Performance profile of synchronization constructs

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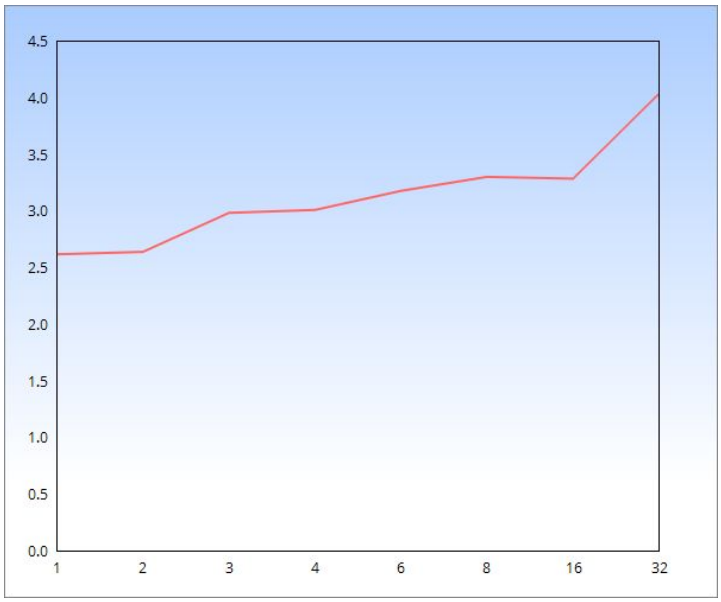
Hardware Specification

Architecture:	x86_64
CPU op-mode(s):	32-bit, 64-bit
Byte Order:	Little Endian
CPU(s):	4
On-line CPU(s) list:	0-3
Thread(s) per core:	2
Core(s) per socket:	2
Socket(s):	1
NUMA node(s):	1
Vendor ID:	GenuineIntel
CPU family:	6
Model:	142
Model name:	Intel(R) Core(TM) i7-7500U CPU @ 2.70GHz
Stepping:	9
CPU MHz:	741.535
CPU max MHz:	3500.0000
CPU min MHz:	400.0000
BogoMIPS:	5808.00
Virtualization:	VT-x
L1d cache:	32K
L1i cache:	32K
L2 cache:	256K
L3 cache:	4096K
NUMA node0 CPU(s):	0-3

Busy wait vs mutex

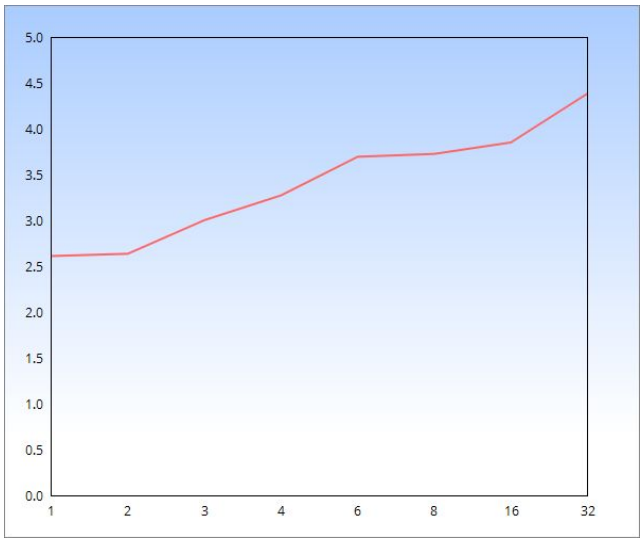
Busy wait with pthread

Threads: 1	Average: 2.61406	Max: 2.61728	Min: 2.61159
Threads: 2	Average: 2.63555	Max: 2.66506	Min: 2.62229
Threads: 3	Average: 2.97974	Max: 2.99169	Min: 2.97018
Threads: 4	Average: 3.00549	Max: 3.05790	Min: 2.95916
Threads: 6	Average: 3.17391	Max: 3.41276	Min: 3.00315
Threads: 8	Average: 3.29739	Max: 3.85393	Min: 3.07052
Threads: 16	Average: 3.28143	Max: 3.41496	Min: 3.17434
Threads: 32	Average: 4.03173	Max: 4.43146	Min: 3.73267



