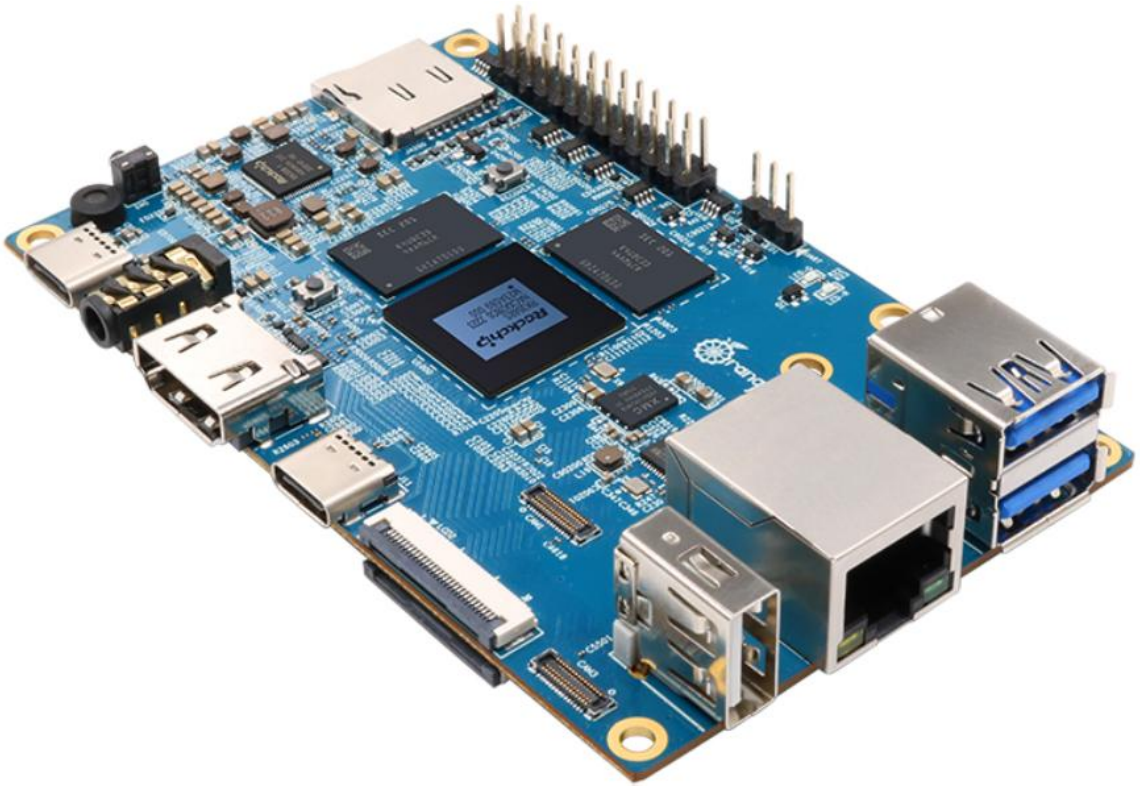
Orange Pi 5

User Manual



Contents

User Manual Update History

Version	date	Release Notes
v0.1	2022-12-02	initial version
v0.2	2022-12-05	1. How to write Linux image to SPI Flash+NVMe SSD 2. The method of uploading files to the Linux system of the development board 3. How to download and install the arm64 version of balenaEtcher 4. How to burn Orange Pi OS (Droid) image to TF card 5. How to burn Orange Pi OS (Droid) image to SPIFlash+NVMe SDD 6. How to Remotely Log In to the Desktop of Linux System

Image update history

date	Release Notes
2022-12-02	Orangepi5_1.0.0_debian_bullseye_desktop_xfce_linux5.10.110.7z * initial version
2022-12-05	Orangepi5_1.0.2_debian_bullseye_desktop_xfce_linux5.10.110.7z * Preinstalled with balenaEtcherhe and Gparted * Pre-installed ffmpeg and mpv player * Add some scripts and configuration files

1. Basic features of Orange Pi 5

1.1. What is Orange Pi 5

Orange Pi 5 adopts Rockchip RK3588S new-generation octa-core 64-bit ARM processor, specifically quad-core A76 and quad-core A55, using Samsung 8nm LP process technology, large-core main frequency up to 2.4GHz, integrated ARM Mali -G610 MP4 GPU, embedded with high-performance 3D and 2D image acceleration modules, built-in AI accelerator NPU with a computing power of up to 6 Tops, has 4GB/8GB/16GB/32GB (LPDDR4/4x) memory, and has up to 8K display processing capabilities.

Orange Pi 5 brings out quite a lot of interfaces, including HDMI output, Type-C, M.2 PCIe2.0x1, Gigabit Ethernet port, USB2.0, USB3.0 interface and 26pin expansion pin header, etc. It can be widely used in high-end tablet, edge computing, artificial intelligence, cloud computing, AR/VR, smart security, smart home and other fields, covering various AIoT industries.

Orange Pi 5 supports Orange Pi OS, the official operating system developed by Orange Pi. At the same time, it supports Android 12.1, Debian11 and other operating systems.

1.2. Purpose of Orange Pi 5

We can use it to achieve:

- A Linux desktop computer
- A Linux web server
- Android tablet
- Android game console, etc.

Of course, there are more functions, because the Orange Pi 5 development board can install Linux systems such as Debian and Ubuntu, and systems such as Android, which means that we can implement it within the scope of the development board hardware and software support. Various functions.

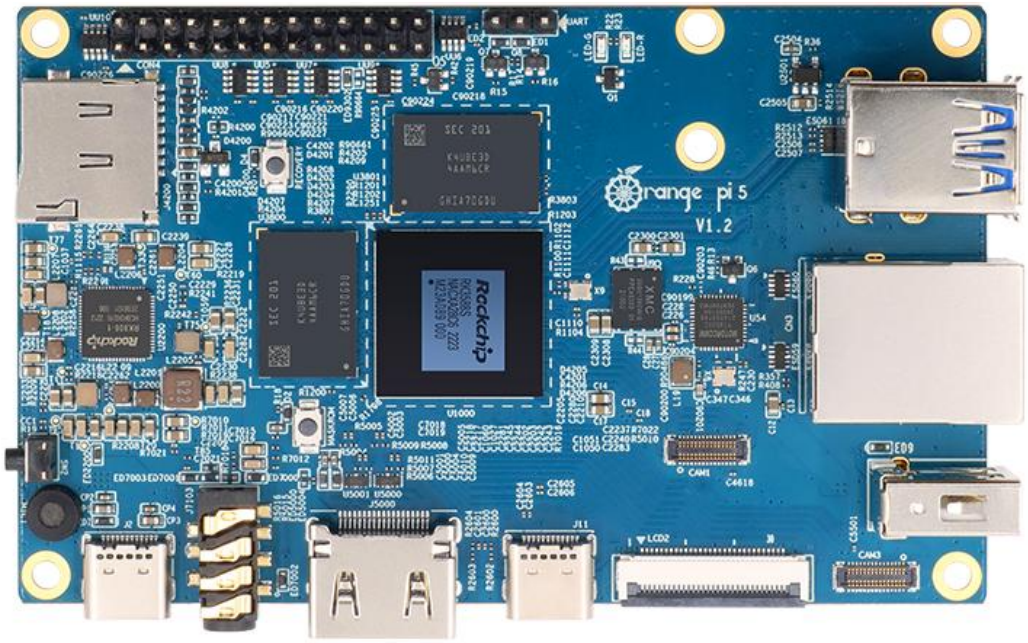
1. 3. Hardware features of Orange Pi 5

Introduction to hardware features	
CPU	• Rockchip RK3588S (8nm LP process) • 8-core 64-bit processor • 4-core Cortex-A76 and 4-core Cortex-A55 core architecture • The main frequency of the large core is up to 2.4GHz, and the main frequency of the small core is up to 1.8GHz
GPU	• Integrated ARM Mali-G610 • OpenGL ES1.1/2.0/3.2, OpenCL 2.2 and Vulkan 1.2
NPU	• Built-in AI accelerator NPU with up to 6 Tops computing power • Support INT4/INT8/INT16 mixed operation
video output	• HDMI 2.1, up to 8K @60Hz • DP1.4（DisplayPort） • 2 * MIPI D-PHY TX 4Lane
Memory	4GB/8GB/16GB/32GB（LPDDR4/4x）
Camera	• 1 * MIPI CSI 4Lane • 2 * MIPI D-PHY RX 4Lane
PMU	RK806-1
onboard storage	• 16MB QSPI Nor FLASH • MicroSD (TF) Card Slot • PCIe2.0x1 M.2 M-KEY (SSD) slot
ethernet	10/100/1000Mbps ethernet (YT8531C)
audio	• 3.5mm headphone jack audio input/output • Onboard MIC input • HDMI output
PCIe M.2 M-KEY	• support PCIe WIFI6+BT5.0+BLE • support SSD
USB	1 * USB3.0 2 * USB2.0 (One of them is shared with Type-C interface)

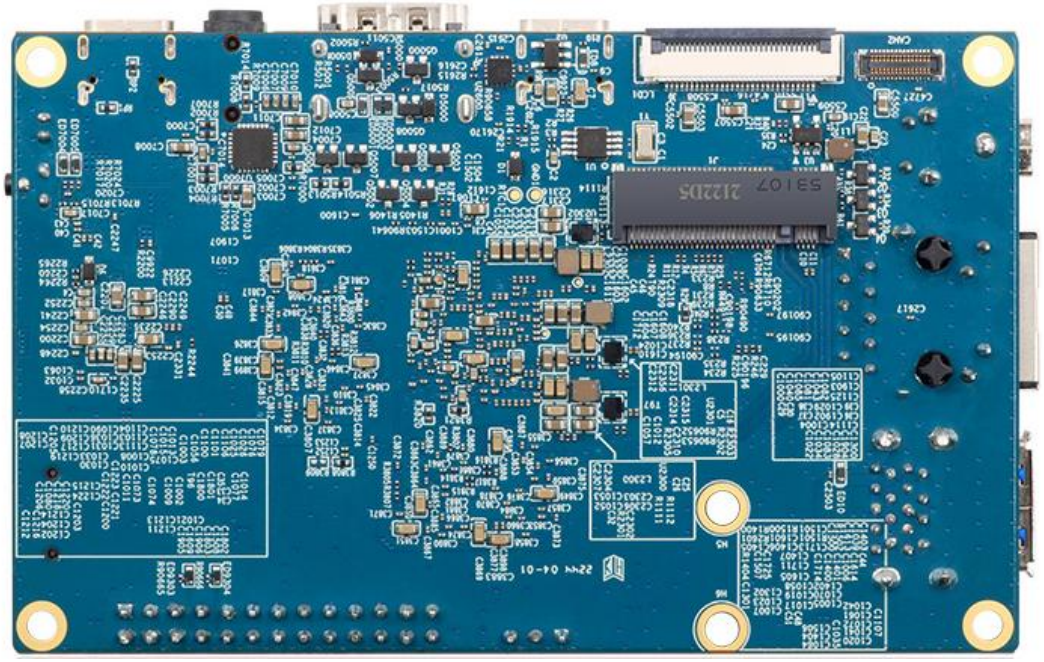
	1 * USB3.0 Type-C
26pin extension header	Used to expand UART, PWM, I2C, SPI, CAN and GPIO interfaces
Debug serial port	3pin debugging serial port
LED light	Power light and status light
button	1 * MaskROM key，1 * RECOVERY，1 * Off button
Power	Type-C interface power supply 5V/4A;
Supported OS	Orange Pi OS (Droid), Android12.1, Debian11 and other operating systems
Introduction of Appearance Specifications	
Product Size	100mm*62mm
weight	46g
range Pi™ is a registered trademark of Shenzhen Xunlong Software Co., Ltd.	

1. 4. Top view and bottom view of Orange Pi 5

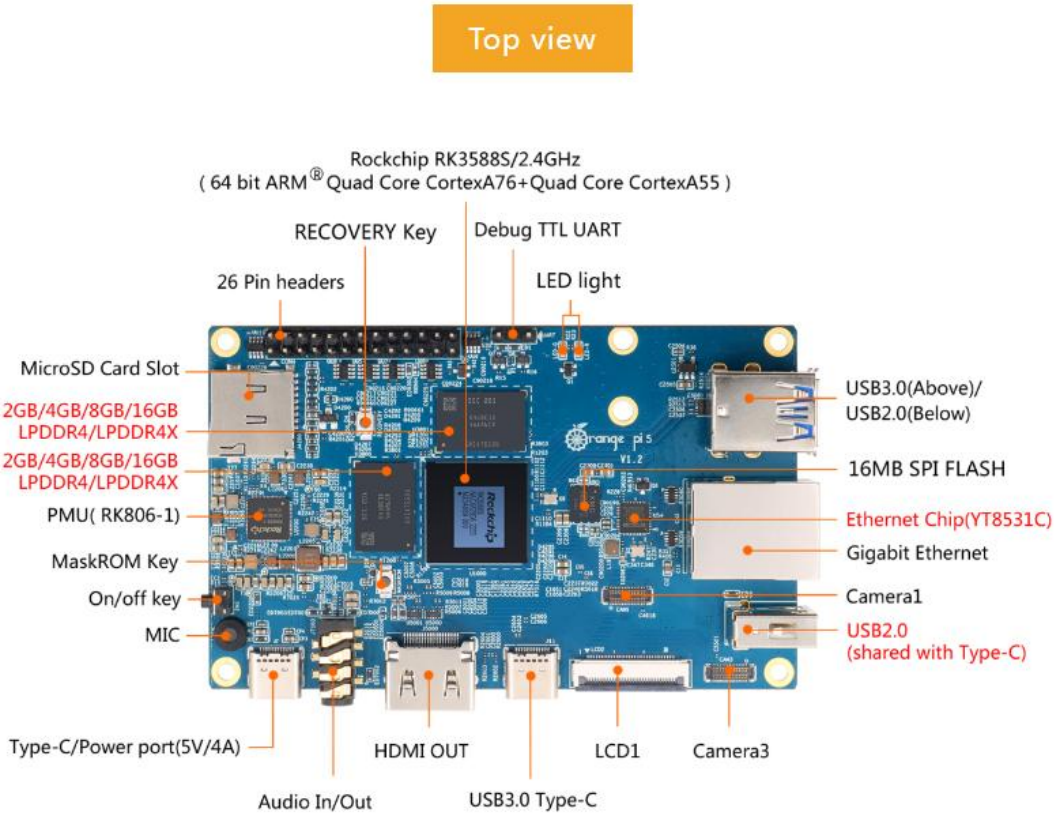
Top view:



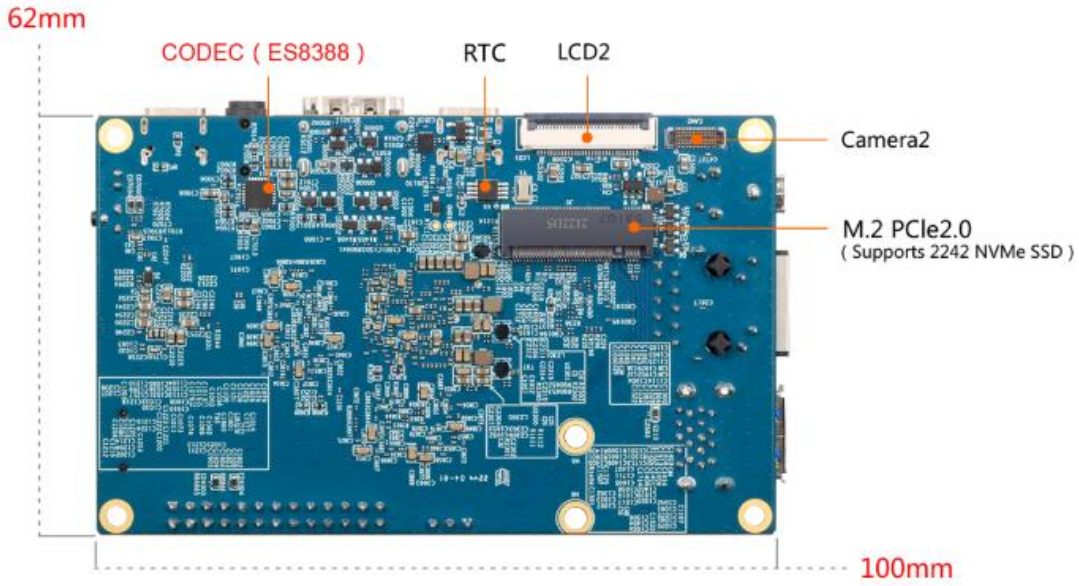
Bottom view:

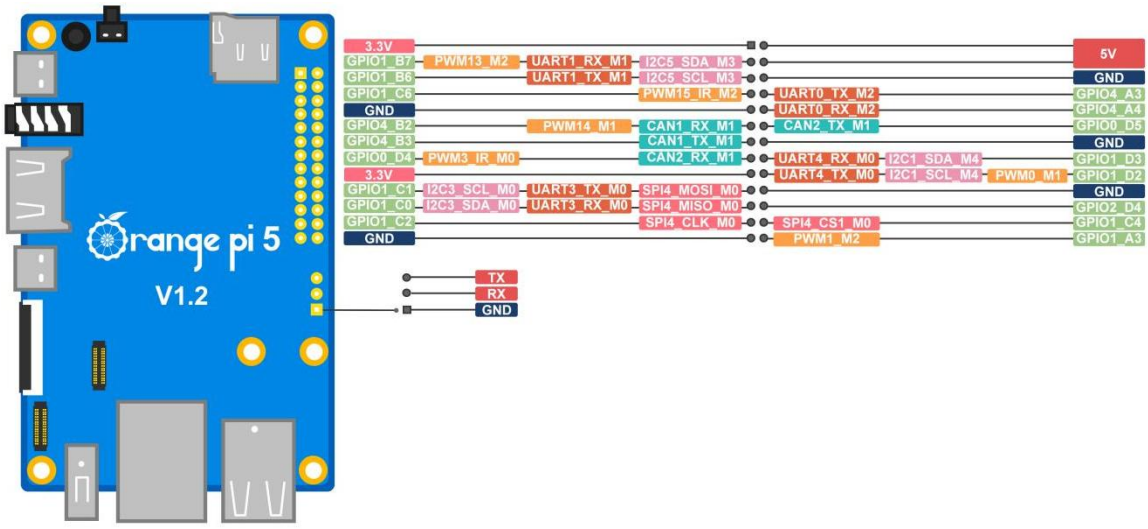


1. 5. Interface details of Orange Pi 5



Bottom view





The diameter of the four positioning holes is 3.0mm, and the diameter of the two M.2 PICE device fixing holes is 3.5mm.

2. Introduction to the use of the development board

2. 1. Prepare the required accessories

1) TF card, a high-speed SanDisk card of class 10 or above with a minimum capacity of 8GB (32GB or above is recommended)

2) TF card reader, used to burn the image into the TF card

3) Display with HDMI interface

4) HDMI to HDMI cable, used to connect the development board to an HDMI monitor or TV for display

Note, if you want to connect a 4K or 8K display, please make sure that the HDMI cable supports 4K or 8K video output.

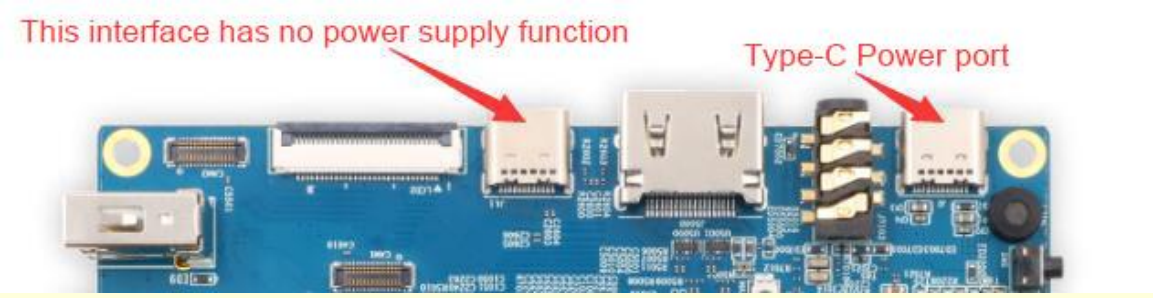
5) Type-C to HDMI cable, connect the development board to an HDMI monitor or TV for display through the Type-C interface

6) Type-C to USB adapter, used to connect USB storage devices or USB devices such as mouse and keyboard

7) 10.1-inch MIPI screen, used to display the system interface of the development board

8) Power adapter, Orange Pi 5 is recommended to use 5V/4A Type-C power supply for power supply

There are two Type-C ports that look the same on the development board. The one on the right is the power port, and the one in the middle has no power supply function. Please don't connect it wrong.



The Type-C power interface of the development board does not support the PD negotiation function, and only supports a fixed 5V voltage input.

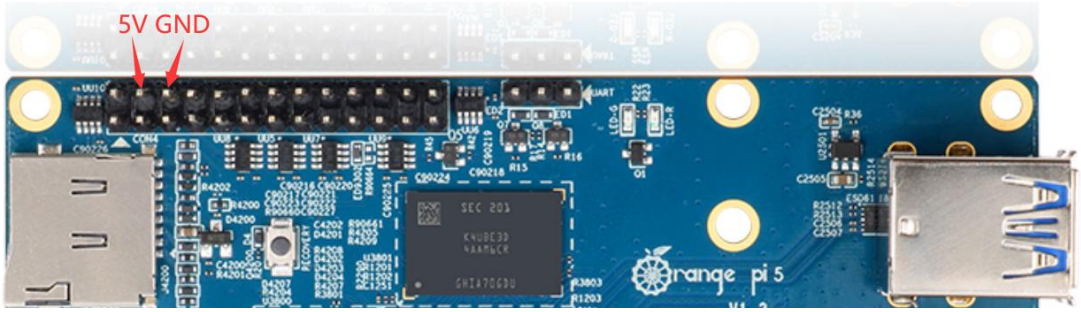
9) The mouse and keyboard of the USB interface, as long as the mouse and keyboard of

the standard USB interface are acceptable, the mouse and keyboard can be used to control the Orange Pi development board

10) USB camera

11) 5V cooling fan. As shown in the figure below, the 5V and GND pins on the 26pin interface of the development board can be connected to the cooling fan. The spacing between the 26pin headers is **2.54mm**. The power interface of the cooling fan can be purchased from Taobao according to this specification.

Note that the 5V pin on the 26pin pin header can be used directly after the development board is plugged into the power supply of the Type-C interface. No other settings are required. In addition, the output voltage of the 5V pin on the 26pin pin header cannot be adjusted and turned off by software. (no PWM function).



12) 100M or 1000M network cable, used to connect the development board to the Internet

13) The data cable of the Type-C interface, used to burn the image to NVMe SSD, use ADB and other functions

14) OV13850 camera with 13 million MIPI interface (picture to be added)

15) Matching shell (pictures and assembly methods to be added)

16) **3.3V** USB to TTL module and DuPont line, when using the serial port debugging function, need USB to TTL module and DuPont line to connect the development board and computer

17) Personal computer with Ubuntu and Windows operating systems installed

1	Ubuntu22.04 PC	Optional, used to compile Linux source code
2	Windows PC	For burning Android and Linux images

2.2. Download the image of the development board and related materials

1) The website for downloading the Chinese version is:

http://www.orangepi.cn/html/hardWare/computerAndMicrocontrollers/service-and-support/Orange-pi-5.html

2) The website for downloading the English version is:

http://www.orangepi.org/html/hardWare/computerAndMicrocontrollers/service-and-support/Orange-pi-5.html

3) The information mainly includes

a. **Android source code:** saved on Google network disk
b. **Linux source code:** saved on Github
c. **User manual and schematic diagram:** saved on Google Cloud Disk
d. **Official tools:** mainly include the software that needs to be used during the use of the development board
e. **Android image:** saved on Google Cloud Disk
f. **Debian image:** saved on Google Cloud Disk

2.3. Method of burning Linux image to TF card based on Windows PC

Note that the Linux image mentioned here specifically refers to the image of Linux distributions such as Debian or Ubuntu downloaded from the Orange Pi data download page.

2.3.1. How to use balenaEtcher to burn Linux image

1) First prepare a TF card with 8GB or larger capacity. The transmission speed of the TF card must be class 10 or above. It is recommended to use a TF card of SanDisk and other brands

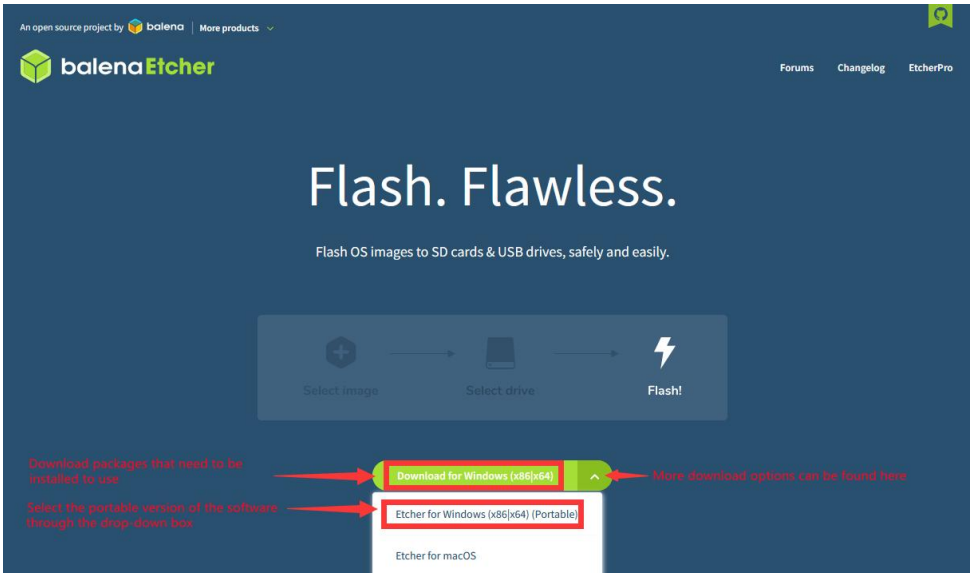
2) Then use the card reader to insert the TF card into the computer

3) Download the Linux operating system image file compression package that you want to burn from the Orange Pi data download page, and then use the decompression software to decompress it. Among the decompressed files, the file ending with "**.img**" is the image file of the operating system. The size is generally more than 2GB

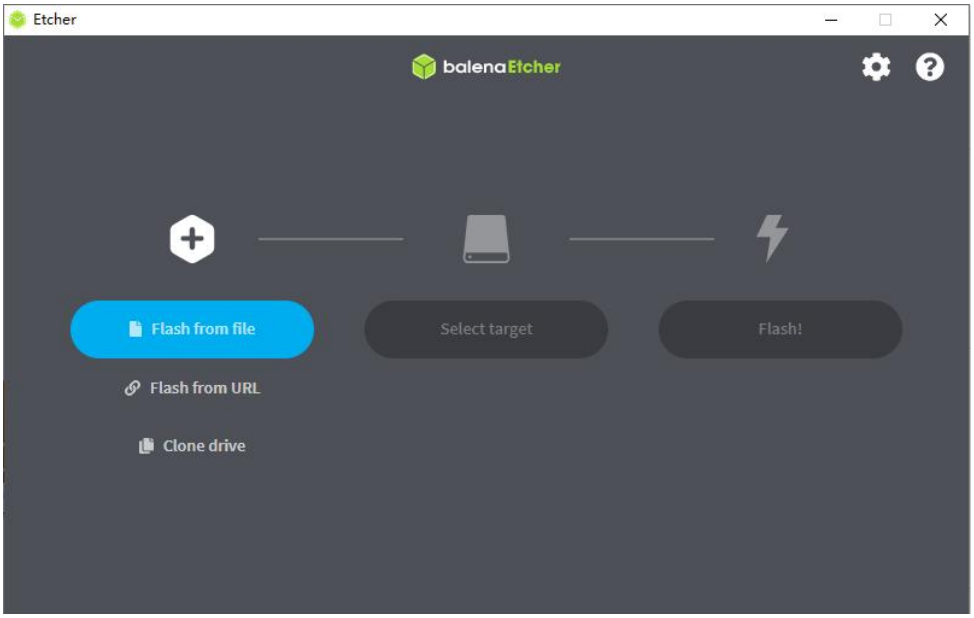
4) Then download the burning software of Linux image——**balenaEtcher**, the download address is

https://www.balena.io/etcher/

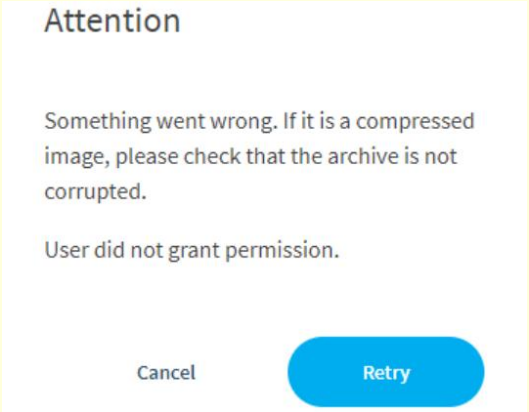
5) After entering the balenaEtcher download page, click the green download button to download the installation package of balenaEtcher. You can also select the Portable version of the balenaEtcher software through the drop-down box. The Portable version does not need to be installed, and you can use it by double-clicking to open it



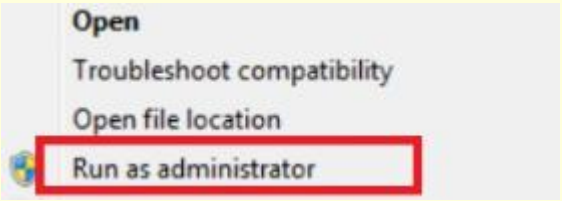
6) If the downloaded version of balenaEtcher needs to be installed, please install it before using it. If you downloaded the Portable version of balenaEtcher, just double-click to open it. The opened balenaEtcher interface is shown in the figure below



When opening balenaEtcher, if the following error is prompted:

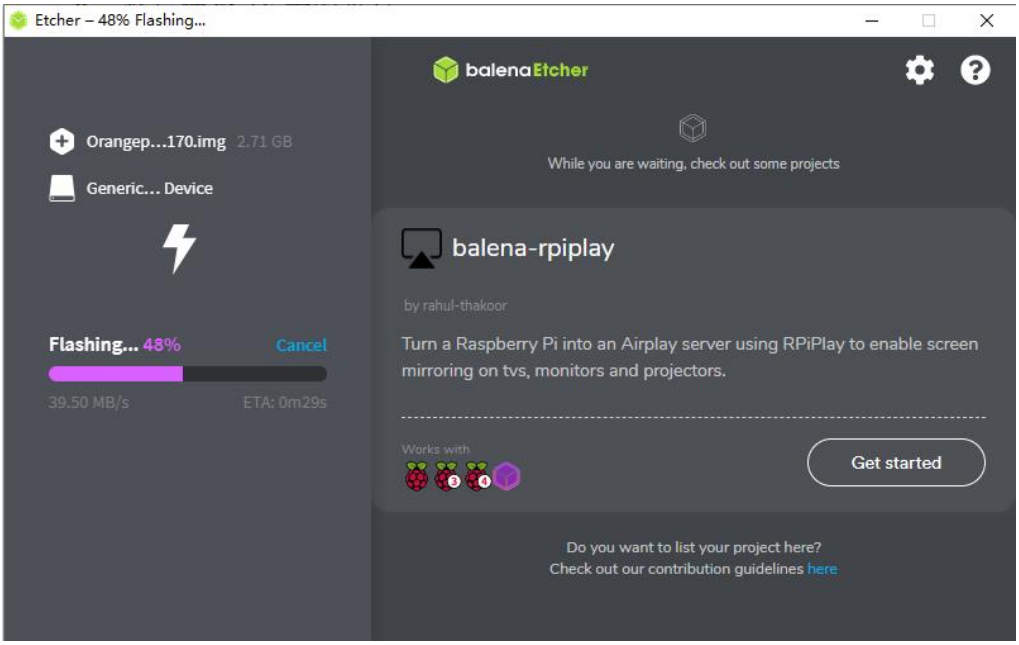


Please select balenaEtcher, right-click, and select Run as administrator.

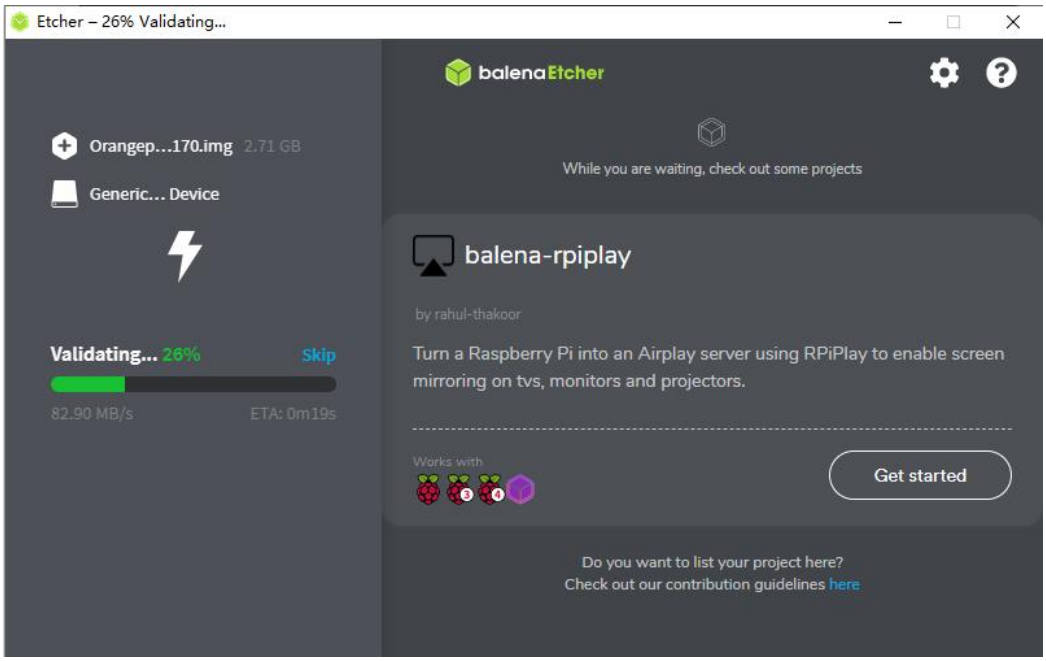


7) The specific steps to use balenaEtcher to burn the Linux image are as follows
   a. First select the path of the Linux image file to be burned
   b. Then select the drive letter of the TF card
   c. Finally, click Flash to start burning the Linux image to the TF card

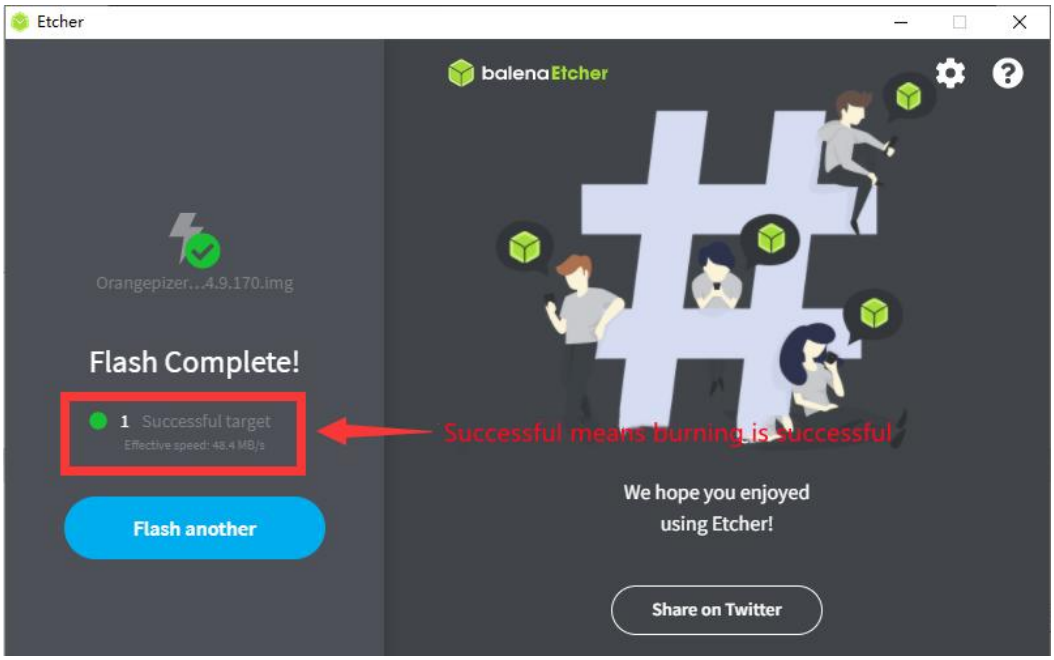
8) The interface displayed in the process of burning the Linux image by balenaEtcher is shown in the figure below, and the progress bar displays purple, indicating that the Linux image is being burned into the TF card



9) After burning the Linux image, balenaEtcher will also verify the image burned into the TF card by default to ensure that there is no problem during the burning process. As shown in the figure below, a green progress bar indicates that the image has been burnt, and balenaEtcher is verifying the burnt image



10) After successful burning, the display interface of balenaEtcher is shown in the figure below. If the green indicator icon is displayed, it means that the image burning is successful. At this time, you can exit balenaEtcher, and then pull out the TF card and insert it into the TF card slot of the development board for use. up



2. 3. 2. How to use Win32Diskimager to burn Linux image

1) First prepare a TF card with 8GB or larger capacity. The transmission speed of the TF card must be class 10 or above. It is recommended to use a TF card of SanDisk and other

brands

2) Then use the card reader to insert the TF card into the computer

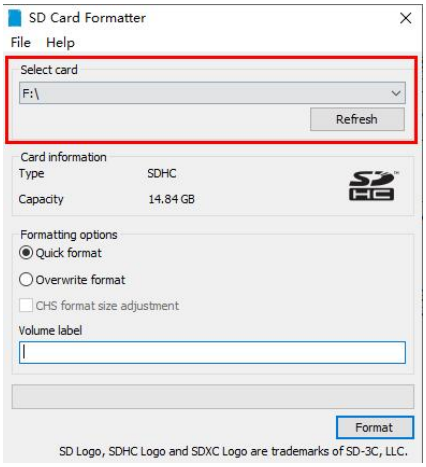
3) Then format the TF card

a. **SD Card Formatter** can be used to format the TF card. The download address is:

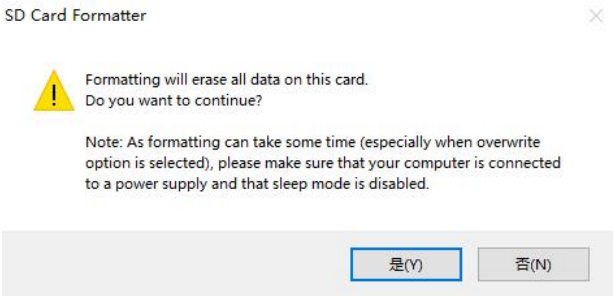
https://www.sdcard.org/downloads/formatter/eula_windows/SDCardFormatterv5_WinEN.zip

b. After downloading, unzip and install directly, and then open the software

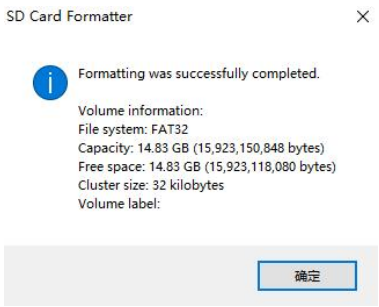
c. If only a TF card is inserted into the computer, the drive letter of the TF card will be displayed in the **"Select card"** column. If multiple USB storage devices are inserted into the computer, you can select the corresponding drive letter of the TF card through the drop-down box



d. Then click "**Format**", a warning box will pop up before formatting, and formatting will start after selecting "Yes (Y)"



e. After formatting the TF card, the information shown in the figure below will pop up, click OK



4) Download the Linux operating system image file compression package that you want to burn from the Orange Pi data download page, and then use the decompression software to decompress it. Among the decompressed files, the file ending with **".img"** is the image file of the operating system. The size is generally more than 2GB

5) Use **Win32Diskimager** to burn the Linux image to the TF card

a. The download page of Win32Diskimager is

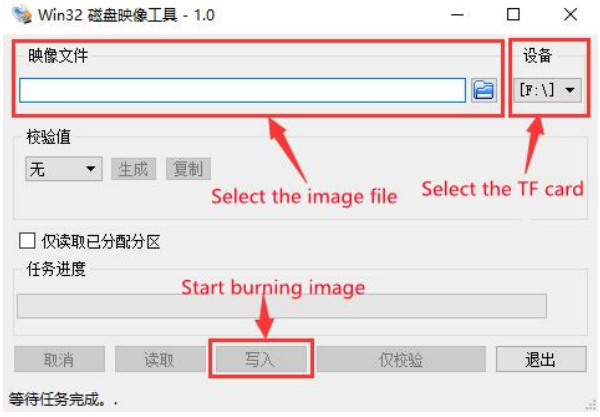
http://sourceforge.net/projects/win32diskimager/files/Archive/

b. After downloading, install it directly. The interface of Win32Diskimager is as follows

a) First select the path of the image file

b) Then confirm that the drive letter of the TF card is consistent with that displayed in the "Device" column

c) Finally click "Write" to start burning



c. After the image writing is completed, click the "Exit" button to exit, and then

you can pull out the TF card and insert it into the development board to start

2. 4. Method of burning Linux image to TF card based on Ubuntu PC

Note that the Linux image mentioned here specifically refers to the image of Linux distributions such as Debian or Ubuntu downloaded from the Orange Pi data download page, and the Ubuntu PC refers to the personal computer with the Ubuntu system installed.

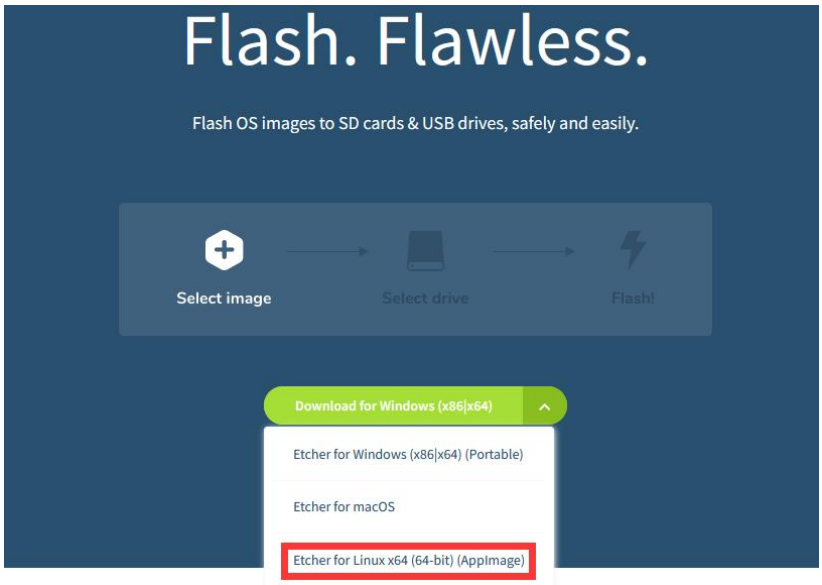
1) First prepare a TF card with 8GB or larger capacity. The transmission speed of the TF card must be class 10 or above. It is recommended to use a TF card of SanDisk and other brands

2) Then use the card reader to insert the TF card into the computer

3) Download the balenaEtcher software, the download address is

https://www.balena.io/etcher/

4) After entering the balenaEtcher download page, please select the Linux version of the software from the drop-down box to download



5) Download the Linux operating system image file compression package that you want to burn from the Orange Pi data download page, and then use the decompression software to decompress it. Among the decompressed files, the file ending with **".img"** is the image file of the operating system. The size is generally more than 2GB

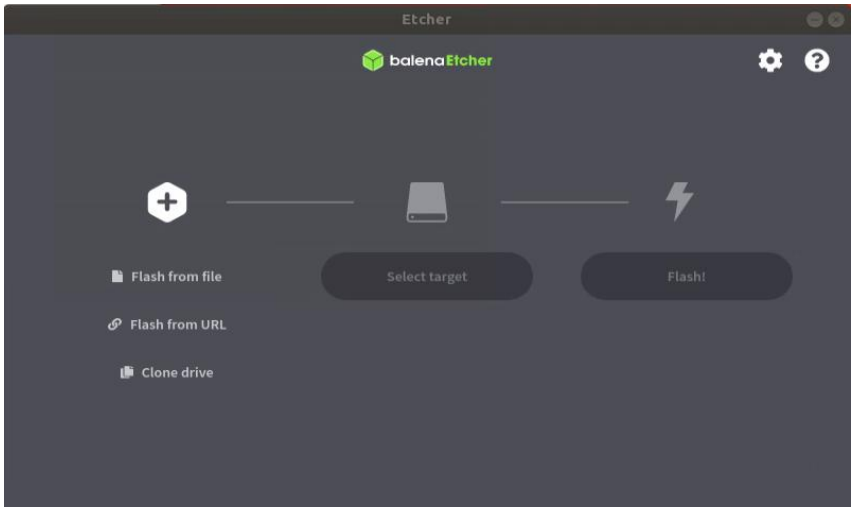
The decompression command for the compressed package ending in 7z is as follows

```
test@test:~$ 7z x Orangepi5_1.0.0_debian_bullseye_desktop_xfce_linux5.10.110.7z
test@test:~$ ls Orangepi5_1.0.0_debian_bullseye_desktop_xfce_linux5.10.110.*
Orangepi5_1.0.0_debian_bullseye_desktop_xfce_linux5.10.110.7z
Orangepi5_1.0.0_debian_bullseye_desktop_xfce_linux5.10.110.sha      #checksum file
Orangepi5_1.0.0_debian_bullseye_desktop_xfce_linux5.10.110.img      #image file
```

6) After decompressing the image, you can first use the **sha256sum -c *.sha** command to calculate whether the checksum is correct. If the prompt is **successful**, it means that the downloaded image is correct, and you can safely burn it to the TF card. If it prompts that the checksum does not match, it means There is a problem with the downloaded image, please try to download again

```
test@test:~$ sha256sum -c *.sha
Orangepi5_1.0.0_debian_bullseye_desktop_xfce_linux5.10.110.img: OK
```

7) Then double-click **balenaEtcher-1.5.109-x64.AppImage** on the graphical interface of Ubuntu PC to open balenaEtcher (no installation required), and the interface after balenaEtcher is opened is shown in the figure below

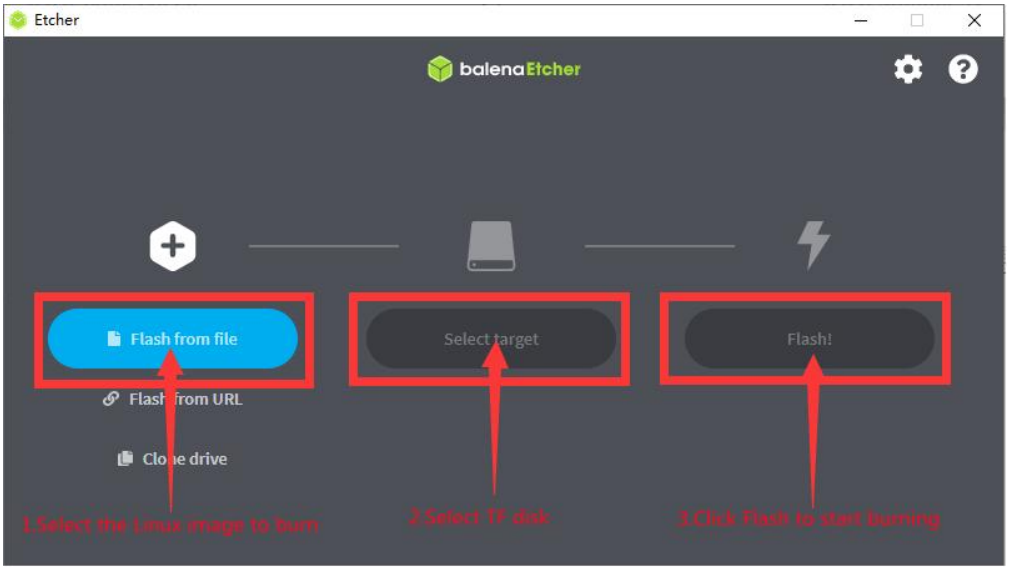


8) The specific steps to use balenaEtcher to burn the Linux image are as follows

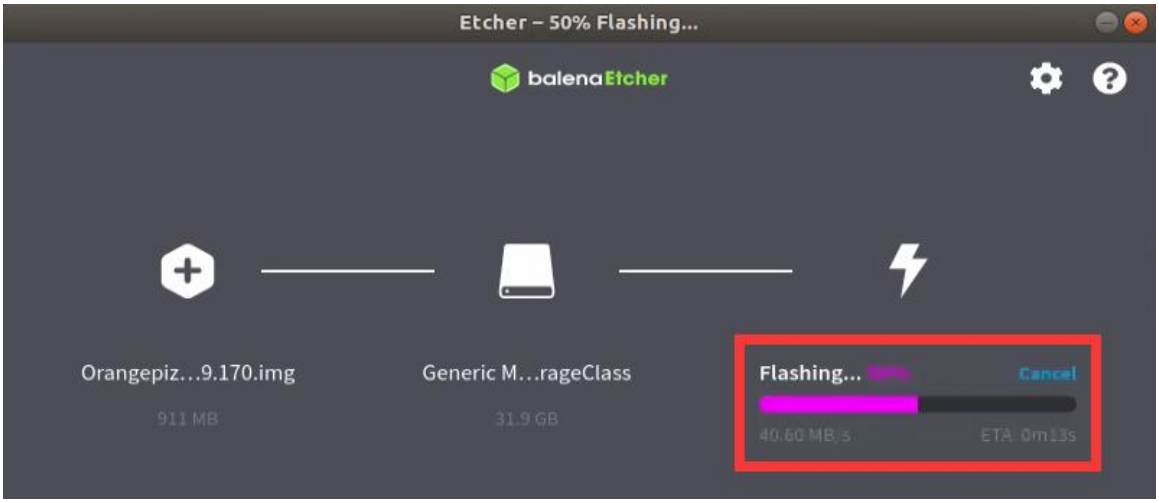
a. First select the path of the Linux image file to be burned

b. Then select the drive letter of the TF card

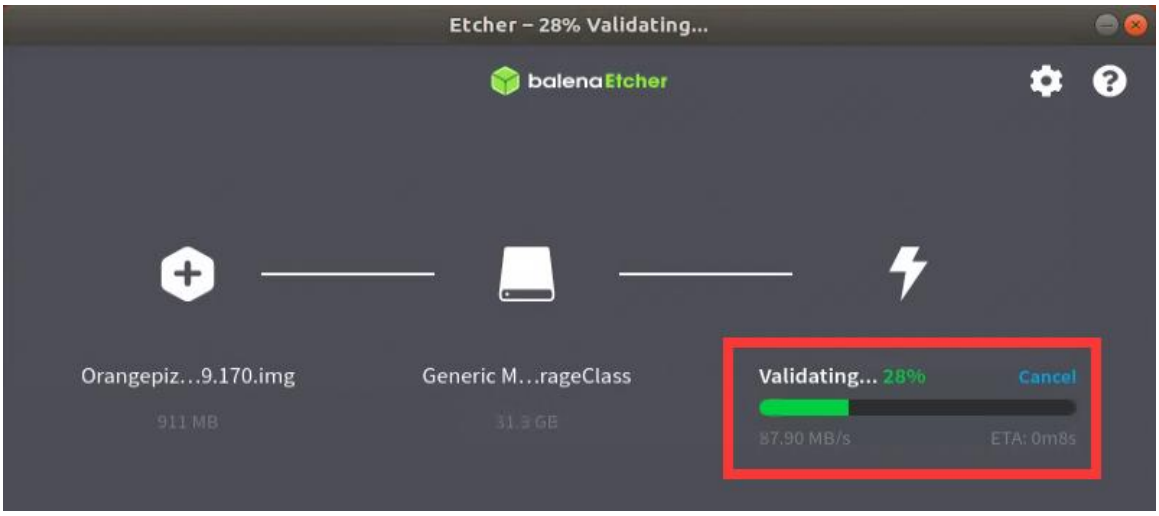
c. Finally, click Flash to start burning the Linux image to the TF card



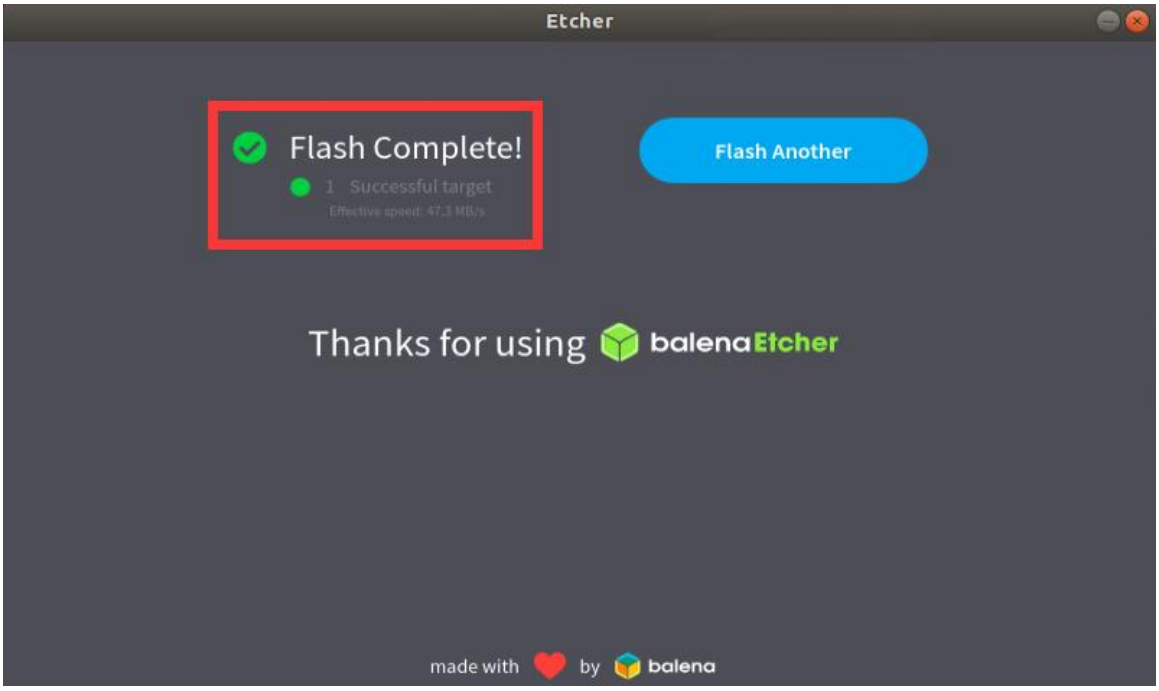
9) The interface displayed in the process of burning the Linux image by balenaEtcher is shown in the figure below, and the progress bar displays purple, indicating that the Linux image is being burned into the TF card



11) After burning the Linux image, balenaEtcher will also verify the image burned into the TF card by default to ensure that there is no problem in the burning process. As shown in the figure below, a green progress bar indicates that the image has been burnt, and balenaEtcher is verifying the burnt image



12) The display interface of balenaEtcher after the successful burning is shown as the figure below. If the green indicator icon is displayed indicating that the image is burned successfully, you can exit balenaEtcher at this time, and then pull out the TF card and insert it into the TF card slot of the development board for use



2. 5. How to write Linux image to SPI Flash+NVMe SSD

Note that the Linux image mentioned here specifically refers to the image of

Linux distributions such as Debian or Ubuntu downloaded from the Orange Pi data download page.

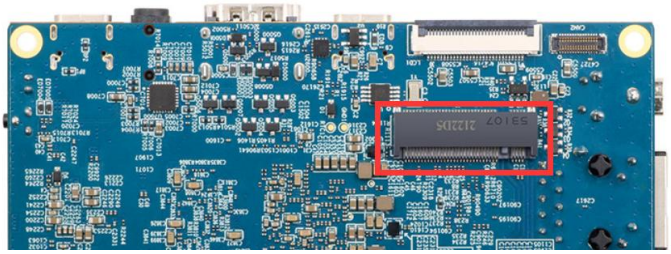
2.5.1. The method of using the dd command to burn

1) First, you need to prepare an NVMe SSD. The PCIe supported by the M.2 slot of the development board is PCIe2.0x1, and the theoretical maximum speed is 500MB/s. PCIe3.0 and PCIe4.0 NVMe SSDs are also available, but the highest speed is only PCIe2.0x1.

