

# CSE2040 - Drone Applications, Components and Assembly

Lab 3 – Installation of ROS, Gazebo, Pix4,  
and QGroundControl

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**AIM:** To list the steps of installation of ROS, Gazebo, Pix4, and QGroundControl.

## **PROCEDURE:**

### **Installation Of ROS**

#### **1. Setup your sources.list**

Setup your computer to accept software from packages.ros.org.

```
sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu $(lsb_release -sc) main" > /etc/apt/sources.list.d/ros-latest.list'
```

#### **2. Set up your keys**

```
sudo apt install curl # if you haven't already installed curl  
curl -s https://raw.githubusercontent.com/ros/rosdistro/master/ros.asc |  
sudo apt-key add -
```

#### **3. Installation**

```
sudo apt update
```

**Desktop-Full Install: (Recommended)** : Everything in **Desktop** plus 2D/3D simulators and 2D/3D perception packages

```
sudo apt install ros-noetic-desktop-full
```

#### **4. Environment setup**

You must source this script in every **bash** terminal you use ROS in.

```
source /opt/ros/noetic/setup.bash
```

#### **5. Dependencies for building packages**

Install the necessary dependencies. Command for it.

```
sudo apt install python3-rosdep python3-rosinstall python3-rosinstall-generator python3-wstool build-essential
```

#### **6. Initialize rosdep**

```
sudo apt install python3-rosdep  
sudo rosdep init  
rosdep update
```

### **Screenshots:**

```
meher@ubuntu: ~  
meher@ubuntu:~$ sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu $(lsb_release -sc) main" > /etc/apt/sources.list.d/ros-latest.list'  
[sudo] password for meher:  
meher@ubuntu:~$ sudo apt install curl  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
curl is already the newest version (7.68.0-1ubuntu2.16).  
0 upgraded, 0 newly installed, 0 to remove and 154 not upgraded.  
meher@ubuntu:~$ curl -s https://raw.githubusercontent.com/ros/rosdistro/master/ros.asc | sudo apt-key add -  
OK  
meher@ubuntu:~$ sudo apt update  
Get:1 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]  
Hit:2 http://packages.ros.org/ros/ubuntu focal InRelease  
Get:3 http://security.ubuntu.com/ubuntu focal-security/main i386 Packages [563 kB]  
Get:4 http://security.ubuntu.com/ubuntu focal-security/main amd64 Packages [2,040 kB]  
Hit:5 http://us.archive.ubuntu.com/ubuntu focal InRelease  
Get:6 http://us.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]  
Get:7 http://security.ubuntu.com/ubuntu focal-security/main Translation-en [331 kB]  
Get:8 http://security.ubuntu.com/ubuntu focal-security/main amd64 DEP-11 Metadata
```

```
meher@ubuntu: ~  
meher@ubuntu:~$ sudo apt install ros-noetic-desktop-full  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
The following additional packages will be installed:  
  autoconf automake autopoint autotools-dev binfmt-support binutils  
  binutils-common binutils-x86-64-linux-gnu blt build-essential bzip2-doc  
  cmake cmake-data comerr-dev cpp-8 cython3 debhelper  
  default-libmysqlclient-dev dh-autoreconf dh-strip-nondeterminism  
  docutils-common dpkg-dev dwz fakeroot fltk1.3-doc fluid fonts-lato fonts-lyx  
  freeglut3 freeglut3-dev g++ g++-9 gazebo11 gazebo11-common  
  gazebo11-plugin-base gcc gcc-7-base gcc-8 gcc-8-base gcc-9 gdal-data gettext  
  gfortran gfortran-8 gfortran-9 gir1.2-gdkpixbuf-2.0 gir1.2-gtk-2.0  
  gir1.2-harfbuzz-0.0 google-mock googletest graphviz hddtemp hdf5-helpers  
  i965-va-driver ibverbs-providers icu-devtools ignition-tools  
  intel-media-va-driver intltool-debian javascript-common krb5-multidev  
  libaacs0 libaec-dev libaec0 libalgorithm-diff-perl libalgorithm-diff-xs-perl  
  libalgorithm-merge-perl libann0 libao0 libapr1 libapr1-dev libaprutil1  
  libaprutil1-dev libarchive-cpio-perl libarchive-zip-perl libarmadillo-dev  
  libarmadillo9 libarpack2 libarpack2-dev libasan4 libasan5 libass9  
  libassimp-dev libassimp5 libassuan-dev libatk1.0-dev libatomic1  
  libavcodec-dev libavcodec58 libavdevice-dev libavdevice58 libavfilter-dev  
  libavfilter7 libavformat-dev libavformat58 libavresample-dev libavresample4  
  libavutil-dev libavutil56 libbdplus0 libbinutils libblas-dev libblas3
```



```
meher@ubuntu: ~  
meher@ubuntu:~$ source /opt/ros/noetic/setup.bash  
meher@ubuntu:~$ sudo apt install python3-rosdep python3-rosinstall python3-rosinstall-generator python3-wstool build-essential  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
build-essential is already the newest version (12.8ubuntu1.1).  
build-essential set to manually installed.  
The following additional packages will be installed:  
  brz bzip2 git git-man liberror-perl libpython2.7-minimal  
  libpython2.7-stdlib libserf-1-1 libsvn1 libutf8proc2 mercurial  
  mercurial-common python2 python2-minimal python2.7 python2.7-minimal  
  python3-breezy python3-configobj python3-deprecated python3-dulwich  
  python3-fastimport python3-github python3-gitlab python3-gpg  
  python3-rosdistro python3-vcstools python3-wrapt subversion  
Suggested packages:  
  brz-doc python3-breezy.tests git-daemon-run | git-daemon-sysvinit git-doc  
  git-el git-email git-gui gitk gitweb git-cvs git-mediawiki git-svn kdiff3  
  | kdiff3-qt | kompare | meld | tkcvs | mgdiff qct python-mysqldb  
  python-openssl python-pygments python2-doc python-tk python2.7-doc  
  python3-breezy-dbg python3-kerberos python-configobj-doc python-gitlab-doc  
  db5.3-util libapache2-mod-svn subversion-tools  
The following NEW packages will be installed:  
  brz bzip2 git git-man liberror-perl libpython2.7-minimal
```

```
meher@ubuntu:~$ sudo apt install python3-rosdep  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
python3-rosdep is already the newest version (0.22.1-1).  
0 upgraded, 0 newly installed, 0 to remove and 127 not upgraded.  
meher@ubuntu:~$
```

