

# Write SUPER original system

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This tutorial supports upgrading SUPER from Jetson Orin official kit and Jetson Orin SUB kit. After upgrading SUPER, only the pure system will be retained, and the tutorial motherboard case cannot run.

**Note: The startup system of Jetson series motherboards is closely related to the Jetpack version of the motherboard. Different Jetpack versions may fail to start**

The tutorial uses VMware to start the Ubuntu22.04 virtual machine as a demonstration

## 1. File download

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Official website: <https://developer.nvidia.com/embedded/jetson-linux-r3643>

**Note: NVIDIA Jetson Linux 36.4.3 corresponds to Jetpack 6.2**

Download the compressed package files corresponding to `Driver Package (BSP)` and `Sample Root Filesystem`:

Activities Firefox Jan 20 15:05

Jetson Linux | NVIDIA Dev https://developer.nvidia.com/embedded/jetson-linux-r3643

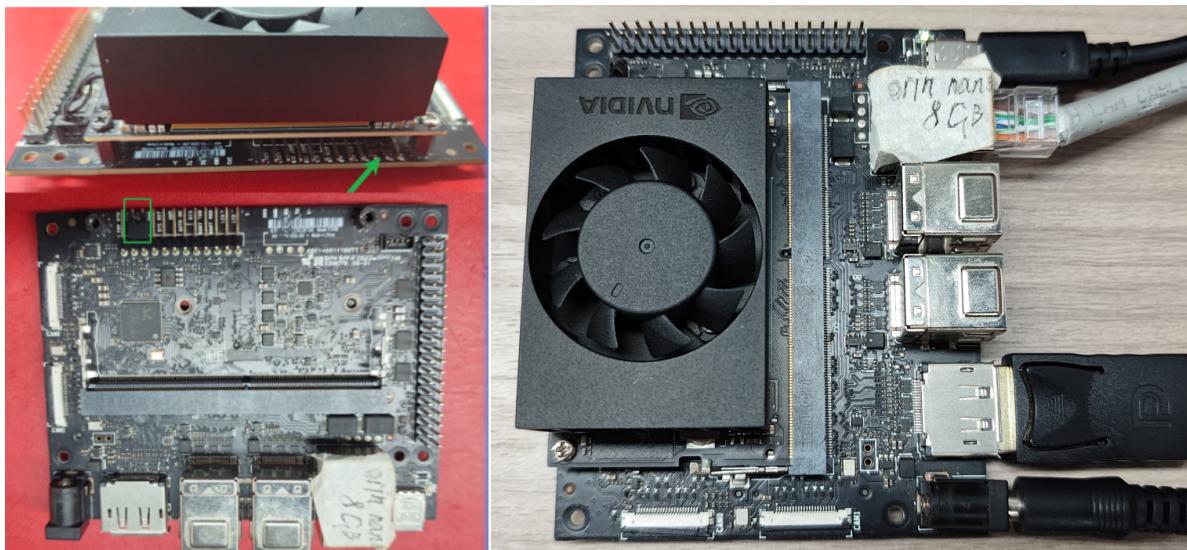
## Downloads and Links

Jetson Orin Modules and Developer Kit		
<b>DRIVERS</b>	<a href="#">Driver Package (BSP)</a>	
	<a href="#">Sample Root Filesystem</a>	
	<a href="#">Jetson Linux API Reference</a>	
<b>SOURCES</b>	<a href="#">Driver Package (BSP) Sources</a>	
	<a href="#">Sample Root Filesystem Sources</a>	
<b>DOCS</b>	<a href="#">Jetson AGX Orin Developer Kit User Guide</a>	
	<a href="#">Jetson Orin Nano Developer Kit User Guide</a>	
	<a href="#">Release Notes</a>	
	<a href="#">Jetson Linux Developer Guide (online version)</a>	
	<a href="#">Software License Agreement</a>	
	<a href="#">Jetson Linux API Reference</a>	
	<a href="#">Release sha1sum hashes</a>	
	<b>TOOLS</b>	<a href="#">WebRTC</a>
		<a href="#">Bootlin Toolchain gcc 11.3</a>

