Lab 5 report

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1 Task 1: MPI hello world

- Following the lab instruction, I downloaded openmpi-4.1.4 and installed to my ~Courses/ on onyx.cs server by using a few Linux command: wget, tar -xvf, pwd (to get absolute path), ./configure --prefix=, make all, make install, then I have bin folder containing openmpi command lines. Therefore, the Makefile may need be changed to match the path of the MPI library on machines.

- Here is the results when I ran "mpicc MPI_simple.c -o hello", "mpirun -np 4 hello".

```
qle010@onyx:~/Courses/COP4520/Lab5 251% ~/Courses/openmpi-4.1.4/bin/mpirun -np 4
hello
Process 1 on onyx out of 4
Process 3 on onyx out of 4
Process 0 on onyx out of 4
Process 2 on onyx out of 4
```

2 Task 2: MPI ring

- The code is attached, and then I ran on onyx server.

- Here is the results when I ran "mpicc MPI_ring.c -o MPI_ring", "mpirun -np 4 MPI_ring", "mpirun -np 8 MPI_ring", "mpirun -np 16 MPI_ring" with relative average time are: 0.000065 (s), 0.000100 (s), and 0.000208 (s).

```
qle010@onyx:~/Courses/COP4520/Lab5 113% ~/Courses/openmpi-4.1.4/bin/mpicc MPI_ring.c
-o MPI_ring
qle010@onyx:~/Courses/COP4520/Lab5 114% ~/Courses/openmpi-4.1.4/bin/mpirun -np 4
MPI_ring
Hello world from processor onyx, rank 0 out of 4 processors
Hello world from processor onyx, rank 2 out of 4 processors
Hello world from processor onyx, rank 1 out of 4 processors
Process 1 received token 112 from process 0
Hello world from processor onyx, rank 3 out of 4 processors
Process 2 received token 112 from process 1
Process 3 received token 112 from process 2
Process 0 received token 112 from process 3
```

```
Elapsed time = 0.000065 seconds
qle010@onyx:~/Courses/COP4520/Lab5 115% ~/Courses/openmpi-4.1.4/bin/mpirun -np 8
MPI_ring
Hello world from processor onyx, rank 4 out of 8 processors
Hello world from processor onyx, rank 6 out of 8 processors
Hello world from processor onyx, rank 0 out of 8 processors
Hello world from processor onyx, rank 1 out of 8 processors
Process 1 received token 112 from process 0
Hello world from processor onyx, rank 2 out of 8 processors
Hello world from processor onyx, rank 3 out of 8 processors
Hello world from processor onyx, rank 5 out of 8 processors
Hello world from processor onyx, rank 7 out of 8 processors
Process 2 received token 112 from process 1
Process 3 received token 112 from process 2
Process 4 received token 112 from process 3
Process 5 received token 112 from process 4
Process 6 received token 112 from process 5
Process 7 received token 112 from process 6
Process 0 received token 112 from process 7
Elapsed time = 0.000100 seconds
qle010@onyx:~/Courses/COP4520/Lab5 116% ~/Courses/openmpi-4.1.4/bin/mpirun -np 16
MPI_ring
Hello world from processor onyx, rank 9 out of 16 processors
Hello world from processor onyx, rank 12 out of 16 processors
Hello world from processor onyx, rank 5 out of 16 processors
Hello world from processor onyx, rank 6 out of 16 processors
Hello world from processor onyx, rank 8 out of 16 processors
Hello world from processor onyx, rank 10 out of 16 processors
Hello world from processor onyx, rank 1 out of 16 processors
Hello world from processor onyx, rank 2 out of 16 processors
Hello world from processor onyx, rank 14 out of 16 processors
Hello world from processor onyx, rank 15 out of 16 processors
Hello world from processor onyx, rank 0 out of 16 processors
Hello world from processor onyx, rank 4 out of 16 processors
Hello world from processor onyx, rank 7 out of 16 processors
Hello world from processor onyx, rank 13 out of 16 processors
Process 1 received token 112 from process 0
Hello world from processor onyx, rank 3 out of 16 processors
Hello world from processor onyx, rank 11 out of 16 processors
Process 2 received token 112 from process 1
Process 3 received token 112 from process 2
Process 4 received token 112 from process 3
Process 5 received token 112 from process 4
Process 6 received token 112 from process 5
Process 7 received token 112 from process 6
Process 8 received token 112 from process 7
Process 9 received token 112 from process 8
Process 10 received token 112 from process 9
Process 11 received token 112 from process 10
Process 12 received token 112 from process 11
Process 13 received token 112 from process 12
Process 14 received token 112 from process 13
Process 15 received token 112 from process 14
Process 0 received token 112 from process 15
Elapsed time = 0.000208 seconds
qle010@onyx:~/Courses/COP4520/Lab5 117%
```