CS 575

Project #1

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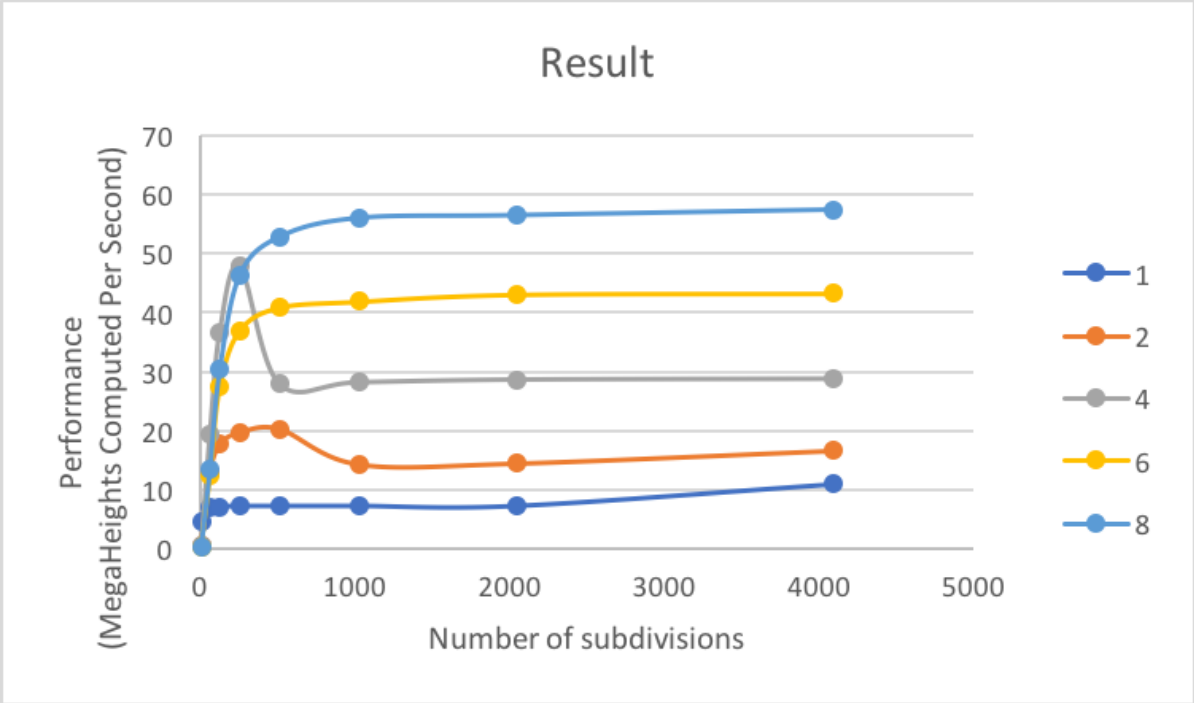
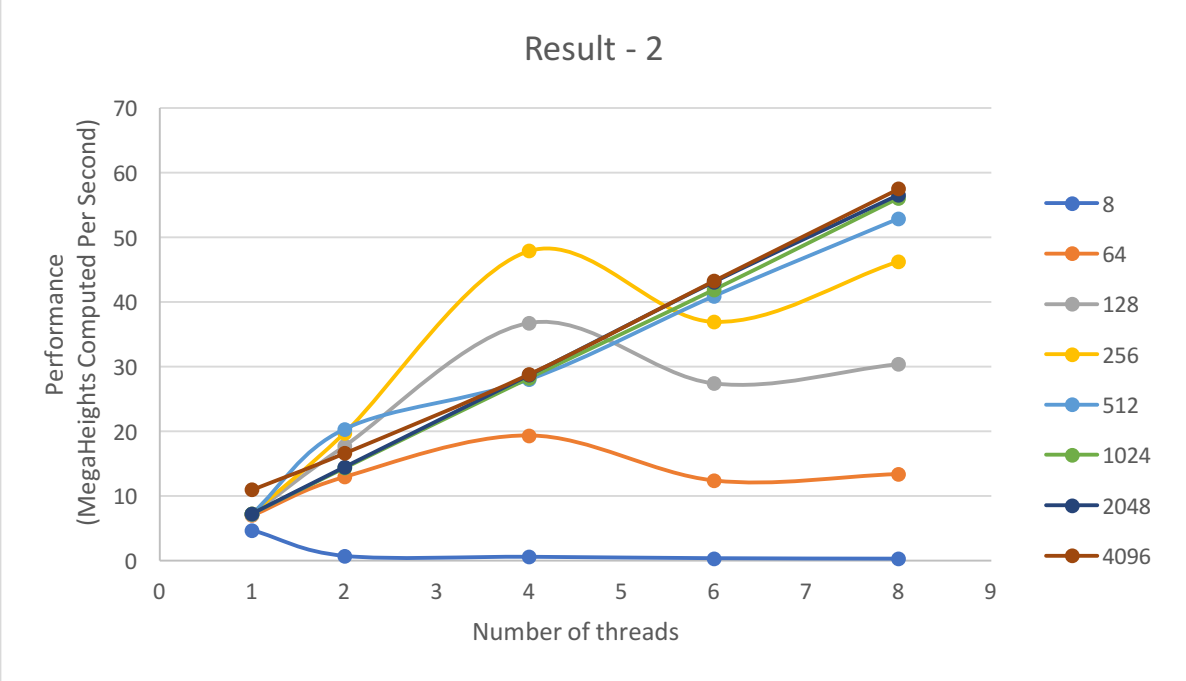
1. **Tell what machine you ran this on**
   School server, flip 2.
2. **What do you think the actual volume is?**
   Approximately to 25.31
3. **Show the performances you achieved in tables and graphs as a function of NUMNODES and NUMT**