## 2. Flashing mode

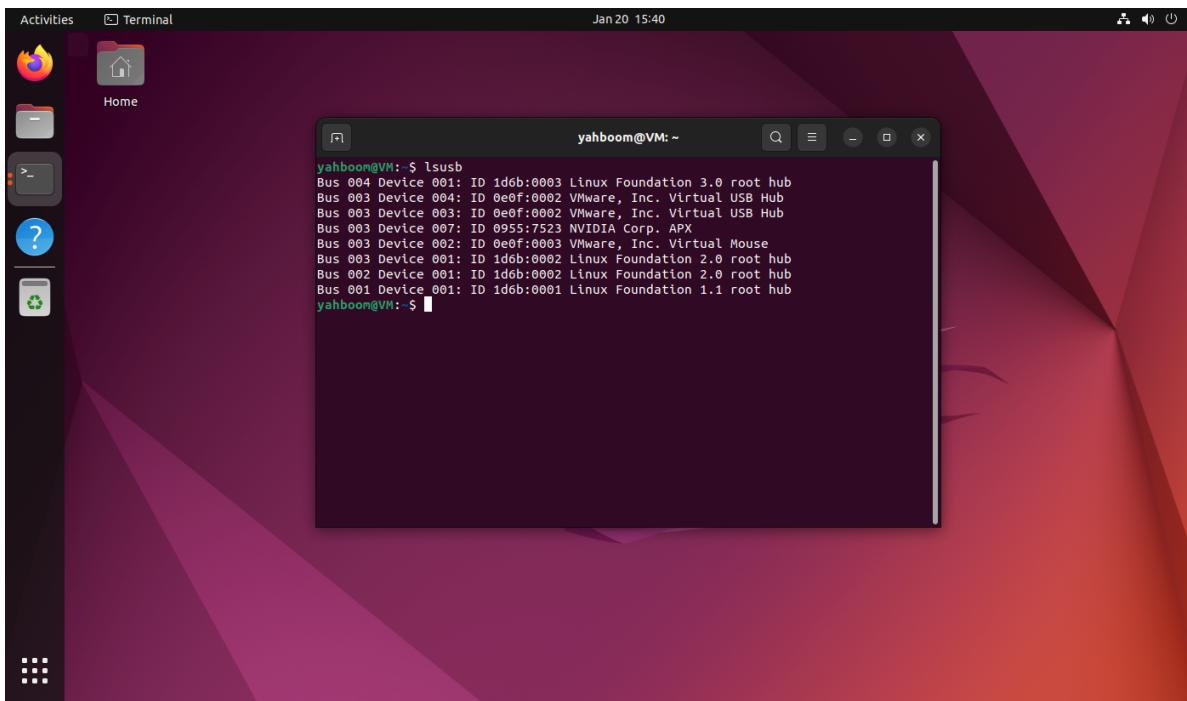
### 2.1. Hardware connection

1. Use a jumper cap to short-circuit the FC REC and GND pins under the core board: the core board can be left unassembled, the picture is just for a clearer observation
2. The Jetson Orin motherboard needs to be connected to a DC power adapter, DP data cable, network cable, and Type C data cable: Type C data cable connects to the computer



### 2.2. Software connection

The motherboard is successfully connected to the Ubuntu system, and the `lssusb` command will show the `NVIDIA Corp. APX` information:

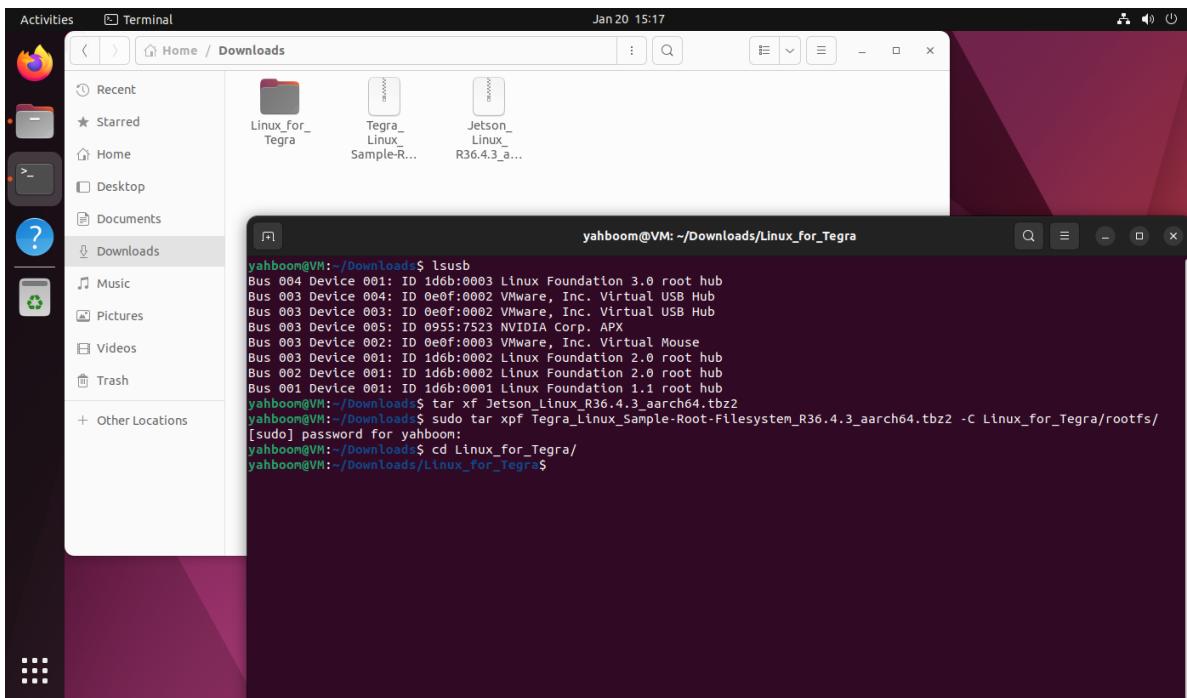


## 3. Burning system

### 3.1. Unzip files

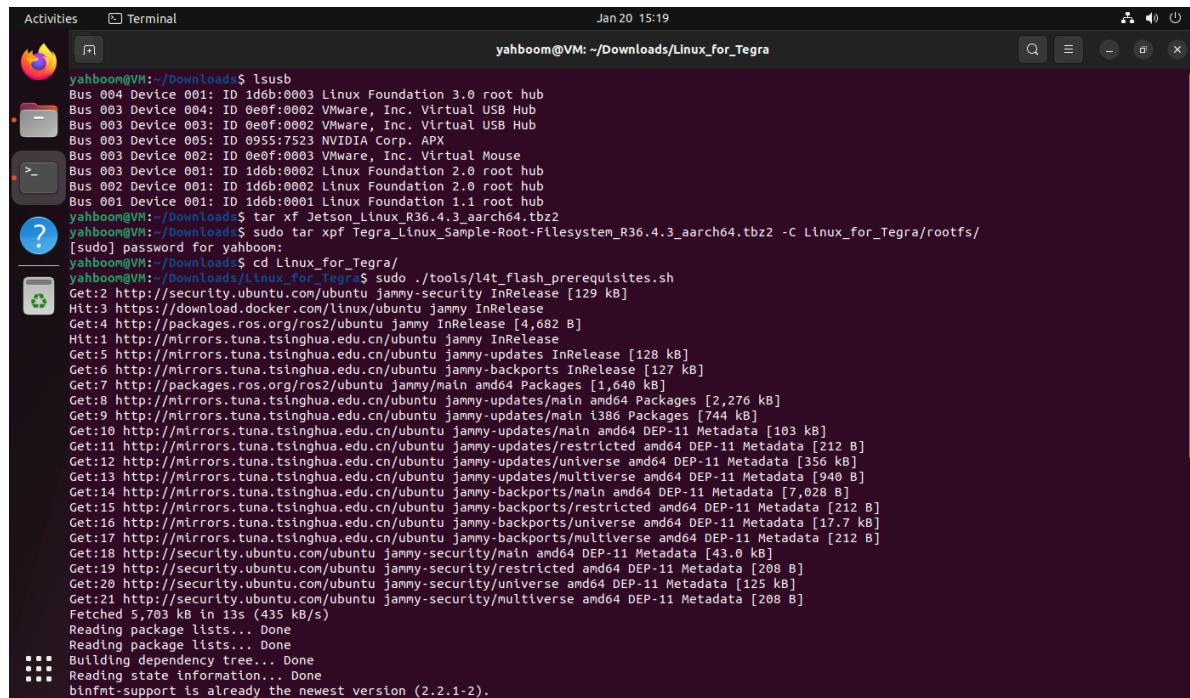
Go to the download folder and open the terminal, then unzip the file in the terminal and go to the specified folder:

```
tar xf Jetson_Linux_R36.4.3_aarch64.tbz2
sudo tar xpf Tegra_Linux_Sample-Root-Filesystem_R36.4.3_aarch64.tbz2 -C
Linux_for_Tegra/rootfs/
cd Linux_for_Tegra/
```