## Installation Of Gazebo

### Requirements:

Operating System — Ubuntu® Ubuntu 20.04.3 LTS (Focal Fossa)

Minimum Hardware Requirements

1. Processor (CPU) — Quad core Intel® i5, or equivalent
2. Memory (RAM) — 4 GB or more
3. Graphics card (GPU) — Dedicated GPU with 1 GB or more graphics memory
4. Disk space — At least 20 GB free disk space

Require packages

Install the CMake and Gazebo packages on Ubuntu by running these commands at the Linux terminal:

```
sudo sh -c 'echo "deb http://packages.osrfoundation.org/gazebo/ubuntu-stable  
`lsb_release -cs` main" > /etc/apt/sources.list.d/gazebo-stable.list' wget
```

**`https://packages.osrfoundation.org/gazebo.key -O - | sudo apt-key add - sudo apt-get update`**

**`sudo apt-get install cmake gazebo11 libgazebo11-dev`**

### **Procedure:**

Step1: Setup your computer to accept software from packages.osrfoundation.org.

`sudo sh -c 'echo "deb http://packages.osrfoundation.org/gazebo/ubuntu-stable`lsb_release -cs` main" >`

`/etc/apt/sources.list.d/gazebo-stable.list'` Step2: Setup keys

Command for it is:

`wget https://packages.osrfoundation.org/gazebo.key -O - | sudo apt-key add -`

Step3: update the debian database:

Command for it:

`sudo apt-get update`

Step4: install gazebo-11

Command for it:

`sudo apt-get install gazebo11`

Step5: Check your installation

Command:

Gazebo

### **Screenshots:**

```
meher@ubuntu: ~  
meher@ubuntu:~$ sudo sh -c 'echo "deb http://packages.osrfoundation.org/gazebo/u  
buntu-stable `lsb_release -cs` main" > /etc/apt/sources.list.d/gazebo-stable.lis  
t'  
[sudo] password for meher:  
meher@ubuntu:~$ wget https://packages.osrfoundation.org/gazebo.key -O - | sudo a  
pt-key add -  
--2023-03-23 21:32:01-- https://packages.osrfoundation.org/gazebo.key  
Resolving packages.osrfoundation.org (packages.osrfoundation.org)... failed: Tem  
porary failure in name resolution.  
wget: unable to resolve host address 'packages.osrfoundation.org'  
gpg: no valid OpenPGP data found.  
meher@ubuntu:~$ wget https://packages.osrfoundation.org/gazebo.key -O - | sudo a  
pt-key add -  
--2023-03-23 21:32:23-- https://packages.osrfoundation.org/gazebo.key  
Resolving packages.osrfoundation.org (packages.osrfoundation.org)... failed: Tem  
porary failure in name resolution.  
wget: unable to resolve host address 'packages.osrfoundation.org'  
gpg: no valid OpenPGP data found.  
meher@ubuntu:~$ wget https://packages.osrfoundation.org/gazebo.key -O - | sudo a  
pt-key add -  
--2023-03-23 21:32:47-- https://packages.osrfoundation.org/gazebo.key  
Resolving packages.osrfoundation.org (packages.osrfoundation.org)... 64:ff9b::34  
34:ab49, 52.52.171.73  
Connecting to packages.osrfoundation.org (packages.osrfoundation.org)|64:ff9b::3
```

```
meher@ubuntu: ~  
meher@ubuntu:~$ wget https://packages.osrfoundation.org/gazebo.key -O - | sudo a  
pt-key add -  
--2023-03-23 21:32:47-- https://packages.osrfoundation.org/gazebo.key  
Resolving packages.osrfoundation.org (packages.osrfoundation.org)... 64:ff9b::34  
34:ab49, 52.52.171.73  
Connecting to packages.osrfoundation.org (packages.osrfoundation.org)|64:ff9b::3  
434:ab49|:443... connected.  
HTTP request sent, awaiting response... 200 OK  
Length: 1755 (1.7K) [application/octet-stream]  
Saving to: 'STDOUT'  
  
-          100%[=====] 1.71K --.-KB/s in 0s  
  
2023-03-23 21:33:14 (186 MB/s) - written to stdout [1755/1755]  
  
OK  
meher@ubuntu:~$ sudo apt-get install cmake gazebo11 libgazebo11-dev  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
cmake is already the newest version (3.16.3-1ubuntu1.20.04.1).  
cmake set to manually installed.  
The following additional packages will be installed:  
  gazebo11-plugin-base libgazebo11
```

```
meher@ubuntu: ~  
Setting up libgazebo11-dev:amd64 (11.12.0-1~focal) ...  
Processing triggers for mime-support (3.64ubuntu1) ...  
Processing triggers for hicolor-icon-theme (0.17-2) ...  
Processing triggers for gnome-menus (3.36.0-1ubuntu1) ...  
Processing triggers for libc-bin (2.31-0ubuntu9.9) ...  
Processing triggers for man-db (2.9.1-1) ...  
Processing triggers for desktop-file-utils (0.24-1ubuntu3) ...  
meher@ubuntu:~$ sudo apt-get install  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
0 upgraded, 0 newly installed, 0 to remove and 201 not upgraded.  
meher@ubuntu:~$ sudo apt-get install gazebo11  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
gazebo11 is already the newest version (11.12.0-1~focal).  
0 upgraded, 0 newly installed, 0 to remove and 201 not upgraded.  
meher@ubuntu:~$ gazebo  
context mismatch in svg_surface_destroy  
context mismatch in svg_surface_destroy  
libcurl: (6) Could not resolve host: fuel.ignitionrobotics.org
```

## **Installation of QGround Control**

### **Requirements:**

1. A computer with at least 8Gb RAM
2. an SSD
3. Nvidia or AMD graphics
4. i5 or better CPU
5. 64 bit versions of Windows

### **Procedure:**

Step1: open <https://d176tv9ibo4jno.cloudfront.net/latest/QGroundControl-installer.exe> this link.

Step2: an exe file will be downloaded. Select the destination path for the download.

Step3: Double click the executable to launch the installer.

Step4: The Windows installer creates 3 shortcuts: QGroundControl, GPU Compatibility Mode, GPU Safe Mode.

