Installing ROS Noetic

1. Configure repositories:

Software programs consist of small parts called packages, and some of these packages are common between programs. If you intend to install a program in Ubuntu, the operating system will gather these packages from sources, but it will check first that if common packages are already installed by another software, then it will download missing packages. This is how Ubuntu works, in order to reduce download time and storage space on the computer.

Ubuntu is configured to download packages from certain sources, called repositories. They are of four types:

a) Main: Canonical-supported free and open-source software.

b) Universe: Community-maintained free and open-source software.

c) Restricted: Proprietary drivers for devices.

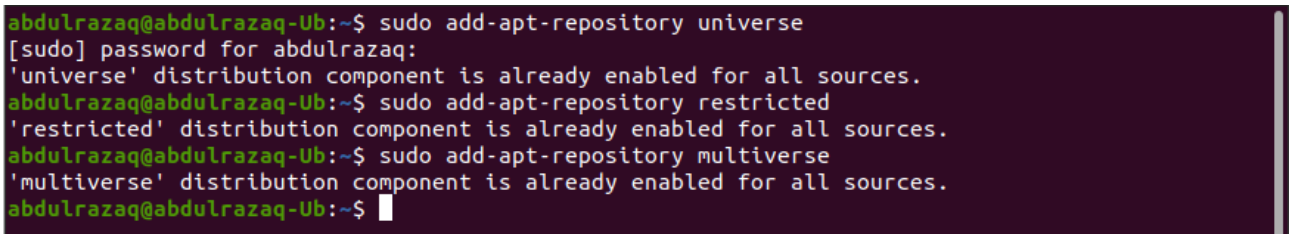
d) Multiverse: Software restricted by copyright or legal issues.

ROS needs “restricted”, “universe” and “multiverse” repositories. They should be enabled by default, but to make sure that the installation process goes smoothly, open the terminal and write the following commands one by one. If If the terminal asks for your password, write it and press “Enter” or “Return” on your keyboard. You will not see anything being written, but your input is actually recorded.

```
sudo add-apt-repository universe
```

```
sudo add-apt-repository restricted
```

```
sudo add-apt-repository multiverse
```



If the commands return errors consult the official Ubuntu guide here.
https://help.ubuntu.com/community/Repositories/Ubuntu

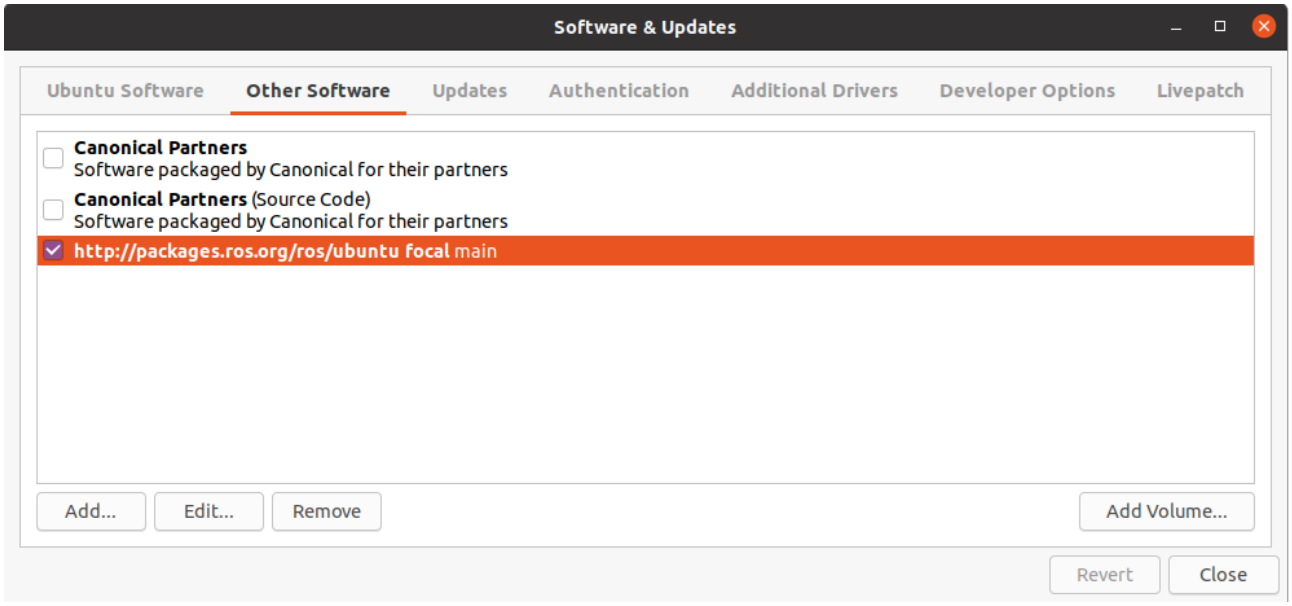
2. Setup your source list to accept ROS packages

