CS525 - Parallel Computing - Homework 2

[AYUSH JAIN - jain207@purdue.edu]

All plots in Plot Folder
Programs:

Q1a) prod_cons_a.c
Q1b) prod_cons_b.c
Q1c) prod_cons_c.c

Q2 a) b) binary_tree.c

Interval = 10 seconds for Q1

Q1 a) Detailed Plot in Plots Folder as 1-a.png

Throughput decreases continuously with increase in number of threads

Readings

n =2
No of insertions 1021611
No of extractions 1020685
Total 2042297
Interval 10
Throughput 204229.700000

n = 4
No of insertions 676840
No of extractions 676651
Total 1353491
Interval 10
Throughput 135349.100000

n = 8
No of insertions 724811
No of extractions 724164
Total 1448975
Interval 10
Throughput 144897.500000

n = 16

No of insertions 606532
No of extractions 606222
Total 1212757
Interval 10
Throughput 121275.700000

n = 32
Processing.....
No of insertions 217981
No of extractions 217935
Total 435923
Interval 10
Throughput 43592.500000

No of insertions 455079
No of extractions 455079
Total 910158
Interval 10
Throughput 91015.800000

n = 64

Processing.....
No of insertions 48959
No of extractions 47959
Total 96918
Interval 10
Throughput 9691.800000

n = 128

No of insertions 1510
No of extractions 1510
Total 3020
Interval 10
Throughput 302.000000

n = 256

Processing.....
No of insertions 265
No of extractions 265
Total 530
Interval 10
Throughput 53.000000

Q1 b) and c) Detailed Plot in Plots folder as 1-b and 1-c.png respectively

b) - Using 2 condition variables for stack
c) - Using 2 condition variables for circular queue

Comparison
n(Number of threads)=2, 4, 8, 16, 32, 64, 128, 256

b) 1130987.10, 823457.50, 895457.10, 827679.30, 1002081.50, 1021501.80, 1007018.20, 1025234.60
c) 1057724.00, 833264.30, 864495.40, 844360.80, 881466.00, 915076.80, 872221.80, 874553.80

As we can, the throughput in c) part is marginally better than b) case for n= 4 and n=32 and for rest , b) has marginally better throughput

Readings

n = 2

No of insertions 5655170
No of extractions 5654659
Total 11309862
Interval 10
Throughput 1130987.100000

No of insertions 5288975
No of extractions 5288215
Total 10577216
Interval 10
Throughput 1057724.000000

n = 4

No of insertions 4117340
No of extractions 4117223
Total 8234573
Interval 10
Throughput 823457.500000

No of insertions 4166311
No of extractions 4166319
Total 8332640
Interval 10
Throughput 833264.300000

n = 8

No of insertions 4477307
No of extractions 4477214
Total 8954550
Interval 10
Throughput 895457.100000

No of insertions 4322577
No of extractions 4322377
Total 8644954
Interval 10
Throughput 864495.400000

n = 16

No of insertions 4138470
No of extractions 4138303
Total 8276782
Interval 10
Throughput 827679.300000

No of insertions 4221807
No of extractions 4221768
Total 8443600
Interval 10
Throughput 844360.800000

n = 32

No of insertions 5010486
No of extractions 5010322
Total 10020814
Interval 10
Throughput 1002081.500000

No of insertions 4407524
No of extractions 4407112
Total 8814659
Interval 10
Throughput 881466.000000

n = 64

No of insertions 5107562
No of extractions 5107437
Total 10215009
Interval 10
Throughput 1021501.800000

No of insertions 4575654
No of extractions 4575096
Total 9150767
Interval 10
Throughput 915076.800000

n = 128

No of insertions 5035151
No of extractions 5035022
Total 10070178
Interval 10
Throughput 1007018.200000

No of insertions 4361256
No of extractions 4360936
Total 8722213
Interval 10
Throughput 872221.800000

n= 256

No of insertions 5126132
No of extractions 5126154
Total 10252329
Interval 10
Throughput 1025234.600000

No of insertions 4372872
No of extractions 4372666
Total 8745538
Interval 10
Throughput 874553.800000

Q2 a) and b)

For both the cases the throughput is maximum approximately at n=8
and lookup throughput is always greater than insertion throughput

Comparison
n=2,4, 8, 16, 32, 64
b) 65688.952, 142930.31, 194498.54, 202680.97, 148610.18, 77983.77
c) 80465.50, 153714.79, 348273.37, 324007.12, 177931.71, 90173.46

n = 2
Elapsed time = 0.003882 seconds
No of insertions 255
Insertion Throughput in nodes/s.....65688.952217

Elapsed time = 0.003169 seconds
No of lookups 255
lookups Throughput in nodes/s.....80465.507072

n = 4
Elapsed time = 0.001784 seconds
No of insertions 255
Insertion Throughput in nodes/s.....142930.311372

Elapsed time = 0.001659 seconds
No of lookups 255
lookups Throughput in nodes/s.....153714.791607

n= 8
Elapsed time = 0.001311 seconds
No of insertions 255
Insertion Throughput in nodes/s.....194498.548827

Elapsed time = 0.000732 seconds
No of lookups 255
lookups Throughput in nodes/s.....348273.370238

n=16

Elapsed time = 0.001258 seconds
No of insertions 255
Insertion Throughput in nodes/s.....202680.977828

Elapsed time = 0.000787 seconds
No of lookups 255
lookups Throughput in nodes/s.....324007.125114

n=32

Elapsed time = 0.001716 seconds
No of insertions 255
Insertion Throughput in nodes/s.....148610.187578

Elapsed time = 0.001433 seconds
No of lookups 255
lookups Throughput in nodes/s.....177931.711862

n= 64

Elapsed time = 0.003270 seconds
No of insertions 255
Insertion Throughput in nodes/s.....77983.778345

Elapsed time = 0.002828 seconds
No of lookups 255
lookups Throughput in nodes/s.....90173.469353