How To Install PHAVER on Mac OS X

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Contents

This short note explains how to install PHAVER (and the needed libraries) for a single user on Mac OS X running Leopard (10.5.6). It might also work for earlier versions (you can report to me in case of a successful install on earlier version). If you want to install PHAVER as a system wide software and have the privileges to do so, you are probably fluent enough in Unix to set the paths correctly.

1 Having OS X Ready for Compiling Everything

The first thing you need to do is to install the Developer Tools from Apple. You can check whether they are already installed by typing in

```
bash-3.2$ gcc
```

into a terminal. If you get

```
bash: gcc: command not found
```

you probably not have the Developer Tools installed. Otherwise you will obtain the version of gcc i.e. something like

```
i686-apple-darwin9-gcc-4.0.1: no input files
```

In case you do not have the Developer Tools installed, install them from the DVD (install the Xcode package) that came with your Mac and after installation check that gcc is found when your run it from a terminal.

2 Installing the Necessary Libraries

The first step is to create a directory in which you will download and compile the Boost, PPL and GMP libraries. Something like

```
bash-3.2$ mkdir phaver-install
```

will create a directory with this name in the current directory. The term *root* directory refers to this directory in the sequel.
Then download the file build-libraries-OSX.sh (Library Installation Script) from http://www-verimag.imag.fr/~frehse/phaver_web/index.html (Method 1, (c)) and move it to the root directory as well.

2.1 Installing Boost

Download the last version of Boost from http://www.boost.org/. At the time of writing the file was boost_1_37_0.tar.gz. Place this file into the root directory. Then use the following command:

```
bash-3.2$ tar zxvf boost_1_37_0.tar.gz
bash-3.2$ cd boost_1_37_0
bash-3.2$ ./configure
....
bash-3.2$ make
...

bash-3.2$ make install prefix=$HOME/local
....
```

This takes a very long time to compile . . . Now you need to add a symbolic link in your local directory so that the Boost include files are found when compiling PHAVER. Do the following:

```
bash-3.2$ ln -s ~/local/include/boost-1_37/boost/ ~/local/include/boost/
```

Boost should then be ready to be used for compiling PHAVER.

2.2 Installing GMP

The current version of GMP at the time of writing was 4.2.4. Download gmp-4.2.4.tar.gz from http://gmplib.org/ and move it to the root directory.
In the root directory type

```
bash-3.2$ bash build-libraries-OSX.sh gmp
```

After a while, the process ends (assuming no error occurred) and the GMP libraries should be installed in your directory ~/local. The following command should produce the corresponding output:

```
bash-3.2$ ls ~/local/lib
libgmp.3.4.4.dylib libgmp.dylib libgmpxx.4.dylib libgmpxx.la
libgmp.3.dylib libgmp.la libgmpxx.a
libgmp.a libgmpxx.4.0.4.dylib libgmpxx.dylib
bash-3.2$
```

Make sure that the tests are passed (there should be some messages `All the xx tests passed` with xx an integer, and this a few times). After this step the GMP libraries are installed in your `~/local` directory.

2.3   Installing PPL

Installing PPL is very similar to installing GMP. You should use version 0.9 of PPL as version 0.10 has been reported not to be "compliant" with the current release of PHAVER. Download `ppl-0.9.tar.gz` from http://www.cs.unipr.it/ppl/Download/ftp/ppl/releases/0.9/ and put the file `ppl-0.9.tar.gz` in the root directory. In the root directory type

```
bash-3.2$ bash build-libraries-OSX.sh ppl
```

Again after a while, it stops (assuming no error occurred) and the PPL libraries are in your `~/local` directory. You can check this as before:

```
bash-3.2$ ls ~/local/lib
libgmp.3.4.4.dylib libgmpxx.a libppl.la libpwl.3.dylib
libgmp.3.dylib libgmpxx.dylib libppl_c.0.1.0.dylib libpwl.a
libgmp.a libgmpxx.la libppl_c.0.dylib libpwl.dylib
libgmp.dylib libppl.6.0.0.dylib libppl_c.a libpwl.la
libgmp.la libppl.6.dylib libppl_c.dylib ppl
libgmpxx.4.0.4.dylib libppl.a libppl_c.la
libgmpxx.4.dylib libppl.dylib libpwl.3.0.0.dylib
bash-3.2$
```

You should now be (finally) ready for starting to compile PHAVER.

