Getting Started with MPI (locally)

For this short introduction in how to get started with MPI locally on your laptop/desktop machine, I'm going to assume that you are running Ubuntu or a similar Linux distribution. If you do not yet run Ubuntu or Linux, I'd recommend you install it on your machine, or run it inside a virtual environment (https://www.virtualbox.org/).

1. Installing OpenMPI:

To install OpenMPI via apt-get, run the following:

```
sudo apt-get install openmpi-bin libopenmpi-dev libopenmpi1.6
```

Note that depending on your Ubuntu version, the OpenMPI version might differ. If the command above fails, try to search what version of libopenmpi is available in your repository by running: apt-cache search libopenmpi

2. Creating a minimal example

First, lets create a folder for our new little MPI test project:

```
mkdir mpi-proj && cd mpi-proj
```

And then create a new C++ file (e.g. hello.cpp) and paste the following minimal example inside:

```
#include <mpi.h>

int main(int argc, char *argv[]) {
    // set up MPI
    MPI_Init(&argc, &argv);

    // get communicator size and my rank
    MPI_Comm comm = MPI_COMM_WORLD;
    int p, rank;
    MPI_Comm_size(comm, &p);
    MPI_Comm_rank(comm, &rank);

    /* code */
    printf("Hello from rank %i/%i.\n", rank, p);

    // finalize MPI
    MPI_Finalize();
    return 0;
}
```

3. Compiling and running:

Let's say we called the file hello.cpp, we can now compile our first MPI program with:

```
mpicxx -o hello hello.cpp
```

And now we can execute our program with let's say 4 processes:

```
mpirun -np 4 ./hello
```

The output should look something like this (no order guaranteed):

```
Hello from rank 2/4.
Hello from rank 0/4.
Hello from rank 1/4.
Hello from rank 3/4.
```