9.2 Jetson Xavier NX write system

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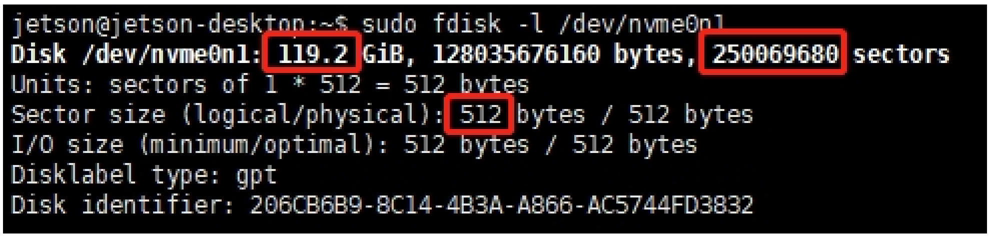
Since the EMMC capacity of the Jetson NX motherboard is too small, it is necessary to burn the system to the SSD solid state drive.

1. View NVME SSD information

Before restoring the system to the solid state drive, you need to check the information of the solid state drive to be restored. Please insert the NVME solid state drive into the SSD socket of the Jetson Xavier NX, and power on the Jetson Xavier NX, open the terminal, and enter the following command to view the information.

sudo fdisk -l /dev/nvme0n1



```
jetson@jetson-desktop:~$ sudo fdisk -l /dev/nvme0n1
Disk /dev/nvme0n1: 119.2 GiB, 128035676160 bytes, 250069680 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: gpt
Disk identifier: 206CB6B9-8C14-4B3A-A866-AC5744FD3832
```

Record the three data in the red box in the figure below. The first data indicates the capacity of the SSD, the second data indicates how many sectors (num_sectors: 250069680), and the third data indicates the words occupied by each sector. The number of sections (sector_size: 512).

2. Prepare the L4T programming package

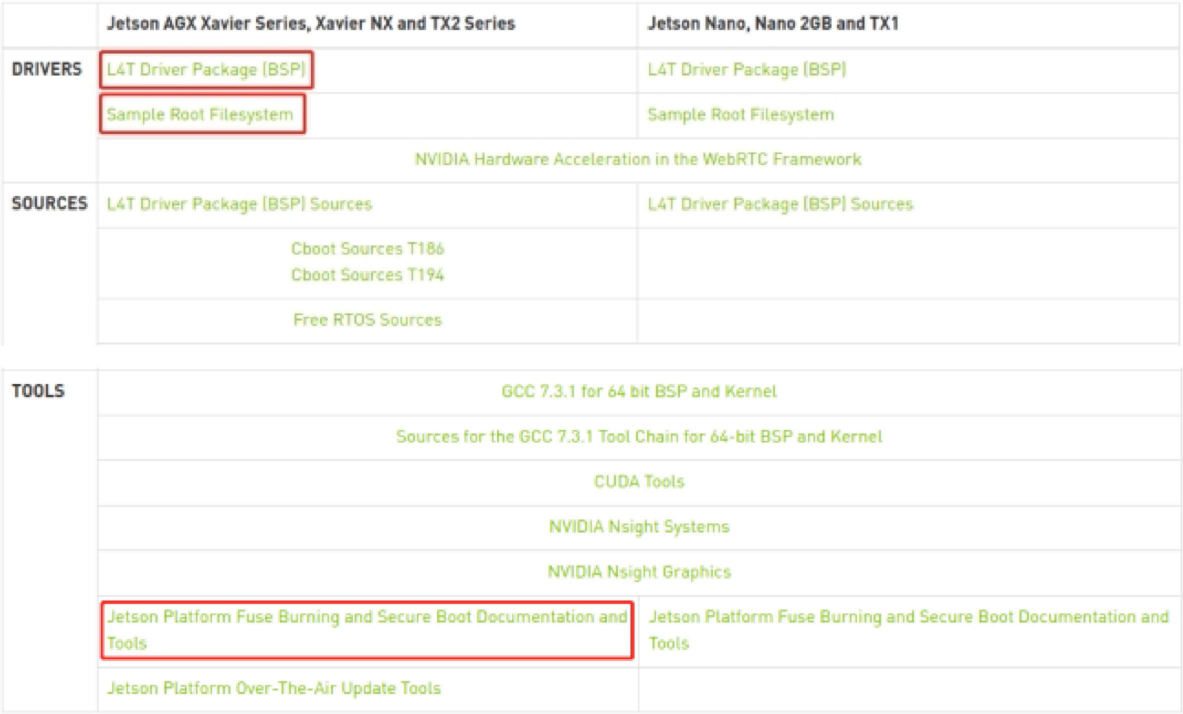
1. Download the file

Go to NVIDIA official website to download Jetson Xavier NX system L4T firmware:

https://developer.nvidia.com/embedded/linux-tegra-r3261

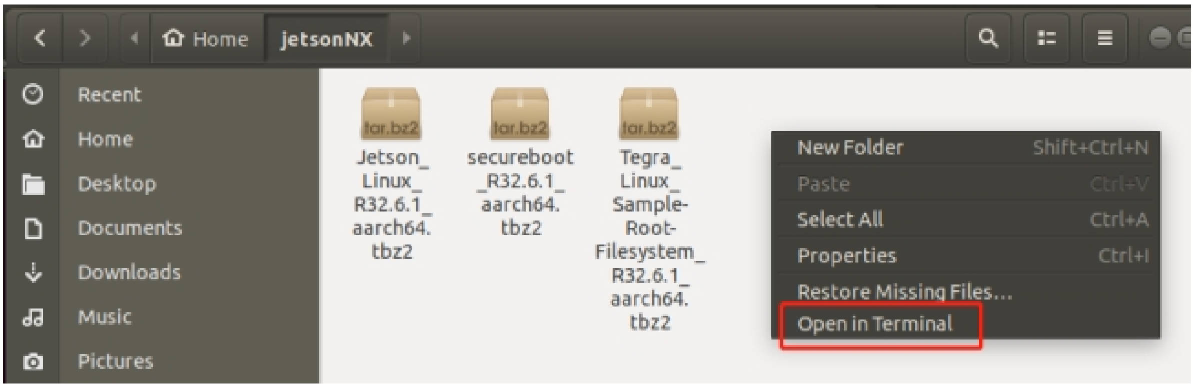
To download the latest version of the firmware, you need to download the Jetson Xavier NX-related L4T Driver Package[BSP], Sample Root Filesystem and Jetson Platform Fuse Burning and Secure Boot Documentation and Tools to the local.

32.6.1 Driver Details



	Jetson AGX Xavier Series, Xavier NX and TX2 Series	Jetson Nano, Nano 2GB and TX1
DRIVERS	L4T Driver Package (BSP)	L4T Driver Package (BSP)
	Sample Root Filesystem	Sample Root Filesystem
	NVIDIA Hardware Acceleration in the WebRTC Framework	
SOURCES	L4T Driver Package (BSP) Sources	L4T Driver Package (BSP) Sources
	Cboot Sources T186 Cboot Sources T194	
	Free RTOS Sources	
TOOLS	GCC 7.3.1 for 64 bit BSP and Kernel	
	Sources for the GCC 7.3.1 Tool Chain for 64-bit BSP and Kernel	
	CUDA Tools	
	NVIDIA Nsight Systems	
	NVIDIA Nsight Graphics	
	Jetson Platform Fuse Burning and Secure Boot Documentation and Tools	Jetson Platform Fuse Burning and Secure Boot Documentation and Tools
	Jetson Platform Over-The-Air Update Tools	

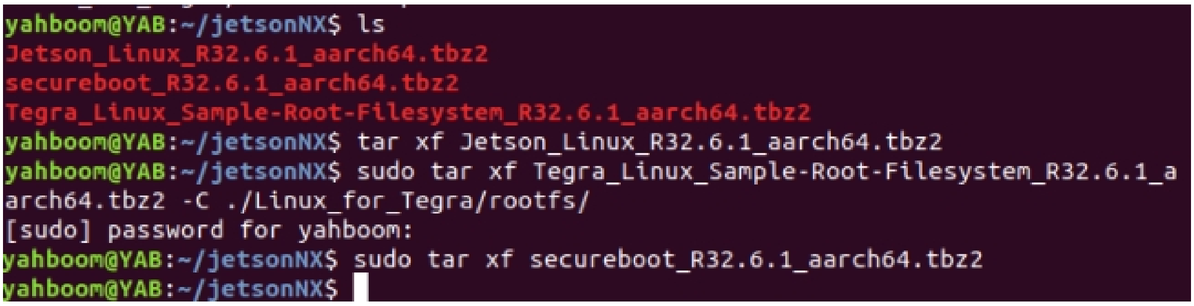
For example: I create a new jetsonNX folder in the virtual machine Ubuntu18.04 system, and download the file to the jetsonNX directory here. Right-click on the blank space to open the terminal.