In the first step, Ubuntu was set to look for software packages in certain repositories. Now it is needed to configure Ubuntu to look for and accept packages from “packages.ros.org”. It is easier to do that in terminal with the following command

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

```
abdulrazaq@abdulrazaq-Ub:~$ sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu $(lsb_rele
ase -sc) main" > /etc/apt/sources.list.d/ros-latest.list'
[sudo] password for abdulrazaq:
abdulrazaq@abdulrazaq-Ub:~$
```

Terminal will not give back any response, but to check that the source was set, go to “Software & Update”, and from “Other Software” tab you should find “packages.ros.org” listed and checked.



3. Add authentication key

When you command Ubuntu to install a software, it searches for needed packages and download them. But before it installs any, it authenticates their integrity with preconfigured keys. So, before you start installing ROS, you should add the key to your list by the following command

```
sudo apt-key adv --keyserver 'hkp://keyserver.ubuntu.com:80' --recv-key C1CF6E31E6BADE8868B172B4F42ED6FBAB17C654
```

```
abdulrazaq@abdulrazaq-Ub:~$ sudo apt-key adv --keyserver 'hkp://keyserver.ubuntu.com:80' --recv-key C1CF6E31E6BADE8868B172B4F42ED6FBAB17C654
Executing: /tmp/apt-key-gpghome.Uu7R56Y33N/gpg.1.sh --keyserver hkp://keyserver.ubuntu.com:80 --recv-key C1CF6E31E6BADE8868B172B4F42ED6FBAB17C654
gpg: key F42ED6FBAB17C654: public key "Open Robotics <info@osrfoundation.org>" imported
gpg: Total number processed: 1
gpg:               imported: 1
```

Terminal output should indicate that the key as imported.

4. Installation

Now, update the list of available packages, so that terminal can download and install ROS, using the following command

```
sudo apt update
```

Enter your password and wait for terminal to finish

```
abdulrazaq@abdulrazaq-Ub:~$ sudo apt update
[sudo] password for abdulrazaq:
Hit:1 http://sa.archive.ubuntu.com/ubuntu focal InRelease
Get:2 http://security.ubuntu.com/ubuntu focal-security InRelease [107 kB]
Get:3 http://sa.archive.ubuntu.com/ubuntu focal-updates InRelease [107 kB]
Get:4 http://sa.archive.ubuntu.com/ubuntu focal-backports InRelease [98.3 kB]
Get:5 http://security.ubuntu.com/ubuntu focal-security/main amd64 DEP-11 Metadata [21.3 kB]
Get:6 http://security.ubuntu.com/ubuntu focal-security/main amd64 c-n-f Metadata [2,952 B]
Get:7 http://security.ubuntu.com/ubuntu focal-security/restricted amd64 c-n-f Metadata [324 B]
Get:8 http://security.ubuntu.com/ubuntu focal-security/universe amd64 DEP-11 Metadata [31.6 kB]
Get:9 http://sa.archive.ubuntu.com/ubuntu focal-updates/main i386 Packages [108 kB]
Hit:10 http://packages.ros.org/ros/ubuntu focal InRelease
Get:11 http://sa.archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [211 kB]
Get:12 http://sa.archive.ubuntu.com/ubuntu focal-updates/main amd64 DEP-11 Metadata [105 kB]
Get:13 http://sa.archive.ubuntu.com/ubuntu focal-updates/restricted i386 Packages [6,376 B]
Get:14 http://sa.archive.ubuntu.com/ubuntu focal-updates/restricted amd64 Packages [23.2 kB]
Get:15 http://sa.archive.ubuntu.com/ubuntu focal-updates/universe amd64 Packages [115 kB]
Get:16 http://sa.archive.ubuntu.com/ubuntu focal-updates/universe i386 Packages [61.9 kB]
Get:17 http://sa.archive.ubuntu.com/ubuntu focal-updates/universe amd64 DEP-11 Metadata [152 kB]
Get:18 http://sa.archive.ubuntu.com/ubuntu focal-backports/universe amd64 DEP-11 Metadata [532 B]
Fetched 1,151 kB in 1s (825 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
250 packages can be upgraded. Run 'apt list --upgradable' to see them.
abdulrazaq@abdulrazaq-Ub:~$
```

