

Serie 12

Remark: Programs shall be executed on the cluster lcvmlc2! Your user name and password are those of the SMA PC's.

Introduction

The cluster lcvmlc1 is made of a master node (lcvmlc2 or master) and 14 compute nodes (node01, node02,...), each with 4 cores. They are connected by a fast myrinet network.

- For working interactively with MPI, one has to connect to a compute node by issuing the command `qlogin`.
- Compilation and linking are done with the Intel compiler and the mpich and myrinet libraries:
`/opt/mpich_mx/bin/mpicc -static -o prog prog.c`
- The command for running the executable `prog` with MPI using p processors is:
`/opt/mpich_mx/bin/mpirun -machinefile machinefile_name -np p prog`
where `machinefile_name` is a file containing the list of the nodes chosen for the computation. This file contains for example:

```
node02 : 4  
node05 : 4  
node06 : 4  
node10 : 4
```

when one needs 16 processors.

Exercise 1 Consider the four processors 0, 1, 2, 3 as a ring, in which 0 follows 3. One wants to compute 2^{16} with this ring, each processor being allowed to make only one multiplication by 2 before sending the result to the next processor. One moves in the ring a vector with two integer components, the first integer is equal to the number of remaining loops and the second one is equal to the variable to multiply. At the beginning, the processor 0 initializes the latter to 1 and, at the end, it prints the result. Make prints for observing how messages are sent or received. The draft of the program is in the file `ring.c`.

Exercise 2 Complete the file `transp.c` for realizing the following process. Partition the 8×8 matrix A with entries $a_{ij} = j - i, 1 \leq i, j \leq 8$ into four 4×4 blocks and compute its transpose with four processors:

- the processor 0 initializes the matrix and send each block to a different processor into a specific variable,
- each processor computes the transpose of its block,
- one sends the transposed blocks to the processor 0 at the place of the original matrix.