CSCI 596: HW 2

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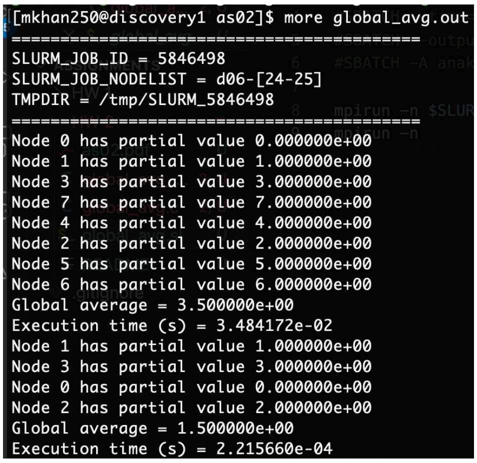
1 Source Code

The text below is the entire code for the *global_avg.c* file, with the requisite modifications to the *global_sum* function.

```c
#include "mpi.h"
#include <stdio.h>

int nprocs;  /* Number of processes */
int myid;    /* My rank */

double global_sum(double partial) {
  /* Implementation of hypercube algorithm as discussed in class */
  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 = mydone + hisdone;
  }
}

int main(int argc, char *argv[]) {
  double partial, sum, avg;
  double cpu1, cpu2;

  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 partial value %le\n", myid, partial);

  cpu1 = MPI_Wtime();
  sum = global_sum(partial);
  cpu2 = MPI_Wtime();

  if (myid == 0) {
    avg = sum/nprocs;
    printf("Global average = %le\n", avg);
    printf("Execution time (s) = %le\n",cpu2-cpu1);
  }

  MPI_Finalize();
  return 0;
}
```

2 Test Run Printout

The figure below shows the printout of *global_avg.c* running on 8 processors and 4 processors, respectively, including the global average and execution time.



```
[mkhan250@discovery1 as02]$ more global_avg.out
==========================================
SLURM_JOB_ID = 5846498
SLURM_JOB_NODELIST = d06-[24-25]
TMPDIR = /tmp/SLURM_5846498
==========================================
Node 0 has partial value 0.000000e+00
Node 1 has partial value 1.000000e+00
Node 3 has partial value 3.000000e+00
Node 7 has partial value 7.000000e+00
Node 4 has partial value 4.000000e+00
Node 2 has partial value 2.000000e+00
Node 5 has partial value 5.000000e+00
Node 6 has partial value 6.000000e+00
Global average = 3.500000e+00
Execution time (s) = 3.484172e-02
Node 1 has partial value 1.000000e+00
Node 3 has partial value 3.000000e+00
Node 0 has partial value 0.000000e+00
Node 2 has partial value 2.000000e+00
Global average = 1.500000e+00
Execution time (s) = 2.215660e-04
```

Figure 1: Printout of global_avg.c