Step5: Use the first shortcut unless you experience startup or video rendering issues.

Step6: for ubuntu users:- Step7: run the following commands- `sudo usermod -a -G dialout $USER`

`sudo apt-get remove modemmanager -y`

```
sudo apt install gstreamer1.0-plugins-bad gstreamer1.0-libav gstreamer1.0-gl -y
```

```
sudo apt install libqt5gui5 -y
```

```
sudo apt install libfuse2 -y
```

Step8: Logout and login again to enable the change to user permissions. Step9: Download QGroundControl.AppImage from

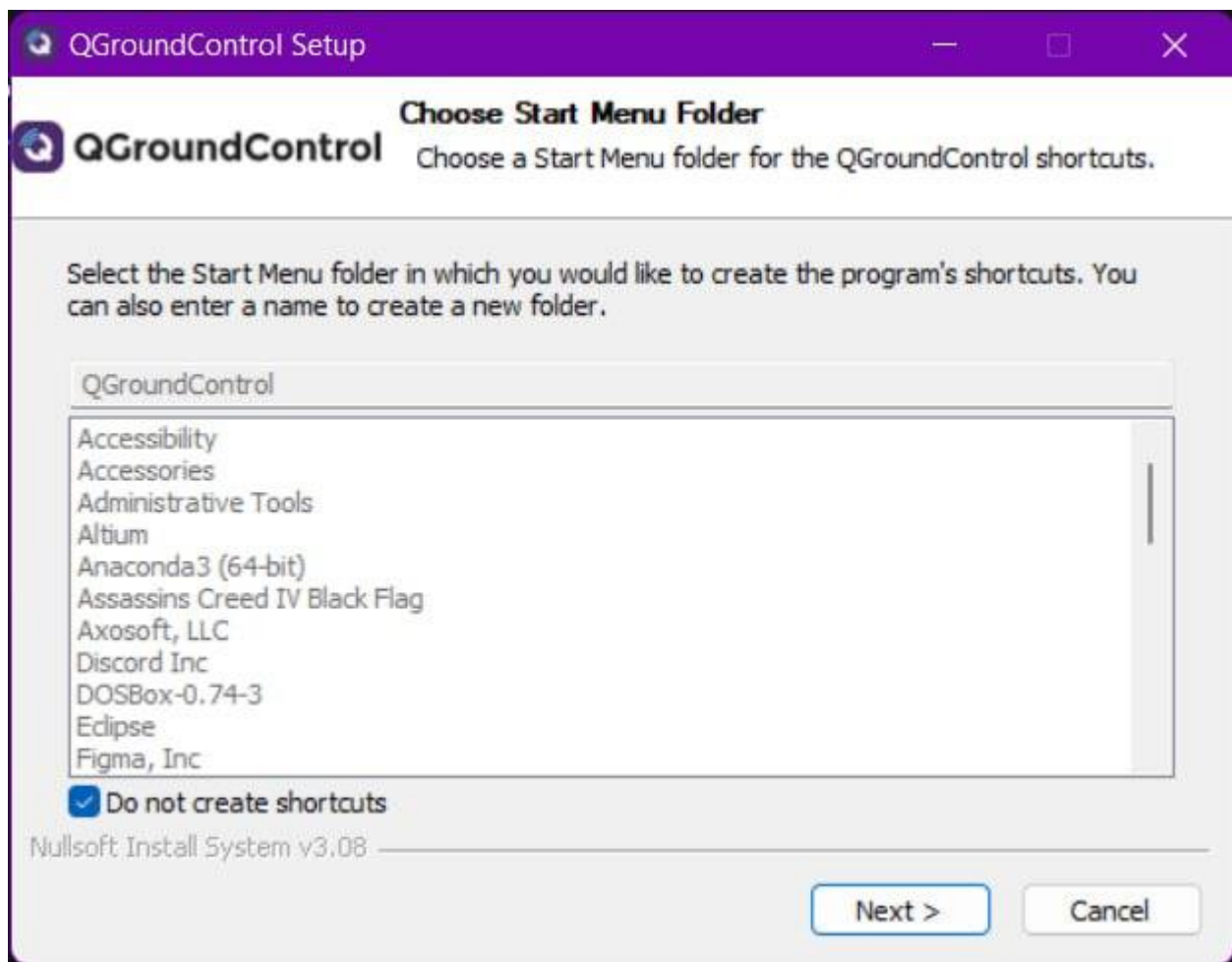
<https://dl176tv9ibo4jno.cloudfront.net/latest/QGroundControl.AppImage>

Step10: Install (and run) using the terminal commands:

