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CS 475

Project #3

5/1/2016

Machine

The machine I ran this on was FLIP3. At the time of running it had a usage under 5% in all three categories.

Table

NOTE: for Tables the X axis is number of threads and the Y axis is NUM(Padding). All compiler optimizations are disabled.

MegaCalcs per second

	Fix #2: 1	Fix #2: 2	Fix #2: 4	Fix #1: 1	Fix #1: 2	Fix #1: 4
0	303.563	606.206	1164.51	292.163	557.013	419.709
1	304.395	586.78	1166.39	291.968	308.937	324.098
2	299.767	608.493	1109.99	295.454	383.294	352.374
3	286.726	576.716	1168.33	292.461	467.975	465.079
4	299.519	583.184	1167.29	248.333	268.542	326.188
5	293.523	592.206	1144.07	294.532	543.632	421.734
6	294.842	608.227	1167.3	299.651	560.374	381.396
7	299.189	606.985	1163.82	298.877	610.108	402.326
8	296.676	583.322	1165.73	259.33	516.395	400.633
9	291.685	583.487	1166.27	251.909	516.319	430.126
10	303.796	583.175	1149.14	229.425	389.712	396.864
11	290.31	583.389	1165.97	295.739	580.691	695.625
12	304.131	607.015	1166.29	280.362	579.602	483.218
13	298.314	594.384	1166.48	300.953	583.782	484.14
14	299.202	584.456	1164.03	258.598	502.956	747.368
15	290.106	583.485	1165.58	290.494	584.36	1167.95
16	297.341	583.522	1166.01	248.731	485.427	1008.09

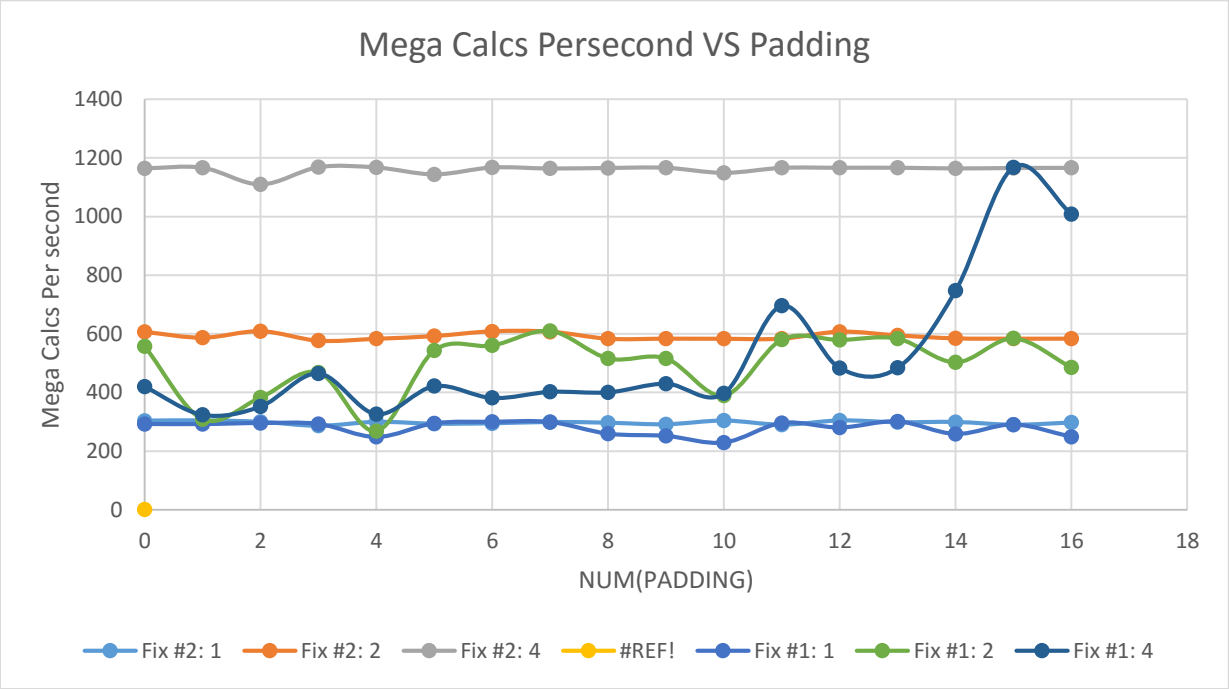
Times speedup compared to T1

	Fix #2: 1	Fix #2: 2	Fix #2: 4	Fix #1: 1	Fix #1: 2	Fix #1: 4
0	1	1.94588	3.66187	1	1.58839	1.03117
1	1	1.93956	3.65386	1	1.55515	1.81771
2	1	1.93826	3.61043	1	0.888108	1.21149
3	1	2.01997	3.87402	1	1.77517	1.20052
4	1	1.94034	3.87709	1	1.66211	1.27037

