
Forlinx Embedded T527 Documentation

Forlinx Embedded

Aug 30, 2025

HARDWARE

1	HARDWARE	2
2	SOFTWARE	3
2.1	Linux5.15.147_User's Manual	3
2.2	Linux5.15.147_User's Compilation Manual	124
3	APPLICATION NOTE	195
3.1	Quick Boot	195
3.2	Display Interface	197
4	Contact Us	201

 Note

To return to the **main Forlinx documentation site**, visit:

[Forlinx Documentation Main Page](#)

Official product overview:

[FET527N-C System On Module](#)

**CHAPTER
ONE**

HARDWARE

2.1 Linux5.15.147_User' s Manual

Document classification: Top secret Secret Internal information Open

2.1.1 Copyright

The copyright of this manual belongs to Baoding Folinx Embedded Technology Co., Ltd. Without the written permission of our company, no organizations or individuals have the right to copy, distribute, or reproduce any part of this manual in any form, and violators will be held legally responsible.

Forlinx adheres to copyrights of all graphics and texts used in all publications in original or license-free forms.

The drivers and utilities used for the components are subject to the copyrights of the respective manufacturers. The license conditions of the respective manufacturer are to be adhered to. Related license expenses for the operating system and applications should be calculated/declared separately by the related party or its representatives.

2.1.2 Overview

This manual is designed to help users quickly familiarize themselves with the product, and understand the interface functions and testing methods. It primarily covers the testing of interface functions on the development board, the methods for flashing images, and troubleshooting procedures for common issues encountered in use. In the process of testing, some commands are annotated to facilitate the user's understanding, mainly for practical use. Please refer to "OK527N-C _ Linux 5.15.147 + Qt5.15.8 User's Compilation Manual" provided by Forlinx for kernel compilation, related application compilation methods and development environment construction.

There are total six parts:

Chapter 1. provides an overview of the product, briefly introducing the interface resources of the development board, the relevant driver paths in the kernel source code, supported flashing and booting methods, as well as explanations of key sections in the documentation;

Chapter 2. is the fast boot/startup of the product, which can adopt two ways of serial port login and network login;

Chapter 3. is QT interface function test of the product;

Chapter 4. is the command line operation of the product for functional testing;

Chapter 5. is the multimedia test of the product, including the playback test of the camera and the video hardware codec test;

Chapter 6. is the image update of the product, which mainly describes the method of updating the image to the storage device. Users can choose the corresponding flashing mode according to the actual situation.

A description of some of the symbols and formats in the manual:

Format	Meaning
//	Interpretation of input instructions or output information
Username@Hostname	root@OK527:~#: Development board serial port login account information,

forlinx@ubuntu: Ubuntu development environment account information

Users can determine the operating environment for functional operations based on this information.

Example: After inserting the TF card, you can use the “ls” command to view the mounting directory.

```
root@OK527:/# ls /run/media                                //List files in the /run/
˓→media directory
mmcblk0p1 mmcblk0p5 mmcblk1p1
```

root@OK527: The username is “root”, the hostname is “OK527”, indicating operations are being performed on the development board using the root user.

// : Explanation of ls /run/media operation, no input required.

2.1.3 Application Scope

This software manual applies to the ForlinxOK527 (V1.3) platform Linux5.15.147 operating system.

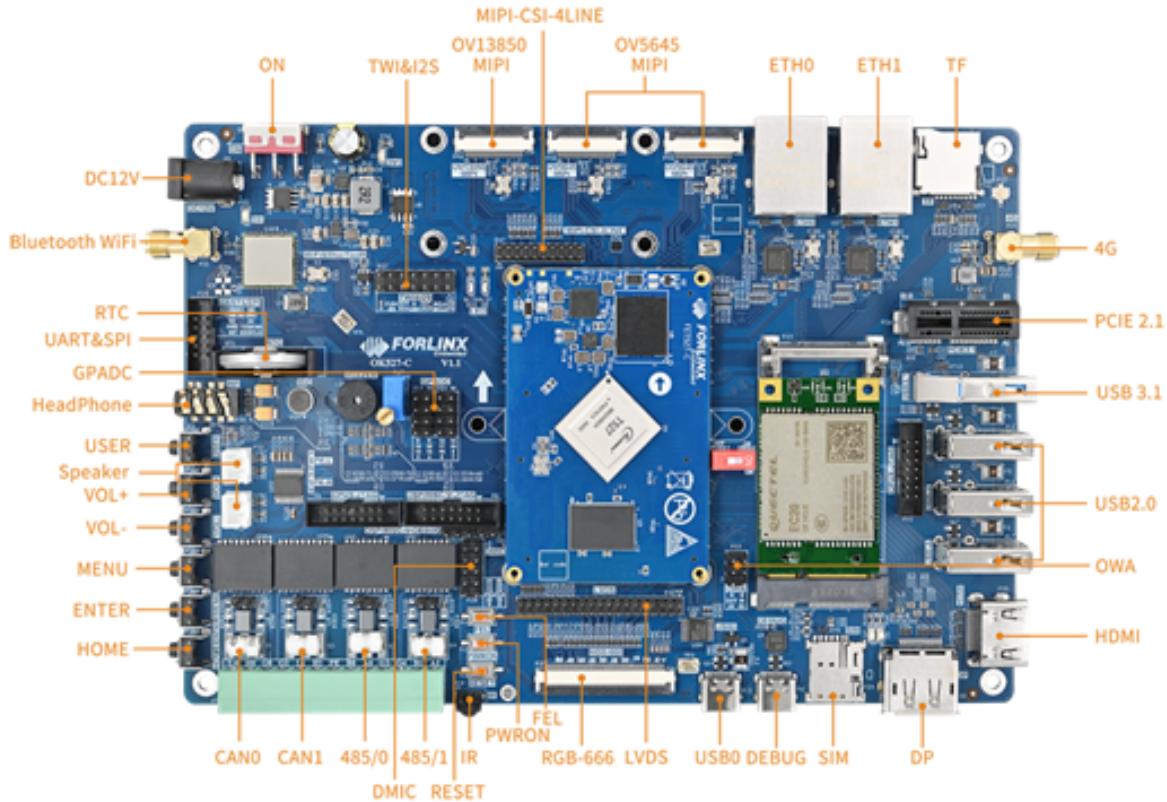
2.1.4 Revision History

Date	Manual Version	SoM Version	Carrier Board Version	Revision History
28/04/2025	V1.0	V1.1	V1.1 and Above	User's Manual Initial Version

2.1.5 1. OK527 Development Board Description

1.1 OK527 Development Board Description

OK527 development board uses a SoM+ carrier board structure, designed and developed based on the AllWinner T527 processor. The processor features an ARM Cortex-A55, 2Tops NPU, HiFi4 DSP, G57 MC1 GPU multi-core heterogeneous architecture. The processor consists of four small cores with a frequency of 1.4GHz and four big cores with a frequency of 1.8GHz. The SoM comes in two configurations: one with 4GB LPDDR4 memory and 32GB eMMC, and the other with 2GB LPDDR4 memory and 16GB eMMC. The OK527N-C development board offers rich interface resources and multiple peripheral interfaces, including network card, CPU built-in audio codec, GPADC, LRADC, TF Card, LVDS, HDM, DP, RGB, WiFi, 4G, PCIe, MIPI-CSI, and more.



Note:

The hardware parameters are not described in this software manual. Before referring to this manual for software development, please read “OK527N-C _ Hardware Manual” under the path of “U disk Path: User Data \ Hardware Data \ 1-Manual” to understand the product naming rules and the hardware configuration information of the product you use, which is helpful for you to use this product.

1.2 Introduction to Linux 5.15.104 System Software Resources

Device	Location of driver source code in the kernel	Device Name
NIC Driver	bsp/drivers/gmac/ bsp/drivers/stmmac	/sys/class/net/eth0 /sys/class/net/eth1
LCD Backlight Driver	drivers/video/backlight/	/dev/disp
LED Driver	drivers/leds/	/sys/class/leds/
USB Port	drivers/usb/storage/	/dev/sd*
USB 4G	drivers/usb/serial/	/dev/ttyUSB*
USB Camera	drivers/media/usb/uvc/uvc_video.c	/dev/video*
SD Driver	bsp/drivers/mmc/	/dev/block/mmcblk_p_
LCD FrameBuffer	bsp/drivers/video/sunxi/	/dev/fb*
serial port driver	bsp/drivers/uart/sunxi-uart.c	/dev/ttyAS*
watchdog driver	bsp/drivers/watchdog/	/dev/watchdog
WIFI	drivers/net/wireless/nxp/mlan/	/sys/class/net/wlan0
Audio Driver	bsp/drivers/sound/platform	/dev/snd/
SPI	bsp/drivers/spi/ drivers/spi/	/dev/spidev*. *
TWI Driver	bsp/drivers/twi/	/dev/i2c-*
PWM Driver	bsp/drivers/pwm/	/dev/sunxi_pwm*
GT911/GT928 touch driver	drivers/input/touchscreen/goodix.c	/dev/input/event*
ft5x06 Touch Driver	drivers/input/touchscreen/edt-ft5x06.c	/dev/input/event*
GPADC driver	bsp/drivers/gpadc/	/dev/input/event*
LRADC key driver	bsp/drivers/lradc/	/dev/input/event*
RTC Driver	drivers/rtc/rtc-rx8010.c	drivers/rtc/rtc-pcf8563.c
IR Driver	bsp/drivers/ir-rx/	/dev/input/event*
awlink driver	bsp/drivers/awlink/	/sys/class/net/awlink*

1.3 Flashing and Boot Settings

OK527 supports TF card and USB OTG programming, and the hardware supports eMMC startup.

Insert the TF card into the development board before powering on. After powering on, the TF card flashing process will begin; otherwise, it will boot from eMMC. For detailed flashing instructions, please refer to the “System Flashing” .

Note: The OK527 development board does not support SPI NOR booting.

2.1.6 2. Fast Startup

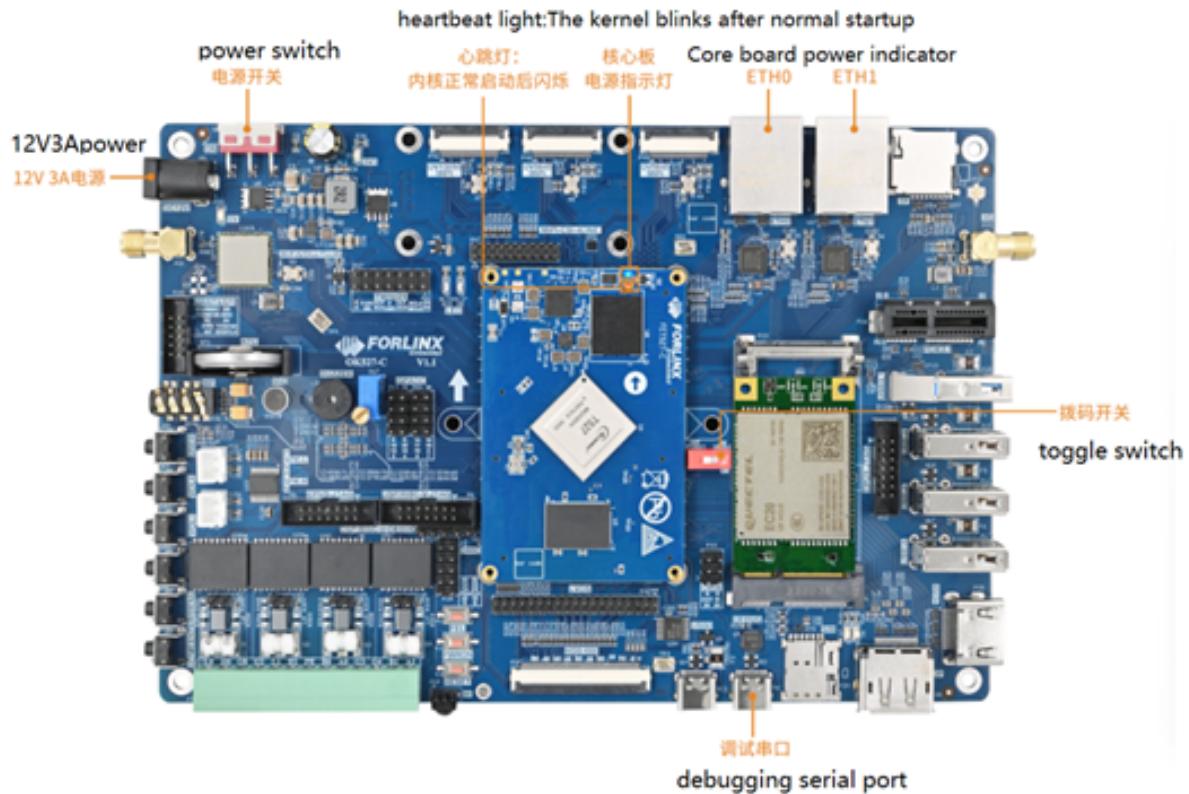
2.1 Preparation Before Startup

The OK527 development board has two system login methods, serial and network login.

Hardware preparation before system startup:

- 12V3A DC Power Cable;
- Debugging serial cable (Serial Login);
- The development board features a USB Type-C port for debugging purposes, allowing you to connect it to a PC using a Type-A to Type-C cable in order to access the board’s status information;
- Network cable (for network login);
- According to the development board interface to connect the screen (Based on display needs);

- Check the booting method (the system will prioritize booting from the TF card if inserted; otherwise, it will boot from eMMC).



2.2 Serial Port Login

2.2.1 Serial Login

Description:

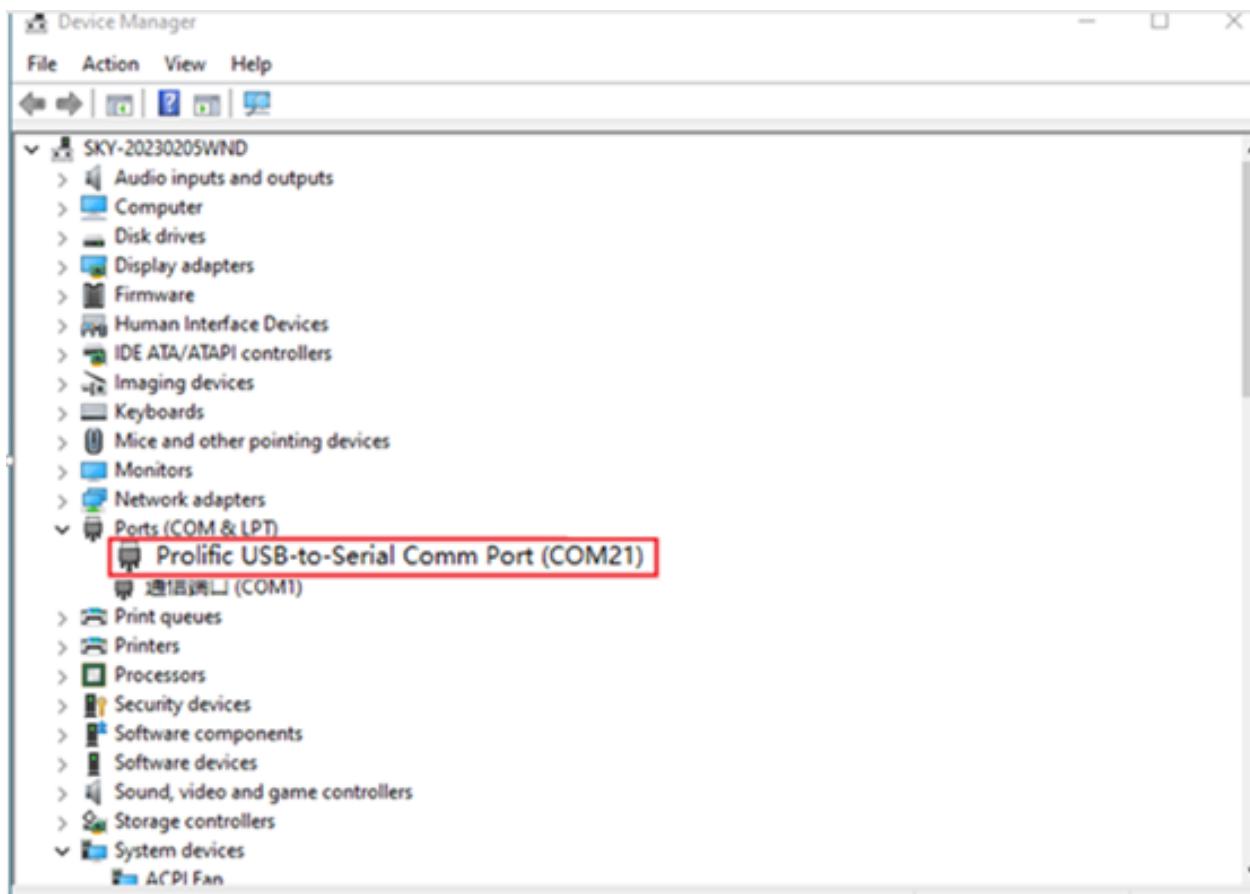
- Serial port settings:** Baud rate 115200, data bit 8, stop bit 1, no parity bit, no flow control;
- The serial terminal login uses the root user without password;**
- Software requirements:** PC Windows system needs to install the terminal software. Because the terminal software has many types, users can choose their familiar one.

The following is an example of how to set up the terminal using putty (02-User Information \01-Software Information \04-Tools\putty-64-bit_x86.exe):

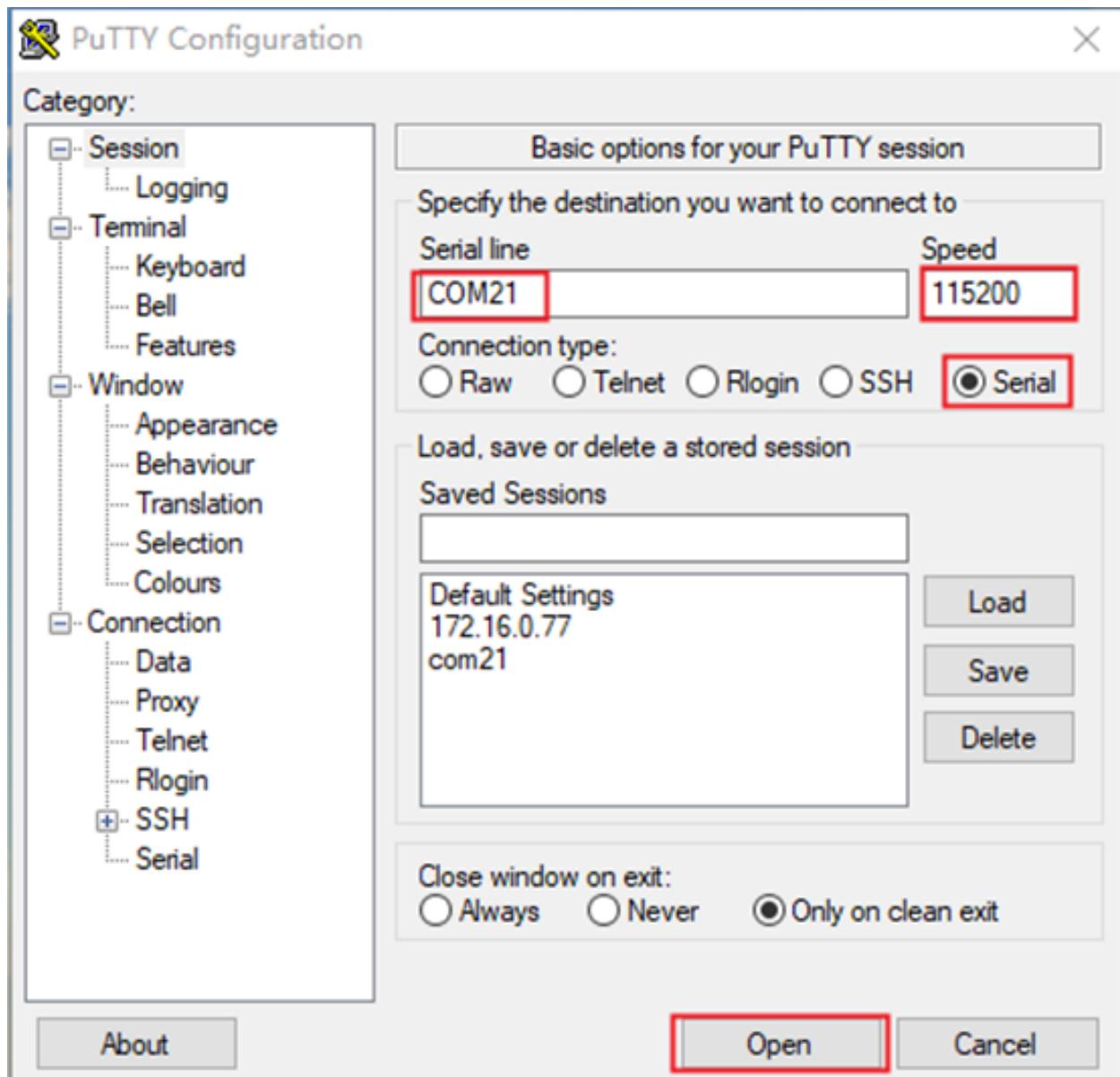
Step 1: Connect the development board and the PC using a serial cable, and verify the serial port number recognized by the computer through the “Device Manager” .

The port number recognized by the computer should be considered as the accurate one;

Choose “USB-Enhanced-SERIAL-A CH342” .



Step 2: Open and configure PuTTY; set the serial line to match the COM port of your computer with a baud rate of 115200.



Step 3: Power on the development board. Serial port will output printing information until “root@OK527:/#” appears, indicating the completion of the boot process. The system defaults to the root account with no password required for login.

2.2.2 Serial Login Common Problems

Connect the PC side to the development board through the Type-C adapter cable and install the corresponding driver (User Information\Software Information\3-Tools\CH343SER.ZIP).

It is better to use a good quality cable to avoid error codes.

2.3 Network Login Methods

2.3.1 Network Connection Test

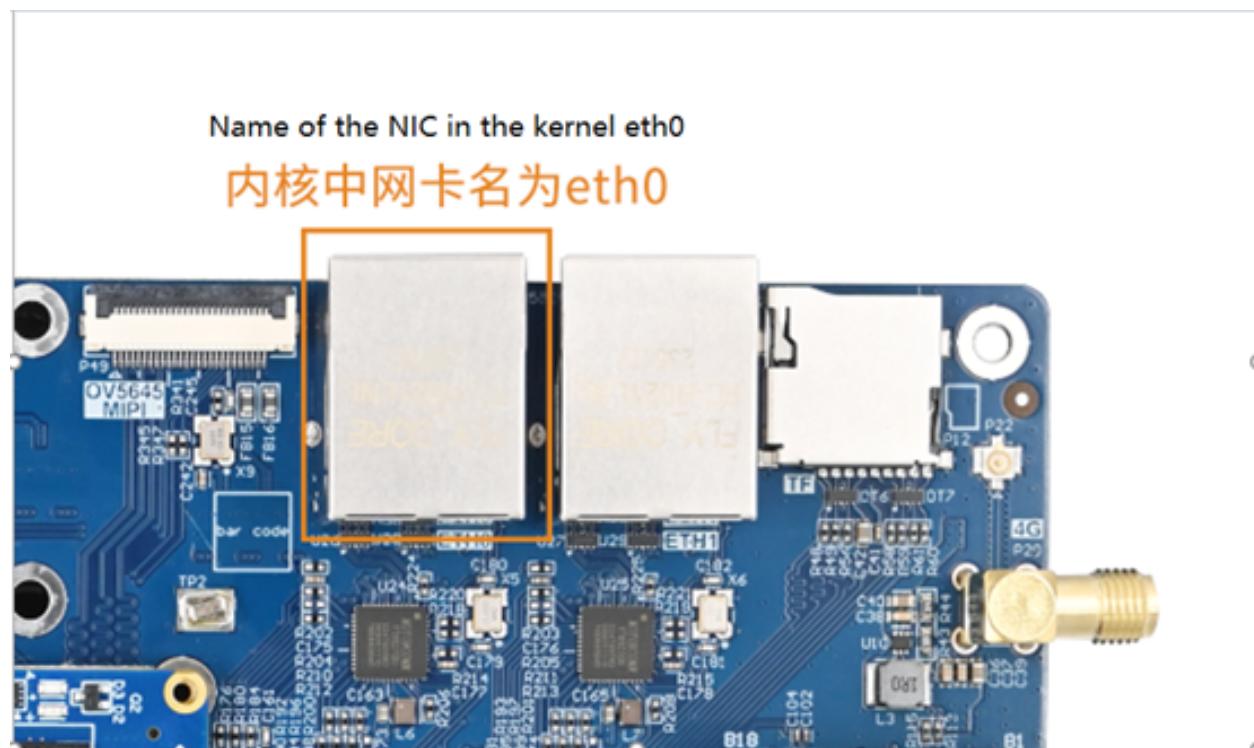
Description:

- The default factory IP for eth0 is 192.168.0.232;
 - The computer and board should be on the same network segment for testing.

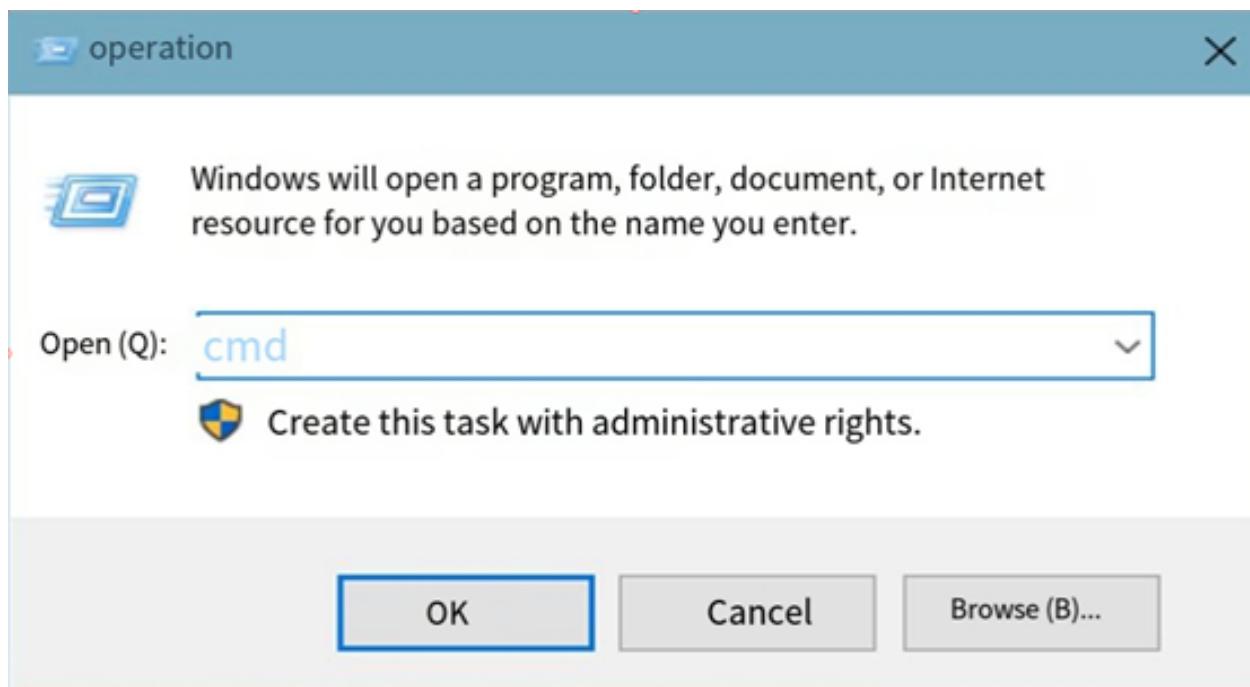
Before login, you should ensure the network connection between the computer and the development board is normal, and use the ping command to test the connection status.

The specific method of operation is as follows:

1. Connect eth0 of the development board to the computer through the network and power up the development board. A red light on the SoM will blink after the kernel starts, and the network card connected to the computer will blink quickly after normal startup. At this point, we can test the network connection;



2. Close the computer firewall (General computer operations, not described here in detail), then open the computer's run command;



3. Use cmd to open the administrator interface , and use the ping command to test the network connection status of the computer and the development board.

A data return indicates a normal network connection.

```
选择管理员: C:\WINDOWS\system32\cmd.exe
Microsoft Windows [版本 10.0.19042.1110]
(c) Microsoft Corporation。保留所有权利。
Development board eth0 default factory ip address
C:\Users\Administrator>ping 192.168.0.232 → 开发板eth0默认出厂IP
正在 Ping 192.168.0.232 具有 32 字节的数据:
来自 192.168.0.232 的回复: 字节=32 时间<1ms TTL=64

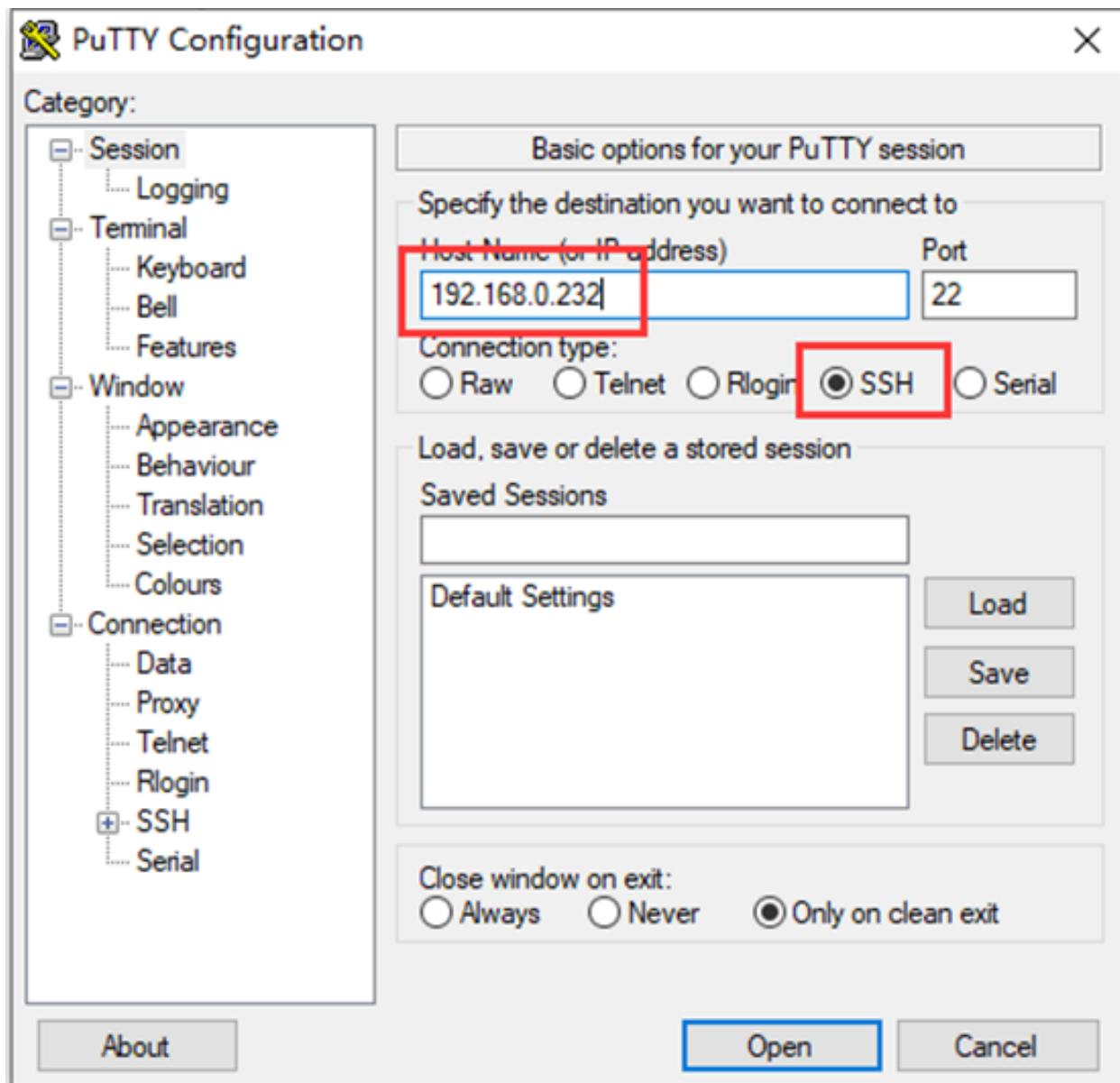
192.168.0.232 的 Ping 统计信息:
    数据包: 已发送 = 4, 已接收 = 4, 丢失 = 0 (0% 丢失),
往返行程的估计时间(以毫秒为单位):
    最短 = 0ms, 最长 = 0ms, 平均 = 0ms

C:\Users\Administrator>
```

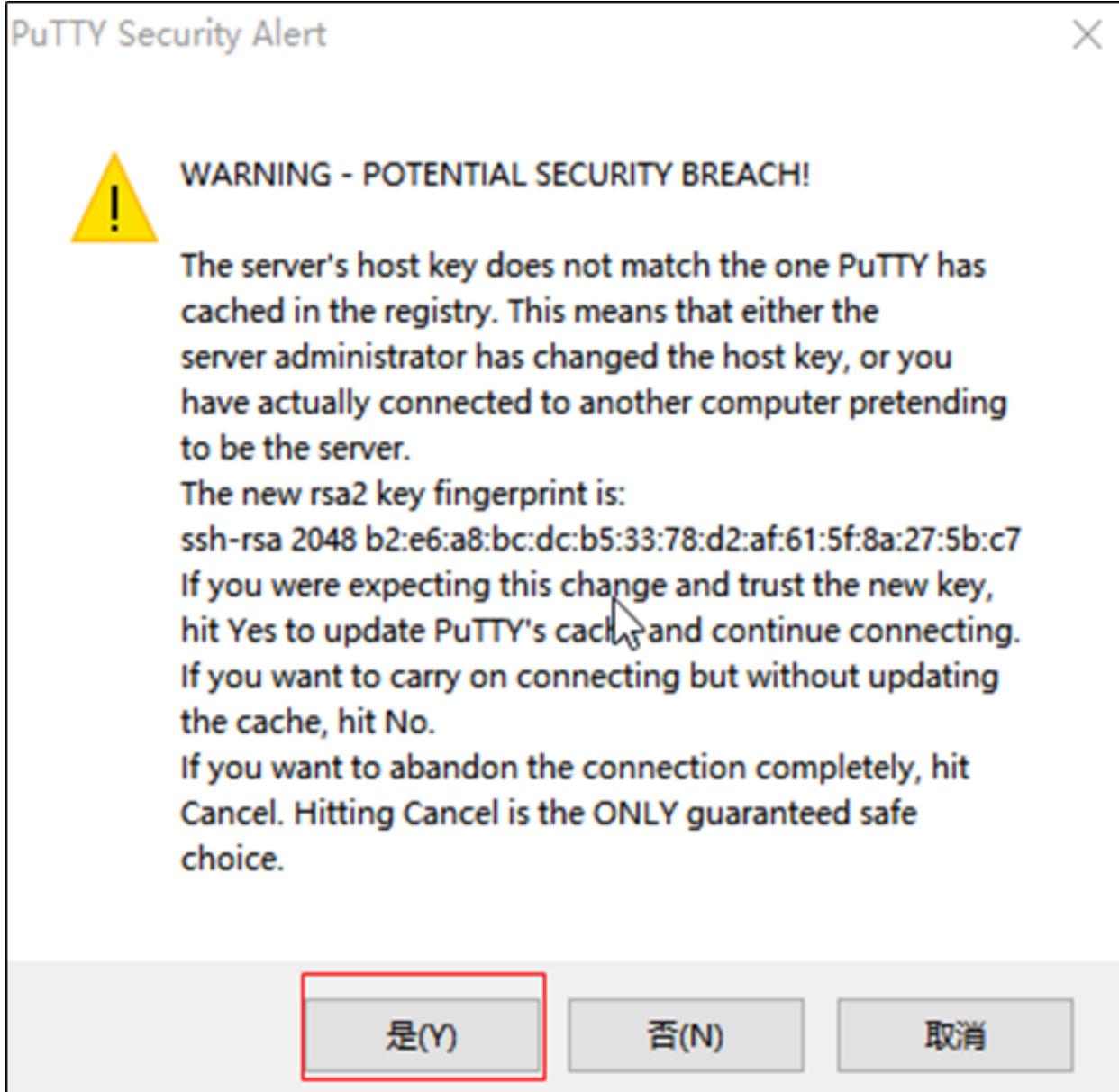
2.3.2 SSH server

Description:

- The default factory SSH login account is “root” and the password is also “root” ;
- The default factory IP for eth0 is 192.168.0.232;
- File transfers can be performed with scp.



Click “Open”, the following dialog box will appear, click “Yes” to enter the login screen.



```
Login as: root
root@192.168.0.232's password: //Enter the password "root" for the root account of the development board as prompted.
root@OK527:~$
```

Use SFTP to copy files, refer to 4.17.2 SFTP

2.4 Screen Switching

Currently, screen switching supports two methods: U-Boot menu and QT application.

In addition, the following rules shall be followed for screen configuration:

When outputting on a single screen, the other disp_type must be none and the disp_pri_type must be the same as the output

When LCD and DP are selected to output simultaneously, LCD must be selected as the
main screen

- a) LCD includes “lcd 1024x600” “mipi 1024x600” “lvds 1280x800” ;
- b) DP includes “dp 1080P60” “dp 2.5k” ;
- c) HDMI automatically configures resolution based on edid.

2.4.1 Dynamic Control of Uboot Menu

This method allows switching without recompiling and burn-in of existing supported screens.

During the Uboot boot process, pressing the spacebar will enter the uboot menu.

```
-----  
0:Exit to console  
1:Reboot  
2:Display0 Type:lvds 1280x800  
3:Display1 Type:hdmi  
4:Device PHY Type:none  
5:display primary screen: disp0_type  
-----
```

The menu options are as follows:

Enter 0 to enter the uboot command line;

Enter 1 to restart uboot;

Enter 2 will cyclically select the Display0 Type screen;

Enter 3 will cyclically select the Display1 Type screen;

Enter 4 will cyclically select the multiplexing of PCIe and USB3.0.

Enter 5 will cyclically select the main screen;

Take the “LVDS 1280x800” and “HDMI” screens as an example. After entering the uboot menu, press the corresponding number until the following content is displayed, and then press 1 to restart.

```
-----  
0:Exit to console  
1:Reboot  
2:Display0 Type:lvds 1280x800  
3:Display1 Type:hdmi  
4:Device PHY Type:none  
5:display primary screen: disp0_type  
-----
```

Note: The current version does not support DP 2560x1440 resolution and HDMI 3840 × 2160 resolution

The DP screen cannot be displayed alone

2.4.2 Qt Program Screen Switching

This method allows switching without recompiling and burn-in of existing supported screens.

Refer to 3.19 Switching Screen Display.

2.5 System Storage

OK527 has multiple specifications, the following are 2+16GB versions.

2.5.1 eMMC

The following table is the eMMC memory partition information of Linux operating system:

Partition Index	Name	Size	File system	Content
mmcblk0p1	boot-resource	32 MB	vfat	boot-resource.fex
mmcblk0p2	env	16 MB	raw	env.fex
mmcblk0p3	boot	64 MB	raw	boot.fex
mmcblk0p4	rootfs	4096MB	ext4	rootfs.fex
mmcblk0p5	userdata	Remaining total	ext4	User partition

Use the df command to view disk usage on a system. The following image depicts the default disk usage upon factory settings (using the QT file system). Please note that this is for reference only, and actual parameters may vary.

```
root@OK527:/# df -Th
Filesystem      Type  Size  Used  Avail Use% Mounted on
/dev/root        ext4  3.9G  1.1G  2.9G  27% /
tmpfs           tmpfs  967M  440K  967M  1% /tmp
tmpfs           tmpfs  967M  460K  967M  1% /run
devtmpfs        devtmpfs 935M    0  935M  0% /dev
/dev/mmcblk0p1   vfat  128M  7.4M  121M  6% /run/media/mmcblk0p1
/dev/mmcblk0p5   ext4   11G   24K  9.7G  1% /run/media/mmcblk0p5
```

2.5.2 Memory

Using the “free” command to view memory usage, the following image shows the memory usage without connecting any peripherals, in MB. It’s for reference only; actual parameters may vary.

```
root@OK527:/# free -m
              total        used         free       shared  buff/cache   available
Mem:       1934        258       1455          13        221       1638
Swap:          0          0            0
```

2.6 System Shutdown

In general, the power can be turned off directly. If there is data storage, function use, or other operations, avoid turning off the power arbitrarily during operation to prevent irreversible damage to the file. In such cases, only re-flashing the firmware can resolve the issue. Before powering off, use the sync command to ensure data is fully written.

The command “reboot” can be used to restart the development board. You can also restart the hardware by pressing the K3 (RESET) key or directly power off and restart.

Long-pressing the K2 (PWRON) button on the development board can turn off the device, and long-pressing K2 again can turn it on.

Note : If the user-designed product using the SoM experiences an unexpected shutdown due to power loss during operation, power-down protection measures can be included in the design to prevent this issue.

2.1.7 3. OK527 Platform Interface Function Use and Test

Description:

Users should follow this section when using the screen with the QT file system, but can skip it for non-QT operations.

This chapter details QT functions. With the default device and driver working normally, it's advisable to test interface functions after command line tests.

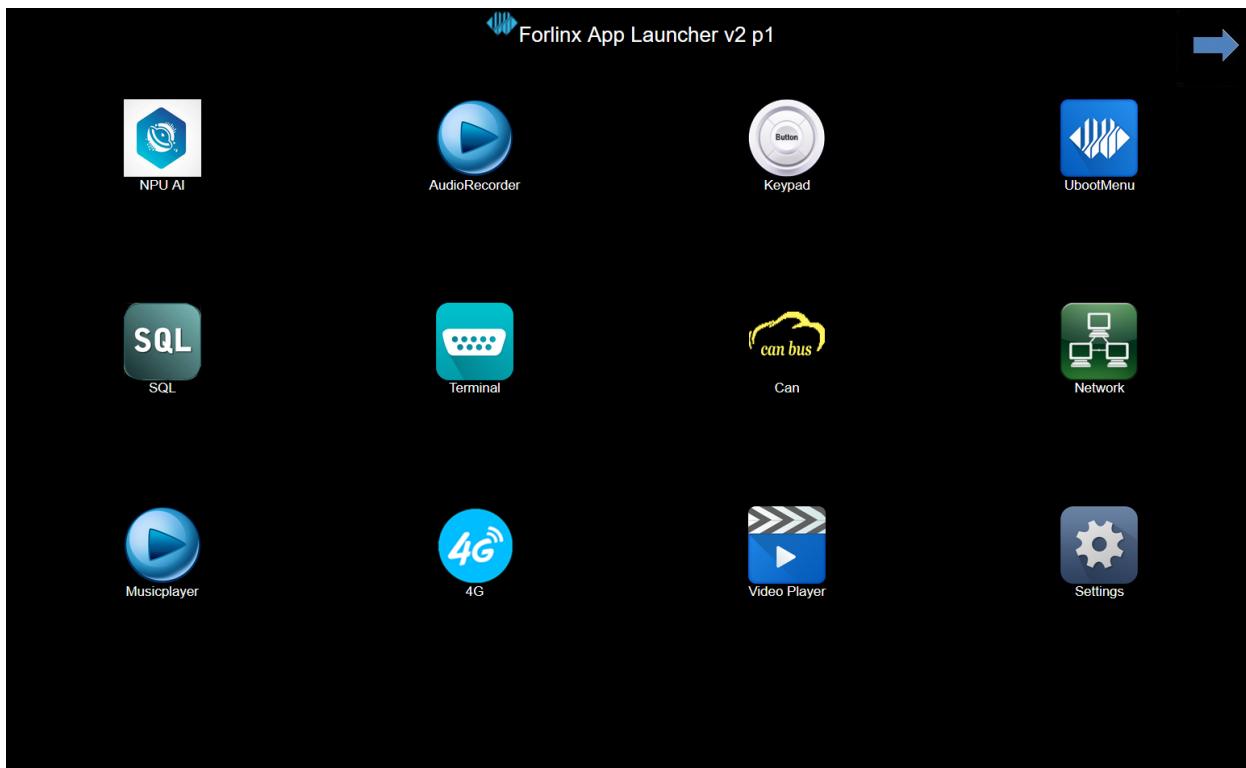
QT test source code path: source code OK 527-linux-sdk/platform/forlinx/forlinx _ qt _ demo.

Testing program path in the development board's file system: /usr/bin.

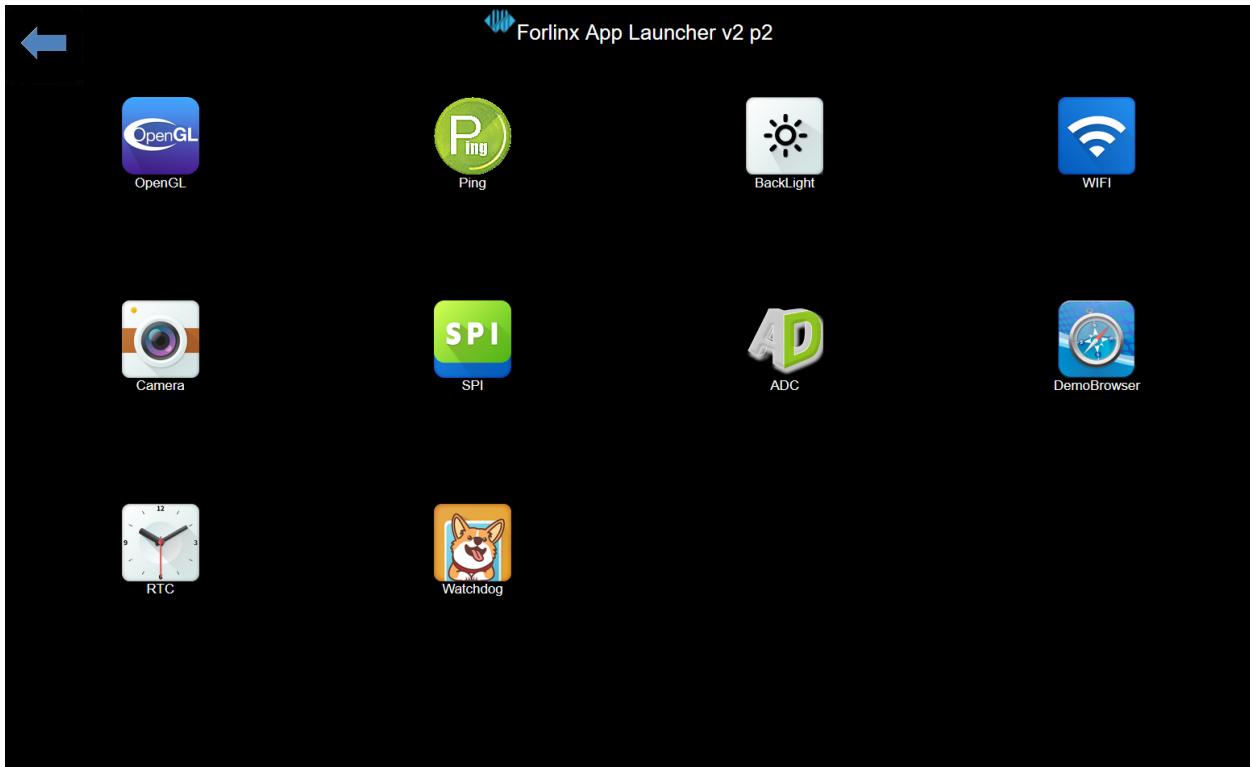
This chapter mainly explains the usage of the expansion interfaces on the development board in QT interface. The testing program is only for reference, and please make adjustments based on your actual situations when using it.

3.1 Introduction to Interface Function

The desktop of the OK527 development board appears as follows after startup:



Click the arrow in the upper right corner to go to the next page.



Video Player is not supported in the current version

3.2 Network Configuration Test

Description:

By factory default, only the eth0 network card is set to STATIC mode;

The IP and network configuration will be stored in the system file (/etc/network/interfaces), ensuring the settings persist across system restarts.



Icon:

Clicking on the network configuration icon will open a interface program that supports two modes: STATIC and DHCP.

STATIC Mode

After clicking on the network configuration icon, select the STATIC mode as shown in the figure. You can then configure the IP address, subnet mask, gateway, and DNS settings. Once you have set the parameters, click on “Apply and Restart Network” .

Relevant Parameter	Meaning
interface	Set up the network card
ip	Set the IP address
netmask	Set the subnet mask
gateway	Set up the gateway
dns	Set DNS

The screenshot shows a network configuration interface for a device with an Intel Atom processor. The interface is set to static IP mode for the interface **eth0**. The configuration fields are as follows:

- ip:** 192.168.1.109
- netmask:** 255.255.255.0
- gateway:** 192.168.1.1
- dns:** 192.168.1.1

At the bottom of the interface, there are two buttons: **Apply and Restart Network** and **Exit**.

DHCP Mode:

Note: Testing must be done on a router that supports automatic IP allocation.

Check DHCP, select the NIC device needing to be configured, and click “Apply and Restart Network” at the bottom of the interface to restart the network and get the ip automatically.

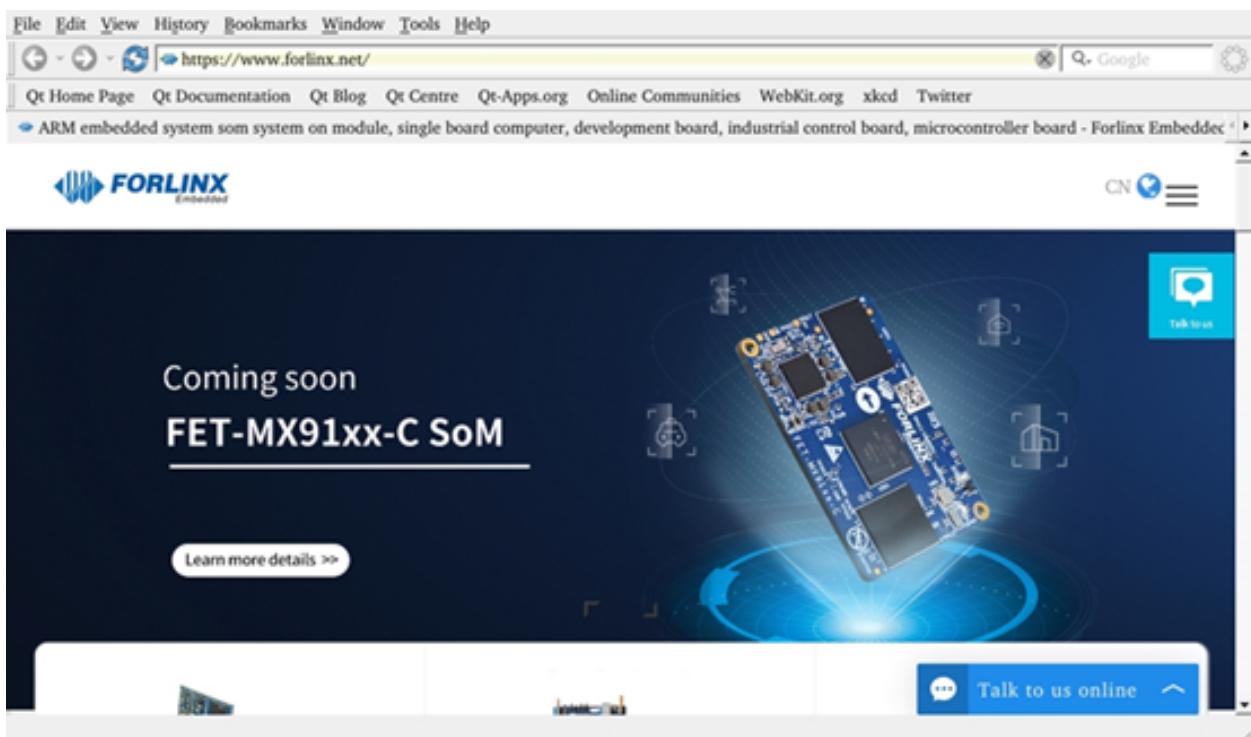


3.3 Browser Test



Icon:

Click the browser icon and ensure a smooth network connection with available DNS before accessing external sites. Upon browser startup, it defaults to visiting Forlinx Embedded's official website, as shown below:



Note: If the development board time is abnormal, it will cause certificate problems.

3.4 4G Test



Icon :

The “4G” test program is used to test the OK527 external 4G module (EC20). Before testing, power off the development board, insert the SIM card into the 4G module (ensure correct SIM direction), and launch the test application. This test employs the EC20 module as a reference.

```
[01-01_08:00:36:304] Quectel_QConnectManager_Linux_V1.6.0.15
[01-01_08:00:36:315] Find /sys/bus/usb/devices/3-1.4 idVendor=0x2c7c idProduct=0x125, bus=0x03, dev=0x004
[01-01_08:00:36:315] Auto find qmichannel = /dev/qcqmio
[01-01_08:00:36:315] Auto find usbnets_adapter = usb0
[01-01_08:00:36:315] netcard driver = GobiNet, driver version = V1.6.2.14
[01-01_08:00:36:315] ioctl(0x89f3, qmap_settings) failed: Operation not supported, rc=-1
[01-01_08:00:36:315] Modem works in QMI mode
[01-01_08:00:36:351] Get clientWDS = 7
[01-01_08:00:36:382] Get clientDMS = 8
[01-01_08:00:36:414] Get clientNAS = 10
[01-01_08:00:36:446] Get clientUIM = 12
[01-01_08:00:36:478] Get clientWDA = 15
[01-01_08:00:36:512] requestBaseBandVersion EC20CEHDLGR06A07M1G
[01-01_08:00:36:639] requestGetSIMStatus SIMStatus: SIM_READY
[01-01_08:00:36:671] requestGetProfile[1] 3gnet//0
[01-01_08:00:36:703] requestRegistrationState2 MCC: 460, MNC: 1, PS: Attached, DataCap: LTE
[01-01_08:00:36:734] requestQueryDataCall IPv4ConnectionStatus: DISCONNECTED
[01-01_08:00:36:735] ifconfig usb0 0.0.0.0
[01-01_08:00:36:749] ifconfig usb0 down
[01-01_08:00:36:798] requestSetupDataCall WdsConnectionIPv4Handle: 0x871f05f0
[01-01_08:00:36:959] ifconfig usb0 up
[01-01_08:00:36:966] udhcpc -f -n -q -t 5 -i usb0
udhcpc: started, v1.35.0
udhcpc: broadcasting discover
udhcpc: broadcasting select for 10.221.240.239, server 10.221.240.240
udhcpc: lease of 10.221.240.239 obtained from 10.221.240.240, lease time 7200
[01-01_08:00:37:161] deleting routers
[01-01_08:00:37:180] adding dns 123.123.123.123
[01-01_08:00:37:181] adding dns 123.123.123.124
```

IP: www.forlinx.com

exit EC20 connect ping

```
ping -c 5 www.forlinx.com
PING www.forlinx.com (211.149.226.120): 56 data bytes
64 bytes from 211.149.226.120: seq=0 ttl=52 time=41.376 ms
64 bytes from 211.149.226.120: seq=1 ttl=52 time=40.799 ms
64 bytes from 211.149.226.120: seq=2 ttl=52 time=41.414 ms
64 bytes from 211.149.226.120: seq=3 ttl=52 time=41.237 ms
64 bytes from 211.149.226.120: seq=4 ttl=52 time=41.471 ms

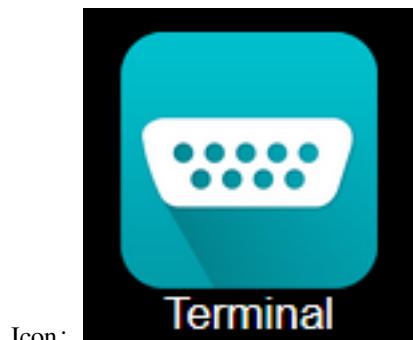
--- www.forlinx.com ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 40.799/41.259/41.471 ms
```

IP: www.forlinx.com

exit EC20 connect ping

Click the CONNECT button then the program will automatically enter the dialing process and get the IP to set the DNS, etc. After waiting patiently for a few seconds, click the ping button to test it.

3.5 UART Test



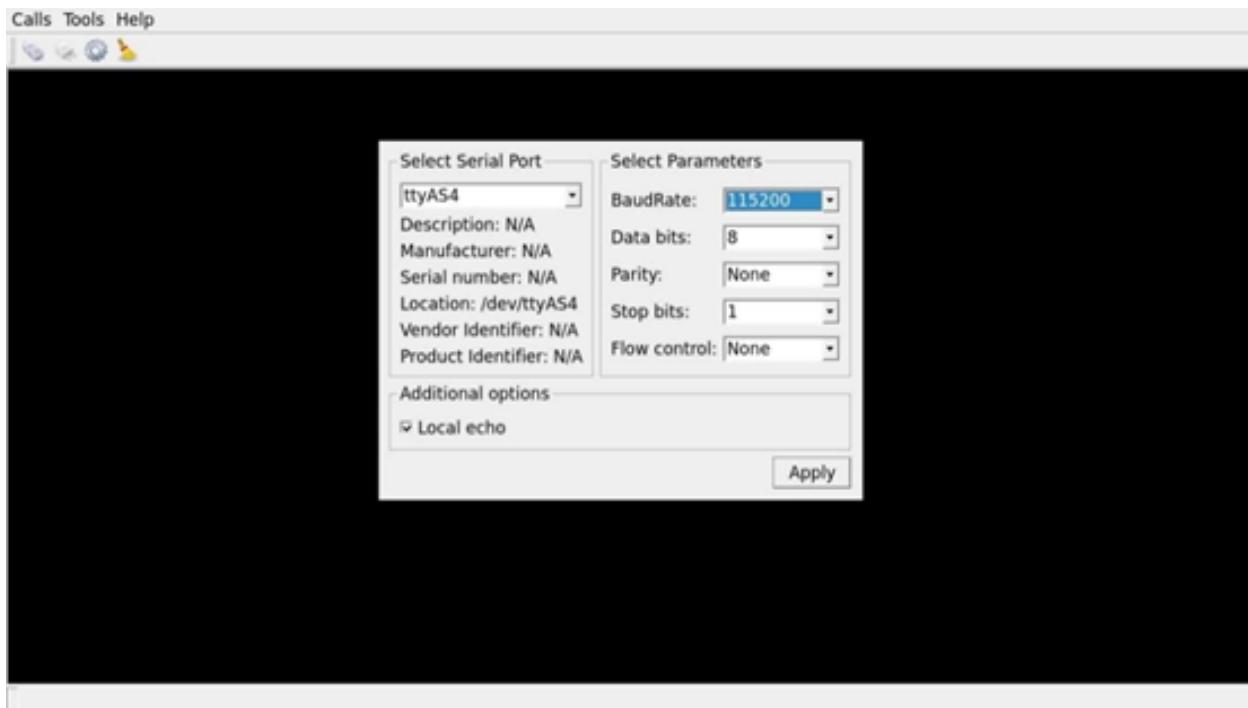
This test uses UART4 (ttyAS4) and conducts serial port testing through the serial tool.

1. Click the UART test icon to enter the following interface to set the serial port parameters:



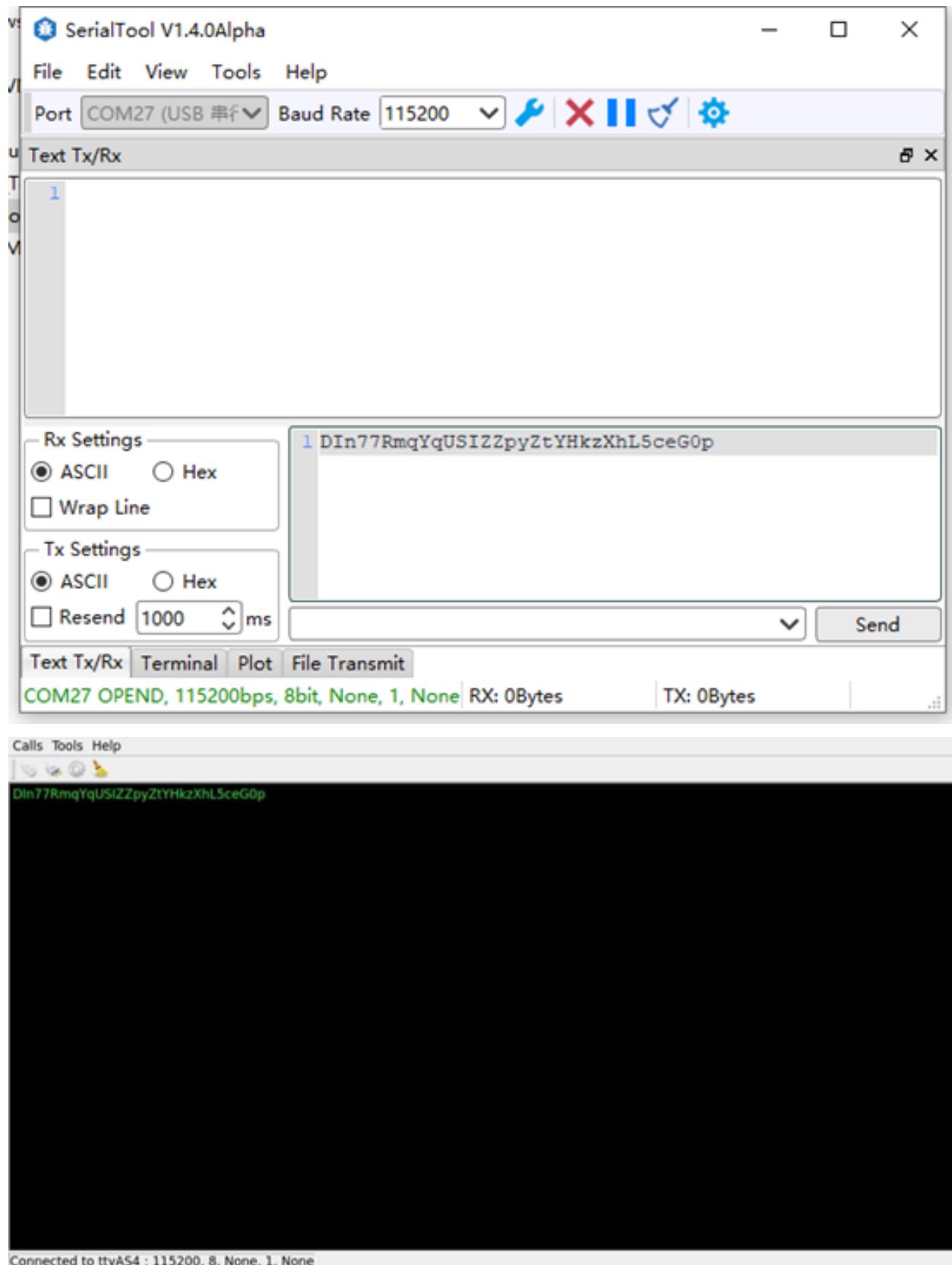
2. Click the setup button in the top left corner to align serial port parameters with those on the computer side, as depicted below:

Relevant Parameter	Meaning
Select Serial Port	Setting the serial port (select UART4, i.e. ttyAS4)
BaudRate	Set baud rate (115200)
Data bits	Set data bits (8 bits)
Parity	Set parity bit (no parity)
Stop bits	Set stop bit (1 bit)
Flow control	Set flow control (no flow control)



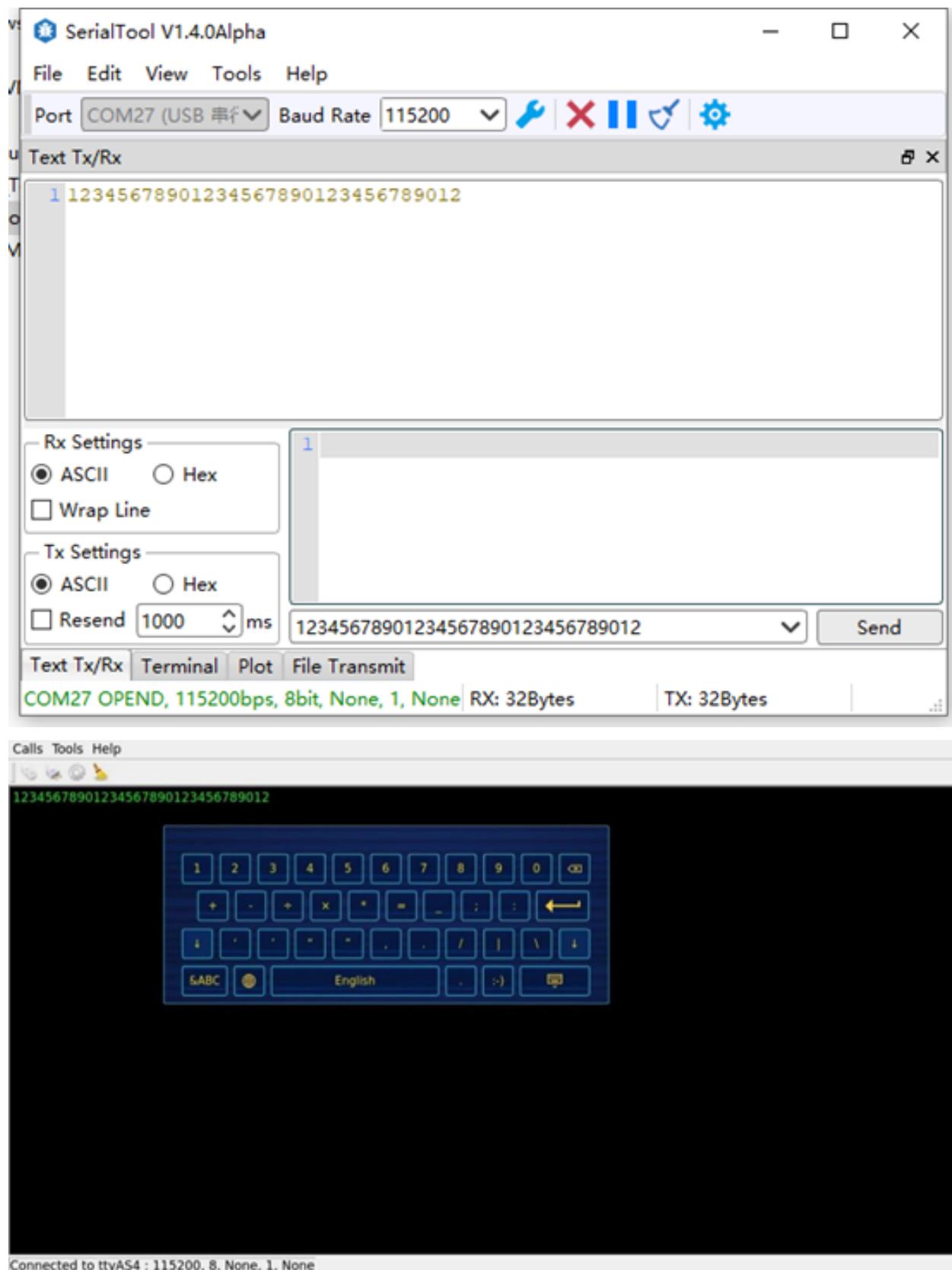
3. After setting the serial port parameters, click the connect button in the upper left corner, then the program can conduct data sending and receiving tests;

4. Open the serial port tool on the computer, and the data received by the serial port will be displayed on the screen at this time;



5. Click on the black - screen area in the middle of the test interface, and a soft keyboard will pop up. After continuously

entering 32 characters, the information printed by the serial port tool is the data sent by Qt.



3.6 ADC Test



Icon:

OK527 supports 24 x, and 14 x GPADC are led out from the OK527 carrier board. By default, all channels are floated. The value of the potentiometer can be measured by shorting the corresponding pin. Max value of 4096 corresponds to a voltage of 1.8V.

Exit	
GPADC3 gpadc0_channel3 event2	10
GPADC4 gpadc0_channel4 event3	9
GPADC5 gpadc0_channel5 event4	10
GPADC6 gpadc0_channel6 event5	9
GPADC7 gpadc0_channel7 event6	10
GPADC12 gpadc1_channel0 event7	278
GPADC13 gpadc1_channel1 event8	275
GPADC14 gpadc1_channel2 event9	276
GPADC15 gpadc1_channel3 event10	276
GPADC16 gpadc1_channel4 event11	274
GPADC17 gpadc1_channel5 event12	275
GPADC18 gpadc1_channel6 event13	275
GPADC19 gpadc1_channel7 event14	277
GPADC20 gpadc1_channel8 event15	278

3.7 WIFI Test

Description:

The AW-CM358 chip is soldered on the OK527 carrier board.

“WIFI” is a tool for configuring and testing the STA (station) mode of Wi-Fi.



1. Click icon to enter test interface, select module from dropdown, enter SSID for Wi-Fi connection.

Enter router name & password in PAWD, click “connect” to WiFi;

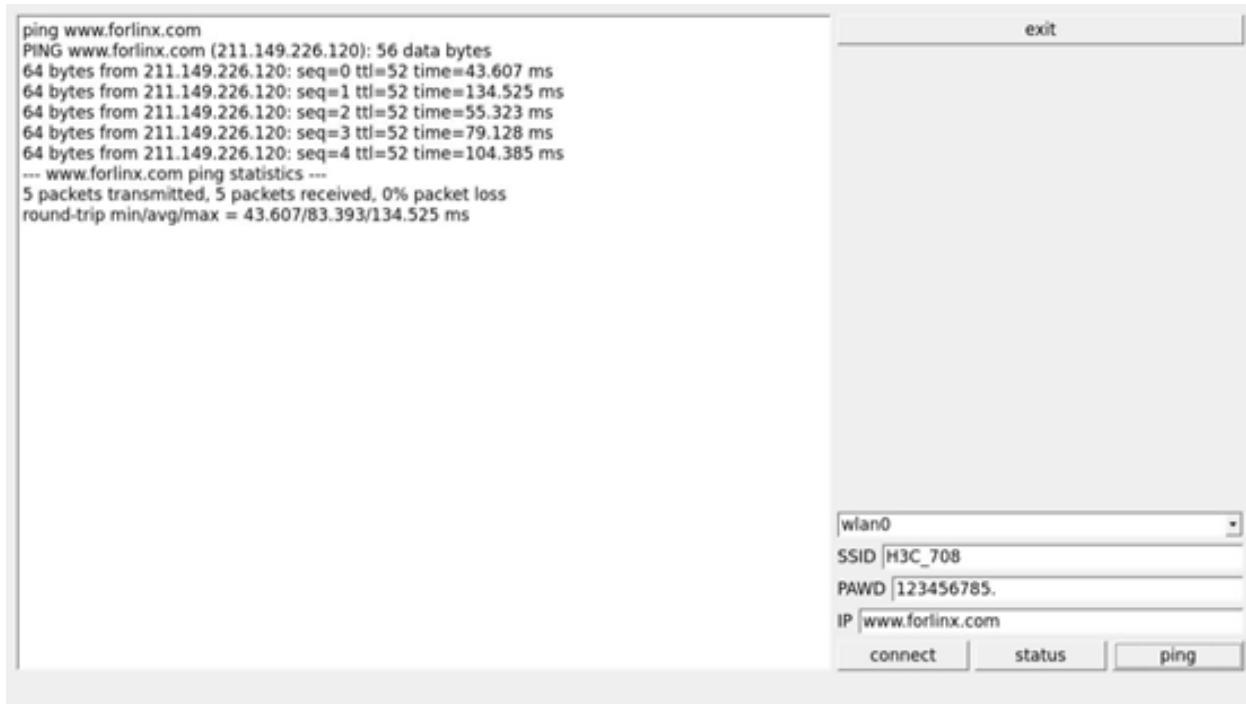
The screenshot shows a terminal window on the left and a configuration dialog on the right. The terminal window displays the following log output:

```
wifi wlan0
ssid H3C_708
pasw 123456785.
waiting...
udhcpc: started, v1.35.0
udhcpc: broadcasting discover
udhcpc: broadcasting select for 192.168.1.4, server 192.168.1.1
udhcpc: lease of 192.168.1.4 obtained from 192.168.1.1, lease time 86400
deleting routers
adding dns 192.168.1.1
connect ok
```

The configuration dialog has the following fields:

wlan0		
SSID H3C_708		
PAWD 123456785.		
IP www.forlinx.com		
<input type="button" value="connect"/>	<input type="button" value="status"/>	<input type="button" value="ping"/>

2. After the connection is successful, click “ping” to test the network after setting the IP;



3.8 RTC Test

Note: Ensure button cell batteries are installed & voltage is normal.



Icon:

RTC test includes setting time, power cycling, rerunning test software, and verifying RTC sync.

Run the RTC test software to view and set the current system time with the following interface:



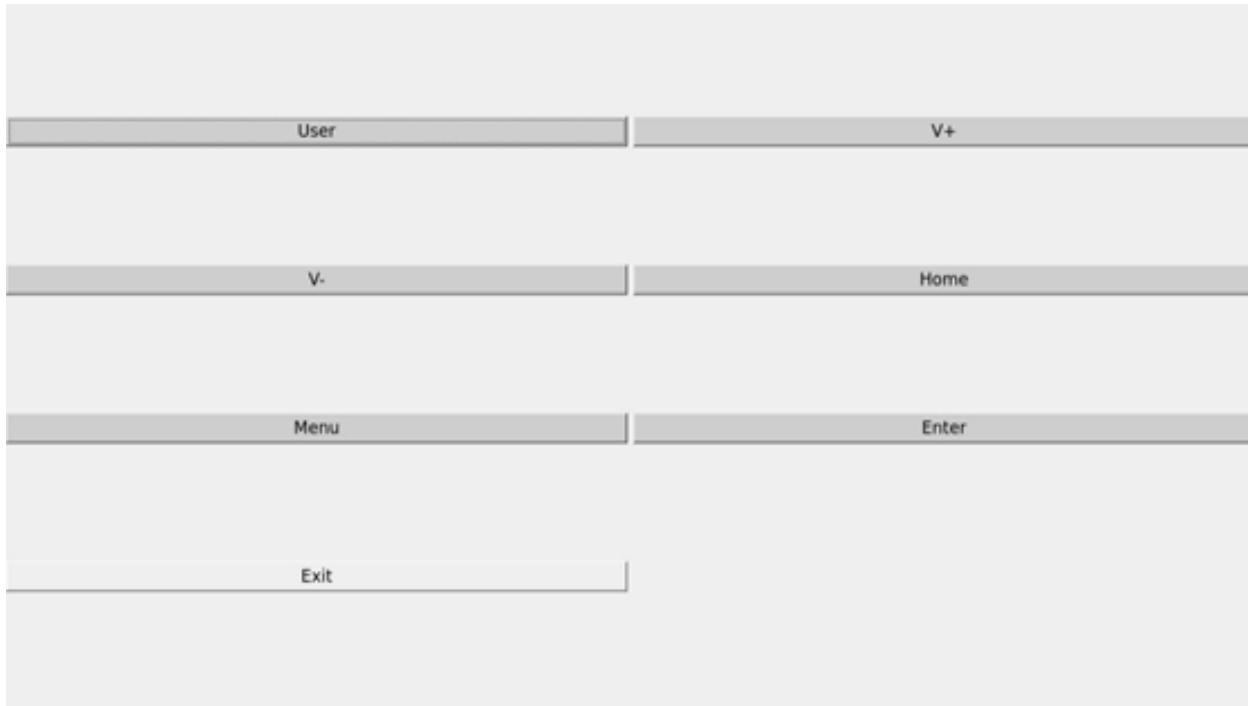
Click “set” to set the time. After setting, click the save button to save the setting. Then power off and power on after a period of time. Run the RTC test software again to read the time automatically. It can be seen that the RTC time has been synchronized and the RTC test is normal.

3.9 Key Test



Icon:

“Keypad” tests platform buttons’ availability by checking if pressed buttons turn blue. Interface shown below.



There are 6 physical buttons USER, VOL +, VOL-, HOME, MENU and ENTER on the side of OK527 carrier board, which respectively correspond to User, V +, V-, Home, Menu and Enter in the test program. When the button is pressed, the corresponding button in the test application will turn blue, indicating that the button function is normal.