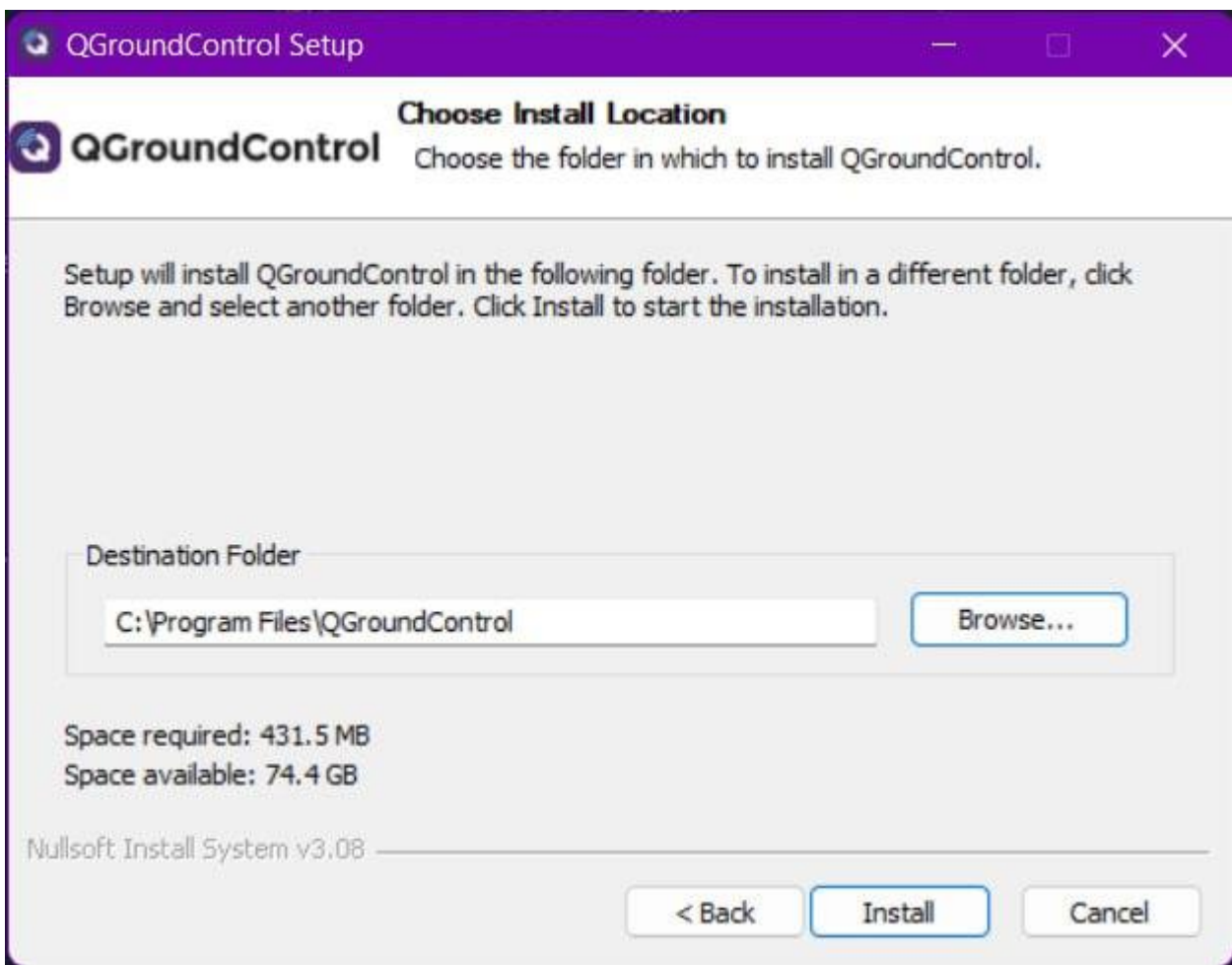
```
chmod +x ./QGroundControl.AppImage
```

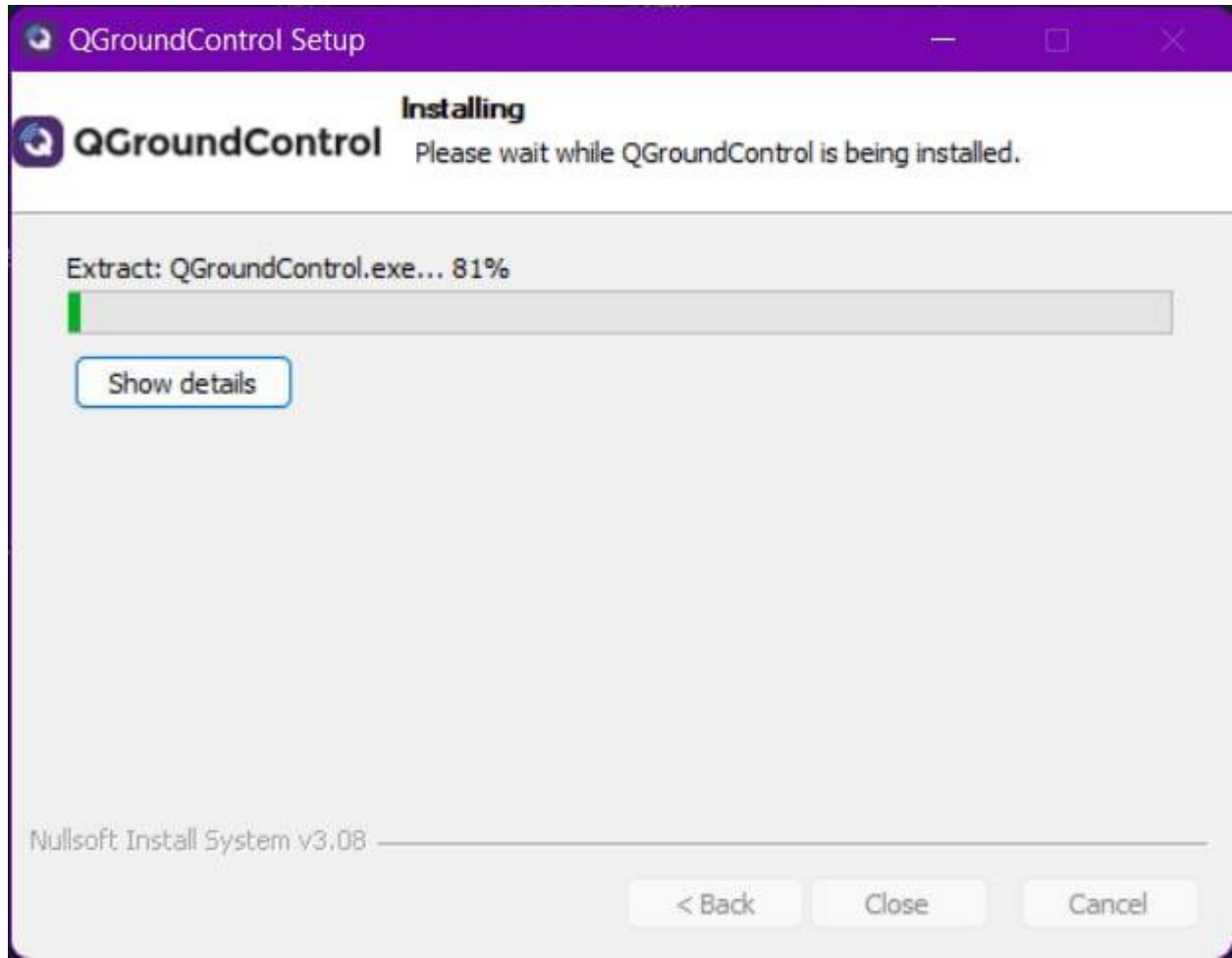
```
./QGroundControl.AppImage (or double click)
```

