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CS475 Project 1

Test Conditions:

This was ran on my personal laptop.

Specs:

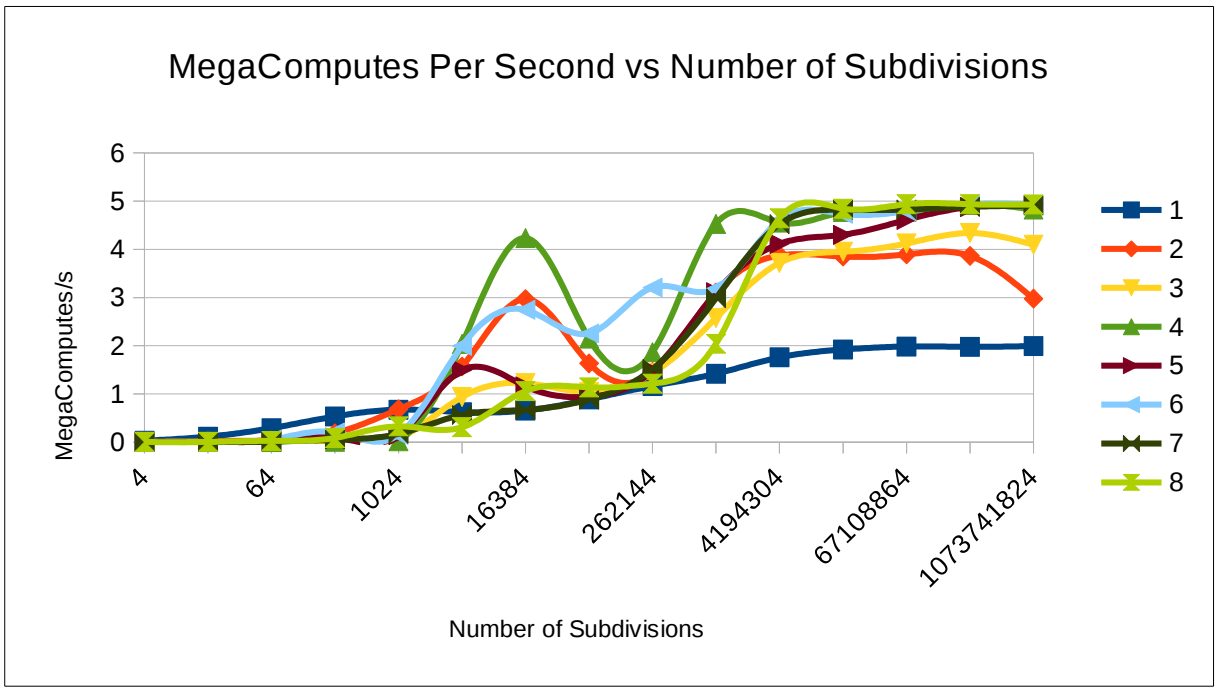
- CPU: Core i3 -2330M CPU (2 Cores, 4 Threads)
- OS: Ubuntu 14.04
- Background Apps: Streaming in Chrome, minimal usage of laptop during testing.

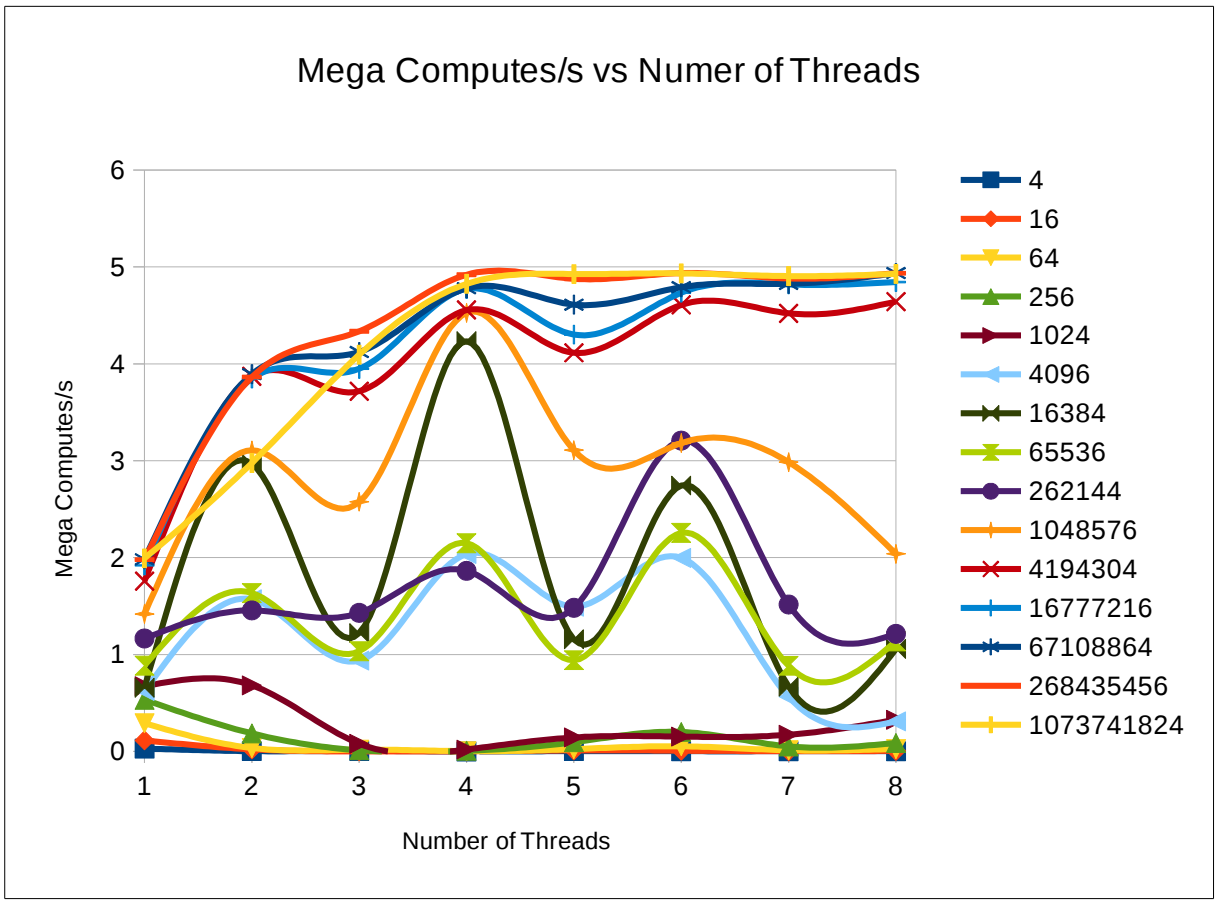
Volume:

After running the program with an increasing NUMS, the values seem to converge on a value of around 14.062 or 14.063. The highest values of NUMS I tested was 2^16.

Recorded Data:

		Number of Threads							
		1	2	3	4	5	6	7	8
Subdivisions	4	0.0307692308	0.0032	0.0057142857	0.0001242622	0.0036036036	0.0025806452	0.002484472	0.0023391813
	16	0.1142857143	0.0219178082	0.0008667389	0.0018223235	0.010738255	0.0084656085	0.0024615385	0.0055172414
	64	0.2909090909	0.0359550562	0.0183908046	0.0033420366	0.0239700375	0.0533333333	0.0123314066	0.0257028112
	256	0.5333333333	0.1868613139	0.0122899664	0.0067332983	0.0955223881	0.2015748031	0.0521384929	0.0870748299
	1024	0.6736842105	0.6826666667	0.0801251956	0.0202772277	0.1446327684	0.153064275	0.1726812816	0.3271565495
	4096	0.6243902439	1.569348659	0.9372997712	2.0378109453	1.4948905109	1.9980487805	0.5641873278	0.3098335855
	16384	0.6564102564	2.968115942	1.2226865672	4.2335917313	1.1578798587	2.7443886097	0.6690077583	1.0590820944
	65536	0.8856216216	1.6351297405	1.0346700347	2.1494260413	0.9416091954	2.2559724613	0.8838300742	1.1369882026
	262144	1.1660172583	1.4557894152	1.4304485431	1.8640688331	1.482211919	3.2078316202	1.5167737083	1.2136296296
	1048576	1.4194690745	3.1072601197	2.5762905088	4.5271392799	3.1092871545	3.182228157	2.9856097492	2.039197993
	4194304	1.7586475245	3.8714984585	3.7175636389	4.5550156927	4.114200516	4.6081631308	4.5212832011	4.6426955347
	16777216	1.9204974433	3.8495039327	3.9489832858	4.7740123155	4.302081907	4.7336301513	4.8193356946	4.8440902686
	67108864	1.9830802654	3.8940507808	4.1220065808	4.7797587217	4.6107688111	4.7907116729	4.8256393847	4.9366423349
	268435456	1.9787436696	3.8633951505	4.3362841048	4.9194880376	4.8776816846	4.9358961789	4.8808744994	4.935431534
	1073741824	1.9929554618	2.9769203369	4.0945224082	4.8250254891	4.9266176107	4.9329512026	4.9053439532	4.9280378182
		Mega Computes/second							





Observations:

Regardless of the number of threads being used, there is an increase in the amount of computations

done per second.

When NUMs goes from 1024 to 16384, there is a sharp rise the Mega Computes/second. There is also a tapering off once NUMS reaches close to 4194304

Another interesting observation to note is for NUMT > 4. These results seem to cluster around each other even though the performance should be worse (running more software threads than available cores/hardware threads for compute intensive tasks).

Explanations:

There is an abnormality where the Mega Computes/second drops for NUMT 2, 4, and 6. It is not clear why this is, but since it happened for multiple threads, you can rule our inadvertent computer usage.

In the seconds graph when the Mega Computes/second drops, this could be due to inefficient cache usage as well as inefficient coding practices in the functions being run by the threads for the compute intensive operations being done.

Parallel Fraction:

$$F = \frac{n}{n-1} \cdot \frac{T_1 - T_n}{T_1} = \frac{4}{4-1} \cdot \frac{0.09865 - 0.043772}{0.09865} = 0.7417198$$

Maximum Speed-up:

$$max\,Speedup = \lim_{x \to inf} Speedup = \frac{1}{F_{paralel}} = \frac{1}{0.7417198} = 1.3482178$$