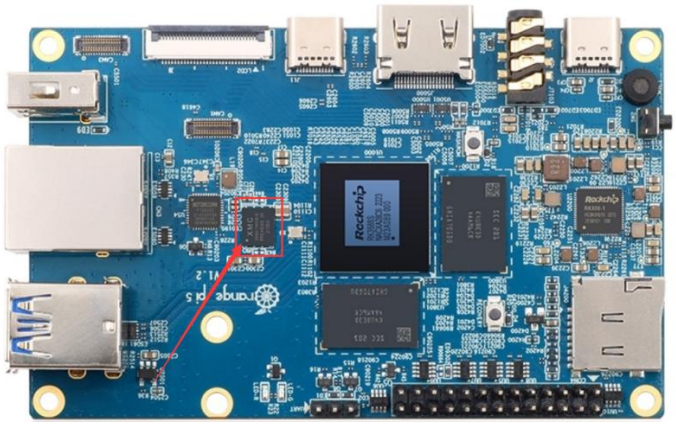
a. The M.2 2230 SSD is as follows

b. The M.2 2242 SSD is as follows

2) Then insert the NVMe SSD into the M.2 PCIe interface of the development board and fix it



3) The position of the SPI Flash on the development board is shown in the figure below, no other settings are required before starting the programming



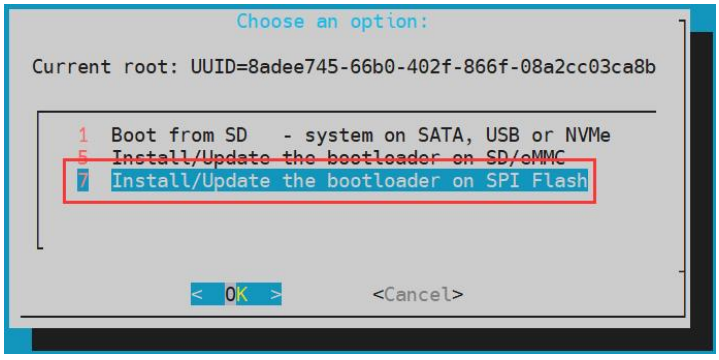
4) Burning the linux image to SPIFlash+NVMe SDD needs to be completed with the help of a TF card, so first you need to burn the linux image to the TF card, and then use the TF card to start the development board to enter the linux system. For the method of burning the Linux image to the TF card, please refer to the instructions in the two sections of the method of burning the Linux image to the TF card based on the Windows PC and the method of burning the Linux image to the TF card based on the Ubuntu PC.

5) After using the TF card to start the Linux system, we first burn the u-boot image into the SPI Flash

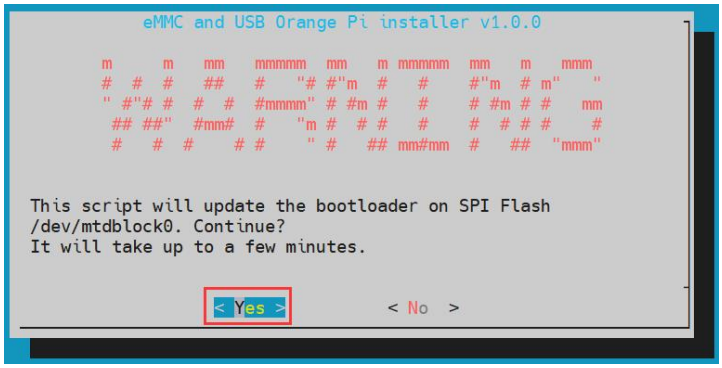
a. Run **nand-sata-install** first, **ordinary users remember to add sudo permission**

```
orangepi@orangepi:~$ sudo nand-sata-install
```

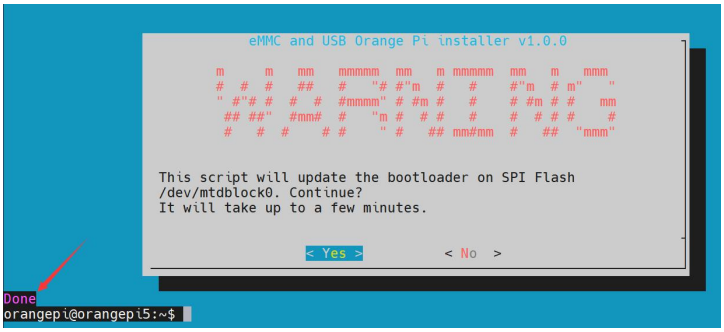
b. then choose **7 Install/Update ther bootloader on SPI Flash**



c. Then select **<Yes>**



d. Then please wait patiently for the burning to complete. After the burning is completed, the display will be as follows (a **Done** will be displayed in the lower left corner):



6) Then upload the linux image file (Debian or Ubuntu image downloaded from the official website) to the TF card. For the method of uploading the linux image file to the development board, please refer to the description in the section of the method of uploading files to the development board Linux system.

7) After uploading the image to the linux system of the development board, we enter the storage path of the image file in the command line of the linux system of the development board. For example, I store the linux image of the development board in the **/home/orangepi/Desktop** directory Download it, and then enter the **/home/orangepi/Desktop** directory to see the uploaded image file.

```
orangepi@orangepi:~$ cd /home/orangepi/Desktop
orangepi@orangepi:~/Desktop$ ls
Orangepi5_x.x.x_debian_bullseye_desktop_xfce_linux5.10.110.img
```

How to enter the command line of the development board linux system?

1. For the method of using the serial port to log in to the terminal, please refer to

the instructions in the section on how to use the debugging serial port.
2. Use ssh to remotely log in to the Linux system, please refer to the instructions in the section of SSH remote login to the development board.
3. If HDMI, LCD and other display screens are connected, you can open a command line terminal on the desktop.

8) Next, let's confirm that the NVMe SSD has been recognized by the development board's linux. If the NVMe SSD is recognized normally, use the **sudo fdisk -l** command to see nvme-related information

```
orangepi@orangepi:~/Desktop$ sudo fdisk -l | grep "nvme0n1"
Disk /dev/nvme0n1: 1.86 TiB, 2048408248320 bytes, 4000797360 sectors
```

Use the **lspci** command to see an NVMe-related PCI device

```
orangepi@orangepi:~/Desktop$ lspci
0004:40:00.0 PCI bridge: Fuzhou Rockchip Electronics Co., Ltd Device 3588 (rev 01)
0004:41:00.0 Non-Volatile memory controller: MAXIO Technology (Hangzhou) Ltd. NVMe SSD Controller MAP1202 (rev 01)
```

9) Then we can use the dd command to clear the NVMe SSD (optional)

```
orangepi@orangepi5:~/Desktop$ sudo dd bs=1M if=/dev/zero of=/dev/nvme0n1 count=2000 status=progress
```

10) Then you can use the dd command to burn the linux image of the development board to the NVMe SSD

a. In the following command, the if= parameter is followed by the full path where the linux image is stored + the name of the Linux image (such as the name of **/home/orangepi/Desktop/Linux image**). Because we have entered the path of the linux image above, we only need to fill in the name of the Linux image.
b. Please do not copy the linux image name in the following command, but replace it with the actual image name (because the version number of the image may be updated).

```
sudo dd bs=1M if=Orangepi5_x.x.x_debian_bullseye_desktop_xfce_linux5.10.110.img of=/dev/nvme0n1 status=progress
```

Note, if you upload a linux image compressed file ending in .7z, please remember to decompress it before using the dd command to burn.

The detailed description of all parameters of the dd command and more usage can be viewed by executing the man dd command in the linux system.

11) After successfully burning the linux image of the development board to the NVMe SSD, you can use the poweroff command to shut down. Then please pull out the TF card, and then short press the power button to turn on, and then the linux system in SPIFlash+NVMe SSD will be started.

12) After starting the system in NVMe SSD, use df -h to see the actual hard disk capacity

c. 128GB NVMe SDD

```
orangepi@orangepi:~$ df -h
Filesystem      Size  Used Avail Use% Mounted on
udev            3.8G  8.0K  3.8G   1% /dev
tmpfs           769M  1.4M  768M   1% /run
/dev/nvme0n1p2  118G  5.8G  111G   5% /
tmpfs           3.8G     0  3.8G   0% /dev/shm
tmpfs           5.0M  4.0K  5.0M   1% /run/lock
tmpfs           3.8G   16K  3.8G   1% /tmp
/dev/nvme0n1p1  256M   90M  166M  36% /boot
/dev/zram1      194M  9.9M  170M   6% /var/log
tmpfs           769M   60K  769M   1% /run/user/1000
tmpfs           769M   48K  769M   1% /run/user/0
```

d. 2TB NVMe SDD

```
orangepi@orangepi5:~$ df -h
Filesystem      Size  Used Avail Use% Mounted on
udev            3.8G  8.0K  3.8G   1% /dev
tmpfs           769M  1.4M  768M   1% /run
/dev/nvme0n1p2  1.9T  4.1G  1.8T   1% /
tmpfs           3.8G     0  3.8G   0% /dev/shm
tmpfs           5.0M  4.0K  5.0M   1% /run/lock
/dev/zram2      3.7G   76K  3.5G   1% /tmp
/dev/nvme0n1p1  256M   90M  166M  36% /boot
/dev/zram1      194M   15M  165M   9% /var/log
tmpfs           769M   60K  769M   1% /run/user/1000
tmpfs           769M   48K  769M   1% /run/user/0
```

13) When the same system is burned in the TF card and the NVMe SSD, **if both the TF card and the NVMe SSD are inserted into the development board, then power on and start the development board, and u-boot will give priority to starting the system in the TF card.** However, since the systems in the TF card and the NVMe SSD are exactly the same, the UUIDs of the /**boot** partition and the **rootfs** partition in the two storage devices are also the same, which may cause the partition in the NVMe SSD to be loaded when the TF card starts. Running the script below resolves this issue.

```
orangepi@orangepi:~$ sudo fix_mmc_ssd.sh
```

Exactly the same system means that the image name is exactly the same. Even if they are all Debian11 systems, the versions are different.

2.5.2. The method of burning with balenaEtcher software

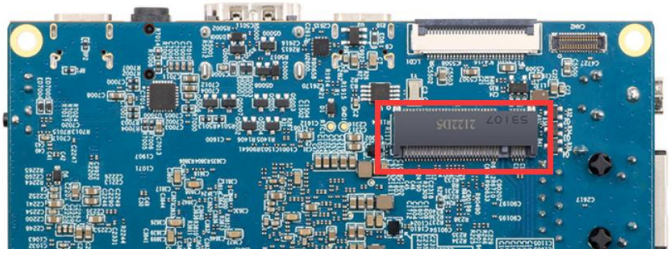
2) First, you need to prepare an NVMe SSD. The PCIe supported by the M.2 slot of the development board is PCIe2.0x1, and the theoretical maximum speed is 500MB/s. PCIe3.0 and PCIe4.0 NVMe SSDs are also available, but the highest speed is only PCIe2.0x1.

a. The M.2 2230 SSD is as follows

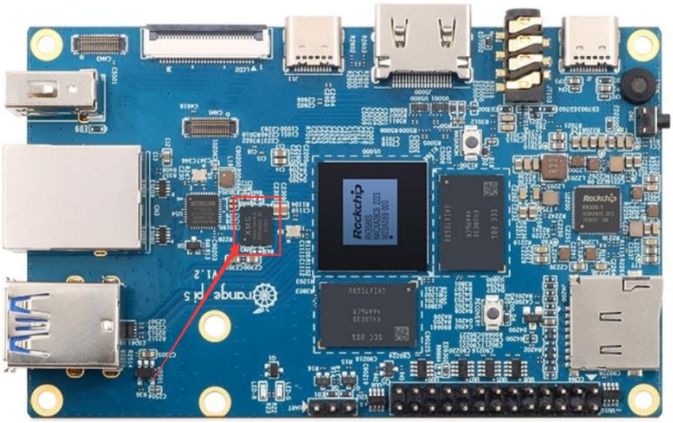
b. The M.2 2242 SSD is as follows

2242规格的SSD

3) Then insert the NVMe SSD into the M.2 PCIe interface of the development board and fix it



4) The position of the SPI Flash on the development board is shown in the figure below, no other settings are required before starting the programming



5) Burning the linux image to SPIFlash+NVMe SDD needs to be completed with the help of a TF card, so first you need to burn the linux image to the TF card, and then use the TF card to start the development board to enter the linux system. For the method of burning the Linux image to the TF card, please refer to the instructions in the two sections of the method of burning the Linux image to the TF card based on the Windows

PC and the method of burning the Linux image to the TF card based on the Ubuntu PC.

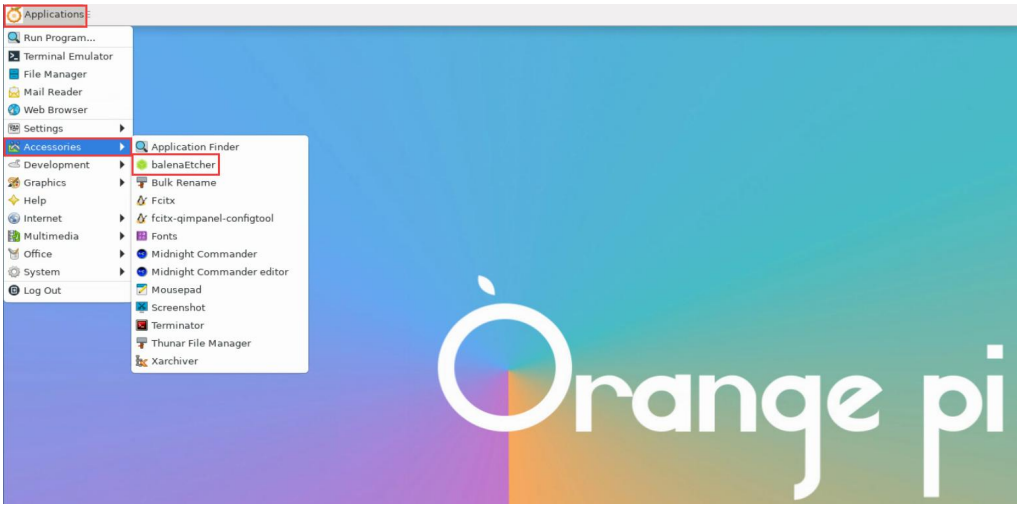
6) After booting into the linux system in the TF card, please confirm that the NVMe SSD has been properly recognized by the linux of the development board. If the NVMe SSD is recognized normally, use the **sudo fdisk -l** command to see **nvme**-related information

```
orangepi@orangepi:~/Desktop$ sudo fdisk -l | grep "nvme0n1"
Disk /dev/nvme0n1: 1.86 TiB, 2048408248320 bytes, 4000797360 sectors
```

Use the **lspci** command to see an NVMe-related PCI device

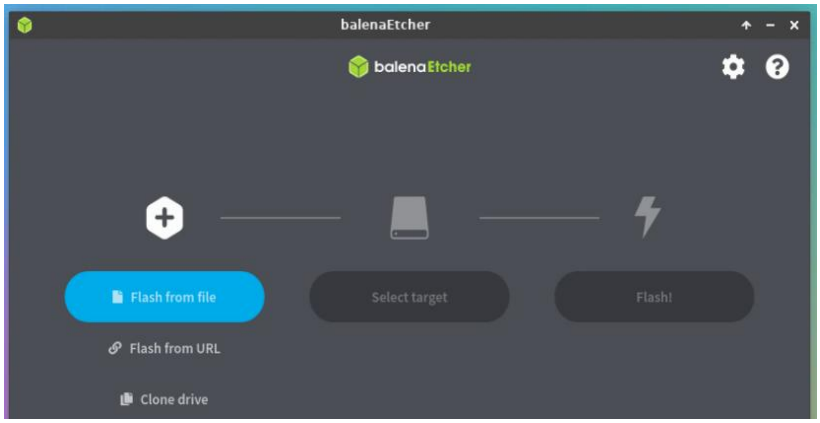
```
orangepi@orangepi:~/Desktop$ lspci
0004:40:00.0 PCI bridge: Fuzhou Rockchip Electronics Co., Ltd Device 3588 (rev 01)
0004:41:00.0 Non-Volatile memory controller: MAXIO Technology (Hangzhou) Ltd. NVMe SSD Controller MAP1202 (rev 01)
```

7) The balenaEtcher has been pre-installed in the linux image, and the opening method is as follows:



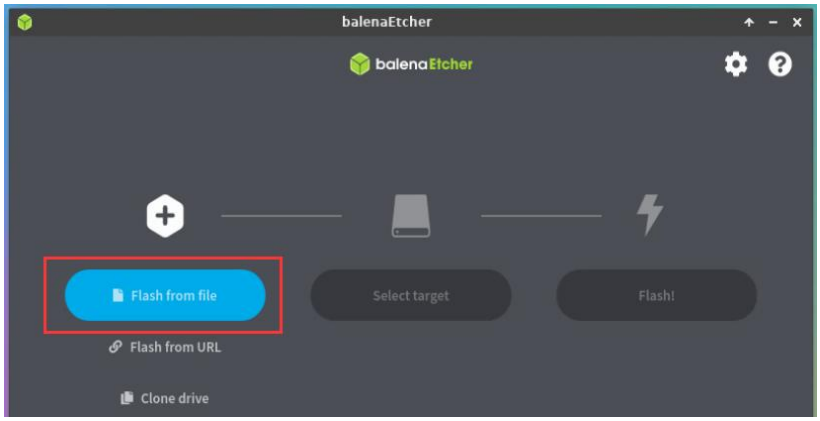
If it is not pre-installed, for how to download and install the arm64 version of balenaEtcher, please refer to the instructions in the section on how to download and install the arm64 version of balenaEtcher.

8) The interface after balenaEtcher is opened is as follows:

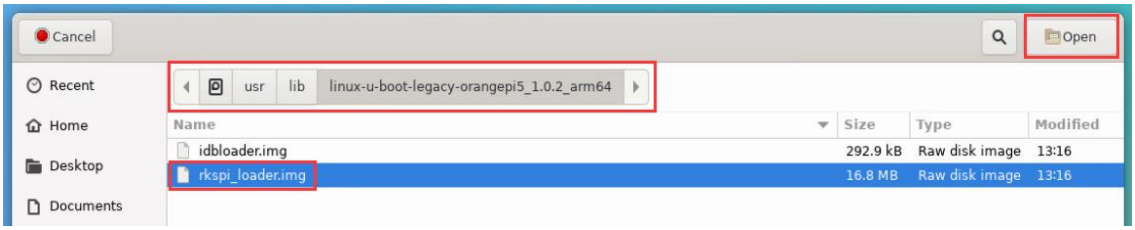


9) The method of using balenaEtcher to burn u-boot to the SPI Flash of the development board is as follows:

a. click **Flash from file** first

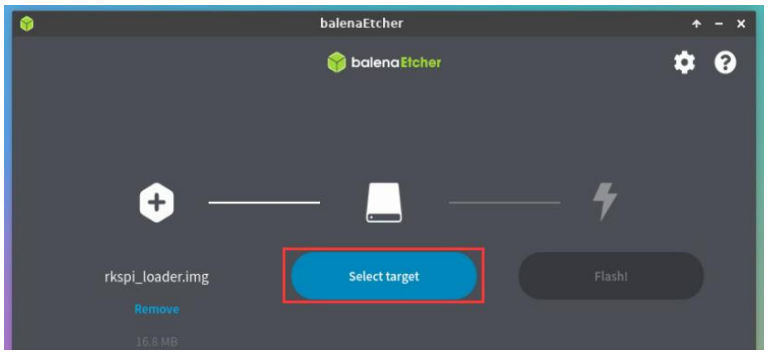


b. Then enter the **/usr/lib/linux-u-boot-legacy-orangepi5_1.x.x_arm64** directory, select **rkspi_loader.img**, and click **Open** to open

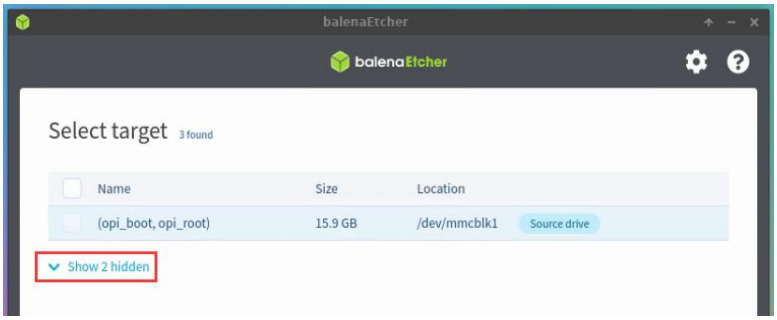


c. The interface after opening **rkspi_loader.img** is as follows:

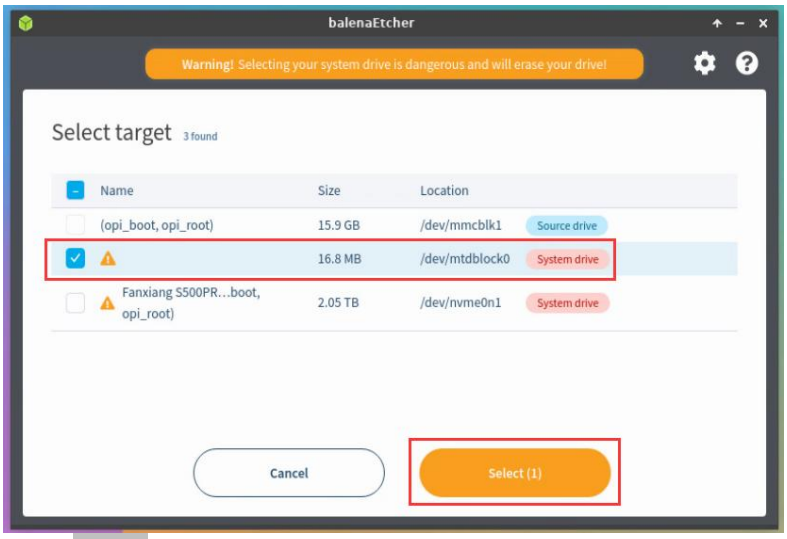
d. Then click **Select target**



e. Then click **Show 2 hidden** to open more options for storage devices

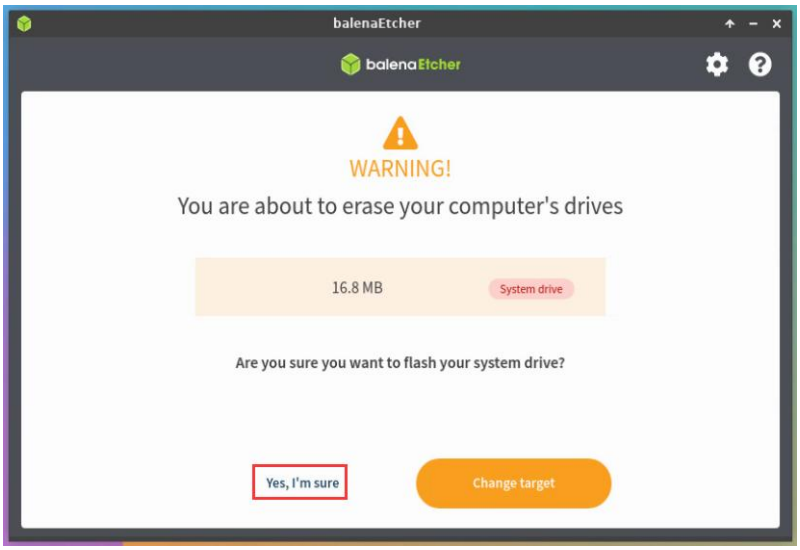


f. Then select the device name of SPI Flash **/dev/mtdblock0**, and click **Select**

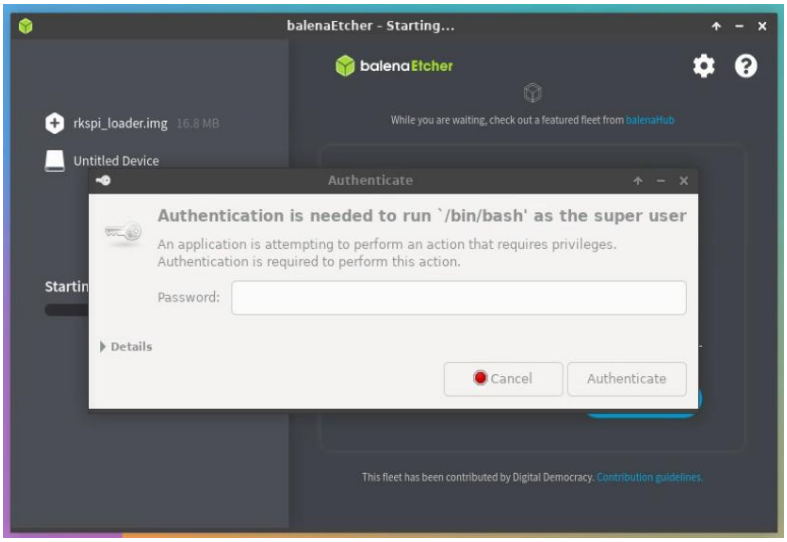


g. Then click **Flash**

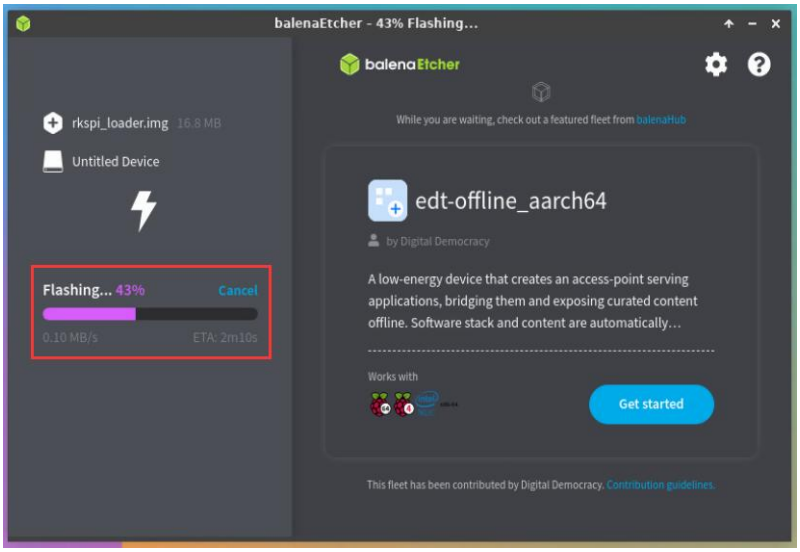
h. Then click **Yes, I'm sure**



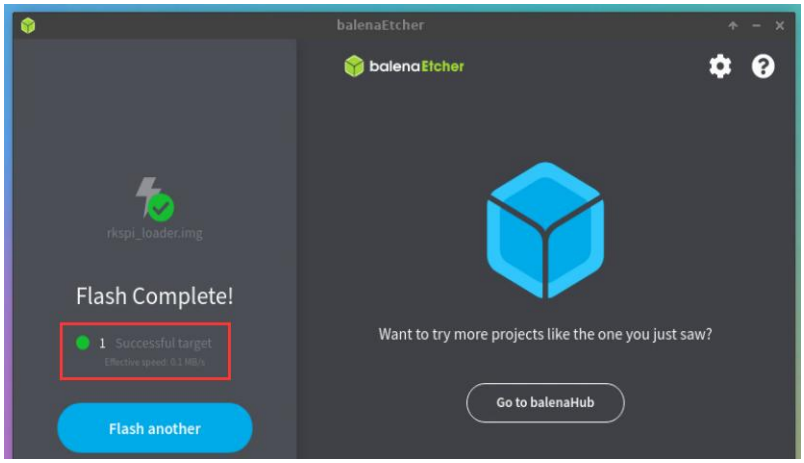
i. Then enter the password orangepi of the development board Linux system, and the U-Boot image will be recorded in SPI Flash



j. The display of the burning process is shown below：

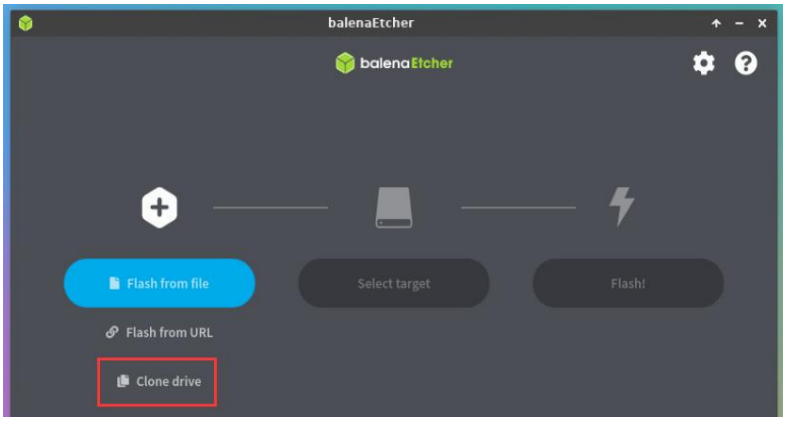


k. The display after the burning is completed is shown below：

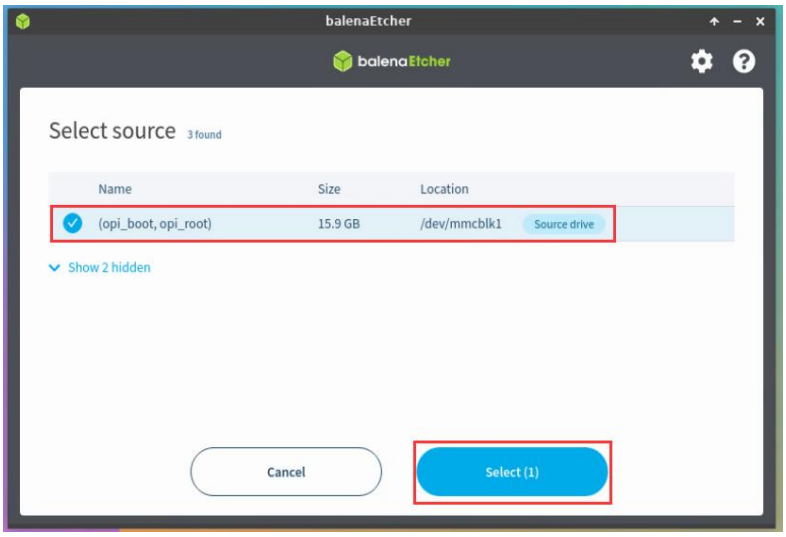


10) Methods from the linux system in the TF card to the NVMe SSD method (this method is equivalent to cloning the system in the TF card to NVME SSD)

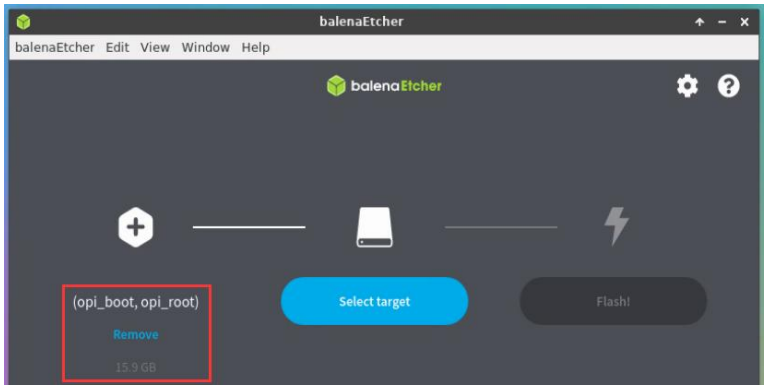
a. First click **Clone drive**



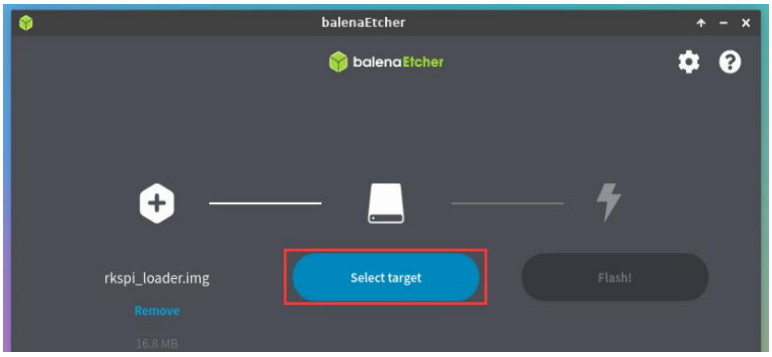
b. Then select the device name of the TF card **/dev/mmcblk1**



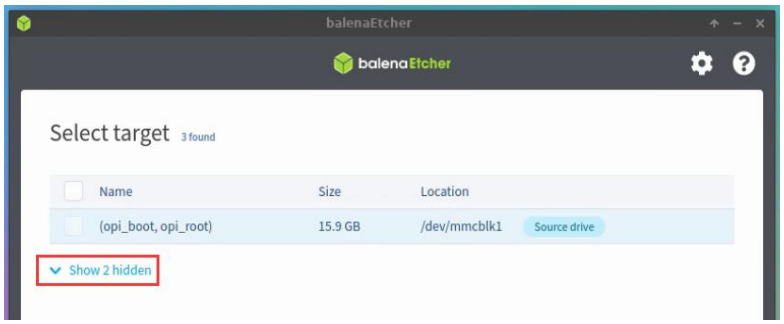
c. The interface after opening the TF card is shown below



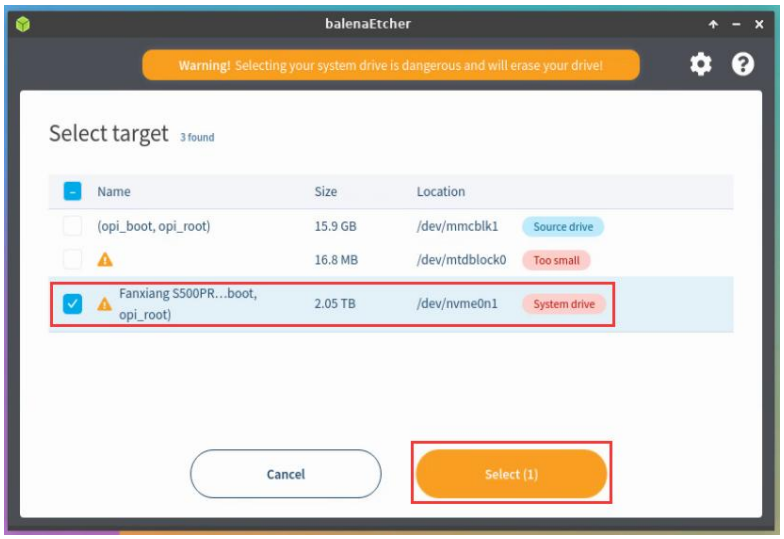
d. Then click **Select target**



e. Then click **Show 2 Hidden** to open more storage equipment options

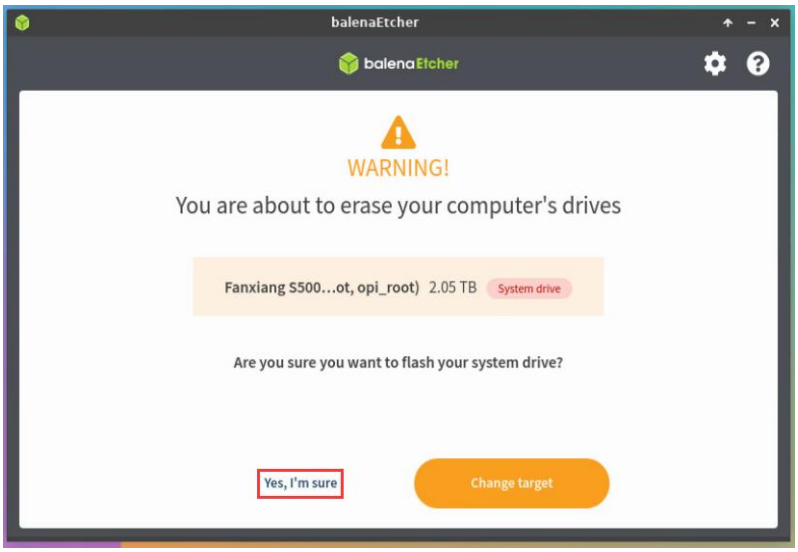


f. Then select NVME SSD's device name**/dev/nvme0n1**, and then click **Select**

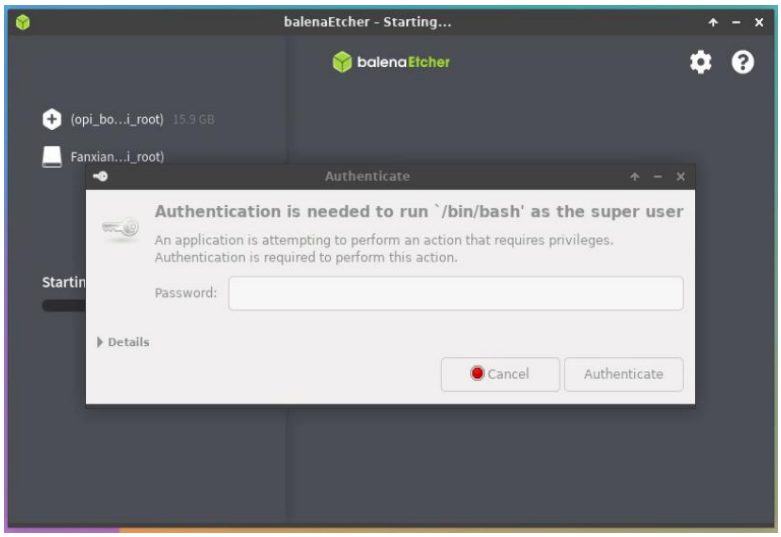


g. Then click **Flash**

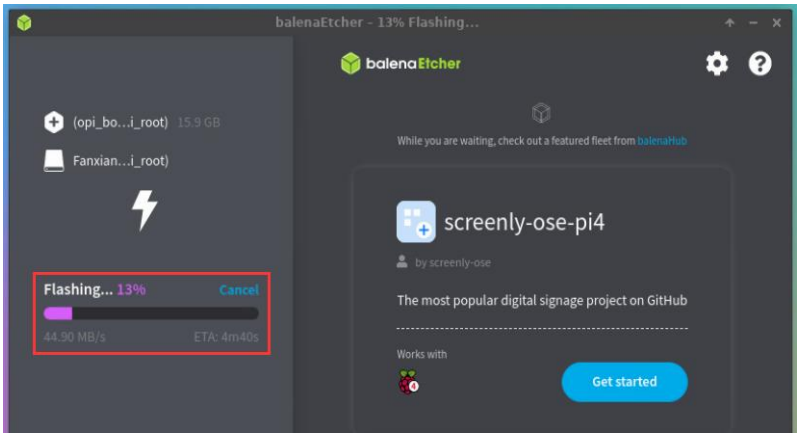
h. Then click **Yes, I'm sure**

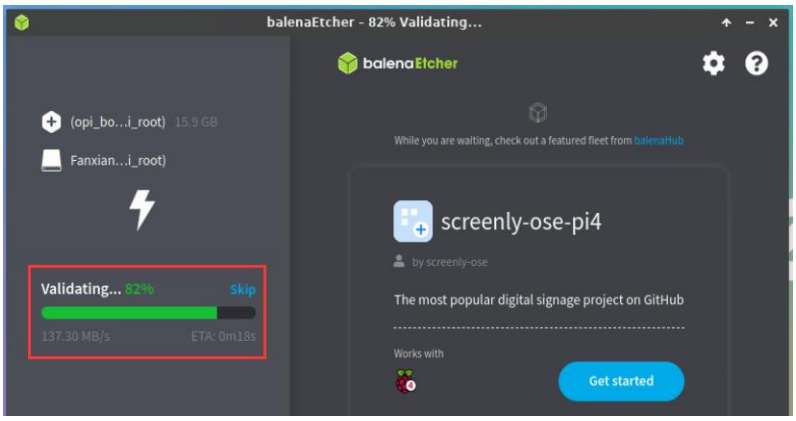


i. Then enter the password orangepi of the development board Linux system, and the U-Boot image will be recorded in SPI Flash

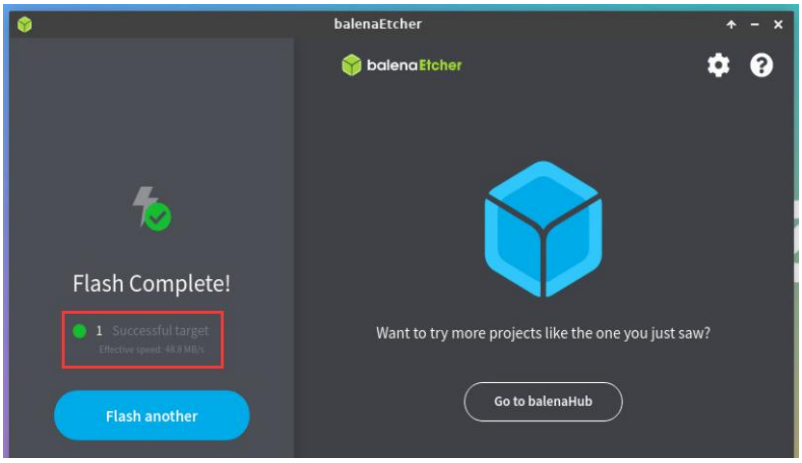


j. The display of the burning process is shown below:



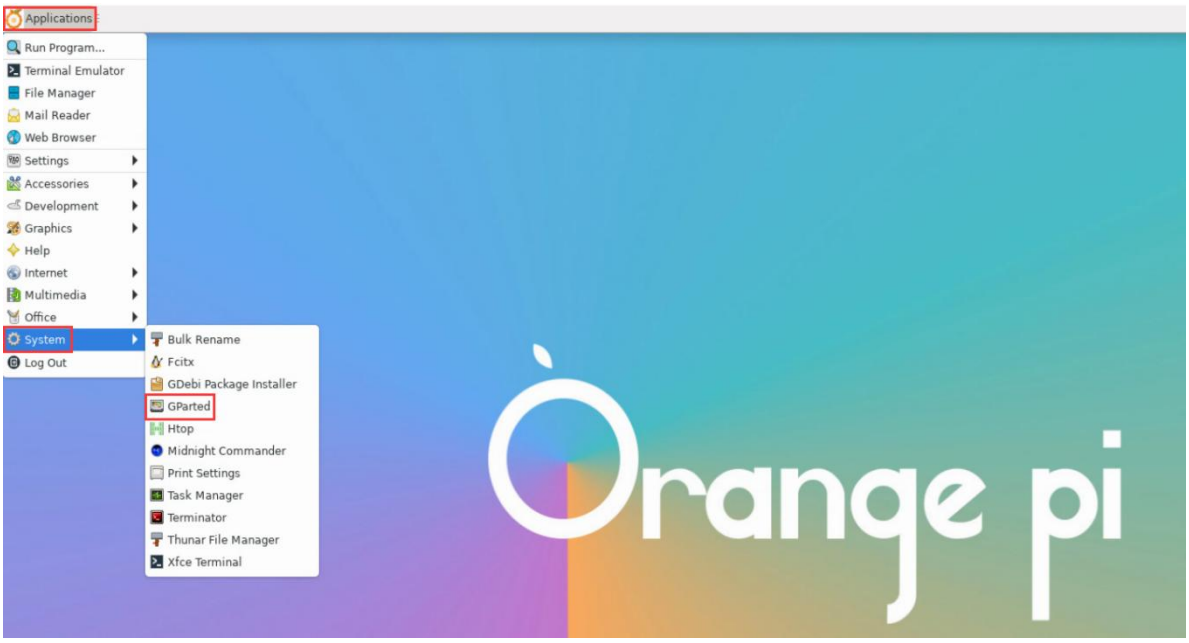


k. The display after the recording is complete shown below:



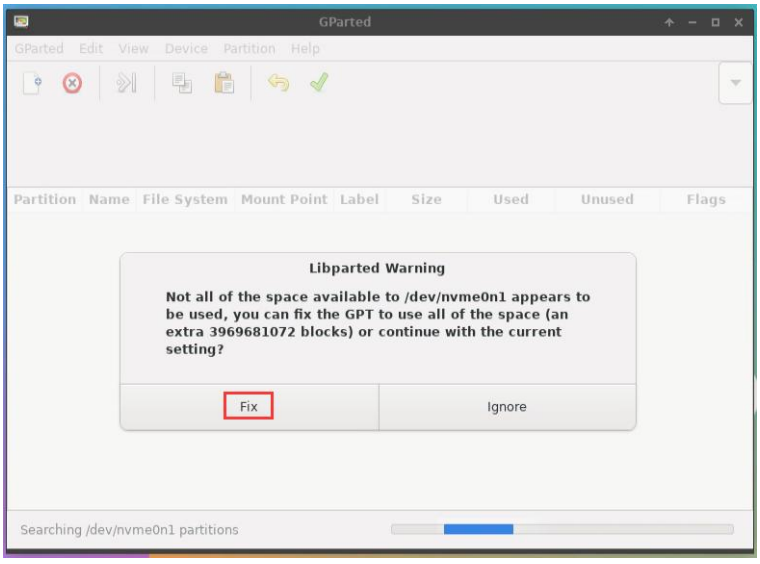
l. Then you need to expand the capacity of the rootfs partition in the NVME SSD, the steps are shown below：

a) First open **GParted**

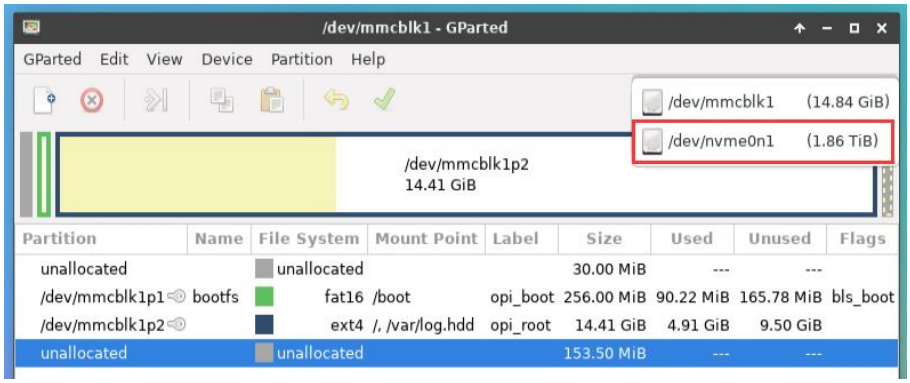


b) Then enter the password of the linux system, click **Authenticate**

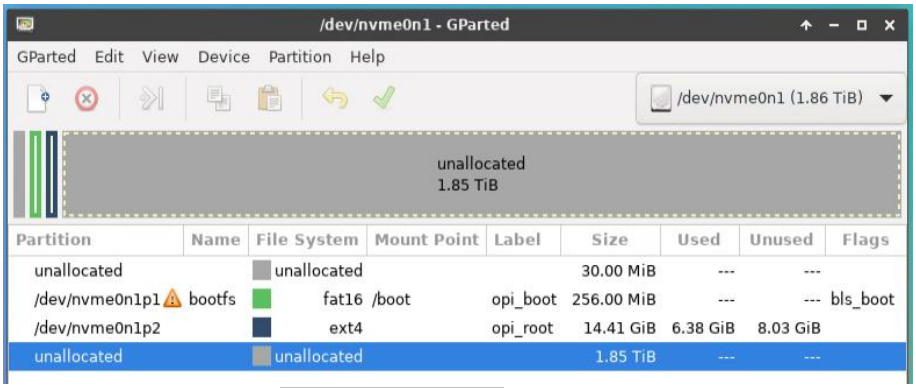
c) Then click **Fix**



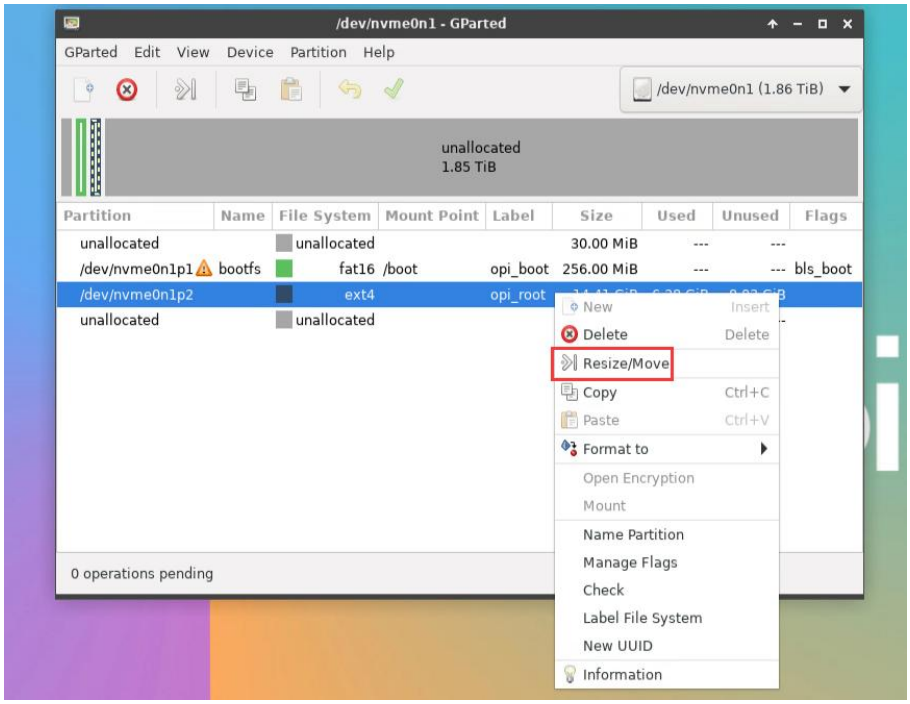
d) Then choose NVMe SSD



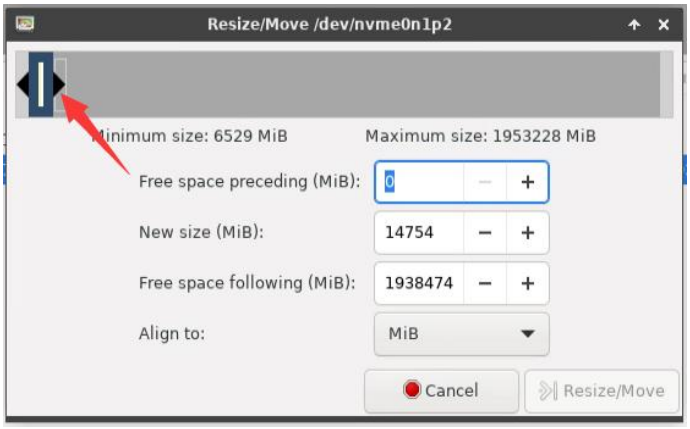
e) The display interface after selecting NVME SSD is shown below:



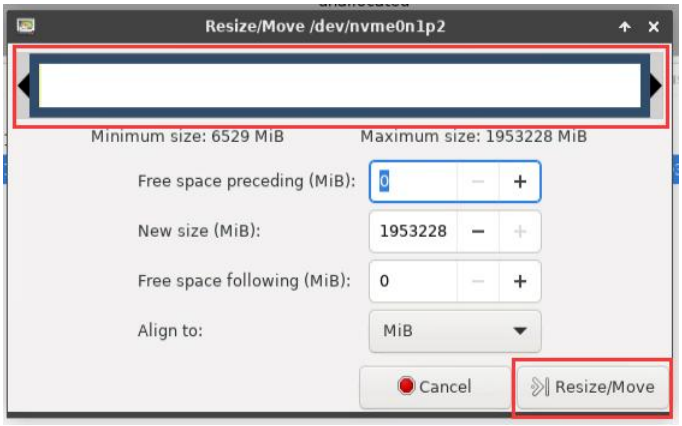
f) then select the **/dev/nvme0n1p2** partition, click right, then select **Resize/Move**



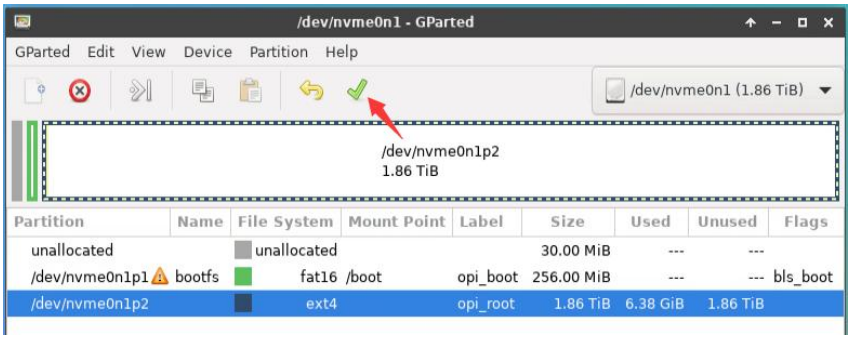
g) Then drag the capacity to maximize the position shown in the figure below



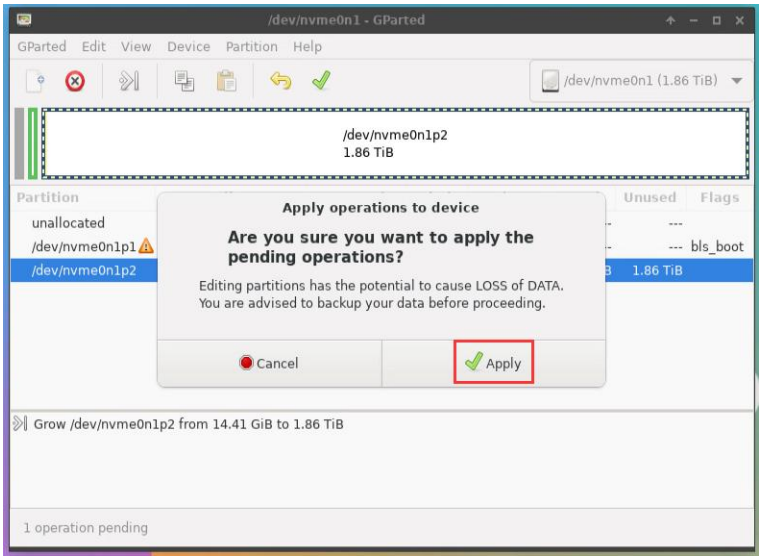
h) Then click **Resize/move**



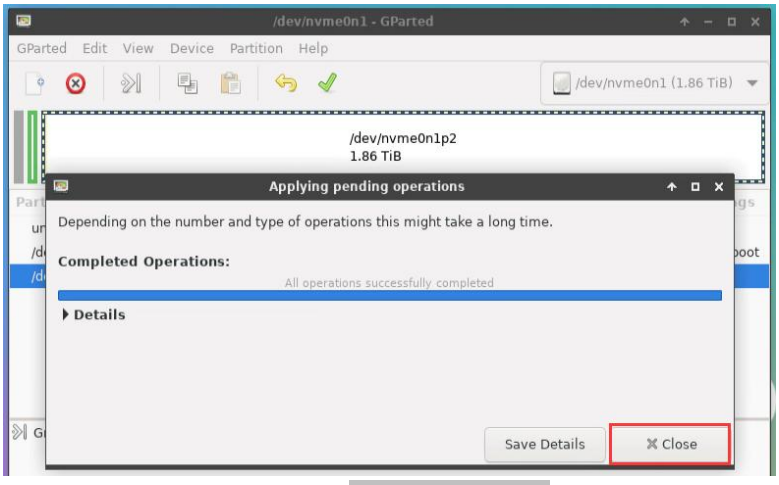
i) Then click the √ of the location in the figure below



j) Click **Apply**



k) And then click **close** to close

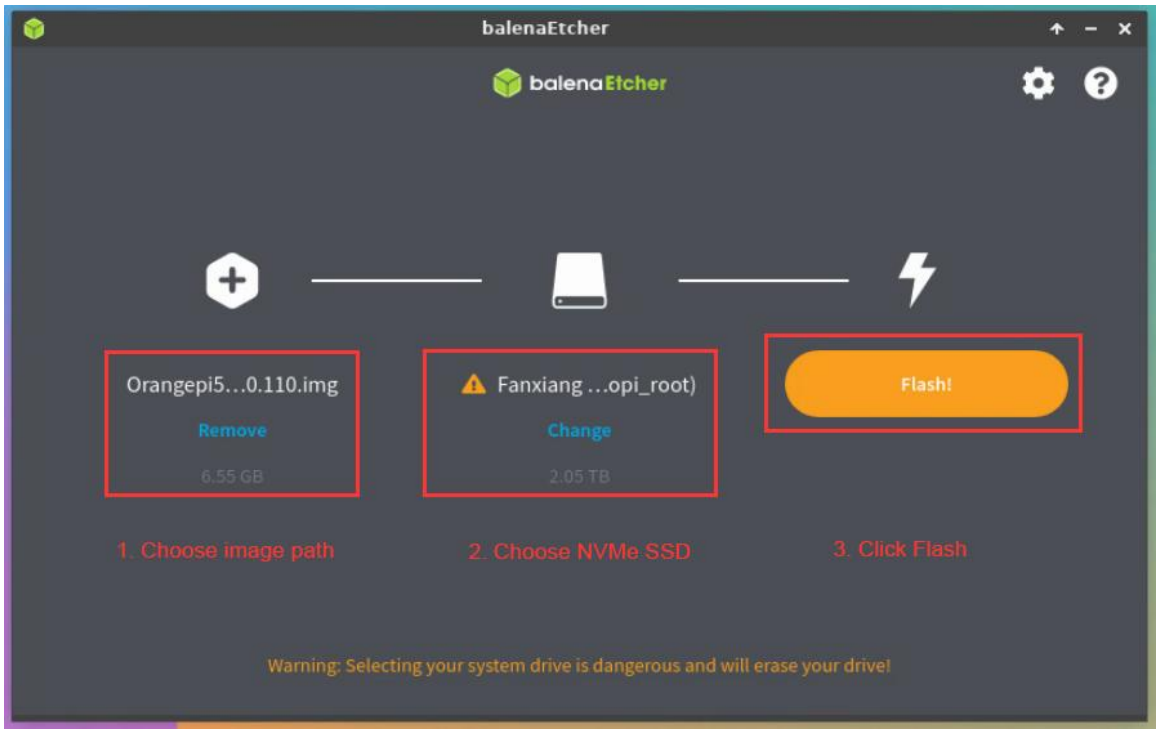


m. At this point, you can use the **sudo poweroff** command to shut down. Then please unplug the TF card and press the power button to turn on the power supply.At this time, the Linux system in SPIFLASH+NVME SSD will be started

11) Step is the system in the clone TF card to the NMVE SSD, we can also directly record the Linux image file to the NVME SSD, here it is probably the next step

a. Upload the Linux image file to the Linux system of the development board

b. Then use balenaetcher to record



c. **Use this method to burn the image without manual expansion. The first start will automatically expand.**

2. 6. The method of burning the Android image to the TF card

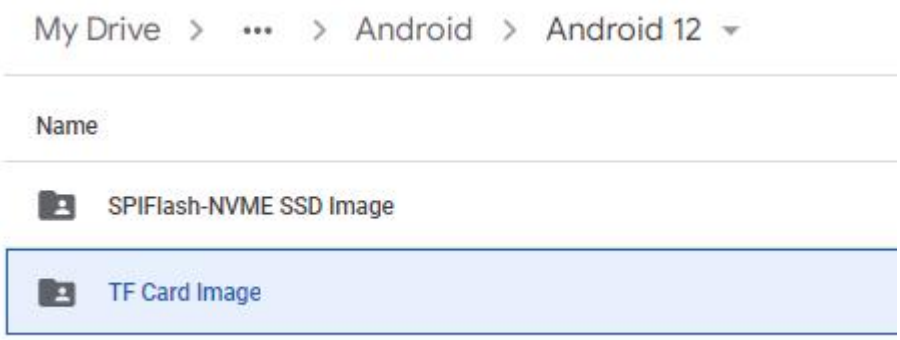
1) First prepare a 8GB or larger TF card. The transmission speed of the TF card must be Class 10 or above. It is recommended to use the TF card of brands such as SanDisk

2) Then use the card reader to insert the TF card into the computer

3) Then download the SDDiskTool burn tool from ORANGE PI's data download page, please make sure that the **version of the SDDiskTool tool is the latest V1.72**

4) Then download the image of Android12 from **Orange PI's data download page**

a. After opening the download link of the Android image, you can see the two types of Android images below, please select the image in the **TF card image** folder for download



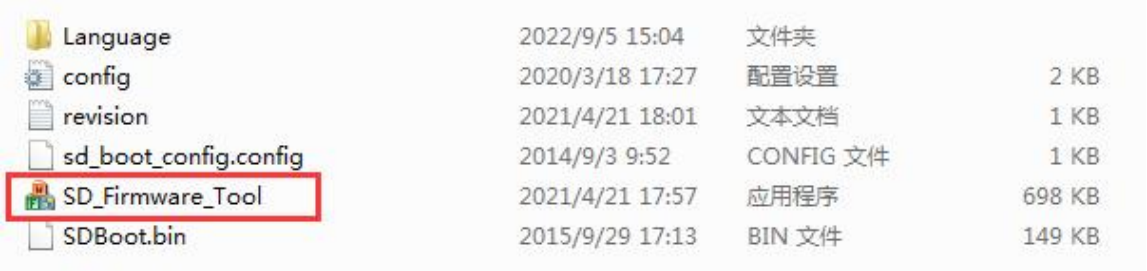
b. After entering the **TF card image folder**, you can see the following two image. The difference between them is as below：

a) The image without LCD is specifically used for HDMI display. It supports 8K display. If you do not use the LCD screen, download the image without LCD

b) If you want to use the LCD screen, select the image with LCD

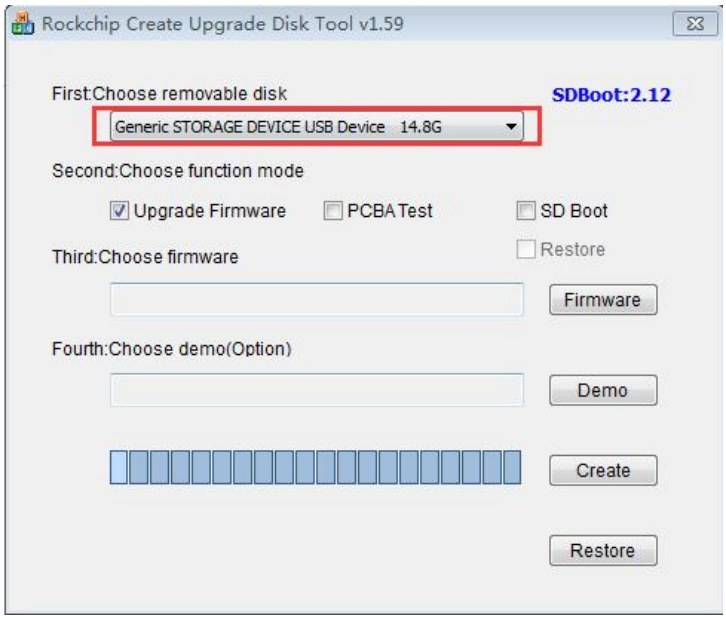
5) Then use the compressed package of the downloaded Android image with decompression software. In the file after decompression, the file ending with ".img" is the Android image file.the memory is above 1GB

6) Then use the decompression software to decompress the **SDDiskTool_v1.72.zip**. This software does not need to be installed. Find **SD_Firmware_Tool.exe** and open it in the folder after decompression.