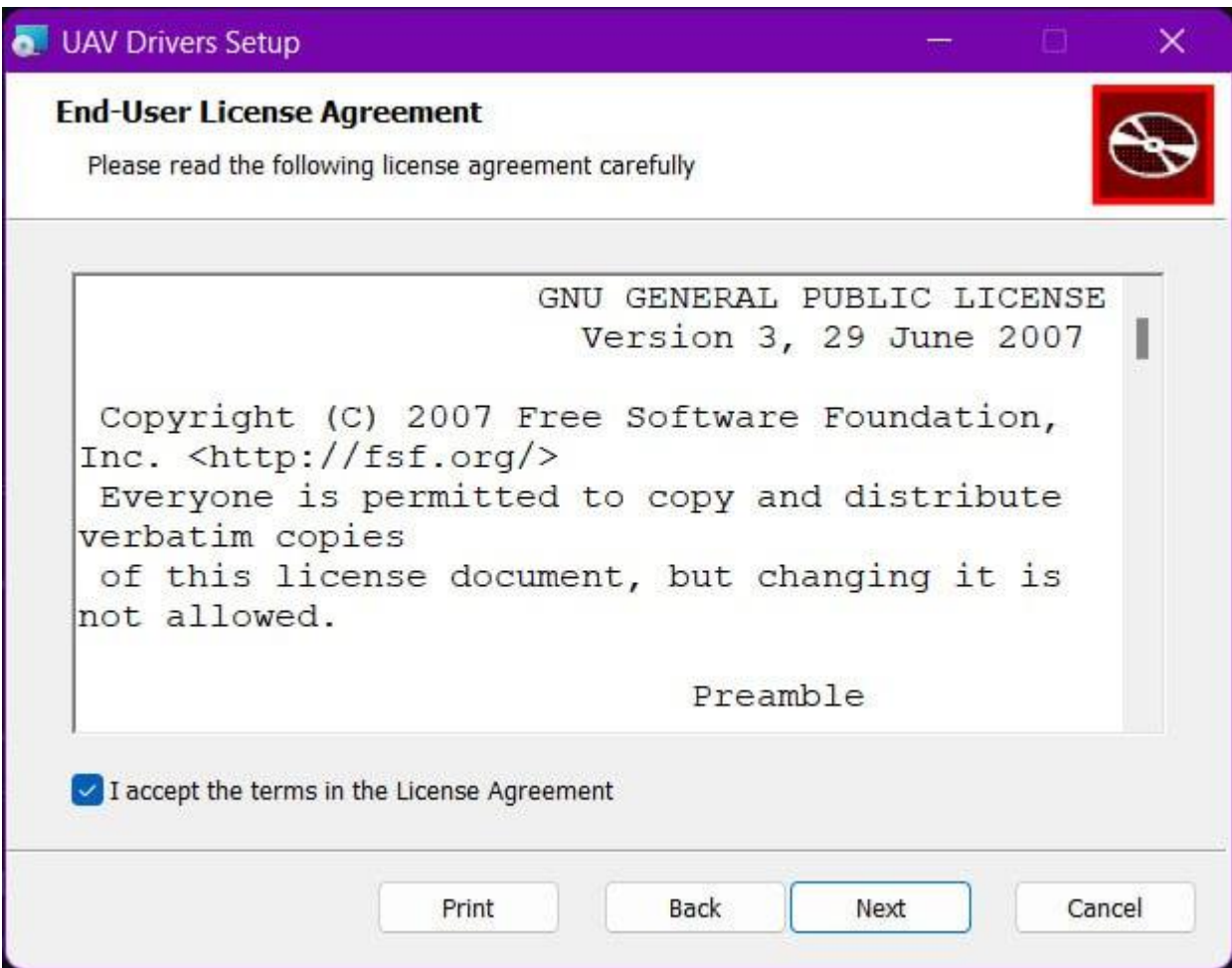
### **Screenshots**

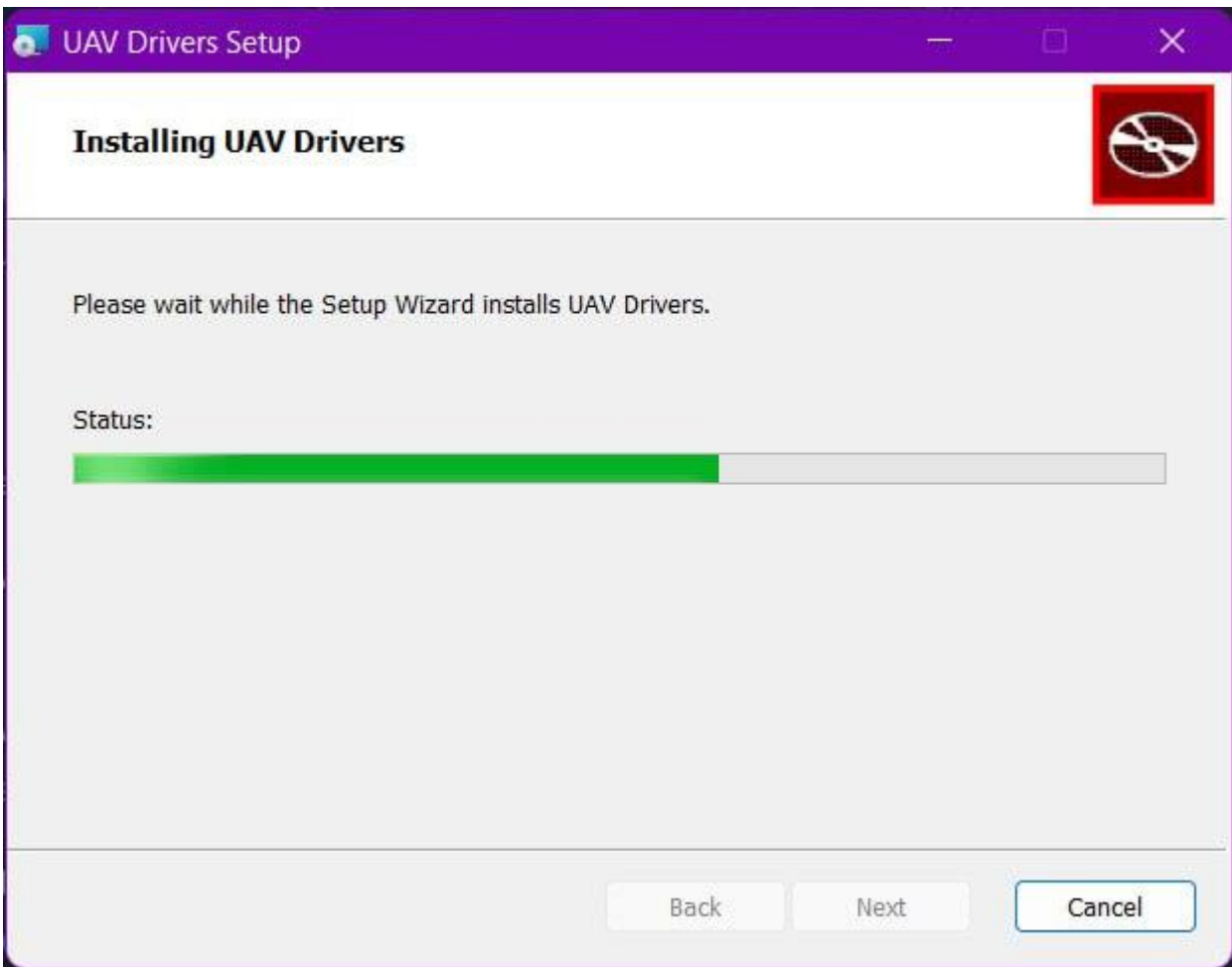














## Device Driver Installation Wizard



### Welcome to the Device Driver Installation Wizard!

This wizard helps you install the software drivers that some computers devices need in order to work.

To continue, click Next.

< Back

Next >

Cancel

Windows Security



Would you like to install this device software?