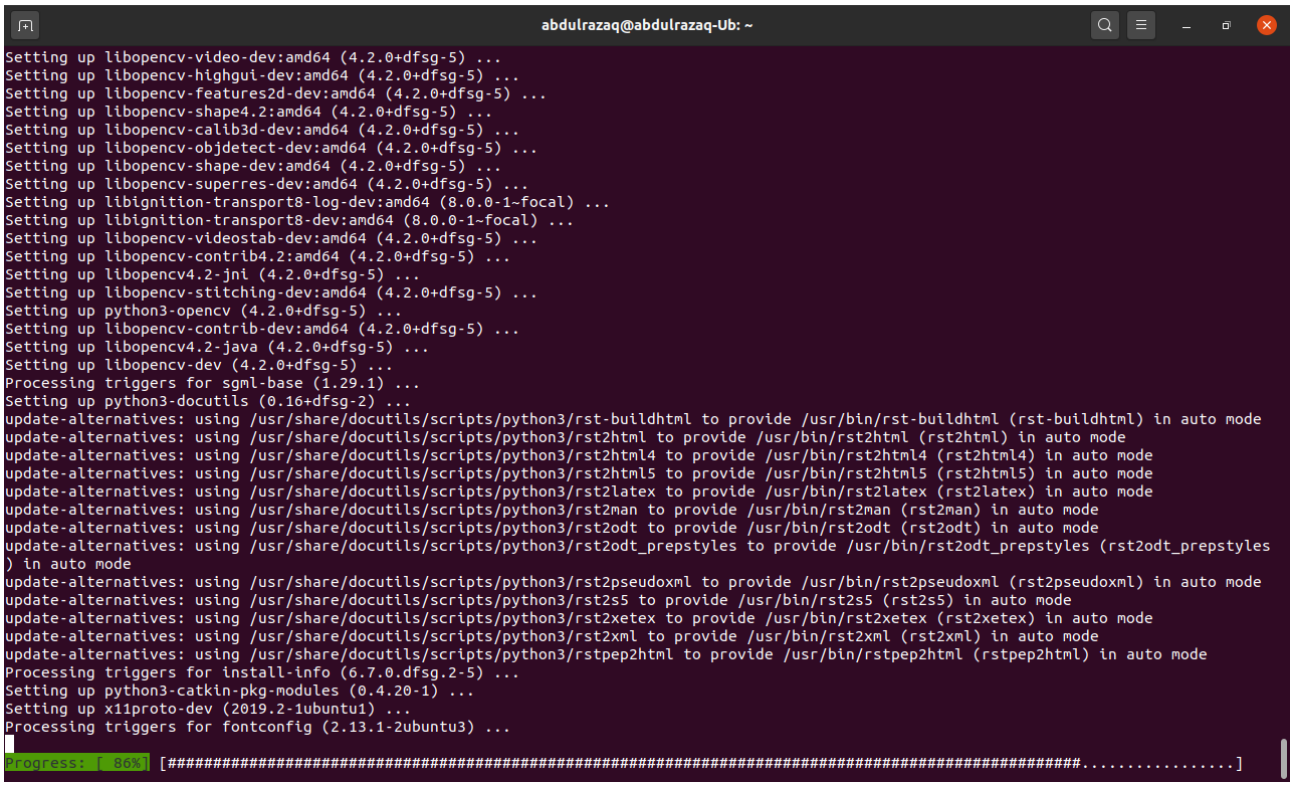
Now ROS can be installed with the following command, which will install additional packages beside ROS. If you do not need all packages, refer to http://wiki.ros.org/noetic/Installation/Ubuntu for more options