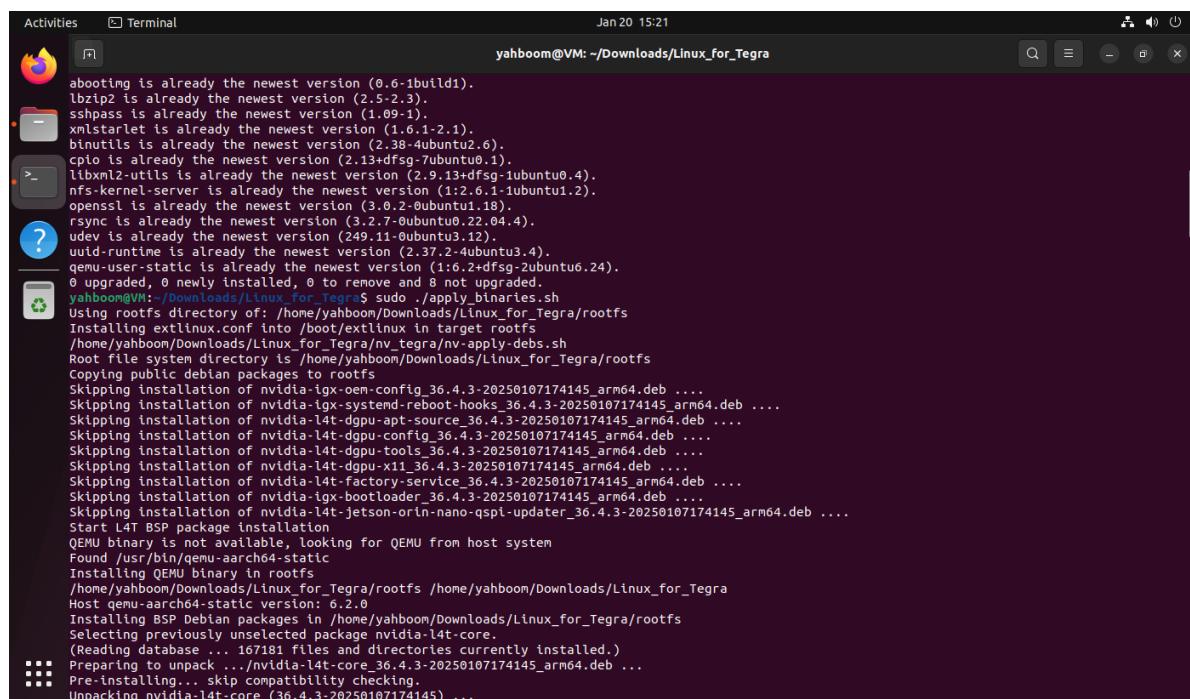
## 3.2. Run the script

```
sudo ./tools/l4t_flash_prerequisites.sh
```



```
Activities Terminal Jan 20 15:19
yahboom@VM:~/Downloads/Linux_for_Tegra
yahboom@VM:~/Downloads$ lsusb
Bus 004 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 003 Device 004: ID 0eef:0002 VMware, Inc. Virtual USB Hub
Bus 003 Device 003: ID 0eef:0002 VMware, Inc. Virtual USB Hub
Bus 003 Device 005: ID 0955:7523 NVIDIA Corp. APX
Bus 003 Device 002: ID 0eef:0003 VMware, Inc. Virtual Mouse
Bus 003 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 002 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 001 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
yahboom@VM:~/Downloads$ tar xf Jetson_Linux_R36.4.3_aarch64.tbz2 -c Linux_for_Tegra/rootfs/
[sudo] password for yahboom:
yahboom@VM:~/Downloads$ cd Linux_for_Tegra/
yahboom@VM:~/Downloads/Linux_for_Tegra$ sudo ./tools/l4t_flash_prerequisites.sh
Get:2 http://security.ubuntu.com/ubuntu jammy InRelease [129 kB]
Hit:3 https://download.docker.com/linux/ubuntu jammy InRelease
Get:4 http://packages.ros.org/ros2/ubuntu jammy InRelease [4,682 B]
Hit:5 http://mirrors.tuna.tsinghua.edu.cn/ubuntu jammy-updates InRelease [128 kB]
Get:6 http://mirrors.tuna.tsinghua.edu.cn/ubuntu jammy-backports InRelease [127 kB]
Get:7 http://packages.ros.org/ros2/ubuntu jammy/main amd64 Packages [1,640 kB]
Get:8 http://mirrors.tuna.tsinghua.edu.cn/ubuntu jammy-updates/main amd64 Packages [2,276 kB]
Get:9 http://mirrors.tuna.tsinghua.edu.cn/ubuntu jammy-updates/main i386 Packages [744 kB]
Get:10 http://mirrors.tuna.tsinghua.edu.cn/ubuntu jammy-updates/main amd64 DEP-11 Metadata [103 kB]
Get:11 http://mirrors.tuna.tsinghua.edu.cn/ubuntu jammy-updates/restricted amd64 DEP-11 Metadata [212 B]
Get:12 http://mirrors.tuna.tsinghua.edu.cn/ubuntu jammy-updates/universe amd64 DEP-11 Metadata [556 kB]
Get:13 http://mirrors.tuna.tsinghua.edu.cn/ubuntu jammy-updates/multiverse amd64 DEP-11 Metadata [940 B]
Get:14 http://mirrors.tuna.tsinghua.edu.cn/ubuntu jammy-backports/main amd64 DEP-11 Metadata [7,028 B]
Get:15 http://mirrors.tuna.tsinghua.edu.cn/ubuntu jammy-backports/restricted amd64 DEP-11 Metadata [212 B]
Get:16 http://mirrors.tuna.tsinghua.edu.cn/ubuntu jammy-backports/universe amd64 DEP-11 Metadata [17,7 kB]
Get:17 http://mirrors.tuna.tsinghua.edu.cn/ubuntu jammy-backports/multiverse amd64 DEP-11 Metadata [212 B]
Get:18 http://security.ubuntu.com/ubuntu jammy-security/main amd64 DEP-11 Metadata [43.0 kB]
Get:19 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 DEP-11 Metadata [208 B]
Get:20 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 DEP-11 Metadata [125 kB]
Get:21 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 DEP-11 Metadata [208 B]
Fetched 5,703 kB in 13s (435 kB/s)
Reading package lists... Done
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
binfmt-support is already the newest version (2.2.1-2).
Activities Terminal Jan 20 15:19