2. Unzip the file, note that sudo cannot be omitted here, otherwise it will affect the subsequent installation, the file is relatively large, and the unzipping time may take a few minutes.

Enter the following command to decompress.

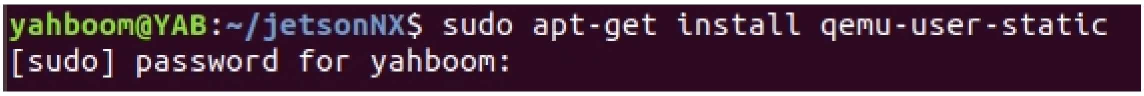
```
tar xf Jetson_Linux_R32.6.1_aarch64.tbz2

sudo tar xf Tegra_Linux_Sample-Root-Filesystem_R32.6.1_aarch64.tbz2 -C
./Linux_for_Tegra/rootfs/

sudo tar xf secureboot_R32.6.1_aarch64.tbz2
```



```
yahboom@YAB:~/jetsonNX$ ls
Jetson_Linux_R32.6.1_aarch64.tbz2
secureboot_R32.6.1_aarch64.tbz2
Tegra_Linux_Sample-Root-Filesystem_R32.6.1_aarch64.tbz2
yahboom@YAB:~/jetsonNX$ tar xf Jetson_Linux_R32.6.1_aarch64.tbz2
yahboom@YAB:~/jetsonNX$ sudo tar xf Tegra_Linux_Sample-Root-Filesystem_R32.6.1_a
arch64.tbz2 -C ./Linux_for_Tegra/rootfs/
[sudo] password for yahboom:
yahboom@YAB:~/jetsonNX$ sudo tar xf secureboot_R32.6.1_aarch64.tbz2
yahboom@YAB:~/jetsonNX$
```

3. Install the qemu file and enter y to confirm the installation.

```
sudo apt-get install qemu-user-static
```

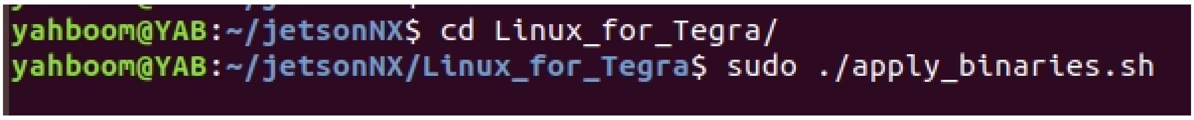


```
yahboom@YAB:~/jetsonNX$ sudo apt-get install qemu-user-static
[sudo] password for yahboom:
```

4. Generate binary files

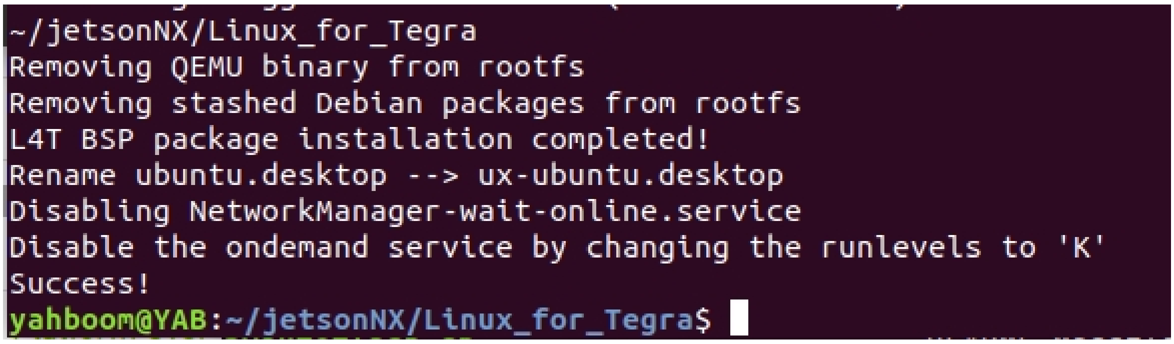
First enter the following command to enter the Linux_for_Tegra folder, and run the command to generate the binary file.

```
cd Linux_for_Tegra

sudo ./apply_binaries.sh
```



```
yahboom@YAB:~/jetsonNX$ cd Linux_for_Tegra/
yahboom@YAB:~/jetsonNX/Linux_for_Tegra$ sudo ./apply_binaries.sh
```

