

Installation Guide for

SeismicUnixGui : a graphical user interface for Seismic Unix (John Stockwell)

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1 Installation Background and Prerequisites

1.1 Tested operating systems

All the installation steps have been tested on new, blank systems and have worked without any errors and are the recommended simplest paths to installing the software.

Particular users have their own specialized software installations and we would like to hear from you if you have any difficulties with the installation (gllore@lsu.edu Subject: SeismicUnixGui)

We have used the following instructions to install SeismicUnixGui under several different operating systems -- sometimes with a little apprehension-- but without any ensuing difficulties.

Linux operating system	Version tested
CentOS	7.7.2003. *.2.2004 and 8
Debian	10 (buster)
Ubuntu	18.04.3, 20.x, 22.x
RedHat	6.9
Cygwin/Microsoft Windows	10 with cygwin-3.1.7

Across all OS's, most installation problems occur when either (1) the environment variables are not properly set and (2) when the necessary Perl CPAN modules do not load correctly. The following installation guide deals with the popular Ubuntu operating system.

Special NOTE: Do not simply cut and paste from this document into your linux environment without paying special attention that you do not introduce invisible character (e.g., spaces) which will generate execution errors.

1.2 Definition of system variables in your computer work environment

In order for Perl to find all the programs that it needs at run time, it will look in pre-defined areas of your hard drive. These pre-defined directories, whether known to the user or not, exist in all or most operating systems. Your system manager usually adds special file locations as needed. Local users can even override the special file locations although that is not a safe practice.

Note for example, that **CWPROOT** is a directory path where the C programs that belong to Seismic Unix are usually installed. In the next Linux example, this path = `"/usr/local/pl/cwp_su_all_44R22"`

If you do not have permission to change your local `".bashrc"` file then ask your systems manager to make some arrangement that will allow your local `".bashrc"` file to pointing to a system-

wide file that only the administrator control, in which case you can add the following line to your local **".bashrc"** file:

```
source /PATH/bashrc_system
```

But, you will need to know what 'PATH' is and what 'bashrc_system' means. If this sounds confusing, see your administrator.

1.2.1 Linux

For my linux example, I usually place Perl programs under **"/usr/local/pl"**. Then, in order for all the Perl scripts and other programs to run, I have to add several new lines of instructions within my file **".bashrc"** file, which is located in my home directory:

```
export LOCAL=/usr/local
# for Seismic Unix
export CWPROOT=$LOCAL/cwp_su_all_44R22
export PATH=$PATH:$CWPROOT/bin
export PATH=$PATH:$CWPROOT/src/Sfio/bin

# for SeismicUnixGui
export SeismicUnixGui=/usr/local/share/perl/5.34.0/App/SeismicUnixGui
export SeismicUnixGui_script=$SeismicUnixGui/script
export PATH=$PATH:$SeismicUnixGui_script
export PERL5LIB=$PERL5LIB:$SeismicUnixGui

# for PGPLOT (fortran plotting libraries)
export PGPLOT_DIR=$LOCAL/pgplot
# default display device for pgplot
export PGPLOT_DEV=/XWINDOW

# for SIOSEIS binaries
Export SIOSEIS=$LOCAL/sioseis
Export PATH=$PATH:$SIOSEIS
```

1.3 Software required by Seismic Unix and SeismicUnixGui

1.3.1 Seismic Unix

Some users experience problems when installing Tk modules in SeismicUnixGui, or Xmotif modules in Seismic Unix. Often, this occurs because of missing libraries. For example, some missing libraries such as the following can be installed manually with the following command:

```
% sudo apt update
% sudo apt install ncftp
% sudo apt install dpkg-dev
% sudo apt install libx11-dev libfreetype6-dev libxft-dev libmotif-dev
% sudo apt install aptitude libpng-dev libz-dev libjpeg-dev
% sudo apt install evince (automatically shipped with ubuntu)
% sudo apt install gfortran (e.g., 4:9.3.0-1ubuntu2)
% sudo apt install libxext-dev (e.g., 2:1.3.4-0ubuntu1)
% sudo apt install git
```

1.3.2 SeismicUnixGui

In order to install **Seismic Unix** properly you will need to make sure the following libraries and standalone programs are installed.