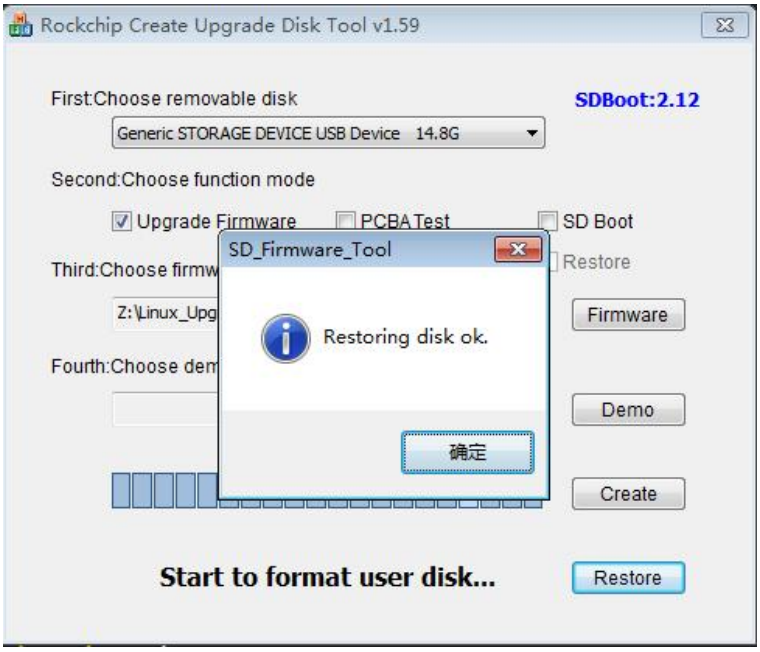


7) After opening the **SDDiskTool**, if the TF card recognition is normal, the disk device will be displayed in the column of the "**Select Moving Disk Device**".**Please be sure to**

confirm that the disk device you want to burn is consistent with the TF card you want to burn. If it is not displayed, you can try to insert the TF card



8) After confirming the disk formation, you can format the TF card first, click the **restoration disk** button in **SDDiskTool**, or you can use the **SD Card Formatter** mentioned earlier

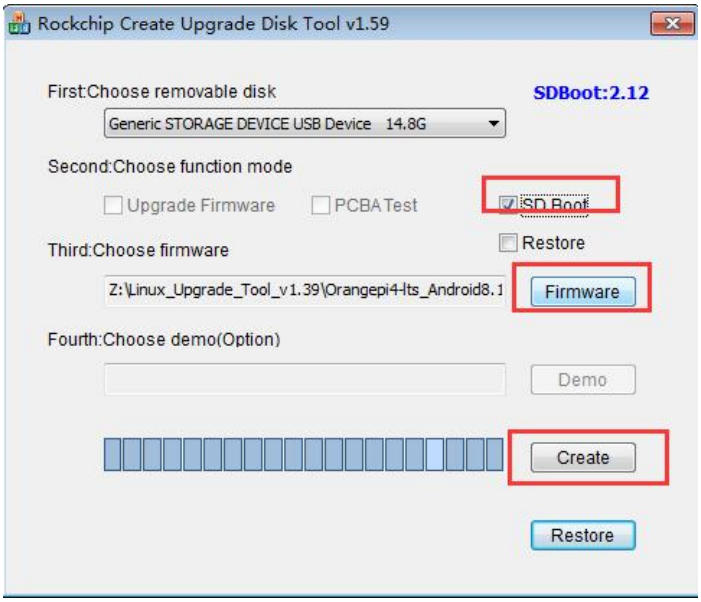


9) Then start writing Android images into the TF card

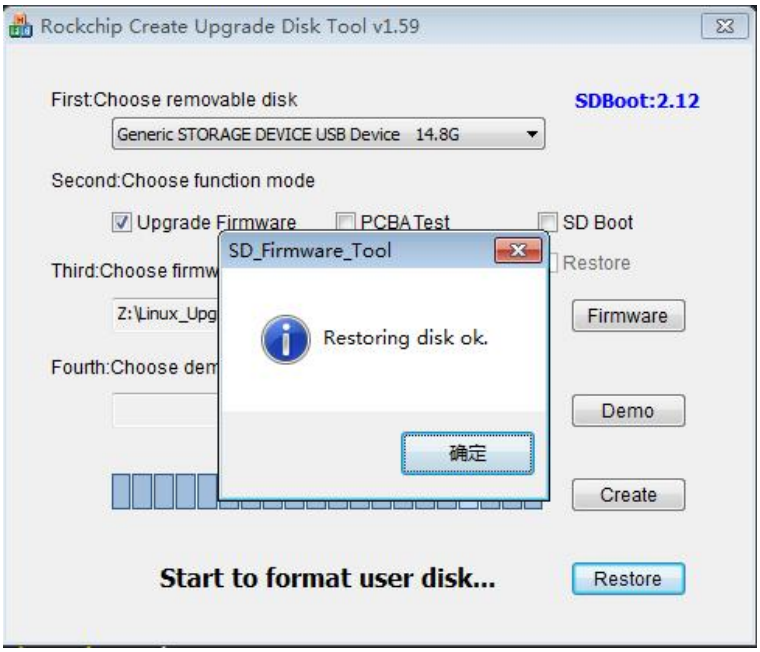
a. First check the "**SD startup**" in "**Select Function Mode**"

b. Then select the path of Android image in the "**Select Upgrade firmware**" column

c. Finally, click the "**Start Creation**" button to start burning the Android image in the TF card



10) After the burning is recorded, you can exit the SDDiskTool software, and then you can pull the TF card out of the computer and insert it into the development board.



2.7. The Method Burning android image to SPI Flash+NVME SSD

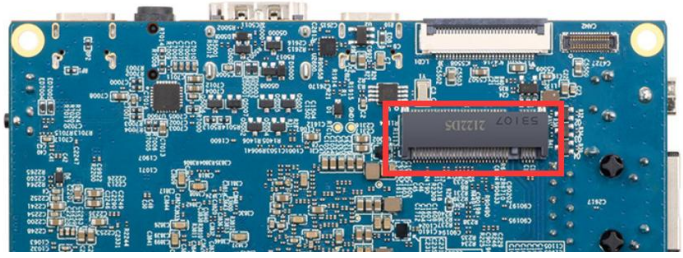
Note that all of the following operations are performed in Windows computers.

1) First of all, you need to prepare a NVMe SSD solid -state hard drive

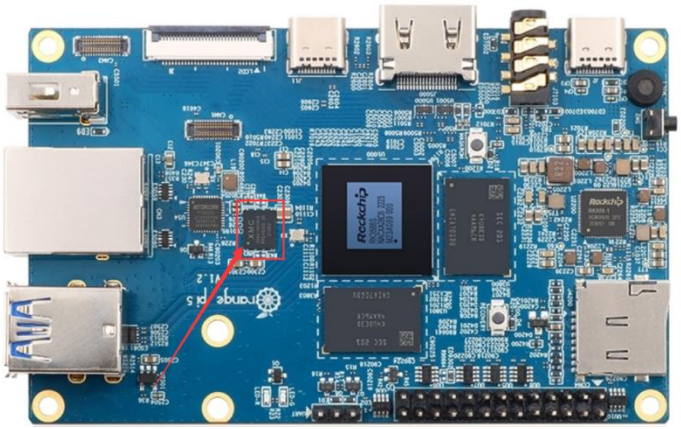
a. M.2 2230 specification SSD is shown below

b. M.2 2242 specifications SSD as shown below

2) Then insert NVME SSD into the M.2 PCIe interface of the development board and fix it



3) The position of the SPI Flash on the development board is shown below, and no other settings are required before the recording.

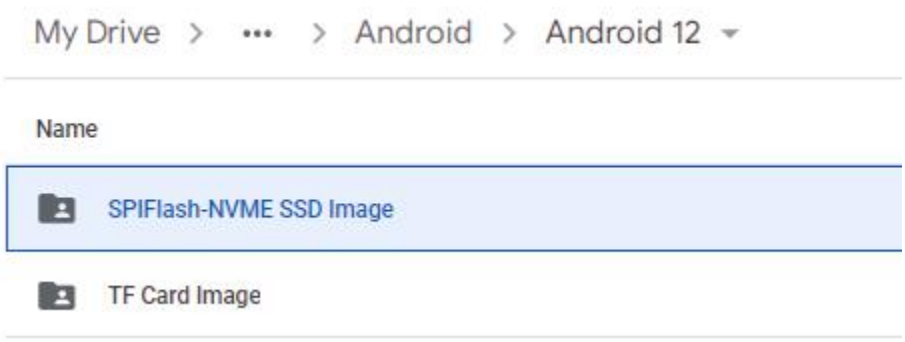


4) You also need to prepare a data cable of a good quality Type-C interface

5) Then download the Rockchip **Driverassitant_v5.12.zip** from **ORANGE PI's data download page**, and the burning tool **RKDevTool_Release_v2.96.zip**, please make sure the version of the downloaded **RKDevTool** tool is v2.96

6) Then download the image of Android12

a. After turning on the download link of the Android image, you can see the two types of Android images below.Please select the image in the **Spiflash-NVMe SSD** folder to download



b. After entering the **SPIFlash-NVME SSD** folder, you can see the following two images. The difference between them is as below：

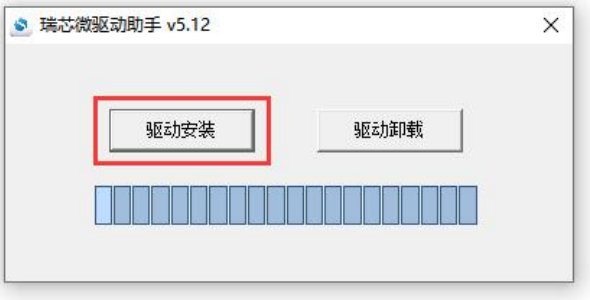
a) The image without LCD is specifically used for HDMI display. It supports 8K display. If you do not use the LCD screen, download the image without LCD

b) If you want to use the LCD screen, select the image with LCD

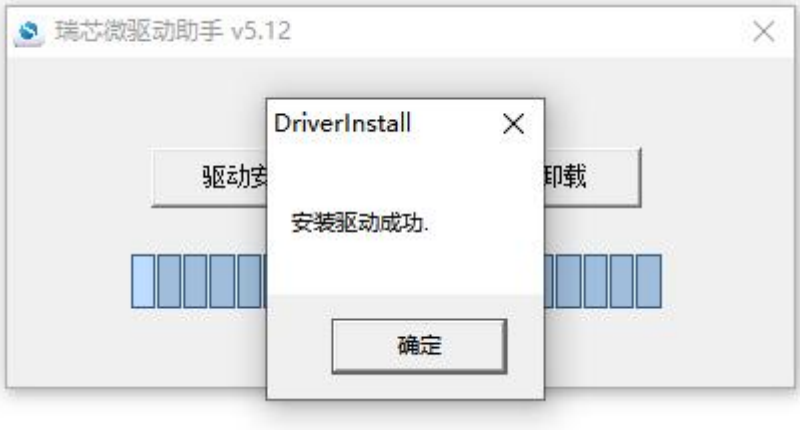
7) Then use the decompression software to decompress the **DriveRassitant_v5.12.zip**, and then find the **DriverInstall.exe** executable file in the folder after decompression

8) The steps of installing Rockchip -driving after opening the **DriverInstall.exe** are shown below

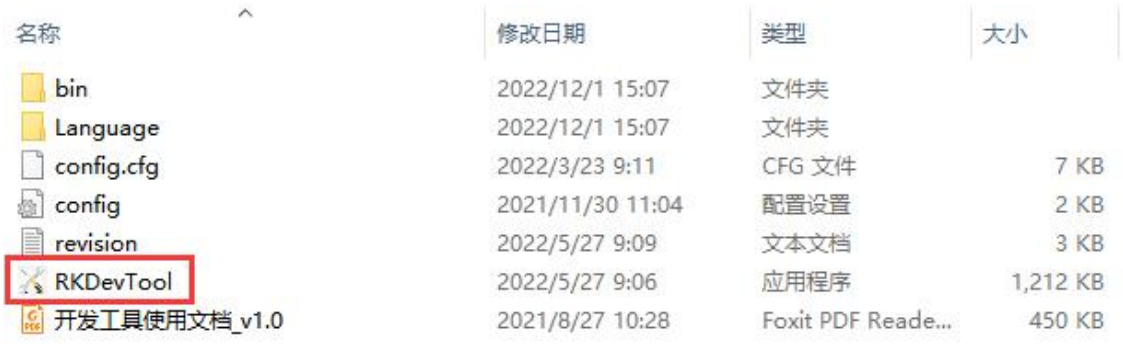
a. Click the "**Drive Installation**" button



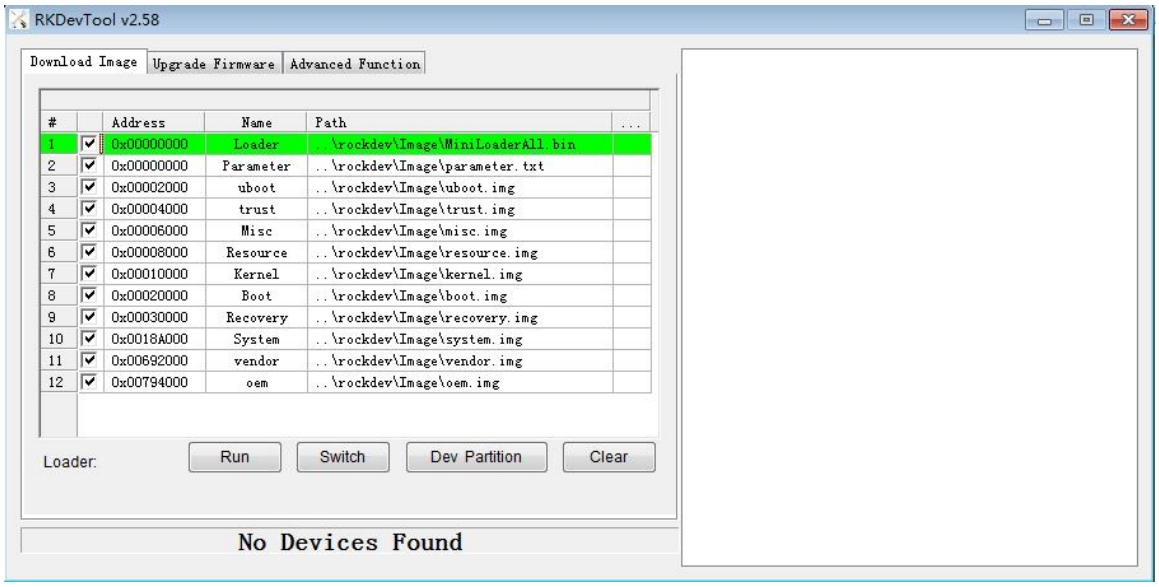
b. After waiting for a while, the window will pop up to prompt "**Installation Drives Success**", and then click the "**OK**" button



9) Then decompress the **RKDevTool_Release_v2.96.zip**. This software does not need to be installed. Find **RKDevTool** in the folder after decompression and open it .

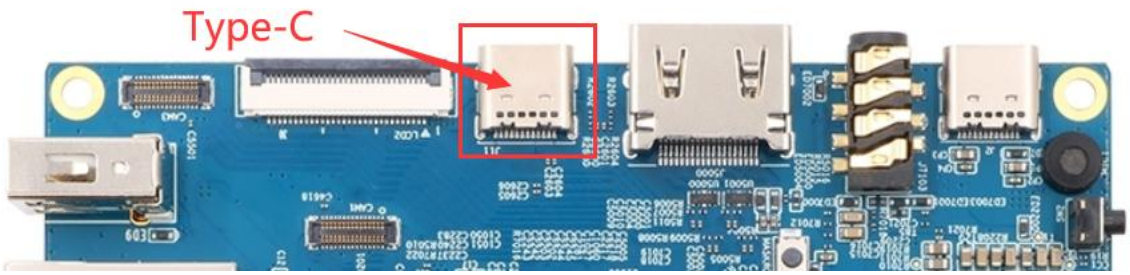


10) After opening the **RKDevTool** burning tool, because the computer has not connected to the development board through the Type-C line, the lower left corner will prompt "**No device is found**"



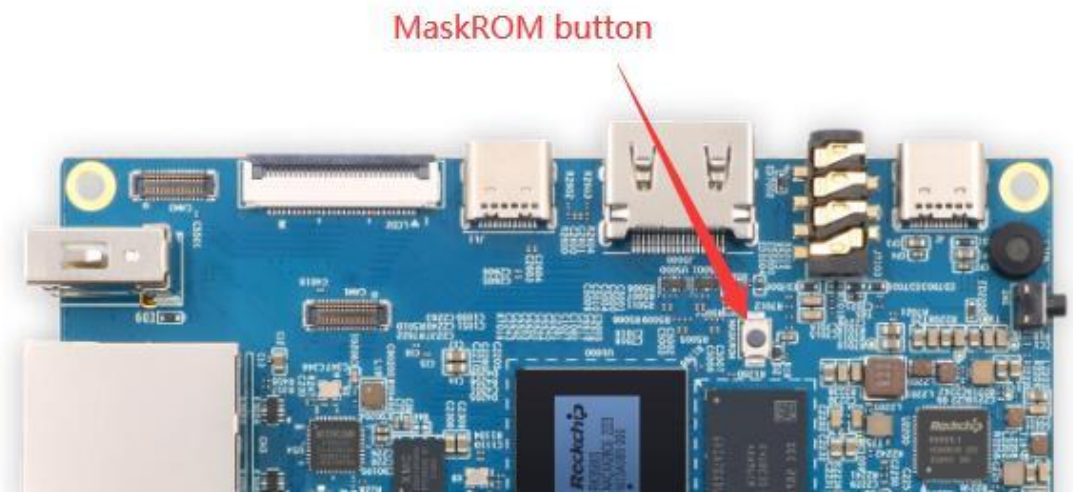
11) Then start burning the Android image to Spiflash+NVMe SSD

a. First connect to the development board and Windows computer through the Type-C data cable. The position of the development board Type-C interface is shown in the figure below

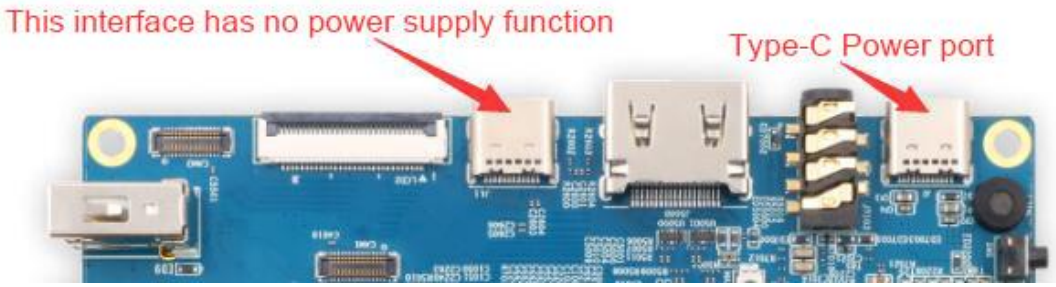


b. Make sure that the development board is not inserted into the TF card, and there is no connection to the power supply

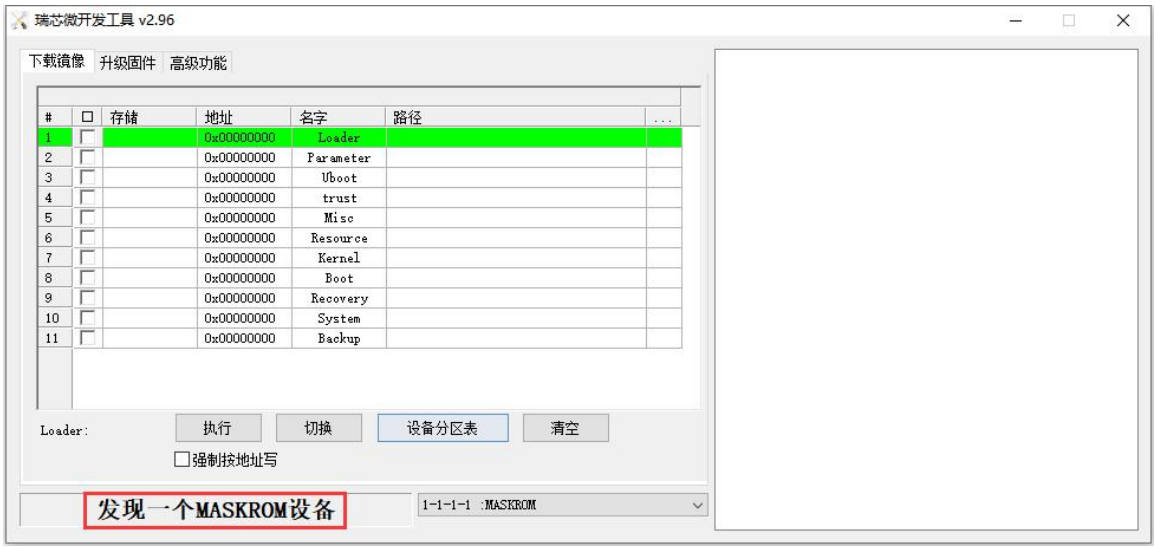
c. Then press the Maskrom button of the development board to not put it. The Maskrom button is in the position of the development board as shown in the figure below:



d. Then connect the power supply of the Type-C interface to the development board and connect to power



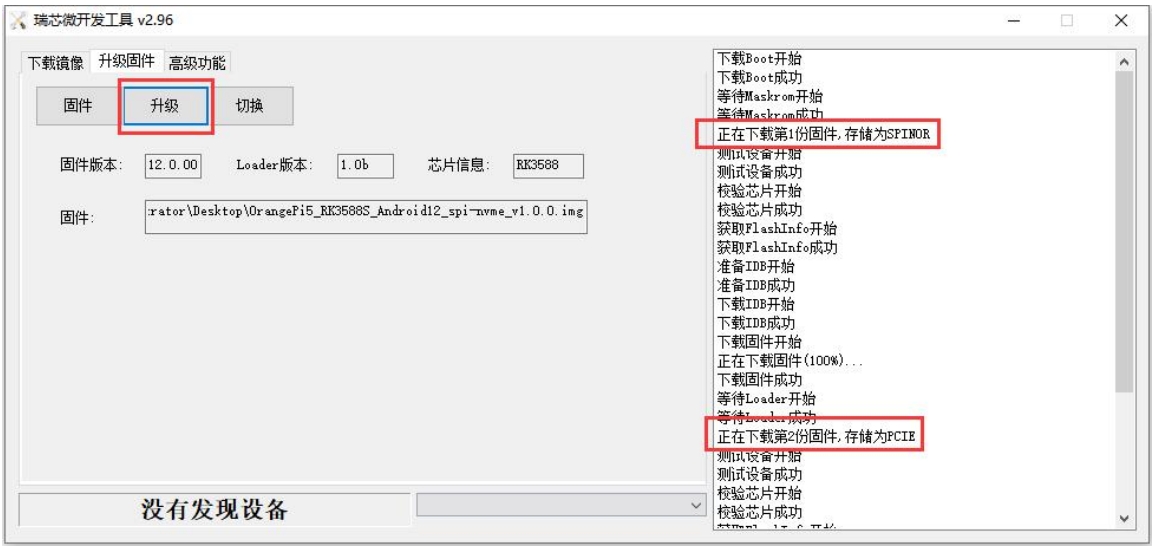
e. If the previous steps are smooth, at this time the development board will enter the **Maskrom** mode, and the interface of the burning tool will be prompted "**Find a Maskrom device**"



f. Then click the "**upgrade firmware**" column of the burning tool

g. Then click the "Firmware" button to select the Android image to be burned

h. Finally, click the "Upgrade" button to start burning. The burning process is shown in the figure below. You can see that the firmware will be burned to SPIFlash first, and then burned to PCIE. After burning is completed, the Android system will start automatically.



2.8. How to burn Orange Pi OS (Droid) image to TF card

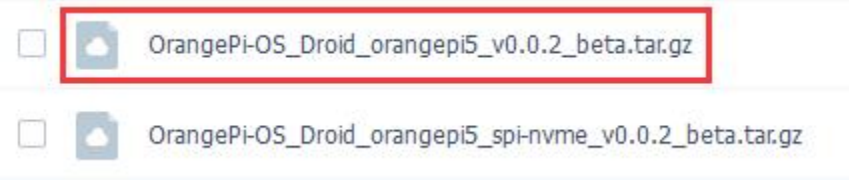
1) First prepare a TF card with 8GB or larger capacity. The transmission speed of the TF card must be class10 or above. It is recommended to use a TF card of SanDisk and other brands

2) Then use the card reader to insert the TF card into the computer

3) Then download the SDDiskTool programming tool from the **Orange Pi data download page, please ensure that the version of the SDDiskTool tool is the latest v1.72**

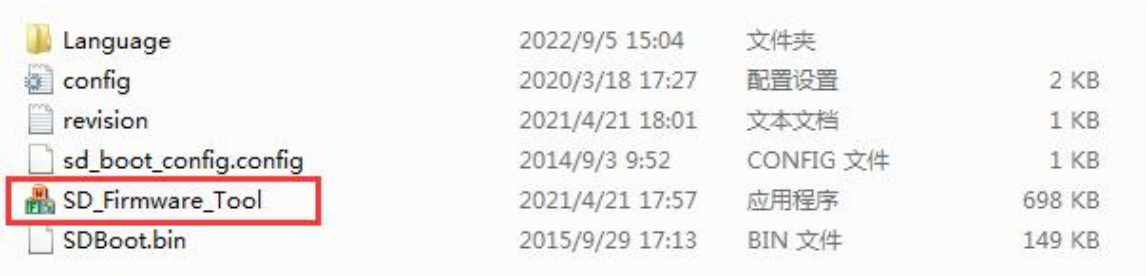
4) Then download the Orange Pi OS (Droid) image from the **Orange Pi download page**

a. After opening the download link of the Orange Pi OS (Droid) image, you can see the following two types of images, please choose the image without **spi-nvme**



5) Then use the decompression software to decompress the compressed package of the downloaded Orange Pi OS (Droid) image. Among the decompressed files, the file ending with ".img" is the Orange Pi OS (Droid) image file, and the size is more than 1GB

6) Then use decompression software to decompress **SDDiskTool_v1.72.zip**, this software does not need to be installed, just find **SD_Firmware_Tool.exe** in the decompressed folder and open it



7) After opening **SDDiskTool**, if the TF card is recognized normally, the inserted disk device will be displayed in the "**Select Removable Disk Device**" column. **Please make sure that the displayed disk device is consistent with the drive letter of the TF card you want to burn Yes,** if there is no display, you can try to unplug the TF card.

8) After confirming the drive letter, you can format the TF card first, click the **restore disk** button in **SDDiskTool**, or use the **SD Card Formatter** mentioned above to format the TF card.

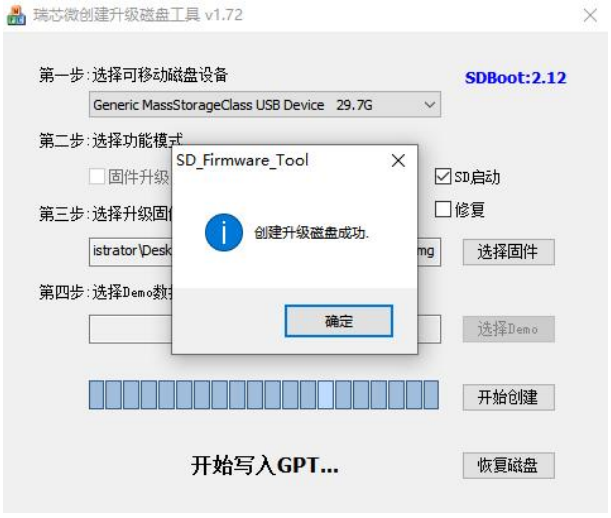
9) Then start to write the Orange Pi OS (Droid) image to the TF card

a. First check "**SD Boot**" in "**Select Function Mode**"

b. Then select the path of the **Orange Pi OS (Droid)** image in the "**Select to upgrade firmware**" column

c. Finally, click the "**Start Create**" button to start burning the **Orange Pi OS (Droid)** image to the TF card

10) After burning, you can exit the SDDiskTool software, and then you can pull out the TF card from the computer and insert it into the development board to start



2. 9. Burn Orange Pi OS (Droid) image to SPIFlash+NVMe SDD

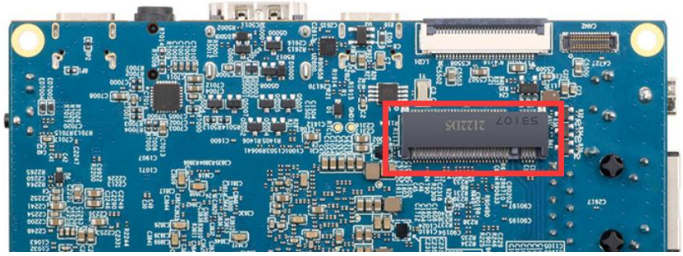
Note that all the following operations are performed on a Windows computer.

1) First, you need to prepare an NVMe SSD solid state drive

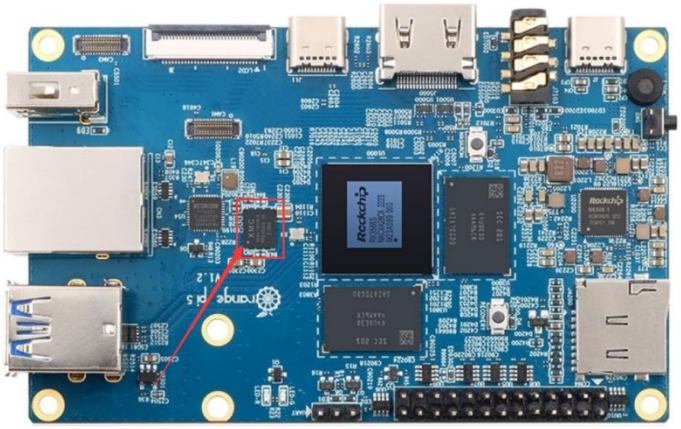
a. The M.2 2230 SSD is as follows

b. The M.2 2242 SSD is as follows

2) Then insert the NVMe SSD into the M.2 PCIe interface of the development board and fix it



3) The position of the SPI Flash on the development board is shown in the figure below, no other settings are required before starting the programming

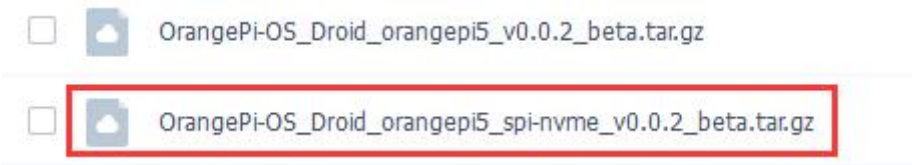


4) It is also necessary to prepare a data cable with a good quality Type-C interface

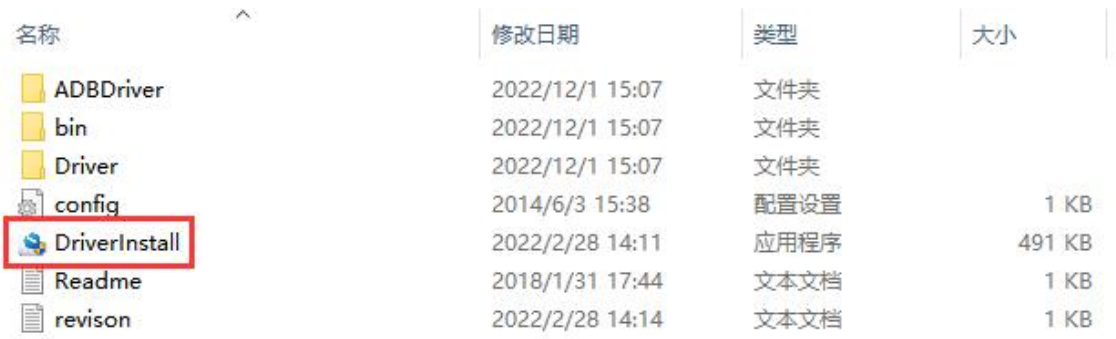
5) Then download Rockchip **DriverAssitant_v5.12.zip** and burning tool **RKDevTool_Release_v2.96.zip from the Orange Pi data download page,** please make sure that the version of the downloaded **RKDevTool tool is v2.96**

6) Then download the Orange Pi OS (Droid) image

a. After opening the download link of the Orange Pi OS (Droid) image, you can see the following two types of images, please select the image with **spi-nvme** to download

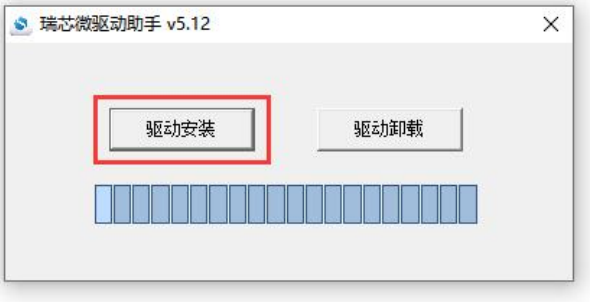


7) Then use the decompression software to decompress **DriverAssitant_v5.12.zip**, and then find the **DriverInstall.exe** executable file in the decompressed folder and open it

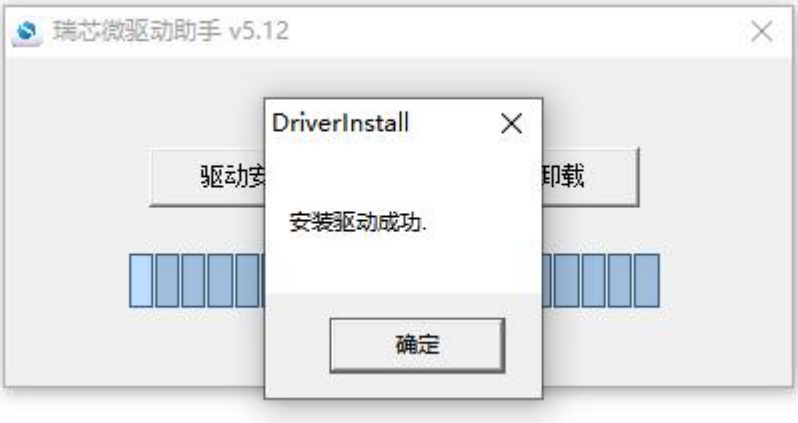


8) After opening **DriverInstall.exe,** the steps to install the Rockchip driver are as follows

a. Click the "**Driver Installation**" button

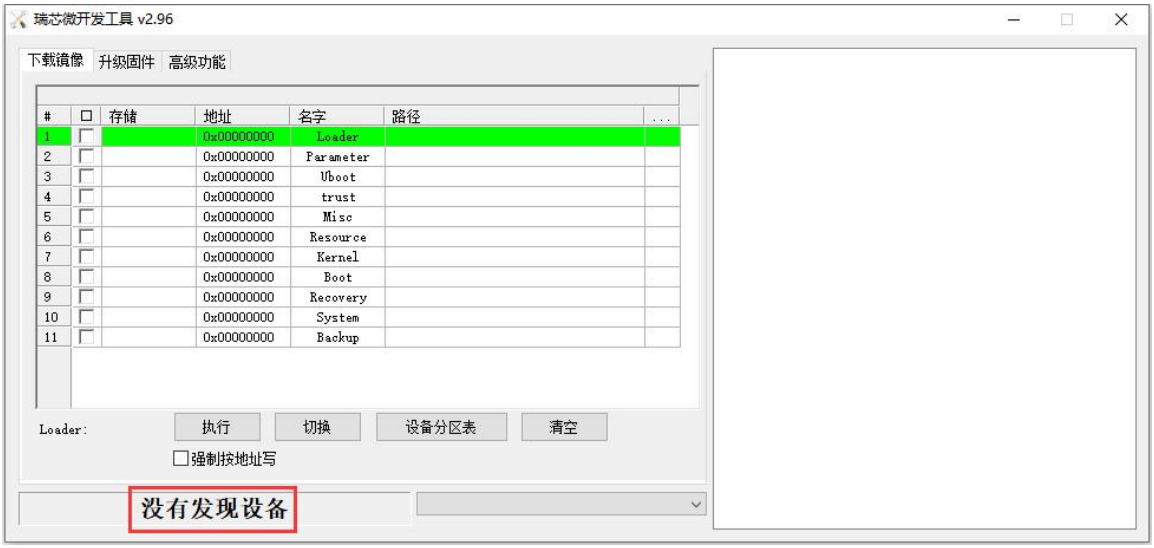


b. After waiting for a period of time, a pop-up window will prompt "**The driver is installed successfully**", and then click the "**OK**" button.



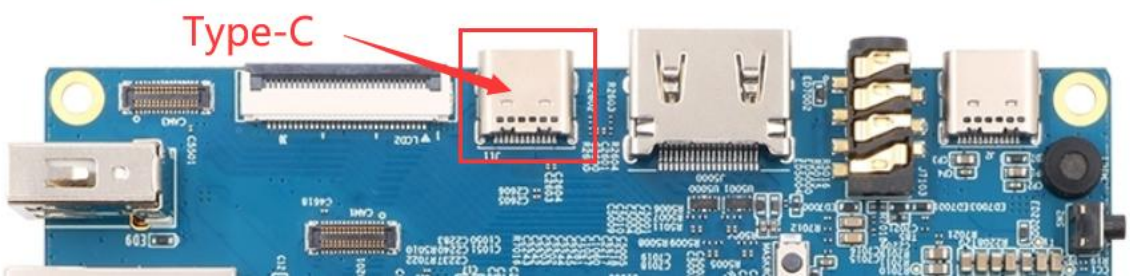
9) Then decompress **RKDevTool_Release_v2.96.zip**, this software does not need to be installed, just find **RKDevTool** in the decompressed folder and open it

10) After opening the **RKDevTool burning tool**, because the computer has not been connected to the development board through the Type-C cable at this time, the lower left corner will prompt "**No device found**"



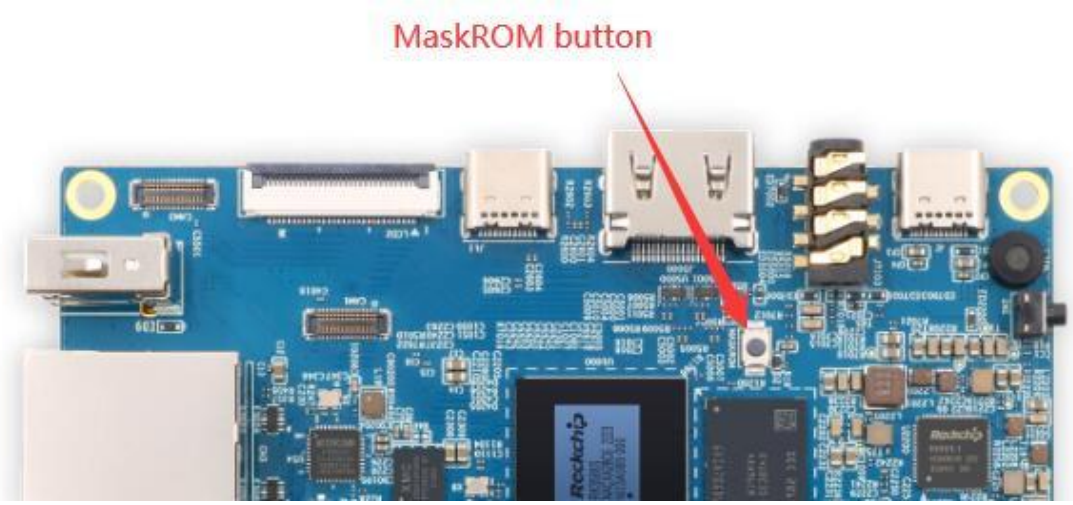
11) Then start burning the Orange Pi OS (Droid) image to SPIFlash+NVMe SSD

a. First, connect the development board to the Windows computer through the Type-C data cable. The position of the Type-C interface on the development board is shown in the figure below

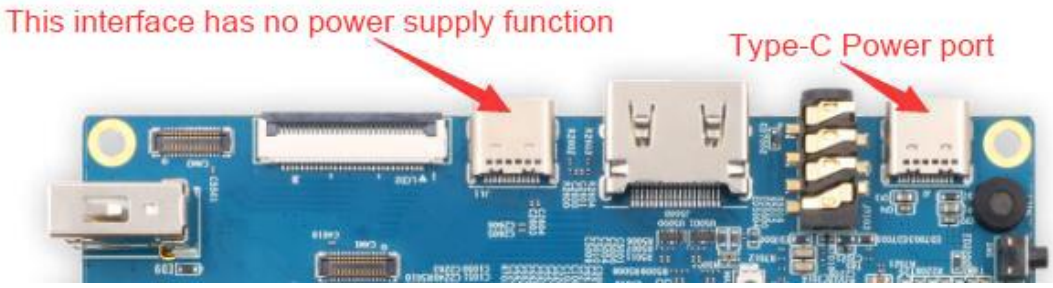


b. Make sure that the development board is not inserted into the TF card and not connected to the power supply

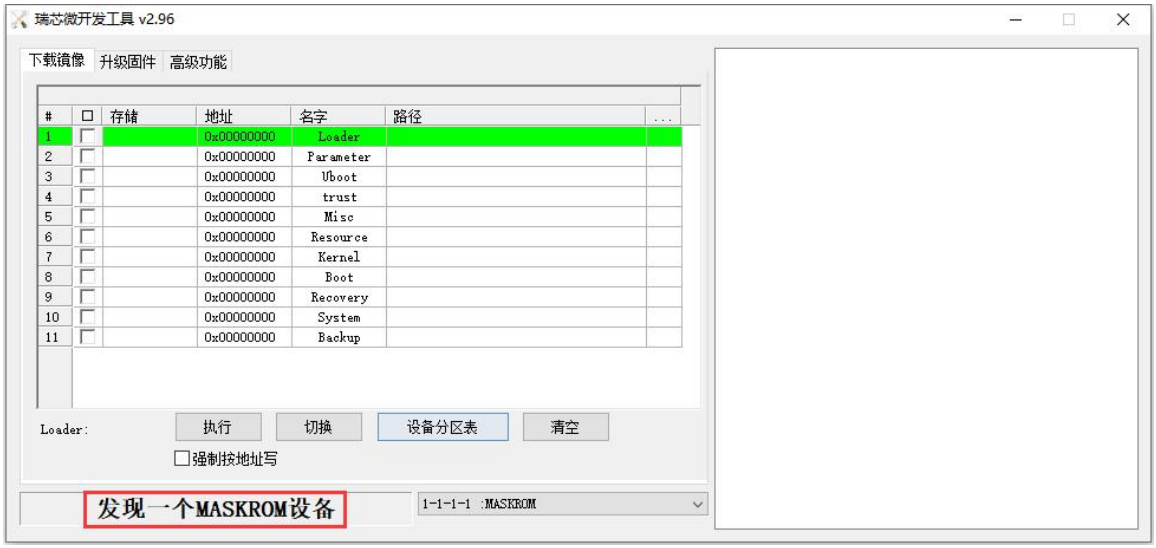
c. Then press and hold the MaskROM button on the development board, the position of the MaskROM button on the development board is shown in the figure below:



d. Then connect the power supply of the Type-C interface to the development board, and power on



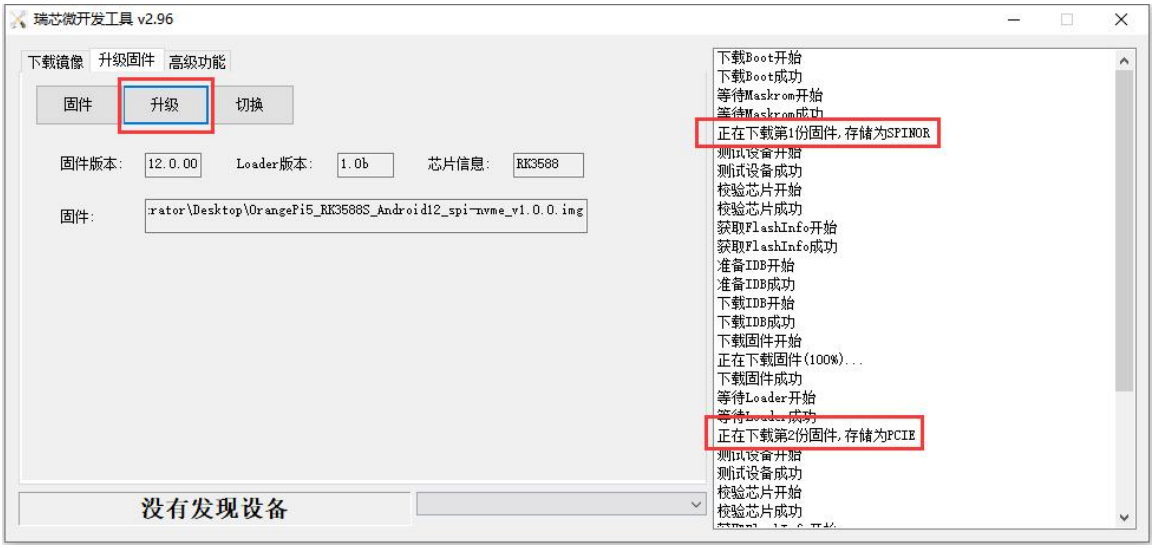
e. If the previous steps are successful, the development board will enter the **MASKROM** mode at this time, and the interface of the burning tool will prompt "**found** a **MASKROM device**"



f. Then click the "**Upgrade Firmware**" column of the burning tool

g. Then click the "**Firmware**" button to select the Android image that needs to be burned

h. Finally, click the "**Upgrade**" button to start burning. The burning process is shown in the figure below. You can see that the firmware will be burned to SPIFlash first, and then burned to PCIE. After burning, the Orange Pi OS (Droid) system will start automatically.



2. 10. Start the Orange Pi development board

1) Insert the TF card with the burned image into the TF card slot of the Orange Pi development board. If the image of SPIFlash+NVMe SSD has been burnt, then there is no need to insert a TF card, just make sure that the NVMe SSD is inserted into the development board normally.

2) ted to a TV or HDMI display through an HDMI-to-HDMI cable. If you buy an LCD screen, you can also use the LCD screen to display the system interface of the development board. If there is a Type-C to HDMI cable, the system interface of the development board can also be displayed through the Type-C interface.

3) Connect a USB mouse and keyboard to control the Orange Pi development board.

4) The development board has an Ethernet port, which can be plugged into a network cable for Internet access.

5) Connect a **high-quality** power adapter with a 5V/4A USB Type-C interface.

Remember not to plug in a power adapter with a voltage output greater than 5V, as this will burn out the development board.

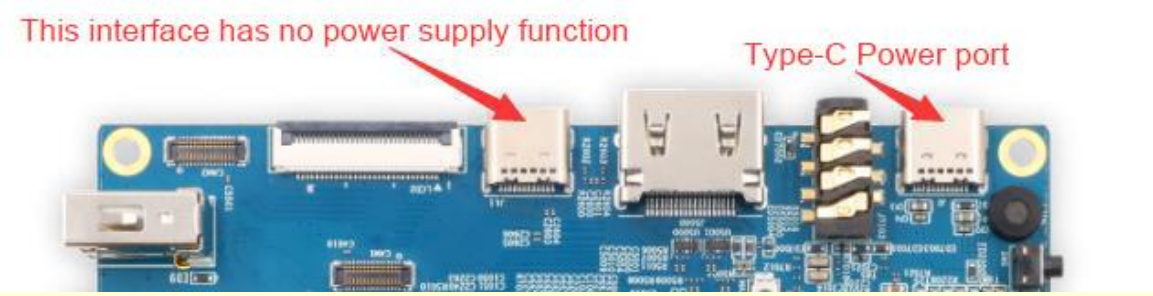
Many unstable phenomena during the power-on and start-up process of the system are basically caused by problems with the power supply, so a reliable power adapter is very important. If you find that there is a phenomenon of continuous

restart during the startup process, please replace the power supply or the Type-C data cable and try again.

The Type-C power port does not support PD negotiation.

In addition, please do not connect the USB interface of the computer to power the development board.

There are two Type-C ports that look the same on the development board. The one on the right is the power port, and the one in the middle has no power supply function. Please don't connect it wrong.



6) Then turn on the switch of the power adapter. If everything is normal, you can see the startup screen of the system on the HDMI monitor or LCD screen.

7) If you want to view the output information of the system through the debugging serial port, please use the serial cable to connect the development board to the computer. For the connection method of the serial port, please refer to the section on **how to use the debugging serial port.**

2. 11. How to use the debugging serial port

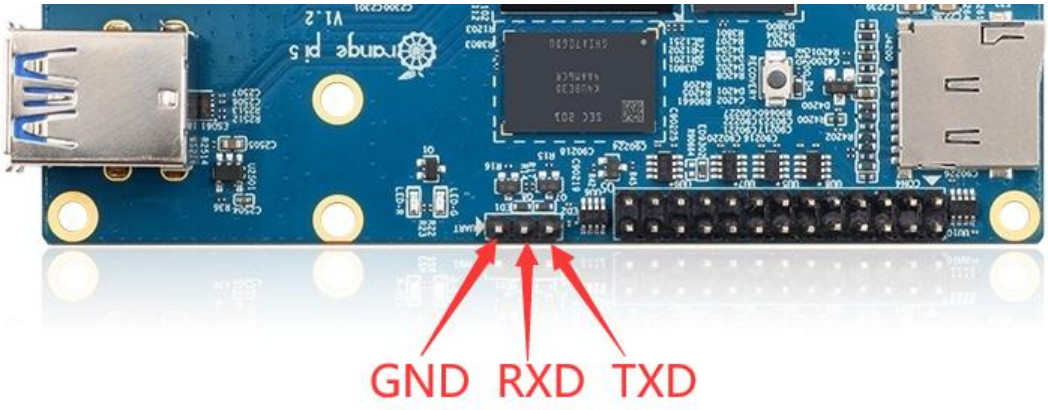
2. 11. 1. Connection instruction of debugging serial port

1) First, you need to prepare a **3.3V** USB to TTL module, and then insert the USB interface end of the USB to TTL module into the USB interface of the computer.

For better compatibility, it is recommended to use the CH340 USB to TTL module instead of the CP2102 USB to TTL module.

Before purchasing a USB to TTL module, please confirm that the module supports a baud rate of 1500000.

2) The corresponding relationship between GND, RXD and TXD pins of the debugging serial port of the development board is shown in the figure below



3) The GND, TXD and RXD pins of the USB to TTL module need to be connected to the debugging serial port of the development board through a DuPont line

a. The GND of the USB to TTL module is connected to the GND of the development board
b. **The RX of the** USB to TTL module is connected to the TX of the development board
c. The TX of the **USB to TTL module** is connected to the RX of the development board

4) The schematic diagram of connecting the USB to TTL module to the computer and the Orange Pi development board is as follows

Schematic diagram of connecting the USB to TTL module to the computer and the Orange Pi development board

The TX and RX of the serial port need to be cross-connected. If you don't want to carefully distinguish the order of TX and RX, you can connect the TX and RX of the serial port casually. If there is no output in the test, then exchange the order of TX and RX, so that there is always a the order is right

2.11.2. How to use the debugging serial port on the Ubuntu platform

There are many serial port debugging software that can be used under Linux, such as putty, minicom, etc. The following demonstrates how to use putty.