3   Installing PHAVER

Download the files `phaver-OSX.tgz` (PHAVer sources) and `build-phaver-OSX.sh` (PHAVer installation script) from http://www-verimag.imag.fr/~frehse/phaver_web/index.html (Method 1, (c)) and place them in the root directory. In the root directory, do the following:

```
bash-3.2$ bash build-phaver-OSX.sh
```

If everything goes well this should terminate with

```
...
----------------------------------------------
PHAVer is now located in /Users/franck/local/bin.
Please add this directory to your path.
bash-3.2$
```

As it is said, you should add this directory to your path. This is how you can do it:

```
bash-3.2$ echo 'export PATH=$PATH:$HOME/local/bin' >> ~/.bash_profile
```

Note that if you do this command twice it will append the path twice as it adds a line to the existing `~/.bash\_profile` file. To be able to check that PHAVER is actually in your path, you need to "refresh" the path variable:

```
bash-3.2$ source ~/.bash_profile
```

and after this, running PHAVER should result in:

```
bash-3.2$ phaver
PHAVer v0.38, last modified Jan. 9, 2007, compiled Jan  5 2009, 20:23:38

Usage: phaver [OPTIONS] <filename> [ [OPTIONS] <filename> ... ]

Command line options:
 -h  more information:
 -v  detailed output and timers, e.g. -v32011:
     -vXXXXXX : A higher number XXX yields more information,
                                             in exponential scale.
               Default is 8000, 32000 is detailed, 256000 is for debugging.
     -vXXXXX1 : Shows timers
     -vXXXX1X : Shows progress-dots (.....)
 -y  : debug parser

For further information visit: http://www.cs.ru.nl/~goranf/
or contact gfrehse@ece.cmu.edu

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bash-3.2$
```

4   Installing PlotUtils

Download the GNUPlot http://www.gnu.org/software/plotutils/ archive from one of
the mirrors at http://www.gnu.org/prep/ftp.html (at the time of writing the current ver-
sion on a Japanese mirror was plotutils-2.5.1.tar.gz). Place it in the root directory and
untar/zip, then configure and install:

```
bash-3.2$ tar zxvf plotutils-2.5.1.tar.gz
...
bash-3.2$ cd plotutils-2.5.1
bash-3.2$ ./configure --prefix=$HOME/local
bash-3.2$ make install
bash-3.2$ which graph
/Users/franck/local/bin/graph
bash-3.2$
```

The last command just checks that the graph program used to plot PHAVER graphs is your local
directory.

5   Running PHAVER and PlotUtils

To check that the programs work correctly, we can use some PHAVER examples from http:
//www-verimag.imag.fr/~frehse/phaver_web/index.html, section *Various Examples*.
Download the zip archive *Various Examples* and place wherever it you wish. Unzip it and cd to
directory bouncing_ball. First you can check your PHAVER program:

```
bash-3.2$ phaver bouncing.pha

  Parsing file bouncing.pha.
  ------------------------
     .......................................
```

```
   Printing symb. states in 21 locations in generator floating point raw format.
   --------------------------------------------------------------------------

Finished. Exiting.
------------------
bash-3.2$
```

So far not impressive, but it produced a graph in the file out_reach. To plot this file, you first need to *launch* X11 on your mac. This application is located in the Applications/Utilities "directory" which you can access from the finder[1]. If you want to stick to your terminal and are allergic to the Finder you can launch it from the terminal:

```
bash-3.2$ open /Applications/Utilities/X11.app
bash-3.2$
```

You should have a pop up terminal (X11 style) which you can close. Now you can do the following:

```
bash-3.2$ phaver bouncing.pha

  Parsing file bouncing.pha.
  -------------------------
      ........................................

  Printing symb. states in 21 locations in generator floating point raw format.
  --------------------------------------------------------------------------

Finished. Exiting.
------------------
bash-3.2$ graph -T X out_reach
bash-3.2$ phaver bouncing_timed.pha

  Parsing file bouncing_timed.pha.
  -------------------------------
      .....................................

  Printing symb. states in 21 locations in generator floating point raw format.
  --------------------------------------------------------------------------

Finished. Exiting.
------------------
bash-3.2$ graph -T X out_reach
bash-3.2$
```

You should see two bouncing balls (plotted as a graph). Impressive! Try out the examples in the fb_refinement directory by running the run.sh and you will see some more plots.

Ackowledgement: I would like to thank Pierre-Alain Reynier (LIF, Marseille, France) for reporting errors in the earlier version of this manual and going through the installation process.

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[1]If X11 is not in this location, you can install it from the DVD that came with your Mac.