You will need:

- **evince**
- **ncftp**

2 Automated installation of SeismicUnixGui by cpan

Most linux-type systems come automatically with the Perl language, but you can check to see if you have Perl installed and its version at the same time, by entering the following command:

```
% perl -v
```

If you have **perl** installed, then the simplest and quickest way to install **SeismicUnixGui** is with the following instruction:

```
% sudo cpan App::SeismicUnixGui
```

There are two questions that **cpan** will ask, related to where you want to install the software. For the first question, in the general case, answer [y].

If you are going to make the software accessible to everyone on your system (“global installation”) you should use the “**sudo**” or superuser option. If your installation will be personal/local use the default option for the second question (“local::lib”).

Cpan will automatically detect if you need additional packages and install them as needed. During the installation you will see that each program is tested thoroughly before. Do not be surprised if the installation takes several minutes.

If, however, you see that some packages are still missing, then load them manually. For example if there is a failure to find the “Moose” package then enter the following on the command line:

```
% sudo cpan Moose
```

2.1.1 Linux

If you install Perl as a regular user, the process will create “**perl5**” as a sub-directory in your home directory. You will have to accept these modifications. You do not need to do anything. But, as a result, you will find several lines of code installed also automatically inside your local “**.bashrc**” file.

I recommend that all software be installed with superuser permissions (**sudo**).

2.1.2 Loading cpan

For all types of operating systems, we recommend that the easiest way to install public Perl modules is to use **cpan**. First of all, **cpan** is a utility that is written in Perl. You need to have sudo privileges at least temporarily when you install **cpan** and the following modules. Later you will be able to use them in SeismicUnixGui as a regular user. (**cpan** can be downloaded from <https://www.cpan.org/>)

If you are working under **Ubuntu**, install **cpan** as follows:

```
% sudo apt upgrade  
% sudo cpan -v
```

(Hint: choose to configure **cpan** automatically)

2.1.3 How to load required Perl modules from the CPAN

When you install SeismicunixGui using **cpan**, cpan will automatically install the packages that you will need. These include some, or all of the following Perl modules:

- **MIME::Base64**

- ***Module::Refresh***
- ***Moose***
- ***Clone***
- ***File::ShareDir***
- ***File::Slurp***
- ***Shell***
- ***Test::Compile::Internal***
- ***Time::HiRes***
- ***Tk***
- ***Tk::JFileDialog***
- ***Tk::Pod***
- ***aliased***
- ***namespace::autoclean***
- ***plocate***

The following packages below have been tested under the following operating systems

Perl module name in cpan format	Ubuntu (20.04.3)	Debian 9.9	Versions tested under Cen- tOS7x	cygwin
Clone	0.45	0.38	0.39	0.43
File::ShareDir	1.118			
File::Slurp	9999.32			
MIME::Base64	3.16			3.15
Module::Refresh	0.18			
Moose	2.2015	2.187	2.2010	2.2012
PDL::Core	2.080			
Perl	5.26.1	5.24.1	5.16.3	5.26.3
Shell	0.73.1	0.73	0.73	0.73
Test::Compile::Internal	1.3			
Time::HiRes	1.9764			
Tk::JFileDialog	2.20	1.62	2.2	2.20
Tk or PerlTk	804.036	804.033	804.034	804.034
Tk::Pod	0.9943	5.41	5.41	5.41
aliased	0.34			
namespace::autoclean	0.29			
plocate	1.1.15-1 ub- untu2			

For each of the above packages use the following commands to install each of them.

2.1.3.1 *Ubuntu*

In addition, go ahead and install **evince**, which is a viewer for postscript files and often already present in your system:

```
% sudo apt install evince (may already form part of your OS)
```

To help when building Perl modules, install the following:

```
% sudo cpan Module::Build          (e.g., V0.4231 installed)
% sudo cpan TAP::Harness           (e.g., V3.42 installed)
```

cpan will find dependencies for the above packages and install them as well, so you may see a lot of additional packages installed during the process.

3 Installation of SeismicUnixGui from github

Most of the SeismicUnixGui scripts, are written in Perl, available at: www.github.com/gllore and can be installed anywhere on your machine, as long as you prescribe their location to the operating system (See 1.2.1).