1) First, insert the USB-to-TTL module into the USB port of the Ubuntu computer. If the connection and recognition of the USB-to-TTL module is normal, you can see the corresponding device node name under **/dev** on the Ubuntu PC. Remember this node name, and then set the serial port software will be used

```
test@test:~$ ls /dev/ttyUSB*
/dev/ttyUSB0
```

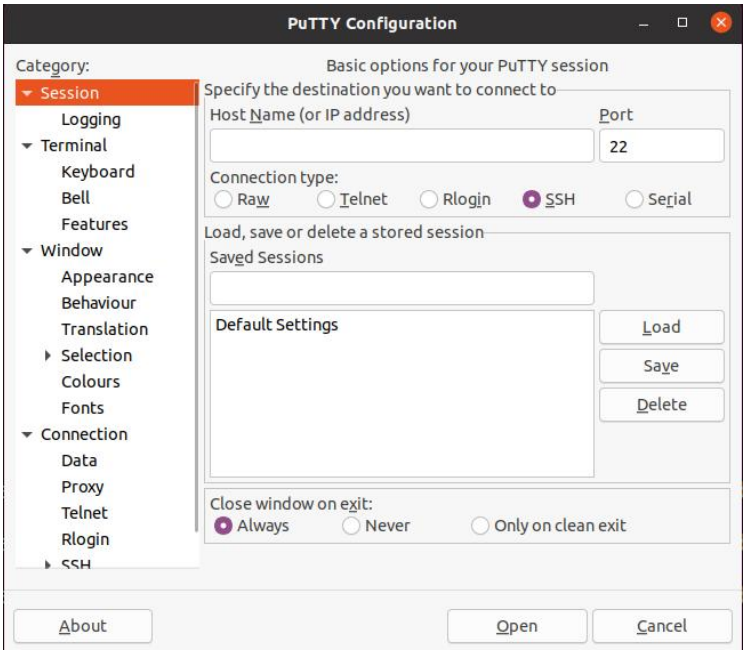
2) Then use the following command to install putty on Ubuntu PC

```
test@test:~$ sudo apt-get update
test@test:~$ sudo apt-get install -y putty
```

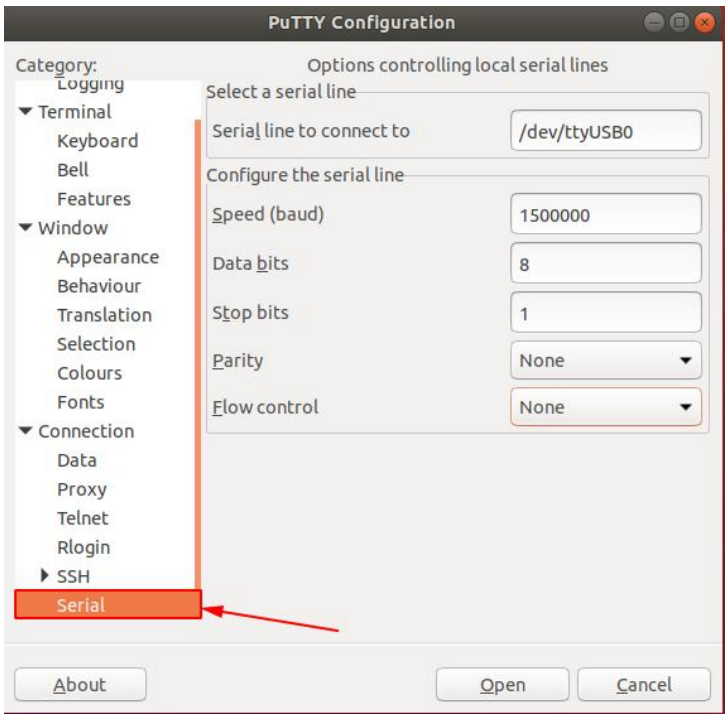
3) Then run putty, **remember to add sudo permission**

```
test@test:~$ sudo putty
```

4) After executing the putty command, the following interface will pop up



5) First select the setting interface of the serial port

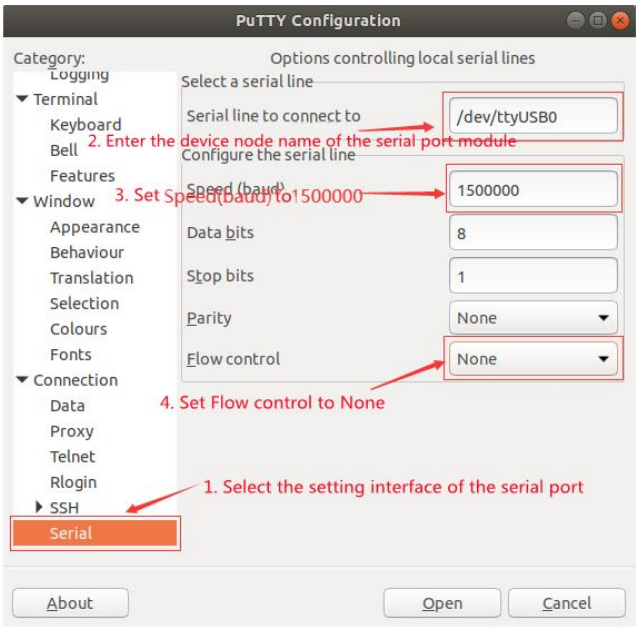


6) Then set the parameters of the serial port

a. Set the Serial line to connect to as /dev/ttyUSB0 (modify to the corresponding node name, generally /dev/ttyUSB0)

b. Set Speed(baud) to 1500000 (the baud rate of the serial port)

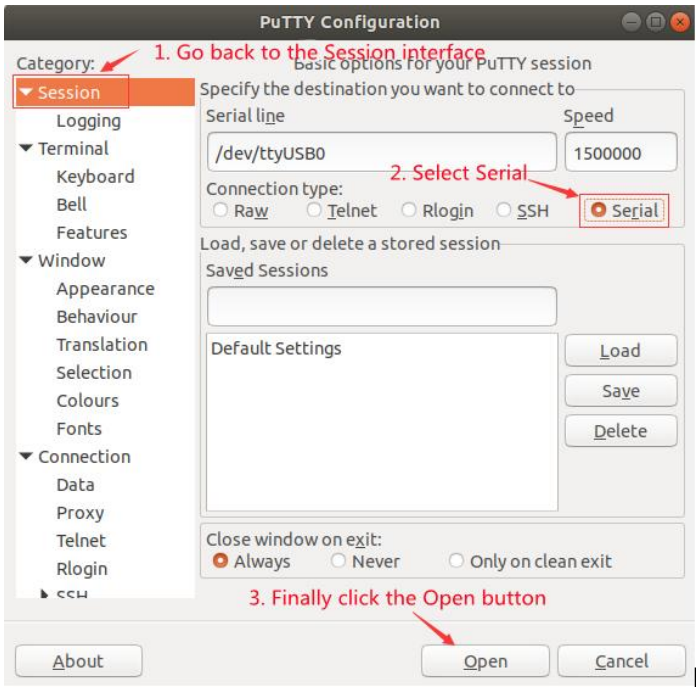
c. Set Flow control to None



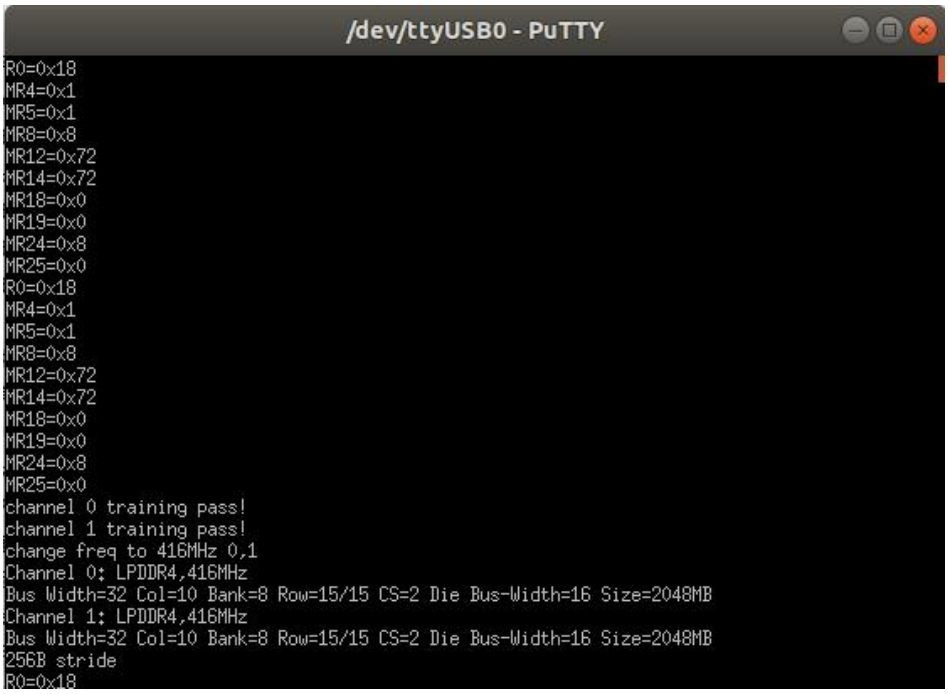
7) After setting the serial port setting interface, return to the Session interface

a. First select the Connection type as Serial

b. Then click the Open button to connect to the serial port



8) After starting the development board, you can see the Log information output by the system from the opened serial port terminal



2. 11. 3. How to use the debugging serial port on Windows platform

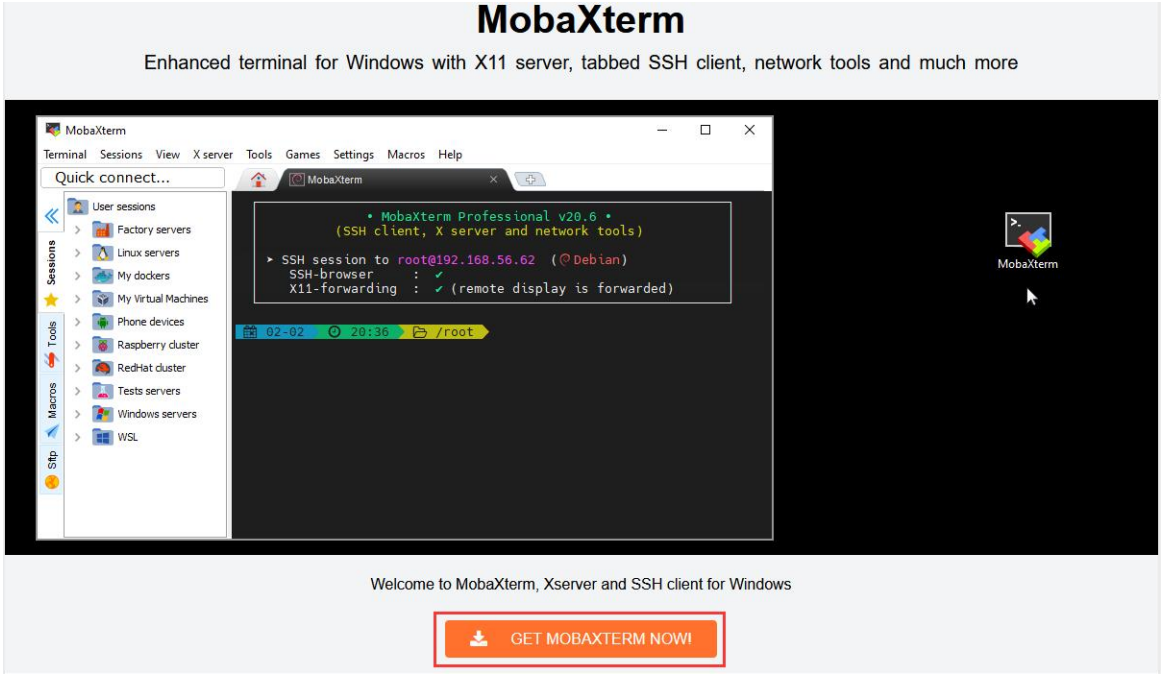
There are many serial port debugging software that can be used under Windows, such as SecureCRT, MobaXterm, etc. The following demonstrates how to use MobaXterm. This software has a free version and can be used without buying a serial number.

1) Download MobaXterm

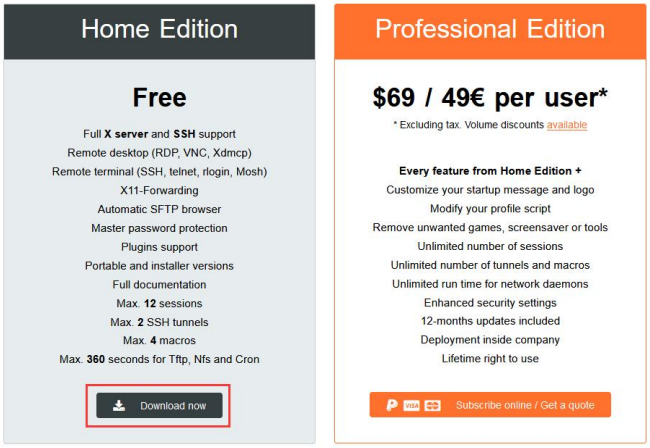
a. Download MobaXterm website as follows

https://mobaxterm.mobatek.net

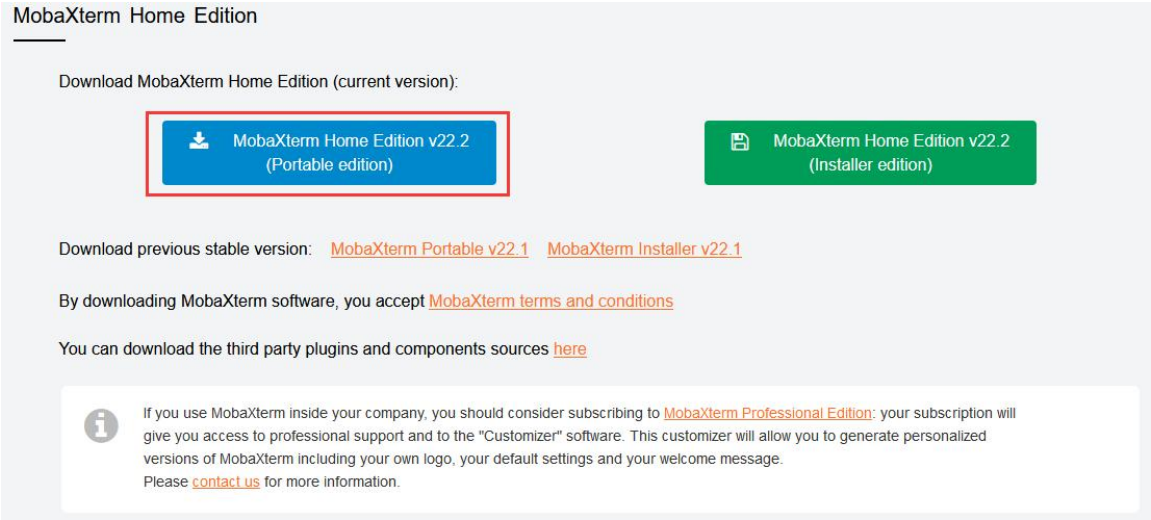
b. After entering the MobaXterm download page, click **GET XOBATERM NOW!**



c. Then choose to download the Home version



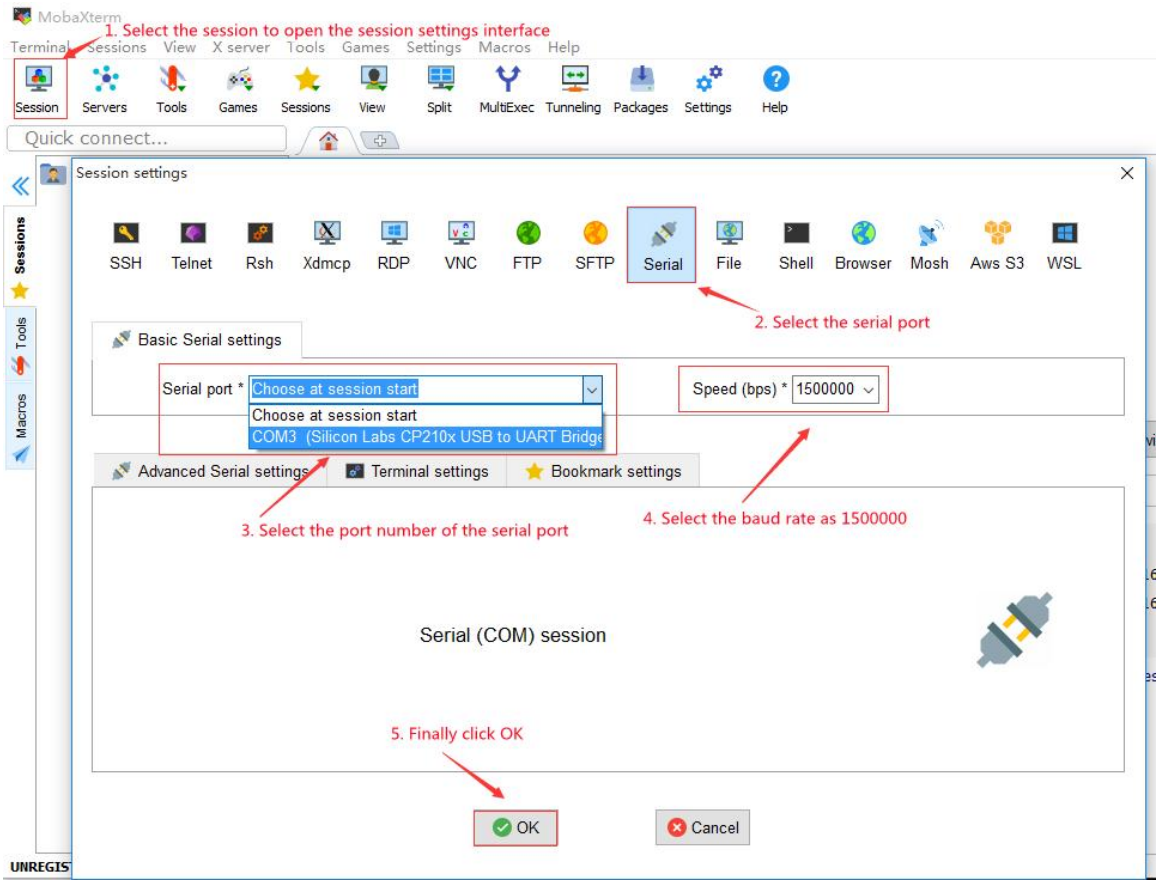
d. Then select Portable portable version, no need to install after downloading, just open it and use it



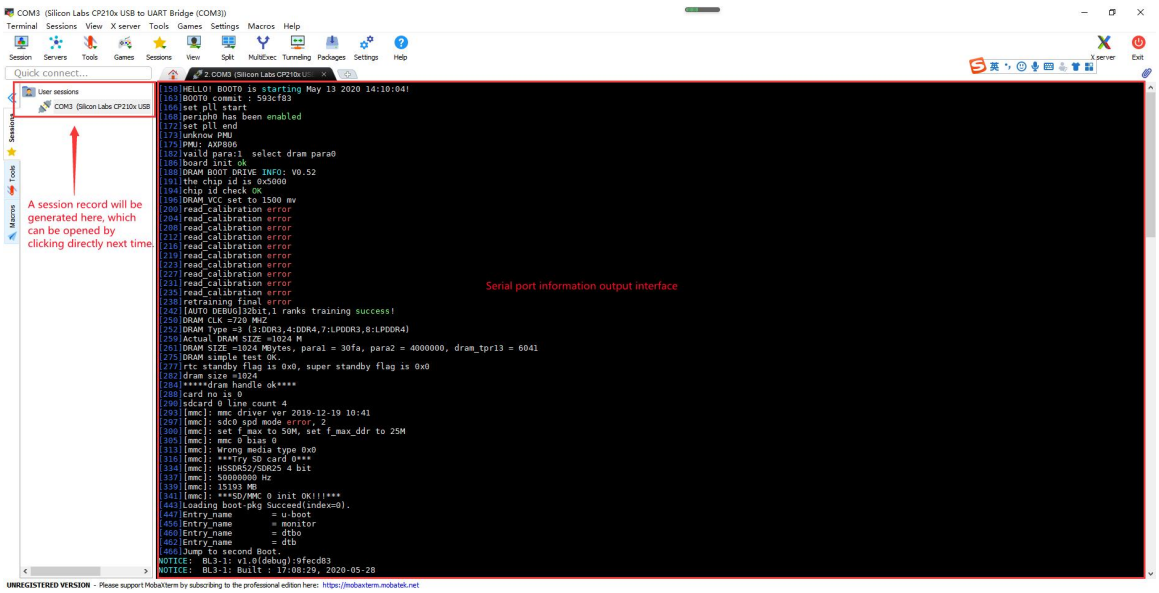
2) After downloading, use decompression software to decompress the downloaded compressed package, you can get the executable software of MobaXterm, and then double-click to open

3) After opening the software, the steps to set up the serial port connection are as follows

a. Open the session settings interface
b. Select the serial port type
c. Select the port number of the serial port (select the corresponding port number according to the actual situation), if you cannot see the port number, please use **360 Driver Master** to scan and install the driver for the USB to TTL serial port chip
d. Select the baud rate of the serial port as **1500000**
e. Finally click the "**OK**" button to complete the settings



4) After clicking the "**OK**" button, you will enter the following interface. At this time, start the development board and you can see the output information of the serial port



2. 12. Instructions for using the 5v pin in the 26pin interface of the development board to supply power

The power supply method we recommend for the development board is to use the 5V/4A Type C interface power cord to plug into the Type-C power interface of the development board for power supply. If you need to use the 5V pin in the 26pin interface to power the development board, please make sure that the power cable and power adapter used can meet the power supply requirements of the development board. If the use is unstable, please switch back to the Type-C power supply.

1) First, you need to prepare a power cord as shown in the figure below

The power cord shown in the picture above can be bought on Taobao, please search and buy by yourself.

2) Use the 5V pin in the 26pin interface to supply power to the development board. The connection method of the power line is as follows

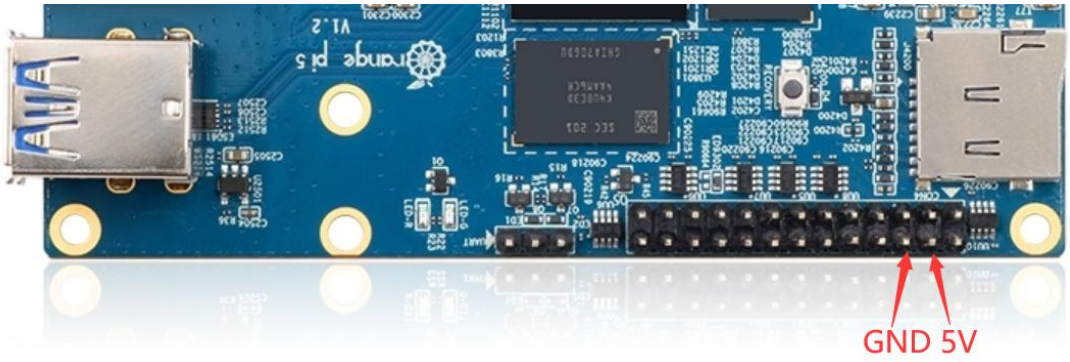
a. The USB A port of the power cord shown in the above picture needs to be

plugged into the 5V/4A power adapter connector (**please do not plug into the USB port of the computer for power supply**)

b. The red DuPont line needs to be plugged into the 5V pin of the development board 26pin

c. The black DuPont line needs to be inserted into the GND pin of the 26pin interface

d. The position of the 5V pin and GND pin of the 26pin interface on the development board is shown in the figure below, **remember not to reverse the connection**



3. Debian system instructions

3. 1. Supported Debian image types and kernel versions

Linux image type	kernel version	server version	Desktop version
Debian 11 - Bullseye	Linux5.10	Support	Support

3. 2. Linux kernel driver adaptation

Function	Linux5.10
USB2.0x2	OK
USB3.0x1	OK
USB Type-C 3.0	OK
Type-C to HDMI display (DP display)	OK
M.2 NVMe SSD boot	OK

AP6275P-WIFI	OK
AP6275P-Bluetooth	OK
GPIO（26pin）	OK
UART（26pin）	OK
SPI（26pin）	OK
I2C（26pin）	OK
CAN（26pin）	OK
PWM（26pin）	OK
3pin debugging serial port	OK
TF card start	OK
HDMI video	OK
HDMI audio	OK
MIPI Camera 1	OK
MIPI Camera 2	OK
MIPI Camera 3	OK
LCD1	OK
LCD2	OK
Gigabit Ethernet port	OK
Network port status light	OK
MIC	OK
Headphone Playback	OK
Headphone recording	OK
led Lights	OK
GPU	OK
NPU	OK
VPU	OK
Switch Button	OK
Watchdog Test	OK

3. 3. The format of linux commands in this manual

1) In this manual, all commands that need to be entered in the Linux system will be framed in the following box

As shown below, the content in the yellow box indicates the content that needs special attention, except for the commands in it.

2) Description of the prompt type in front of the command

a. The prompt in front of the command refers to the content of the red part in the box below, which is not part of the linux command, so when entering the command in the linux system, please do not enter the content of the red font part.

```
orangepi@orangepi:~$ sudo apt update
root@orangepi:~# vim /boot/boot.cmd
test@test:~$ ssh root@192.168.1.xxx
root@test:~# ls
```

b. **root@orangepi:~$** The prompt indicates that this command is entered in **the linux system of the development board.** The **$** at the end of the prompt indicates that the current user of the system is an ordinary user. When executing a privileged command, you need to add **sudo.**

c. **root@orangepi:~#** The prompt indicates that this command is entered in t**he linux system of the development board,** and the # at the end of the prompt indicates that the current user of the system is the root user, who can execute any desired command.

d. **test@test:~$** The prompt indicates that this command is entered in the Ubuntu PC or Ubuntu virtual machine, not in the linux system of the development board. The **$** at the end of the prompt indicates that the current user of the system is an ordinary user. When executing privileged commands, sudo needs to be added

e. **root@test:~#** The prompt indicates that this command is entered in the Ubuntu PC or Ubuntu virtual machine, not in the linux system of the development board. The # at the end of the prompt indicates that the current user of the system is the root user and can execute any command you want

3) What are the commands that need to be entered?

a. As shown below, **the black bold part is the command** that needs to be input, and the content below the command is the output content (some commands have output, some may not have output), this part of the content does not need to be input

```
root@orangepi:~# cat /boot/orangepiEnv.txt
verbosity=7
bootlogo=false
console=serial
```

b. As shown below, some commands cannot be written in one line and will be placed on the next line. As long as the black and bold parts are all commands that need to be input. When these commands are entered into one line, the last "\" of each line needs to be removed, this is not part of the command. In addition, there are spaces in different parts of the command, please don't miss it.

```
orangepi@orangepi:~$ echo  \
"deb [arch=$(dpkg --print-architecture)  \
signed-by=/usr/share/keyrings/docker-archive-keyring.gpg]  \
https://download.docker.com/linux/debian  \
$(lsb_release -cs) stable" | sudo tee /etc/apt/sources.list.d/docker.list > /dev/null
```

3. 4. Linux system login instructions

3. 4. 1. Linux system default login account and password

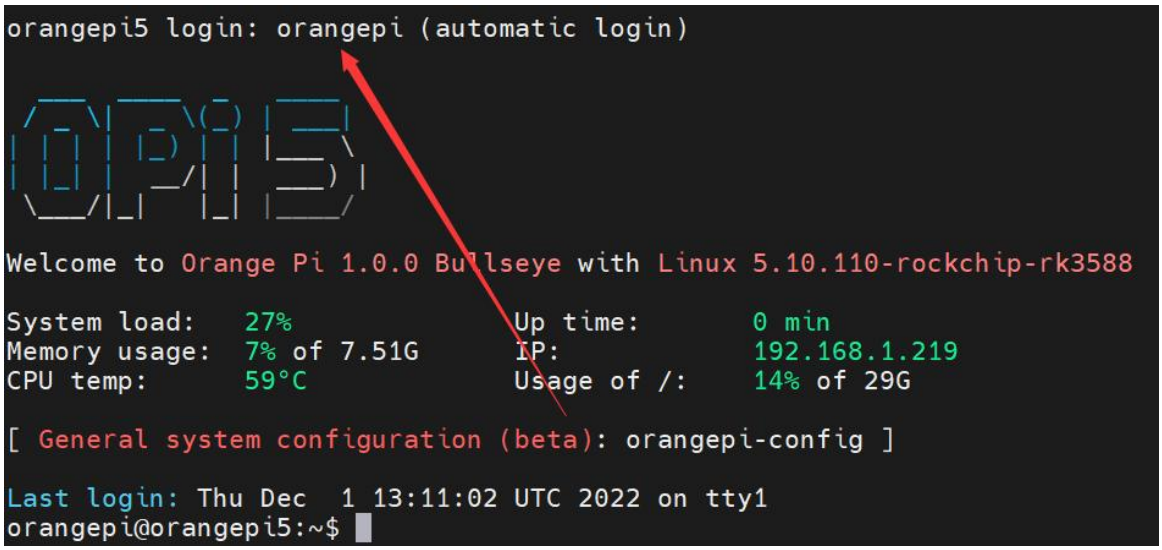
Account	Password
root	orangepi
orangepi	orangepi

Note that when entering the password, the specific content of the entered password will not be displayed on the screen, please do not think that there is any fault, just press Enter after inputting.

When the wrong password is prompted, or there is a problem with the ssh connection, please note that as long as you are using the Linux image provided by Orange Pi, please do not suspect that the above password is wrong, but look for other reasons.

3. 4. 2. How to set automatic terminal login in Linux system

1) By default, the Linux system automatically logs in to the terminal, and the default login user name is **orangepi**



2) Use the following command to set the root user to automatically log in to the terminal

```
orangepi@orangepi:~$ sudo auto_login_cli.sh root
```

3) Use the following command to disable automatic login terminal

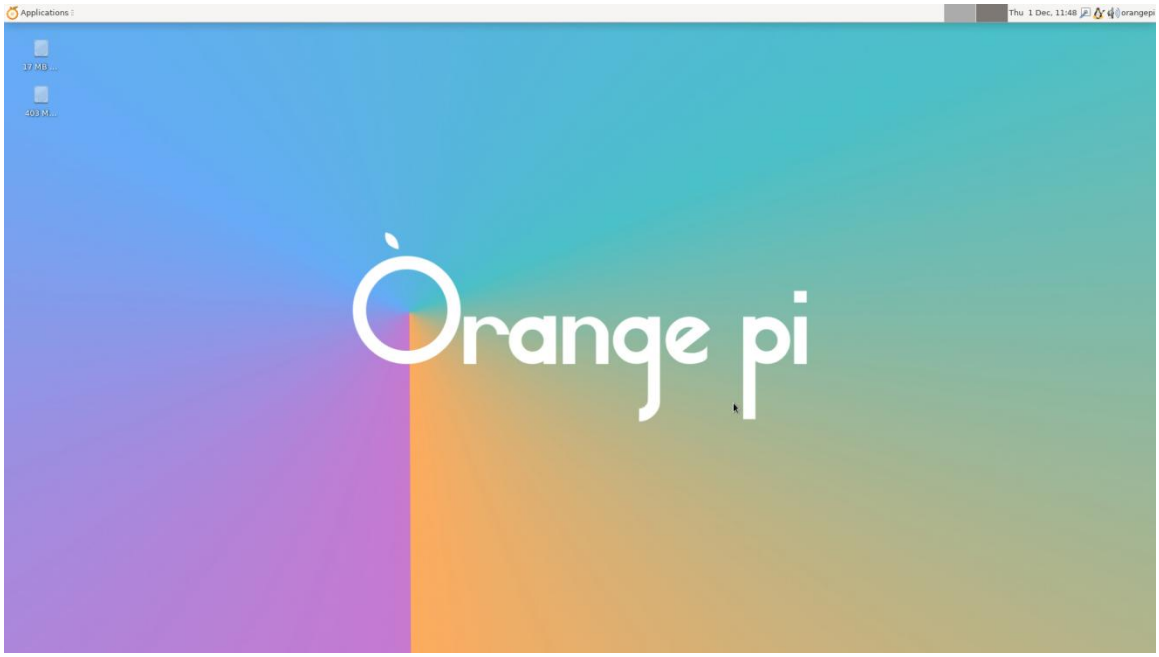
```
orangepi@orangepi:~$ sudo auto_login_cli.sh -d
```

4) Use the following command to set the orangepi user to automatically log in to the terminal again

```
orangepi@orangepi:~$ sudo auto_login_cli.sh orangepi
```

3. 4. 3. Instructions for automatic login of Linux desktop version system

1) After the desktop version system is started, it will automatically log in to the desktop without entering a password



2) Run the following command to prohibit the desktop system from automatically logging into the desktop

```
orangepi@orangepi:~$ sudo disable_desktop_autologin.sh
```

3) Then restart the system and a login dialog box will appear, at which point a password is required to enter the system

3. 4. 4. Setting method of root user automatic login in Linux desktop version system

1) Execute the following command to set the desktop system to automatically log in as the root user

```
orangepi@orangepi:~$ sudo desktop_login.sh root
```

2) Then restart the system, it will automatically use the root user to log in to the desktop

Note that if you log in to the desktop system as the root user, you cannot use pulseaudio in the upper right corner to manage audio devices.

Also note that this is not a bug, since pulseaudio is not allowed to run as root.

3) Execute the following command to set the desktop system to automatically log in as the orangepi user again.

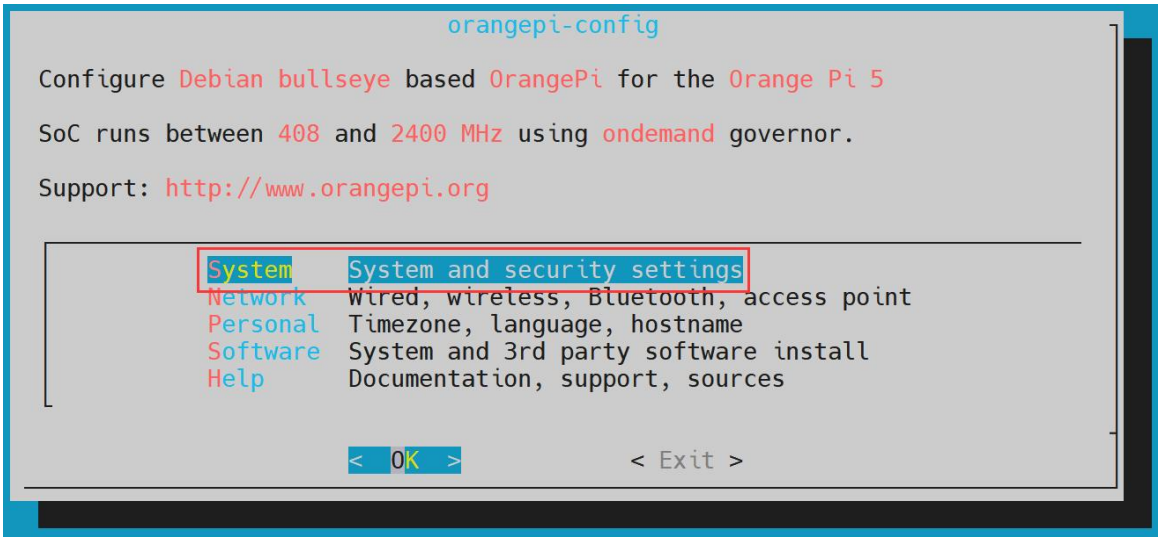
```
orangepi@orangepi:~$ sudo desktop_login.sh orangepi
```

3. 4. 5. The method of disabling the desktop in the Linux desktop version system

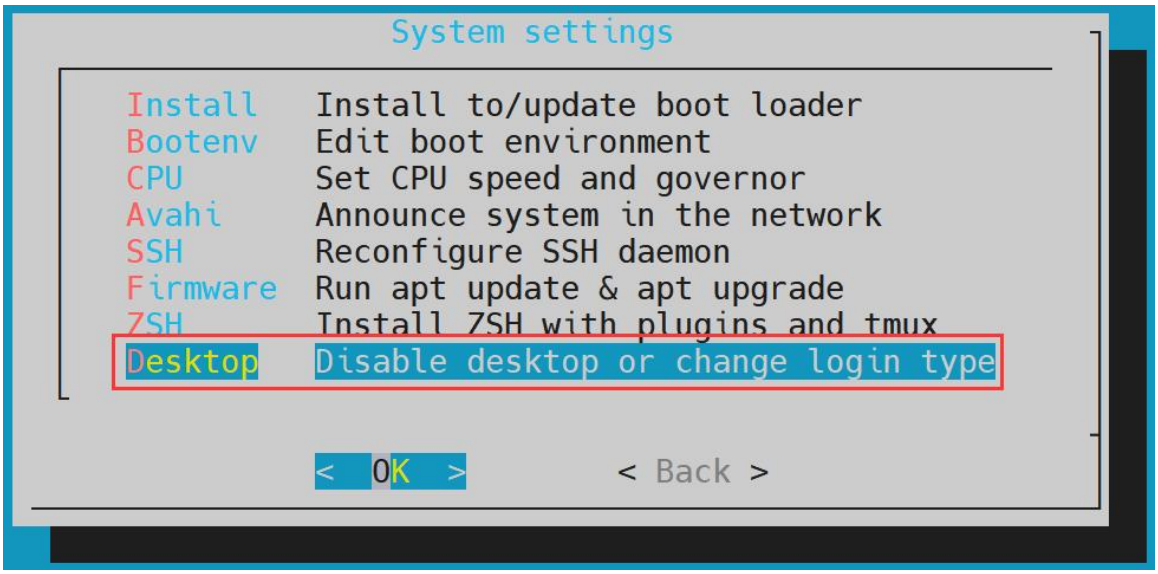
1) First enter the following command in the command line, **please remember to add sudo permission**

```
orangepi@orangepi:~$ sudo orangepi-config
```

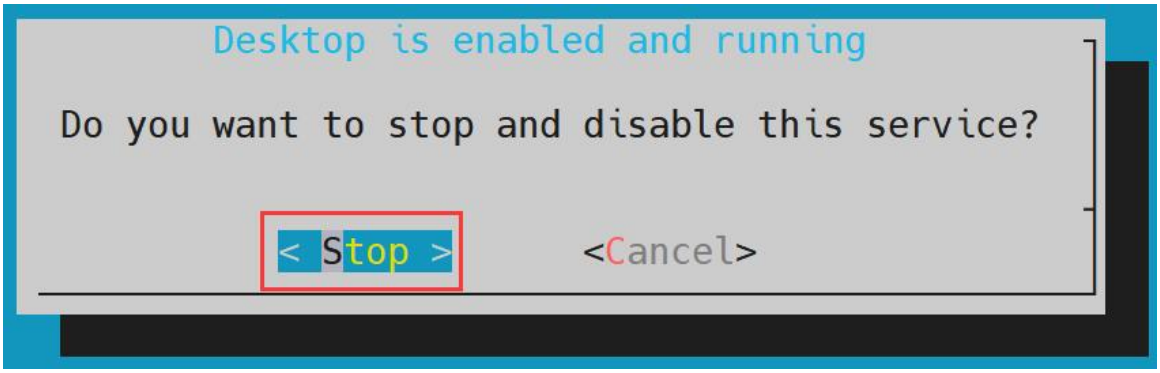
2) Then select **System**



3) Then select **Desktop**



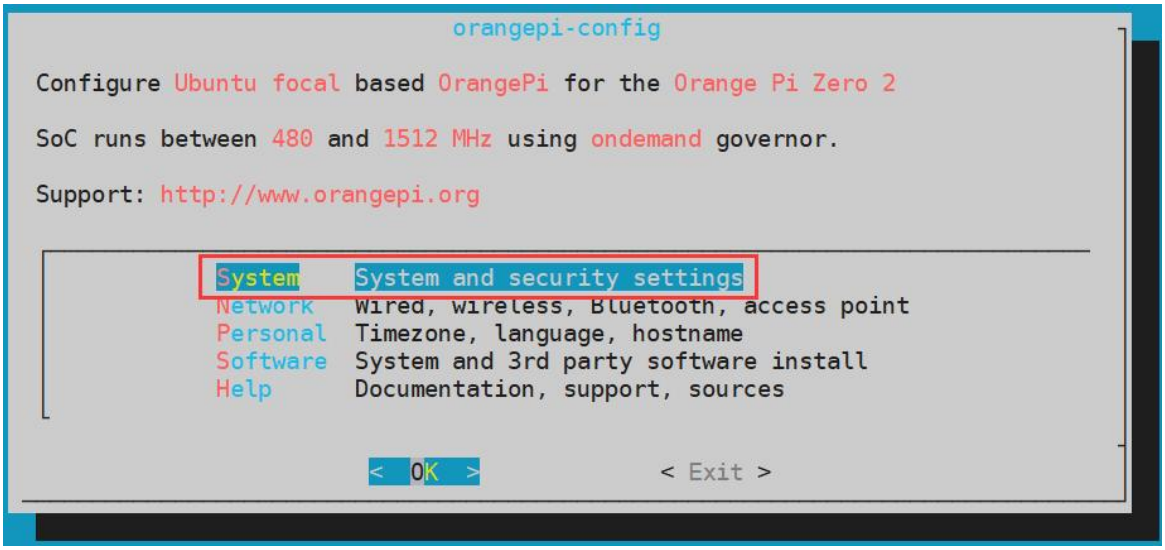
4) Then select **<Stop>**



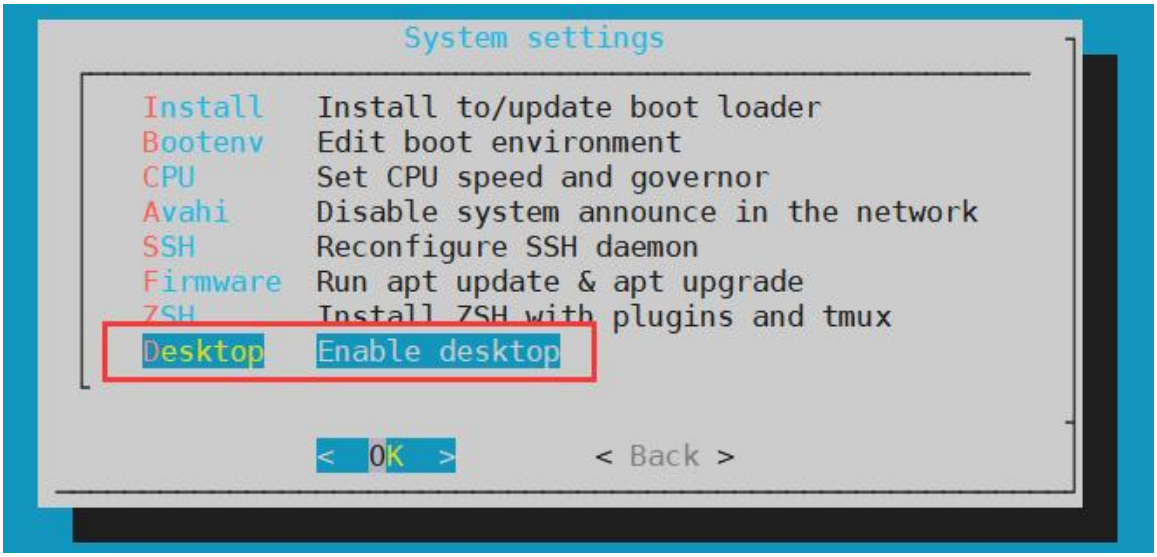
5) Then restart the Linux system and you will find that the desktop will not be displayed.
6) The steps to reopen the desktop are as follows:
   a. First enter the following command in the command line, **please remember to add sudo permission**

```
orangepi@orangepi:~$ sudo orangepi-config
```

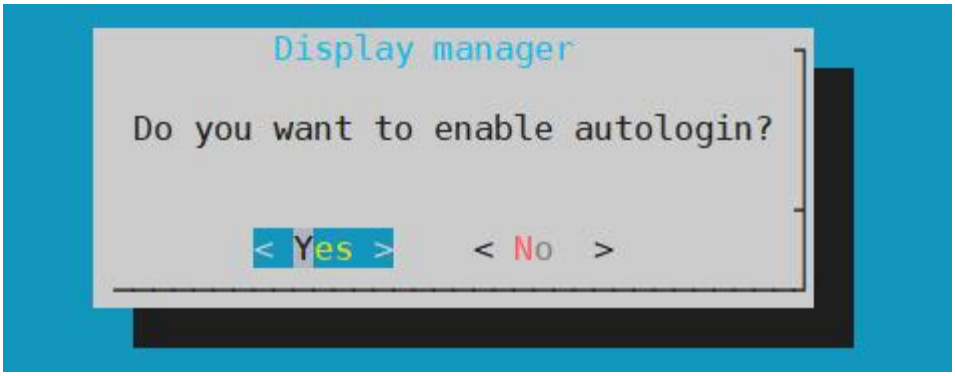
   b. Then choose**System**



   c. Then choose**Desktop Enable desktop**



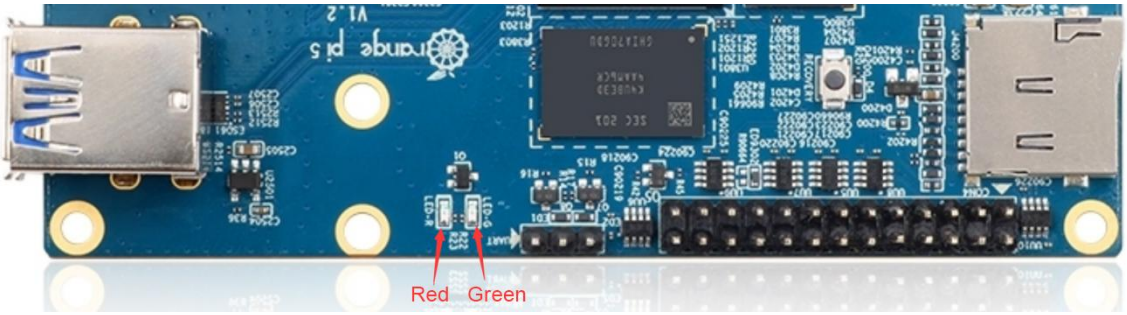
   d. Then choose whether to automatically log in to the desktop. If you select **<Yes>**, you will automatically log in to the desktop. If you select **<No>**, the input interface for user and password will be displayed, and you need to enter the password to enter the desktop.



e. After selection, the HDMI monitor will display the desktop

3. 5. Onboard LED Light Test Instructions

1) There are two LED lights on the development board, one is green and the other is red. The location is shown in the figure below:



2) As long as the development board is powered on, the red LED light will always be on, which is controlled by the hardware and cannot be turned off by the software.

3) The green LED light will keep flashing after the kernel is started, which is controlled by software.

Note that the following operations should be performed under the root user.

4) The method of setting the green light on and off and flashing is as follows

a. First enter the setting directory of the green light

```
root@orangepi:~# cd /sys/class/leds/status_led
```

b. The command to set the green light to stop flashing is as follows

```
root@orangepi:/sys/class/leds/status_led# echo none > trigger
```

c. The command to set the green light to be on is as follows

```
root@orangepi:/sys/class/leds/status_led# echo 1 > brightness
```

d. The command to set the green light to flash is as follows

```
root@orangepi:/sys/class/leds/status_led# echo heartbeat > trigger
```

3. 6. Network connection test

3. 6. 1. Ethernet port test

1) First, insert one end of the network cable into the Ethernet interface of the development board, and connect the other end of the network cable to the router, and ensure that the network is unblocked

2) After the system starts, it will automatically assign an IP address to the Ethernet card through **DHCP**, **without any other configuration**

3) The command to view the IP address in the Linux system of the development board is as follows

```
orangepi@orangepi:~$ ip addr show eth0
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    link/ether 4a:fe:2b:3d:17:1c brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.150/24 brd 192.168.1.255 scope global dynamic noprefixroute eth0
       valid_lft 43150sec preferred_lft 43150sec
    inet6 fe80::9a04:3703:faed:23be/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
```

When using ifconfig to view the IP address, if the following information is prompted, it is because sudo is not added. The correct command is：sudo ifconfig

```
orangepi@orangepi:~$ ifconfig
Command 'ifconfig' is available in the following places
 * /sbin/ifconfig
 * /usr/sbin/ifconfig
The command could not be located because '/sbin:/usr/sbin' is not included in the PATH environment variable.
This is most likely caused by the lack of administrative privileges associated with your user account.
ifconfig: command not found
```

There are three ways to view the IP address after the development board starts:

1. Connect the HDMI display, then log in to the system and use the ip addr show eth0 command to view the IP address

2. Enter the ip addr show eth0 command in the debugging serial terminal to view the IP address

3. If there is no debugging serial port and no HDMI display, you can also check the IP address of the development board network port through the management interface of the router. However, in this method, some people often cannot see the IP address of the development board normally. If you can't see it, the debugging method is as follows

A）First check whether the Linux system has started normally. If the green light of the development board is blinking, it is generally started normally. If only the red light is on, it means that the system has not started normally;

B）Check whether the network cable is plugged in tightly, or try another network cable;

C）Try another router (I have encountered many problems with the router, such as the router cannot assign the IP address normally, or the IP address has been assigned normally but cannot be seen in the router);

D）If there is no router to replace, you can only connect to an HDMI display or use the debugging serial port to check the IP address.

In addition, it should be noted that the development board DHCP automatically assigns an IP address without any settings.

4) The command to test the network connectivity is as follows, the **ping** command can be interrupted through the shortcut key of **Ctrl+C**

```
orangepi@orangepi:~$ ping www.baidu.com -I eth0
PING www.a.shifen.com (14.215.177.38) from 192.168.1.12 eth0: 56(84) bytes of data.
64 bytes from 14.215.177.38 (14.215.177.38): icmp_seq=1 ttl=56 time=6.74 ms
64 bytes from 14.215.177.38 (14.215.177.38): icmp_seq=2 ttl=56 time=6.80 ms
64 bytes from 14.215.177.38 (14.215.177.38): icmp_seq=3 ttl=56 time=6.26 ms
64 bytes from 14.215.177.38 (14.215.177.38): icmp_seq=4 ttl=56 time=7.27 ms
^C
--- www.a.shifen.com ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3002ms
rtt min/avg/max/mdev = 6.260/6.770/7.275/0.373 ms
```

3.6.2. WIFI connection test

Please do not connect to WIFI by modifying the /etc/network/interfaces configuration file. There will be problems connecting to the WIFI network in this way.

3.6.2.1. The server version image connects to WIFI through commands

When the development board is not connected to Ethernet, not connected to HDMI display, but only connected to the serial port, it is recommended to use the commands demonstrated in this section to connect to the WIFI network. Because nmtui can only display characters in some serial port software (such as minicom), and cannot display the graphical interface normally. Of course, if the development board is connected to an Ethernet or HDMI display, you can also use the commands demonstrated in this section to connect to the WIFI network.