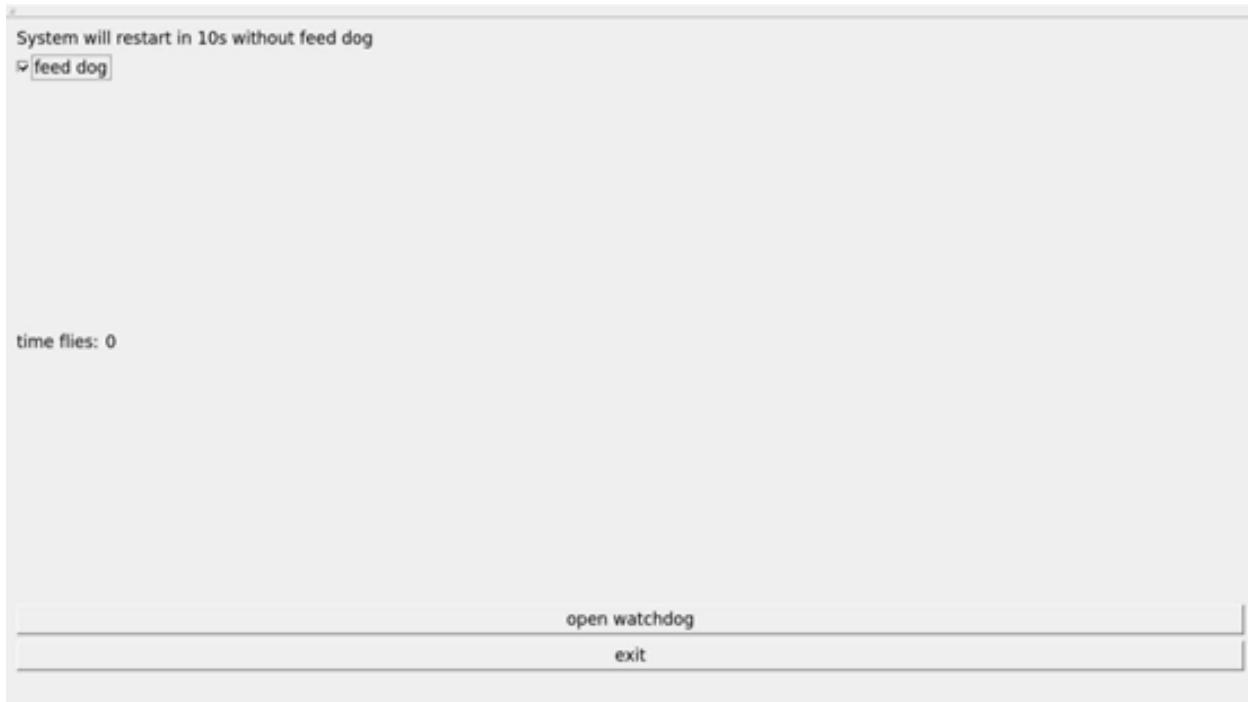
3.10 Watchdog Test



Icon:

“WatchDog” tests the functionality of the watchdog feature.

Interface as follows:



Checking “feed dog” & clicking “open watchdog” starts watchdog function with dog-feeding. System shouldn’t restart under normal conditions.

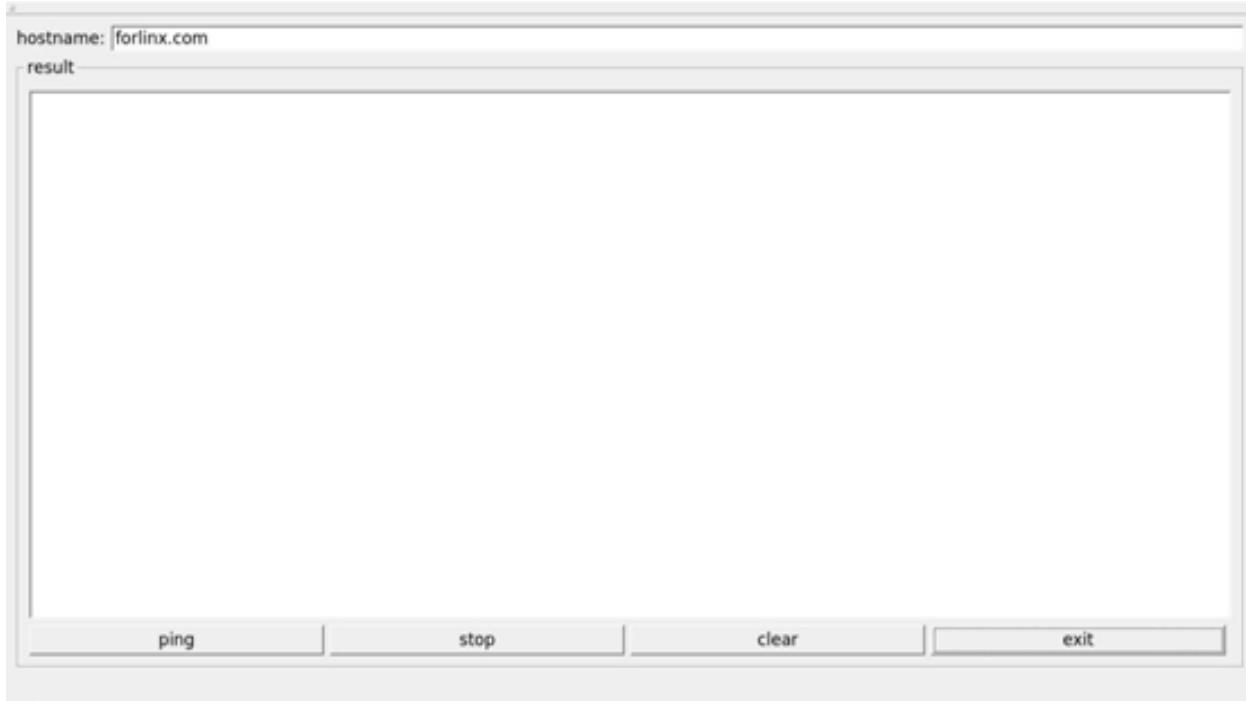
Unchecking “Feed Dog” & clicking “Activate Watchdog” starts watchdog function without dog-feeding. After about 10 seconds, the system restarts, indicating normal watchdog function.”

3.11 Ping Test



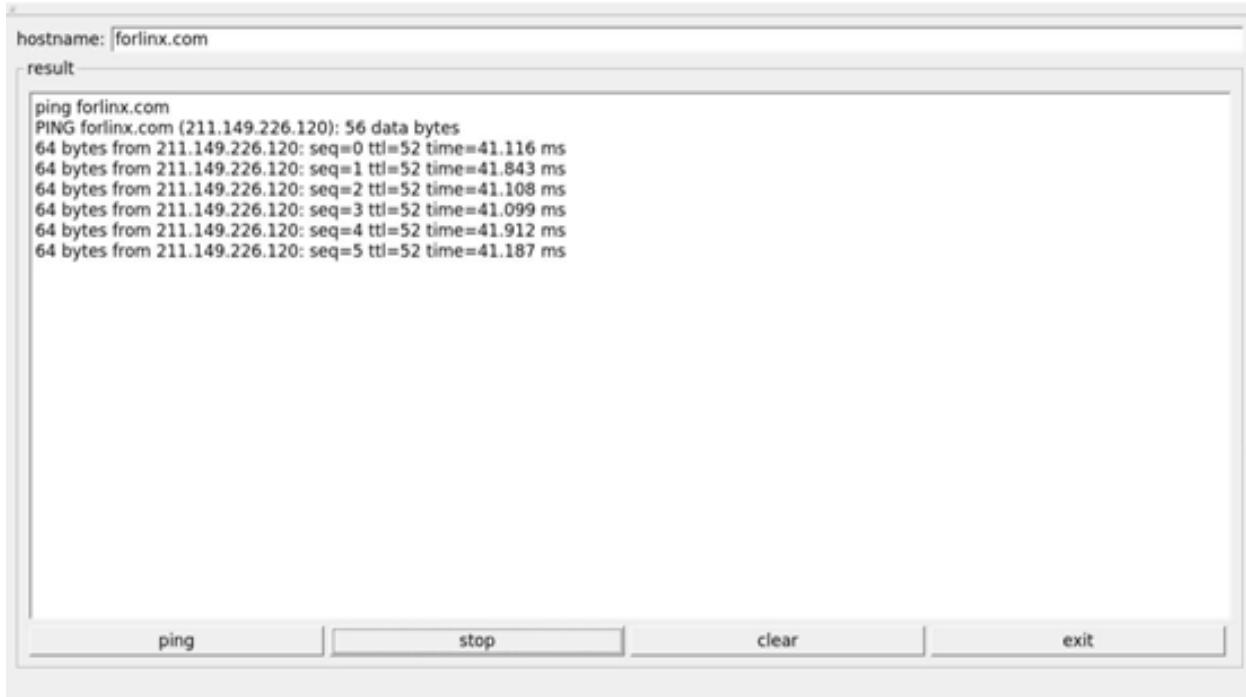
Icon:

“Ping” is a graphical tool for network testing, offering a user-friendly interface for ping operations.



Write the target IP address in the “hostname” column. Click the “ping” button, and the “result” column will display the ping outcome. Click “stop” to end the ping test, and “clear” to erase the information in the “result” column.

As shown in the figure, the network connection is smooth.



3.12 Camera Test

Icon:



Click the icon to enter the camera test program, which supports MIPI CSI interface and UVC camera. During the test, the UVC camera or mipi ov5645 needs to be inserted first, the device name corresponding to the UVC is /dev/video1, and the device name of the MIPI OV5645 at the P48 position of the carrier board is /dev/video0. Carrier board P49 location MIPI OV5645 device name is /dev/video4.

Open the QT test program.



Choose the camera video device node;

Set the camera resolution;

Click “Start” to capture video;

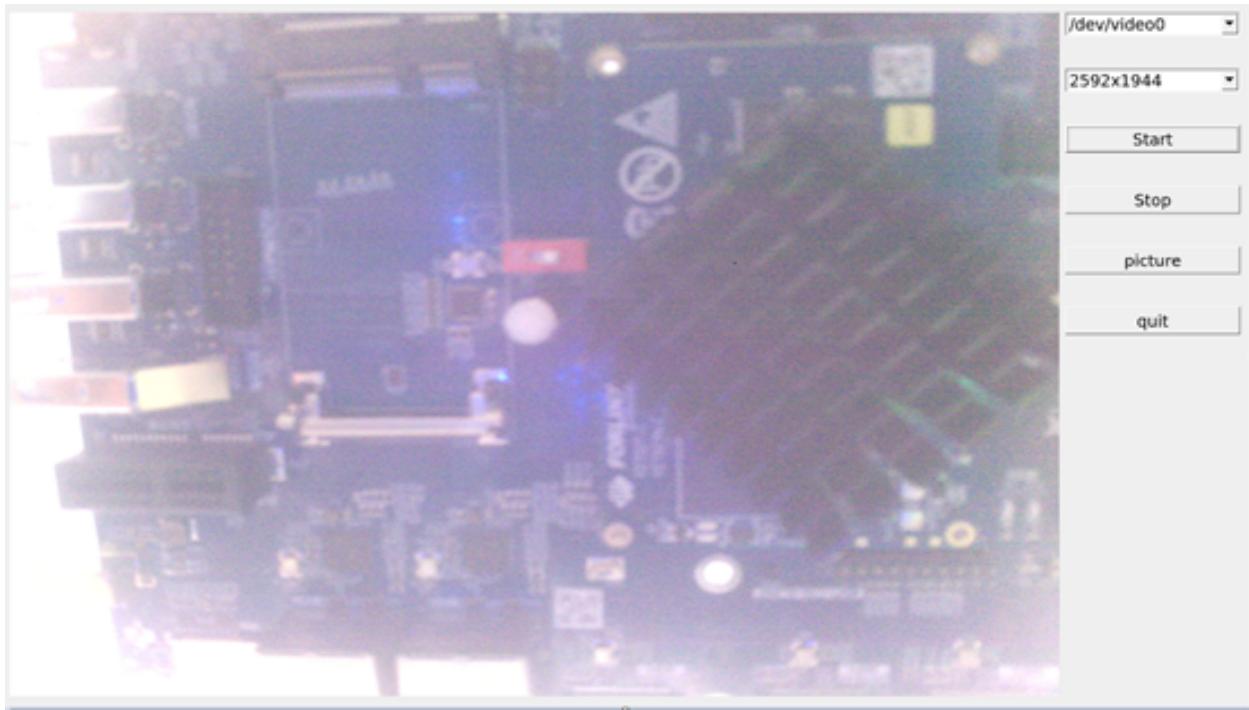
Click “Stop” to end capture;

Click “Picture” to take a photo;

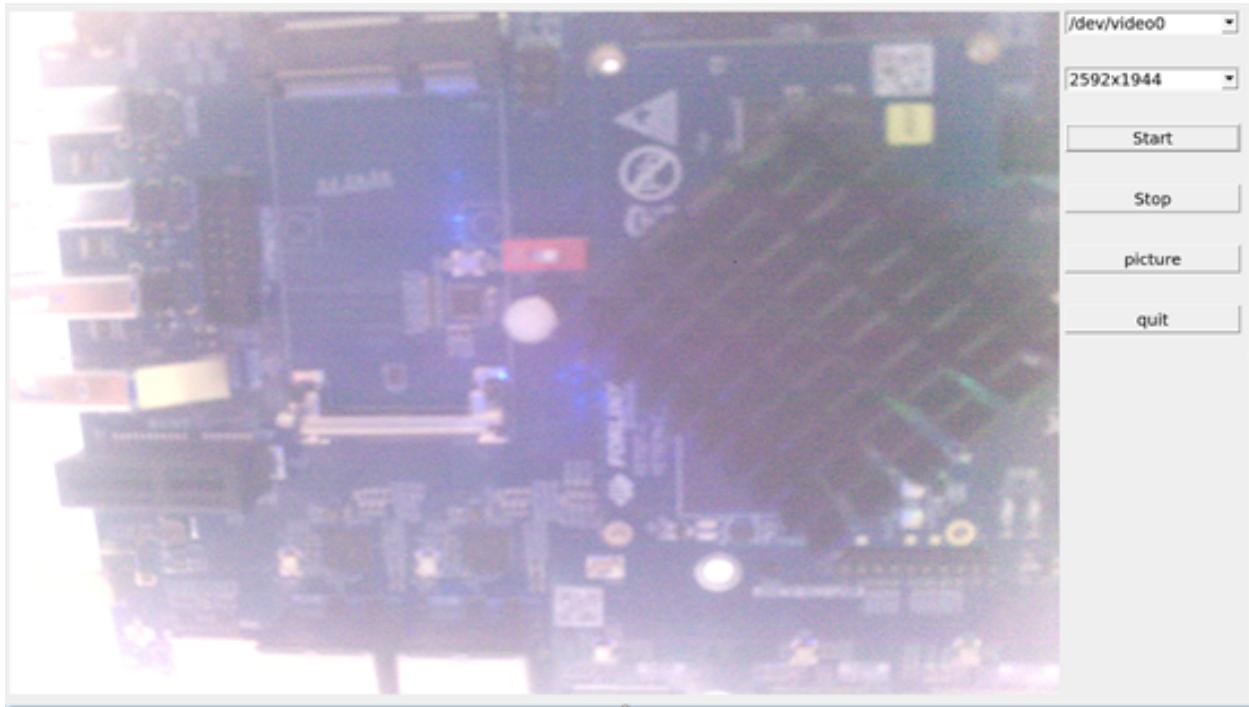
Save the photo with a name and at a chosen path.

Note: Please select the camera device and resolution based on your actual situation.

Take mipiov5645 camera as an example for test.

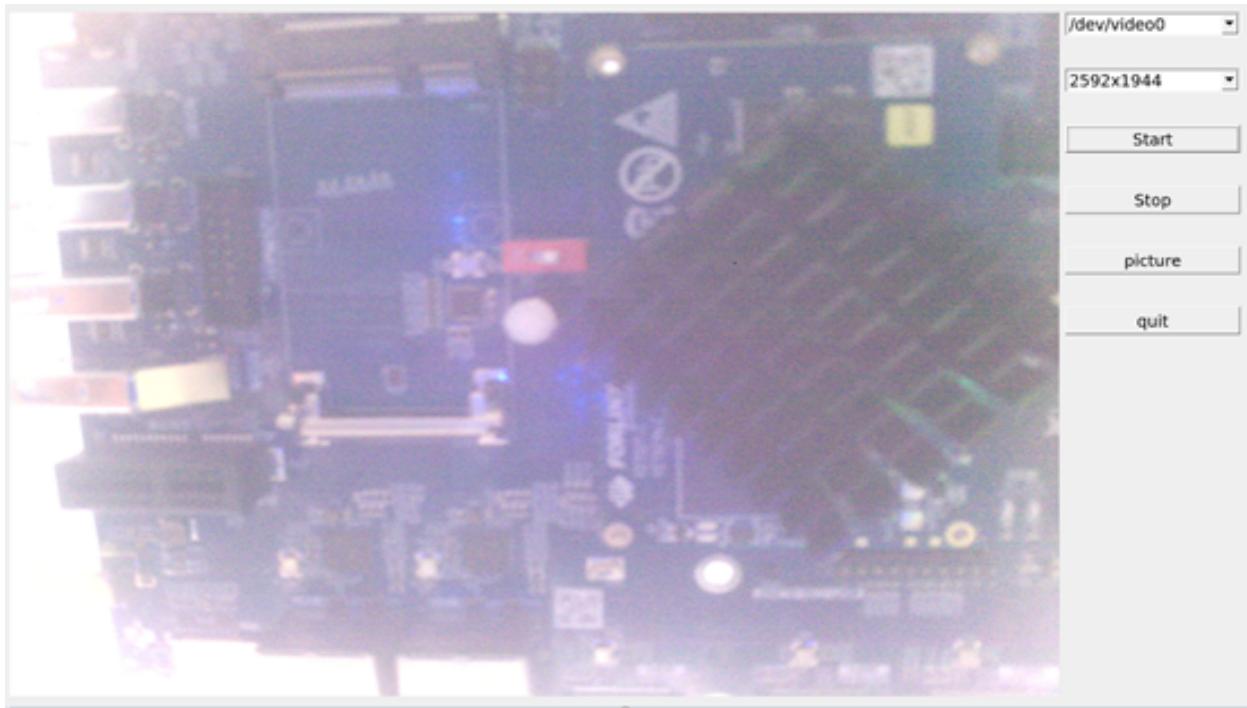


Click “Picture” to take photos and save them in /root/. Use Windows built-in image viewer to view them.



The current MIPI OV5645 module supports resolutions of 1280x960, 1920x1080, and 2592x1944 respectively.

The following is an example test of the OV5645 resolution of 2592x1944 connected to the carrier board P48.



Note: If TP2855 is used for testing, the device tree needs to be modified and recompiled to generate an image.

The modification method is as follows:

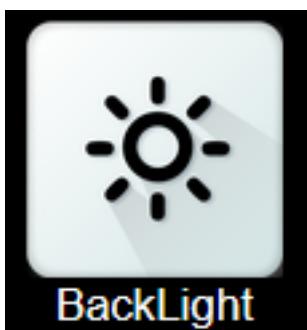
Open OKT527-linux-sdk1.3/kernel/linux-5.15/arch/arm64/boot/dts/allwinner/OKT527-C-Linux.dts device tree;

Uncomment TP2855 and comment out OV13855 at the same time, recompile the image after saving, and test with this application after flashing.

```
kernel > linux-5.15 > arch > arm64 > boot > dts > allwinner >  OKT527-C-Linux.dts
 1  /*
 2   * Forlinx Technology CO., Ltd. okt527-c soc board.
 3   *
 4   * soc board support.
 5   */
 6 /dts-v1/;
 7
 8 #include "OKT527-C-Common.dtsi"
 9 #include "OKT527-C-Common-TP2815.dtsi"
10 //#include "OKT527-C-Common-OV13855.dtsi"
11
```

3.13 Backlight Test

Icon:



“BackLight” is an LCD backlight adjustment App with a left-right progress bar for brightness control.

Click to open the interface as follows:



Drag the slider in the interface to set the LCD backlight brightness. 1 is the darkest, 255 is the brightest, and 0 needs to be set through the command line. Refer to “4.21 LCD Backlight Adjustment” .

3.14 Play/Record Test

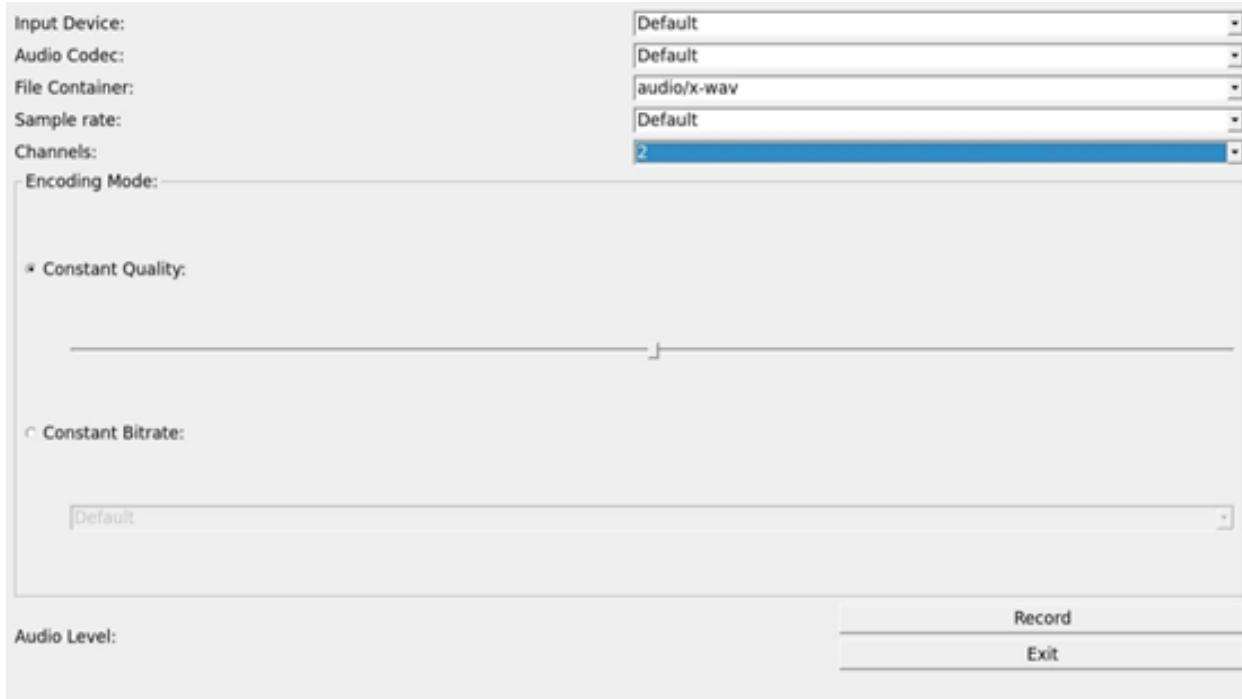
Icon:



Before conducting the audio recording test, please insert the prepared microphone into the mic port. Click the icon to enter the recording test application, which can be used to check if the sound card recording function is working properly.

Choose where to save the recording file. Click “Start” to begin recording and “Stop” to end.

The interface is as follows:



Click the Record button to test the recording. The recording file is saved in the root directory.

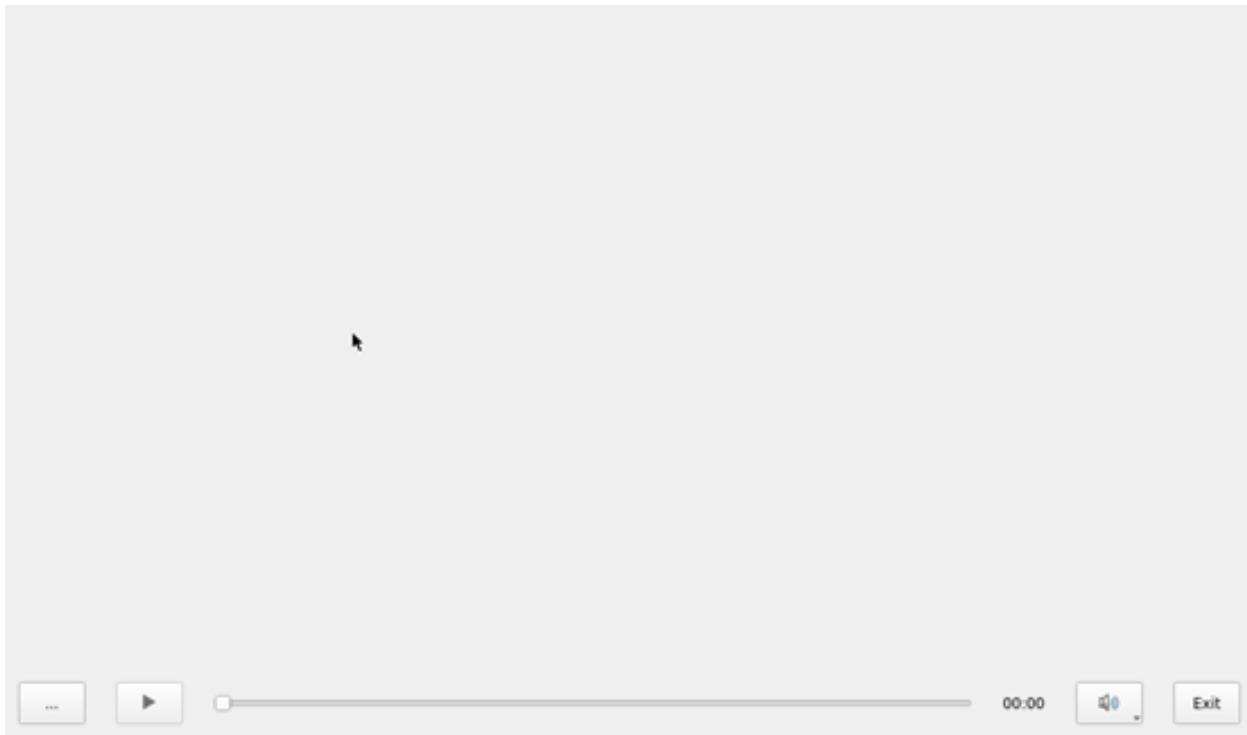


3.15 Music Play Test



Use the “Musicplayer” app icon to conduct a music playback test.

“music player” is a simple audio test application that can be used to test the function of the sound card or as a simple audio player.

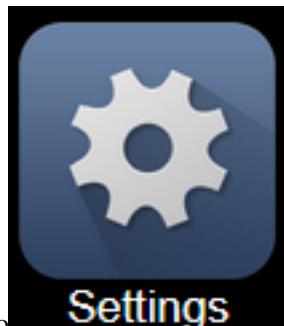


Application Interfaces

Click the button in the lower left corner and select test audio /forlinx/media/test.mp3

3.16 CPU Frequency Configuration Test

OK527 has CPU0 to CPU3 with a maximum frequency of 1.4GHz, and CPU4 to CPU7 with a maximum frequency of 1.8GHz. By default, the CPU dynamically adjusts its frequency based on load. Alternatively, you can set a fixed CPU frequency.

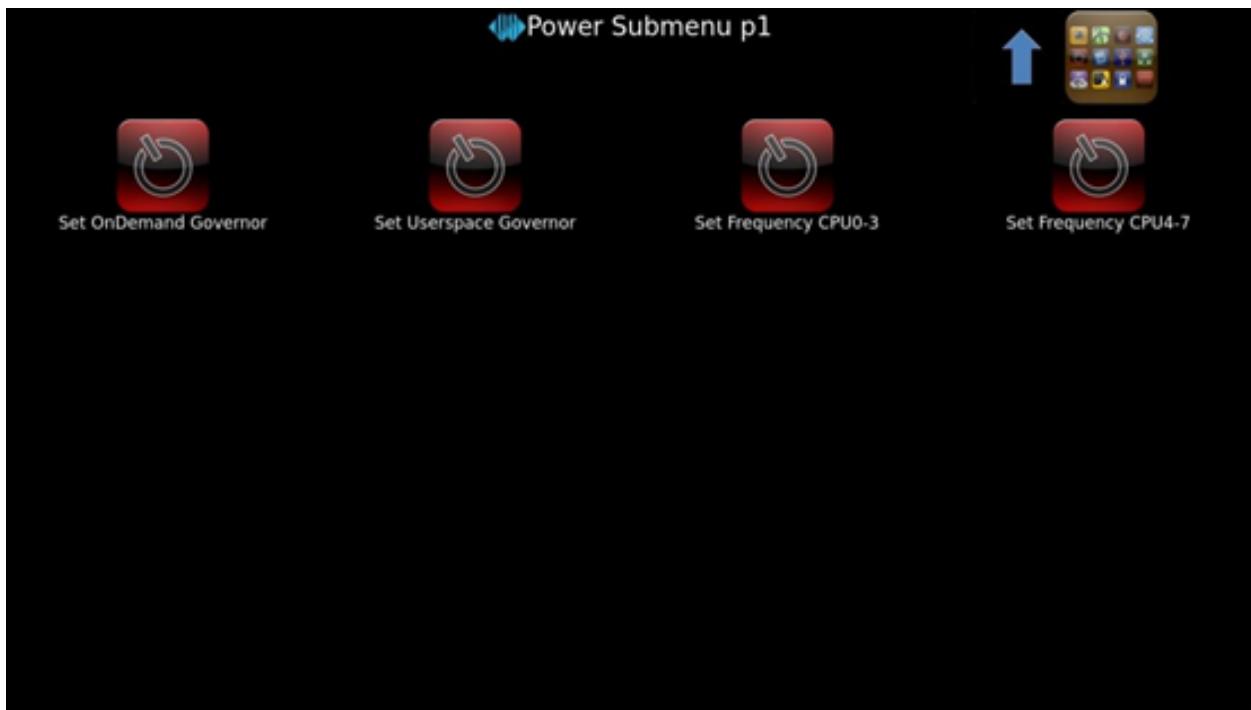


Click the desktop setting icon to enter the next menu:



Click the desktop icon to enter the CPU main frequency setting page:





Set OnDemand Governor: Dynamically adjust the main frequency on demand;

Set Userspace Governor: Set CPU frequency in user mode;

Set Frequency CPU0-3: Adjust the frequency of the small cores;

Set Frequency CPU4-7: Adjust the frequency of the big cores;

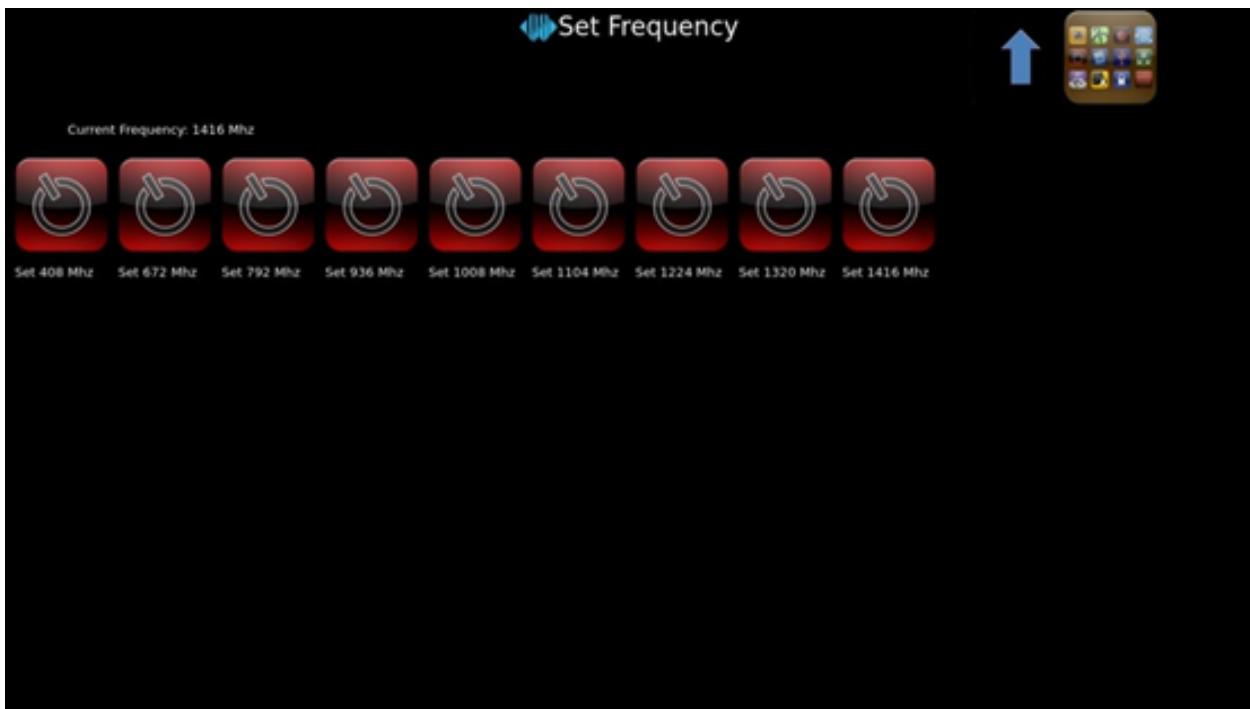
As an example for setting the frequency of the small cores: First, click “Set Userspace Governor,” then a dialog box will pop up; click “RUN.”



Set Userspace Governor

Set the kernel's power management settings to use the userspace governor. The userspace governor allows the user to manually change the kernel's frequency. The kernel will not dynamically alter the frequency no matter the system load.

Then, click “Set Frequency CPU0-3” to set a fixed frequency. (Click the arrow in the top right corner to return to the previous directory, and click the icon in the top right corner to return to the main directory).



Select the desired frequency for configuration based on the needs.

3.17 SQLite3 Database Test



Icon:

Click on the icon to access the database testing interface.

Forlinx Embedded T527 Documentation

File Help

	Title	Author Name	Genre	Year	Rating
1	Foundation	Isaac Asi...	Science Fi...	1951	★★★
2	Foundati...	Isaac Asi...	Science Fi...	1952	★★★★
3	Second F...	Isaac Asi...	Science Fi...	1953	★★★
4	Foundati...	Isaac Asi...	Science Fi...	1982	★★★
5	Foundati...	Isaac Asi...	Science Fi...	1986	★★★★
6	Prelude t...	Isaac Asi...	Science Fi...	1988	★★★
7	Forward t...	Isaac Asi...	Science Fi...	1993	★★★
8	The Powe...	Graham ...	Fiction	1940	★★★★
9	The Third...	Graham ...	Fiction	1950	★★★★★
10	Our Man ...	Graham ...	Fiction	1958	★★★★
11	Guards! G...	Terry Prat...	Fantasy	1989	★★★
12	Night Wa...	Terry Prat...	Fantasy	2002	★★★
13	Going Pos...	Terry Prat...	Fantasy	2004	★★★

Details

Title:	Foundation
Author:	Isaac Asimov
Genre:	Science Fiction
Year:	1951
Rating:	3

Select the column that needs to be modified, and click on an empty area after making the changes.

File Help

	Title	Author Name	Genre	Year	Rating
1	Foundation	Terry Prat...	Science Fi...	2021	★★★
2	Foundati...	Isaac Asi...	Science Fi...	2021	★★★★
3	Second F...	Isaac Asi...	Science Fi...	1953	★★★
4	Foundati...	Isaac Asi...	Science Fi...	1982	★★★
5	Foundati...	Isaac Asi...	Science Fi...	1986	★★★★
6	Prelude t...	Isaac Asi...	Science Fi...	1988	★★★
7	Forward t...	Isaac Asi...	Science Fi...	1993	★★★
8	The Powe...	Graham ...	Fiction	1940	★★★★
9	The Third...	Graham ...	Fiction	1950	★★★★★
10	Our Man ...	Graham ...	Fiction	1958	★★★★
11	Guards! G...	Terry Prat...	Fantasy	1989	★★★
12	Night Wa...	Terry Prat...	Fantasy	2002	★★★
13	Going Pos...	Terry Prat...	Fantasy	2004	★★★

Details

Title:	Foundation and Empire
Author:	Isaac Asimov
Genre:	Science Fiction
Year:	2021
Rating:	3

3.18 SPI Test

Icon:



Click on the icon to enter the SPI testing interface. Short-circuit the SPI0_MOSI and SPI0_MISO pins, then click “send” below to receive the data sent out and complete the test.



Short-circuit the SPI0_MOSI and SPI0_MISO pins, then click “send” below to receive the data sent out and complete the test.

3.19 Switching Display Screen

Icon:



Click the icon to enter the interface, click the corresponding button to modify the display settings, and click “Apply” to

save the configuration, which will take effect in the next restart.

In addition, the following rules shall be followed for screen configuration:

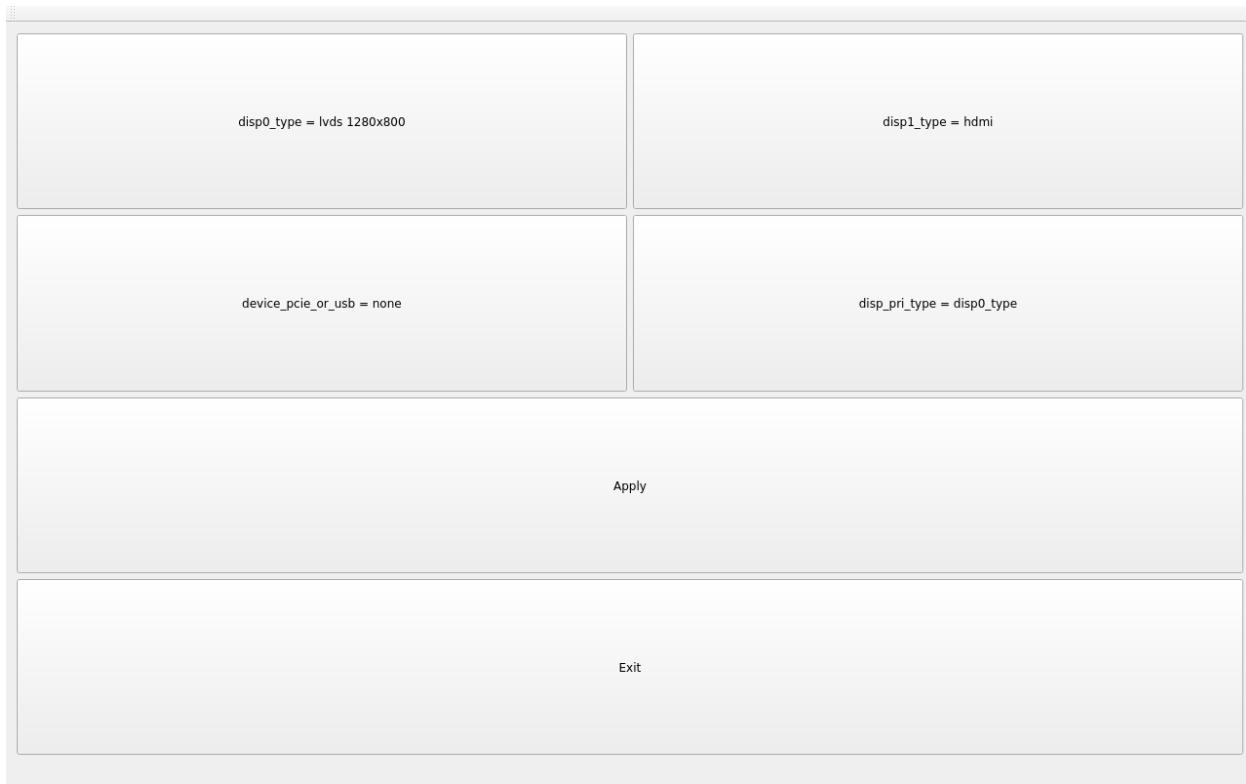
When outputting on a single screen, the other disp _ type must be none and the disp _
↳ pri _ type must be the same as the output.

When LCD and HDMI are selected for simultaneous output, LCD must be selected as the
↳ main screen

a) LCD includes “lcd 1024x600” “mipi 1024x600” “lvds 1280x800” ;

b) DP includes “dp 1080P60” “dp 2.5k” ;

c) HDMI automatically configures resolution based on edid.

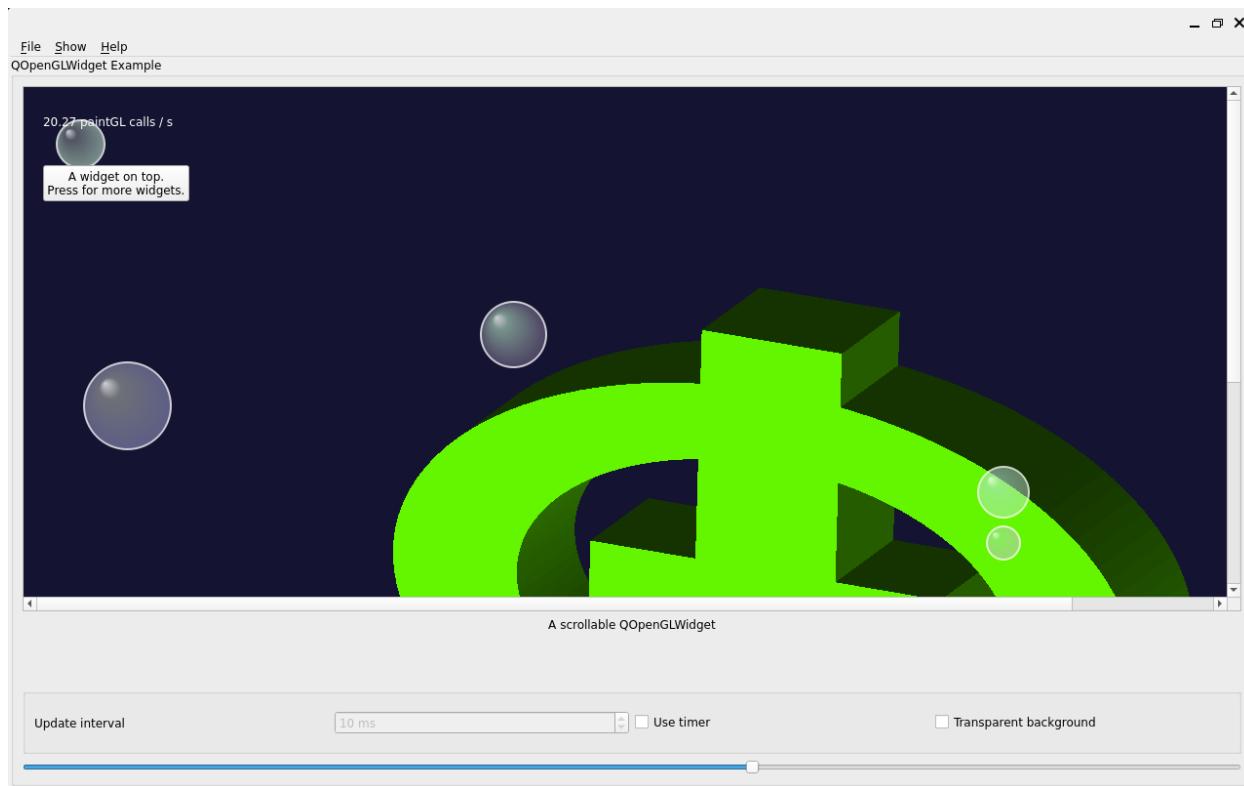


3.20 OpenGL

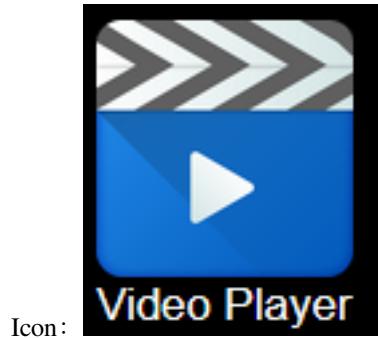


Icon:

The current frame rate is only 20 frames.

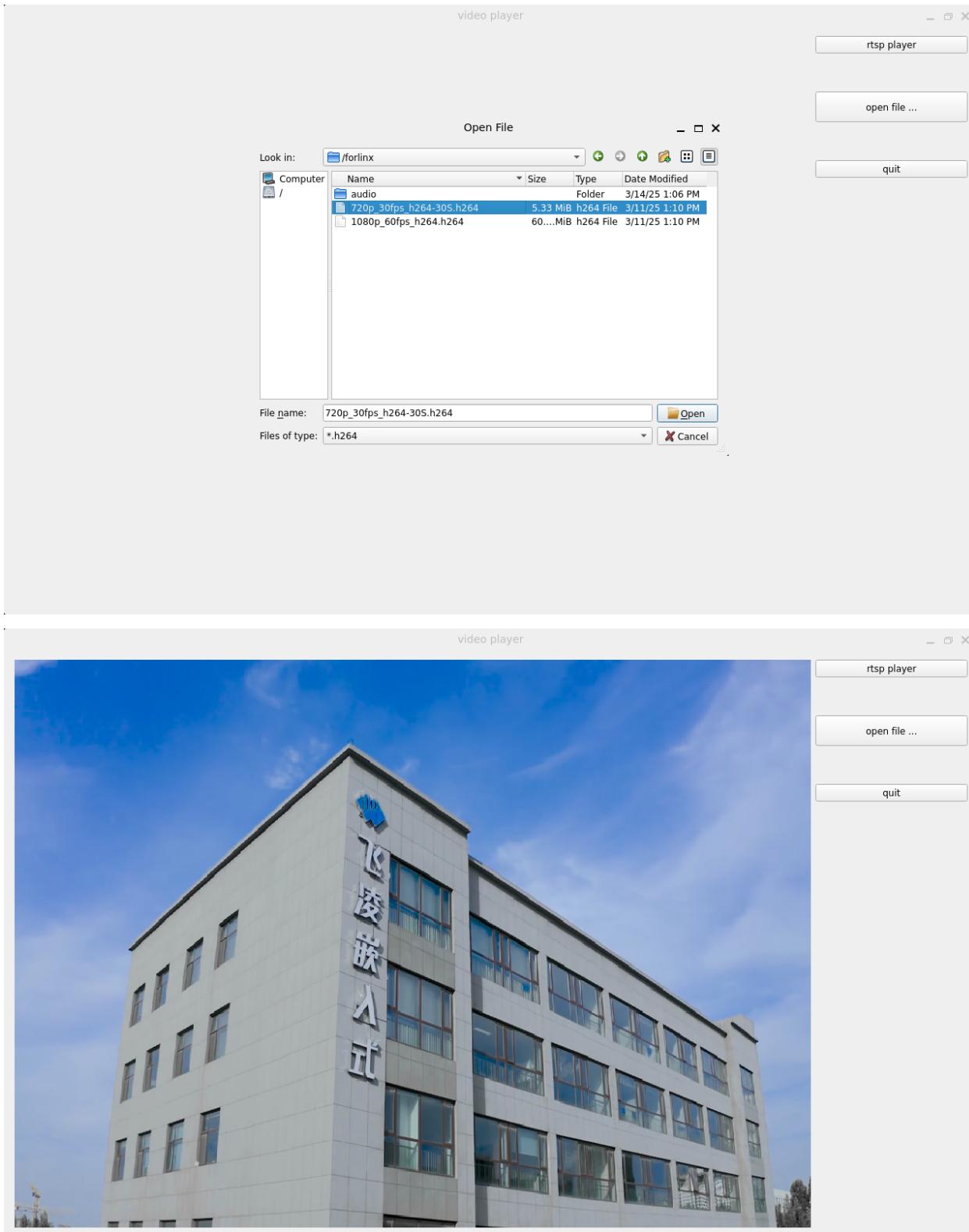


3.21 Video Player

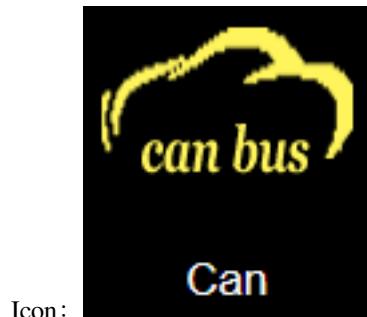


Icon:

Click "open file" to select the test video to play.



3.22 CAN Test



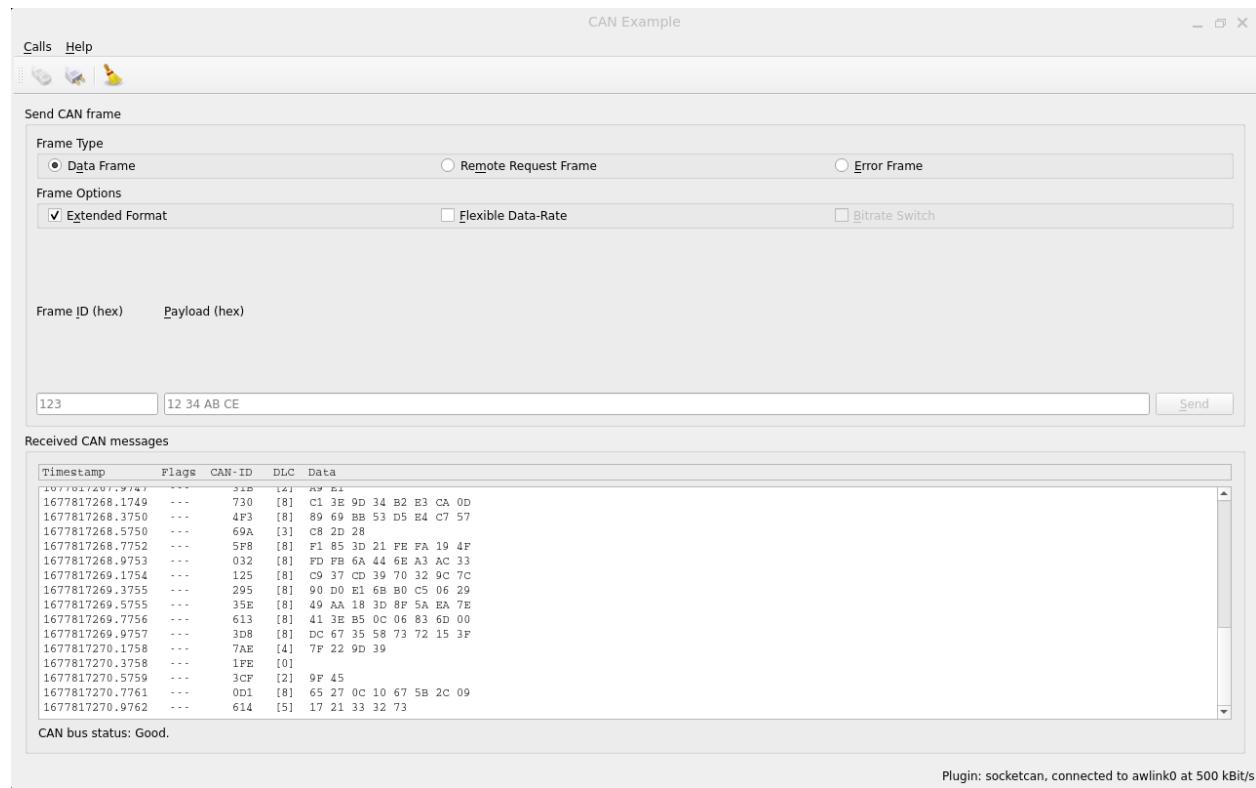
Icon:

Configure can0 as shown in the figure below:

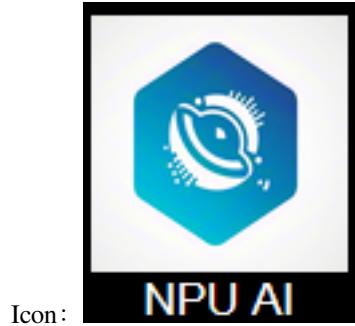
Timestamp	Flags	CAN-ID	DLC	Data
1677817239.4903	---	474	[8]	6C 4B 91 43 03
1677817238.4984	---	381	[8]	62 B1 26 40 62
1677817238.6984	---	731	[4]	45 9E E0 4E
1677817238.8984	---	4C9	[0]	
1677817239.0987	---	356	[8]	EC CE C5 51 79
1677817239.2987	---	558	[5]	98 33 C9 42 0B
1677817239.4981	---	4B8	[8]	A0 67 C1 44 86 I
1677817239.6981	---	50C	[8]	E5 F5 E5 25 01 I
1677817239.8981	---	6C0	[1]	84
1677817240.0991	---	379	[7]	A4 E3 E6 7E AA
1677817240.2992	---	35B	[8]	CB 0D 2F 50 24 08 9E 3C
1677817240.4993	---	5E9	[7]	23 CB ED 58 3F 39 F5
1677817240.6994	---	225	[8]	B8 B5 E0 31 7D B7 2F 76
1677817240.8994	---	374	[1]	88
1677817241.0996	---	140	[8]	B6 85 E0 62 4C 66 D7 68
1677817241.2996	---	182	[8]	4D 36 E1 4B 42 E0 72 26

```
root@OK527:/# ip link set awlink1 up type can bitrate 500000
[58662.966792] IPv6: ADDRCONF(NETDEV_CHANGE): can1: link becomes ready
root@OK527:/# ip link set dev awlink1 txqueuelen 4096
root@OK527:/# cangen awlink
```

Configure can1 on the command line of the development board to send, and observe whether can0 receives data in the interface.



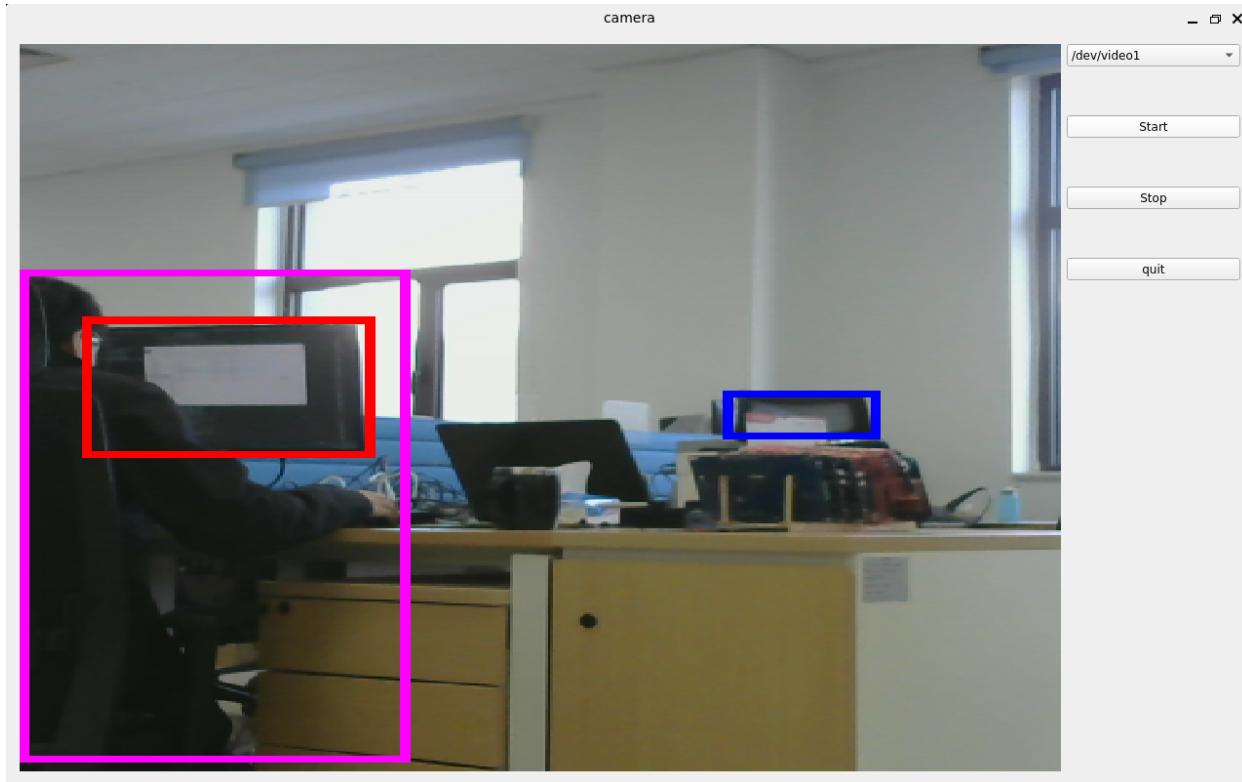
3.23 NPU_AI_CAMERA



Icon :

Insert the UVC camera and click the start button.

Note: NPU testing is only supported in the OK 527N-C version.



2.1.8 4. OK527 Command Line Function Test

The OK527 platform has various built-in command line tools available to users.

Test program source code path: OK527-linux-sdk/platform/forlinx/forlinx_cmd_demo/

Testing program path: “path” : /usr/bin

4.1 System Information Query

To view the kernel information, enter the following command:

```
root@OK527:/# uname -a
Linux OK527 5.15.147 #10 SMP PREEMPT Thu Mar 13 17:01:54 HKT 2025 aarch64 GNU/Linux
```

To view CPU information:

```
root@OK527:/# cat /proc/cpuinfo
processor      : 0
BogoMIPS      : 48.00
Features       : fp asimd aes pmull sha1 sha2 crc32 atomics fphp asimdhfp cpuid_
→asimdrdm lrcpc dcpop asimddp
CPU implementer: 0x41
CPU architecture: 8
CPU variant   : 0x2
CPU part      : 0xd05
CPU revision  : 0

processor      : 1
```

(continues on next page)

(continued from previous page)

```

BogoMIPS      : 48.00
Features      : fp asimd aes pmull sha1 sha2 crc32 atomics fphp asimdhp cpuid_
  ↳asimdrdm lrcpc dcpop asimddp
CPU implementer : 0x41
CPU architecture: 8
CPU variant    : 0x2
CPU part       : 0xd05
CPU revision   : 0

processor     : 2
BogoMIPS      : 48.00
Features      : fp asimd aes pmull sha1 sha2 crc32 atomics fphp asimdhp cpuid_
  ↳asimdrdm lrcpc dcpop asimddp
CPU implementer : 0x41
CPU architecture: 8
CPU variant    : 0x2
CPU part       : 0xd05
CPU revision   : 0

processor     : 3
BogoMIPS      : 48.00
Features      : fp asimd aes pmull sha1 sha2 crc32 atomics fphp asimdhp cpuid_
  ↳asimdrdm lrcpc dcpop asimddp
CPU implementer : 0x41
CPU architecture: 8
CPU variant    : 0x2
CPU part       : 0xd05
CPU revision   : 0

processor     : 4
BogoMIPS      : 48.00
Features      : fp asimd aes pmull sha1 sha2 crc32 atomics fphp asimdhp cpuid_
  ↳asimdrdm lrcpc dcpop asimddp
CPU implementer : 0x41
CPU architecture: 8
CPU variant    : 0x2
CPU part       : 0xd05
CPU revision   : 0

processor     : 5
BogoMIPS      : 48.00
Features      : fp asimd aes pmull sha1 sha2 crc32 atomics fphp asimdhp cpuid_
  ↳asimdrdm lrcpc dcpop asimddp
CPU implementer : 0x41
CPU architecture: 8
CPU variant    : 0x2
CPU part       : 0xd05
CPU revision   : 0

processor     : 6
BogoMIPS      : 48.00
Features      : fp asimd aes pmull sha1 sha2 crc32 atomics fphp asimdhp cpuid_

```

(continues on next page)

(continued from previous page)

```

→asimdrdm lrcpc dcpop asimddp
CPU implementer : 0x41
CPU architecture: 8
CPU variant      : 0x2
CPU part         : 0xd05
CPU revision     : 0

processor        : 7
BogoMIPS         : 48.00
Features          : fp asimd aes pmull sha1 sha2 crc32 atomics fphp asimdhp cpuid
→asimdrdm lrcpc dcpop asimddp
CPU implementer : 0x41
CPU architecture: 8
CPU variant      : 0x2
CPU part         : 0xd05
CPU revision     : 0

```

View environment variable information:

```

root@OK527:/# env
SHELL=/bin/sh
bt_mac=
snum=50075789d0c4c701f53
selinux=0
EDITOR=/bin/vi
PWD=/
wifi_mac=
HOME=/
LANG=en_US.UTF-8
uboot_backup=ubootA
uboot_message=2018.07-gdd4de6c (03/03/2025-07:11:21)
boot_type=2
mac1_addr=9a:76:ec:cf:ee:9a
QT_QPA_PLATFORM=wayland-egl
QT_QPA_EGLFS_NO_LIBINPUT=1
TERM=vt102
slub_debug=UFPZ
USER=root
SHLVL=1
WESTON_DISABLE_ATOMIC=1
QT_QPA_FONTDIR=/usr/share/fonts
specialstr=
XDG_RUNTIME_DIR=/var/run
bootreason=usb
partitions=boot-
→resource@mmcblk0p1:env@mmcblk0p2:boot@mmcblk0p3:rootfs@mmcblk0p4:UDISK@mmcblk0p5
WESTON_AFBC_GBM_MODIFIERS=1
PATH=/bin:/sbin:/usr/bin:/usr/sbin
QT_QPA_PLATFORM_PLUGIN_PATH=/usr/lib/qt/plugins
mac0_addr=9a:76:ec:cf:ee:9d
DBUS_SESSION_BUS_ADDRESS=unix:path=/var/run/dbus/system_bus_socket
_=/usr/bin/env

```

4.2 Frequency Test

Description: T527 has 8 cores, the small core is CPU 0 ~ CPU3, and the large core is CPU 4 ~ CPU7. This process takes cpu0 as an example, and the actual process cpu0 to cpu3 will change at the same time.

1. All cpufreq governor types supported in the current kernel:

```
root@OK527:/# cat /sys/devices/system/cpu/cpu0/cpufreq/scaling_available_governors
conservative ondemand userspace powersave performance schedutil
```

The userspace indicates user mode, in which other users' programs can adjust the CPU frequency.

2. View the current CPU supported frequency level.

```
root@OK527:/# cat /sys/devices/system/cpu/cpu0/cpufreq/scaling_available_frequencies
408000 672000 792000 936000 1008000 1104000 1224000 1320000 1416000
```

3. Set to user mode and modify the frequency to 936000:

```
root@OK527:/# echo userspace > /sys/devices/system/cpu/cpu0/cpufreq/scaling_governor
root@OK527:/# echo 936000 > /sys/devices/system/cpu/cpu0/cpufreq/scaling_setspeed
```

View the modified current frequency:

```
root@OK527:/# cat /sys/devices/system/cpu/cpu0/cpufreq/cpuinfo_cur_freq
936000
```

4.3 Temperature Test

View the temperature value:

```
root@OK527:/# cat /sys/class/thermal/thermal_zone0/temp
51322
```

The temperature value is 51°C.

4.4 DDR Bandwidth Test

The following test results were measured by the 4 + 32G version.

```
root@OK527:/# fltest_memory_bandwidth.sh
L1 cache bandwidth rd test with # process
0.008192 12361.88
0.008192 12449.86
0.008192 13783.93
0.008192 12340.49
0.008192 12254.37
L2 cache bandwidth rd test
0.131072 11583.94
0.131072 11567.28
0.131072 11575.68
0.131072 11623.23
0.131072 11633.31
Main mem bandwidth rd test
52.43 6094.25
52.43 6115.57
```

(continues on next page)

(continued from previous page)

```

52.43 6085.05
52.43 6068.85
52.43 6111.30
L1 cache bandwidth wr test with # process
0.008192 24473.79
0.008192 24422.20
0.008192 19275.65
0.008192 21933.80
0.008192 24428.48
L2 cache bandwidth wr test
0.131072 12644.41
0.131072 10001.18
0.131072 12649.41
0.131072 11240.93
0.131072 12613.62
Main mem bandwidth wr test
52.43 1193.16
52.43 1204.21
52.43 1198.73
52.43 1198.10
52.43 1204.82
L1 cache bandwidth rdwr test with # process
0.008192 13312.77
0.008192 13422.16
0.008192 10639.39
0.008192 13438.48
0.008192 13268.48
L2 cache bandwidth rdwr test
0.131072 9320.89
0.131072 9215.81
0.131072 9277.19
0.131072 9309.70
0.131072 9324.90
Main mem bandwidth rdwr test
52.43 2143.45
52.43 2101.27
52.43 2106.50
52.43 2102.70
52.43 2102.79
...
root@OK527:/#

```

The LPDDR4 bandwidth of the OK527-C-S is shown above, with a read bandwidth of about 6094M/s and a write bandwidth of about 1193M/s.

4.5 Watchdog Test

Watchdog is a frequently used function in embedded systems, and the device node for the watchdog in OK527 is /dev/watchdog. The watchdog timeout is up to 16 seconds.

To activate the watchdog, set the reset time to 10 seconds, and regularly “feed” the watchdog, you can use the `fltest_watchdog` command. This command will open the watchdog and perform the necessary “feeding” operation,

ensuring that the system does not reboot.

```
root@OK527:/# fltest_watchdog -t 10 -c  
Watchdog Ticking Away!
```

When using ctrl+c to end the test program, kicking the dog is stopped, the watchdog is on, and the system is reset after 10s.

If you do not want to reset, please enter the command to close the watchdog within 10 seconds after ending the program:

```
root@OK527:/# fltest_watchdog -d //Turn off  
→the watchdog
```

Start watchdog, set reset time 10s, do not kick the watchdog.

This command turns on the watchdog, but does not feed the dog, and the system restarts after 10 seconds.

```
root@OK527:/# fltest_watchdog -t 10
```

4.6 RTC Function Test

Note: Ensure button cell batteries are installed & voltage is normal.

RTC test, mainly through the use of date and hwclock tools to set the software and hardware time, test whether the software clock reads the RTC clock synchronously when the board is powered off and then powered on.

```
root@OK527:/# date -s "2023-08-01 15:16:30" //Set  
→software time  
Tue Aug 1 15:16:30 CST 2023  
root@OK527:/# hwclock -u -w //Synchronize software  
→time to hardware time  
root@OK527:/# hwclock -u -r //Display  
→hardware time  
Tue Aug 1 15:16:40 2023 0.000000 seconds
```

Then power down and power up the board, enter the system, and read the system time. After that, we can see that the time has synchronized.

```
root@OK527:/# date  
Tue Aug 1 15:20:46 CST 2023
```

4.7 Key Test

There are 9 keys on the carrier board, including 6 keys on the side. The key codes of USER, VOL +, VOL-, MENU, ENTER and HOME are 113, 115, 114, 139, 28 and 102 respectively, which correspond to PCB screen printing K9, K4, K5, K6, K7 and K8 respectively; In addition, the silk-screen K1 is an FEL key for flashing programs, K2 is a poweron key, and K3 is a reset key.

Execute the following command for the test of 6 keys on the side:

```
root@OK527:/# fltest_keytest  
key113 Presse  
key113 Released  
key115 Presse  
key115 Released  
key114 Presse
```

(continues on next page)

(continued from previous page)

```

key114 Released
key139 Presse
key139 Released
key28 Presse
key28 Released
key102 Presse
key102 Released

```

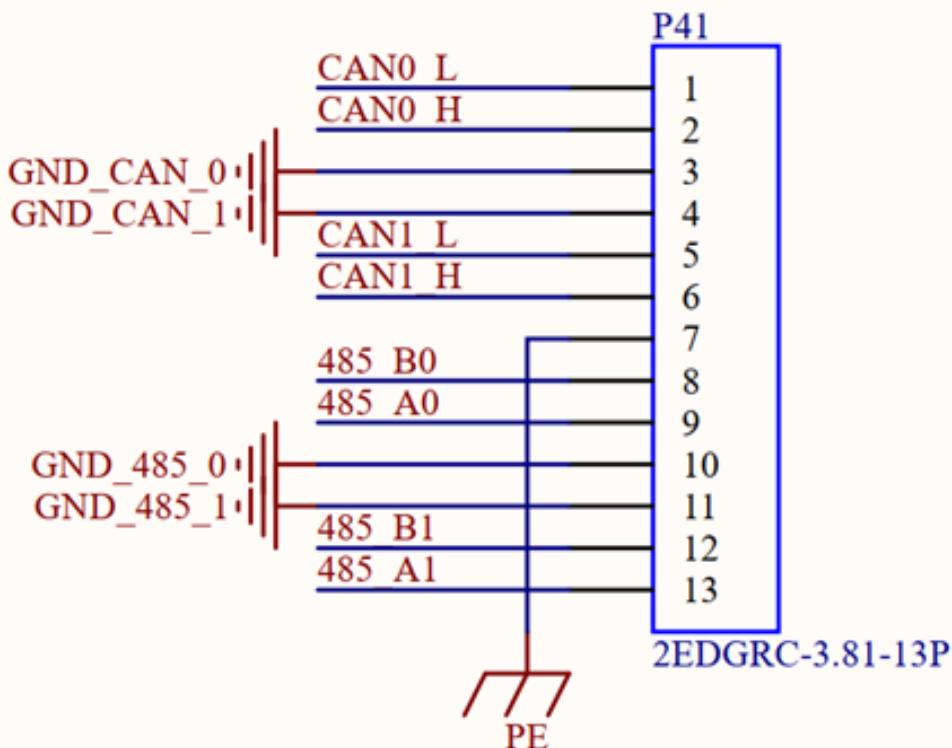
4.8 UART Test

OK527-C development board is provided with 6 x UART, wherein the UART ports on the development board are:

UART	Device Nodes	Description
UART0	/dev/ttyAS0	Debugging serial port cannot be used directly for this test.
UART1	/dev/ttyAS1	Bluetooth is connected and cannot be used directly for this test.
UART2	/dev/ttyAS2	TTL level, multiplexed with SPI, cannot be used directly for this test
UART3	/dev/ttyAS3	TTL level, multiplexed with SPI, cannot be used directly for this test
UART4	/dev/ttyAS4	RS485 level, can be used for this test.
UART5	/dev/ttyAS5	RS485 level, can be used for this test.

The current version of SDK supports up to 1.5M bps.

This test uses UART4 test, respectively UART4 A and B, to the USB to 485 to test the serial port.



Enter the following command in the serial port of the development board:

```
root@OK527:/# fltest_uarttest -d /dev/ttyAS4 -b 115200 -r &
[1] 1953
root@OK527:/# fltest_uarttest -d /dev/ttyAS5 -b 115200 -w
tx_0: Gpi2GoMkYyw12IE9sEBcG6yI0DpmDbFT
rx_0: Gpi2GoMkYyw12IE9sEBcG6yI0DpmDbFT
[1]+ Done fltest_uarttest -d /dev/ttyAS4 -b 115200 -r
root@OK527:/#
```

4.9 USB to Four Serial Port Conversion Test

Description:

- Support XR21V1414USB to Serial Chip Driver;
- **USB to four serial port conversion is an optional module. If you have the need for it, please contact the sales personnel of Forlinx Embedded.**

1. After powering on the development board, connecting the USB to four serial port modules via USB HOST shows specific printing info on the terminal;

```
root@OK527:/# [ 93.708671] usb 1-1.2: new full-speed USB device number 4 using ↵
sunxi-ehci
[ 94.019353] cdc_xr_usb_serial 1-1.2:1.0: This device cannot do calls on its own. ↵
It is not a modem.
[ 94.051170] cdc_xr_usb_serial 1-1.2:1.0: ttyXR_USB_SERIAL0: USB XR_USB_SERIAL ↵
device
[ 94.071060] cdc_xr_usb_serial 1-1.2:1.2: This device cannot do calls on its own. ↵
It is not a modem.
[ 94.100860] cdc_xr_usb_serial 1-1.2:1.2: ttyXR_USB_SERIAL1: USB XR_USB_SERIAL ↵
device
[ 94.120908] cdc_xr_usb_serial 1-1.2:1.4: This device cannot do calls on its own. ↵
It is not a modem.
[ 94.140883] cdc_xr_usb_serial 1-1.2:1.4: ttyXR_USB_SERIAL2: USB XR_USB_SERIAL ↵
device
[ 94.170770] cdc_xr_usb_serial 1-1.2:1.6: This device cannot do calls on its own. ↵
It is not a modem.
[ 94.183344] cdc_xr_usb_serial 1-1.2:1.6: ttyXR_USB_SERIAL3: USB XR_USB_SERIAL ↵
device
[ 94.197509] usbcore: registered new interface driver cdc_xr_usb_serial
[ 94.208693] xr_usb_serial_common: Exar USB UART (serial port) driver
```

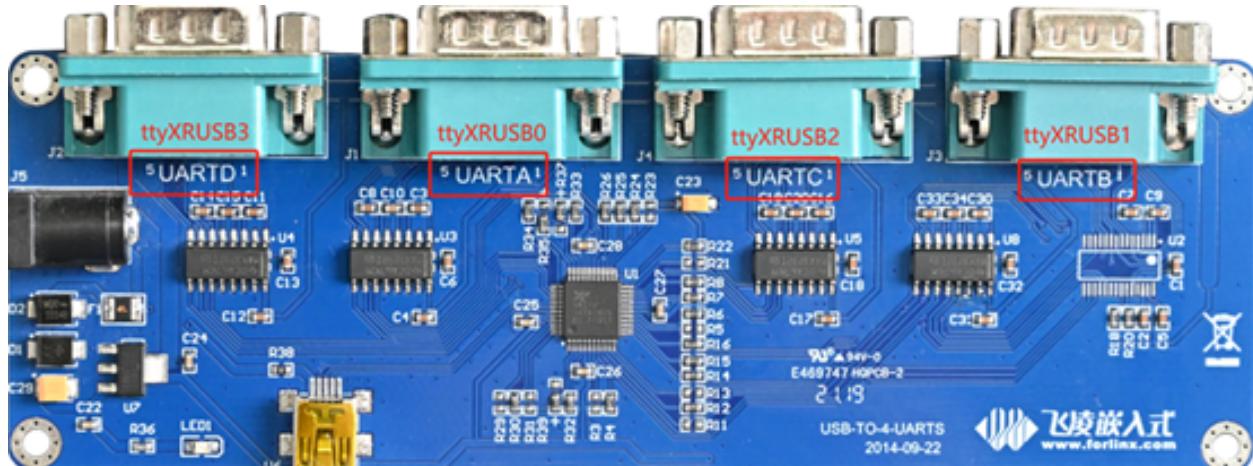
2. Viewusb device status throughlsusb:

```
root@OK527:/# lsusb
Bus 003 Device 001: ID 1d6b:0002
Bus 001 Device 001: ID 1d6b:0002
Bus 001 Device 002: ID 046d:0825
Bus 004 Device 001: ID 1d6b:0001
Bus 002 Device 001: ID 1d6b:0003
Bus 003 Device 005: ID 04e2:1414      //The vid and pid of the conversion chip
Bus 003 Device 002: ID 1a40:0101
```

Check whether there is a production node underdev:

```
root@OK527:/# ls /dev/ttyXRUSB*
/dev/ttyXRUSB0  /dev/ttyXRUSB1  /dev/ttyXRUSB2  /dev/ttyXRUSB3
```

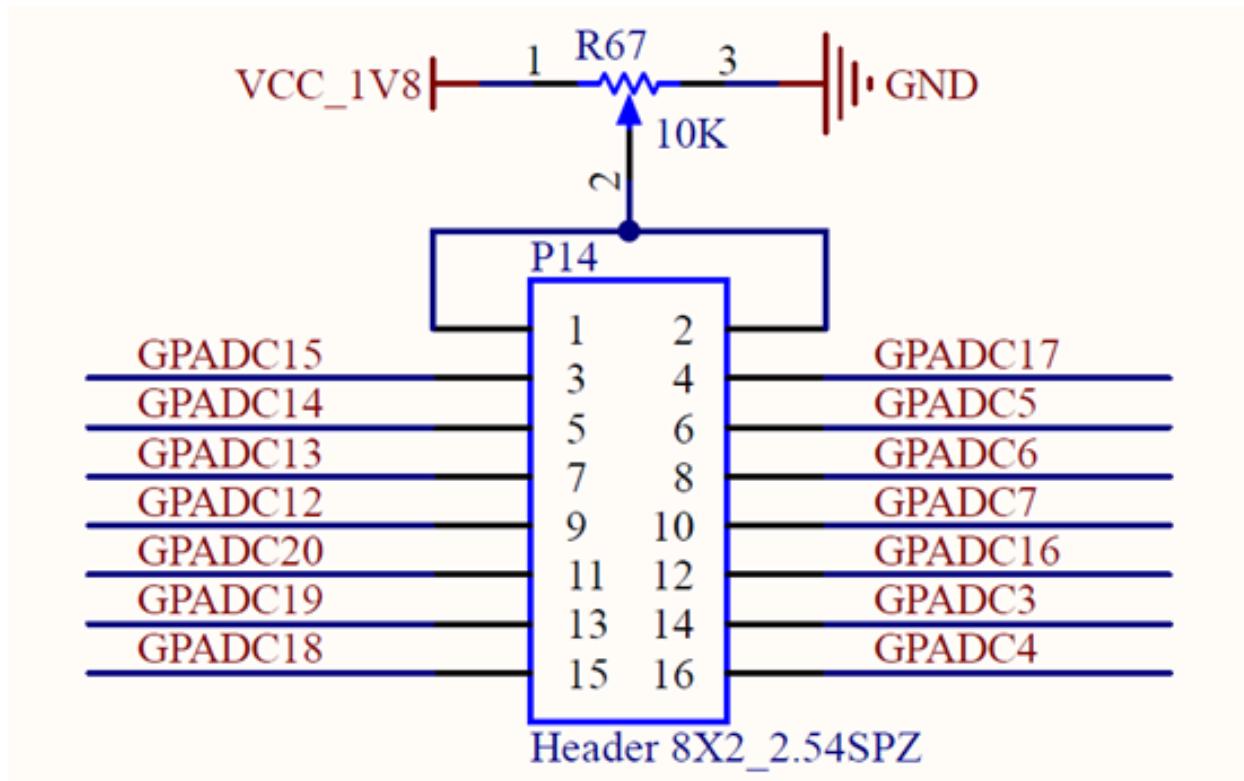
3. The mapping between the four extended serial ports and their corresponding device nodes is shown in the diagram below:



4Please refer to “UART Test” for the test method.

