Parallel Computing Lab
Nilay Ganvit - 200001053
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Lab 5

Write a MPI program to create ring topology and then compute prefix sum.

Code:

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

int main( argc, argv )
int argc;
char **argv;
{
   int rank, value, size, false=0;
   int right_nbr, left_nbr;
   MPI_Comm   ring_comm;
   MPI_Status status;

   MPI_Init( &argc, &argv );

   MPI_Comm_size( MPI_COMM_WORLD, &size );
   MPI_Cart_create( MPI_COMM_WORLD, 1, &size, &false, 1, &ring_comm );
   MPI_Cart_shift( ring_comm, 0, 1, &left_nbr, &right_nbr );
   MPI_Comm_rank( ring_comm, &rank );
   MPI_Comm_size( ring_comm, &size );
   do {
   if (rank == 0) {
       scanf( "%d", &value );
       MPI_Send( &value, 1, MPI_INT, right_nbr, 0, ring_comm );
   }
   else {
       MPI_Recv( &value, 1, MPI_INT, left_nbr, 0, ring_comm,
             &status );
             printf( "Node %d got %d\n", rank, value );
             value = value + rank ;
             printf("current prefix sum at node %d = %d\n",rank, value);
       MPI_Send( &value, 1, MPI_INT, right_nbr, 0, ring_comm );
   }
```

```
   } while (value >= 0);

   MPI_Finalize( );
   return 0;
}
```

Input/Output:

```
nilay@Nilay-PC:~/cs359$ mpicc -o mpi ring.c
nilay@Nilay-PC:~/cs359$ mpiexec -n 15 ./mpi
0
Node 1 got 0
current prefix sum at node 1 = 1
Node 2 got 1
current prefix sum at node 2 = 3
Node 3 got 3
current prefix sum at node 3 = 6
Node 4 got 6
current prefix sum at node 4 = 10
Node 5 got 10
current prefix sum at node 5 = 15
Node 6 got 15
current prefix sum at node 6 = 21
Node 7 got 21
current prefix sum at node 7 = 28
Node 8 got 28
current prefix sum at node 8 = 36
Node 9 got 36
current prefix sum at node 9 = 45
Node 10 got 45
current prefix sum at node 10 = 55
Node 11 got 55
current prefix sum at node 11 = 66
Node 12 got 66
current prefix sum at node 12 = 78
Node 13 got 78
current prefix sum at node 13 = 91
Node 14 got 91
current prefix sum at node 14 = 105
```