Build and Install OpenMPI, GCC (GFortran), and OpenCoarrays on Linux Ubuntu 14.04 LTS (64 bit)

The following simple instructions for building and installing OpenMPI, GCC (GFortran), and OpenCoarrays on Linux Ubuntu 14.04 LTS are derived from my own experiences and proved to work well on several shared memory systems (laptop computers). Some practical experience with Linux Ubuntu is required.

0 – Prerequisites
0-1:
Open the Ubuntu Software-Center and install g++ (the GNU C++ compiler), as well as GFortran. The Ubuntu Software Center does offer only older versions of these and we will remove them later on. For now, we need these older versions to compile OpenMPI.

1 – Build and Install OpenMPI
1-1:
Visit www.open-mpi.org and download the latest OpenMPI version, with file name extension 'tar.bz2' (e.g. openmpi-1.8.4.tar.bz2).
1-2:
Right-click and unpack the downloaded archive file.
1-3:
Open a terminal window and change to the directory with the unpacked files (using the cd command).
1-4:
To build and install OpenMPI, enter the following commands:
./configure (this takes a little while)
make (-||-)
sudo make install

2 – Build and Install GCC
2-1:
Open the Ubuntu Software-Center and install the *flex* program.
2-2:
Visit https://gcc.gnu.org and download the snapshot file (name extension 'tar.bz2') of the latest GCC release. Unpack the downloaded archive file.
2-3:
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).*
2-4:
Switch to the main directory in the terminal window and enter:
./contrib/download_prerequisites
2-5:
Create a new directory elsewhere for the GCC installation (we name it *GCC-7-install* for this example).
2-6:
Switch to the build directory in the terminal window and enter:
../configure --prefix=/home/ms/GCC-7-install --enable-languages=c,c++,fortran --disable-multilib
(replace the above path '/home/ms/GCC-7-install' with your actual path)
2-7:
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).
2-8:
In the buid directory enter:
make install
2-9:
Open the Ubuntu Software-Center and uninstall GFortran (that is only the old version).

2-10:
In the Ubuntu Software-Center, install gksu.
2-11:
Open a terminal window and enter:
sudo -s (to get root access, you must confirm with your password)
gksu gedit /etc/bash.bashrc
2-12:
Add the following lines at the end of the file:
PATH=$PATH:/home/ms/GCC-7-install/bin (please replace this path with your actual path to the */bin* folder)
export PATH
LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/home/ms/GCC-7-install/lib64 (please replace this path with your actual path to the */lib64* folder)
export LD_LIBRARY_PATH
2-13:
Save the file and restart the terminal window.
To test the installation enter:
gfortran --version

3 – Compile the OpenCoarrays library
3-1:
Visit www.opencoarrays.org to download and unpack the OpenCoarrays tar.gz file.
3-2:
Open a terminal window and switch to the *src* sub-folder of the unpacked OpenCoarrays directory using the cd command.
3-3:
Enter the following command:
make
Alternatively, you may also enter:
make mpi

4 - Compile and Run a Coarray Program:
4-1:
Open a terminal window and switch to the folder containing your .f90 source code files.
4-2:
To compile, enter:
mpifort -fcoarray=lib -L/home/ms/OpenCoarrays/.../mpi hello_coarray.f90 -lcaf_mpi -o hello
(please replace the above path to the OpenCoarays mpi folder by your actual path)
4-3:
To run the compiled program, enter:
mpirun -np m ./hello
(please replace *m* with the actual number of coarray images you want to use for program execution)

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