4.10 GPADC Test

The development board provides 14 channels for GPADC, with a voltage sampling range of 0 to 1.8V. Before testing the adjustable resistance value, it is necessary to short-circuit the P14 terminal. Through the P14 terminal, select which channel of the GPADC to connect to the R67 potentiometer:



Each channel corresponds to the following:

Schematic label	Event number	Number in soc
GPADC3	/dev/input/event2	gpadc0_channel3
GPADC4	/dev/input/event3	gpadc0_channel4
GPADC5	/dev/input/event4	gpadc0_channel5
GPADC6	/dev/input/event5	gpadc0_channel6
GPADC7	/dev/input/event6	gpadc0_channel7
GPADC12	/dev/input/event7	gpadc1_channel0
GPADC13	/dev/input/event8	gpadc1_channel1
GPADC14	/dev/input/event9	gpadc1_channel2
GPADC15	/dev/input/event10	gpadc1_channel3
GPADC16	/dev/input/event11	gpadc1_channel4
GPADC17	/dev/input/event12	gpadc1_channel5
GPADC18	/dev/input/event13	gpadc1_channel6
GPADC19	/dev/input/event14	gpadc1_channel7
GPADC20	/dev/input/event15	gpadc1_channel8

Run the fltest _ adc, input 3, read the /dev/input/event3 event, corresponding to channel 4 of GPADC0, corresponding to schematic GPADC4.

```
root@OK527:/#fltest_adc
Available devices:
/dev/input/event2:      sunxi-gpadc0/channel3/input0
/dev/input/event3:      sunxi-gpadc0/channel4/input0
/dev/input/event4:      sunxi-gpadc0/channel5/input0
/dev/input/event5:      sunxi-gpadc0/channel6/input0
/dev/input/event6:      sunxi-gpadc0/channel7/input0
/dev/input/event7:      sunxi-gpadc1/channel0/input0
/dev/input/event8:      sunxi-gpadc1/channel1/input0
/dev/input/event9:      sunxi-gpadc1/channel2/input0
/dev/input/event10:     sunxi-gpadc1/channel3/input0
/dev/input/event11:     sunxi-gpadc1/channel4/input0
/dev/input/event12:     sunxi-gpadc1/channel5/input0
/dev/input/event13:     sunxi-gpadc1/channel6/input0
/dev/input/event14:     sunxi-gpadc1/channel7/input0
/dev/input/event15:     sunxi-gpadc1/channel8/input0
Select the device event number: 3
sunxi-gpadc0/channel4/input0
[ 919.877925] sunxi-gpadc 2009000.gpadc0: Enable channel 4 value 848
value 846
value 848
value 849
value 849
```

4.11 TF Test

Description:

The SD card mounts at /run/media, allowing hot-plugging. Terminal displays SD card information.

If the file system doesn't support NTFS, format the TF card as FAT32 before use, especially if unsure of its current format.

The device node is “/dev/mmcblk1” after the eMMC version is inserted into the TF card.

The following test commands are based on the eMMC version.

1. Insert the TF card into the card slot on the carrier board. Under normal circumstances, the development board terminal will display the following printing information:

```
[ 1157.138343] sunxi-mmc 4020000.sdmmc: sdc set ios:clk 0Hz bm PP pm UP vdd 23 width_
↪1 timing LEGACY(SDR12) dt B
[ 1157.149582] sunxi-mmc 4020000.sdmmc: no vqmmc,Check if there is regulator
[ 1157.169740] sunxi-mmc 4020000.sdmmc: sdc set ios:clk 400000Hz bm PP pm ON vdd 23_
↪width 1 timing LEGACY(SDR12) dt B
[ 1157.193961] sunxi-mmc 4020000.sdmmc: sdc set ios:clk 400000Hz bm PP pm ON vdd 23_
↪width 1 timing LEGACY(SDR12) dt B
[ 1157.208550] sunxi-mmc 4020000.sdmmc: sdc set ios:clk 400000Hz bm PP pm ON vdd 23_
↪width 1 timing LEGACY(SDR12) dt B
[ 1157.222435] sunxi-mmc 4020000.sdmmc: sdc set ios:clk 400000Hz bm PP pm ON vdd 23_
↪width 1 timing LEGACY(SDR12) dt B
[ 1157.237016] sunxi-mmc 4020000.sdmmc: sdc set ios:clk 400000Hz bm PP pm ON vdd 23_
↪width 1 timing LEGACY(SDR12) dt B
[ 1157.358250] sunxi-mmc 4020000.sdmmc: sdc set ios:clk 0Hz bm PP pm ON vdd 23 width_
↪1 timing LEGACY(SDR12) dt B
[ 1157.369389] sunxi-mmc 4020000.sdmmc: no vqmmc,Check if there is regulator
[ 1157.389574] sunxi-mmc 4020000.sdmmc: sdc set ios:clk 400000Hz bm PP pm ON vdd 23_
↪width 1 timing LEGACY(SDR12) dt B
[ 1157.408944] mmc1: host does not support reading read-only switch, assuming write-
↪enable
[ 1157.418575] sunxi-mmc 4020000.sdmmc: sdc set ios:clk 400000Hz bm PP pm ON vdd 23_
↪width 4 timing LEGACY(SDR12) dt B
[ 1157.431870] sunxi-mmc 4020000.sdmmc: sdc set ios:clk 400000Hz bm PP pm ON vdd 23_
↪width 4 timing UHS-SDR104 dt B
[ 1157.443255] sunxi-mmc 4020000.sdmmc: sdc set ios:clk 150000000Hz bm PP pm ON vdd_
↪23 width 4 timing UHS-SDR104 dt B
[ 1157.455037] mmc1: new ultra high speed SDR104 SDHC card at address 5048
[ 1157.463121] mmcblk1: mmc1:5048 SD32G 29.7 GiB
[ 1157.470663] mmcblk1: p1
[ 1157.474099] sunxi:sound-mach:[ERR]: 432 simple_parse_of(): simple_dai_link_of_
↪failed
[ 1157.575863] squashfs: Unknown parameter 'umask'
[ 1157.583393] FAT-fs (mmcblk1p1): Volume was not properly unmounted. Some data may_
↪be corrupt. Please run fsck.

root@OK527:/#
```

2. Check the mount directory:

```
root@OK527:/# ls /run/media
↪media directory
mmcblk0p1  mmcblk0p5  mmcblk1p1 //List files in the/run/
```

3. Write test:

```
root@OK527:/# dd if=/dev/zero of=/run/media/mmcblk1p1/test bs=1M count=500 conv=fsync
500+0 records in
500+0 records out
```

(continues on next page)

(continued from previous page)

```
524288000 bytes (524 MB, 500 MiB) copied, 10.6269 s, 49.3 MB/s
```

4. Read the test:

Note: To ensure the accuracy of the data, please restart the development board to test the reading speed.

```
root@OK527:/#dd if=/dev/mmcblk1p1 of=/dev/null bs=1M count=500 iflag=direct
500+0 records in
500+0 records out
524288000 bytes (524 MB, 500 MiB) copied, 7.56327 s, 69.3 MB/s
```

5. After using the TF card, uninstall it with umount before ejecting it.

```
root@OK527:/#umount /run/media/mmcblk1p1
```

Note: Plug and unplug the TF card after exiting the TF card mounting path.

4.12 Storage Test

The OK527 platform's eMMC runs by default in HS400 mode. Below is a simple test of the eMMC's read and write speed using the ext4 file system as an example.

Write test:

```
root@OK527:/#dd if=/dev/zero of=/run/media/mmcblk0p5/data.img bs=1M count=500
↪conv=fsync
500+0 records in
500+0 records out
524288000 bytes (524 MB, 500 MiB) copied, 4.39941 s, 119 MB/s
```

Read test:

Note: To ensure the accuracy of the data, please restart the development board to test the reading speed.

```
root@OK527:/#dd if=/run/media/mmcblk0p5/data.img of=/dev/null bs=1M count=500
↪iflag=direct
500+0 records in
500+0 records out
524288000 bytes (524 MB, 500 MiB) copied, 2.16065 s, 243 MB/s
```

4.13 USB Mouse Test

Description:

Hot-plugging of USB mouse and USB keyboard is supported.

Connect the USB mouse to the USB interface of the OK527 platform, and the print information of the serial port terminal is as follows:

```
[ 469.514707] usb 1-1.3: new low-speed USB device number 3 using sunxi-ehci
[ 469.754922] usb 1-1.3: New USB device found, idVendor=17ef, idProduct=608d,
↪bcdDevice= 1.00
[ 469.764363] usb 1-1.3: New USB device strings: Mfr=1, Product=2, SerialNumber=0
[ 469.772616] usb 1-1.3: Product: Lenovo USB Optical Mouse
[ 469.778627] usb 1-1.3: Manufacturer: PixArt
```

(continues on next page)

(continued from previous page)

```
[ 469.786636] input: PixArt Lenovo USB Optical Mouse as /devices/platform/
↳soc@3000000/4200000.ehci1-controller/usb1/1-1/1-1.3/1-1.3:1.0/0003:17EF:608D.0001/
↳input/input18
[ 469.803644] hid-generic 0003:17EF:608D.0001: input: USB HID v1.11 Mouse [PixArt_
↳Lenovo USB Optical Mouse] on usb-sunxi-ehci-1.3/input0
```

At this time, the arrow cursor appears on the screen, the mouse can work normally.

When the USB mouse is unplugged, the arrow cursor on the screen disappears and the mouse is successfully removed.

4.14 USB 2.0

Description:

Support hot-plugging of USB flash drive devices;

If NTFS isn't supported and you're unsure of the USB drive's format, it's best to format it to FAT32 before using it.

Note the distinction between USB 3.0 and USB 2.0 interfaces.

OK527 supports three USB2.0 interfaces. Users can connect USB mouse, USB keyboard, U disk and other devices on any on-board USB HOST interface, and support hot plug of the above devices. Here's a demo using the example of mounting a USB disk.

The terminal shows USB flash drive info, which can vary due to the many types available.

- Upon booting the development board, plug a USB flash drive into its USB host interface;

Serial port information:

```
[ 299.407137] usb 1-1.1: new high-speed USB device number 3 using sunxi-ehci
[ 299.623907] usb 1-1.1: New USB device found, idVendor=23a9, idProduct=ef18,_
↳bcdDevice= 1.00
[ 299.633348] usb 1-1.1: New USB device strings: Mfr=1, Product=2, SerialNumber=0
[ 299.641597] usb 1-1.1: Product: DISK
[ 299.645655] usb 1-1.1: Manufacturer: USB
[ 299.650672] usb-storage 1-1.1:1.0: USB Mass Storage device detected
[ 299.658180] scsi host0: usb-storage 1-1.1:1.0
[ 300.667827] scsi 0:0:0:0: Direct-Access      SCSI      DISK           1.00 PQ: 0_
↳ANSI: 4
[ 300.678224] sd 0:0:0:0: [sda] 31223936 512-byte logical blocks: (16.0 GB/14.9 GiB)
[ 300.687472] sd 0:0:0:0: [sda] Write Protect is off
[ 300.692856] sd 0:0:0:0: [sda] Mode Sense: 03 00 00 00
[ 300.699217] sd 0:0:0:0: [sda] No Caching mode page found
[ 300.705180] sd 0:0:0:0: [sda] Assuming drive cache: write through
[ 300.733381] sda: sda1
[ 300.739080] sd 0:0:0:0: [sda] Attached SCSI removable disk
[ 300.926482] squashfs: Unknown parameter 'umask'
[ 300.935819] FAT-fs (sda1): Volume was not properly unmounted. Some data may be_
↳corrupt. Please run fsck.
```

- Check the mount directory:

```
root@OK527:/#ls /run/media/
mmcblk0p1  mmcblk0p5  sda1
```

“sda1” represents the first partition of the first USB storage device inserted, and so forth.

3. View the contents of the USB flash drive:

```
root@OK527:/#ls -l /run/media/sda1
total 8
drwxrwx--- 2 root disk 8192 Sep 23 2021 'System Volume Information'
-rwxrwx--- 1 root disk 0 Apr 25 09:25 test
```

4. Write test: Write speeds are limited by the specific storage device:

```
root@OK527:/#dd if=/dev/zero of=/run/media/sda1/test bs=1M count=500 conv=fsync
500+0 records in
500+0 records out
524288000 bytes (524 MB, 500 MiB) copied, 58.7372 s, 8.9 MB/s
```

5. Read test:

Note: To ensure the accuracy of the data, please restart the development board to test the reading speed.

```
root@OK527:/#dd if=/run/media/sda1/test of=/dev/null bs=1M count=500 iflag=direct
500+0 records in
500+0 records out
524288000 bytes (524 MB, 500 MiB) copied, 18.4939 s, 28.3 MB/s
```

6. Before removing the USB flash drive, it's necessary to unmount it using “umount” .

```
root@OK527:/#umount /run/media/sda1
```

Note: Unplug the USB disk after exiting the mount path.

4.15 OTG Test

OK527-C board includes an OTG (On-The-Go) interface. In Device mode, it can be used for activities such as firmware flashing, ADB file transfer, and debugging. In Host mode, it allows you to connect regular USB devices to the board. When using a Type-C adapter cable to connect OK527-C to a PC, OK527-C will automatically configure OTG as Device mode. Similarly, when using an OTG cable to plug in a USB flash drive or other devices, the system will automatically configure OTG as Host mode.

1. After the development board boots up, connect a USB flash drive to the development board's OTG interface using a Type-C to Type-A cable.

Serial port information:

```
[ 854.830829] sunxi:sunxi_usbc:[INFO]: insmod_host_driver
[ 854.830829]
[ 854.838363] sunxi:ehci_sunxi:[INFO]: [ehci0-controller]: sunxi_usb_enable_ehci
[ 854.846465] sunxi:ehci_sunxi:[INFO]: [sunxi-ehci0]: probe, pdev->name: 4101000.
↳ehci0-controller, sunxi_ehci: 0xfffffff0c009691ef8, 0x:fffffff0c009d0d000, irq_no:87
[ 854.862647] sunxi-ehci 4101000.ehci0-controller: supply hci not found, using dummy_
↳regulator
[ 854.873372] sunxi-ehci 4101000.ehci0-controller: EHCI Host Controller
[ 854.880616] sunxi-ehci 4101000.ehci0-controller: new USB bus registered, assigned_
↳bus number 5
[ 854.890346] sunxi-ehci 4101000.ehci0-controller: irq 135, io mem 0x04101000
[ 854.910818] sunxi-ehci 4101000.ehci0-controller: USB 2.0 started, EHCI 1.00
```

(continues on next page)

(continued from previous page)

```
[ 854.918710] usb usb5: New USB device found, idVendor=1d6b, idProduct=0002, ↵
↳bcdDevice= 5.15
[ 854.927990] usb usb5: New USB device strings: Mfr=3, Product=2, SerialNumber=1
[ 854.936091] usb usb5: Product: EHCI Host Controller
[ 854.941559] usb usb5: Manufacturer: Linux 5.15.147 ehci_hcd
[ 854.947804] usb usb5: SerialNumber: sunxi-ehci
[ 854.953154] hub 5-0:1.0: USB hub found
[ 854.957379] hub 5-0:1.0: 1 port detected
[ 854.961978] sunxi:ohci_sunxi:[INFO]: [ohci0-controller]: sunxi_usb_enable_ohci
[ 854.970099] sunxi:ohci_sunxi:[INFO]: [sunxi-ohci0]: probe, pdev->name: 4101400. ↵
↳ohci0-controller, sunxi_ohci: 0xfffffff009692b88
[ 854.983136] sunxi-ohci 4101400.ohci0-controller: supply hci not found, using dummy ↵
↳regulator
[ 854.992743] sunxi-ohci 4101400.ohci0-controller: OHCI Host Controller
[ 854.999983] sunxi-ohci 4101400.ohci0-controller: new USB bus registered, assigned ↵
↳bus number 6
[ 855.009657] debugfs: Directory 'sunxi-ohci' with parent 'ohci' already present!
[ 855.017887] sunxi-ohci 4101400.ohci0-controller: irq 136, io mem 0x04101400
[ 855.086895] usb usb6: New USB device found, idVendor=1d6b, idProduct=0001, ↵
↳bcdDevice= 5.15
[ 855.096168] usb usb6: New USB device strings: Mfr=3, Product=2, SerialNumber=1
[ 855.104269] usb usb6: Product: OHCI Host Controller
[ 855.109736] usb usb6: Manufacturer: Linux 5.15.147 ohci_hcd
[ 855.115983] usb usb6: SerialNumber: sunxi-ohci
[ 855.121260] hub 6-0:1.0: USB hub found
[ 855.125483] hub 6-0:1.0: 1 port detected
[ 855.218822] usb 5-1: new high-speed USB device number 2 using sunxi-ehci
[ 855.382081] usb 5-1: New USB device found, idVendor=05e3, idProduct=0747, ↵
↳bcdDevice= 8.19
[ 855.391268] usb 5-1: New USB device strings: Mfr=3, Product=4, SerialNumber=5
[ 855.399272] usb 5-1: Product: USB Storage
[ 855.403764] usb 5-1: Manufacturer: Generic
[ 855.408353] usb 5-1: SerialNumber: 000000000819
[ 855.414264] usb-storage 5-1:1.0: USB Mass Storage device detected
[ 855.421491] scsi host0: usb-storage 5-1:1.0
[ 856.431909] scsi 0:0:0:0: Direct-Access      Generic  STORAGE DEVICE  0819 PQ: 0 ↵
↳ANSI: 6
[ 856.962020] sd 0:0:0:0: [sda] 31116288 512-byte logical blocks: (15.9 GB/14.8 GiB)
[ 856.971757] sd 0:0:0:0: [sda] Write Protect is off
[ 856.977140] sd 0:0:0:0: [sda] Mode Sense: 87 00 00 00
[ 856.984008] sd 0:0:0:0: [sda] Write cache: disabled, read cache: enabled, doesn't ↵
↳support DPO or FUA
[ 857.005850] sda: sda1
[ 857.012361] sd 0:0:0:0: [sda] Attached SCSI removable disk
[ 857.237318] FAT-fs (sda1): Volume was not properly unmounted. Some data may be ↵
↳corrupt. Please run fsck.
```

2. Check the mount directory:

```
root@OK527:/#ls /run/media/
mmcblk0p1  mmcblk0p5  sda1
```

“sda1” represents the first partition of the first USB storage device inserted, and so forth.

3. View the contents of the USB flash drive:

```
root@OK527:/#ls -l /run/media/sda1
total 8
drwxrwx--- 2 root disk 8192 Sep 23 2021 'System Volume Information'
-rwxrwx--- 1 root disk 0 Apr 25 09:25 test
```

4. Write test: Write speeds are limited by the specific storage device:

```
root@OK527:/#dd if=/dev/zero of=/run/media/sda1/test bs=1M count=500 conv=fsync
500+0 records in
500+0 records out
524288000 bytes (524 MB, 500 MiB) copied, 63.8278 s, 8.2 MB/s
```

5. Read test:

Note: To ensure the accuracy of the data, please restart the development board to test the reading speed.

```
root@OK527:/#dd if=/run/media/sda1/test of=/dev/null bs=1M count=500 iflag=direct
500+0 records in
500+0 records out
524288000 bytes (524 MB, 500 MiB) copied, 18.2891 s, 28.7 MB/s
```

6. Before removing the USB flash drive, it's necessary to unmount it using “umount” .

```
root@OK527:/#umount /run/media/sda1
```

4.16 Ethernet Configuration

OK527-C comes with 2 x Gigabit Ethernet ports. When connected to the network via an Ethernet cable, the factory default configuration sets eth0 to the static IP 192.168.0.232. The OK527-C's network card can be configured via the configuration file /etc/network/interfaces.

4.16.1 Gigabit Ethernet Static IP Configuration

Note: In the kernel, the Gigabit Ethernet card is identified as eth0, and its default IP address is 192.168.0.232.

After booting the development board, execute the following command to open the network configuration file/etc/network/interfaces

```
root@OK527:/#vi /etc/network/interfaces
```

Content as follows (slight differences may occur after software version updates; users should refer to actual information):

iface: Used to specify a network card that requires a fixed IP;

address: Used to specify an IP address that needs to be fixed;

netmask: Used to set the subnet mask;

gateway: Used to specify a gateway;

```
root@OK527:/# cat /etc/network/interfaces
# interface file auto-generated by buildroot
```

```
auto lo
```

(continues on next page)

(continued from previous page)

```
iface lo inet loopback

auto eth0
iface eth0 inet static
address 192.168.0.232
netmask 255.255.255.0
gateway 192.168.0.1
root@OK527:/#
```

Setnameserver

```
root@OK527:/#vi /etc/resolv.conf

nameserver 114.114.114.114
nameserver 8.8.8.8
```

After setting according to the actual situation, save and exit, use sync to synchronize, restart the development board or execute the ip addr flush dev eth0 to clear the network card ip, and then use the ifdown-a and ifup-a commands to restart and stop the configuration, so that the configuration file can take effect.

4.16.2 Ethernet Speed Test**Description:**

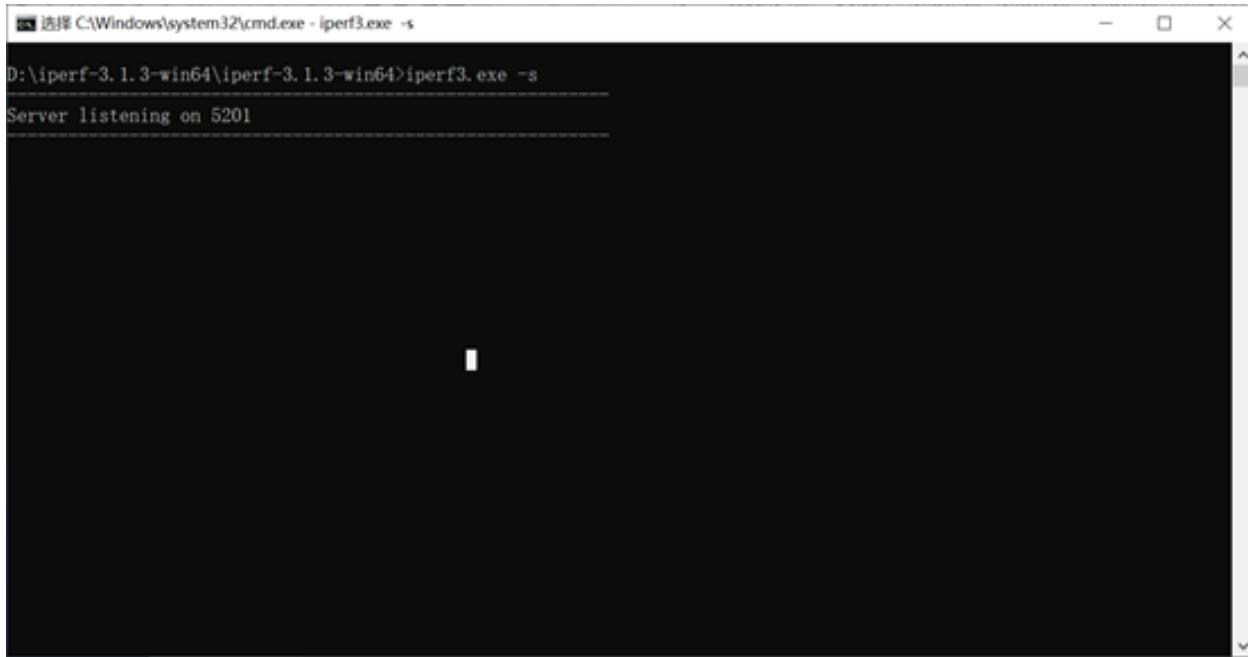
Test the communication speed between the development board and the computer to ensure that they can communicate properly.

The iperf3 tool (02-User Data\01-Software Data\04-Tools\iperf-3.1.3-win64.zip) is assumed to be installed on Windows for this test.

Use network speed testing tool iperf3, test OK527-C carrier board eth0 network speed.

Run iperf3 server mode on the cmd command terminal in Windows:

```
D:\iperf-3.1.3-win64\iperf-3.1.3-win64>iperf3.exe -s
```



Development board eth0 IP is 192.168.1.11, windows IP is 192.168.1.39, input at the OK527 serial port debugging terminal.

```
root@OK527:/# iperf3 -c 192.168.1.39          //Test upload bandwidth
Connecting to host 192.168.1.39, port 5201
[ 5] local 192.168.1.11 port 55152 connected to 192.168.1.39 port 5201
[ ID] Interval      Transfer     Bitrate      Retr  Cwnd
[ 5]  0.00-1.00    sec   95.2 MBytes   799 Mbits/sec   0   217 KBytes
[ 5]  1.00-2.00    sec   93.0 MBytes   780 Mbits/sec   0   217 KBytes
[ 5]  2.00-3.00    sec   95.3 MBytes   800 Mbits/sec   0   217 KBytes
[ 5]  3.00-4.00    sec   94.8 MBytes   796 Mbits/sec   0   217 KBytes
[ 5]  4.00-5.00    sec   93.9 MBytes   787 Mbits/sec   0   217 KBytes
[ 5]  5.00-6.00    sec   94.4 MBytes   792 Mbits/sec   0   217 KBytes
[ 5]  6.00-7.00    sec   93.3 MBytes   783 Mbits/sec   0   217 KBytes
[ 5]  7.00-8.00    sec   94.3 MBytes   791 Mbits/sec   0   217 KBytes
[ 5]  8.00-9.00    sec   90.2 MBytes   756 Mbits/sec   1   217 KBytes
[ 5]  9.00-10.00   sec   94.0 MBytes   789 Mbits/sec   0   217 KBytes
[ ID] Interval      Transfer     Bitrate      Retr
[ 5]  0.00-10.00   sec   939 MBytes   787 Mbits/sec   1
[ 5]  0.00-10.00   sec   938 MBytes   787 Mbits/sec

iperf Done.
root@OK527:/# iperf3 -c 192.168.1.39 -R          //Test download bandwidth
Connecting to host 192.168.1.39, port 5201
Reverse mode, remote host 192.168.1.39 is sending
[ 5] local 192.168.1.11 port 40676 connected to 192.168.1.39 port 5201
[ ID] Interval      Transfer     Bitrate
[ 5]  0.00-1.00    sec   113 MBytes   946 Mbits/sec
[ 5]  1.00-2.00    sec   109 MBytes   916 Mbits/sec
[ 5]  2.00-3.00    sec   112 MBytes   940 Mbits/sec
[ 5]  3.00-4.00    sec   112 MBytes   944 Mbits/sec
[ 5]  4.00-5.00    sec   108 MBytes   907 Mbits/sec
```

(continues on next page)

(continued from previous page)

```
[ 5] 5.00-6.00 sec 110 MBytes 924 Mbits/sec
[ 5] 6.00-7.00 sec 111 MBytes 934 Mbits/sec
[ 5] 7.00-8.00 sec 111 MBytes 928 Mbits/sec
[ 5] 8.00-9.00 sec 112 MBytes 941 Mbits/sec
[ 5] 9.00-10.00 sec 110 MBytes 919 Mbits/sec
- - - - -
[ ID] Interval Transfer Bitrate
[ 5] 0.00-10.00 sec 1.08 GBytes 930 Mbits/sec
[ 5] 0.00-10.00 sec 1.08 GBytes 930 Mbits/sec
                                         sender
                                         receiver

iperf Done.
root@OK527:/#
```

OK527-C Gigabit network bandwidth is:

Eth0 upload speed 787Mbps, download speed 930Mbps

Eth1 upload speed 948Mbps, download speed 945Mbps

4.17 Network Services

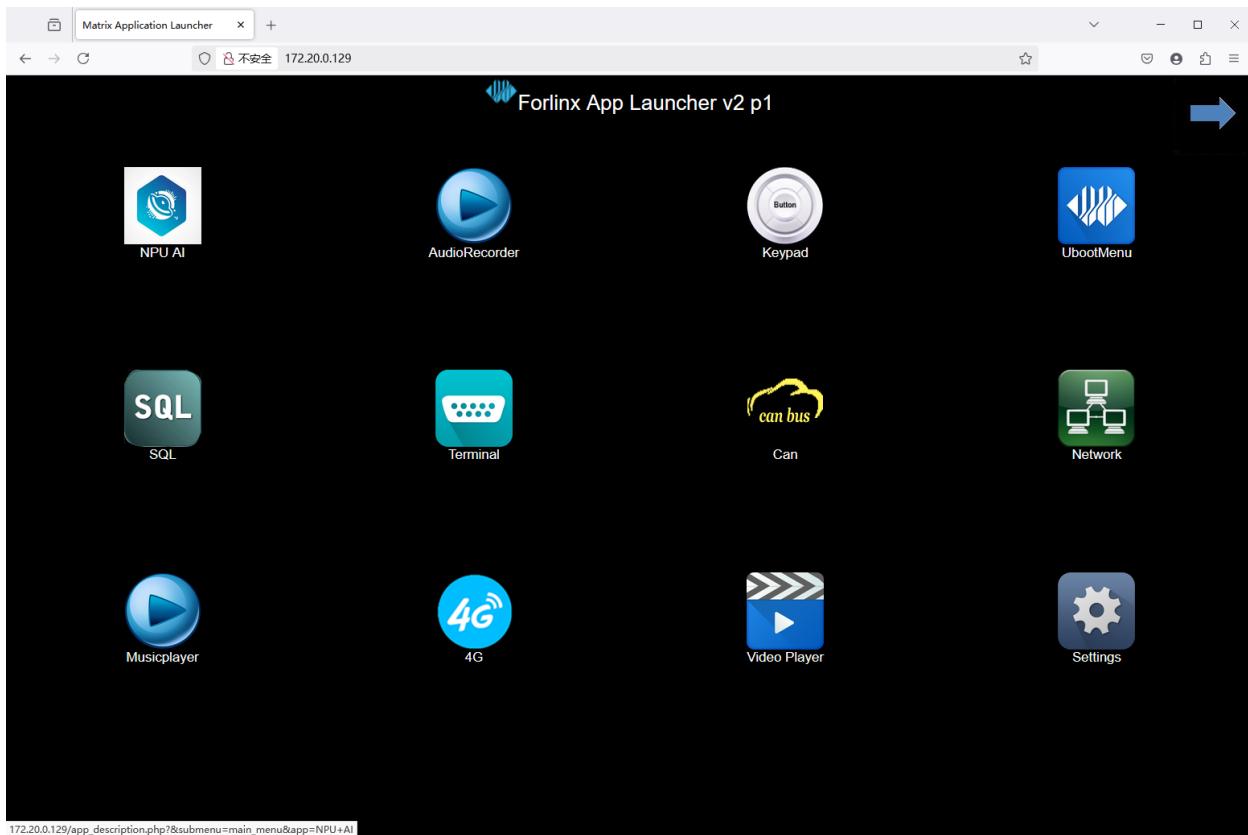
Description:

The default IP for eth0 is 192.168.0.232

4.17.1 Web Services

Note: To properly use this feature, the PC's IP address must be in the same network segment as the development board's.

The OK527 development board comes with the lighttpd web server pre-installed, and the lighttpd service has been automatically started at system startup. Enter the IP address of the board into the PC browser to view the web pages in the board's webserver, as shown in the following figure:



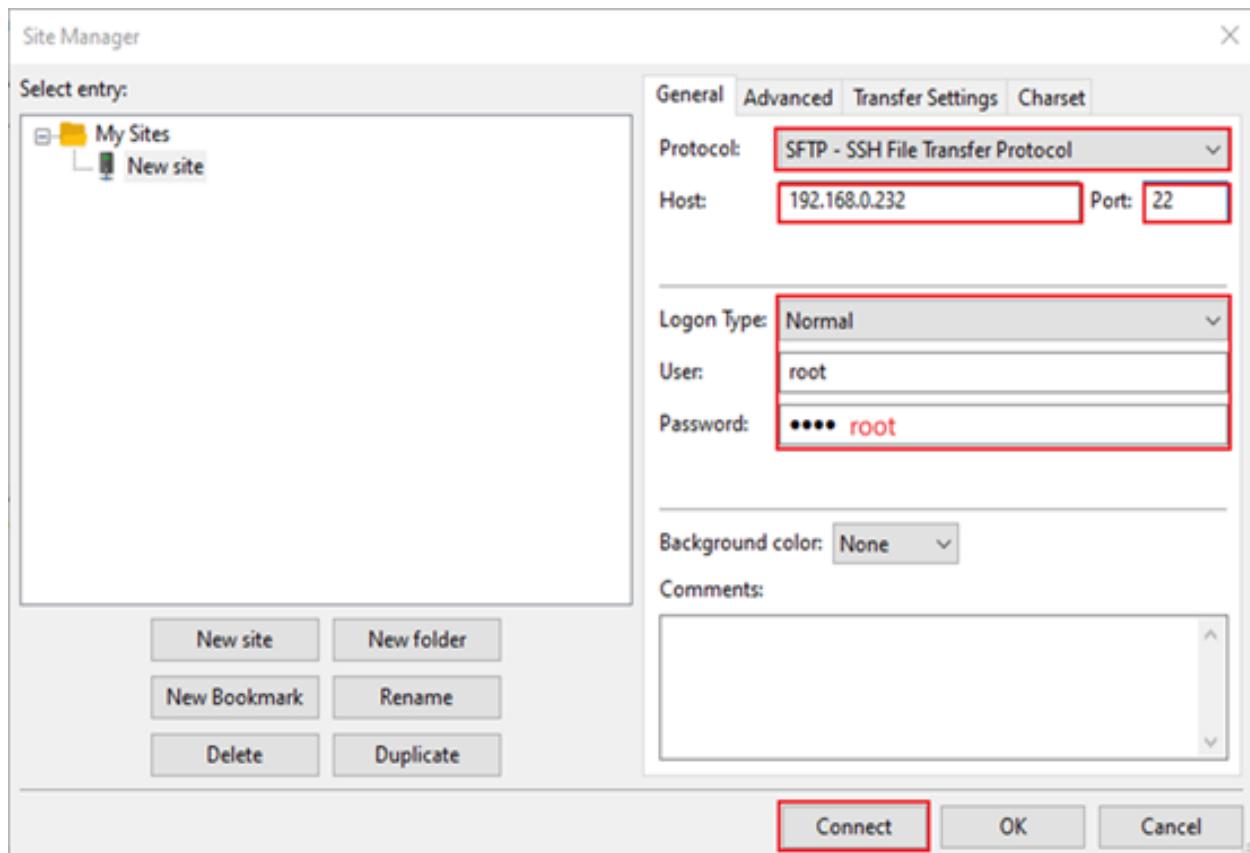
4.17.2 SFTP

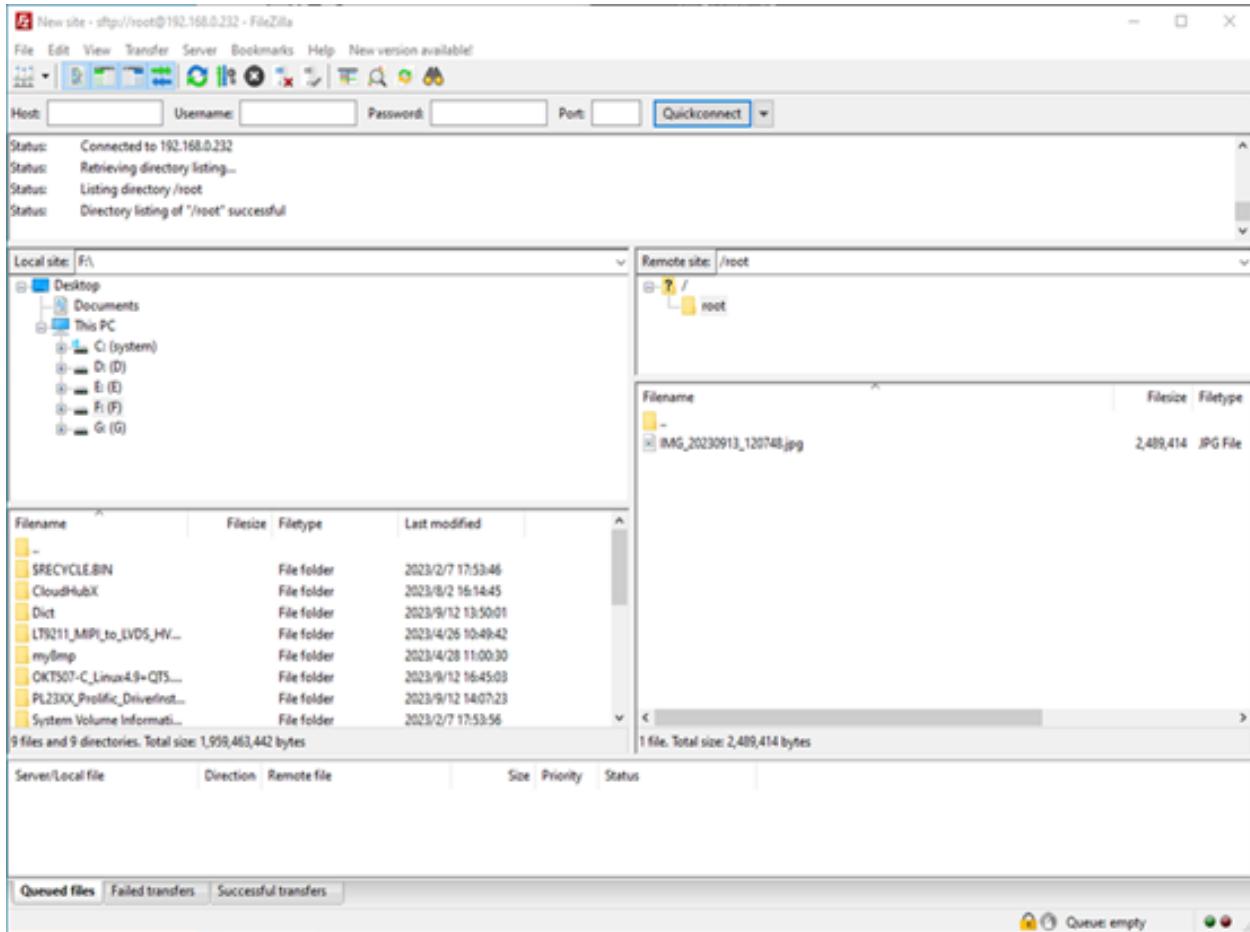
Installation package path: 02-User information \ 01-Software information \ 04-Tools \ FileZilla*

The OK527-C development board supports SFTP service, and it is automatically enabled during system startup. Once the IP address is set, it can function as an SFTP server. The following describes how to utilize the SFTP tool for file transfer.

Install FileZilla tool on Windows and follow the steps shown in the image below to set it up.

Open the filezilla tool, click on File and select Site Manager.





Once we have successfully logged in, we can upload and download.

4.18 WIFI Test

4.18.1 STA Mode

Description:

The network environment is different, so please set it according to the actual situation when you do this experiment.

The development board supports the connection of 2.4G and 5G wireless hotspots

This mode is used as a station to connect to the wireless network. In the following test, the router uses WPA encryption, the connected wifi is 2.4GHz, the hotspot name is H3C _ 708, and the password is 123456785. Due to the different network environments, users should set up according to the actual situation when conducting this test:

1. Enter the following command in the development board terminal:

The meanings of the related parameters in the command are as follows:

Parameter	Meaning
-i	Wireless NIC Node Name
-s	Actual wifi hotspot connected
-p	-p: followed by the parameter Password refers to the password of the actual wifi hotspot to be connected. If the current hotspot does not have a password, the parameter after -p is NONE.

The serial port prints as follows:

```
root@OK527:/# fltest_wifi.sh -i wlan0 -s H3C_708 -p 123456785.
[ 204.803506] sunxi-gmac 4500000.gmac0 eth0: Link is Down
wifi wlan0
ssid H3C_708
pasw 123456785.
waiting...
[ 211.388935] IPv6: ADDRCONF(NETDEV_CHANGE): wlan0: link becomes ready
udhcpc: started, v1.35.0
udhcpc: broadcasting discover
udhcpc: broadcasting discover
udhcpc: broadcasting select for 192.168.1.20, server 192.168.1.1
udhcpc: lease of 192.168.1.20 obtained from 192.168.1.1, lease time 86400
deleting routers
adding dns 192.168.1.1
adding dns 114.114.114.114
connect ok
```

2. Check whether it can ping the external network and enter the following command in the terminal:

```
root@OK527:/#ping -I wlan0 baidu.com -c 4          //Assign the wlan0 NIC to ping 4
times
PING baidu.com (110.242.68.66): 56 data bytes
64 bytes from 110.242.68.66: seq=0 ttl=54 time=95.213 ms
64 bytes from 110.242.68.66: seq=1 ttl=54 time=119.289 ms
64 bytes from 110.242.68.66: seq=2 ttl=54 time=40.234 ms
64 bytes from 110.242.68.66: seq=3 ttl=54 time=64.454 ms

--- baidu.com ping statistics ---
4 packets transmitted, 4 packets received, 0% packet loss
round-trip min/avg/max = 40.234/79.797/119.289 ms
```

4.18.2 AP Mode

Description:

Ensure that the Gigabit LAN card is eth0 connected to the network and that the network works well before performing this test;

5GHz hotspot on by default

To enable the 2.4GHz hotspot and modify the /usr/bin/fltest_hostap.sh, change “hostapd/etc/hostapd-5g.conf &” to “hostapd/etc/hostapd-2.4g.conf &”

1. Configure Hotspot

WiFi Hotspot Name: OK527_WIFI_5G_AP

Password: 12345678

Check by hotspot name, password and /etc/hostapd-5g.conf.

```
root@OK527:/# fltest_hostap.sh
done!
uap0: interface state UNINITIALIZED->COUNTRY_UPDATE
[    74.247545] IPv6: ADDRCONF(NETDEV_CHANGE): uap0: link becomes ready
uap0: interface state COUNTRY_UPDATE->ENABLED
uap0: AP-ENABLED
uap0: STA 86:de:12:63:58:96 IEEE 802.11: authenticated
uap0: STA 86:de:12:63:58:96 IEEE 802.11: associated (aid 1)
uap0: AP-STA-CONNECTED 86:de:12:63:58:96
uap0: STA 86:de:12:63:58:96 WPA: pairwise key handshake completed (RSN)
uap0: EAPOL-4WAY-HS-COMPLETED 86:de:12:63:58:96
```

4.19 4G Test

Description:

The driver supports the Quectel EC20 4G module .

OK527 supports a 4G module. Before starting the development board, connect the 4G module, install the 4G antenna, insert the SIM card, and then power on the board. Perform a dial-up internet connection on the EC20 module.

4.19.1 EC20 Test

Description:

When testing with an IoT card, ensure the module's firmware version; older versions may require upgrading to EC20 firmware for compatibility.

Some IoT SIM cards may require specific account credentials when dialing. Users should adjust the instructions accordingly based on the actual situation.

You can use the quectelCM -help command to see the meaning of the relevant parameters.

1. After connecting the module and powering up the board and module, check the USB status through the lsusb command;

```
root@OK527:/# lsusb
Bus 005 Device 001: ID 1d6b:0002
Bus 003 Device 001: ID 1d6b:0002
Bus 003 Device 003: ID 2c7c:0125      //EC20
Bus 001 Device 001: ID 1d6b:0002
Bus 005 Device 002: ID 05e3:0747
Bus 006 Device 001: ID 1d6b:0001
Bus 001 Device 002: ID 046d:0825
Bus 004 Device 001: ID 1d6b:0001
Bus 002 Device 001: ID 1d6b:0003
Bus 003 Device 002: ID 1a40:0101
```

View device node status under /dev

```
root@OK527:/#ls /dev/ttyUSB*
/dev/ttyUSB0  /dev/ttyUSB1  /dev/ttyUSB2  /dev/ttyUSB3
```

2. After the equipment is successfully identified, the dial-up Internet access test can be conducted;

```
root@OK527:/#fltest_quentel.sh &
```

Printing information is as follows:

```
[08-01_15:52:56:355] Quectel_QConnectManager_Linux_V1.6.0.15
[08-01_15:52:56:356] Find /sys/bus/usb/devices/3-1.4 idVendor=0x2c7c idProduct=0x125, ↵
↳ bus=0x003, dev=0x003
[08-01_15:52:56:356] Auto find qmichannel = /dev/cdc-wdm0
[08-01_15:52:56:356] Auto find usbnet_adapter = usb0
[08-01_15:52:56:356] netcard driver = qmi_wwan_q, driver version = V1.2.9
[08-01_15:52:56:356] ioctl(0x89f3, qmap_settings) failed: Operation not supported, ↵
↳ rc=-1
[08-01_15:52:56:357] Modem works in QMI mode
[08-01_15:52:56:362] cdc_wdm_fd = 7
[08-01_15:52:56:448] Get clientWDS = 7
[08-01_15:52:56:480] Get clientDMS = 1
[08-01_15:52:56:512] Get clientNAS = 2
[08-01_15:52:56:544] Get clientUIM = 1
[08-01_15:52:56:576] Get clientWDA = 1
[08-01_15:52:56:608] requestBaseBandVersion EC20CEHDLGR06A09M1G
[08-01_15:52:56:736] requestGetSIMStatus SIMStatus: SIM_READY
[08-01_15:52:56:768] requestGetProfile[1] 3gnet///0
[08-01_15:52:56:800] requestRegistrationState2 MCC: 460, MNC: 1, PS: Attached, ↵
↳ DataCap: LTE
[08-01_15:52:56:832] requestQueryDataCall IPv4ConnectionStatus: DISCONNECTED
[08-01_15:52:56:832] ifconfig usb0 0.0.0.0
[08-01_15:52:56:839] ifconfig usb0 down
[08-01_15:52:56:896] requestSetupDataCall WdsConnectionIPv4Handle: 0x86d8a500
[08-01_15:52:57:024] ifconfig usb0 up
[08-01_15:52:57:031] udhcpc -f -n -q -t 5 -i usb0
udhcpc: started, v1.35.0
udhcpc: broadcasting discover
udhcpc: broadcasting select for 10.104.48.49, server 10.104.48.50
udhcpc: lease of 10.104.48.49 obtained from 10.104.48.50, lease time 7200
[08-01_15:52:57:232] deleting routers
[08-01_15:52:57:252] adding dns 202.99.160.68
[08-01_15:52:57:252] adding dns 202.99.166.4
```

If it can automatically allocate an IP and add DNS, then the EC20 dial-up is successful.

3. After successfully dialing, use the ifconfig command to check the network interface, which is typically named usb0 (the interface name may vary depending on the actual situation). Then, test the network status using the ping command;

```
root@OK527:/# ping -I usb0 baidu.com -c4
PING baidu.com (110.242.68.66): 56 data bytes
64 bytes from 110.242.68.66: seq=0 ttl=53 time=59.096 ms
64 bytes from 110.242.68.66: seq=1 ttl=53 time=69.325 ms
64 bytes from 110.242.68.66: seq=2 ttl=53 time=69.955 ms
64 bytes from 110.242.68.66: seq=3 ttl=53 time=83.063 ms

--- baidu.com ping statistics ---
```

(continues on next page)

(continued from previous page)

```
4 packets transmitted, 4 packets received, 0% packet loss
round-trip min/avg/max = 59.096/70.359/83.063 ms
```

4.20 Play/Record Test

Description:

OK527 provides 1 3.5mm audio jack and 2 XH-2.54-2PS speaker ports, with both the carrier board mic and headphone mic capable of recording.

Playback test:

```
root@OK527:/# aplay /forlinx/audio/30s.wav
root@OK527:/# mpg123 /forlinx/audio/30s.mp3
```

Volume control:

```
root@OK527:/# amixer           //Read the audio configuration, where HPOUT Gain
↳ is the headphone volume
...
Simple mixer control 'HPOUT Gain',0
  Capabilities: volume volume-joined
  Playback channels: Mono
  Capture channels: Mono
  Limits: 0 - 7
  Mono: 7 [100%]
...
root@OK527:/# amixer set "HPOUT Gain" 5          //Set the volume to 5 and the
↳ level to 0 to 7
Simple mixer control 'HPOUT Gain',0
  Capabilities: volume volume-joined
  Playback channels: Mono
  Capture channels: Mono
  Limits: 0 - 7
  Mono: 5 [71%]
```

When the earphone is not plugged in, it is output by the speaker. When the earphone is plugged in, the speaker is muted and output by the earphone.

HDMI audio test

```
root@OK527:/# aplay -l
**** List of PLAYBACK Hardware Devices ****
card 0: audiocodec [audiocodec], device 0: sunxi-snd-plat-audio-sunxi-snd-codec_
↳ 7110000.codec-0 []
Subdevices: 1/1
Subdevice #0: subdevice #0
card 1: sndhdmi [sndhdmi], device 0: sunxi-snd-plat-i2s-soc@3000000:hdmi_codec_
↳ soc@3000000:hdmi_code []
Subdevices: 1/1
Subdevice #0: subdevice #0
root@OK527:/# aplay -D plughw:1,0 /forlinx/audio/30s.wav
```

Note: HDMI display needs to be configured on the UBOOT menu.

Recording test:

```
root@OK527:/# arecord -c2 -r 48000 -f S16_LE -d 3 mic.wav
Recording WAVE 'mic.wav' : [ 4608.610608] [SNDCODEC][sunxi_card_hw_
↪params][630]:stream_flag: 1
Signed 16 bit LittleEndian, Rate 48000 Hz, Stereo
```

The recording will collect the carrier board mic and the earphone mic as the left and right channels of the recording.

4.21 LCD Backlight Adjustment

Backlight level range (0–255), maximum level 255, 0 indicating turn off. Enter the system and enter the following command in the terminal to perform the backlight test.

When the LCD screen (lcd 800x480, lcd 1024x600, mipi 1024x600, lvds 1280x800) is selected as “Primary Disp”, usefltest_backlight get 0; otherwise, usefltest_backlight get 1. The following command is an example assuming the LCD screen is selected as “Primary Disp” .

1. View the current screen backlight value:

```
root@OK527:/# fltest_backlight get 0
Current brightness: 50
↪backlight value is 50 //The current
```

2. Backlight is off:

```
root@OK527:/# fltest_backlight set 0 0
The brightness has been set to: 0
↪backlight //Turn off the
```

3. LCD backlight is on:

```
root@OK527:/# fltest_backlight set 0 125
The brightness has been set to: 125
↪Backlight modification is successful //Set backlight to 1
root@OK527:/# fltest_backlight get 0
Current brightness: 125
↪start //
```

4.22 Closing the Desktop

```
root@OK527:/# /etc/init.d/S42matrix-browser stop
↪desktop //Turn off the
Stopping matrix-browser: OK
root@OK527:/# /etc/init.d/S42matrix-browser
↪start //Turn on the desktop
Starting matrix-browser: OK
```

4.23 LED Test

The OK527-C SoM has a controllable red LED that flashes when the card is powered on.

The testing method is as follows:

1. To view trigger conditions:

```
root@OK527:/# cat /sys/class/leds/heartbeat/trigger
none rc-feedback rfkill-any rfkill-none kbd-scrolllock kbd-numlock kbd-capslock kbd-
↪kanalock kbd-shiftlock kbd-altgrlock kbd-ctrllock kbd-altlock kbd-shiftlock kbd-
↪shiftlock kbd-ctrllock kbd-ctrllock mmc0 mmc1 [heartbeat] rfkill0
```

Where [heartbeat] indicates that the current trigger condition is the system heartbeat light. Write the above string in trigger to modify the trigger condition.

2. User Control

When the led trigger condition is set to none, the user can control the on and off of the led lamp through the command:

```
root@OK527:/# echo none > /sys/class/leds/heartbeat/trigger
root@OK527:/# echo 1 > /sys/class/leds/heartbeat/brightness
root@OK527:/# echo 0 > /sys/class/leds/heartbeat/brightness
```

3. Change the red LED to a heartbeat light

```
root@OK527:/# echo heartbeat > /sys/class/leds/heartbeat/trigger
```

At this time, the LED has a system clock control, blinking according to a certain rhythm.

4.24 SQLite3 Test

SQLite3 is a lightweight, ACID-compliant relational database management system with a low footprint. The OK527-C development board is ported with version 3.25.3 of sqlite3.

```
root@OK527:/# sqlite3
SQLite version 3.38.5 2022-05-06 15:25:27
Enter ".help" for usage hints.
Connected to a transient in-memory database.
Use ".open FILENAME" to reopen on a persistent database.
root@OK527:/# sqlite3
SQLite version 3.38.5 2022-05-06 15:25:27
Enter ".help" for usage hints.
Connected to a transient in-memory database.
Use ".open FILENAME" to reopen on a persistent database.
sqlite> create table tbl1 (one varchar(10), two smallint);           //Create tbl1
sqlite> insert into tbl1 values('hello!',10);
sqlite> insert into tbl1 values('goodbye', 20);                      //
↪Insert data in the table tbl1
sqlite> select * from tbl1;                                         //Query the
↪
↪contents in table tbl1
hello!|10
goodbye|20
sqlite> delete from tbl1 where one = 'hello!';                     //
↪Delete the data
sqlite> select * from tbl1;                                         //Query the
↪
↪contents in table tbl1
goodbye|20
sqlite> .
↪quit
```

(continues on next page)

(continued from previous page)

```
↳/Exit the database (or use the.exit command)
root@OK527:/#
```

4.25 Boot Script Configuration

4.25.1 Temporary Autoboot Script Setup

1. Create a shell script first:

```
root@OK527:/# vi /etc/autorun.sh
```

Modify the file reference as follows (users need to modify according to the actual situation):

```
#!/bin/sh
while :
do
    sleep 1
done
```

2. After modification, save and exit, and add execution permission to the script

```
root@OK527:/#chmod +x /etc/autorun.sh
```

3. Add at the end of the /etc/init.d/rcS file

/etc/autorun.sh &

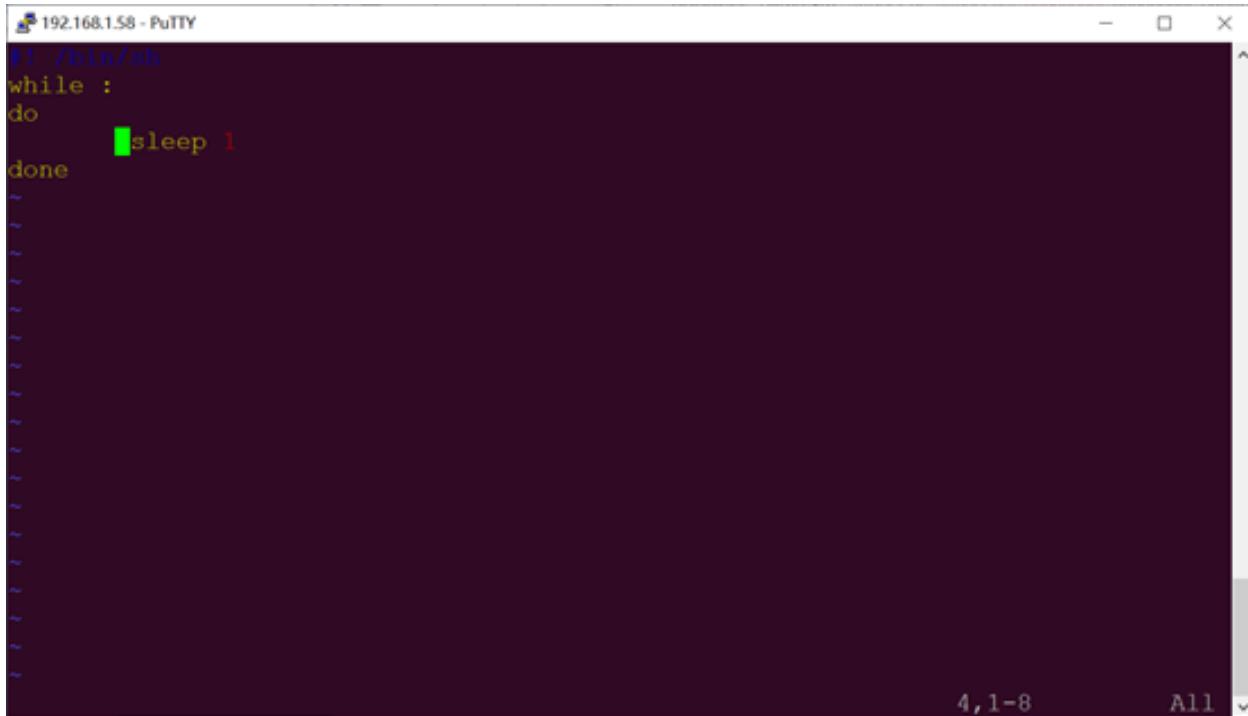
Save and Exit

4.25.2 Flash-Image Boot Script Integration

Add a startup script during image flashing, you need to modify the source code in the development environment. Here are the steps to follow:

1. Enter the OK527-linux-sdk source code package, and create a autorun.sh file under the following path: buildroot/buildroot-202205/board/forlinx/okt527/fs-overlay/etc.

The format of the content is as follows, and the user can modify it according to the actual needs:



```
192.168.1.58 - PuTTY
#!/bin/sh
while :
do
    sleep 1
done
```

Use the chmod +x autorun.sh command to add execution permissions to the file.

2. Add the newly created shell script to the OK527 root filesystem rcS file.

Copy rcS from out/t527/oxt527/buildroot/buildroot/target/etc/init.d/rcS

to buildroot/buildroot-202205/board/worldinx/oxt527/fs overlay/etc/init.d/

Add a shell statement at the end of the buildroot/buildroot-202205/board/worldinx/oxt527/fs overlay/etc/init.d/rcS file:/etc/autorun.sh&.

3. Recompile and package

Please refer to the compilation chapter of “OK527-C_Linux5.15.104+Qt5.12.5 User’s Compilation Manual” .

4.26 A55 CoreMark Test

The most well-known and commonly used Benchmarks in the field of embedded processors are Dhrystone and CoreMark. CoreMark is a comprehensive benchmark that is used to measure the performance of the central processing unit (CPU) employed in embedded systems. It was developed by shay gal-on of eembc in 2009, aiming to become an industry standard and replace the outdated dehrystone benchmark.

The OK527-C platform has the CoreMark test program ported by default, and you can use the following commands to test it:

1. Set the CPU small core and large core to high-performance mode respectively.

```
root@OK527:/# echo performance > /sys/devices/system/cpu/cpu0/cpufreq/scaling_governor
root@OK527:/# echo performance > /sys/devices/system/cpu/cpu4/cpufreq/scaling_governor
```

2. CoreMark test

```
root@OK527:/# coremark
2K performance run parameters for coremark.
CoreMark Size      : 666
```

(continues on next page)

(continued from previous page)

```
Total ticks      : 16379
Total time (secs): 16.379000
Iterations/Sec   : 6715.916723
Iterations       : 110000
Compiler version : GCC10.3.1 20210621
Compiler flags    : -O2 -lrt
Memory location  : Please put data memory location here
(e.g. code in flash, data on heap etc)
seedcrc          : 0xe9f5
[0]crcclist      : 0xe714
[0]crcmatrix     : 0x1fd7
[0]crcstate      : 0x8e3a
[0]crcfinal      : 0x33ff
Correct operation validated. See readme.txt for run and reporting rules.
CoreMark 1.0 : 6715.916723 / GCC10.3.1 20210621 -O2 -lrt / Heap
root@OK527:/#
```

4.27 A55 Dhystone Test

Dhystone is a comprehensive benchmark program designed by Reinhold P. Weicker in 1984, used to test CPU (integer) computing performance. Dhystone does not include floating-point operations, and its output is the number of times Dhystone is run per second, which corresponds to the number of iterations of the main loop per second.

The Dhystone testing program has been successfully ported to the OK527-C platform. You can use the following command to run the test.

1. Set the CPU to high performance mode

```
root@OK527:/# echo performance > /sys/devices/system/cpu/cpu0/cpufreq/scaling_governor
root@OK527:/# echo performance > /sys/devices/system/cpu/cpu4/cpufreq/scaling_governor
```

2. Dhystone test

```
root@OK527:/# echo 50000000 | dhystone           //Run the Dhystone test 50000000
→times

Dhystone Benchmark, Version 2.1 (Language: C)

Program compiled without 'register' attribute

Please give the number of runs through the benchmark:
Execution starts, 50000000 runs through Dhystone
Execution ends

Final values of the variables used in the benchmark:

Int_Glob:      5
should be:    5
Bool_Glob:     1
should be:    1
Ch_1_Glob:    A
should be:    A
Ch_2_Glob:    B
```

(continues on next page)

(continued from previous page)

```

should be:    B
Arr_1_Glob[8]:      7
should be:    7
Arr_2_Glob[8][7]:   50000010
should be:  Number_Of_Runs + 10
Ptr_Glob->
Ptr_Comp:          -1692515680
should be: (implementation-dependent)
Discr:             0
should be:    0
Enum_Comp:         2
should be:    2
Int_Comp:          17
should be:    17
Str_Comp:          DHRYSTONE PROGRAM, SOME STRING
should be:  DHRYSTONE PROGRAM, SOME STRING
Next_Ptr_Glob->
Ptr_Comp:          -1692515680
should be: (implementation-dependent), same as above
Discr:             0
should be:    0
Enum_Comp:         1
should be:    1
Int_Comp:          18
should be:    18
Str_Comp:          DHRYSTONE PROGRAM, SOME STRING
should be:  DHRYSTONE PROGRAM, SOME STRING
Int_1_Loc:          5
should be:    5
Int_2_Loc:          13
should be:    13
Int_3_Loc:          7
should be:    7
Enum_Loc:           1
should be:    1
Str_1_Loc:          DHRYSTONE PROGRAM, 1'ST STRING
should be:  DHRYSTONE PROGRAM, 1'ST STRING
Str_2_Loc:          DHRYSTONE PROGRAM, 2'ND STRING
should be:  DHRYSTONE PROGRAM, 2'ND STRING

Microseconds for one run through Dhystone:    0.2
Dhrystones per Second:                      6090134.0

root@OK527:/#

```

4.28 Chip-ID Verification

Serial debug terminal input:

```

root@OK527:/# cat /sys/class/sunxi_info/sys_info
sunxi_platform : T527
sunxi_secure   : normal

```

(continues on next page)

(continued from previous page)

```

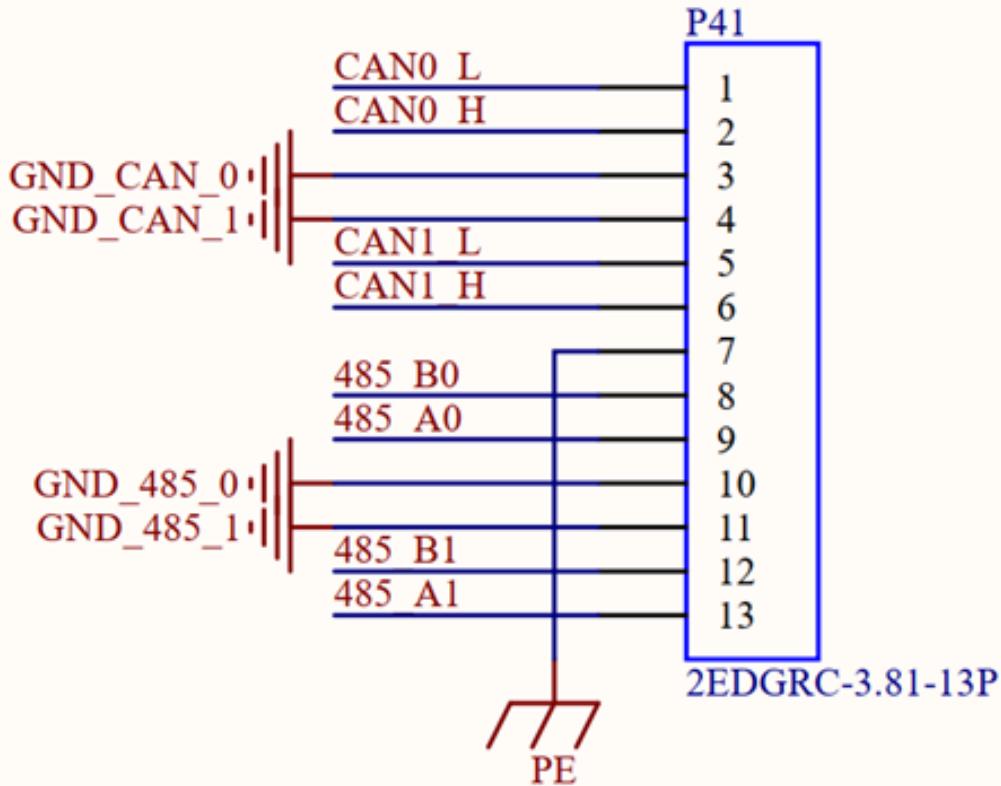
sunxi_serial      : 40821e9375789d0c000050c000000000
sunxi_chiptype   : 00005f10
sunxi_batchno    : 0x18900002
sunxi_soc_ver    : 0x2

```

4.29 CAN Test

There are 2 x CAN on the carrier board, which are led out to the P41 connecting seat.

Short H, L, and GND of can0 and can1, respectively, to test.



Set the Can service:

```

root@OK527:/# ip link set awlink0 up type can bitrate 500000
[58659.636796] IPv6: ADDRCONF(NETDEV_CHANGE): can0: link becomes ready
root@OK527:/# ip link set awlink1 up type can bitrate 500000
[58662.966792] IPv6: ADDRCONF(NETDEV_CHANGE): can1: link becomes ready
root@OK527:/# ip link set dev awlink0 txqueuelen 4096
root@OK527:/# ip link set dev awlink1 txqueuelen 4096

```

Set can0 to receive and can1 to send:

```

root@OK527:/# candump awlink0 &
[1] 18633

```

(continues on next page)

(continued from previous page)

```
root@OK527:/# cangen awlink1
awlink0 790 [1] A4
awlink0 3A0 [3] 31 A1 15
awlink0 04B [2] DD EF
awlink0 39D [8] AE 37 BF 78 59 95 FB 68
awlink0 6A6 [2] D2 DE
awlink0 59D [4] A5 60 7F 04
awlink0 019 [0]
```

4.30 SPI Test

SPI1 (located at the P29 terminal), led out from the OK527 carrier board.

Short-circuit SPI1_MOSI & SPI1_MISO for testing.

```
root@OK527:/# fltest_spidev_test -D /dev/spidev0.0 -s 1000000
spi mode: 0
bits per word: 8
max speed: 1000000 Hz (1000 KHz)

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 FF
DE AD BE EF BA AD
F0 0D

PASS
```

If there is a problem with SPI communication, all received data is 00.

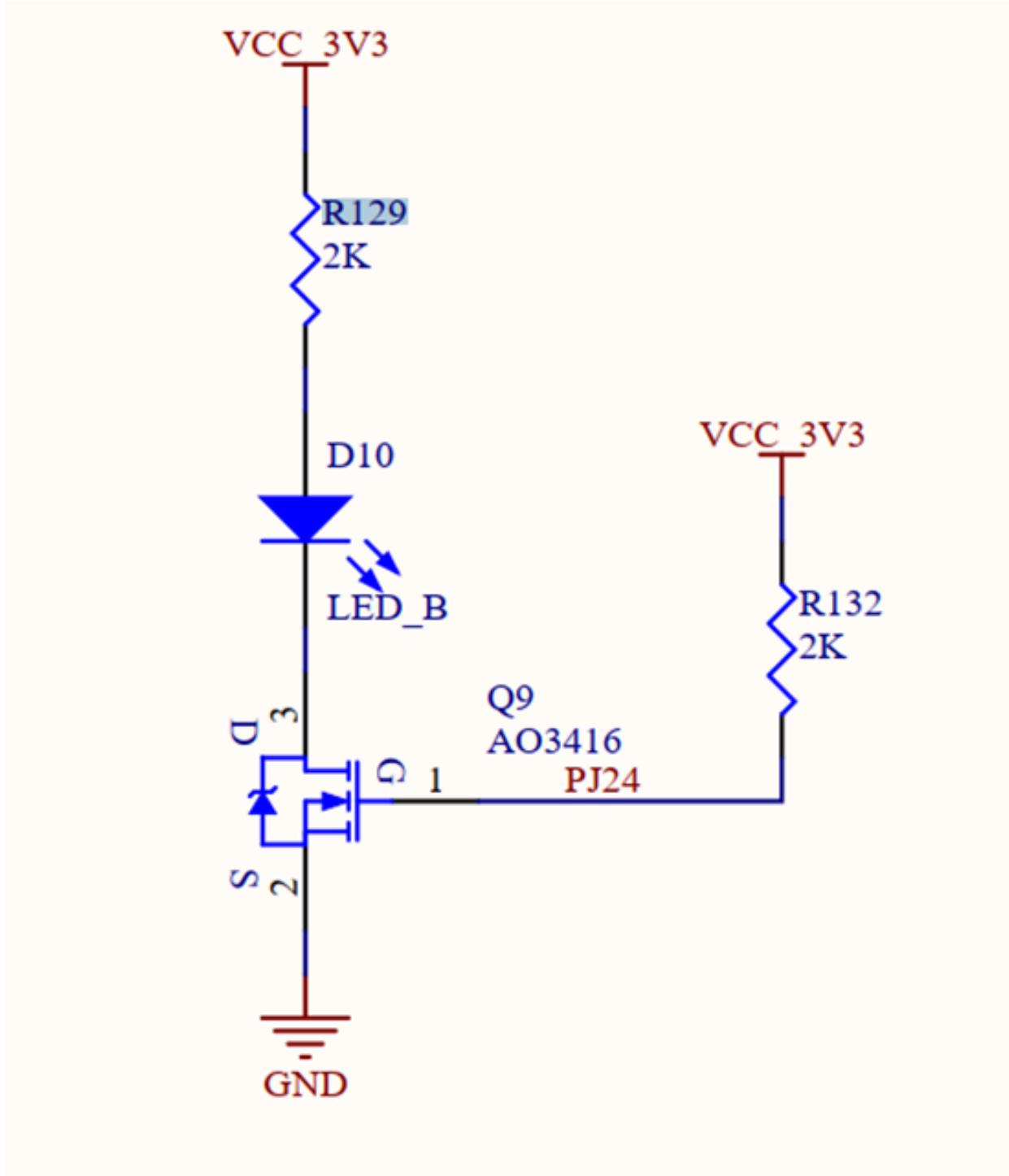
```
root@OK527:/# fltest_spidev_test -D /dev/spidev0.0 -s 1000000
spi mode: 0
bits per word: 8
max speed: 1000000 Hz (1000 KHz)

00 00 00 00 00 00
00 00 00 00 00 00
00 00 00 00 00 00
00 00 00 00 00 00
00 00 00 00 00 00
00 00 00 00 00 00
00 00

ERR: rx != tx
```

4.31 GPIO Test

Take PJ24 as an example, PJ24 can control D10 blue led.



Set PJ24 output low level

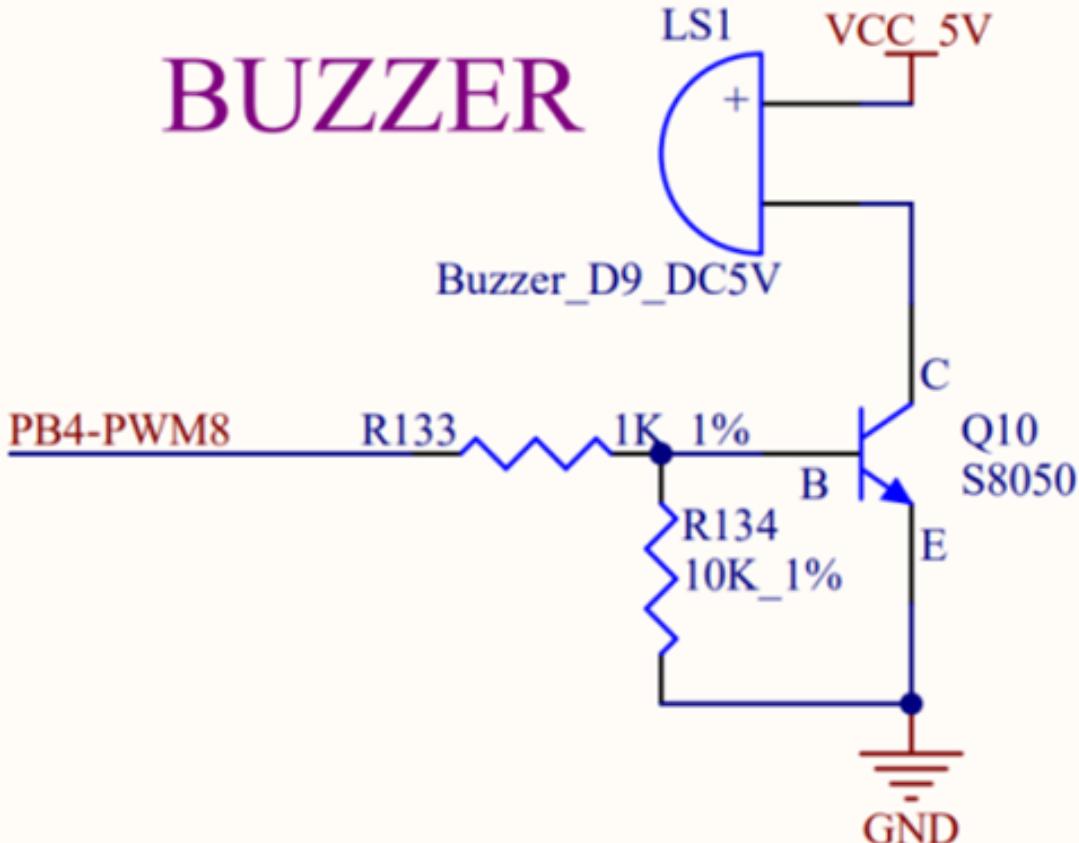
```
root@OK527:/# fltest_gpio.sh PJ24 0
==== PJ24 === gpio312 ===
out: 0
```

Read PJ24 pin input level

```
root@OK527:/# fltest_gpio.sh PJ24 in
==== PJ24 === gpio312 ===
read: 1
```

4.32 Buzzer Test

The buzzer of OK527-C is a passive buzzer, and the PWM signal can be input.



Set PJ24 output high level

```
root@OK527:/# echo 8 > /sys/class/pwm/pwmchip0/export
root@OK527:/# echo 10000000 > /sys/class/pwm/pwmchip0/pwm8/period
root@OK527:/# echo 5000000 > /sys/class/pwm/pwmchip0/pwm8/duty_cycle
root@OK527:/# echo 1 > /sys/class/pwm/pwmchip0/pwm8/enable      //使能蜂鸣器
root@OK527:/# echo 0 > /sys/class/pwm/pwmchip0/pwm8/enable      //关闭蜂鸣器
root@OK527:/# echo 8 > /sys/class/pwm/pwmchip0/unexport
```

4.33 USB3.0

OK527-C's USB3.0 and PCIE are multiplexed functions, and only one works at the same time. Need to switch functions in the uboot menu

Change the carrier board DIP switch, select USB3.0, press the space to enter the uboot menu interface after the development board is powered on, press 4 to cycle in “pcie” “USB 3.0”, and select “USB 3.0” as shown below:

```
-----
0:Exit to console
1:Reboot
2:Display0 Type:lvds 1280x800
3:Display1 Type:hdmi
4:Device PHY Type:usb 3.0
5:display primary screen: disp0_type
-----
```

Then press 1 to restart to test the USB 3.0 function. Refer to “[4.14 USB 2.0](#)” for the test method.

4.34 PCIE

USB3.0 and PCIE of OK527-C are multiplexing functions, and only one can work at the same time. Need to switch functions in the uboot menu

Change the DIP switch on the carrier board, select PCIE2.1. After powering on the development board, press the space bar to enter the uboot menu interface. Press 4 to cycle through “PCIE” and “USB 3.0”. Select “PCIE” as shown below:

```
-----
0:Exit to console
1:Reboot
2:Display0 Type:lvds 1280x800
3:Display1 Type:hdmi
4:Device PHY Type:pcie
5:display primary screen: disp0_type
-----
```

Then press 1 to restart to test the pcie function.