Name: ArduPilot Project Ports (COM & LPT)

Publisher: Michael Osborne



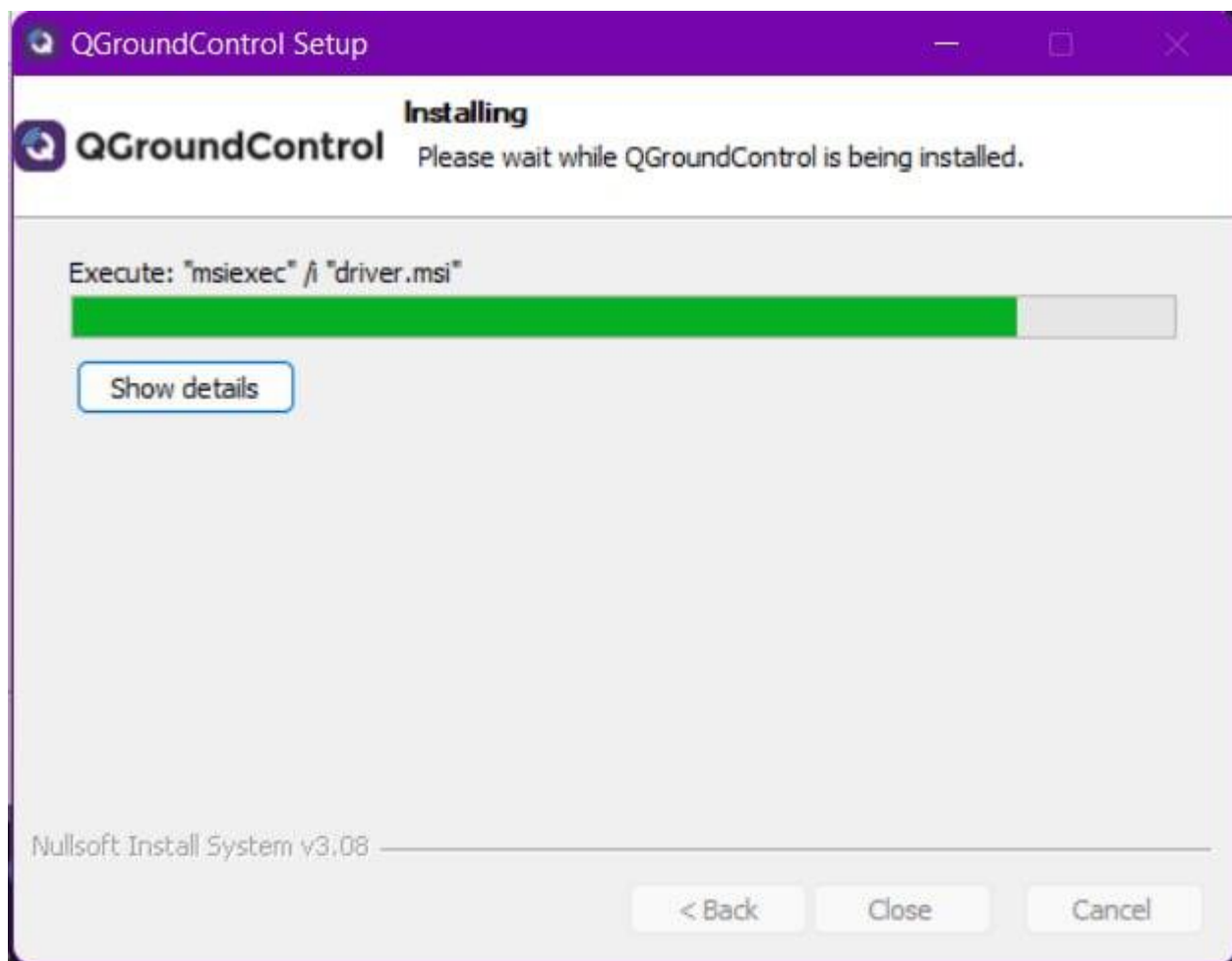
Always trust software from "Michael Osborne".

Install

Don't Install



You should only install driver software from publishers you trust. [How can I decide which device software is safe to install?](#)





## Completing the Device Driver Installation Wizard

The drivers were successfully installed on this computer.

