**Project 1 Report**

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**1. Size of the work unit**

When N=1000000 and K=4, we have tried various different situations to determine the best CPU utilization rate, the results are presented below.

|  |  |  |  |
| --- | --- | --- | --- |
| Work Unit | CPU | REAL | CPU utilization |
| 100 | 2.543 | 1.15 | 2.21 |
| 1000 | 0.092 | 0.057 | 1.61 |
| **10000** | **0.020** | **0.015** | **1.33** |
| 20000 | 0.057 | 0.043 | 1.32 |
| 100000 | 0.021 | 0.016 | 1.31 |

Based on the data above, it is found that the larger the work unit, the less the working CPU time and real-time. However, the larger the work unint, the less the CPU utilization ratio.

By observing the data above, we determine that **work unit is 10000** and thus the actor number is 100. The reasonale is, when work uint is 20000, the CPU time is around 0.02s and the CPU utilization ratio is also relatively high.

**2 Result of runninng the program**The result of runnning the program is shown below:

(base) bingqideMacBook-Pro:Project1 qibing$ dotnet fsi Main.fsx 1000000 4

Real: 00:00:00.419, CPU: 00:00:00.328, GC gen0: 1, gen1: 0, gen2: 0

We can find under N=1000000, K=4, there is no perfect square numbers

**3. The running time for the program**

N=1000000, k=4, work unit=20000

(base) bingqideMacBook-Pro:Project1 qibing$ time dotnet fsi Main.fsx 1000000 4

Real: 00:00:00.879, CPU: 00:00:01.884, GC gen0: 35, gen1: 2, gen2: 0

real 0m3.666s

user 0m3.587s

sys 0m0.777s

**We can find that the CPU time(5.445+0.921) vs. real-time ratio is around 1.85, which is acceptable**

**4. The largest problem we managed to solve**

The largest problem we have solved is N=100000000, k=24

It generates numerous results.

Part of the results is presented below.

99858737

99863521

99897293

99897412

99936012

99990488

99991397

Real: 00:06:19.184, CPU: 00:21:37.104, GC gen0: 5793, gen1: 40, gen2: 3

real 6m24.942s

user 17m40.092s

sys 4m1.705s