The following test uses the RTL8125 network card.

```
root@OK527:/# lspci
01:00.0 Class 0200: 10ec:8168
00:00.0 Class 0604: 16c3:abcd
root@OK527:/# ifconfig -a | grep enp
enp1s0      Link encap:Ethernet  HWaddr 00:00:00:00:00:05
```

Note: The network speed follows the “barrel effect”. In this test, the RTL8125 is a 2.5g network card, but the network card of the 192.168.1.39 computer is a gigabit network card, so the final test speed is a gigabit speed.

4.35 IR-RX

The OK527-C supports infrared receiving.

```
root@OK527:/# evtest
No device specified, trying to scan all of /dev/input/event*
Available devices:
/dev/input/event0:sunxi-keyboard
/dev/input/event1:sunxi_ir_recv
/dev/input/event2:sunxi-gpadc0/channel13/input0
/dev/input/event3:sunxi-gpadc0/channel14/input0
/dev/input/event4:sunxi-gpadc0/channel15/input0
/dev/input/event5:sunxi-gpadc0/channel16/input0
```

(continues on next page)

(continued from previous page)

```

/dev/input/event6:sunxi-gpadc0/channel17/input0
/dev/input/event7:sunxi-gpadc1/channel10/input0
/dev/input/event8:sunxi-gpadc1/channel11/input0
/dev/input/event9:sunxi-gpadc1/channel12/input0
/dev/input/event10:    sunxi-gpadc1/channel13/input0
/dev/input/event11:    sunxi-gpadc1/channel14/input0
/dev/input/event12:    sunxi-gpadc1/channel15/input0
/dev/input/event13:    sunxi-gpadc1/channel16/input0
/dev/input/event14:    sunxi-gpadc1/channel17/input0
/dev/input/event15:    sunxi-gpadc1/channel18/input0
/dev/input/event16:    axp2202-pek
/dev/input/event17:    audiocodec Headphones

Select the device event number [0-17]: 1      //选择 sunxi_ir_recv 对应的 event 编号
Input driver version is 1.0.1
Input device ID: bus 0x19 vendor 0x1 product 0x1 version 0x100
Input device name: "sunxi_ir_recv"
Supported events:
Event type 0 (EV_SYN)
Event type 1 (EV_KEY)
Event code 14 (KEY_BACKSPACE)
Event code 15 (KEY_TAB)
Event code 52 (KEY_DOT)
Event code 83 (KEY_KPdot)
Event code 102 (KEY_HOME)
Event code 103 (KEY_UP)
Event code 105 (KEY_LEFT)
Event code 106 (KEY_RIGHT)
Event code 108 (KEY_DOWN)
Event code 113 (KEY_MUTE)
Event code 114 (KEY_VOLUMEDOWN)
Event code 115 (KEY_VOLUMEUP)
Event code 116 (KEY_POWER)
Event code 119 (KEY_PAUSE)
Event code 128 (KEY_STOP)
Event code 139 (KEY_MENU)
Event code 141 (KEY_SETUP)
Event code 158 (KEY_BACK)
Event code 163 (KEY_NEXTSONG)
Event code 164 (KEY_PLAYPAUSE)
Event code 165 (KEY_PREVIOUSSONG)
Event code 166 (KEY_STOPCD)
Event code 168 (KEY_REWIND)
Event code 207 (KEY_PLAY)
Event code 208 (KEY_FASTFORWARD)
Event code 256 (BTN_0)
Event code 352 (KEY_OK)
Event code 365 (KEY_EPG)
Event code 377 (KEY_TV)
Event code 402 (KEY_CHANNELUP)
Event code 403 (KEY_CHANNELDOWN)
Event code 407 (KEY_NEXT)
Event code 412 (KEY_PREVIOUS)

```

(continues on next page)

(continued from previous page)

```

Event code 512 (KEY_NUMERIC_0)
Event code 513 (KEY_NUMERIC_1)
Event code 514 (KEY_NUMERIC_2)
Event code 515 (KEY_NUMERIC_3)
Event code 516 (KEY_NUMERIC_4)
Event code 517 (KEY_NUMERIC_5)
Event code 518 (KEY_NUMERIC_6)
Event code 519 (KEY_NUMERIC_7)
Event code 520 (KEY_NUMERIC_8)
Event code 521 (KEY_NUMERIC_9)
Event code 717 (BTN_TRIGGER_HAPPY14)
Event code 719 (BTN_TRIGGER_HAPPY16)
Event code 721 (BTN_TRIGGER_HAPPY18)
Event type 2 (EV_REL)
Event code 0 (REL_X)
Event code 1 (REL_Y)
Event type 4 (EV_MSC)
Event code 4 (MSC_SCAN)
Key repeat handling:
Repeat type 20 (EVREP)
Repeat code 0 (REP_DELAY)
Value    400
Repeat code 1 (REP_PERIOD)
Value    80
Properties:
Property type 5 (INPUT_PROP_POINTING_STICK)
Testing ... (interrupt to exit)
Event: time 1704962021.400475, type 4 (EV_MSC), code 4 (MSC_SCAN), value 15
Event: time 1704962021.400475, type 1 (EV_KEY), code 519 (KEY_NUMERIC_7), value 1
Event: time 1704962021.400475, ----- SYN_REPORT -----
Event: time 1704962021.452943, type 4 (EV_MSC), code 4 (MSC_SCAN), value 15
Event: time 1704962021.452943, ----- SYN_REPORT -----
Event: time 1704962021.696805, type 1 (EV_KEY), code 519 (KEY_NUMERIC_7), value 0
Event: time 1704962021.696805, ----- SYN_REPORT -----
Event: time 1704962024.777524, type 4 (EV_MSC), code 4 (MSC_SCAN), value 46
Event: time 1704962024.777524, ----- SYN_REPORT -----
Event: time 1704962024.829971, type 4 (EV_MSC), code 4 (MSC_SCAN), value 46
Event: time 1704962024.829971, ----- SYN_REPORT -----
^Croot@OK527:/#

```

4.36 Bluetooth Test

The AW-CM358 module of the OK527-C carrier board, with integrated Bluetooth capability. This section demonstrates the use of Bluetooth for file transfer between the phone and the board.

Bluetooth Configuration

```

root@OK527:/# bluetoothctl                                //Open the BlueZ Bluetooth
↳ device
Agent registered
[CHG] Controller E8:FB:1C:66:FA:A6 Pairable: yes
[bluetooth]# power on          //Enable the Bluetooth device

```

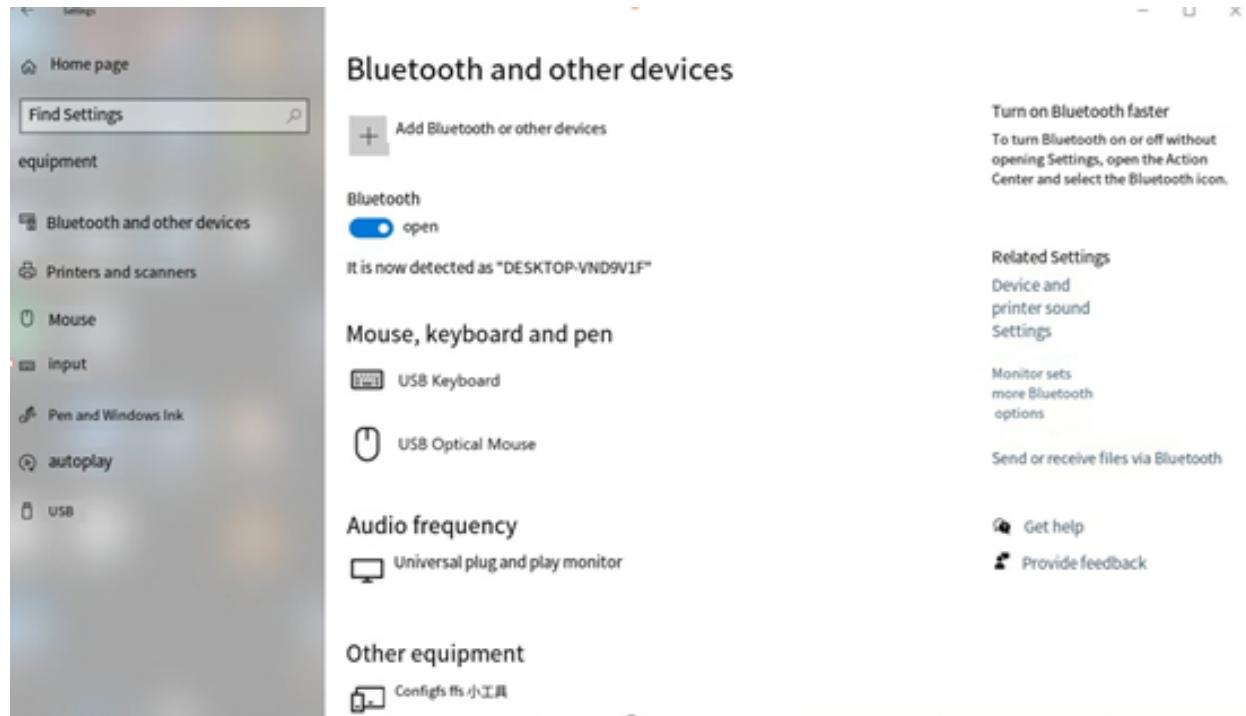
(continues on next page)

(continued from previous page)

```
[CHG] Controller E8:FB:1C:66:FA:A6 Class: 0x00100000
Changing power on succeeded
[CHG] Controller E8:FB:1C:66:FA:A6 Powered: yes
[bluetooth]# pairable on      // Set to pairable mode
Changing pairable on succeeded
[bluetooth]# discoverable on //Set to discoverable mode
Changing discoverable on succeeded
[CHG] Controller E8:FB:1C:66:FA:A6 Discoverable: yes
[bluetooth]# agent on       //Enable the agent
Agent is already registered
[bluetooth]# default-agent // Set the current agent as the default agent
Default agent request successful
[bluetooth]#
```

1. Development Board Passive Pairing.

After the above settings, open the computer to search for Bluetooth, click “Add Bluetooth or other devices”, a “OKT527” device will appear, click this Bluetooth to try to pair.



At the same time, the information printed on the development board is as follows. Enter yes:

```
[CHG] Device 2C:DB:07:C7:4F:F6 Connected: yes
Request confirmation
[agent] Confirm passkey 153732 (yes/no) : yes
```

2. View and remove connected devices:

```
[bluetooth]# devices          //View connected
↳ Bluetooth device
Device 2C:DB:07:C7:4F:F6 DESKTOP-VND9V1F
```

(continues on next page)

(continued from previous page)

```
[bluetooth]# remove 2C:DB:07:C7:4F:F6 //Remove the device
[DEL] Device 2C:DB:07:C7:4F:F6 DESKTOP-VND9V1F
Device has been removed
```

3. Development board active pairing

In addition to passive pairing, it is also possible to send an active pairing request from the development board terminal

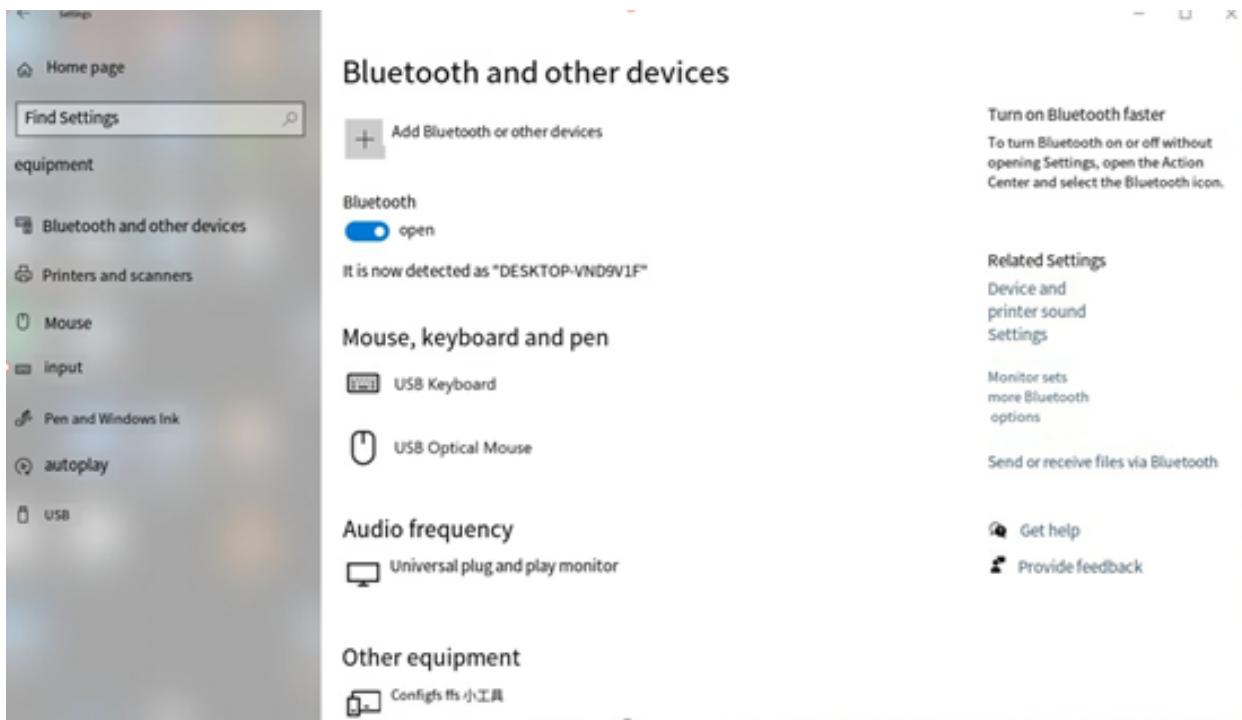
```
[bluetooth]# scan on      //Start scanning
Discovery started
[CHG] Controller E8:FB:1C:66:FA:A6 Discovering: yes
[NEW] Device 7B:01:59:ED:69:50 7B-01-59-ED-69-50
[NEW] Device 7C:71:13:5F:A3:8F 7C-71-13-5F-A3-8F
[NEW] Device 14:16:9E:62:39:BD zzy
[NEW] Device 2C:DB:07:C7:4F:F6 DESKTOP-VND9V1F //Locate the device to pair
[CHG] Device 14:16:9E:62:39:BD RSSI: -74
[bluetooth]# scan off      //Turn off scanning
Discovery stopped
[CHG] Device 2C:DB:07:C7:4F:F6 TxPower is nil
[CHG] Device 2C:DB:07:C7:4F:F6 RSSI is nil
[CHG] Device 14:16:9E:62:39:BD RSSI is nil
[CHG] Device 7C:71:13:5F:A3:8F TxPower is nil
[CHG] Device 7C:71:13:5F:A3:8F RSSI is nil
[CHG] Device 7B:01:59:ED:69:50 RSSI is nil
[CHG] Controller E8:FB:1C:66:FA:A6 Discovering: no
[bluetooth]# pair 2C:DB:07:C7:4F:F6      //Pair with the specified device
Attempting to pair with 14:16:9E:62:39:BD
[CHG] Device 14:16:9E:62:39:BD Connected: yes
Request confirmation
[agent] Confirm passkey 807166 (yes/no): yes      //Confirm the key
[CHG] Device 14:16:9E:62:39:BD Modalias: bluetooth:v000Fp1200d1436
[CHG] Device 14:16:9E:62:39:BD UUIDs: 00001105-0000-1000-8000-00805f9b34fb
.....
[CHG] Device 14:16:9E:62:39:BD UUIDs: fa88c0d0-afac-11de-8a99-0800200c9a67
[CHG] Device 14:16:9E:62:39:BD ServicesResolved: yes
[CHG] Device 14:16:9E:62:39:BD Paired: yes
Pairing successful
[CHG] Device 14:16:9E:62:39:BD ServicesResolved: no
[CHG] Device 14:16:9E:62:39:BD Connected: no
[bluetooth]#
```

At the same time, the pairing request appears on the computer interface, click the pairing, the board end prints and inputs yes, and the end pairing is successful.

4. Development board to receive documents

After successful pairing, you can use Bluetooth to send files to the board on the computer side.

Click on “Send or receive files via Bluetooth”



Select “Send File”

←  Bluetooth file transfer

Transfer files using Bluetooth

You can use Bluetooth technology to wirelessly transfer files between the computer and a Bluetooth device or between the computer and another Bluetooth-enabled computer.

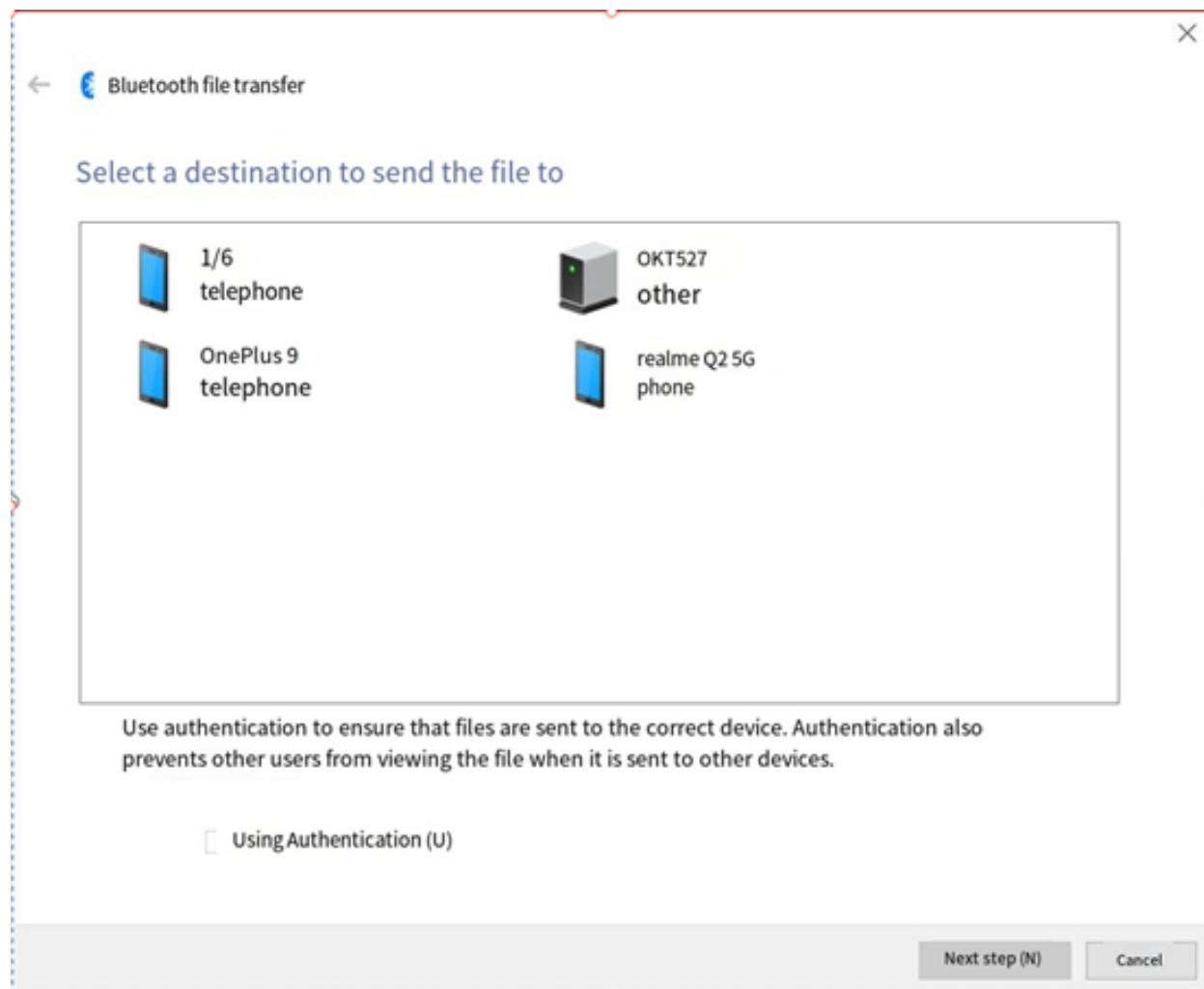
To continue, select whether you want to send or receive the file.

 **Send files (S)**
Make sure that the computer or device you plan to send the file to is turned on and ready to receive the file.

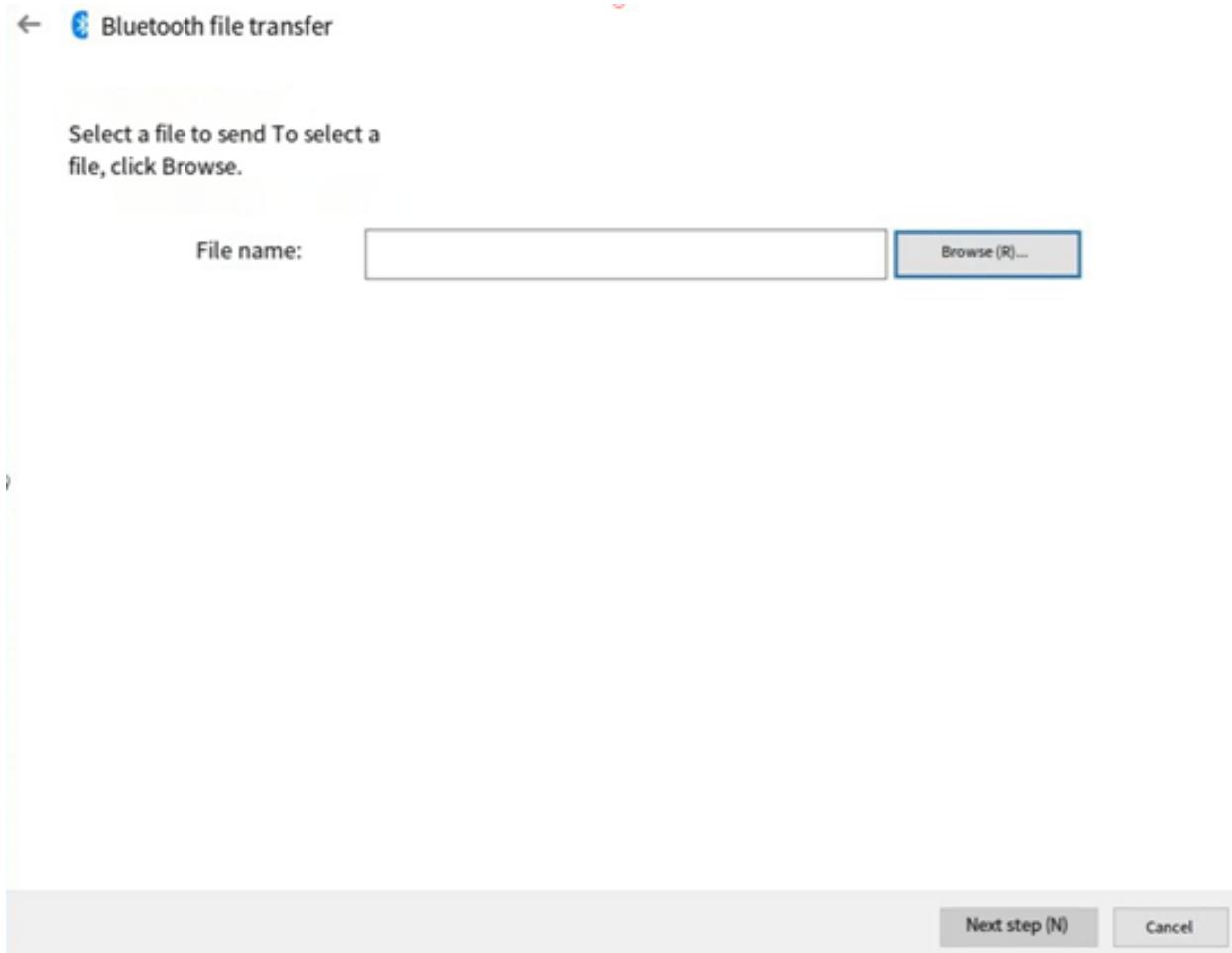
 **Receive file**
This action allows your computer to receive files sent from another computer or device with Bluetooth enabled.

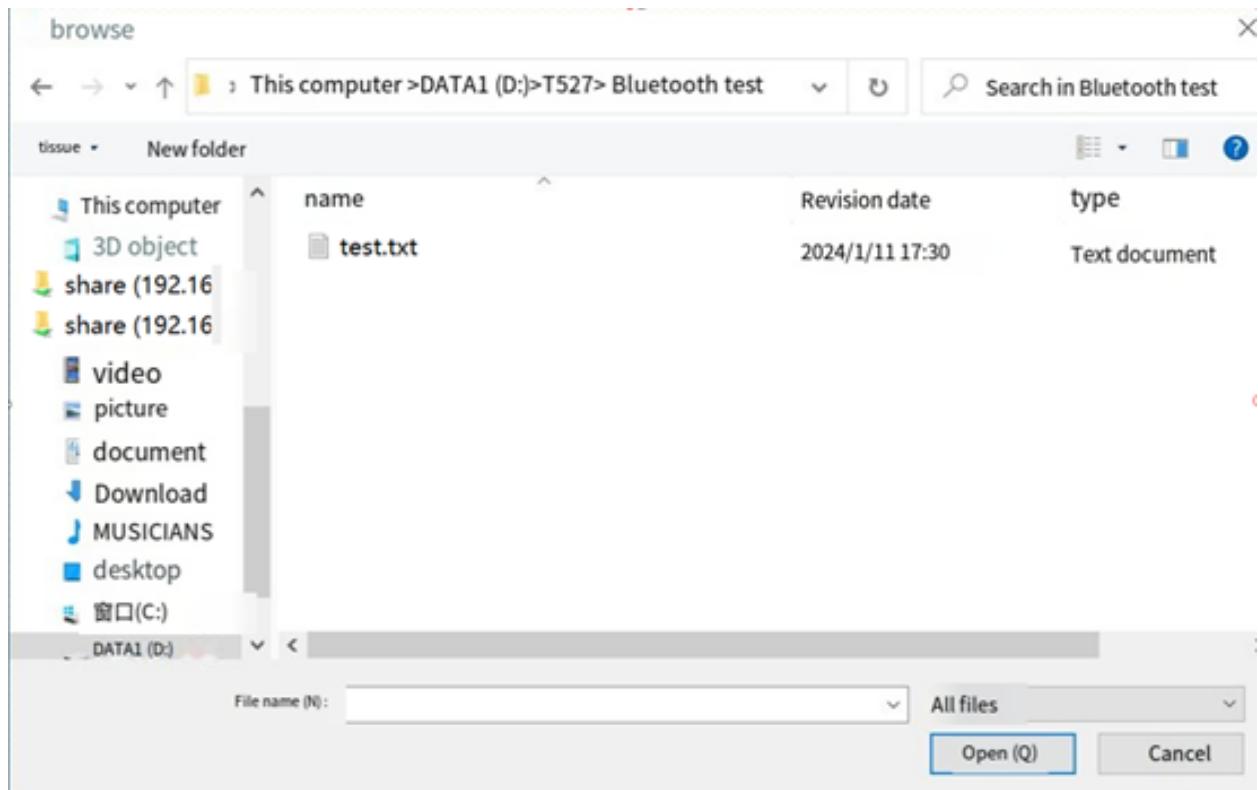
Next - Step (N) **Cancel**

Select OKT527.

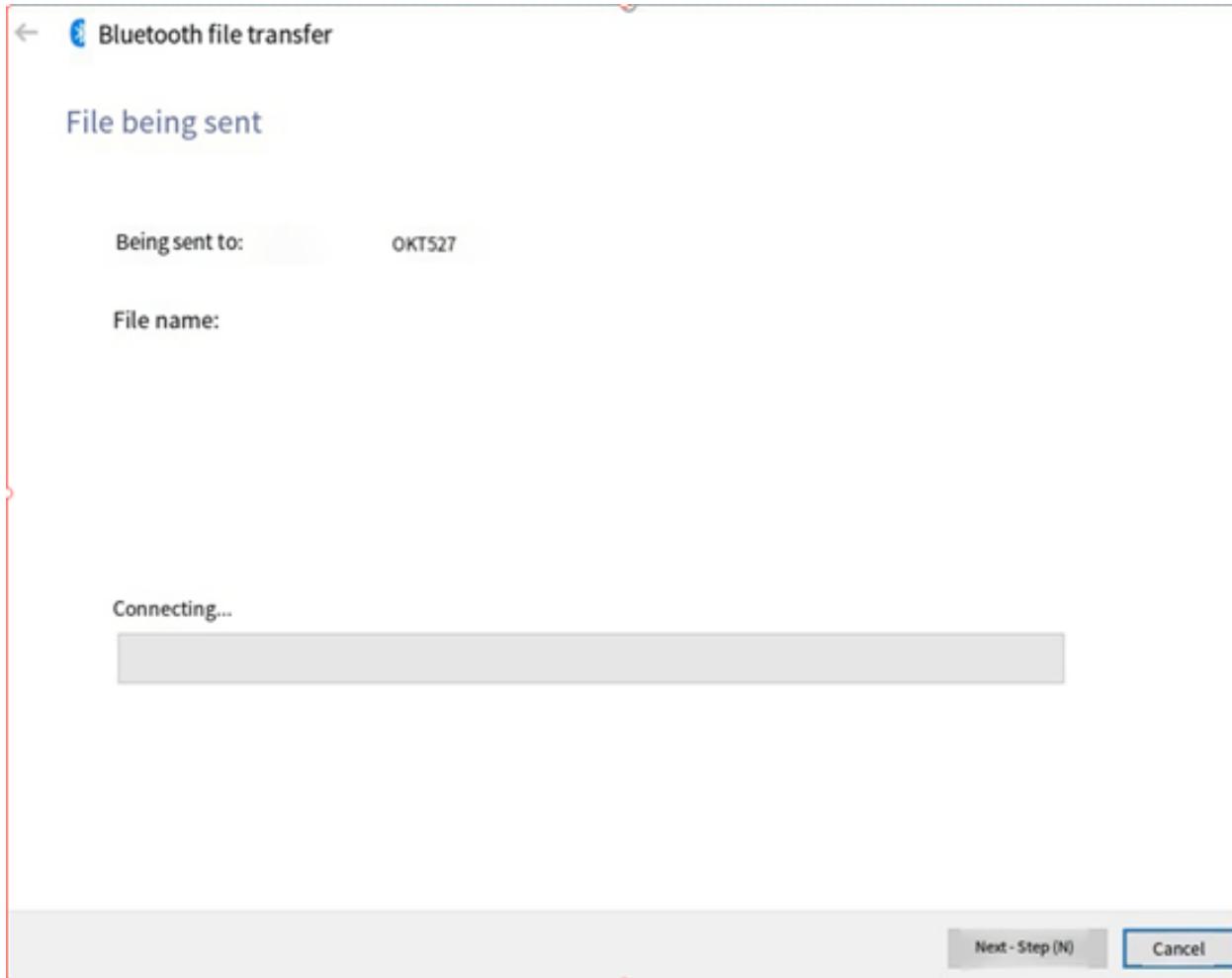


Select a file to send.





Wait for the send completion



←  Bluetooth file transfer

The file was successfully transferred

Recipient: OKT527

Sent files:

filename	size
test.txt	3.04当

Received files are saved in the /tmp directory.

5. The development board is to send files.

Similarly, you can use the development board to send files to the computer.

The test method is as follows:

Select “Receive File” on the computer side.

←  Bluetooth file transfer

Transfer files using Bluetooth

You can use Bluetooth technology to wirelessly transfer files between the computer and a Bluetooth device or between the computer and another Bluetooth-enabled computer.

To continue, select whether you want to send or receive the file.

 **Send files (S)**

Make sure that the computer or device you plan to send the file to is turned on and ready to receive the file.

 **Receive file**

This action allows your computer to receive files sent from another computer or device with Bluetooth enabled.

[Next step \(N\)](#)

[Cancel](#)

```
root@OK527:~# bluetoothctl
Agent registered
[CHG] Controller E8:FB:1C:66:FA:A6 Pairable: yes
[bluetooth]# paired-devices          //View paired device
Device 2C:DB:07:C7:4F:F6 DESKTOP-VND9V1F
[bluetooth]# exit
root@OK527:~# fltest_obexctl.sh
[NEW] Client /org/bluez/obex
[obex]# connect 2C:DB:07:C7:4F:F6      //Link the specified device
Attempting to connect to 2C:DB:07:C7:4F:F6
[NEW] Session /org/bluez/obex/client/session0 [default]
[NEW] ObjectPush /org/bluez/obex/client/session0
Connection successful
[2C:DB:07:C7:4F:F6]# send /run/media/mmcblk0p1/bootlogo.bmp //Send files
Attempting to send /run/media/mmcblk0p1/bootlogo.bmp to /org/bluez/obex/client/
→session0
[NEW] Transfer /org/bluez/obex/client/session0/transfer0
Transfer /org/bluez/obex/client/session0/transfer0
Status: queued
Name: bootlogo.bmp
Size: 1339239
Filename: /run/media/mmcblk0p1/bootlogo.bmp
```

(continues on next page)

(continued from previous page)

```
Session: /org/bluez/obex/client/session0
[CHG] Transfer /org/bluez/obex/client/session0/transfer0 Status: active
[CHG] Transfer /org/bluez/obex/client/session0/transfer0 Transferred: 65433 (@65KB/s)
→ 00:19)
[CHG] Transfer /org/bluez/obex/client/session0/transfer0 Transferred: 130961 (@65KB/s)
→ 00:18)
.....
[CHG] Transfer /org/bluez/obex/client/session0/transfer0 Status: complete
[DEL] Transfer /org/bluez/obex/client/session0/transfer0
[2C:DB:07:C7:4F:F6]# exit
root@OK527:~#
```

The computer will receive the incoming file request for file transfer.

6. Board sink, connected to mobile phone

```
//Execute the following instructions in order root@OK527:/# bluealsa -p a2dp-source -
→ p a2dp-sink -p hfp-hf -p hfp-ag -p hsp-hs -p hsp-ag &
root@OK527:/# bluetoothctl
[bluetooth]# power on
[bluetooth]# pairable on
[bluetooth]# discoverable on
[bluetooth]# agent on
# Then connect the mobile phone to the board.
# And then all kinds of yes
# Trust the mobile
[bluetooth]# trust 54:09:10:2A:01:75
[bluetooth]# quit

root@OK527:/# bluealsa-aplay -l
**** List of PLAYBACK Bluetooth Devices ****
hci0: 54:09:10:2A:01:75 [1/6], phone
SCO (CVSD): S16_LE 1 channel 8000 Hz
**** List of CAPTURE Bluetooth Devices ****
hci0: 54:09:10:2A:01:75 [1/6], phone
A2DP (SBC): S16_LE 2 channels 44100 Hz
SCO (CVSD): S16_LE 1 channel 8000 Hz

# Record from bluealsa, then play to default device (soc internal codec)
root@OK527:/# arecord -fcd -D bluealsa | aplay

# When the mobile phone plays music, the board rings.
```

4.37 NPU Test

OK527N-C integrates 2Tops NPU and currently has six models built-in: Fairmot, MobileNet_V2, VGG19, struct2depth, yolact, and yolov5s-sim-640.

This section mainly demonstrates the use of NPU through routines.

The location of the NPU test routine is as follows:

```
root@OK527:/# ls /etc/npu/sample_viplite
Fairmot  MobileNet_V2  VGG19  struct2depth  yolact  yolov5s-sim-640
```

(continues on next page)

(continued from previous page)

```
root@OK527:/# ls /etc/npu/sample_viplite/Fairmot/
1088x608x3.dat  network_binary.nb  sample.txt

// 1088x608x3.dat  Input data for test
// network_binary.nb Network model for testing
// sample.txt        Configuration file for test
```

The configuration file is as follows:

```
root@OK527:/# cd /etc/npu/sample_viplite/Fairmot
root@OK527:/etc/npu/sample_viplite/Fairmot# cat sample.txt

vpm_run is a framework for testing VIPLite driver.

#You may put comment by starting with a '#'.
#####A separator makes the list clear.
[network]
/etc/npu/sample_viplite/Fairmot/network_binary.nb      //Specify the network model to_
use
[input]
/etc/npu/sample_viplite/Fairmot/1088x608x3.dat      //Specify the input data

You can also add comparison files and output files by adding [golden] and [output] in_
the configuration file:
[network]
./ network_binary.nb
[input]
./ input_0.dat
[golden]                                //Compare files
./ output0_10_1.dat
[output]                                 //Output files
./ output_0.dat
Here's how to run it: -l 10 means execute the test 10 times, and the results are as_
follows
root@OK527:/etc/npu/sample_viplite/Fairmot# vpm_run -s sample.txt -l 10
loop_count=10, device_id=0, file_name=sample.txt
test started.
init vip lite, driver version=0x00010d00...
VIPLite driver software version 1.13.0.0-AW-2023-10-19
vip lite init OK.

cid=0x10000016, device_count=1
device[0] core_count=1
init test resources, batch_count: 1 ...
create/prepare networks ...
batch i=0, binary name: /etc/npu/sample_viplite/Fairmot/network_binary.nb
input 0 dim 1088 608 3 1, data_format=2, quant_format=2, name=input[0], scale=1.
zero_point=0
output 0 dim 272 152 1 1, data_format=2, name=uid_9_out_0, scale=0.003889, zero_point=0
output 1 dim 272 152 4 1, data_format=2, name=uid_8_out_0, scale=0.123799, zero_
```

(continues on next page)

(continued from previous page)

```
→point=39
output 2 dim 272 152 2 1, data_format=2, name=uid_7_out_0, scale=0.024050, zero_
→point=32
output 3 dim 272 152 1 1, data_format=2, name=uid_6_out_0, scale=0.003889, zero_point=0
output 4 dim 128 272 152 1, data_format=1, name=uid_41_out_0, none_quant
nbg name=/etc/npu/sample_viplite/Fairmot/network_binary.nb
create network 0: 26301 us.
memory pool size=17419776byte
network core count=1
input 0 name: /etc/npu/sample_viplite/Fairmot/1088x608x3.dat
prepare network 0: 35679 us.
batch: 0, loop count: 1
start to run network=/etc/npu/sample_viplite/Fairmot/network_binary.nb
run time for this network 0: 346532 us.
run network done...
profile inference time=344865us, cycle=239992405
***** nb TOP5 *****
--- Top5 ---
40528: 0.987698
1088: 0.979921
1360: 0.976033
1632: 0.976033
1904: 0.976033
***** nb TOP5 *****
--- Top5 ---
165375: 26.740648
165374: 20.055487
165373: 18.941294
165105: 15.846311
81599: 14.979715
***** nb TOP5 *****
--- Top5 ---
80179: 3.246813
80312: 3.246813
80327: 3.246813
80351: 3.246813
80359: 3.246813
***** nb TOP5 *****
--- Top5 ---
40256: 0.987698
40257: 0.987698
40528: 0.987698
40529: 0.987698
40800: 0.987698
***** nb TOP5 *****
--- Top5 ---
7: 0.329834
5222406: 0.302002
5222534: 0.301758
5222662: 0.300781
5222790: 0.290527
```

2.1.9 5. OK527 Platform Multimedia Test

The audio and video part of OK527 platform supports hardware decoding. All of the examples in this section are based on command line forms.

There is a video processing unit VPU inside the OK527 platform, which supports video hard decoding in the following formats:

Video Decoding: H265 supports up to 4K @ 30fps and H264 supports up to 4K @ 24fps

Video Encoding: JPEG, up to 4096x4096

Table of hardware decoder parameters for the OK527 platform:

Video Decoder	Format	Resolution	Frame rate
	H.265	4K	60 fps
	H.264	4K	30 fps
	VP9	4K	60 fps
Video Encoder	H264	4K	24 fps

5.1 UVC Play Test

Note:

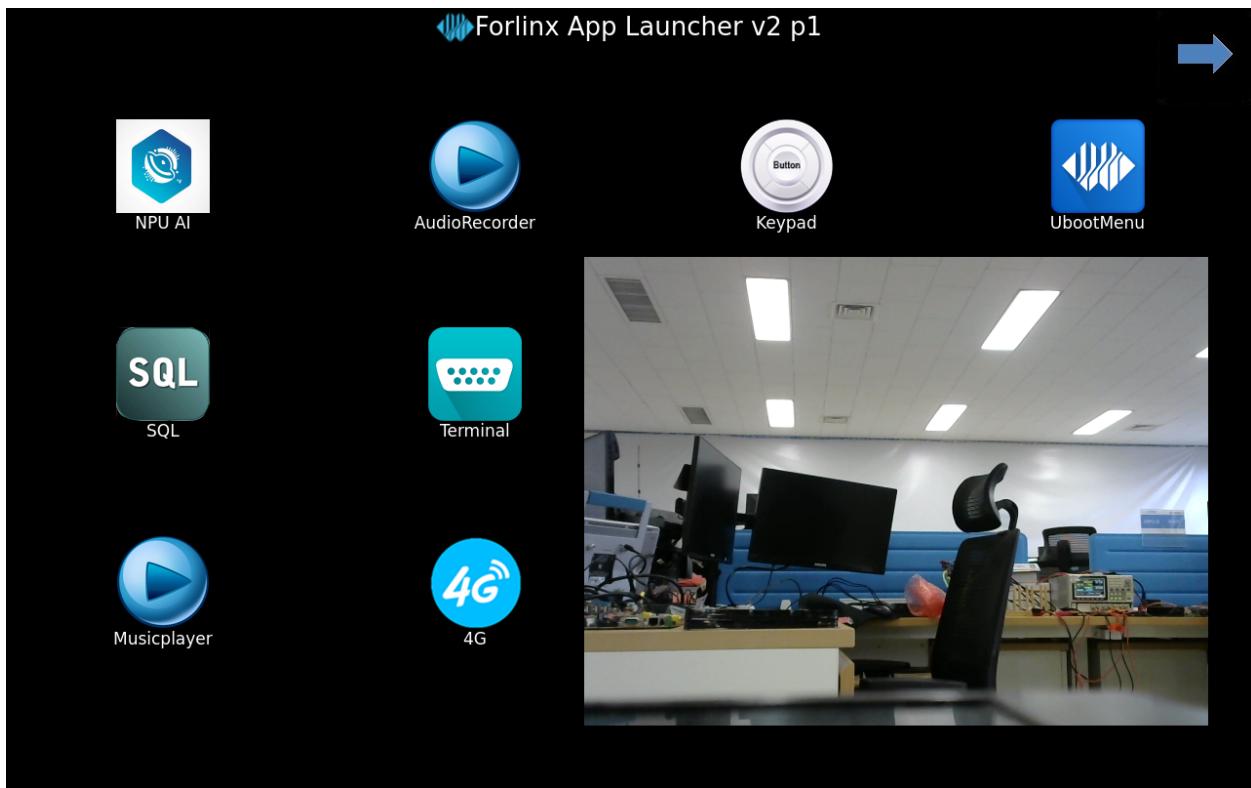
Before performing the tests in this section, refer to “Closing the Desktop” to close the desktop test program and clear the screen.

The device node recognized by the OK527 UVC camera is /dev/video1, and this test uses LVDS as the display device.

1. Capture Test

```
root@OK527:/# gst-launch-1.0 v4l2src device=/dev/video1 ! videoconvert ! video/x-raw,
˓→format=NV12,width=640,height=480,framerate=30/1 ! waylandsink

.
```



5.2 OV5645 Acquisition Test

Command line collection of MIPI cameras is currently not supported, but can be collected using the Qt application.

5.3 Video Hardware Decoding

OK527 supports H264, H265 video hard decoding, H265 supports up to 4K @ 60fps, H264 supports up to 4K @ 30 fps

The current encoding and decoding uses the gstreamer method, which can only decode without encoding.

```
root@OK527:/# gst-launch-1.0 filesrc location=/forlinx/1080p_60fps_h264.mp4 !_
parsebin ! omxh264dec ! filesink location=h264.yuv

...
stream stopped, reason error
WARNING: omx_vdec_aw <standbyOutBufferArr:659>: ** return pic when flush,i[0],
↳pPic[0x7f70001328]
WARNING: omx_vdec_aw <standbyOutBufferArr:659>: ** return pic when flush,i[1],
↳pPic[0x7f70001498]
WARNING: omx_vdec_aw <standbyOutBufferArr:659>: ** return pic when flush,i[4],
↳pPic[0x7f700018e8]
WARNING: omx_vdec_aw <standbyOutBufferArr:659>: ** return pic when flush,i[5],
↳pPic[0x7f70001a58]

Freeing pipeline ...
```

Check if the h264.yuv file has been generated after completion.

Video Preview

```
root@OK527:/# gst-launch-1.0 filesrc location=/forlinx/1080p_30fps_h265.mp4 !_
parsebin ! omxhevcvideodec ! waylandsink
```

.

.

.

2.1.10 6. System Flashing

The OK527-C development board currently supports both OTG and TF card programming. The corresponding burning tool is provided in the user information, and the user can choose anyone to burn the image.

6.1 Image Required for Flashing

Image Path: 02-User Profile\01-Software Profile\03-Mirror & Source Code\01-Image File

Image	Description
t527_linux_okt527_uart0.img	Factory default image (eMMC)

Note: The provided image file has been compressed. Please decompress it before burning it.

6.2 OTG Flashing

6.2.1 Flashing Tools Installation

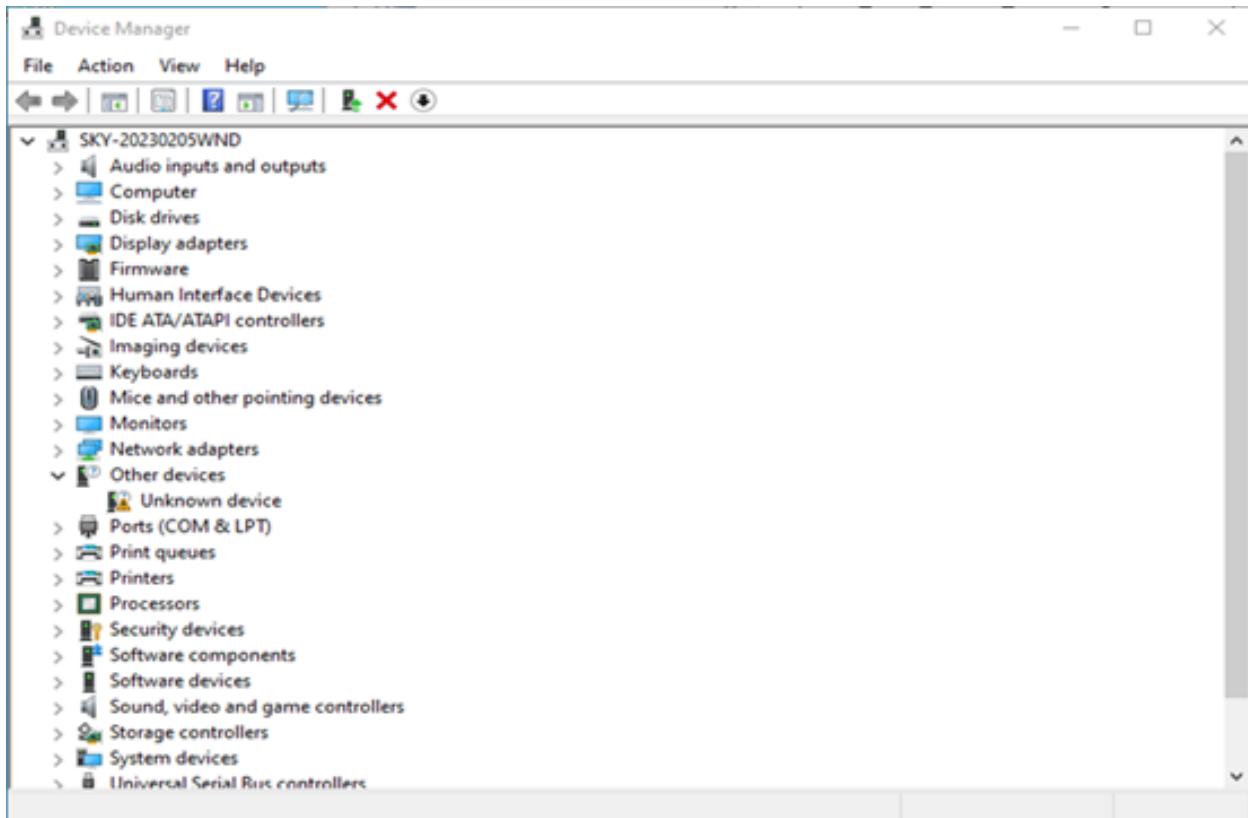
Path: 02-User Information \ 01-Software Information \ 04-Tools \ PhoenixSuit _ V1.10.zip

Unzip the Phoenix Suit _ V1.10.zip and connect the development board to the PC using the Type-C cable.

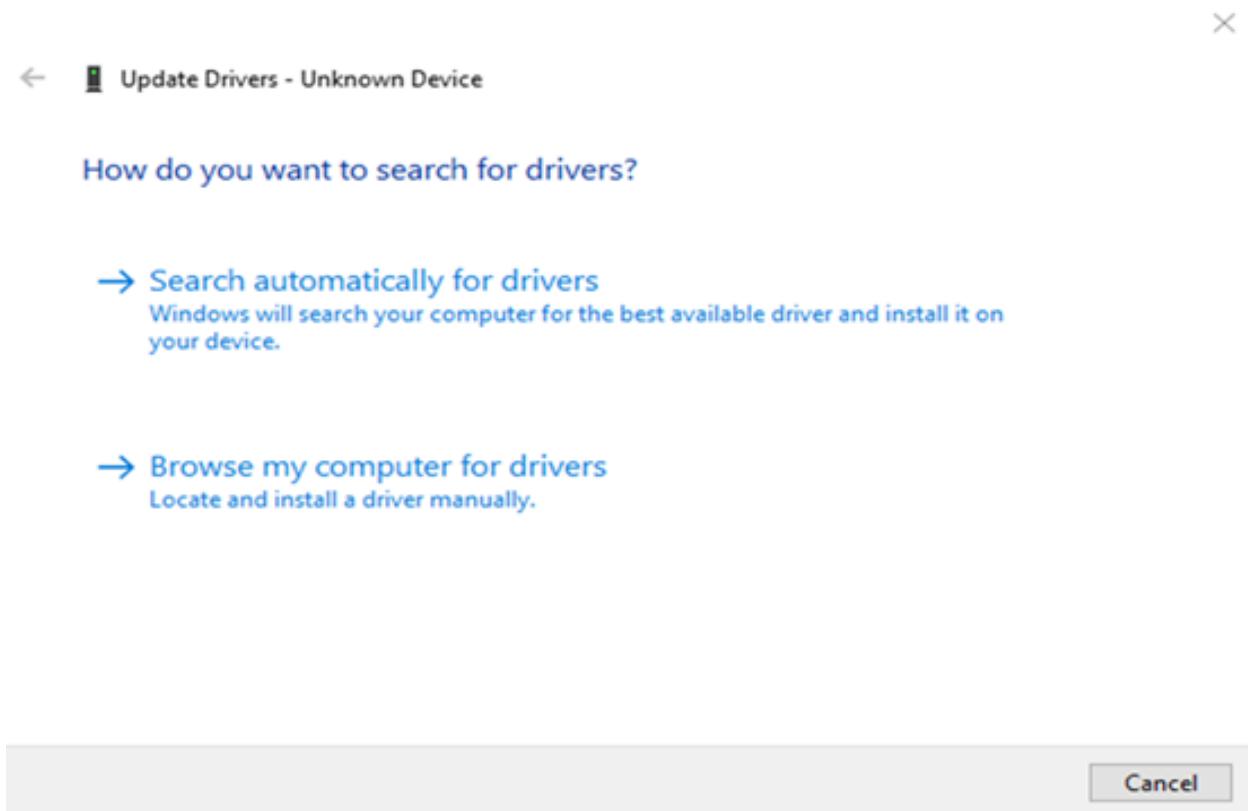
Use the Type-C cable to connect the development board and the host. Press and hold the FEL key and press the RESET key to reset the system. Release the RESET key for about two seconds and then release the FEL key.

Note: Make sure to release the RESET button first, then release the FEL button.

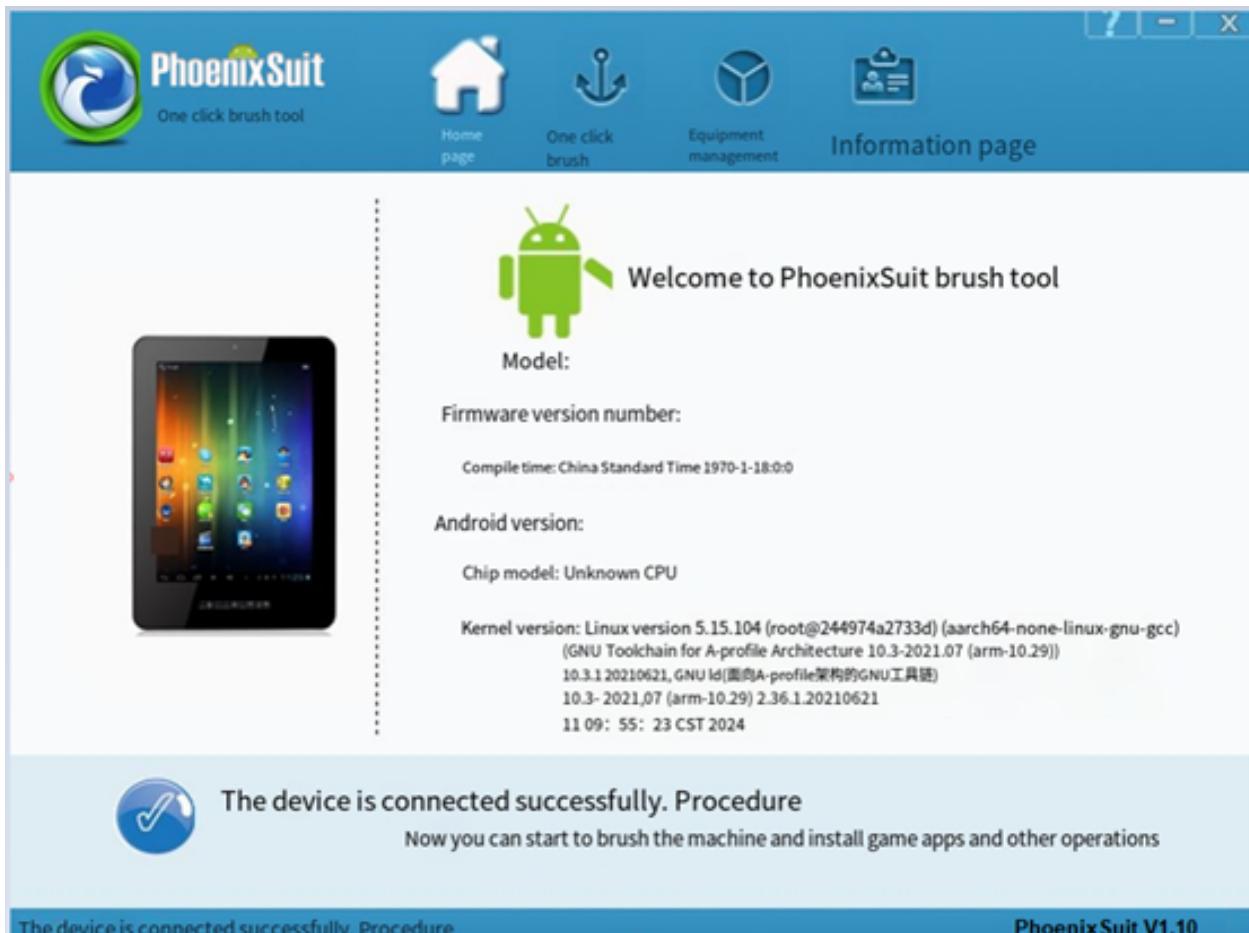
Open the windows device manager, find an unknown device with a yellow exclamation mark, select to install the driver manually, right-click the unknown device, and select “Update Driver”



Select “Browse my computer for drivers” and then select the extracted V1.10 directory of the Phoenix Suit ...



Wait for the driver to finish installing, and run PhoenixSuit.exe, the bottom left corner shows “The device has been connected successfully” .

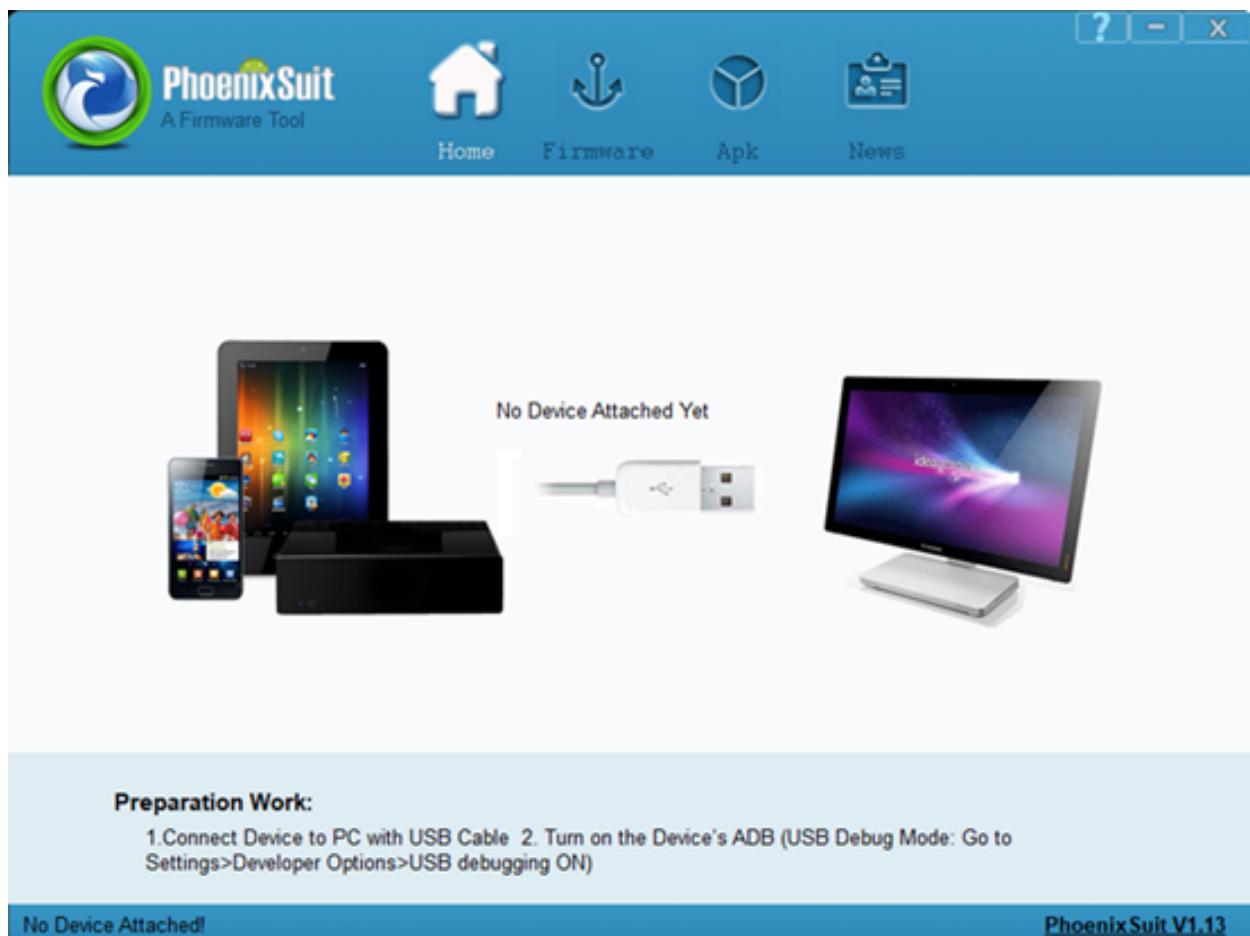


6.2.2 OTG Flashing Method

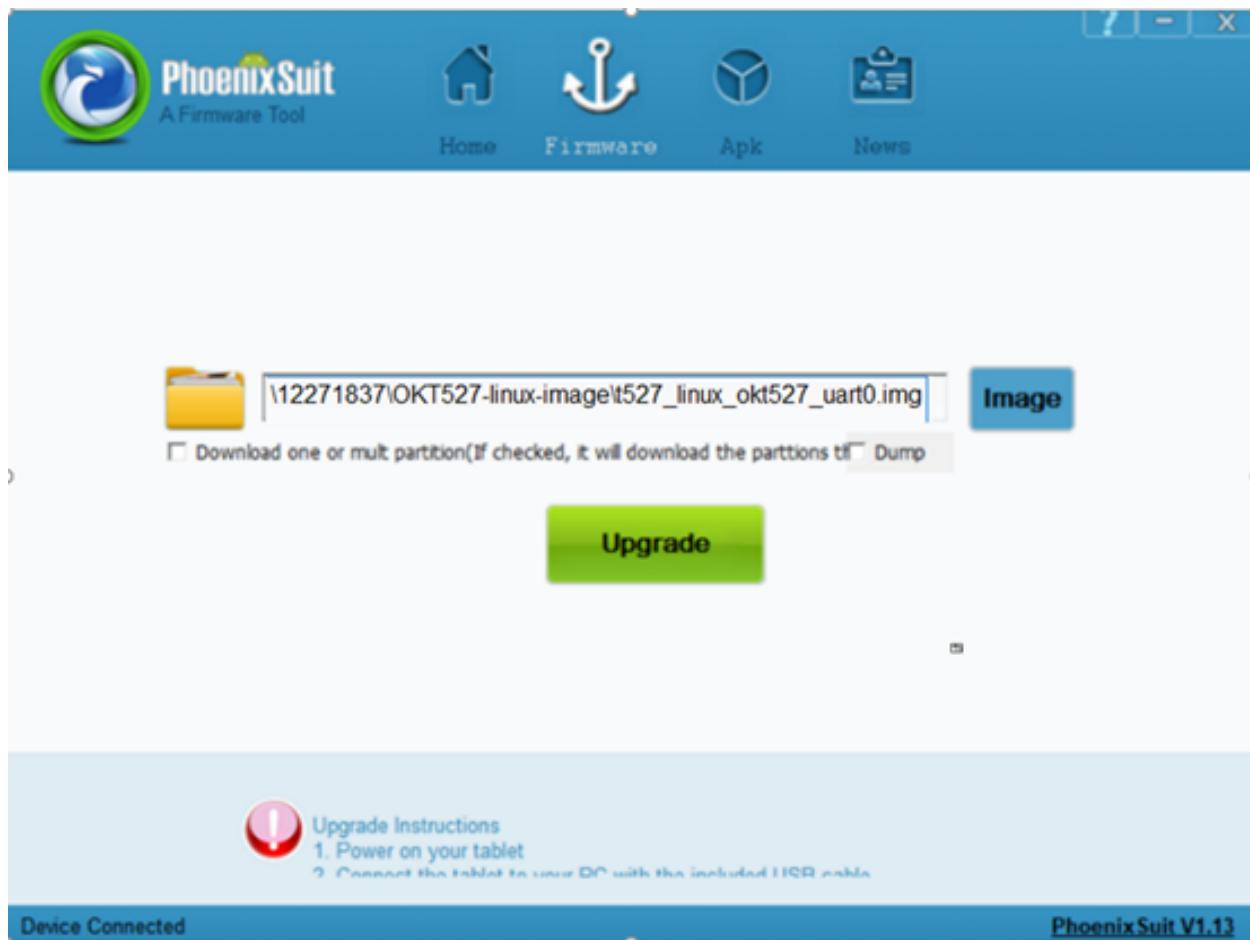
1. OTG Full Flashing Test

This method will flash the entire img image.

As shown in the following interface:



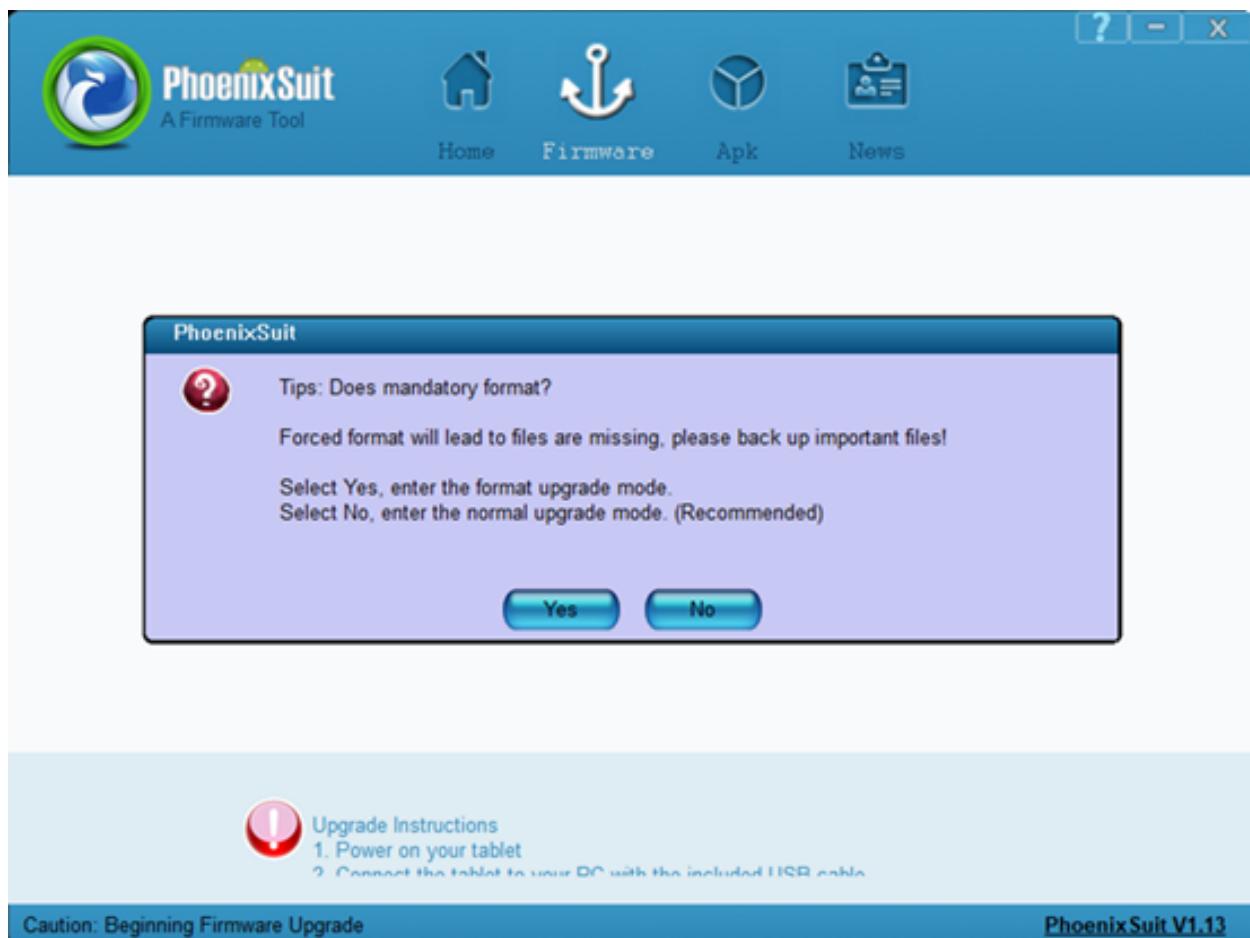
In the following interface, click on “One-click Flash” and then click on “Browse” to select the firmware image file.



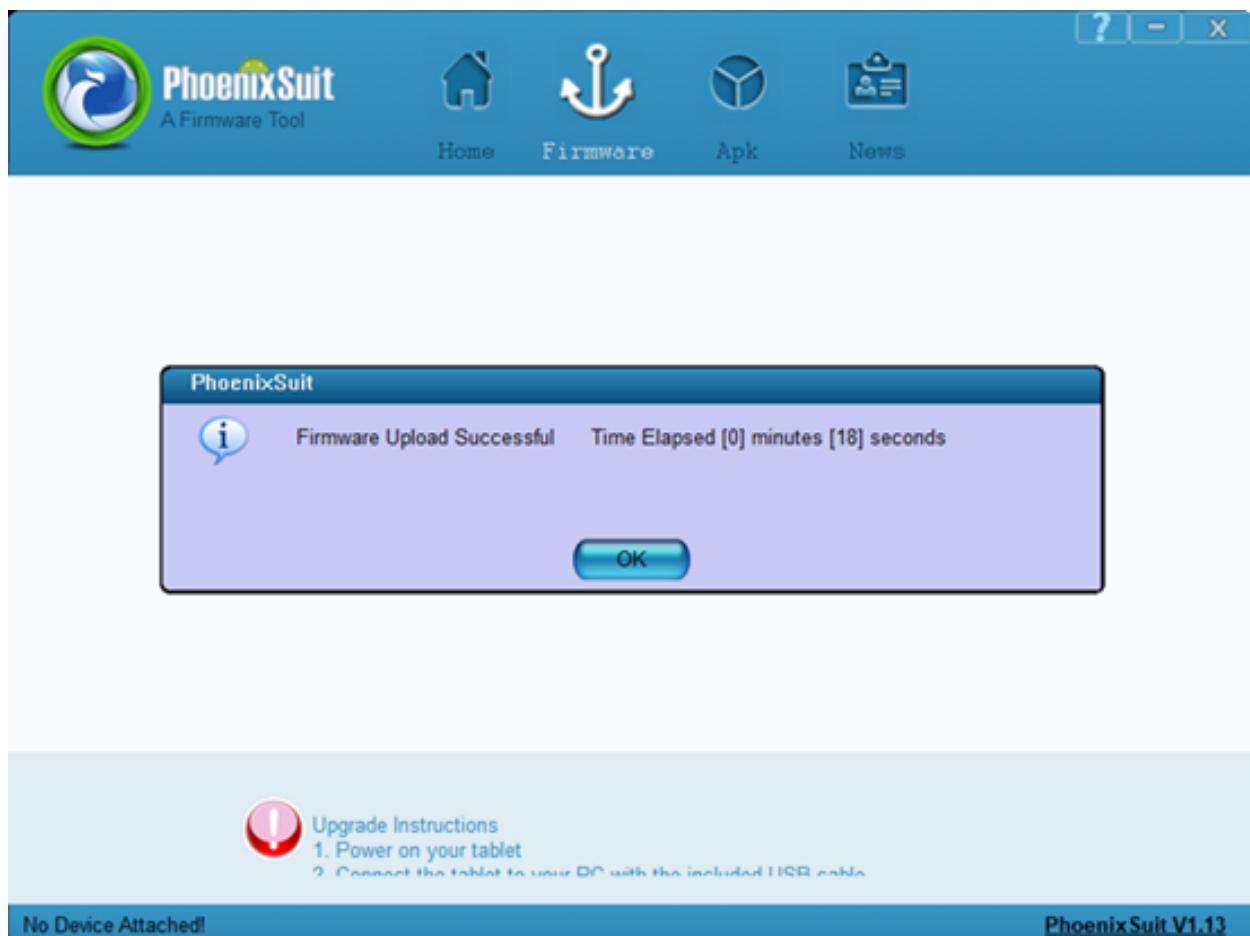
Connect the development board and the host using a Type-A to Type-C cable, do not power on the board initially, press the FEL key, power on the board, then release the FEL key.

Note: Be sure to press the FEL key when the power is off.

In the following interface, click “Yes” to enter the formatting upgrade mode.



Wait for the flashing to finish, the following interface will pop up:



Power on and start the OK527 board.

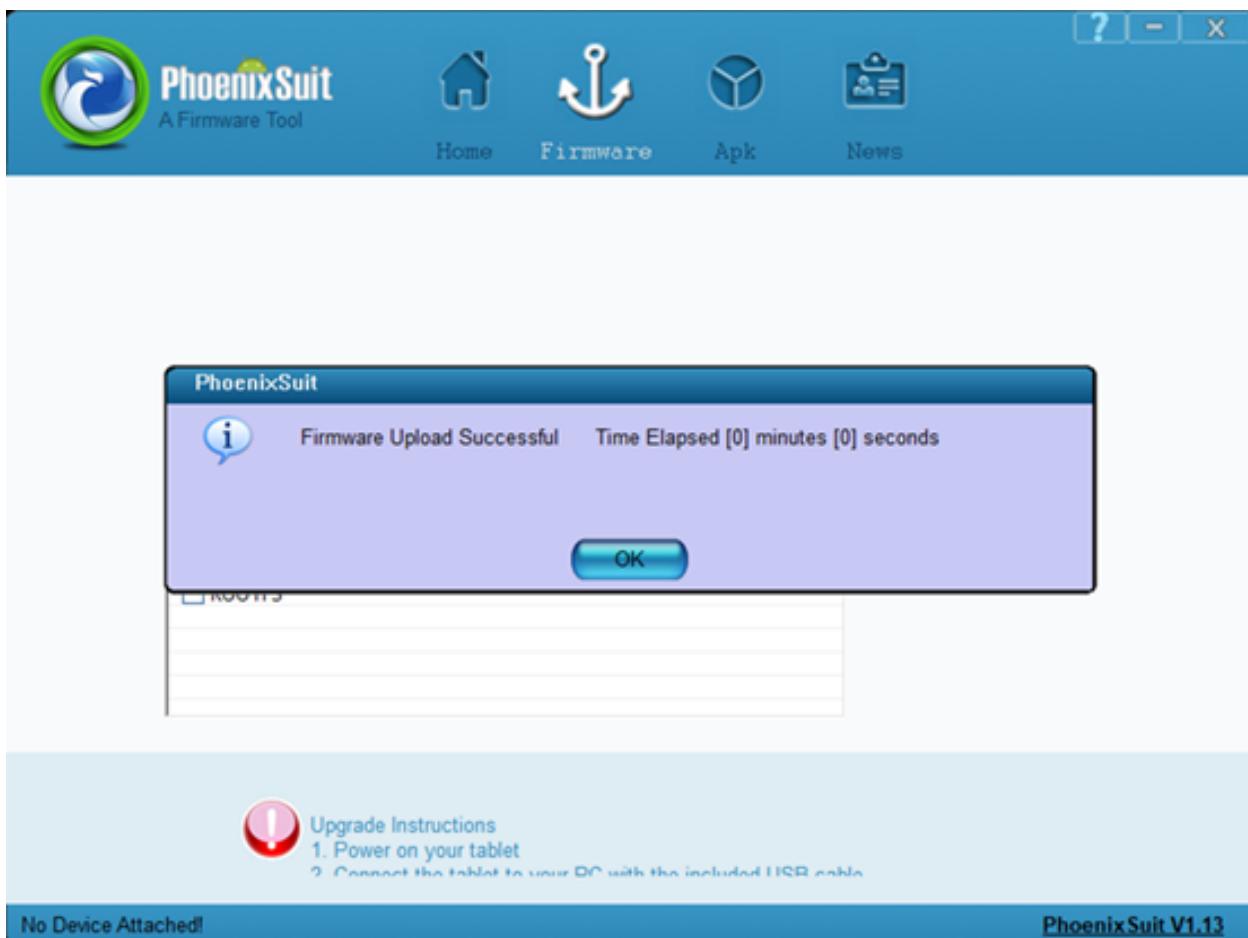
2. Update the image separately.
 - 1) Separate flashing test for OTG Uboot

In the following interface, check the checkbox “Single or Multi-zone Download (Check this option, the flashing tool downloads the partitions you selected)”, check “BOOT-RESOURCE” , “ENV” , checkboxes.