yahboom@VM:~/Downloads/Linux_for_Tegra
yahboom@VM:~/Downloads$
```

```
sudo ./apply_binaries.sh
```



```
Activities Terminal Jan 20 15:21
yahboom@VM:~/Downloads/Linux_for_Tegra
abootimg is already the newest version (0.6-1build1).
lzip2 is already the newest version (2.5-2.3).
sshpss is already the newest version (1.09-1).
xmistarlet is already the newest version (1.6.1-2.1).
binutils is already the newest version (2.38-4ubuntu2.6).
cpio is already the newest version (2.13+dfsg-7ubuntu0.1).
ltbxm12-utils is already the newest version (2.9.13+dfsg-1ubuntu0.4).
nfs-kernel-server is already the newest version (1:2.6.1-1ubuntu1.2).
openssl is already the newest version (3.0.2-0ubuntu1.18).
rsync is already the newest version (3.2.7-0ubuntu0.22.04.4).
udev is already the newest version (249.11-0ubuntu3.12).
uidl-runtime is already the newest version (2.37.2-4ubuntu3.4).
gemu-user-static is already the newest version (1:6.2+dfsg-2ubuntu6.24).
0 upgraded, 0 newly installed, 0 to remove and 8 not upgraded.
yahboom@VM:~/Downloads/Linux_for_Tegra$ sudo ./apply_binaries.sh
Using rootfs directory of: /home/yahboom/Downloads/Linux_for_Tegra/rootfs
Installing extlinux.conf into /boot/extlinux in target rootfs
/home/yahboom/Downloads/Linux_for_Tegra/nv_tegra/nv-apply-debs.sh
Root file system directory is /home/yahboom/Downloads/Linux_for_Tegra/rootfs
Copying public debian packages to rootfs
Skipping installation of nvidia-igx-oem-config_36.4.3-20250107174145_arm64.deb ...
Skipping installation of nvidia-igx-systemd-reboot-hooks_36.4.3-20250107174145_arm64.deb ...
Skipping installation of nvidia-l4t-dgpu-apt-source_36.4.3-20250107174145_arm64.deb ...
Skipping installation of nvidia-l4t-dgpu-config_36.4.3-20250107174145_arm64.deb ...
Skipping installation of nvidia-l4t-dgpu-tools_36.4.3-20250107174145_arm64.deb ...
Skipping installation of nvidia-l4t-dgpu-x11_36.4.3-20250107174145_arm64.deb ...
Skipping installation of nvidia-l4t-factory-service_36.4.3-20250107174145_arm64.deb ...
Skipping installation of nvidia-igx-bootloader_36.4.3-20250107174145_arm64.deb ...
Skipping installation of nvidia-l4t-jetson-orin-nano-qspi-updater_36.4.3-20250107174145_arm64.deb ...
Start L4T BSP package installation
QEMU binary is not available, looking for QEMU from host system
Found /usr/bin/qemu-aarch64-static
Installing QEMU binary in rootfs
/home/yahboom/Downloads/Linux_for_Tegra/rootfs /home/yahboom/Downloads/Linux_for_Tegra
Host qemu-aarch64-static version: 6.2.0
Installing BSP Debian packages in /home/yahboom/Downloads/Linux_for_Tegra/rootfs
Selecting previously unselected package nvidia-l4t-core.
(Reading database ... 167181 files and directories currently installed.)
Preparing to unpack .../nvidia-l4t-core_36.4.3-20250107174145_arm64.deb ...
Pre-installing... skip compatibility checking.
Unpacking nvidia-l4t-core (36.4.3-20250107174145) ...
Activities Terminal Jan 20 15:21
yahboom@VM:~/Downloads$
```