1) First log in to the linux system, there are the following three ways
   a. If the development board is connected with a network cable, you can remotely log in to **the Linux system through ssh**
   a. If the development board is connected to the debugging serial port, you can use the serial port terminal to log in to the Linux system
   b. If the development board is connected to the HDMI display, you can log in to the linux system through the terminal displayed on the HDMI

2) First use the **nmcli dev wifi** command to scan the surrounding WIFI hotspots

```
orangepi@orangepi:~$ nmcli dev wifi
```

```
root@orangepi:~# nmcli dev wifi
IN-USE  BSSID              SSID                MODE   CHAN  RATE        SIGNAL  BARS  SECURITY
        28:6C:07:6E:87:2E  [redacted]_orangepi  Infra  9     260 Mbit/s  97            WPA1 WPA2
        D8:D8:66:A5:BD:D1  [redacted]           Infra  10    270 Mbit/s  90            WPA1 WPA2
        A0:40:A0:A1:72:20  [redacted]           Infra  4     405 Mbit/s  82            WPA2
        28:6C:07:6E:87:2F  [redacted]_orangepi_5G Infra  149   540 Mbit/s  80            WPA1 WPA2
        CA:50:E9:89:E2:44  [redacted]           Infra  1     130 Mbit/s  79            WPA1 WPA2
        A0:40:A0:A1:72:31  [redacted]           Infra  100   405 Mbit/s  67            WPA2
        D4:EE:07:08:A9:E0  [redacted]           Infra  4     130 Mbit/s  55            WPA1 WPA2
        88:C3:97:49:25:13  [redacted]           Infra  6     130 Mbit/s  52            WPA1 WPA2
        00:BD:82:51:53:C2  [redacted]           Infra  12    130 Mbit/s  49            WPA1 WPA2
        C0:61:18:FA:49:37  [redacted]           Infra  149   270 Mbit/s  47            WPA1 WPA2
        04:79:70:8D:0C:B8  [redacted]           Infra  153   270 Mbit/s  47            WPA2
        04:79:70:FD:0C:B8  [redacted]           Infra  153   270 Mbit/s  47            WPA2
        9C:A6:15:DD:E6:0C  [redacted]           Infra  10    270 Mbit/s  45            WPA1 WPA2
        B4:0F:3B:45:D1:F5  [redacted]           Infra  48    270 Mbit/s  45            WPA1 WPA2
        E8:CC:18:4F:7B:44  [redacted]           Infra  157   135 Mbit/s  45            WPA1 WPA2
        B0:95:8E:D8:2F:ED  [redacted]           Infra  11    405 Mbit/s  39            WPA1 WPA2
        C0:61:18:FA:49:36  [redacted]           Infra  11    270 Mbit/s  24            WPA1 WPA2
root@orangepi:~#
```

3) Then use the **nmcli** command to connect to the scanned WIFI hotspot, where:

a. **wifi_name** needs to be replaced with the name of the WIFI hotspot you want to connect to

b. **wifi_passwd** needs to be replaced with the password of the WIFI hotspot you want to connect to

```
orangepi@orangepi:~$ nmcli dev wifi connect wifi_name password wifi_passwd
Device 'wlan0' successfully activated with 'cf937f88-ca1e-4411-bb50-61f402eef293'.
```

4) Through the **ip addr show wlan0** command, you can view the IP address of wifi

```
orangepi@orangepi:~$ ip addr show wlan0
11: wlan0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 23:8c:d6:ae:76:bb brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.11/24 brd 192.168.1.255 scope global dynamic noprefixroute wlan0
       valid_lft 259192sec preferred_lft 259192sec
    inet6 240e:3b7:3240:c3a0:c401:a445:5002:ccdd/64 scope global dynamic noprefixroute
       valid_lft 259192sec preferred_lft 172792sec
    inet6 fe80::42f1:6019:a80e:4c31/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
```

5) Use the **ping** command to test the connectivity of the wifi network, and the **ping** command can be interrupted through the shortcut key Ctrl+C

```
orangepi@orangepi:~$ ping www.orangepi.org -I wlan0
PING www.orangepi.org (182.92.236.130) from 192.168.1.49 wlan0: 56(84) bytes of data.
64 bytes from 182.92.236.130 (182.92.236.130): icmp_seq=1 ttl=52 time=43.5 ms
64 bytes from 182.92.236.130 (182.92.236.130): icmp_seq=2 ttl=52 time=41.3 ms
64 bytes from 182.92.236.130 (182.92.236.130): icmp_seq=3 ttl=52 time=44.9 ms
64 bytes from 182.92.236.130 (182.92.236.130): icmp_seq=4 ttl=52 time=45.6 ms
64 bytes from 182.92.236.130 (182.92.236.130): icmp_seq=5 ttl=52 time=48.8 ms
^C
--- www.orangepi.org ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4006ms
rtt min/avg/max/mdev = 41.321/44.864/48.834/2.484 ms
```

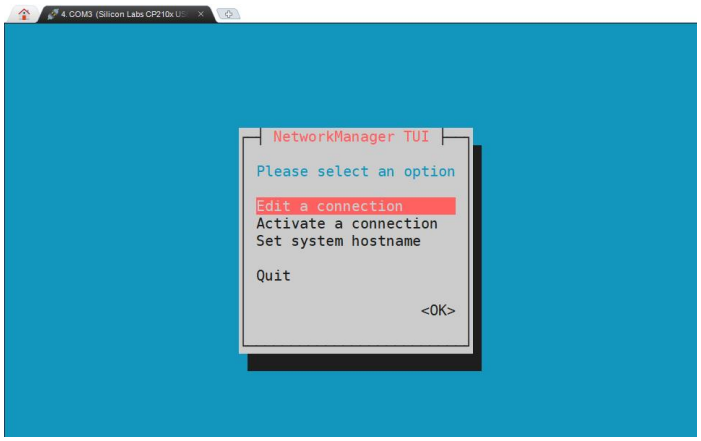
3.6.2.2. The server image connects to WIFI in a graphical way

1) First log in to the linux system, there are the following three ways
   a. If the development board is connected with a network cable, you can remotely log in to the **Linux system through ssh**
   b. If the development board is connected to the debugging serial port, you can use the serial port terminal to log in to the linux system (please use MobaXterm for the serial port software, and minicom cannot display the graphical interface)
   c. If the development board is connected to the HDMI display, you can log in to the linux system through the terminal displayed on the HDMI

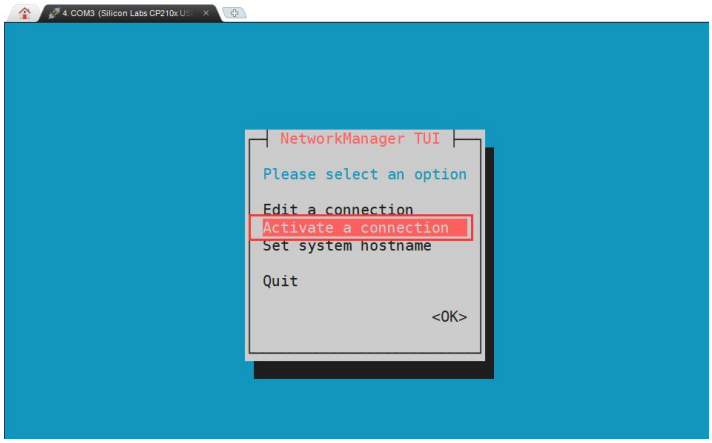
2) Then enter the nmtui command in the command line to open the wifi connection interface

```
orangepi@orangepi:~$ nmtui
```

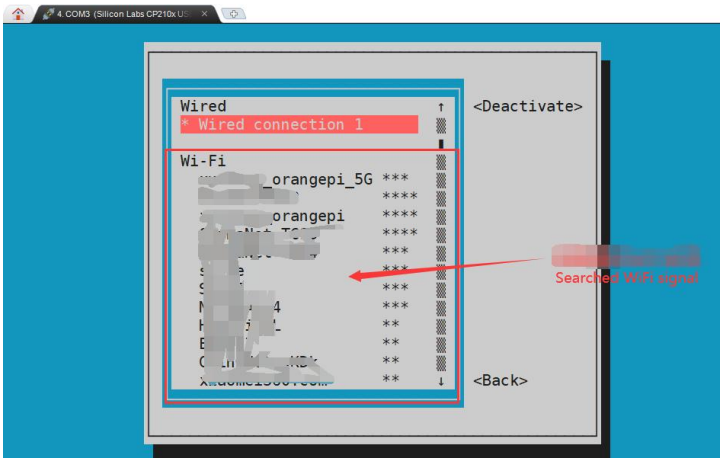
3) Enter the nmtui command to open the interface as shown below



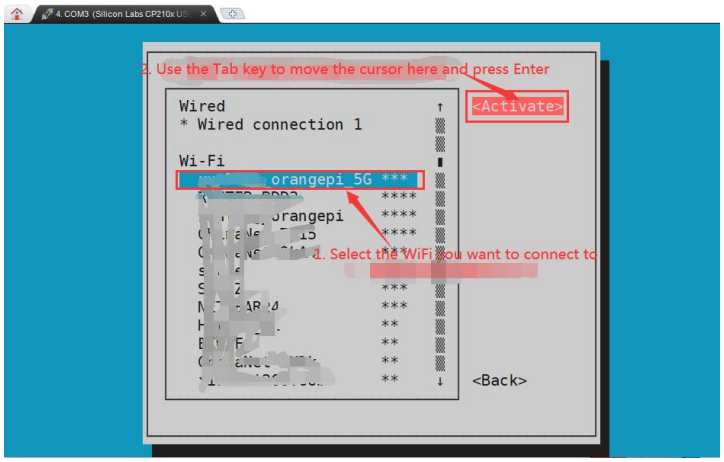
4) Select **Activate a connect** and press Enter



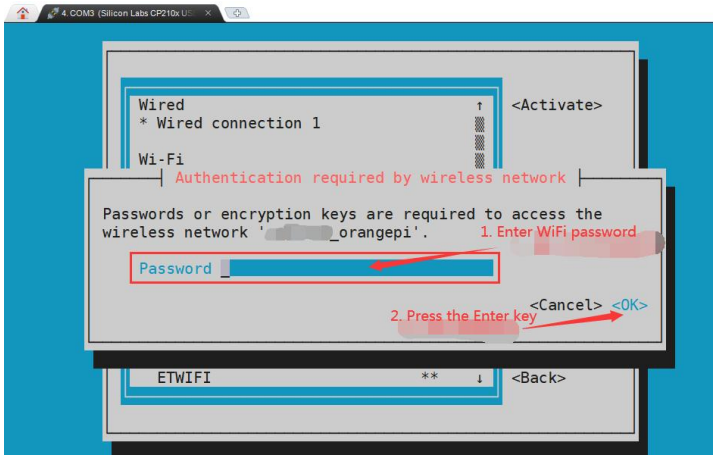
5) Then you can see all the searched WIFI hotspots



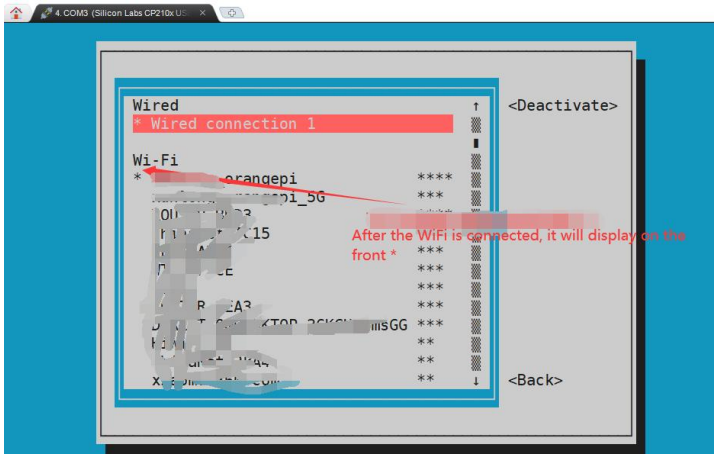
6) Select the WIFI hotspot you want to connect to, then use the Tab key to position the cursor on **Activate** and press Enter



7) Then a dialog box for entering a password will pop up, enter the corresponding password in **Pssword** and press Enter to start connecting to WIFI



8) After the WIFI connection is successful, a "*" will be displayed in front of the connected WIFI name



9) You can view the IP address of wifi through the **ip addr show wlan0** command

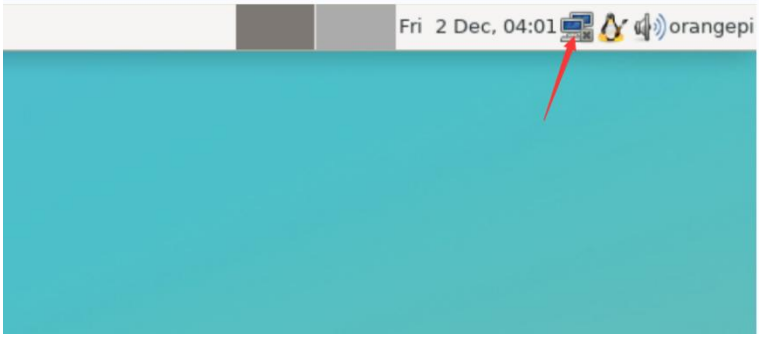
```
orangepi@orangepi:~$ ip addr show wlan0
11: wlan0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 24:8c:d3:aa:76:bb brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.11/24 brd 192.168.1.255 scope global dynamic noprefixroute wlan0
       valid_lft 259069sec preferred_lft 259069sec
    inet6 240e:3b7:3240:c4a0:c401:a445:5002:ccdd/64 scope global dynamic noprefixroute
       valid_lft 259071sec preferred_lft 172671sec
    inet6 fe80::42f1:6019:a80e:4c31/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
```

10) Use the **ping** command to test the connectivity of the wifi network, and the **ping** command can be interrupted through the shortcut key **Ctrl+C**

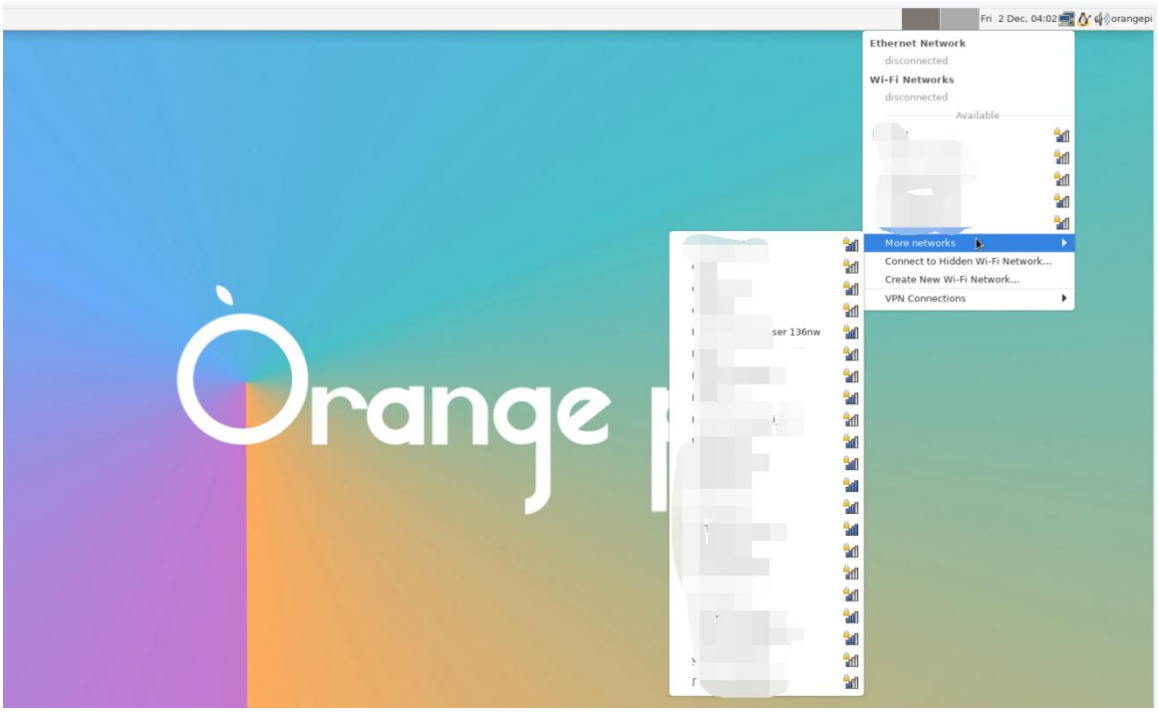
```
orangepi@orangepi:~$ ping www.orangepi.org -I wlan0
PING www.orangepi.org (182.92.236.130) from 192.168.1.49 wlan0: 56(84) bytes of data.
64 bytes from 182.92.236.130 (182.92.236.130): icmp_seq=1 ttl=52 time=43.5 ms
64 bytes from 182.92.236.130 (182.92.236.130): icmp_seq=2 ttl=52 time=41.3 ms
64 bytes from 182.92.236.130 (182.92.236.130): icmp_seq=3 ttl=52 time=44.9 ms
64 bytes from 182.92.236.130 (182.92.236.130): icmp_seq=4 ttl=52 time=45.6 ms
64 bytes from 182.92.236.130 (182.92.236.130): icmp_seq=5 ttl=52 time=48.8 ms
^C
--- www.orangepi.org ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4006ms
rtt min/avg/max/mdev = 41.321/44.864/48.834/2.484 ms
```

3.6.2.3. Test method of desktop image

1) Click the network configuration icon in the upper right corner of the desktop (please do not connect the network cable when testing WIFI)

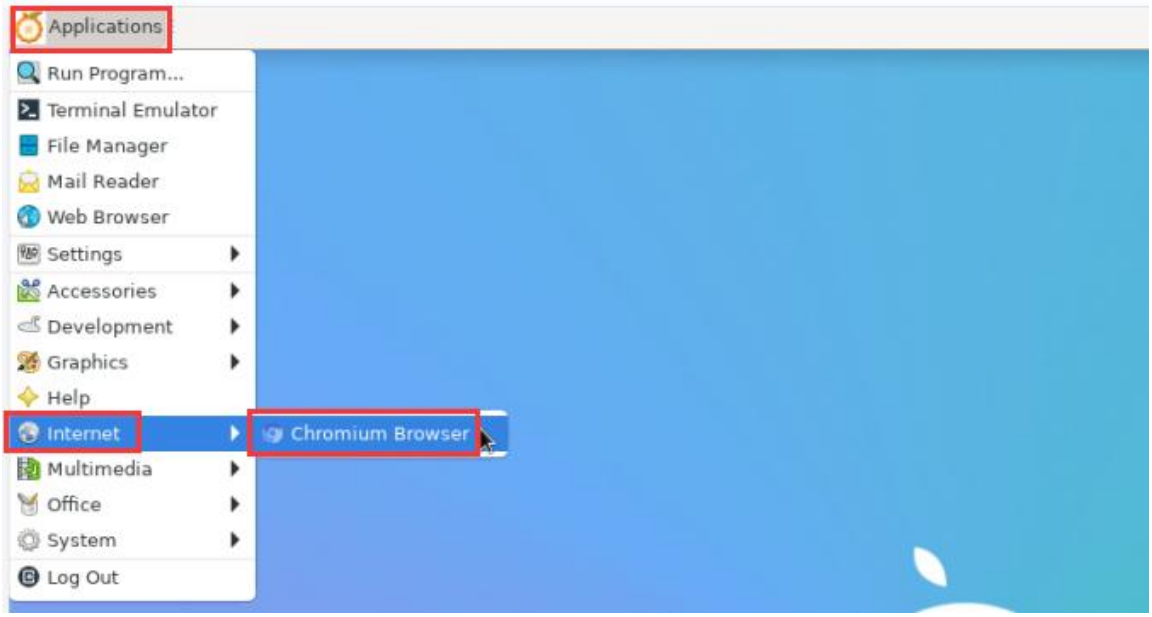


2) Click **More networks** in the pop-up drop-down box to see all scanned WIFI hotspots, and then select the WIFI hotspot you want to connect to



3) Then enter the password of the WIFI hotspot, and then click **Connect** to start connecting to WIFI

4) After connecting to WIFI, you can open the browser to check whether you can access the Internet. The entrance of the browser is shown in the figure below



5) If you can open other web pages after opening the browser, it means that the WIFI connection is normal

3. 6. 3. How to set a static IP address

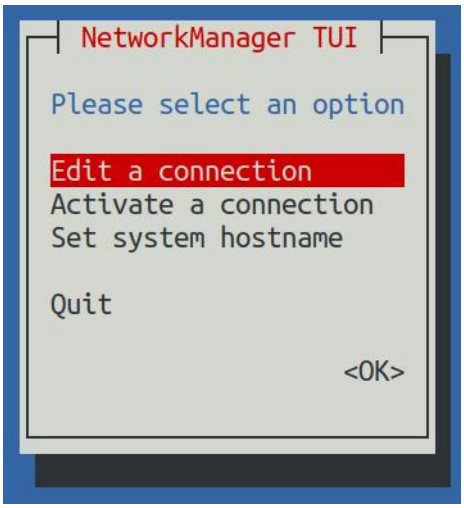
Please do not set a static IP address by modifying the /etc/network/interfaces configuration file.

3. 6. 3. 1. Use the nmtui command to set a static IP address

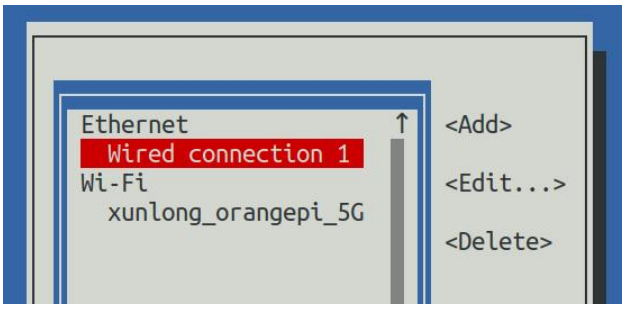
1) First run the **nmtui** command

```
orangepi@orangepi:~$ nmtui
```

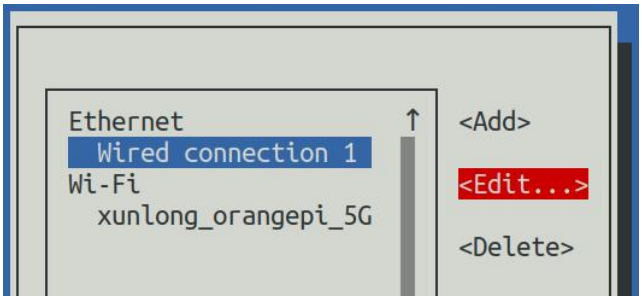
2) Then select **Edit a connection** and press Enter



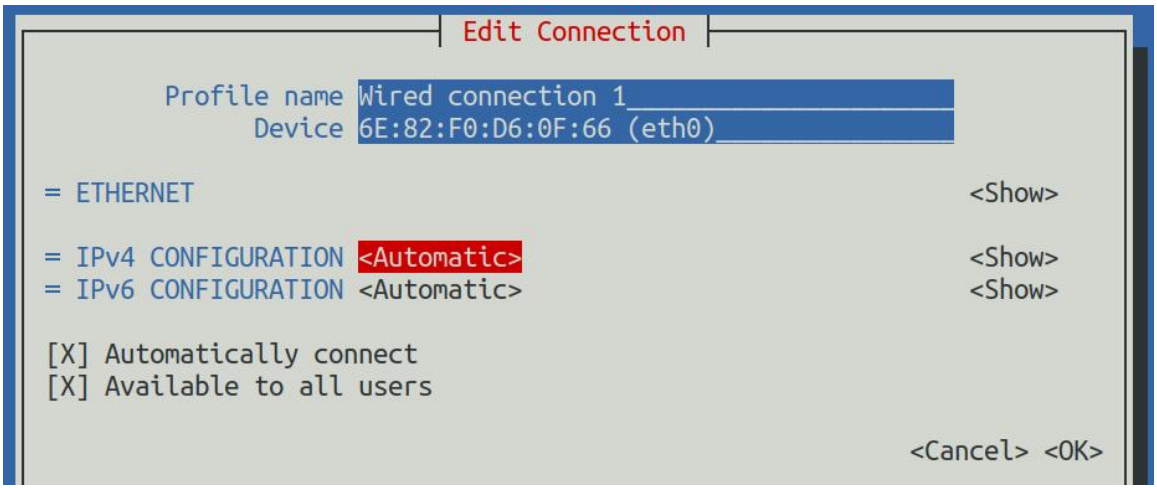
3) Then select the network interface that needs to set a static IP address, for example, to set the static IP address of the **Ethernet** interface, select **Wired connection 1.**



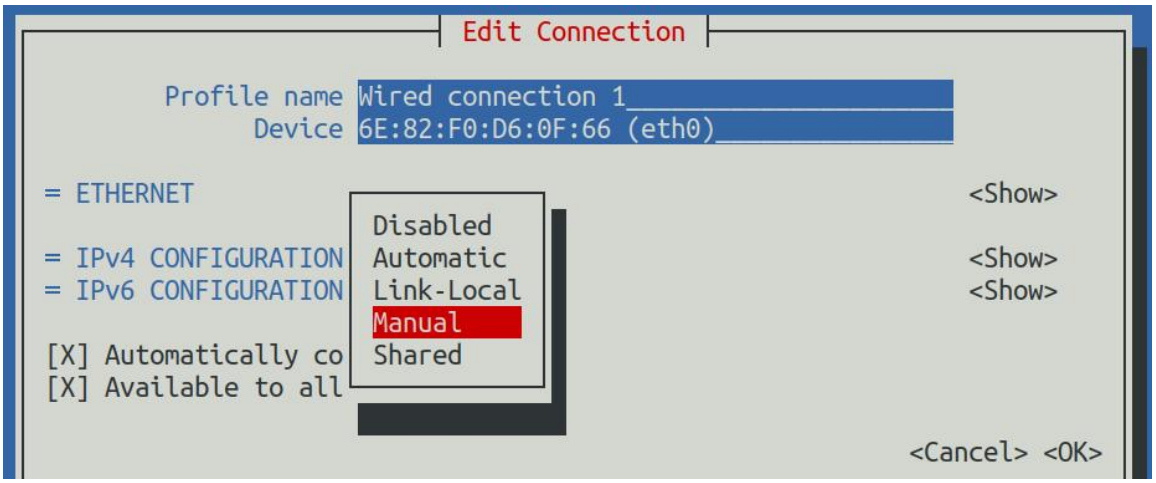
4) Then select **Edit** via the **Tab** key and press the Enter key



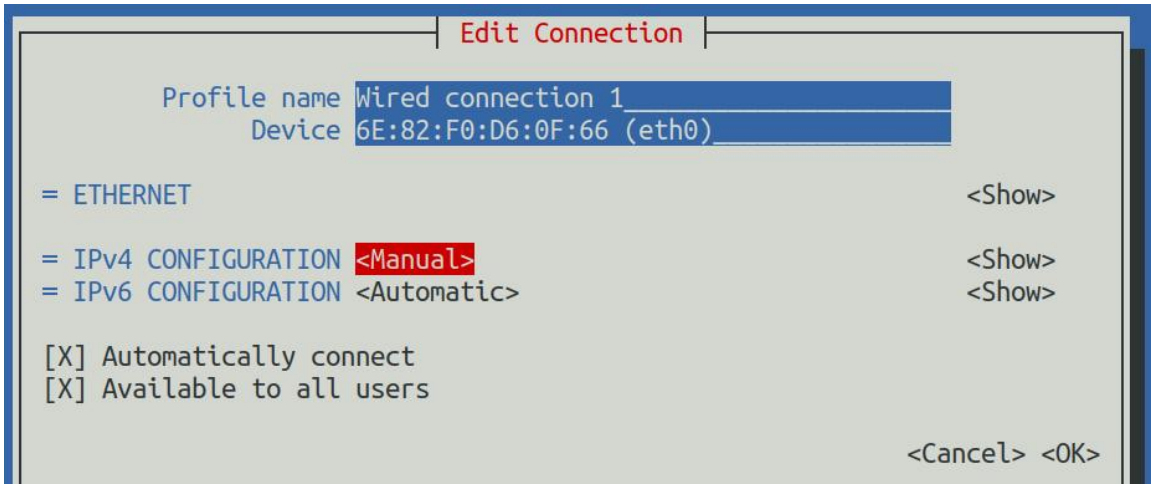
5) Then use the Tab key to move the cursor to the **<Automatic>** position shown in the figure below to configure IPv4



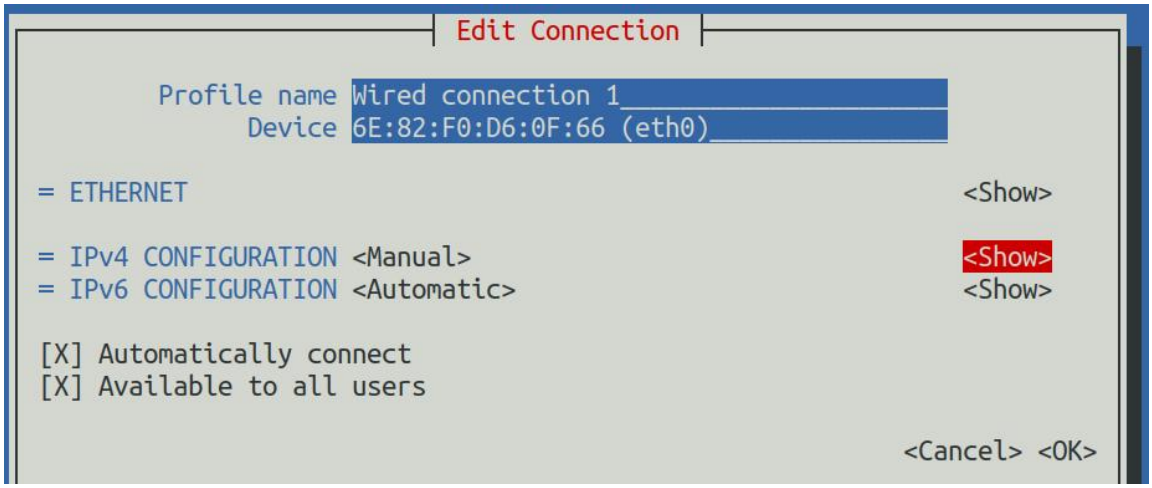
6) Then press Enter, select **Manual** through the up and down arrow keys, and press Enter to confirm



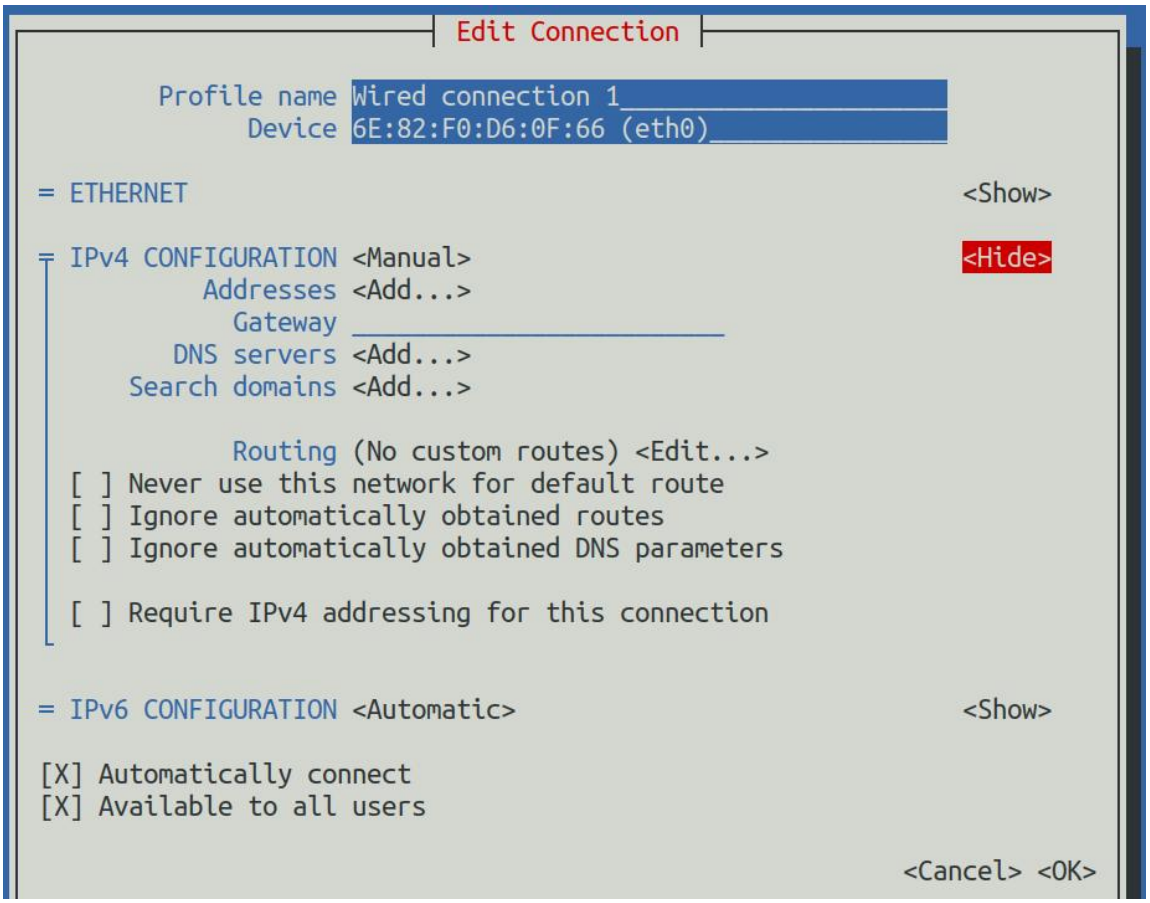
7) The display after selection is shown in the figure below



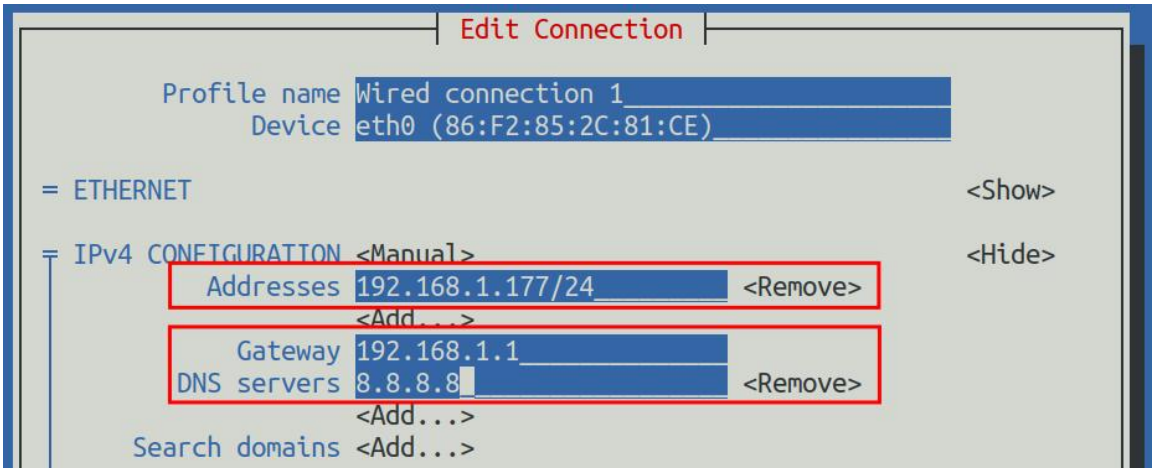
8) Then move the cursor to **<Show>** via the Tab key



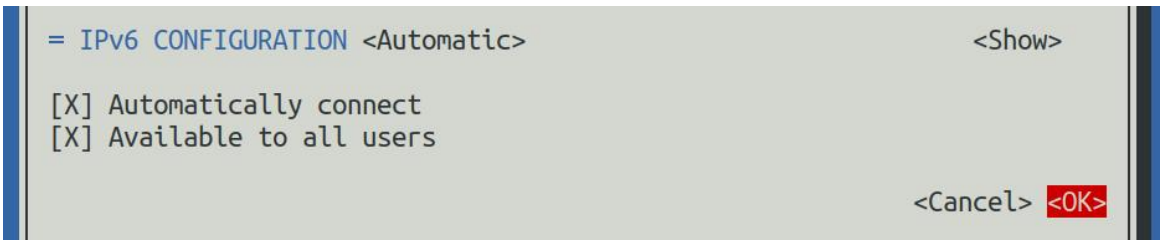
9) Then press Enter, and the following setting interface will pop up after entering



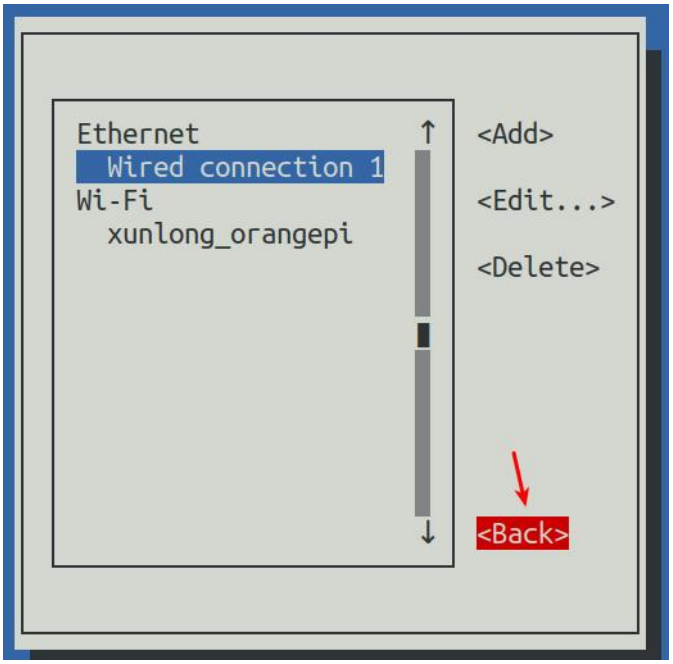
10) Then you can set the IP address (Addresses), gateway (Gateway) and DNS server address in the position shown in **the** figure below (**there are many other setting options in it, please explore by yourself**), please set according to your specific needs, The values set in the image below are just an example



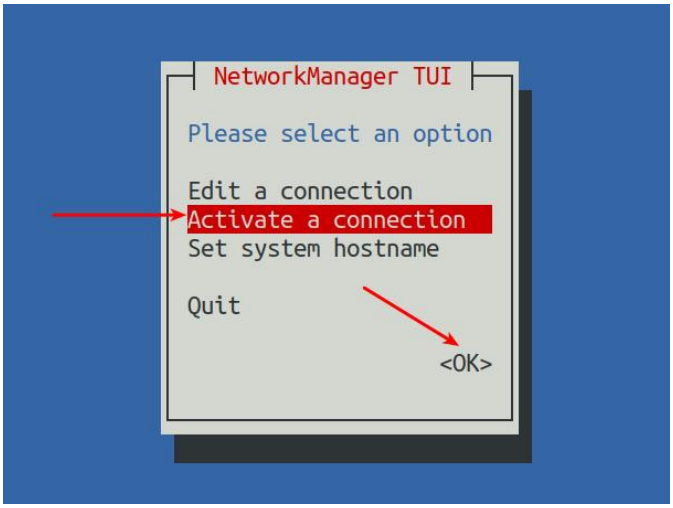
11) After setting, move the cursor to **<OK>** in the lower right corner, and press Enter to confirm



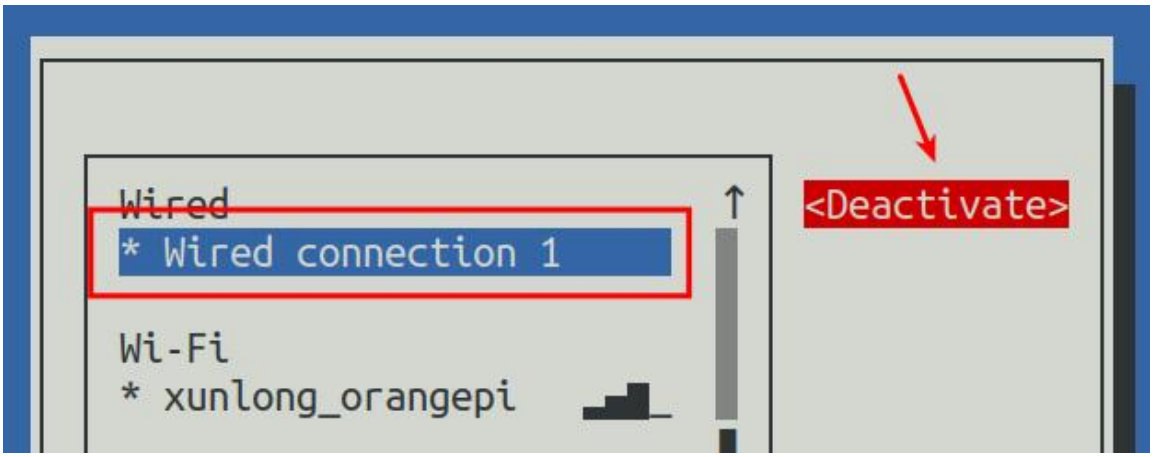
12) Then click **<Back>** to return to the previous selection interface



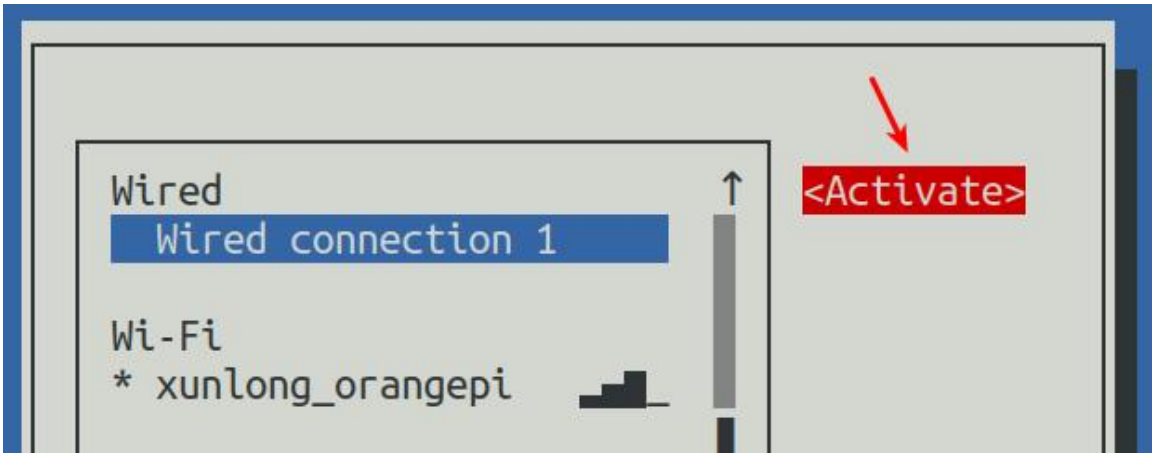
13) Then select **Activate a connection**, then move the cursor to **<OK>**, and finally click Enter



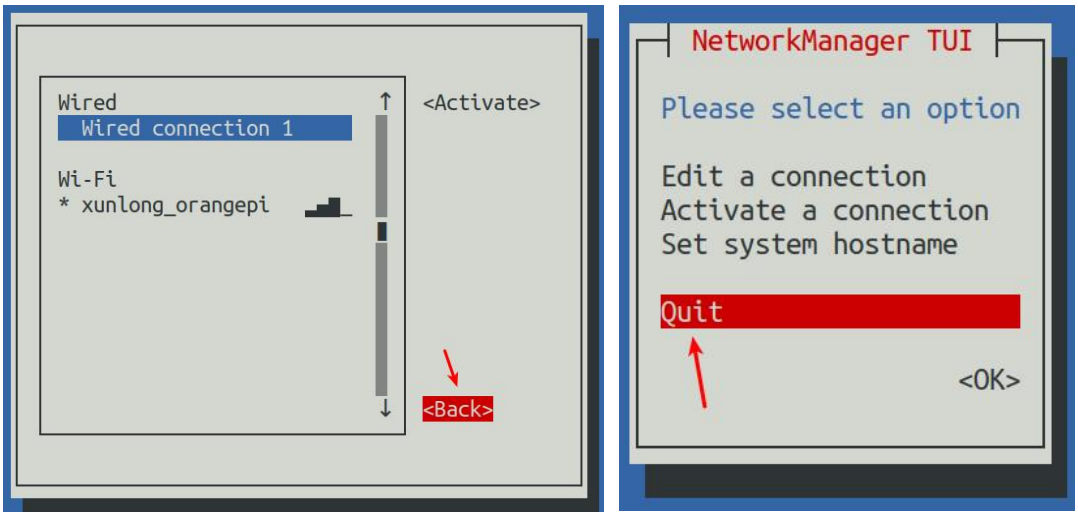
14) Then select the network interface that needs to be set, such as **Wired connection 1,** then move the cursor to **<Deactivate>,** and press Enter to disable **Wired connection 1**



15) Then please do not move the cursor, and then press the Enter key to re-enable **Wired connection 1**, so that the static IP address set earlier will take effect



16) Then you can exit nmtui through the **<Back>** and **Quit** buttons



17) Then through **ip addr show eth0**, you can see that the IP address of the network port has changed to the static IP address set earlier

```
orangepi@orangepi:~$ ip addr show eth0
3: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 5e:ac:14:a5:92:b3 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.177/24 brd 192.168.1.255 scope global noprefixroute eth0
       valid_lft forever preferred_lft forever
    inet6 241e:3b8:3240:c3a0:e269:8305:dc08:135e/64 scope global dynamic noprefixroute
       valid_lft 259149sec preferred_lft 172749sec
    inet6 fe80::957d:bbbe:4928:3604/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
```

18) Then you can test the connectivity of the network to check whether the IP address is configured OK, and the ping command can be interrupted through the shortcut key **Ctrl+C**

```
orangepi@orangepi:~$ ping 192.168.1.47 -I eth0
PING 192.168.1.47 (192.168.1.47) from 192.168.1.188 eth0: 56(84) bytes of data.
64 bytes from 192.168.1.47: icmp_seq=1 ttl=64 time=0.233 ms
64 bytes from 192.168.1.47: icmp_seq=2 ttl=64 time=0.263 ms
64 bytes from 192.168.1.47: icmp_seq=3 ttl=64 time=0.273 ms
64 bytes from 192.168.1.47: icmp_seq=4 ttl=64 time=0.269 ms
64 bytes from 192.168.1.47: icmp_seq=5 ttl=64 time=0.275 ms
```

```
^C
--- 192.168.1.47 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4042ms
rtt min/avg/max/mdev = 0.233/0.262/0.275/0.015 ms
```

3.6.3.2. Use the nmcli command to set a static IP address

1) If you want to set the static IP address of the network port, please plug the network cable into the development board first. **If you need to set the static IP address of WIFI, please connect the WIFI first,** and then start to set the static IP address

2) Then you can view the name of the network device through the **nmcli con show** command, as shown below

a. **orangepi**is the name of the WIFI network interface (the name is not necessarily the same)

b. **Wired connection 1** is the name of the Ethernet interface

```
orangepi@orangepi:~$ nmcli con show
NAME                UUID                                  TYPE      DEVICE
orangepi            cfc4f922-ae48-46f1-84e1-2f19e9ec5e2a  wifi      wlan0
Wired connection 1  9db058b7-7701-37b8-9411-efc2ae8bfa30  ethernet  eth0
```

3) Then enter the following command, where

a. **"Wired connection 1"** means to set the static IP address of the Ethernet port. If you need to set the static IP address of the WIFI, please modify it to the corresponding name of the WIFI network interface (you can get it through the **nmcli con show** command)

b. **ipv4.addresses** is followed by the static IP address to be set, which can be modified to the value you want to set

c. **ipv4.gateway** Indicates the address of the gateway

```
orangepi@orangepi:~$ nmcli con mod "Wired connection 1"  \
ipv4.addresses "192.168.1.110"  \
ipv4.gateway "192.168.1.1"  \
ipv4.dns "8.8.8.8"  \
ipv4.method "manual"
```

4) Then restart the linux system

```
orangepi@orangepi:~$ sudo reboot
```

5) Then re-enter the linux system and use the **ip addr show eth0** command to see that the IP address has been set to the desired value

```
orangepi@orangepi:~$ ip addr show eth0
3: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 5e:ae:14:a5:91:b3 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.110/32 brd 192.168.1.110 scope global noprefixroute eth0
       valid_lft forever preferred_lft forever
    inet6 240e:3b7:3240:c3a0:97de:1d01:b290:fe3a/64 scope global dynamic noprefixroute
       valid_lft 259183sec preferred_lft 172783sec
    inet6 fe80::3312:861a:a589:d3c/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
```

3. 7. SSH remote login development board

Linux systems enable ssh remote login by default and allow the root user to log in to the system. Before logging in with ssh, you first need to ensure that the Ethernet or wifi network is connected, and then use the ip addr command or check the router to obtain the IP address of the development board.

3. 7. 1. SSH remote login development board under Ubuntu

1) Obtain the IP address of the development board

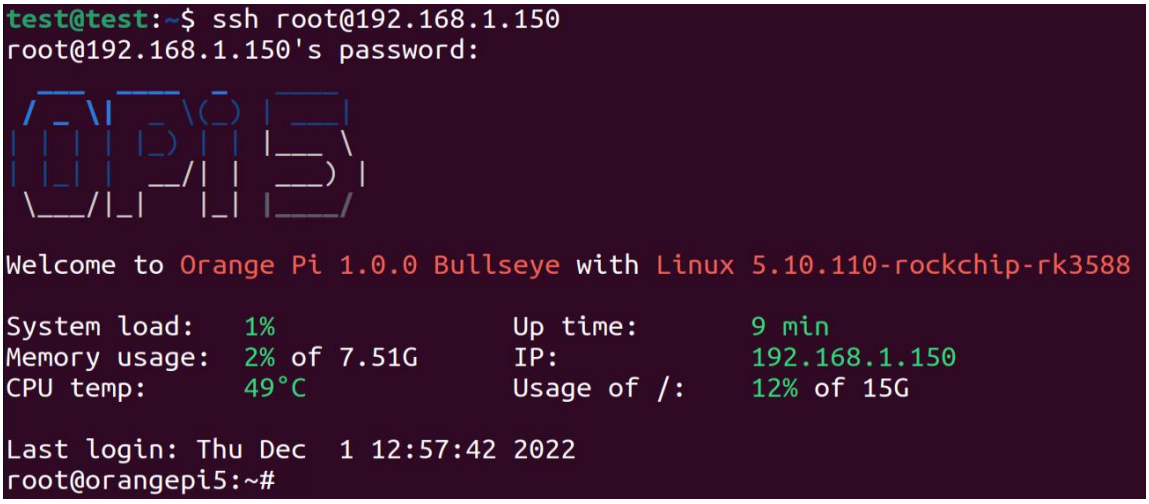
2) Then you can remotely log in to the linux system through the ssh command

```
test@test:~$ ssh root@192.168.1.xxx          (Need to be replaced with the IP address of the development board)
root@192.168.1.xx's password:          （Enter the password here, the default password is orangepi）
```

Note that when entering the password, the specific content of the entered password will not be displayed on the screen, please do not think that there is any fault, just press Enter after inputting.

If you are prompted to refuse the connection, as long as you are using the image provided by Orange Pi, please do not suspect that the password orangepi is wrong, but find other reasons.

3) After successfully logging in to the system, the display is as shown in the figure below



If ssh cannot log in to the linux system normally, please first check whether the IP address of the development board can be pinged. If the ping is ok, you can log in to the linux system through the serial port or HDMI display and then enter the following command on the development board and try again. Is it possible to connect:

root@orangepi:~# **reset_ssh.sh**

If it still doesn't work, try to reset the system.

3. 7. 2. SSH remote login development board under Windows

1) First obtain the IP address of the development board

2) Under Windows, you can use MobaXterm to remotely log in to the development board, first create a new ssh session

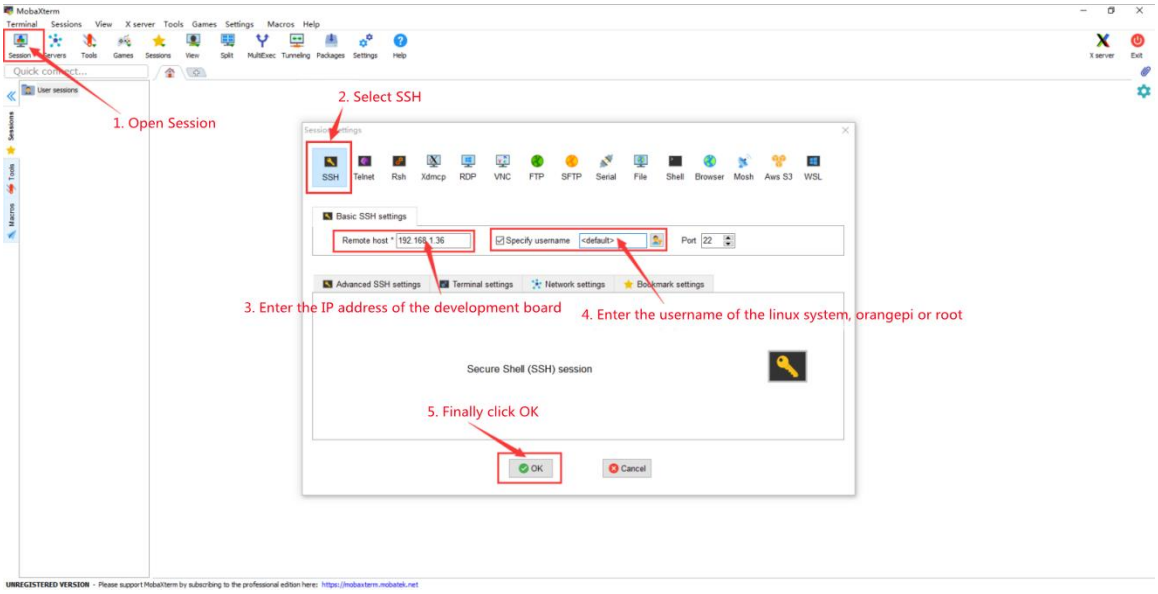
a. Open **Session**

b. Then select **SSH** in **Session Setting**

c. Then enter the IP address of the development board in the **Remote host**

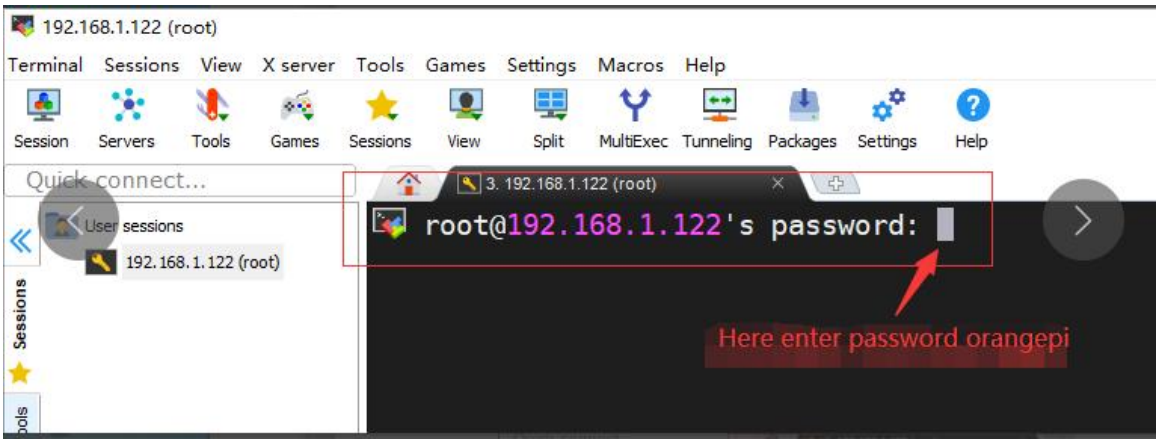
d. Then enter the user name **root** or **orangepi** of the linux system in **Specify username**

e. Finally click **OK**

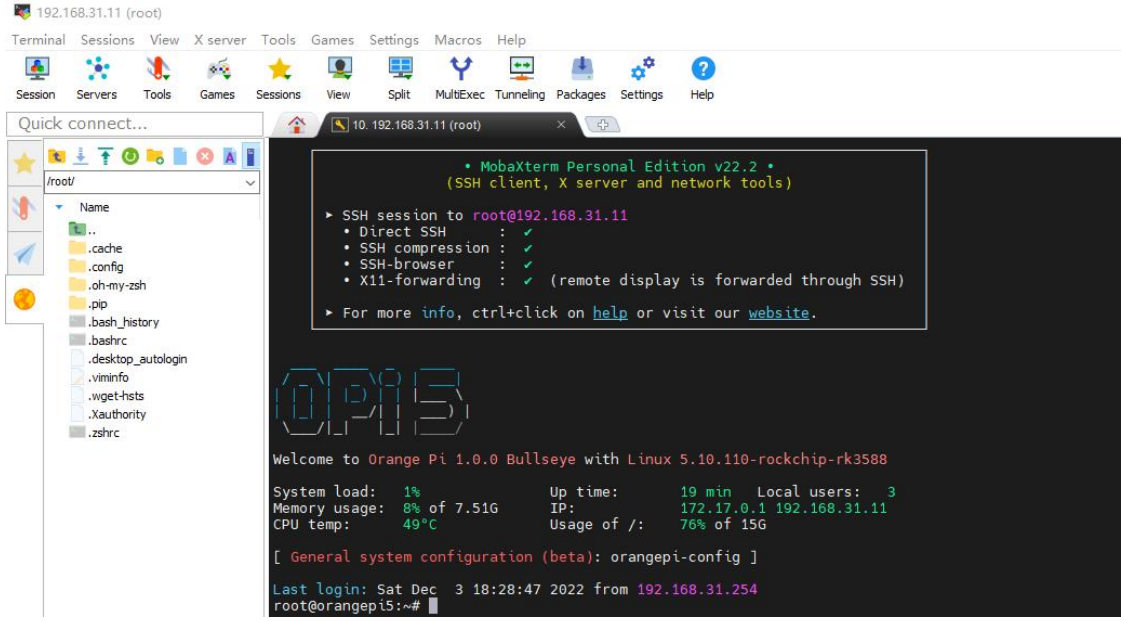


3) Then you will be prompted to enter a password. The default passwords for root and orangepi users are orangepi

Note that when entering the password, the specific content of the entered password will not be displayed on the screen, please do not think that there is any fault, just press Enter after inputting.



4) After successfully logging in to the system, the display is as shown in the figure below



3. 8. The method of uploading files to the Linux system of the development board

3. 8. 1. The method of uploading files to the development board Linux system in Ubuntu PC

3. 8. 1. 1. How to upload files using the scp command

1) Use the scp command to upload files from the Ubuntu PC to the Linux system of the development board. The specific commands are as follows

a. **file_path：** Need to be replaced with the path of the file to be uploaded
b. **orangepi：** It is the user name of the Linux system of the development board, and it can also be replaced with other ones, such as root
c. **192.168.xx.xx:** It is the IP address of the development board, please modify it according to the actual situation
d. **/home/orangepi:** The path in the Linux system of the development board can also be modified to other paths

```
test@test:~$ scp  file_path  orangepi@192.168.xx.xx:/home/orangepi/
```

2) If you want to upload a folder, you need to add the -r parameter

```
test@test:~$ scp -r dir_path orangepi@192.168.xx.xx:/home/orangepi/
```

3) There are more usages of scp, please use the following command to view the man manual

```
test@test:~$ man scp
```

3.8.1.2. How to upload files with Filezilla

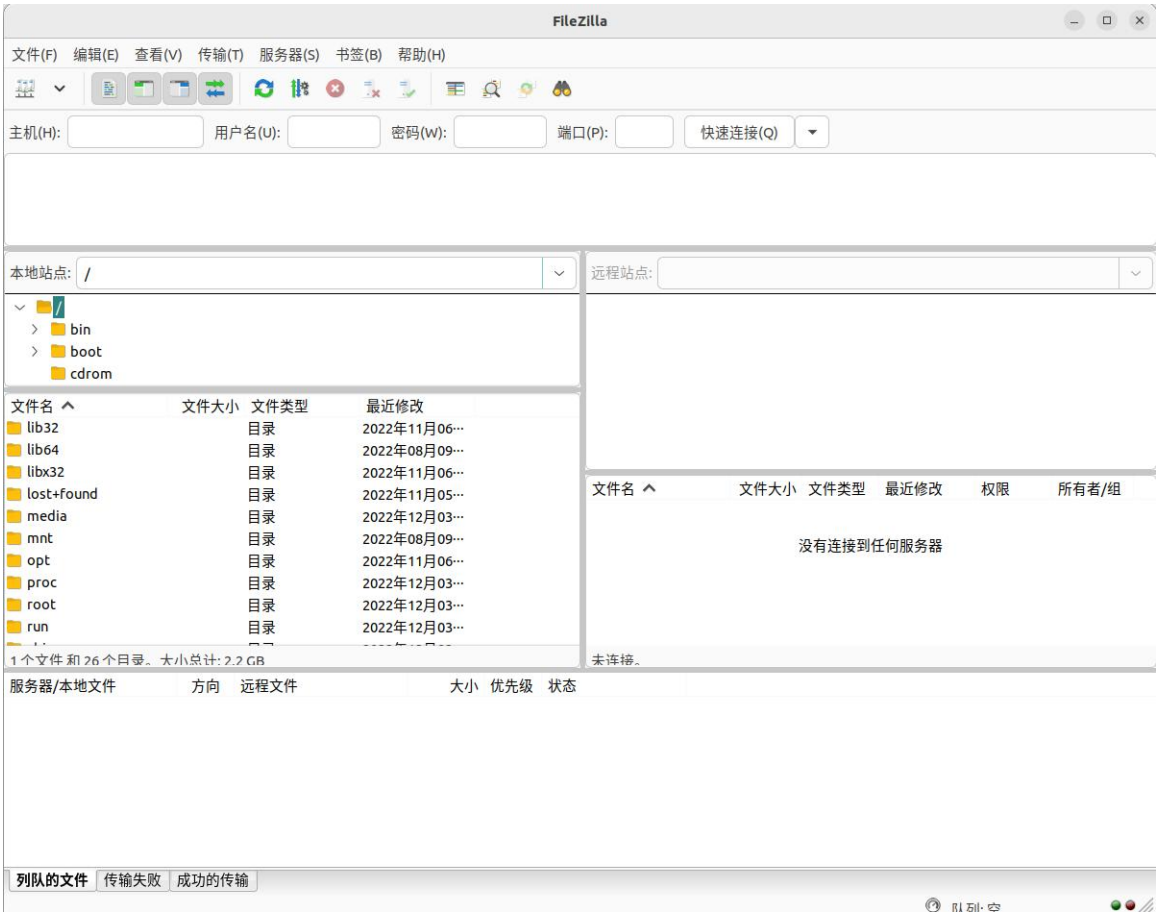
1) First install Filezilla in Ubuntu PC

```
test@test:~$ sudo apt install -y filezilla
```

2) Then use the following command to open Filezilla

```
test@test:~$ filezilla
```

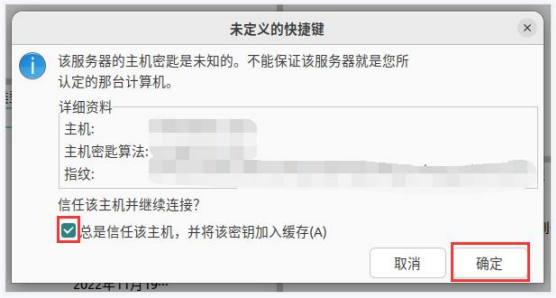
3) The interface after Filezilla is opened as shown below. At this time, the empty remote site is empty.



