

Build and Install GCC 7.3.0, gfortran 8.0.1, MPICH 3.2.1, and OpenCoarrays 2.0.0 (to allow for Fortran 2018 coarray team support) on Linux Ubuntu 14.04 LTS (64 bit)

The simple instructions for building and installing GCC 7.3.0 (gcc and g++), GCC 8.0.1 (gfortran 8.0.1), MPICH 3.2.1, and OpenCoarrays 2.0.0 (to allow for Fortran 2018 coarray team support) on Linux Ubuntu 14.04 LTS are derived from my own experiences and proved to work well on a shared memory laptop computer. Some practical experience with Linux Ubuntu is required.

0 – Prerequisites

0-1:

Open the Ubuntu Software-Center and install g++, as well as gfortran.

The Ubuntu Software Center does offer only older versions (4.8.4) of these and we will remove them later. For now, we need these older versions to compile GCC 7.3.0 / 8.0.1 and MPICH 3.2.1.

1 – Build and Install GCC 7.3.0 (C and C++ only)

1-1:

Open the Ubuntu Software-Center and install the *flex* program.

1-2:

Visit <https://gcc.gnu.org> and download the GCC 7.3.0 release archive file (name extension 'tar.gz'). Unpack the downloaded archive file.

1-3:

Open the unpacked directory (we call it *main* directory in the following) and create a new directory within it, and name it 'build' (e.g. use *mkdir build*).

1-4:

Open a terminal window, change to the main directory and enter:

```
./contrib/download_prerequisites
```

1-5:

Create a new directory elsewhere for the GCC installation (we name it '*GCC-7-3-0-release-install-only-c--and-cplusplus*' for this example).

1-6:

Switch to the build directory in the terminal window and enter:

```
../configure --prefix=/home/ms/GCC-7-3-0-release-install-only-c--and-cplusplus --enable-languages=c,c++ --disable-multilib
```

(replace the above path '*/home/ms/GCC-7-3-0-release-install-only-c--and-cplusplus*' with your actual path)

1-7:

Still being within the build directory enter the following command to compile the GCC:

```
make -jN
```

where N is the number of cores+1 on your machine (e.g. type *make -j5* on a quad core computer).

(Be aware, this may take several hours on your system, from my own experiences 2 - 4.5 hours).

1-8:

In the build directory enter:

```
make install
```

1-9:

Open the Ubuntu Software-Center and remove g++ (that is only the old version 4.8.4).

1-10:

In the Ubuntu Software-Center, install gksu.

1-11:

Open a terminal window and enter:

```
sudo -s (to get root access, you must confirm with your password)
```

```
gksu gedit /etc/bash.bashrc
```

1-12:

Add the following lines at the end of the file:

`PATH=$PATH:/home/ms/GCC-7-3-0-release-install-only-c--and-cplusplus/bin` (please replace this path with your actual path to the `/bin` folder)

`export PATH`

`LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/home/ms/GCC-7-3-0-release-install-only-c--and-cplusplus/lib64` (please replace this path with your actual path to the `/lib64` folder)

`export LD_LIBRARY_PATH`

1-13:

Save the file and exit the terminal window.

To test the installation open a new terminal window and enter:

`g++ --version`

2 – Build and Install GCC 8.0.1 (GFortran only)**2-1:**

Visit <https://gcc.gnu.org> and download the GCC 8.0.1 snapshot archive file (name extension 'tar.xz'). Unpack the downloaded archive file.

2-2:

Open the unpacked directory (we call it *main* directory in the following) and create a new directory within it, and name it 'build' (e.g. use `mkdir build`).

2-3:

Open a terminal window, change to the main directory and enter:

`./contrib/download_prerequisites`

2-4:

Create a new directory elsewhere for the GCC installation (we name it '*GCC-8-install-only-gfortran*' for this example).

2-5:

Switch to the build directory in the terminal window and enter:

`./configure --prefix=/home/ms/GCC-8-install-only-gfortran --enable-languages=fortran --disable-multilib` (replace the above path '*/home/ms/GCC-8-install-only-gfortran*' with your actual path)

2-6:

Still being within the build directory enter the following command to compile the GCC:

`make -jN`

where N is the number of cores+1 on your machine (e.g. type `make -j5` on a quad core computer). (Be aware, this may take several hours on your system, from my own experiences 2 - 4.5 hours).

2-7:

In the build directory enter:

`make install`

2-8:

Open the Ubuntu Software-Center and remove gfortran (that is only the old version 4.8.4).

2-9:

Open a terminal window and enter:

`sudo -s` (to get root access, you must confirm with your password)

`gksu gedit /etc/bash.bashrc`

2-10:

Add the following lines at the end of the file:

`PATH=$PATH:/home/ms/GCC-8-install-only-gfortran/bin` (please replace this path with your actual path to the `/bin` folder)

`export PATH`

`LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/home/ms/GCC-8-install-only-gfortran/lib64` (please replace this path with your actual path to the `/lib64` folder)

`export LD_LIBRARY_PATH`

2-11:

Save the file and exit the terminal window.

To test the installation open a new terminal window and enter:

`gfortran --version`

3 – Build and Install MPICH 3.2.1 for use with OpenCoarrays 2.0.0

3-0:

Open the Ubuntu Software-Center and install g++ (version 4.8.4), but do NOT install gfortran (4.8.4) to leave the gfortran 8.0.1 installation intact. (The OpenCoarrays installation later does require that the MPICH *mpi.mod* file is created by the same version of the gfortran compiler).

3-1:

Visit www.mpich.org and download the latest MPICH version 3.2.1 (stable release), with file name extension 'tar.gz' (e.g. mpich-3.2.1.tar.gz).

3-2:

Right-click and unpack the downloaded archive file.

3-3:

Open a terminal window and change to the directory with the unpacked files (using the cd command).

3-4:

To compile MPICH, enter the following commands:

`./configure` (this takes a little while)

`make` (-||-)

Exit the terminal window.

3-5:

Now, open the Ubuntu Software-Center and install gfortran (version 4.8.4). This makes gfortran 4.8.4 the currently installed compiler.

3-6:

Open a new terminal window and change to the directory with the unpacked files (using the cd command).

To install MPICH, enter

`sudo make install`

in the terminal window.

4 – Compile and install the OpenCoarrays 2.0.0 library

4-0:

Open the Ubuntu Software-Center and remove gfortran, g++, and gcc (the old versions 4.8.4).

4-1:

Visit www.opencoarrays.org, download and unpack the OpenCoarrays 2.0.0 tar.gz file.

4-2:

Open a terminal window and switch to the *main* folder of the unpacked OpenCoarrays directory using the cd command.

4-3:

Enter the following command:

`./install.sh`

Follow the instructions.

5 - Compile and Run a Coarray Program:

5-1:

Open a terminal window and source the installed setup.sh file:

`cd /home/ms/OpenCoarrays-2.0.0/prerequisites/installations`

`source setup.sh`

5-2:

To compile, enter:

`caf hello.f90 -o a.out`

5-3:

To run the compiled program, enter:

`cafrun -np m ./a.out`

(replace *m* with the actual number of coarray images you want to use for program execution)