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

```
abdulrazaq@abdulrazaq-Ub:~$ 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 blt bzip2-doc cmake cmake-data comerr-dev cpp-8 curl cython3 dbus dbus-x11
  debhelper default-libmysqlclient-dev dh-autoreconf dh-strip-nondeterminism docutils-common dwz fltk1.3-doc fluid fonts-lato fonts-lyx
  freeglut3 freeglut3-dev gazebo11 gazebo11-common gazebo11-plugin-base gcc-8 gcc-8-base gdal-data gfortran gfortran-8 gfortran-9
  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 javascript-common krb5-multidev libaacs0 libaec-dev libaec0 libann0 libaom0 libapr1 libapr1-dev
  libaprutil1 libaprutil1-dev libarchive-cpio-perl libarmadillo-dev libarmadillo9 libarpack2 libarpack2-dev libass9 libassimp-dev
  libassimp5 libassuan-dev libatk-bridge2.0-0 libatk-bridge2.0-dev libatk1.0-dev libatspi2.0-dev libavcodec-dev libavcodec58
  libavdevice-dev libavdevice58 libavfilter-dev libavfilter7 libavformat-dev libavformat58 libavresample-dev libavresample4 libavutil-dev
  libavutil56 libbdplus0 libblas-dev libblas3 libblkid-dev libbluray2 libboost-all-dev libboost-atomic-dev libboost-atomic1.71-dev
  libboost-atomic1.71.0 libboost-chrono-dev libboost-chrono1.71-dev libboost-chrono1.71.0 libboost-container-dev
  libboost-container1.71-dev libboost-container1.71.0 libboost-context-dev libboost-context1.71-dev libboost-context1.71.0
  libboost-coroutine-dev libboost-coroutine1.71-dev libboost-coroutine1.71.0 libboost-date-time-dev libboost-date-time1.71-dev
  libboost-dev libboost-exception-dev libboost-exception1.71-dev libboost-fiber-dev libboost-fiber1.71-dev libboost-fiber1.71.0
  libboost-filesystem-dev libboost-filesystem1.71-dev libboost-graph-dev libboost-graph-parallel-dev libboost-graph-parallel1.71-dev
  libboost-graph-parallel1.71.0 libboost-graph1.71-dev libboost-graph1.71.0 libboost-iostreams-dev libboost-iostreams1.71-dev
  libboost-locale-dev libboost-locale1.71-dev libboost-log-dev libboost-log1.71-dev libboost-log1.71.0 libboost-math-dev
  libboost-math1.71-dev libboost-math1.71.0 libboost-mpi-dev libboost-mpi-python-dev libboost-mpi-python1.71-dev libboost-mpi-python1.71.0
  libboost-mpi1.71-dev libboost-mpi1.71.0 libboost-numpy-dev libboost-numpy1.71-dev libboost-numpy1.71.0 libboost-program-options-dev
  libboost-program-options1.71-dev libboost-program-options1.71.0 libboost-python-dev libboost-python1.71-dev libboost-python1.71.0
  libboost-random-dev libboost-random1.71-dev libboost-random1.71.0 libboost-regex-dev libboost-regex1.71-dev libboost-regex1.71.0
  libboost-serialization-dev libboost-serialization1.71-dev libboost-serialization1.71.0 libboost-stacktrace-dev
  libboost-stacktrace1.71-dev libboost-stacktrace1.71.0 libboost-system-dev libboost-system1.71-dev libboost-system1.71.0
  libboost-test-dev libboost-test1.71-dev libboost-test1.71.0 libboost-thread-dev libboost-thread1.71-dev libboost-timer-dev
  libboost-timer1.71-dev libboost-timer1.71.0 libboost-tools-dev libboost-type-erasure-dev libboost-type-erasure1.71-dev
  libboost-type-erasure1.71.0 libboost-wave-dev libboost-wave1.71-dev libboost-wave1.71.0 libboost1.71-dev libboost1.71-tools-dev libbs2b0
  libbullet-dev libbullet2.88 libbz2-dev libcaf-openmpi-3 libcairo-script-interpreter2 libcairo2-dev libcdt5 libcfitsio-dev libcfitsio-doc
  libcfitsio8 libcgraph6 libcharls-dev libcharls2 libchromaprint1 libclang1-10 libcoarrays-dev libcoarrays-openmpi-dev libcodec2-0.9
  libconsole-bridge-dev libconsole-bridge0.4 libcurl4-openssl-dev libdap-dev libdap25 libdapclient6v5 libdapserver7v5 libdatrie-dev
  libdbus-1-3 libdbus-1-dev libdc1394-22 libdc1394-22-dev libdebhelper-perl libdouble-conversion3 libegl-dev libegl1-mesa-dev
  libeigen3-dev libepoxy-dev libepsilon-dev libepsilon1 libevent-core-2.1-7 libevent-dev libevent-extra-2.1-7 libevent-openssl-2.1-7
  libevent-pthreads-2.1-7 libexif-dev libexif-doc libexif12 libexpat1-dev libfabric1 libffi-dev libfftw3-double3
  libfile-stripnondeterminism-perl libflann-dev libflann1.9 libflite1 libfltk-cairo1.3 libfltk-forms1.3 libfltk-gl1.3 libfltk-images1.3
  libfltk1.3 libfltk1.3-dev libfontconfig1-dev libfreeimage-dev libfreeimage3 libfreetype-dev libfreetype6-dev libfreexl-dev libfreexl1
```

```
The following packages will be upgraded:
  dbus dbus-x11 libatk-bridge2.0-0 libdbus-1-3 libexif12 libjpeg-turbo8 libjson-c4 libldap-2.4-2 libmysqlclient21 libpython3.8
  libpython3.8-minimal libpython3.8-stdlib libsqlite3-0 python3.8 python3.8-minimal
15 upgraded, 1055 newly installed, 0 to remove and 197 not upgraded.
Need to get 582 MB of archives.
After this operation, 2903 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://sa.archive.ubuntu.com/ubuntu focal-updates/main amd64 python3.8 amd64 3.8.2-1ubuntu1.1 [364 kB]
Get:2 http://packages.ros.org/ros/ubuntu focal/main amd64 ignition-tools amd64 1.0.0-1~focal [4216 B]
Get:3 http://packages.ros.org/ros/ubuntu focal/main amd64 libignition-common3 amd64 3.5.0-1~focal [88.1 kB]
Get:4 http://packages.ros.org/ros/ubuntu focal/main amd64 libignition-common3-av amd64 3.5.0-1~focal [14.2 kB]
Get:5 http://sa.archive.ubuntu.com/ubuntu focal-updates/main amd64 libpython3.8 amd64 3.8.2-1ubuntu1.1 [1620 kB]
Get:6 http://packages.ros.org/ros/ubuntu focal/main amd64 libignition-common3-core-dev amd64 3.5.0-1~focal [93.6 kB]
Get:7 http://packages.ros.org/ros/ubuntu focal/main amd64 libignition-common3-av-dev amd64 3.5.0-1~focal [7560 B]
Get:8 http://packages.ros.org/ros/ubuntu focal/main amd64 libignition-math6 amd64 6.4.0-1~focal [72.1 kB]
Get:9 http://packages.ros.org/ros/ubuntu focal/main amd64 libignition-math6-dev amd64 6.4.0-1~focal [117 kB]
Get:10 http://sa.archive.ubuntu.com/ubuntu focal-updates/main amd64 libpython3.8-stdlib amd64 3.8.2-1ubuntu1.1 [1666 kB]
```

