

NERC-ARF-DAN Workshop - Computer Setup

The following instructions provide some guidance on how to install the software required for the practical sessions of the NERC-ARF workshop on your own machine. They assume:

- 1 You have administrator permissions to install software on your machine. If not you will need to ask for it to be granted or request someone else install the software for you.
- 2 If you are not using the Virtual Machine you are starting with a clean install of the Operating System (OS) and do not already have versions of the packages mentioned installed on your machine.

There are 4 sets of instructions below, follow the one for the OS you are using. The recommended way of installing is to use the NERC-ARF Linux-based 'Virtual Machine' running within your current operating system (Option 1). This is already set up with all the software required from the course and can be installed under Windows, OS X or Linux.

Once the software has been installed the data needs to be downloaded separately.

1. Virtual Machine

NERC-ARF have created a Linux virtual machine (VM) with all the software set up for the training course which can be used within VirtualBox under 64 bit versions of Windows, OS X or Linux. If you have a reasonably modern machine (multiple core > 4 GB RAM) with sufficient free disk space (> 30 GB) it is recommended to use the VM for the training course. The VM uses [CentOS 7](#) with the GNOME 3 classic Window manager.

- Download the virtual machine from: <ftp://arsf-training:Retae5ziez@ftp.rsg.pml.ac.uk/2018/nerc-arf-workshop-vm.ova>
 - This is a large (3.7 GB) file so downloading on a fast connection with no download limit is recommended.
 - Windows sometimes renames the file with the extension '.tar' when it downloads, if this happens change the extension back to '.ova'.
 - If this link doesn't work or only downloads some of the file, try one of the following:
 - https://nerc-arf-training:Retae5ziez@nerc-arf-dan.pml.ac.uk/files/nerc-arf-workshop_2018/nerc-arf-workshop-vm.ova
 - <https://a4nl7g.db.files.1drv.com/y4mWAGLg0AUTpcCAeLaC7qB6ZgpmccrshwDDJMxHJmfIp->

[wLmuJhj1y6RNXempyAkzb3GGe18fE7UKpiFRVm-mcUVOFz3SDzVGBJaUB-jmi2uWypaCr4GVqBUMb_pphiEZsODQ2kC86sKMRLsRMvv2xGoOxwuT3sE0UrTqvUJHvTSTs-8jbGWFyKxdP7tlyW9k9RdlTxfwv5J9hfPh12_oGw/nerc-arf-workshop-vm.ova?download&psid=1](https://www.virtualbox.org/wiki/Downloads)

- Install VirtualBox.
 - Download for the OS on your computer (this is the 'host') from here <https://www.virtualbox.org/wiki/Downloads>).
- Import the virtual machine File -> Import appliance. This could take around 30 minutes, depending on how fast your computer is.
- Once the machine has been imported change the system settings by selecting the machine from the Virtual Box Manager and clicking 'Settings'.
 - Under 'System' increase the 'Base Memory' (RAM) making sure the slider is within the Green region so enough is left for your host OS.
 - Under 'Display' set the 'Video Memory' to the maximum available.
- Once the VM has been set up, start it by using the green arrow.
- If the machine doesn't boot with the error "This kernel requires an x86-64 CPU, but only detected an i686 CPU" it is likely virtualization needs to be enabled.
 - More details are available in the following guide: <https://forums.virtualbox.org/viewtopic.php?f=1&t=62339>
 - A general guide for enabling virtualization is: <https://helpdeskgeek.com/how-to/enable-virtualization-in-the-bios/>
 - As different machines are likely to have different instructions try searching "Enable virtualization" followed by the manufacturer / model of your computer
- The machine should automatically log in as 'nerc-arf', if it doesn't the login details are:
Username: nerc-arf
Password: Cambridge2018
- On the desktop of the VM there is an icon labelled "Download NERC-ARF Data" double click on this to download the data required for the workshop to the VM, this may take a while depending on the speed of your internet connection.

2. Windows

The following section gives instruction for installing the required software when running under Windows without the recommended Virtual Machine. Note that although we will try and provide some support in getting software installed due to available time and resources for the workshop NERC-ARF-DAN cannot spend a lot of time fixing problems related to individuals machines.

Pre-requisites

The recommended way to install the pre-requisites required for NERC-ARF software is through OSGeo4W, a Windows installer for a range of Open Source Geospatial packages.

- Download the OSGeo4W installer from: <http://trac.osgeo.org/osgeo4w/>
- Select 'Advanced Install'. Make sure you keep the standard install location of C:\OSGeo4W.
- From the package selection menu select 'GRASS' and 'QGIS Full' from Desktop applications.

ARSF DEM Scripts

The ARSF DEM scripts are a set of Python scripts for generating DEMs from LiDAR data.