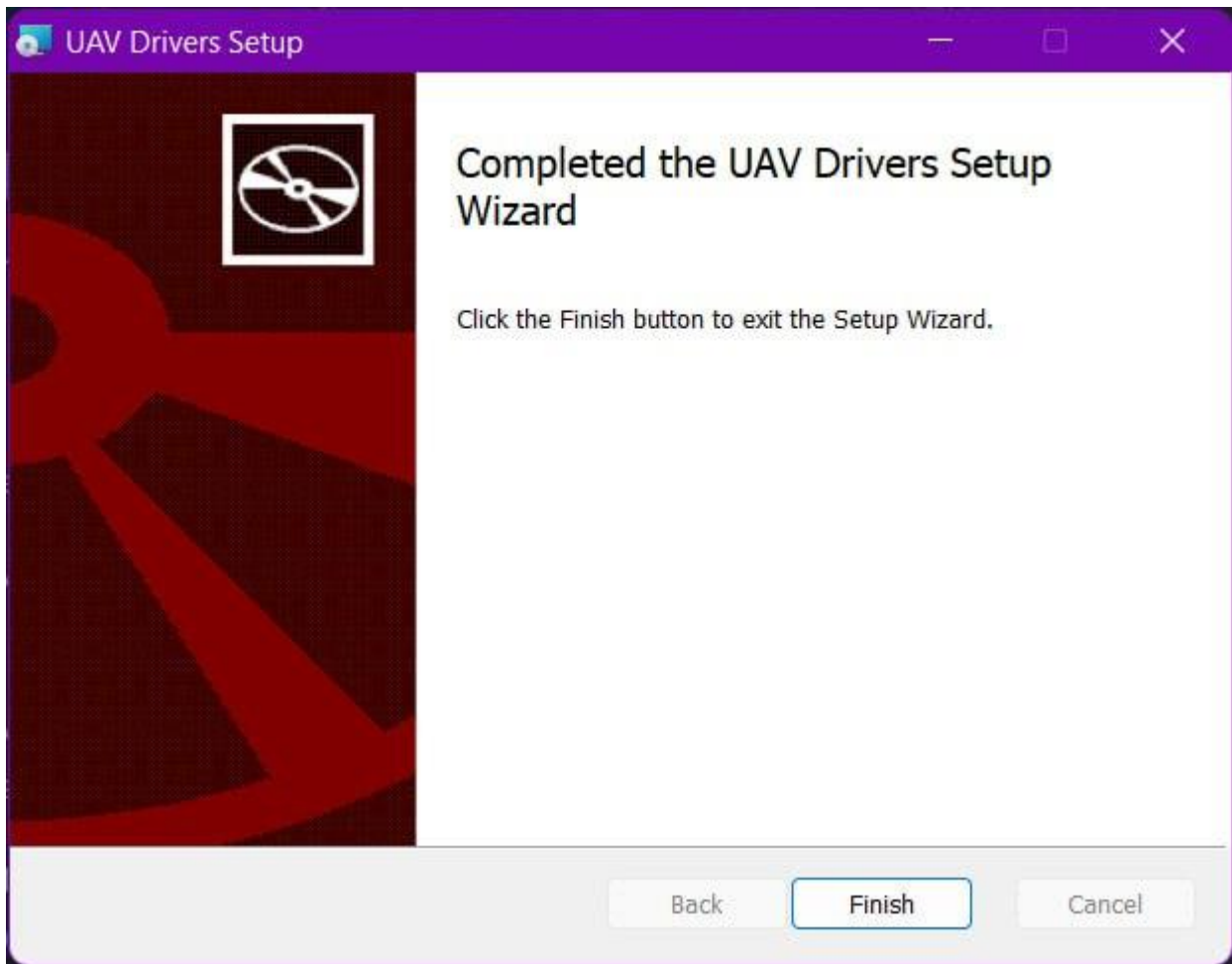
You can now connect your device to this computer. If your device came with instructions, please read them first.

Driver Name	Status
✓ Arduino LLC (www.ardui...	Ready to use
✓ ArduPilot Project (usbser...	Ready to use
✓ ArduPilot Project USB (...)	Ready to use

< Back

Finish

Cancel



## **Installation of Pix4**

### **Requirements:**

1. Remote control for the safety pilot - Taranis Plus remote control (or equivalent)
2. Development computer - 1. MacBook Pro (early 2015 and later) with OSX 10.15 or later
2. Lenovo Thinkpad 450 (i5) with Ubuntu Linux 18.04 or later
3. Ground control station (computer or tablet) - 1. iPad (requires Wifi telemetry adapter)
2. Any MacBook or Ubuntu Linux laptop (can be the development computer)
3. Samsung Note 4 or equivalent (any recent Android tablet or phone with a large enough screen to run QGroundControl effectively).
4. Vehicle capable of running PX4
5. Safety glasses
6. Tether (multicopter only - for more risky tests)

### **Procedure:**

Step 1: Start QGroundControl and connect the vehicle.



