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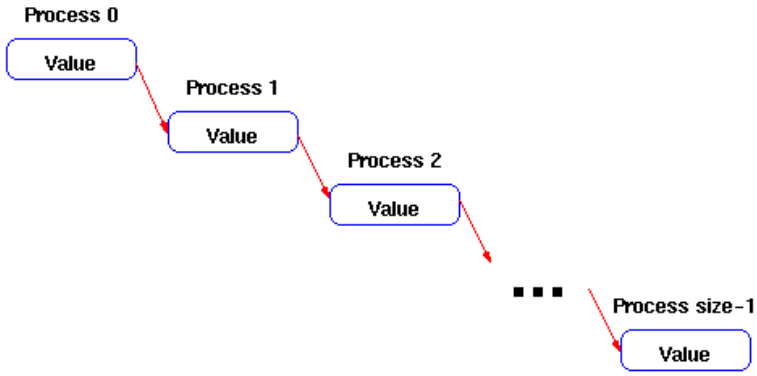
LAB ASSESSMENT #9

SCENARIO – 1: Broadcast by ring

Study the given C program that takes data from process zero and sends it to all of the other processes by sending it in a ring and its logical approach is based on MPI. That is, process i should receive the data and send it to process i+1, until the last process is reached. Analyse its key factors in terms of network application system.



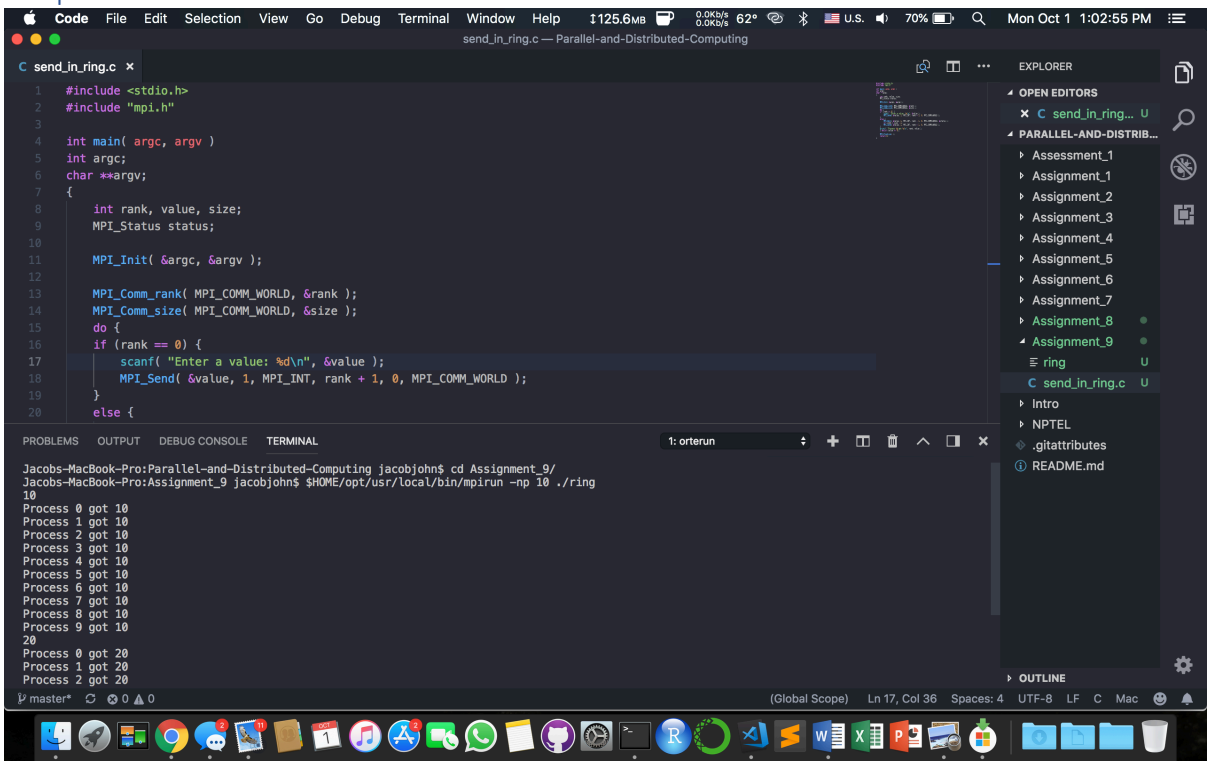
Assume that the data consists of a single integer. Process zero reads the data from the user.

Code:

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

int main( argc, argv )
int argc;
char **argv;
{
    int rank, value, size;
    MPI_Status status;

    MPI_Init( &argc, &argv );

    MPI_Comm_rank( MPI_COMM_WORLD, &rank );
    MPI_Comm_size( MPI_COMM_WORLD, &size );
    do {
    if (rank == 0) {
        scanf( "Enter a value: %d\n", &value );
        MPI_Send( &value, 1, MPI_INT, rank + 1, 0, MPI_COMM_WORLD );
    }
```

```
    else {
        MPI_Recv( &value, 1, MPI_INT, rank - 1, 0, MPI_COMM_WORLD, &status );
        if (rank < size - 1)
        MPI_Send( &value, 1, MPI_INT, rank + 1, 0, MPI_COMM_WORLD );
    }
    printf( "Process %d got %d\n", rank, value );
    } while (value >= 0);

    MPI_Finalize( );
    return 0;
}
```

Output:



Execution

Jacobs-MacBook-Pro:Parallel-and-Distributed-Computing jacobjohn$ cd Assignment_9/
Jacobs-MacBook-Pro:Assignment_9 jacobjohn$ $HOME/opt/usr/local/bin/mpirun -np 10 ./ring
10
Process 0 got 10
Process 1 got 10
Process 2 got 10
Process 3 got 10
Process 4 got 10
Process 5 got 10
Process 6 got 10
Process 7 got 10
Process 8 got 10
Process 9 got 10
20
Process 0 got 20
Process 1 got 20

```
Process 2 got 20
Process 3 got 20
Process 4 got 20
Process 5 got 20
Process 6 got 20
Process 7 got 20
Process 8 got 20
Process 9 got 20
```

Conceptual discussion

In computer networking, telecommunication and information theory, broadcasting is a method of transferring a message to all recipients simultaneously. Broadcasting can be performed as a high-level operation in a program, for example broadcasting Message Passing Interface, or it may be a low-level networking operation, for example broadcasting on Ethernet.

All-to-all communication is a computer communication method in which each sender transmits messages to all receivers within a group. This contrasts with the point-to-point method in which each sender communicates with one receiver.

Both Ethernet and IPv4 use an all-ones broadcast address to indicate a broadcast packet. Token Ring uses a special value in the IEEE 802.2 control field.

Broadcasting may be abused to perform a type of DoS-attack known as a Smurf attack. The attacker sends fake ping requests with the source IP-address of the victim computer. The victim computer is flooded by the replies from all computers in the domain.

A common error is to pass the object where the address of the object is needed. For example,

```
MPI_Status status;
...
MPI_Recv( ..., status );
```

is incorrect; it must be

```
MPI_Recv( ..., &status );
```

This is also true for buffers, and is a common error when passing single element buffers. For example,

```
int value;
...
MPI_Send( value, 1, MPI_INT, ... );
```

is incorrect; it must be

```
MPI_Send( &value, 1, MPI_INT, ... );
```