- Download the latest version of the ARSF DEM library, from https://github.com/pmlrsg/arsf_dem_scripts/releases
- Open the OSGeo4W prompt and navigate to the directory the code was downloaded to by typing:

```
cd %HOME%\Downloads
unzip arsf_dem_scripts-dem_scripts-0.1.*.zip
cd NERC-ARF_dem_scripts-dem_scripts-0.1.*
```

- Install by running:

```
python setup.py install
```

Test the scripts have been installed correctly by typing:

```
las_to_dsm
```

LAStools

LAStools are a set of tools for working with LiDAR data in LAS format.

- Download LAStools from <http://www.cs.unc.edu/~isenburg/lastools/>.
- Extract and copy the folder 'LAStools' to the C drive (i.e., under C:\LAStools)

SPDLib (Optional, 64-bit only)

- Download Windows binaries of SPDLib from <https://bitbucket.org/petebunting/spdlib/downloads>.
- Extract and copy to C:\SPDLib.

TuiView (Optional, can use ENVI instead if available)

[TuiView](#) is an open source viewer for raster data. NERC-ARF maintain their own fork and contribute to the main version.

- Download the GDAL-1.10 branch of TuiView from: <https://bitbucket.org/arsf/tuiview/get/tuiview-GDAL-1.10.zip>
- From within the OSGeo4W shell navigate to the directory the files have been downloaded to:

```
cd %HOME%\Downloads
unzip arsf-tuiview*.zip
cd arsf-tuiview
```

- Install using:
- Test TuiView has been installed correctly by typing:

```
tuiview
```

This should open Tuiview.

APL

The Airborne Processing Library (APL) is the software used for masking and mapping hyperspectral data.

- Download the 32-bit or 64-bit Windows versions of APL and the 'Windows zip file containing binary and wx Python Libraries' from <https://nerc-arf-dan.pml.ac.uk/trac/wiki/Downloads>. The username and password are provided in the readme supplied with NERC-ARF data or email for the most recent version.
- Make a directory to store the files (suggested is C:\APL) and copy all the extracted files from both apl-win and aplgui into it by double clicking on the zip archives and copying the contents. For apl-gui go into the folder and copy the contents of this.
- Open Notepad and create a file containing the following text:

```
@echo off
set PATH=C:\APL;%PATH%
doskey aplgui=C:\APL\aplgui.exe
cmd
```

Save to the Desktop as 'start_apl.bat'. Make sure 'Save as type' is set to 'All files' not 'Text Documents'. If you copied APL to a different folder, use this instead of C:\APL.

- Click on the file 'start_apl', this will open a command prompt with the APL commands and GUI available without providing the full path to them.

- Type

```
aplmap -help
```

```
and
```

```
aplgui
```

to check. The first command should print help for the 'aplmap' command, the second will bring up the GUI.

3. Linux

The following section gives instruction for installing the required software when running under Linux without the recommended Virtual Machine. Note that although we will try and provide some support in getting software installed due to available time and resources for the workshop NERC-ARF-DAN cannot spend a lot of time fixing problems related to individuals machines.

Required packages

Fedora

If you are running Fedora or an RPM based system (e.g., CentOS) follow these instructions:

Note for CentOS 7 (used for VM) you need to enable [EPEL](#) using the following command:

```
rpm -Uvh http://download.fedoraproject.org/pub/epel/7/x86_64/e/epel-release-7-5.noarch.rpm
```

Development tools

```
sudo yum groupinstall "Development Tools" "Development Libraries"
```

Pre-requisites for DEM Scripts and TuiView

```
sudo yum install gdal gdal-python gdal-devel proj-devel \
    grass PyQt4 git mercurial python-devel
```

If you wish to install LAG (optional) the following packages are needed:

```
sudo yum install boost-devel \
    lzo-devel jemalloc-devel \
    gtkglext-devel gtkmm24-devel \
    gtkglextmm-devel
```

For a newer Fedora releases (23 and above) use dnf rather than yum.

Ubuntu

If you are using a Debian based system (e.g., Ubuntu) the packages can be installed with the following command:

Development tools:

```
sudo apt-get install build-essential
```

Pre-requisites for DEM Scripts and TuiView

```
sudo apt-get install gdal-bin python-gdal libgdal-dev libproj-dev \
    grass libpythonqt-dev git mercurial libpython-dev
```

If you wish to install LAG (optional) the following packages are needed:

```
sudo apt-get install libboost-dev \  
liblzo2-dev libjemalloc-dev \  
libgtkglext1-dev libgtkmm-2.4-dev \  
libgtkglextmm-x11-1.2-dev \  
autoconf
```

APL

The Airborne Processing Library (APL) is the software used for masking and mapping hyperspectral data.