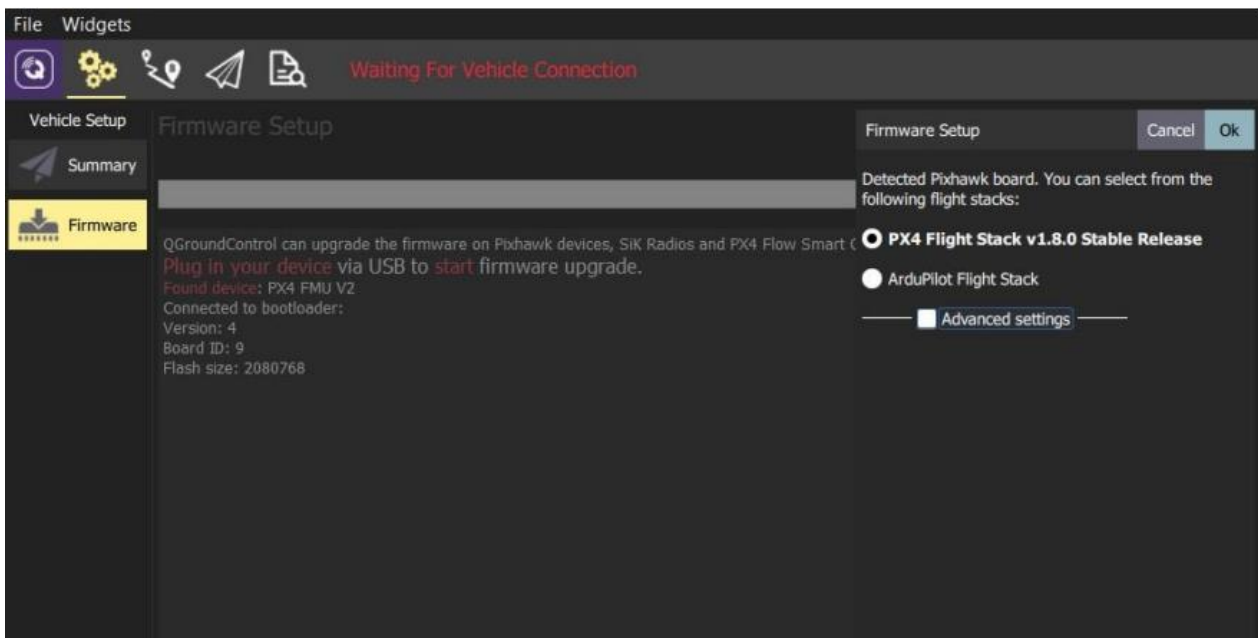
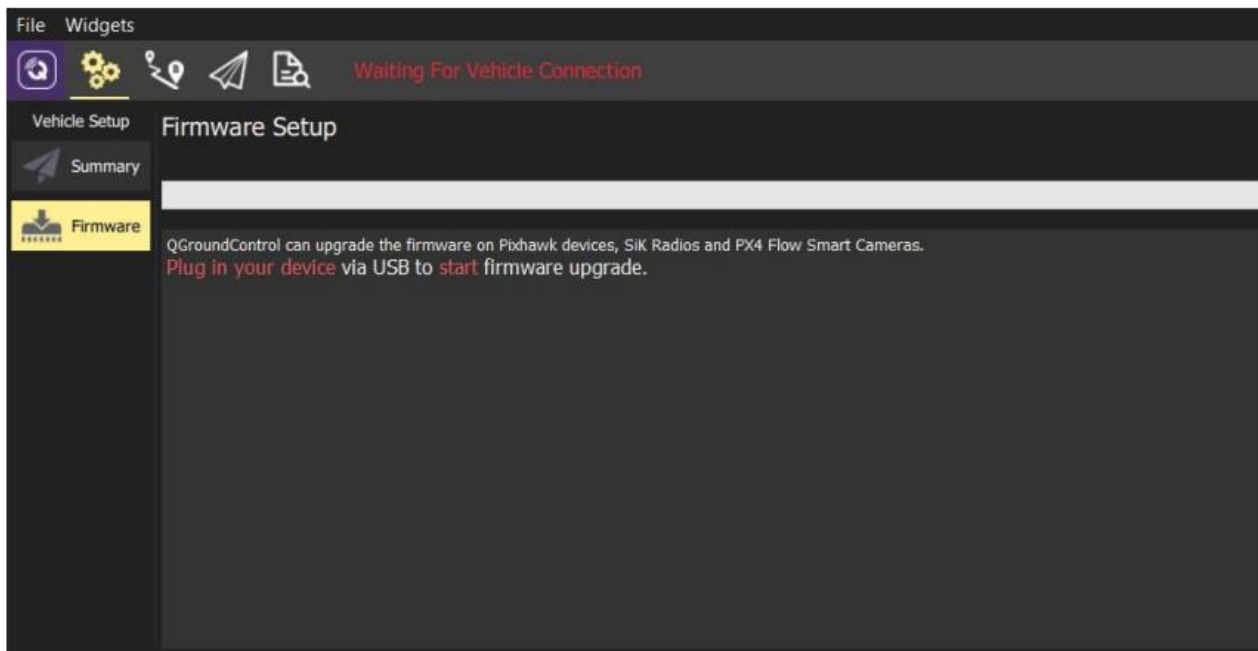
Step2: Select "Q" icon > Vehicle Setup > Firmware (sidebar) to open Firmware Setup.

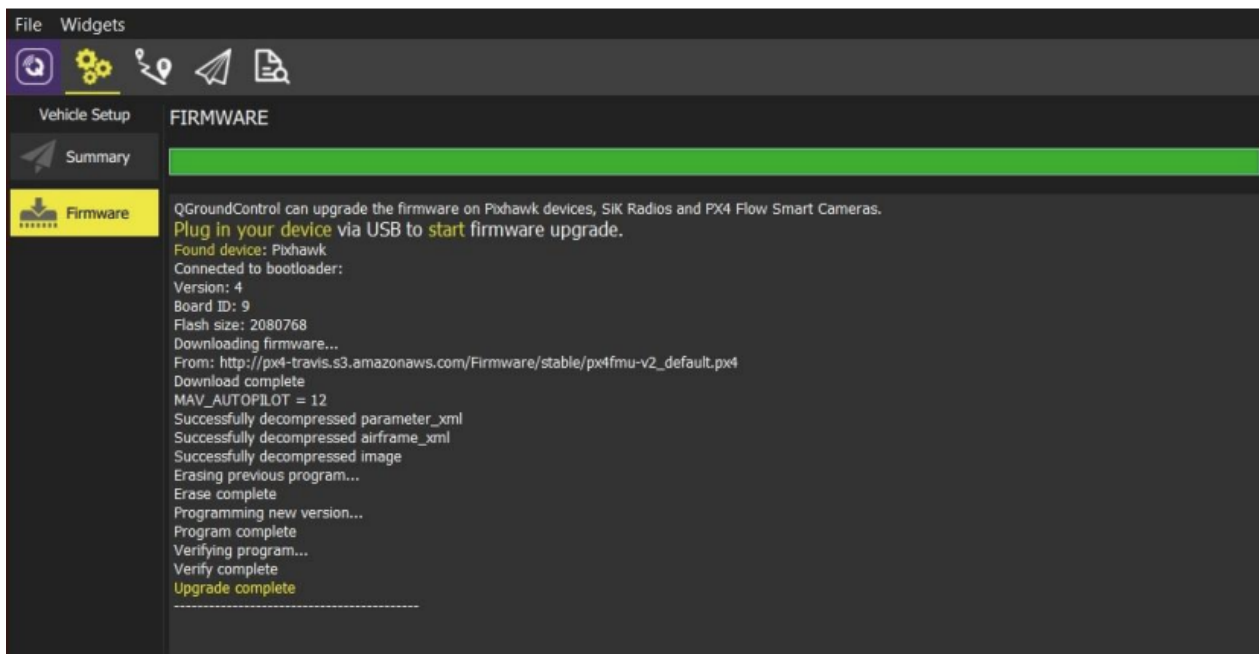
Step3: Connect the flight controller directly to your computer via USB.

Step4: Select the PX4 Flight Stack X.x.x Release option to install the latest stable version of PX4 for your hardware (autodetected).

Step5: Click the OK button to start the update

### **Screenshots:**





## CONCLUSION:

Thus, we have listed all the steps required to install the required softwares.