Practical No 10

PRN: 22520005

Name: Aftab Imtiyaj Bhadgaonkar

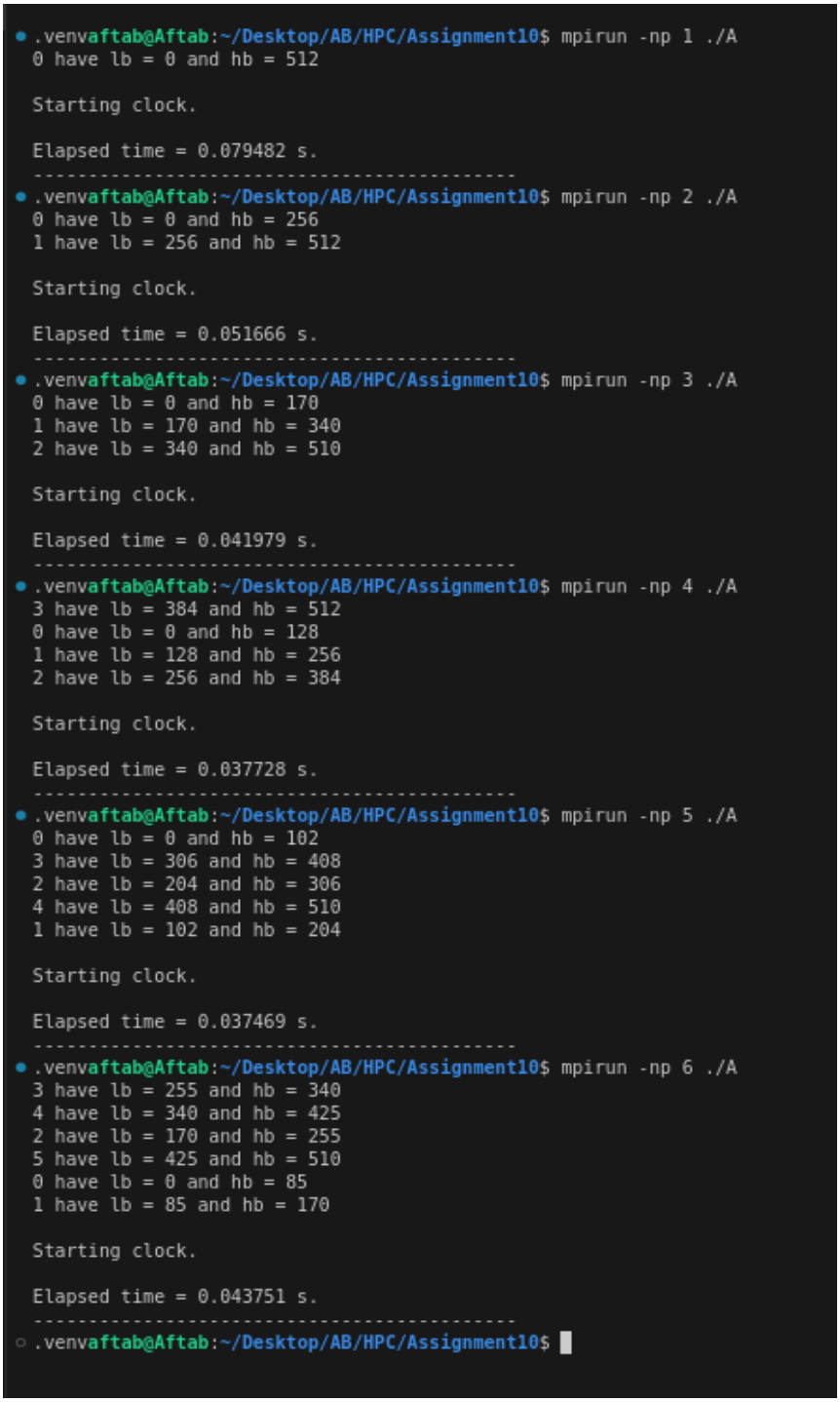
Batch: B6

Course: High Performance Computing Lab

Title of practical: Analysis of MPI Programs

1) Execute the MPI program (Program A) with a fixed size broadcast. Plot the performance of the broadcast with varying numbers of processes (with constant messagesize). Explain the performance observed.