## 3.3. Burn the system to the solid state drive

```
sudo ./tools/kernel_flash/l4t_initrd_flash.sh --external-device nvme0n1p1 -c
tools/kernel_flash/flash_l4t_t234_nvme.xml -p "-c
bootloader/generic/cfg/flash_t234_qspi.xml" --showlogs --network usb0 jetson-
orin-nano-devkit-super internal
```

Note: Both Jetson Orin Nano and Jetson Orin NX can use the same command to burn the system to the SSD

```
Add config /lib/modprobe.d/aliases.conf
Add config /lib/modprobe.d/fbdev-blacklist.conf
Add config /lib/modprobe.d/systemd.conf
Cleaning up the temporary directory for updating the initrd..
/home/yahboom/Downloads/Linux_for_Tegra
Removing QEMU binary from rootfs
Removing stashed Debian packages from rootfs
L4T BSP package installation completed!
Disabling NetworkManager-wait-online.service
Disable the ondemand service by changing the runlevels to 'K'
Success!
yahboom@VM:~/Downloads/Linux_for_Tegra$ sudo ./tools/kernel_flash/l4t_initrd_flash.sh --external-device nvme0n1p1 -c tools/kernel_flash/flash_l4t_t234_nvme.xml -p "-c bootloader/generic/cfg/flash_t234_qspi.xml" --showlogs --network usb0 jetson-orin-nano-devkit-super internal
Please install the Secureboot package to use initrd flash for fused board
# Entry added by NVIDIA Initrd Flash tool
/home/yahboom/Downloads/Linux_for_Tegra/tools/kernel_flash/tmp 127.0.0.1(rw,nohide,insecure,no_subtree_check,async,no_root_squash)
rpcbind: another rpcbind is already running. Aborting
Export list for localhost:
/home/yahboom/Downloads/Linux_for_Tegra/tools/kernel_flash/tmp 127.0.0.1
/home/yahboom/Downloads/Linux_for_Tegra/tools/kernel_flash/l4t_initrd_flash_internal.sh --no-flash --external-device nvme0n1p1 -c tools/kernel_flash/flash_l4t_t234_nvme.xml -p "-c bootloader/generic/cfg/flash_t234_qspi.xml" --showlogs --network usb0 jetson-orin-nano-devkit-super internal
*****
*
* Step 1: Generate flash packages *
*
*****
Create folder to store images to flash
Generate image for internal storage devices
Generate images to be flashed
ADDITIONAL_DTB_OVERLAY=" "/home/yahboom/Downloads/Linux_for_Tegra/flash.sh --no-flash --sign -c bootloader/generic/cfg/flash_t234_qspi.xml jets
on-orin-nano-devkit-super internal

#####
# L4T BSP Information:
# R36 , REVISION: 4.3
# User release: 0.0
#####
ECID is 0x80012344705D1D76C00000001D8140
copying device_config(/home/yahboom/Downloads/Linux_for_Tegra/bootloader/generic/BCT/tegra234-mbi-bct-device-p3767-0000.dts)... done.
copying misc_config(/home/yahboom/Downloads/Linux_for_Tegra/bootloader/generic/BCT/tegra234-mbi-bct-nisc-p3767-0000.dts)... done.
copying emc_fuse_dev_params(/home/yahboom/Downloads/Linux_for_Tegra/bootloader/generic/BCT/tegra234-br-bct-diag-boot.dts)... done.
```

Note: During the burning process, the user needs to connect the device to the virtual machine in time, otherwise it will cause the link to time out!

```
/home/yahboom/Downloads/Linux_for_Tegra
*****
*
* Step 3: Start the flashing process *
*
*****
Waiting for target to boot-up...
Unknown device "/sys/class/net/usb0": No such device
Unknown device "/sys/class/net/usb0": No such device
Waiting for target to boot-up...
Waiting for device to expose ssh .....Waiting for device to expose ssh ...Run command: flash on fc00:1:1:0::2
SSH ready
blockdev: cannot open /dev/mmcblk0boot0: No such file or directory
[ 0]: l4t_flash_from_kernel: Serial Number: 1424524330436
[ 0]: l4t_flash_from_kernel: Starting to create gpt for emmc
Active index file is /mnt/internal/flash.idx
Number of lines is 61
max_index=60
[ 2]: l4t_flash_from_kernel: Successfully create gpt for emmc
[ 2]: l4t_flash_from_kernel: Starting to create gpt for external device
Active index file is /mnt/external/flash.idx
Number of lines is 18
max_index=17
Writing item=1, 9:0:primary_gpt, 512, 19968, gpt_primary_9_0.bin, 16896, fixed-<reserved>-0, b9e666a49460eb45d65a2e20d5289eb608e231b0
```

