

## 代码

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

int main(int argc, char **argv)
{
    // 描述通信子集大小和当前进程序号
    int rank, size;
    char data = 0;

    // 记录时间
    double start_time, stop_time, cost_time;

    // MPI 初始化
    MPI_Init(&argc, &argv);
    MPI_Comm_rank(MPI_COMM_WORLD, &rank);
    MPI_Comm_size(MPI_COMM_WORLD, &size);

    // 记录开始时间
    start_time = MPI_Wtime();

    // 向后发送消息, tag = 0
    MPI_Send(&data, 1, MPI_INT, (rank + 1) % size, 0, MPI_COMM_WORLD);
    // Recv 是阻塞的, 接收到消息时回到运行
    MPI_Recv(&data, 1, MPI_INT, (rank - 1 + size) % size, 0, MPI_COMM_WORLD,
    MPI_STATUS_IGNORE);

    stop_time = MPI_Wtime();
    cost_time = stop_time - start_time;

    printf("Process %d: spend %f seconds for one full circle of transmission\n",
    rank, cost_time);

    MPI_Finalize();
    return 0;
}
```

## 执行脚本

```
#!/bin/bash
#SBATCH -J hpc_homework1_test_1    #作业名
#SBATCH -p cpu-quota
#SBATCH -N 3                      #3个节点
#SBATCH -n 28                     #28个cpu
#SBATCH -o homework1.out # 将屏幕的输出结果保存到当前文件夹的test_hpc_1.out
#SBATCH -e homework1.err # 将屏幕的输出结果保存到当前文件夹的test_hpc_1.err

srun hostname | sort > machinefile.${SLURM_JOB_ID}
NP=`cat machinefile.${SLURM_JOB_ID} | wc -l`
module load intel/19.0.5.281
export I_MPI_HYDRA_TOPOLIB=ip1
```

```
mpirun -genv I_MPI_FABRICS shm:dapl -np ${NP} -f ./machinefile.${SLURM_JOB_ID}
./tes
sed -i 's/\r$//' test.sh
```

## 执行结果

```
Documentation:  http://lmud.readthedocs.org
Github:         https://github.com/TACC/lmud
Sourceforge:   https://sourceforge.net/projects/lmud
TACC Homepage:  https://www.tacc.utexas.edu/research-development/tacc-projects/lmud

To report a bug please read http://lmud.readthedocs.io/en/latest/075_bug_reporting.html

[cd177336581n0] homework1$ module load intel/19.0.5.281
[cd177336581n0] homework1$ mpirun -o tes homework1.c
mpirun: error: homework1.c: No such file or directory
[cd177336581n0] homework1$ ls
[cd177336581n0] homework1$ pwd
/home/[cd177336581n0] homework1
[cd177336581n0] homework1$ mpirun -o tes homework1.c
[cd177336581n0] homework1$ sbatch test.sh
sbatch: error: Unable to open file test.sh
[cd177336581n0] homework1$ ls
homework1.c  tes
[cd177336581n0] homework1$ sbatch test.sh
sbatch: error: batch script contains DOS line breaks (\r\n)
[cd177336581n0] homework1$ vim test.sh
[cd177336581n0] homework1$ vim test.sh
[cd177336581n0] homework1$ sbatch test.sh
sbatch: error: batch script contains DOS line breaks (\r\n)
[cd177336581n0] homework1$ vim test.sh
[cd177336581n0] homework1$ sbatch test.sh
sbatch: error: batch script contains DOS line breaks (\r\n)
[cd177336581n0] homework1$ cat
[cd177336581n0] homework1$ sed -i 's/\r$//' your_script.sh
sed: can't read your_script.sh: No such file or directory
[cd177336581n0] homework1$ cat
[cd177336581n0] homework1$ sed -i 's/\r$//' your_script.sh
sed: can't read your_script.sh: No such file or directory
[cd177336581n0] homework1$ sed -i 's/\r$//' test.sh
[cd177336581n0] homework1$ sbatch test.sh
Submitted batch job 8442896
[cd177336581n0] homework1$ ls
homework1.c  homework1.out  homework1.out  machinefile.8442896  tes  test.sh
[cd177336581n0] homework1$ cat homework1.out
Process 0: spend 0.075523 seconds for one full circle of transmission
Process 0: spend 0.580681 seconds for one full circle of transmission
Process 11: spend 0.254136 seconds for one full circle of transmission
Process 12: spend 0.072543 seconds for one full circle of transmission
Process 5: spend 0.261776 seconds for one full circle of transmission
Process 4: spend 0.603261 seconds for one full circle of transmission
Process 2: spend 0.277573 seconds for one full circle of transmission
Process 14: spend 0.278161 seconds for one full circle of transmission
Process 8: spend 0.250042 seconds for one full circle of transmission
Process 26: spend 0.282588 seconds for one full circle of transmission
Process 13: spend 0.148716 seconds for one full circle of transmission
Process 3: spend 0.590605 seconds for one full circle of transmission
Process 20: spend 0.287406 seconds for one full circle of transmission
Process 24: spend 0.102494 seconds for one full circle of transmission
Process 27: spend 0.090574 seconds for one full circle of transmission
Process 4: spend 0.501254 seconds for one full circle of transmission
Process 10: spend 0.119478 seconds for one full circle of transmission
Process 1: spend 0.115181 seconds for one full circle of transmission
Process 17: spend 0.297828 seconds for one full circle of transmission
Process 22: spend 0.280636 seconds for one full circle of transmission
Process 18: spend 0.114571 seconds for one full circle of transmission
Process 4: spend 0.144469 seconds for one full circle of transmission
Process 25: spend 0.152649 seconds for one full circle of transmission
Process 19: spend 0.144956 seconds for one full circle of transmission
Process 15: spend 0.232098 seconds for one full circle of transmission
Process 16: spend 0.157223 seconds for one full circle of transmission
Process 21: spend 0.151800 seconds for one full circle of transmission
Process 22: spend 0.194651 seconds for one full circle of transmission
[cd177336581n0] homework1$
```