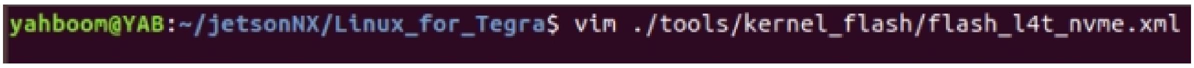
When you see the final success, it means OK.



```
~/jetsonNX/Linux_for_Tegra
Removing QEMU binary from rootfs
Removing stashed Debian packages from rootfs
L4T BSP package installation completed!
Rename ubuntu.desktop --> ux-ubuntu.desktop
Disabling NetworkManager-wait-online.service
Disable the ondemand service by changing the runlevels to 'K'
Success!
yahboom@YAB:~/jetsonNX/Linux_for_Tegra$
```

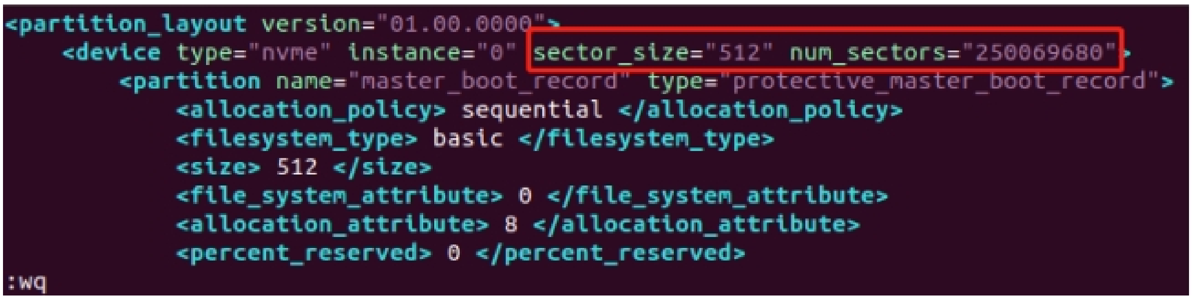
3. Modify system data

```
vim ./tools/kernel_flash/flash_l4t_nvme.xml
```



```
yahboom@YAB:~/jetsonNX/Linux_for_Tegra$ vim ./tools/kernel_flash/flash_l4t_nvme.xml
```

Press i to enter the edit mode, and then replace the data of sector_size and num_sectors queried in the first step.



```
<partition_layout version="01.00.0000">
    <device type="nvme" instance="0" sector_size="512" num_sectors="250069680">
        <partition name="master_boot_record" type="protective_master_boot_record">
            <allocation_policy> sequential </allocation_policy>
            <filesystem_type> basic </filesystem_type>
            <size> 512 </size>
            <file_system_attribute> 0 </file_system_attribute>
            <allocation_attribute> 8 </allocation_attribute>
            <percent_reserved> 0 </percent_reserved>
:wq
```

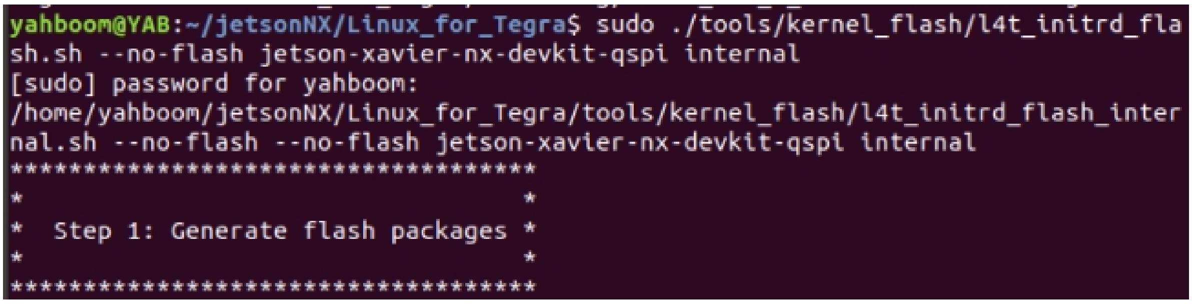
After the modification is completed, press the ESC key to exit the editing mode, then enter :wq and press the Enter key to save and exit.

