 Number to be decomposed entered -> **n**  
 Start time of program is initialized  
 All threads are initialized to run task with the number **n** All threads are started  
 Start time of thread is initialized  
 Task is completed  
 Task gives output  
 Time elapsed in thread is calculated and displayed  
 Time elapsed in program is calculated and displayed  
 Program exit

Multiprocessing  
 Number of processes entered -> **p**  
 Number to be decomposed entered -> **n**  
 Start time of program is initializedFor loop to start all processes  
 If process is parent after fork break  
 Do task  
 Time elapsed in program is calculated and displayed  
 Program exit

# Report

Observations  
In this scenario the threads are faster until 5 threads are being used in which case the processes become comparingly faster.

Until 6 threads/processes the average time per task only increased by ~10% for every 6 threads/processes added. After 6 threads/processes (core count of the test CPU) the average time per task increased by ~18%

Adding threads and Processes will only give diminishing returns. With two threads I can finish 4 tasks in the same time it takes eight threads to finish 8 tasks. That might be half the output but only ¼ of the resources.

# Test/Data

I used the prime number 275604541 to test threads and processes. If the task printed 275604541 it was considered a pass. As all the tests were passing I removed the print statement to shave off a few milliseconds per execution to get better measurements.

## Thread results

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  | avg time | increase in time |
| 7.572586 | 7.723447 |  |  |  |  |  |  |  | 7.648017 |  |
| 7.849611 | 7.907723 | 7.929413 | 7.655431 | 7.668755 | 7.704434 |  |  |  | 7.785895 | 102% |
| 7.972217 | 7.977858 | 9.489164 | 9.498611 |  |  |  |  |  | 8.734463 | 112% |
| 8.266532 | 9.802132 | 9.837715 | 10.20252 | 10.27588 |  |  |  |  | 9.676956 | 111% |
| 10.40618 | 10.46398 | 10.47517 | 10.6844 | 10.79708 | 10.8434 |  |  |  | 10.6117 | 110% |
| 11.96335 | 12.08044 | 12.22843 | 12.32144 | 12.505 | 12.50547 | 12.57829 | 12.33963 |  | 12.31526 | 116% |
| 14.36525 | 14.71769 | 14.73191 | 14.98983 | 15.02981 | 15.16965 | 15.21431 | 15.29366 |  | 14.93901 | 121% |
| 15.40188 | 15.39869 | 15.54096 | 15.72786 | 15.84807 | 15.93779 | 15.96948 | 16.04493 | 16.32673 | 15.7996 | 106% |

## Process results

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  | avg time | increase in time |
| 7.69253 | 8.147778 |  |  |  |  |  |  |  | 7.920154 |  |
| 7.873421 | 7.930536 | 7.935526 |  |  |  |  |  |  | 7.913161 | 100% |
| 8.034604 | 8.099726 | 10.01841 | 10.02629 |  |  |  |  |  | 9.044759 | 114% |
| 8.312295 | 9.574999 | 9.718467 | 10.14286 | 10.21888 |  |  |  |  | 9.5935 | 106% |
| 10.05908 | 10.06951 | 10.08151 | 10.10342 | 10.10952 | 10.60908 |  |  |  | 10.17202 | 106% |
| 10.80004 | 10.95429 | 11.71284 | 11.96106 | 11.99569 | 12.0177 | 12.4215 |  |  | 11.69473 | 115% |
| 13.3684 | 13.57331 | 13.69827 | 13.97194 | 13.98013 | 13.96823 | 13.99288 | 14.45108 |  | 13.87553 | 119% |
| 14.43323 | 14.73889 | 15.08694 | 15.1057 | 15.14817 | 15.24789 | 15.3194 | 15.40719 | 15.47359 | 15.10678 | 109% |

## Machine

CPU

AMD FX-6100 Six-Core Processor   
Core Speed 3913.1 MHz

TDP Limit 95.0 Watts

## Process experiment

peymantp@peymantp-desktop:~/Documents/BTech/8005/Assignment1$ ./processes 1 275604541

275604541

spent: 6.542530 secs

peymantp@peymantp-desktop:~/Documents/BTech/8005/Assignment1$ ./processes 2 275604541

275604541

spent: 7.692530 secs

275604541

spent: 8.147778 secs

peymantp@peymantp-desktop:~/Documents/BTech/8005/Assignment1$ ./processes 3 275604541

275604541

spent: 7.873421 secs

275604541

spent: 7.930536 secs

275604541

spent: 7.935526 secs

peymantp@peymantp-desktop:~/Documents/BTech/8005/Assignment1$ ./processes 4 275604541

275604541

spent: 8.034604 secs

275604541

spent: 8.099726 secs

275604541

spent: 10.018410 secs

275604541

spent: 10.026294 secs

peymantp@peymantp-desktop:~/Documents/BTech/8005/Assignment1$ ./processes 5 275604541

275604541

spent: 8.312295 secs

275604541

spent: 9.574999 secs

275604541

spent: 9.718467 secs

275604541

spent: 10.142860 secs

275604541

spent: 10.218878 secs

peymantp@peymantp-desktop:~/Documents/BTech/8005/Assignment1$./processes 6 275604541

275604541

spent: 10.059076 secs

275604541

spent: 10.069505 secs

275604541

spent: 10.081507 secs

275604541

spent: 10.103417 secs

275604541

spent: 10.109515 secs

275604541

spent: 10.609076 secs

peymantp@peymantp-desktop:~/Documents/BTech/8005/Assignment1$./processes 7 275604541