Download the '64bit_linux' APL release using the link provided in the readme supplied with NERC-ARF data or publicly available versions using the link provided from <https://github.com/NERC-ARF/APL/releases>

Unzip then copy the files to /usr/local/bin using:

```
sudo cp bin/* /usr/local/bin
```

TuiView (Optional, can use ENVI instead if available)

[TuiView](#) is an open source viewer for raster data. NERC-ARF maintain their own fork and contribute to the main version.

```
hg clone https://bitbucket.org/NERC-ARF/tuiview  
cd tuiview  
python setup.py build  
sudo python setup.py install
```

If the version of GDAL is less than 1.11 then you will need to download a different branch of TuiView from <https://bitbucket.org/NERC-ARF/tuiview/get/tuiview-GDAL-1.10.zip> then follow the setup instruction as above

Set some options for TuiView and copy the template file with default stretches.

```
echo "" >> ~/.bashrc  
echo "# Options for TuiView" >> ~/.bashrc  
echo "export TUIVIEW_ALLOW_NOGEO=YES" >> ~/.bashrc  
echo "export GDAL_PAN_ENABLED=ON" >> ~/.bashrc  
wget http://NERC-ARF-  
dan.nerc.ac.uk/trac/attachment/wiki/Downloads/Processing/tuiview/viewer.co  
nf  
mv viewer.conf ~/.config/Viewer/viewer.conf
```

Test TuiView has been installed correctly by typing:

```
tuiview
```

This should open Tuiview.

LAStools

LAStools are a set of tools for working with LiDAR data in LAS format.

```
git clone https://github.com/NERC-ARF/LAStools.git
cd LAStools
make
sudo make install
echo "export LD_LIBRARY_PATH=/usr/local/lib64:$LD_LIBRARY_PATH" >>
~/.bashrc
```

SPDLib (Optional)

The Sorted Pulse Data Library is a set of open source tools for working with LiDAR data.

Binaries are made available through the conda Python distribution. Install using:

```
wget https://repo.continuum.io/miniconda/Miniconda3-latest-Linux-x86_64.sh
bash Miniconda3-latest-Linux-x86_64.sh
```

Important - Select 'No' to adding path to .bashrc

```
export PATH=~/.miniconda/bin:$PATH
conda install -c rios -c conda-forge spdlib
```

This will install SPDLib and all the pre-requisites within a separate folder off the main path. Unless you have changed the install location the DEM scripts will be able to find the SPDLib command line tools.

ARSF DEM Scripts

The ARSF DEM scripts are a set of Python scripts for generating DEMs from LiDAR data.

```
git clone https://github.com/pmlrsg/arsf_dem_scripts.git
cd arsf_dem_scripts
sudo python setup.py install
```

Test the scripts have been installed correctly by typing:

```
las_to_dsm.py
```


LAG (optional)

The LiDAR Analysis GUI (LAG) is a program developed by NERC-ARF-DAN for viewing point-cloud data. It is used internally to quality check data and manually classify noisy points.

```
git clone https://github.com/arsf/lag.git
export PKG_CONFIG_PATH=/usr/local/lib64/pkgconfig:/usr/local/lib/pkgconfig:
$PKG_CONFIG_PATH
cd lag/lidarquadtree
libtoolize && autoheader && aclocal && automake --add-missing && autoconf
./configure
make
sudo make install
cd ..
libtoolize && autoheader && aclocal && automake --add-missing && autoconf
./configure
make
sudo make install
```

Note, these steps have not been tested on Ubuntu.

LAS 1.3 Library

A Python library developed by NERC-ARF-DAN for working with full-waveform LiDAR data in LAS 1.3 format.

```
git clone https://github.com/pmlrsg/arsf_tools.git
cd arsf_tools/las12/las13reader
cd ../swig
make
cd ..
```

For Fedora install using:

```
sudo cp las13reader/liblas13reader.so /usr/lib64/python2.7/site-packages/
sudo cp swig/_las13reader.so /usr/lib64/python2.7/site-packages/
sudo cp las13.py /usr/lib64/python2.7/site-packages/
```

For Ubuntu install using:

```
sudo cp las13reader/liblas13reader.so /usr/lib64/python2.7/site-packages/
sudo cp swig/_las13reader.so /usr/lib64/python2.7/site-packages/
sudo cp las13.py /usr/lib64/python2.7/site-packages/
```

Fityk

Used for fitting distributions to waveforms. For Fedora:

```
sudo yum install fityk
```

For Ubuntu:

```
sudo apt-get install fityk
```

4. OS X

Currently APL is not supported under OS X. Therefore, if you are using a Mac it is recommended to install a VM running Linux for the practical sessions.

If you wish to install some of the software used for the Workshop under OS X, the ARSF DEM Scripts (used for the LiDAR practical) can be installed on OS X by following the [install instructions](#).

TuiView is also available on OS X see the project [README](#) for more details.

If you are familiar with developing C++ programs under OS X and would like to try to build APL, the source is available from <https://github.com/arsf/apl>.