4. build a system image

1. Build the qspi startup component

Execute the following commands in the Linux_for_Tegra directory

```
sudo ./tools/kernel_flash/l4t_initrd_flash.sh --no-flash jetson-xavier-nx-devkit-qspi internal
```

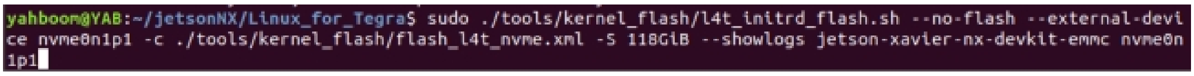


```
yahboom@YAB:~/jetsonNX/Linux_for_Tegra$ sudo ./tools/kernel_flash/l4t_initrd_fla
sh.sh --no-flash jetson-xavier-nx-devkit-qspi internal
[sudo] password for yahboom:
/home/yahboom/jetsonNX/Linux_for_Tegra/tools/kernel_flash/l4t_initrd_flash_inter
nal.sh --no-flash --no-flash jetson-xavier-nx-devkit-qspi internal
************************************
*                                  *
*  Step 1: Generate flash packages *
*                                  *
************************************
```

2. Build the system image

Execute the following commands in the Linux_for_Tegra directory

```
sudo ./tools/kernel_flash/l4t_initrd_flash.sh --no-flash --external-device nvme0n1p1 -c ./tools/kernel_flash/flash_l4t_nvme.xml -S 118GiB --showlogs jetson-xavier-nx-devkit-emmc nvme0n1p1
```



```
yahboom@YAB:~/jetsonNX/Linux_for_Tegra$ sudo ./tools/kernel_flash/l4t_initrd_flash.sh --no-flash --external-devi
ce nvme0n1p1 -c ./tools/kernel_flash/flash_l4t_nvme.xml -S 118GiB --showlogs jetson-xavier-nx-devkit-emmc nvme0n
1p1
```

Explanation of the above parameters:

--no-flash: Indicates that the system is only compiled and not burned.

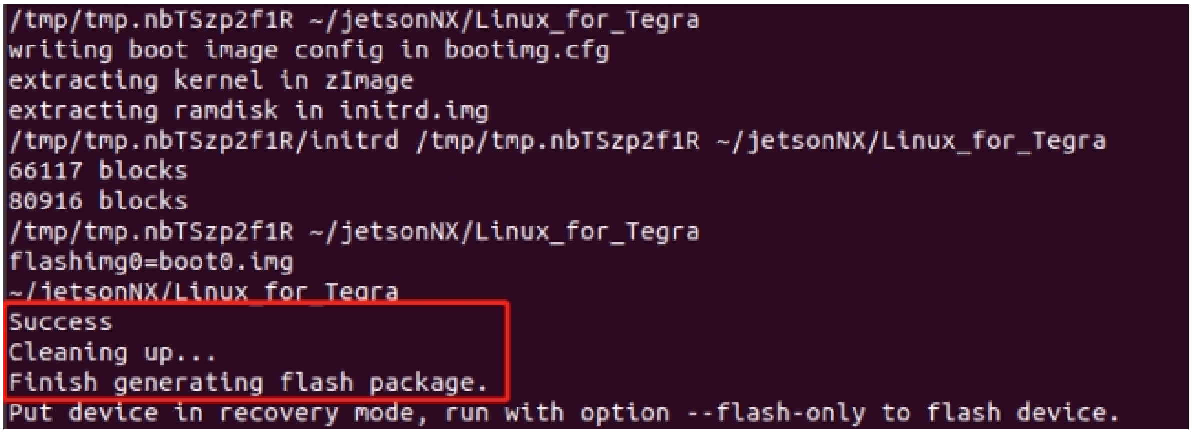
--external-device nvme0n1p1: Indicates burning to the /dev/nvme0n1p1 device, that is, the APP partition of the SSD.