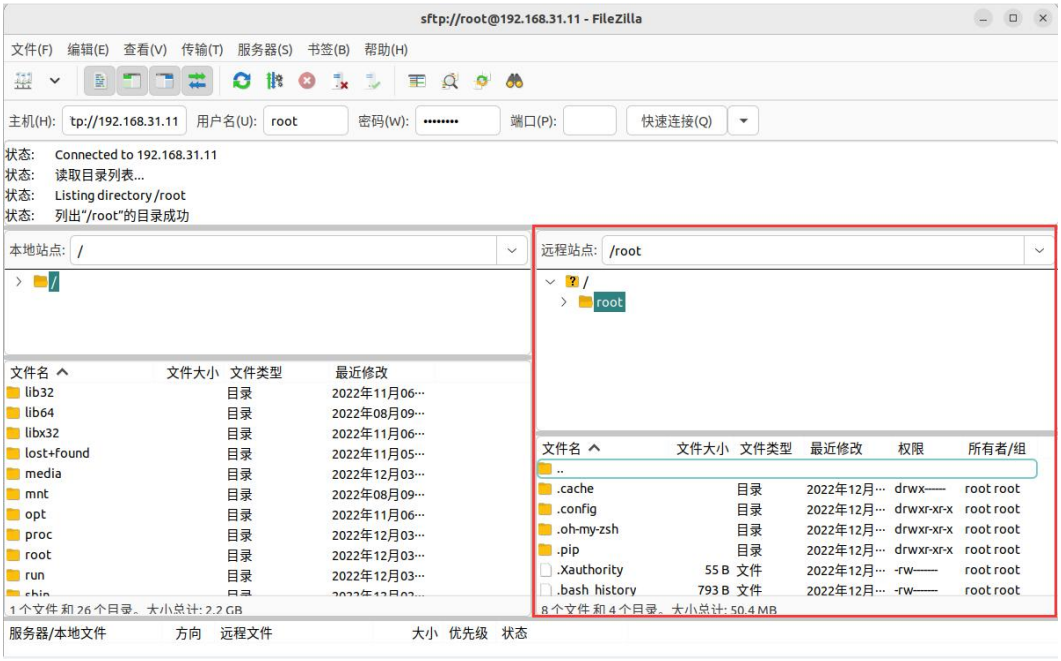
4) The method of connecting the development board is shown in the figure below

5) Then select to **save the password,** and then click **OK**

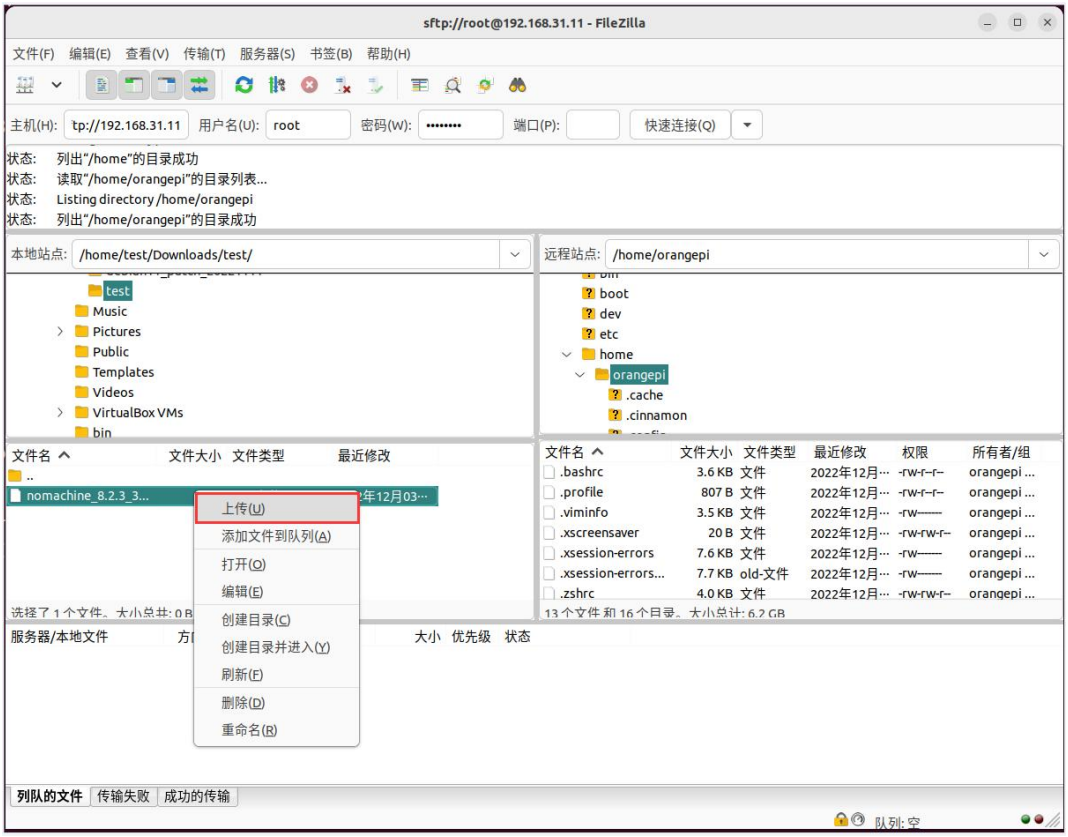
6) Then choose to trust the host, and then click OK



7) After the connection is successful, you can see the directory structure of the development board Linux file system on the right side of the Filezilla software



8) Then select the path to the development board on the right of the Filezilla software, and then select the file to be uploaded in the Ubuntu PC on the left of the Filezilla software, right -click the mouse, and then click the upload option to start uploaded files to the development board to the development board .



9) After the upload is completed, you can go to the corresponding path in the linux system to view the uploaded file

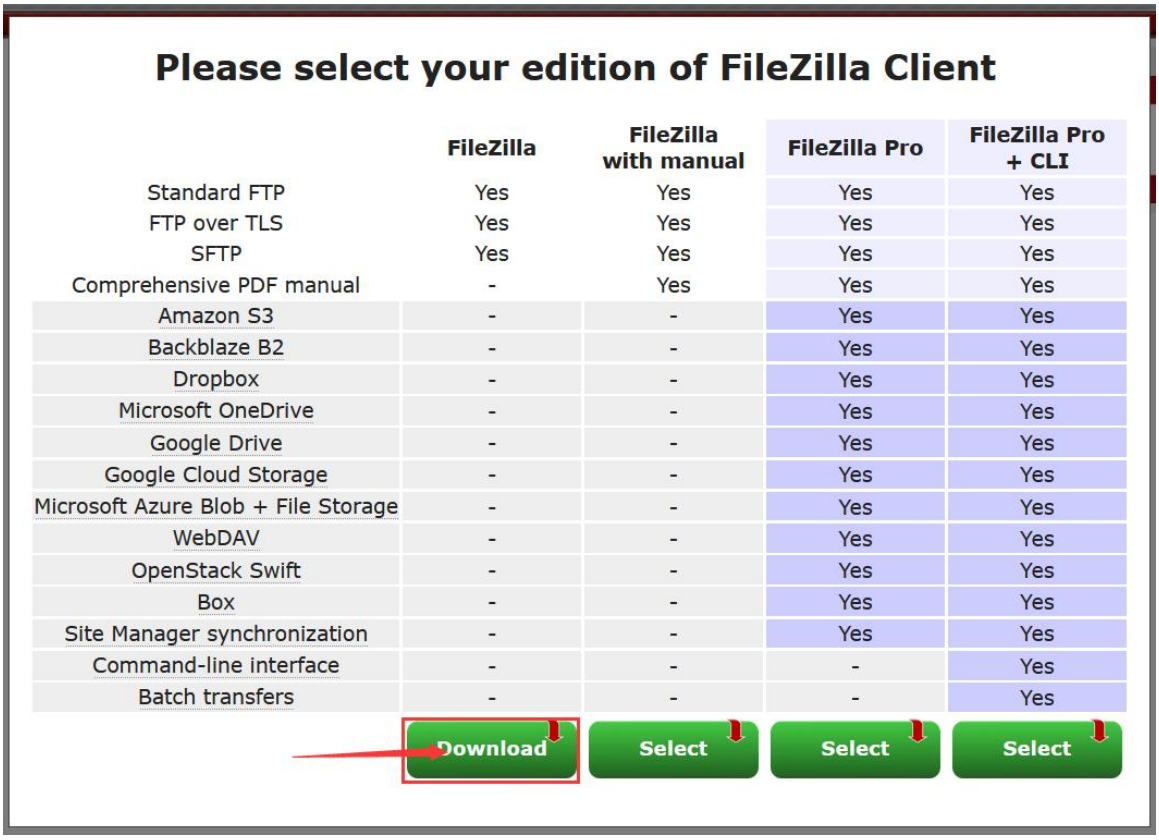
10) The method of uploading the folder is the same as the method of uploading the file, so I won't go into details here

3.8.2. Upload files in Windows PC to the method of upload files to the development board Linux system

3.8.2.1. How to upload files with Filezilla

1) First download the installation file of the Filezilla software Windows version, the download link is shown below

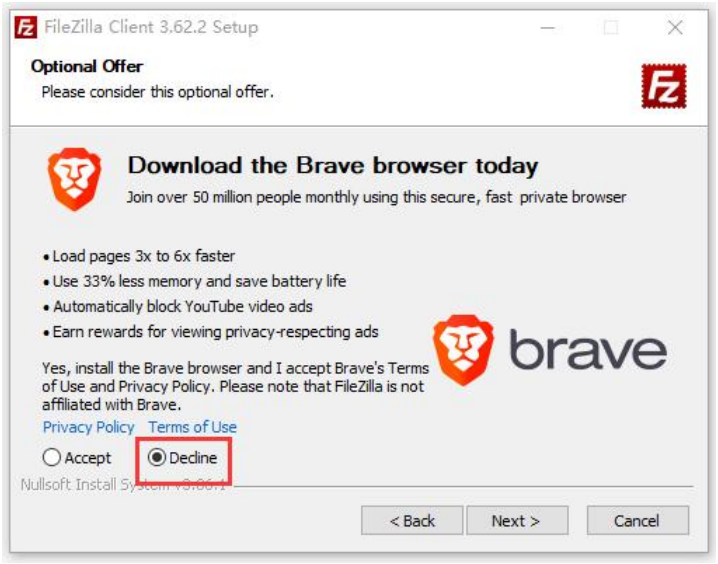
https://filezilla-project.org/download.php#close



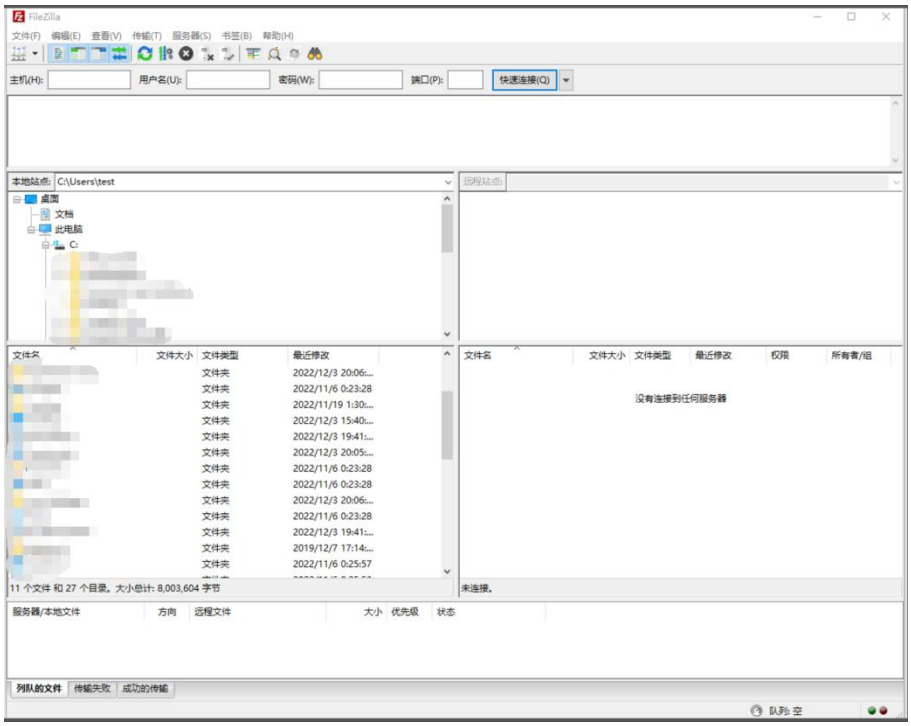
2) The downloaded installation package is shown below, and then double -click to install it directly

FileZilla_Server_1.5.1_win64-setup.exe

During the installation process, please select **Decline** in the installation interface below, and then select **NEXT>**

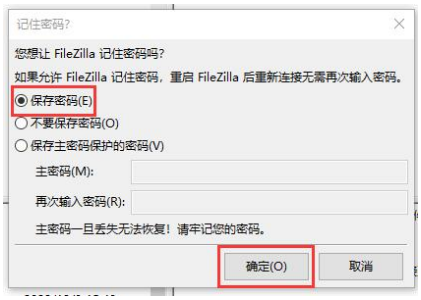


3) The interface after Filezilla is opened as shown below. At this time, the empty remote site is empty.

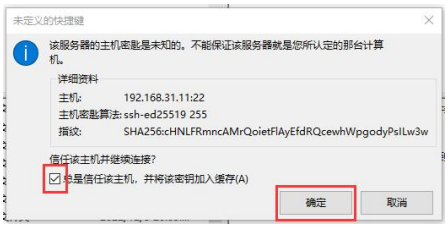


4) The method of connecting the development board is shown in the figure below:

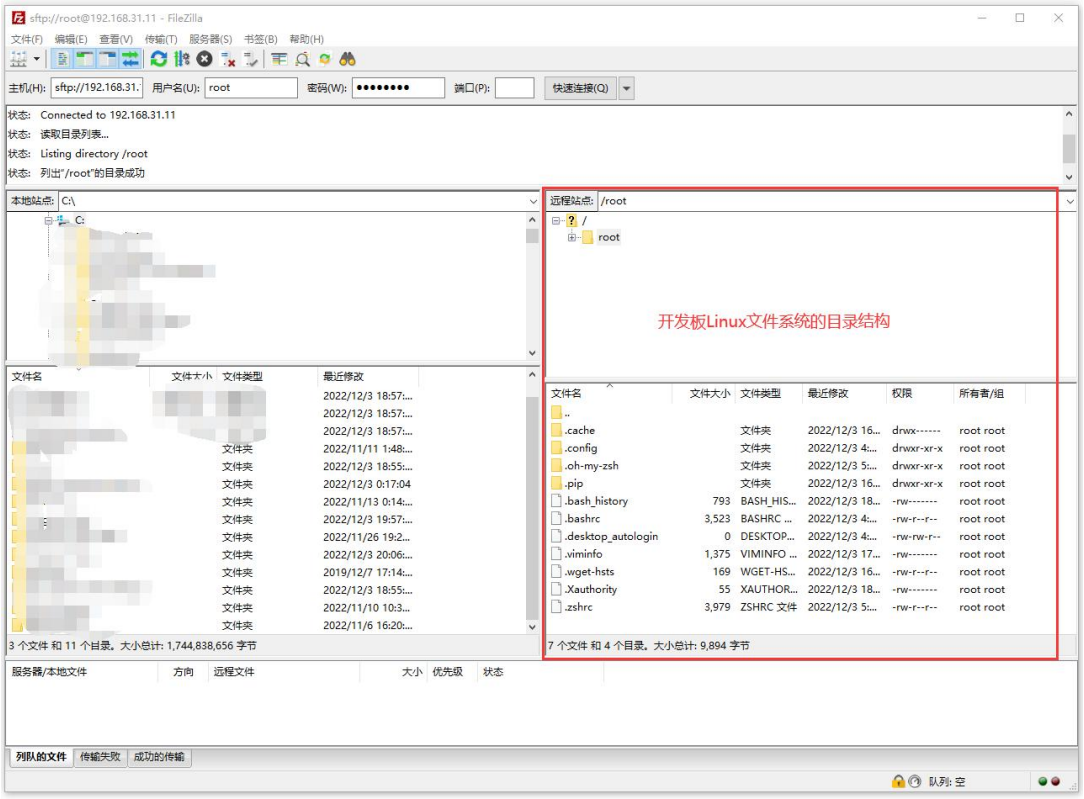
5) Then select to **save the password**, and then click **OK**



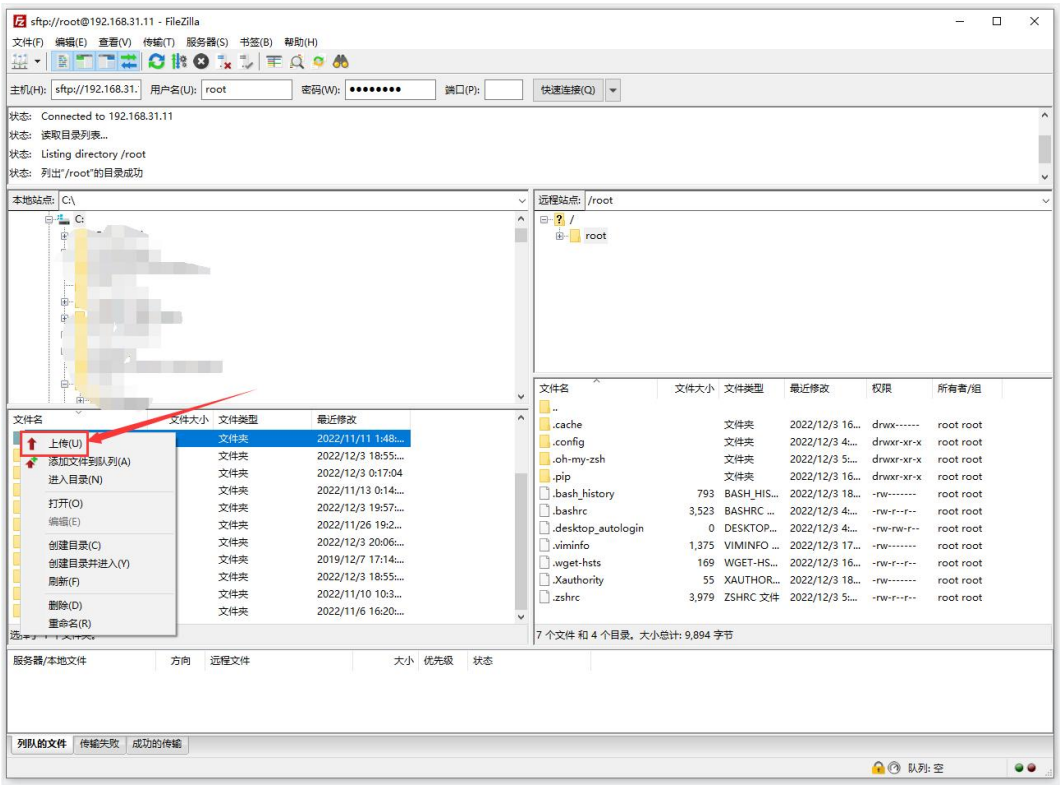
6) Then choose to **trust the host**, and then click **OK**



7) After the connection is successful, you can see the directory structure of the development board Linux file system on the right side of the Filezilla software



8) Then select the path to the development board on the right of the Filezilla software, and then select the files to be uploaded in the Windows PC on the left of the Filezilla software, right -click the mouse, and then click the upload option to start uploaded files to the development board



9) After the upload is completed, you can go to the corresponding path in the linux system to view the uploaded file

10) The method of uploading the folder is the same as the method of uploading the file, so I won't go into details here

3. 9. HDMI Test

3. 9. 1. HDMI Display Test

1) Use HDMI to HDMI cable to connect Orange PI development board and HDMI display

2) After starting the Linux system, if the HDMI display has an image output instructions, the HDMI interface is normal

Note that although many laptops have an HDMI interface, the HDMI interface of the notebook generally only has the output function and does not have the function of HDMI in. That is to say, the HDMI output of other devices cannot be displayed on the screen of the notebook.

When you want to get the HDMI of the development board to the laptop HDMI interface, please confirm that your notebook is a function that supports HDMI in.

When HDMI is not displayed, please check if the HDMI line is tightly tightened. After confirming that the wiring is fine, you can try to display a different screen.

3.9.2. HDMI to VGA display test

1) First of all, you need to prepare the following accessories

a. HDMI to VGA converter

b. A VGA cable

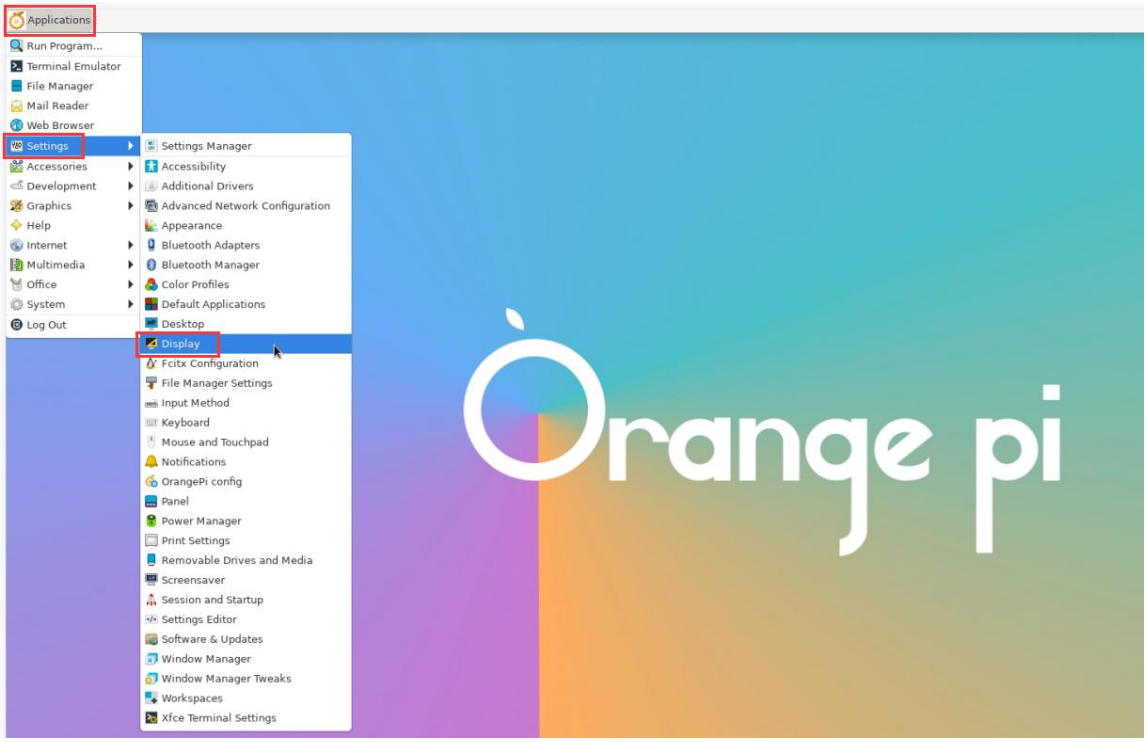
c. A display or television that supports VGA interfaces

2) HDMI to VGA display test as shown below

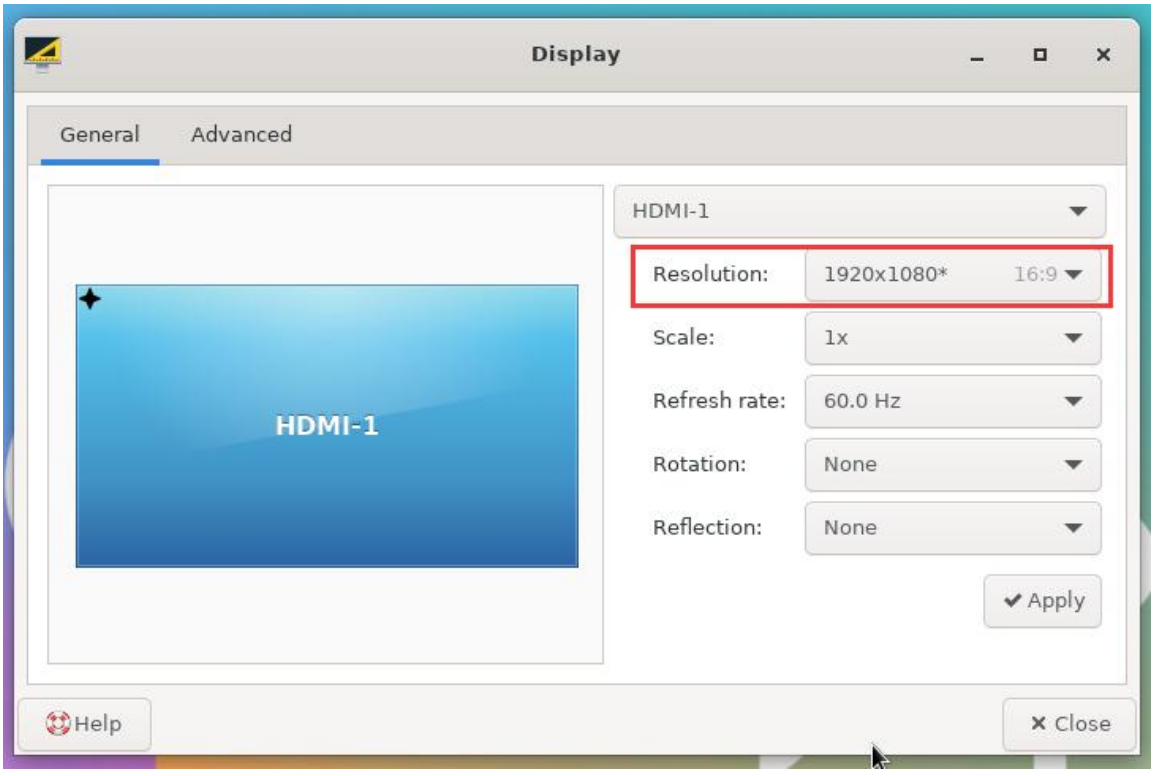
When using HDMI to VGA display, the linux system of the development board and the development board does not need to make any settings. It only needs to be displayed normally for the development board HDMI interface. So if there is a problem with the test, please check whether there is a problem with the HDMI to the VGA converter, VGA cable and display.

3. 9. 3. HDMI resolution setting method

1) First open **Display** in **Settings**

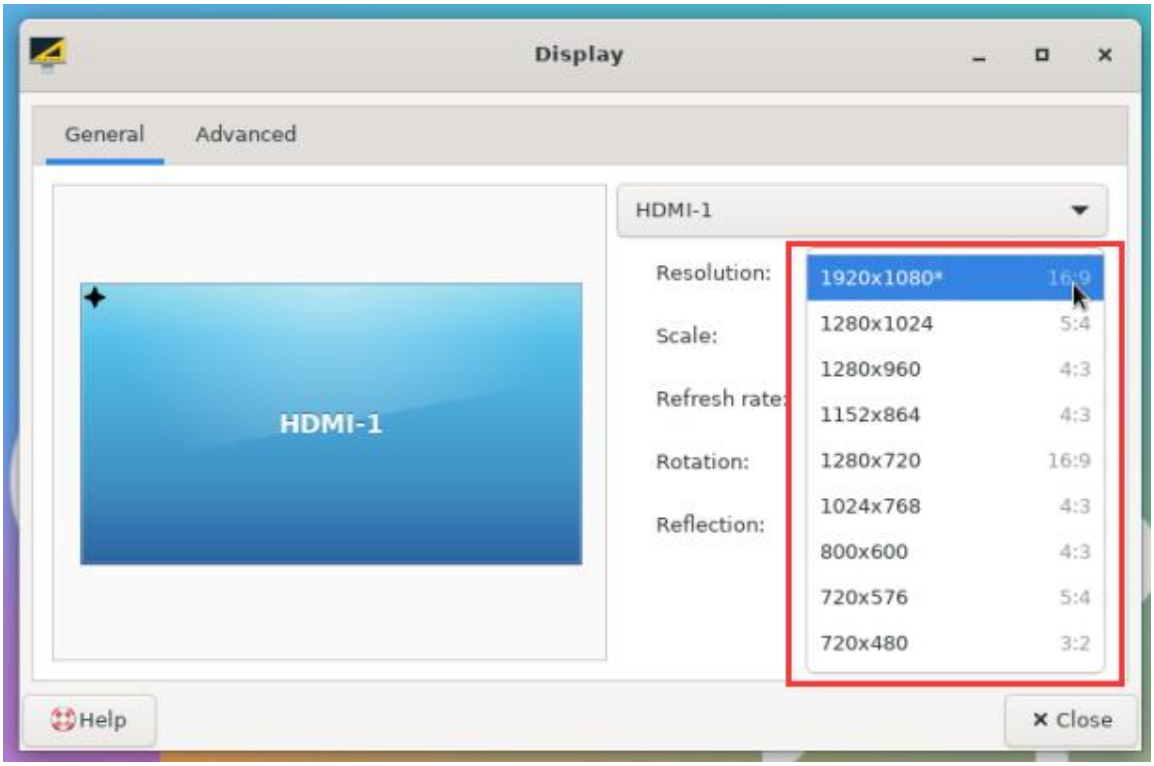


2) Then you can see the current resolution of the system

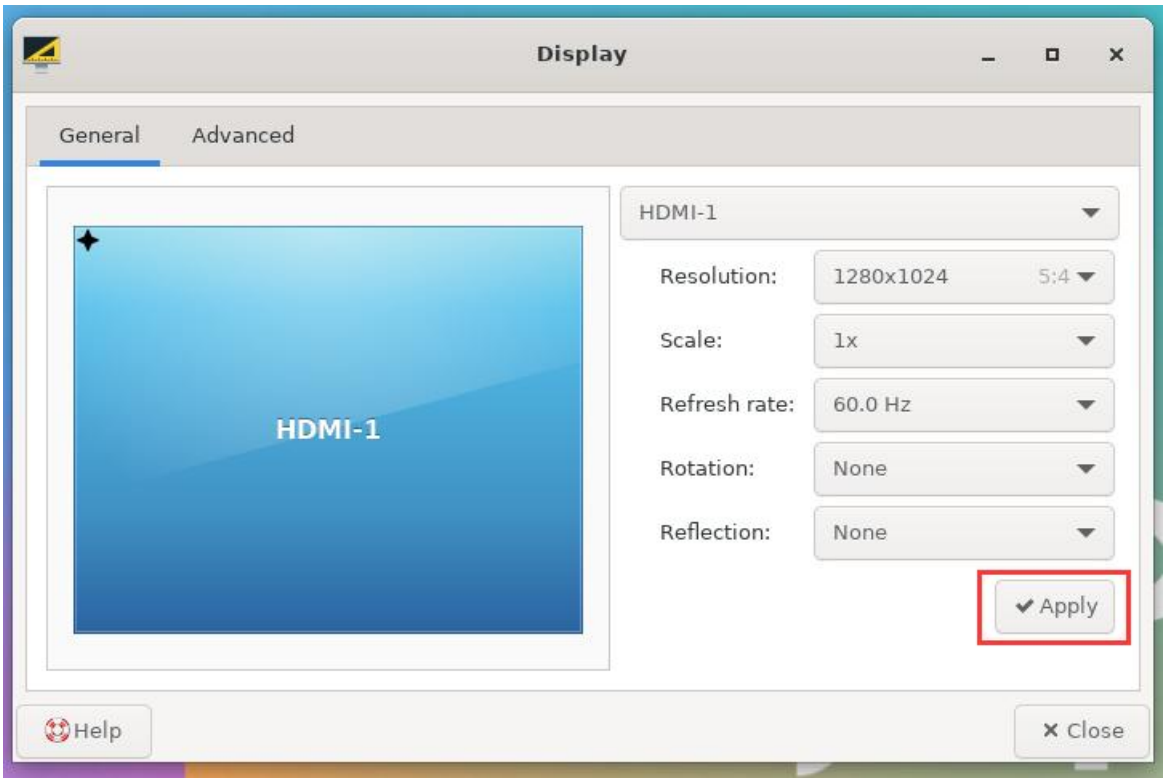


3) Click the drop -down box of resolution (resolution) to see all the resolution currently

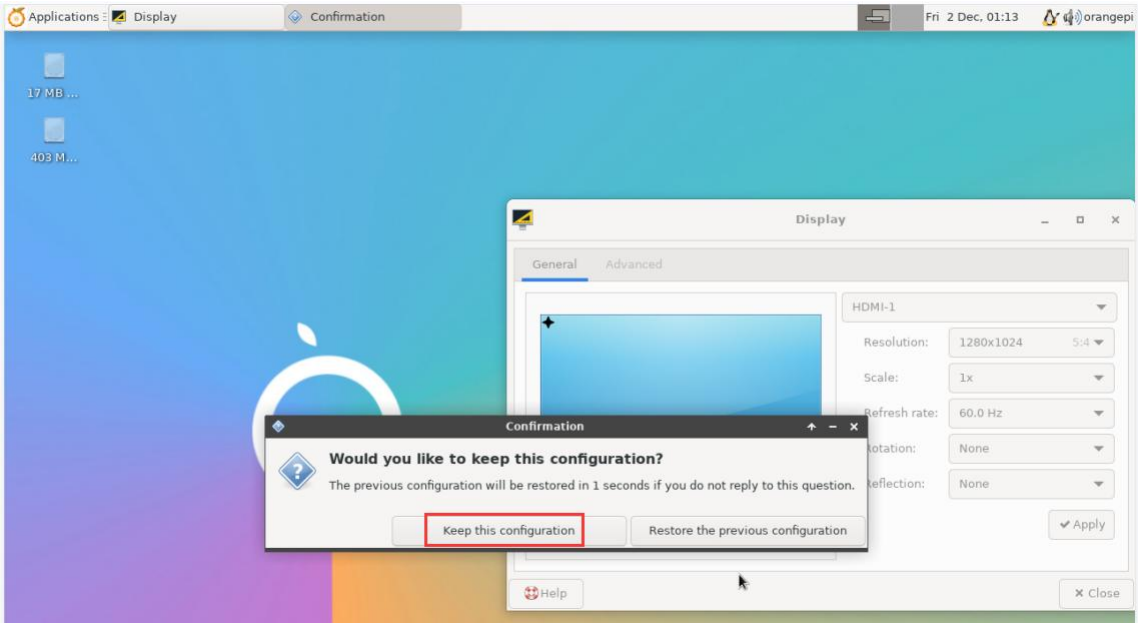
supported by the display



4) Then select the resolution you want to set, and then click Apply



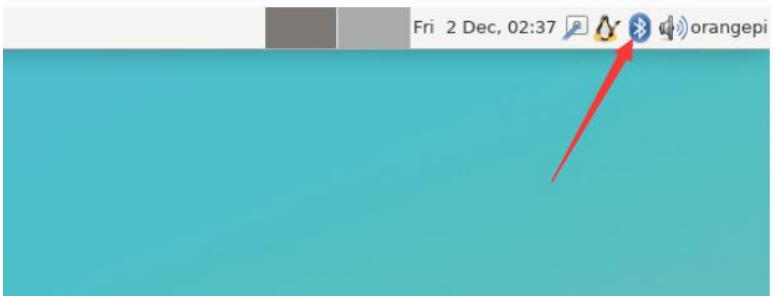
5) After the new resolution is settings, select **Keep The Configuration**



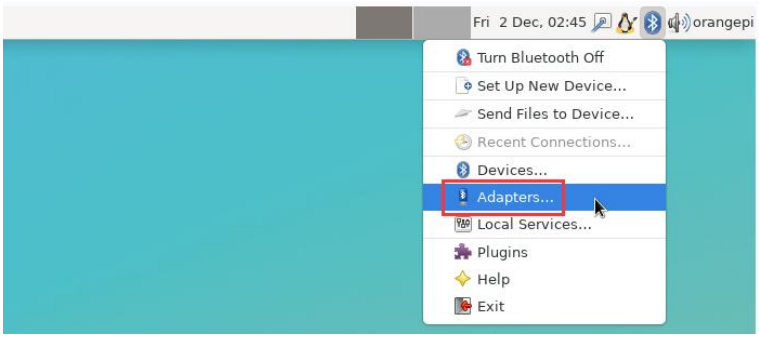
3. 10. How to use Bluetooth use

3. 10. 1. The test method of the desktop image

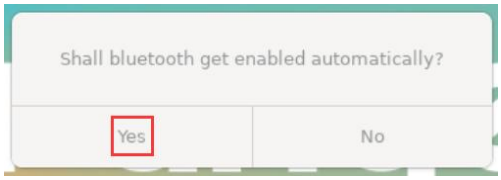
1) Click the Bluetooth icon in the upper right corner of the desktop



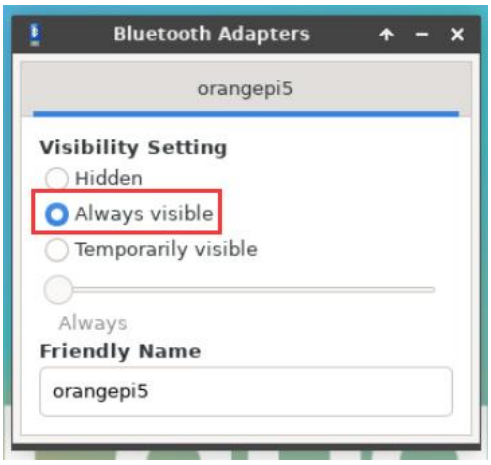
2) Then select the adapter



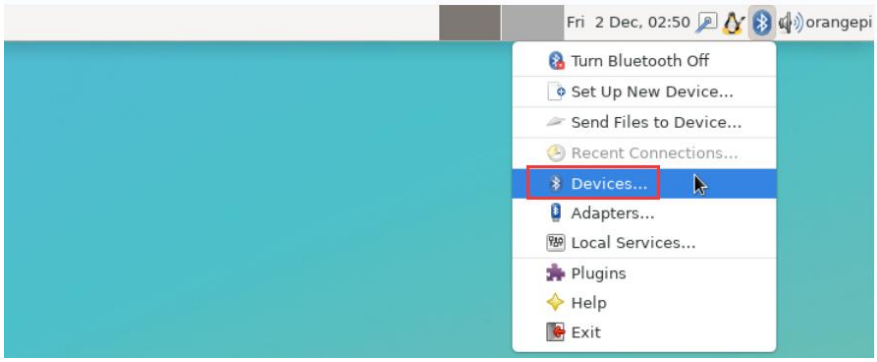
3) If there is a prompt interface, please select **YES**



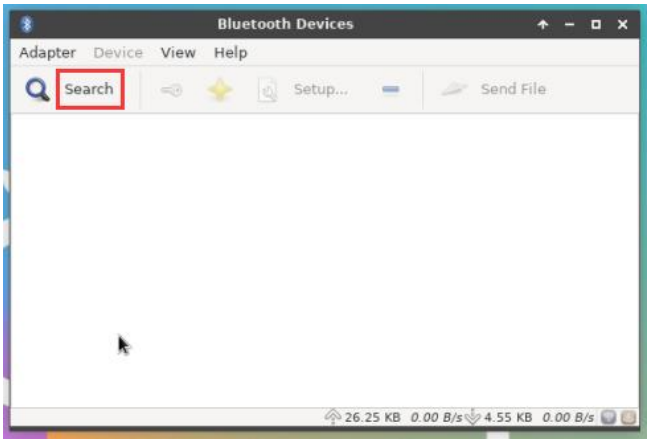
4) Then set **VISIBILITY SETTING** as **Always Visible** in the Bluetooth adapter setting interface, and then close it



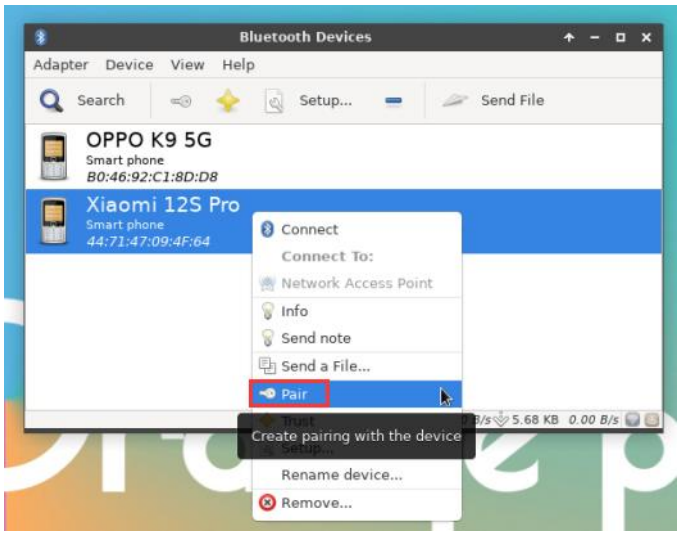
5) Then open the configuration interface of the Bluetooth device



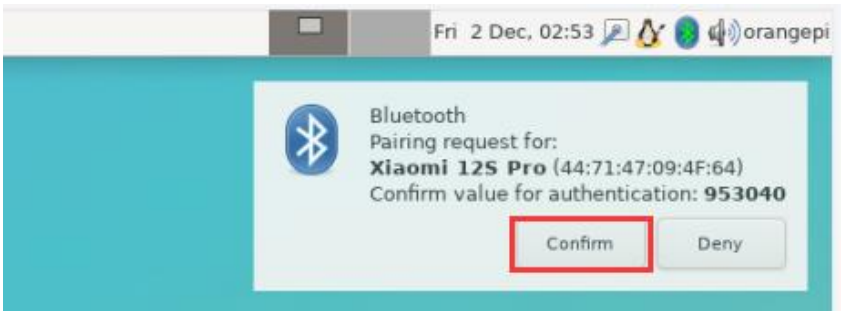
6) Click **Sea**rch to start scanning the surrounding Bluetooth equipment



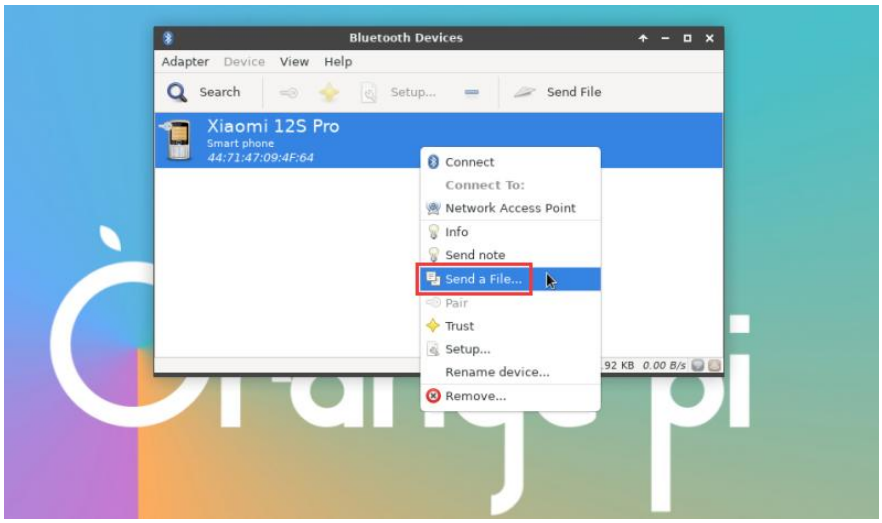
6) Then select the Bluetooth device you want to connect, and then click the right mouse button to pop up the operating interface of this Bluetooth device. Select **Pair** to start pairing. The demonstration here is to match the Android phone pairing.



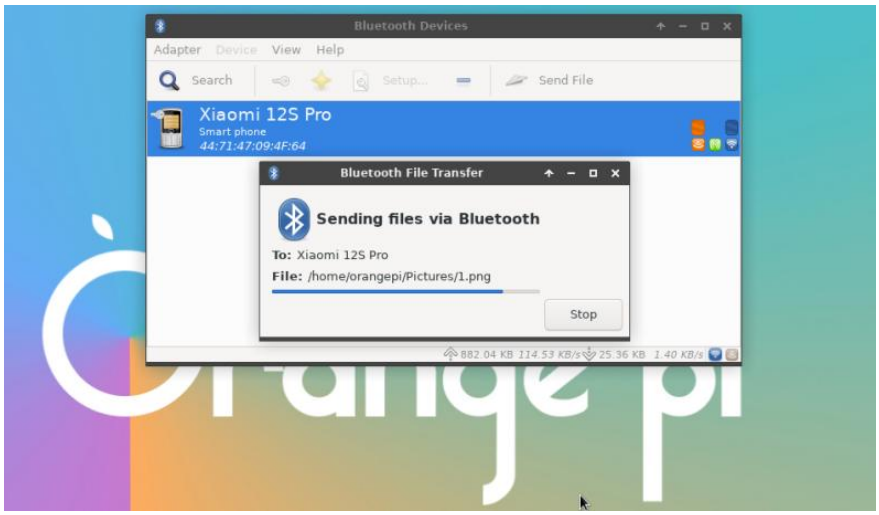
7) When pairing, the pairing confirmation box will pop up in the upper right corner of the desktop. Select **Confirm** to confirm. At this time, you need to confirm on the mobile phone



8) After pairing with the mobile phone, you can choose the paired Bluetooth device, then right -click to select **Send A File** to start sending a picture to the phone



9) The interface of the sending picture is shown below



3. 11. USB interface test

The USB interface can connect to USB Hub to expand the number of USB interfaces.

3. 11. 1. Connect the USB mouse or keyboard test

1) Insert the keyboard of the USB interface into the USB interface of Orange PI development board

2) Connect Orange PI development board to HDMI display

3) If the mouse or keyboard can normal operating systems, the USB interface is used normally (the mouse can only be used in the desktop system)

3. 11. 2. Connect USB storage device test

1) First insert the U disk or USB mobile hard disk into the USB interface of Orange PI development board

2) Execute the following command. If you can see the output of SDX, the U disk recognition is successful

```
orangepi@orangepi:~$ cat /proc/partitions | grep "sd*"
major minor  #blocks  name
   8        0   30044160 sda
   8        1   30043119 sda1
```

3) Use the mount command to mount the U disk into/**mnt**, and then you can view the file in the U disk

```
orangepi@orangepi:~$ sudo mount /dev/sda1 /mnt/
orangepi@orangepi:~$ ls /mnt/
test.txt
```

The U disk in the Linux system mount Exfat format can use the following command

```
orangepi@orangepi:~$ sudo apt-get install exfat-utils exfat-fuse
orangepi@orangepi:~$ sudo mount -t exfat /dev/sda1 /mnt/
```

4) You can view the capacity of the U disk through the **DF -H** command after the

mounting

```
orangepi@orangepi:~$ df -h | grep "sd"
/dev/sda1              29G  208K   29G   1% /mnt
```

3.11.3. USB wireless network card test

The current USB wireless network card that can be tested is shown below. Please test it by yourself if you cannot use the USB wireless network card driver if you cannot use it.

No.	Model	
1	RTL8723BU Support 2.4G WIFI+BT4.0	
	RTL8811 Support 2.4G +5G WIFI	

3.11.3.1. RTL8723BU test

1) First insert the RTL8723BU wireless network card module into the USB interface of the development board

2) Then the Linux system will automatically load the RTL8723BU Bluetooth and WiFi -related kernel modules. You can see that the kernel module below is automatically loaded through the LSMOD command

```
orangepi@orangepi:~$ lsmod
Module                  Size  Used by
rfcomm                 57344  16
rtl8xxxu              106496  0
rtk_btusb              61440  0
```

3) You can see the loading information of the RTL8723BU module through the DMESG command

```
orangepi@orangepi:~$ dmesg
......
[    83.438901] usb 2-1: new high-speed USB device number 2 using ehci-platform
```

```
[      83.588375] usb 2-1: New USB device found, idVendor=0bda, idProduct=b720, bcdDevice= 2.00
[     83.588403] usb 2-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[     83.588422] usb 2-1: Product: 802.11n WLAN Adapter
[     83.588443] usb 2-1: Manufacturer: Realtek
[     83.588460] usb 2-1: SerialNumber: 00e04c000001
[     83.601974] Bluetooth: hci0: RTL: examining hci_ver=06 hci_rev=000b lmp_ver=06 lmp_subver=8723
[     83.603894] Bluetooth: hci0: RTL: rom_version status=0 version=1
[     83.603920] Bluetooth: hci0: RTL: loading rtl_bt/rtl8723b_fw.bin
[     83.610108] Bluetooth: hci0: RTL: loading rtl_bt/rtl8723b_config.bin
[     83.611274] Bluetooth: hci0: RTL: cfg_sz 68, total sz 22564
[     83.658494] rtk_btusb: Realtek Bluetooth USB driver ver 3.1.6d45ddf.20220519-142432
[     83.658651] usbcore: registered new interface driver rtk_btusb
[     83.667124] usb 2-1: This Realtek USB WiFi dongle (0x0bda:0xb720) is untested!
[     83.667137] usb 2-1: Please report results to Jes.Sorensen@gmail.com
[     83.890140] usb 2-1: Vendor: Realtek
[     83.890153] usb 2-1: Product: 802.11n WLAN Adapter
[     83.890159] usb 2-1: rtl8723bu_parse_efuse: dumping efuse (0x200 bytes):
.....
[     83.890412] usb 2-1: RTL8723BU rev E (SMIC) 1T1R, TX queues 3, WiFi=1, BT=1, GPS=0, HI PA=0
[     83.890417] usb 2-1: RTL8723BU MAC: 00:13:ef:f4:58:ae
[     83.890421] usb 2-1: rtl8xxxu: Loading firmware rtlwifi/rtl8723bu_nic.bin
[     83.895289] usb 2-1: Firmware revision 35.0 (signature 0x5301)
[     84.050893] Bluetooth: hci0: RTL: fw version 0x0e2f9f73
[     84.266905] Bluetooth: RFCOMM TTY layer initialized
[     84.266949] Bluetooth: RFCOMM socket layer initialized
[     84.266999] Bluetooth: RFCOMM ver 1.11
[     84.884270] usbcore: registered new interface driver rtl8xxxu
[     84.912046] rtl8xxxu 2-1:1.2 wlx0013eff458ae: renamed from wlan0
```

4) Then you can see the RTL8723BU WIFI device node through the **Sudo iFconfig** command. Please refer to the **WiFi connection** test.

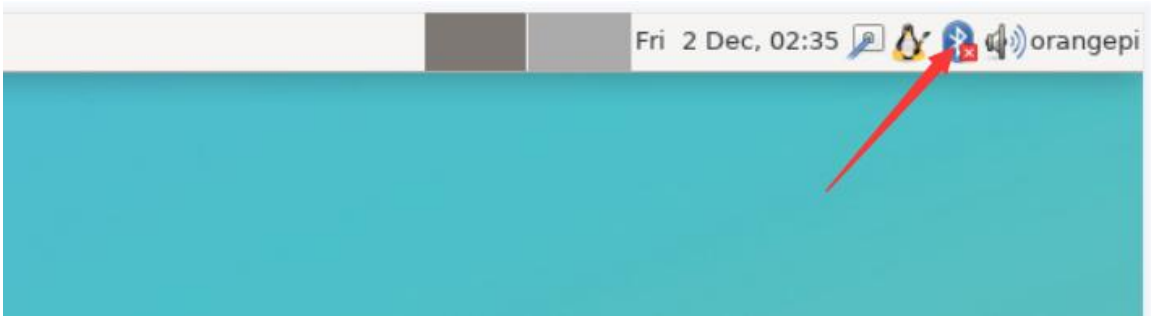
```
orangepi@orangepi:~$ sudo ifconfig wlx0013eff458ae
```

```
wlx0013eff458ae: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        ether 00:13:ef:f4:58:ae  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

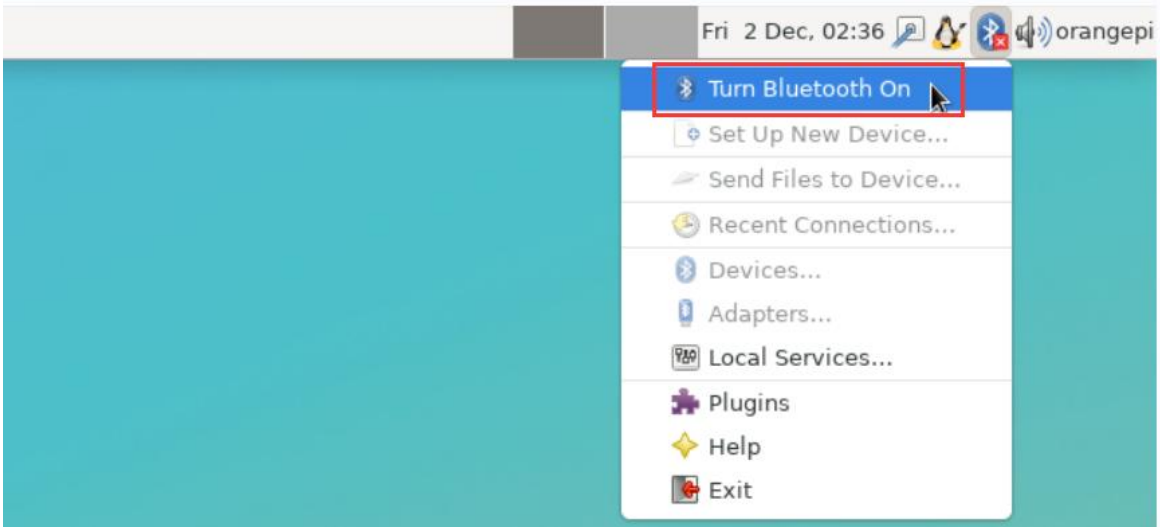
5) Then you can see the USB Bluetooth device through the **HCICONFIG** command

```
orangepi@orangepi:~$ sudo apt update && sudo apt install bluez
orangepi@orangepi5:~$ hciconfig
hci0:   Type: Primary  Bus: USB
        BD Address: 00:13:EF:F4:58:AE  ACL MTU: 820:8  SCO MTU: 255:16
        DOWN
        RX bytes:1252 acl:0 sco:0 events:125 errors:0
        TX bytes:23307 acl:0 sco:0 commands:125 errors:0
```

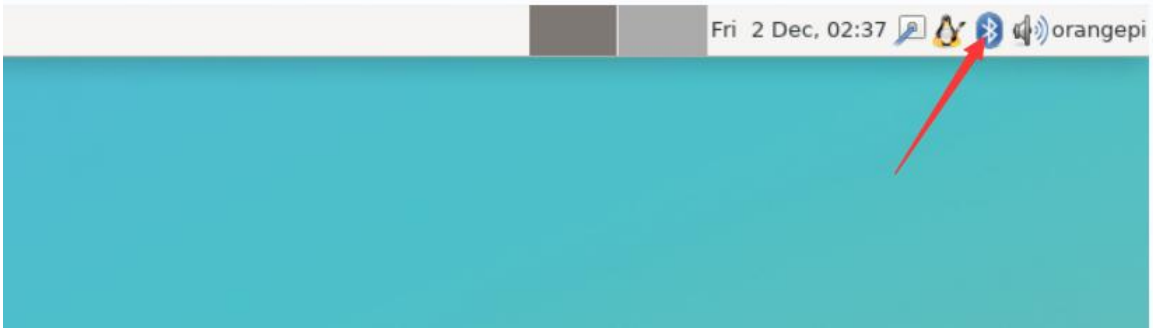
6) You can also see the Bluetooth icon on the desktop. At this time, Bluetooth has not been opened, so a red **X** will be displayed



7) Click **Turn bluetooth on** to open Bluetooth



8) The display after opening Bluetooth is shown below



9) For the test method of Bluetooth, please refer to the **use of Bluetooth**.

3. 11. 3. 2. RTL8811 Test

1) First insert the RTL8811 wireless network card module into the USB interface of the development board

2) Then the Linux system will automatically load the RTL8811 WIFI -related kernel module. You can see that the kernel module below is automatically loaded through the LSMOD command.

```
orangepi@orangepi:~$ lsmod
Module                  Size  Used by
8821cu               1839104  0
```

3) You can see the loading information of the RTL8723BU module through the DMESG command

```
orangepi@orangepi:~$ dmesg
[  118.618194] usb 2-1: new high-speed USB device number 2 using ehci-platform
[  118.767152] usb 2-1: New USB device found, idVendor=0bda, idProduct=c811, bcdDevice= 2.00
[  118.767181] usb 2-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[  118.767199] usb 2-1: Product: 802.11ac NIC
[  118.767219] usb 2-1: Manufacturer: Realtek
[  118.767235] usb 2-1: SerialNumber: 123456
[  119.500530] usbcore: registered new interface driver rtl8821cu
[  119.525498] rtl8821cu 2-1:1.0 wlx1cbfced9d260: renamed from wlan0
```

4) Then you can see the WiFi device node through the **Sudo iFconfig** command. Please refer to the **WiFi connection** test of the WIFI connection and test method.

