CUDA Setup on Ubuntu 22.04

Fred J. Frigo
03-Sep-2023

This document will describe how to load the CUDA Toolkit (version 10.2) on Ubuntu 22.04 (LTS) with Quadro K620 hardware since the default installation of CUDA for Ubuntu 22.04 did not function properly for this hardware.

The following steps were taken to install the CUDA development environment.

1. Verify a supported NVIDIA graphics card exists.

```
$ sudo lspci | grep -i nvidia
01:00.0 VGA compatible controller: NVIDIA Corporation GM107GL [Quadro K620] (rev a2)
```

2. Find the recommended NVIDIA driver.

```
#  ubuntu-drivers devices
```

```
root@COE-LNX-1525:/var/log# ubuntu-drivers devices
WARNING:root:_pkg_get_support nvidia-driver-390: package has invalid Support
== /sys/devices/pci0000:00/0000:00:01.0/0000:01:00.0 ==
modalias : pci:v000010DEd000013BBsv0000103Csd00001098bc03sc00i00
vendor   : NVIDIA Corporation
model    : GM107GL [Quadro K620]
driver   : nvidia-driver-450-server - distro non-free
driver   : nvidia-driver-465 - third-party non-free
driver   : nvidia-driver-455 - third-party non-free
driver   : nvidia-driver-470 - third-party non-free recommended
driver   : nvidia-driver-460 - third-party non-free
driver   : nvidia-driver-418-server - distro non-free
driver   : nvidia-driver-390 - distro non-free
driver   : nvidia-driver-450 - third-party non-free
driver   : nvidia-340 - distro non-free
driver   : nvidia-driver-470-server - distro non-free
driver   : nvidia-driver-460-server - distro non-free
driver   : xserver-xorg-video-nouveau - distro free builtin
```

3. Install the CUDA Development System

   This is the process for installing the CUDA development system on Ubuntu 22.04 for Quadro K620 hardware. The following steps were performed (as super-user):

   a. Remove old “cuda” and “nvidia” packages.

      # apt list --installed | grep “*cuda*”
      # apt list --installed | grep “*nvidia*”
      # apt-get remove --autoremove “*nvidia*” “*cuda*”

b. Install gcc-8 (GNU C/C++ compiler version 8 from 20.04 archive)
Add the following line of text to /etc/apt/sources.list:

deb [arch=amd64] http://archive.ubuntu.com/ubuntu focal main universe

apt update
apt upgrade
apt install gcc-8 g++-8
update-alternatives --install /usr/bin/gcc gcc /usr/bin/gcc-8 80 --slave /usr/bin/g++ g++ /usr/bin/g++-8 --slave /usr/bin/gcov gcov /usr/bin/gcov-8