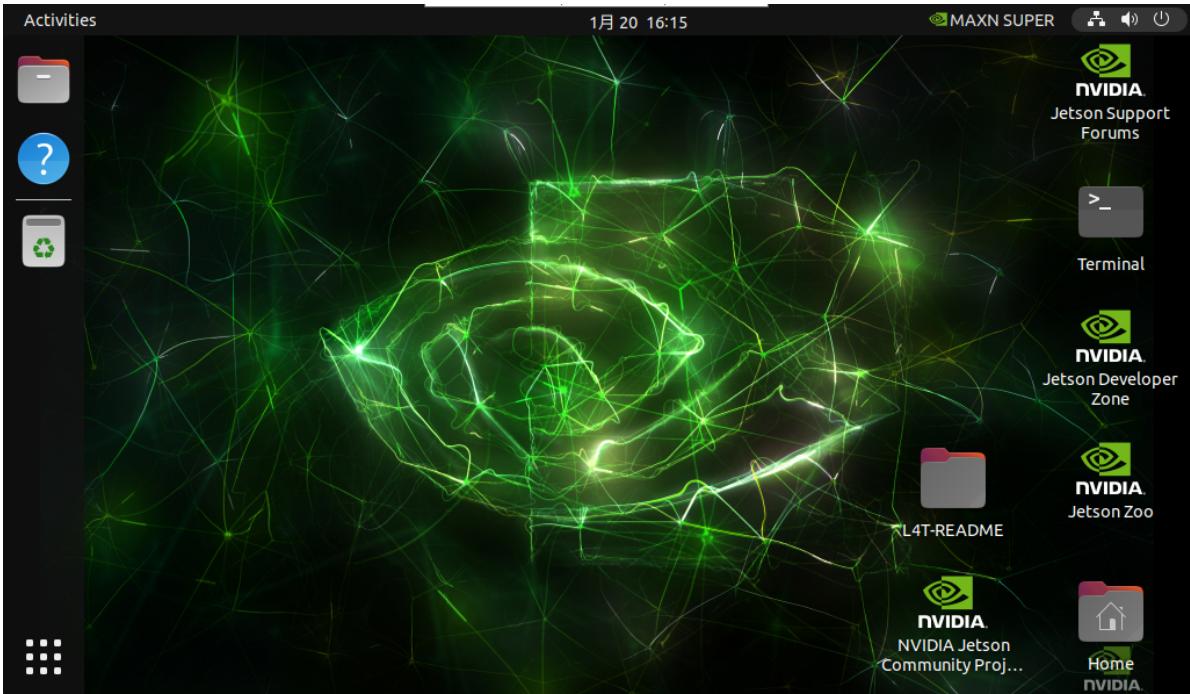
```

Activities Terminal Jan 20 15:54
yahboom@VM: ~/Downloads/Linux_for_Tegra
[ 215]: l4t_flash_from_kernel: Warning: skip writing B.Reserved on boot partition as no image is specified
[ 215]: l4t_flash_from_kernel: Warning: skip writing uefi_variables partition as no image is specified
[ 215]: l4t_flash_from_kernel: Warning: skip writing uefi_firmware partition as no image is specified
[ 215]: l4t_flash_from_kernel: Warning: skip writing reserved partition as no image is specified
[ 215]: l4t_flash_from_kernel: Warning: skip writing worm partition as no image is specified
Writing bct_backup.img (partition: BCT-boot-chain_backup) into /dev/mtd0
Sha1 checksum matched for /mnt/internal/bct_backup.img
Writing /mnt/internal/bct_backup.img (32768 bytes) into /dev/mtd0:66715648
Copied 32768 bytes from /mnt/internal/bct_backup.img to address 0x03fa0000 in flash
[ 215]: l4t_flash_from_kernel: Warning: skip writing reserved_partition partition as no image is specified
Writing gpt_backup_secondary_3_0.bin (partition: secondary_gpt_backup_secondary_3_0.bin)
Sha1 checksum matched for /mnt/internal/gpt_backup_secondary_3_0.bin
Writing /mnt/internal/gpt_backup_secondary_3_0.bin (16896 bytes) into /dev/mtd0:66846720
Copied 16896 bytes from /mnt/internal/gpt_backup_secondary_3_0.bin to address 0x03fc0000 in flash
Writing qspi_bootblob_ver.txt (partition: B-VER) into /dev/mtd0
Sha1 checksum matched for /mnt/internal/qspi_bootblob_ver.txt
Writing /mnt/internal/qspi_bootblob_ver.txt (109 bytes) into /dev/mtd0:66912256
Copied 109 bytes from /mnt/internal/qspi_bootblob_ver.txt to address 0x03fd0000 in flash
Writing qspi_bootblob_ver.txt (partition: A-VER) into /dev/mtd0
Sha1 checksum matched for /mnt/internal/qspi_bootblob_ver.txt
Writing /mnt/internal/qspi_bootblob_ver.txt (109 bytes) into /dev/mtd0:66977792
Copied 109 bytes from /mnt/internal/qspi_bootblob_ver.txt to address 0x03fe0000 in flash
Writing gpt_secondary_3_0.bin (partition: secondary_gpt) into /dev/mtd0
Sha1 checksum matched for /mnt/internal/gpt_secondary_3_0.bin
Writing /mnt/internal/gpt_secondary_3_0.bin (16896 bytes) into /dev/mtd0:67091968
Copied 16896 bytes from /mnt/internal/gpt_secondary_3_0.bin to address 0x03ffbe00 in flash
[ 215]: l4t_flash_from_kernel: Successfully flush the qspi
writing item=17, 9:0:secondary_gpt, 61203267072, 16896, gpt_secondary_9_0.bin, 16896, fixed-<reserved>-0, 5606a1a80e17a4ee4bb7478f0a832318c8ed65c
5
[ 243]: l4t_flash_from_kernel: Successfully flush the external device
[ 243]: l4t_flash_from_kernel: Flashing success
[ 243]: l4t_flash_from_kernel: The device size indicated in the partition layout xml is smaller than the actual size. This utility will try to fix the GPT.
Flash is successful
Reboot device
Cleaning up...
Log is saved to Linux_for_Tegra/initrdlog/flash_3-2_0_20250120-154849.log
yahboom@VM: ~/Downloads/Linux_for_Tegra$ 