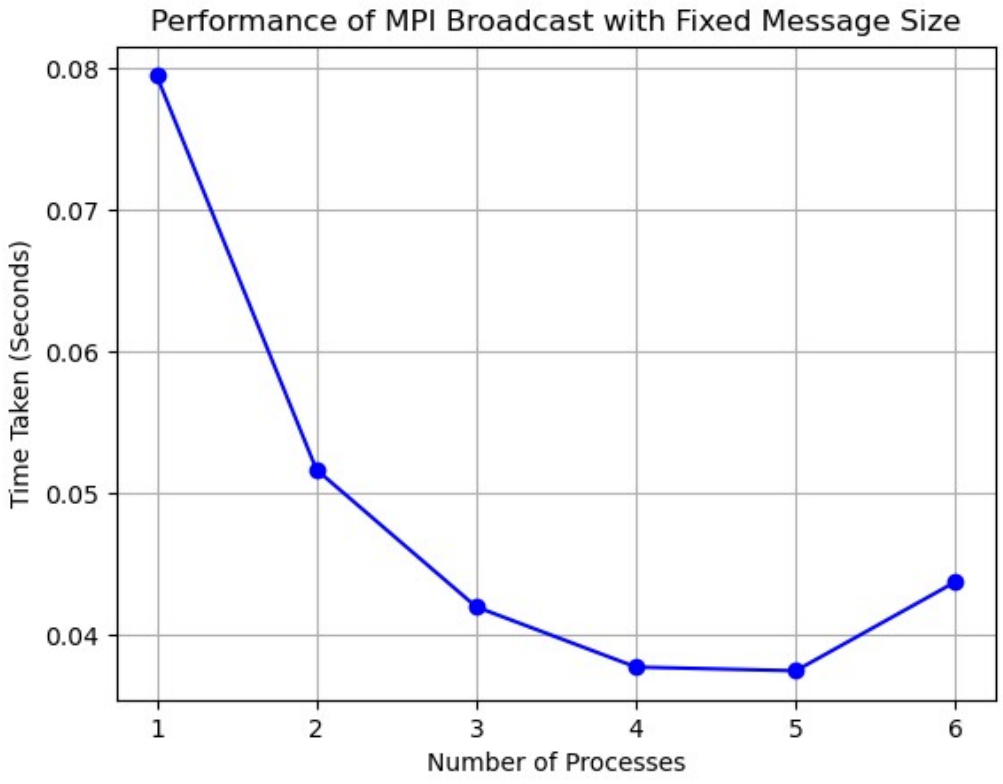
Screenshot:


.venvaftab@Aftab:~/Desktop/AB/HPC/Assignment10$ mpirun -np 1 ./A
0 have lb = 0 and hb = 512
Starting clock.
Elapsed time = 0.079482 s.
.venvaftab@Aftab:~/Desktop/AB/HPC/Assignment10$ mpirun -np 2 ./A
0 have lb = 0 and hb = 256
1 have lb = 256 and hb = 512
Starting clock.
Elapsed time = 0.051666 s.
.venvaftab@Aftab:~/Desktop/AB/HPC/Assignment10$ mpirun -np 3 ./A
0 have lb = 0 and hb = 170
1 have lb = 170 and hb = 340
2 have lb = 340 and hb = 510
Starting clock.
Elapsed time = 0.041979 s.
.venvaftab@Aftab:~/Desktop/AB/HPC/Assignment10$ mpirun -np 4 ./A
3 have lb = 384 and hb = 512
0 have lb = 0 and hb = 128
1 have lb = 128 and hb = 256
2 have lb = 256 and hb = 384
Starting clock.
Elapsed time = 0.037728 s.
.venvaftab@Aftab:~/Desktop/AB/HPC/Assignment10$ mpirun -np 5 ./A
0 have lb = 0 and hb = 102
3 have lb = 306 and hb = 408
2 have lb = 204 and hb = 306
4 have lb = 408 and hb = 510
1 have lb = 102 and hb = 204
Starting clock.
Elapsed time = 0.037469 s.
.venvaftab@Aftab:~/Desktop/AB/HPC/Assignment10$ mpirun -np 6 ./A
3 have lb = 255 and hb = 340
4 have lb = 340 and hb = 425
2 have lb = 170 and hb = 255
5 have lb = 425 and hb = 510
0 have lb = 0 and hb = 85
1 have lb = 85 and hb = 170
Starting clock.
Elapsed time = 0.043751 s.
.venvaftab@Aftab:~/Desktop/AB/HPC/Assignment10$