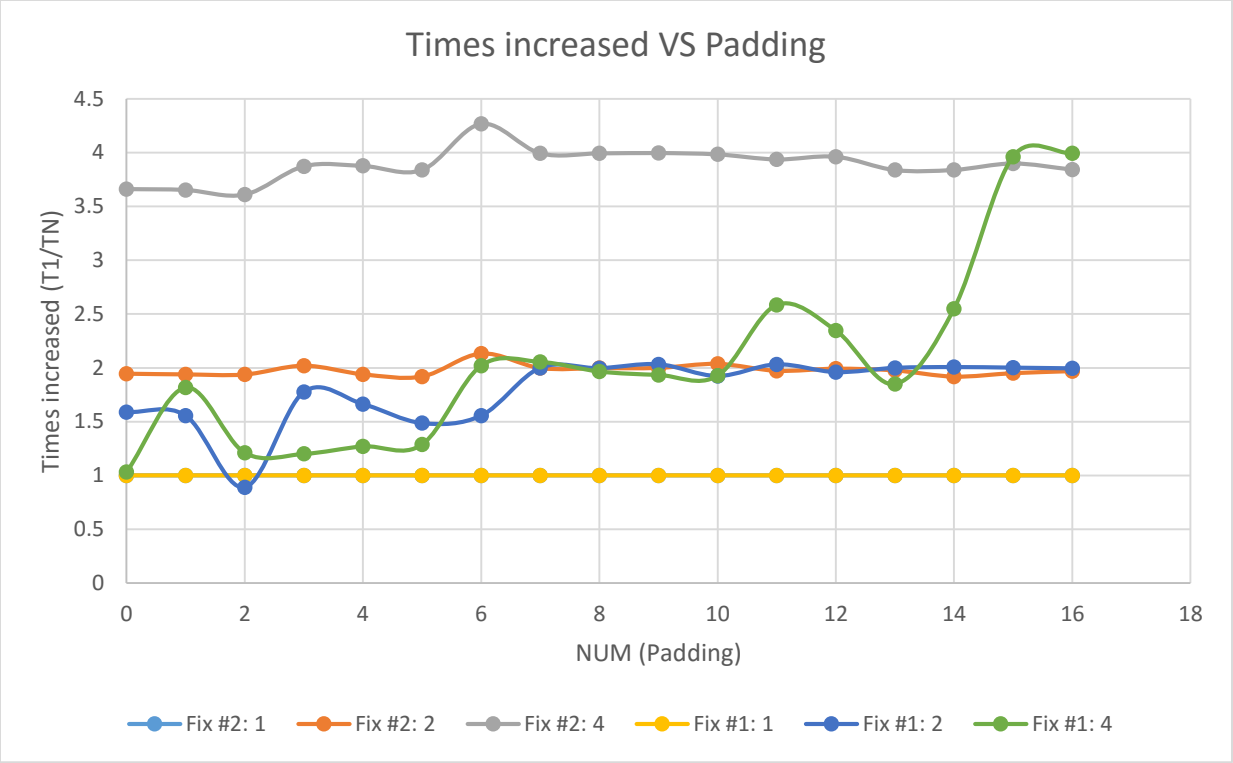
5	1	1.91965	3.83947	1	1.48541	1.28799
6	1	2.13265	4.26866	1	1.55485	2.02069
7	1	1.99826	3.99473	1	1.99967	2.05505
8	1	1.99735	3.99419	1	1.99582	1.96613
9	1	1.99976	3.99739	1	2.03235	1.9345
10	1	2.03715	3.98467	1	1.92328	1.9264
11	1	1.97317	3.93779	1	2.03136	2.58444
12	1	1.9922	3.96278	1	1.95949	2.34794
13	1	1.97651	3.83887	1	1.9987	1.84958
14	1	1.91905	3.84014	1	2.00613	2.5481
15	1	1.95082	3.89998	1	2.00063	3.96312
16	1	1.96994	3.8432	1	1.99411	3.99378

Graphs

MegaCalcs Per second



Times speed up (T1/TN)



Analysis

In the analysis of the output megacalcs and times increased We can see that fix number two has no increase or decrease in performance in either chart. This is because it is consistent and doesn't rely on padding in the sense of adding to the cache line when writing but by making a private version of the variable on each of the threads stacks. This means that is gets consistent performance at the max possible for that number of threads, this is because since each thread has its own copy it can read and write it and not have to worry about any other thread trying to interact with that data like it does in fix number 1. The Yellow, Orange, and Grey lines in the second graph all represent fix number two.

Fix number one on the other hand increases slowly as the padding increases. But increases more when the amount of padding plus the integer add to be a complete cache line because then it is all on one line. This is seen at 15 and 16 byte(padding) because 15+1 bytes is 16 which is one fourth the length of a cache line so it is easy to pull it in and perform operations on. But as the NUM increases the times increase does grow except on 1 core because it wouldn't make any sense for there to be any speed up because it would be (T1/T1) which would just be one.

So to conclude, Fix #2 is much more efficient and consistent. It basically provides the speeds at constant rates. This is because each of the cores in fix #2 gets a private copy of the variable. Where in fix #1 there is not private so we have to read in cache lines and provides the ability for two cores to false share or go to read or write data at the same time. This causes the smaller increase but as we increase the size on the cache line we can read it in in whole.