Installing Software Pre-Requisites for Simulation and Analysis

Brian Clark [*1], Hannah Hasan [†1], Jude Rajasekera [‡1], and Carl Pfendner [§1]

[1]Department of Physics and the Center for Cosmology and Astroparticle Physics, The Ohio State University

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Abstract

Advice on installing simulation software prerequisites (ROOT, Boost, etc) on Linux computers.

1 Introduction

1.1 Requirements for Simulation Only

All simulation software needed for UHE-radio neutrino simulations of the IceMC heritage– that is, IceMC, AraSim, ShelfMC– require a set of pre-requisite software packages. Principal amongst these is ROOT [1]. Given that ROOT is not installed on most systems and its compile is operating-system specific, users must often install ROOT manually. In addition, AraSim's RayTracer code requires Boost [2].

If you are just interested in running simulation software, you should stop here, and just follow the instructions in section 2 . ShelfMC and IceMC just require ROOT, and AraSim requires ROOT and Boost. The versions of these codes that we recommend are ROOT 5.34.34 and Boost 1.49.0. These are verified to play well together on RHEL 6.4, RHEL 6.7, RHEL 6.8, and Mint 17.3.

1.2 Requirements for Data Analysis

Running full-blown analysis code, like AraRoot, requires at least four other packages/dependencies: CMake [3], GSL[4], Sqlite [5], FFTW [6]. Always install ROOT last.

[*]clark.2668@osu.edu
[†]hasan.112@osu.edu
[‡]rajasekera.3@osu.edu
[§]pfendner.1@osu.edu

Versions of all these code pacakges that are verified to play together nicely are the following: ROOT 5.34.34, Boost 1.49.0, FFTW 3.3.4, Sqlite 3090200, CMake 3.4.0, and GSL 1.16. These are verified to play well together on RHEL 6.4, RHEL 6.7, RHEL 6.8, and Mint 17.3.

1.3 Directory Structure and General Procedure

Hannah and Jude will write this part.

2 Installing Simulation Dependencies

The two simulation dependencies are BOOST and ROOT.

2.1 Installing ROOT

Hannah and Jude will write this part

2.2 Installing Boost

Boost is an extended C++ library necessary for AraSim's raytracing algorithm. The tar file for version 1.49.0 can by obtained via the following command:

`wget http://sourceforge.net/projects/boost/files/boost/1.49.0/boost_1_49_0.tar.gz`

After downloading the `tar.gz` file, it can be unzipped with

`tar -xvzf boost_1_49_0.tar.gz`

The `x` option extracts files; `v` specifies verbose action, i.e. the files will be listed as they are extracted; `z` specifies that the files should be decompressed using `gzip`; and `f` is necessary in order to specify what file needs to be decompressed. Additionally, if you would like the extracted files to be placed in a particular directory, then `-C [path to directory]` may be appended to the above command (without brackets), so the whole line reads:

`tar -xvzf boost_1_49_0.tar.gz -C [path to directory]`

Upon extraction, there will be a new directory containing the extracted files. Among these will be an executable shell script called `bootstrap.sh`. Execute it by typing

`./bootstrap`

and after bootstrapping is finished,

`./b2 install`

to complete installation.

3 Installing Data Analysis Dependencies

Aside from designating the install directory (through `--prefix=~/tools`), Carl Pfendner documented necessary arguments and CFLAGS for the code to compile correctly on

computing clusters. If you would like to try an automated installations script for all these dependencies, you can use `https://github.com/clark2668/AutomaticInstall`.

3.1 Installing GSL

The GNU scientific library is needed for ROOT to compile the MathMore library. The configure command with necessary flags is:

```
./configure CFLAGS=-m64 --with-pic --enable-shared --prefix=~/tools
```

Then run `make` and `make install` to finish the installation.

3.2 Installing FFTW

FFTW is the analysis software's Fourier transform engine. The configure command with necessary flags is:

```
./configure --enable-shared --prefix=~/tools
```

Then run `make` and `make install` to finish the installation.

3.3 Installing CMake

CMake is the build system for AraRoot. The configure command is

```
./configure --enable-shared --prefix=~/tools
```

Then run `gmake` and `make install` to finish the installation.

3.4 Installing Sqlite

Sqlite is used by AraRoot to store data about the stations, such as antenna locations, etc. The configure command is

```
./configure --enable-shared --prefix=~/tools
```

Then run `make` and `make install` to finish the installation.

3.5 Installing Boost

Follow the instructions from the simulation section for the installation of Boost.

3.6 Installing ROOT

When installing ROOT for compatibility with data analysis, it has to be asked to compile with FFTW and with GSL so that it generates the MathMore library. Because ROOT is annoying, you must also specify an `etcdir`. The configure command to use is (and yes, it really is that long...):

```
./configure --with-fftw3-incdir=~/tools/include
            --with-fftw3-libdir=~/tools/lib
            --with-gsl-incdir=~/tools/include
            --with-gsl-libdir=~/tools/lib
            --enable-gsl-shared
```

```
--etcdir=~/tools/etc
```

Then run `make` and `make install` to finish the installation.

References

[1] https://root.cern.ch/.

[2] http://www.boost.org/.

[3] https://cmake.org/.

[4] https://www.gnu.org/software/gsl/.

[5] https://www.sqlite.org/.

[6] http://www.fftw.org/.