In order to download these files from the github site you can run the following shell script. You must have administrator privileges. The following example script will place the SeismicUnixGui package within the “pl directory” that has the path: “**/usr/local/pl**”. The script below is saved as a file with any name you choose, e.g., “**clone.sh**”. You can create this file inside your home directory. Then to activate the instructions on the command line enter the following:

```
% bash clone.sh
```

3.1 Linux

The contents of the file “clone.sh” are as follows:

```
#!/bin/bash
# my name is clone.sh

# give a name to directory
installation_directory_for_SeismicUnixGui=/usr/local/pl/

# create installation directory
mkdir $installation_directory_for_SeismicUnixGui

# change into the installation directory
```

```
cd $installation_directory_for_SeismicUnixGui

# clone the directory from the remote site on to your computer
git clone https://github.com/gllore/SeismicUnixGui.git

# git status
git status
```

4 Fortran modules in SeismicUnixGui

There are “Tools” in SeismicUnixGui that communicate with programs written in Fortran (e.g., `immodpg`). These SeismicUnixGui modules (e.g., for raytracing reflections and refracted arrivals) are written in Fortran and some as well, use fortran plotting libraries for interactive forward modeling.

You will first need to install the graphic libraries (PGPLOT)

*Instructions that follow work with Ubuntu, and many (not all) of the following steps are very similar in other operating systems(OS) but for all OS it is essential to have the directory paths correctly identified for your operating system.

4.1 pgplot (*Ubuntu)

The principal plotting library is “**pgplot**”, which has to be downloaded and compiled separately.

Extensive instructions on the use and installation of `pgplot` are available from <https://www.astro.caltech.edu/~tjp/pgplot/>.

In brief:

- Download the library, as follows, from a remote web directory to your local home directory:

```
% ncftpget ftp://astro.caltech.edu/pub/pgplot/pgplot5.2.tar.gz
```

- Decompress the downloaded file: `pgplot5.2.tar.gz`, and place the reconstituted directories and files it contains within a general directory: “**/usr/local/src/pgplot**”, i.e.:

```
% mkdir /usr/local/src
% tar -xvzf pgplot5.2.tar.gz
% mv pgplot /usr/local/src/
```

- Prepare and compile code (A good explanation is available at https://www.gnu.org/software/gnuastro/manual/html_node/PGPLOT.html#FOOT220)

```
% cd /usr/local/src/pgplot
$ gedit drivers.list
```

Remove the “!” for the following lines, save and close the file:

```
XWDRIV 1 /XWINDOW
XWDRIV 2 /XSERVE
```

Specify the type of fortran compiler to use by opening the following file:
/usr/local/src/pgplot/sys_linux/g77_gcc.conf file:

```
% gedit /usr/local/src/pgplot/sys_linux/g77_gcc.conf
```

Change the following lines from:

```
FCOMPL="g77"
```

to

```
FCOMPL="gfortran",
```

and from :

```
XINCL="-I/usr/X11R6/include"
```

to

```
XINCL="-I/usr/include/X11"
```

and from:

```
LIBS="-L/usr/X11R6/lib -lX11"
```

to:

```
LIBS="-L/usr/lib -lX11"
```

and save it. This is a very important step during the compilation of the code.

Create a folder within “/usr/local” and copy the modified “**drivers.list**” to the new folder.

```
% mkdir /usr/local/pgplot
```

(Remember that your directory address for unpacking files is at location: **/usr/local/src/pgplot** but that the final address where you will install pgplot is at: **/usr/local/pgplot**)

```
% cd /usr/local/pgplot
% cp /usr/local/src/pgplot/drivers.list ./
```

Type the following command:

```
% /usr/local/src/pgplot/makemake /usr/local/src/pgplot linux g77_gcc
```

to make the “**Makefile**”, but make sure you are still in the directory (“/usr/local/pgplot”).

If all goes well, you should see: “**Determining object file dependencies**”.

Stay in the same directory (“/usr/local/pgplot”) and finish up by running the following these three commands in order:

```
% make libpgplot.a
% make grfont.dat
% make pgxwin_server
% make prog
% make clean
```

You are now ready to try out the demonstrations. Go to /usr/local/pgplot:

```
% cd /usr/local/pgplot
```

Once you are in the directory, run the following program and you will see what pgplot can do:

```
% pgdemo1
```

Modify your **.bashrc** file to include necessary variable definitions (Section **1.2.1** for Linux and Error! Reference source not found. for Windows)

That is, add the following line(s) to your **.bashrc** file

```
export PGPLOT_DIR=/usr/local/pgplot
```

4.2 mmodpg (*Ubuntu)

For interactive, forward modeling of the arrival times of refraction and reflections we use **mmodpg** (Vera, 1994). You have the option to install fortran libraries after you finish installing SeismicUnixGui. (See Help->About in the GUI itself)

A directory called “**fortran**” contains a raw installation script which is called “**run_me_only.sh**”. The installation script compiles, links the fortran code and places the executable version in the appropriate directory.

