Distributed-Operating-System-Principles (COP5615) Project 1

Perfect squares formed by the sums of consecutive squares

#Group members:

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#Steps to run

1. Unzip the file and navigate inside the folder
2. Open Terminal
3. Run the following command:

   dotnet fsi --langversion:preview proj1.fsx 1000000 24

   Output:

   [Prints first number of the sequence that forms a perfect square]

   real: <real time> in ms
   user: <user time> in ms
   sys: <sys time> in ms
   Num of Cores Used in the computation
   ratio of CPU time to Real Time

#Size of work unit for each worker actor

The work unit considered was k where a sequence of numbers of size k was given to each actor.

- The actor then squares each of those values of size k and adds it up.
- Another approach was to simultaneously square all the values from 1 to N by assigning it to actors and then sum up each sequence of size k parallely.
- But this would take more time and space, since the boss would need to wait till all the squares are computed by workers and also store it.

- For an input of 1000000 it was found that dividing the work to 1000 actors where each actor received 1000 work units, used the most cores delivering the best performance.
- But when the input N<1000 we create only N actors and assigned 1 unit of work for each actor.
- When 10,000 actors were spawned it was found to be more cumbersome to maintain this number of actors than perform the squaring.

For an input N=1000000 and k=24

No. of Actors	Work Unit Received by each actor	Cores Used
1000	1000	4.84
10000	100	4.59
100000	10	4.08

#Result of running dotnet fsi proj1.fsx 1000000 4

There are no sequences of length k = 4 for n = 1000000

#Running time for n = 1000000 and k = 4
Real Time: 4142 ms
CPU Time: 20130 ms
Num of Cores: 8 Cores Used: 4.859971

```
shaunak@shaunak-ZenBook-Q536FD-Q536FD:~/DOSproj1$ dotnet fsi --langversion:preview proj.fsx 1000000 4
Real: 00:00:00.000, CPU: 00:00:00.000, GC gen0: 0, gen1: 0, gen2: 0


/home/shaunak/DOSproj1/proj.fsx(104,38): warning FS0044: This construct is deprecated. please use List.item

Real Time: 4142 ms
CPU Time: 20130 ms
Num of Cores: 8 Cores Used: 4.859971
end
```

#Largest Problem solved

N = 10^8 and k = 24

```
shaunak@shaunak-ZenBook-Q536FD-Q536FD:~/DOSproj1$ dotnet fsi --langversion:preview proj.fsx 100000000 24
Real: 00:00:00.000, CPU: 00:00:00.000, GC gen0: 0, gen1: 0, gen2: 0


/home/shaunak/DOSproj1/proj.fsx(104,38): warning FS0044: This construct is deprecated. please use List.item

121
20


76
25


1

44
9


197

304

1301

353

540

3597

856

2053

3112

5448

8576

12981

20425

30908

35709

54032

84996
```

```
128601

202289

306060

353585

534964

841476

1273121

2002557

3029784

3500233

5295700

8329856

12602701

19823373

29991872

34648837

45863965

52422128

82457176

Real Time: 571544 ms
CPU Time: 2743960 ms
Num of Cores: 8 Cores Used: 4.800960
```