-c ./tools/kernel_flash/flash_l4t_nvme.xml: Specify the burned xml file, that is, the file modified in the third step.

-S 118GiB: Indicates the size of the space occupied by the system APP partition. This value is the SSD capacity queried in the first step -1. Since the actual capacity of the SSD used this time is only 119.2GiB, the system also needs to reserve 1GiB space for other partitions, so the APP can occupy 118GiB.

--showlogs: Indicates that LOG information is displayed.

jetson-xavier-nx-devkit-emmc nvme0n1p1: Indicates that the Jetson Xavier NX device and the nvme0n1p1 partition are burned.



```
/tmp/tmp.nbTSzp2f1R ~/jetsonNX/Linux_for_Tegra
writing boot image config in bootimg.cfg
extracting kernel in zImage
extracting ramdisk in initrd.img
/tmp/tmp.nbTSzp2f1R/initrd /tmp/tmp.nbTSzp2f1R ~/jetsonNX/Linux_for_Tegra
66117 blocks
80916 blocks
/tmp/tmp.nbTSzp2f1R ~/jetsonNX/Linux_for_Tegra
flashimg0=boot0.img
~/jetsonNX/Linux_for_Tegra
Success
Cleaning up...
Finish generating flash package.
Put device in recovery mode, run with option --flash-only to flash device.
```

Finally, seeing Success indicates that the system was successfully built.

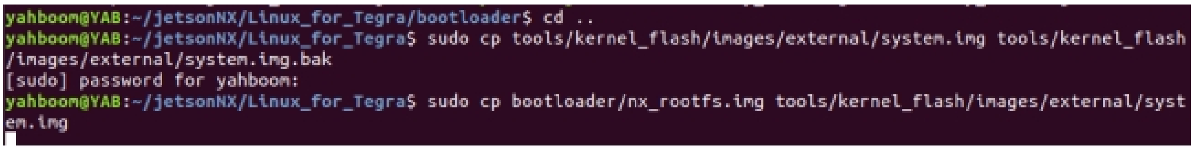
5. Replace the IMG file of the system

1. Go to the factory image in the data to download the latest version of the image system compressed package file, and then decompress to get the img image file.
2. Enter the Linux_for_Tegra directory
3. Copy the original system file img as a backup (in order to save space, no backup can be made)

```
sudo cp tools/kernel_flash/images/external/system.img
tools/kernel_flash/images/external/system.img.bak
```

4. Copy and overwrite the system.img system file Copy the nx_rootfs.img file generated in the previous step to the external/ directory and overwrite the system.img file.

```
sudo cp bootloader/nx_rootfs.img tools/kernel_flash/images/external/system.img
```



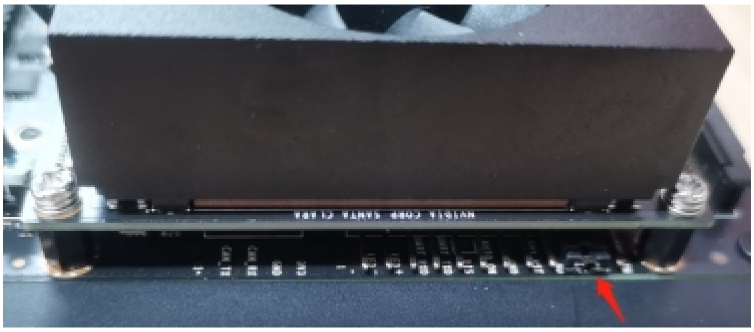
```
yahboom@YAB:~/jetsonNX/Linux_for_Tegra/bootloader$ cd ..
yahboom@YAB:~/jetsonNX/Linux_for_Tegra$ sudo cp tools/kernel_flash/images/external/system.img tools/kernel_flash
/images/external/system.img.bak
[sudo] password for yahboom:
yahboom@YAB:~/jetsonNX/Linux_for_Tegra$ sudo cp bootloader/nx_rootfs.img tools/kernel_flash/images/external/syst
em.img
```

Among them, bootloader/nx_rootfs.img is the path of the downloaded factory image file. It is modified according to the actual path. The name has been modified in advance to nx_rootfs.img. Note that the name cannot be in Chinese.