c. Select GCC 8.0 as default compiler
update-alternatives --config gcc

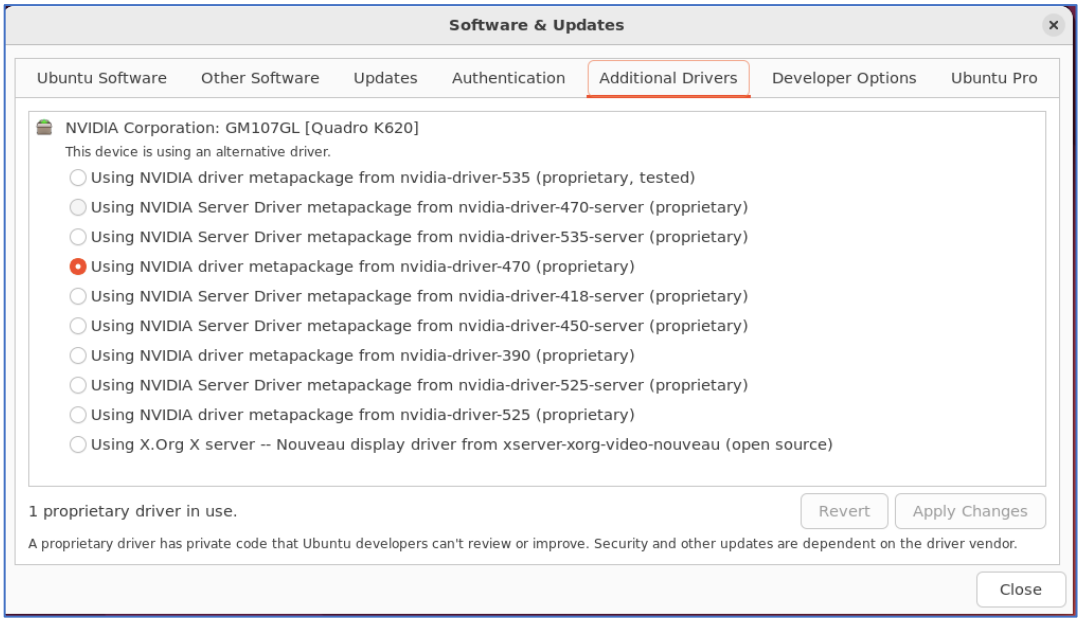
d. Install CUDA toolkit version 10.2 (November 2019)
NOTE: Skip the driver installation!
https://developer.nvidia.com/cuda-toolkit-archive

e. Modify /etc/environment for the cuda-10.2 toolkit

```
opus@COE-LNX-1525:~/EECE5510$ cat /etc/environment
PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin:/usr/local/cuda-10.2/bin"
LD_LIBRARY_PATH="/usr/local/cuda-10.2/lib64"
opus@COE-LNX-1525:~/EECE5510$
```

4. Install NVIDIA driver (in this case we are using 470 for compatibility):
```
#  apt install nvidia-driver-470
```

5. Reboot, then confirm driver is selected.



6. Verify NVIDIA drivers are working:

```
opus@COE-LNX-1525:~/EECE5510$ nvidia-smi
Mon Sep  4 10:13:47 2023
+-----------------------------------------------------------------------------+
| NVIDIA-SMI 470.199.02   Driver Version: 470.199.02   CUDA Version: 11.4     |
|-------------------------------+----------------------+----------------------+
| GPU  Name        Persistence-M| Bus-Id        Disp.A | Volatile Uncorr. ECC |
| Fan  Temp  Perf  Pwr:Usage/Cap|         Memory-Usage | GPU-Util  Compute M. |
|                               |                      |               MIG M. |
|===============================+======================+======================|
|   0  Quadro K620         Off  | 00000000:01:00.0 Off |                  N/A |
| 34%   38C    P8     1W /  30W |     39MiB /  1994MiB |      0%      Default |
|                               |                      |                  N/A |
+-------------------------------+----------------------+----------------------+

+-----------------------------------------------------------------------------+
| Processes:                                                                  |
|  GPU   GI   CI        PID   Type   Process name                  GPU Memory |
|        ID   ID                                                   Usage      |
|=============================================================================|
|    0   N/A  N/A      1086      G   /usr/lib/xorg/Xorg                 31MiB |
|    0   N/A  N/A      1291      G   /usr/bin/gnome-shell                3MiB |
+-----------------------------------------------------------------------------+
```

7. Verify the compilers:

```
frigof — opus@COE-LNX-1525: ~ — ssh opus@bloomcounty.eng.mu.edu...
opus@COE-LNX-1525:~$ gcc --version
gcc (Ubuntu 8.4.0-3ubuntu2) 8.4.0
Copyright (C) 2018 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

opus@COE-LNX-1525:~$ nvcc --version
nvcc: NVIDIA (R) Cuda compiler driver
Copyright (c) 2005-2019 NVIDIA Corporation
Built on Wed_Oct_23_19:24:38_PDT_2019
Cuda compilation tools, release 10.2, V10.2.89
opus@COE-LNX-1525:~$
```