```

## 4. Start the system

After the system is successfully burned, disconnect the mainboard power supply (disconnect the DC power adapter and Type-C data cable), and then unplug the jumper cap that shorts FC REC and GND under the core board; after confirming that the above operations are completed, reconnect the DC power adapter and DP data cable (connect to the display) to start the system.



```

Activities Terminal Jan 20 16:20 MAXN SUPER
jtop MAXN SUPER|CPU 7.2%|GPU 0.0%
Model: NVIDIA Jetson Orin Nano Engineering Reference Developer Kit Super - Jetpack 6.2 [L4T 36.4.3]
1 [|| 3.0%] 1.7GHz 4 [| | 7.1%] 1.7GHz
2 [|| 7.0%] 1.7GHz 5 [ 1.0%] 1.7GHz
3 [ 3.0%] 1.7GHz 6 [ 2.0%] 1.7GHz
Mem [||||| 1.3G/7.4G] FAN [||||| 30.6%] 1655RPM
Swp [ 0k/3.7G] Jetson Clocks: running
Emc [204MHz:::3.2GHz] 3.2GHz 0% NV Power[2]: MAXN_SUPER
Uptime: 0 days 0:2:28
GPU [ 0.0%] 1.0GHz
Dsk [## 7.8G/232G]
PID USER GPU TYPE PRI S CPU% MEM [GPU MEM] Command
1802 jetson I G 20 S 6.4 68.2M 57.2M gnome-shell
1498 jetson I G 20 S 1.3 15.6M 32.5M Xorg
1734 jetson I G 20 S 1.5 14.9M 2.9M gnome-remote-de
2277 jetson I G 20 S 0.2 10.9M 853k xdg-desktop-por

[HW engines]
APE: [OFF]
NVDEC: [OFF]
NVJPG: [OFF] NVJPG1: [OFF]
SE: [OFF] VIC: [OFF]

[Sensor]
cpu 49.62C
cv0 Offline
cv1 Offline
cv2 Offline
gpu 51.34C
soc0 49.03C
soc1 50.69C
soc2 49.41C
tj 51.34C

[Power]
CPU GPU CV 1.6W 1.7W
SOC 2.4W 2.4W
VDD_IN 7.4W 7.4W

[Inst] [Avg]
(c) 2024, RB

```

1ALL 2GPU 3CPU 4MEM 5ENG 6CTRL 7INFO Quit

```

Activities Terminal Jan 20 16:20 MAXN SUPER
jtop 4.3.1 - (c) 2024, Raffaello Bonghi [raffaello@rnext.it]
Website: https://rnext.it/jetson_stats

Platform
Machine: aarch64
System: Linux
Distribution: Ubuntu 22.04 Jammy Jellyfish
Release: 5.15.148-tegra
Python: 3.10.12

Serial Number: [s|XX CLICK TO READ XXX]
Hardware
Model: NVIDIA Jetson Orin Nano Engineering Reference Devel
699-level Part Number: 699-13767-0005-300 R.1
P-Number: p3767-0005
Module: NVIDIA Jetson Orin Nano (Developer kit)
SoC: tegra234
CUDA Arch BIN: 8.7
L4T: 36.4.3
Jetpack: 6.2

Libraries
CUDA: MISSING
cuDNN: MISSING
TensorRT: MISSING
VPI: MISSING
Vulkan: 1.3.204
OpenCV: 4.5.4 with CUDA: NO

Hostname: yahboom
Interfaces
enP8p1s0: 192.168.2.116

(c) 2024, RB

```

1ALL 2GPU 3CPU 4MEM 5ENG 6CTRL 7INFO Quit

## 5. Component environment

The above is only to complete the burning of the pure system. If you need `CUDA`, `TensorRT` and other environments, users also need to refer to [Chapter 2 Motherboard Basics: Installing Jetson Component Environment] for operation!