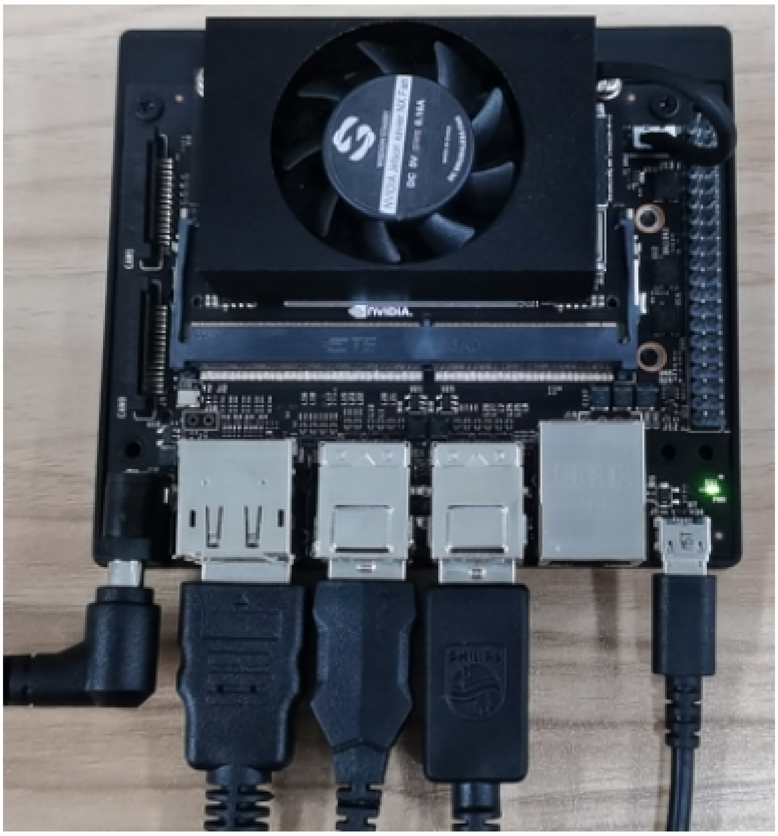
6. Enter the flash mode

1. Jetson Xavier NX enters the system REC flashing mode.

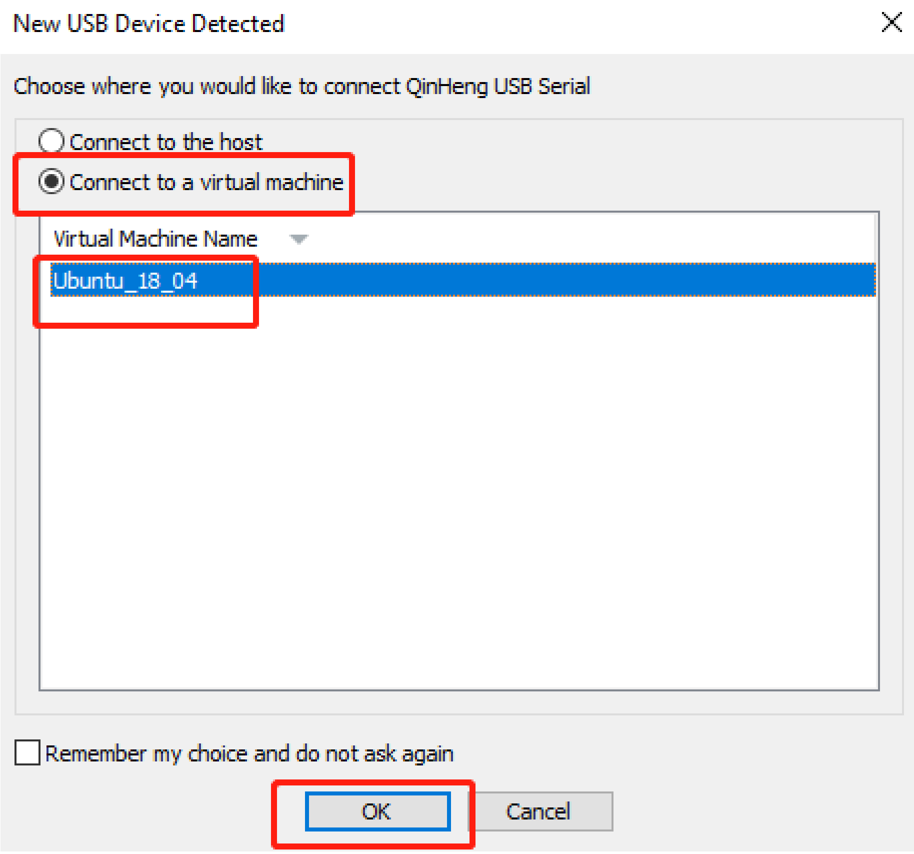
Connect the jumper caps to the FC REC and GND pins, that is, to the second and third pins of the carrier board below the core board, as shown in the image below:



2. Connect the line, connect the HDMI display, mouse, keyboard and microUSB data cable to the Jetson NX, and finally plug in the power supply. Since the jumper cap has been connected to the FC REC and GND pins in the previous step, it will automatically enter the REC flashing mode after power on.



Note here that using a virtual machine requires setting the device to connect to the virtual machine.



New USB Device Detected

Choose where you would like to connect QinHeng USB Serial

○ Connect to the host

● Connect to a virtual machine

Virtual Machine Name

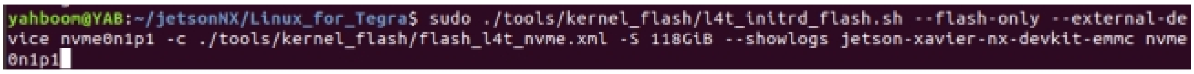
Ubuntu_18_04

□ Remember my choice and do not ask again

7. start brushing

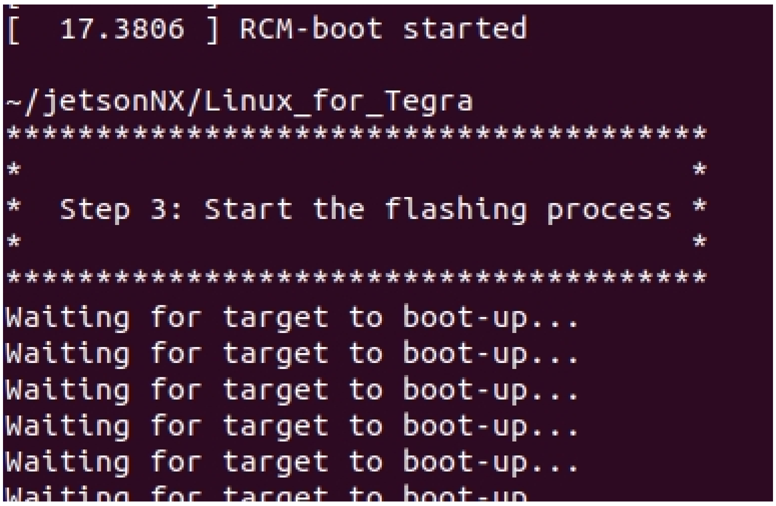
Open a terminal and execute the following commands in the Linux_for_Tegra directory:

```
sudo ./tools/kernel_flash/l4t_initrd_flash.sh --flash-only --external-device
nvme0n1p1 -c ./tools/kernel_flash/flash_l4t_nvme.xml -S 118GiB --showlogs
jetson-xavier-nx-devkit-emmc nvme0n1p1
```



```
yahboom@YAB:~/jetsonNX/Linux_for_Tegra$ sudo ./tools/kernel_flash/l4t_initrd_flash.sh --flash-only --external-de
vice nvme0n1p1 -c ./tools/kernel_flash/flash_l4t_nvme.xml -S 118GiB --showlogs jetson-xavier-nx-devkit-emmc nvme
0n1p1
```

Note: After starting to burn the system, Jetson Xavier NX will restart again. If you are using a virtual machine, you need to manually connect Jetson Xavier NX to the virtual machine, otherwise it will fail to connect and exit the programming over time.



```
[   17.3806 ] RCM-boot started

~/jetsonNX/Linux_for_Tegra
***************************************
*                                     *
*  Step 3: Start the flashing process *
*                                     *
***************************************
Waiting for target to boot-up...
Waiting for target to boot-up...
Waiting for target to boot-up...
Waiting for target to boot-up...
Waiting for target to boot-up...
Waiting for target to boot-up
```

After the programming is complete, the Jetson Xavier NX will automatically power on.

Note: After programming the system, please unplug the jumper caps of FC REC and GND.

If you need to burn the backup system later, you can start from the fifth step.