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Homework X

Question Y

Develop a simple MPI program using C/C++ and OpenMPI that uses at least 2 nodes on Discovery and utilizes at least 16 processes on each node (a minimum of 32 processes in total). You are suggested to use the sample batch script provided on Canvas for specifying your OpenMPI configuration and running your program.

a) *Start with an integer variable that you will pass to each process, where process 1 prints the value, increments the value by 1, and sends it to process 2. Process 2 prints the value, then increments the value by 1 and sends it to process 3. Repeat this for all 64 processes. When performing printing, print both the integer value, as well as identify which process is printing, and on which node this process is running on.*

Code for this part of the assignment is included in the file *"Q1a.c"* and can be executed by running the *"Q1a.script"* file. The results obtained are reported in Figure 1.

```
[[aliaga.s@login-00 homework4]$ more Q1a.out
 Proces 0 from the Node c0206 increments count from 0 to 1.
 Proces 1 from the Node c0206 increments count from 1 to 2.
 Proces 2 from the Node c0206 increments count from 2 to 3.
 Proces 3 from the Node c0206 increments count from 3 to 4.
 Proces 4 from the Node c0206 increments count from 4 to 5.
 Proces 5 from the Node c0206 increments count from 5 to 6.
 Proces 6 from the Node c0206 increments count from 6 to 7.
 Proces 7 from the Node c0206 increments count from 7 to 8.
 Proces 8 from the Node c0206 increments count from 8 to 9.
 Proces 9 from the Node c0206 increments count from 9 to 10.
 Proces 10 from the Node c0206 increments count from 10 to 11.
 Proces 11 from the Node c0206 increments count from 11 to 12.
 Proces 12 from the Node c0206 increments count from 12 to 13.
 Proces 13 from the Node c0206 increments count from 13 to 14.
 Proces 14 from the Node c0206 increments count from 14 to 15.
 Proces 15 from the Node c0206 increments count from 15 to 16.
 Proces 16 from the Node c0223 increments count from 16 to 17.
 Proces 17 from the Node c0223 increments count from 17 to 18.
 Proces 18 from the Node c0223 increments count from 18 to 19.
 Proces 19 from the Node c0223 increments count from 19 to 20.
 Proces 20 from the Node c0223 increments count from 20 to 21.
 Proces 21 from the Node c0223 increments count from 21 to 22.
 Proces 22 from the Node c0223 increments count from 22 to 23.
 Proces 23 from the Node c0223 increments count from 23 to 24.
 Proces 24 from the Node c0223 increments count from 24 to 25.
 Proces 25 from the Node c0223 increments count from 25 to 26.
 Proces 26 from the Node c0223 increments count from 26 to 27.
 Proces 27 from the Node c0223 increments count from 27 to 28.
 Proces 28 from the Node c0223 increments count from 28 to 29.
 Proces 29 from the Node c0223 increments count from 29 to 30.
 Proces 30 from the Node c0223 increments count from 30 to 31.
 Proces 31 from the Node c0223 increments count from 31 to 32.
```

Figure 1: Results of the count to 32 with OpenMPI

b) *Next, continuing the printing, but once the value gets to 64, decrement the value, and continue to print out the value until the decremented value is zero.*

Code for this part of the assignment is included in the file *"Q1b.c"* and can be executed by running the *"Q1b.script"* file. The results obtained are reported in Figure 2.

```
[aliaga.s@login-00 homework4]$ more Q1b.out
Proces 0 from the Node c0206 increments count from 0 to 1.
Proces 1 from the Node c0206 increments count from 1 to 2.
Proces 2 from the Node c0206 increments count from 2 to 3.
Proces 3 from the Node c0206 increments count from 3 to 4.
Proces 4 from the Node c0206 increments count from 4 to 5.
Proces 5 from the Node c0206 increments count from 5 to 6.
Proces 6 from the Node c0206 increments count from 6 to 7.
Proces 7 from the Node c0206 increments count from 7 to 8.
Proces 8 from the Node c0206 increments count from 8 to 9.
Proces 9 from the Node c0206 increments count from 9 to 10.
Proces 10 from the Node c0206 increments count from 10 to 11.
Proces 11 from the Node c0206 increments count from 11 to 12.
Proces 12 from the Node c0206 increments count from 12 to 13.
Proces 13 from the Node c0206 increments count from 13 to 14.
Proces 14 from the Node c0206 increments count from 14 to 15.
Proces 15 from the Node c0206 increments count from 15 to 16.
Proces 16 from the Node c0245 increments count from 16 to 17.
Proces 17 from the Node c0245 increments count from 17 to 18.
Proces 18 from the Node c0245 increments count from 18 to 19.
Proces 19 from the Node c0245 increments count from 19 to 20.
Proces 20 from the Node c0245 increments count from 20 to 21.
Proces 21 from the Node c0245 increments count from 21 to 22.
Proces 22 from the Node c0245 increments count from 22 to 23.
Proces 23 from the Node c0245 increments count from 23 to 24.
Proces 24 from the Node c0245 increments count from 24 to 25.
Proces 25 from the Node c0245 increments count from 25 to 26.
Proces 26 from the Node c0245 increments count from 26 to 27.
Proces 27 from the Node c0245 increments count from 27 to 28.
Proces 28 from the Node c0245 increments count from 28 to 29.
Proces 29 from the Node c0245 increments count from 29 to 30.
Proces 30 from the Node c0245 increments count from 30 to 31.
Proces 31 from the Node c0245 increments count from 31 to 32.
Process 0 from the Node c0206 decrements count from 32 to 31.
Process 1 from the Node c0206 decrements count from 31 to 30.
Process 2 from the Node c0206 decrements count from 30 to 29.
Process 3 from the Node c0206 decrements count from 29 to 28.
Process 4 from the Node c0206 decrements count from 28 to 27.
Process 5 from the Node c0206 decrements count from 27 to 26.
Process 6 from the Node c0206 decrements count from 26 to 25.
Process 7 from the Node c0206 decrements count from 25 to 24.
Process 8 from the Node c0206 decrements count from 24 to 23.
Process 9 from the Node c0206 decrements count from 23 to 22.
Process 10 from the Node c0206 decrements count from 22 to 21.
Process 11 from the Node c0206 decrements count from 21 to 20.
Process 12 from the Node c0206 decrements count from 20 to 19.
Process 13 from the Node c0206 decrements count from 19 to 18.
Process 14 from the Node c0206 decrements count from 18 to 17.
Process 15 from the Node c0206 decrements count from 17 to 16.
Process 16 from the Node c0245 decrements count from 16 to 15.
Process 17 from the Node c0245 decrements count from 15 to 14.
Process 18 from the Node c0245 decrements count from 14 to 13.
Process 19 from the Node c0245 decrements count from 13 to 12.
Process 20 from the Node c0245 decrements count from 12 to 11.
Process 21 from the Node c0245 decrements count from 11 to 10.
Process 22 from the Node c0245 decrements count from 10 to 9.
Process 23 from the Node c0245 decrements count from 9 to 8.
Process 24 from the Node c0245 decrements count from 8 to 7.
Process 25 from the Node c0245 decrements count from 7 to 6.
Process 26 from the Node c0245 decrements count from 6 to 5.
Process 27 from the Node c0245 decrements count from 5 to 4.
Process 28 from the Node c0245 decrements count from 4 to 3.
Process 29 from the Node c0245 decrements count from 3 to 2.
Process 30 from the Node c0245 decrements count from 2 to 1.
Process 31 from the Node c0245 decrements count from 1 to 0.
```

Figure 2: Results of the count to 32 and posterior decrement with OpenMPI