Analysis:

Cores	Time
1	0.079482
2	0.051666
3	0.041979
4	0.037728
5	0.037469
6	0.043751

Graph:



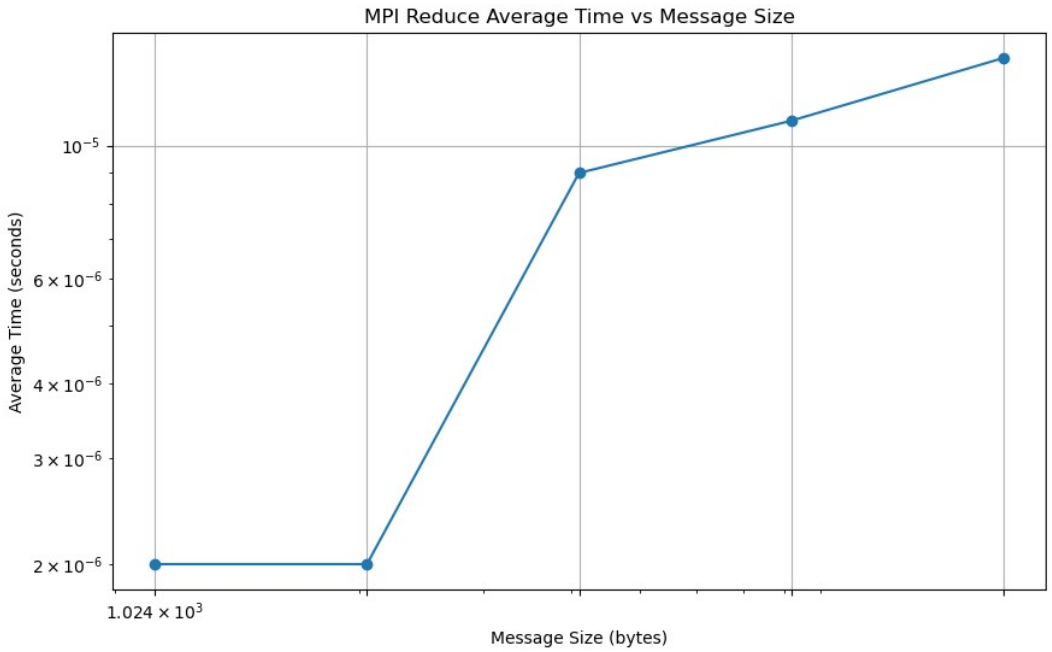
2. Repeat problem 2 above with varying message sizes for reduction (Program B). Explain the observed performance of the reduction operation.

Screenshot:

```
aftab@Aftab:~/Desktop/AB/HPC/Assignment10$ mpicc -o B assignment_10B.c
aftab@Aftab:~/Desktop/AB/HPC/Assignment10$ mpirun -np 6 ./B 1024 2048 4096 8192 16384 > timing_data1.txt
aftab@Aftab:~/Desktop/AB/HPC/Assignment10$ python3 plotB.py
  Processing line: Average time for reduce with message size 1024: 0.000004 secs
  Processing line: Average time for reduce with message size 2048: 0.000003 secs
  Processing line: Average time for reduce with message size 4096: 0.000014 secs
  Processing line: Average time for reduce with message size 8192: 0.000017 secs
  Processing line: Average time for reduce with message size 16384: 0.000022 secs
aftab@Aftab:~/Desktop/AB/HPC/Assignment10$ mpirun -np 4 ./B 1024 2048 4096 8192 16384 > timing_data2.txt
aftab@Aftab:~/Desktop/AB/HPC/Assignment10$ python3 plotB.py
  Processing line: Average time for reduce with message size 1024: 0.000002 secs
  Processing line: Average time for reduce with message size 2048: 0.000002 secs
  Processing line: Average time for reduce with message size 4096: 0.000009 secs
  Processing line: Average time for reduce with message size 8192: 0.000011 secs
  Processing line: Average time for reduce with message size 16384: 0.000014 secs
aftab@Aftab:~/Desktop/AB/HPC/Assignment10$
```

Graph:

Processors: 4



Processors: 6