```
orangepi@orangepi:~$ sudo ifconfig wlx1cbfced9d260
wlx1cbfced9d260: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        ether 1c:bf:ce:d9:d2:60  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

3. 11. 4. USB Camera Test

1) First of all, you need to prepare a USB camera that supports the UVC protocol in the figure below, and then insert the USB camera into the USB interface of the Orange PI development board

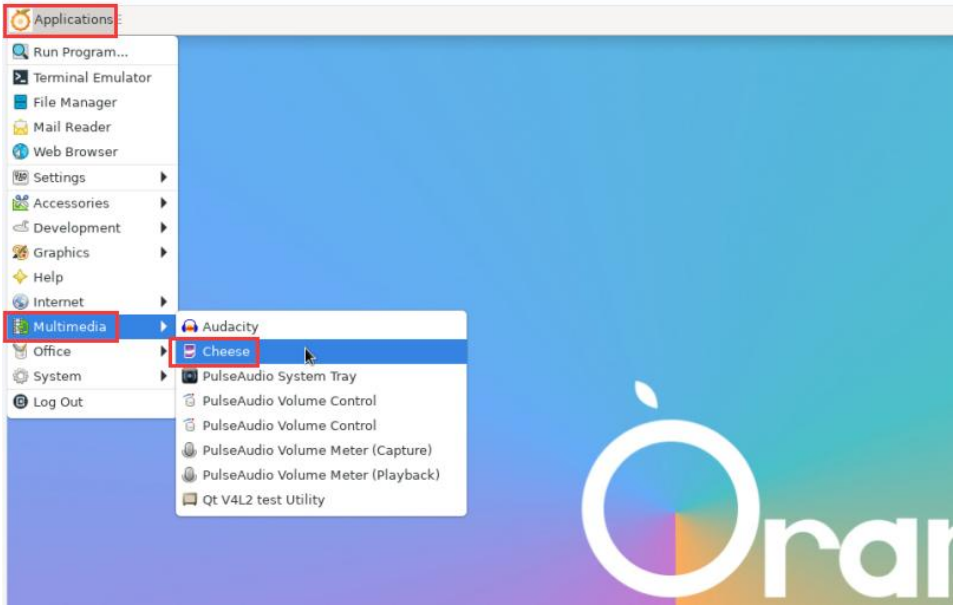
2) You can see that the USB camera's device node information is/dev/video0 through the V4L2-CTL command

```
orangepi@orangepi:~$ v4l2-ctl --list-devices
Q8 HD Webcam: Q8 HD Webcam (usb-fc880000.usb-1):
        /dev/video0
        /dev/video1
        /dev/media0
```

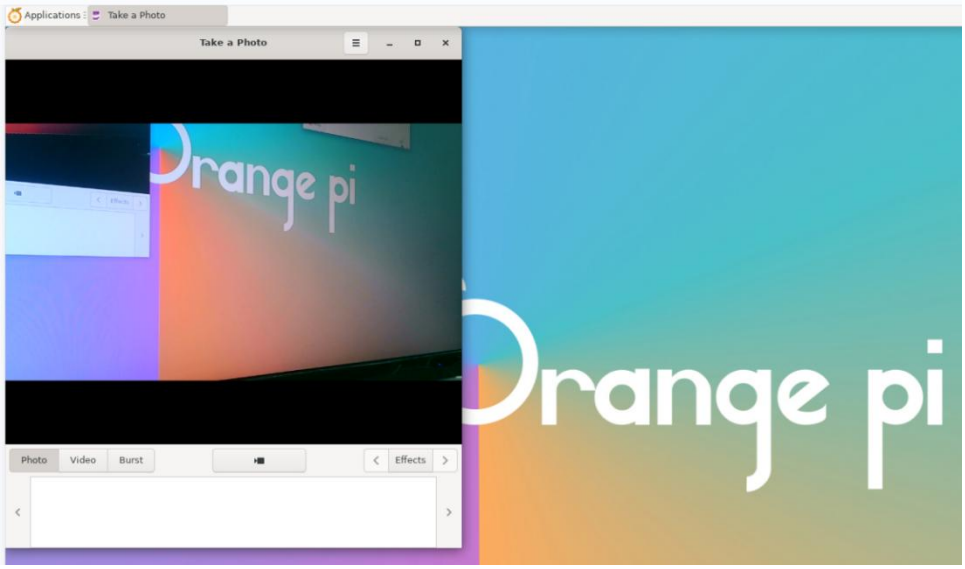
Note that L in V4L2 is a lowercase letter L, not numbers 1.

In addition, Video's serial number is not necessarily Video0, please refer to what you see.

3) In the desktop system, you can use cheese to directly open the USB camera. The cheese opening method is shown in the figure below:



The interface after cheese opens the USB camera is shown below:



4) How to test the USB camera using FSWEBCAM to test the USB camera

a. Install fswebcam

```
orangepi@orangepi:~$ sudo apt update
orangepi@orangepi:~$ sudo apt-get install -y fswebcam
```

b. After installing fswebcam, you can use the following command to take pictures

a) -d options for device nodes for specifying USB cameras

b) -no-Banner is used to remove the watermark of photos

c) -r option is used to specify the resolution of the photo

d) -S The option is set to the number of frames that skipped before

e) ./ Image.jpg for setting the name and path of the generated photos

```
orangepi@orangepi:~$ sudo fswebcam -d /dev/video0   \
--no-banner -r 1280x720 -S 5 ./image.jpg
```

c. In the Linux system of the server version, you can use the SCP command to pass the picture to the Ubuntu PC to watch it after taking the photo

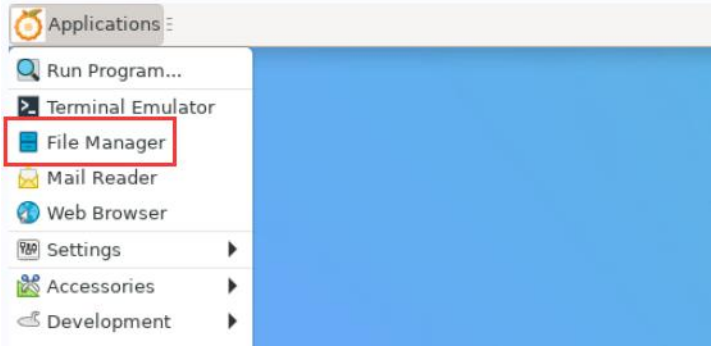
```
orangepi@orangepi:~$ scp image.jpg test@192.168.1.55:/home/test （Modify the IP address and path according to the actual situation）
```

d. In the Linux system of the desktop version, you can directly view the pictures taken through the HDMI display

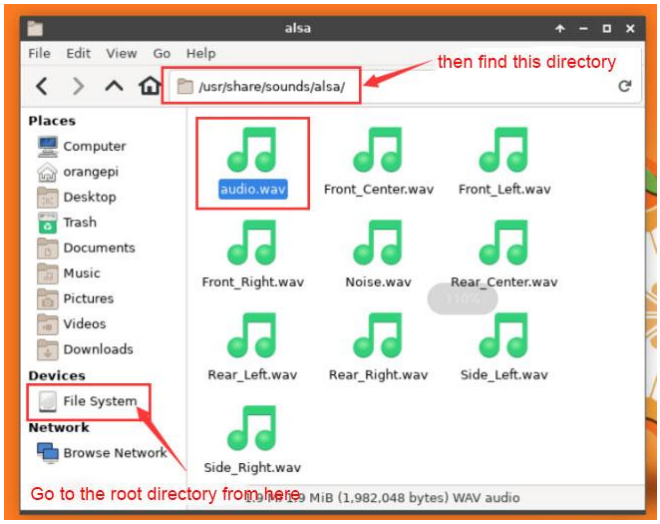
3. 12. Audio Test

3. 12. 1. Test the audio method in the desktop system

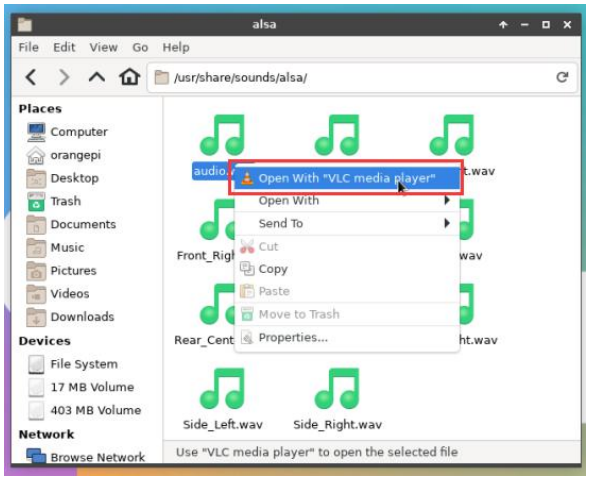
1) First open the file manager



2) Then find the following file (if there is no audio file in the system, you can upload an audio file to the system by yourself)

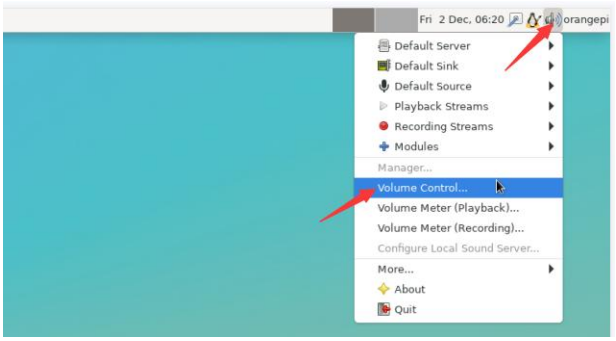


3) Then select the Audio.WAV file, right -click and select VLC to open it to start playing

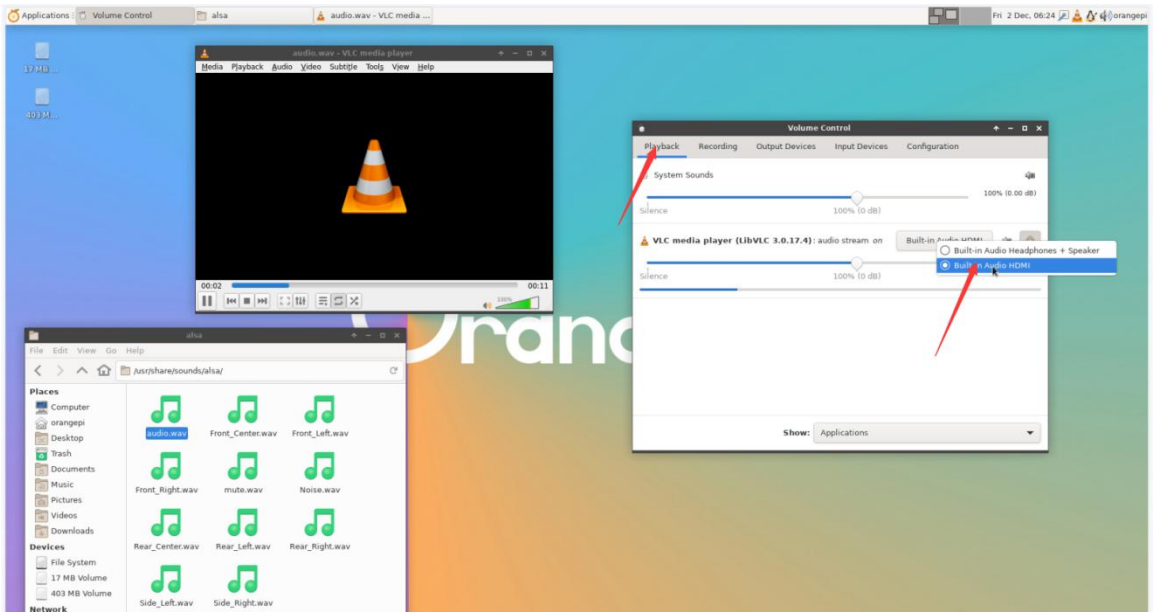


4) Methods to switch different audio equipment such as HDMI playback and headset playback

a. First open the volume control interface



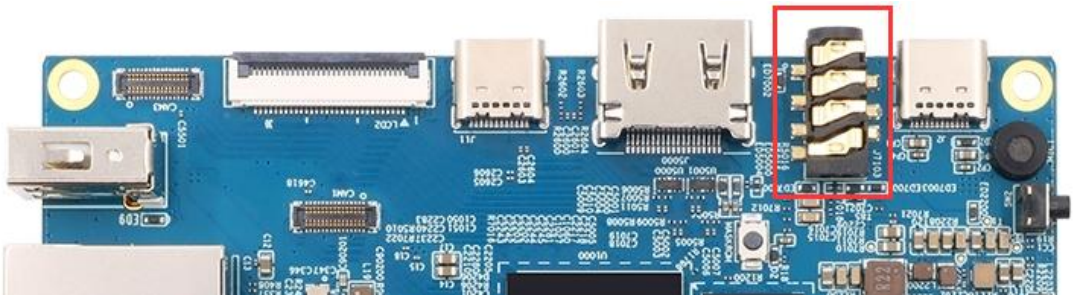
b. When playing audio, the audio device options that play software can be used will be displayed in **PlayBack**. As shown in the figure below, which audio device you need to play here can be set



3. 12. 2. How to play the audio with the command line

3. 12. 2. 1. Play audio test of the headset interface

1) First insert the headset into the headphone jack of the development board



2) Then you can check the sound card device supported by the Linux system through the **aplay -l** command. From the output below, **Card 2** is the sound card device of the ES8388, which is the sound card device of the headphones.

```
orangepi@orangepi:~$ aplay -l
**** List of PLAYBACK Hardware Devices ****
card 0: rockchipdp0 [rockchip-dp0], device 0: rockchip-dp0 spdif-hifi-0 [rockchip-dp0 spdif-hifi-0]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 1: rockchiphdmi0 [rockchip-hdmi0], device 0: rockchip-hdmi0 i2s-hifi-0 [rockchip-hdmi0 i2s-hifi-0]
  Subdevices: 1/1
```

```
  Subdevice #0: subdevice #0
card 2: rockchipes8388 [rockchip-es8388], device 0: dailink-multicodecs ES8323.6-0010-0 [dailink-multicodecs ES8323.6-0010-0]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
```

3) Then use the **aplay** command to play the audio file that comes with the system.

```
orangepi@orangepi:~$ aplay -D hw:2,0 /usr/share/sounds/alsa/audio.wav
Playing WAVE 'audio.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
```

3. 12. 2. 2. HDMI Audio Playback Test

1) First use HDMI to HDMI cable to connect Orange PI development board to the TV (other HDMI displays need to ensure that audio can be played)

2) Then check the HDMI sound card serial number. From the output below, you can know that the HDMI sound card is **Card 1**

```
orangepi@orangepi:~$ aplay -l
**** List of PLAYBACK Hardware Devices ****
card 0: rockchipdp0 [rockchip-dp0], device 0: rockchip-dp0 spdif-hifi-0 [rockchip-dp0 spdif-hifi-0]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 1: rockchiphdmi0 [rockchip-hdmi0], device 0: rockchip-hdmi0 i2s-hifi-0 [rockchip-hdmi0 i2s-hifi-0]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 2: rockchipes8388 [rockchip-es8388], device 0: dailink-multicodecs ES8323.6-0010-0 [dailink-multicodecs ES8323.6-0010-0]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
```

4) Then use the **aplay** command to play the audio file that comes with the system.

```
orangepi@orangepi:~$ aplay -D hw:1,0 /usr/share/sounds/alsa/audio.wav
```

3. 13. Temperature Sensor

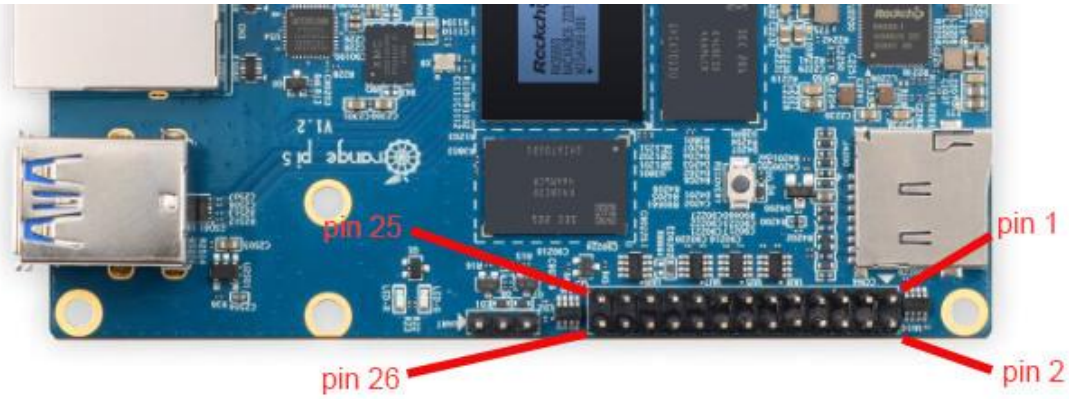
The command of the system temperature sensor is:

```
orangepi@orangepi:~$ sensors
gpu_thermal-virtual-0
Adapter: Virtual device
temp1:        +47.2°C

littlecore_thermal-virtual-0
Adapter: Virtual device
temp1:        +47.2°C

bigcore0_thermal-virtual-0
Adapter: Virtual device
temp1:        +47.2°C

tcpm_source_psy_6_0022-i2c-6-22
Adapter: rk3x-i2c
in0:           0.00 V  (min =  +0.00 V, max =  +0.00 V)
curr1:         0.00 A  (max =  +0.00 A)

npu_thermal-virtual-0
Adapter: Virtual device
temp1:        +47.2°C

center_thermal-virtual-0
Adapter: Virtual device
temp1:        +47.2°C

bigcore1_thermal-virtual-0
Adapter: Virtual device
temp1:        +47.2°C

soc_thermal-virtual-0
Adapter: Virtual device
```

```
temp1:          +47.2°C   (crit = +115.0°C)
```

3. 14. 26 PIN interface pin explanation

1) Orange Pi 5 Development board 26 PIN interface pins, please refer to the figure below



2) Orange Pi 5 Development board 26 PIN interface pins The function as shown in the table below

a. Below is the complete pins of 26pin

复用功能	复用功能	复用功能	GPIO	GPIO序号	引脚序号	引脚序号	GPIO序号	GPIO	复用功能	复用功能	复用功能
			3.3V		1	2		5V			
PWM13_M2（febf0010）	UART1_RX_M1（feb40000）	I2C5_SDA_M3	GPIO1_B7	47	3	4		5V			
	UART1_TX_M1	I2C5_SCL_M3	GPIO1_B6	46	5	6		GND			
		PWM15_IR_M2（febf0030）	GPIO1_C6	54	7	8	131	GPIO4_A3	UART0_TX_M2（fd890000）		
			GND		9	10	132	GPIO4_A4	UART0_RX_M2		
	PWM14_M1（febf0020）	CAN1_RX_M1	GPIO4_B2	138	11	12	29	GPIO0_D5	CAN2_TX_M1	I2C1_SDA_M2	
		CAN1_TX_M1	GPIO4_B3	139	13	14		GND			
PWM3_IR_M0（fd8b0030）	I2C1_SCL_M2	CAN2_RX_M1	GPIO0_D4	28	15	16	59	GPIO1_D3	UART4_RX_M0（feb70000）	I2C1_SDA_M4	PWM1_M1（fd8b0010）
			3.3V		17	18	58	GPIO1_D2	UART4_TX_M0	I2C1_SCL_M4	PWM0_M1（fd8b0000）
I2C3_SCL_M0	UART3_TX_M0（feb60000）	SPI4_MOSI_M0	GPIO1_C1	49	19	20		GND			
I2C3_SDA_M0	UART3_RX_M0	SPI4_MISO_M0	GPIO1_C0	48	21	22	92	GPIO2_D4			
	PWM3_IR_M2（fd8b0030）	SPI4_CLK_M0	GPIO1_C2	50	23	24	52	GPIO1_C4	SPI4_CS1_M0		
			GND		25	26	35	GPIO1_A3	PWM1_M2（fd8b0010）		

b. The following form is a picture on the left half of the full table above, which can be seen clearly

复用功能	复用功能	复用功能	GPIO	GPIO序号	引脚序号
			3.3V		1
PWM13_M2（febf0010）	UART1_RX_M1（feb40000）	I2C5_SDA_M3	GPIO1_B7	47	3
	UART1_TX_M1	I2C5_SCL_M3	GPIO1_B6	46	5
		PWM15_IR_M2（febf0030）	GPIO1_C6	54	7
			GND		9
	PWM14_M1（febf0020）	CAN1_RX_M1	GPIO4_B2	138	11
		CAN1_TX_M1	GPIO4_B3	139	13
PWM3_IR_M0（fd8b0030）	I2C1_SCL_M2	CAN2_RX_M1	GPIO0_D4	28	15
			3.3V		17
I2C3_SCL_M0	UART3_TX_M0（feb60000）	SPI4_MOSI_M0	GPIO1_C1	49	19
I2C3_SDA_M0	UART3_RX_M0	SPI4_MISO_M0	GPIO1_C0	48	21
	PWM3_IR_M2（fd8b0030）	SPI4_CLK_M0	GPIO1_C2	50	23
			GND		25

c. The following form is a picture on the right half of the top table above, which

can be seen clearly

引脚序号	GPIO序号	GPIO	复用功能	复用功能	复用功能
2		5V			
4		5V			
6		GND			
8	131	GPIO4_A3	UART0_TX_M2（fd890000）		
10	132	GPIO4_A4	UART0_RX_M2		
12	29	GPIO0_D5	CAN2_TX_M1	I2C1_SDA_M2	
14		GND			
16	59	GPIO1_D3	UART4_RX_M0（feb70000）	I2C1_SDA_M4	PWM1_M1（fd8b0010）
18	58	GPIO1_D2	UART4_TX_M0	I2C1_SCL_M4	PWM0_M1（fd8b0000）
20		GND			
22	92	GPIO2_D4			
24	52	GPIO1_C4	SPI4_CS1_M0		
26	35	GPIO1_A3	PWM1_M2（fd8b0010）		

In the table above, the PWM is marked with the address of the corresponding register. Which PWMCHIP corresponds to which PWMCHIP corresponding to the 26PIN pins in the/SYS/Class/PWM//is useful.

3) There are a total of 17 GPIO ports in the 26PIN interface, and the voltage of all GPIO ports is **3.3V**

3. 15. How to install Wiringop

Note that Wiringop has been pre -installed in the Debian11 image released by Orange PI. Unless Wiringop's code is updated, it is not necessary to re -download and install and use it directly.

The storage path of the compiled Wiringop's deb in Orange-Build is:
orangepi-build/external/cache/debs/arm64/wiringpi_2.46.deb

After entering the system, you can run the GPIO Readall command. If you can see the output below, it means that Wiringop is pre -installed and can be used normally.

```
root@orangepi5:~# gpio readall
 +------+-----+----------+--------+---+   OPI5   +---+--------+----------+-----+------+
 | GPIO | wPi |   Name   |  Mode  | V | Physical | V |  Mode  | Name     | wPi | GPIO |
 +------+-----+----------+--------+---+----++----+---+--------+----------+-----+------+
 |      |     |     3.3V |        |   |  1 || 2  |   |        | 5V       |     |      |
 |   47 |   0 |    SDA.5 |     IN | 1 |  3 || 4  |   |        | 5V       |     |      |
 |   46 |   1 |    SCL.5 |     IN | 1 |  5 || 6  |   |        | GND      |     |      |
 |   54 |   2 |   PWM15  |     IN | 1 |  7 || 8  | 0 | ALT6   | RXD.0    | 3   | 131  |
 |      |     |      GND |        |   |  9 || 10 | 0 | IN     | TXD.0    | 4   | 132  |
 |  138 |   5 |  CAN1_RX |     IN | 1 | 11 || 12 | 1 | IN     | CAN2_TX  | 6   | 29   |
 |  139 |   7 |  CAN1_TX |     IN | 1 | 13 || 14 |   |        | GND      |     |      |
 |   28 |   8 |  CAN2_RX |     IN | 1 | 15 || 16 | 1 | IN     | SDA.1    | 9   | 59   |
 |      |     |     3.3V |        |   | 17 || 18 | 1 | IN     | SCL.1    | 10  | 58   |
 |   49 |  11 | SPI4_TXD |     IN | 1 | 19 || 20 |   |        | GND      |     |      |
 |   48 |  12 | SPI4_RXD |     IN | 1 | 21 || 22 | 1 | IN     | GPIO2_D4 | 13  | 92   |
 |   50 |  14 | SPI4_CLK |     IN | 1 | 23 || 24 | 1 | ALT1   | SPI4_CS1 | 15  | 52   |
 |      |     |      GND |        |   | 25 || 26 | 1 | IN     | PWM1     | 16  | 35   |
 +------+-----+----------+--------+---+----++----+---+--------+----------+-----+------+
 | GPIO | wPi |   Name   |  Mode  | V | Physical | V |  Mode  | Name     | wPi | GPIO |
 +------+-----+----------+--------+---+   OPI5   +---+--------+----------+-----+------+
root@orangepi5:~#
```

Wiringop currently mainly adapts to the function of setting GPIO input and output, and setting high and low levels. Functions such as hardware PWM cannot be used.

1) Download the code of Wiringop

```
orangepi@orangepi:~$ sudo apt update
orangepi@orangepi:~$ sudo apt install -y git
orangepi@orangepi:~$ git clone https://github.com/orangepi-xunlong/wiringOP.git -b next
```

Note that Orange Pi 5 needs to download the code of the Wiringop NEXT branch, please don't miss the parameter of -b next.

If you have a problem with the download code from GitHub, you can download the source code compression package of Wiringop-opi5.gz in the official tools of the Orange Pi 5 data download page.

2) Compile and install wiringOP

```
orangepi@orangepi:~$ cd wiringOP
orangepi@orangepi:~/wiringOP$ sudo ./build clean
orangepi@orangepi:~/wiringOP$ sudo ./build
```

3) Test the output of the GPIO Readall command as follows

```
root@orangepi5:~# gpio readall
 +------+-----+----------+--------+---+   OPI5   +---+--------+----------+-----+------+
 | GPIO | wPi |   Name   |  Mode  | V | Physical | V |  Mode  | Name     | wPi | GPIO |
 +------+-----+----------+--------+---+----++----+---+--------+----------+-----+------+
 |      |     |     3.3V |        |   |  1 || 2  |   |        | 5V       |     |      |
 |   47 |   0 |    SDA.5 |     IN | 1 |  3 || 4  |   |        | 5V       |     |      |
 |   46 |   1 |    SCL.5 |     IN | 1 |  5 || 6  |   |        | GND      |     |      |
 |   54 |   2 |    PWM15 |     IN | 1 |  7 || 8  | 0 | ALT6   | RXD.0    | 3   | 131  |
 |      |     |      GND |        |   |  9 || 10 | 0 | IN     | TXD.0    | 4   | 132  |
 |  138 |   5 |  CAN1_RX |     IN | 1 | 11 || 12 | 1 | IN     | CAN2_TX  | 6   | 29   |
 |  139 |   7 |  CAN1_TX |     IN | 1 | 13 || 14 |   |        | GND      |     |      |
 |   28 |   8 |  CAN2_RX |     IN | 1 | 15 || 16 | 1 | IN     | SDA.1    | 9   | 59   |
 |      |     |     3.3V |        |   | 17 || 18 | 1 | IN     | SCL.1    | 10  | 58   |
 |   49 |  11 | SPI4_TXD |     IN | 1 | 19 || 20 |   |        | GND      |     |      |
 |   48 |  12 | SPI4_RXD |     IN | 1 | 21 || 22 | 1 | IN     | GPIO2_D4 | 13  | 92   |
 |   50 |  14 | SPI4_CLK |     IN | 1 | 23 || 24 | 1 | ALT1   | SPI4_CS1 | 15  | 52   |
 |      |     |      GND |        |   | 25 || 26 | 1 | IN     | PWM1     | 16  | 35   |
 +------+-----+----------+--------+---+----++----+---+--------+----------+-----+------+
 | GPIO | wPi |   Name   |  Mode  | V | Physical | V |  Mode  | Name     | wPi | GPIO |
 +------+-----+----------+--------+---+   OPI5   +---+--------+----------+-----+------+
root@orangepi5:~#
```

3. 16. 26Pin interface GPIO, I2C, UART, SPI and PWM test

Note that if you need to set overlays at the same time, open multiple configurations at the same time, please use the space to write in one line as follows.

orangepi@orangepi:~$ **sudo vim /boot/orangepiEnv.txt**

overlays=i2c1-m2 lcd1 ov13850-c1 pwm13-m2 spi4-m0-cs1-spidev uart0-m2

3. 16. 1. 26pin GPIO port test

The Debian11 system released by Orange Pi has a Blink_all_GPIO program pre-installed. This program will set up all 17 GPIO ports in 26Pin to switch high and low levels.

After running the blink_all_gpio program, when using a multimeter to measure the level of the GPIO port, you will find that the GPIO pin will be switched between 0 and 3.3V. Use this program to test whether the GPIO port can work normally.

The method of running blink_all_gpio program is shown below:

orangepi@orangepi5:~$ **sudo blink_all_gpio** #Remember to add Sudo permissions

[sudo] password for orangepi: #You need to enter a password here

1) Below is No. 7 pin -corresponding to GPIO1_C6 -corresponding WPI serial number 2 -as an example how to set the height of the GPIO port

```
root@orangepi5:~# gpio readall
 +------+-----+----------+--------+---+   OPI5   +---+--------+----------+-----+------+
 | GPIO | wPi |   Name   |  Mode  | V | Physical | V |  Mode  | Name     | wPi | GPIO |
 +------+-----+----------+--------+---+----++----+---+--------+----------+-----+------+
 |      |     |     3.3V |        |   |  1 || 2  |   |        | 5V       |     |      |
 |   47 |   0 |    SDA.5 |     IN | 1 |  3 || 4  |   |        | 5V       |     |      |
 |   46 |   1 |    SCL.5 |     IN | 1 |  5 || 6  |   |        | GND      |     |      |
 |   54 |   2 |    PWM15 |     IN | 1 |  7 || 8  | 0 | ALT6   | RXD.0    | 3   | 131  |
 |      |     |      GND |        |   |  9 || 10 | 0 | IN     | TXD.0    | 4   | 132  |
 |  138 |   5 | CAN1_RX  |     IN | 1 | 11 || 12 | 1 | IN     | CAN2_TX  | 6   | 29   |
 |  139 |   7 | CAN1_TX  |     IN | 1 | 13 || 14 |   |        | GND      |     |      |
 |   28 |   8 | CAN2_RX  |     IN | 1 | 15 || 16 | 1 | IN     | SDA.1    | 9   | 59   |
```

2) First set the GPIO port as the output mode, the third parameter needs to enter the serial number of the wpi corresponding to the pins

```
root@orangepi:~/wiringOP# gpio mode 2 out
```

3) Then set the GPIO port to output the low level. After setting, you can use the value of the voltage of the pins with a multimeter. If it is 0V, it means that the low -power flat is successful

```
root@orangepi:~/wiringOP# gpio write 2 0
```

Using GPIO Readall, you can see the value of No. 7 pin (v) to 0

```
root@orangepi5:~# gpio readall
 +------+-----+----------+--------+---+   OPI5   +---+--------+----------+-----+------+
 | GPIO | wPi |   Name   |  Mode  | V | Physical | V |  Mode  | Name     | wPi | GPIO |
 +------+-----+----------+--------+---+----++----+---+--------+----------+-----+------+
 |      |     |     3.3V |        |   |  1 || 2  |   |        | 5V       |     |      |
 |   47 |   0 |    SDA.5 |     IN | 1 |  3 || 4  |   |        | 5V       |     |      |
 |   46 |   1 |    SCL.5 |     IN | 1 |  5 || 6  |   |        | GND      |     |      |
 |   54 |   2 |    PWM15 |    OUT | 0 |  7 || 8  | 0 | ALT6   | RXD.0    | 3   | 131  |
 |      |     |      GND |        |   |  9 || 10 | 0 | IN     | TXD.0    | 4   | 132  |
 |  138 |   5 | CAN1_RX  |     IN | 1 | 11 || 12 | 1 | IN     | CAN2_TX  | 6   | 29   |
```

4) Then set the GPIO port to output high levels. After setting, you can use the value of the voltage of the pins with a multimeter. If it is 3.3V, it means that the high -power flat is successful

```
root@orangepi:~/wiringOP# gpio write 2 1
```

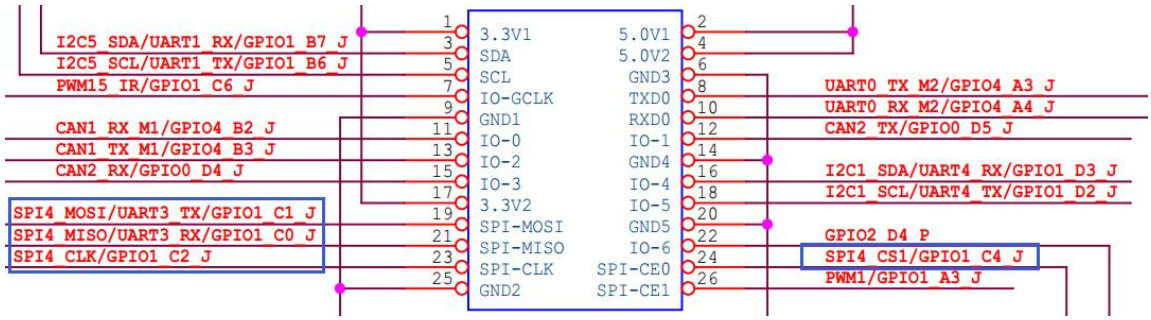
Using GPIO Readall, you can see the value of No. 7 pin (v) into 1

```
root@orangepi5:~# gpio readall
 +------+-----+----------+--------+---+   OPI5   +---+--------+----------+-----+------+
 | GPIO | wPi |   Name   |  Mode  | V | Physical | V |  Mode  | Name     | wPi | GPIO |
 +------+-----+----------+--------+---+----++----+---+--------+----------+-----+------+
 |      |     |     3.3V |        |   |  1 || 2  |   |        | 5V       |     |      |
 |   47 |   0 |    SDA.5 |     IN | 1 |  3 || 4  |   |        | 5V       |     |      |
 |   46 |   1 |    SCL.5 |     IN | 1 |  5 || 6  |   |        | GND      |     |      |
 |   54 |   2 |    PWM15 |    OUT | 1 |  7 || 8  | 0 | ALT6   | RXD.0    | 3   | 131  |
 |      |     |      GND |        |   |  9 || 10 | 0 | IN     | TXD.0    | 4   | 132  |
 |  138 |   5 | CAN1_RX  |     IN | 1 | 11 || 12 | 1 | IN     | CAN2_TX  | 6   | 29   |
```

5) The setting method of other pins is similar. Just modify the serial number of the wpi serial number as the number of pinnastes.

3. 16. 2. 26pin SPI test

1) From the schematic diagram of the 26PIN interface, the SPI available for Orange Pi 5 is SPI4



In the Debian11 system, the SPI4 in 26PIN is closed by default and needs to be opened manually.

Add the configuration of the red font part below to the /Boot/orangepienv.txt, and then restart the Linux system to open the SPI4.

orangepi@orangepi:~$ **sudo vim /boot/orangepiEnv.txt**
overlays=spi4-m0-cs1-spidev

2) First check whether there is a **SPIDEV4.1** device node in the Linux system. If it exists, it means that the SPI4 has been set.

```
orangepi@orangepi:~$ ls /dev/spidev4.1
/dev/spidev4.1
```

Note that/dev/spidev4.0 cannot be used, please use /DEV/spidev4.1, don't make

mistakes.

3) Do not pick up the two pins of the SPI4 MOSI and MISO in short, and run the output result of the spidev_test as shown below. You can see that the data of TX and RX is inconsistent

```
orangepi@orangepi:~$ sudo spidev_test -v -D /dev/spidev4.1
spi mode: 0x0
bits per word: 8
max speed: 500000 Hz (500 KHz)
TX | FF FF FF FF FF FF 40 00 00 00 00 95 FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF F0 0D    | ......@....▒.....................▒.
RX | FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF    | ................................
```

4) Then the MOSI (No. 19 pins in 26Pin interface) and MISO (No. 21 in the 26Pin interface) of the SPI4 and MISO (pin 21 in 26Pin interface) run the output of SPIDEV_test as follows. You can see the sending and receiving receiving Data

```
orangepi@orangepi:~$ sudo spidev_test -v -D /dev/spidev4.1
spi mode: 0x0
bits per word: 8
max speed: 500000 Hz (500 KHz)
TX | FF FF FF FF FF FF 40 00 00 00 00 95 FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF F0 0D    | ......@....▒.....................▒.
RX | FF FF FF FF FF FF 40 00 00 00 00 95 FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF F0 0D    | ......@....▒.....................▒.
```

3. 16. 3. 26pin I2C test

1) From the table below, the I2C available for ORANGE PI 5 is I2C1, I2C3, and I2C5.

复用功能	复用功能	复用功能	GPIO	GPIO序号	引脚序号	引脚序号	GPIO序号	GPIO	复用功能	复用功能	复用功能
			3.3V		1	2		5V			
PWM13_M2（febf0010）	UART1_RX_M1（feb40000）	I2C5_SDA_M3	GPIO1_B7	47	3	4		5V			
	UART1_TX_M1	I2C5_SCL_M3	GPIO1_B6	46	5	6		GND			
		PWM15_IR_M2（febf0030）	GPIO1_C6	54	7	8	131	GPIO4_A3	UART0_TX_M2（fd890000）		
			GND		9	10	132	GPIO4_A4	UART0_RX_M2		
	PWM14_M1（febf0020）	CAN1_RX_M1	GPIO4_B2	138	11	12	29	GPIO0_D5	CAN2_TX_M1	I2C1_SDA_M2	
		CAN1_TX_M1	GPIO4_B3	139	13	14		GND			
PWM3_IR_M0（fd8b0030）	I2C1_SCL_M2	CAN2_RX_M1	GPIO0_D4	28	15	16	59	GPIO1_D3	UART4_RX_M0	I2C1_SDA_M4	PWM1_M1（fd8b0010）
			3.3V		17	18	58	GPIO1_D2	UART4_TX_M0	I2C1_SCL_M4	PWM0_M1（fd8b0000）
I2C3_SCL_M0	UART3_TX_M0	SPI4_MOSI_M0	GPIO1_C1	49	19	20		GND			
I2C3_SDA_M0	UART3_RX_M0	SPI4_MISO_M0	GPIO1_C0	48	21	22	92	GPIO2_D4			
	PWM3_IR_M2（fd8b0030）	SPI4_CLK_M0	GPIO1_C2	50	23	24	52	GPIO1_C4	SPI4_CS1_M0		
			GND		25	26	35	GPIO1_A3	PWM1_M2（fd8b0010）		

It can be seen from the above table that I2C1 can be exported from the 12 and 15 pins of 26pin (I2C1_M2), or it can also be exported from the 16 and 18 pins of 26pin (I2C1_M4). Please follow your own needs Choose a group. Please don't think that this is two different I2C bus.

In the Debian11 system, the I2C in 26Pin is closed by default, and it needs to be opened manually to use.

Add the configuration of the red font part below to the /Boot/orangepienv.txt, and then restart the Linux system to open the I2C1, i2C3, and I2C5 at the same time. If you only need to open one, then fill in one.

The setting of I2C1_M2 is shown below:

orangepi@orangepi:~$ **sudo vim /boot/orangepiEnv.txt**

overlays=i2c1-m2 i2c3-m0 i2c5-m3

The setting of I2C1_M4 is shown below:

orangepi@orangepi:~$ **sudo vim /boot/orangepiEnv.txt**

overlays=i2c1-m4 i2c3-m0 i2c5-m3

2) After starting the linux system, first confirm that the I2C device node exists under/dev

```
orangepi@orangepi:~$ ls /dev/i2c-*
/dev/i2c-0   /dev/i2c-10   /dev/i2c-3   /dev/i2c-6   /dev/i2c-9
/dev/i2c-1   /dev/i2c-2    /dev/i2c-5   /dev/i2c-7
```

3) Then connect a I2C device on the I2C pin of the 26PIN connector

	i2c1-m2	i2c1-m4	i2c3-m0	i2c5-m3
Sda Pin	Corresponding No. 12 pin	Corresponding No. 16 pin	Corresponding No. 21 pin	Corresponding No. 3 pin

Sck Pin	Corresponding No. 15 pin	Corresponding No. 18 pin	Corresponding No. 19 pin	Corresponding No. 5 pin
Vcc Pin	Corresponding No. 1 pin	Corresponding No. 1 pin	Corresponding No. 1 pin	Corresponding No. 1 pin
Gnd Pin	Corresponding No. 6 pin	Corresponding No. 6 pin	Corresponding No. 6 pin	Corresponding No. 6 pin

4) Then use the **i2cdetect -y** command If the address of the connected I2C device can be detected, it means that I2C can be used normally

```
orangepi@orangepi:~$ sudo i2cdetect -y 1      #i2c1 command
orangepi@orangepi:~$ sudo i2cdetect -y 3      #i2c3 command
orangepi@orangepi:~$ sudo i2cdetect -y 5      #i2c5 command
```

```
orangepi@orangepi5:~$ sudo i2cdetect -y 5
[sudo] password for orangepi:
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:                         -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
20: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
50: 50 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- 68 -- -- -- -- -- -- --
70: -- -- -- -- -- -- -- --
orangepi@orangepi5:~$
```

3. 16. 4. 26pin UART Test

1) From the table below, the UART available for Orange Pi 5 is UART0, UART1, UART3, and UART4. There are four sets of UART bus

复用功能	复用功能	复用功能	GPIO	GPIO序号	引脚序号	引脚序号	GPIO序号	GPIO	复用功能	复用功能	复用功能
			3.3V		1	2		5V			
PWM13_M2 (febf0010)	UART1_RX_M1 (feb40000)	I2C5_SDA_M3	GPIO1_B7	47	3	4		5V			
	UART1_TX_M1	I2C5_SCL_M3	GPIO1_B6	46	5	6		GND			
		PWM15_IR_M2 (febf0030)	GPIO1_C6	54	7	8	131	GPIO4_A3	UART0_TX_M2 (fd890000)		
			GND		9	10	132	GPIO4_A4	UART0_RX_M2		
	PWM14_M1 (febf0020)	CAN1_RX_M1	GPIO4_B2	138	11	12	29	GPIO0_D5	CAN2_TX_M1	I2C1_SDA_M2	
		CAN1_TX_M1	GPIO4_B3	139	13	14		GND			
PWM3_IR_M0 (fd8b0030)	I2C1_SCL_M2	CAN2_RX_M1	GPIO0_D4	28	15	16	59	GPIO1_D3	UART4_RX_M0 (feb70000)	I2C1_SDA_M4	PWM1_M1 (fd8b0010)
			3.3V		17	18	58	GPIO1_D2	UART4_TX_M0	I2C1_SCL_M4	PWM0_M1 (fd8b0000)
I2C3_SCL_M0	UART3_TX_M0 (feb60000)	SPI4_MOSI_M0	GPIO1_C1	49	19	20		GND			
I2C3_SDA_M0	UART3_RX_M0	SPI4_MISO_M0	GPIO1_C0	48	21	22	92	GPIO2_D4			
	PWM3_IR_M2 (fd8b0030)	SPI4_CLK_M0	GPIO1_C2	50	23	24	52	GPIO1_C4	SPI4_CS1_M0		
			GND		25	26	35	GPIO1_A3	PWM1_M2 (fd8b0010)		

In the Debian11 system, the UART in 26Pin is closed by default, and it needs to be opened manually to use.

Add the configuration of the red font part below to the /boot/orangepienv.txt, and

then restart the Linux system to open UART0, UART1, UART3, and UART4 at the same time. If you only need to open one, then fill in one.

orangepi@orangepi:~$ **sudo vim /boot/orangepiEnv.txt**
overlays=uart0-m2 uart1-m1 uart3-m0 uart4-m0

2) After entering the linux system, first confirm whether there is a device node corresponding to UART under/dev

orangepi@orangepi:~$ **ls /dev/ttyS***
/dev/ttyS0 /dev/ttyS1 /dev/ttyS3 /dev/ttyS4 /dev/ttyS9

3) Then start testing the UART interface, first use the RX and TX of the UART interface to be tested by the DuPont line

	uart0	uart1	uart3	uart4
Tx Pin	Corresponding to No. 8 Pin	Corresponding to No. 5 Pin	Corresponding to No. 19 Pin	Corresponding to No. 18 Pin
Rx Pin	Corresponding to No. 10 Pin	Corresponding to No. 3 Pin	Corresponding to No. 21 Pin	Corresponding to No. 16 Pin

4) Use the **GPIO Serial** command to test the loop function of the serial port as shown below. If you can see the following printing, it means that the serial communication is normal

a. Test UART0

orangepi@orangepi:~$ **sudo gpio serial /dev/ttyS0**
[sudo] password for orangepi: #Enter the password here

Out: 0: -> 0
Out: 1: -> 1
Out: 2: -> 2
Out: 3: -> 3

```
Out:    4:  ->    4
Out:    5:  ->    5^C
```

b. Test UART1

```
orangepi@orangepi:~$ sudo gpio serial /dev/ttyS1
[sudo] password for orangepi:    #Enter the password here

Out:    0:  ->    0
Out:    1:  ->    1
Out:    2:  ->    2
Out:    3:  ->    3
Out:    4:  ->    4
Out:    5:  ->    5^C
```

c. Test UART3

```
orangepi@orangepi:~$ sudo gpio serial /dev/ttyS3
[sudo] password for orangepi:    #Enter the password here

Out:    0:  ->    0
Out:    1:  ->    1
Out:    2:  ->    2
Out:    3:  ->    3
Out:    4:  ->    4
Out:    5:  ->    5^C
```

d. Test UART4

```
orangepi@orangepi:~$ sudo gpio serial /dev/ttyS4
[sudo] password for orangepi:    #Enter the password here

Out:    0:  ->    0
Out:    1:  ->    1
Out:    2:  ->    2
Out:    3:  ->    3
Out:    4:  ->    4
Out:    5:  ->    5^C
```

3. 16. 5. PWM Test Method

1) From the table below, the PWM available for Orange Pi 5 includes PWM0, PWM1, PWM3, PWM13, PWM14, and PWM15.

复用功能	复用功能	复用功能	GPIO	GPIO序号	引脚序号	引脚序号	GPIO序号	GPIO	复用功能	复用功能	复用功能
			3.3V		1	2		5V			
PWM13_M2（febf0010）	UART1_RX_M1（feb40000）	I2C5_SDA_M3	GPIO1_B7	47	3	4		5V			
	UART1_TX_M1	I2C5_SCL_M3	GPIO1_B6	46	5	6		GND			
		PWM15_IR_M2（febf0030）	GPIO1_C6	54	7	8	131	GPIO4_A3	UART0_TX_M2（fd890000）		
			GND		9	10	132	GPIO4_A4	UART0_RX_M2		
	PWM14_M1（febf0020）	CAN1_RX_M1	GPIO4_B2	138	11	12	29	GPIO0_D5	CAN2_TX_M1	I2C1_SDA_M2	
		CAN1_TX_M1	GPIO4_B3	139	13	14		GND			
PWM3_IR_M0（fd8b0030）	I2C1_SCL_M2	CAN2_RX_M1	GPIO0_D4	28	15	16	59	GPIO1_D3	UART4_RX_M0（feb70000）	I2C1_SDA_M4	PWM1_M1（fd8b0010）
			3.3V		17	18	58	GPIO1_D2	UART4_TX_M0	I2C1_SCL_M4	PWM0_M1（fd8b0000）
I2C3_SCL_M0	UART3_TX_M0（feb60000）	SPI4_MOSI_M0	GPIO1_C1	49	19	20		GND			
I2C3_SDA_M0	UART3_RX_M0	SPI4_MISO_M0	GPIO1_C0	48	21	22	92	GPIO2_D4			
	PWM3_IR_M2（fd8b0030）	SPI4_CLK_M0	GPIO1_C2	50	23	24	52	GPIO1_C4	SPI4_CS1_M0		
			GND		25	26	35	GPIO1_A3	PWM1_M2（fd8b0010）		

You can see from the above table:

pwm1 can be exported from No. 16 in 26pin (PWM1_M1), or you can also guide from the 26th pin of 26Pin (PWM1_M2)

pwm3 can be exported from No. 15 in 26pin (PWM3_M0), or you can also guide from the 23rd foot of 26Pin (PWM3_M2)

Please choose the corresponding pins according to your needs. Please don't think that this is two different PWM bus.

In the Debian11 system, the PWM in 26PIN is closed by default, and you need to open it manually to use it.

Add the configuration of the red font part below to the /Boot/orangepienv.txt, and then restart the Linux system to open PWM0, PWM13, PWM14 and PWM15 at the same time. If you only need to open one, then fill in one.

orangepi@orangepi:~$ **sudo vim /boot/orangepiEnv.txt**

overlays=pwm0-m1 pwm13-m2 pwm14-m1 pwm15-m2

Select the settings of pwm1_m1 as shown below. Please do not open the pwm1_m1 and PWM1-M2 at the same time:

orangepi@orangepi:~$ **sudo vim /boot/orangepiEnv.txt**

overlays=pwm1-m1

Select the settings of pwm1_m2 as shown below：

orangepi@orangepi:~$ **sudo vim /boot/orangepiEnv.txt**

overlays=pwm1-m2

Select the settings of PWM3_M0 as shown below, PWM3-M0 and PWM3-M2 Please do not open at the same time：

```
orangepi@orangepi:~$ sudo vim /boot/orangepiEnv.txt
overlays=pwm3-m0

Select the settings of pwm3_m2 as shown below：
orangepi@orangepi:~$ sudo vim /boot/orangepiEnv.txt
overlays=pwm3-m2
```

2) After opening a PWM, a PWMCHIPX (x is a specific number) will be available in**/sys/class/pwm/**in. For example View pwmchipx of**/sys/class/pwm/**down will change from two to three

```
orangepi@orangepi:~$ ls /sys/class/pwm/
pwmchip0  pwmchip1  pwmchip2
```

3) Which pwmchip corresponds to PWM15 above? Let's first check the output of **ls /sys/class/pwm/ -l** command. As shown below

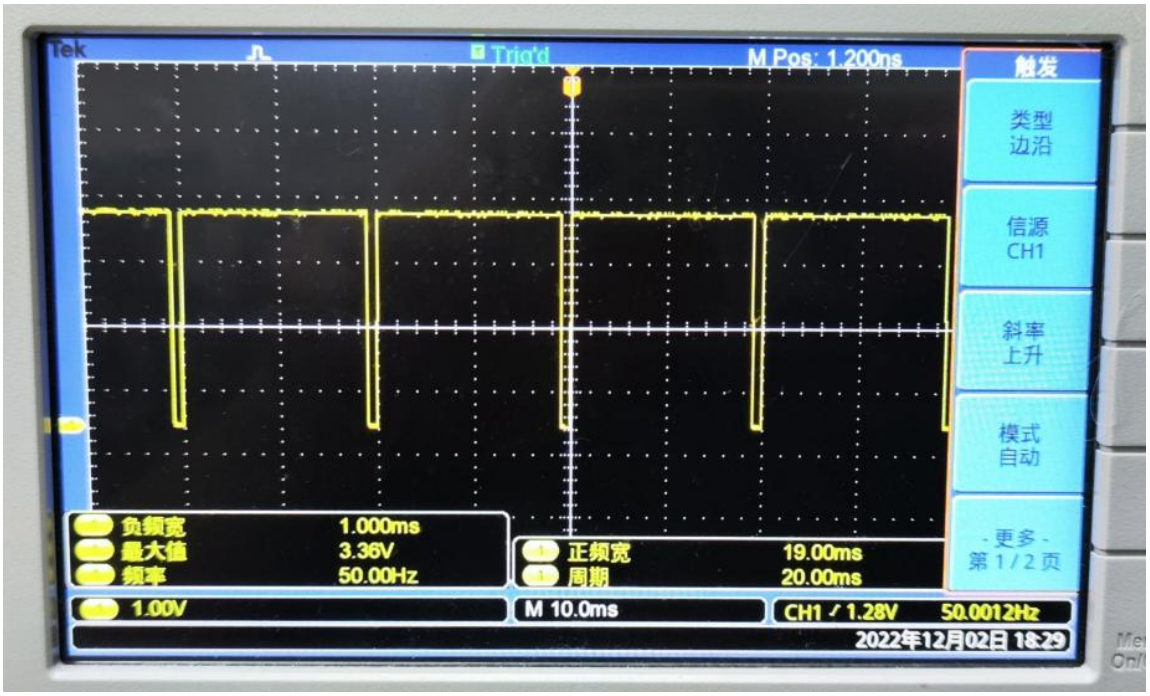
```
orangepi@orangepi5:~$ ls /sys/class/pwm/ -l
total 0
lrwxrwxrwx 1 root root 0 Dec  2 10:20 pwmchip0 -> ../../devices/platform/fd8b0020.pwm/pwm/pwmchip0
lrwxrwxrwx 1 root root 0 Dec  2 10:20 pwmchip1 -> ../../devices/platform/febd0020.pwm/pwm/pwmchip1
lrwxrwxrwx 1 root root 0 Dec  2 10:20 pwmchip2 -> ../../devices/platform/febf0030.pwm/pwm/pwmchip2
orangepi@orangepi5:~$
```

4) Then from the table below, the base address of the pwm15 register is Febf0030. Then look at the output of **ls /sys/class/pwm/ -l** command, you can see that the link in PWMCHIP2 is connected to Febf0030.PWM, so the pwm15 corresponds to PWMCHIP as PWMCHIP2

复用功能	复用功能	复用功能	GPIO	GPIO序号	引脚序号	引脚序号	GPIO序号	GPIO	复用功能	复用功能	复用功能
			3.3V		1	2		5V			
PWM13_M2（febf0010）	UART1_RX_M1（feb40000）	I2C5_SDA_M3	GPIO1_B7	47	3	4		5V			
	UART1_TX_M1	I2C5_SCL_M3	GPIO1_B6	46	5	6		GND			
		PWM15_IR_M2（febf0030）	GPIO1_C6	54	7	8	131	GPIO4_A3	UART0_TX_M2（fd890000）		
			GND		9	10	132	GPIO4_A4	UART0_RX_M2		
	PWM14_M1（febf0020）	CAN1_RX_M1	GPIO4_B2	138	11	12	29	GPIO0_D5	CAN2_TX_M1	I2C1_SDA_M2	
		CAN1_TX_M1	GPIO4_B3	139	13	14		GND			
PWM3_IR_M0（fd8b0030）	I2C1_SCL_M2	CAN2_RX_M1	GPIO0_D4	28	15	16	59	GPIO1_D3	UART4_RX_M0（feb70000）	I2C1_SDA_M4	PWM1_M1（fd8b0010）
			3.3V		17	18	58	GPIO1_D2	UART4_TX_M0	I2C1_SCL_M4	PWM0_M1（fd8b0000）
I2C3_SCL_M0	UART3_TX_M0（feb60000）	SPI4_MOSI_M0	GPIO1_C1	49	19	20		GND			
I2C3_SDA_M0	UART3_RX_M0	SPI4_MISO_M0	GPIO1_C0	48	21	22	92	GPIO2_D4			
	PWM3_IR_M2（fd8b0030）	SPI4_CLK_M0	GPIO1_C2	50	23	24	52	GPIO1_C4	SPI4_CS1_M0		
			GND		25	26	35	GPIO1_A3	PWM1_M2（fd8b0010）		

5) Then use the following command to allow the pwm15 to output a 50Hz square wave (please switch to the root user first, and then execute the following command)

```
root@orangepi:~# echo 0 > /sys/class/pwm/pwmchip2/export
root@orangepi:~# echo 20000000 > /sys/class/pwm/pwmchip2/pwm0/period
root@orangepi:~# echo 1000000 > /sys/class/pwm/pwmchip2/pwm0/duty_cycle
root@orangepi:~# echo 1 > /sys/class/pwm/pwmchip2/pwm0/enable
```



6) The other PWM testing methods are similar to the PWM15 above

3. 17. Hardware Watch The Door Dog Test

The WatchDog_teest program is pre -installed in the Debian11 system released by Orange PI for testing directly.

