n = 1048576

# of processes	Broadcast Time	# of processes	Parallel Prefix Time	# of processes	Total Time
1	0.003	1	4.046	1	12.594
2	0.022	2	2.019	2	6.347
4	0.044	4	1.011	4	3.194
8	0.09	8	0.591	8	1.702
16	0.171	16	0.289	16	0.829
32	0.311	32	0.142	32	0.419
64	0.726	64	0.104	64	0.238

# of processes	Broadcast Speedup	# of processes	Parallel Prefix Speedup	# of processes	Total Speedup
2	0.1363636364	2	2.003962358	2	1.984244525
4	0.06818181818	4	4.001978239	4	3.943018159
8	0.03333333333	8	6.846023689	8	7.399529965
16	0.01754385965	16	14	16	15.19179735
32	0.009646302251	32	28.49295775	32	30.05727924
64	0.004132231405	64	38.90384615	64	52.91596639

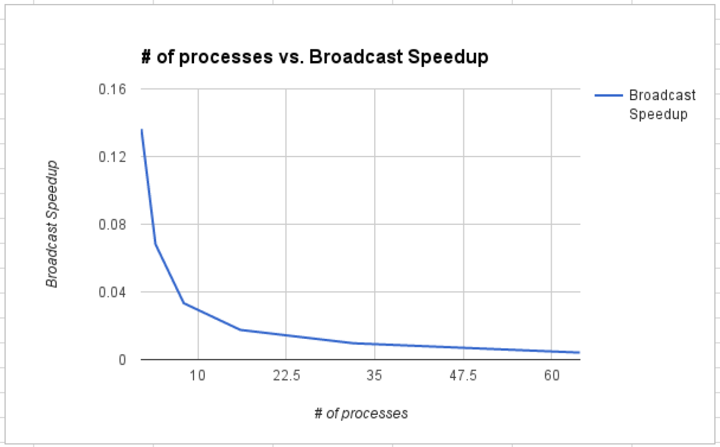
The Broadcast speedup is about what I would expect, cutting roughly in half each time, which corresponds to the double number of processes, so nothing unexpected here.

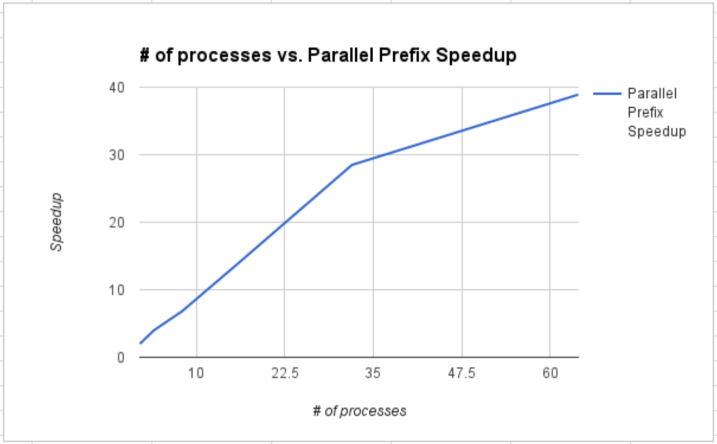
In the parallel prefix speedup we see the speedup double until 8 processes where the values start to taper off. At p = 8, the communication cost starts to offset the double speedup that you would expect by doubling the # of processes.

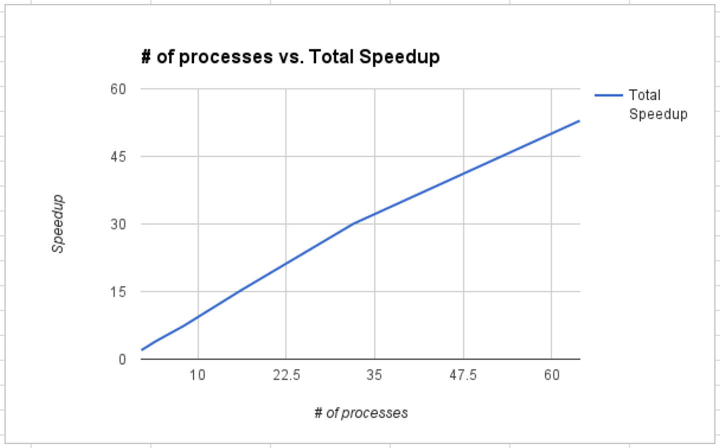
The total speedup however maintains its doubling efficiency until p = 64 where it decreases to a 1.755 times, and likely would continue to taper off for larger values of p. This code is extremely efficient to parallelize as generating over a million values is reduced to .238 seconds, a 52.9 times speedup.

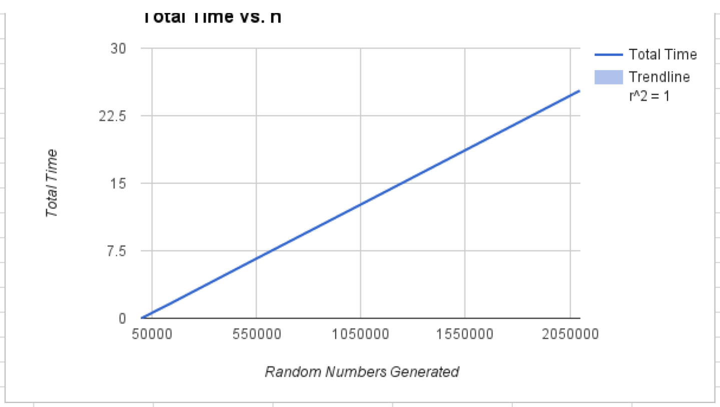
n	Total Time
16	0.000269
32	0.000449
64	0.000814
128	0.001562
256	0.003122
512	0.006032
1024	0.011058
2048	0.023985
4096	0.04897
8192	0.094714
16384	0.187456
32768	0.381517
65536	0.773024
131072	1.53642
262144	3.12874
524288	6.31674
1048576	12.6219
2097152	25.2849

Here in Total time vs. n the results are not surprising at all. Each successive doubling of n near perfectly corresponds with a doubling in total time. I included a trend line to illistrate this point where the resulting r^2 = 1.









Total Time vs. n
Total Time
Trendline r^2 = 1
30
22.5
15
7.5
0
50000
550000
1050000
1550000
2050000
Random Numbers Generated