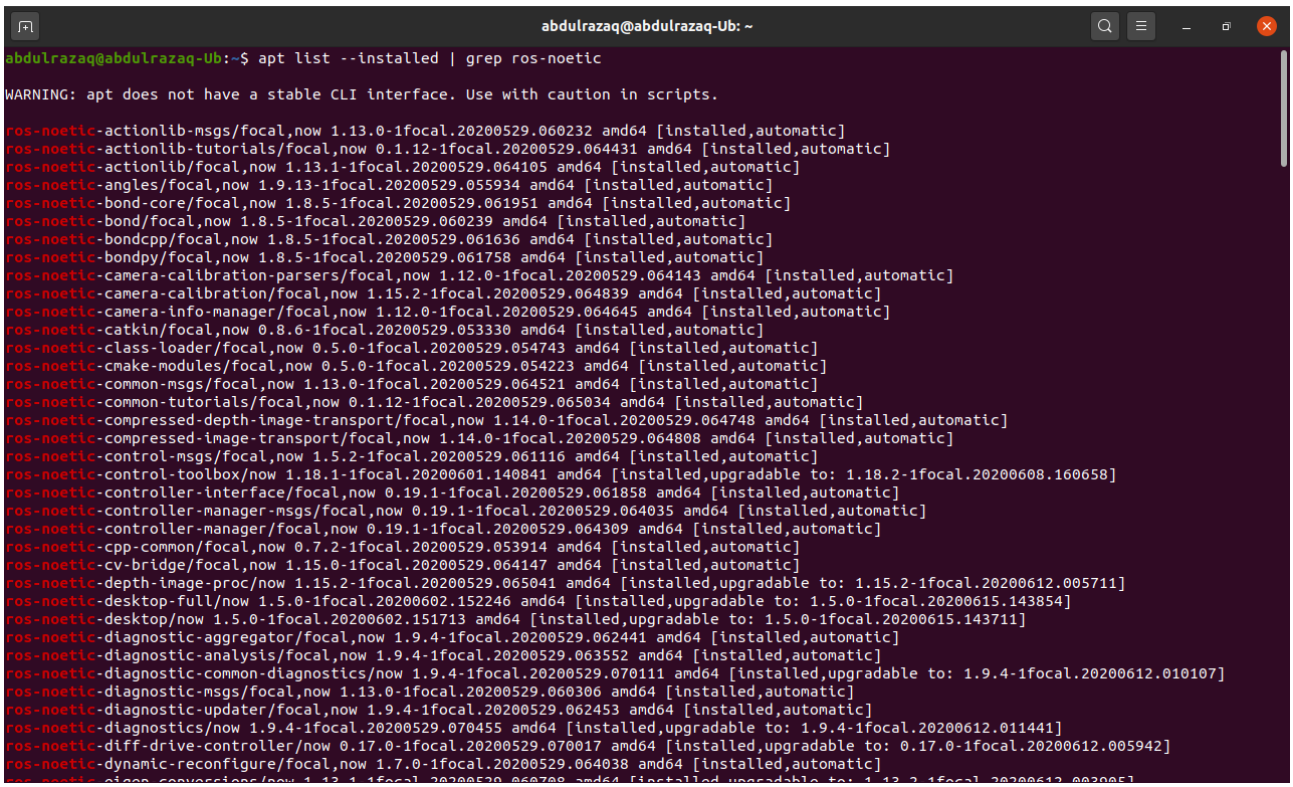
Terminal will list all packages that will be downloaded or updated for installation, and it will ask your permission to proceed. Type “y” to continue or “n” to abort. After you permit, terminal will download and install packages. You will find progress percentage at the bottom.