The method of running the WatchDog_test program is shown below:

a. The second parameter 10 indicates the counting time of the door. If there is no dog feeding in this time, the system will restart

b. We can feed the dog by pressing any key (except ESC) on the keyboard. After the dog is fed, the program will print a line of Keep Alive.

```
orangepi@orangepi:~$ sudo watchdog_test 10
open success
options is 33152,identity is sunxi-wdt
put_usr return,if 0,success:0
The old reset time is: 16
return ENOTTY,if -1,success:0
return ENOTTY,if -1,success:0
```

```
put_user return,if 0,success:0
put_usr return,if 0,success:0
keep alive
keep alive
keep alive
```

3. 18. View the serial number of the RK3588S chip

The commands of the RK3588S chip serial number are shown below. The serial number of each chip is different, so you can use the serial number to distinguish multiple development boards.

```
orangepi@orangepi:~$ cat_serial.sh
Serial          : 1404a7682e86830c
```

3. 19. Method of installing docker

1) The Debian11 image provided by Orange Pi has been pre -installed with Docker, but the Docker service is not opened by default

2) Use **enable_docker.sH** script to enable the docker service, and then you can start using the docker command, and the docker service will be automatically activated next time the system starts the system

```
orangepi@orangepi:~$ enable_docker.sh
```

3) Then you can use the following command to test the docker.

```
orangepi@orangepi:~$ docker run hello-world
Unable to find image 'hello-world:latest' locally
latest: Pulling from library/hello-world
256ab8fe8778: Pull complete
Digest:
sha256:7f0a9f93b4aa3022c3a4c147a449ef11e0941a1fd0bf4a8e6c9408b2600777c5
Status: Downloaded newer image for hello-world:latest

Hello from Docker!
This message shows that your installation appears to be working correctly.
```

```
.....
```

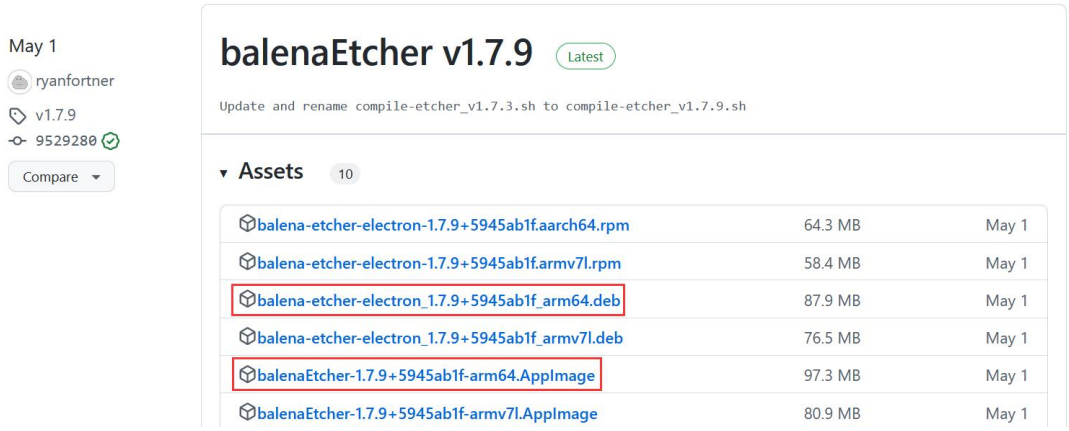
3. 20. Download the method of downloading and installing ARM64 Balenaetcher

1) The download address of Balenaetcher ARM64 is:
   a. The download address of the **.deb** installation package is shown below, you need to install it to use

https://github.com/Itai-Nelken/BalenaEtcher-arm/releases/download/v1.7.9/balena-etcher-electron_1.7.9+5945ab1f_arm64.deb

   b. The download address of the AppImage version without installation is shown below:

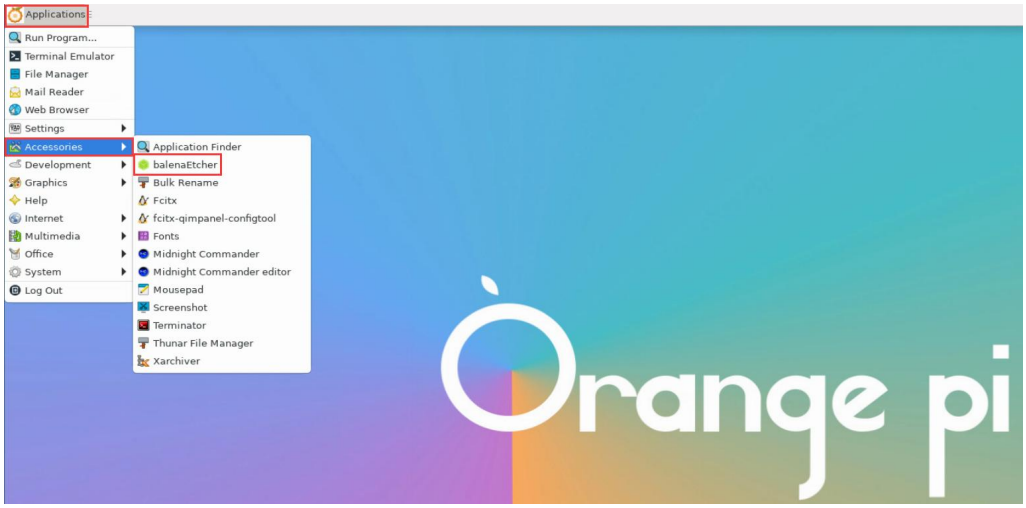
https://github.com/Itai-Nelken/BalenaEtcher-arm/releases/download/v1.7.9/balenaEtcher-1.7.9+5945ab1f-arm64.AppImage



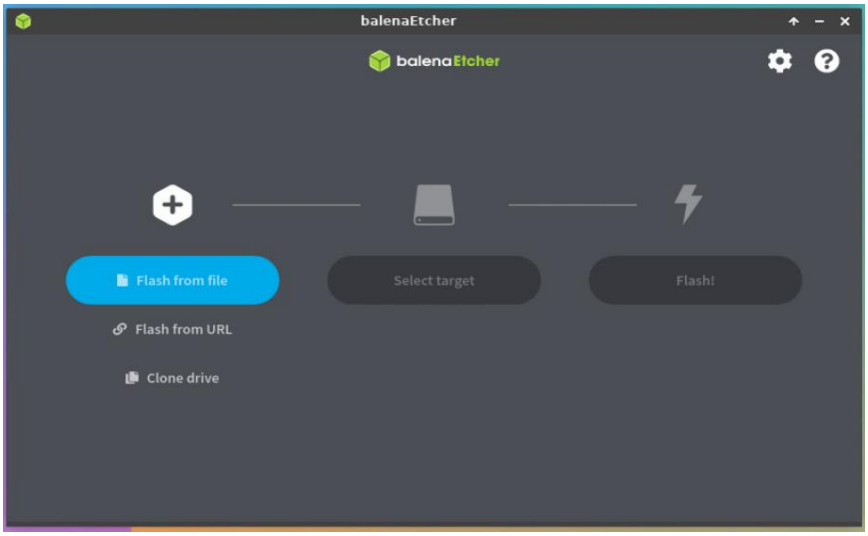
2) How to install the deb version Balenaetcher:
   a. The Balenaetcher installation command of the .**deb** version is shown below:

```
orangepi@orangepi:~$ sudo apt install -y  \
--fix-broken ./balena-etcher-electron_1.7.9+5945ab1f_arm64.deb
```

   b. After the balenaEtcher installation of deb version is completed, it can be opened in Application



c. The interface after the opening of Balenaetcher is opened as follows:

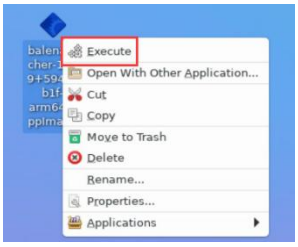


3) How to use the AppImage version of Balenaetcher：

a. First add permissions to Balenaetcher

```
orangepi@orangepi:~/Desktop$ chmod +x balenaEtcher-1.7.9+5945ab1f-arm64.AppImage
```

b. Then select the AppImage version Balenaetcher, right -click the mouse, and then click Execute to open Balenaetcher



3. 21. The installation method of the pagoda Linux panel

Pagoda Linux panel is a server management software that improves operation and maintenance efficiency. It supports more than 100 server management functions such as one -click LAMP/LNMP/Cluster/Monitoring/Website/FTP/Database/Java (excerpted from the official website of the pagoda)

1) The order of compatibility recommendation of the pagoda Linux system is

```
Debian11 > Ubuntu 22.04
```

2) Then enter the following command in the Linux system to start the installation of the pagoda

```
orangepi@orangepi:~$ sudo install_bt_panel.sh
```

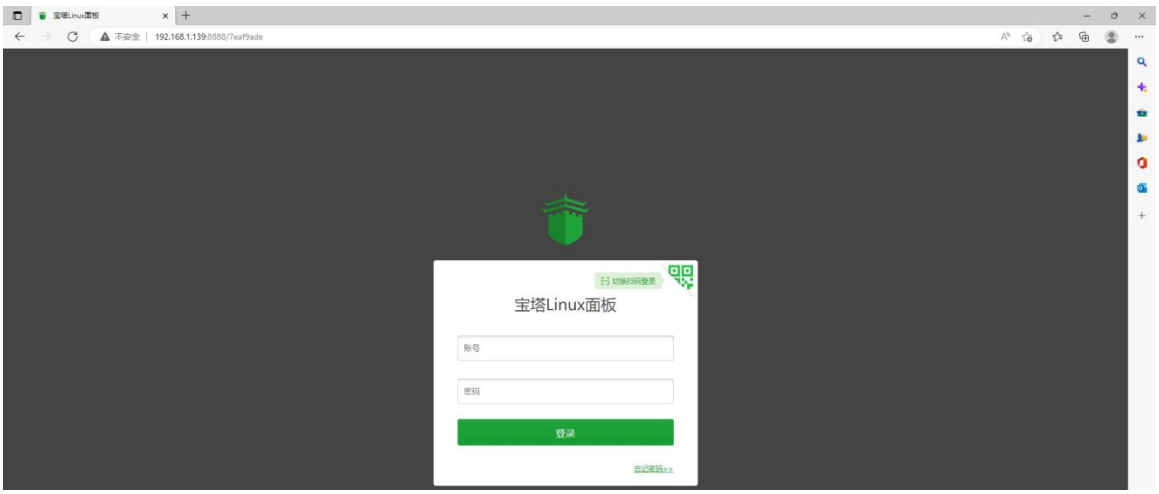
3) Then the pagoda installation program reminds whether to install **Bt-Panel** to **/www** folder, and enter Y at this time

```
+----------------------------------------------------------------------
| Bt-WebPanel FOR CentOS/Ubuntu/Debian
+----------------------------------------------------------------------
| Copyright © 2015-2099 BT-SOFT(http://www.bt.cn) All rights reserved.
+----------------------------------------------------------------------
| The WebPanel URL will be http://SERVER_IP:8888 when installed.
+----------------------------------------------------------------------

Do you want to install Bt-Panel to the /www directory now?(y/n): y
```

4) Then what to do is wait patiently. When you see the printing information below the terminal output, it means that the pagoda has been installed. The entire installation process takes about 12 minutes.There may be some differences according to the difference in network speed

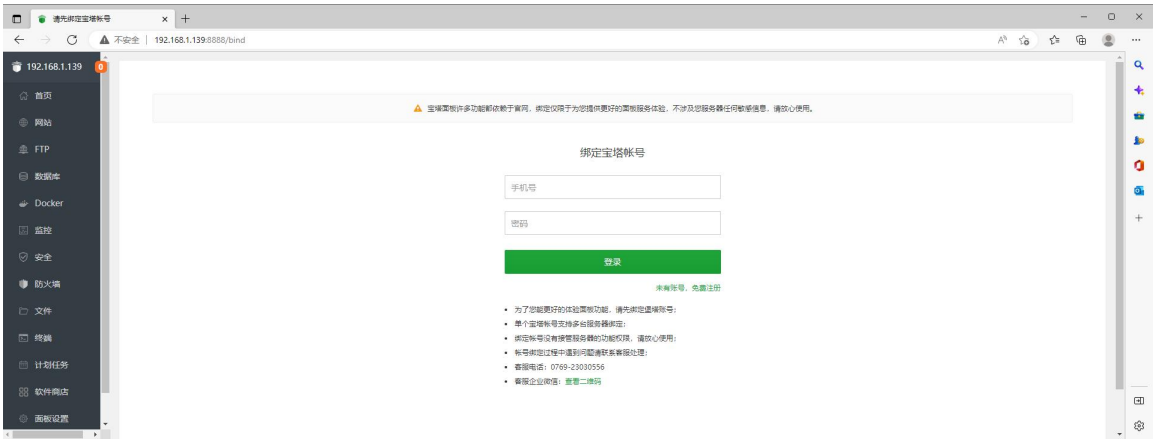
```
================================================================
Congratulations! Installed successfully!
================================================================
外网面板地址: http://183.15.204.10:8888/7eaf9ade
内网面板地址: http://192.168.1.139:8888/7eaf9ade
username: nslvetif
password: fec12d4b
If you cannot access the panel,
release the following panel port [8888] in the security group
若无法访问面板，请检查防火墙/安全组是否有放行面板[8888]端口
================================================================
Time consumed: 12 Minute!
root@orangepi5:~#
```

5) Enter the **board address** displayed above in the browser to open the login interface of the pagoda Linux panel, and then enter the **username** and **password** displayed in the corresponding position.

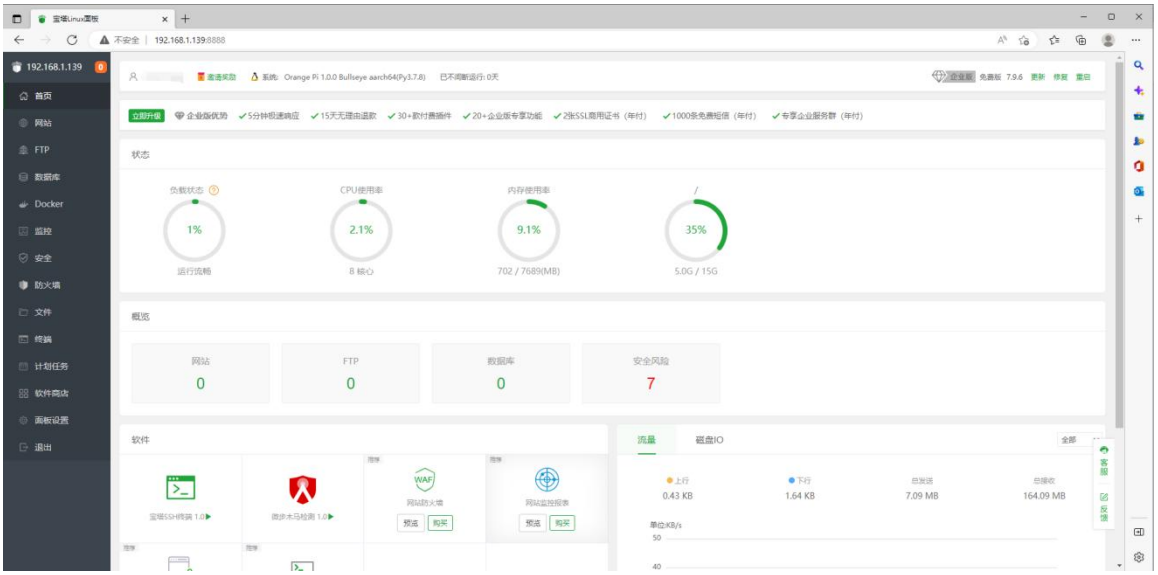


6) After successfully logging in to the pagoda, the following welcome interface will pop up. First of all, please take the intermediate user notice to read to the bottom, and then you can choose "I have agreed and read the" User Agreement ", and then click" Enter the panel " You can enter the pagoda

7) After entering the pagoda, you will first prompt the account that needs to be bound to the official website of the pagoda. If there is no account number, you can go to the official website of the pagoda (https://www.bt.cn) to register a account

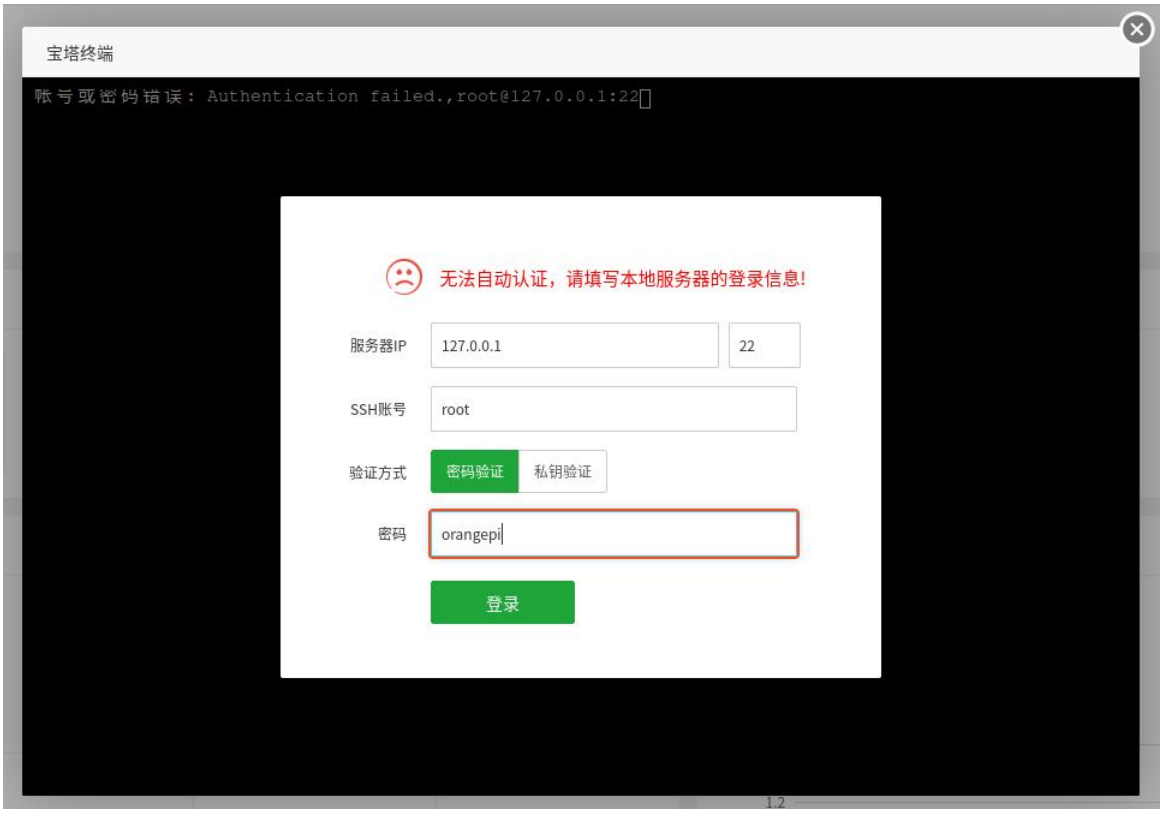


8) The final display interface is shown in the figure below. You can intuitively see some status information of the development board Linux system, such as load status, CPU usage, memory usage, and storage space usage.

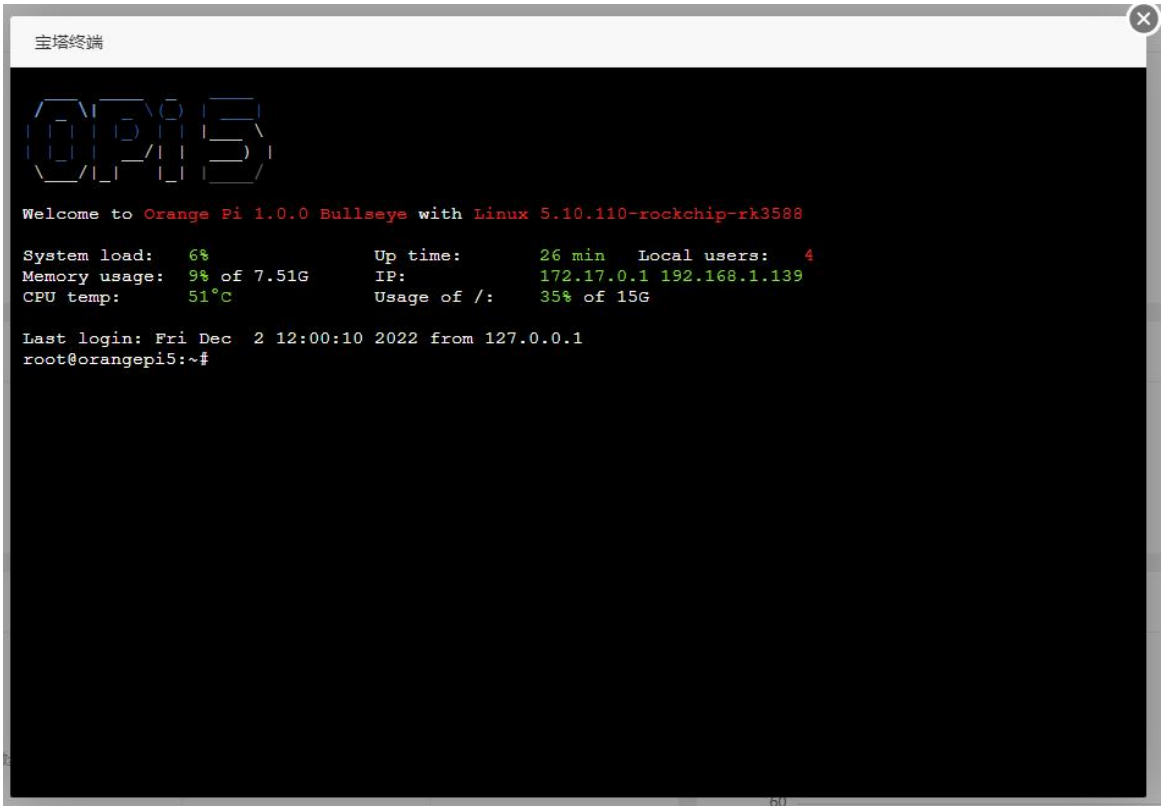


9) Test the SSH terminal login of the pagoda

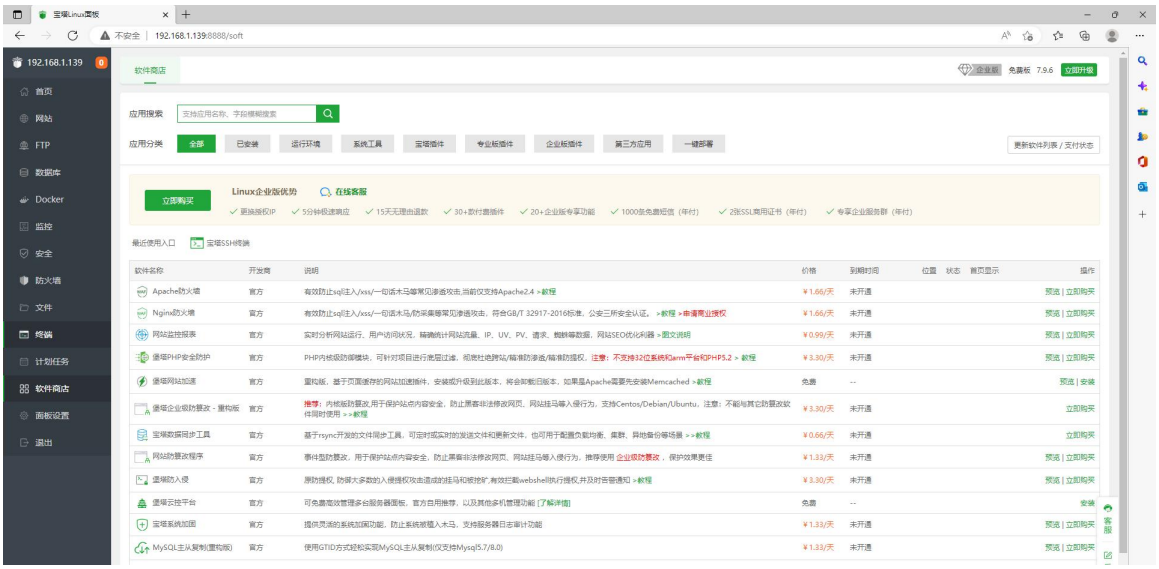
a. After opening the SSH terminal of the pagoda, you will first prompt the password of the development board system. At this time, enter **orangepi** in the password box (the default password, if you have modification, please fill in the modified one).



b. The display after successful login is shown in the figure below



10) Software such as Apache, MySQL, and PHP can be installed in the software store of the pagoda, and various applications can be deployed in one click. Please explore it yourself.



11) Pagoda command line tool test

```
orangepi@orangepi5:~$ sudo bt
[sudo] password for orangepi:
==============宝塔面板命令行==================
(1) 重启面板服务              (8) 改面板端口
(2) 停止面板服务              (9) 清除面板缓存
(3) 启动面板服务              (10) 清除登录限制
(4) 重载面板服务
(5) 修改面板密码              (12) 取消域名绑定限制
(6) 修改面板用户名            (13) 取消IP访问限制
(7) 强制修改MySQL密码         (14) 查看面板默认信息
(22) 显示面板错误日志         (15) 清理系统垃圾
(23) 关闭BasicAuth认证        (16) 修复面板(检查错误并更新面板文件到最新版)
(24) 关闭动态口令认证            (17) 设置日志切割是否压缩
(25) 设置是否保存文件历史副本  (18) 设置是否自动备份面板
(0) 取消                      (29) 取消访问设备验证
============================================
请输入命令编号：14
============================================
正在执行(14)...
============================================
curl: (28) Resolving timed out after 10000 milliseconds
==================================================================
BT-Panel default info!
==================================================================
外网面板地址: http://:8888/7eaf9ade
内网面板地址: http://192.168.1.139:8888/7eaf9ade
*以下仅为初始默认账户密码，若无法登录请执行bt命令重置账户/密码登录
username: nslvetif
password: ********
If you cannot access the panel,
release the following panel port [8888] in the security group
若无法访问面板，请检查防火墙/安全组是否有放行面板[8888]端口
==================================================================
orangepi@orangepi5:~$
```

12) For more functions of the pagoda, please refer to the following information to explore by yourself

manual：**http://docs.bt.cn**
Forum link：**https://www.bt.cn/bbs**
GitHub link：**https://github.com/aaPanel/BaoTa**

3. 22. How to remotely log in to the Linux system desktop

3. 22. 1. Use nomachine remote login

Make sure the Ubuntu or Debian system installed on the development board is a desktop version. In addition, nomachine also provides detailed documents. It is strongly recommended to read this document to be familiar with the use of nomachine. The document link is shown below:

https://knowledgebase.nomachine.com/DT10R00166

Nomachine supports Windows, Mac, Linux, iOS, and Android platforms, so we can remotely log in to control Orange PI development boards through Nomachine on a variety of devices. The following demonstrates the Linux system desktop of the Orange PI development board through Nomachine in Windows. For installation methods for other platforms, please refer to the official documentation of Nomachine.

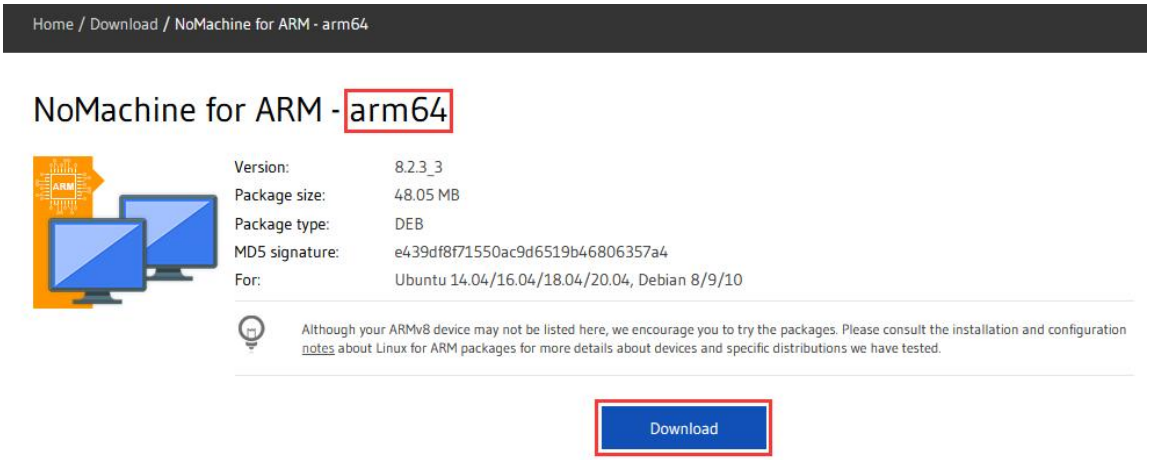
Before operation, please ensure that the Windwos computer and the development board are in the same local area network, and the Ubuntu or Debian system that can log in to the development board normally.

1) First download the installation package of Nomachine software Linux **arm64** deb version, and then install it in the linux system of the development board

a. Since RK3588S is a SOC of the ARMV8 architecture, the system we use is Ubuntu or Debian, so you need to download **Nomachine for ARMV8 DEB** installation package. The download link is shown below:

Note that this download link may change, please recognize the deb package of the Armv8/Arm64 version.

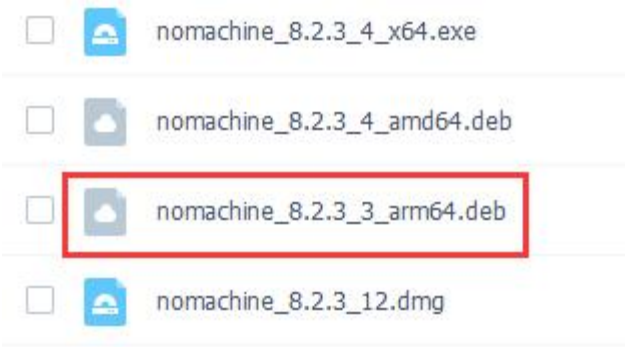
https://downloads.nomachine.com/download/?id=116&distro=ARM



b. In addition, you can also download the installation package of **NoMachine** in the official tool

First enter **the remote login software-Nomachine** folder

Then download the arm64 version of the deb installation package



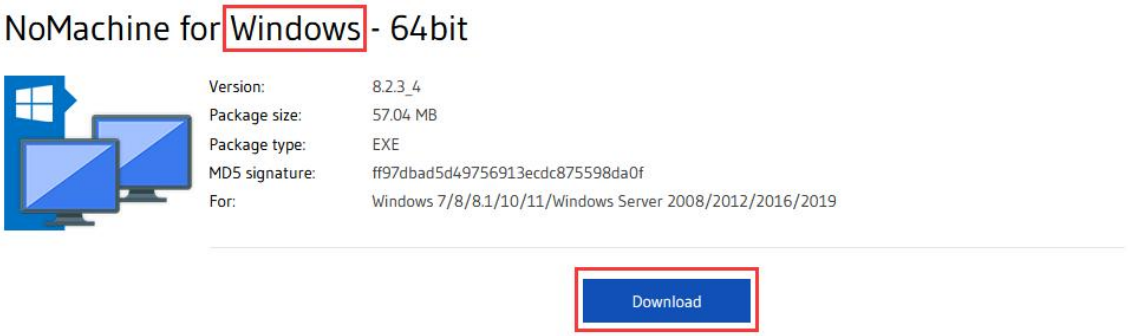
c. Then upload the downloaded **nomachine_8.2.3_arm64.deb** to the Linux system of the development board

d. Then use the following command to install **NoMachine** in the Linux system in the development board

```
orangepi@orangepi:~$ sudo dpkg -i nomachine_8.2.3_3_arm64_arm64.deb
```

2) Then download the NoMachine software Windows version of the installation package, the download address is shown below

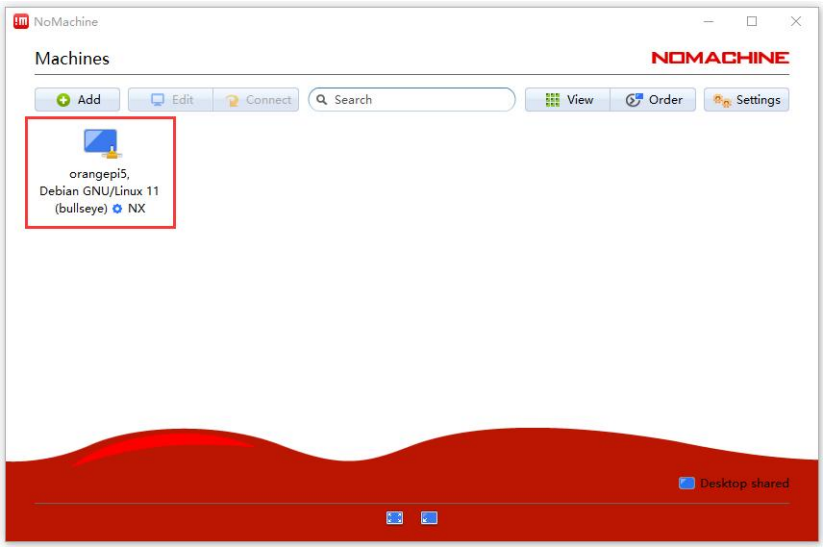
https://downloads.nomachine.com/download/?id=8



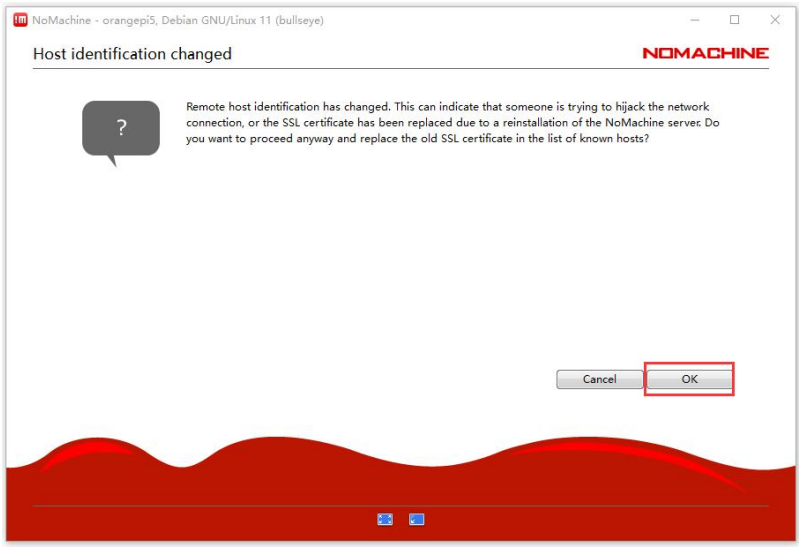
3) Then install nomachine in Windows, **please restart the computer after installation**

4) Then open **NoMachine** in Window

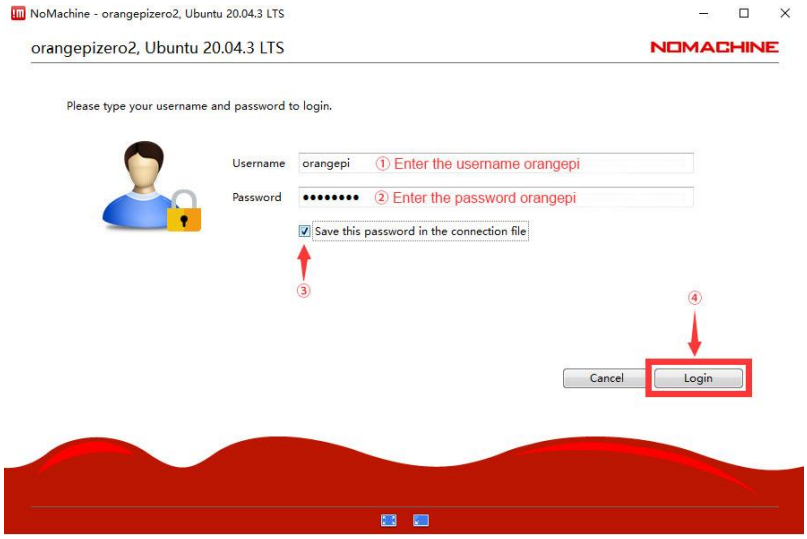
5) After NoMachine starts, it will automatically scan the other equipment installed in the local area network with NoMachine. After entering the main interface of NoMachine, you can see that the development board is already in the connected device list, and then click the location shown in the red box below in the figure below. You can start logging in to the linux system desktop of the development board



6) Then click **OK**



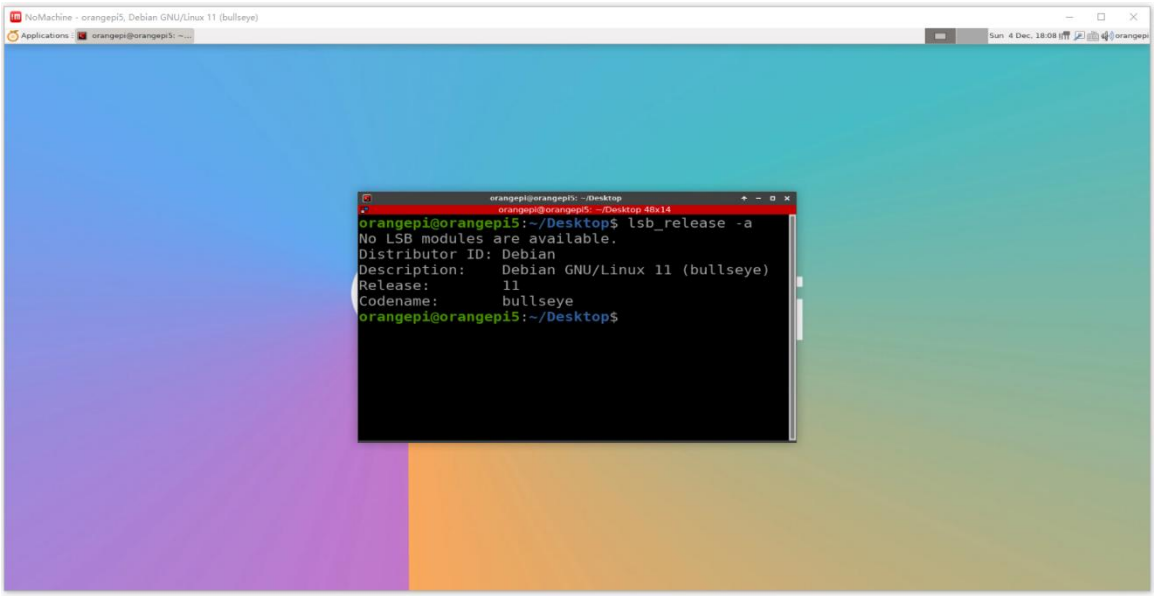
7) Then enter the user name and password of the linux system in the corresponding position in the figure below, and then click **login** to start logging in



8) Then click OK in the next interface

9) Finally, you can see the desktop of the development board Linux system

a. Debian11



3. 22. 2. Use VNC Remote Login

Please ensure that Windwos computers and development boards are in the same local area network before operation, and can log in to the Ubuntu or Debian system that can log in to the development board normally

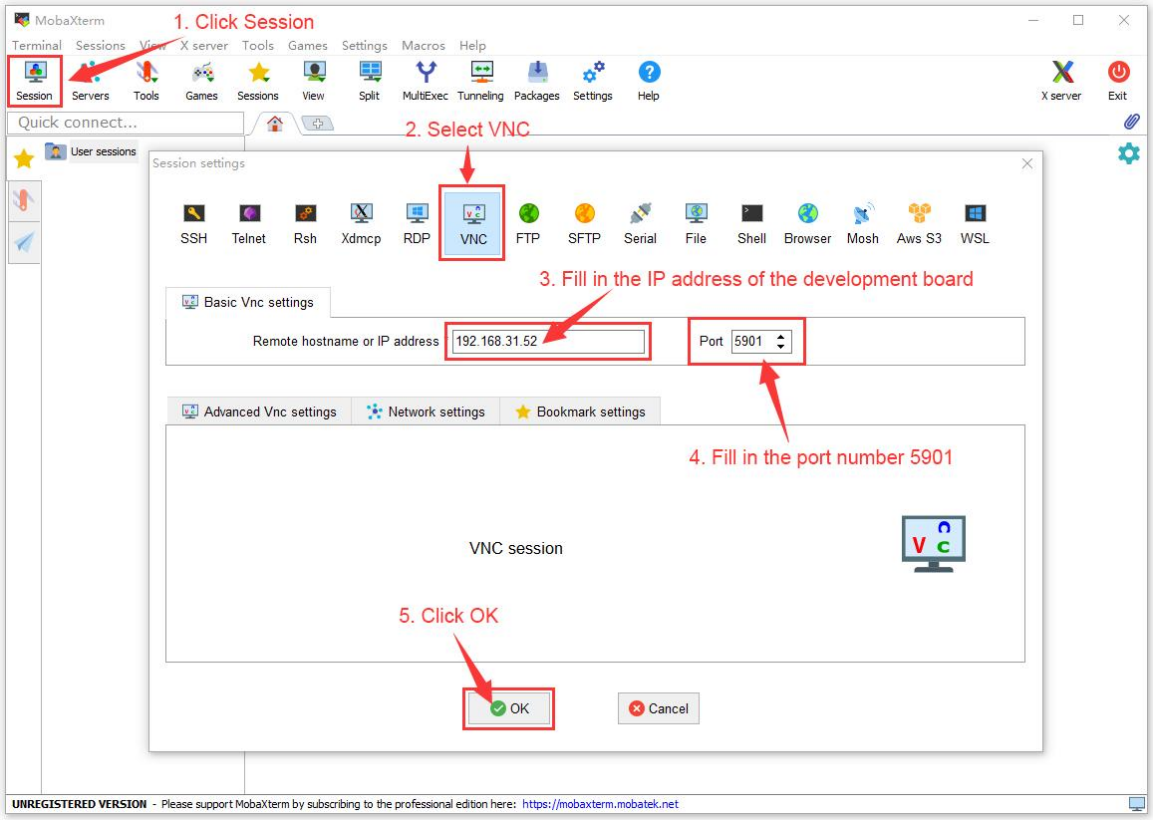
1) First run the **set_vnc.sh** script settings, **remember to add sudo permissions**

```
orangepi@orangepi:~$ sudo set_vnc.sh
You will require a password to access your desktops.
```

```
Password:          #Set the vnc password here, 8 -bit characters
Verify:            #Set the vnc password here, 8 -bit characters
Would you like to enter a view-only password (y/n)? n
xauth:    file /root/.Xauthority does not exist

New 'X' desktop is orangepi5:1

Creating default startup script /root/.vnc/xstartup
Starting applications specified in /root/.vnc/xstartup
Log file is /root/.vnc/orangepi5:1.log

Killing Xtightvnc process ID 3047

New 'X' desktop is orangepi5:1

Starting applications specified in /root/.vnc/xstartup
Log file is /root/.vnc/orangepi5:1.log
```

2) The steps to connect the development board Linux system desktop using MobaxTerm software are shown below:

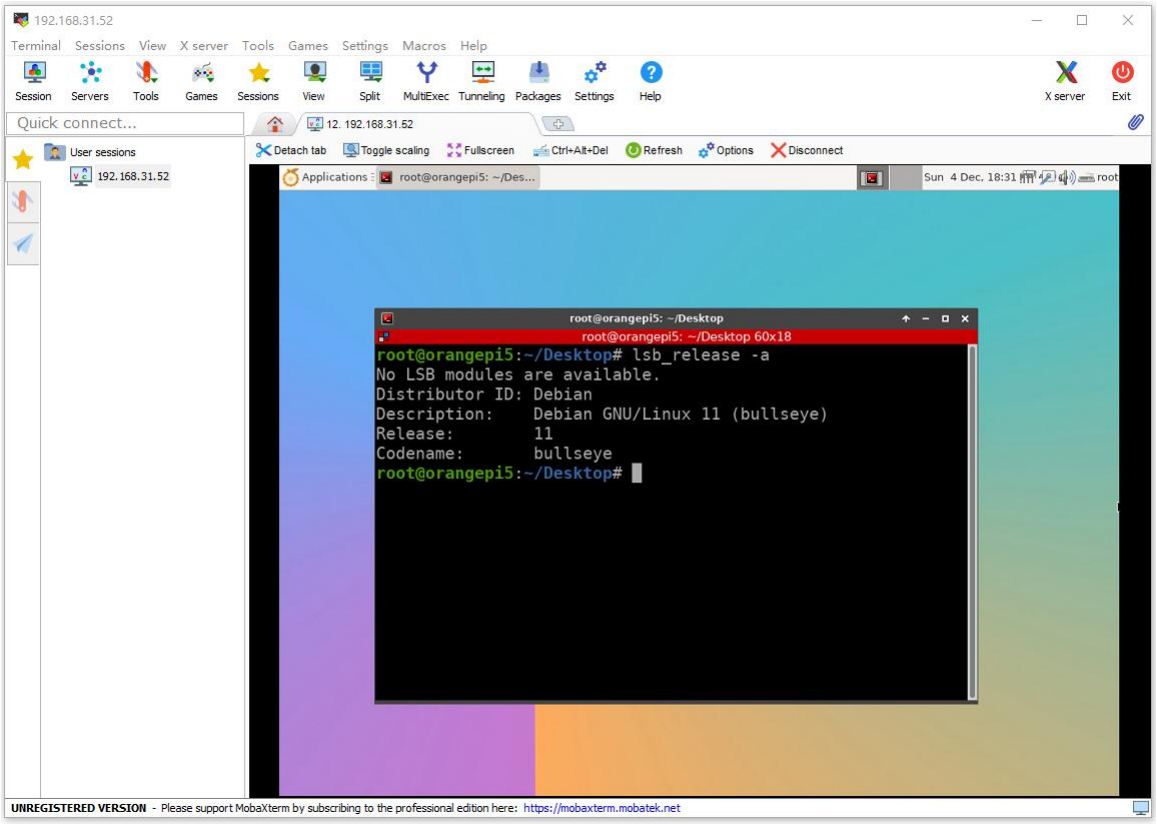
a. First click Session, then select VNC, then fill in the IP address and port of the development board, and finally click OK to confirm



b. Then enter the password of the VNC set before

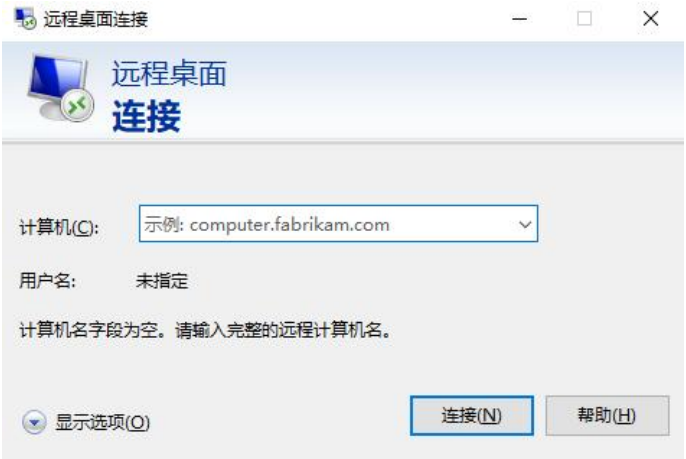
c. The interface after the login is successfully displayed as shown in the figure below, and then you can remotely operate the desktop of the linux system remotely.

a) Debian11 login shows the following shown



3) The steps to log in to the development board Linux system desktop using the **remote desktop connection** of Windows are

a. First open the **remote desktop connection** that comes with Windows



b. Then enter the IP address of the development board

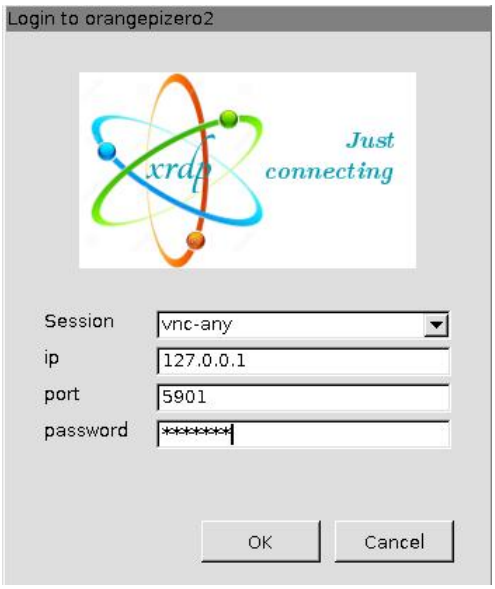
c. Then set the connection information according to the description below

a) **Session：** You need to choose vnc-ay

b) **ip：** You can enter 127.0.0.0 or the IP address of the development board

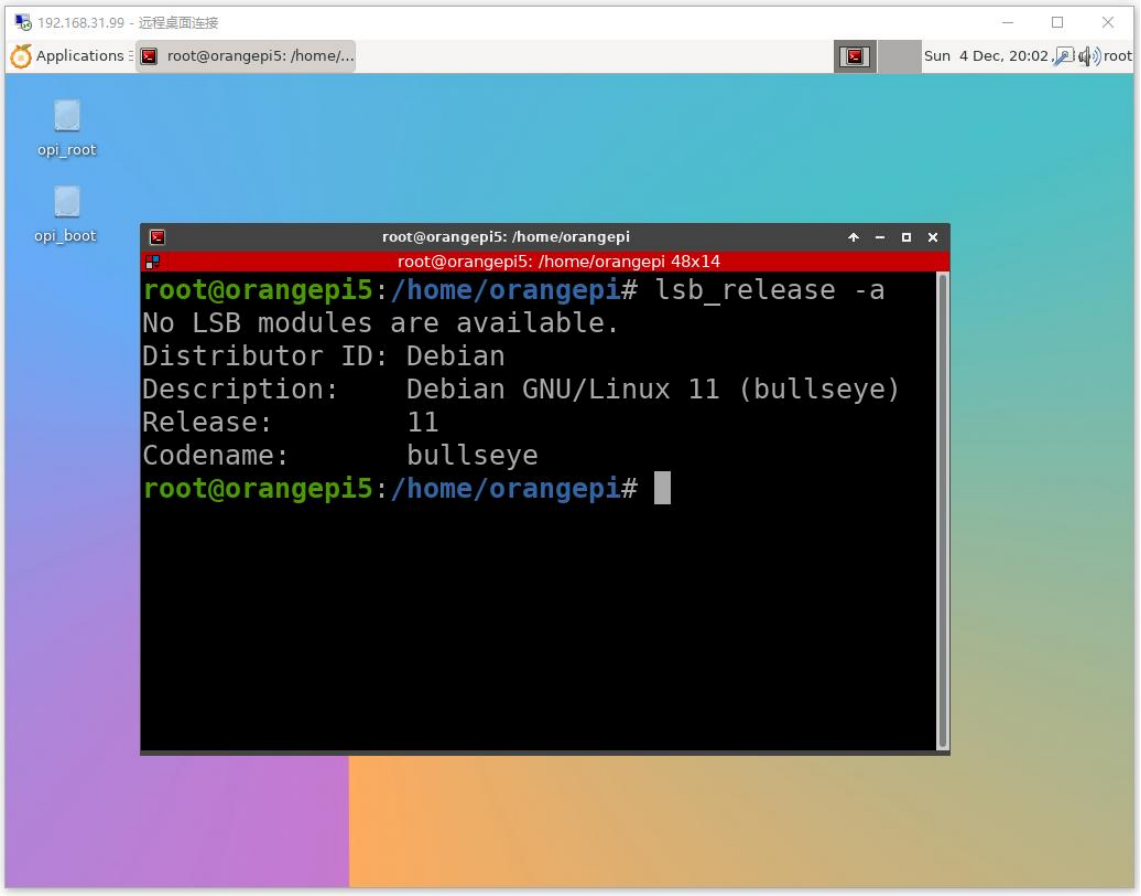
c) **port：** Generally 5901

d) **password：** You need to enter the password of vnc



d. The display of successfully logging in to the development board Linux system desktop is shown in the figure below

a) Debian11 login shows the following shown



3. 23. Some programming language test supported by the Linux system

3. 23. 1. Debian Bullseye system

1) Debian Bullseye is installed with the gcc compilation tool chain by default, which can directly compile the C language program in the linux system of the development board

a. The version of gcc is shown below

```
orangepi@orangepi:~$ gcc --version
gcc (Debian 10.2.1-6) 10.2.1 20210110
Copyright (C) 2020 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.
```

b. The **hello_World.c** program that writes **C** language

```
orangepi@orangepi:~$ vim hello_world.c
```

```
#include <stdio.h>

int main(void)
{
        printf("Hello World!\n");

        return 0;
}
```

c. Then compile and run **hello_world.c**

```
orangepi@orangepi:~$ gcc -o hello_world hello_world.c
orangepi@orangepi:~$ ./hello_world
Hello World!
```

2) Debian Bullseye's default installation with Python3

a. Python specific version is shown below

```
orangepi@orangepi:~$ python3
Python 3.9.2 (default, Feb 28 2021, 17:03:44)
[GCC 10.2.1 20210110] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

b. The **hello_world.py** program that writes python language

```
orangepi@orangepi:~$ vim hello_world.py
print('Hello World!')
```

c. The results of running **hello_world.py** are shown below

```
orangepi@orangepi:~$ python3 hello_world.py
Hello World!
```

3) Debian Bullseye's compilation tool and operating environment without Java default

a. You can use the following command to install openjdk, the latest version in Debian Bullseye is openjdk-17

```
orangepi@orangepi:~$ sudo apt install -y openjdk-17-jdk
```

b. After installation, you can check the version of Java

```
orangepi@orangepi:~$ java --version
```

c. Write the Java version of **hello_world.java**

```
orangepi@orangepi:~$ vim hello_world.java
```

```
public class hello_world
{
        public static void main(String[] args)
        {
                System.out.println("Hello World!");
        }
}
```

d. Then compile and run **hello_world.java**

```
orangepi@orangepi:~$ javac hello_world.java
orangepi@orangepi:~$ java hello_world
Hello World!
```

3. 23. 2. Ubuntu Jammy System

1) Ubuntu Jammy is installed with the gcc compilation tool chain by default, which can directly compile the C language program in the linux system of the development board

a. The version of gcc is shown below

```
orangepi@orangepi:~$ gcc --version
gcc (Ubuntu 11.2.0-19ubuntu1) 11.2.0
Copyright (C) 2021 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.
```

b. The **hello_World.c** program that writes C language

```
orangepi@orangepi:~$ vim hello_world.c
#include <stdio.h>

int main(void)
{
        printf("Hello World!\n");

        return 0;
}
```

c. Then compile and run **hello_world.c**

```
orangepi@orangepi:~$ gcc -o hello_world hello_world.c
orangepi@orangepi:~$ ./hello_world
```

```
Hello World!
```

2) Ubuntu jammy is installed with Python3 by default

a. Python3 specific version is shown below

```
orangepi@orangepi:~$ python3
Python 3.10.4 (main, Apr  2 2022, 09:04:19) [GCC 11.2.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

b. The **hello_world.py** program that writes Python language

```
orangepi@orangepi:~$ vim hello_world.py
print('Hello World!')
```

c. The results of running **hello_world.py** are shown below

```
orangepi@orangepi:~$ python3 hello_world.py
Hello World!
```

3) Ubuntu Jammy defaults to compile tools and operating environments that are not installed in Java

a. You can use the following command to install openjdk-18

```
orangepi@orangepi:~$ sudo apt install -y openjdk-18-jdk
```

b. After installation, you can check the version of Java

```
orangepi@orangepi:~$ java --version
openjdk 18-ea 2022-03-22
OpenJDK Runtime Environment (build 18-ea+36-Ubuntu-1)
OpenJDK 64-Bit Server VM (build 18-ea+36-Ubuntu-1, mixed mode, sharing)
```

c. Write the java version **hello_world.java**

```
orangepi@orangepi:~$ vim hello_world.java
public class hello_world
{
        public static void main(String[] args)
        {
                System.out.println("Hello World!");
        }
}
```

d. Then compile and run **hello_world.java**

```
orangepi@orangepi:~$ javac hello_world.java
```

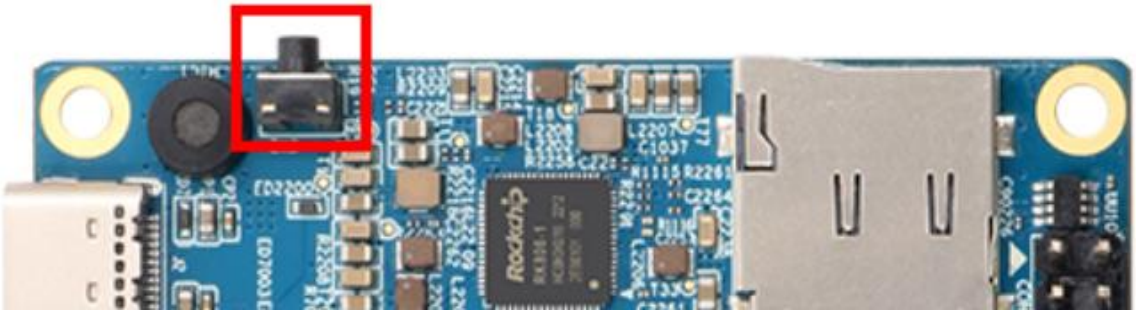
```
orangepi@orangepi:~$ java hello_world
Hello World!
```

3. 24. The method of shutting down and restarting the development board

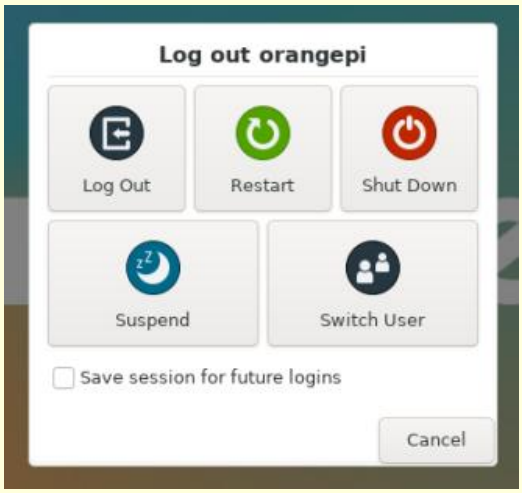
1) In the process of running the linux system, if the Type-C power supply is directly out of power, it may cause the file system to lose certain data or damage. Therefore, please use the **poweroff** command to turn off the linux system of the development board before power off, and then then again Unplug the power supply

```
orangepi@orangepi:~$ sudo poweroff
```

2) In addition, the development board is equipped with a switch button, and you can also **press the switch button** on the development board to turn off

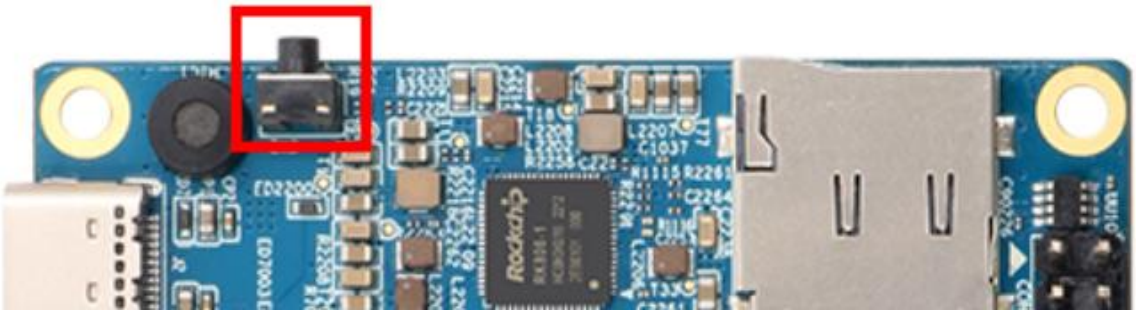


Note that the Debian11 desktop version system will pop up the confirmation box shown in the figure below after pressing the buttons. You need to click the Shut Down option before turning off。



In addition, please note that the Suspend function shown in the figure above is unavailable

3) After shutting down, press the switch button on the development board to turn on.



4) Restart the command of the Linux system

```
orangepi@orangepi:~$ sudo reboot
```