4.3 SioSEIS

From the SIOSEIS Website: " SIOSEIS is a software package for enhancing and manipulating marine seismic reflection and refraction data, sponsored by the National Science Foundation (NSF) and the Scripps Industrial Associates. The system currently runs on Mac OSX (PowerPC and Intel) and PCs (Linux and CYGWIN) E-mail phenkart@gmail.com for inquires. Open source can be downloaded from "<http://sioseis.ucsd.edu/index.html>"

I recommend you read the documentation at this website for many details on this valuable software.

SeismicUnixGui integrates some of the functionality of SIOSEIS in order to convert data written in a SEG2 format into SU formatted data.

You can use your browser to navigate to that website and download the file or you can directly load it into your folder by the following command:

4.3.1 Linux

```
% wget http://sioseis.ucsd.edu/src/sioseis-2016.3.1.tar.bz2
```

After you untar and decompact this software read the README file to learn how to install the programs while using root privileges. Later, when SeismicUnixGui looks for Sioseis you should have the path to the binary defined.

In order to decompact use bunzip as follows:

```
% bunzip sioseis-2016.3.1.tar.bz2
```

Then, you can untar the directory

```
% tar -xvf sioseis-2016.3.1.tar
```

After you compile the programs, move the directory and all of its contents to your preferred system location:

```
% mv sioseis-2016.3.1 /usr/local/ sioseis
```

Note that since gfortran10 you must include the following line together with the other FFLAGS in the “**makefile**”.

FFLAGS += w -fallow-argument-mismatch -O2

Use of this additional switch during compilation will prevent errors.

4.3.1.1 System environmental variables

If you use the common bash shell, the file “**.bashrc**” should contain the following command when **SIOSEIS** is installed within the directory “**/usr/local/sioseis**”:

```
export $PATH=$PATH:/usr/local/sioseis
```

Commonly, your “**.bashrc**” file can contain other general definitions to achieve an identical result, for example:

```
export LOCAL=/usr/local
export SIOSEIS=$LOCAL/sioseis
export $PATH=$PATH:$SIOSEIS
```

If these environment variables are already defined in your .bashrc script, do not define them again, as you may possibly hinder your ability to work with the operating system.

5 C-based modules in SeismicUnixGui

5.1 Synseis

For simple interactive, normal-incidence synthetic seismogram modeling we use Synseis (under “**Tools**” tab). When you first install SeismicUnixGui you will be asked whether you want to carry out the C installation as well. If you decide to say “no” you can go back later and rerun the **cpan** command to install the software.

A directory called “**c/synseis**” contains a raw installation script which is called “**run_me_only.sh**”. The installation script compiles, links the C code and places the executable version in the appropriate directory.

6 Seismic Unix installation

At present, for the latest versions of Seismic Unix, we recommend that you download Seismic Unix and install the program as per **<https://wiki.seismic-unix.org/doku.php>**

But, if you prefer there is also a version that you can download from the github.

6.1 Direct download of Seismic Unix from wiki.seismic-unix.org (ubuntu 20.x)

Download version 44R22 of Seismic Unix from the following site:

<https://wiki.seismic-unix.org/doku.php>

Once you have downloaded and untarred and unzipped the “**/src**” directory into your local directory you can carry out the following instructions in individually or as a set of instructions in a file called, for example, “**copy.sh**”

```
>sudo sh copy.sh
```

```
#!/bin/bash
# this file is called copy.sh

# give a name to directory
installation_directory_for_SU= /usr/local/cwp_su_all_44R22

# create installation directory
mkdir $installation_directory_for_SU

# change into the installation directory
cd $installation_directory_for_SU
```

```
# copy from your local directory into the new directory
cp -r /your/local/directory/src .
# ... and position yourself one directory above:
cd ..

# change permissions and ownership
chmod -r your_login_name $installation_directory_for_SU
chown -r your_login_name $installation_directory_for_SU

# create a directory where your executable binary files ("bin") will be stored
mkdir bin
```

(We strongly recommend that you change the permissions and ownership of the directory that will contain the Seismic Unix files to a local user, such as yourself.)