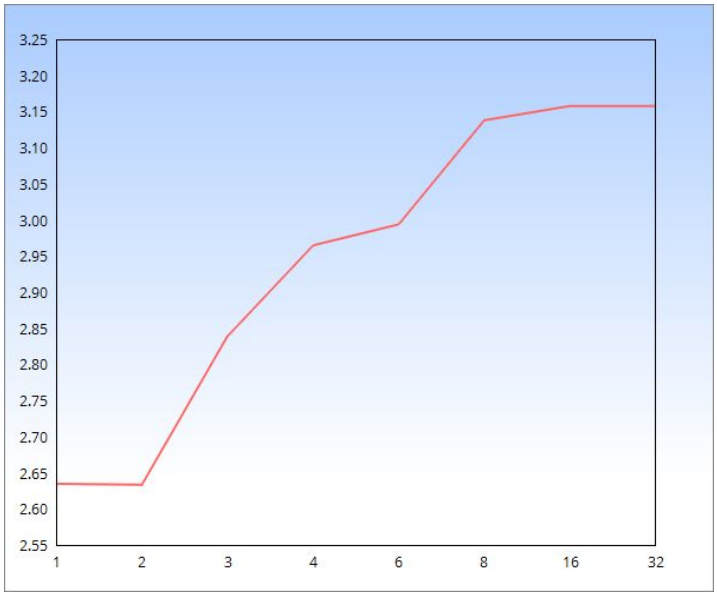
Busy wait With C++ thread

Threads: 1	Average: 2.61034	Max: 2.62024	Min: 2.59834
Threads: 2	Average: 2.63528	Max: 2.72841	Min: 2.60171
Threads: 3	Average: 3.00182	Max: 3.10629	Min: 2.97007
Threads: 4	Average: 3.27232	Max: 3.38482	Min: 3.20859
Threads: 6	Average: 3.69325	Max: 3.90102	Min: 3.58248
Threads: 8	Average: 3.72464	Max: 4.08511	Min: 3.51022
Threads: 16	Average: 3.84944	Max: 4.04731	Min: 3.62565
Threads: 32	Average: 4.38334	Max: 4.75714	Min: 4.12076



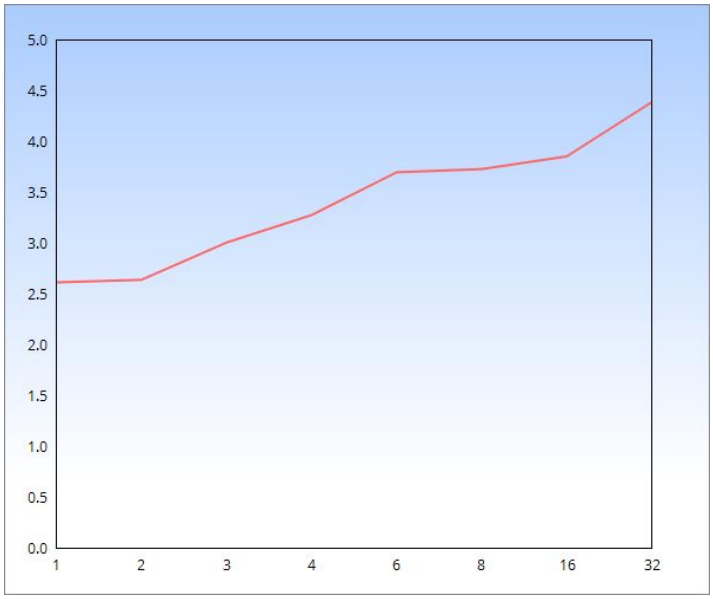
Mutex with pthread

Threads: 1	Average: 2.63460	Max: 2.63959	Min: 2.62889
Threads: 2	Average: 2.63340	Max: 2.64521	Min: 2.62670
Threads: 3	Average: 2.83905	Max: 2.84792	Min: 2.82654
Threads: 4	Average: 2.96479	Max: 2.96906	Min: 2.96005
Threads: 6	Average: 2.99378	Max: 3.12315	Min: 2.95066
Threads: 8	Average: 3.13788	Max: 3.14730	Min: 3.12798
Threads: 16	Average: 3.15761	Max: 3.17550	Min: 3.13873
Threads: 32	Average: 3.15759	Max: 3.16117	Min: 3.15465



Mutex with C++ thread

Threads: 1	Average: 2.60373	Max: 2.62639	Min: 2.57241
Threads: 2	Average: 2.65149	Max: 2.67254	Min: 2.60843
Threads: 3	Average: 2.96078	Max: 2.97565	Min: 2.93993
Threads: 4	Average: 3.20460	Max: 3.29497	Min: 3.12268
Threads: 6	Average: 3.32350	Max: 3.33817	Min: 3.31462
Threads: 8	Average: 3.34025	Max: 3.35521	Min: 3.32282
Threads: 16	Average: 3.34999	Max: 3.36252	Min: 3.33894
Threads: 32	Average: 3.38172	Max: 3.43962	Min: 3.34354