	8 nodes	64 nodes	128 nodes	256 nodes	512 nodes	1024 nodes	2048 nodes	4096 nodes
1 thread	4.65	6.97	7.14	7.22	7.23	7.23	7.23	10.94
2 threads	0.67	12.92	17.7	19.71	20.31	14.29	14.44	16.59
4 threads	0.53	19.32	36.73	47.88	27.98	28.23	28.68	28.83
6 threads	0.31	12.37	27.37	36.91	40.87	41.89	43.08	43.27
8 threads	0.24	13.37	30.36	46.28	52.87	56.08	56.56	57.5





4. **What patterns are you seeing in the speeds?**
   In the first graph, we can see the performance will continue to increase until the subdivision is over 1000. In the both of the graphs, we can observe that when the number of threads increase, the performance will increase as well, and their relationship is almost linear.
5. **Why do you think it is behaving this way?**
   We know that there is always a sequential portion that can't be divided, so 8 threads' performance will not be 8 times better than 1 thread 's performance. And for some threads, there aren't enough data to be divided efficiently, so that sometimes less thread will do better than more threads.

6. **What is the Parallel Fraction for this application, using the Inverse Amdahl equation?**

Speedup$_n$=$\frac{T_1}{T_n} = \frac{1}{\frac{F_{parallel}}{n} - F_{sequential}} = \frac{1}{\frac{F_{parallel}}{n} + (1 - F_{parallel})}$

Parallel Fraction:

	8 nodes	64 nodes	128 nodes	256 nodes	512 nodes	1024 nodes	2048 nodes	4096 nodes
2 threads	-11.88	0.92	1.19	1.27	1.29	0.99	1.00	0.68
4 threads	-15.55	1.28	1.61	1.70	1.48	1.49	1.50	1.24
6 threads	-28.00	0.87	1.48	1.61	1.65	1.65	1.66	1.49
8 threads	-36.75	0.96	1.53	1.69	1.73	1.74	1.74	1.62

7. **Given that Parallel Fraction, what is the maximum speed-up you could ever get?**

Max Speedup = $\frac{1}{1 - F_{parallel}} = \frac{1}{1 - 0.99} = 100$