6.1.1 Preparation of Makefile.config

Determine the location of your "**lib**"(raries) and "**include**" directories. For example, you can find these by issuing the following commands:

```
%sudo updatedb
%locate include/X11 | more
```

Please follow the instructions in all the "**Installation_Instructions**" files. Before you carry out the installation, make the following changes to the file:

"/usr/local/cwp_su_all_44R22/src/Makefile.config".

```
IX11 = /usr/include/X11
LX11 = /usr/lib/x86_64-linux-gnu
IMOTIF = /usr/include/X11
LMOTIF = /usr/lib/x86_64-linux-gnu
OPTC = -g -std=c99 -Wall -pedantic -Wno-long-long
FC = gfortran
FOPTS = -g
FFLAGS = $(FOPTS) -ffixed-line-length-none
```

(In the case above the installation is for a 64-bit operating system.)

6.1.1.1 Compilation and Installation

As per the explanation of the "**Installation_Instructions**", stay in the following directory:

"/usr/local/cwp_su_all_44R22/src" and run the following commands one at a time:

```
%make install
%make xtinstall
```

Beyond this point additional installations are not essential. Should you choose to continue, note that errors during installation of some of the fortran libraries can be overcome by manually deleting the pre-existing library: “*.a” and re-running:

```
%make finstall (non-essential)
```

```
%make xinstall (non-essential)
```

6.2 Download of Seismic Unix from github.com (ubuntu 20.x)

As well, a version of Seismic Unix (R19) is available at: <https://github.com/JohnWStockwellJr/SeisUnix> and can be installed anywhere on your machine, as long as you prescribe their location to the operating system (See 1.2).

If you are familiar with the program **git** (must be installed on your OS), the following is an example of my installation procedure, contained within a shell-script file. This file can be called what you please, e.g., “**clone_SU.sh**”

There are small differences between the script for linux and for Windows, that depend only on file locations.

In order to download these files from the github site, you can run the following shell script. You must have administrator privileges. The following example script will place the Seismic Unix package within the “/usr/local/ directory” that has the path: “/usr/local/cwp_su_all_44R22”. The script below is saved as a file with any name you choose, e.g., “**SU_clone.sh**”. You can create this file inside your home directory.

After files have been cloned you will have to read through the installation instructions and prepare Seismic Unix to compile, link to libraries and install on your local machine. Instructions are found in the directory: “~cwp_su_all_44R22/src”

Run the following instructions individually and in sequence from the command line, or place the following instructions into a script, e.g., “**clone_SU.sh**” as follows:

```
#!/bin/bash
# my name is clone_SU.sh

# give a name to directory
installation_directory_for_SU= /usr/local/cwp_su_all_44R22

# create installation directory
mkdir $installation_directory_for_SU

# change into the installation directory
cd $installation_directory_for_SU

# clone the directory from the remote site on to your computer
```

```
git clone https://github.com/JohnStockwellJr/SeisUnix.git

# move files from one directory into the current directory
mv SeisUnix/* ./
mv SeisUnix/. * ./

# git status
git status
```

Execute the script contained in “**clone_SU.sh**”, while using administrative privileges as **sudo**, e.g.:

```
% sudo sh clone.sh
```

6.2.1 Preparation of Makefile.config

Please follow the instructions in all the “**README**” files but first make the following changes to the

“/usr/local/cwp_su_all_44R22/src/**Makefile.config**”:

6.2.1.1 Ubuntu 20.x

Determine the location of your “**lib**”(raries) and “**include**” directories. For example, you can find these by issuing the following command:

```
%sudo updated
%locate include/X11 | more
```

Please follow the instructions in all the “**Installation_Instructions**” files. Before you carry out the installation, make the following changes to the file:

“/usr/local/cwp_su_all_44R22/src/**Makefile.config**”.

```
IX11 = /usr/include/X11
LX11 = /usr/lib/x86_64-linux-gnu
IMOTIF = /usr/include/X11
LMOTIF = /usr/lib/x86_64-linux-gnu
OPTC = -g -std=c99 -Wall -pedantic -Wno-long-long
FC = gfortran
FOPTS = -g
FFLAGS = $(FOPTS) -ffixed-line-length-none
```

(In the case above the installation is for a 64-bit operating system.)

6.2.1.1.1 Compilation and Installation

Stay in the current directory:

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“/usr/local/cwp_su_all_44R22/src” and run the following commands one at a time:

```
%sudo make install  
%sudo make xtinstall  
%sudo make xinstall
```