Connect the development board and the host using a Type-A to Type-C cable, do not power on the board initially, press the FEL key, power on the board, then release the FEL key. Wait for flashing to finish, the following interface will pop up:

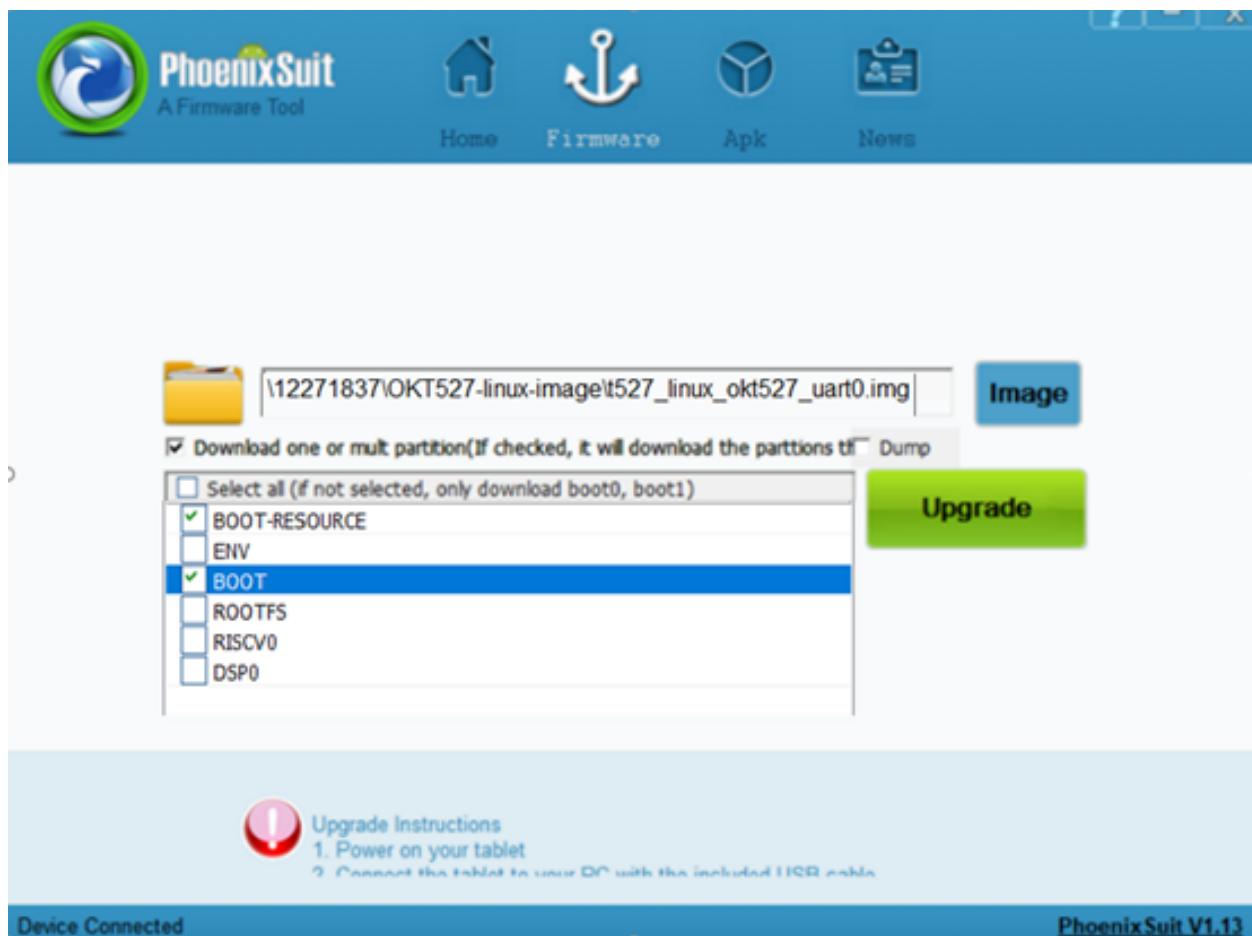
Note: Be sure to press the FEL key when the power is off.



2) Flash the kernel image and device tree (dtb) file via OTG

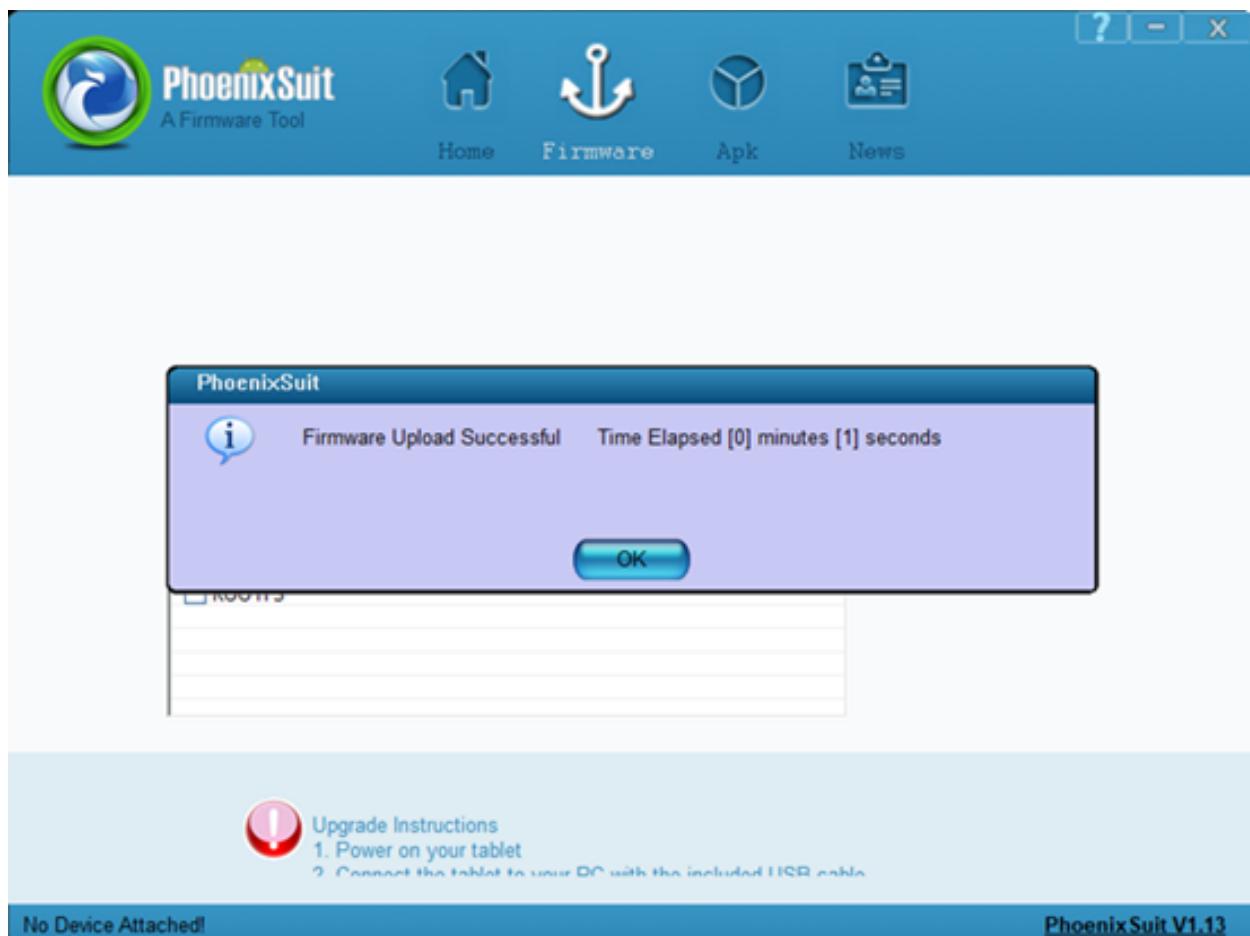
Check the “Single/Multiple Partition Download” box in the interface (flashing tool downloads selected partitions), also check “BOOT-RESOURCE” and “BOOT” .

Place the kernel image in the “BOOT” partition, and the device tree (DTB) file and U-Boot in the “BOOT-RESOURCE” partition.



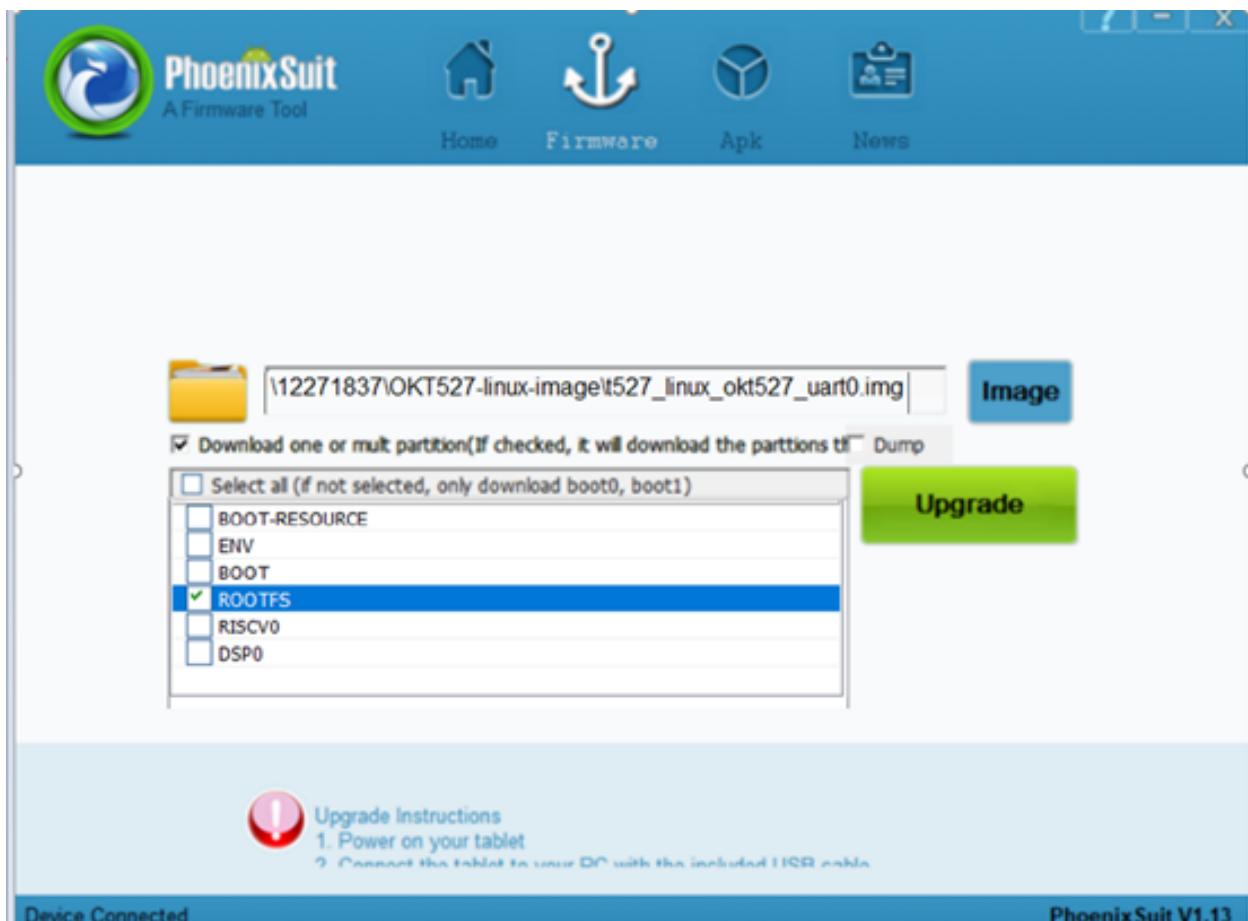
Connect the development board and the host using a Type-A to Type-C cable, do not power on the board initially, press the FEL key, power on the board, then release the FEL key. Wait for flashing to finish, the following interface will pop up:

Note: Be sure to press the FEL key when the power is off.



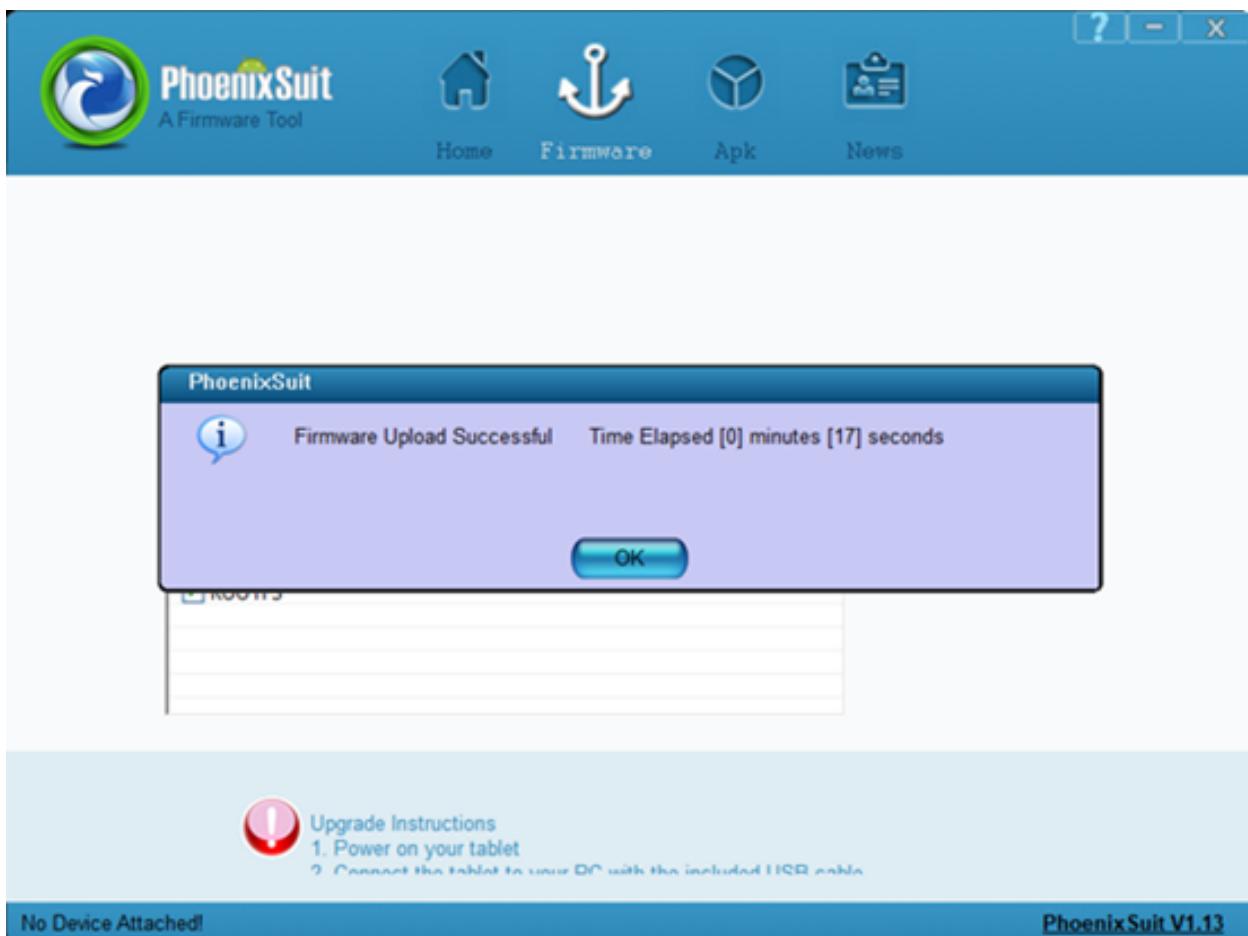
3) OTG flashing File System

Check the “Single/Multiple Partition Download” box in the interface (flashing tool downloads selected partitions), also check “ROOTFS” .



Connect the development board and the host using a Type-A to Type-C cable, do not power on the board initially, press the FEL key, power on the board, then release the FEL key. Wait for flashing to finish, the following interface will pop up:

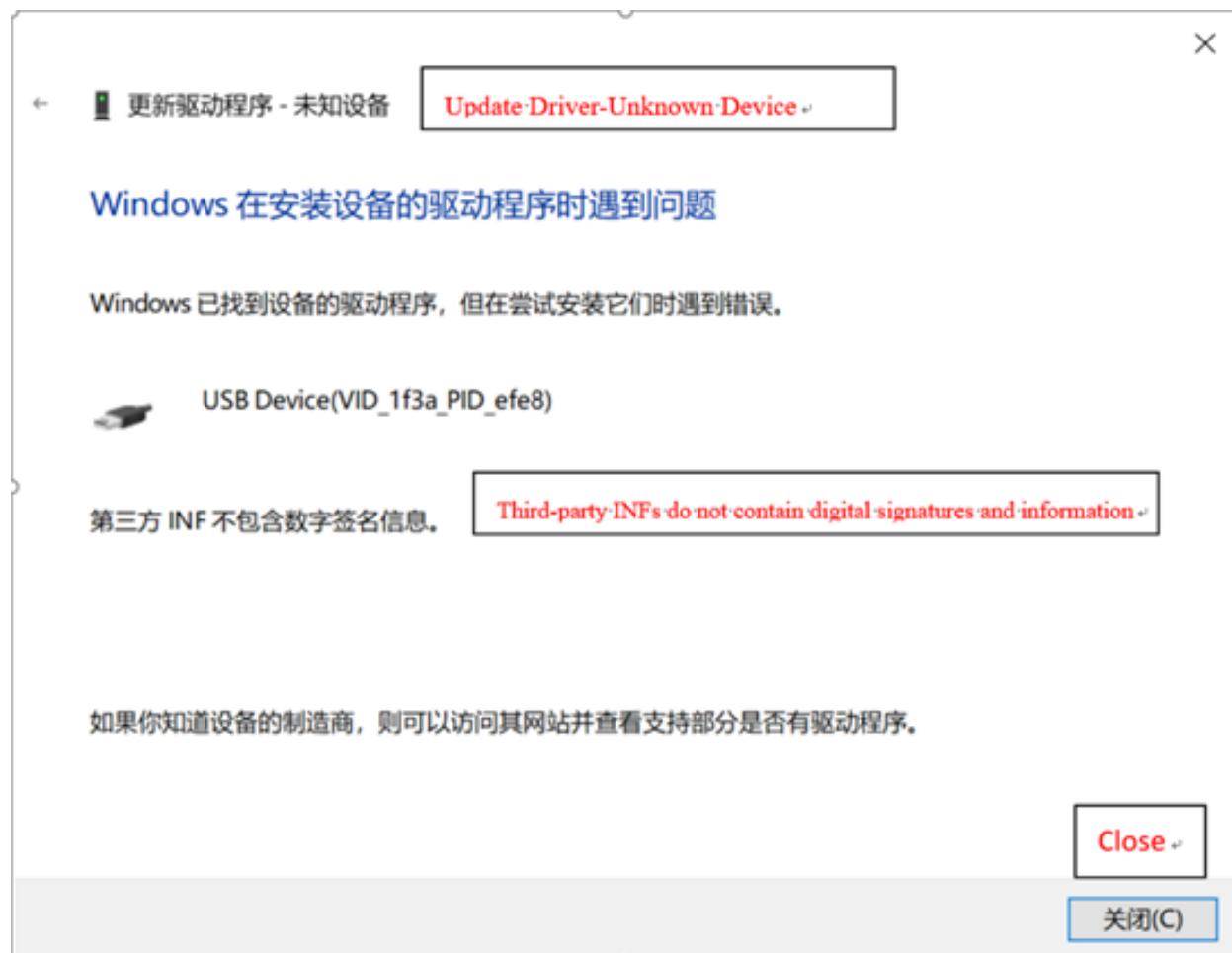
Note: Be sure to press the FEL key when the power is off.



6.2.3 OTG Flashing Common Issues

1. Driver installation failed

Some users still see an “Unknown Device” after installing USB drivers per the manual. Clicking on it shows a message about a third-party INF lacking digital signature info, as shown below.

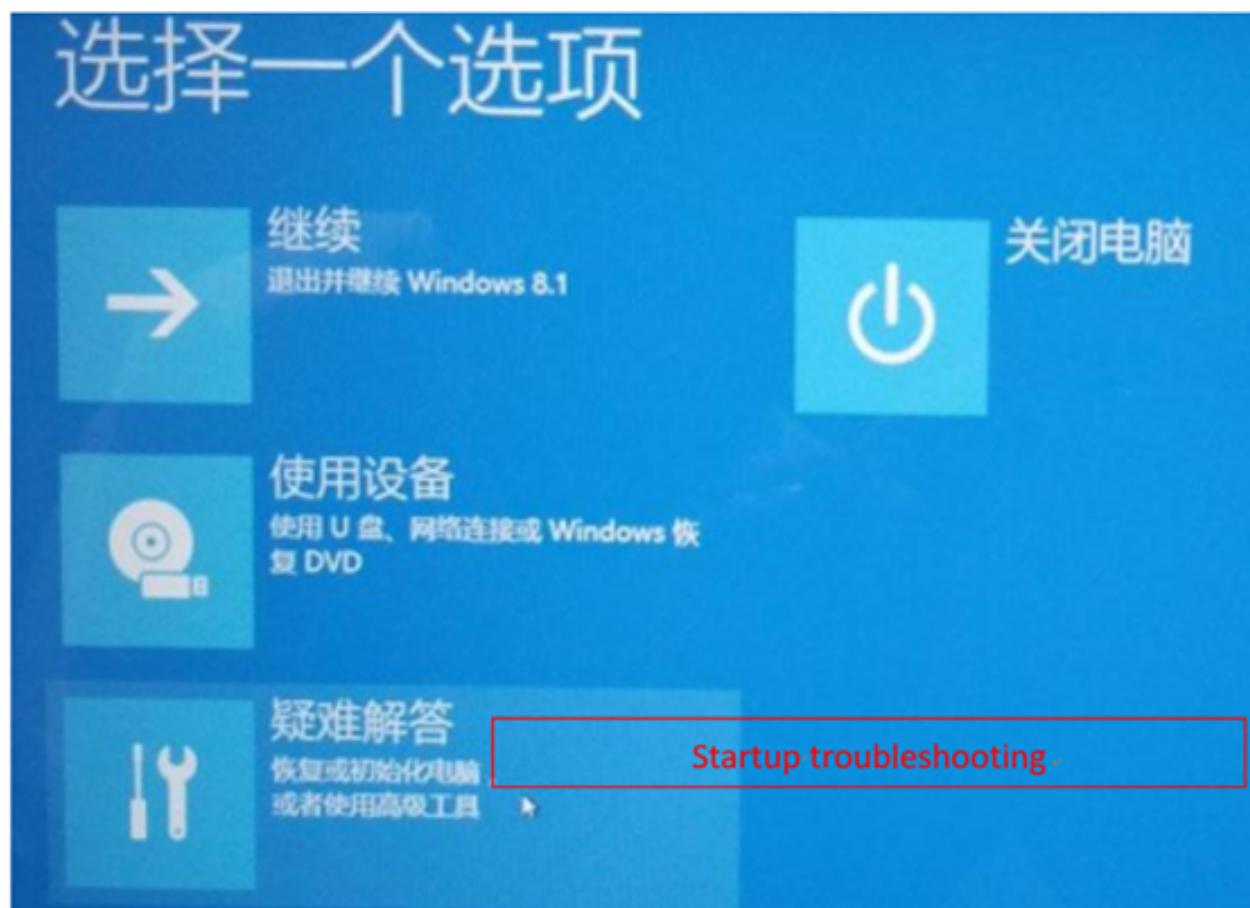


This occurs because some Windows systems disallow unsigned drivers to ensure system stability, resulting in failed installation of unsigned drivers. Users need to disable driver signature enforcement on their computers before installing drivers according to the manual.

- Solution to the problem that the third-party INF does not contain digital signature information.
 - 1) First press and hold Shift + to restart



2) At startup, select Troubleshooting –Advanced Options –Startup Settings



3. In the boot settings screen, click Reboot in the lower right corner to reboot into the boot settings; you can use the number keys 7 or functional keys F7; disable driver forced signing;

启动设置

Enable settings

按一个数字以从下列选项中进行选择:

使用数字键或功能键 F1-F9.

- 1) 启用调试
- 2) 启用启动日志记录
- 3) 启用低分辨率视频
- 4) 启用安全模式
- 5) 启用带网络连接的安全模式
- 6) 启用带命令提示符的安全模式
- 7) 禁用驱动程序强制签名
- 8) 禁用预先启动反恶意软件保护
- 9) 禁用失败后自动重新启动

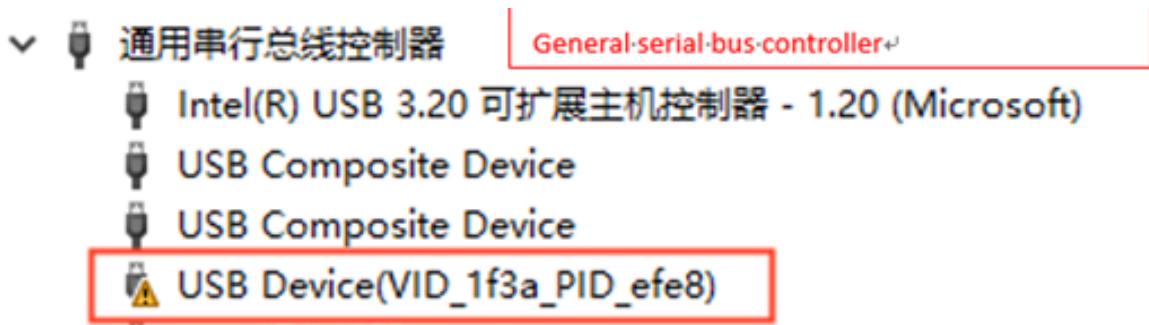
按 F10 以查看更多选项

按 Enter 以返回到操作系统

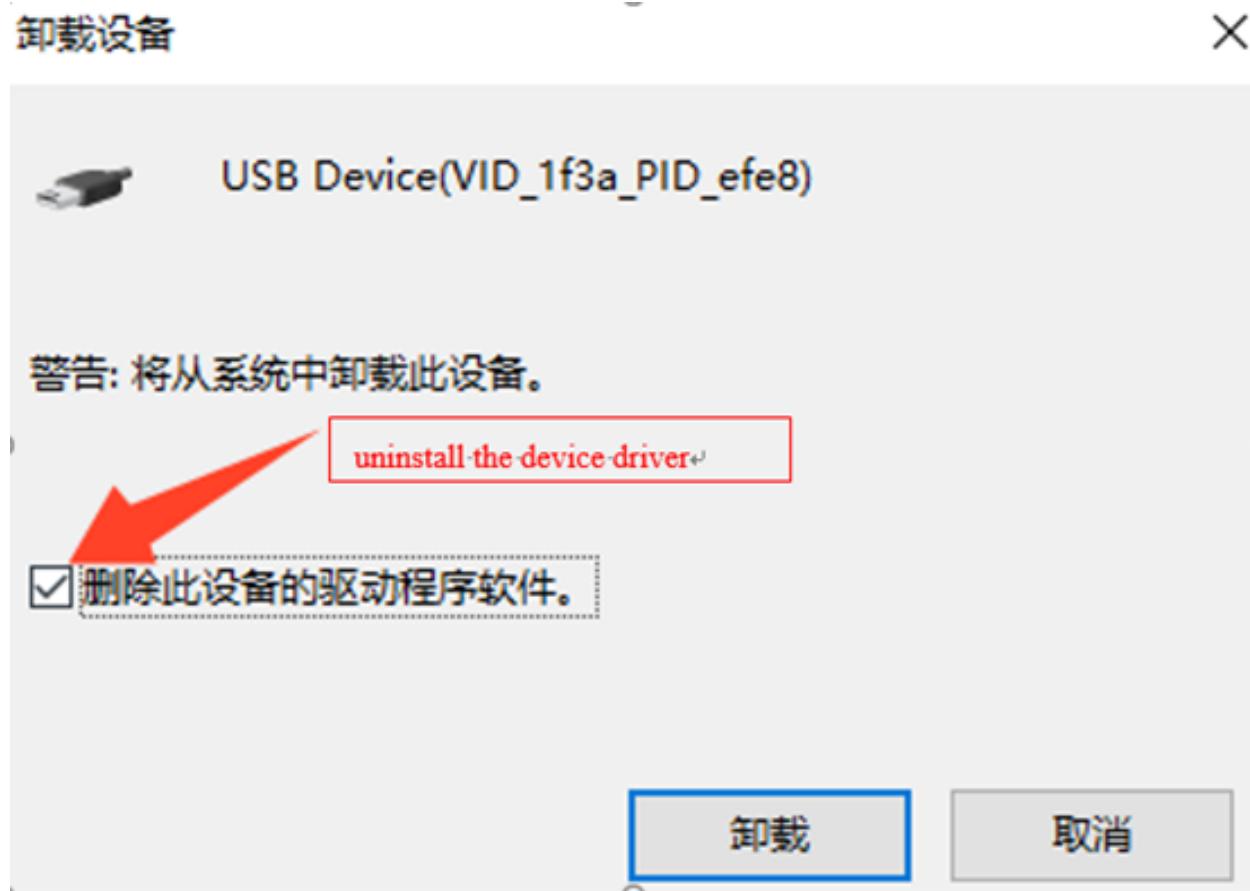
2. Improper use of FEL key

When flashing, do not power up the board first, press the FEL key and then power up the board, and then release the FEL key.

3. The device name has appeared, but the board still cannot be recognized.



Due to numerous unknown devices in Device Manager, choosing the wrong one might install the driver incorrectly. Right-click the device, uninstall it and the device driver.



Then unplug other USB devices, set the development board to flashing mode, connect to the host, and reinstall the driver.

6.3 TF Card Flashing

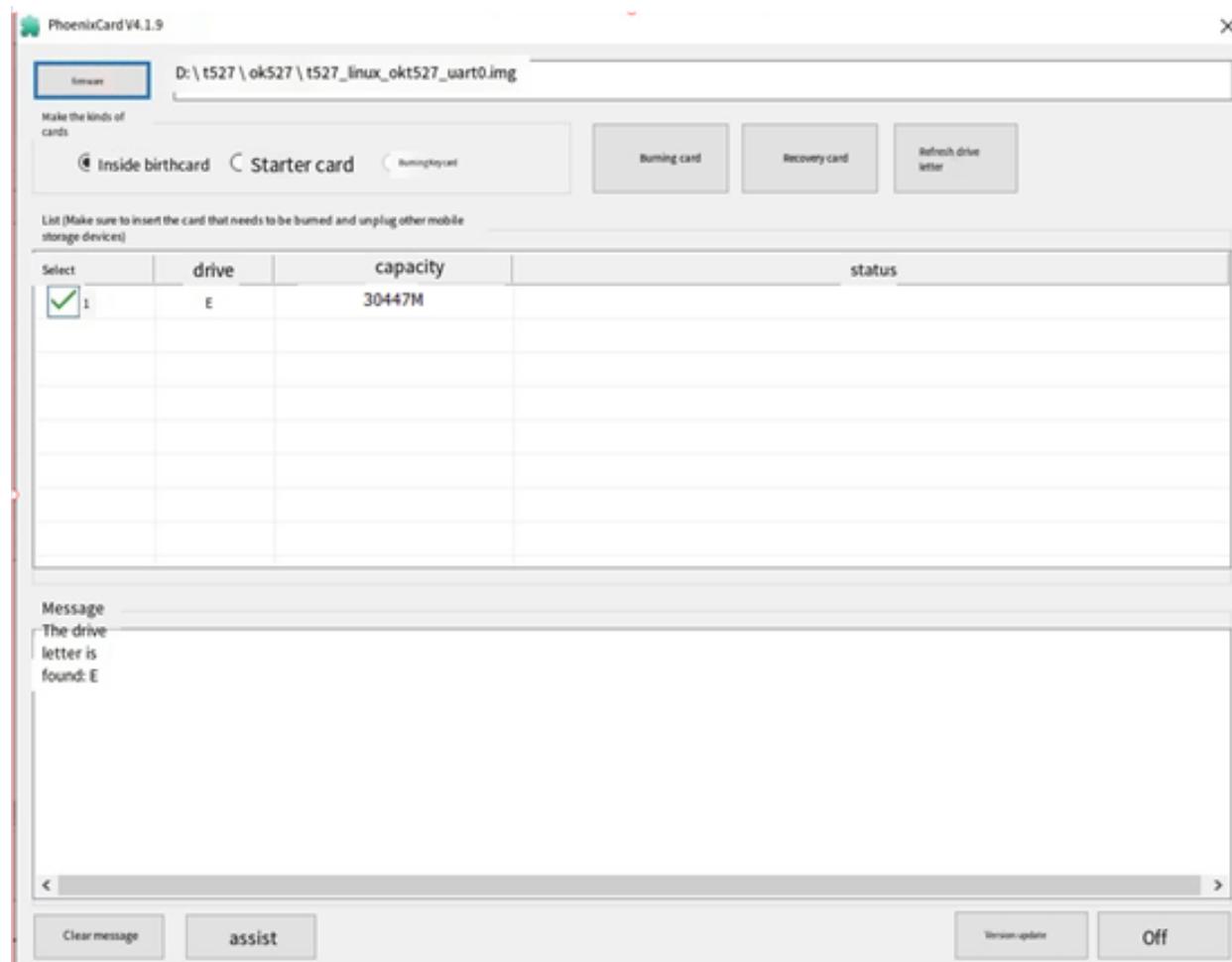
6.3.1 TF Flashing Card Creation

Creation path: 02-user information\01-software information\04-tools\PhoenixCard_V4.1.9.zip

1. Insert the 8GB/16GB/32GB TF card into the USB port of the PC using a card reader;

2. Copy the PhoenixCard_V4.1.9.zip to any directory on Windows, then double-click the PhoenixCard.exe file inside the PhoenixCard_V4.1.9 directory.

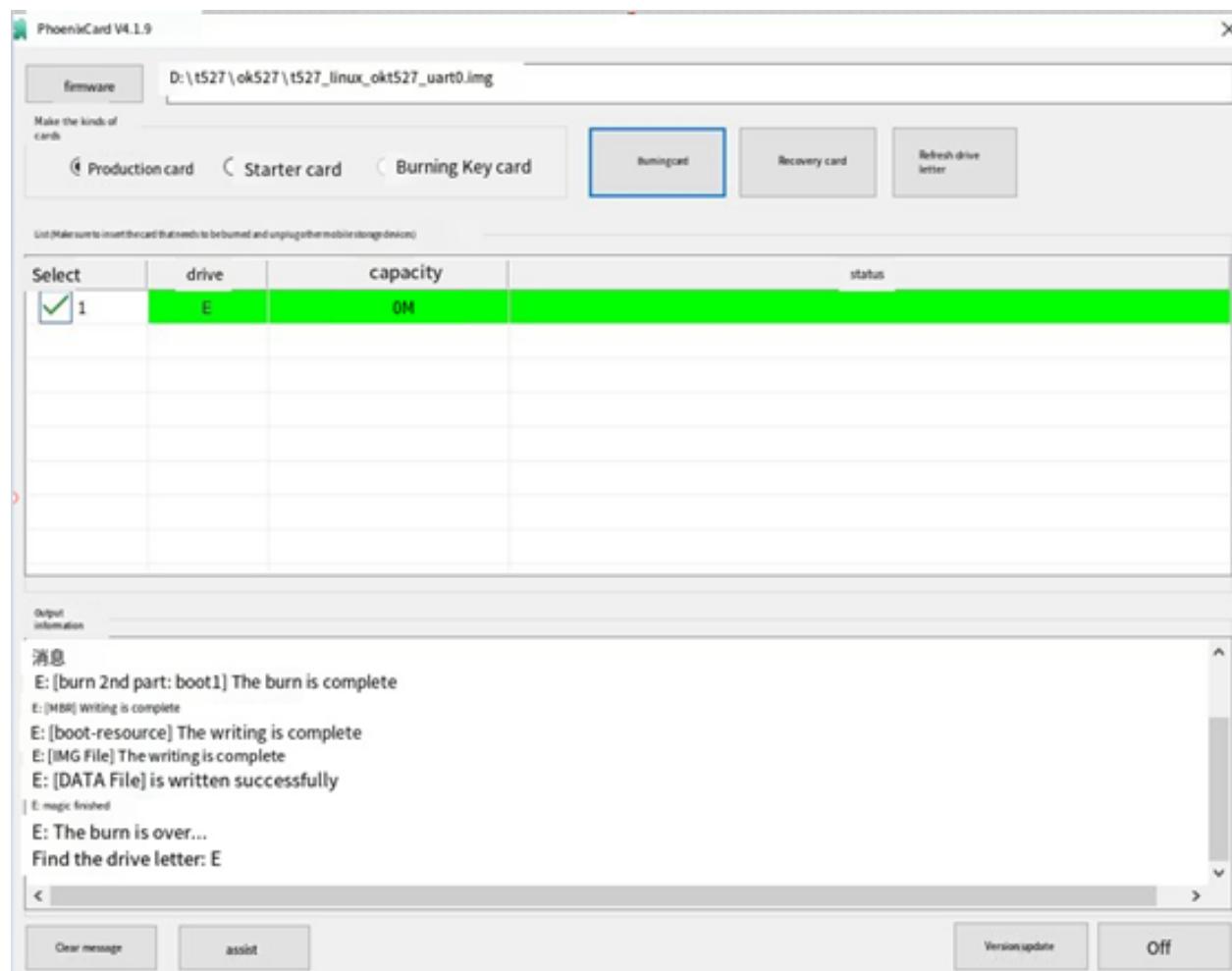
As shown in the following interface:



Note: When there are multiple partitions on the TF card, please click on “Restore Card” first, and then click on “Burn Card”. Otherwise, it may result in a failed burn process.

3. Click on “Firmware” to browse OK527 firmware image, select “Mass Production Card,” and click “Flash Card” .

After flashing, as shown in the following interface:



6.3.2 TF Card Flashing

1. Insert the TF card, power on and start the card, and the system will automatically enter the programming process.

After the programming is completed, the screen and serial port will prompt:

```
...
chunk 4392(4395)
chunk 4393(4395)
chunk 4394(4395)
[76.477] successed in writting part rootfs
origin_verify value = b32fc317, active_verify value = b32fc317
[76.486] successed in verify part rootfs
[76.490] successed in download part rootfs
[76.494] begin to download part riscv0
partdata hi 0x0
partdata lo 0x1f39bc
sparse: bad magic
[76.599] successed in writting part riscv0
origin_verify value = 1cc2c38d, active_verify value = 1cc2c38d
[76.619] successed in verify part riscv0
```

(continues on next page)

(continued from previous page)

```
[76.623]successed in download part riscv0
[76.627]begin to download part dsp0
partdata hi 0x0
partdata lo 0x4c4b0
sparse: bad magic
[76.650]successed in writting part dsp0
origin_verify value = 9720f44d, active_verify value = 9720f44d
[76.662]successed in verify part dsp0
[76.665]successed in download part dsp0
[76.672]successed in downloading part
uboot size = 0x16c000
storage type = 2
sunxi_sprite_deal_uboot ok
[76.761]successed in downloading uboot
[76.768][mmc]: write mmc 2 info ok
storage type = 2
[76.780]successed in downloading boot0
CARD OK
[76.784]sprite success
sprite_next_work=1
next work 1
SUNXI_UPDATE_NEXT_ACTION_NULL
=====
|           update   finish           |
|           |                   |
=====
remind_type : GPIO_LED
```

2. Pull out the TF card and power on the board to start the system.

During mass production, monitor the red light on the SoM to gauge flashing completion. The process changes as follows:

Flashing preparation stage: The red light of the SoM is always off.

Flashing completion stage: The red light of the SoM is off.

3. TF Card Restoration

Path of recovery tool: 02-User information \ 01-Software information \ 04-Tools \ PanasonicSDFormatter.zip

Copy PanasonicSDFormatter.zip to any window directory and unzip it, insert the TF card into the Windows host, and run SDFormatter.exe as administrator.



Click on “Options Settings,” select Erase and Format, and then click Format to restore the burned TF card to a regular TF card.

2.2 Linux5.15.147_User’s Compilation Manual

Document classification: Top secret Secret Internal information Open

2.2.1 Copyright

The copyright of this manual belongs to Baoding Folinx Embedded Technology Co., Ltd. Without the written permission of our company, no organizations or individuals have the right to copy, distribute, or reproduce any part of this manual in any form, and violators will be held legally responsible.

Forlinx adheres to copyrights of all graphics and texts used in all publications in original or license-free forms.

The drivers and utilities used for the components are subject to the copyrights of the respective manufacturers. The license conditions of the respective manufacturer are to be adhered to. Related license expenses for the operating system and applications should be calculated/declared separately by the related party or its representatives.

2.2.2 Overview

This manual is designed to enable users of the Forlinx Embedded development board to quickly understand the compilation process of the products and familiarize themselves with the compilation methods of Forlinx products. The application needs to be cross-compiled on an ubuntu host before it can run on the development board. By following the methods provided in the compilation manual and performing practical operations, you will be able to successfully compile your own software code.

The manual will provide instructions for setting up the environment but there may be some unforeseen issues during the environment setup process. For beginners, it is recommended to use the pre-configured development environment provided by us. This will allow you to quickly get started and reduce development time.

Linux systems are typically installed in three ways: Dual system on a real machine, single system on a real machine, and virtual machine. Different installation methods have their advantages and disadvantages. This manual only provides methods to build ubuntu in a virtual machine.

Computer Hardware Requirements: It is recommended to have at least 16GB memory or above. It allows for allocating a sufficient memory to the virtual machine (recommended to allocate 10GB or above), while still leaving enough resources for other operations on Windows. Insufficient memory allocation may result in slower performance on Windows.

The manual is mainly divided into five chapters:

Chapter 1. is about the installation of virtual machine software, providing a brief introduction to the download and installation of VMware software;

Chapter 2. offers the loading of the Ubuntu system;

Chapter 3. is about the setup, configuration and installation of necessary tools for the Ubuntu system, as well as common issues related to the development environment;

Chapter 4. is the data and compilation method required for the compilation of the source code of the product;

Chapter 5. Configuration of the Qt compilation environment and methods for compiling programs;

A description of some of the symbols and formats associated with this manual:

Format	Meaning
//	Interpretation of input instructions or output information
User- name@Host:	root@forlinx: Development board login account information, forlinx@ubuntu Development environment: Ubuntu account information. Users can use this information to determine the environment for functional operations.

For example, when copying source code, you can use the “ls” command to view the source code files:

```
forlinx@ubuntu:~$ ls /mnt/hgfs/share/ //View files in
 ↳ a shared directory
OKT527-linux-sdk.tar.bz2
```

forlinx@ubuntu: The username is forlinx and the hostname is ubuntu, indicating that the user forlinx is used on the development environment ubuntu for operations.

// : Explanation of ls /run/media operation, no input required.

2.2.3 Application Scope

This software manual is applicable to the OK527 platform Linux 5.15 operating system of Forlinx.

2.2.4 Revision History

Date	Manual Version	Revision History
28/04/2025	V1.0	User's Compilation Manual Initial Version

2.2.5 1. VMware Virtual Machine Software Installation

This chapter mainly introduces the installation of VMware virtual machines, using VMware Workstation 15 Pro v15.5.6 as an example to demonstrate the installation and configuration process of the operating system.

1.1 VMware Software Download & Purchase

Visit Vmware official website <https://www.vmware.com/cn.html> for downloading Workstation Pro and obtaining the product key. VMware is a paid software that requires purchasing, or you can choose to use a trial version.

The screenshot shows the VMware website homepage. At the top, there is a navigation bar with links for "United States (English)", "Shop VMware", and "My Account". Below the navigation bar is the VMware logo and a search bar labeled "Search" with a magnifying glass icon. To the right of the search bar is a blue button labeled "GET STARTED". The main content area is organized into three columns: "Tools & Training", "Support", and "Blogs & Communities". Under "Tools & Training", there are links to "VMware Customer Connect", "VMware Trust Center", "Learning & Certification", "Tech Zone", "Product Downloads", "Product Trials", "Cloud Services Engagement Platform", "Hands-on Labs", "Services", "Professional Services", and "Customer Success". Under "Support", there are links to "Support Offerings", "Skyline", "Support Customer Welcome Center", "Marketplace", "Cloud Marketplace", "VMware Marketplace", "Videos", "VMware Video Library", and "VMware Explore Video Library". Under "Blogs & Communities", there are links to "Blogs", "Podcasts", "News & Stories", "Communities", "Customers", "Customer Stories", "Events", "VMware Explore", "SpringOne", and "All Events & Webcasts". At the bottom of the page, there is a button labeled "SEE ALL RESOURCES".

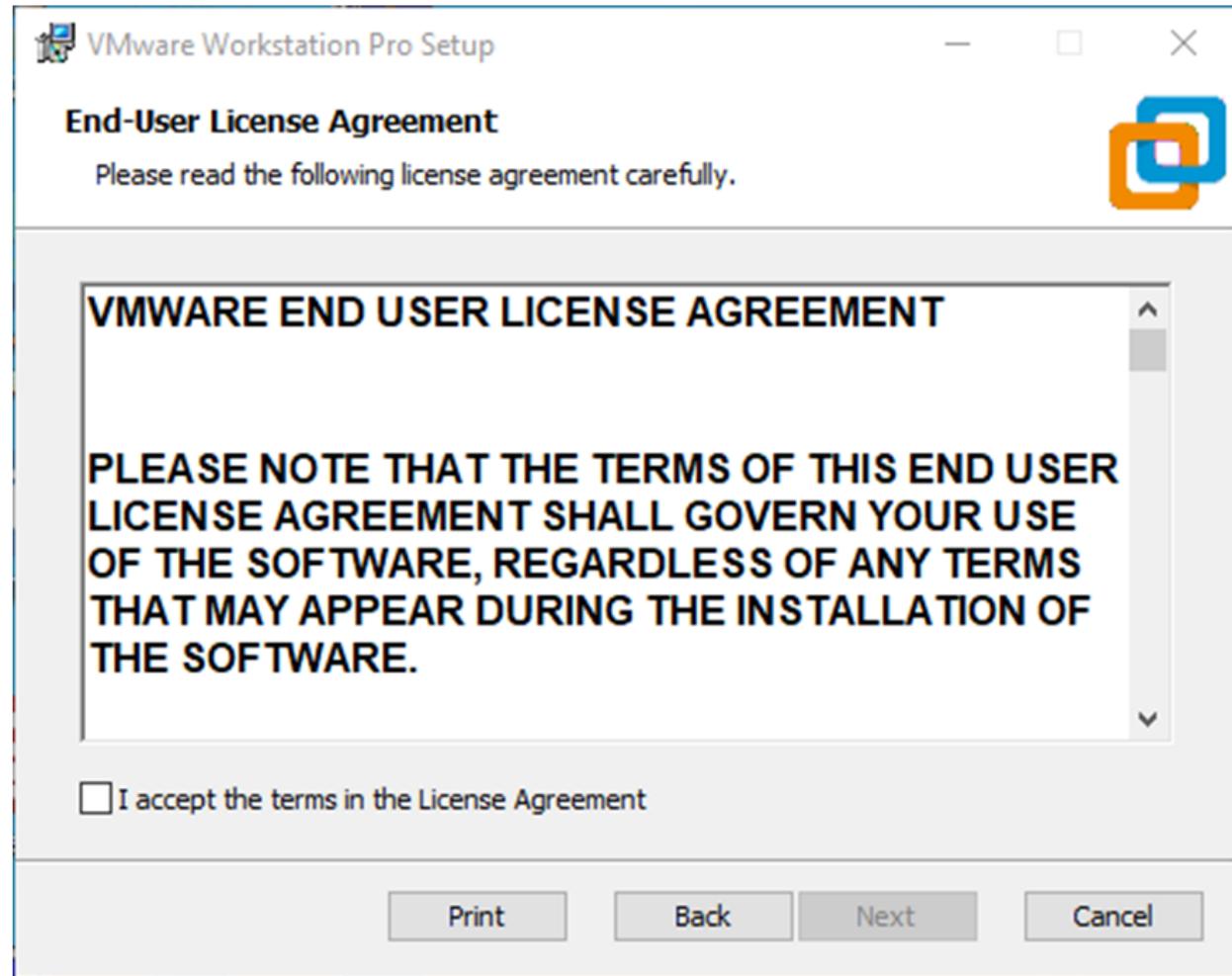
After the download is complete, double-click the installation file to start the installation program.

1.2 VMware Software Installation

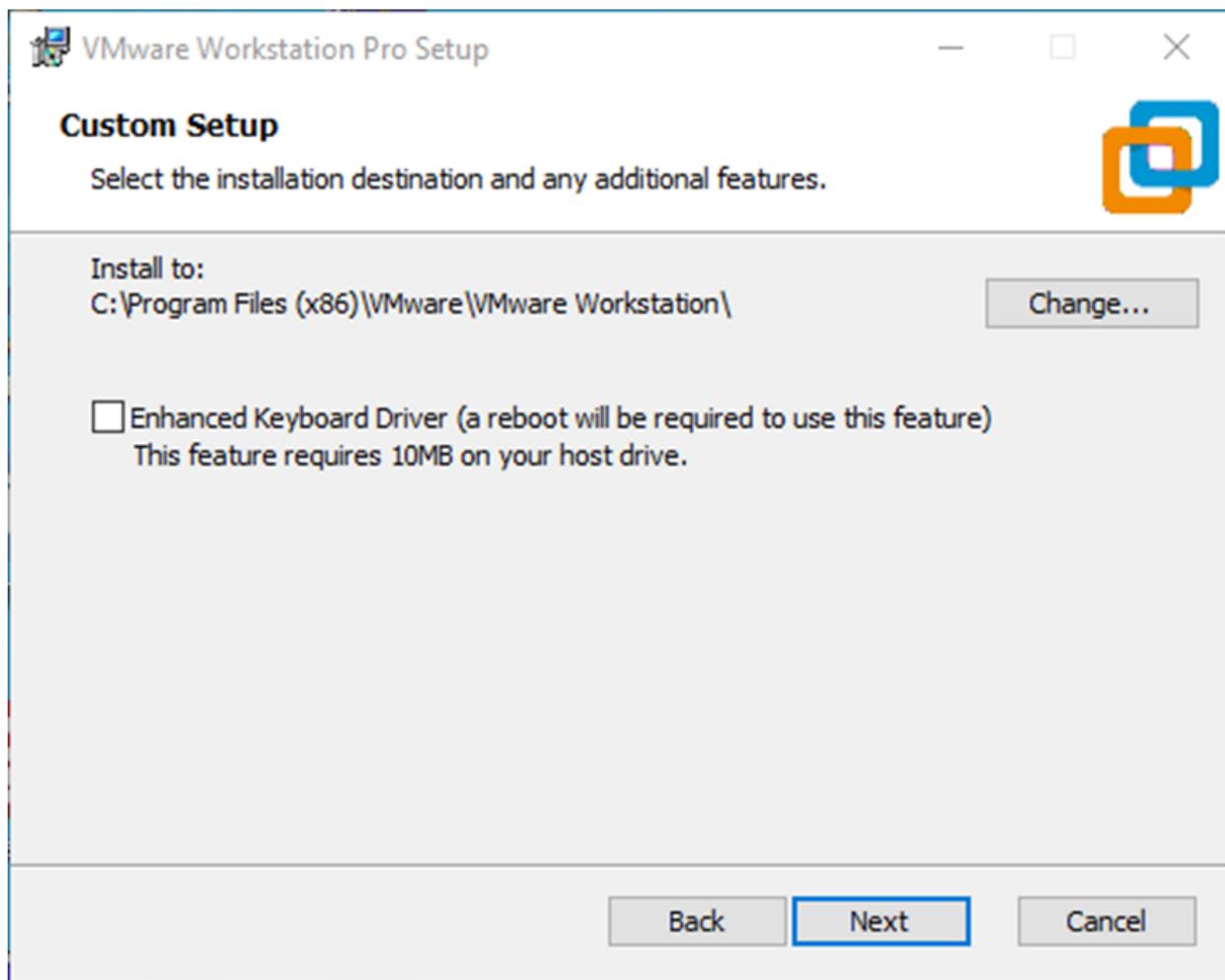
Double-click the startup program to enter the installation wizard.



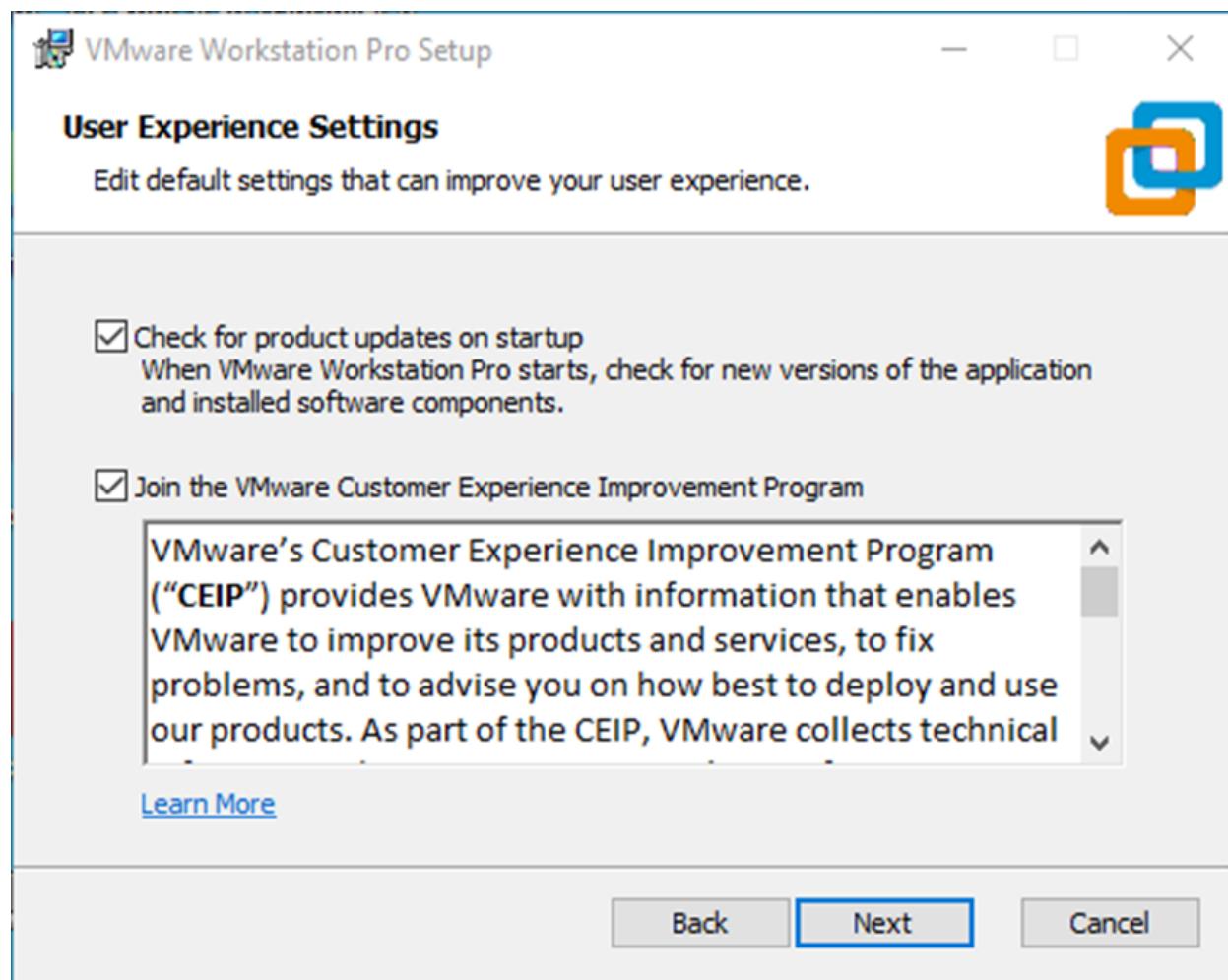
Click on “Next” .



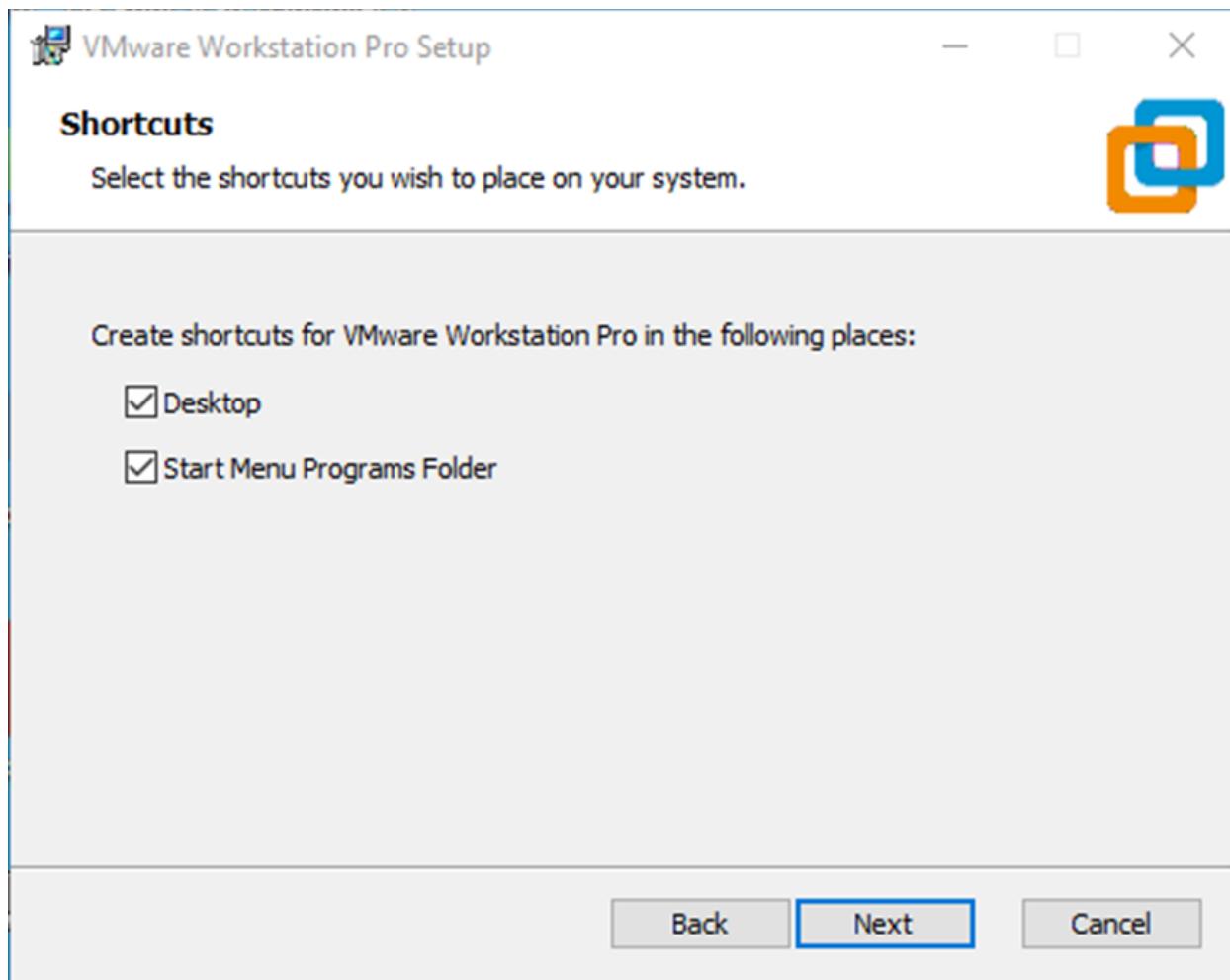
Check the terms in the license agreement that I accept, then click “Next” .



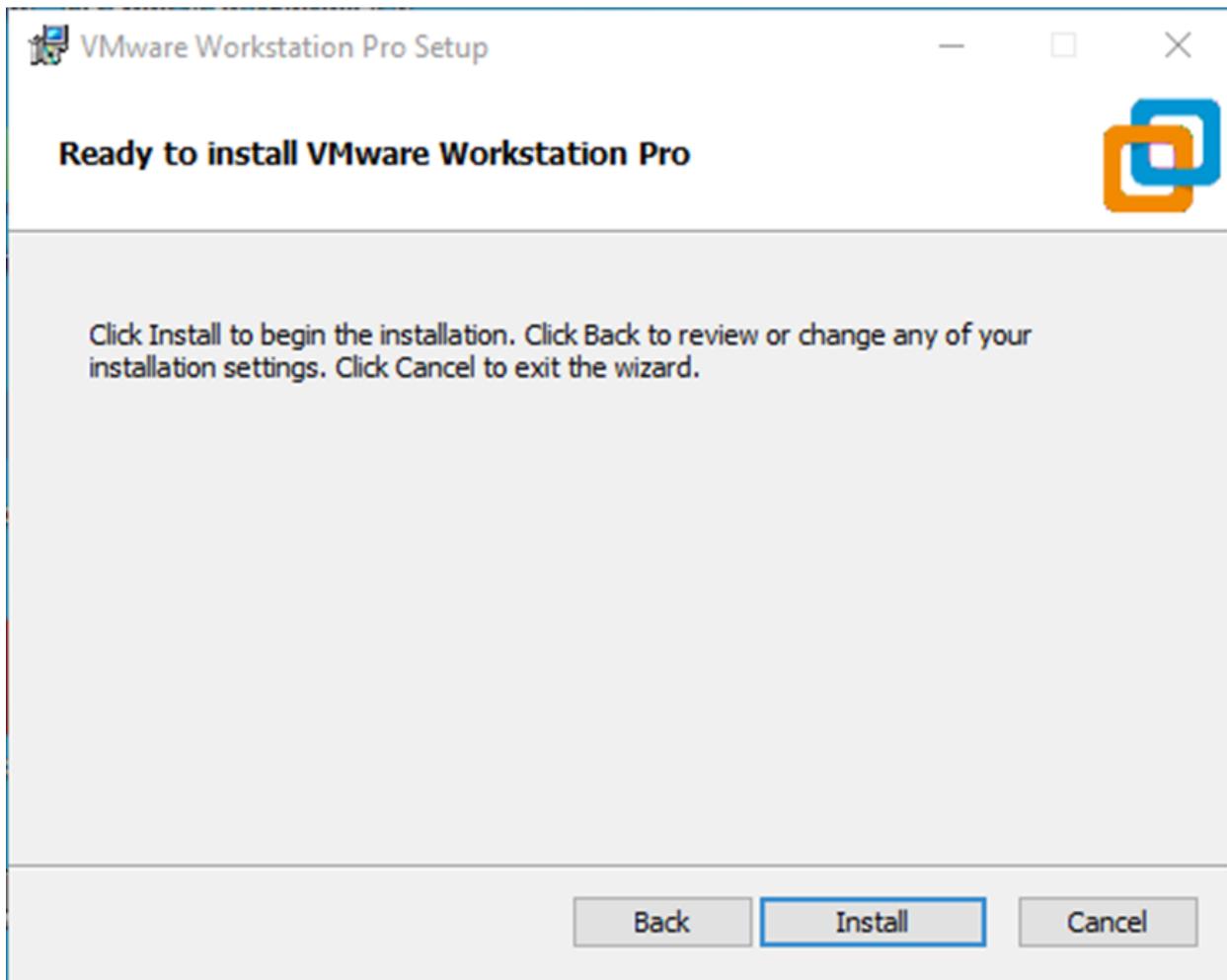
Modify the installation location to the partition where you want to install the software on your computer, then click “Next” .



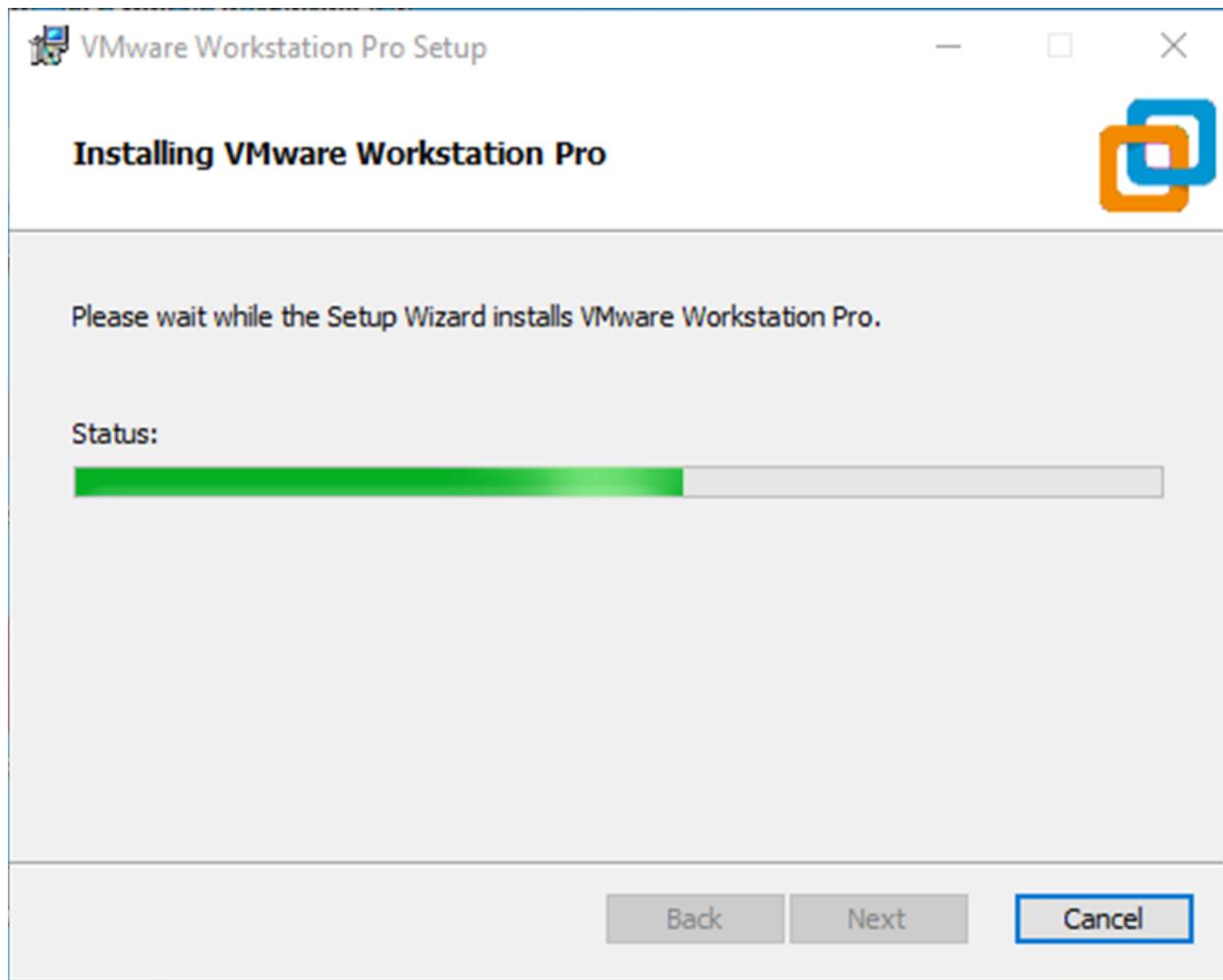
Check and click on “Next” .



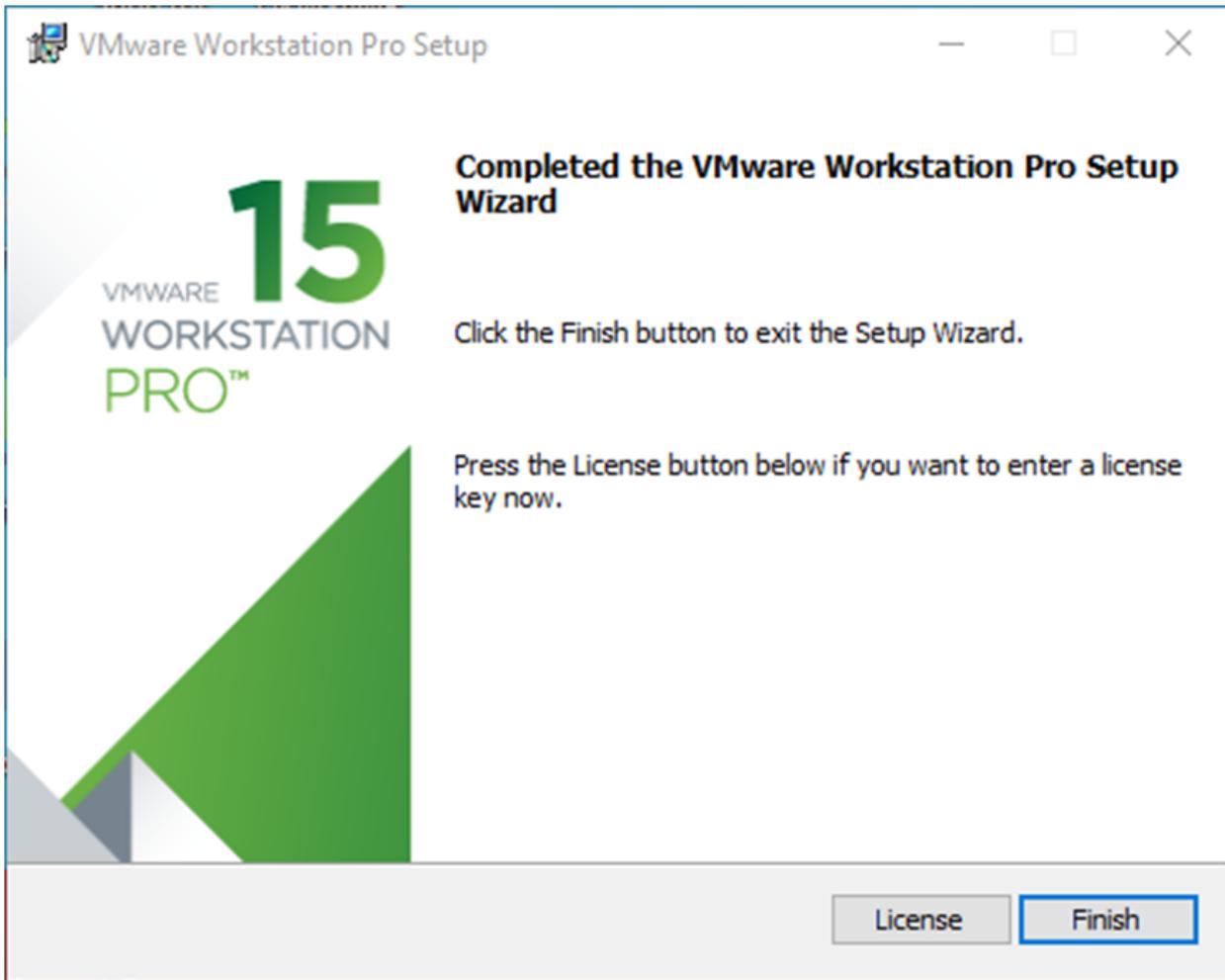
Check the box to add a shortcut, then click “Next” .



Click “Installation” .



Wait for the installation to complete.



Click “Finish” to try it out. If users need to use it for a long time, they need to buy it from the official and fill in the license.

2.2.6 2. Loading the Existing Ubuntu Development Environment

Note:

It is recommended for beginners to directly use the pre-built virtual machine environment provided by Forlinx, which already includes installed cross-compiler and Qt environment. After understanding this chapter, you can directly jump to the compilation chapter for further study.

The development environment provided for general users is: forlinx (username), forlinx (password). The superuser is: root (username), root (password).

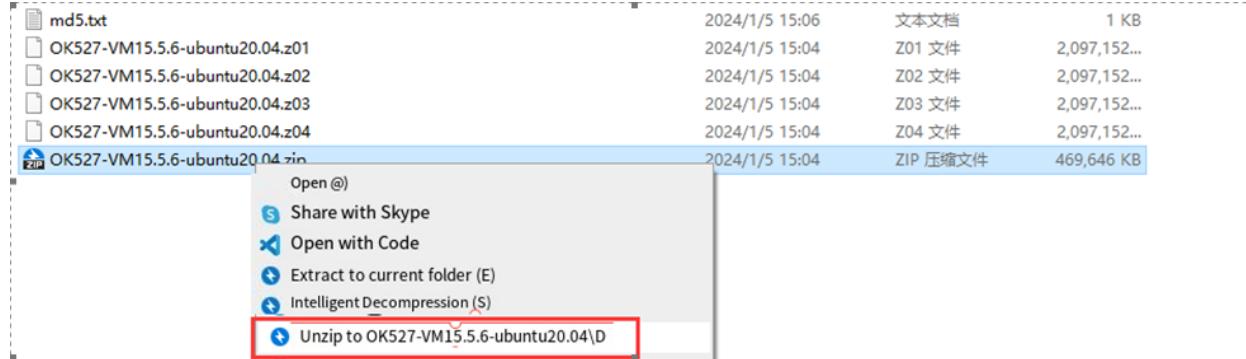
Please ask your sales representative for the download link.

There are two ways to use a virtual machine environment in VMware: one is to directly load an existing environment, and the other is to create a new environment. First talk about how to load an existing environment.

First, download the development environment provided by Forlinx. There is an MD5 verification file in the development environment data. After downloading the development environment data, first performs MD5 verification on the compressed package of the development environment (02-User Data \ 01-Software Data \ 04-Tools \ md5sums-1.2.zip) to check whether the verification code is consistent with the verification code in the verification file. If they are consistent, the downloaded file is normal; if not, the file may be damaged and needs to be downloaded again.

md5.txt	2024/1/5 15:06	文本文档	1 KB
OK527-VM15.5.6-ubuntu20.04.z01	2024/1/5 15:04	Z01 文件	2,097,152...
OK527-VM15.5.6-ubuntu20.04.z02	2024/1/5 15:04	Z02 文件	2,097,152...
OK527-VM15.5.6-ubuntu20.04.z03	2024/1/5 15:04	Z03 文件	2,097,152...
OK527-VM15.5.6-ubuntu20.04.z04	2024/1/5 15:04	Z04 文件	2,097,152...
OK527-VM15.5.6-ubuntu20.04.zip	2024/1/5 15:04	ZIP 压缩文件	469,646 KB

Select OK527-VM15.5.6-ubuntu20.04 and right click to extract to the current folder or your own directory:



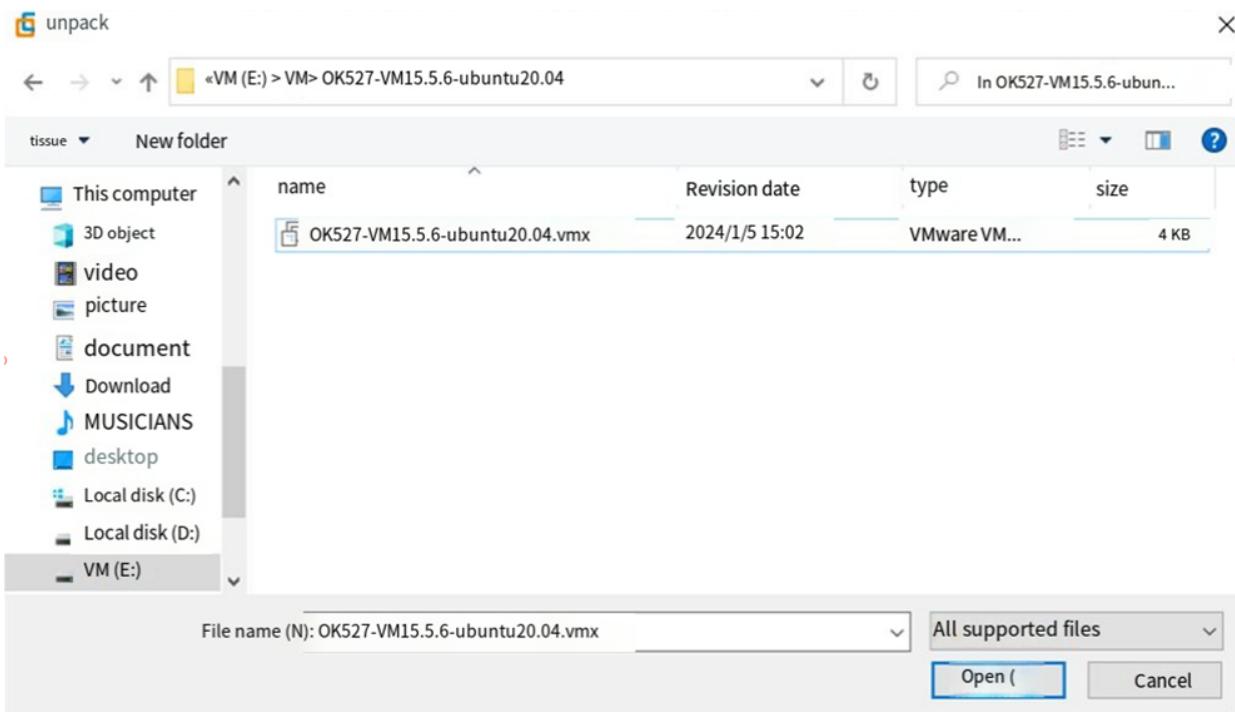
After the extraction is complete, you will obtain the development environment OK527-VM15.5.6-ubuntu20.04.

OK527-VM15.5.6-ubuntu20.04 folder in the OK527-VM15.5.6-ubuntu20.04.vmx is the file to be opened by the virtual machine.

