

```

1  //-----
2  // standard blocking ring
3  //-----
4  #if (defined __linux__ ) || (defined _AIX) || (defined __APPLE__ )
5      #include <sys/types.h>
6      #include <sys/stat.h>
7      #include <unistd.h>
8  #elif (defined _WIN32) || (defined _WIN64)
9      #include <conio.h>
10     #include <direct.h>
11 #endif
12
13 #include<mpi.h>
14 #include<stdio.h>
15 #include <iostream>
16 using namespace std;
17
18 int main(int argc, char** argv)
19 {
20     int i, n=0, rank, size, dest, src, mess=0;
21     double time;
22
23     MPI_Request* request = new MPI_Request();
24     MPI_Status* status = new MPI_Status();
25
26     MPI_Init(&argc, &argv);
27     MPI_Barrier(MPI_COMM_WORLD);
28     time = -MPI_Wtime();
29
30     MPI_Comm_rank(MPI_COMM_WORLD, &rank);
31     MPI_Comm_size(MPI_COMM_WORLD, &size);
32     if (rank == 0) {
33         printf("\nThere are %d processes.\n", size);
34         mess = 333;
35         cout << "Select how many times the message " << mess << " should be shifted"
36             << " in the direction of a cycle of processes!\nIt should be n >= 0 and"
37             << " n < " << size << ".\n n = ";
38         cin >> n;
39         cout << endl;
40         fflush(stdout);
41     }
42     MPI_Bcast(&n, 1, MPI_INT, 0, MPI_COMM_WORLD);
43
44     for (i = 0; i < n; i++) {
45         dest = (rank + 1) % size;
46         MPI_Send(&mess, 1, MPI_INT, dest, 0, MPI_COMM_WORLD);
47         printf("send: %d->%d\n", rank, dest);
48
49         src = (rank + size - 1) % size;
50         MPI_Recv(&mess, 1, MPI_INT, src, 0, MPI_COMM_WORLD, status);
51         printf("receive: %d->%d\n", src, rank);
52     }
53
54     printf("processor %d: sum of messages = %d\n\n", rank, mess);
55
56     time += MPI_Wtime();
57     if (rank == 0)
58         printf("\nTime = %10.6f s\n", time);
59
60     fflush(stdout);
61     MPI_Finalize();
62
63     delete status;
64     delete request;
65
66     return 0;
67 }

```