

# CSCI-596 Homework 1

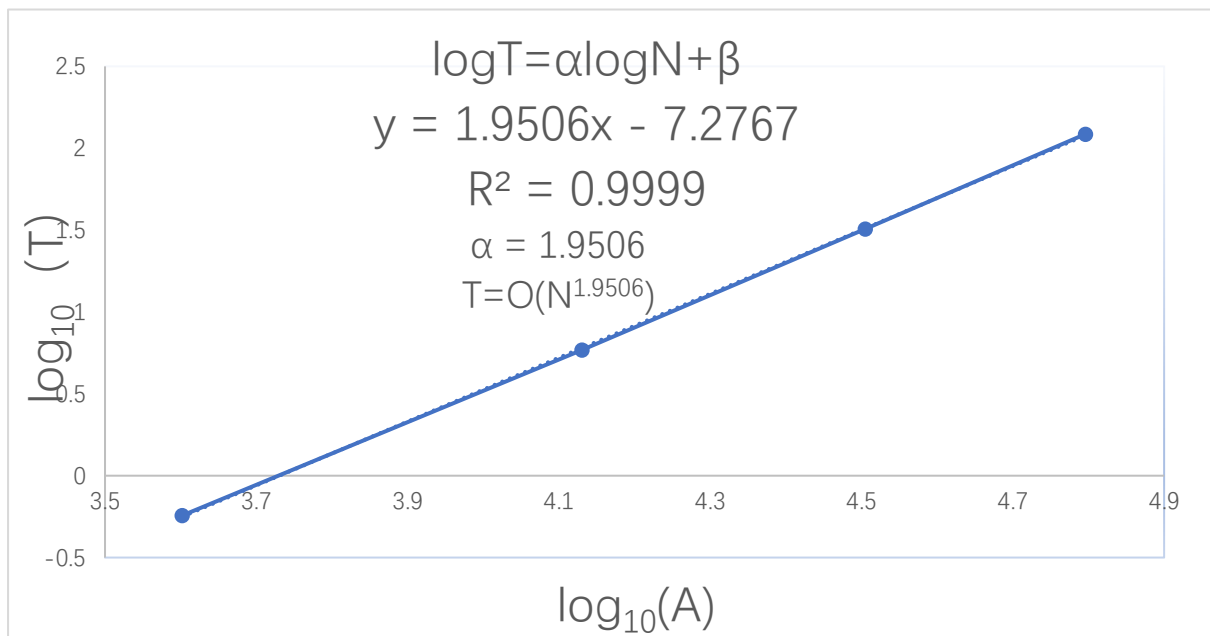
Youzhi Qu

CSCI-596 homework1

Prof. Aiichiro Nakano

1-1.

N	T	Log <sub>10</sub> (N)	Log <sub>10</sub> (T)
4000	0.57101	3.602059991	-0.243356286
13500	5.872	4.130333768	0.768786047
32000	32.122	4.505149978	1.506802578
62500	121.95	4.795880017	2.086181805



1-2.

$3\text{GHz} * 2(x + \text{FMA}) * 4(\text{SIMD}) * 4(\text{quadcore}) = 96\text{Gflop/s}$

2-1.

**global.c :**

```
#include "mpi.h"
#include <stdio.h>
int nprocs; /* Number of processors */
int myid; /* My rank */

double global_sum(double partial) {
    /* Implement your own global summation here */
}
```

```

double mydone, hisdone;
int bitvalue , partner;
MPI_Status status;
mydone = partial;
for( bitvalue = 1 ; bitvalue < nprocs ; bitvalue *= 2){
    partner = myid ^ bitvalue ;
    MPI_Send(&mydone, 1, MPI_DOUBLE,partner,bitvalue,MPI_COMM_WORLD);
    MPI_Recv(&hisdone, 1,
MPI_DOUBLE,partner,bitvalue,MPI_COMM_WORLD,&status);
    mydone += hisdone;
}
return mydone;
}

```

```

int main(int argc, char *argv[]) {
    double partial, sum, avg;

    MPI_Init(&argc, &argv);
    MPI_Comm_rank(MPI_COMM_WORLD, &myid);
    MPI_Comm_size(MPI_COMM_WORLD, &nprocs);

    partial = (double) myid;
    printf("Node %d has %le\n", myid, partial);

    sum = global_sum(partial);

    if (myid == 0) {
        avg = sum/nprocs;
        printf("Global average = %le\n", avg);
    }

    MPI_Finalize();

    return 0;
}

```

### **global.sl:**

```

#!/bin/bash
#SBATCH --ntasks-per-node=4
#SBATCH --nodes=2
#SBATCH --time=00:00:59
#SBATCH --output=global.out
#SBATCH -A lc_an2

```

```
WORK_HOME=/home/rcf-proj/an2/youzhiqu
cd $WORK_HOME
srun -n $SLURM_NTASKS --mpi=pmi2 ./global
srun -n 4 --mpi=pmi2 ./global
```

**global.out:**

```
-----
Begin SLURM Prolog Sun 09 Sep 2018 09:07:44 PM PDT
Job ID:      1479575
Username:    youzhiqu
Accountname: lc_an2
Name:        global.sl
Partition:   quick
Nodes:       hpc[1121-1122]
TasksPerNode: 4(x2)
CPUSPerTask: Default[1]
TMPDIR:      /tmp/1479575.quick
SCRATCHDIR:  /staging/scratch/1479575
Cluster:     uschpc
HSDA Account: false
End SLURM Prolog
-----

Node 0 has 0.000000e+00
Global average = 3.500000e+00
Node 1 has 1.000000e+00
Node 2 has 2.000000e+00
Node 6 has 6.000000e+00
Node 3 has 3.000000e+00
Node 7 has 7.000000e+00
Node 5 has 5.000000e+00
Node 4 has 4.000000e+00
Node 1 has 1.000000e+00
Node 3 has 3.000000e+00
Node 0 has 0.000000e+00
Global average = 1.500000e+00
Node 2 has 2.000000e+00
```

```
Begin SLURM Prolog Sun 09 Sep 2018 09:07:44 PM PDT
Job ID:      1479575
Username:    youzhiqu
Accountname: lc_an2
Name:        global.sl
Partition:   quick
Nodes:       hpc[1121-1122]
TasksPerNode: 4(x2)
CPUSPerTask: Default[1]
TMPDIR:      /tmp/1479575.quick
SCRATCHDIR:  /staging/scratch/1479575
Cluster:     uschpc
HSDA Account: false
```

End SLURM Prolog

-----  
Node 0 has 0.000000e+00  
Global average = 3.500000e+00  
Node 1 has 1.000000e+00  
Node 2 has 2.000000e+00  
Node 6 has 6.000000e+00  
Node 3 has 3.000000e+00  
Node 7 has 7.000000e+00  
Node 5 has 5.000000e+00  
Node 4 has 4.000000e+00  
Node 1 has 1.000000e+00  
Node 3 has 3.000000e+00  
Node 0 has 0.000000e+00  
Global average = 1.500000e+00  
Node 2 has 2.000000e+00