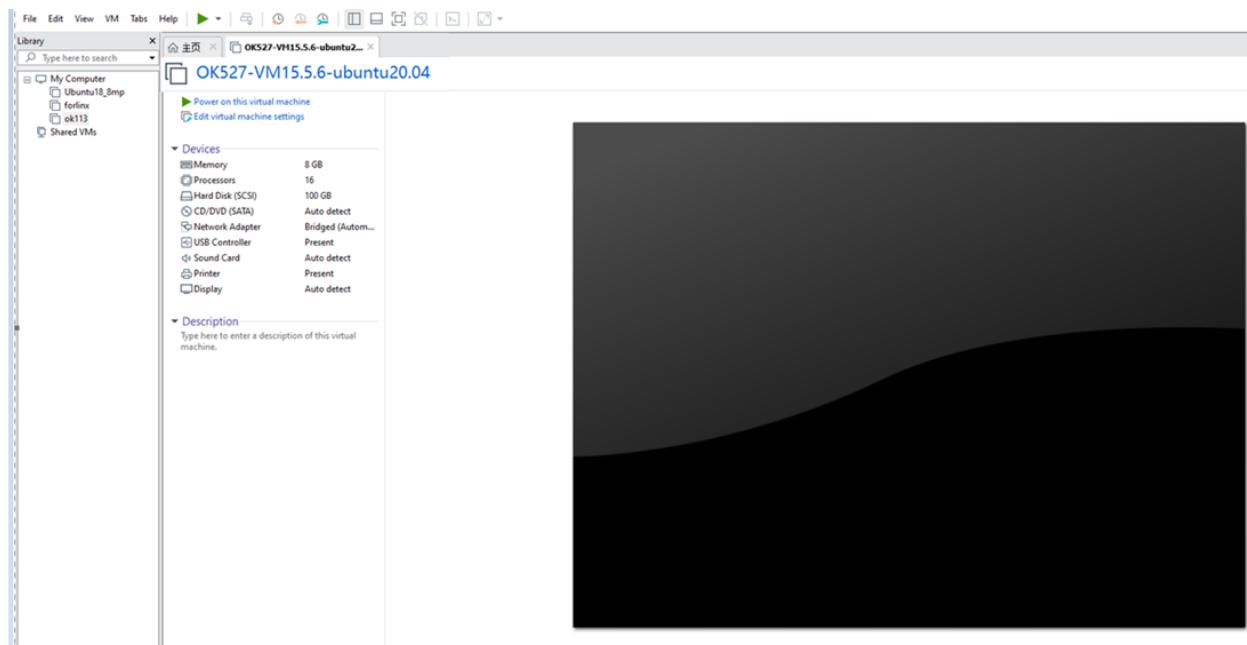
Open the installed virtual machine.



Navigate to the directory where the recently extracted OK527-VM15.5.6-ubuntu20.04 virtual machine file is located, and double-click on the startup file to open it.



Turn on this virtual machine after loading is complete to run it and enter the system's interface.



The default login account for automatic login in the development environment is “forlinx” .

2.2.7 3. New Ubuntu Development Environment Setup

Note: Beginners are not recommended to set up a system on their own. It is recommended to use an existing virtual machine environment. If you do not need to set up the environment, you can skip this section.

This chapter mainly explains the process of setting up the Ubuntu system and installing Qt Creator. If the user is not using Qt, the installation of Qt Creator can be ignored.

3.1 Ubuntu System Setup

The version of Ubuntu we chose to install is 20.04, and the introduction and development in this manual are all carried out on Ubuntu 20.04. First, go to the Ubuntu official website to get the Ubuntu 20.04 64-bit image. The download address is: [<http://releases.ubuntu.com/20.04/>](http://releases.ubuntu.com/20.04/)

Download “Ubuntu-20.04.6-desktop-amd64.iso” (you can download the version that you actually need; this is just an example with 20.04.6).

Select an image

Ubuntu is distributed on three types of images described below.

Desktop image

The desktop image allows you to try Ubuntu without changing your computer at all, and at your option to install it permanently later. This type of image is what most people will want to use. You will need at least 1024MiB of RAM to install from this image.

64-bit PC (AMD64) desktop image

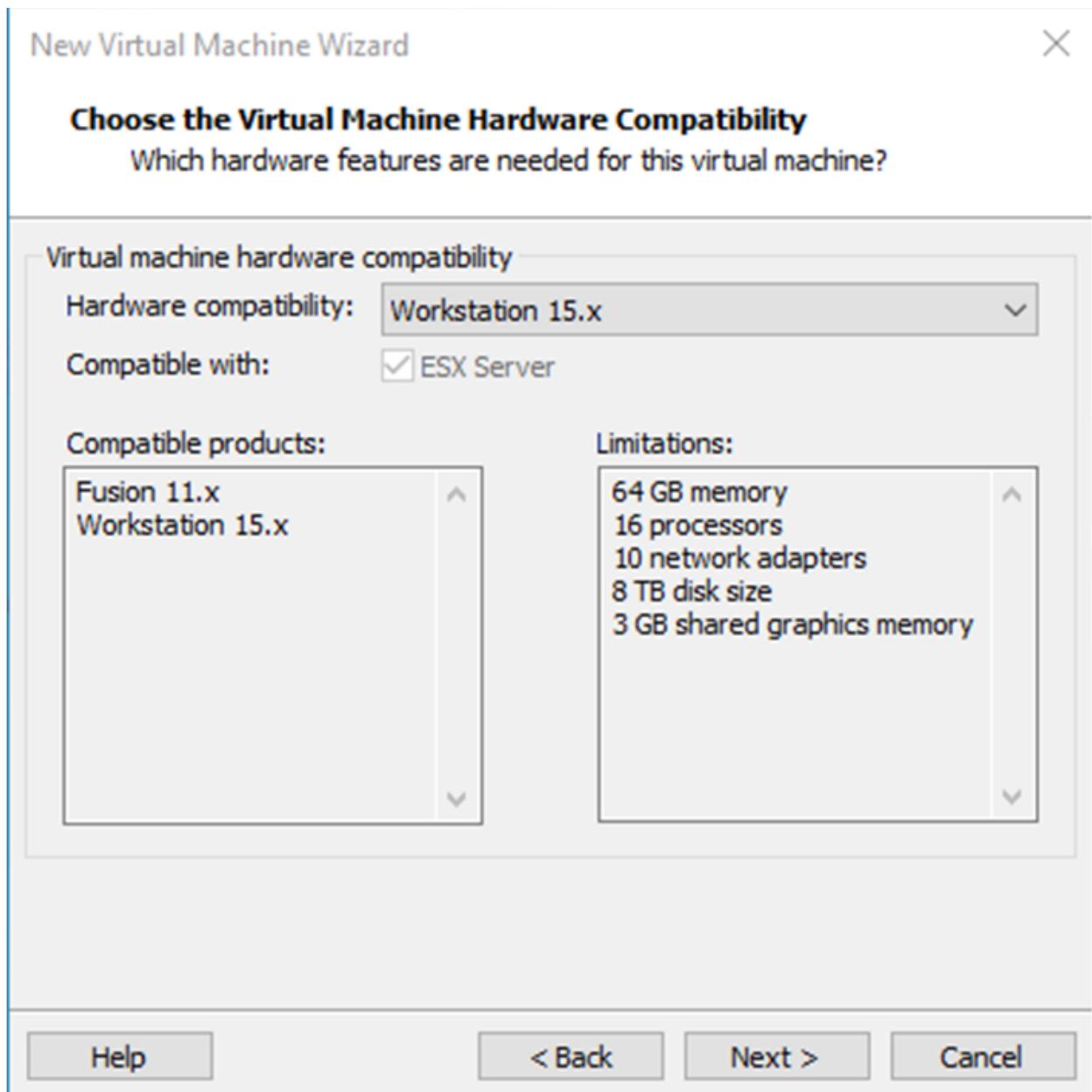
Choose this if you have a computer based on the AMD64 or EM64T architecture (e.g., Athlon64, Opteron, EM64T Xeon, Core 2). Choose this if you are at all unsure.

3.1.1 Ubuntu Virtual Machine Setup

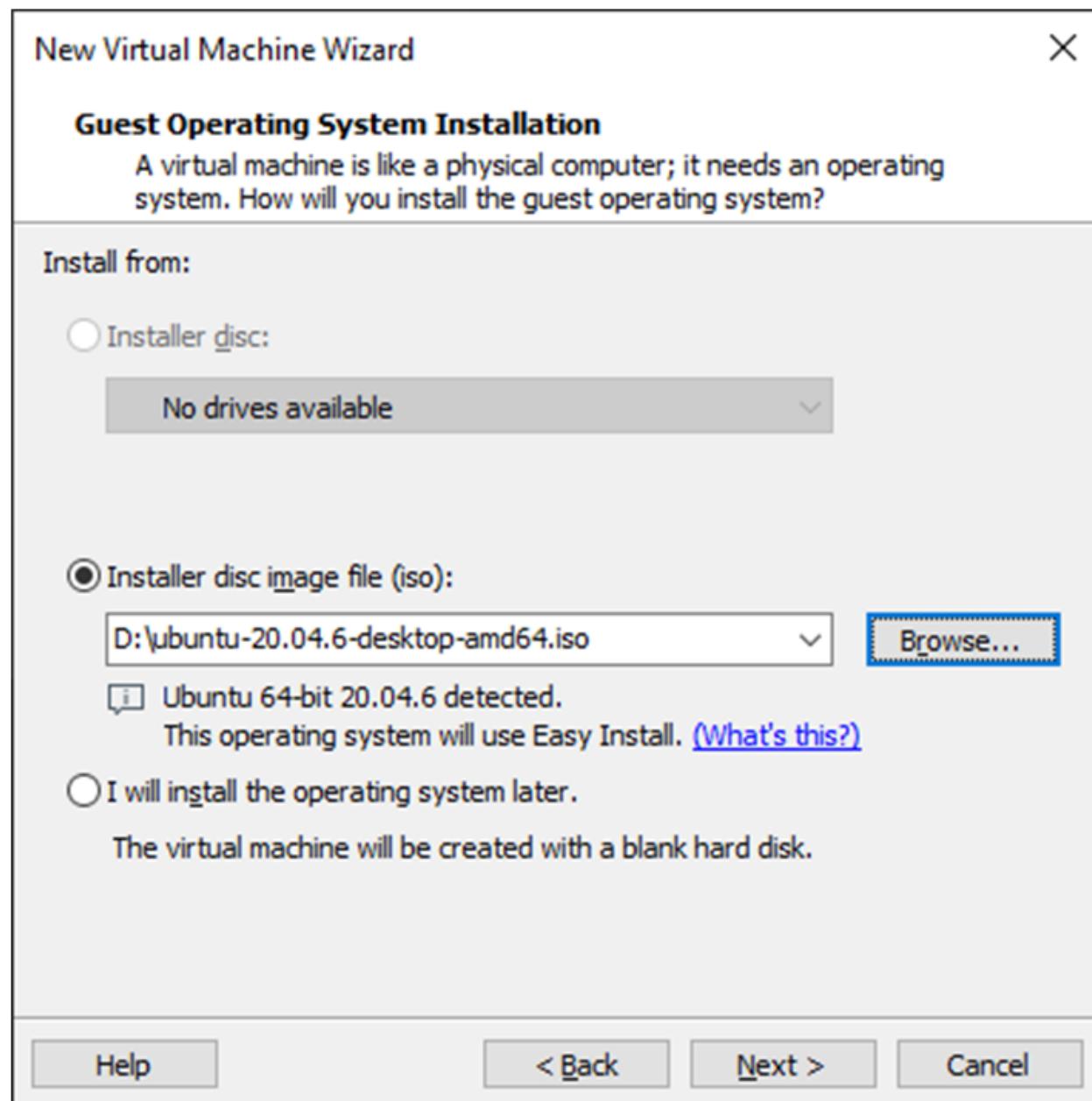
Step 1: Open the VMware software and click on “Create New Virtual Machine”. Enter the following interface, check “Customize (Advanced)” and click “Next” :



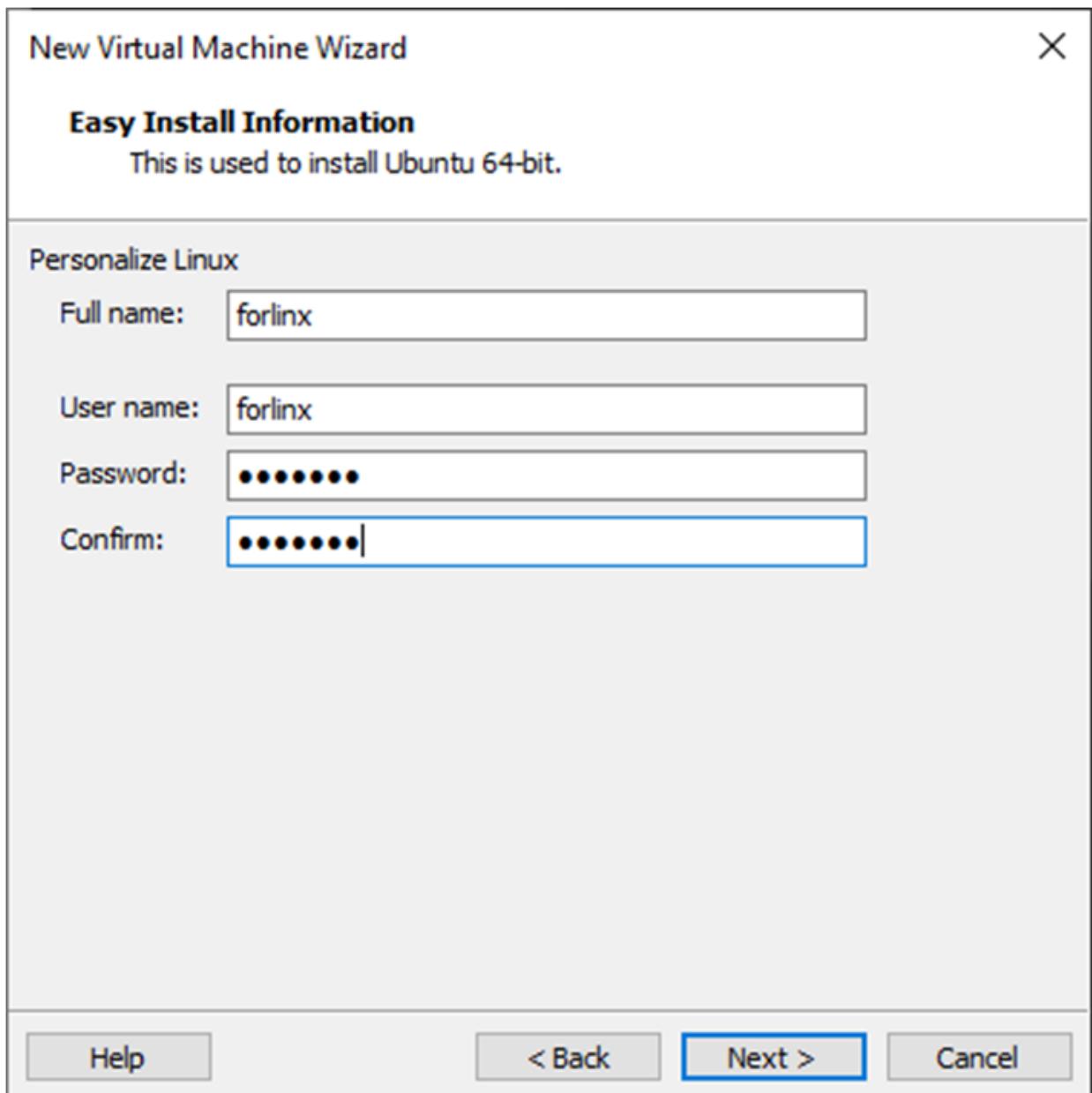
Step 2: Select the compatibility of the corresponding VMware version. The version can be viewed in Help-> About VMware Workstation. Click “Next” after confirmation:



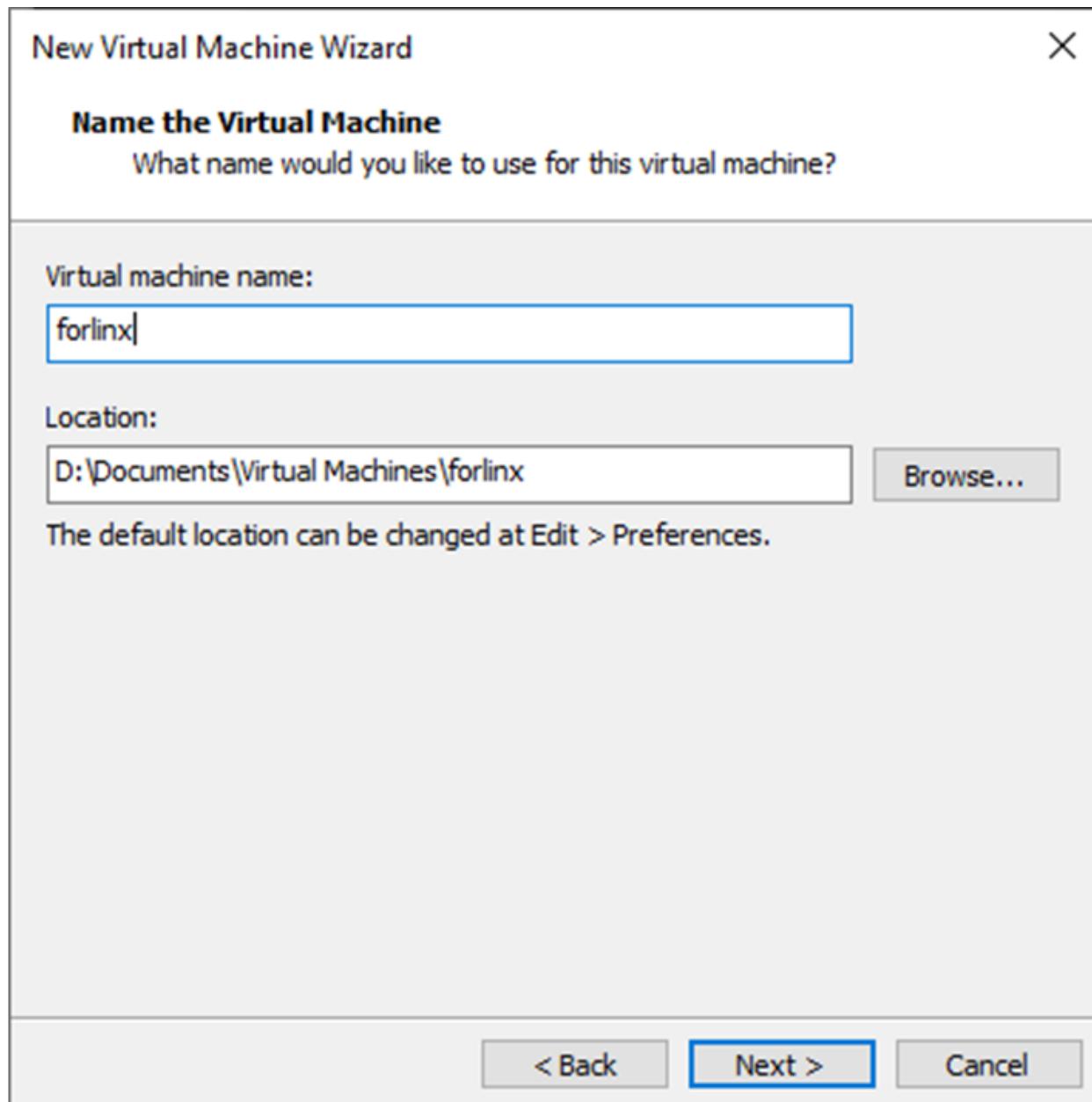
Select “Install program from disc image file” , then click “Next”;



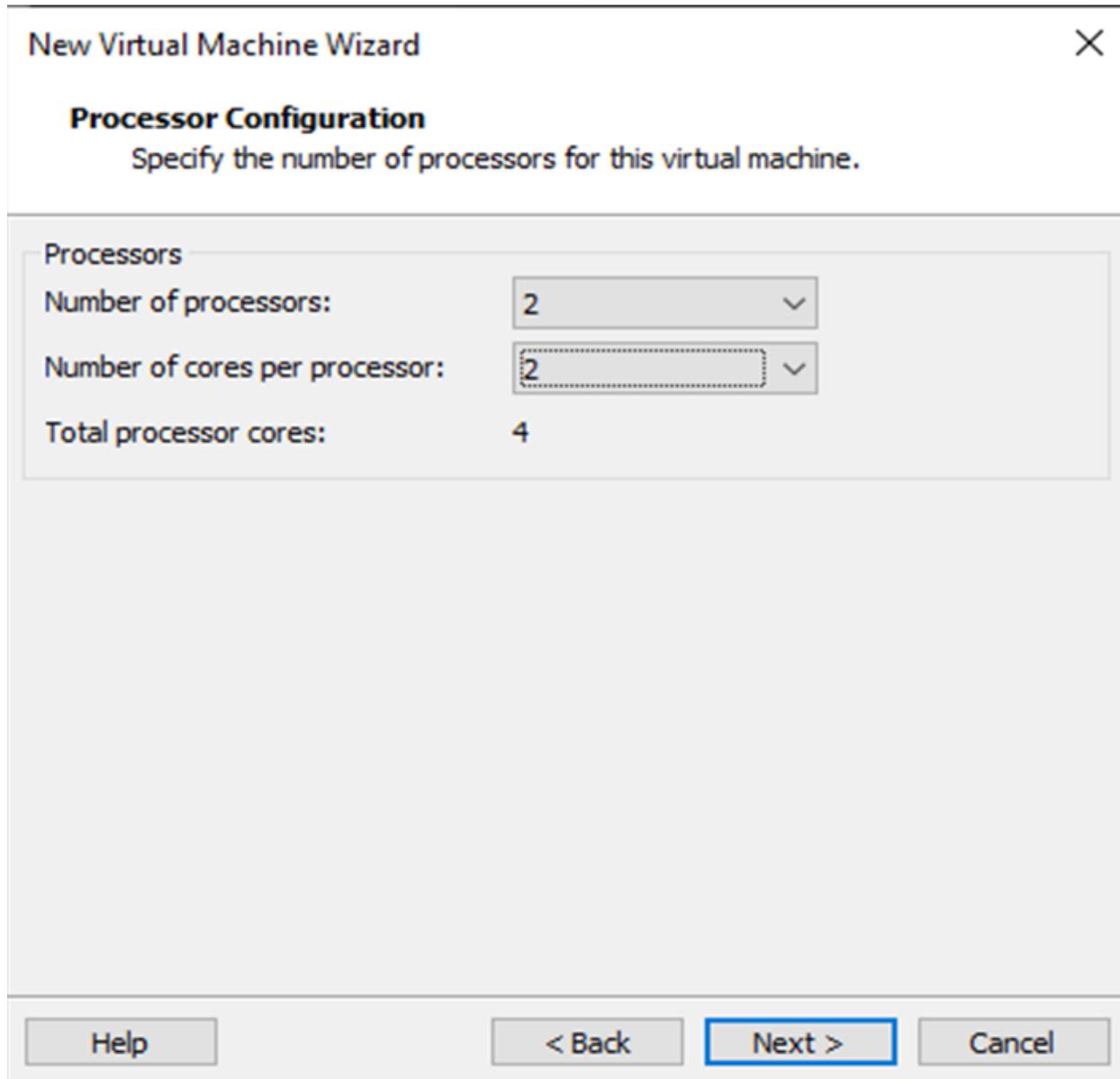
Enter full name, user name and password and click “Next” :



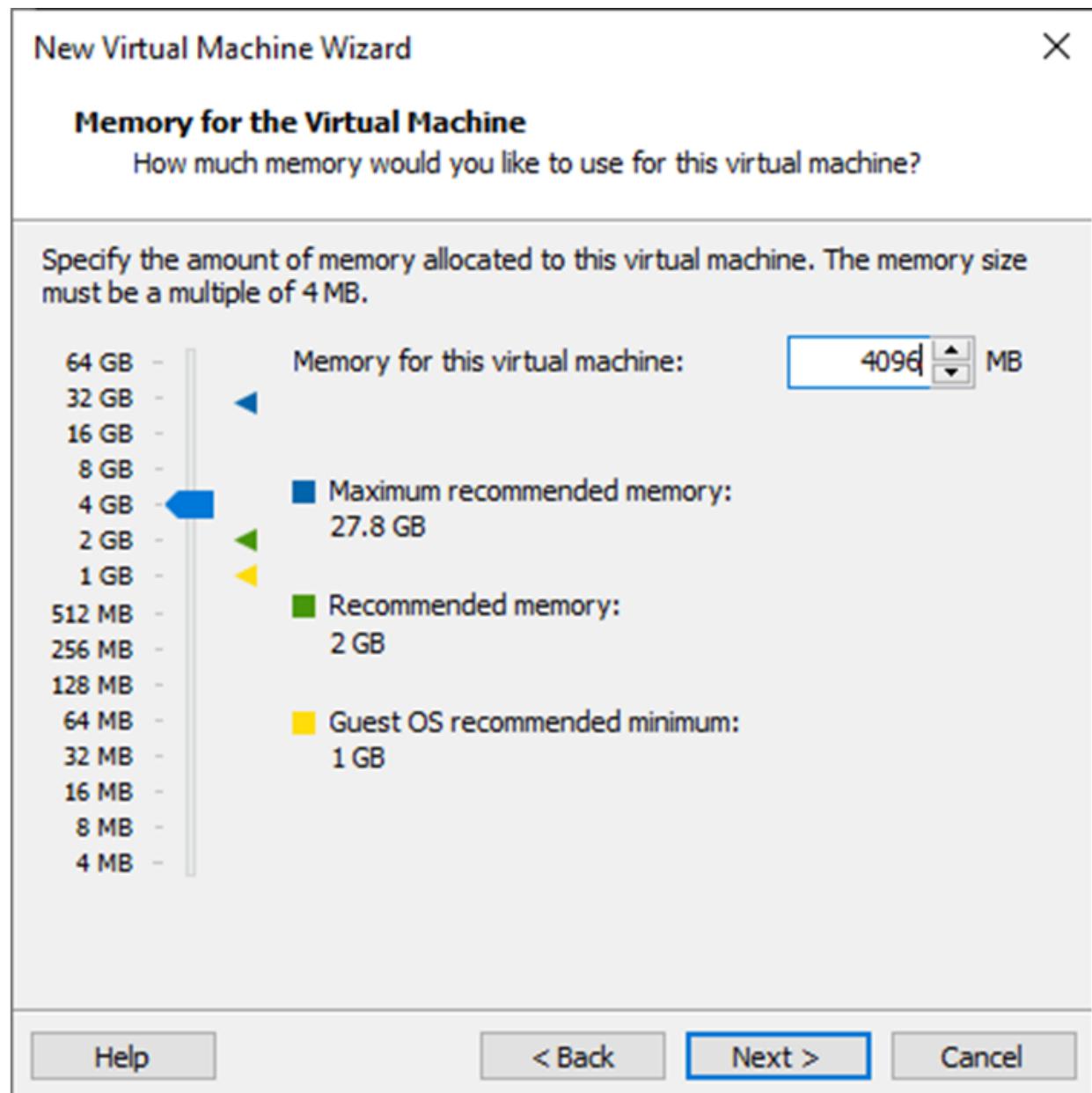
Enter the virtual machine name and configuration installation location, and click “Next” :



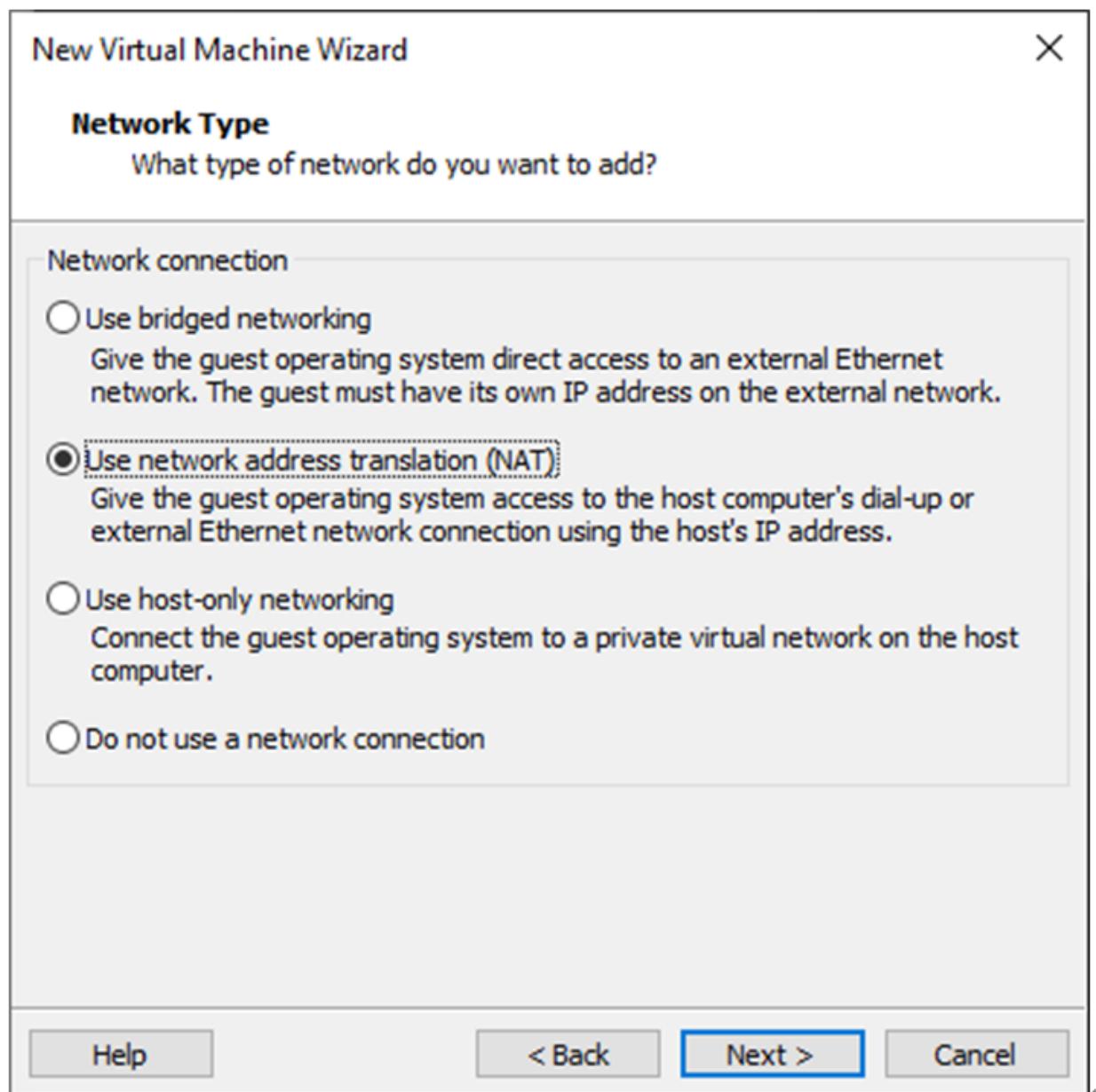
To configure the number of cores, click “Next” :



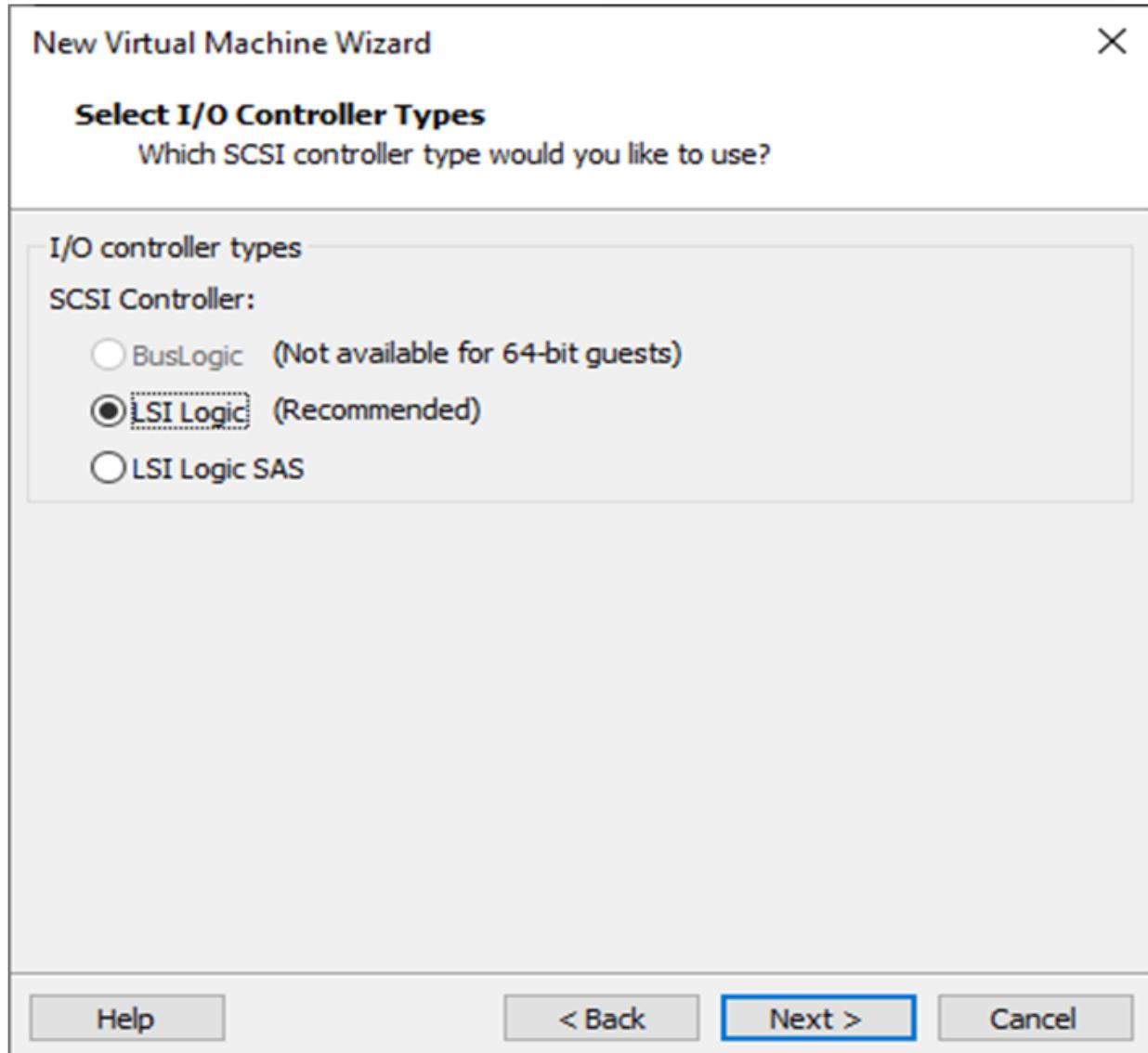
To configure at least 8GB of memory, select Next:



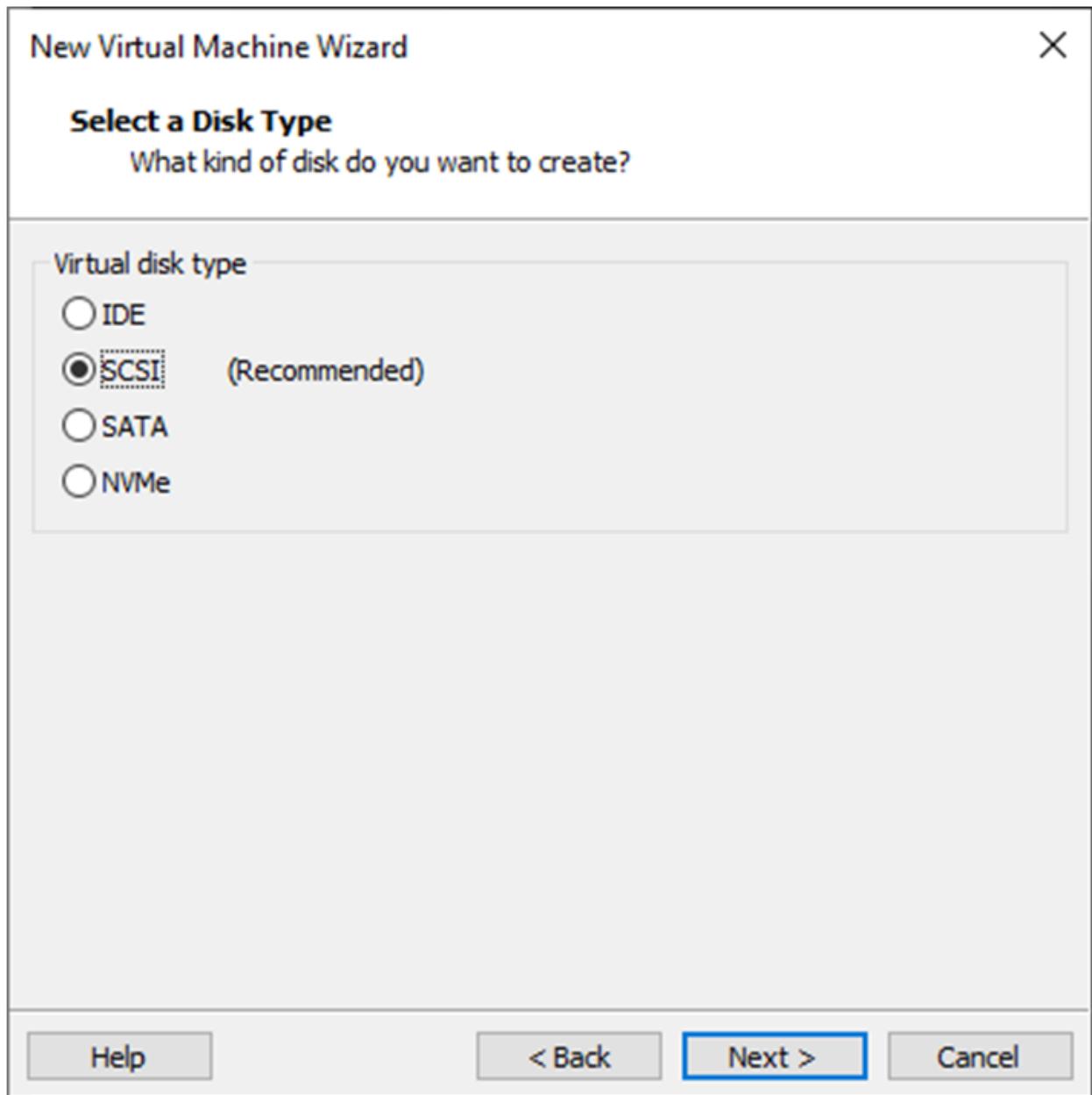
Set the network type, use the default NAT form for networking, and click “Next” . Keep the default values for the remaining steps until you reach the step to specify the disk capacity.



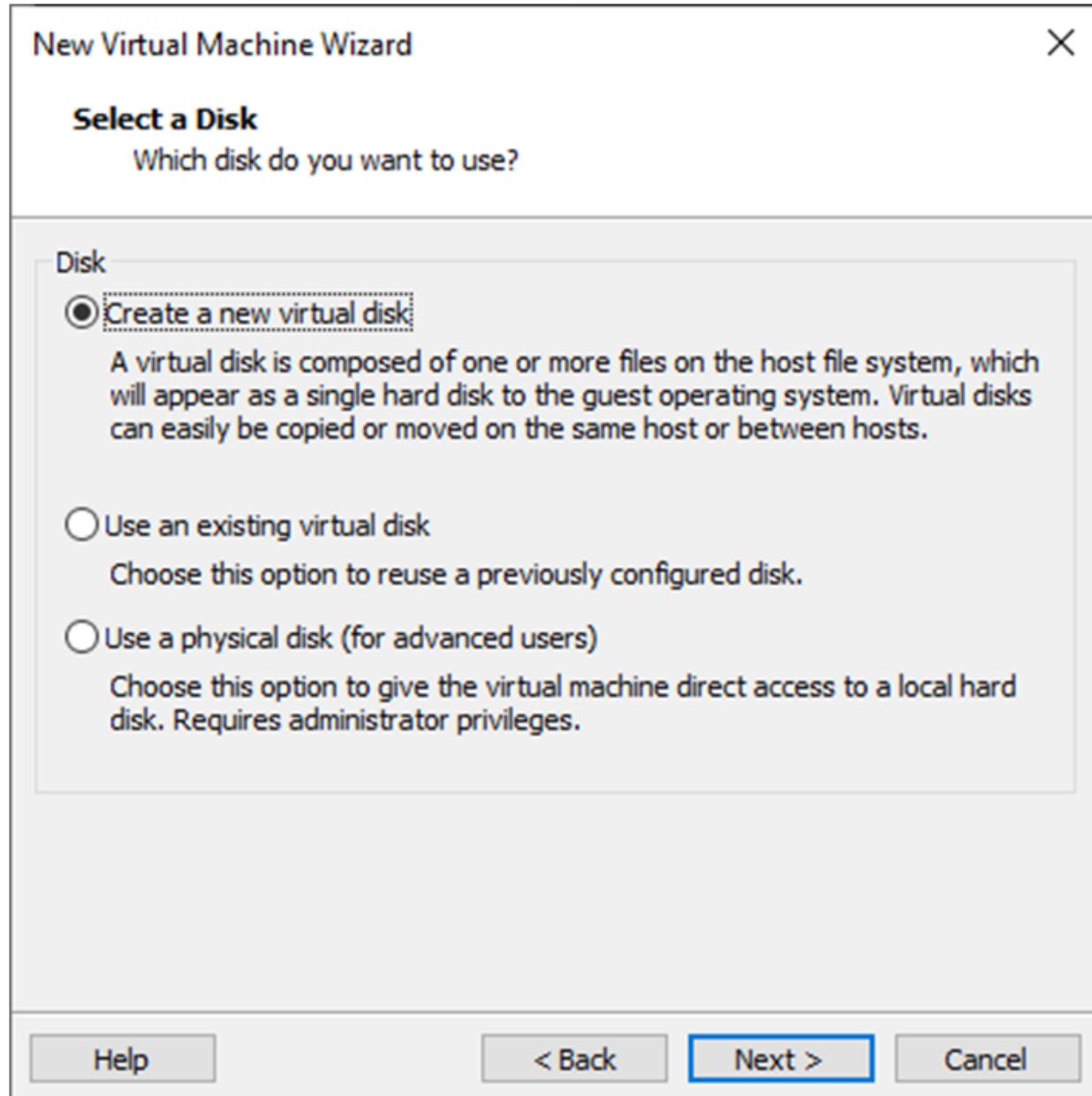
Use the recommended I/O controller; click “Next” :



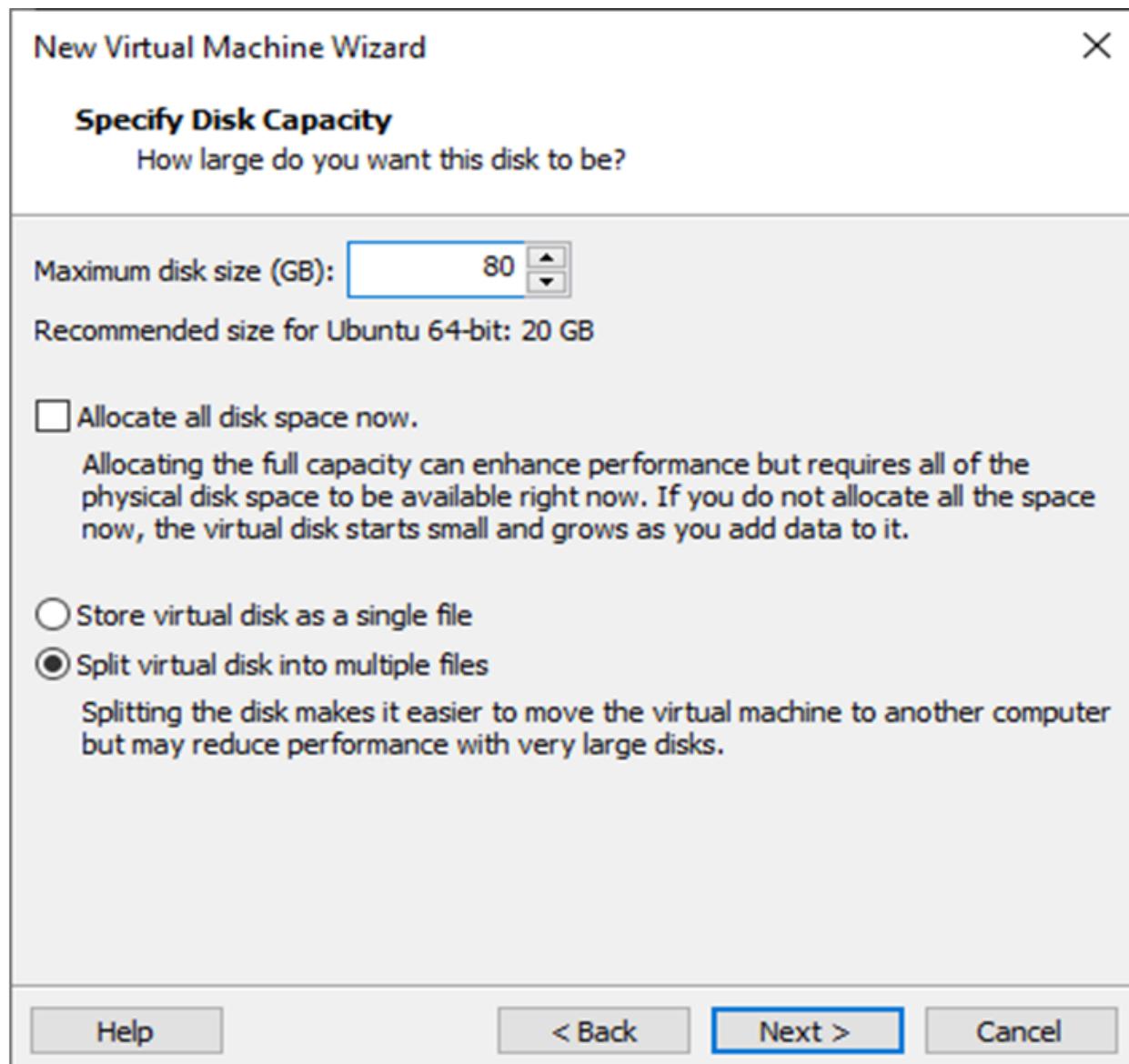
Use the recommended disk type; click “Next” :



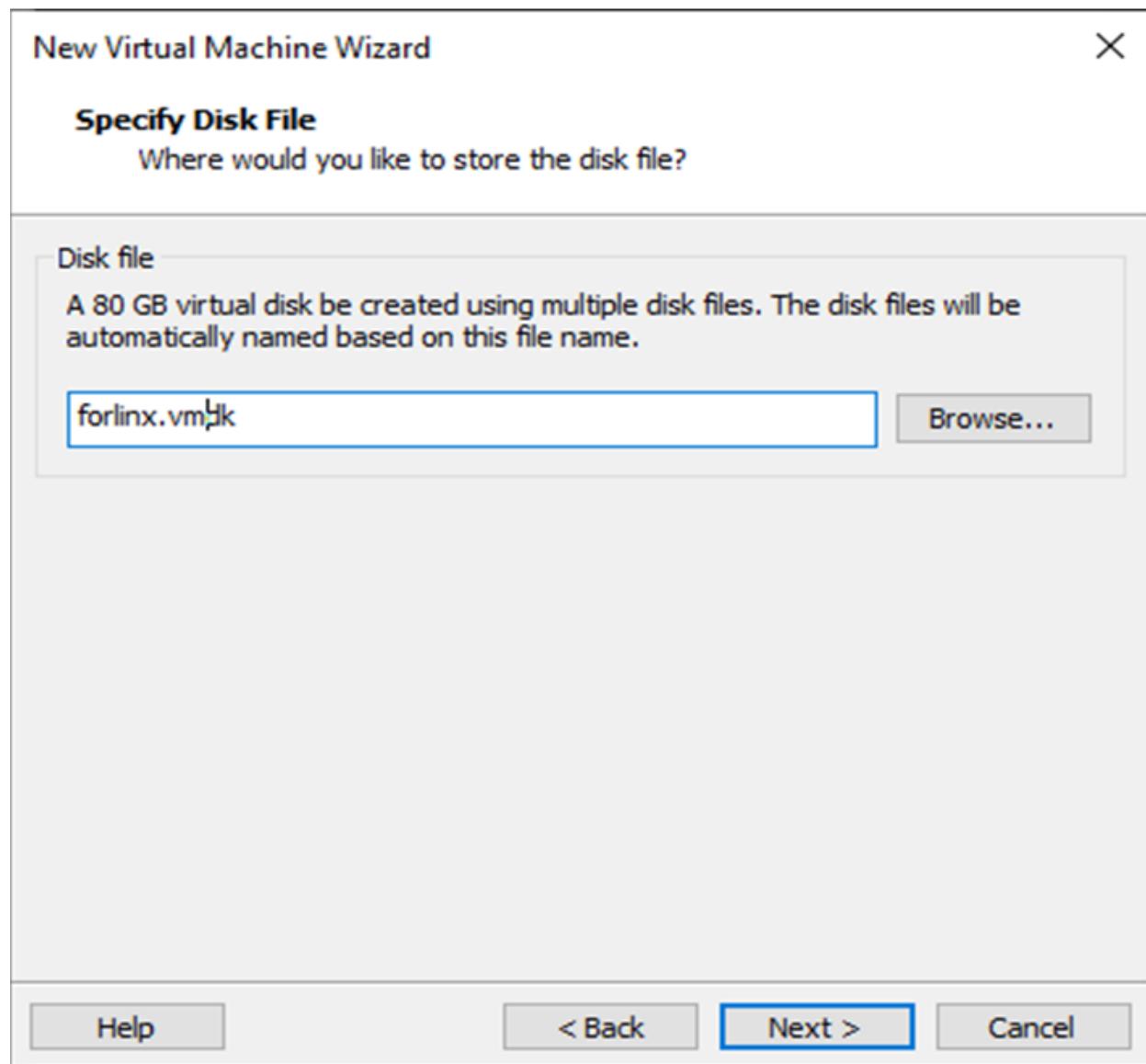
Use the default options; create a new virtual disk and click “Next” :



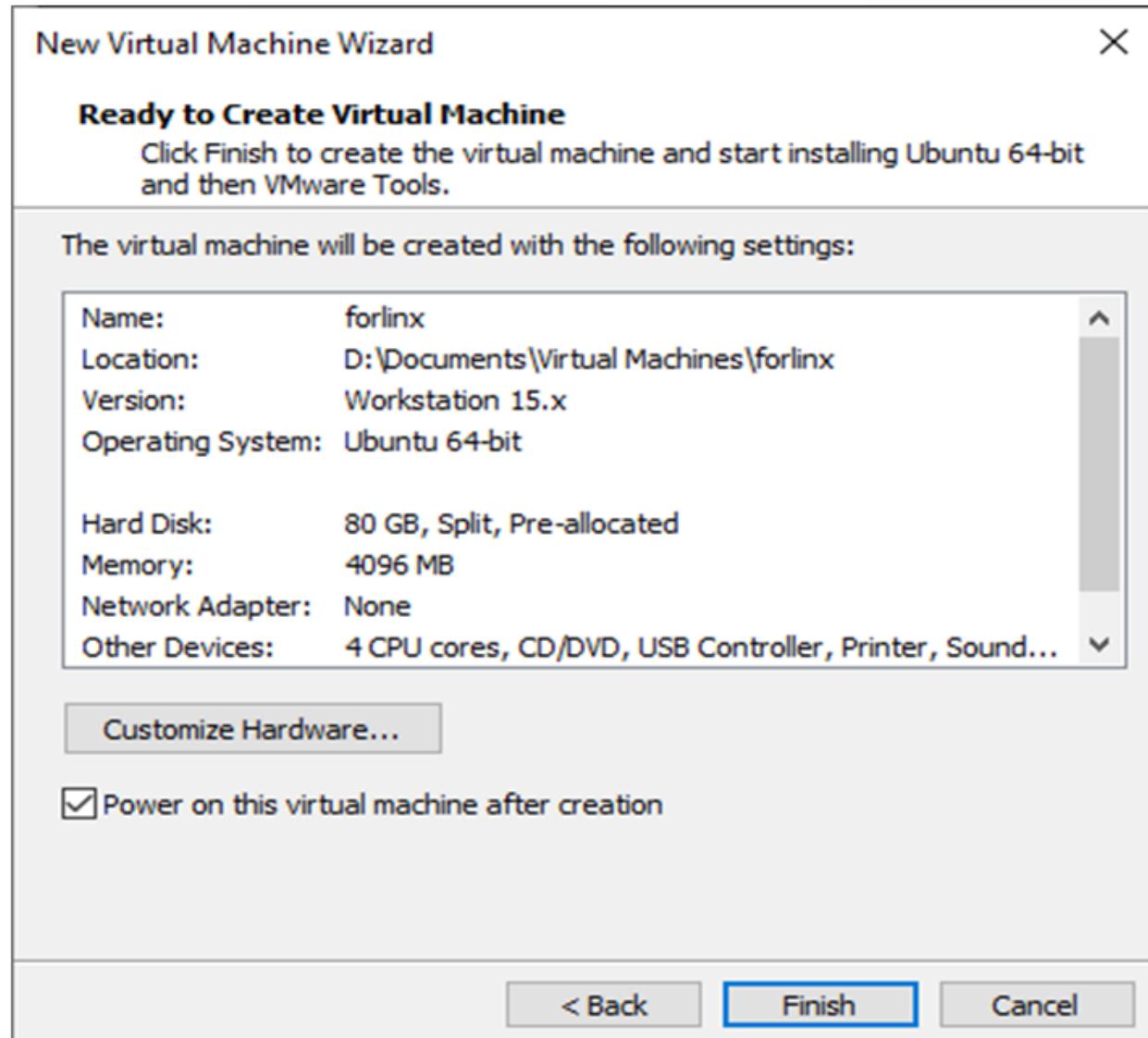
Allocate a disk size of 80G and divide the virtual disk into multiple files, and click “Next” :

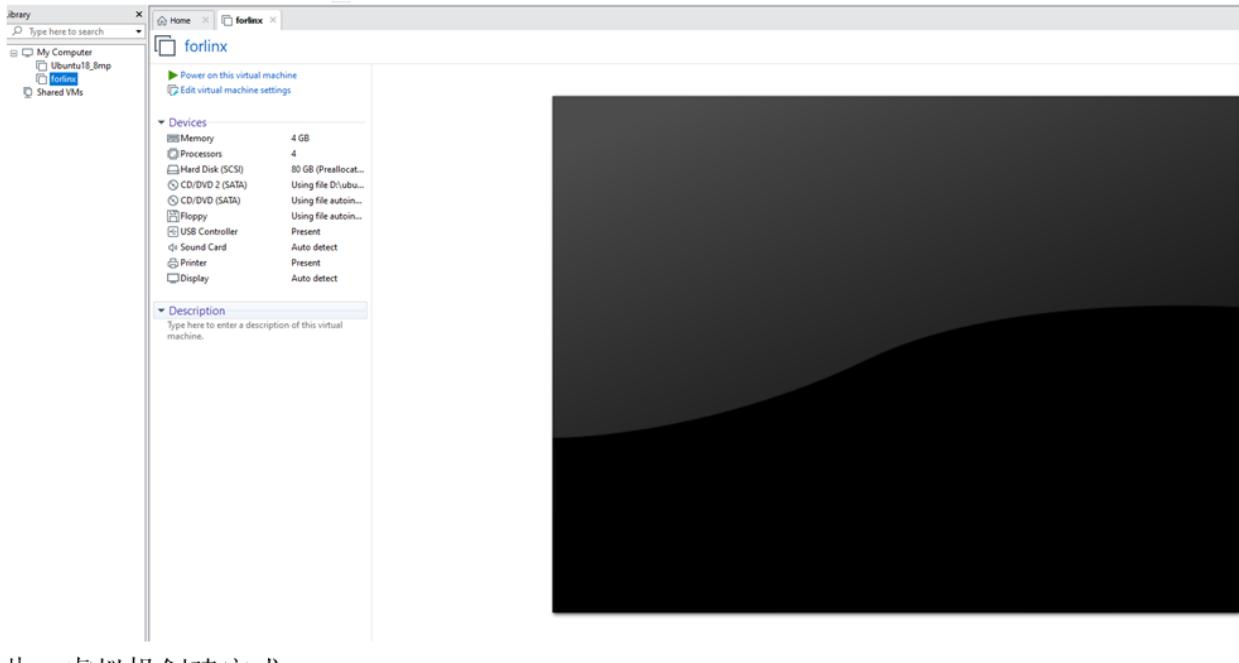


Click “Next” by default:



Click “Finish” :





The virtual machine creation is now complete.

Then click “Open this virtual machine” to start installing the image and wait patiently.

The ubuntu system installation is complete.

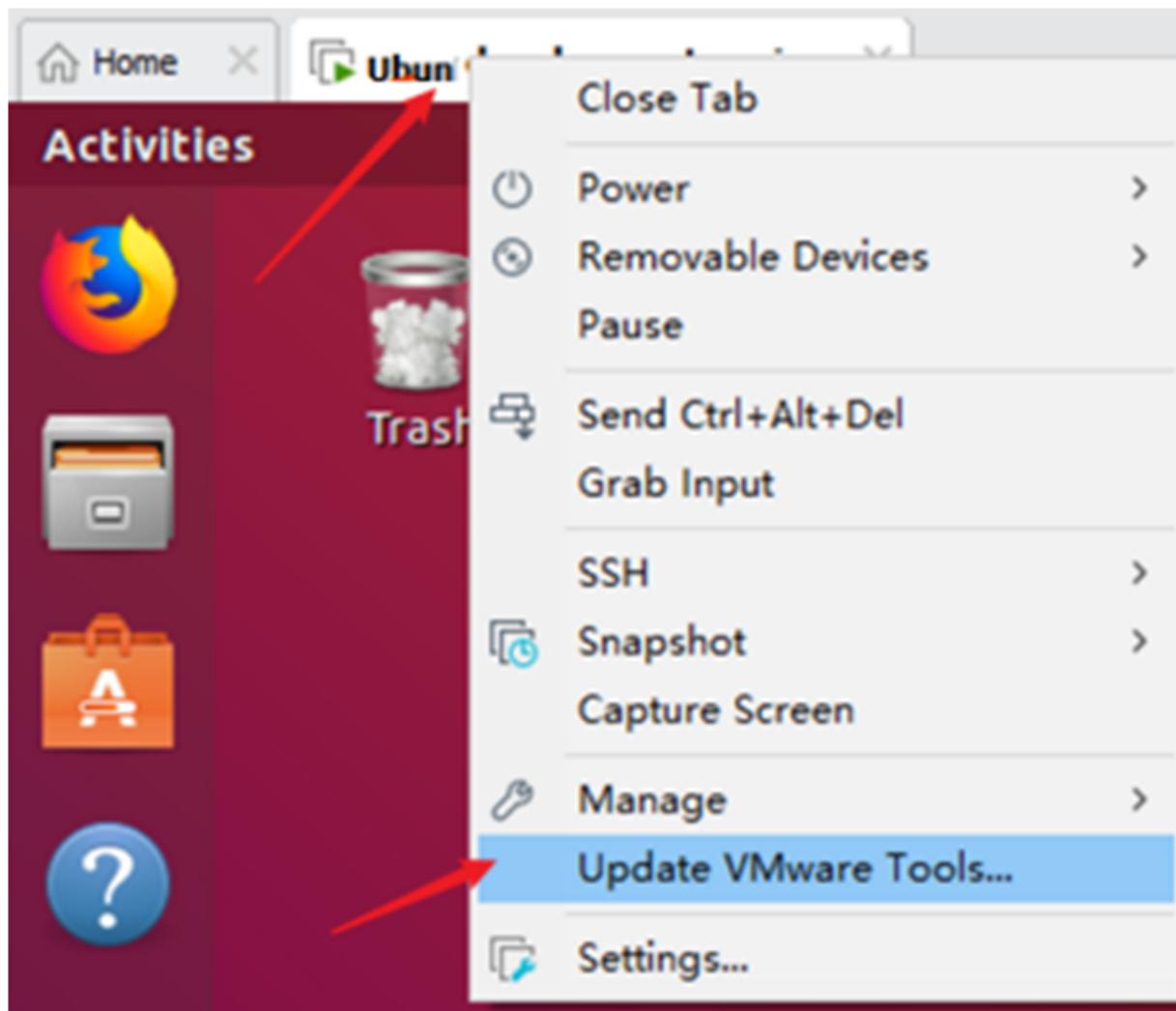
3.1.2 UbuntuBasic Configuration

3.1.2.1 VMware ToolsInstallation

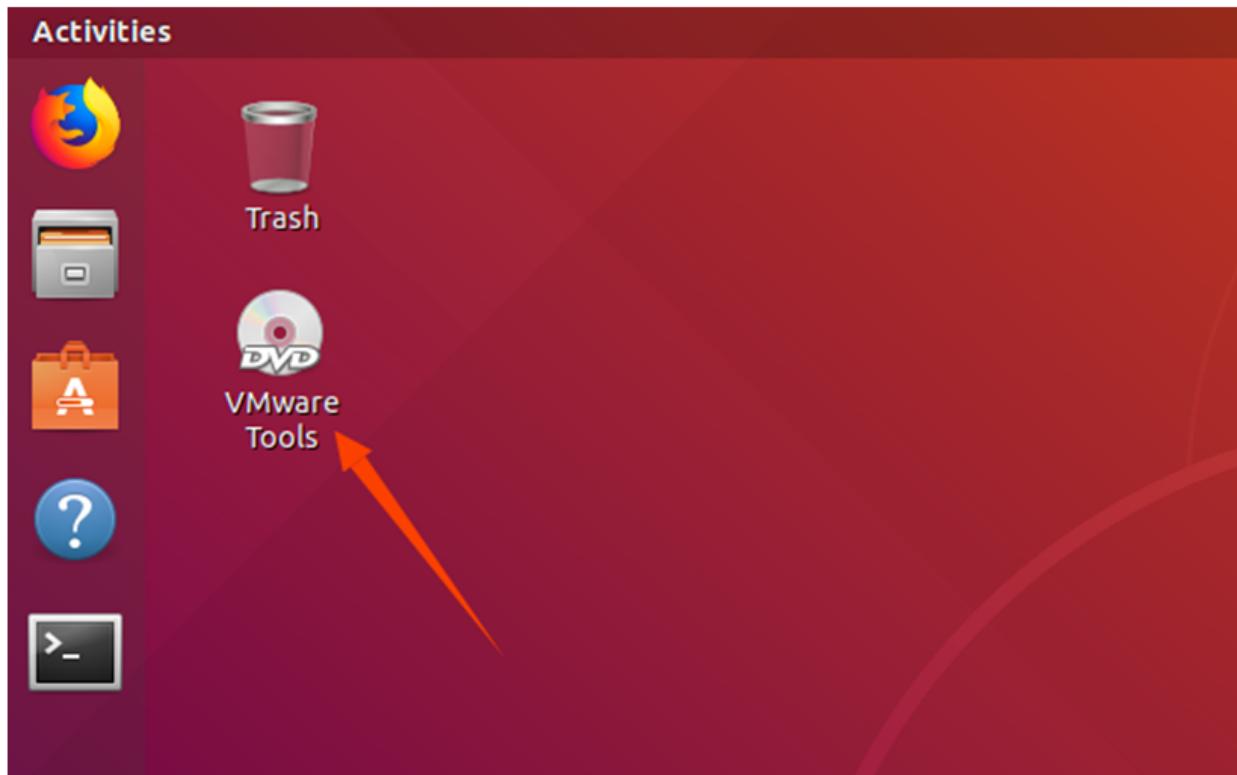
VMware Tools will be installed automatically after the virtual machine is created. If it is not successful, follow the steps below.

If you do not install the tool, you cannot use copy-paste file drag and drop between the Windows host and the virtual machine.

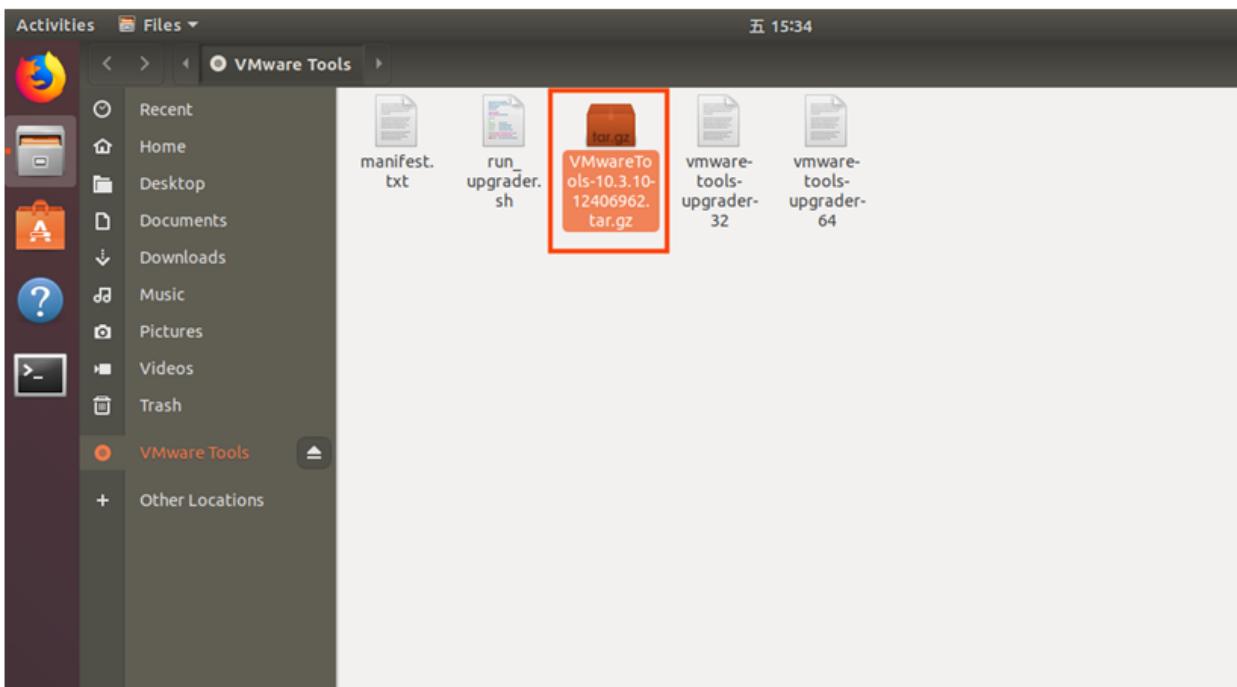
First click on “Virtual Machine” on the VMware navigation bar, then click “Install VMware Tools” in the drop-down box.



Once done, enter Ubuntu and the VMware Tools CD will appear on your desktop and click into it.



Enter and see a compressed file `VMwareTools-10.3.10-12406962.tar.gz` (it may be different for different VM versions); copy the file under the home directory (i.e. the directory with the home personal username)



Press [Ctrl+Alt+T] to bring up the Terminal Command Interface and enter the command:

```
forlinx@ubuntu:~$ sudo tar xvf VMwareTools-10.3.10-12406962.tar.gz
```

```
forlinx@ubuntu:~$ sudo tar xvf VMwareTools-10.3.10-12406962.tar.gz
[sudo] password for forlinx: [REDACTED]
```

After the extraction is complete, a file named “vmware-tools-distrib” will appear.

```
forlinx@linux:~/VMwareTools-10.3.10-12406962$ ls
Desktop examples.desktop Public VMwareTools-10.3.10-12406962.tar.gz
Documents Music Templates vmware-tools-distrib
Downloads Pictures Videos
forlinx@linux:~$ [REDACTED]
```

Go back to the terminal and enter:

```
cd vmware-tools-distrib
```

Enter the directory:

Input again:

```
sudo ./vmware-install.pl
```

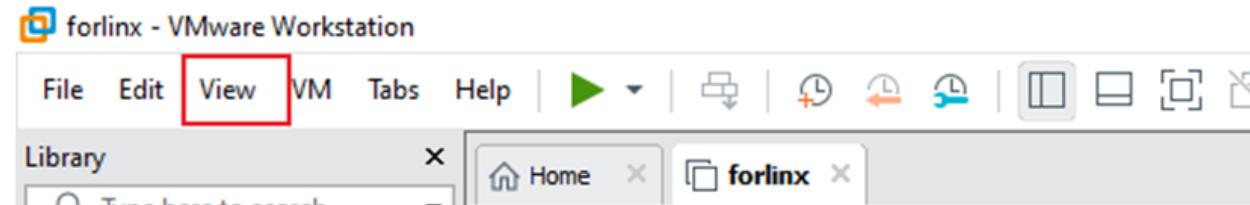
Enter the password, and then start the installation. Enter yes when asked, and enter the default installation.

```
forlinx@linux:~/vmware-tools-distrib$ sudo ./vmware-install.pl
open-vm-tools packages are available from the OS vendor and VMware recommends
using open-vm-tools packages. See http://kb.vmware.com/kb/2073803 for more
information.
Do you still want to proceed with this installation? [no] yes [REDACTED]
```

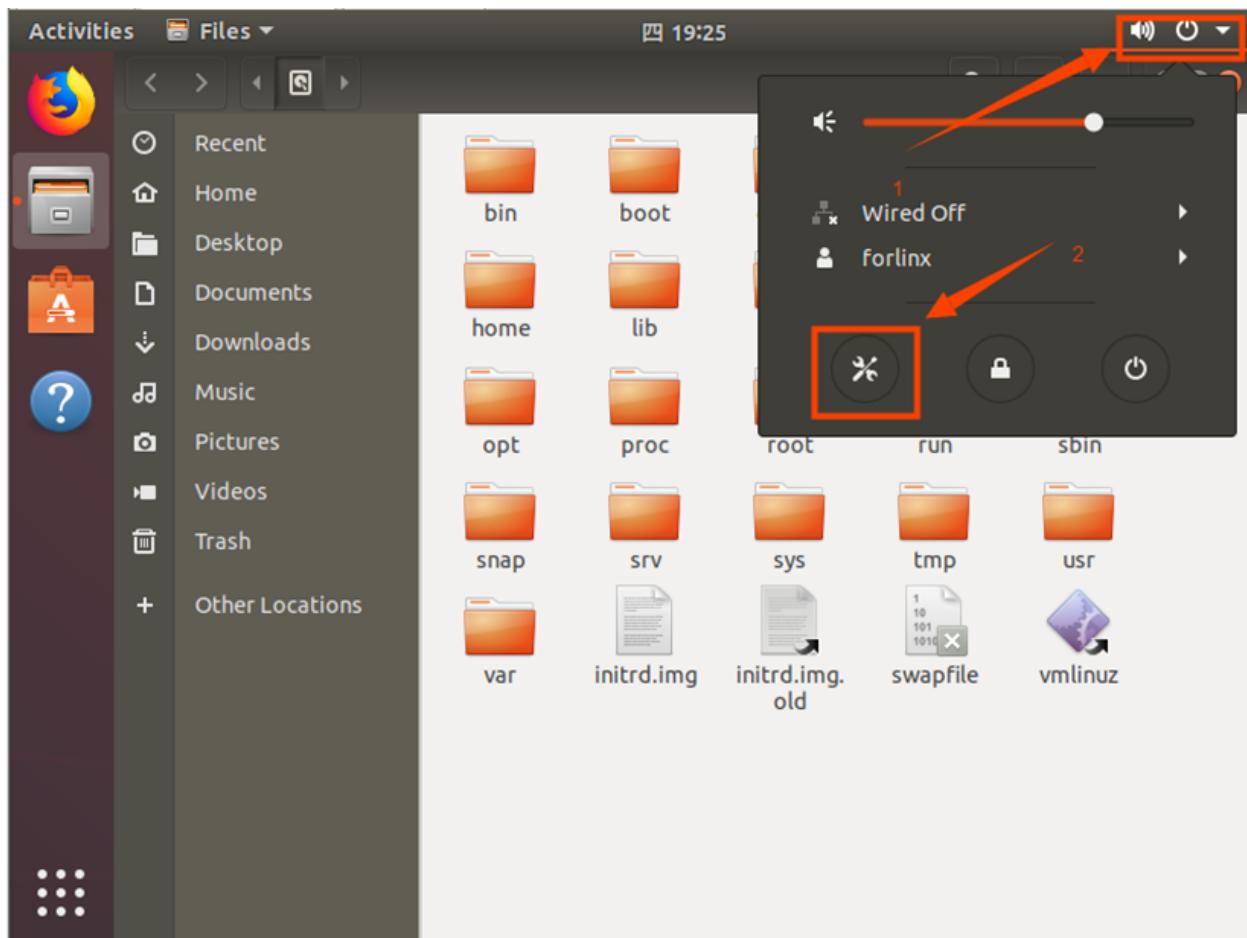
Once the VMware tools is complete, we can implement file copy and paste between Windows and Ubuntu.

3.1.2.2 Virtual Machine Full Screen Display

If the virtual machine is not able to be displayed in full screen, you can resolve this issue by clicking on “View” and selecting “Autofit Guest.” This will adjust the display to fit the screen automatically, enabling you to have a full-screen experience in the virtual machine.

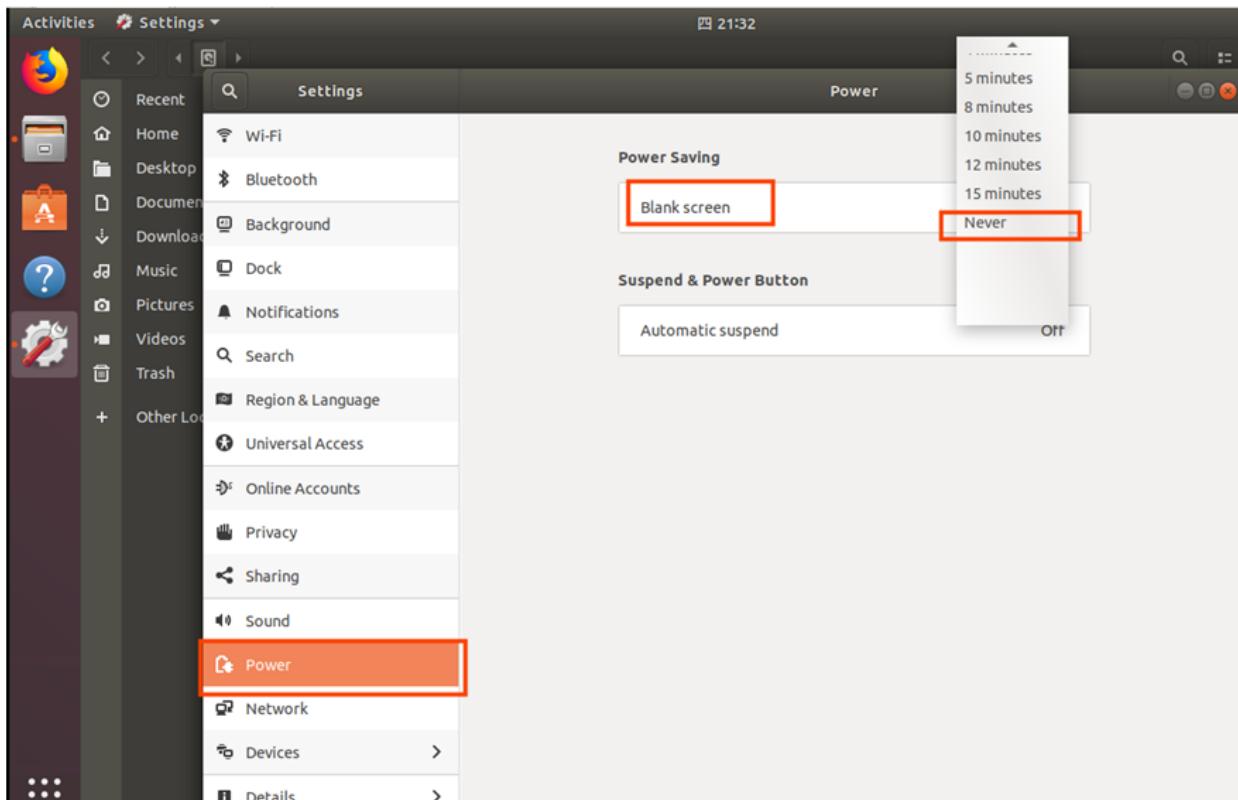


Make most of the system settings in the location shown. A lot of the setup requirements on Ubuntu can be done here.



3.1.2.3 Virtual Machine Hibernation Settings

Also, the default hibernation is 5min, if you don't want to set hibernation, just set it to Never by setting Power->Blank screen.



