cGENIE Quick-start Guide: 'muffin' version [Mac]

Ben Ward

January 19, 2018

This is the Quick-start Guide for installing cGENIE-muffin on a Mac.

To install the muffin release of cGENIE on a Mac you will need a number of software packages, including Fortran, C++ and NetCDF. The best way to get hold of these is via a package management system, such as Homebrew (https://brew.sh) or MacPorts (https://www.macports.org). This guide is based on Homebrew, because it is slightly more user friendly than MacPorts, and is kept more up-to-date with changes in the Apple operating system. (If you are already a MacPorts user, please see Appendix A.)

1. First of all, you will need XCode, which can be downloaded from the app store, or here...
   https://developer.apple.com/xcode/downloads
   After installing XCode, it is necessary to enable command line tools, by entering at the command line...
   `xcode-select --install`

2. Get Homebrew by pasting the following at the terminal command line...
   `/usr/bin/ruby -e "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/master/install)"`
   Next, type '`brew doctor`'. This should tell you "`your system is ready to brew`". If it doesnt, see Appendix B.

3. Install Fortran, C++, NetCDF and some other useful libraries at the command line (using Homebrew) as follows:
   ```
   brew tap homebrew/science
   brew install cmake
   brew install gcc
   brew install hdf5 --with-fortran
   brew install netcdf
   brew install wget
   ```

4. Get hold of a (read-only) copy of the current 'muffin' branch of cGENIE source code via the command:
   `svn co https://svn.ggy.bris.ac.uk/subversion/genie/branches/cgenie.muffin`
   `--username=genie-user cgenie.muffin`
   for the 'head' (current development version). NOTE: All this must be typed continuously on ONE LINE, with a S P A C E before '`--username`', and before '`cgenie`'. Unless you have logged onto the `svn` server before from your computing account, you be asked for a password – it is `g3n1e-user`.

5. Adjust the cGENIE environment variables for your installation by editing
   `cgenie.muffin/genie-main/user.mak` and setting:
   `MACHINE=OSX`
   and
   `NETCDF_DIR=/usr/local/Cellar/netcdf/4.5.0`

6. Finally, in cgenie.muffin/genie-main/makefile.arc, comment out:
   ```
   #NETCDF=
       $(LIB_SEARCH_FLAG)$(PATH_QUOTE)$(NETCDF_DIR)/lib$(PATH_QUOTE) $(LIB_FLAG)$(NETCDF_NAME)
   ```
   and un-comment
   ```
   NETCDF_NAMEF=$(NETCDF_NAME)f
   NETCDF=$(LIB_SEARCH_FLAG)$(PATH_QUOTE)$(NETCDF_DIR)/lib$(PATH_QUOTE)
       $(LIB_FLAG)$(NETCDF_NAME) $(LIB_FLAG)$(NETCDF_NAME) $(LIB_FLAG)$(NETCDF_NAMEF)
   ```

7. To test the code installation – change directory to `cgenie.muffin/genie-main` and type:
   `make testbiogem`
   This compiles a carbon cycle enabled configuration of cGENIE and runs a short test, comparing the results against those of a pre-run experiment (also downloaded alongside the model source code). It serves to check

software and directory environment settings in `user.mak` (or `user.sh`) and for a netCDF error, check the value of the `NETCDF_DIR` environment variable. (Refer to the User Manual for addition fault-finding tips.) If environment variables are changed: before re-trying the test, you will need to type:

`make cleanall`

That is is for the basic installation. To run the model it is a simple matter of calling the 'runmuffin.sh' shell script from `genie-main` and supplying a couple of parameter values, e.g.:

```
./runmuffin.sh cgenie.eb_go_gs_ac_bg.worjh2.ANTH / EXAMPLE.worjh2.Caoetal2009.SPIN 10000
```

Refer to the *c*GENIE `User_manual` for more information regarding installing, running, and analyzing model output, and *c*GENIE `Examples` for more information on this specific example.[1] Read the *c*GENIE `READ-ME`.

_____

Appendix A

You are here because you have already installed MacPorts, presumably by following the instructions here: https://www.macports.org/install.php. You now have two options, either remove MacPorts entirely, replacing it with Homebrew, or install the required packages through MacPorts and a number of precompiled binaries.

Option 1: Remove MacPorts from your system... (to be replaced by Homebrew)

1. Back up your system (i.e. using Time Machine).
2. To uninstall MacPorts, enter at the terminal:
   ```
   sudo port -f uninstall installed
   ```
   Then remove everything that is left from MacPorts:
   ```
   sudo rm -rf /opt/local
   sudo rm -rf /Applications/DarwinPorts
   sudo rm -rf /Applications/MacPorts
   sudo rm -rf /Library/LaunchDaemons/org.macports.*
   sudo rm -rf /Library/Receipts/DarwinPorts*.pkg
   sudo rm -rf /Library/Receipts/MacPorts*.pkg
   sudo rm -rf /Library/StartupItems/DarwinPortsStartup
   sudo rm -rf /Library/Tcl/darwinports1.0
   sudo rm -rf /Library/Tcl/macports1.0
   sudo rm -rf ~/.macports
   ```
   Note that the `sudo` command is inserted before the `rm` (i.e. remove) command in order to enable the correct permissions.
3. You may now continue with your installation as described in the main text. You may have to delete some files (using `sudo rm`), as recommended by `brew doctor`.

Option 2: Install required packages through MacPorts and precompiled binaries...

1. First of all, synchronize your installation of MacPorts:
   ```
   sudo port -v selfupdate
   ```
2. Then install Netcdf and related C^{++} and Fortran libraries at the command line using MacPorts, as follows:
   ```
   sudo port install netcdf
   sudo port install netcdf-cxx
   sudo port install netcdf-fortran
   ```
3. Download precompiled fortran and C^{++} binaries appropriate to your operating system (El Capitan & Sierra, etc.) from http://hpc.sourceforge.net. Install as follows, amending the file number to match your version of OSX (e.g. El Capitan & Sierra are associated with the 7.1 binaries).
   ```
   cd ~/Downloads/
   gunzip gcc-7.1-bin.tar.gz
   sudo tar -xvf gcc-7.1-bin.tar -C /.
   gunzip gfortran-7.1-bin.tar.gz
   sudo tar -xvf gfortran-7.1-bin.tar -C /.
   ```
   If your operating system is not listed here, you will either have to wait until it is, or install Homebew.

Appendix B

Errors identified by 'brew doctor' are most likely associated with some incompatible files in your software libraries, perhaps from a previous installation of MacPorts. Try to follow the suggestions given to you by 'brew doctor', deleting any problematic files (using `sudo rm` to overcome any permission issues). Note that you may wish to do a system backup first.