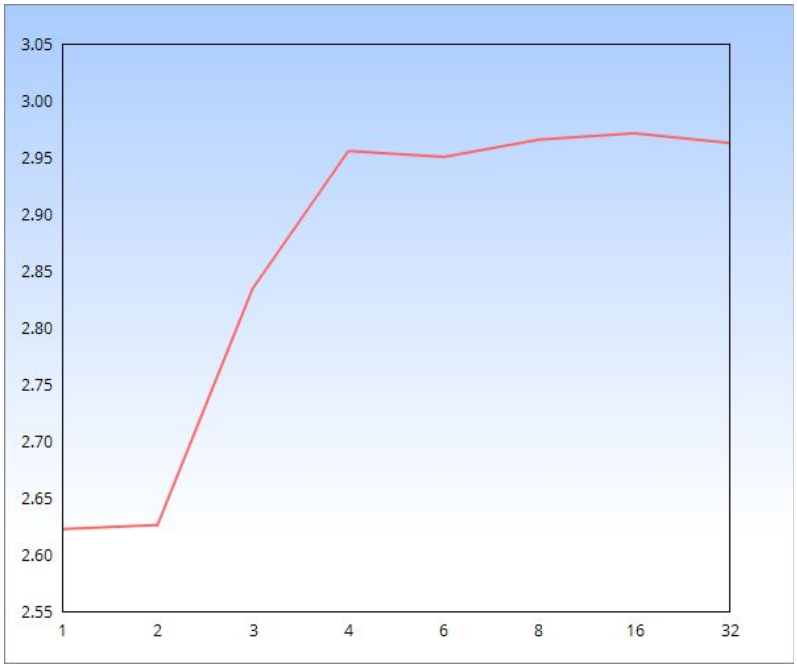
Here for the problem of adding numbers till n using many threads where the load is balanced over all the threads almost equally

Busy wait works better than mutex solution
Pthread library works faster than the C++ thread library

For some unknown reason the execution time is increasing with the number of threads. It should have reduced due to parallelism. Due to this it is not possible to actually find out any speedup values.

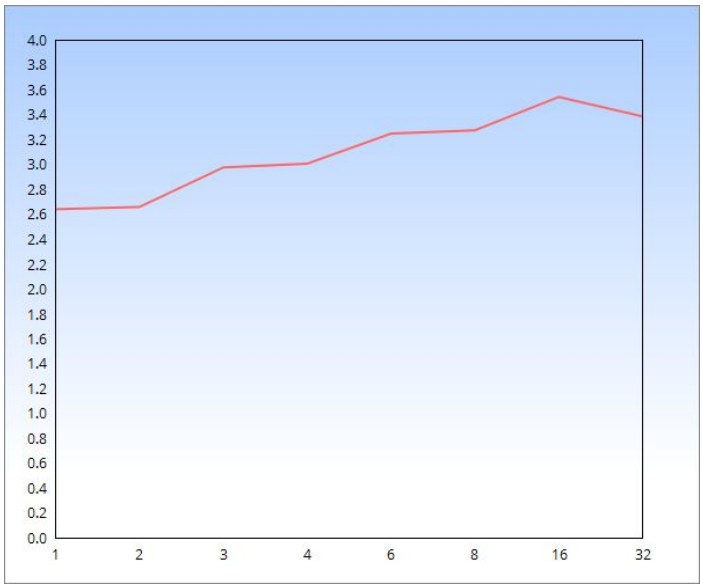
Barrier with condition variable

Threads: 1	Average: 2.62234	Max: 2.64835	Min: 2.61280
Threads: 2	Average: 2.62597	Max: 2.64323	Min: 2.61066
Threads: 3	Average: 2.83470	Max: 2.84388	Min: 2.81591
Threads: 4	Average: 2.95537	Max: 2.96735	Min: 2.93058
Threads: 6	Average: 2.95015	Max: 2.95478	Min: 2.94054
Threads: 8	Average: 2.96542	Max: 2.98982	Min: 2.95385
Threads: 16	Average: 2.97097	Max: 2.99320	Min: 2.95962
Threads: 32	Average: 2.96242	Max: 2.97282	Min: 2.95321



Barrier with busy wait and mutex

Threads: 1	Average: 2.63855	Max: 2.64539	Min: 2.63017
Threads: 2	Average: 2.65679	Max: 2.68617	Min: 2.61004
Threads: 3	Average: 2.97399	Max: 2.98286	Min: 2.96625
Threads: 4	Average: 3.00424	Max: 3.01330	Min: 2.99357
Threads: 6	Average: 3.24611	Max: 3.39146	Min: 3.09926
Threads: 8	Average: 3.27227	Max: 3.48359	Min: 3.14005
Threads: 16	Average: 3.54013	Max: 3.88129	Min: 3.09630
Threads: 32	Average: 3.38401	Max: 3.62516	Min: 3.20855



Barrier with semaphore

Threads: 1	Average: 2.60545	Max: 2.61867	Min: 2.59809
Threads: 2	Average: 2.61067	Max: 2.62334	Min: 2.58672
Threads: 3	Average: 2.81999	Max: 2.83857	Min: 2.80806
Threads: 4	Average: 2.95088	Max: 2.95289	Min: 2.94832
Threads: 6	Average: 2.90644	Max: 2.94742	Min: 2.81350
Threads: 8	Average: 2.93951	Max: 2.95462	Min: 2.89364
Threads: 16	Average: 2.95311	Max: 2.95438	Min: 2.95059
Threads: 32	Average: 2.95522	Max: 2.95904	Min: 2.95349