3.1.3 VMSwapfileSettings

The memory allocated when creating the virtual machine is 8GB. If the 8GB memory is not enough during compilation, the size of the swapfile needs to be modified.

```
forlinx@ubuntu:~$ sudo swapoff /swapfile
forlinx@ubuntu:~$ sudo dd if=/dev/zero of=/swapfile bs=1M count=16384
forlinx@ubuntu:~$ sudo mkswap /swapfile
forlinx@ubuntu:~$ sudo swapon /swapfile
```

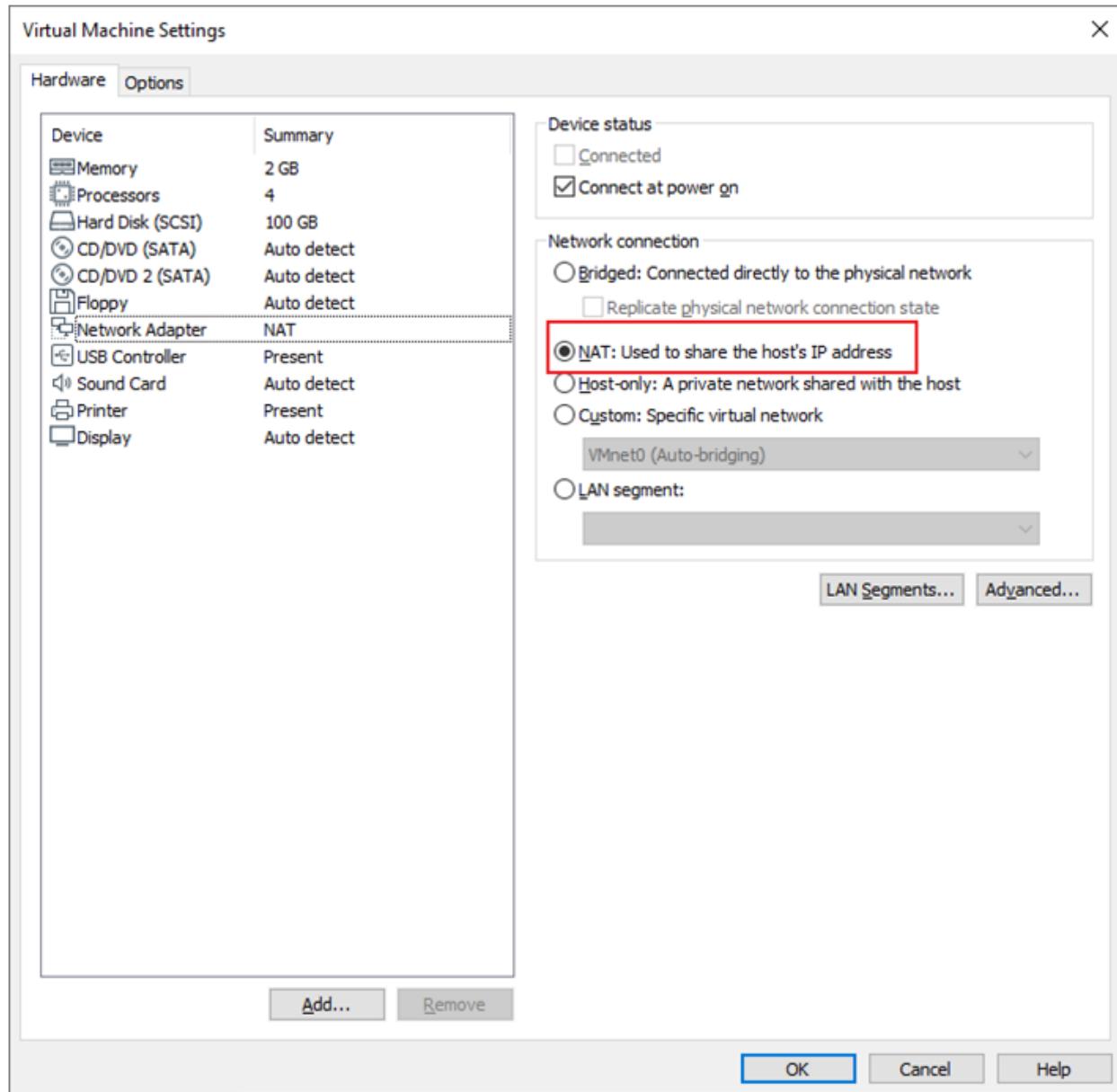
3.1.4 Virtual Machines Network Settings

3.1.4.1 NATConnection Method

By default, after the virtual machine is installed, the network connection method is set to NAT, which shares the host machine's IP address.

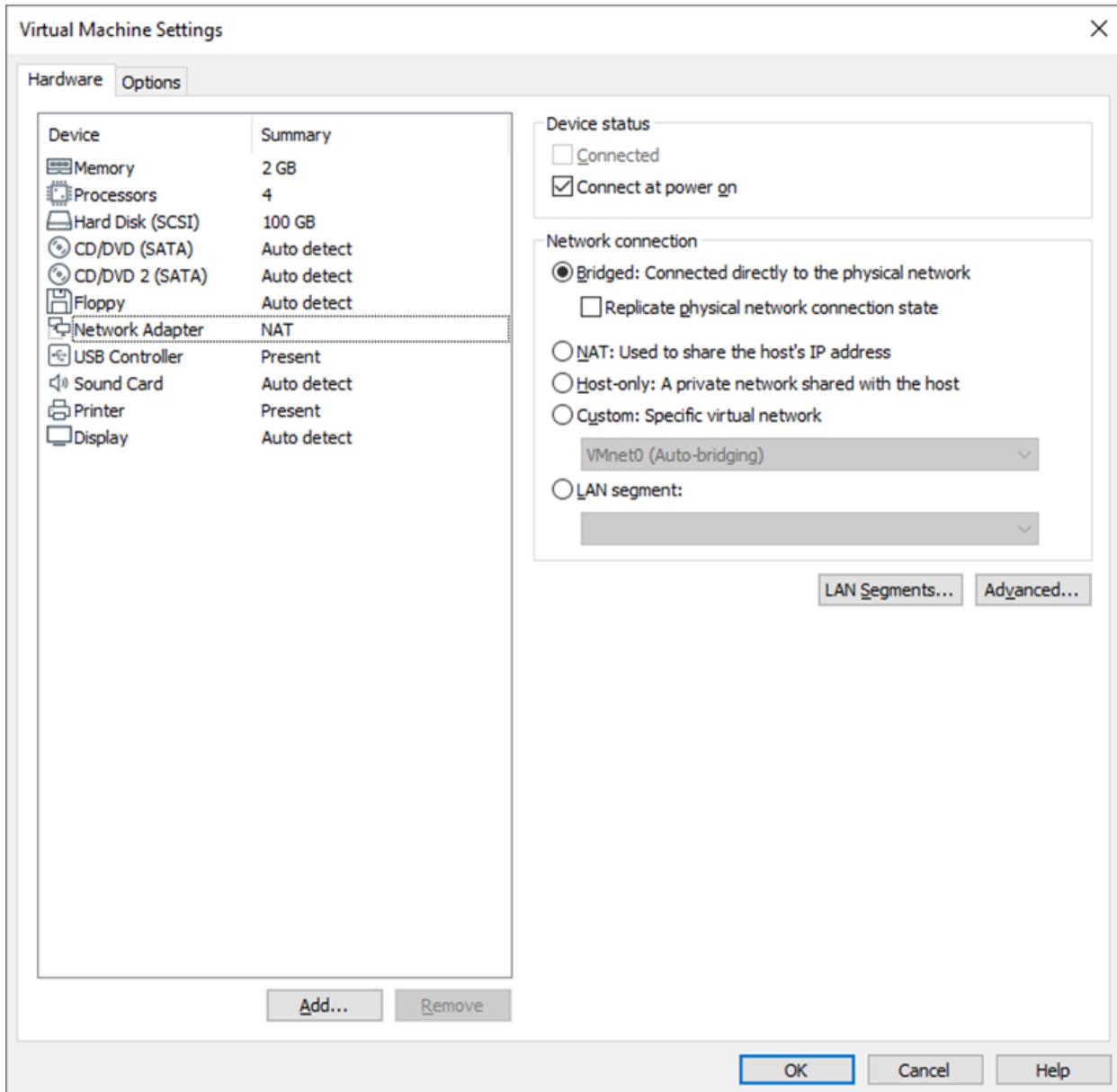
This configuration does not need to be changed when performing tasks like installing dependencies or compiling code.

When the VMware virtual NIC is set to NAT mode in a virtual machine, the network in the Ubuntu environment can be set to dynamic IP. In this mode the virtual NAT device and the host NIC are connected to communicate for Internet access. This is the most common way for our VM to access the external network.



3.1.4.2 Bridge Connection

When the VMware virtual NIC device is in bridge mode, the host NIC and the virtual machine NIC communicate through the virtual bridge, and the network IP and the host need to be set in the same network segment in the Ubuntu environment. If accessing an external network, you need to set the DNS to be consistent with the host NIC. If TFTP, SFTP and other servers are used, the network contact mode of the virtual machine needs to be set as the bridge mode.



3.2 Toolkit Installation

To install the necessary toolkit for T527N compilation, please execute the following command to install it, and make sure that the network can be used normally and you can access the external network before installation:

```
forlinx@ubuntu:~$ sudo apt-get update
forlinx@ubuntu:~$ sudo apt-get install openssh-server vim git fakeroot make automake \
autoconf libtool libssl-dev bc dosfstools mtools parted iproute2 kmod \
libyaml-dev device-tree-compiler python flex bison build-essential \
u-boot-tools libncurses-dev lib32stdc++6 lib32z1 libc6:i386 \
nodejs gyp ninja-build bison flex gperf ruby
```

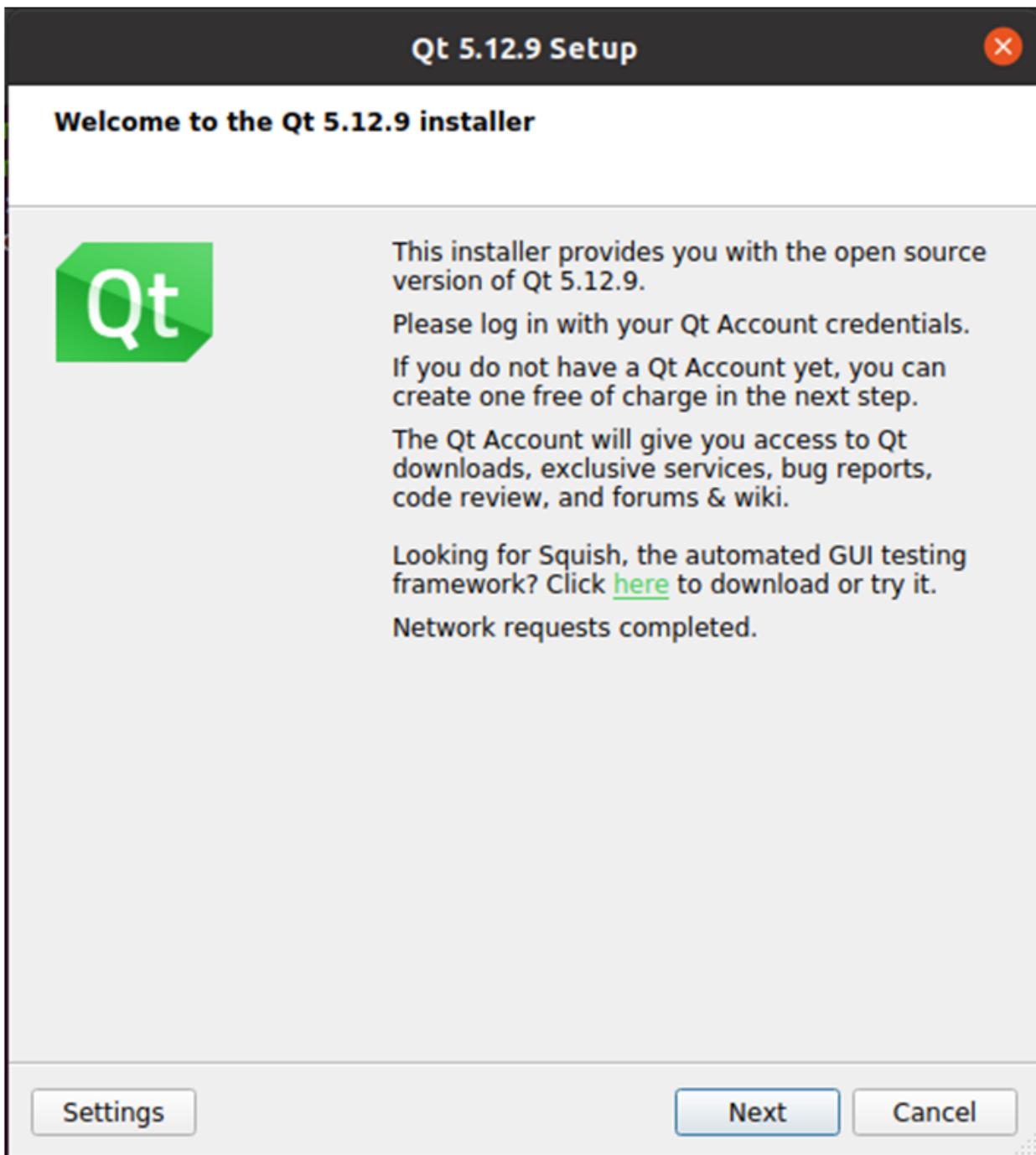
3.3 Qt Creator Installation

Path: 02-User Information\01-Software Information\04-Tools\qt-opensource-linux-x64-5.12.9.run

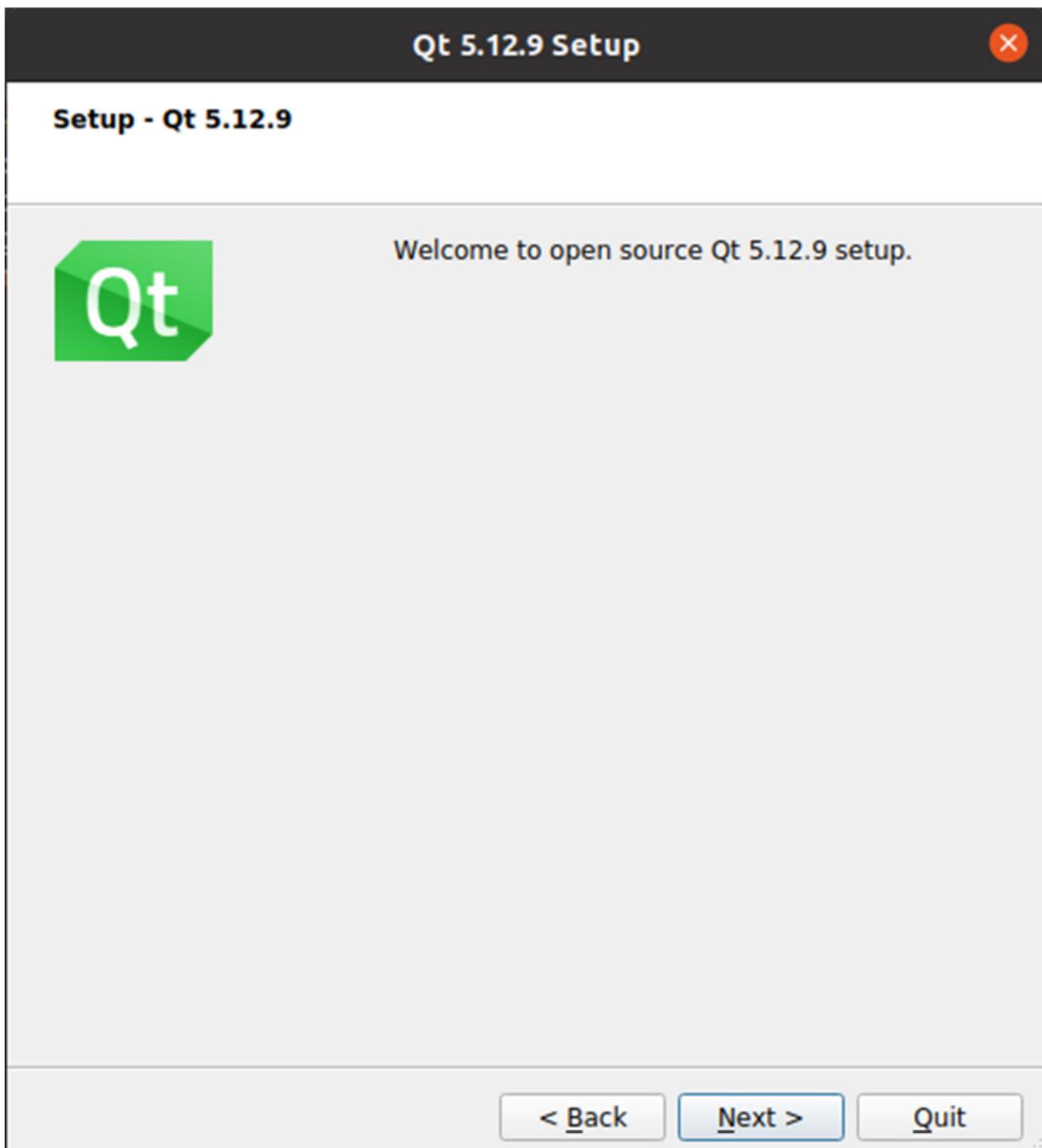
Copy qt-opensource-linux-x64-5.12.9.run to any directory in the current user's home directory and execute it:

```
forlinx@ubuntu:~$ chmod 777 qt-opensource-linux-x64-5.12.9.run  
forlinx@ubuntu:~$ ./qt-opensource-linux-x64-5.12.9.run
```

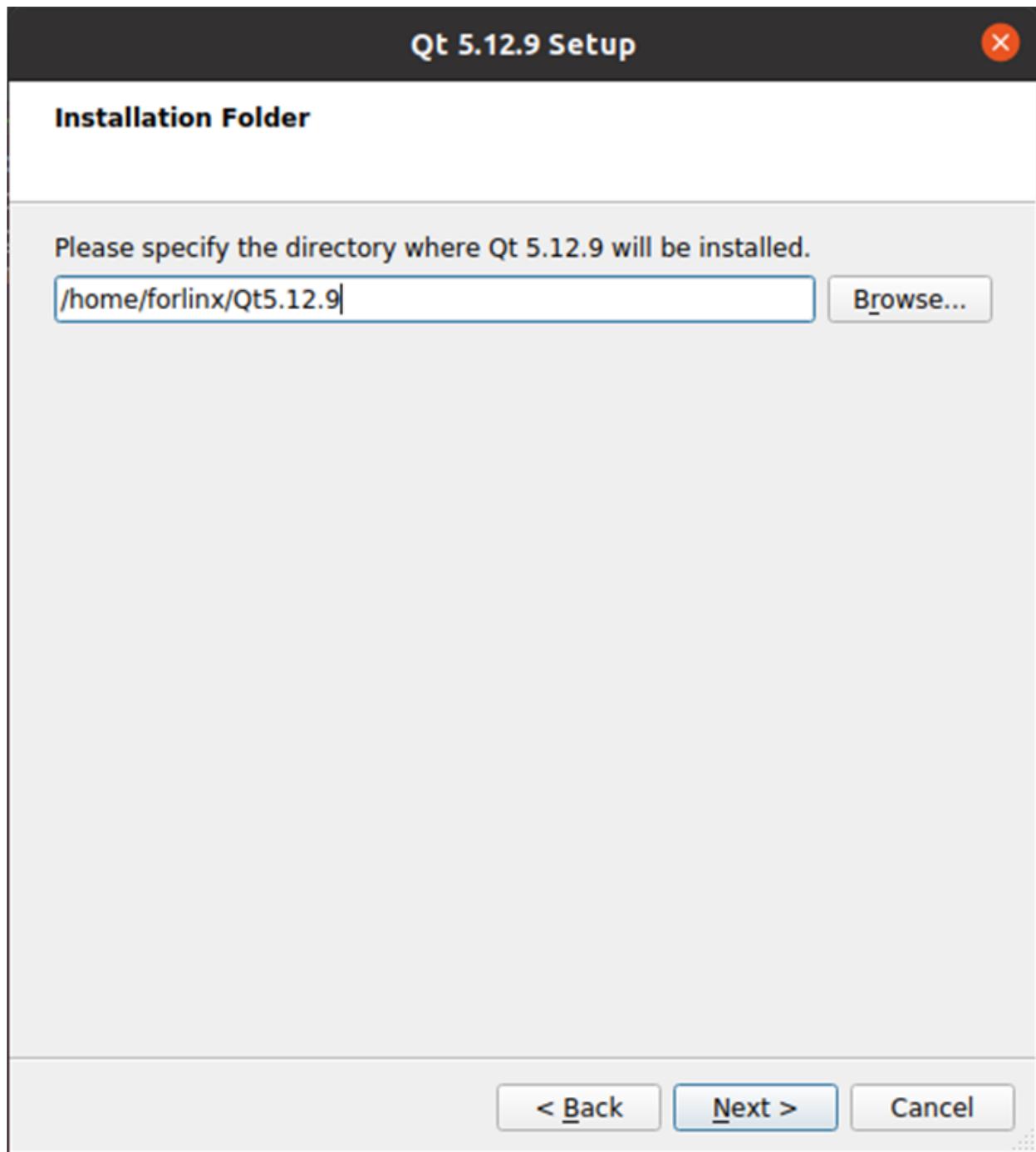
The following interface will pop up. Click "Next" to enter the next step:



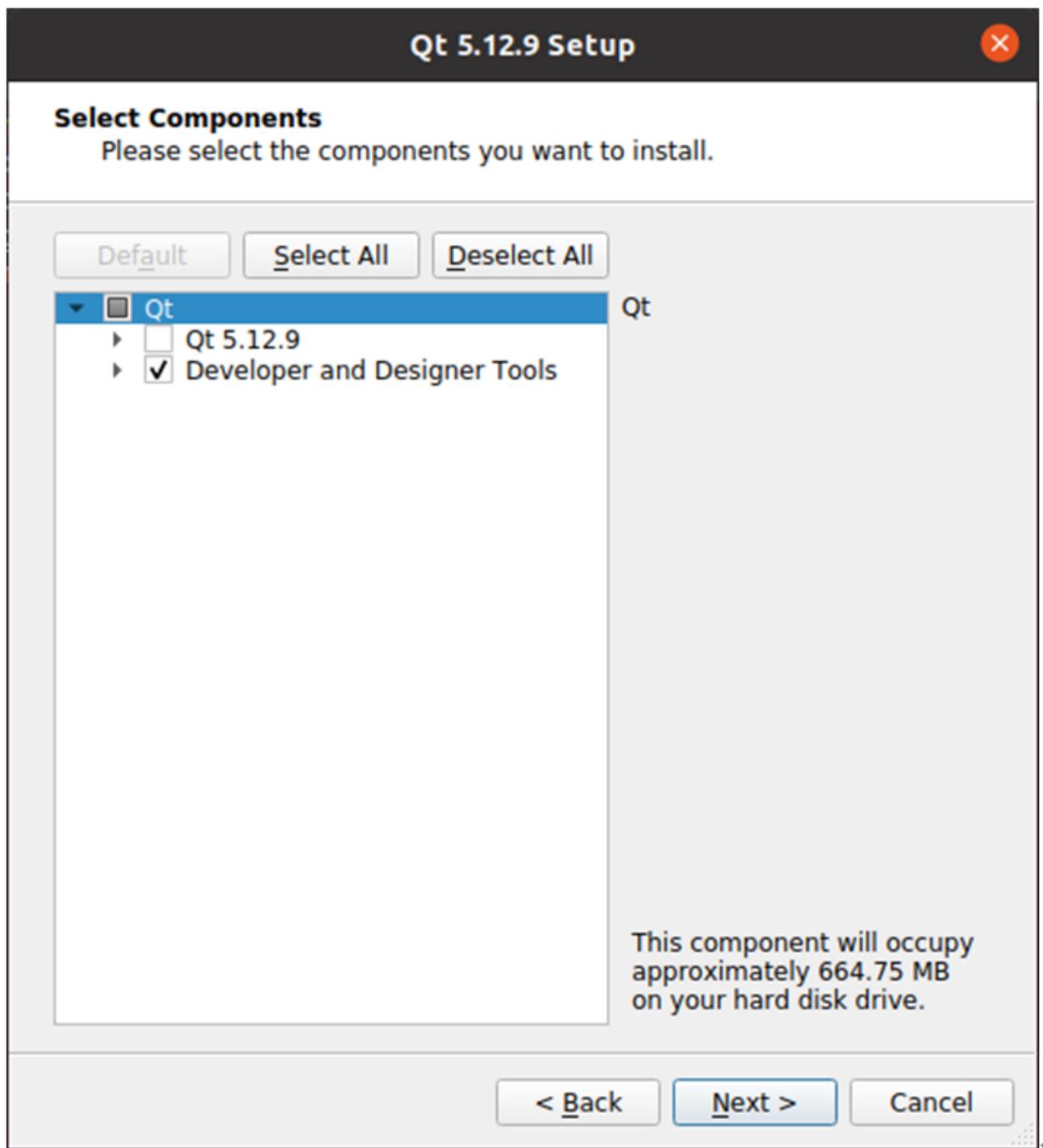
Click “Next” to go to the next step:



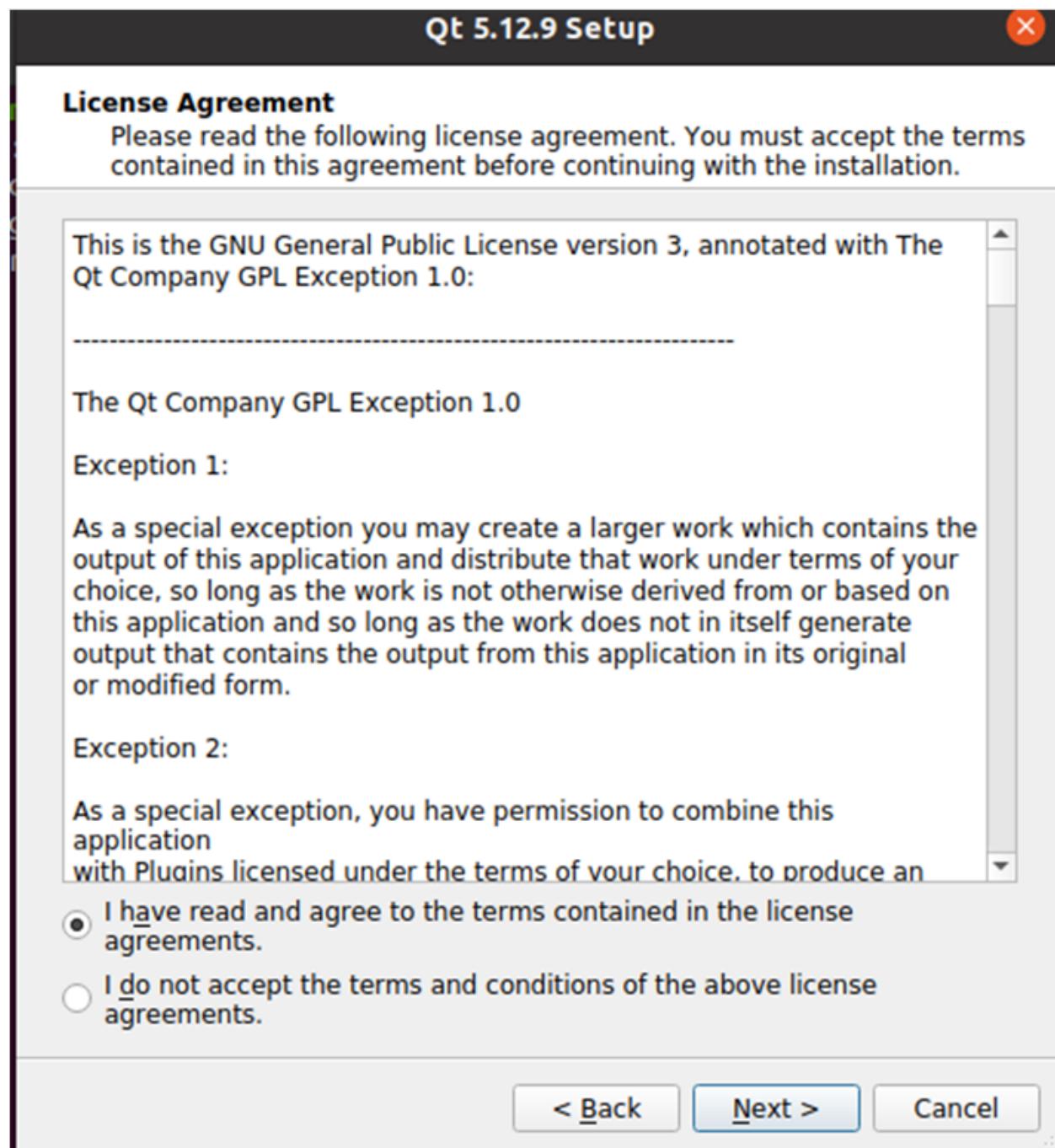
In the following interface, click “Browse…” to select the installation path of Qtcreator, after the selection is complete, click “Next” to enter the next step:



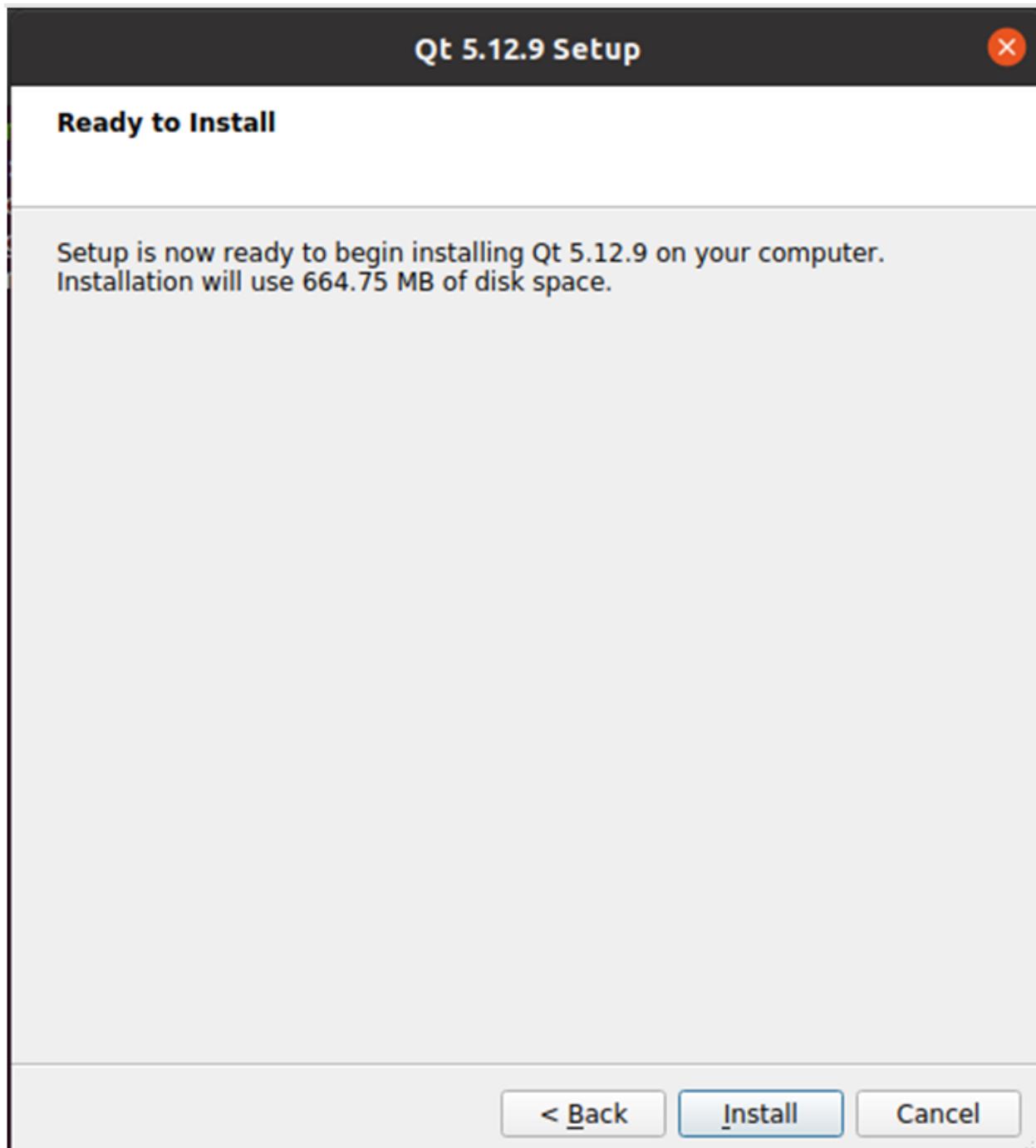
In the following screen, click “Next” to the next step:



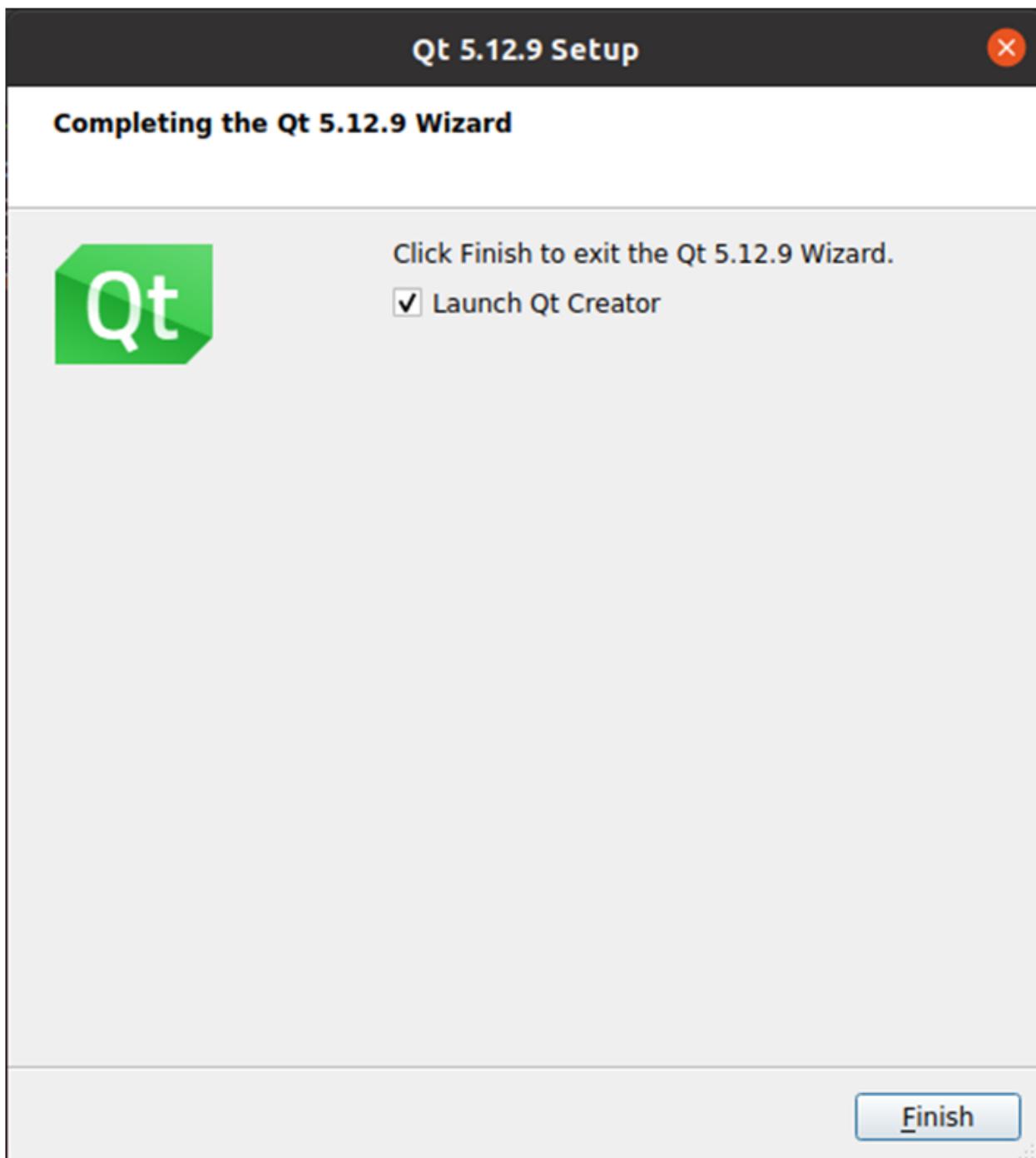
Agree to the agreement and click “Next” :



Click Install to install:



After the installation is completed, the following interface will be displayed. Uncheck the option “Launch Qt Creator” “and click” Finish “to complete the installation steps of Qt Creator:



Go to the /home/forlinx/Qt5.12.9/Tools/QtCreator/bin/ directory of the actual qtcreator installation directory:

```
forlinx@ubuntu:~$ cd /home/forlinx/Qt5.12.9/Tools/QtCreator/bin/
```

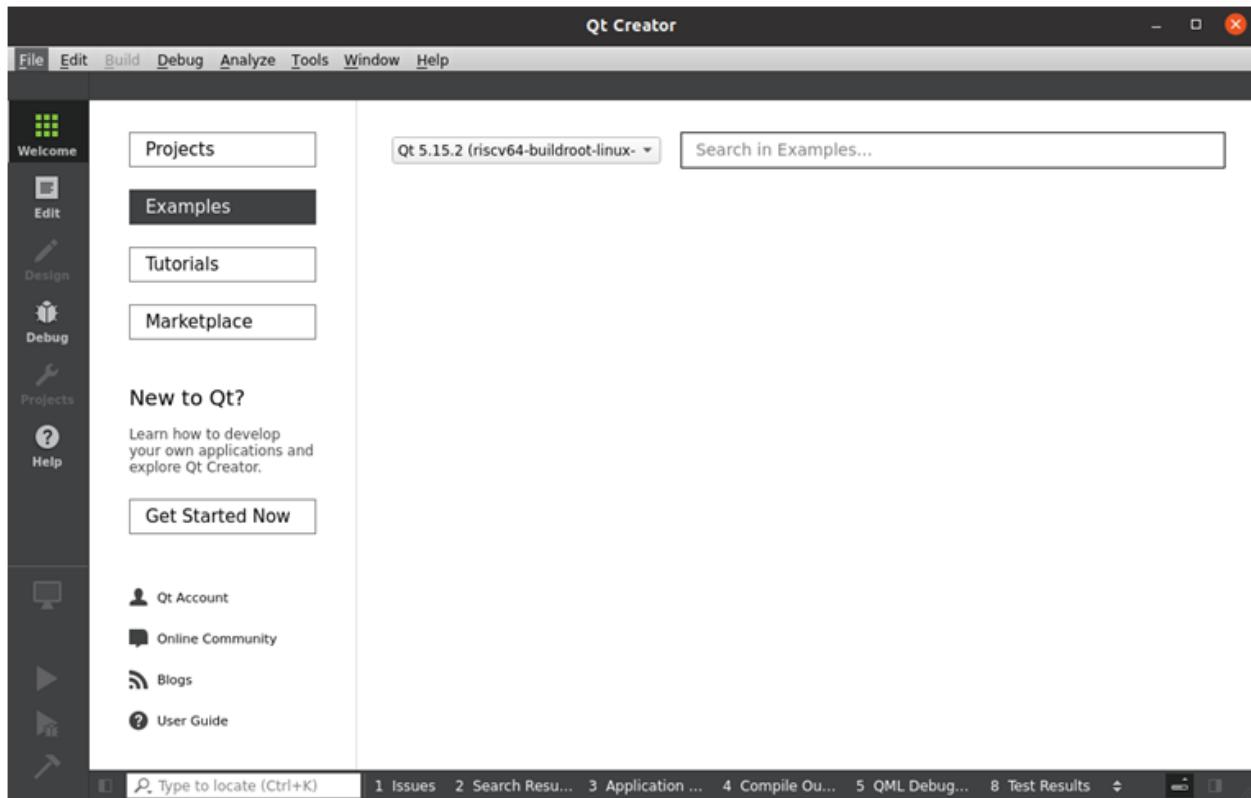
Boot Qt Creator :

```
forlinx@ubuntu:~/Qt5.12.9/Tools/QtCreator/bin $ sudo ./qtcreator
[sudo] password for forlinx: forlinx //Enter the password of forlinx user without any response
```

(continues on next page)

(continued from previous page)

```
QStandardPaths: XDG_RUNTIME_DIR not set, defaulting to '/tmp/runtime-root'
QStandardPaths: XDG_RUNTIME_DIR not set, defaulting to '/tmp/runtime-root'
```



The Qt Creator tool screen appears. Qt Creator is installed.

3.4 Qt Compilation Environment Configuration

Path: User profile \ software profile \ 3-tools \ host. tar. gz

There are libraries and cross-compilation tools required for compiling Qt programs in the host. tar. gz.

The configuration steps are as follow:

1. Unzip the compilation environment zip;

Because the qmake tool depends on local paths, this toolkit can only be placed in a fixed path: /opt/. Avoid unrecognized due to source code path change

Unzip the tool kit

```
forlinx@ubuntu:~$ sudo tar -xf host.tar.gz -C /opt/
```

If you cannot find the compressed package, you can also compile the source code first and copy out/t527/okt527/buildroot/buildroot/host/to the /opt/directory

2. Qt Creator environment configuration

First open the Qt Creator software.

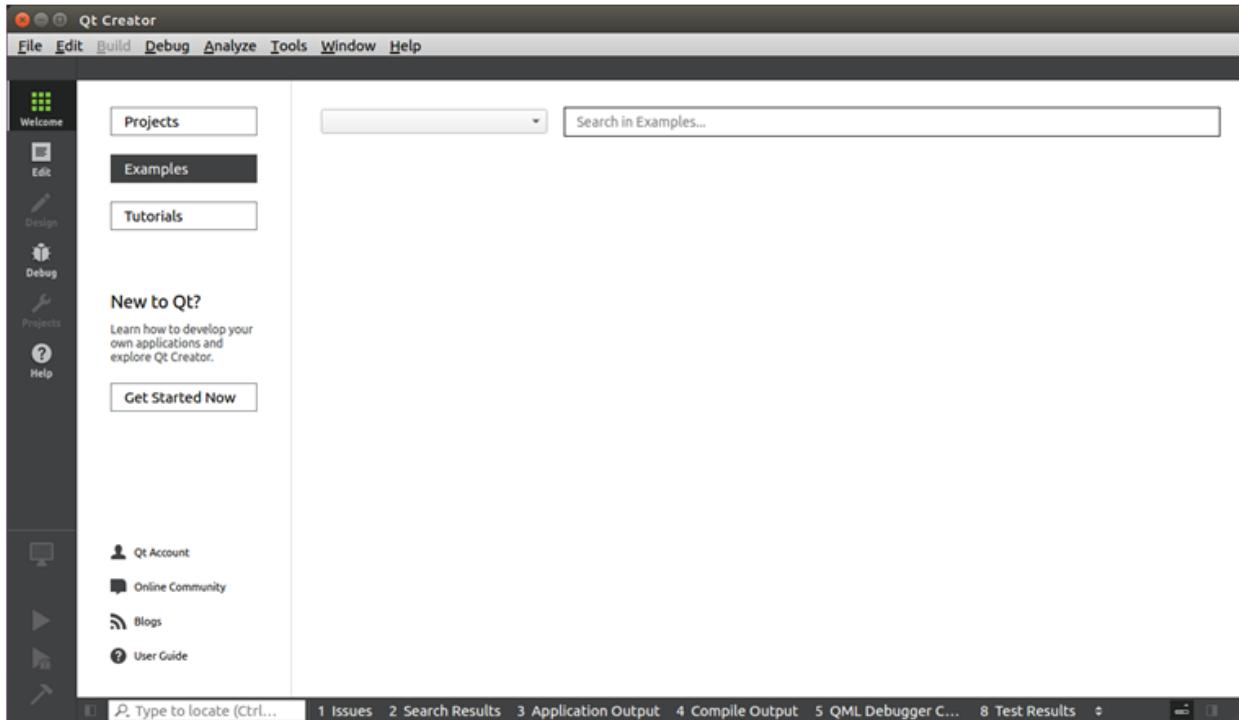
Go to the /home/forlinx/Qt5.12.9/Tools/QtCreator/bin/ directory of the actual qtcreator installation directory:

```
forlinx@ubuntu:~$ cd /home/forlinx/Qt5.12.9/Tools/QtCreator/bin/
```

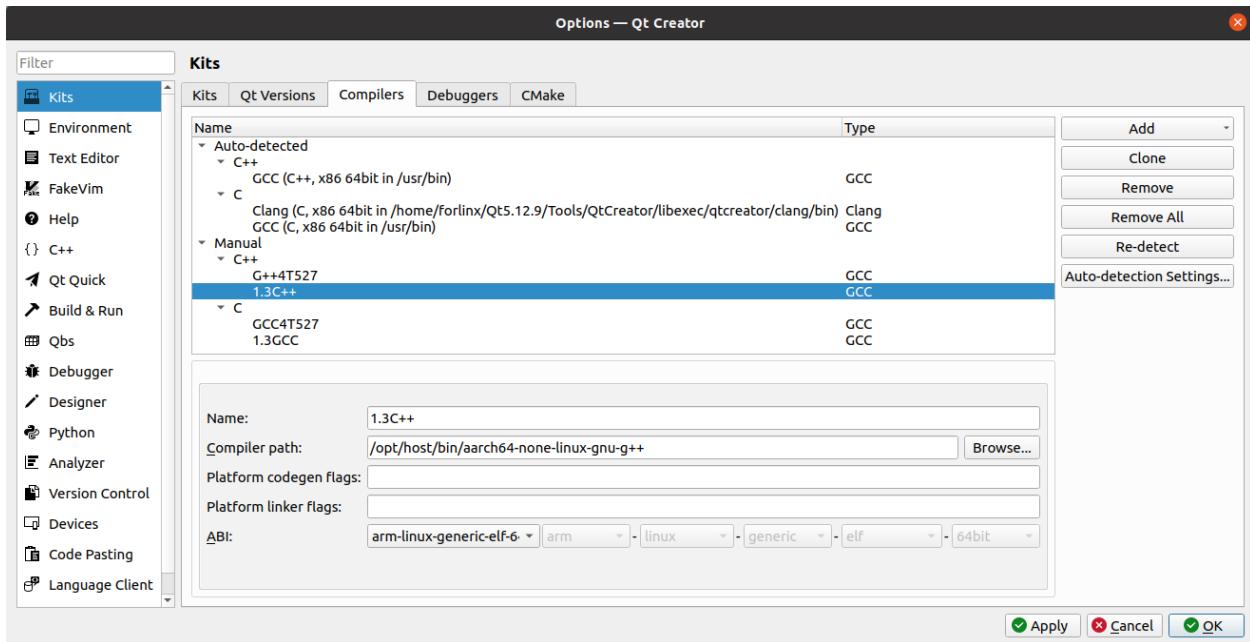
Boot Qt Creator :

```
forlinx@ubuntu:~/Qt5.12.9/Tools/QtCreator/bin $ sudo ./qtcreator
[sudo] password for forlinx: forlinx //输入 forlinx 用户的密码,
无回显
QStandardPaths: XDG_RUNTIME_DIR not set, defaulting to '/tmp/runtime-root'
QStandardPaths: XDG_RUNTIME_DIR not set, defaulting to '/tmp/runtime-root'
```

Start the Qt Creator program and click on the Tools->option:

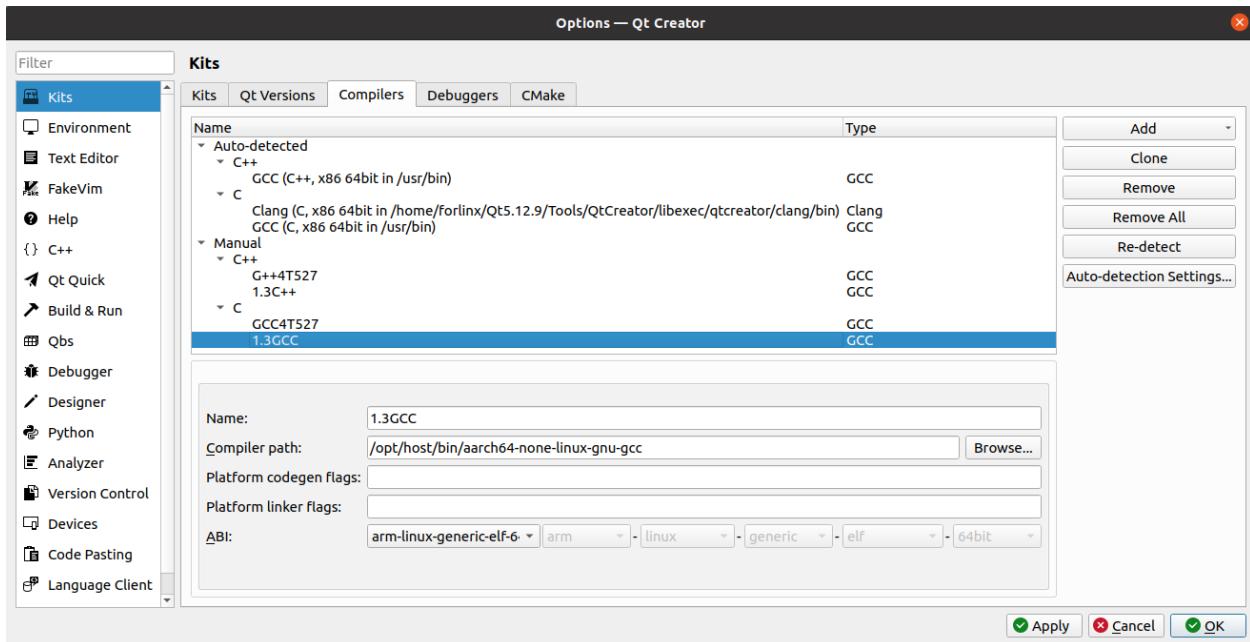


Enter the Options interface, click “Kits” on the left side, then click the “Compilers” tab in the upper center, and click “Add->GCC->C++” on the right side, as shown in the figure:



Find “aarch64-none-linux-gnu-g ++” under/opt/host/bin, select it, click Open, and modify the Name

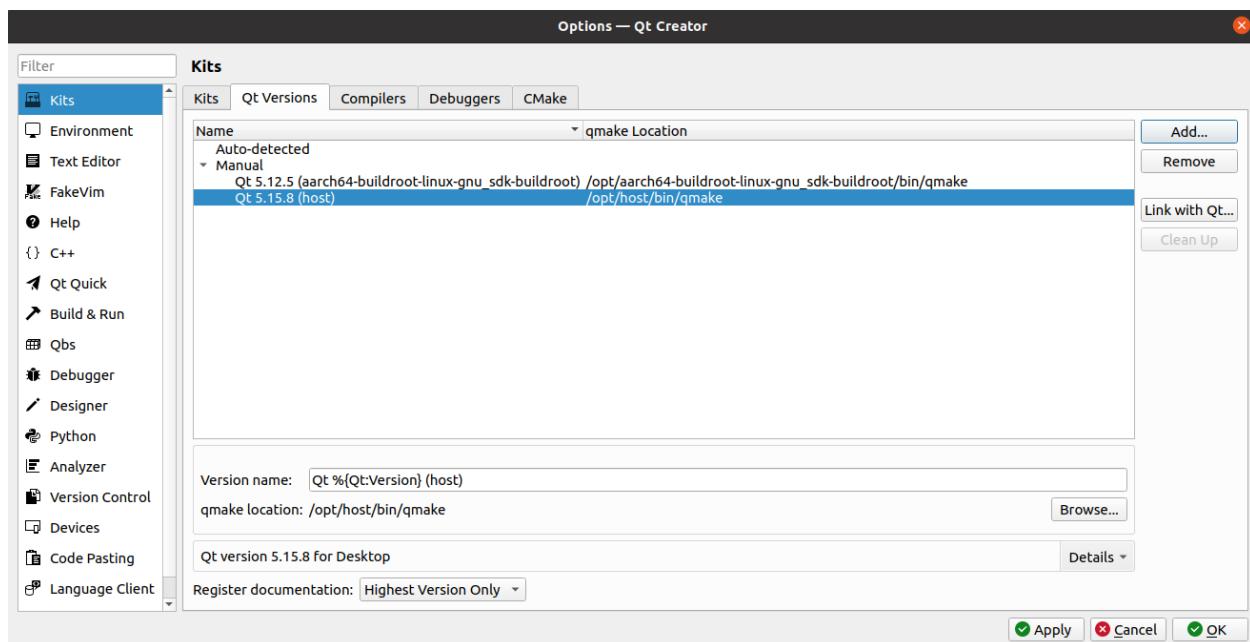
Follow the same method to add GCC compiler and click “Add->GCC->C” on the right side; as shown in the figure:



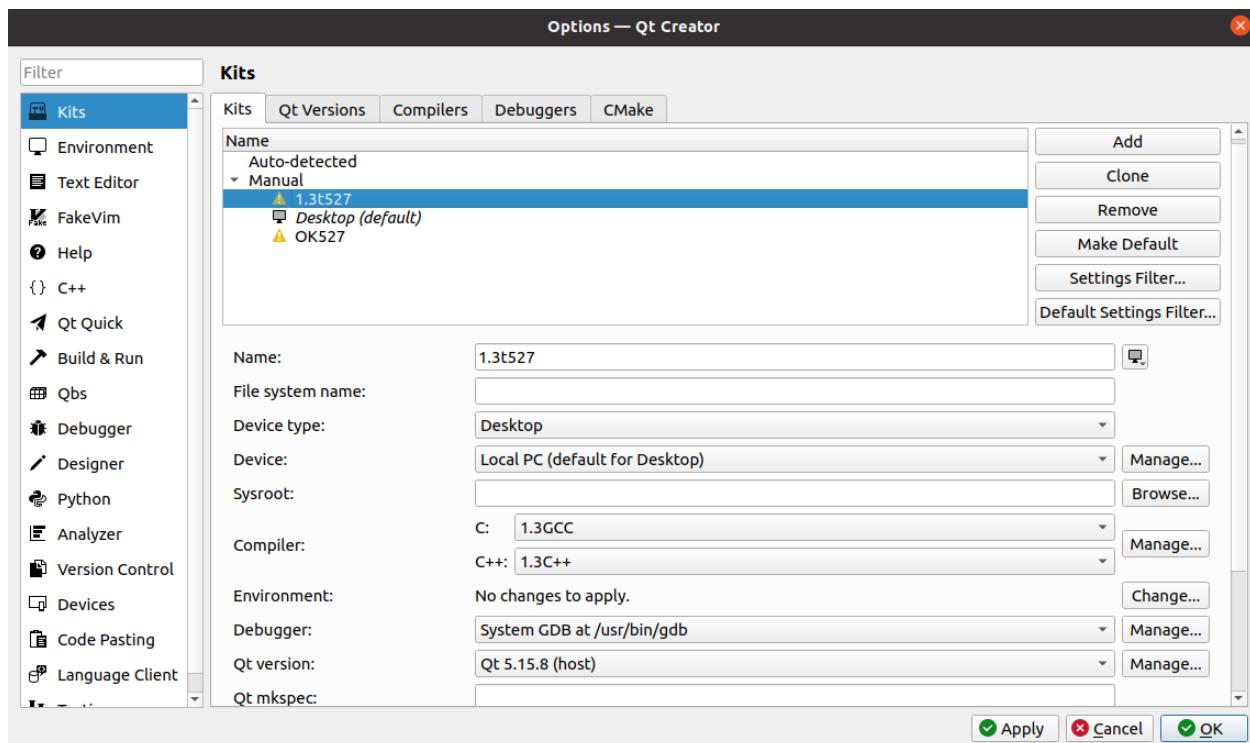
Find “aarch64-none-linux-gnu-gcc” under/opt/host/bin, select it, click Open, and modify the Name

Click on the Qt Versions tab and click on “Add” :

Find qmake in the directory /opt/host/bin, select it and click Open, add it and display it as below, click “Apply” .

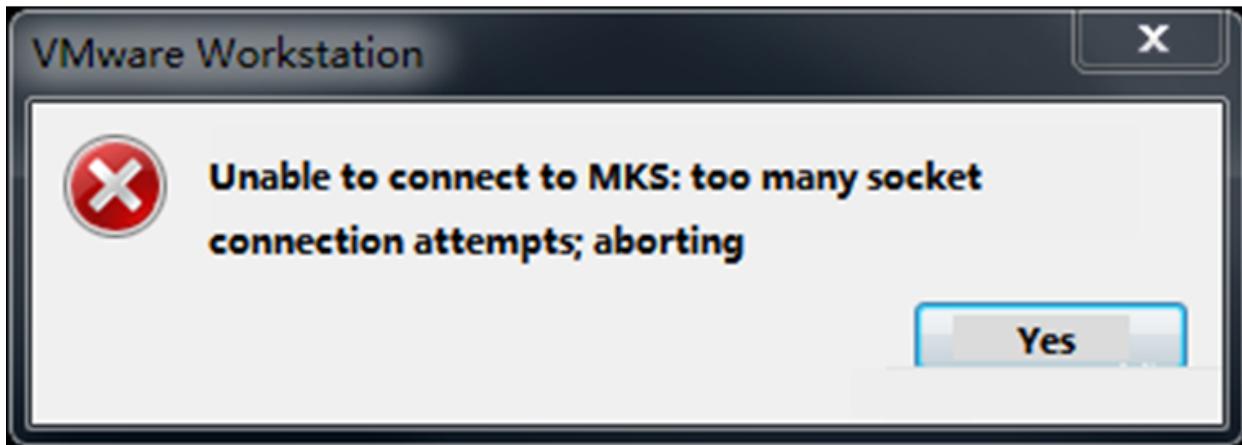


Click the Kits tab, click Add on the right, add a new kit, modify it according to the following figure, and click “Apply” .



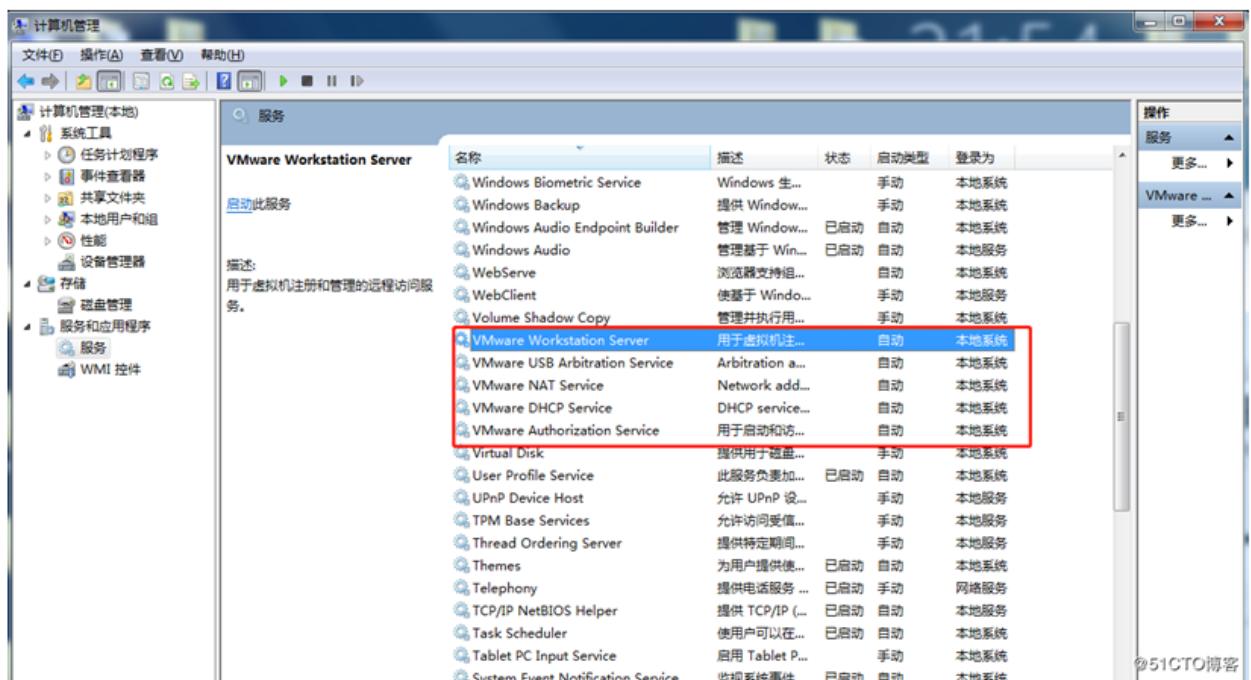
3.5 VMware Solution to Error Reporting

Error 1: Unable to connect to MKS. Too many socket connection attempts; giving up.



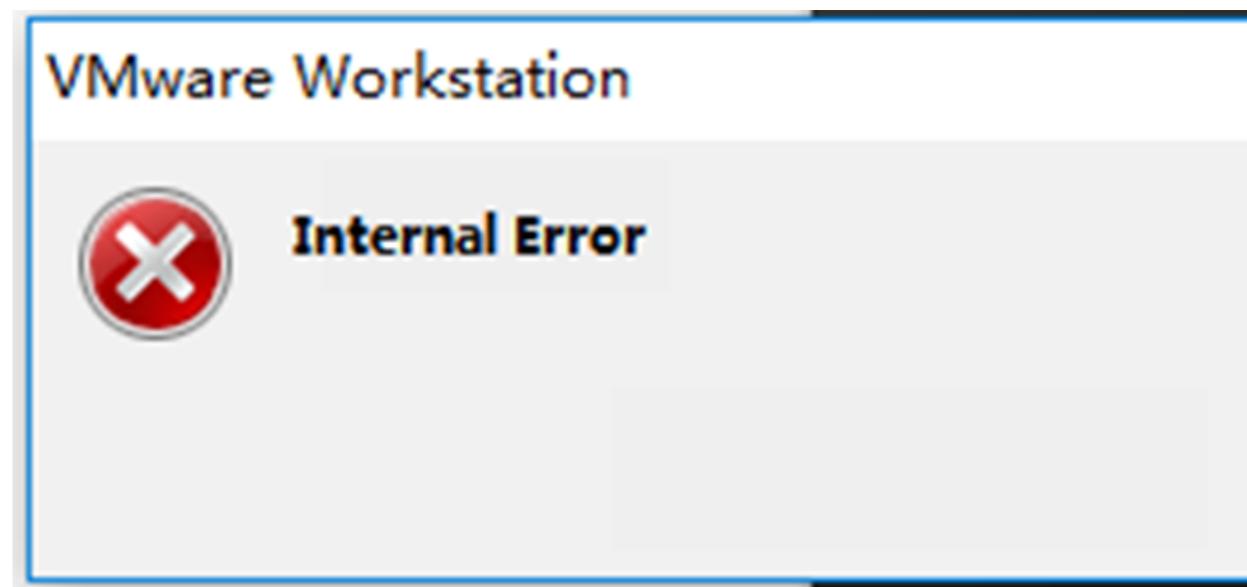
Solution:

My Computer -> Right click -> Management -> Services and Applications -> Services: turn on all the services about VMware.



After the service starts successfully, restart the virtual machine; or hang the virtual machine first, and when the service starts, continue to run the hung virtual machine;

Error 2: Internal error



Solution: Refer to solution 1

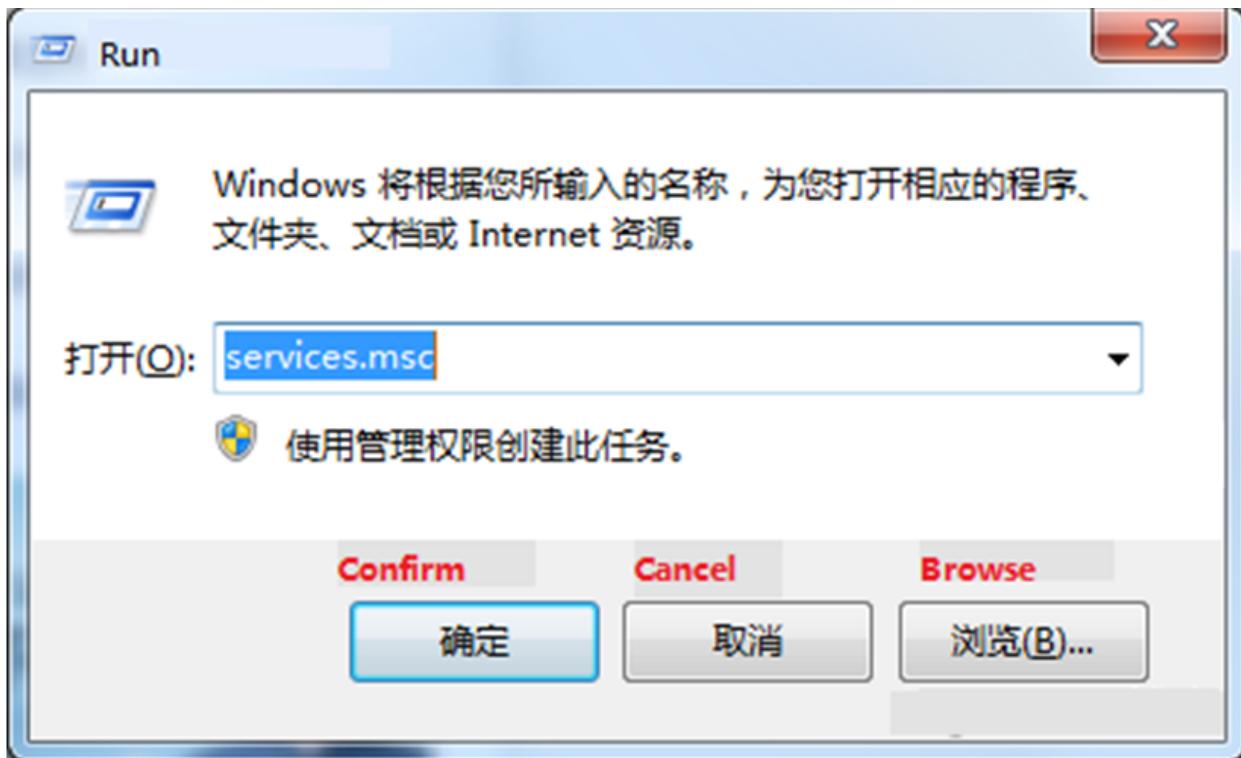
Error 3: Unable to install service VMware Authorization Service (VMAuthdService)



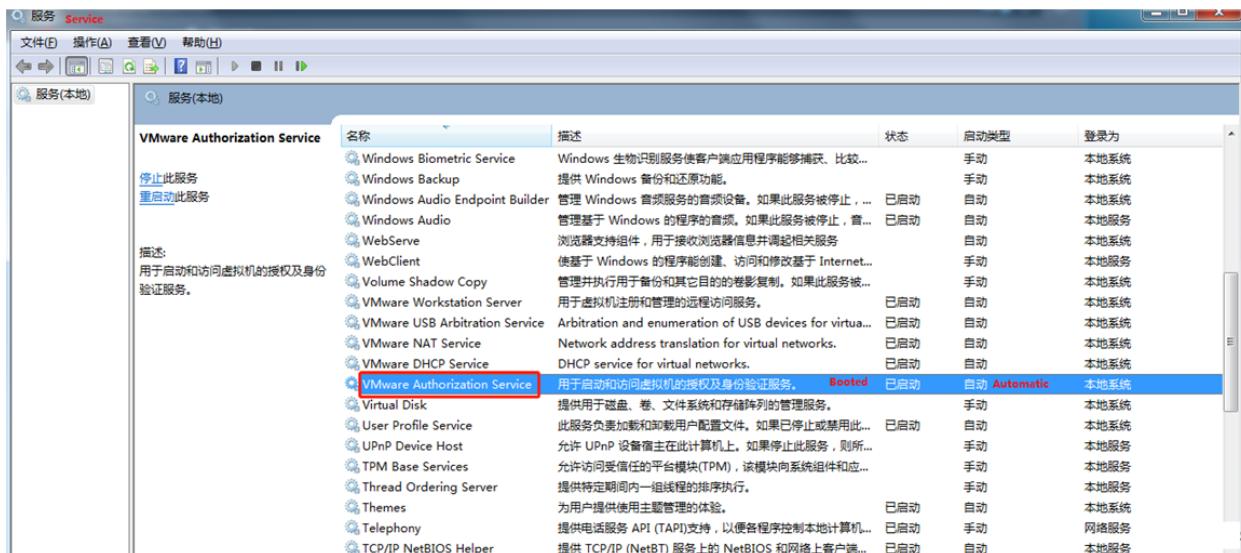
Solution:

win+R

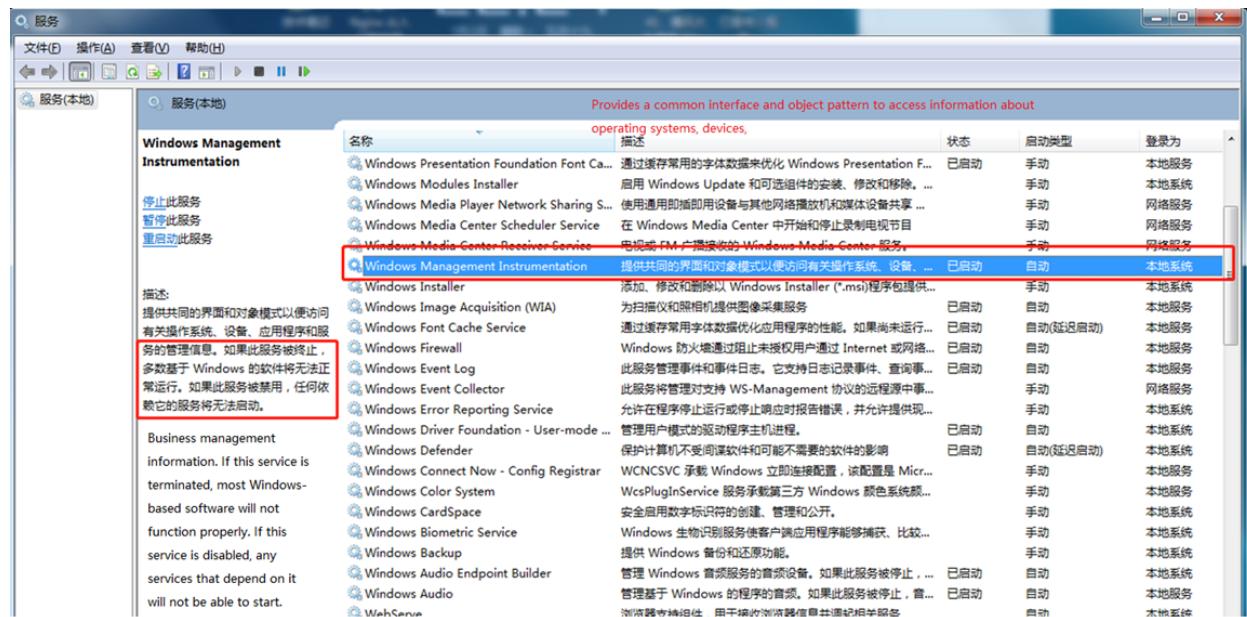
Enter services.msc



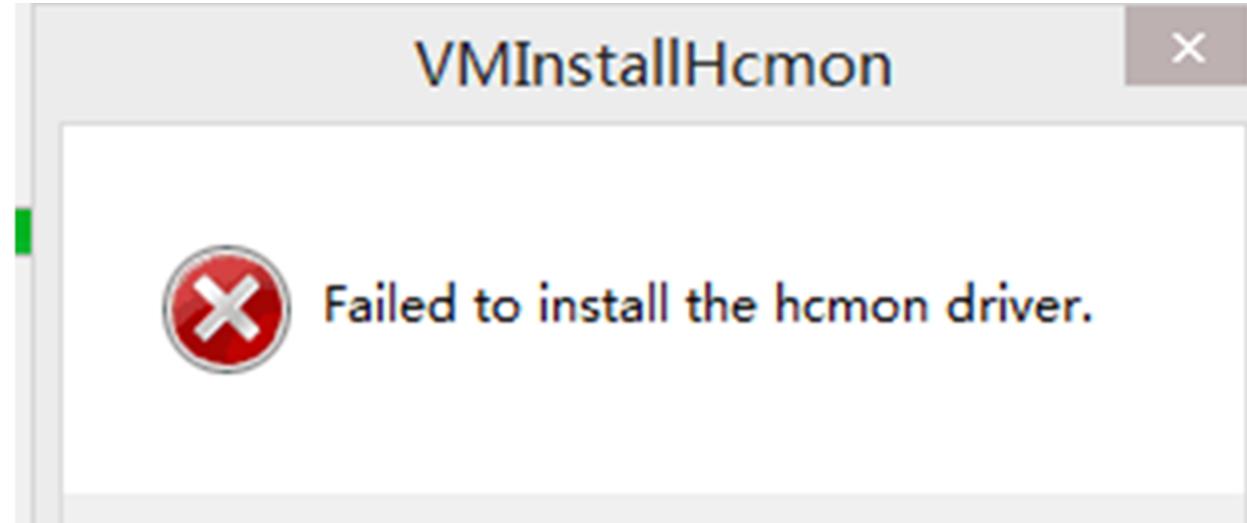
Then find the service and start it up as an authorization and authentication service for starting and accessing virtual machines.



WMI must start first.



Error 4: Failed to install the hcmon driver



Solution: Delete C:\Windows\System32\drivers\hcmon.sys, then install again.

Error 5: Intel VT-x in disabled state



Solution:

- ① Enter the BIOS screen while booting (F2 or F12)
- ② configuration → intel virtual technology → “change disabled to enabled” → “save the setting, exit and reboot.”
- ③ Reopen VMware and turn on the virtual machine.

If that doesn't work, just turn the firewall off and reopen the VM. (varies by machine)

Error 6: The virtual machine appears to be in use... Acquiring Ownership (T)

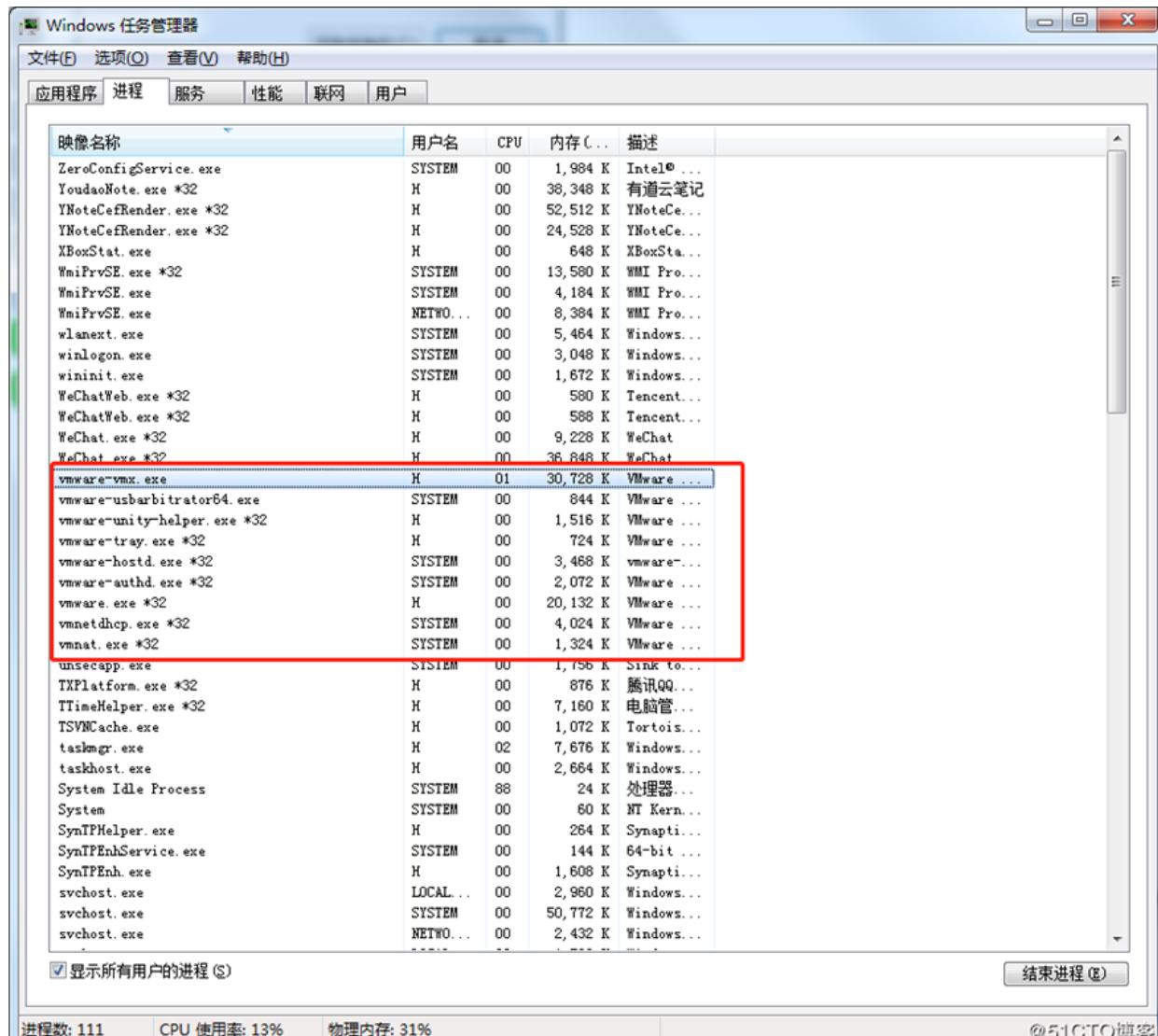


Solution:

- ① Shut down the virtual machine

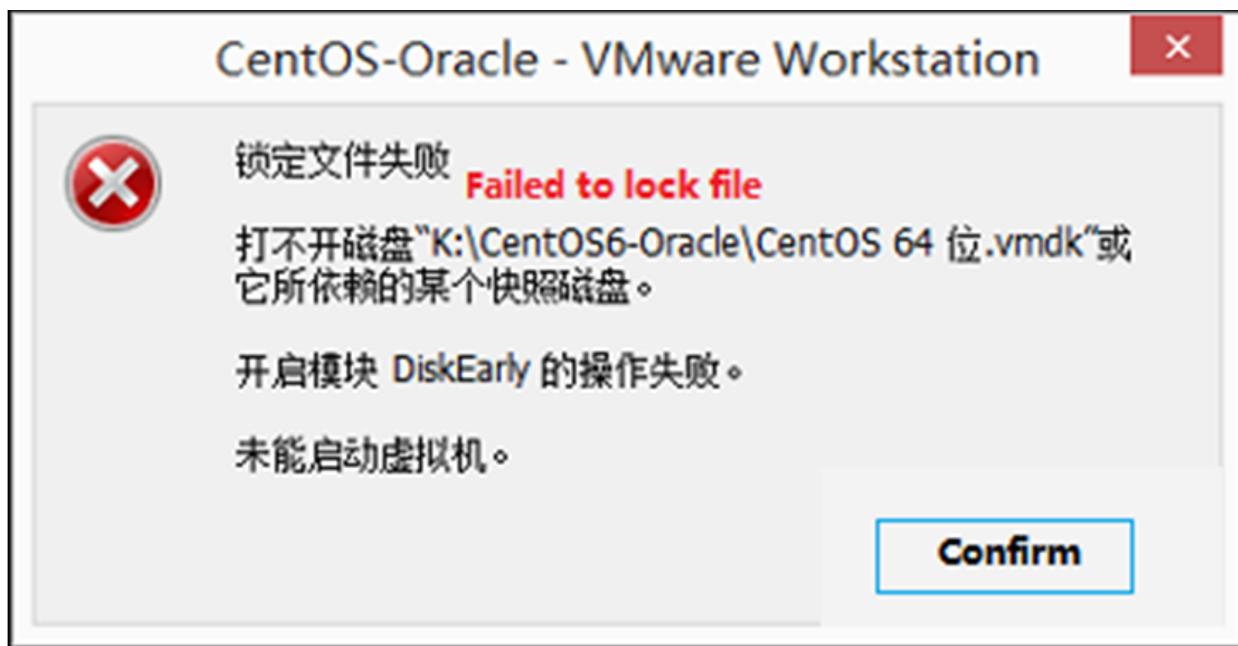
② Enter the storage directory of the virtual machine and delete the *.lck file, where lck represents the locked file.

