02616 Fall 2025: Labs for week 01

Today's menu

1. "Hello World" with MPI
2. "Hello World" with communication (Send/Recv)
3. "Ring" with MPI
4. Intro to LSF batch jobs
5. Run "Hello World" and "Ring" as a batch job (single node)

Note:

All the labs are designed and tested on the DTU HPC system. As you will have to use the system later in this course anyway, to exploit many of the features/topics we will cover, we suggest that you start to use it today!

1. "Hello World" with MPI

Implement the MPI version of "Hello World", as shown on the lecture slides. To make sure, that we are all using the same MPI version (which we will continue to use throughout the course), you should load this:

`module load mpi/5.0.8-gcc-13.4.0-binutils-2.44`

We also provide a sample Makefile, and some C source templates in a ZIP file, that you can use for today's labs.

2. "Hello World" with communication

In the example above, we have not used any communication between ranks. In the file `hello_n.c` , we provide the example with communication from the lecture. Compile and run it, e.g. like this

```
make hello_n
mpirun -np 2 ./hello_n
```

What happens if you run it for different numbers of ranks, e.g. 1, 3, 4? What do you need to change, when it doesn't work!

3. MPI Ring communication

In this exercises, we want to implement communication in a ring of N ranks, i.e. rank 0 sends to 1, 1 sends to 2, ..., N-2 sends to N-1, and N-1 sends to 0! We provide an example code for this in `ring_c.c`. Does it work? If not, what do you need to do, to fix it!

4. LSF batch jobs

If you are not familiar with the usage of the LSF batch system, e.g. from other courses like 02613 or 02614, or if you need to refresh your LSF skills, then please follow the instructions in the `exercise_batch_lsf.pdf`. This is needed for the next exercise below.

5. Submitting "Hello World" and "Ring" as batch jobs

In the last exercise today, you will submit your MPI programs from above as batch jobs to the cluster. The jobs should run on a single node, using different numbers of ranks, and to achieve this, you should only have to change a single line in the job script (or the corresponding command line option of bsub).