When installation process is completed, you can check that with the following command

apt list --installed | grep ros-noetic

This command will list all installed packages of ROS Noetic

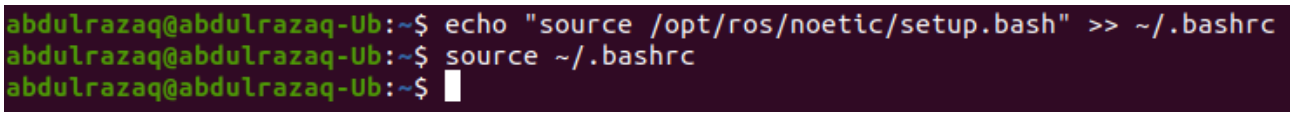


5. Setting up the environment

At this point, you must source a script every time you want to use ROS. So, it is convenient to make terminal sources this script once it is launched. It is performed by this commands one by one

echo "source /opt/ros/noetic/setup.bash" >> ~/.bashrc

source ~/.bashrc

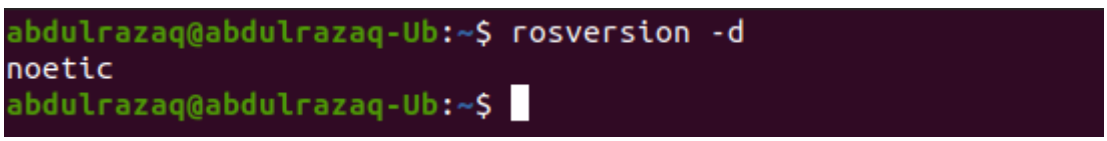


6. Confirming installation

Finally, close all terminal windows and start a fresh one. Write the following command in terminal.

rosversion -d

If terminal responds with “noetic”, then you are all set



7. Reference and credit

The following links are credited for instructions mentioned above. Refer to them for much detailed instructions

http://wiki.ros.org/noetic/Installation/Ubuntu

https://help.ubuntu.com/community/Repositories/Ubuntu

https://askubuntu.com/questions/148638/how-do-i-enable-the-universe-repository

https://help.ubuntu.com/community/Repositories/CommandLine

https://github.com/qboticslabs/ros_install_noetic

https://www.cyberciti.biz/faq/apt-get-list-packages-are-installed-on-ubuntu-linux/