③ Open the Windows Task Manager and kill the VMware process



④ Reopen the virtual machine

Error 7: Failed to lock file



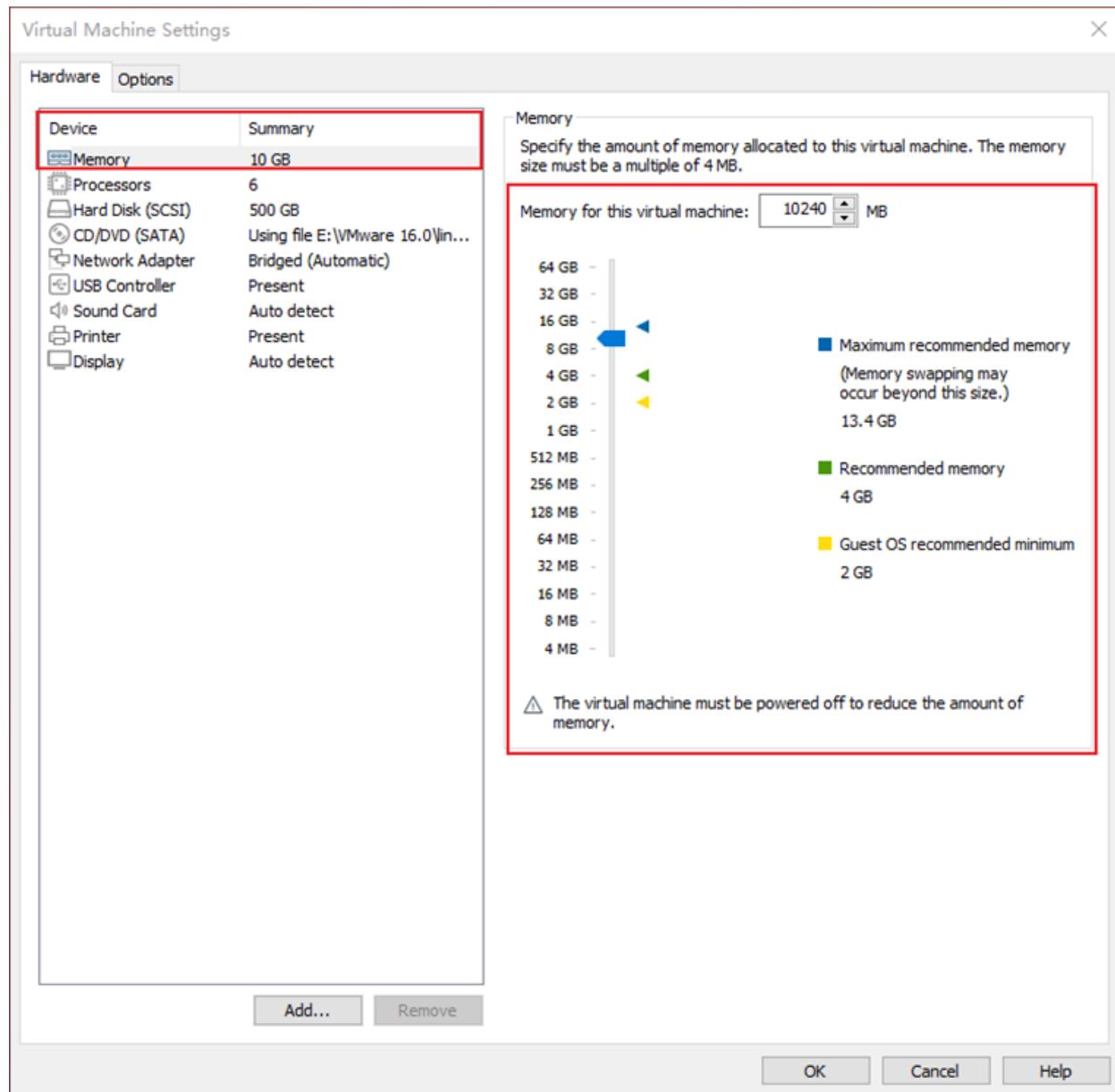
Solution:

- ① Go to the virtual machine's storage directory
- ② Delete .vmem.lck, .vmdk.lck, *.vmx.lck
- ③ Reopen the VM, you can enter the VM normally

Error 8: The virtual machine could not be started because there was not enough memory available on the host.

Solution:

The virtual machine does not have enough memory to run the image's maximum requirements; increase the virtual machine's memory and reboot the virtual machine



2.2.8 4. Ubuntu Compilation

Note: Please do not skip this paragraph.

The development environment is the hardware and software platform that developers need during the development process. Development environment is not a fixed style . In the previous article, it explains in detail how to build an embedded Linux development environment. If you already know a lot about embedded development, you can build the environment according to your needs. If you encounter some problems, you can search for related information from some big Linux forums and websites to solve them. The operations mentioned in this section are performed on the development environment provided by us, which has been tested by Forlinx. If you are not very familiar with embedded development, recommend you to use the environment provided by Forlinx.

**The development environment provided for general users is: forlinx (username), forlinx (password). **

The superuser is: root (username), root (password).

4.1 Preparation Before Startup

4.1.1 Versions

Virtual Machine Software: Vmware 15.1.0

Recommended Development Environment OS: Ubuntu 20.04 64-bit

Cross toolchain: gcc-arm-10.3-2021.07-x86_64-aarch64-none-linux-gnu (kernel)

aarch64-buildroot-linux-gnu_sdk-buildroot (应用)

Bootloader version: u-boot-2018.07

Kernel version: linux-5.15.147

Development board QT version: qt5.15.8

4.1.2 Source Code Copy and Release

Kernel source code path: user data \ software data \ 2-image and source code \ 1-source code \ OKT527-linux-sdk 1.3.tar.bz2.

1. Copy Source Code

OKT527-linux-sdk1.3.tar.bz2 includes the toolchain, user SDK, Linux kernel, file system, source code for test programs, and some tools.

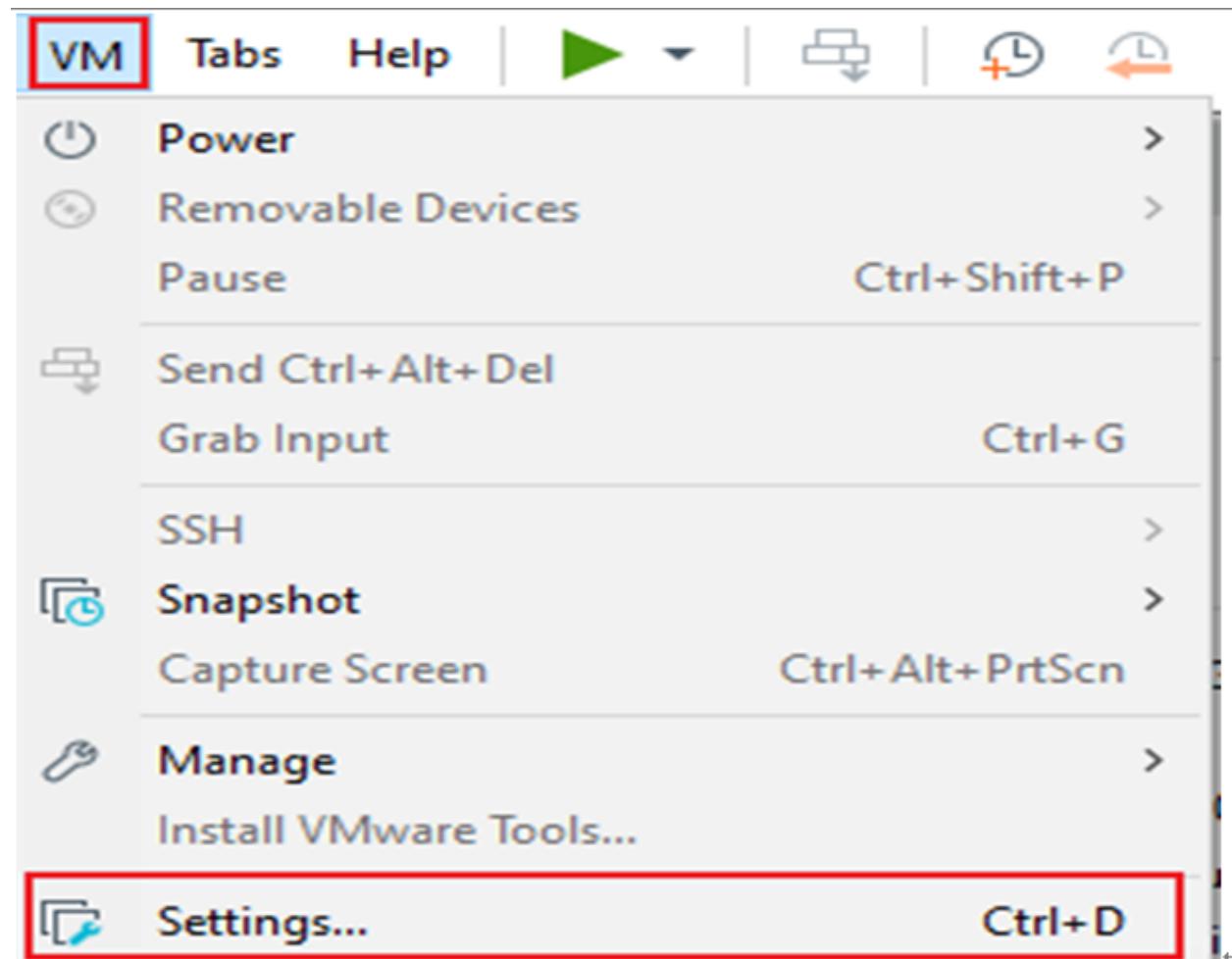
```
forlinx@ubuntu:~$ mkdir /home/forlinx/work  
↳ //Create working path
```

Copy the source package to the virtual machine /home/forlinx/work directory.

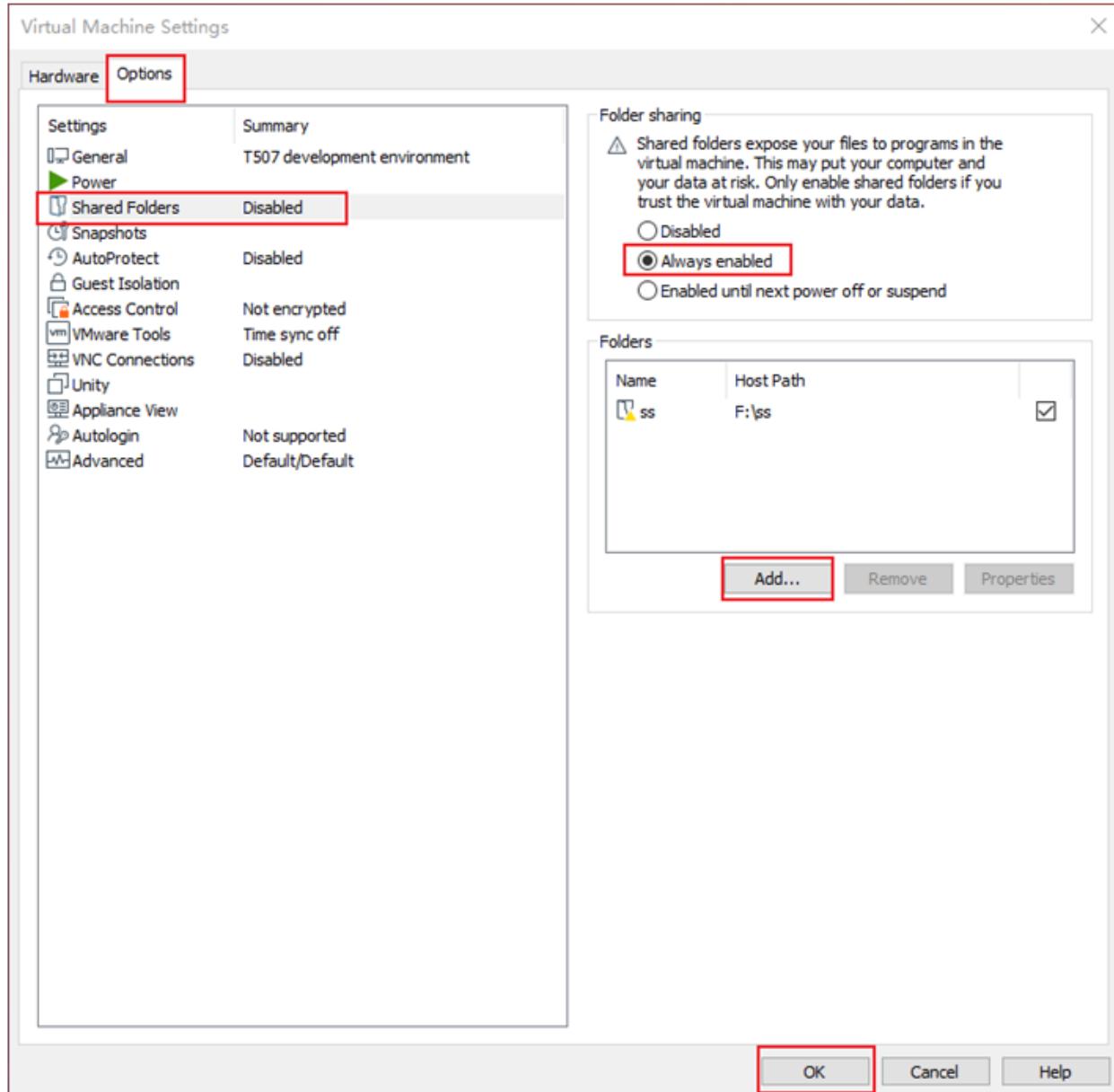
You can directly drag and drop the source package from your computer to a folder on the desktop of the virtual machine, or use a shared folder to copy it using the command; here we focus on the use of shared folders

There are many kinds of file transfers between ubuntu and Windows hosts. After installing VMware Tools, you can set up a virtual machine shared folder to mount the file directory of the Windows host to ubuntu for file sharing.

Click “Virtual Machine” on the menu bar and select “Settings” .



Click “Options” , enable “Shared Folders” , set the shared directory on the Windows host, and click “OK” .



After completing the virtual machine's file sharing setup, place the source code package OKT527-linux-sdk1.3.tar.bz2 into the Windows host's shared folder. Here, we'll name it "share".

The shared folder is in the mount directory /mnt/hgfs/share in ubuntu; view the files in the mount directory.

```
forlinx@ubuntu:~$ ls /mnt/hgfs/share/ //View files in share
˓→the shared directory
OKT527-linux-sdk1.3.tar.bz2
```

Copy the source code from the shared folder to ubuntu's /home/forlinx/work directory for md5 checksum:

```
forlinx@ubuntu:~$ cp /mnt/hgfs/share/OKT527-linux-sdk1.3.tar.bz2.* /home/forlinx/work/
forlinx@ubuntu:~$ cd /home/forlinx/work
forlinx@ubuntu:~/work$ md5sum OKT527-linux-sdk1.3.tar.bz2.*
```

The returned md5 checksum is the same as the one in the profile, so you can unzip the source code:

```
forlinx@ubuntu:~/work$ cat OKT527-linux-sdk1.3.tar.bz2.0* | tar jxv
```

4.1.3 Common File Path of Source Code

OK527-C platform, the software configuration file path (starting under the SDK source code OKT527-linux-sdk path) is as follows:

Document type	path
Kernel configuration file	device/config/chips/t527/configs/okt527/linux-5.15/bsp_defconfig
Device tree file	kernel/linux-5.15/bsp/configs/linux-5.15/sun5iw3p1.dtci kernel/linux-5.15/arch/arm64/boot/dts/allwinner/OKT527-C-Common.dtci
	kernel/linux-5.15/arch/arm64/boot/dts/allwinner/OKT527-C-Linux.dts
sysconfig.fex	device/config/chips/t527/configs/okt527/sys_config.fex
File system source files.	File add path buildroot/buildroot-202205/board/forlinx/okt527/fs-overlay/Final packaging path out/t527/okt527/buildroot/buildroot/target
uboot environment variable settings file	Device/config/chips/t527/configs/okt527/buildroot/env.cfg You can modify this file if you need to modify or add default environment variables.

OK527-C platform, the test program path (SDK source code starts under OKT527-linux-sdk path) is as follows:

platform/framework/auto/cmd_demo Command Line Test Program Source Directory

platform/framework/auto/qt_demo Qt test program source directory

Source code path		
qt-demo	4G	platform/forlinx/forlinx_qt_demo/4g
	ADC	platform/forlinx/forlinx_qt_demo/adc
	Backlight	platform/forlinx/forlinx_qt_demo/backlight
	SQL	platform/forlinx/forlinx_qt_demo/books
	Browser	platform/forlinx/forlinx_qt_demo/browser
	Camera test	platform/forlinx/forlinx_qt_demo/camera
	Sound recording	platform/forlinx/forlinx_qt_demo/fltest_qt_audiorecorder
	Video play	platform/forlinx/forlinx_qt_demo/fltest_qt_musicplayer
	Key test	platform/forlinx/forlinx_qt_demo/keypad
	Desktop	platform/forlinx/forlinx_qt_demo/matrix-browser
	Network Configuration	platform/forlinx/forlinx_qt_demo/network
	ping	platform/forlinx/forlinx_qt_demo/ping_test
		platform/forlinx/forlinx_qt_demo/qopenglwidget
	rtc	platform/forlinx/forlinx_qt_demo/rtc
	Spi	platform/forlinx/forlinx_qt_demo/spitest
	Serial test	platform/forlinx/forlinx_qt_demo/terminal
	Watchdog	platform/forlinx/forlinx_qt_demo/watchdog
	WiFi	platform/forlinx/forlinx_qt_demo/wifi
cmd-demo	Video Hardware Decoding	platform/forlinx/forlinx_cmd_demo/decoderTest
	Video Hardware Encoding	platform/forlinx/forlinx_cmd_demo/encoder_test
	Clear screen	platform/forlinx/forlinx_cmd_demo/fbinit_test
	GPADC	platform/forlinx/forlinx_cmd_demo/fltest_adc
	Backlight	platform/forlinx/forlinx_cmd_demo/fltest_backlight

continues on next page

Table 1 – continued from previous page

Source code path	
Key test	platform/forlinx/forlinx_cmd_demo/fltest_keytest
SPI Test	platform/forlinx/forlinx_cmd_demo/fltest_spidev_test
UART	platform/forlinx/forlinx_cmd_demo/fltest_uarttest
USB camera	platform/forlinx/forlinx_cmd_demo/fltest_usbcam
Watchdog	platform/forlinx/forlinx_cmd_demo/fltest_watchdog
ec20 4G	platform/forlinx/forlinx_cmd_demo/quectelCM
wifi	platform/forlinx/overlay_rootfs/usr/bin/fltest_wifi.sh
Wifi-ap	platform/forlinx/overlay_rootfs/usr/bin/fltest_hostap.sh
gpio	platform/forlinx/overlay_rootfs/usr/bin/fltest_gpio.sh
Desktop	platform/forlinx/overlay_rootfs/etc/init.d/S60Matrix_Browser

4.2 Source Code Compilation

4.2.1 Full Compilation

Full compilation refers to the unified compilation of source code, including kernel source code, library files, applications, file system packaging, and so on.

First select the configuration:

```
forlinx@ubuntu:~$ cd /home/forlinx/work/OKT527-linux-sdk //Enter_
↳ source code path
forlinx@ubuntu:~/work/OKT527-linux-sdk$ ./build.sh config //
↳ Execute configure commands
```

```
forlinx@ubuntu:~/work/OKT527-linux-sdk$ ./build.sh config
=====ACTION List: mk_config ;=====
options :
All available board:
 0. okt527
Choice [okt527]:
Setup BSP files
.
...
```

Run the compilation script for full compilation:

```
forlinx@ubuntu:~/work/OKT527-linux-sdk$ ./build.sh
```

Note: If compilation of qt_webengine stalls or results in errors, please switch to a more powerful host machine to run the virtual machine environment.

or:

Delete OKT527-linux-sdk1.3/out/t527/okt527/buildroot/buildroot/build/qt5webengine-5.15.8/ directory

And switch to OKT527-linux-sdk1.3/buildroot/buildroot-202205/package/qt5/qt5webengine directory

Modify the qt5web engine. mk films

```
**QT5WEBENGINE_ENV += NINJAFLAGS="-j32"**
```

modify to

```
**QT5WEBENGINE_ENV += NINJAFLAGS="-j8"**
```

```
define QT5WEBENGINE_CREATE_HOST_PYTHON_WRAPPER
    mkdir -p $(@)/host-bin
    sed $@HOST_DIR$$(HOST_DIR)%g $(QT5WEBENGINE_PKGDIR)/host-python-wrapper.in > $(@)/host-bin/python
    chmod +x $(@)/host-bin/python
endef
QT5WEBENGINE_PRE_CONFIGURE_HOOKS += QT5WEBENGINE_CREATE_HOST_PYTHON_WRAPPER

QT5WEBENGINE_ENV += NINJAFLAGS="-j32"
define QT5WEBENGINE_COPY_CHROMIUM
    rm -rf $(@)/src/3rdparty
    cp -a $(QT5WEBENGINE_CHROMIUM_DIR) $(@)/src/3rdparty
endef
QT5WEBENGINE_POST_PATCH_HOOKS += QT5WEBENGINE_COPY_CHROMIUM

define QT5WEBENGINE_CREATE_HOST_PKG_CONFIG
    mkdir -p $(@)/host-bin
    sed $@HOST_DIR$$(HOST_DIR)%g $(QT5WEBENGINE_PKGDIR)/host-pkg-config.in > $(@)/host-bin/host-pkg-config
    chmod +x $(@)/host-bin/host-pkg-config
endef
QT5WEBENGINE_PRE_CONFIGURE_HOOKS += QT5WEBENGINE_CREATE_HOST_PKG_CONFIG
QT5WEBENGINE_ENV += \
    GN_PKG_CONFIG_HOST=$(@)/host-bin/host-pkg-config \
    GN_HOST_TOOLCHAIN_EXTRA_CPPFLAGS="$(HOST_CPPFLAGS)"

QT5WEBENGINE_CONF_ENV = $(QT5WEBENGINE_ENV)
QT5WEBENGINE_MAKE_ENV = $(QT5WEBENGINE_ENV)

$eval $(qmake-package)
-- INSERT --
```

158,37

Continue to execute the build. sh to compile.

After the source code is compiled you need to generate an image to package the various files and configuration files generated by the compilation.

Execute the pack command to generate the image file:

```
forlinx@ubuntu:~/work/OKT527-linux-sdk$ ./build.sh pack
...
Dragon execute image.cfg SUCCESS !
-----image is at-----
655M      ~/work/OKT527-linux-sdk/out/t527_linux_okt527_uart0.img
pack finish
```

4.2.2 Individual Kernel Device Tree Compilation

Compile the kernel alone only for the kernel source code to compile, affecting the driver, applicable to only modify the kernel to compile.

After selecting the configuration according to the previous method:

```
forlinx@ubuntu:~$ cd /home/forlinx/work/OKT527-linux-sdk
forlinx@ubuntu:~/work/OKT527-linux-sdk$ ./build.sh kernel          //
↳ Execute compile kernel command
...
Copy modules to target ...
15985 blocks
28830 blocks
bootimg_build
Copy boot.img to output directory ...

sun5iw3p1 compile all(Kernel+modules+boot.img) successful
```

(continues on next page)

(continued from previous page)

...

```
forlinx@ubuntu:~/work/OKT527-linux-sdk$ ./build.sh pack
```

4.2.3 Individual Test Program Compilation

When modifying the test program separately, you can compile only the test program to reduce the amount of compilation.

```
forlinx@ubuntu:~$ cd /home/forlinx/work/OKT527-linux-sdk
forlinx@ubuntu:~/work/OKT527-linux-sdk$ source .buildconfig          //
↳ Configuration before compilation
forlinx@ubuntu:~/work/OKT527-linux-sdk$ ./platform/forlinx/build.sh
```

4.2.4 Individual U-Boot Compilation

Compile uboot separately using the following command.

```
forlinx@ubuntu:~/work/OKT527-linux-sdk$ ./build.sh brandy
forlinx@ubuntu:~/work/OKT527-linux-sdk$ ./build.sh pack
```

Note: The content of uboot is not open source, and it will report an error when compiled separately. Just ignore it.

4.2.5 Individual Filesystem Compilation

During the full compilation process, the file system will not be compiled and needs to be modified and compiled separately. Enter the file system directory to compile and configure modifications.

The compilation instructions are as follows, using the compile script in the buildroot-202205.

```
forlinx@ubuntu:~/work/OKT527-linux-sdk/buildroot/buildroot-202205$ ./build.sh
```

If you want to modify the configuration, you can do so as follows. Use the above instructions to compile after the modification is completed.

```
forlinx@ubuntu:~/work/OKT527-linux-sdk/buildroot/buildroot-202205$ make OKT527-C-
↳ Linux_defconfig ARCH=arm64                                //Read the_
↳ current configuration
forlinx@ubuntu:~/work/OKT527-linux-sdk/buildroot/buildroot-202205$ make_
↳ menuconfig        //Enter the graphic configuration interface to modify the_
↳ configuration
forlinx@ubuntu:~/work/OKT527-linux-sdk/buildroot/buildroot-202205$ cp ../../out/t527/
↳ okt527/buildroot/.config configs/OKT527-C-Linux_defconfig      /
↳ /Save the modified content as the default configuration
```

4.2.6 OKT527-linux-sdk Clearance

This operation clears all intermediate files. However, it does not affect the source files, including those that have already had changes made to them.

```
forlinx@ubuntu:~$ cd /home/forlinx/work/OKT527-linux-sdk
forlinx@ubuntu:~/work/OKT527-linux-sdk$ ./build.sh clean //  
→ Execute the clear command
```

4.2.7 Boot Logo Replacement

Replace device/config/chips/t527/boot-resource/boot-resource/bootlogo.bmp

The image is in bmp format, 720x480 resolution, with the file name “bootlogo.bmp” .

Repackage the image

```
forlinx@ubuntu:~/work/OKT527-linux-sdk$ ./build.sh pack
```

4.2.8 Individual Development Board Firmware Update

After compiling the image, uboot, device tree, and kernel can be updated separately, and uboot, device tree file boot _ package. fex, and kernel file boot. fex can be copied from the out/pack _ out/.

Here, a USB drive is used for testing, with files placed on the USB drive and mounted to/run/media/sda1/. You can also transfer files to the development board through the network port

Uboot and device tree updates

```
dd if=/run/media/sda1/boot_package.fex of=/dev/mmcblk0 seek=32800
dd if=/run/media/sda1/boot_package.fex of=/dev/mmcblk0 seek=24576
```

Kernel update

```
dd if=/run/media/sda1/boot.fex of=/dev/mmcblk0p3 conv=fsync
```

The entire file system update is not supported for the time being. If necessary, the required files can be transferred by U disk or SSH.

4.3 Qt Configuration and Use

The OKT527-linux-sdk1.3.tar.bz2 provided by Forlinx offers a complete development dependency environment for Qt 5.15.8. The development environment has already installed Qt Creator 5.12.9. Please set up the Qt Creator 5.15.8 environment on your own by following the methods described previously.

4.3.1 OKT527-linux-sdk Installation

Please refer to Chapter 3 for SDK installation and full compilation.

4.3.2 Qt Creator Environment Configuration

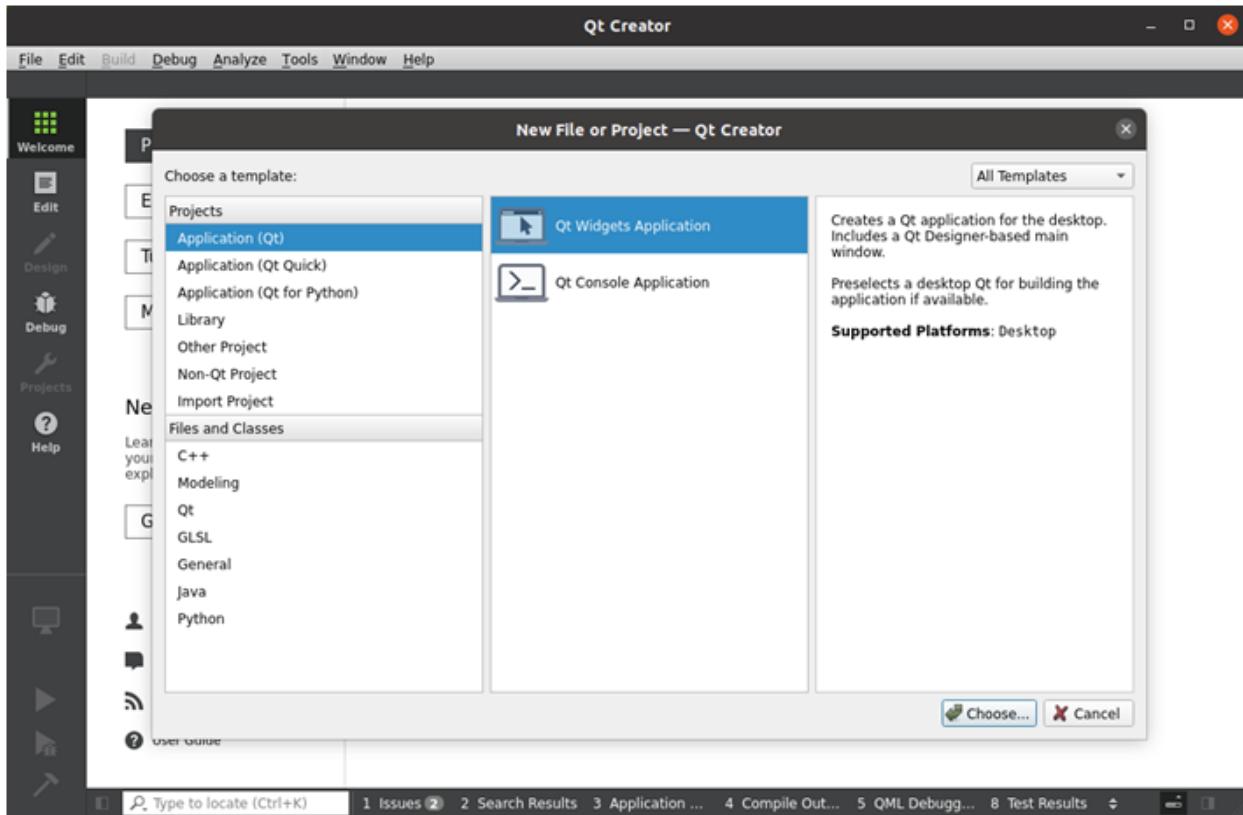
Please refer to Chapter 3. for installation and configuration.

4.3.3 Qt Creator Development Examples

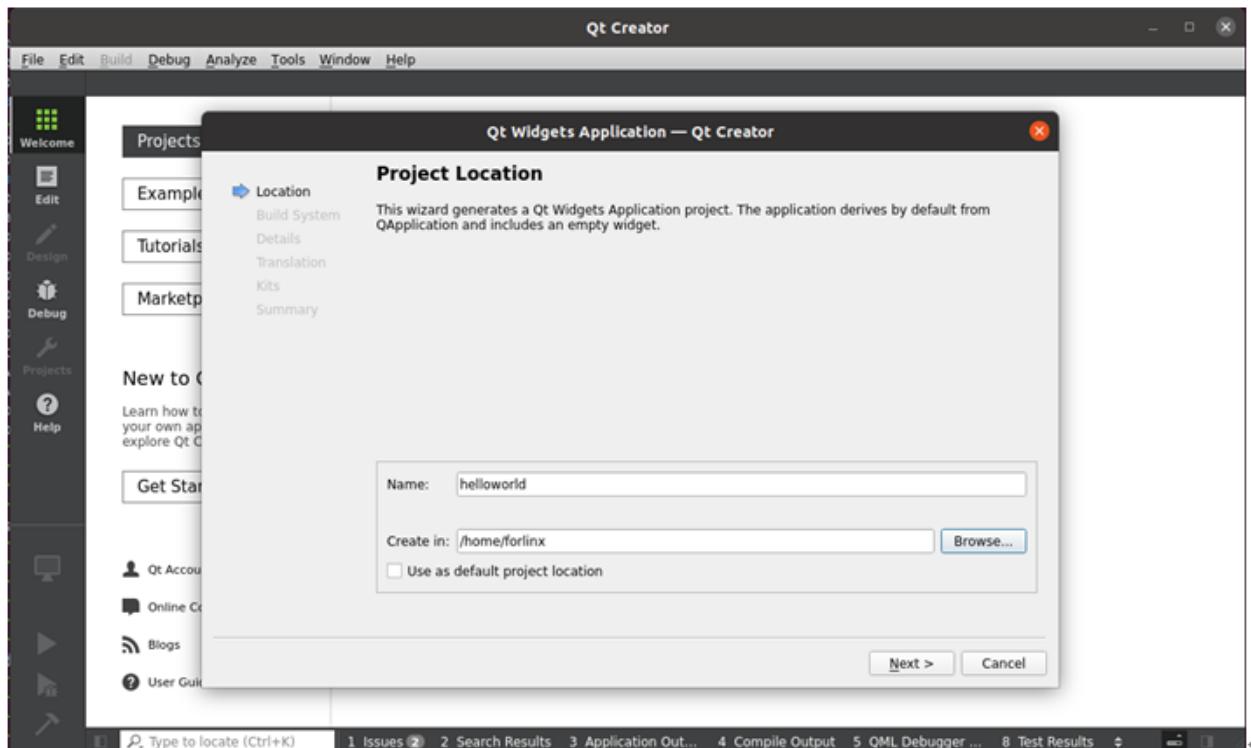
Open the Qt Creator software.

```
forlinx@ubuntu:~$ cd /home/forlinx/Qt5.12.9/Tools/QtCreator/bin/
forlinx@ubuntu:~/qtcreator-4.7.0/bin$ sudo ./qtcreator
```

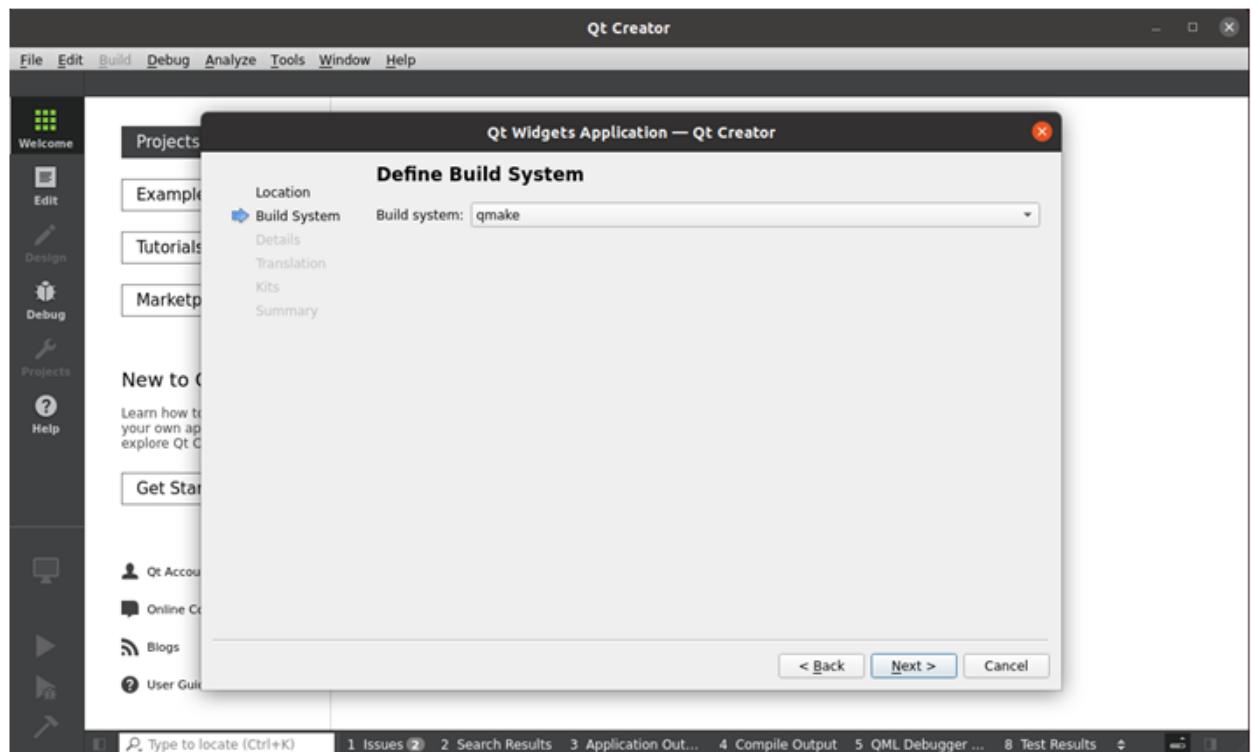
Start the Qt Creator program, enter the Qt Creator interface, click “File” -> “New File or Project” to create a new project, select “Application (Qt)” -> “Qt Widgets Application”, then click “Choose” in the right corner. Application (Qt)” -> “Qt Widgets Application”, then click “Choose” in the lower right corner:



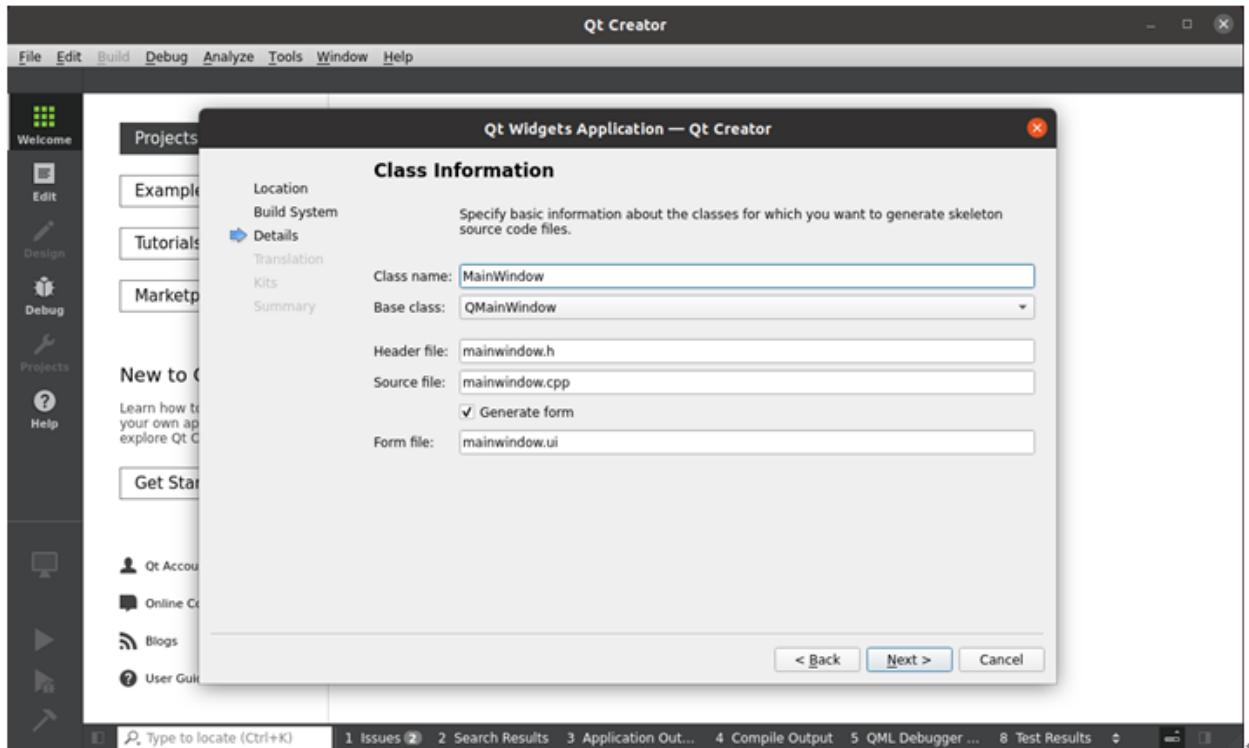
In the following interface, change the name of the new project to “helloworld”, select the installation path /home/forlinx, and then click “Next” :



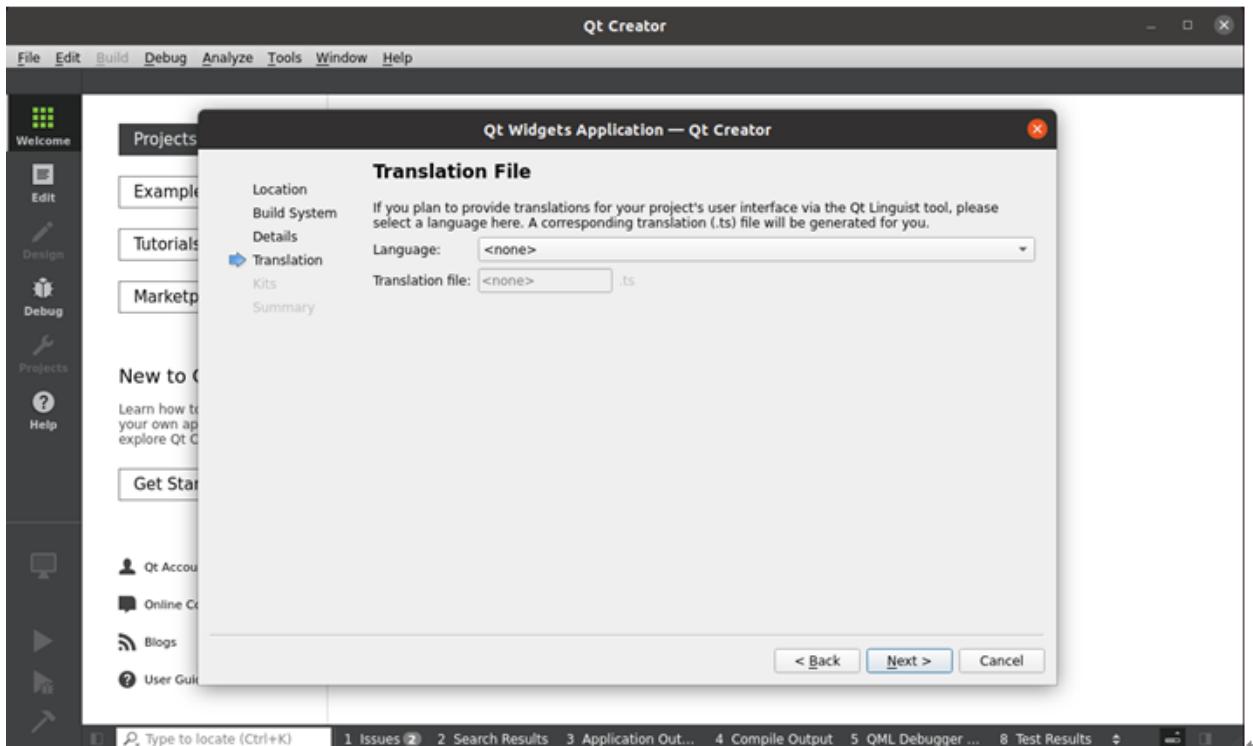
Select qmake and click “Next” to continue.



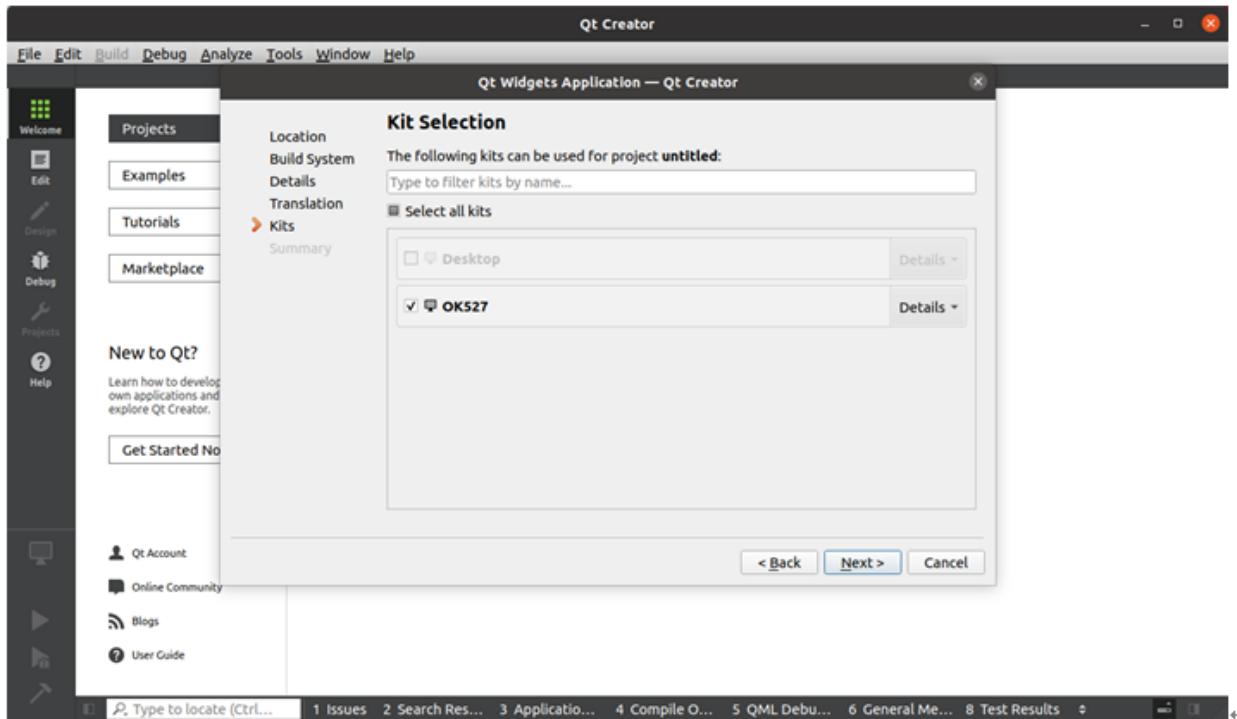
In the following interface, you can modify the Class name and Base class as required. The default is used here, and then click “Next” :



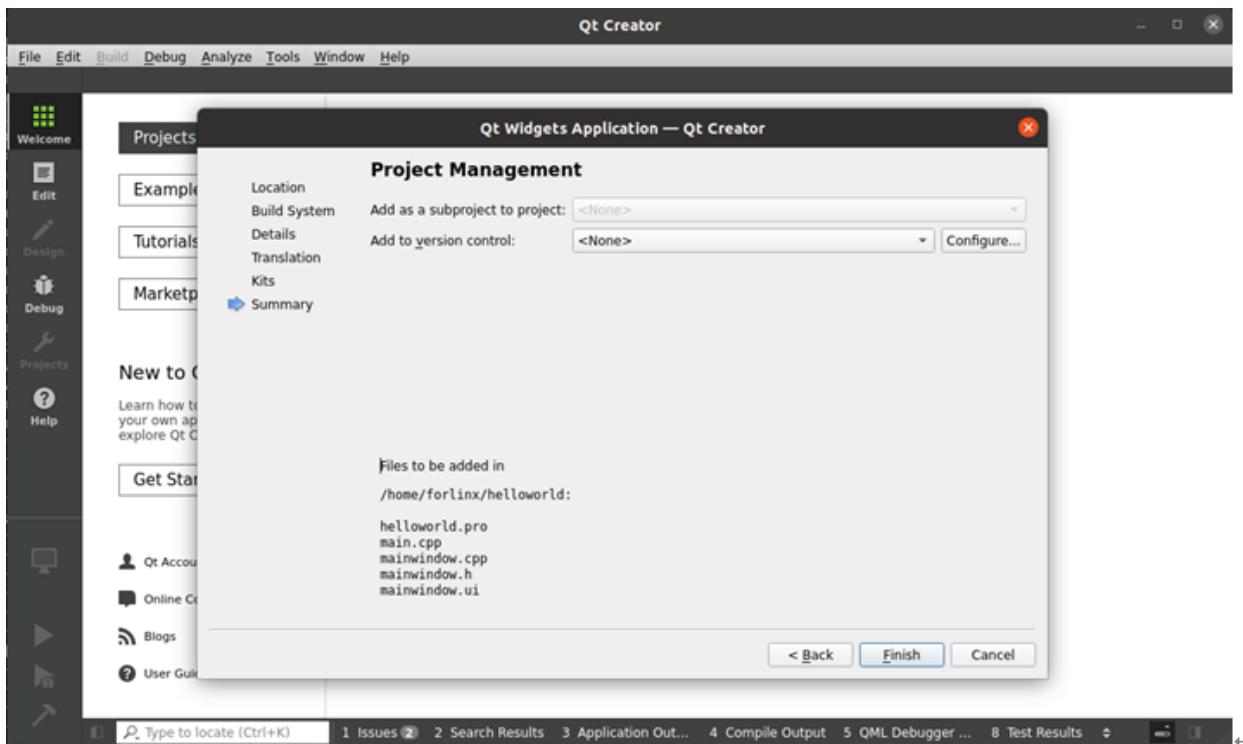
Translation files can be selected, and languages can be selected if there is a need for multi-language support. Use the default here and click “Next” :



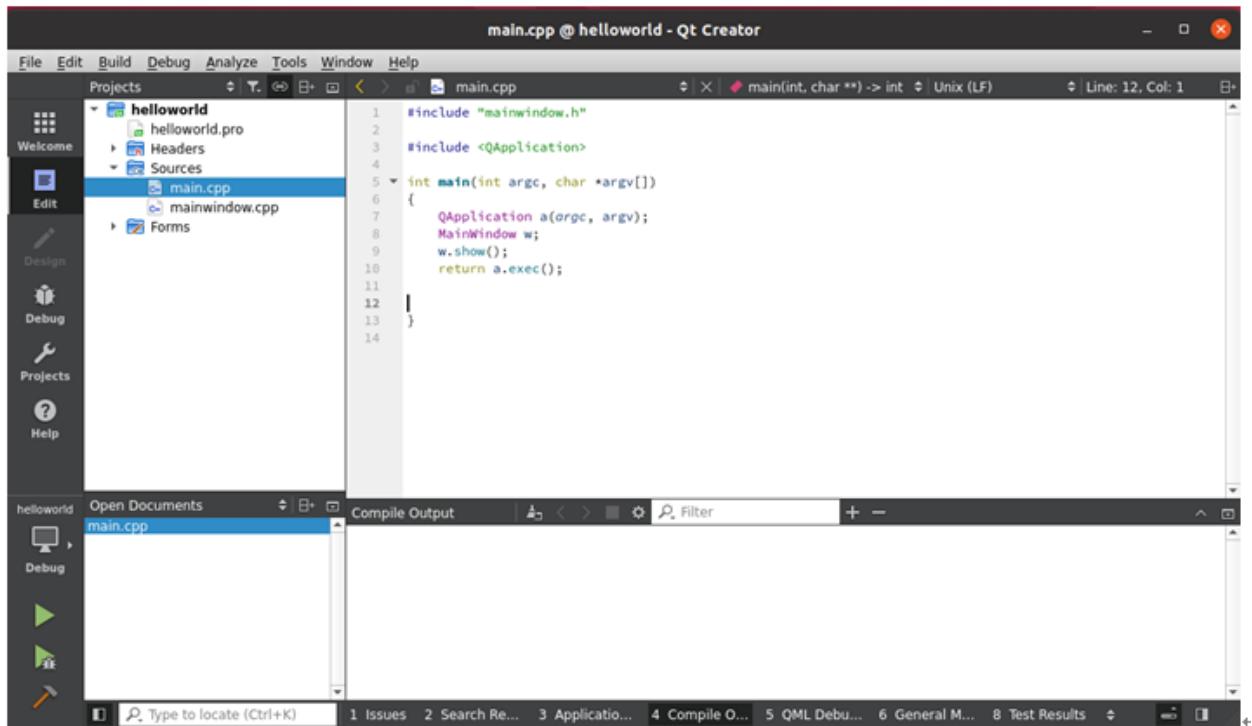
In the following screen, select “OK527” as the kit of the current project, and then click “Next” :



In the following interface, click “Finish” to complete the new project:



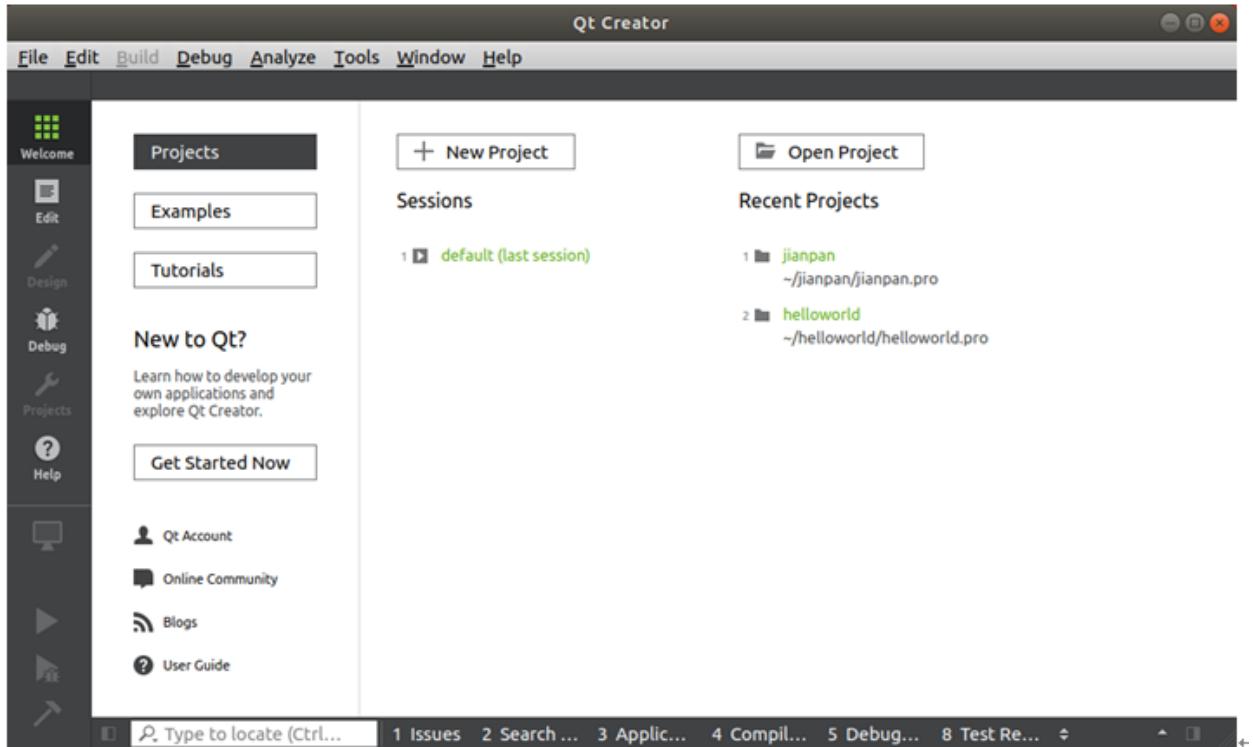
When the creation of the new project is complete, the following window can be displayed:



When the program is written, click the hammer icon in the lower left corner to cross-compile and copy the compiled executable program to the development board to test the application.

4.3.4 Qt Creator FQA

Open the Qt Creator integrated development environment from the command line or through a shortcut. Once launched, you will see a interface similar to the one below:



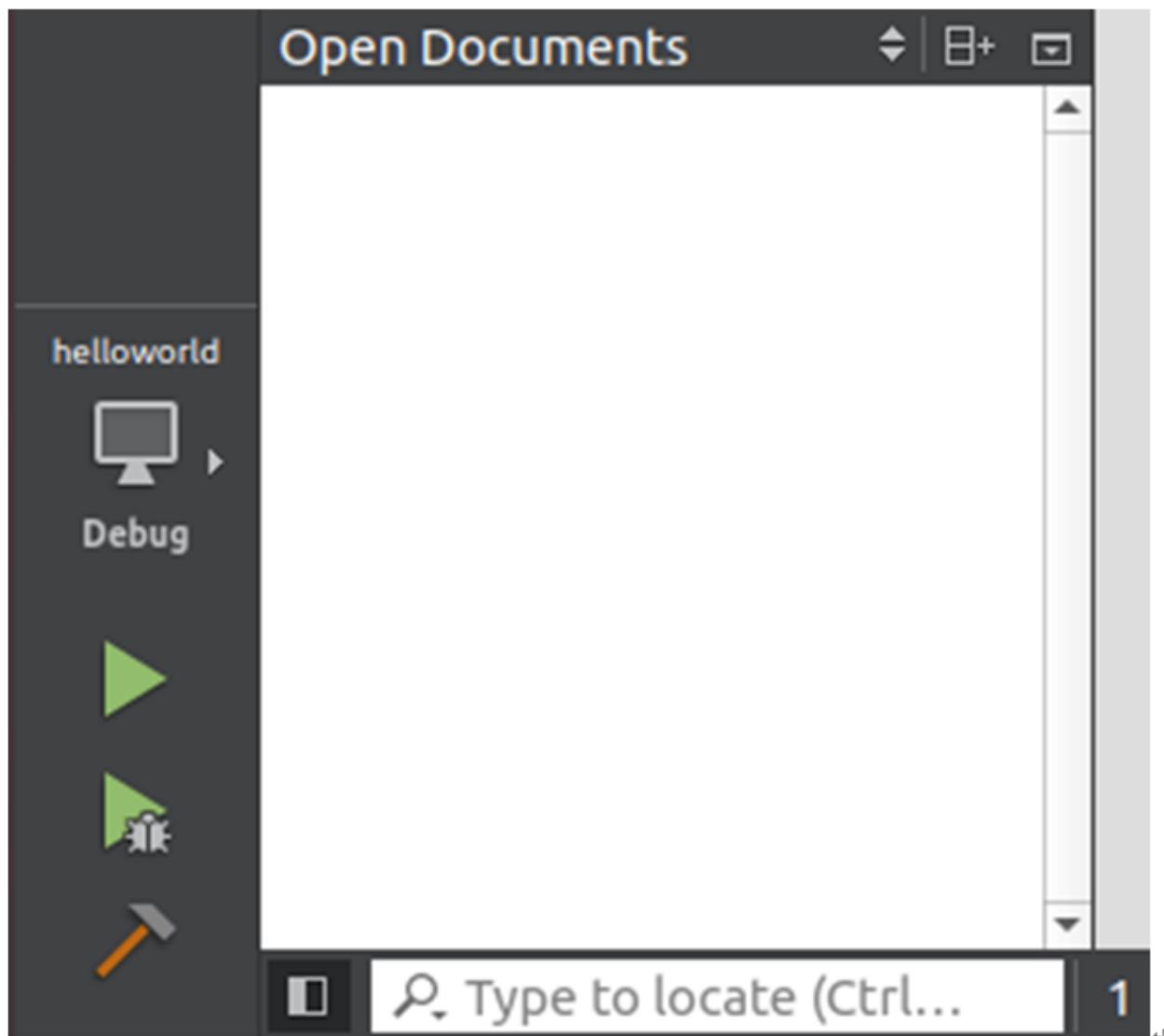
The “Design” button, “Project” button, and the “Build and Debug” area on the left side will only become available after opening or creating a project.

There are the positioning tools and output panes underneath the QtCreator, which are used when writing project code , running and debugging programs. There are seven output panes: Issues (problems with the project build), Search Results (searches for the contents of the project file), Application Output (display of runtime and debugging information), Compile Output (compilation and linking commands and their output information), QML/JS Console (the QML command window), Summary Information (a summary of the project’ s information), and Version Control (a system of control of the version.)

1. Click the hammer button in the lower left corner and find that there is no compilation information. The solution is as follows:

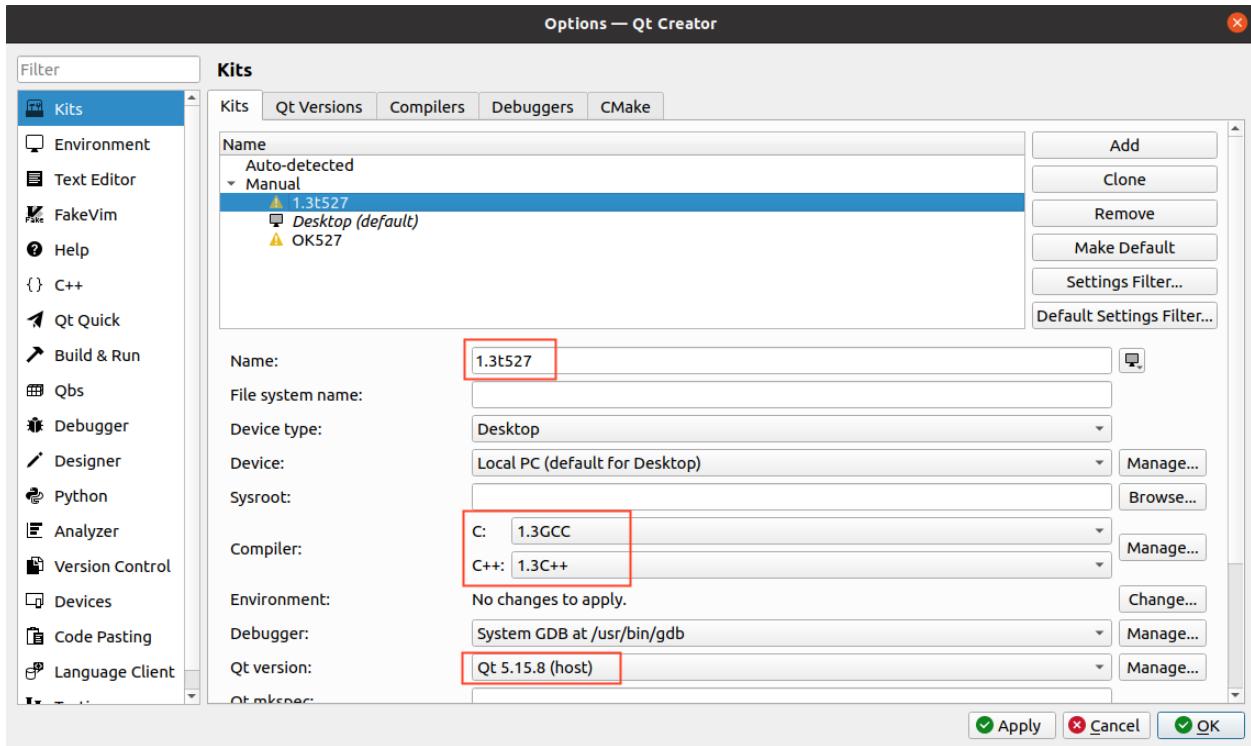
By default, the selected output pane is 1 (Issues) for viewing. If you need to check the compilation information, you will need to select 4 (Compile Output) in the output pane location.

Build Debugging



2. The solution to the issue of the gray debug/run button in Qt Creator is as follows:

This problem occurs because there is a problem configuring the C, C++ and Qt versions in the kits suite, maybe there is a problem with the paths, maybe you haven't done a full compilation, just change the editor language.



Please check if the cross-compiler path configuration in the checkbox is correct.

For the specific configuration method, refer to the chapter “[3.4 Configuration of Qt Compilation Environment](#)” .

APPLICATION NOTE

3.1 Quick Boot

Document classification: Top secret Secret Internal information Open

3.1.1 Copyright

The copyright of this manual belongs to Baoding Folinx Embedded Technology Co., Ltd. Without the written permission of our company, no organizations or individuals have the right to copy, distribute, or reproduce any part of this manual in any form, and violators will be held legally responsible.

Forlinx adheres to copyrights of all graphics and texts used in all publications in original or license-free forms.

The drivers and utilities used for the components are subject to the copyrights of the respective manufacturers. The license conditions of the respective manufacturer are to be adhered to. Related license expenses for the operating system and applications should be calculated/declared separately by the related party or its representatives.

3.1.2 Application Scope

This note is primarily applicable to the Linux 5.15 operating system on the Forlinx OKT527-C platform. Other platforms can also refer to it, but there may be differences between platforms, requiring modifications according to your actual requirements.

3.1.3 Methods for Quick Boot

The quick boot of T527 generally involves modifications to parts such as U-Boot environment variables and the kernel.
(1) Optimization of U-Boot Quick Boot

Modify the U-Boot environment variables. Change the delay bootdelay to 0 seconds to eliminate the waiting time for entering the U-Boot menu.

Open the following file:

device/config/chips/t527/configs/okt527/longan/env.cfg

Find bootdelay = 1 and change it to bootdelay = 0.

```
#uboot system env config
bootdelay=0 //Default delay is 1 s, change to 0
```

Turn off the boot0 debug information printing. Modify the following file:

device/config/chips/t527/configs/okt527/sys_config.fex
modify debug_mode to 0

```
[product]
version = "527"
machine = "okt527"

[platform]
eraseflag = 0
debug_mode = 0                                //Default is 1 s, change to 0
```

(2) Optimization of Kernel Quick Boot

Reduce the collection of kernel printing information.

Open the following file:

kernel/linux-5.15/drivers/char/random.c

Change CRNG_READY in the last line of the following code to CRNG_EMPTY.

```
static enum {
    CRNG_EMPTY = 0, /* Little to no entropy collected */
    CRNG_EARLY = 1, /* At least POOL_EARLY_BITS collected */
    CRNG_READY = 2 /* Fully initialized with POOL_READY_BITS collected */
} crng_init __read_mostly = CRNG_EMPTY;
#define crng_ready() (likely(crng_init >= CRNG_EMPTY))           //默认为 CRNG_READY, 改为
CRNG_EMPTY
```

Modify the serial port printing priority.

Open the following file:

device/config/chips/t527/configs/okt527/longan/env.cfg

Modify loglevel to 0

```
init=/init
loglevel=0                                     //Default is 8 s, change to 0
selinux=0
```

(3) Optimization of File System Startup

Trim unnecessary services that start automatically at boot to reduce the startup time.

Open the following file:

buildroot/buildroot-202205/package/allwinner/post_build.sh

Delete the /etc/preinit service by commenting out the following 7 lines.

```
add_preinit_to_inittab() {
    if [ -e ${TARGET_DIR}/etc/inittab ]; then
        #insert preinit
        grep "::sysinit:/etc/preinit" ${TARGET_DIR}/etc/inittab >/dev/null
        if [ $? -eq 0 ]; then
            echo "preinit is already in inittab!"
        else
            echo "preinit is not in inittab, add it!"
            sed -i '/Startup the system/a ::sysinit:/etc/preinit' ${TARGET_DIR}/etc/inittab
        fi
        #commented ttyS0, insert /bin/sh
```

You can also delete unnecessary services, such as the Bluetooth service. Delete platform/forlinx/overlay_rootfs/etc/init.d/S40nxp, or rename it to 40nxp so that this service will not start.

After the modifications are completed, save the changes and exit. Then perform a full compilation, package the image, and burn it to the board. After making the above modifications, the boot test shows that the device can start up in about 7 - 8 seconds.

3.2 Display Interface

Document classification: Top secret Secret Internal information Open

3.2.1 Copyright

The copyright of this manual belongs to Baoding Folinx Embedded Technology Co., Ltd. Without the written permission of our company, no organizations or individuals have the right to copy, distribute, or reproduce any part of this manual in any form, and violators will be held legally responsible.

Forlinx adheres to copyrights of all graphics and texts used in all publications in original or license-free forms.

The drivers and utilities used for the components are subject to the copyrights of the respective manufacturers. The license conditions of the respective manufacturer are to be adhered to. Related license expenses for the operating system and applications should be calculated/declared separately by the related party or its representatives.

3.2.2 Application Scope

This manual is primarily applicable to the Forlinx OKT527 platform running Linux5.15. It can be used as a reference for other platforms, but differences between platforms may exist, and customers will need to modify it to suit their own use.

3.2.3 Debugging of MIPI Screen Initialization Sequence

This test is based on the user materials of OK527 - C & OK527N - C_Linux5.15.147 + Qt5.15.8. The old BSP does not support this modification.

3.2.4 Introduction

For T527 screen debugging, the U - Boot device tree and the kernel device tree need to be modified respectively. Currently, the U - Boot source code is not open - sourced. You can first debug the kernel. After the kernel works normally, contact us to debug the U - Boot.

device/config/chips/t527/configs/okt527/uboot-board.dts

kernel/linux-5.15/arch/arm64/boot/dts/allwinner/OKT527-C-Common.dtis

Adjusting the parameters of the MIPI screen is not very different from other screens. You need to configure the pins, backlight, and screen parameters. Only some MIPI screens need to add an initialization sequence.

3.2.5 Modification Method

Take the kernel device tree as an example, and the same applies to the U - Boot device tree.

```
&dsi0 {
    status = "disabled";
    pinctrl-0 = <&dsi0_4lane_pins_a>;           //Configure pins
    pinctrl-1 = <&dsi0_4lane_pins_b>;           //Configure pins
    pinctrl-names = "active", "sleep";
```

(continues on next page)

(continued from previous page)

```

panel: panel@0 {
    compatible = "allwinner,virtual-panel";
    status = "okay";
    reg = <0>;
    power0-supply = <&reg_cldo3>;
    power1-supply = <&reg_dcdo4>;
    power2-supply = <&reg_cldo1>;

    backlight = <&backlight0>;           //Backlight configuration. Note_
    ↪that the backlight enable pin PI12 needs to be commented out.
    ↪           //Or replace it with the actually used pin, as there is a discrepancy_
    ↪here with the hardware.

    power-delay-ms = <0>;
    reset-delay-ms = <0>;
    ↪                           //Reset pin delay
    enable-delay-ms = <0>;
    reset-gpios = <&pio PI 12 GPIO_ACTIVE_HIGH>;           //Configure the screen's_
    ↪reset pin, and remap the backlight enable pin to this location according to the_
    ↪hardware design.
    width-mm = <68>;
    ↪                           //
    ↪Screen width
    height-mm = <121>;
    ↪                           //Screen_
    ↪height

    dsi,flags = <(MIPI_DSI_MODE_VIDEO | MIPI_DSI_MODE_VIDEO_BURST | MIPI_DSI_MODE_>;
    ↪NO_EOT_PACKET>;
    dsi,format = <0>; //<MIPI_DSI_FMT_RGB888>;
    dsi,lanes = <4>;           //Lane number configuration
    panel-init-sequence = [      //Initialization sequence
        ];
    // panel-exit-sequence = [      //Close the sequence, some screens require
    //     ];

    display-timings {
        native-mode = <&dsi_timing0>

        dsi_timing0: timing0 {           //Screen parameter configuration
            hback-porch      = <48>;
            hfront-porch     = <40>;
            hactive          = <1024>;
            hsync-len         = <48>;
            vback-porch      = <48>;
            vfront-porch     = <40>;
            vactive          = <600>;
            vsync-len         = <4>;
            clock-frequency  = <45000000>;
            vsync-active      = <0>;
            hsync-active      = <0>;
            de-active         = <0>;
        }
    }
}

```

(continues on next page)

(continued from previous page)

```
pixelclk-active = <0>;
};

};
```

The above is the content of DSI. The initialization sequence needs to be filled in according to Allwinner's defined logic. Generally, the initialization provided by the screen manufacturer is added in the driver. So the format is generally as follows:

```
#if 1 //zheng shao
SPI_WriteComm(0xFF);
SPI_WriteData(0x77);
SPI_WriteData(0x01);
SPI_WriteData(0x00);
SPI_WriteData(0x00);
SPI_WriteData(0x10);

SPI_WriteComm(0xC0);
SPI_WriteData(0x3B);
SPI_WriteData(0x00);
... ...
//Part of the content
//is omitted
SPI_WriteComm(0x11);

Delay(120);

SPI_WriteComm(0x29);

SPI_WriteComm(0x36);
SPI_WriteData(0x00);

SPI_WriteComm(0x3A);
SPI_WriteData(0x60);
#endif
```

After modification, it should be:

```
39 00 06 FF 77 01 00 00 10
39 00 03 C0 3B 00
...
//Part of the content is omitted
05 78 01 11
05 00 01 29
15 00 02 36 00
15 00 02 3A 60
```

The original data format is: Write several data sequentially at a certain address.

The new data format is: [Packet type][Sending delay][Data length][*n MIPI screen initialization data] // Hexadecimal numbers

Packet type: When the length of the written data is 1, 2, 3, and above, it is 05, 15, 39 respectively.

Sending delay: Fill in 00 when there is no delay. If there is a delay, convert it to a hexadecimal number. For example, the above - mentioned delay of 120 corresponds to 78.

Data length: It refers to the number of bytes of the original address and data. For example, in the first group, 0x77 0x01 0x00 0x00 0x10 are written sequentially at 0xff, a total of 5 bytes, so the total is 6 bytes.

Initialization data: Fill in the address and data of the original data.

Some original data are in the following format, which are arranged according to the address, the number of data, and the data value.

```
{0x9B,12,{0x03,0x6A,0x03,0x7F,0x03,0x96,0x03,0xB7,0x03,0xDF,0x03,0xFF} },  
{0x36,1,{0x0A} } ,  
{0x11,0,{0x00} } ,  
{REGFLAG_DELAY, 120, {} } ,
```

Similarly, count the address and the number of data, determine the delay, and fill them in according to Allwinner's format.

```
39 00 0d 9b 03 6a 03 7f 03 96 03 b7 03 df 03 ff  
15 00 02 36 0a  
05 78 01 11
```

Fill all the initialization sequences into the device tree according to the above - mentioned format. After modifying other screen parameters, compile and test the display of the MIPI screen.

If there is still no display, check the backlight, measure the pin waveforms of the MIPI screen, and confirm that the initialization sequence is written successfully. If the screen shows a garbled image, adjust the screen parameters.

**CHAPTER
FOUR**

CONTACT US

If you have any questions, please contact us at:

- **Contact Sales:** sales@forlinx.com
 - **Technical Support:** support@forlinx.com
 - **Website:** www.forlinx.net
-

Thank you for choosing Forlinx Embedded. We're committed to supporting your development journey.