275604541

spent: 10.800041 secs

275604541

spent: 10.954286 secs

275604541

spent: 11.712835 secs

275604541

spent: 11.961057 secs

275604541

spent: 11.995694 secs

275604541

spent: 12.017695 secs

275604541

spent: 12.421504 secs

-----------------------------------------------------------------------

peymantp@peymantp-desktop:~/Documents/BTech/8005/Assignment1$ ./processes2 8 275604541

spent: 13.368399 secs

spent: 13.573313 secs

spent: 13.698270 secs

spent: 13.971937 secs

spent: 13.980130 secs

spent: 13.968228 secs

spent: 13.992875 secs

spent: 14.451083 secs

peymantp@peymantp-desktop:~/Documents/BTech/8005/Assignment1$ ./processes2 9 275604541

spent: 14.433229 secs

spent: 14.738891 secs

spent: 15.086941 secs

spent: 15.105699 secs

spent: 15.148170 secs

spent: 15.247893 secs

spent: 15.319402 secs

spent: 15.407186 secs

spent: 15.473587 secs

## Threading Experiment

peymantp@peymantp-desktop:~/Documents/Assignment\_1$ ./multithread6 141650939

141650939

spent: 5.320150 secs

141650939

spent: 5.330402 secs

141650939

spent: 5.345049 secs

141650939

spent: 5.363283 secs

141650939

spent: 5.409448 secs

141650939

spent: 5.432961 secs

Total spent: 5.433364 secs

peymantp@peymantp-desktop:~/Documents/Assignment\_1$ ./multithread6 275604541

275604541

spent: 10.406180 secs

275604541

spent: 10.463977 secs

275604541

spent: 10.475171 secs

275604541

spent: 10.684398 secs

275604541

spent: 10.797078 secs

275604541

spent: 10.843395 secs

Total spent: 10.843929 secs

peymantp@peymantp-desktop:~/Documents/Assignment\_1$ ./multithread5 275604541

275604541

spent: 8.266532 secs

275604541

spent: 9.802132 secs

275604541

spent: 9.837715 secs

275604541

spent: 10.202521 secs

275604541

spent: 10.275882 secs

Total spent: 10.276114 secs

peymantp@peymantp-desktop:~/Documents/Assignment\_1$ ./multithread4 275604541

275604541

spent: 7.972217 secs

275604541

spent: 7.977858 secs

275604541

spent: 9.489164 secs

275604541

spent: 9.498611 secs

Total spent: 9.498906 secs

peymantp@peymantp-desktop:~/Documents/Assignment\_1$ ./multithread3 275604541

275604541

spent: 7.849611 secs

275604541

spent: 7.907723 secs

275604541

spent: 7.929413 secs

peymantp@peymantp-desktop:~/Documents/Assignment\_1$ ./multithread3 275604541

275604541

spent: 7.655431 secs

275604541

spent: 7.668755 secs

275604541

spent: 7.704434 secs

Total spent: 7.704795 secs

peymantp@peymantp-desktop:~/Documents/Assignment\_1$ ./multithread2 275604541

275604541

spent: 7.572586 secs

275604541

spent: 7.723447 secs

Total spent: 7.723573 secs

peymantp@peymantp-desktop:~/Documents/Assignment\_1$ ./multithread1 275604541

275604541

spent: 6.835381 secs

Total spent: 6.835590 secs

peymantp@peymantp-desktop:~/Documents/Assignment\_1$ ./singlethread 275604541 6

275604541

spent: 7.678676 secs

275604541

spent: 6.610758 secs

275604541

spent: 6.631928 secs

275604541

spent: 6.611547 secs

275604541

spent: 6.698522 secs

275604541

spent: 6.998028 secs

Total spent: 41.229606 secs

-----------------------------------------------------------------------

peymantp@peymantp-desktop:~/Documents/BTech/8005/Assignment1$ ./threads 275604541

spent: 11.963353 secs

spent: 12.080435 secs

spent: 12.228433 secs

spent: 12.321437 secs

spent: 12.505000 secs

spent: 12.505471 secs

spent: 12.578289 secs

Total spent: 12.586694 secs

peymantp@peymantp-desktop:~/Documents/BTech/8005/Assignment1$ ./threads 275604541

spent: 11.100489 secs

spent: 12.074148 secs

spent: 12.368896 secs

spent: 12.434865 secs

spent: 12.512965 secs

spent: 12.772515 secs

spent: 13.113497 secs

Total spent: 13.117382 secs

peymantp@peymantp-desktop:~/Documents/BTech/8005/Assignment1$ ./threads 275604541

spent: 14.365248 secs

spent: 14.717688 secs

spent: 14.731913 secs

spent: 14.989829 secs

spent: 15.029814 secs

spent: 15.169645 secs

spent: 15.214308 secs

spent: 15.293659 secs

Total spent: 15.307391 secs

peymantp@peymantp-desktop:~/Documents/BTech/8005/Assignment1$ ./threads 275604541

spent: 15.401875 secs

spent: 15.398693 secs

spent: 15.540959 secs

spent: 15.727862 secs

spent: 15.848067 secs

spent: 15.937787 secs

spent: 15.969479 secs

spent: 16.044928 secs

spent: 16.326734 secs

Total spent: 16.328229 secs